

# TELEPHONE INSTRUMENT MAINTENANCE MANUAL



**ITT** KELLOGG TELECOMMUNICATIONS DIVISION  
FULTON DRIVE • CORINTH, MISSISSIPPI

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INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION

**INTRODUCTION**

**TELEPHONE MAINTENANCE  
MANUAL**

The present Manual is a comprehensive compilation of all the necessary engineering information for the field maintenance of the ITT-Kellogg range of standard production telephone instruments and component parts.

The Manual is produced in loose leaf form in order to facilitate the inclusion of additional sheets on new equipment, as they are issued, and revised sheets as required by improvements and changes in design.

A complete list, which will be revised periodically, of all sub-sections in the Manual is given, in both alphabetical and numerical form, on the following two pages. For convenience of reference, the Manual is divided into three sections. Section 1 provides general information, such as code numbering, and installation and maintenance data. Section 2 provides specific information on the various component parts of telephone instruments and Section 3 provides details on each individual type of telephone instrument.

The sub-sections of the Manual are double indexed for convenience. The primary index is provided by the number at the top outer corner of each page (such as M2C-RIN/GEN), the sheets being filed alphabetically or numerically in each section. The secondary index is provided by the quick reference markings at the edge of each sheet. Single, double and triple marks are used for sections 1, 2 and 3, respectively. The marks in each case line up with those on the summarized index sheet at the beginning of each section.

**SUB-SECTION INDEX**

This sub-section provides a complete listing of all material covered by the completed pages of the Telephone Manual. Page 1 provides an alphabetical index to all sub-sections while page 2 gives a full

list, in numerical order and complete with issue numbers, of the sub-sections issued to date. This index will be re-issued, periodically, as the issue or re-issue of sub-sections makes changes necessary.

**ALPHABETICAL LISTING**

Equipment	Number	Equipment	Number
Bell; Type 75 Loud Ringing Type 139 Extension (also see Ringer)	M2C-RIN/75 M2C-RIN/139	<b>Instruments; cont'd.</b>	
Cleaning	M1C-LUB	Without Dial and Night Light	M3A-703/30
Codes; Color	M1A-COL	Without Dial and Night Light, With Message Waiting Light	M3A-703/37 /38
Numbers, Telephone Instrument	M1A-NUM	Paystation Telephone, Prepay	M3B-581/30
Common Audible Signal Unit	M2C-RIN/144	Wall Type, K-554 Series Telephones	M3A-554/SER
Compact Desk Telephones (K-700)	<b>see Instruments</b>	Without Special Features	M3A-554/30
Cradle Switch; Assemblies	M2H-CRS-1	With Lift-to-Talk Feature	M3A-554/33
Spring Assemblies	M2H-CRS-2	With Separate Ringing Circuit	M3A-554/35
Desk Telephones	<b>see Instruments</b>	Key, Switch Assemblies	M2H-KYS-1
Dials; Telephone Instrument	M2A-DLS/GEN	Turn and Push, Assembly	M2H-TPK-1
Type 19	M2A-DLS/19	Key Telephones	<b>see Instruments</b>
Type 24	M2A-DLS/24	Lubrication	M1C-LUB
Type 28	M2A-DLS/28	Network, Type 75335-1	M2B-75335-1
Testers	M1C-TST/DLS	Type 190107	M2B-190107
<b>Handset;</b> Type 65	M2G-65	Paystation Telephones;	<b>see Instruments</b>
Type 69	M2G-69	Receiver, Type 75547	<b>see Handset</b>
Hook Switch; Assemblies	M2H-HKS-1	Ringer, Telephone Service	<b>Sub-sections</b>
Installation; Data	M1B-INST	Straight Line, Type 130	M2C-RIN/GEN
<b>Instruments;</b>		Type 136/138	M2C-RIN/130
Desk Type, K-500 Series Telephones	M3A-500/SER	Type 79938	M2C-RIN/136 /138
Without Special Features	M3A-500/30	Freq. Select. Type 131/133	M2C-79938
With Dial Light	M3A-500/31	Type 137	M2C-RIN/131 /133
With Dial and Night Light	M3A-500/32	Type 79939	M2C-RIN/137
With Lift-to-Talk Feature	M3A-500/33	Loud Ringing Bell	M2C-79939
With PBX Push Button	M3A-500/34	Extension	M2C-RIN/75
With Separate Ringing Circuit	M3A-500/35	Common Audible Signaling Unit	M2C-RIN/139
With Message Waiting Light	M3A-500/37 /38	Tester	M2C-RIN/144
With Exclusion Switch	M3A-502/30	Switch, Assemblies, Cradle	M1C-TST/RIN
With Two Line Switch	M3A-510/30 /36	Spring Assemblies, Cradle	M2H-CRS-1
With Two Line and Hold Feature	M3A-575/30 /36	Assemblies, Hook	M2H-CRS-2
With Exclusion Switch	M3A-502/30	Assemblies, Key	M2H-HKS-1
With Two Line Feature	M3A-510/30 /36	Assemblies, Key	M2H-KYS-1
Desk Type, KEY Series Telephones	M3C-KEY/SER	Assemblies, Plunger	M2H-PLS-1
4 Key, 3 Line Instrument	M3C-544/30	Assemblies, Turn and Push Key	M2H-TPK-1
6 Key, 5 Line Instrument	M3C-564/30	Telephone Instruments	<b>see Instruments</b>
With Amphenol Plug	/40	Test Equipment	M1C-TEQ
6 Key, 5 line w/Exclusion sw. with Amphenol Plug	M3C-565/30 /40	Tester, Dial	M1C-TST/DLS
For use with 3A Speakerphone with Amphenol Plug	M3C-565/39 /42	Ringer	M1C-TST/RIN
With Three Line and Hold Feature	M3C-576/30	Tools	M1C-TEQ
Desk Type, K-700 Series Telephones	M3A-700/SER	Transmitter, Type 75555	<b>see Handset</b>
With Dial and Night Light	M3A-701/30	Holder Type 75384	<b>Sub-sections</b>
With Dial and Night Light and Message Waiting Light	M3A-701/37 /38	Trouble Shooting	M1C-TRB
		Wall Telephones	<b>see Instruments</b>

**NUMERICAL LISTING**

GENERAL

SECTION 3

Title	Number	Issue
Introduction	M-INT	1
Section Index	M-IND	2

Title	Number	Issue
Index, Instruments	M3-IND	1

SECTION 1

Title	Number	Issue
Index, General Information	M1-IND	1
Color Codes	M1A-COL	1
Telephone Instrument Code Numbers	M1A-NUM	1
Installation Data	M1B-INST	1
Lubrication and Cleaning	M1C-LUB	1
Tools and Test Equipment	M1C-TEQ	1
Trouble Shooting	M1C-TRB	1
Dial Testers	M1C-TST/DLS	1
Ringer Testers	M1C-TST/RIN	1

K-500 Series Desk Type Telephones	M3A-500/SER	1
Type 500--(--)-30- Desk Telephone	M3A-500/30	1
Type 500--(--)-31- Desk Telephone	M3A-500/31	1
Type 500--(--)-32- Desk Telephone	M3A-500/32	1
Type 500--(--)-33- Desk Telephone	M3A-500/33	1
Type 500--(--)-34- Desk Telephone	M3A-500/34	1
Type 500--(--)-35- Desk Telephone	M3A-500/35	1
Type 500--(--)-37- and 500--(--)-38- Desk Telephones	M3A-500/37/38	1
Type 502--(--)-30- Desk Telephone	M3A-502/30	1
Type 510--(--)-30- and 510--(--)-36- Desk Telephones	M3A-510/30/36	1

SECTION 2

Title	Number	Issue
Index, Components	M2-IND	1
Telephone Instrument Dials	M2A-DLS/GEN	1
Type 19--(-)-450 Dial	M2A-DLS/19	1
Type 24(-)-450 Dial	M2A-DLS/24	1
Type 28--(-)-450 Dial	M2A-DLS/28	1
Type 75335-1 Network	M2B-75335-1	1
Type 190107 Network	M2B-190107	1
Telephone Service Ringers	M2C-RIN/GEN	1
Type 75(--)-470 Ringer	M2C-RIN/75	1
Type 130(--)-470 Straight Line Rngr.	M2C-RIN/130	1
Type 131(--)-470 and 133(--)-470 Frequency Selective Ringers	M2C-RIN/131/133	2
Type 136(--)-470 and 138(--)-470 Straight Line Ringers	M2C-RIN/136/138	1
Type 137(--)-470 Freq. Sel. Rngrs.	M2C-RIN/137	2
Type 139(--)-470 Extension Ringer	M2C-RIN/139	1
Type 144(--)-470 Com.Aud.Sig. Unit	M2C-RIN/144	1
Type 79938 Straight Line Rngr. Mech.	M2C-79938	1
Type 79939 Freq. Sel. Rngr. Mech.	M2C-79939	2
Type 65--(--)-410 Handset	M2G-65	1
Type 69--(--)-410 Handset	M2G-69	1
Cradle Switch Assemblies	M2H-CRS-1	1
Cradle Switch Spring Assemblies	M2H-CRS-2	1
Hook Switch Assemblies	M2H-HKS-1	1
Key Switch Assemblies	M2H-KYS-1	1
Plunger Switch Assemblies	M2H-PLS-1	1
Turn and Push Key Assemblies	M2H-TPK-1	1

K-554 Series Wall Type Telephones	M3A-554/SER	1
Type 554--(--)-30- Wall Telephone	M3A-554/30	1
Type 554--(--)-33- Wall Telephone	M3A-554/33	1
Type 554--(--)-35- Wall Telephone	M3A-554/35	1
Type 558--(--)-30- Wall Telephone	M3A-558/30	1
Type 575--(--)-30- and 575--(--)-36- Desk Telephones	M3A-575/30/36	1
K-700 Series Desk Type Telephones	M3A-700/SER	1
Type 701--(LR)-30- Desk Telephone	M3A-701/30	1
Type 701--(LR)-37- and 701--(LR)-38- Desk Telephones	M3A-701/37/38	1
Type 703--(LR)-30- Desk Telephone	M3A-703/30	1
Type 703--(LR)-37- and 703--(LR)-38- Desk Telephones	M3A-703/37/38	1
Type 581--(--)-30- Prepay Paystation Telephone	M3B-581/30	1
Key Series Desk Type Telephones	M3C-KEY/SER	1
Type 544--(--)-30- Desk Telephone	M3C-544/30	1
Type 564--(--)-30- and 564--(--)-40- Desk Telephones	M3C-564/30/40	1
Type 565--(--)-30- and 565--(--)-40- Desk Telephones	M3C-565/30/40	1
Type 565--(--)-39- and 565--(--)-42- Desk Telephones	M3C-565/39/42	1
Type 576--(--)-30- Desk Telephone	M3C-576/30	1

**ORDERING INFORMATION** AND CODE NUMBERING **A**

**INSTALLATION DATA** **B**

**MAINTENANCE DATA** TOOLS, TEST EQUIPMENT  
AND TROUBLE SHOOTING **C**

SECTION I

**GENERAL INFORMATION**

INDEX

## COLOR CODES

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2 COLOR CODE NUMBERS	1		
3 EXCEPTIONS	1		

### 1 GENERAL

1.1 The various telephone housings and many of the attached parts are available in a wide choice of colors. The color of any unit or part is indicated by a section of the identifying number for each

item. This section of the number must be filled in from the information given in this publication, as noted in the descriptive sub-section for each item, in order to complete the identifying number.

### 2 COLOR CODE NUMBERS

2.1 Table 2-1 lists all the currently available colors and the corresponding identifying numbers. Particular care should be taken to select the

correct assembly color code for the black handset, bakelite or plastic, as required. Note the two series of numbers under each heading in the table.

Table 2-1 COLOR CODE NUMBERS

Color	Assembly Code Number	Piece-Part Suffix Number	Notes
Black	00 (2,3) 21 (4)	-1 (3) -21 (4)	
Red	02	-2	(1) Obsolete color codes
(1)	03	-3	
Yellow	04	-4	(2) Type 65 Handset only:
Green	05	-5	Code "00" denotes black bakelite.
(1)	06	-6	Code "01" denotes black plastic.
(1)	07	-7	
(1)	08	-8	(3) Standard series.
Ivory	09	-9	
(1)	10	-10	(4) Auxiliary series. Complete
Rose Pink	11	-11	assemblies always use series
Aqua Blue	12	-12	00-16. Sub-assemblies may also
Light Beige	13	-13	use series 21-36. Piece-parts
Light Gray	14	-14	with corresponding suffix numbers
White	15	-15	in each series (eg. -7 and -27)
Sea Green	16	-16	have mechanical differences.

### 3 EXCEPTIONS

3.1 Some assemblies and piece parts are not available in the full range of colors. Refer to the descriptive sub-section for each assembly for information on the color range available.

3.2 Special assemblies made up from piece parts of more than one basic color are not allocated code numbers. Each part of non-standard color on such assemblies must be noted individually.

# TELEPHONE INSTRUMENT CODE NUMBERS

## CONTENTS

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2	CODE NUMBERING SYSTEM	1		
3	RINGER CODE NUMBERS	1		
4	SPECIAL FEATURE CODE NUMBERS	2		

## 1 GENERAL

1.1 Each of the many variations of the standard types of telephone instruments is identified by an individual code number. The code number consists of five parts which specify the various features of the instrument.

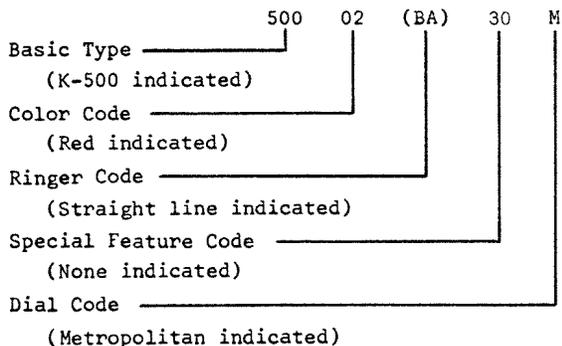
1.2 The sub-section describing each instrument is indexed by the basic type number of the telephone. This type number must be extended, as detailed in

the following sections, in order to fully identify the instrument by the addition of the designation codes for the color, the class of ringer, special features - if any - and the class of dial.

1.3 Special features are available with certain instruments only. The index numbers of the various sub-sections describing each basic type of unit show which special features are available.

## 2 CODE NUMBERING SYSTEM

2.1 The method of forming the code number for any telephone instrument is indicated below:



2.2 The availability of colors and the possible combinations of ringers, special features and dials, are noted in the descriptive sub-section for

each type of telephone. The sub-section index for the example shown is 500/30.

2.3 A complete listing of color code numbers is given in leaflet M1A-COL.

2.4 Details of the ringer codes used to show the class of assembly installed in a combined type of telephone instrument are given in Section 3.

2.5 The special feature code numbers are given in Section 4 with a brief description of each feature.

2.6 The following code letters are used to show the class of dial which is fitted to the telephone.

- M Metropolitan dial.
- R Regular (numerals only) dial.
- N No dial - dummy plug fitted.

## 3 RINGER CODE NUMBERS

3.1 A complete range of ringer sub-assemblies is available for use in combination types of telephone instruments. Refer to the sub-section describing the instrument for details of the types of ringer with which the telephone can be equipped.

3.2 The number codes used to identify the class of ringer installed in a telephone instrument are listed in Table 3-1. The code (LR) is always used when the telephone is not equipped with an internal ringer.

Table 3-1 RINGER CODE NUMBERS

NON-FREQUENCY SELECTIVE		FREQUENCY SELECTIVE					
Description	Code	HARMONIC		SYNCHROMONIC		DECIMONIC	
		Frequency	Code	Frequency	Code	Frequency	Code
Straight Line Biased	BA	33-1/3 cps	*A1	30 cps	*B1	20	*C1
Straight Line Biased with gas tube (superimposed signalling)	TBA	50 cps	*A2	42 cps	*B2	60	*C2
Electronic (used with tone ringing signals)	ER	66-2/3 cps	*A3	54 cps	*B3	30	*C3
		16-2/3 cps	*A4	66 cps	*B4	40	*C4
		25 cps	*A5	16 cps	*B5	50	*C5

Note: All non-frequency selective ringers have volume controls.

Note: For frequency selective ringers replace \* by W if volume control is required or by L if volume control is not required.

#### 4 SPECIAL FEATURE CODE NUMBERS

4.1 Some types of telephone instrument may have special features added to the basic unit. These features are described in the following paragraphs under their code identifying numbers. Reference must be made to the descriptive leaflet of each telephone instrument in order to ascertain which features can be added to any particular telephone.

##### 4.1 NO SPECIAL FEATURES (Code 30)

This code is always used to identify any basic instrument without special features.

##### 4.2 DIAL LIGHT (Code 31)

A small, shrouded lamp is located at the upper left of the dial. The lamp glows when the handset is lifted. A four conductor base cord is provided but a power transformer, type 31( )690, must be specified separately.

##### 4.3 DIAL LIGHT AND NIGHT LIGHT (Code 32)

This is the same as feature code 31 with the addition of a switch at the lower left of the dial. The switch can be set so that the lamp is either dark or glows dimly, for use as a night light, when the handset is in its cradle but glows brightly when the handset is lifted.

##### 4.4 LIFT-TO-TALK SWITCH (Code 33)

A modified form of plunger is fitted in the left side of the cradle switch of the desk telephone and a modified hookswitch assembly is fitted to the wall telephone. Lifting the handset only connects the receiver unit. The left hand plunger, or hook-switch, must be lifted, operating extra contacts, before dialing or talking can take place.

##### 4.5 PUSH BUTTON (Code 34)

A small push button is fitted in front of the handset cradle to provide a signaling (grounding) circuit which is required on some PABX equipment.

##### 4.6 SEPARATE RING AND TALK CIRCUITS (Code 35)

A four conductor mounting cord provides separate isolated circuits for ringing and talking.

##### 4.7 FOUR CONDUCTOR CORD (Code 36)

A four conductor base cord allows a smaller terminal block to be used with two line telephones when it is not necessary to provide the interphone signaling circuit.

##### 4.8 MESSAGE WAITING LAMP 1/25 watt (Code 37)

An NE 51 lamp and red lens located at the upper left of the dial is used to indicate that an unanswered caller has left a message at the switchboard.

##### 4.9 MESSAGE WAITING LAMP 1/4 watt (Code 38)

This is the same as feature code 37 except that a higher power, longer life lamp type NE 51H is used.

##### 4.10 TYPE 28 DIAL (Code 39)

This feature provides two dial off-normal contacts as required for speakerphone systems.

##### 4.11 AMPHENOL PLUG (Code 40)

An Amphenol multi-conductor plug is fitted to the base cord of any key telephone unit. A mating socket on the installation cable permits rapid changing of instruments for maintenance purposes.

# INSTALLATION INFORMATION

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2	PORTABLE INSTALLATIONS	1	3-1	2
3	DIAL LIGHT/NIGHT LIGHT INSTALLATIONS	2		
4	INSTRUMENT MODIFICATIONS	2		

### 1 GENERAL CONSIDERATIONS

1.1 Precise installation procedures will depend upon each company's local policies. This section is intended as a general guide and to provide some indication of the possibilities of adapting regular instruments for special applications.

1.2 The installation of a telephone instrument at a customer's premises is essentially the provision of a service and, for complete satisfaction of the customer, must be treated as such. Neat work and prompt and courteous attention to complaints are essential for good customer relations.

1.3 The major aspects to be considered for each installation are:

- a) Safety for the customer, installer and repair personnel.

- b) Convenience of location, in accordance with the customer's wishes and local practices.
- c) Availability of an AC power outlet with adequate current capacity, if required.
- d) Accessibility of all wiring and equipment for maintenance purposes.

1.4 The following points should be verified after the installation is completed:

- a) Proper operation of all equipment installed, in conjunction with all existing equipment if extra equipment has been added.
- b) Customer's understanding of the use and operation of all equipment controls.
- c) Correct telephone number and number card.
- d) Over-all appearance of the installation and the tidiness of the work area.

### 2 PORTABLE INSTALLATIONS

2.1 There are many cases where the customer desires that one, or more, telephone(s) be made portable so that it (they) may be used in more than one location in the same building. This is accomplished by fitting a plug to the instrument mounting cord and terminating the station wiring in a mating, wall mounted socket. Portable installations should only be made in the following situations:

- a) Single line service where the ringer is mounted externally to the telephone and may be wired permanently to the line.
- b) Extension instruments where the main instrument ringer is permanently connected to the line.
- c) Manual switchboard extensions where the operator may be notified when the instrument is moved.
- d) Special installations, such as those where the customer wishes to make, but not receive, calls on a particular line.

2.2 In addition to the foregoing conditions there may be technical reasons why a particular type of instrument can not be used for portable service. These include:

- a) Message waiting instruments where this special feature should not be rendered inoperative.
- b) Exclusion type telephones where the excluded stations would also be disconnected when the plug was disconnected.

- c) Any type of instrument which requires more than some six or eight external connections. The usual plug and socket used for portable service has a capacity of four connections.
- d) Emergency telephones where the service could be accidentally disconnected.

2.3 The illustration of Fig. 2-1 shows the method of connecting a portable telephone using a 602()755 plug and a 602()735 jack. It should be noted that the original instrument mounting cord may have to be changed to a four conductor type in some cases.

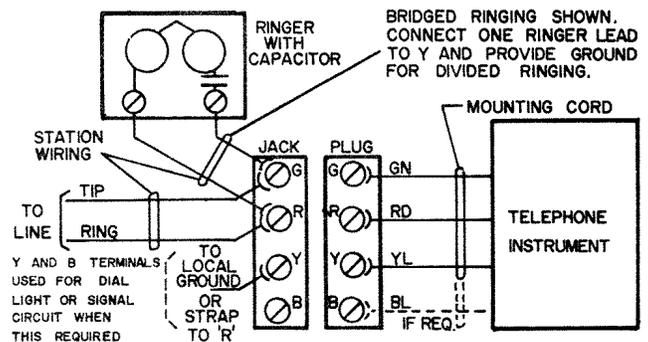


Fig. 2-1 PORTABLE INSTALLATION WIRING

### 3 DIAL LIGHT/NIGHT LIGHT INSTALLATIONS

3.1 The installation of a dial light/night light telephone requires the provision of a source of AC or DC power (6-8 volts at a current of 0.3 amps). In order to avoid the necessity of making wired connections to the electrical power circuits, which must be done by a licenced electrical contractor, a plug-in, current limiting type of transformer is available.

3.2 The type 31( )690 transformer is designed to provide the AC power required to operate the lamp of one dial light type telephone instrument. It consists of a completely molded unit with two flat pins spaced to fit the standard utility outlet. Two terminals on the wall side of the case provide

connections for the low voltage output and can not be touched when the unit is plugged into an outlet.

3.3 Typical installation arrangements for a dial light type of telephone are shown in Fig. 3-1. Due to the low voltage operation of the dial light it is essential that the resistance of the wiring between the transformer and the telephone instrument is kept as low as possible to avoid excessive power loss. It is recommended that the length of station wiring between the transformer and the telephone should not be more than 150 feet. Also, mounting cords longer than six feet should not be used. Wherever possible the transformer should be located close to the ringer or terminal block.

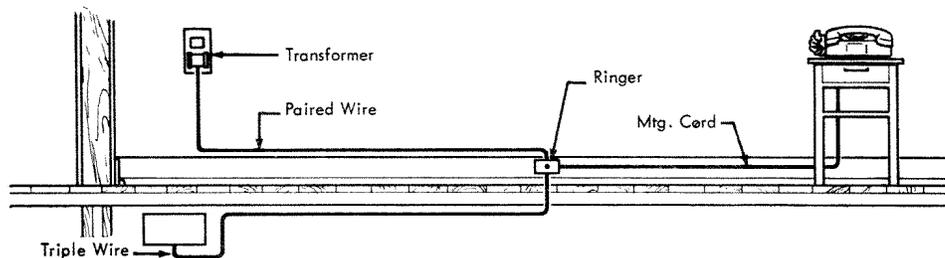


Fig. 3-1 DIAL LIGHT TRANSFORMER WIRING

### 4 INSTRUMENT MODIFICATIONS

4.1 The majority of requirements for telephone instruments are fulfilled by one of the units from the standard manufactured range. However, occasions arise when an instrument is required for a special application. When a reasonable number of units of the same type are required it may be economical to have these manufactured to specification. In most cases, however, the requirement is only for one or two units; these are most economically produced by modifying standard units in the field. A number of typical modifications are given in the following paragraphs.

#### 4.2 FREQUENCY SELECTIVE RINGERS

All the telephone instruments described in part 3 of the manual are available with straight line ringers. Many of them are not listed as being available with frequency selective ringers as the demand for this combination is extremely small. It is quite possible to fit a frequency ringer to any of these instruments if the application so requires.

#### 4.3 BUZZER IN PLACE OF RINGER

Buzzers, AC or DC operated, may be fitted to any manual type of telephone, instead of the usual ringer, in order to provide instruments for use on direct lines between two locations.

#### 4.4 PUSH BUTTON

The 500--(--)-34- telephone is provided with a push button which is wired for the specific purpose of grounding one side of the line (required on some

types of PABX equipment). The wiring of this button may be modified to provide an interphone signalling circuit. It may also be necessary to replace the mounting cord with a four conductor type, dependant upon the circuitry used, and replace the ringer by a buzzer, see paragraph 4.3.

#### 4.5 KEY TELEPHONE PUSH BUTTONS

The method of converting pick-up keys for use as signalling keys is given in sub-section M2H-KYS-1. The customer may desire that any unused keys are rendered inoperative. This is accomplished by removing the telephone housing and then the plunger and retainer assembly of the key. A bushing, part number 79409, is then placed under each plunger to be made inoperative and the plunger and retainer assembly is replaced. The modified keys can not now be depressed.

Note: One bushing, type 79409, is supplied loose with each key telephone.

#### 4.6 RECORD OF MODIFICATIONS

It is suggested that each company maintains a record of the modifications applied to telephone instruments for special applications. A copy of an amended circuit label should be provided to all the maintenance personnel.

#### 4.7 TECHNICAL ASSISTANCE

The Engineering Department of ITT-Kellogg is always ready to assist in the application of telephone equipment to special conditions.

# LUBRICATION AND CLEANING

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1	INTRODUCTION	1
2	LUBRICANTS AND APPLICATION	1
3	CLEANING SOLUTIONS AND USES	1

### 1 INTRODUCTION

1.1 This sub-section is intended as a guide to the general principles of, and materials used in, the cleaning and lubrication of the component parts of telephone instruments.

1.2 The recommended lubricant, and the method of application, for each component part of the various telephone instruments is noted in the appropriate paragraph of the descriptive sub-section for the individual parts.

1.3 The method to be used to clean contaminated instrument parts must depend upon the cause of the contamination. The information given below assumes that the contamination is of the more usual form of dirt or grease. If other forms of contamination are present, care must be taken that the cleaning method used does not harm the parts in any way. Corroded parts should be replaced and not cleaned as it is extremely difficult to clean such parts satisfactorily without specialized equipment.

### 2 LUBRICANTS AND APPLICATION

#### 2.1 ITTK DIAL LUBRICANT 79946

This is the most widely used lubricant for telephone instrument parts. The compound contains a proportion of silicone fluid and has excellent high and low temperature stability. It is non-corrosive to the metals and plastics used in the instruments.

#### 2.2 MOLYKOTE TYPE Z

This is a dry type of graphited lubricant which finds application where a wet type would tend to collect excessive dirt or be objectionable to users of the instrument. Lubrication of the coin chutes of paystation instruments and the cradle switch plungers of desk type instruments are some typical applications.

#### 2.3 ALTERNATIVE TYPES

##### 2.3.1 Mineral Oil Types

High quality mineral oil lubricants are generally satisfactory for most applications where a liquid type is required, such as shaft bearings. Make certain that the compound used

has adequate temperature stability and is non-corrosive to the parts to which it is applied.

##### 2.3.2 Grease Types

Lubriplate is a grease type of lubricant that has excellent stability and is recommended for use on either metals or plastics, especially where parts have a rubbing action (such as key switch slide plates).

##### 2.3.3 Stick Types

These "dry" type lubricants are generally stated as suitable for use on door latches or parts that may come into contact with clothing. They can be used on parts with which the user may, directly or indirectly, come into contact, such as coin chutes and cradle switch plungers.

#### 2.4 APPLICATION OF LUBRICANTS

All lubricants must be applied sparingly in order to avoid splash or creep into areas where their presence would cause trouble. Liquid types are best applied with a small camel hair brush and grease or stick types with an orange stick or the tip of the finger.

### 3 CLEANING SOLUTIONS AND USES

3.1 There are many commercially available cleaning preparations for electronic types of equipment. It is recommended that a high quality non-filming type, with a mineral spirits base, is selected. Be certain that the preparation does not contain any additives which may be corrosive to the metal parts or solvent to the plastic parts of the telephone instruments. If in doubt, make a test on a few discarded parts or inquire from the manufacturers. Carbon Tetrachloride preparations are to be avoided as they produce a film which can cause trouble with dirty electrical contacts.

3.2 Exterior plastic parts can be cleaned and polished with many of the regular household types of products. It is, however, suggested that a test be made to check that the product does not react on the plastic, causing etching or discoloring, and is not susceptible to marking when handled.

3.3 In locations where exceptional humidity may cause trouble the use of a protective spray, made expressly to combat these conditions, can provide almost complete protection. These preparations may also contain fungicides and some lubricant.

# TOOLS AND TEST EQUIPMENT FOR TELEPHONE INSTRUMENT MAINTENANCE

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## 1 INTRODUCTION

1.1 The number and types of tools and items of test equipment supplied to either mobile or shop maintenance personnel will depend upon the extent of the work to be performed by each of these two groups. This sub-section is intended as a guide to the minimum tools and test equipment required to provide adequate facilities for the field repair and maintenance of telephone instruments.

1.2 The following sections detail the various items recommended for use by the maintenance staff of the categories noted above. The lists are split into groups showing how the requirements vary with the complexity of the work to be performed by each category. The listing of a specific manufacturer or type of any item is for illustrative purposes only and is not intended as a recommendation.

## 2 RECOMMENDED TOOLS

2.1 Table 2-1 lists the recommended tools for the replacement of faulty component parts of telephone instruments, at the subscriber's premises, without the use of a soldering instrument. In the event that maintenance on the subscriber's premises is restricted to changing the complete instrument, only the items marked with an asterisk (\*) may be necessary.

2.2 The additional tools required to permit the normal field adjustments to be made on an installed telephone are listed in Table 2-2. The additional tools required for shop maintenance purposes are listed in Table 2-3.

2.3 Most telephone companies will extend these lists of tools depending upon their own preferences and requirements. In many cases the lists will be combined with those for line maintenance and also installation tools.

2.4 A small quantity of consumable supplies will be required in addition to the tools listed. These will include Rosin Core Solder, Electrical Tape, Lubricant, Cleaning Fluid, etc. It is recommended that a separate tool box is provided to carry the tools and supplies required for the maintenance of telephone instruments, when this involves more than changing of the complete instrument. Some small consumable items, such as lamps, fuses, terminal screws, etc., may be conveniently carried in the small compartments of this box.

Table 2-1 BASIC TOOLS REQUIRED

Item	Description	Size
1	Screwdriver, Instrument type	3" x 1/8"
2*	Screwdriver, Instrument type	6" x 3/16"
3*	Screwdriver, Cabinet type	8" x 1/4"
4*	Pliers, Long Nose Wiring type	6"
5*	Pliers, Sidecutting	5"
6	Pliers, Slip Joint or Pipe Grip	6"
7	Wrenches, Combination type	3/16" - 3/8"
8	Contact Cleaner or Burnisher	3/16" Blade
9	Dust or Cheese Cloth	as requ'd.

Table 2-2 TOOLS FOR ADJUSTMENTS

Item	Description	Size
1	Adjuster, Spring, Straight Tips	.020" Slots
2	Adjuster, Spring, Angled Tips	.020" Slots
3	Pliers, Flat Nose, Straight	5"
4	Tension Gauge (2 gram divisions)	0-50 grams
5	Tension Gauge (20 gram divisions)	0-500 grams
6	Tension Gauge (4 ozs. divisions)	0-5 lbs.
7	Thickness Gauges	.002" - .040"

Table 2-3 SHOP TOOLS

Item	Description	Size
1	Wrenches, Socket	3/16" - 3/8"
2	Wrench, Adjustable	4"
3	Soldering Pencil or Gun	30w - 65w
4	Drill, Hand or Power	1/4" Cap.
5	Twist Drills	1/16" - 1/4"
6	Small anvil or Steel Block	-
7	Hammer, Ball-Pein type	1/2 lb.
8	Punch, Riveting type	6"
9	Punch, Center	4"

### 3 RECOMMENDED TEST EQUIPMENT

3.1 Table 3-1 lists the recommended basic test equipment required for the shop maintenance and repair of faulty telephone instruments. Two of these items, the continuity tester and the multi-range meter, will also be found useful for trouble shooting installation wiring in the subscriber's premises. Consideration should be given to the advantages of equipping the mobile maintenance crews with one or both of these items.

3.2 Correct shop adjustment of ringers requires the use of a ringer test set-up. Where more than the occasional ringer is adjusted it will be found that a ringer test set (see sub-section MLC-TST/RIN for details of an easily assembled unit) saves a considerable amount of time.

3.3 Refer to sub-section MLC-TST/DLS for details of dial test sets and dial testing.

3.4 Table 3.2 lists more comprehensive test equipment which is more likely to be of value to the larger operating companies requiring extensive test and adjustment facilities. For the smaller companies it is usually more economical to return some component parts to the factory, for repair, rather than invest in this type of equipment.

Table 3-1 BASIC TEST EQUIPMENT REQUIRED

Item	Description	Type
1	Continuity Tester	- Battery operated buzzer or test lamp.
2	Multi-range Meter	- Simpson model 260 or similar high resistance.
3	Ringer Test Set	- See Paragraph 3.2.
4	Dial Speed Tester	- See Paragraph 3.3 and
5	Dial Pulse Counter	- Sub-section
6	Pulse Ratio Tester	- MLC-TST/DLS.

Table 3-2 ADVANCED TEST EQUIPMENT

Item	Description	Type or Use
1	Ringer Magnetizing Set	- See Sub-section
2	Ringer Demagnetizing Set	- M2C-RIN/GEN.
3	Audio Generator	- General testing
4	AC Vacuum Tube Voltmeter	- and also used
5	Calibrated Attenuator	- with items 6 & 7.
6	Artificial Mouth	- Testing of
7	Artificial Ear	- transmitter and receiver units.
8	Impedance Bridge	- CRL type for general testing.
9	Wire Chief's Test Set	- General testing. Commercial item.

### 4 JIGS, FIXTURES AND ADAPTERS

4.1 The test and adjustment of some of the parts of telephone instruments is greatly facilitated by the use of test jigs, fixtures and adapters. Many of these items are very easily made up, as required, by the individual operating company - very few of them are available ready made commercially. The following paragraphs detail a number of the more useful and commonly needed items.

#### 4.2 RINGER TEST JIG

For correct adjustment of ringer mechanisms it is essential that they are mounted on a proper, or simulated, telephone baseplate. The test jig is made from a discarded telephone baseplate with the bottom portion of a cradle switch bracket mounted in position to hold the ringer frame. This assembly must then be weighted to represent the total weight of a typical telephone instrument, it MUST NOT be mounted solidly to the work bench. Terminals may be fitted to enable the ringer leads to be connected easily and quickly.

#### 4.3 DIAL TEST JIG

This item will be found to save appreciable time where a reasonable number of dials are tested and adjusted in the shop. It is simply a U-shaped bracket formed to hold the dial upside down so that adjustments may be made on the mechanism without the need to hold the dial in the hand. Any required digits can be dialed by feeling for the appropriate finger hole, or a mirror can be mounted under the dial face to enable the finger plate to be seen. Terminals may be fitted to the side of the bracket for connection of the dial leads, if necessary.

#### 4.4 COIN CHUTE GAUGES

These are available commercially and consist of a set of metal disks in standard, undersize and oversize ranges representing 5¢, 10¢ and 25¢ coins. They are used to check the coin rejection settings of the paystation telephone mechanisms.

#### 4.5 TEST ADAPTERS

The actual types of test adapters required by any maintenance shop will depend upon the type and volume of equipment to be tested and repaired. Some of the more commonly required adapters are detailed below:

- Test Line from exchange - terminated on binding posts and extension telephone socket; with switches to connect ringer, convert to four wire circuit (500--(--))35- telephone), or other function as required.
- Amphenol Socket - wired via switches to connect any desired circuit of a key type telephone to the test line.
- Amphenol Plug wired out to terminal strip - this item may be plugged into the socket of item b) so that key telephones without plugs may be connected and tested. This arrangement is also useful for connecting other telephones requiring multi-conductor circuits - such as those for use with 3A speakerphone systems and two or three line instruments.
- Artificial Line(s) - either switched into the test line circuit or wired in with test leads when required. This item is useful when testing ringers or dials for functioning over long loop circuits. (See also sub-section MLC-TST/DLS).

## TROUBLE SHOOTING

This sub-section is intended as a guide to assist in trouble shooting installed instruments. Listed below are some of the many faulty conditions, which may be experienced in a telephone instrument, and their possible causes and remedies.

Whether faulty instruments are repaired on site or replaced and returned to the shop for repair, will depend upon the individual company practice. In the latter case it is recommended that each removed

instrument be tagged to indicate the symptoms of the trouble.

Instruments repaired in the shop should be given a thorough check for other possible faults before they are returned to stock or re-installed. It is not an uncommon situation for an instrument to develop more than one fault at a time, especially if the trouble is due to a lightning surge or severe mechanical shock.

### 1 DIALING TROUBLES

POSSIBLE TROUBLE	CORRECTIVE ACTION
<b>1.1 NO DIAL TONE</b>	
a: Open in mounting or handset cord.	Replace cord.
b: Open or shorted receiver unit.	Replace receiver unit.
c: Dial pulse contacts open or off-normal contacts closed.	Adjust or replace dial.
d: Open winding in network coils.	Replace network.
e: Cradle switch contacts not functioning correctly.	Check for misplaced plastic cover. Adjust contacts or replace switch assembly.
<b>1.2 CANNOT BREAK DIAL TONE</b>	
a: Dial pulse contacts not opening.	Adjust or replace dial.
b: Filter or ringer capacitor shorted.	Replace network or ringer capacitor.
<b>1.3 RECEIVING WRONG NUMBERS</b>	
a: Dial pulse contacts wrongly functioning.	Adjust contacts or replace dial.
b: Incorrect dial speed (For most conditions, dial speed must be considerably in error to cause trouble).	Adjust dial speed or replace dial.
c: Leaky filter or ringer capacitor.	Replace network or ringer capacitor.
<b>1.4 DIAL CLICKS IN RECEIVER</b>	
a: Dial off-normal contacts not closing.	Adjust contacts or replace dial.

### 2 TRANSMISSION TROUBLES

POSSIBLE TROUBLE	CORRECTIVE ACTION
<b>2.1 CANNOT HEAR</b>	
a: Open receiver unit or handset cord.	Replace receiver unit or handset cord.
b: Dial off-normal contacts not opening.	Adjust contacts or replace dial.
c: Open winding in network coils.	Replace network.
d: Cradle switch contacts not opening correctly.	Check for misplaced plastic cover. Adjust contacts or replace switch assembly.
e: Shorted receiver or receiver varistor.	Replace receiver unit.
<b>2.2 OTHER PARTY CANNOT HEAR</b>	
a: Shorted transmitter unit or handset cord.	Replace transmitter unit or handset cord.
b: Shorted varistor in network.	Replace network.
<b>2.3 HIGH SIDETONE LEVEL</b>	
a: Defective balancing in network.	Replace network.
<b>2.4 DISTORTION AND/OR CLICKS</b>	
a: Faulty receiver unit or receiver varistor.	Replace receiver unit.
b: Faulty transmitter unit.	Replace transmitter unit.
c: Loose connections.	Retighten connections as necessary.
<b>2.5 RADIO INTERFERENCE</b>	
a: Pick up of local radio station in receiver.	Install 0.02 mfd., suppression capacitor (type 75559) between network terminals L2 and F.

3 RINGING TROUBLES

POSSIBLE TROUBLE	CORRECTIVE ACTION	POSSIBLE TROUBLE	CORRECTIVE ACTION
<b>3.1 NO RING</b>		<b>3.4 RINGS WHEN OTHER PARTY CALLED</b>	
a: Wrong ringer type. (Most likely to be observed on new installation).	Check ringer type and replace if incorrect.	a: Wrong ringer.	Replace with correct type.
b: Ringer disconnected or wrongly wired.	Check ringer wiring. Correct as necessary.	b: Wrong ringer or line connections.	Check connections and remake as necessary.
c: Ringer wired for silencing.	Rewire for ringer operation.	c: Incorrect ringing frequency.	Check ringing generator frequency.
d: No ground (party line) connection.	Connect ground per local practices.	d: Frequency selective ringer incorrectly tuned.	Retune or replace ringer.
e: Control wheel (biased ringer) in cut-off position.	Reset wheel to ring position and disable cut-off position if desired.	e: Wrong capacitor for frequency selective ringer.	Replace capacitor or complete ringer assembly.
f: Obstruction between magnet and armature or gongs and clapper.	Remove obstruction and readjust ringer if necessary.	<b>3.5 UNABLE TO TRIP RINGING</b>	
g: Open ringer coil.	Replace ringer.	a: Open dial pulse contacts.	Adjust contacts or replace dial.
h: Open ringer capacitor.	Replace network or ringer capacitor.	b: Open coil winding or varistor in network.	Replace network.
<b>3.2 VOLUME TOO HIGH OR TOO LOW</b>		c: Loose or open connection.	Check connections and remake as necessary.
a: Control wheel in wrong position.	Reset wheel. Instruct customer if required.	d: Cradle switch contacts not making.	Check for misplaced plastic cover. Adjust contacts or replace switch assembly.
b: One or both gongs loose.	Tighten mounting screws and readjust.	<b>3.6 TRIPS RING, CANNOT CONVERSE</b>	
c: Obstruction between gongs and clapper or against armature or clapper stem.	Remove obstruction and readjust ringer if necessary	a: Open handset cord, transmitter or receiver unit.	Replace faulty item.
d: Telephone or extension ringer on sound absorbing material.	Relocate telephone or extension ringer in accordance with wishes of customer.	b: Dial off-normal contacts not open.	Readjust dial contacts or replace dial.
<b>3.3 BELL TAPS WHILE DIALING</b>		c: Receiver 'shorting' contacts of cradle switch not open.	Check for misplaced plastic cover. Adjust contacts or replace switch assembly.
a: Wrongly connected ringer.	Check and reconnect as necessary.	d: Faulty coil winding or open capacitors in network.	Replace network.
b: Bias spring in low notch (biased ringer).	Check ringer and set bias spring in high notch if necessary. Refer to Section M2C.		

# DIAL TESTING AND TEST SETS

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4	PULSE COUNTING	2		

## 1 INTRODUCTION

1.1 Correct testing of telephone instrument dials requires that at least two, and preferably three, electrical tests are made after the preliminary mechanical adjustments have been completed. These tests are for dial speed (number of impulses per second), pulse ratio (ratio of make, or break, period to total time of one pulse) and number of pulses when dial is fully wound up and released. The last of these tests is not essential; it is recommended, however, as cases have been reported where the dial has been incorrectly assembled and has delivered an incorrect number of pulses.

1.2 During the electrical tests, appropriate mechanical adjustments are made to correct any discrepancies in the measured parameters. The full method of adjustment is given in sub-section M2A-DLS/GEN and the specific data for each individual type of dial is given in the appropriate descriptive sub-section.

1.3 There are a number of instruments available, commercially, which are specifically made for the purpose of testing dials. The following sections detail various ways of making the required tests.

## 2 DIAL SPEED TESTING

2.1 The simpler forms of dial speed test set operate on the electromechanical principle. They consist of a spring, or synchronous motor, driven shaft which is normally prevented from rotating by a detent. The first dial break pulse is arranged to trip the detent and the shaft commences to turn. A second, normally disengaged, detent or clutch is arranged to stop the shaft when the dial pulses cease or the off-normal contacts open. The amount of rotation of the shaft is indicated by a pointer against a scale which is calibrated in fractions of a second. This form of tester must be calibrated for use with a specific type of dial. Once it is set it provides more than adequate accuracy for the adjustment of telephone instrument dials.

2.2 A more refined version of the type of tester described above also contains a pulse counter which is mechanically coupled to the speed tester. The speed tester drives off-scale if less than ten impulses are received. All the electromechanical types of dial speed tester are reset manually.

2.3 There are a number of all-electronic methods of dial speed testing; many of them have been used in the design of commercially available instruments. The remainder of this section describes a number of methods of making dial speed tests with various items of equipment. It should be noted that the speed of rotation of the dial is not constant during the return motion. This is due to the fact that a definite amount of time is taken for the mechanism to start from the rest position and reach the maximum speed allowed by the governor. The amount of speed variation during the pulsing period is only slight but it must be allowed for with some forms of measurement. Refer also to section 3.

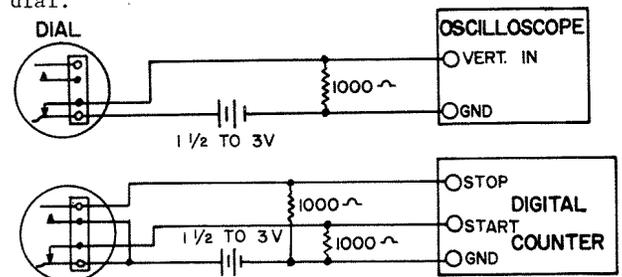
### 2.4 OSCILLOSCOPE METHOD (see Fig. 2-1)

The instrument should have a medium to long persistence screen and the time base capable of providing a sweep of one second duration. Connect

the impulse springs of the dial in series with a battery (1.1/2 to 3 Volts) and a 1,000 Ohm resistor. Then connect the oscilloscope vertical terminals across the resistor. Adjust the trigger control to cause the sweep to start at the beginning of the first break pulse. The number of pulses will be displayed on the trace and the dial speed should be adjusted so that the tenth pulse is completed just before completion of the horizontal sweep period; by an amount of 1/26 of the sweep time in the case of standard 10 IPS telephone dials (the last make period).

### 2.5 DIGITAL COUNTER METHOD (see Fig. 2-1)

If a digital counter is available this may be used to measure the dial speed. The set-up is very similar to that described for the oscilloscope in the previous paragraph. In this case, however, the dial off-normal springs must be wired in series with a second resistor and then to the stop or gate terminal of the counter. The counter is set to trigger on the first break pulse and stop when the gate signal is removed by the off-normal contacts. The time indicated is the total pulsing time of the dial.



Note: Circuit for stop and gate signals may have to be modified for some types of digital counter.

Fig. 2-1 OSCILLOSCOPE AND COUNTER CONNECTIONS

### 2.6 SIMPLE DIAL SPEED TESTER (see Fig. 2-2)

This easy to assemble arrangement provides more than adequate accuracy, using the 60 c/s power line frequency as a standard, for testing the speed of telephone dials. The final shaft of the motor is geared to make one revolution every two seconds and carries a pointer which may be set manually. Relay A operates when the dial is connected. Relay B operates as soon as the dial is rotated from the normal position and disconnects the operate circuit of relay A, which remains held over its own contact. Relay A releases at the start of the first break pulse and connects the power to the motor. The off-normal contacts open at the end of the dial rotation and release relay B, which disconnects the power from the motor. The amount of rotation of the

pointer measures the speed of the dial when the digit '0' is dialled. A scale may be fitted to the unit so that dial speed may be read off directly.

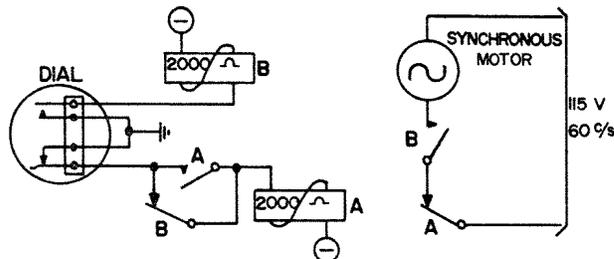


Fig. 2-2 SIMPLE DIAL SPEED TESTER

## 3 PULSE RATIO TESTING

3.1 Accurate measurement of the pulse ratio of a dial necessitates the use of reasonably complex test equipment. A number of pulse ratio test sets are available commercially, some of which measure the pulse ratio on a specific pulse in the train and some of which measure the average ratio over all the pulses in the train. At least one test set is available in which there are facilities for making measurements on any single pulse in the train.

3.2 A number of methods of making pulse ratio tests with standard items of test equipment are given below. As stated in section 2, the dial speed varies slightly during the pulsing period -- the first few pulses being longer than the remainder -- making compensation necessary with the more refined methods of measurement.

### 3.3 OSCILLOSCOPE METHOD

The connections for this test are the same as for the speed test (shown in Fig. 2-1). The time base is set to provide a recurrent sweep of one fifth of a second duration; the trigger control is then set to cause the sweep to reset at the start of the first pulse. Two complete pulses will occur during each sweep of the time base and this will repeat five times when the digit '0' is dialled. The consecutive traces will not be superimposed perfectly, due to the variation in dial speed (see para. 3.2), but it will be possible to measure the relative durations of the make and break periods of the average of alternate pulses. The accuracy to be expected depends upon the accuracy with which the oscilloscope scale can be read.

### 3.4 DIGITAL COUNTER METHOD

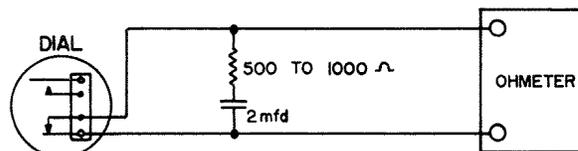
For this method the dial speed is measured as described in section 2.5. The connections are then

changed so that the counter only functions when the pulse springs are open. The ratio of the second measurement to the first will be the break pulse ratio of the dial.

### 3.5 CAPACITOR-OHMETER METHOD

The equipment used for this method must first be calibrated with a known accurate dial. The setup is shown in Fig. 3-1. With the accurate dial connected and the digit '0' dialled, it will be noted that the meter needle falls to the same low point each time the dial is operated. Once this point is established, the pulse ratio of any other dial may be checked. If the break pulse period of the unknown dial is too long then the meter needle will fall below the established reference point and if the break pulse period is too short then the needle will not fall to the reference point.

This method is capable of quite accurate comparisons. The meter scale could be marked with high and low limit points if calibration facilities are available. The actual percentage drop of the meter needle with respect to a given break pulse ratio depends upon the values of resistance and capacitance in the circuit and the damping of the meter movement. Hence it is not possible to pre-calibrate the meter.



NOTE: OHMMETER POWER SUPPLY SHOULD BE 15 TO 80 VOLTS DC.

Fig. 3-1 CAPACITOR-OHMMETER PULSE RATIO TESTER

## 4 PULSE COUNTING

4.1 It will occasionally be necessary to measure the number of pulses generated by a dial. This can be done simply by connecting it to any type of stepping switch, with a suitable spark suppression circuit across the pulsing contacts, and checking the action of the switch against the digit dialled.

4.2 The oscilloscope can be used as detailed in section 2.4, where the display shows each of the pulses in the train. The digital counter can also be used by setting the trigger so that one count is obtained at the start of each pulse, using the connections given in section 3.4.

# RINGER TEST EQUIPMENT

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## 1 INTRODUCTION

1.1 In order to obtain maximum performance from ringer mechanisms it is essential that the proper test equipment is used. As with many other types of similar mechanisms, in which permanent magnets are used, the magnets are magnetized, adjusted to strength and stabilized after the mechanism is assembled. Disassembly of the magnetic components reduces the strength of the magnet and consequently affects the sensitivity of the ringers.

1.2 The equipment required to magnetize and adjust the strength of the permanent magnet is detailed in section 2. It is available from companies which specialize in magnetic equipment and is usually built to order.

1.3 The ringer test set described in section 3 is designed for simple assembly and to perform all the functions required for thorough testing of ringers.

## 2 MAGNETIZATION AND DEMAGNETIZATION

### 2.1 MAGNETIZING EQUIPMENT

This equipment consists of an adjustable DC power supply connected to a large solenoid with two pole pieces which are shaped to fit close to the ends of the magnet in the assembled ringer. Note that biased and frequency selective ringers require different shapes of pole pieces. In operation, the current through the solenoid is set so that when the magnet of an assembled ringer is placed between the pole pieces, and the current is switched on, the magnet is saturated.

the magnetizing equipment described in the previous paragraph except that the solenoid is much smaller. The pole pieces are conveniently placed around the magnet of the assembled ringer while it is wired to the test set (section 3) and in position in the test jig (sub-section MLC-TEQ). In operation, the current through the solenoid is adjusted to provide the required amount of demagnetization of the ringer magnet and obtain optimum performance.

### 2.2 DEMAGNETIZATION EQUIPMENT

This equipment is only required when biased type ringers are to be adjusted. It is similar to

### 2.3 OPERATIONAL PROCEDURE

The method of applying the magnetizing and demagnetizing equipment to the adjustment of the strength of the ringer magnets is detailed in sub-section M2C-RIN/GEN.

## 3 RINGER TEST SET

### 3.1 SPECIFICATIONS

The test set provides the following features:

- a) Selection of any one of up to five externally generated ringing frequencies.
- b) Adjustable series resistance from 0 to 80,000  $\Omega$ .
- c) Four values of ringer series capacitor.
- d) Optional load, representing five frequency selective ringers (one of each frequency in the series) in parallel.
- e) Meter to read voltage across ringer under test.
- f) Facilities to bias gas tube type ringers.
- g) Facilities to check the ringer under test for dial pulse rejection.

The test set is completely self-contained except for the connections to the externally generated ringing supplies.

### 3.2 CONSTRUCTIONAL DATA

The test set may be assembled either as a case or panel mounted unit. The circuitry may be varied to suit individual needs - such as omitting the gas tube biasing arrangements, if they are not required, or substituting a single push button for the five ringing supply buttons when only biased type ringers are to be serviced.

All the component parts are either standard telephone equipment items or are readily available from radio/electronic supply houses.

Calibration of the test set is not required. The meter provides the necessary standard for test purposes. Terminals may be provided and an external meter used, if desired.

Table 3-1 RINGER TEST SET - PARTS LIST

Item	Description	Qty	Item	Description	Qty
1	Push Button, Single Pole, Double Throw	5	16	Resistor, 54,000 Ohms, 1 Watt, 5%	1
2	Push Button, Single Pole, Normally Open	1	17	Resistor, 750,000 Ohms, 1/2 Watt, 1%	1
3	Key or Switch, Single Pole, Two Way, Center Off, Normally Closed	6	18	Capacitor, 4 mfd, 300 Volt, 10%	1
4	Key or Switch, Two Pole, Two Way, Center Off, Transfer Contacts	1	19	Capacitor, 0.1 mfd, 400 Volt, 10%	1
5	Key or Switch, Two Pole, Double Throw, Transfer Contacts	1	20	Capacitor, 0.25 mfd, 400 Volt, 10%	1
6	Key or Switch, Single Pole, Single Throw, Normally Closed	1	21	Capacitor, 0.35 mfd, 400 Volt, 10%	1
7	Key or Switch, Single Pole, Two Way	1	22	Capacitor, 0.47 mfd, 400 Volt, 10%	1
8	Resistor, 22 Ohms, 1/2 Watt, 5%	2	23	Capacitor, 1.5 mfd, 400 Volt, 10%	1
9	Resistor, 1,000 Ohms, 40 Watt, 5%	1	24	Meter, 0-50 VAC, 5,000 Ohms/Volt	1
10	Resistor, 2,000 Ohms, 20 Watt, 5%	1	25	Terminals	9
11	Resistor, 3,000 Ohms, 20 Watt, 5%	1	26	Battery, 45 Volt 'B' type	1
12	Resistor, 6,000 Ohms, 10 Watt, 5%	2	27	Dial, Standard Telephone Type	1
13	Resistor, 9,000 Ohms, 5 Watt, 5%	1	28	Dial Mount	1
14	Resistor, 18,000 Ohms, 5 Watt, 5%	1	29	Relay, Standard Impulsing Type, 200 Ohm, Dual Coils	1
15	Resistor, 27,000 Ohms, 2 Watt, 5%	1	30	Case or Panel, c/w battery bracket	1
			31	Battery Connector	1
			32	Wire, Hardware, etc.	as req.

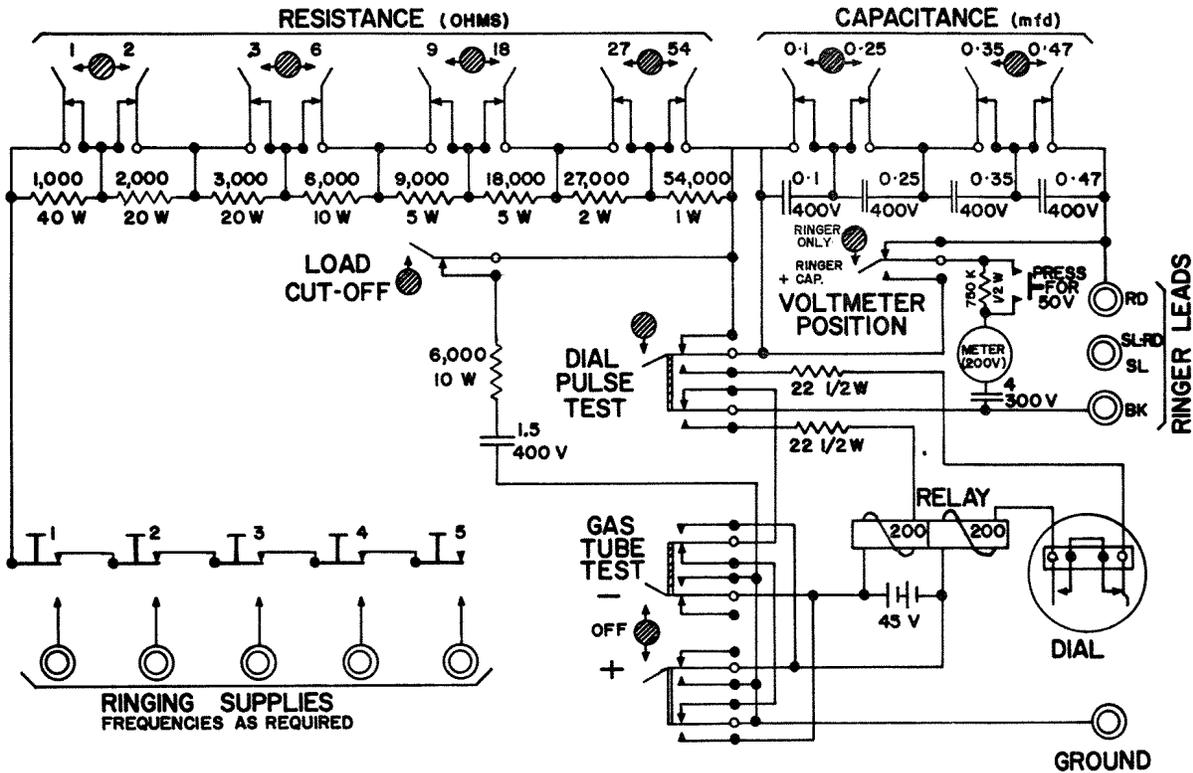


Fig. 3-1 RINGER TEST SET - CIRCUIT DIAGRAM

3.3 OPERATIONAL DATA

The complete method of testing ringer units is detailed in sub-section M2C-RIN/GEN. A brief explanation of the circuit features of the test set follows.

The ringing source selected by one of the push buttons is connected through the variable resistance to the ringer under test; through the selected capacitor, if required. The load network, which may be switched out as necessary, is shunted across the ringer and capacitor.

The meter may be switched to measure the voltage across the ringer coil only or across the ringer and capacitor, in series, as specified in the

test data for the particular ringer under test.

The normal meter sensitivity is 200 volts FSD. This may be increased to 50 volts FSD by pressing the meter button, permitting more accurate readings for small deflections.

Negative or positive bias may be selected for the gas tube type ringer tests. The bias battery is connected in series with the ringer.

The battery connection for the dial pulse rejection tests is made through the dial off-normal contacts. This prevents accidental discharge of the battery in the event that the dial key is left in the test position.

SECTION 2  
**COMPONENTS**  
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# TELEPHONE INSTRUMENT DIALS

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## 1 GENERAL DESCRIPTION

1.1 Each of the various types of dials consists of a rigid metal base on which are mounted the numeral ring, finger plate and number card assembly, finger stop and dust cover protected gear train and contact spring assemblies.

1.2 The dials can be supplied with either of two types of numeral ring marking; type D with numerals only and type G with letters as well as numerals - Metropolitan type dial. Standard type dials have the characters marked outside the finger plate to provide greater legibility, with a marker spot located centrally under each finger plate hole. Compact type dials have the characters marked below each finger plate hole.

1.3 The dial units are designed to provide a series, dependent upon the digit dialed, of uniform impulses at a speed of ten or twenty, dependent upon the type of dial, impulses per second. An auxiliary set of contacts is arranged to operate whenever the finger plate is moved from the rest position.

1.4 As the finger plate is rotated from the rest position, to wind up the main spring, an actuator pin is moved away from the off-normal springs so that the contacts actuate. At the same time the pulse spring locking cam is moved away from the impulse springs to prevent impulsing by allowing both springs to move as a unit against the surface of the pulsing cam. The helical spring clutch rides freely on the governor shaft during this dial wind-up and prevents the governor from causing resistance to the forward rotation of the finger plate.

1.5 When the finger plate is released the dial is driven to the normal position by the tension of the main spring. The spring clutch engages the governor to maintain a uniform speed of return and the

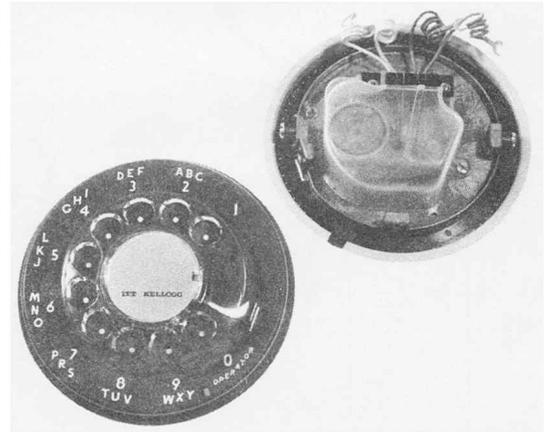


Fig. 1-1 TYPICAL DIAL

locking cam moves into engagement with the impulse springs to permit the impulse cam to cause the springs to break contact for each unit of the dialed digit. As the mechanism reaches the rest position the actuator pin causes the off-normal springs to break contact just after the impulse springs close to complete the last impulse.

1.6 The dials are designed for mounting in a U-shaped bracket to which they are clamped by means of two screws fitted laterally behind the numeral ring. The number card can easily be changed after removal of the lucite finger plate - disassembly of the unit is not necessary.

## 2 ASSOCIATED PUBLICATIONS

2.1 Specific details of each type of dial are given in individual sub-sections in this section of the manual, each indexed by the type number of the dial to which it applies. The information given in this sub-section is of a general nature and applies to all the telephone dials.

2.2 The types of dial used with each type of telephone are noted in the sub-section in which the instrument is described.

2.3 The full code number for each type of dial is given in the title of the individual descriptive sub-section. The color code (sub-section M1A-COL) must be inserted in place of the two dashes, where applicable, and the type of numeral ring code (see individual dial sub-section) must be inserted in place of the single dash inside the brackets in order to complete the code number for each type of assembly.

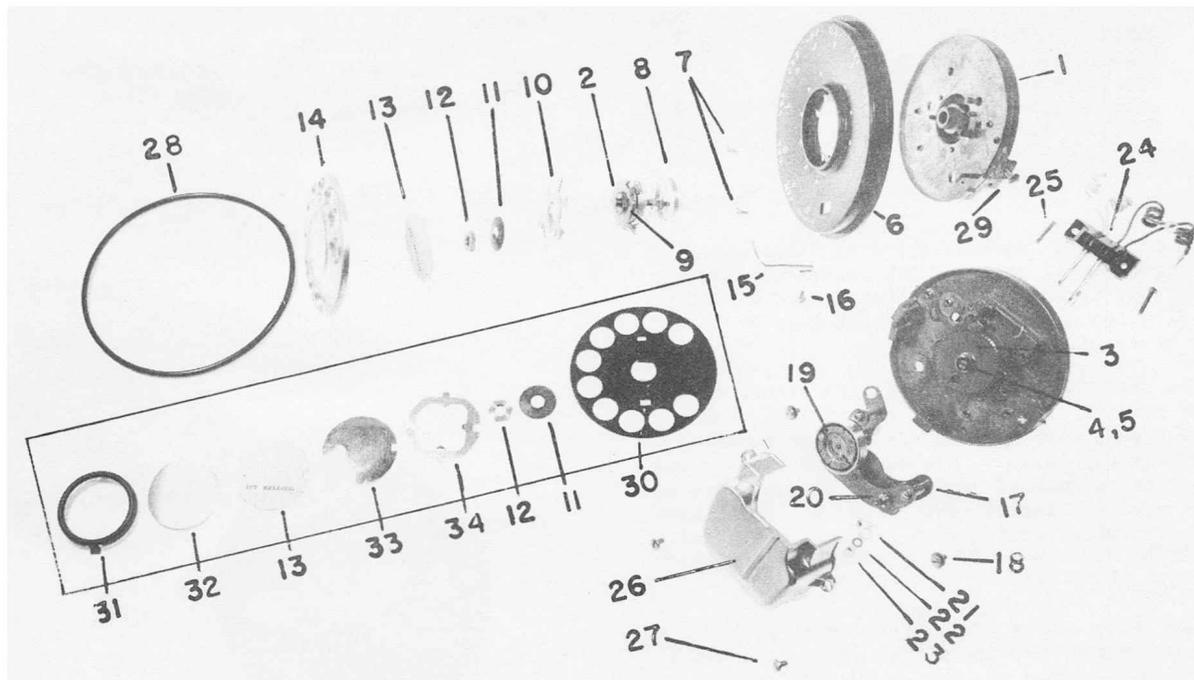


Fig. 3-1 COMPONENT PARTS - EXPLODED VIEW

Rotate finger plate fully clockwise. Insert opened paper clip into tab release hole to depress tab by 1/8". Rotate finger plate slightly more clockwise and lift from spider spring.

Place finger plate squarely over spider spring with "0" finger hole directly over "9" character marking on numeral ring. Turn finger plate in an anti-clockwise direction until tab latches in notch.

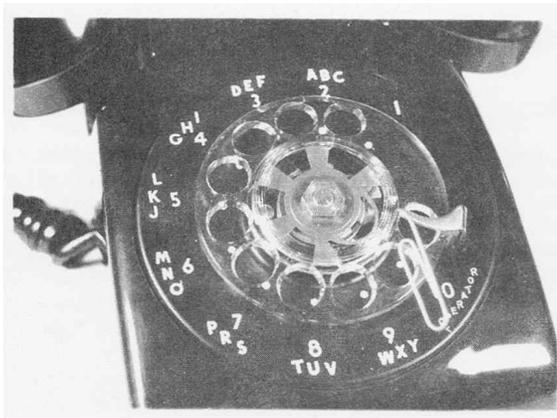


Fig. 3-2 REMOVING LUCITE FINGER PLATE



Fig. 3-3 REPLACING LUCITE FINGER PLATE

### 3 DISASSEMBLY AND ASSEMBLY

3.1 Dials should be disassembled and assembled only when necessary for maintenance purposes. The procedures given in the following paragraphs, which apply specifically to the types 19 and 28 units, should be followed. The exploded view of Fig. 3-1 shows the component parts of the type 19 dial.

#### 3.2 DISASSEMBLY

- a: Remove the screws (27) and dust cover (26).
- b: Remove the screws (25) and spring assembly (24).
- c: Loosen but do not remove the nut (5) holding the main gear assembly (3).
- d: Remove the screws (18) and gear train assembly (17).
- e: Remove the finger plate (14), see Fig. 3-2.
- f: Remove the special hex. nut (12), the spring washer (11) and the spider spring (10).
- g: Pull the cam casting (9) forward and unwind the main spring (8), then lift out the cam casting and main spring.
- h: Remove the nut (5), the washer (4), the main gear assembly (3) and the main shaft (2).
- i: Remove the screw (16) and the finger stop (15).
- j: Remove the screws (7) and the numeral ring (6).
- k: Remove the gasket (28) from the finger plate.

**NOTE:** Disassembly of the spring washer (20), cam (21), washer (22) and impulse cam (23) of the types 19 and 28 dials should be avoided where possible. If these parts must be disassembled refer to paragraph 3.3f, below.

#### 3.3 ASSEMBLY

- a: Locate the numeral ring (6) on the base (1) and fix with the screws (7).
- b: Insert the finger stop (15) through the slot in the finger plate and fix with screw (16).
- c: Insert the main shaft (2) from the front of the base then mount the main gear (3) using the washer (4) and nut (5). **DO NOT TIGHTEN THE NUT AT THIS STAGE.**

- d: Insert the formed tip of the main spring (8) into the hole in the cam casting (9) and fit the first coil of the spring over the lugs on the casting. The second coil of the spring must lie inside the lips of the two lugs.
- e: With the shunt spring actuator pin on the main gear (5) held midway between the figures 8 and 9 on the numeral ring place the spring and cam casting over the main shaft from the front of the base. Locate the angled tip of the spring in its slot then rotate the cam casting two full turns clockwise, to tension the main spring, and press the cam casting over the flattened portion of the main shaft. Now fit the spider spring (10), with the small tab pointing midway between positions 9 and 0 on the numeral ring and the flanges of the center hole towards the cam casting. Add the spring washer (11) and nut (12) then tighten.
- f: Replace the gear train assembly (17), turning the gears so that the impulse cam (23) takes up the position shown in the descriptive sub-section for the particular dial, then tighten with screws (18).
- g: Tighten the nut (5), which was previously left loose, to hold the main gear securely.
- h: Place the spring assembly (24) in position, locating the ends of the springs correctly against the actuating cams (see individual descriptive sub-section), and secure with screws (25).
- i: Fit the number card (13), if required, in the finger plate (14), matching the notch in the card with the tab inside the recess of the finger plate, then replace the finger plate, see Fig. 3-3.
- j: Lubricate the dial, if necessary, section 4.
- k: Adjust the dial as detailed in section 5.
- l: Mount the dust cover (26) with screws (27).
- m: Replace the gasket (28) over the rim of the numeral ring.

### 4 LUBRICATION

4.1 It is essential that the dial mechanism is lubricated correctly so that smooth, trouble-free performance will be obtained.

4.2 Clean all existing lubricant and collected dirt from the mechanism with a good quality, non-filming commercial solvent, using a small brush with firm bristles. Disassemble the mechanism as necessary for this operation. **IT IS VERY IMPORTANT THAT THE INTERNAL PARTS OF THE GOVERNOR MECHANISM ARE FREE FROM LUBRICANT AND DIRT.**

4.3 A fine camel hair brush is recommended for applying lubricant. Use a high quality lubricant such as ITTK Dial Lubricant 79946. Apply sparingly to both bearings of each gear shaft, the main shaft and the clutch spring. Apply a very light film to the teeth of each gear. Operate the dial several times to spread the lubricant then check the gear train adjustment and speed, see section 5. **AVOID EXCESSIVE LUBRICATION AS IT TENDS TO COLLECT DIRT AND CAN CREEP INTO THE GOVERNOR DRUM.**

## 5 TEST AND ADJUSTMENT

5.1 First check the individual sub-section, in which the specific dial is described, for details of any special tests or adjustments. Then proceed as outlined below.

5.2 Tests and readjustments of dials should be carried out in the order given in the following paragraphs. It will be necessary to remove the dust cover to obtain access to the moving parts of the assembly.

### 5.3 PRELIMINARY CHECKS

Check for end play in the main shaft, maximum .010", and all gear train shafts, maximum .015". Excessive end play in the main shaft may be caused by a loose end nut and in the gear train shafts may be caused by loose assembly screws. Check all gears for worn teeth. Badly worn parts must be replaced before adjusting the dial.

### 5.4 GEAR TRAIN

Slowly rotate the finger plate in both the wind and unwind directions and check for binding and gear train noise. If readjustment is required slightly loosen the two gear train mounting screws and slide the assembly to adjust the mesh of the drive pinion with the main gear. The mounting holes in the gear train baseplate are made oversize to permit this adjustment which must be made to obtain minimum gear train noise without binding. Tighten the mounting screws securely and recheck.

### 5.5 DIAL SPEED

Check the speed of the dial on a reliable pulse speed tester. If the speed falls outside the range given under the TEST heading in the individual descriptive sub-section, readjust it to be within the range given under the heading of READJUST. The speed is controlled by the end-to-end tension of the governor spring; reducing the inward tension of the spring causes the speed to be reduced and increasing the inward tension causes the speed to be increased. Adjust the spring tension by curving or flattening the spring at the center of the loop, using a pair of tweezers with flat jaws. Be sure that the loop of the spring is kept approximately parallel with the governor housing and has a clearance of about 1/64" from all other parts of the governor mechanism, except for the tips of the spring connecting to the weights.

### 5.6 CONTACT SPRINGS

Each of the springs must be approximately straight and the bar contacts of mating springs must make approximately on center. Bend the springs at the base to obtain the specified tension and position adjustments. Refer to the individual descriptive sub-section for the specific values of spring tension and contact clearance.

#### 5.6.1 Shunt Springs

With the dial at normal each make spring must be straight, have the correct minimum contact separation from its mating lever spring and be approximately perpendicular to the mounting block. With the dial rotated from the normal position each lever spring must provide the required contact pressure against its make spring. With the dial at normal each break spring must provide the correct contact pressure against its mating lever spring. With the dial rotated from the normal position each break spring must have the correct minimum contact separation from its mating lever spring.

#### 5.6.2 Pulsing Springs

During the return motion of the dial the pulsing contacts must have the correct minimum contact separation on each pulse. With the contacts fully parted the lever spring must bear against the pulsing cam with the correct pressure, measured at the tip of the spring. Rotate the dial FROM the normal position until the lever spring rests against the low part of the cam. In this condition the break spring must provide the correct contact pressure against the lever spring, measured at the tip of the break spring. Note that there must be a slight clearance between the tip of the break spring and the trigger locking cam with the dial at normal.

### 5.7 PULSE RATIO

Check the break period of the dial pulses on a reliable pulse ratio tester. If the pulse ratio is outside the range given under the TEST heading in the individual descriptive sub-section, readjust it to be within the range given under the heading of READJUST. The adjustment is effected by slight bending of the tab of the pulsing lever spring at a point just behind the pulsing cam. Bending the tab away from the cam increases the break time and bending it towards the cam reduces the break time. Refer also to the last sentence of paragraph 5.6.2.

## TYPE 19--(-)450 DIAL

The type 19 dial is the standard pulsing device used on the 500 and 554 series telephone instruments. It is designed for service on any type of automatic switching system requiring dial impulses at a speed of 10 impulses per second, nominal, and a pulse ratio with a break period of 60 to 70 percent of the pulse duration. A single, normally open, off-

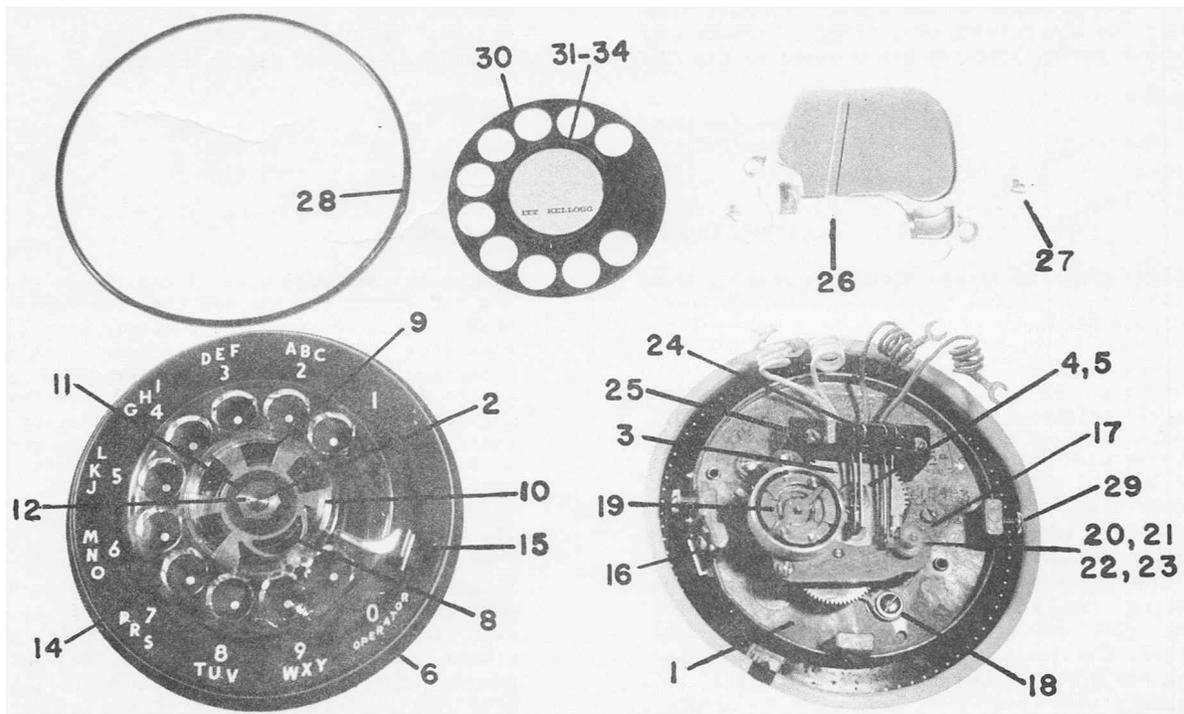
normal contact is provided in addition to the normally closed pulsing contacts. Each contact spring is provided with a flexible connection lead. The 4.1/4" diameter numeral ring is available in colors to match the various telephone housings. A lucite finger plate is provided. Tropicalization treatment can be applied, if specified.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty	Item	Description	Number	Qty
1	Base Assembly	75485	1	18	Bind. Hd. Mach. Screw	75576-2	2
2	Main Shaft	75460	1	19	Governor Spring	75461	1
3	Main Gear Assembly	75475	1	20	Spring Washer	75454	1
4	Washer	60629	1	21	Cam (Trigger Locking)	75452	1
5	Hex. Nut	63986	1	22	Washer	75453	1
6	Numeral Ring	75482-Ø	1	23	Impulse Cam	75451	1
7	Special Screw	75468	2	24	Spring Assembly	75437	1
8	Main Spring	75466	1	25	Rd. Hd. Mach. Screw	69378	2
9	Cam Casting	75449	1	26	Dust Cover	75438	1
10	Spider Spring	79287	1	27	Bind. Hd. Mach. Screw	75576-2	2
11	Spring Washer	75467	1	28	Gasket	75474-2	1
12	Special Hex. Nut	75469	1	29	Bind. Hd. Mach. Screw	75487-2	2
13	Number Card	75419	1	30	Finger Plate (Metal)	75465	*1
14	Finger Plate (Lucite)	79284	1	31	Retaining Ring	75412	*1
15	Finger Stop	75480-2	1	32	Protector	75413	*1
16	Special Screw	75481	1	33	Retaining Disc	75416	*1
17	Gear Train Assembly	75479	1	34	Retaining Spring	75417	*1
				35	Finger Stop	75480	*1

Ø Replace by color code suffix, from series 1-16 for type G or from series 21-36 for type D numeral ring, to complete part number.

\* These parts used in place of items 10, 14 and 15 when the black metal finger plate is fitted.



a) Front View

b) Rear View

Fig. 1 IDENTIFICATION OF DIAL PARTS

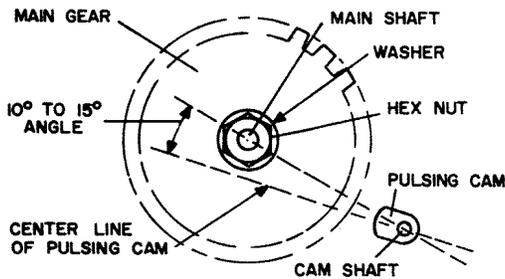


Fig. 2 POSITION OF PULSING CAM

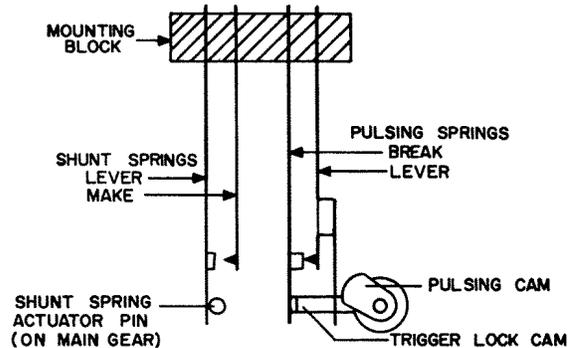


Fig. 3 CONTACT ARRANGEMENT

SPECIFIC TEST AND ADJUSTMENT DATA

Refer to sub-section M2A-DLS/GEN for complete test and adjustment procedure.

Impulse Cam

The impulse cam is push fitted to the splined cam shaft. The correct rotary position is shown in Fig. 2. The cam may be positioned either by removing it from the shaft and replacing it in the correct position or by loosening the gear train mounting screws so that the gears may be turned, to obtain correct alignment of the cam, and then remeshed with the main gear. The latter method is recommended except when the cam has been removed for other purposes.

Spring Assembly Position

The correct position of the spring assembly with respect to the pulsing cam, trigger locking cam and shunt spring actuator pin is shown in Fig. 3.

Dial Speed

Test: 9.0 to 11.0 pulses/second.  
Readjust: 9.5 to 10.5 pulses/second.

Spring Pressures

Shunt lever spring to make spring; 20 grams min.  
Pulsing lever spring against cam; 12±7 grams.  
Pulsing breakspring to lever spring, with trigger locking cam away and cam in low posn. 30±7 grams.

Spring Clearances

Between the contacts of the open shunt springs; .015" min.  
Between the contacts of the open pulsing springs; .010" min.

Note that there must be a slight clearance between the tip of the pulsing break spring and the tip of the trigger locking cam with the dial at normal.  
Between the edge of the cam riding tip of the pulsing lever spring and the top surface of the trigger locking cam there must be a minimum clearance of .006" during rotation of the dial.

Pulse Ratio

	Percent Make.	Percent Break.
Test:	38.5±4	61.5±4
Readjust:	38.5±2	61.5±2

ALTERNATIVE FINGER PLATE ASSEMBLIES

Two earlier types of finger plates, differing from the standard lucite type, have been produced. These are described below.

Metal Finger Plate

This type is only available in black for fitting to black telephones. The component parts are shown in the exploded view on the type 19 dial in sub-section M2A-DLS/GEN and are listed in the parts list of this sub-section.

The retaining ring (31) is removed by prying up at the top edge with a knife or small screwdriver. The retaining disc (33), number card (13) and protector (32) may be removed from the retaining ring after taking out the retaining spring (34) by squeezing the two inner tabs together. The finger plate (30) is removed after taking off nut (12) and spring washer (11). Reassembly is a reversal of the above processes; the tab at the bottom of the retaining ring being

placed in the lower slot of the finger plate and the tab at the top snapped into the upper slot. NOTE: A different shape of finger stop (35) is used with the metal finger plate. It differs from that used with the lucite finger plate only in the angle between the top and side arms. It may be adapted for use with the lucite finger plate by slightly bending up the top arm until it is parallel with the top of the lucite finger plate.

Lucite Finger Plate

This differs from the current type of lucite finger plate only by the fact that a separate protector (32) was used in front of the number card and a retaining spring (not listed) was fitted behind the number card. The spring is removed or replaced by turning it slightly to move its tabs in the guide slots in the finger plate recess.

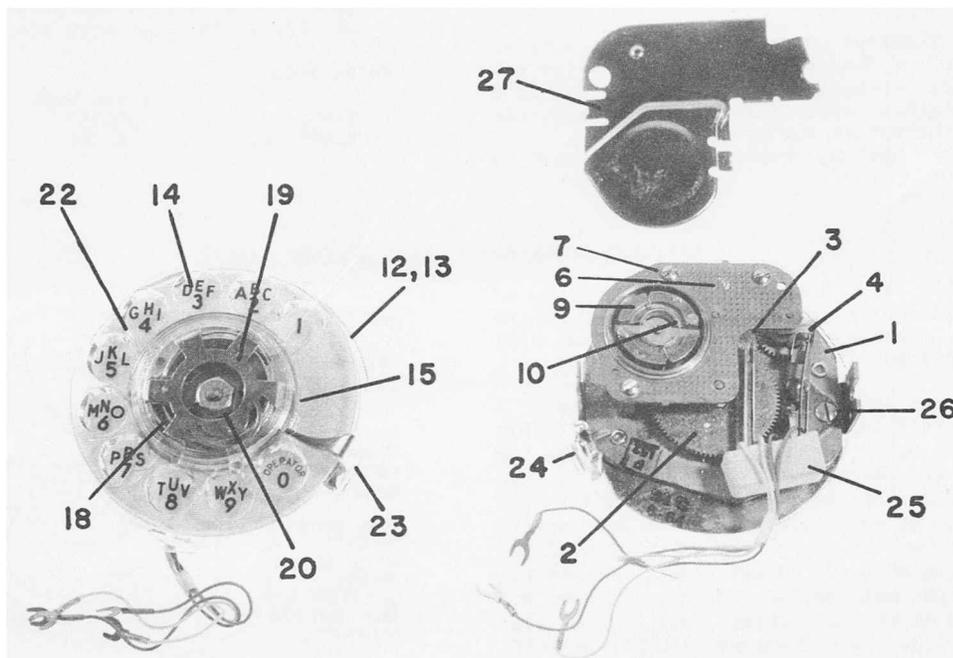
## TYPE 24(-)450 DIAL

The type 24 dial is the standard pulsing device used on all 700 series compact desk telephone instruments. It is designed for service on any type of automatic switching system requiring dial impulses at a speed of 10 impulses per second, nominal, and a pulse ratio with a break period of 61.5 percent of the pulse duration.

A single, normally open, off-normal contact is fitted in addition to the normally closed pulsing contacts. Each contact spring is provided with a flexible connection lead. A small lamp may be set behind the 3" diameter translucent number plate to provide diffused dial illumination or night light service. A lucite finger plate is provided.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty	Item	Description	Number	Qty
1	Gear Train and Bracket Assembly c/w items 2 thru 10	190218	1	15	Retainer Ring	190214	1
2	Main Gear Assembly	190205-1	1	16	Bushing	190255	1
3	Intermediate Gear Assembly	190222	1	17	Spring and Spider Assembly comprising items 18 and 19	190235	1
4	Cam Assembly	190241	1	18	Spring (Main)	190258	1
5	Clutch Assembly	190234	1	19	Spider (Spring) Assembly	190238	1
6	Governor Drum and Plate Assy.	190243	1	20	Hex. Nut	77007-2	1
7	Fil. Hd. Mach. Screw	68293	3	21	Number Card	75415	1
8	Washer	75478	1	22	Finger Plate	79284	1
9	Weight and Drive Bar Assembly	190257	1	23	Finger Stop	190209	1
10	Spring	75461	1	24	Special Screw	190262-2	1
11	Positioning Ring	86387	1	25	Spring Assembly	190255	1
12	Ring	190213	1	26	Bind. Hd. Mach. Screw	75576-2	1
13	Reflector Ring	190203	1	27	Cover	190201	1
14a	Numerical Ring (Type G)	190204	1	28	Gasket	190261	1
b	Numerical Ring (Type D)	190367	1	29	Bind. Hd. Mach. Screw	75392-2	2



a) Front View

b) Rear View

Fig. 1 IDENTIFICATION OF DIAL PARTS

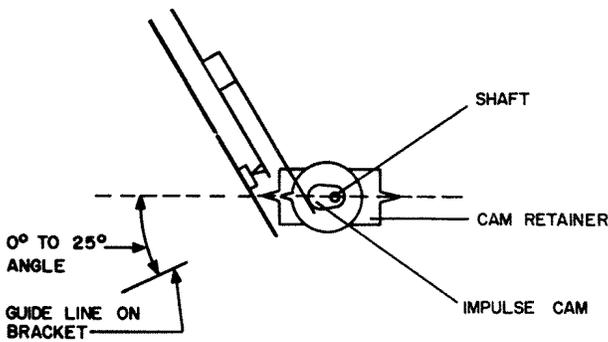


Fig. 2 POSITION OF PULSING CAM

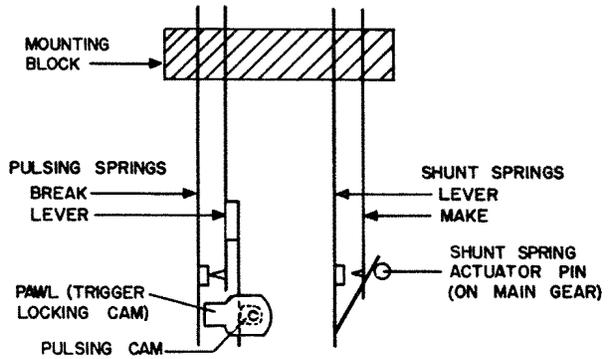


Fig. 3 CONTACT ARRANGEMENT

**SPECIFIC TEST AND ADJUSTMENT DATA**

Refer to sub-section M2A-DLS/GEN for complete test and adjustment data.

**Impulse Cam**

The correct rotary position of the impulse cam is shown in Fig. 2. The cam is positioned by loosening the three gear train mounting screws, so that the cam shaft may be rotated without the rest of the gears, then aligning the arrow end of the cam retainer as indicated. The gears are then remeshed and the mounting screws tightened.

**Spring Assembly Position**

The correct position of the spring assembly with respect to the pulsing cam, pawl and shunt spring actuator pin is shown in Fig. 3.

**Pawl**

The force required to rotate the pawl, applied to the tip of the pawl and radial to the cam shaft, must not be less than 1/2 gram. With a force of 5 grams, applied at the same point, the pawl must not rotate during dial rundown. Any pawl not meeting these requirements must be replaced.

Dial Speed	
Test;	9.0 to 11.0 pulses/second.
Readjust;	9.5 to 11.5 pulses/second.

**Spring Pressures**

Shunt lever spring to make spring;	20 grams min.
Pulsing lever spring against cam;	12±7 grams.
Pulsing break spring to lever spring, with pawl away and cam in low position;	30±7 grams.

**Spring Clearances**

Between the contacts of the open shunt springs;	.015" min.
Between the contacts of the open pulsing springs;	.010" min.

Note that there must be a slight clearance between the tip of the pulsing break spring and the tip of the pawl with the dial at normal.

**Pulse Ratio**

	Percent Make.	Percent Break.
Test;	38.5±4	61.5±4
Readjust;	38.5±2	61.5±2

**SPECIFIC DISASSEMBLY AND ASSEMBLY DATA**

The disassembly and assembly procedures given in sub-section M2A-DLS/GEN apply only generally to the type 24 dial. The major differences for this dial are outlined below.

- a: The dust cover is clipped to the dial frame.
- b: The gear train is not a separate sub-assembly but is built up on the dial base and held by the rear plate and three screws.
- c: The spider spring is shaped so that a separate cam casting is not necessary. The main spring is hooked over the three tabs on the rim of the spider spring then the spider spring is rotated, to tension the main spring, and pressed over the flatted end of the main shaft. See Fig. 4; also paragraphs 3.3d and e of sub-section M2A-DLS/GEN.
- d: A positioning ring is fitted in the center of the reflector ring in order to locate the numeral ring correctly. The location of the positioning ring is indicated in Fig. 4.

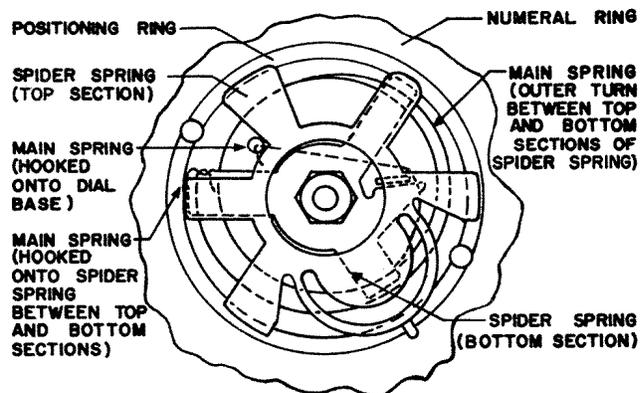


Fig. 4 MAIN SPRING, SPIDER SPRING AND POSITIONING RING LOCATION

## TYPE 28--(-)450 DIAL

The type 28 dial is a special pulsing device for use on speakerphone types of telephone instruments. It is designed for service on any type of automatic switching system requiring dial impulses at a speed of 10 impulses per second, nominal, and a pulse ratio with a break period of 60 to 70 percent of the pulse duration. Two, normally open, sets of off-normal contacts are provided in addition to the normally closed pulsing contacts. Each contact

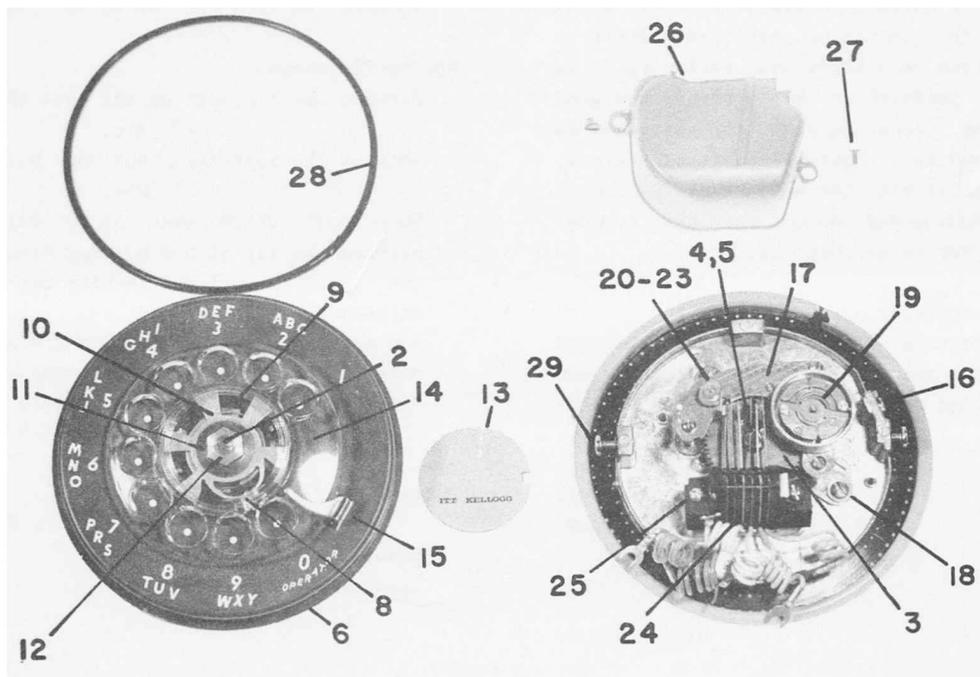
spring is provided with a flexible connection lead. The 4.1/4" diameter numeral ring is available in colors to match the various telephone housings. A lucite finger plate is provided. Tropicalization treatment can be applied, if specified.

The type 28 dial is identical in most respects to the type 19 dial and many of the parts of the two assemblies are interchangeable.

Fig. 1 IDENTIFICATION OF DIAL PARTS

Item	Description	Number	Qty	Item	Description	Number	Qty
1	Base Assembly	75485	1	18	Bind. Hd. Mach. Screw	75576-2	2
2	Main Shaft	75460	1	19	Governor Spring	75461	1
3	Main Gear Assembly	75475-2	1	20	Spring Washer	75454	1
4	Washer	84768-2	1	21	Cam (Trigger Locking)	75452	1
5	Hex. Nut	84767-2	1	22	Washer	75453	1
6	Numeral Ring	75482-Ø	1	23	Impulse Cam	75451	1
7	Special Screw	75468	2	24	Spring Assembly	84766-1	1
8	Main Spring	75466	1	25	Rd. Hd. Mach. Screw	69378	2
9	Cam Casting	75449	1	26	Dust Cover	75438	1
10	Spider Spring	79287	1	27	Bind. Hd. Mach. Screw	75576-2	2
11	Spring Washer	75467	1	28	Gasket	75474-2	1
12	Special Hex. Nut	75469	1	29	Bind. Hd. Mach. Screw	75487-2	2
13	Number Card	75419	1				
14	Finger Plate (Lucite)	79284	1				
15	Finger Stop	75480-2	1				
16	Special Screw	75481	1				
17	Gear Train Assembly	75479	1				

Ø Replace by color code suffix, from series 1-16 for type G or from series 21-36 for type D numeral ring, to complete part number.



a) Front View

b) Rear View

Table 1 REPLACEABLE PARTS

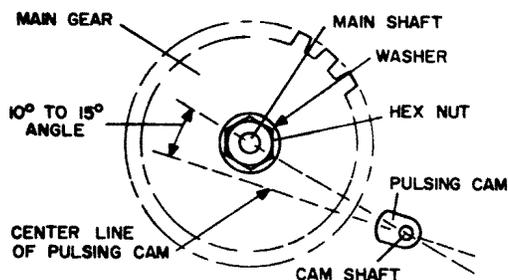


Fig. 2 POSITION OF PULSING CAM

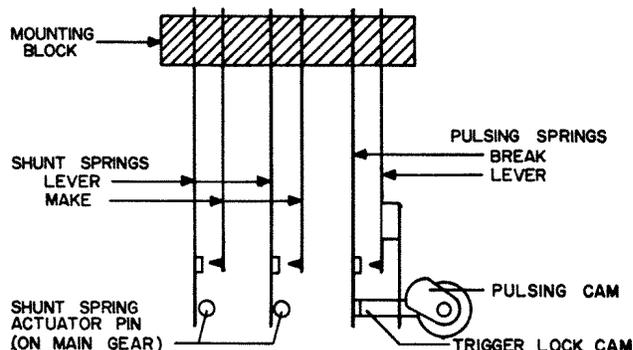


Fig. 3 CONTACT ARRANGEMENT

### SPECIFIC TEST AND ADJUSTMENT DATA

Refer to sub-section M2A-DLS/GEN for complete test and adjustment procedure.

#### Impulse Cam

The impulse cam is press fitted to the splined cam shaft. The correct rotary position is shown in Fig. 2. The cam may be positioned either by removing it from the shaft and replacing it in the correct position or by loosening the gear train mounting screws so that the gears may be turned, to obtain correct alignment of the cam, and then remeshed with the main gear. The latter method is recommended except when the cam has been removed for other purposes.

#### Spring Assembly Position

The correct position of the spring assembly with respect to the pulsing cam, trigger locking cam and shunt spring actuator pin is shown in Fig. 3.

#### Dial Speed

Test; 9.0 to 11.0 pulses/second.  
Readjust; 9.5 to 10.5 pulses/second.

#### Spring Pressures

Each shunt lever spring to its mating make spring; 20 grams min.  
Pulsing lever spring against cam;  $12 \pm 7$  grams.  
Pulsing break spring to lever spring, with trigger locking cam away and cam in low posn.  $30 \pm 7$  grams.

#### Spring Clearances

Between the contacts of the open shunt springs; .015" min.  
Between the contacts of the open pulsing springs; .010" min.  
Note that there must be a slight clearance between the tip of the pulsing break spring and the tip of the trigger locking cam with the dial at normal.  
Between the edge of the cam riding tip of the pulsing lever spring and the top surface of the trigger locking cam there must be a minimum clearance of .006" during rotation of the dial.

#### Pulse Ratio

	Percent Make.	Percent Break.
Test;	$38.5 \pm 4$	$61.5 \pm 4$
Readjust;	$38.5 \pm 2$	$61.5 \pm 2$

# TYPE 75335-1 NETWORK

## CONTENTS

Section	Page	Figure	Page
1 GENERAL DESCRIPTION	1	2-1 CIRCUIT DIAGRAM	1
2 TECHNICAL DESCRIPTION	1	3-1 TERMINAL BOARD LAYOUT	2
3 TESTING	2	Table	
		3-1 POINT TO POINT TEST VALUES	2

## 1 GENERAL DESCRIPTION

1.1 The type 75335-1 network assembly provides all the components necessary to connect and match the impedance of the type 65 handset transmitter and receiver units to a two wire telephone circuit.

1.2 The unit incorporates radio frequency filter

and side tone balancing circuits and a 0.5 mfd. ringer capacitor in addition to the other circuits.

1.3 All the components are mounted on the underside of the molded terminal board which is clipped to the sealing compound filled mounting container.

## 2 TECHNICAL DESCRIPTION

2.1 The circuit is shown in Fig. 2-1; the dashed lines show typical connections to other components of a complete telephone instrument. The features of the circuit are briefly discussed in the following paragraphs.

### 2.2 EQUALIZATION

The basic network design provides an increase in transmission characteristics of some 10 db over previous circuits. It has therefore been possible to include the two shunt varistors in the circuit

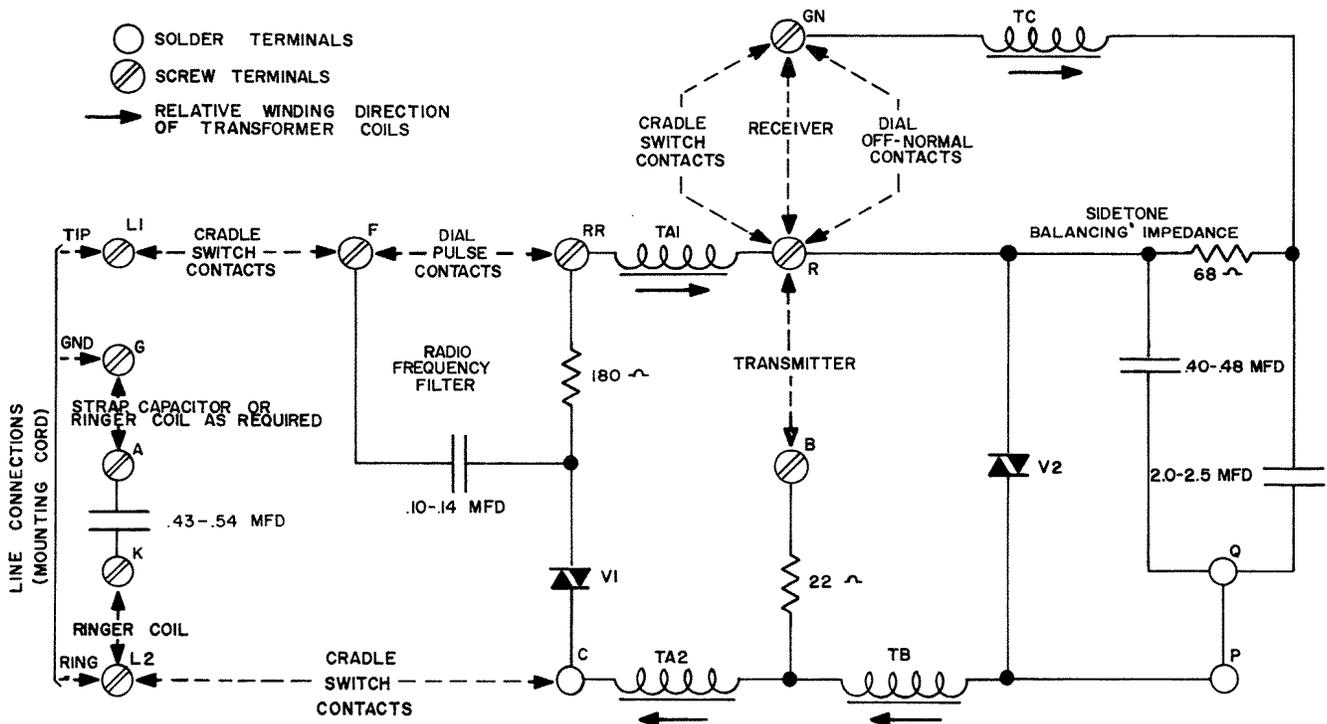


Fig. 2-1 CIRCUIT DIAGRAM

to produce increased losses on short loops and yet have negligible effect on long loops; the varistor effective resistances changing inversely to the current flowing through them.

### 2.3 TRANSMISSION

The direction of winding of the four coils of the transformer is indicated by arrows in Fig. 2-1. Received speech currents pass via windings TA<sub>1</sub>, TB and TA<sub>2</sub>, each of which produces an additive voltage in winding TC. The received currents also produce a voltage across the 68 ohms resistor that opposes and is almost equal to that produced by the induced voltages in winding TC. There is, therefore, very little power loss in the resistor and varistor and maximum power in the receiver. The low impedance of the transmitter is matched to the loop by the turns ratio of winding TB to windings TA<sub>1</sub> and TA<sub>2</sub>.

### 2.4 SIDETONE BALANCING

The current variations due to the transmitter

are in opposite phase in windings TA and TB. The induced voltages in winding TC are also in opposite phase and the resultant voltage is opposed by the voltage produced across the 68 ohms resistor. The net effect is that very small signals are produced in the receiver due to transmitter current changes and sidetone is very low. Also, as there is little power loss in the receiver, maximum transmitting levels are attained. Both varistors contribute to this condition by automatically compensating for various loop conditions to provide close matching of the loop impedance and the balancing network impedance with the transmitter circuit.

### 2.5 RADIO FREQUENCY FILTERING

The 180 ohms resistor and .10 mfd capacitor provide a filter network to suppress high frequency signal components of the dial pulses which might otherwise be radiated from the telephone line and cause local interference with broadcast radio reception.

## 3 TESTING

3.1 Thorough testing of the network assembly can only be performed with elaborate test equipment. An adequate check on performance, for maintenance purposes, is to compare a suspected unit with a known good unit by substitution. Resistance and capacitance checks can be carried out between many of the terminals, as can be seen from Fig. 2-1. Note that the soldered connection between terminals P and Q can be opened to permit testing of the two network capacitors. Fig. 3-1 shows the layout of the terminal board of the assembly.

3.2 To assist in testing network assemblies in the field, Table 3-1 gives the values of resistance and capacitance which should be measured when tests are made between various pairs of terminals.

Table 3-1 POINT TO POINT TEST VALUES

Terminals	Components	Test Value
F - RR	Filter Capacitor	.09 - .14
A - K	Ringer Capacitor	.43 - .54
R - Q	Network Capacitors	(4) 2.4 - 3.0
C - RR	V1 and filter resistor	(1) 4.7K min (2) 890-1070
C - P	TA <sub>2</sub> and TB windings	28.8-35.2
B - C	TA <sub>2</sub> winding and resistor	35.1-42.9
B - P	TB winding and resistor	33.3-40.7
R - GN	TC winding and resistor	74.3-90.7
R - RR	TA <sub>1</sub> winding	12.1-14.9
R - P	V2	(1) 1.6K min (3) 72-87

NOTES: All capacitance values in microfarads and all resistance values in ohms.  
(1) with 1 ma dc flowing through circuit.  
(2) with 10 ma dc flowing through circuit.  
(3) with 100 ma dc flowing through circuit.  
(4) with strap P-Q removed.

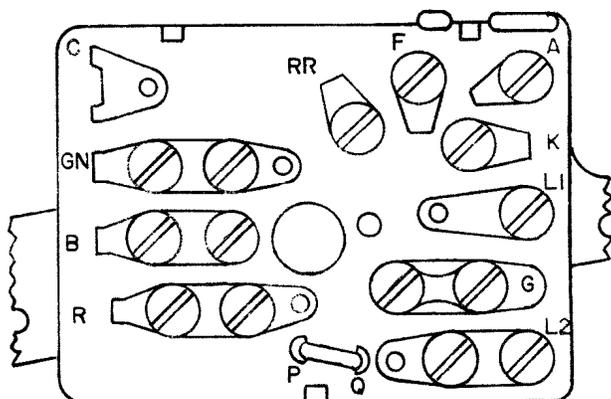


Fig. 3-1 TERMINAL BOARD LAYOUT

# TYPE 190107 NETWORK

## CONTENTS

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2	TECHNICAL DESCRIPTION	1	3-1	TERMINAL BOARD LAYOUT	2
3	TESTING	2	Table		
			3-1	POINT TO POINT TEST VALUES	2

## 1 GENERAL DESCRIPTION

1.1 The type 190107 network assembly provides all the components necessary to connect and match the impedance of the type 65 handset transmitter and receiver units to a two wire telephone circuit.

1.2 The unit incorporates radio frequency filter

and side tone balancing circuits in addition to the impedance matching components.

1.3 All the components are mounted to the underside of the molded terminal board which is clipped to the sealing compound filled mounting container.

## 2 TECHNICAL DESCRIPTION

2.1 The circuit is shown in Fig. 2-1; the dashed lines show typical connections to other components of a complete telephone instrument. The features of the circuit are briefly discussed in the following paragraphs.

### 2.2 EQUALIZATION

The basic network design provides an increase in transmission characteristics of some 10 db over previous circuits. It has therefore been possible to include the two shunt elements in the circuit

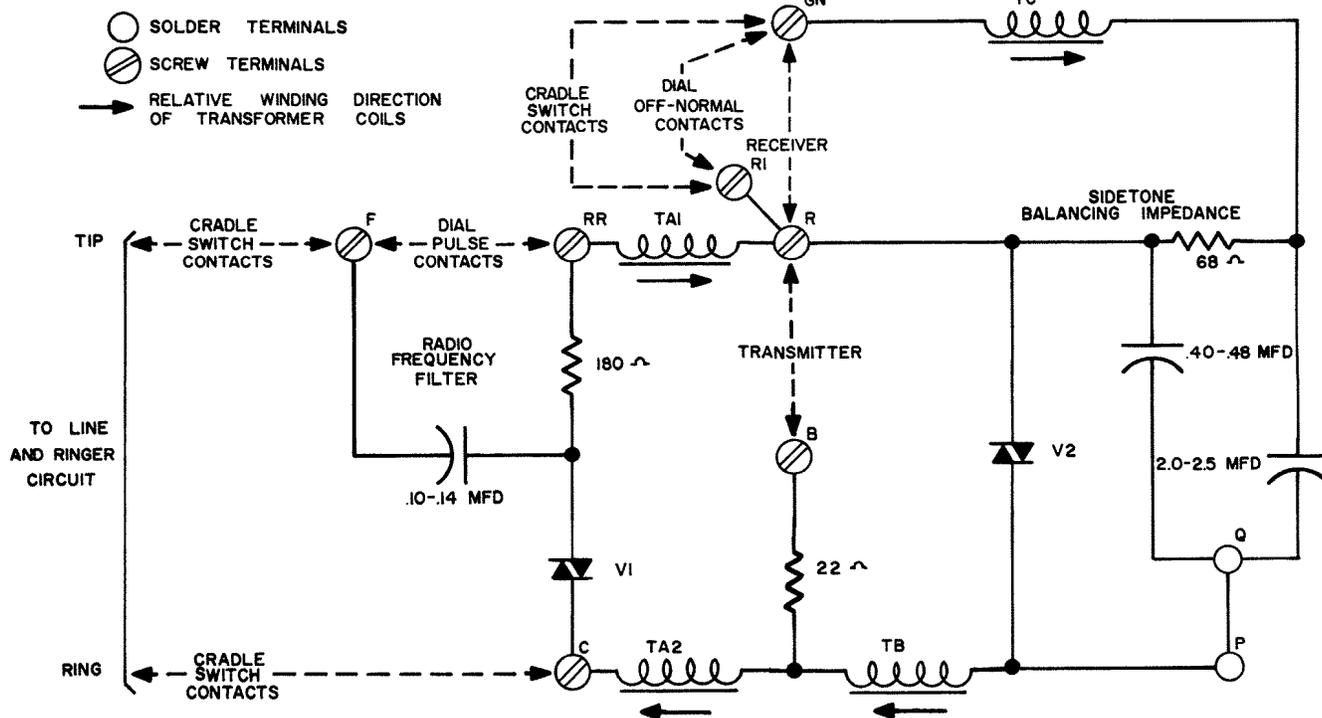


Fig. 2-1 CIRCUIT DIAGRAM

to produce increased losses on short loops and yet have negligible effect on long loops; the varistor effective resistances changing inversely to the current flowing through them.

2.3 TRANSMISSION

The direction of winding of the four coils of the transformer is indicated by arrows in Fig. 2-1. Received speech currents pass via windings TA<sub>1</sub>, TB and TA<sub>2</sub>, each of which produces an additive voltage in winding TC. The received currents also produce a voltage across the 68 ohms resistor that opposes and is almost equal to that produced by the induced voltages in winding TC. There is, therefore, very little power loss in the resistor and varistor and maximum power in the receiver. The low impedance of the transmitter is matched to the loop by the turns ratio of winding TB to windings TA<sub>1</sub> and TA<sub>2</sub>.

2.4 SIDETONE BALANCING

The current variations due to the transmitter

are in opposite phase in windings TA and TB. The induced voltages in winding TC are also in opposite phase and the resultant voltage is opposed by the voltage produced across the 68 ohms resistor. The net effect is that very small signals are produced in the receiver due to transmitter current changes and sidetone is very low. Also, as there is little power loss in the receiver, maximum transmitting levels are attained. Both varistors contribute to this condition by automatically compensating for various loop conditions to provide close matching of the loop impedance and the balancing network impedance with the transmitter circuit.

2.5 RADIO FREQUENCY FILTERING

The 180 ohms resistor and .10 mfd capacitor provide a filter network to suppress high frequency signal components of the dial pulses which might otherwise be radiated from the telephone line and cause local interference with broadcast radio reception.

3 TESTING

3.1 Thorough testing of the network assembly can only be performed with elaborate test equipment. An adequate check on performance, for maintenance purposes, is to compare a suspected unit with a known good unit by substitution. Resistance and capacitance checks can be carried out between many of the terminals, as can be seen from Fig. 2-1. Note that the soldered connection between terminals P and Q can be opened to permit testing of the two network capacitors. Fig. 3-1 shows the layout of the terminal board of the assembly.

3.2 To assist in testing network assemblies in the field, Table 3-1 gives the values of resistance and capacitance which should be measured when tests are made between various pairs of terminals.

Table 3-1 POINT TO POINT TEST VALUES

Terminals	Components	Test Value
F - RR	Filter capacitor	.09 - .14
R - Q	Network capacitors	(4) 2.4 - 3.0
C - RR	V1 and filter resistor	(1) 4.7K min (2) 890-1070
C - P	TA <sub>2</sub> and TB windings	28.8-35.2
B - C	TA <sub>2</sub> winding	35.1-42.9
B - P	TB winding	33.3-40.7
R - GN	TC winding and resistor	74.3-90.7
R - RR	TA winding	12.1-14.9
R - P	V2	(1) 1.6K min

NOTES: All capacitance values in microfarads and all resistance values in ohms  
 (1) with 1 ma dc flowing through circuit.  
 (2) with 10 ma dc flowing through circuit.  
 (3) with 100 ma dc flowing through circuit.  
 (4) with strap P-Q removed.

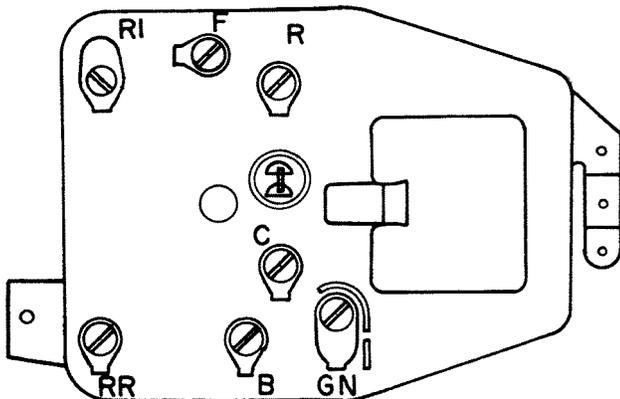


Fig. 3-1 TERMINAL BOARD LAYOUT

# TELEPHONE SERVICE RINGERS

## CONTENTS

Section	Page	Figure	Page
1 GENERAL DESCRIPTION	1	1-1 TYPICAL RINGER	1
2 ASSOCIATED PUBLICATIONS	1	5-1 IDENTIFICATION OF RINGER PARTS	5
3 DISASSEMBLY AND ASSEMBLY	2	Table	
4 LUBRICATION	2	5-1 FREQUENCY SELECTIVE RINGER CAPACITORS	6
5 TEST AND ADJUSTMENT	3	5-2 FREQUENCY SELECTIVE RINGER WEIGHTS	6

## 1 GENERAL DESCRIPTION

1.1 This sub-section provides general information on all types of single-gong and two-gong ringers. Specific information, parts lists and special adjustments are given in the individual descriptive sub-sections.

1.2 Each ringer consists of a cast, non-magnetic, alloy frame on which all the component parts are mounted. A typical ringer is illustrated in Fig. 1-1. A laminated soft-iron core carries the single coil and is clamped to the soft-iron yoke which is bolted to the frame. The armature and clapper assembly is spring mounted to the frame so that the clapper may be vibrated by the armature, due to the magnetic field produced by the coil and yoke, to strike the gong(s). Increased sensitivity is provided by biasing the armature by means of a small permanent magnet clamped in the frame. A mechanical volume control is fitted on most types of ringer so that the user may adjust the sound output level. The coil is provided with flexible wire leads for connection to the other components in the telephone.

1.3 The ringers are designed to function from an alternating current source. Units are available for all the standard ringing frequencies from 16 to

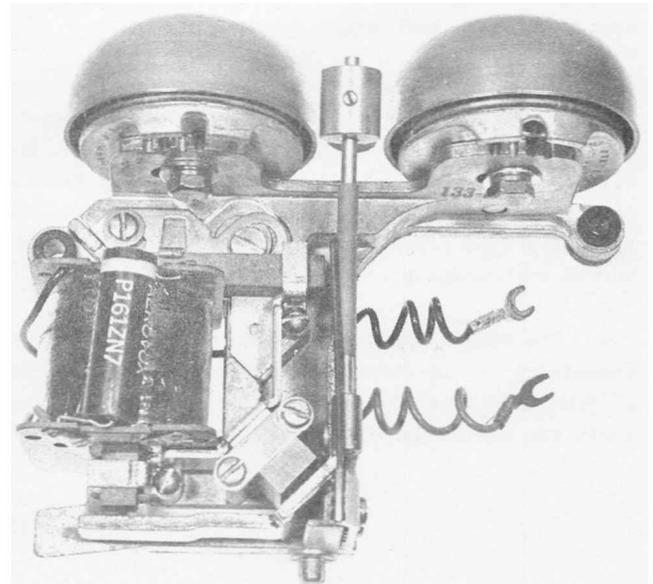


Fig. 1-1 TYPICAL RINGER

66-2/3 cycles per second. The sensitivity is such that satisfactory operation is obtained on the longest circuits and the high impedance prevents excessive bridging and unbalance losses on multi-party lines. A three point, anti-vibration mounting to the telephone base is provided.

## 2 ASSOCIATED PUBLICATIONS

2.1 Specific details of each type of ringer are given in individual sub-sections in this section of the manual, each indexed by the type number of the ringer to which it applies. The information given in this sub-section is of a general nature and applies to all the telephone ringers.

2.2 The types of ringer which can be used with each type of telephone are noted in the sub-section in which the instrument is described. Extension ringers of similar type may also be used.

2.3 A list of ringer classification code numbers is given in sub-section M1A-NUM. For any ringer unit without housing, the asterisk shown in the frequency selective ringer code numbers is always replaced by the letter "H".

2.4 The full code number for each type of ringer is given in the title of the individual descriptive sub-section. The classification code, noted above, must be inserted in place of the two dashes shown in each title in order to complete the code number.

### 3 DISASSEMBLY AND ASSEMBLY

#### CAUTION

THE STRENGTH OF THE PERMANENT MAGNET IS ADJUSTED AFTER ASSEMBLY OF THE RINGER. DISASSEMBLY OF ANY OF THE PARTS OF THE MAGNETIC CIRCUIT MAY ADVERSELY AFFECT THE PERFORMANCE OF THE RINGER. SPECIAL EQUIPMENT IS NECESSARY TO REMAGNETIZE AND ADJUST THE STRENGTH OF THE MAGNET IN ORDER TO OBTAIN OPTIMUM PERFORMANCE.

3.1 The gongs and resonators, if fitted, are removed by unscrewing their lockwasher mounting screws. Note that earlier models of some ringers had the resonators riveted to the frame. The gong mounting control wheels of the frequency selective ringers are removed by unscrewing the hexagonal head, lockwasher screws.

3.2 In order to remove the magnet from a BA type ringer, first remove the armature and clapper assembly then slide the magnet out of the frame. Do not strain the tab of the frame holding the magnet as it may break off. The magnet of a frequency selective type ringer may be lifted out after the screws and clamping plate are removed.

3.3 The coil is removed from a BA type ringer by unscrewing the lamination clamping screws and from a frequency selective type ringer by loosening the shunt bar and slide plate clamping screws.

3.4 Reassembly is a reversal of the procedures given for disassembly. The following points must be noted:

#### 3.4.1 All Ringers

- a) The end of the magnet nearest the armature must repel the north seeking pole of a compass and the opposite end of the magnet must be tight against the pole piece assembly.
- b) When facing the gong end of a two-gong ringer and with the frame facing downwards, gong "B" is on the left and gong "A" is on the right.

#### 3.4.2 BA Type Ringers

- a) When replacing the armature, the end of the bias spring must be located in its adjusting slot in the bracket on the frame.
- b) When replacing the coil, the number of core laminations used should result in the coil core being comfortably filled but not force fitted. A minimum weight of 16 grams of laminations must be used.

### 4 LUBRICATION

4.1 Ringers without volume controls do not require lubrication.

4.2 First clean away all existing lubricant from

the volume control mechanism then apply a light film of Lubriplate or similar non-drying lubricant to all rubbing surfaces of the volume control parts. Take care to avoid excessive lubrication.

### 5 TEST AND ADJUSTMENT

5.1 Thorough checking of ringers requires the use of specialized test equipment which will not always be available in the field. The portions of the procedures requiring the use of this test equipment are printed in upper case type. These steps may be omitted at the cost of a reduction in the overall performance of the ringer. Note that the strength of the permanent magnet will only be reduced by a small amount if care is taken not to disturb the armature, magnet and shunt bar or pole piece when changing a faulty coil.

5.2 The ringer under test must be firmly mounted in a test fixture, such as a telephone base plate which has been weighted to the normal weight of a

complete instrument, in order to carry out the tests and adjustments correctly.

5.3 For test and adjustment purposes, telephone ringers may be conveniently divided into the two general classifications of straight line and frequency selective types. The generalized test and adjustment procedures for these two groups are given in the following paragraphs. Reference must also be made to the individual sub-section for each type of ringer where specific sensitivity values and test and adjustments figures are quoted.

5.4 An easily assembled test board for ringer testing is described in sub-section M1C-TST/RIN.

## 5.5 STRAIGHT LINE RINGERS

First check the individual sub-section, in which the specific ringer is described, for details of any special tests or adjustments. Then proceed as outlined below.

### 5.5.1 Mechanical Adjustments

- a: The residual plate must lie flat on the rear face of the armature. Reshape the plate if necessary.
- b: With the bias spring set in the low notch, nearest the coil, the armature must be firmly tensioned against the rear pole face. Bend the bias spring near its base to adjust.
- c: The clapper stem must be straight and in line with the armature. Reshape the clapper stem if necessary.
- d: There must be a clearance of about 1/16" between the clapper and the "B", or single, gong when the armature is held against the rear pole face. Slightly bend the rear pole face to obtain this clearance. Note that on two gong ringers the identifying letter on the "B" gong must be positioned directly above the mounting screw before making this adjustment which should result in the clapper stem being approximately in line with the notch in the frame bridge piece.
- e: With the armature resting against the rear pole face there must be a clearance of .045" to .050" between the armature stud and the front pole face. Slightly bend the front pole face, at the portion parallel to the length of the magnet, to obtain the required clearance.
- f: Check the stop rod, two gong ringer, or rubber cam, single gong ringer, adjustment as detailed in the individual ringer sub-section if the ringer is fitted with a volume control.
- g: Slight readjustment of the "B" gong and/or clapper stem may be required in order to obtain an even, good quality ring during the electrical tests. The final adjustments, however, must meet the requirements outlined above.

### 5.5.2 Electrical Tests

The objective of the electrical tests is to obtain optimum balance between the forces, acting on the armature, from the bias spring and the permanent magnet. Take care to avoid demagnetization of the magnet if magnetization equipment is not available.

- a: PLACE THE RINGER IN THE MAGNETIZING FIXTURE AND SATURATE THE MAGNET
- b: Place the ringer in the test fixture and connect the leads to the test board, or equivalent circuitry. Switch in the 0.5 mf capacitor and switch out the resistive load.
- c: Adjust the value of the series resistance to produce the specified (see individual ringer sub-section) voltages across the ringer coil and capacitor, in series, at each ringing frequency in turn. The ringer must function well with the voltages given under the heading of "Maximum" and must ring steadily, with the clapper hitting both gongs, with the voltages given under the heading of "Minimum". With the voltages given under the heading of "Ultimate" the ringer should just tinkle with the volume control, if fitted, in the maximum loudness position. If the magnetic circuit has not been broken and the ringer has not been re-magnetized, adjustment of the bias spring tension will normally be all that is required to obtain the specified performance. If the ringer has been remagnetized it will be necessary to follow steps "d" through "e" below.
- d: SWITCH THE DEMAGNETIZER TO "CHARGE" AND ADJUST THE VOLTAGE TO 60V.
- e: SWITCH TO "DEMAGNETIZE" THEN RECHECK THE RINGER AS IN STEP "C". REPEAT THESE TWO STEPS, AS NECESSARY, WITH DEMAGNETIZING VOLTAGE UP TO 70V.
- f: Switch to "Dial Pulse Test" and dial a series of "0" pulses. If tinkling occurs increase the bias spring tension then recheck the sensitivity, as detailed above.
- g: Set the bias spring in the high tension notch, away from the coil, then check the operation using the voltages given, in the individual ringer sub-section, for the high bias setting. If additional demagnetization is applied in order to meet the requirements with high bias recheck the sensitivity and rejection of dial pulses with the low bias setting.
- h: Extreme difficulty in obtaining the correct functioning, as detailed above, is usually caused by incorrect mechanical adjustment or a coil with shorted turns. A coil mounted in a ringer should show an inductance of about 33 Henries with a dissipation factor of about 0.05 (Q about 20).

## 5.6 FREQUENCY SELECTIVE RINGERS

First check the individual sub-section, in which the specific ringer is described, for details of any special tests or adjustments. Then proceed as outlined below.

### 5.5.1 Mechanical Adjustments

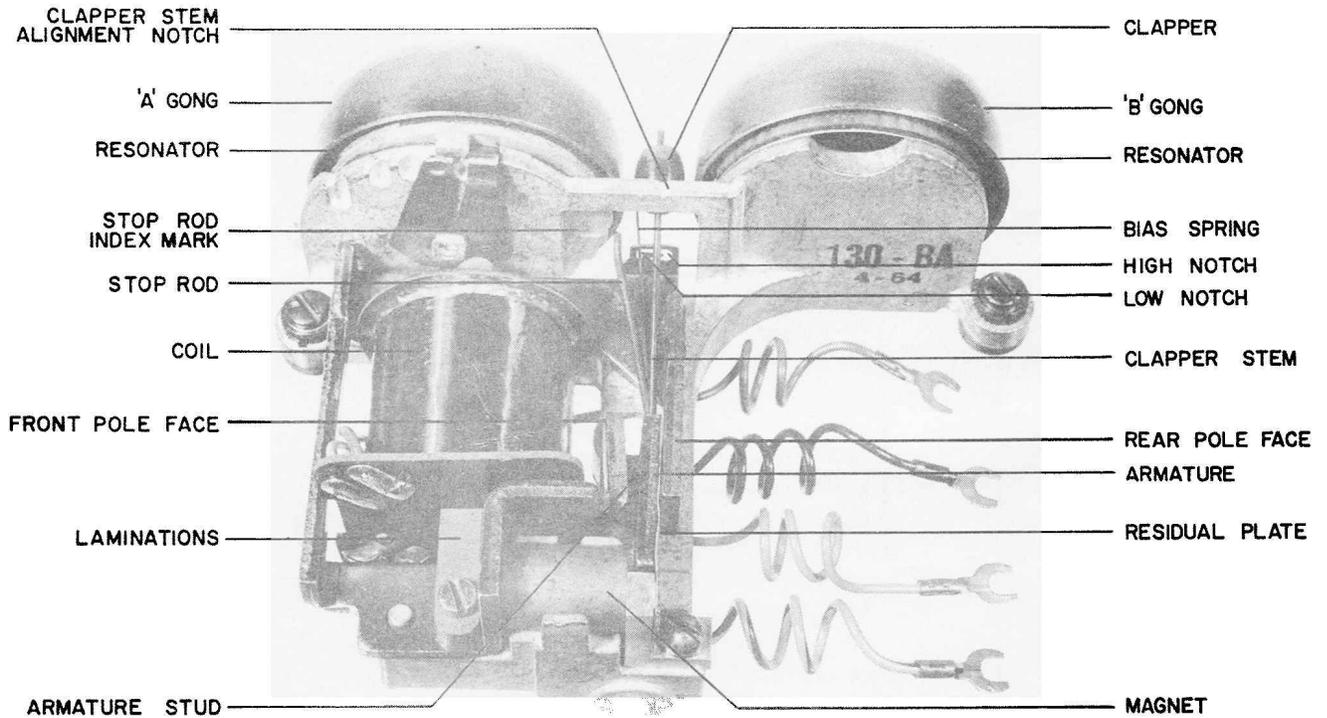
- a: Slightly loosen the hexagonal head mounting screws and rotate the gongs away from the clapper, using a screwdriver through the slot in the control wheel, with its tip in one of the slots in the casting, as a lever.
- b: The tuning stem must be parallel to the frame edge and the weight must be centered between the gongs of a two-gong ringer. Carefully adjust the stem near its base, if necessary.
- c: If a separate clapper unit is fitted the ball must be centered between the gongs and be in line with their mounting screws on the two gong ringer or must rest 1/16" to 3/32" away from the gong and strike it within 1/8" of its edge on a single gong ringer. Slightly bend the clapper stem, forward of the angled section, to obtain these settings. Check that the clapper ball and stem are clear of the tuning weight by about 1/32". The clapper stem must rest against the rubber tubing on the tuning stem with a pressure within the range given in the individual ringer sub-section. Slightly bend the clapper stem near its base to obtain this adjustment.
- d: Check that the two arms of the armature are straight and parallel to the frame; and the gaps between the armature and laminations are about equal. Damaged armatures should be replaced and not readjusted.
- e: Loosen the slide plate clamping screw and adjust the eccentric screw to about the mid-point of its range. Tighten the clamping screw.

### 5.5.2 Electrical Tests

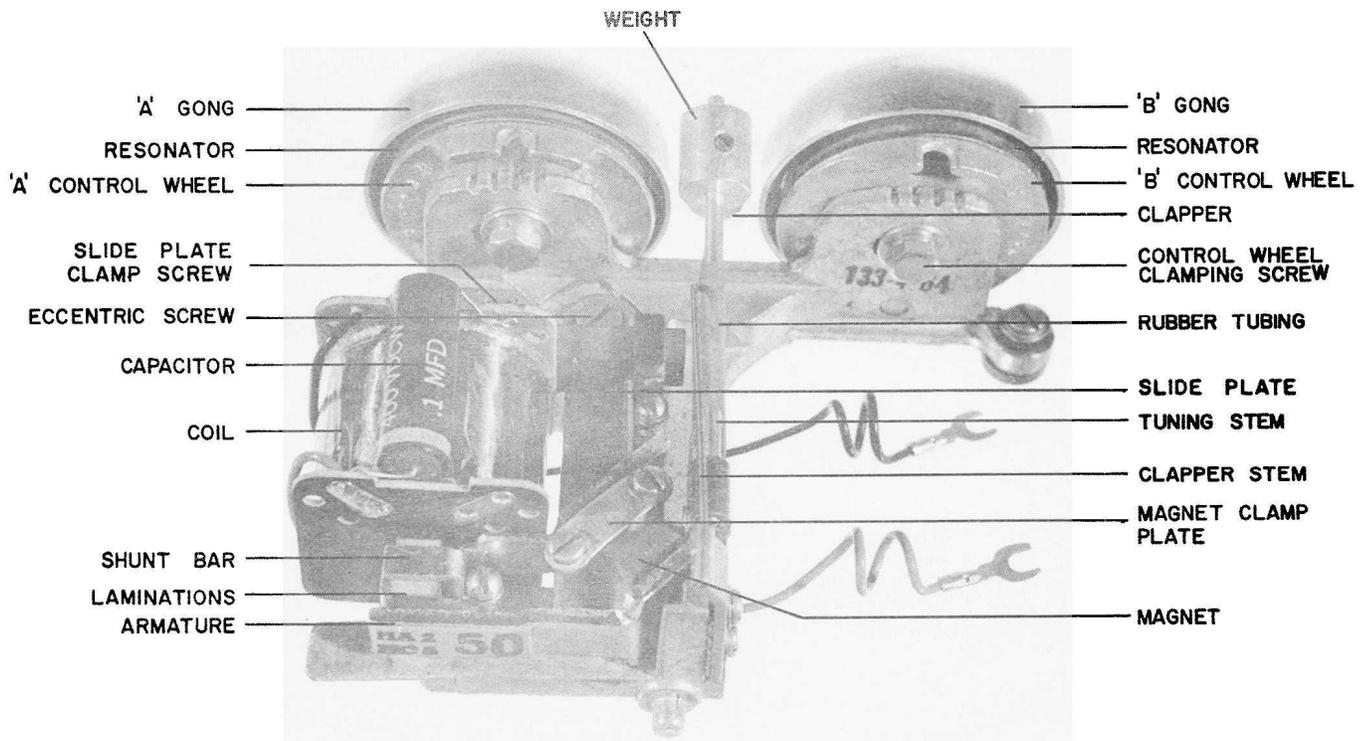
The objective of the electrical tests is to adjust the ringer mechanism for mechanical resonance and to set the electrical sensitivity.

- a: PLACE THE RINGER IN THE MAGNETIZING FIXTURE AND SATURATE THE MAGNET.
- b: Place the ringer in the test fixture and connect the leads to the test board, or equivalent circuitry. Switch in the required capacitor value, if the ringer does not have its own capacitor, as listed in Table 5-1. Switch in a series resistance of 6,000 ohms.
- c: Momentarily apply ringing current at the highest frequency in the series in order to stabilize the magnet.

- d: Connect ringing current at the correct frequency and adjust the tuning weight for maximum swing of the tuning stem and clapper. The range of weights commonly used on each type of ringer are given in Table 5-2. The weight must not extend more than 1/8" beyond the end of the tuning stem and must not strike the corner of the network assembly when the ringer is mounted in a telephone.
- e: Switch in the resistive load. Adjust the value of the series resistance to produce the specified (see individual ringer sub-section) voltages across the ringer coil, or coil and capacitor if so stated, at the correct ringing frequency. The ringer must function well with the voltages given under the heading of "Maximum" and must ring steadily, with the clapper hitting both gongs, with the voltages given under the heading of "Minimum". With the voltages given under the heading of "Ultimate" the ringer should just tinkle with the volume control, if fitted, in the maximum loudness position. To effect the adjustments first connect ringing current to obtain the specified maximum voltage. Then rotate the gongs (see paragraph 5.5.1a for the method used) on two gong ringers, one at a time, so that the clapper strikes them uniformly. Then adjust the eccentric screw to set the sensitivity so that the ringer functions correctly at the other values of voltage. Slight readjustment of the gongs, clapper pressure, tuning weight and sensitivity may be made to obtain optimum performance. Take care not to increase the sensitivity too much as the armature will clatter when the unit is operated with zero series resistance.
- f: Apply each of the other four ringing signals in the series with zero series resistance and check that cross-ringing is not present. If necessary reduce the sensitivity and re-check as detailed in step "e".
- g: Switch to the dial pulse position and check that the ringer will not tinkle or bell tap while dialing a series of "0" digits.
- h: Check the operation of the volume control, if fitted. See individual ringer sub-section.
- i: Extreme difficulty in obtaining the correct functioning, as detailed above, is usually caused by incorrect adjustments or a coil with shorted turns. A coil mounted in a ringer should show an inductance of about 33 Henries with a dissipation factor of about 0.05 (Q about 20).



a) Straight Line Ringer



b) Frequency Selective Ringer

Fig. 5-1 IDENTIFICATION OF RINGER PARTS

TABLE 5-1 FREQUENCY SELECTIVE RINGER CAPACITORS

Capacitor Value	Ringer Frequencies
0.1 mf	50, 54, 60, 66, 66-2/3 cps
0.25 mf	40, 42 cps
0.35 mf	33-1/3 cps
0.5 mf	16, 16-2/3, 20, 25, 30 cps

TABLE 5-2 FREQUENCY SELECTIVE RINGER WEIGHTS

Length	Part Number	Style	Ringer Types and Frequencies		Weight Outline		
11/32"	75585-15	"A"	HA2 50 cps HA3 66-2/3 cps HB3 54 cps	HB4 66 cps HC5 50 cps			
5/16"	75585-14					HC2 60 cps	
3/8"	75585-13						
7/16"	75585-12		"B"	HA1 33-1/3 cps HB2 42 cps		HC3 30 cps HC4 40 cps	HB1 30 cps
1/2"	75585-11						
9/16"	75585-10			HA4 16-2/3 cps HA5 25 cps		HB5 16 cps HC1 20 cps	
5/8"	75585-9						
11/16"	75585-8			HA1 33-1/3 cps HB2 42 cps		HC3 30 cps HC4 40 cps	HB1 30 cps
3/4"	75585-7						
13/16"	75585-6			HA4 16-2/3 cps HA5 25 cps		HB5 16 cps HC1 20 cps	
7/8"	75585-5						
15/16"	75585-4	HA1 33-1/3 cps HB2 42 cps		HC3 30 cps HC4 40 cps	HB1 30 cps		
1"	75585-3						
1-1/16"	75585-2	HA4 16-2/3 cps HA5 25 cps	HB5 16 cps HC1 20 cps				
1-1/8"	75585-1						
1-1/4"	75585-16	HA1 33-1/3 cps HB2 42 cps	HC3 30 cps HC4 40 cps	HB1 30 cps			
1-1/8"	84211-4						
1-3/16"	84211-3	HA4 16-2/3 cps HA5 25 cps	HB5 16 cps HC1 20 cps				
1-1/4"	84211-2						
1-5/16"	84211-1	HA1 33-1/3 cps HB2 42 cps	HC3 30 cps HC4 40 cps	HB1 30 cps			

Note: Slight variation of weight sizes, beyond the ranges shown, is permissible.

## TYPE 75(--)-301 EXTENSION RINGER

The 75(--)-301 extension ringer is a loud ringing type designed for indoor or outdoor installation in noisy locations. It consists of a wall bracket supporting a horizontal base plate which has two, four inch diameter gongs mounted below it and the

ringer mechanism mounted vertically above it. A rustproof, weather tight cover protects the ringer mechanism which is available in a range of types covering all ringing frequencies. The assembly is mounted with two screws through the wall bracket.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty
1	Bracket	79929	1
2	Baseplate	79926	1
3	Hex. Hd. Lockwasher Screw	79258-2	1
4	Gong (B)	79934	1
5	Gong (A)	79935	1
6	Bushing (Gong B)	79936	1
7	Washer (Gong B)	57171	1
8	Washer (Gong A)	242-2	1
9	Hex. Hd. Lockwasher Screw	79258-3	2
10	Washer	63990	2
11	Hex. Hd. Lockwasher Screw	79258-5	2
12	Terminal Strip	72233-5	1
13	Lockwasher - internal teeth	63988	2
14	Rd. Hd. Mach. Screw	64567	2
15	Cover	79923	1
16	Spring Washer	54368	3
17	Cabinet Lock Screw	4639	3
18	Ringer	See Table 2	1
19	Capacitor	See Table 2	1
20	Tubing (for item 19 leads)	71613	2

Table 2 RINGERS AND CAPACITORS

Code	Frequency	Ringer	Capacitor
BA	20	79938	75593-4
HA1	33-1/3	79939-1	75593-3
HA2	50	79939-2	75593-1
HA3	66-2/3	79939-3	75593-1
HA4	16-2/3	79939-4	75593-4
HA5	25	79939-5	75593-4
HB1	30	79939-6	75593-4
HB2	42	79939-7	75593-2
HB3	54	79939-8	75593-1
HB4	56	79939-9	75593-1
HB5	16	79939-10	75593-4
HC1	20	79939-11	75593-4
HC2	60	79939-12	75593-1
HC3	30	79939-13	75593-4
HC4	40	79939-14	75593-2
HC5	50	79939-15	75593-1

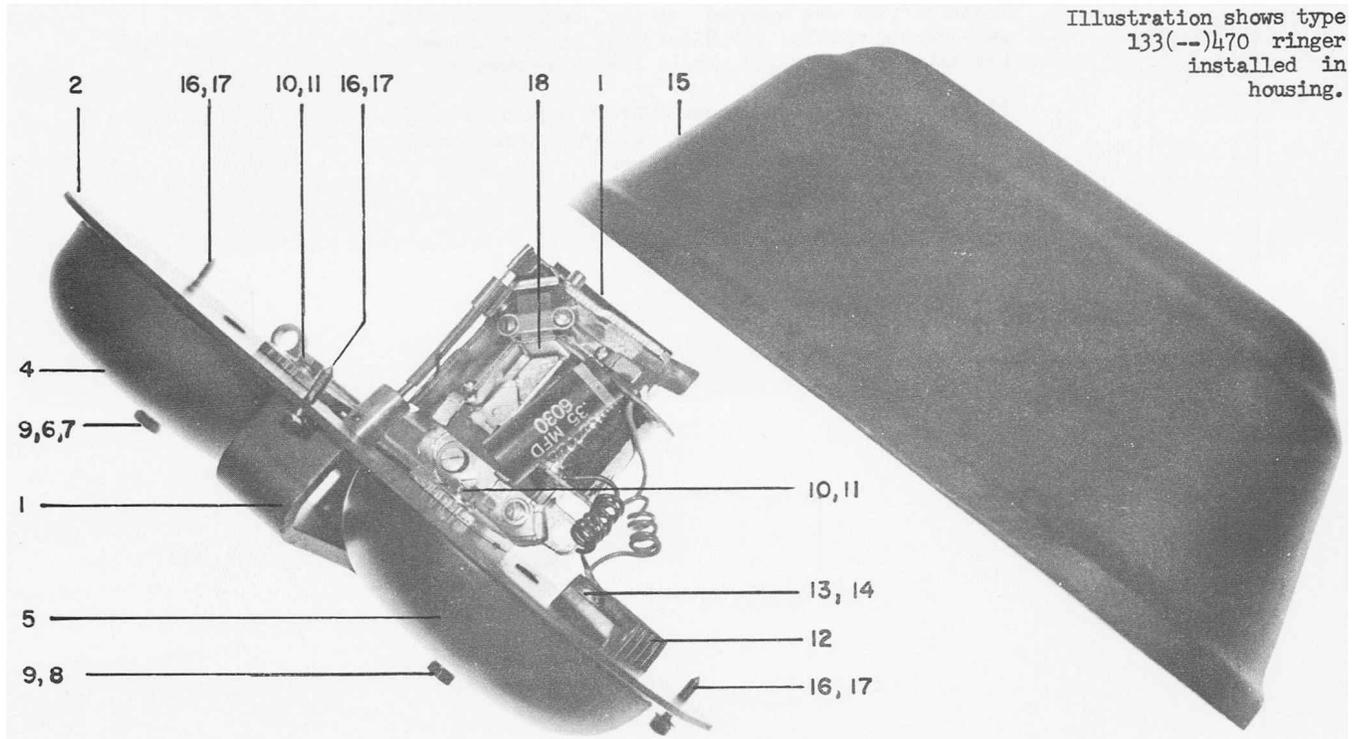


Illustration shows type 133(--)-470 ringer installed in housing.

Fig. 1 FRONT VIEW - COVER REMOVED

The cover of the ringer assembly may be lifted off after the three cabinet lock screws are loosened. If it is necessary to disassemble a ringer unit, take care to replace the gongs and mounting washers correctly (see Fig. 1 and Table 1).

Complete adjustments for the ringer mechanisms are given in the sub-sections indexed by the mechanism type number. It is necessary, however, for the mechanism to be mounted in a housing, complete with gongs, before it can be adjusted.



Fig. 2 WIRING DIAGRAMS

#### SPECIAL ASSEMBLIES

The 75(--)-301 ringer is only supplied with either the 79938 or 79939 ringer installed or less ringer unit. It is possible to mount the following ringer types in the type 75 housing, however, the desired ringer and housing must be ordered separately:

131(--)-470                      141(--)-470  
133(--)-470                      142(--)-470

These ringers are mounted on the baseplate in the same manner as types 79938 and 79939 after the gongs, resonators and control wheels have been removed.

It is not possible to mount ringers type 130(--)-470 in the type 75 housing without considerable modification to the ringer frame.

## TYPE 130(--)-470 STRAIGHT LINE RINGER

The 130 ringer is a double wound coil, two gong, straight line, biased type of unit equipped with a mechanical volume control and assembled on an open, die-cast metal frame. In combination with types 131, 133, 141 and 142 frequency selective ringers it provides a complete range of units which meet

the requirements of every class of telephone line ringer. Flexible wire leads are provided for the coil connections of the ringer. The unit is mounted to the telephone instrument base by a locating stud and two screws, each with a shock absorbing rubber bush.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty
1	Mounting Frame Assy.	75388	1
2	Gong (A)	75396	1
3	Gong (B)	75397	1
4	Resonator	75372	2
5	Rd. Hd. Lockwasher Screw	75408-2	3
6	Support Pole Piece Assy.	75398	1
7	Core Lamination	75395	* 18
8	Coil	75422	1
9	Flat Fil. Hd. Mach. Screw	75409-2	2
10	Magnet	75369	1
11	Armature & Clapper Assy.	75393	1
12	Rubber Foot	75371	2
13	Mounting Screw	75366	2

\* Minimum weight of 16 grams of laminations must be used.

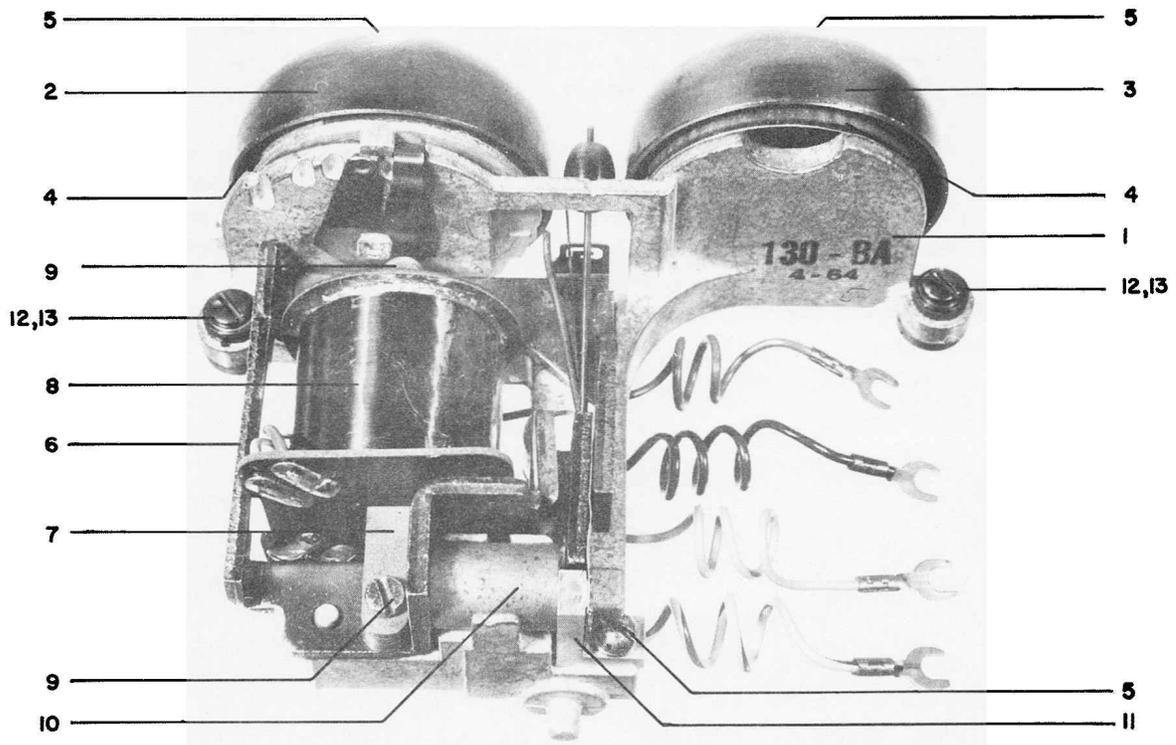


Fig. 1 TOP VIEW

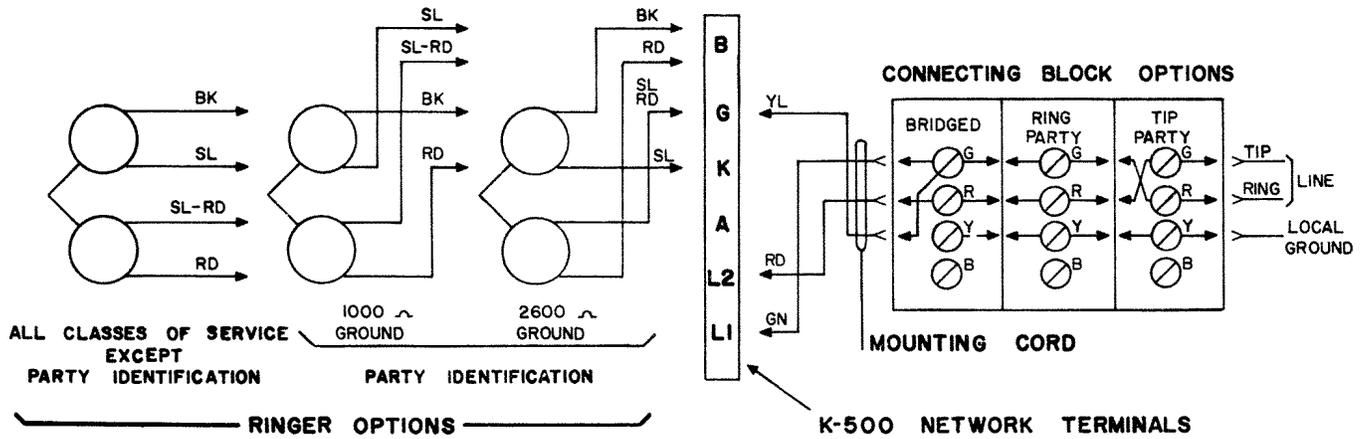


Fig. 2 TYPICAL WIRING DIAGRAMS

SPECIFIC TEST AND ADJUSTMENT DATA

Refer to sub-section M2C-RIN/GEN for complete test and adjustment procedure.

Stop Rod

Rotate the "A" gong to the minimum loudness position. The stop rod must line up with the reference mark on the eccentric cam and, with the armature operated, must strike the rim of the cam in all volume positions except maximum loudness so that the clapper is held 1/16" away from the "A" gong. Bend the rod near its base to obtain these adjustments. Check that the stop rod does not touch the bias spring bracket or the "A" gong.

Ringer Cut-off

With the stop tab on the detent spring bent away from the frame and the control wheel rotated to the cut-off position check that the stop rod rests on the eccentric cam and prevents movement of the armature assembly.

Sensitivity(Using moving coil meter and ERG source)

The ringer should function strongly with the maximum voltages, steadily with the minimum voltages and just tinkle with the ultimate voltages applied across the coil and capacitor.

Condition	Frequency	Max.V	Min.V	Ult.V
Low Bias	16 cps	44	36	26
	20 cps	63	48	37
	30 cps	88	56	40
High Bias	16 cps	67	58	47
	20 cps	87	77	61
	30 cps	120	107	81

Volume Positions

The adjusted ringer must function in such a manner that both gongs are equally audible in the three loudest positions of the volume control when the maximum voltages specified above are applied. This same condition is desirable, but not essential, in the lowest volume position of the control.

## TYPE 131(--)-470 AND TYPE 133(--)-470 FREQUENCY SELECTIVE RINGERS

The 131 ringer is a single coil, two gong, frequency selective type of unit equipped with a mechanical volume control and assembled on an open, die-cast metal frame. The 133 ringer is identical except that the volume control is omitted. The 141 and 142 ringers are similar units in all respects

except that they are provided with split winding coils for party identification on toll ticketing systems. Flexible wire leads are provided for the coil connections of the ringer which is mounted on the telephone base by a locating stud and two screws, each with a shock absorbing rubber bushing.

Table 1  
REPLACEABLE PARTS

Item	Description	Number	Qty
1	Mounting Frame	75577	1
2	Control Wheel (B)	75570-1	1
3	Control Wheel (A)	75570-2	1
4	Washer	63990	2
5	Hex. Hd. Lockwasher Screw	79258-2	2
6	Gong (A)	75396	1
7	Gong (B)	75397	1
8	Resonator	75372	2
9	Rd. Hd. Lockwasher Screw	75408-2	2
10	Eccentric Washer	75560	1
11	Slide Plate & Lamination Assy.	75578	1
12	Coil	See Table 2	1
13	Bind. Hd. Flat Washer Screw	84366-2	1
14	Shunt Bar	75566	1
15	Rd. Hd. Lockwasher Screw	79259-2	2
16	Magnet	75562	1
17	Clamping Plate	75563	1
18	Rnd. Hd. Lockwasher Screw	79259-2	2
19	Armature	See Table 2	1
20	Weight	See Table 2	1
21	Clapper Assy.	See Table 2	1
22	Rnd. Hd. Lockwasher Screw	79259-2	2
23	Rubber Foot	75371	2
24	Mounting Screw	75366	2
25	Wire Assy. (With Coil 75582 Only)	75328-38	1
26	Damper Spring (Type 131 Only)	75580	1
27	Rubber Tubing (For Tuning Stem)	84217	1
28	Headless Set Screw (For Weight)	58687	1

Table 2  
FREQUENCY SELECTIVE PARTS

Code	Frequency	Coil	Armature	Weight	Clapper
HA1	33-1/3	83336-3	75584-9	75585-2	84215-2
HA2	50	83336-1	75584-10	75585-11	84215-1
HA3	66-2/3	83336-1	75584-11	75585-11	84215-1
HA4	16-2/3	75582	75584-7	84211-2	84215-2
HA5	25	75582	75584-12	84211-2	84215-2
HB1	30	75582	75584-9	75585-2	84215-2
HB2	42	83336-2	75584-10	75585-2	84215-1
HB3	54	83336-1	75584-10	75585-11	84215-1
HB4	66	83336-1	75584-11	75585-11	84215-1
HB5	16	75582	75584-7	84211-2	84215-2
HC1	20	75582	75584-8	84211-2	84215-2
HC2	60	83336-1	75584-11	75585-10	84215-1
HC3	30	75582	75584-3	84211-2	84215-2
HC4	40	83336-2	75584-10	75585-2	84215-1
HC5	50	83336-1	75584-10	75585-11	84215-1

Notes:

1. Coil part 83336-\* includes capacitor 75593-\* (same suffix number).
2. Coil part 75582 requires separate capacitor as provided in 75335 network.
3. Refer to section M2C-RIN/GEN for detailed information on weight sizes and type numbers.

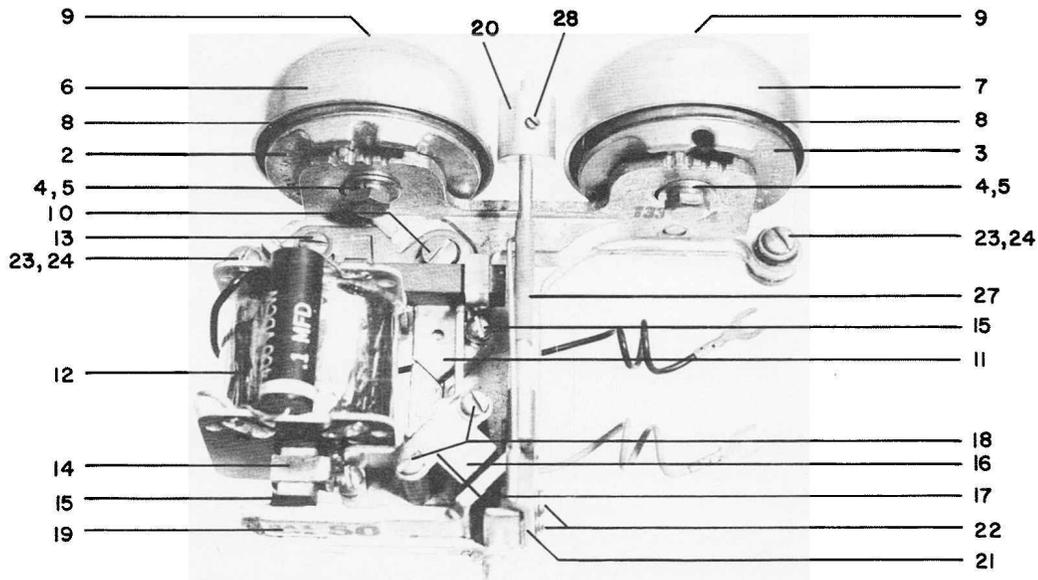


Fig. 1 TOP VIEW

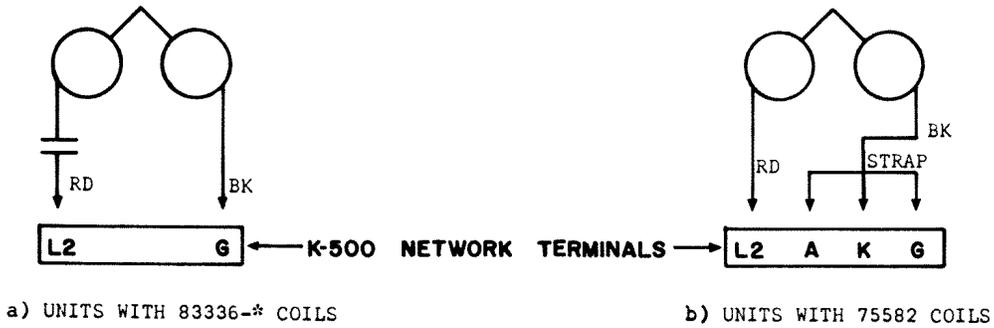


Fig. 2 TYPICAL WIRING DIAGRAMS

SPECIFIC TEST AND ADJUSTMENT DATA

Refer to sub-section M2C-RIN/GEN for complete test and adjustment procedure.

Clapper Pressure

The pressure of the clapper stem against the rubber sleeve on the tuning stem must be set within the following ranges:

Ringer Frequency	Pressure
16, 16-2/3, 20, 25 cps	0-2 ozs 0-60 grams
30, 33-1/3 cps	1-3 ozs 20-90 grams
40, 42 cps	2-3 ozs 60-90 grams
50, 54 cps	3-4 ozs 90-120 grams
60, 66, 66-2/3 cps	3-5 ozs 90-150 grams

The pressure must be measured at the top of the angled portion of the clapper stem.

Volume Control (Damper)

In the high position both snubbers must be clear of the gongs.

In the middle position the snubber must rest firmly on gong "B".

In the low position both snubbers must rest firmly against their respective gongs.

Bend the spring arms carrying the snubbers to effect the adjustments.

Sensitivity(Using moving coil meter and ERG source)

The ringer should function strongly with the maximum voltages, steadily with the minimum voltages and just tinkle with the ultimate voltages applied across the coil only for the 16 thru 25 cycle ringers and across the coil and capacitor for the 30 thru 66-2/3 cycle ringers.

Code	Frequency	Max.V	Min.V	Ult.V
HA1	33-1/3 cps	33	25	20
HA2	50 cps	80	68	56
HA3	66-2/3 cps	77	60	54
HA4	16-2/3 cps	24	17	12
HA5	25 cps	34	25	18
HB1	30 cps	42	33	22
HB2	42 cps	44	32	23
HB3	54 cps	76	63	50
HB4	66 cps	66	57	52
HB5	16 cps	20	14	8
HC1	20 cps	28	21	15
HC2	60 cps	90	79	58
HC3	30 cps	42	33	22
HC4	40 cps	47	35	28
HC5	50 cps	80	68	56

## TYPE 136(--)-470 AND TYPE 138(--)-470 COMPACT STRAIGHT LINE RINGERS

The 136 compact ringer is a double wound coil, single gong, straight line, biased type of unit equipped with a mechanical volume control and assembled on a die-cast metal base with a molded plastic cover. The 138 ringer is identical except for the addition of a gas tube and the use of a large cover. In combination with the type 137

frequency selective ringer these units provide a complete range which meet the requirements of every need for a compact telephone line main or extension ringer. Screw terminals are provided for all lead connections. The base casting is fitted with four shock absorbing rubber feet through which the mounting screws are inserted.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty	Item	Description	Number	Qty
1	Frame and Gong Assy.	190146	1	10	Terminal Board	190148-1	1
2	Support Pole Piece Assy.	75398	1	11	Rd. Hd. Mach. Screw	69778	1
3	Core Lamination	75395	* 18	12	Spacer	190141-1	1
4	Coil	75422-2	1	13	Lever Lock	190142-1	1
5a	Flat Fil. Hd. Mach. Screw	# 75409-2	2	14	Lever Stop	190143-1	1
b	Flat Fil. Hd. Mach. Screw	Ø 75409-4	2	15	Cord Retainer	190144-1	2
6	Magnet	75369	1	16	Rubber Foot	75371	4
7	Armature and Clapper Assy.	190066-1	1	17a	Cover (Type 136)	190192-1	1
8a	Rd. Hd. Lockwasher Screw	# 75408-2	4	b	Cover (Type 138)	190577-1	1
b	Rd. Hd. Lockwasher Screw	Ø 75408-4	1	18	Cabinet Lock Screw	190178-2	1
c	Rd. Hd. Mach. Screw	Ø 64127	3	19	Tube (Type 138 only)	75599	1
9	Capacitor	190440-1	1	20	Bracket (Type 138 only)	190576-1	1

NOTES: \* Minimum weight of 16 grams of laminations must be used.  
# Items 5a and 8a used on type 136 assembly only.  
Ø Items 5b, 8b and 8c used on type 138 assembly only.

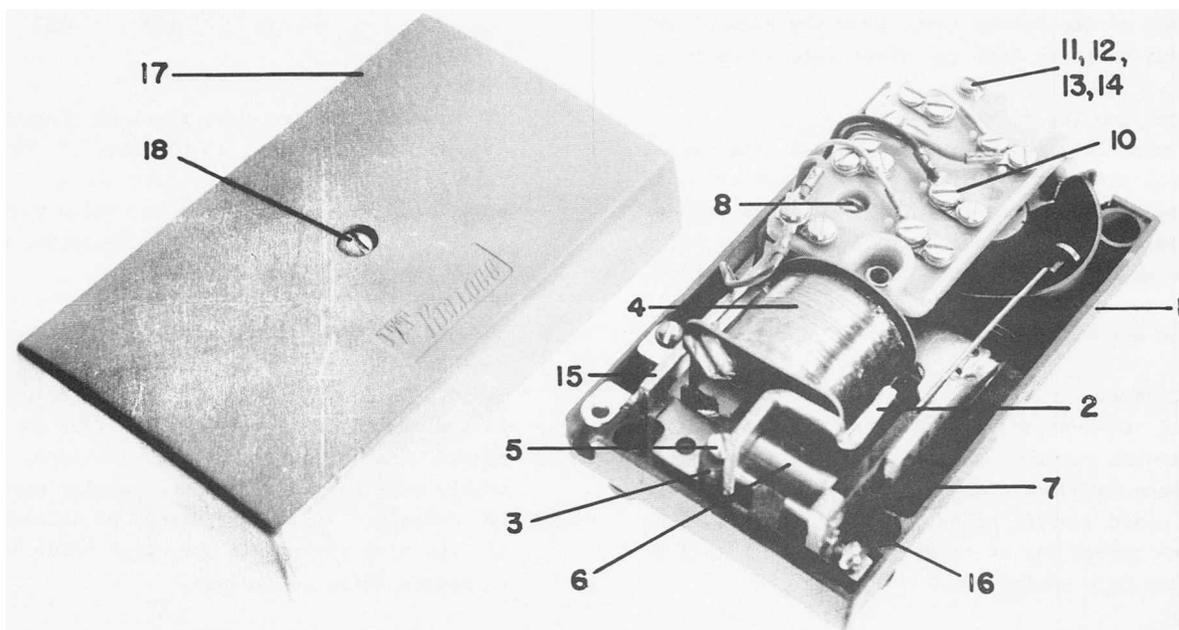


Fig. 1 TOP VIEW - COVER REMOVED

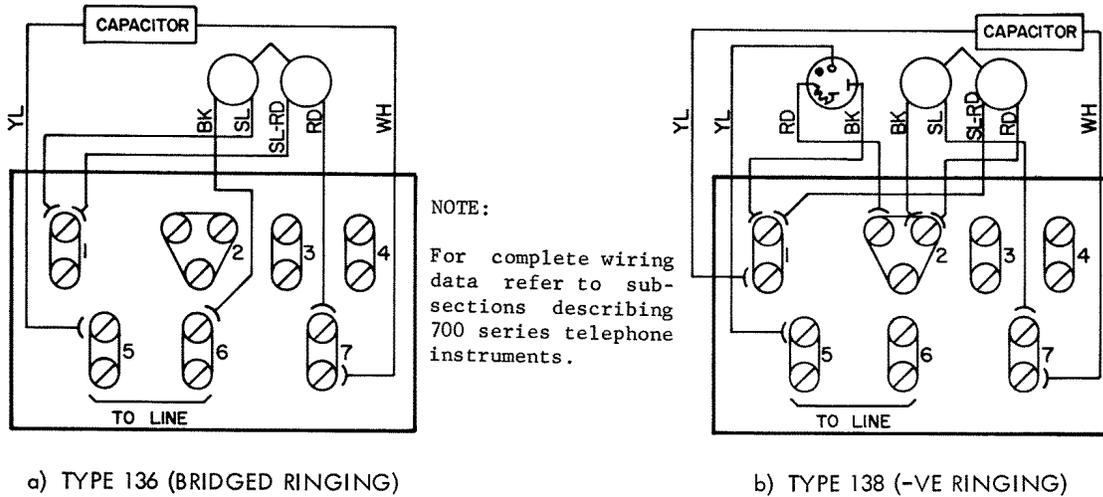


Fig. 2 RINGER WIRING (AS SHIPPED)

SPECIFIC TEST AND ADJUSTMENT DATA

Refer to sub-section M2C-RIN/GEN for complete test and adjustment procedure.

Rubber Cam

With the control lever in the lowest volume position there must be a clearance of 1/16" between the tip of the rubber cam and the bushing of the clapper. Rotate the rubber cam on the shaft to obtain the required clearance. The top surface of the bushing of the clapper must be set between, level with and 1/32" below the top surface of the rubber cam. Bend the stem of the clapper near its base to effect this adjustment.

Lever Lock and Lever Stop

The lever lock may be set to prevent the volume control being moved from the loud position, if desired. The lever stop may be set to prevent the volume control lever from being lifted over the step of the frame into the cut-off position. No free movement of the clapper is permissible in the cut-off position.

Volume Control

Moving the volume control from the highest to the lowest position should result in a reduction in sound output of 10 db. This may be measured on a sound output meter. Slight repositioning of the rubber cam or clapper may be necessary to achieve this variation.

Sensitivity (using moving coil meter and ERG source)

The ringer should function strongly with the maximum voltages, steadily with the minimum voltages and just tinkle with the ultimate voltages applied across the coil and capacitor.

Condition	Frequency	Max.V	Min.V	Ult.V
Low Bias	16 cps	44	36	26
	20 cps	63	48	37
	30 cps	88	56	40
High Bias	16 cps	67	58	47
	20 cps	87	77	61
	30 cps	120	107	81

Gas Tube

The type 138 ringer must first be checked, and adjusted if necessary, in the same manner as the type 136 ringer. Then connect the gas tube and apply the ringing signals in series with a 45 to 48 volt battery (refer to sub-section MIC-TST /RIN, for test circuit).

With the bias spring in the low tension position and the gas tube biased to conduction the ringer must function strongly with a series resistance of 10,000 ohms in circuit at frequencies of 16, 20 and 30 cps. When the gas tube is reverse biased the ringer must not function, or may tinkle very slightly, with no series resistance in circuit. It will probably be necessary to set the bias spring in the high notch in order to obtain these conditions.

## TYPE 137(--)-470 COMPACT FREQUENCY SELECTIVE RINGER

The 137 compact ringer is a single coil, single gong, frequency selective type of unit, with a volume control, assembled on a die-cast metal base and fitted with a molded plastic protective cover. In combination with types 136 and 138 it provides a

complete range of units which meet the requirements of every class of service for compact telephone line main or extension ringers. Screw terminals are provided for all lead connections and the base casting is fitted with shock absorbing rubber feet.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty
1	Frame and Gong Assy.	190194	1
2	Slide Plate & Lamination Assy.	75578	1
3	Binding Hd. Flat Washer Screw	84366-2	1
4	Eccentric Washer	75560	1
5	Coil	75582-2	1
6	Shunt Bar	75566	1
7	Magnet	75562	1
8	Clamping Plate	75563	1
9	Rnd. Hd. Lockwasher Screw	79259-2	2
10	Capacitor	See Table 2	1
11	Retaining Clip	190472-1	1
12	Armature	See Table 2	1
13	Weight	See Table 2	1
14	Clapper Assy.	84215-3	1
15	Grommet	81958	1
16	Rnd. Hd. Lockwasher Screw	79259-2	4
17	Terminal Board	190188-1	1
18	Rd. Hd. Mach. Screw	75408-2	2
19	Cord Retainer	190181-1	1
20	Flat Fil. Hd. Mach. Screw	75409-2	1
21	Rubber Foot	75371	3
22	Cover	190192-1	1
23	Cabinet Lock Screw	190178-2	1
24	Binding Hd. Machine Screw	75576-2	1
25	Rubber Tubing (For Tuning Stem)	84217	1
26	Headless Set Screw	58687	1

Table 2 FREQUENCY SELECTIVE PARTS

Code	Frequency	Armature	Weight	Capacitor
HA1	33-1/3	75584-15	75585-8	190440-3
HA2	50	75584-16	75585-9	190440-5
HA3	66-2/3	75584-17	75585-13	190440-5
HA4	16-2/3	75584-13	75585-2	190440-4
HA5	25	75584-18	75585-4	190440-4
HB1	30	75584-15	75585-4	190440-4
HB2	42	75584-16	75585-6	190440-2
HB3	54	75584-16	75585-11	190440-5
HB4	66	75584-17	75585-13	190440-5
HB5	16	75584-13	75585-2	190440-4
HC1	20	75584-14	75585-2	190440-4
HC2	60	75584-17	75585-13	190440-5
HC3	30	75584-15	75585-4	190440-4
HC4	40	75584-16	75585-6	190440-2
HC5	50	75584-16	75585-9	190440-5

NOTE: Refer to section M2C-RIN/GEN for detailed information on weight sizes and type numbers.

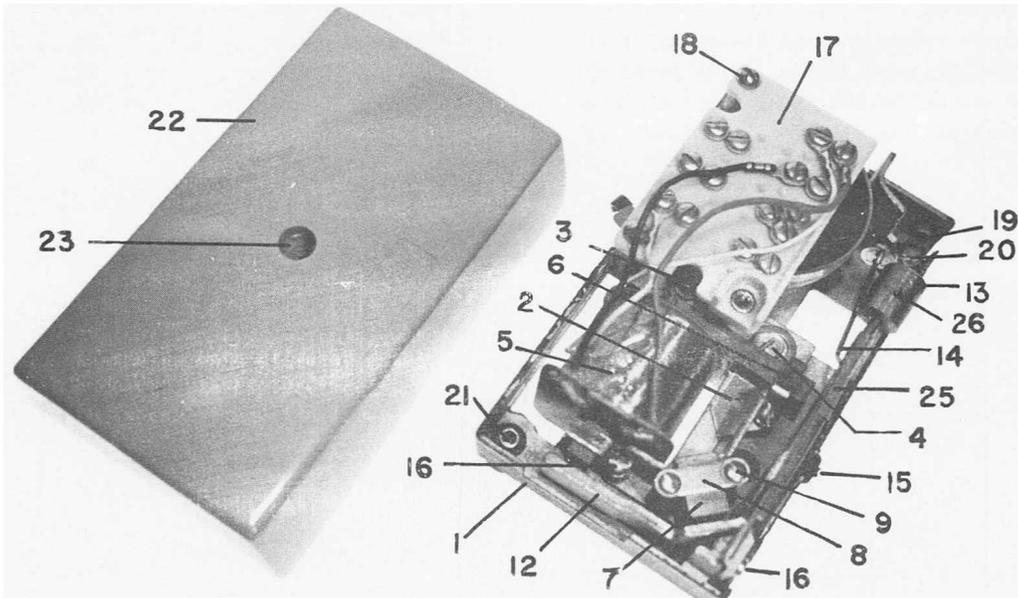
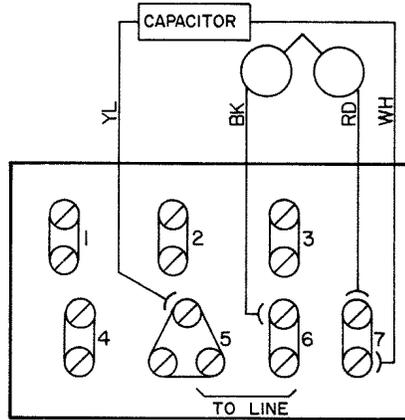


Fig. TOP VIEW - COVER REMOVED



NOTE: For complete wiring data refer to sub-sections describing 700 series telephone instruments.

Fig. 2 RINGER WIRING (AS SHIPPED)  
 (BRIDGED RINGING)

SPECIFIC TEST AND ADJUSTMENT DATA

Refer to sub-section M2C-RIN/GEN for complete test and adjustment procedure.

Sensitivity (using moving coil meter and ERG source)

The ringer should function strongly with the maximum voltages, steadily with the minimum voltages and just tinkle with the ultimate voltages applied across the coil and capacitor.

Clapper Pressure

The pressure of the clapper stem against the rubber sleeve on the tuning stem must be set within the following ranges:

Ringer Frequency	Pressure
16, 16-2/3, 20, 25 cps	0-1 ozs 0-30 grams
30, 33-1/3 cps	0-3 ozs 0-90 grams
40, 42, 50, 54, 60, 66, 66-2/3 cps	3-5 ozs 90-150 grams

The pressure must be measured at the top of the angled portion of the clapper stem.

Code	Frequency	Max.V	Min.V	Ult.V
HA1	33-1/3 cps	33	25	20
HA2	50 cps	80	68	56
HA3	66-2/3 cps	77	60	54
HA4	16-2/3 cps	24	17	12
HA5	25 cps	34	25	18
HB1	30 cps	42	33	22
HB2	42 cps	44	32	23
HB3	54 cps	76	63	50
HB4	66 cps	66	57	52
HB5	16 cps	20	14	8
HC1	20 cps	28	21	15
HC2	60 cps	90	79	58
HC3	30 cps	42	33	22
HC4	40 cps	47	35	28
HC5	50 cps	80	68	56

Volume Control (Damper)

The sleeve on the volume control lever must rest tightly against the gong in the quiet position and must be clear of the gong in the loud position. Reshape the tip of the lever if necessary.

## TYPE 139(--)-470 EXTENSION RINGER

The 139 ringer is designed for use as an extension unit, it may be used as the main ringer if the telephone is not equipped with an internal ringer. The assembly consists of a type 130, 131 or 133 ringer mounted on a steel baseplate and protected

by a molded, snap-on plastic housing. External connections are made to a terminal block mounted on the baseplate which is provided with mounting holes. Units fitted with type 130 or 131 ringer assemblies are equipped with volume controls.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty
1	Baseplate	84362-1	1
2	Terminal Board	190148-1	1
3	Rd. Hd. Mach. Screw	61906	2
4	Cable Hanger	78825-3	1
5	Bind. Hd. Mach. Screw	75392-3	1
6	Fastener Stud	79753-2	1
7	Link (only with freq. sel. rin)	79754	1
8	Fastener Stud (for item 7)	79753-1	1
9	Gas Tube (only with TBA ringer)	75599	1
10	Ringer	See Table 2	1
11	Capacitor Assembly	See Table 2	1
12	Cover	84259-1	1

Table 2 RINGERS AND CAPACITORS

Code	Frequency	Ringer	Capacitor
LR	-	None	190440-6
BA	20	130(BA)470	190440-7
TBA	20	130(BA)470	190440-7
*A1	33-1/3	** (HA1)470	None
*A2	50	** (HA2)470	None
*A3	66-2/3	** (HA3)470	None
*A4	16-2/3	** (HA4)470	190440-6
*A5	25	** (HA5)470	190440-6
*B1	30	** (HB1)470	190440-6
*B2	42	** (HB2)470	None
*B3	54	** (HB3)470	None
*B4	66	** (HB4)470	None
*B5	16	** (HB5)470	190440-6
*C1	20	** (HC1)470	190440-6
*C2	60	** (HC2)470	None
*C3	30	** (HC3)470	190440-6
*C4	40	** (HC4)470	None
*C5	50	** (HC5)470	None

Notes for Table 2

1. For ringer with volume control replace \* by "W" and \*\* by "131".
2. For ringer less volume control replace \* by "L" and \*\* by "133".

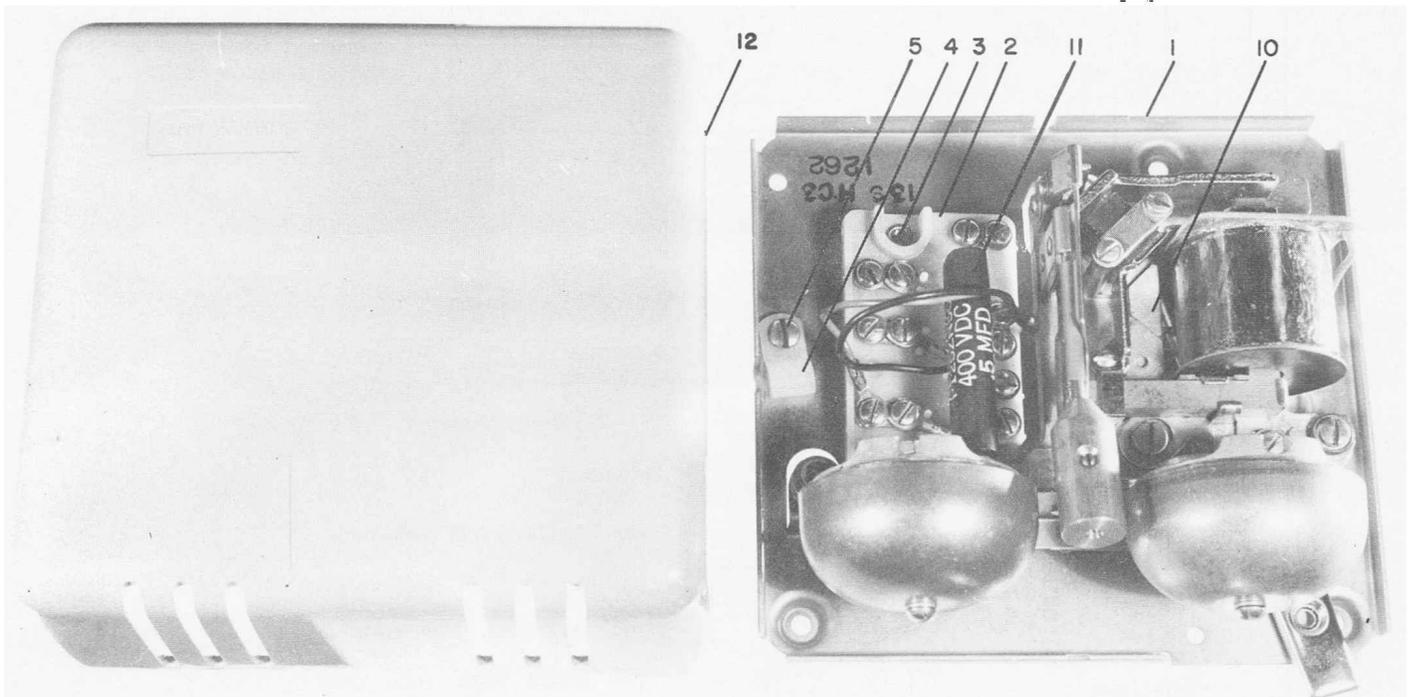
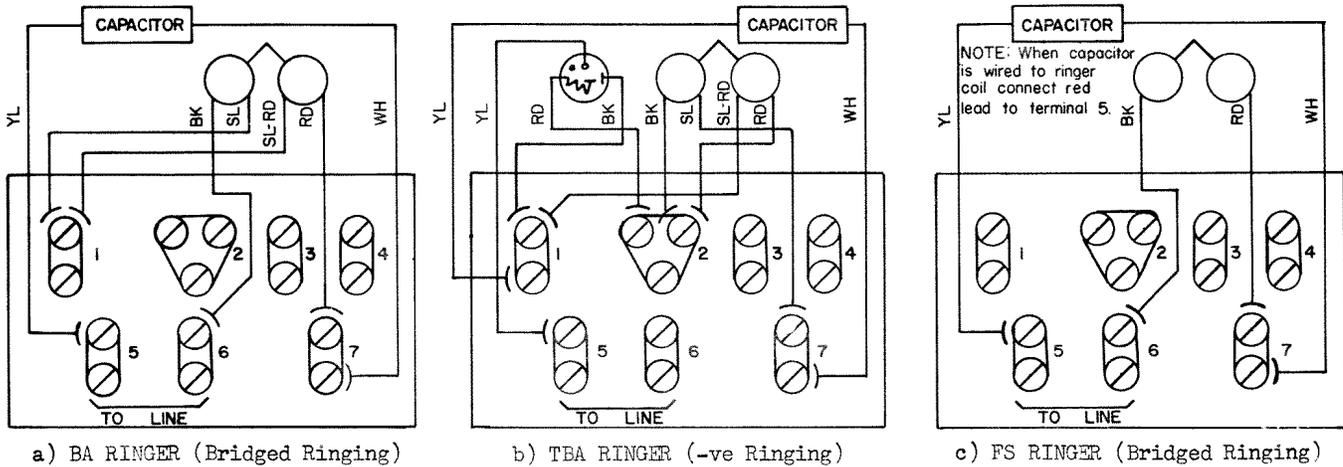


Fig. 1 TOP VIEW - COVER REMOVED

The cover of the assembly is removed by loosening the screw on the top edge of the cover, pulling the bottom of the cover away from the base then lifting the cover clear of the baseplate.

Refer to the appropriate descriptive sub-section for specific details of each of the ringer units which may be fitted in the type 139 extension ringer housing.

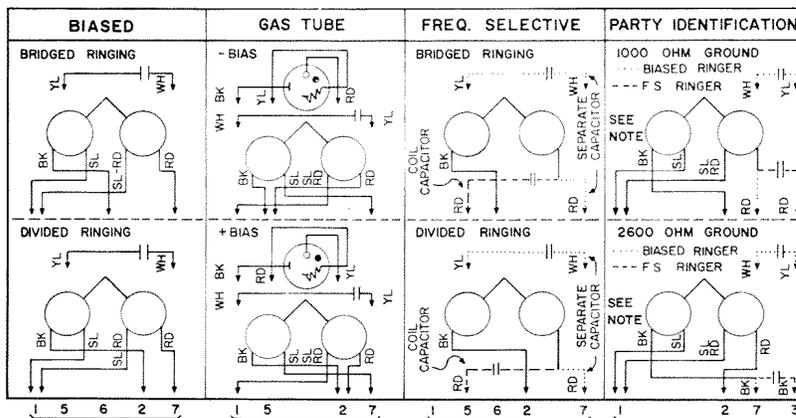


a) BA RINGER (Bridged Ringing)

b) TBA RINGER (-ve Ringing)

c) FS RINGER (Bridged Ringing)

Fig. 2 RINGER WIRING (AS SHIPPED)



**NOTE**

Party Identification: Transfer slate hook switch lead from L2 to A on 500 series telephone network. Mounting cord connections shown for ring party. For tip party reverse green and red cord conductors on ringer terminal board and use ring party station wiring.

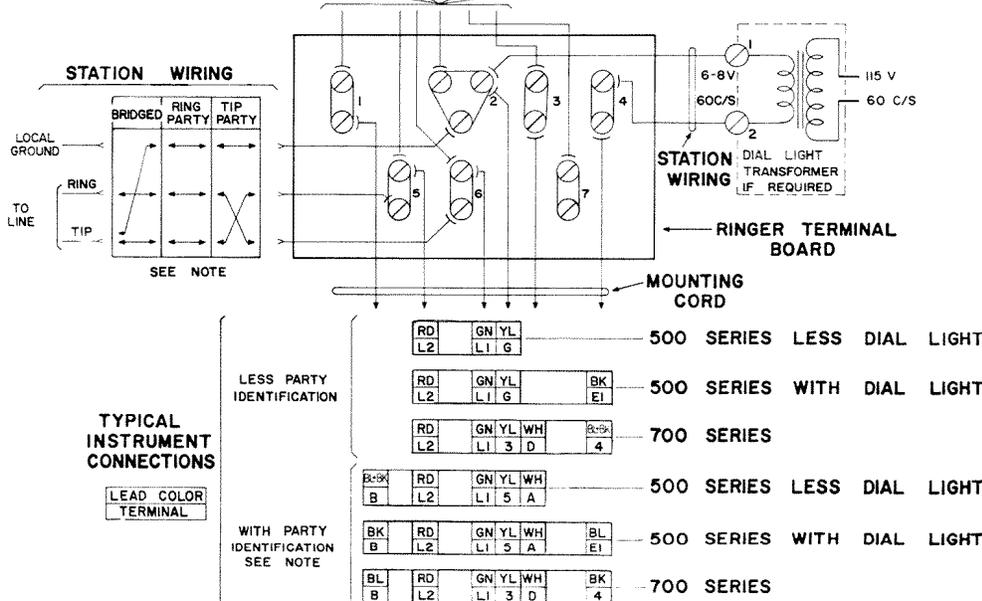


Fig. 3 RINGER INSTALLATION WIRING

## TYPE 144( )470 COMMON AUDIBLE SIGNAL UNIT

The 144 Common Audible Signal Unit is designed to provide a common buzzer signal from ringing signals on any one of up to three individual telephone exchange lines. The unit is intended to be used in conjunction with the type 576 three line and hold key telephone. A separate neon indicator lamp underneath each pick-up key on the telephone glows whenever a ringing signal is received on its own line, thus providing a definite indication of the calling line.

Simultaneous ringing signals on more than one line may cause the audible buzzer signal to vary from that normally heard with a single line signal, dependent upon the relative phase of the multiple ringing signals.

The complete unit is mounted in the telephone instrument in the position occupied by the usual mechanical type of ringer. No additional power supplies are required to operate the unit.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty
1	Mounting Bracket	86396	1
2	Socket	95649	3
3	Terminal Strip	95653	1
4	Rivet	60025	7
5	Resistor	62948-99	3
6	Tubing	50551-3	6
7	Resistor	64342-179	1
8	Capacitor	80678-3	1
9	Capacitor	75593-4	1
10	Tubing	71613	6
11	Capacitor	95286	1
12	Tubing	50551	2
13	Resistor	64342-181	1
14	Tubing (wire strap insulation)	50551-5	3
15	Wire Assembly (RD)	75326-11	1
16	Wire Assembly (BK) (Buzzer leads)	75326-70	2
17	Wire Assembly (BL)	75326-88	1
18	Wire Assembly (GR)	75326-91	1
19	Wire Assembly (BK)	75326-114	1
20	Tube (Type 5823)	95648	3
21	Rd. Hd. Mach. Screw	61906	2
22	Buzzer	95654	1
23	Bind. Hd. Mach. Screw	72594-3	2
24	Lock Washer	73949	2

**NOTE:**

Buzzer is shipped mounted on end of bracket. To install in telephone, dismount buzzer and insert screws through two of vent holes in baseplate to locate buzzer approximately as shown with respect to mounting bracket.

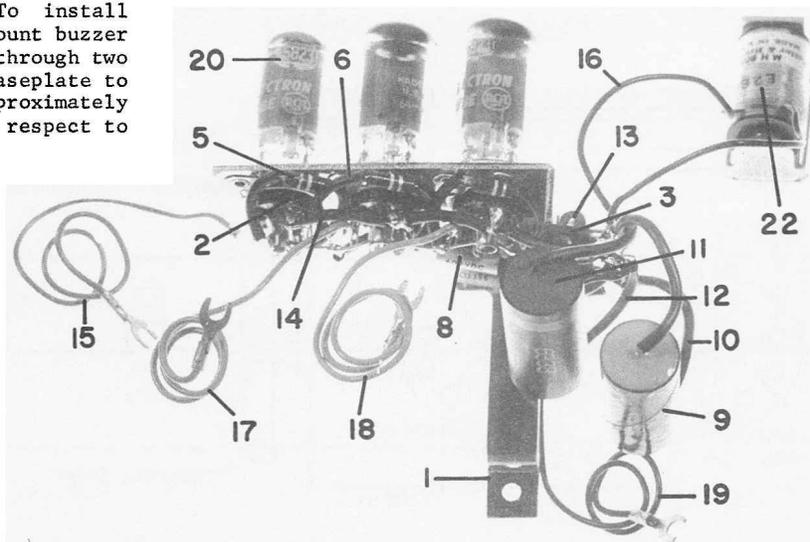


Fig. 1 TOP VIEW

TEST DATA

Testing of the common audible signal units requires a sine wave source of ringing voltage at a frequency of 30±1 cps., with a distortion of not more than 5% at a level of 75 volts under load. This voltage is applied through a 1 watt, 47 ohms ±10% resistor to each section of the signal unit in turn, connecting the common (black) lead to one side of the source and each of the red, blue and green leads, in turn, to the other side of the source.

The sound output from the buzzer must be vigorous and uniform in each case, without undue chatter.

If desired, the action of the gas tubes can be checked with a battery connected generator source. In this case the 'X' straps (see diagrams) must be cut and the common black lead must be connected to the positive (ground) side of the source. Reversal of the connections will reverse bias the gas tubes and prevent operation. The source voltage required in this case will be 95 volts.

Table 2 MINIMUM RINGING GENERATOR OUTPUT FOR VARIOUS LINE LOOP RESISTANCES

TYPE OF GENERATOR CONNECTION	LINE LOOP RESISTANCE (OHMS)	VOLTAGE REQUIRED FOR NUMBER OF UNITS ON LINE		
		1	2	3
BATTERY	0	95V	100V	115V
	600	105V	110V	120V
	1000	110V	115V	125V
	1200	112V	118V	128V
GROUND	0	75V	75V	75V
	600	77V	80V	82V
	1000	77V	81V	88V
	1200	78V	82V	90V

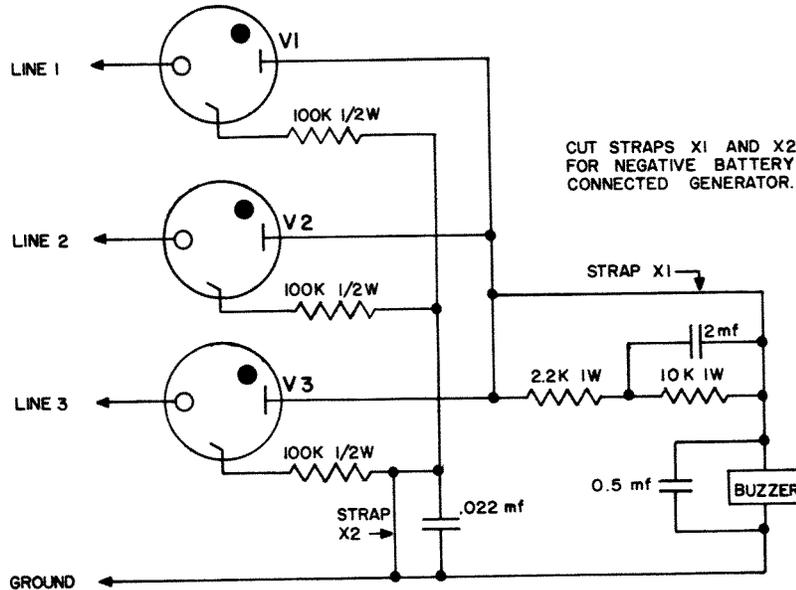


Fig. 2 SCHEMATIC DIAGRAM

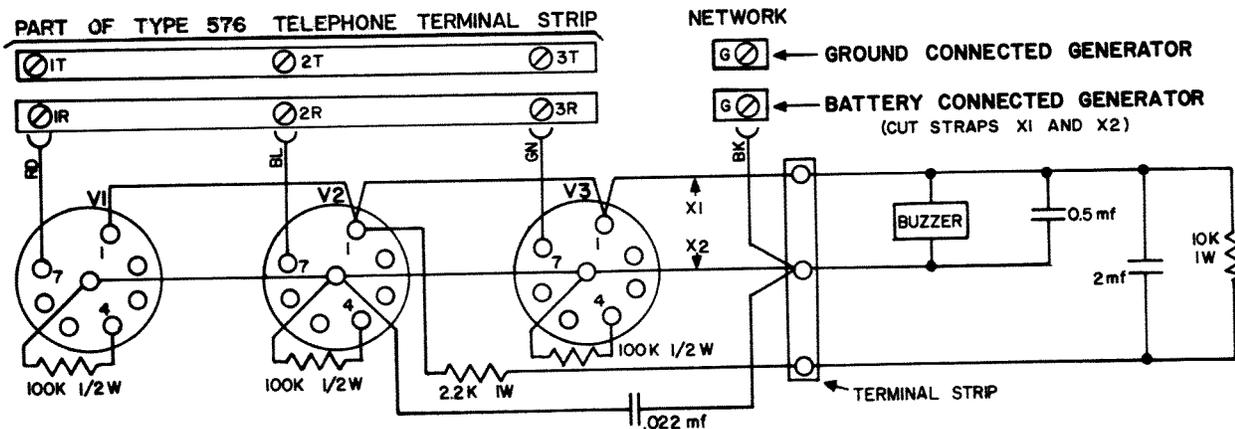


Fig. 3 WIRING AND INSTALLATION DIAGRAMS

## TYPE 79938 STRAIGHT LINE RINGER MECHANISM

The 79938 ringer mechanism is a double wound coil, straight line, biased type of unit without gongs. It is assembled on an open die-cast metal frame. In combination with type 79939 frequency selective ringer mechanism it provides a range of telephone

line ringer mechanisms for use with separately mounted gongs. Flexible wire leads are provided for the coil connections of the mechanism and the frame is provided with a number of alternative mounting holes.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty
1	Mounting Frame	79931	1
2	Coil	75422	1
3	Magnet	75369	1
4	Pole Piece Assembly	75398	1
5	Core Lamination	75395	*18
6	Rd. Hd. Lockwasher Screw	75408-2	1
7	Flat Fil. Hd. Mach. Screw	75409-2	2
8	Clapper Assembly	75393	1

\* Minimum weight of 16 grams of laminations must be used.

SPECIFIC TEST AND ADJUSTMENT DATA

Refer to sub-section M2C-RIN/GEN for complete test and adjustment procedure.

Sensitivity (Using moving coil meter and ERG source)

The ringer should function strongly with the maximum voltages, steadily with the minimum voltages and just tinkle with the ultimate voltages applied across the coil and capacitor.

Condition	Frequency	Max.V	Min.V	Ult.V
Low Bias	16 cps	44	36	26
	20 cps	63	48	37
	30 cps	88	56	40
High Bias	16 cps	67	58	47
	20 cps	87	77	61
	30 cps	120	107	81

NOTE: The ringer mechanism must be assembled on a suitable base, complete with gongs, in order to carry out the adjustment procedure.

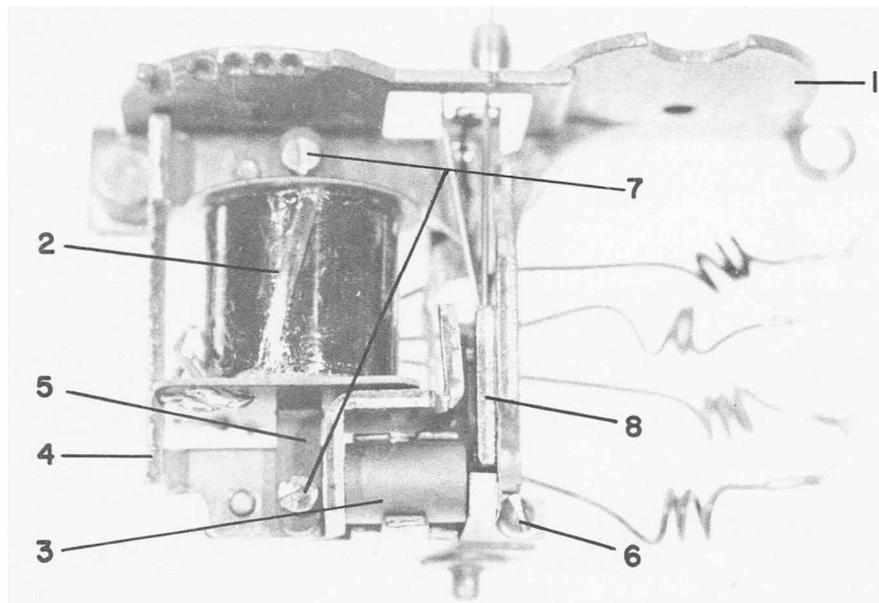


Fig. 1 TOP VIEW

## TYPE 79939 FREQUENCY SELECTIVE RINGER MECHANISM

The 79939 ringer mechanism is a single wound coil, frequency selective type of unit without gongs. It is assembled on an open die-cast metal frame. In combination with type 79938 straight line ringer mechanism it provides a range of telephone line

ringer mechanisms for use with separately mounted gongs. Flexible wire leads are provided for the coil connections of the mechanism and the frame is provided with a number of alternative mounting holes.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty
1	Mounting Frame	75577	1
2	Coil	75582	1
3	Magnet	75562	1
4	Clamping Plate	75563	1
5	Slide Plate & Lamination Assy.	75578	1
6	Rd. Hd. Lockwasher Screw	79259-2	3
7	Rnd. Hd. Lockwasher Screw	79259-2	2
8	Clapper Assembly	See Table 2	1
9	Armature	See Table 2	1
10	Weight	See Table 2	1
11	Rnd. Hd. Lockwasher Screw	79259-2	2
12	Shunt Bar	75566	1
13	Washer	64197	1
14	Eccentric Washer	75560	1
15	Rubber Tubing (for Tuning Stem)	84217	1
16	Headless Set Screw (for Weight)	58687	1

Table 2 FREQUENCY SELECTIVE PARTS

Type	Frequency	Armature	Weight	Clapper
79939-1	33-1/3	75584-9	75586-6	84215-2
79939-2	50	75584-10	75586-11	84215-1
79939-3	66-2/3	75584-11	75586-11	84215-1
79939-4	16-2/3	75584-7	82411-3	84215-2
79939-5	25	75584-12	75585-2	84215-2
79939-6	30	75584-9	75585-5	84215-2
79939-7	42	75584-10	75585-6	84215-1
79939-8	54	75584-10	75585-11	84215-1
79939-9	66	75584-11	75585-11	84215-1
79939-10	16	75584-7	84211-3	84215-2
79939-11	20	75584-8	75585-2	84215-2
79939-12	60	75584-11	75585-10	84215-1
79939-13	30	75584-9	75585-5	84215-2
79939-14	40	75584-10	75585-6	84215-1
79939-15	50	75584-10	75585-11	84215-1

NOTE: Refer to section M2C-RIN/CEN for detailed information on weight sizes and type numbers.

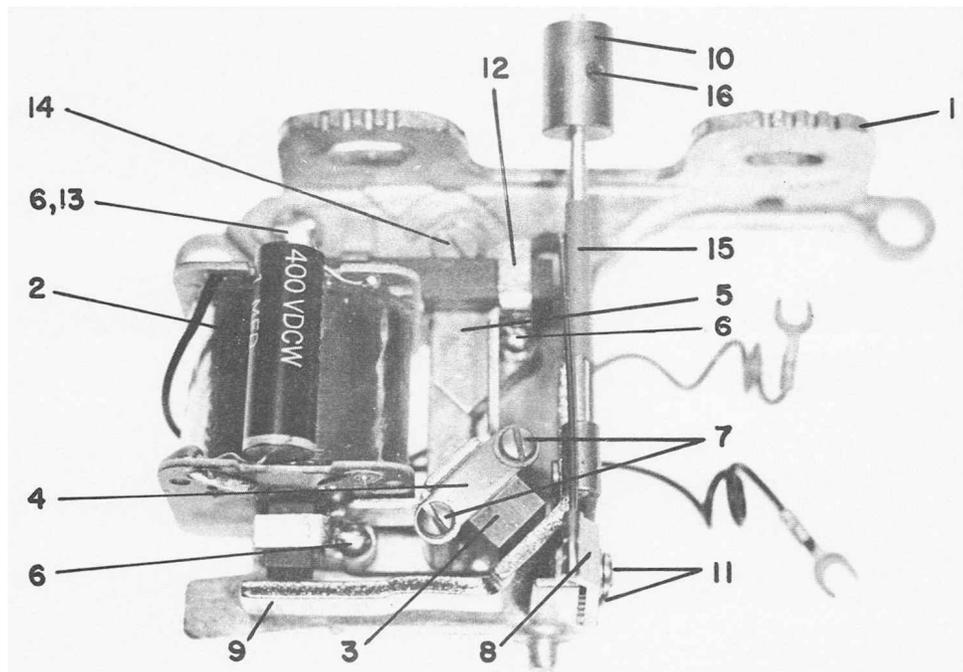


Fig. 1 TOP VIEW

Refer to sub-section M2C-RIN/GEN for complete test and adjustment procedure.

16 thru 25 cycle ringers and across the coil and capacitor for the 30 thru 66-2/3 cycle ringers.

**Clapper Pressure**

The pressure of the clapper stem against the rubber sleeve on the tuning stem must be set within the following ranges:

Ringer Frequency	Pressure
16, 16-2/3, 20, 25 cps	0-2 ozs 0-60 grams
30, 33-1/3 cps	1-3 ozs 30-90 grams
40, 42 cps	2-3 ozs 60-90 grams
50, 54 cps	3-4 ozs 90-120 grams
60, 66, 66-2/3 cps	3-5 ozs 90-150 grams

The pressure must be measured at the top of the angled portion of the clapper stem.

**Sensitivity(Using moving coil meter and ERG source)**

The ringer should function strongly with the maximum voltages, steadily with the minimum voltages and just tinkle with the ultimate voltages applied across the coil only for the

Code	Frequency	Max.V	Min.V	Ult.V
HA1	33-1/3 cps	33	25	20
HA2	50 cps	80	68	56
HA3	66-2/3 cps	77	60	54
HA4	16-2/3 cps	24	17	12
HA5	25 cps	34	25	18
HB1	30 cps	42	33	22
HB2	42 cps	44	32	23
HB3	54 cps	76	63	50
HB4	66 cps	66	57	52
HB5	16 cps	20	14	8
HC1	20 cps	28	21	15
HC2	60 cps	90	79	58
HC3	30 cps	42	33	22
HC4	40 cps	47	35	28
HC5	50 cps	80	68	56

NOTE: The ringer mechanism must be assembled on a suitable base, complete with gongs, in order to carry out the adjustment procedure.

## TYPE 65--(--)-410 HANDSET

### CONTENTS

Section	Page	Figure	Page
1	GENERAL DESCRIPTION	1	4-1 COMPONENT PARTS - EXPLODED VIEW
2	TECHNICAL DESCRIPTION	1	2
3	TESTING	1	Table
4	DISASSEMBLY AND ASSEMBLY	2	5-1 REPLACEABLE PARTS
5	PART NUMBERS	2	2

### i GENERAL DESCRIPTION

1.1 The type 65 handset consists of a molded housing, comprising a handle and two screw-on caps, which contains a high quality carbon granule type transmitter at one end and a ring armature receiver at the other. A four wire cord is used to provide separate electrical circuits for the hermetically sealed transmitter and receiver units.

1.2 The molded housing is designed so that the

transmitter unit, which operates efficiently in any position, is correctly located close to the mouth of the user when the receiver is placed to the ear.

1.3 The handset is available molded in black bakelite, with either a coiled or straight cord, or in black or colored plastic, with a matching color of coiled cord, in the same range of colors as the various telephone housings.

### 2 TECHNICAL DESCRIPTION

2.1 The carbon granule transmitter unit has a rising response, relative to the 1000 cps nominal level of 53 db above 1 millivolt with a sound input pressure of 28 dynes/sq.cm. from -3 db at 200 cps to +3 db at 4000 cps. The peak thermal noise output is 12.7 millivolts for an aged unit. The operating current is 30 to 75 milliamperes dc and the nominal dc resistance is 45 ohms. Pressure type electrical connections are used.

2.2 The ring armature receiver has a response of +3 db, relative to the 1000 cps nominal level of 73 db above the sound output reference pressure of (1 dyne/sq.cm.)<sup>2</sup> per watt of electrical power, over the range of 400 to 3200 cps. An input power of 1

milliwatt at any frequency between 500 and 2500 cps will not produce any distortion or rattling. The nominal impedance is 150 ohms at 1000 cps. Screw connector terminals are fitted and a varistor shunt across them protects users from high level acoustic shocks and the magnet from abnormal line surges.

2.3 The plastic type of handset handle has an acoustic baffle in the form of a ball of cotton inserted through the receiver cavity into the stem. Its purpose is to reduce the acoustic coupling from the receiver to the transmitter, which are both vented to the handle cavity, that would otherwise impair the clarity of reception. The bakelite type of handle has adequate built-in acoustic baffling.

### 3 TESTING

3.1 Thorough testing of both the transmitter and receiver units requires the use of special test equipment. However, a suspected faulty unit can be adequately checked for maintenance purposes by direct comparison with, or substitution by, a known good unit.

3.2 Faulty transmitter units will usually show up

by causing noise in the circuit or low transmission levels. A dc ohmeter test is not a reliable check on the condition of a carbon type transmitter.

3.3 Faulty receiver units will usually show up by causing distortion due to a loose or damaged diaphragm or faulty varistor, or having no output due to an open circuit coil or shorted varistor.

4 DISASSEMBLY AND ASSEMBLY

4.1 The exploded view of Fig. 4-1 shows all the component parts of the handset. Disassembly and assembly procedures are given in the following paragraphs. Note that the cord holder is part of the handle molding in the bakelite type of handset and the cotton ball (9) is not required.

4.2 DISASSEMBLY

- a: Unscrew the receiver cap (1) from the handle (10) in an anticlockwise direction.
- b: Tilt the receiver unit (2) out of the handle then loosen the two terminal screws (3) and disconnect the wires.
- c: Remove the cotton ball (9) from inside the stem of the handle.
- d: Unscrew the transmitter cap (4) from the handle and remove the transmitter unit (5).
- e: Lift the transmitter holder (6) out of the handle then loosen the two terminal screws (7) and disconnect the wires.
- f: Lift the handset cord (8) out of the slot of the cord holder (11), remove the cord holder and pull the cord out of the handle.

4.3 ASSEMBLY

- a: Insert the handset cord (8) through the small hole in the end of the handle (10) feeding the two white wires through the stem. Fit the cord holder (11) into the grooves in the side of the transmitter cavity and press the bush of the cord into the slot of the holder.
- b: Connect the red wire to the outer contact terminal and the black wire to the center contact terminal of the transmitter holder (6) and tighten the screws (7). Locate the transmitter holder in the handle cavity with the tab on the holder in one of the smaller notches in the cavity wall.

- c: Place the transmitter unit (5) inside the transmitter cap (4) then screw the cap onto the handle in a clockwise direction.
- d: Insert the cotton ball (9) into the stem of the handle through the receiver cavity.
- e: Connect one white wire to each terminal on the receiver unit (2), tighten the terminal screws (3) then place the unit in its cavity and screw the receiver cap (1) onto the handle in a clockwise direction.

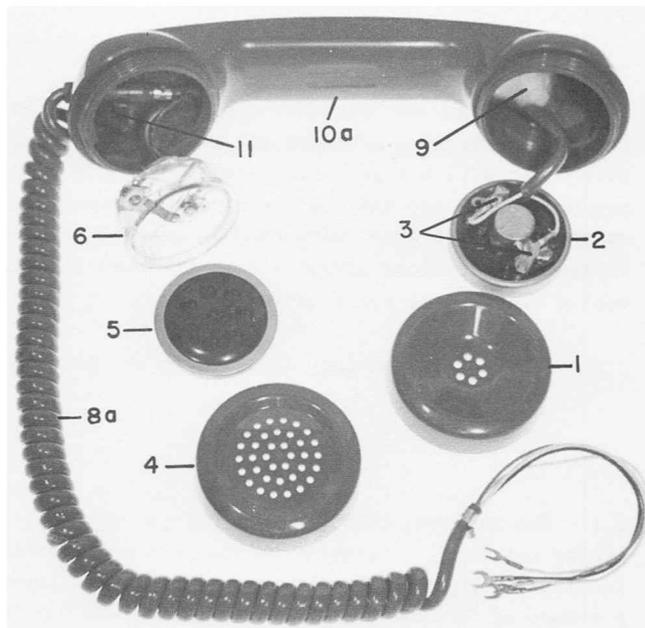
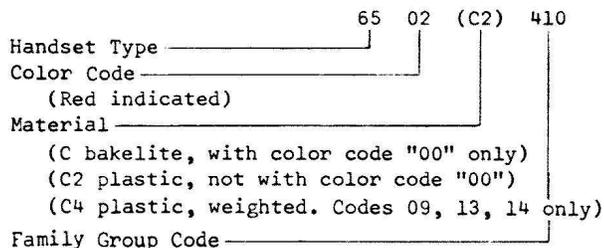


Fig. 4-1 COMPONENT PARTS - EXPLODED VIEW

5 PART NUMBERS

5.1 The complete code number required to specify a particular handset assembly consists of four parts. The method of forming this number is shown below. Refer to section M1A-COL of the manual for complete listing of colors and corresponding code identifying numbers.



5.2 The various component parts of the handset are listed in Table 5-1. The item numbers shown in the list correspond with those used to identify the various parts in the exploded view of Fig. 4-1.

Table 5-1 REPLACEABLE PARTS

Item	Description	Number	Use	Qty
1a	Receiver Cap (Plastic)	79289-*	#	1
b	(Bakelite)	75381	∅	
2	Receiver Unit c/w item 3	75547		1
3&7	Terminal Screw	75386		4
4a	Transmitter Cap (Plastic)	79290-*	#	1
b	(Bakelite)	75380	∅	
5	Transmitter Unit	75555		1
6	Transmitter Holder c/w it. 7	75384		1
8a	Handset Cord (Coiled)	1005**(7)650	#	1
b	(Black, straight)	303000( )650	∅	
9	Cotton Ball	79545	#	1
10a	Handle (Plastic)	79250-*	#	1
b	(Plastic, weighted)	190520-*	#	
c	(Bakelite)	75383	∅	
11	Cord Holder	79293	#	1
#	These parts used on plastic handsets only.			
∅	These parts used on bakelite handsets only.			
*	Replace by color code suffix from series 1-16.			
**	Replace by color code number from series 00-16.			

# TYPE 69--(--)-410 HANDSET

## CONTENTS

Section		Page	Figure		Page
1	GENERAL DESCRIPTION	1	4-1	COMPONENT PARTS - EXPLODED VIEW	2
2	TECHNICAL DESCRIPTION	1	4-2	WIRING DIAGRAMS	2
3	TESTING	1			
4	DISASSEMBLY AND ASSEMBLY	2	Table		
5	PART NUMBERS	2	5-1	REPLACEABLE PARTS	2

### 1 GENERAL DESCRIPTION

1.1 The type 69 handset consists of a molded housing, comprising a handle and two screw-on caps, which contains a high quality carbon granule type transmitter at one end and a ring armature receiver at the other. A push button switch is mounted in the stem of the housing. Either a five or six conductor coiled cord may be provided with the unit.

1.2 The molded housing is designed so that the transmitter unit, which operates efficiently in any position, is correctly located close to the mouth of the user when the receiver is placed to the ear.

1.3 The handset and cord are available in the same range of colors as the telephone housings.

### 2 TECHNICAL DESCRIPTION

2.1 The carbon granule transmitter unit has a rising response, relative to the 1000 cps nominal level of 53 db above 1 millivolt with a sound input pressure of 28 dynes/sq.cm. from -3 db at 200 cps to +3 db at 4000 cps. The peak thermal noise output is 12.7 millivolts for an aged unit. The operating dc resistance is 45 ohms. Pressure type electrical connections are used.

nominal impedance is 150 ohms at 1000 cps. Screw connector terminals are fitted and a varistor shunt across them protects users from high level acoustic shocks and the magnet from abnormal line surges.

2.3 The push button switch is wired to separate cord conductors from the transmitter and receiver units for independent connection to the external circuits.

2.2 The ring armature receiver has a response of +3 db, relative to the 1000 cps nominal level of 73 db above the sound output reference pressure of (1 dyne/sq.cm.)<sup>2</sup> per watt of electrical power, over the range of 400 to 3200 cps. An input power of 1 milliwatt at any frequency between 500 and 2500 cps will not produce any distortion or rattling. The

2.4 A ball of cotton, inserted into the stem of the handle through the receiver cavity, forms an acoustic baffle. Its purpose is to reduce the acoustic coupling from the receiver to the transmitter, which are both vented to the handle cavity, that would otherwise impair the quality of reception.

### 3 TESTING

3.1 Thorough testing of both the transmitter and receiver units requires the use of special test equipment. However, a suspected faulty unit can be adequately checked for maintenance purposes by direct comparison with, or substitution by, a known good unit.

by causing noise in the circuit or low transmission levels. A dc ohmeter test is not a reliable check on the condition of a carbon type transmitter.

3.2 Faulty transmitter units will usually show up

3.3 Faulty receiver units will usually show up by causing distortion due to a loose or damaged diaphragm or faulty varistor, or having no output due to an open circuit coil or shorted varistor.

4 DISASSEMBLY AND ASSEMBLY

4.1 The exploded view of Fig. 4-1 shows all the component parts of the handset. Disassembly and assembly procedures are given below.

4.2 DISASSEMBLY

- a: Unscrew the receiver cap (1) from the handle (10) in an anticlockwise direction.
- b: Tilt the receiver unit (2) out of the handle then loosen the two terminal screws (3) and disconnect the wires.
- c: Remove the cotton ball (9) from inside the stem of the handle.
- d: Unscrew the transmitter cap (4) from the handle and remove the transmitter unit (5).
- e: Lift the transmitter holder (6) out of the handle then loosen the two terminal screws (7) and disconnect the wires.
- f: Remove the two cap screws (16) and remove the escutcheon (14), plunger bar (17), membrane (13) and restoring spring (15).
- g: Lift the switch assembly (12) out of the handle then loosen the two terminal screws and disconnect the wires.
- h: Lift the handset cord (8) out of the slot of the cord holder (11), remove the cord holder and pull the cord out of the handle.

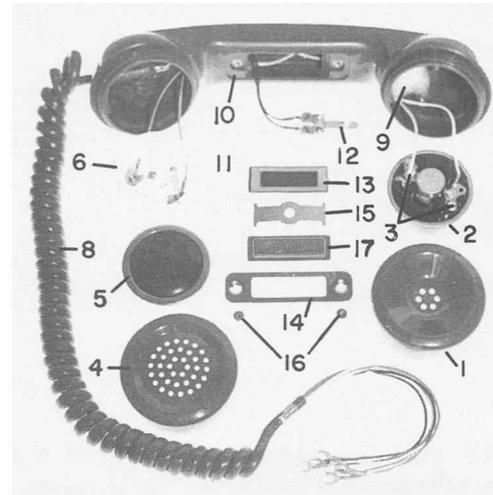


Fig. 4-1 COMPONENT PARTS - EXPLODED VIEW

4.3 ASSEMBLY

The parts of the handset may be conveniently re-assembled in the reverse order from that given for disassembly. The following points should be specially noted.

- a: The cord conductors must be reconnected as shown in the wiring diagrams of Fig. 4-2.
- b: The transmitter holder must be replaced in its cavity with the tab on the holder in one of the smaller notches in the cavity wall.
- c: The parts of the push button switch must be replaced in the following order:
  - 1) Switch Assembly
  - 2) Membrane Assembly
  - 3) Restoring Spring - Tips resting on membrane
  - 4) Plunger Bar
  - 5) Escutcheon
  - 6) Cap Screws

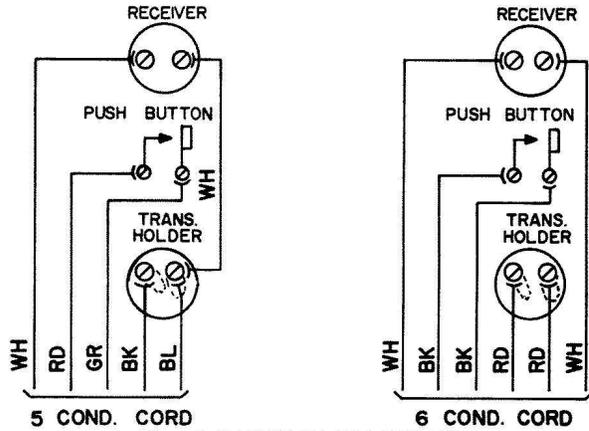
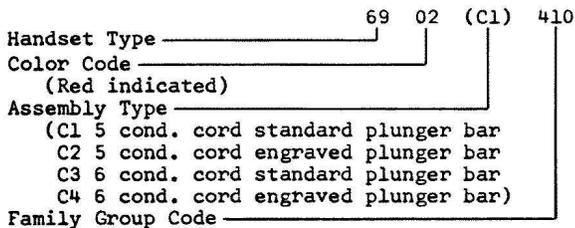


Fig. 4-2 WIRING DIAGRAMS

5 PART NUMBERS

5.1 The complete code number required to specify a particular handset assembly consists of four parts. The method of forming this number is shown below. Refer to section M1A-COL of the manual for complete listing of colors and corresponding code identifying numbers.



5.2 The various component parts of the handset are listed in Table 5-1. The item numbers shown in the list correspond with those used to identify the various parts in the exploded view of Fig. 4-1.

Note: Standard plunger bar is engraved "ITT-KELLOGG"  
Special engraving may occupy 1" long by 9/32" high.

Table 5-1 REPLACEABLE PARTS

Item	Description	Number	Qty
1	Receiver Cap	79289-*	1
2	Receiver Unit c/w item 3	75547	1
3&7	Terminal Screw	75386	4
4	Transmitter Cap	79290-*	1
5	Transmitter Unit	75555	1
6	Transmitter Holder c/w item 7	75384	1
8a	Handset Cord (5 Cond.)	1018** ( )650	1
b	Handset Cord (6 Cond.)	1019** ( )650	
9	Cotton Ball	79545	1
10	Handle	84495-*	1
11	Cord Holder	79293	1
12	Switch Assembly	80032	1
13	Membrane Assembly	80036	1
14	Escutcheon	80033-2	1
15	Restoring Spring	80035	1
16	Fl. Hd. Cap Screw	80040	2
17a	Plunger Bar - Standard	84498-*	1
b	Plunger Bar - Engraved	84498-Ø	

\* Replace by color code suffix from series 1-16.  
\*\* Replace by color code number from series 00-16.  
Ø Replace by color code suffix from series 21-36 and specify engraving required.

# CRADLE SWITCH ASSEMBLIES

## CONTENTS

Section		Page	Figure		Page
1	GENERAL DESCRIPTION	1	2-1	TYPICAL CRADLE SWITCH	1
2	DISASSEMBLY AND ASSEMBLY	1	3-1	CONTACT ARRANGEMENTS	2
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4	LUBRICATION	2	Table		
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### 1 GENERAL DESCRIPTION

1.1 Each cradle switch assembly consists of a spring loaded operating arm pivoted on a frame so that movement of the arm is imparted to the lever springs of a spring nest assembly which is mounted on the lower part of the same frame. Each contact spring is provided with a flexible wire lead to connect to the other components in the telephone instrument.

1.2 The cradle switch assembly is mounted in the telephone so that placing the handset in the cradle presses the plungers against the extremities of the operating arm to actuate the contact springs.

1.3 Several different contact arrangements are available to meet the requirements of the various telephone instrument circuits (see paras. 3 and 5).

### 2 DISASSEMBLY AND ASSEMBLY

2.1 The various parts of a typical cradle switch assembly are identified in Fig. 2-1.

2.2 To disassemble the unit, first remove the coil spring holding the operating arm in the raised position, then slide out the pivot pin. Disengage the end of the operating bar from the slot in the operating arm and remove the arm. Reassemble the parts in the reverse order. Make sure that the grooves in the pivot pin rest in the elongated holes of the operating arm and mounting frame.

2.3 The spring nest assembly should only be removed from the mounting frame if it is necessary to replace a contact spring or lead. The cover is removed by squeezing the sides, to clear the lugs on its rear edge through the locking slots in the frame, and lifting. Removal of the operating and positioning bars is accomplished by disengaging the keying section from one of the springs, rotating

the bar one quarter turn and lifting it out. Reassembly is a reversal of these procedures. Refer to Table 5-1 for the order of assembly of the parts of the spring nest.

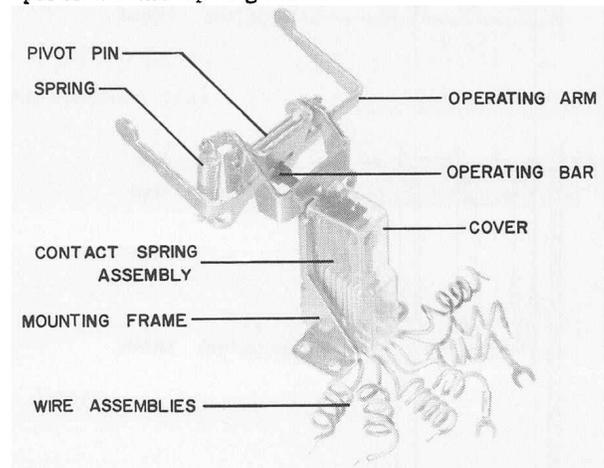


Fig. 2-1 TYPICAL CRADLE SWITCH

### 3 TEST AND ADJUSTMENT

3.1 The operating and positioning bars must move through the springs without binding. Realign the spring nest as necessary to obtain this condition.

3.2 The normal position of the assembly is with the operating arm fully released and the operated position is with the arm fully depressed.

3.3 SPRING ADJUSTMENTS

Adjust the contact springs of the assembly to meet the requirements detailed in the following paragraphs.

3.3.1 Spring Pressures

The pressure between each pair of closed contacts must be within the range of 20 to 35 grams. This is measured at each tip of the break springs with the operating arm in the normal position and at each tip of the lever springs with the arm in the fully operated position. With the operating arm in either position, each spring not making electrical contact must be tensioned against a shoulder of the operating or positioning bar.

3.3.2 Spring Clearances

The clearance between each pair of open contacts, in either the normal or operated condition, must be at least .020".

There must be a perceptible clearance between any break or lever spring, when it is in electrical contact with another spring, and the shoulder of the bar on which it rests in the other position of the operating arm.

There must be a clearance of at least 1/32" between springs not designed to make electrical contact when the assembly is normal or operated.

3.3.3 Contact Sequence and Alignment

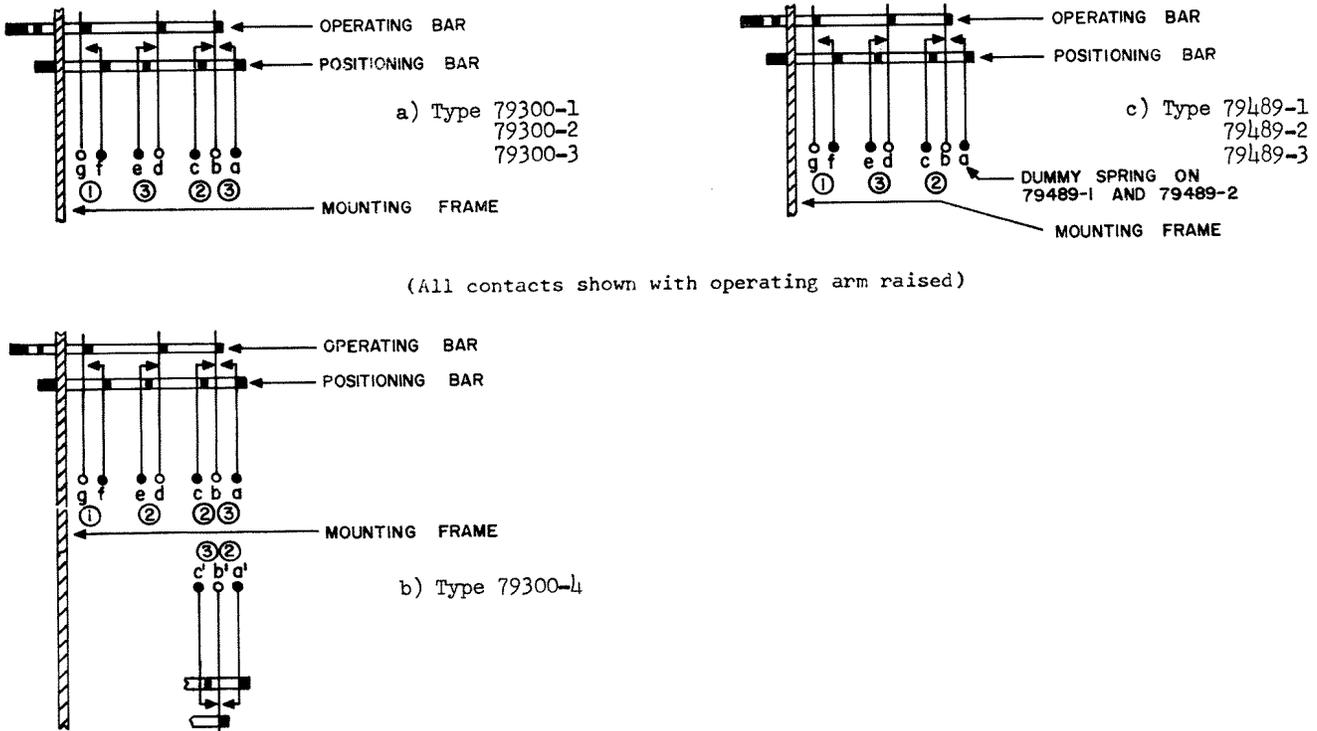
The contacts in each assembly must operate in the sequence shown by the circled numbers in Fig. 3-1 when the operating arm is moved from the normal position. Contacts marked with the same number should function at approximately the same time.

The two contacts of each mating pair of springs must make and break simultaneously.

The bar contacts must mate approximately on centers.

3.4 OPERATING FORCE

With the cradle switch assembly mounted so that the contact springs are vertical, a force between 7 and 9 ounces must fully actuate the operating arm when it is applied to either tip of the arm in a direction parallel to the length of the contact springs.



(All contacts shown with operating arm raised)

Fig. 3-1 CONTACT ARRANGEMENTS

4 LUBRICATION

4.1 Any existing lubricant must be cleaned off with a good quality, non-filming commercial solvent. Using a small camel hair brush, apply a small

amount of high quality lubricant, such as ITTK dial lubricant 79946, to each of the four bearing points of the pivot pin.

5 REPLACEABLE PARTS

5.1 The component parts of the various cradle switch assemblies are listed in Table 5-1. The position numbers (noted in brackets) show the order of assembly, starting from the mounting frame, of the parts of the spring nest for each type of cradle switch.

Table 5-1 REPLACEABLE PARTS

Item	Description	Number	Quantity per Assembly						
			75300-1	75300-2	75300-3	75300-4	79489-1	79489-2	79489-3
1a	Mounting Frame	75301	1	1		1			
b	Mounting Frame	75301-2			1				
c	Mounting Frame	79484					1		
d	Mounting Frame	79484-2							1
e	Mounting Frame	190172-1						1	
2a	Operating Arm	75302	1		1	1			
b	Operating Arm	79602		1					
c	Operating Arm	79491					1		
d	Operating Arm	190173-1							1
3	Grommet	75303	1	1	1	1	1	1	1
4	Pivot Pin	75308	1	1	1	1	1	1	1
5	Spring	75307	1	1	1	1	1	1	1
6	Cover	75306	1	1	1	1	1	1	1
7	Operating Bar	75305	1	1	1	1	1	1	1
8	Positioning Bar	75304	1	1	1	1	1	1	1
9a	Bushing	75322	2	2	2		2	2	
b	Bushing	75322-3				2			
c	Bushing	75322-5							2
10a	Rd. Hd. Mach. Screw	59031	2	2	2		2	2	2
b	Rd. Hd. Mach. Screw	84796-1				2			
11	Nut	75323	1(24)	1(24)	1(24)	1(24)	1(23)	1(23)	1(24)
12	Insulator	75321	5(1,5,11,17,20,23)	6(1,5,11,17,20,23)	6(1,5,11,17,20,23)	4(5,11,11,33)	6(1,5,11,17,20,22)	5(1,5,11,17,20,22)	6(1,5,11,17,20,23)
13	Insulator	75321-3	3(2,8,11)	3(2,8,14)	3(2,8,14)	2(1,8)	3(2,8,14)	3(2,8,14)	3(2,8,14)
14	Insulator	75321-4				5(2,17,20,26,29)			
15	Insulator	84778-1				1(23)			
16	Contact Spring Assy.	75315	1(21)	1(21)	1(21)				1(21)
17	Contact Spring Assy.	75316	1(18)	1(18)	1(18)				
18	Contact Spring Assy.	75317	1(3)	1(3)	1(3)		1(3)	1(3)	
19	Contact Spring Assy.	75318	2(9,15)	2(9,15)	2(9,15)	1(13)	2(10,16)	2(10,16)	1(15)
20	Contact Spring Assy.	75319	1(12)	1(12)	1(12)	1(7)	2(13,19)	2(13,19)	1(12)
21	Contact Spring Assy.	75320	1(6)	1(6)	1(6)		1(7)	1(7)	1(6)
22	Contact Spring Assy.	84788-1				1(24)			
23	Contact Spring Assy.	84789-1				1(4)			1(3)
24	Contact Spring Assy.	84790-1				1(22)			
25	Contact Spring Assy.	84791-1				1(10)			1(9)
26	Contact Spring Assy.	84792-1				1(19)			
27	Contact Spring Assy.	84793-1				1(16)			
28	Contact Spring Assy.	84794-1				1(28)			
29	Contact Spring Assy.	84795-1				1(32)			
30	Contact Spring Assy.	86373-1							1(18)
31	Spring	75310					1(22)	1(22)	
32	Spring	84786-1				1(30)			
33	Wire Assembly (SL)	75326-1	1(22)	1(22)	1(22)				1(22)
34	Wire Assembly (SL-YL)	75326-2	1(19)	1(19)	1(19)				
35	Wire Assembly (SL-GR)	75326-3	1(13)	1(13)	1(13)				
36	Wire Assembly (SL-WH)	75326-4	1(10)	1(10)	1(10)	1(9)	1(11)	1(11)	1(19)
37	Wire Assembly (SL-BK)	75326-5	1(4)	1(4)	1(4)	1(3)	1(4)	1(4)	1(4)
38	Wire Assembly (SL-BN)	75326-6	1(16)	1(16)	1(16)		1(17)	1(17)	1(10)
39	Wire Assembly (SL-RD)	75326-7	1(7)	1(7)	1(7)	1(6)	1(8)	1(8)	1(7)
40	Wire Assembly (SL-YL)	75326-74					1(20)	1(20)	1(13)
41	Wire Assembly (SL-GR)	75326-75				1(12)	1(14)	1(14)	1(16)
42	Wire Assembly (BN)	75326-148				1(15)			
43	Wire Assembly (SL)	75326-149				1(18)			
44	Wire Assembly (YL)	75326-150				1(21)			
45	Wire Assembly (SL-YL)	75326-151				1(25)			
46	Wire Assembly (SL-BN)	75326-152				1(27)			
47	Wire Assembly (BL)	75326-153				1(31)			

## CRADLE SWITCH ASSEMBLIES

### CONTENTS

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3 TEST AND ADJUSTMENT	2		
4 LUBRICATION			

### 1 GENERAL DESCRIPTION

1.1 These cradle switch assemblies are used on the 700 Series of compact desk telephones. Each assembly consists of a spring loaded operating arm, pivoted on a bearing which is molded into the same plastic block as the contact springs, mounted with two sets of contacts on each side of the insulating actuator block which is riveted to the center part of the operating arm. The coiled spring holds the operating arm in a position which operates two of the sets of contacts when the arm is in the raised or off-hook position. These two sets of contacts are released and the opposite two sets are operated when the arm is moved to the on-hook position.

1.2 Separate flexible wire leads are provided for each contact spring to connect them to the other components in the telephone instrument. The leads are joined to the contact springs inside the molded portion of the assembly.

1.3 The complete assembly is mounted to the base of the telephone instrument by means of three rivets through its bracket, which is molded into the same block as the contact springs, so that placing the handset in the cradle depresses the plungers against the extremities of the operating arm to actuate the contact springs.

### 2 DISASSEMBLY AND ASSEMBLY

2.1 The various parts of the cradle switch are identified in Fig. 2-1.

2.2 To disassemble the unit, first remove the coil spring holding the operating arm in the raised position, then lift the arm carefully from between the sets of contact springs. Reassemble the parts by placing the operating arm over its pivot pin and between the sets of contact springs. Then hook the loops of the coiled spring over the lugs on the arm and the assembly mounting bracket. Make sure that the operating arm functions freely and is securely pivoted in the groove of the bearing pin.

2.3 The spring nest assembly can not be taken apart. In the event of damage to the contacts, springs or leads the complete spring nest assembly must be replaced. Note that the 703 type telephone instruments do not require the use of one set of make contacts. It may be possible, therefore, to use certain damaged assemblies from 701 type instruments in 703 type instruments.

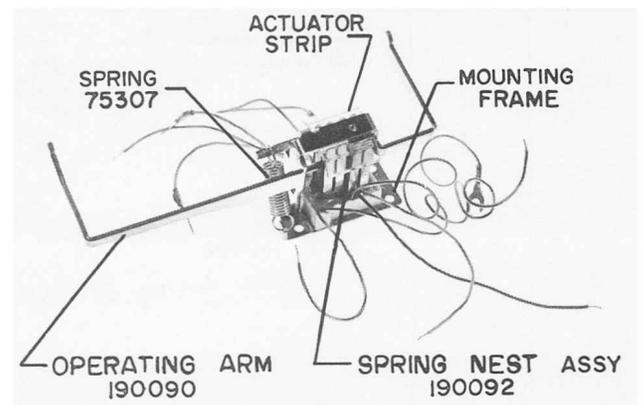


Fig. 2-1 TYPICAL CRADLE SWITCH

### 3 TEST AND ADJUSTMENT

3.1 The operating arm, and the insulated actuator strip mounted on it, must move freely between the sets of contact springs.

3.2 The normal position of the assembly is with the operating arm fully released and the operated position is with the arm fully depressed.

#### 3.3 SPRING ADJUSTMENTS

Adjust the contact springs of the assembly to meet the requirements detailed in the following paragraphs.

##### 3.3.1 Spring Pressures

The pressure between each pair of closed contacts must be within the range of 10 to 20 grams. This is measured at each tip of the break springs on the side of the assembly where the springs are in contact with the actuator strip and at each tip of the lever springs on the opposite side of the assembly, when the operating arm is in the normal position. The same conditions must be satisfied when measuring at each tip of the lever springs on the side of the assembly where the springs are NOT in contact with the actuator strip, when the operating arm is in the fully operated position. With the

operating arm in either position, each spring not making electrical contact must be tensioned against a buffer spring or the central insulating block.

##### 3.3.2 Spring Clearances

The clearance between each pair of open contacts, in either the normal or operated condition, must be at least .020".

There must be a perceptible clearance between any buffer spring and the contact spring which rests on it, in either position of the operating arm, when the contact spring is in electrical contact with another spring, in the other position of the operating arm.

##### 3.3.3 Contact Sequence and Alignment

The contacts in each assembly must operate in the sequence shown by the circled numbers in Fig. 3-1 when the operating arm is moved from the normal position. Contacts marked with the same number should function at approximately the same time.

The two contacts of each mating pair of springs must make and break simultaneously.

The bar contacts must mate approximately on centers.

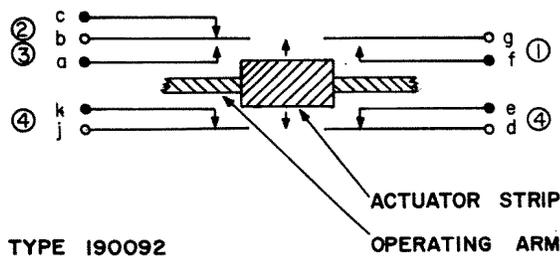


Fig. 3-1 CONTACT ARRANGEMENTS

### 4 LUBRICATION

4.1 Any existing lubricant must be cleaned off with a good quality, non-filming commercial solvent. Using a small camel hair brush, apply a small

amount of high quality lubricant, such as ITTK dial lubricant 79946, to each of the two bearing points of the bearing pin. Avoid excessive lubrication.

# HOOK SWITCH ASSEMBLIES

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## 1 GENERAL DESCRIPTION

1.1 Each hook switch assembly consists of a cast metal hook and a spring loaded operating arm which are interlocked and pivoted on a common frame. Movement of the hook and arm is imparted to the lever springs of a spring nest assembly mounted on the lower part of the frame. Each contact spring is provided with a flexible wire lead to connect to the other components in the telephone instrument.

1.2 The hook switch assembly is mounted in a wall type telephone so that hanging the handset in the hook causes the contact springs to be actuated.

1.3 Several different contact and mechanical arrangements are available to meet the requirements of the various telephone instrument circuits (see paragraphs 3 and 5).

## 2 DISASSEMBLY AND ASSEMBLY

2.1 The various parts of a typical hook switch assembly are identified in Fig. 2-1.

2.2 To disassemble the unit, first remove the coil spring(s) holding the operating arm and cradle hook in the raised position then slide out the pivot pin and remove the cradle hook. Note that the lift-to-talk version of the assembly has two flat washers between the right hand side of the cradle hook and the mounting frame. Disengage the end of the operating bar from the slot in the operating arm and remove the arm. Reassemble the parts in the reverse order; make sure that the grooves in the pivot pin rest in the elongated holes of the operating arm and mounting frame.

2.3 The spring nest assembly should only be removed from the mounting frame if it is necessary to replace a contact spring or lead. The cover is removed by squeezing the sides, to clear the lugs on its rear edge through the locking slots in the frame, and lifting. Removal of the operating and positioning bars is accomplished by disengaging the

keying section from one of the springs, rotating the bar one quarter turn and lifting it out. Reassembly is a reversal of these procedures. Refer to Table 5-1 for the order of assembly of the parts of the spring nest.

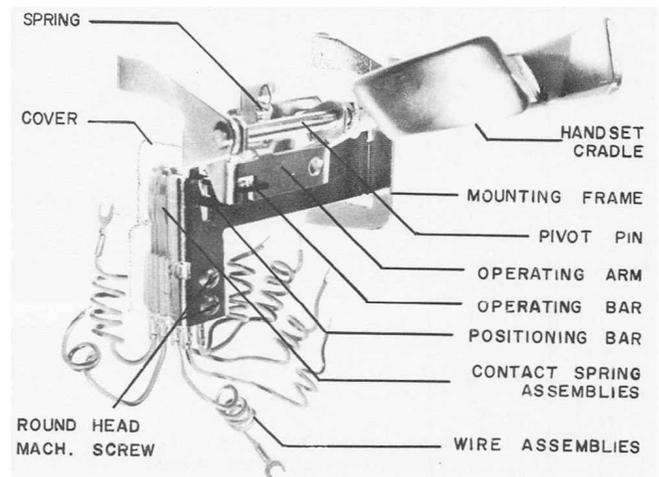


Fig. 2-1 TYPICAL HOOK SWITCH

## 3 TEST AND ADJUSTMENT

3.1 The operating and positioning bars must move through the springs without binding. Realign the spring nest as necessary to obtain this condition.

3.2 The normal position of the assembly is with the operating arm fully released and the operated position is with the arm fully depressed.

3.3 SPRING ADJUSTMENTS

Adjust the contact springs of the assembly to meet the requirements detailed in the following paragraphs.

3.3.1 Spring Pressures

The pressure between each pair of closed contacts must be within the range of 20 to 35 grams. This is measured at each tip of the break springs with the operating arm in the normal position and at each tip of the lever springs with the arm in the fully operated position. With the operating arm in either position, each spring not making electrical contact must be tensioned against a shoulder of the operating or positioning bar.

3.3.2 Spring Clearances

The clearance between each pair of open contacts, in either the normal or operated condition, must be at least .020".

There must be a perceptible clearance between any break or lever spring, when it is in electrical contact with another spring, and the shoulder of the bar on which it rests in the other position of the operating arm.

There must be a clearance of at least 1/32" between springs not designed to make electrical contact when the assembly is normal or operated.

3.3.3 Contact Sequence and Alignment

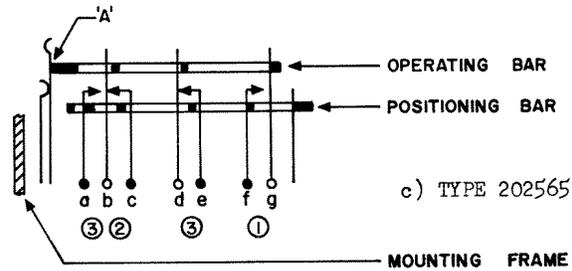
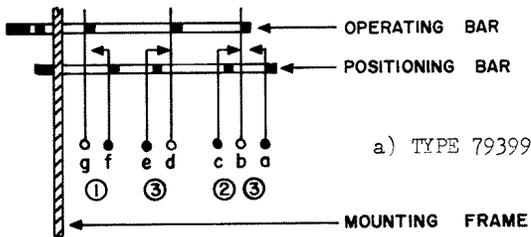
The contacts in each assembly must operate in the sequence shown by the circled numbers in Fig. 3-1 when the operating arm is moved from the normal position. Contacts marked with the same number should function approximately at the same time. On the "lift-to-talk" type assembly, the contact marked with a number in a double circle must operate before the arm of the cradle hook comes to rest against the stop on the frame. Moving the cradle hook to the side must then allow it to rise completely and operate the remaining contacts in the order shown.

The two contacts of each mating pair of springs must make and break simultaneously.

The bar contacts must mate approximately on centers.

3.4 OPERATING FORCE

With the hook switch assembly mounted so that the contact springs are vertical, a force of 4 ounces must not fully depress the cradle hook and a force of 8 ounces must fully depress the hook. The forces should be applied by using type 65-C handset shells which have been weighted at the transmitter end. The cradle hook of the "lift-to-talk" assembly must slide freely on the pivot pin.



Insertion of .025" shim between spring and operating bar at point "A" with cradle hook depressed must not operate any contacts.

(ALL CONTACTS SHOWN WITH CRADLE HOOK RAISED)

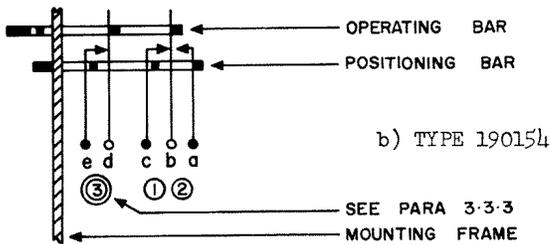


Fig. 3-1 CONTACT ARRANGEMENTS

4 LUBRICATION

4.1 Any existing lubricant must be cleaned off with a good quality, non-filming commercial solvent. Using a small camel hair brush, apply a small amount of high quality lubricant, such as ITTK dial

lubricant 79946, to each of the bearing points of the pivot pin, to the bearings of the cradle hook and to the rubbing surfaces of the arms at the rear of the cradle hook.

5 REPLACEABLE PARTS

5.1 The component parts of the various hook switch assemblies are listed in Table 5-1. The position numbers (noted in brackets) show the order of assembly, starting from the mounting frame, of the parts of the spring nest for each type of hook switch.

Table 5-1 REPLACEABLE PARTS

Item	Description	Number	Quantity per Assembly		
			79399	190154	202565
1a	Mounting Frame	79297	1		
b	Mounting Frame	190152		1	
c	Mounting Frame	26899-3			1
2	Operating Arm	79307	1	1	
3a	Handset Cradle	79417	1		
b	Handset Cradle	190153		1	
c	Handset Cradle	81564			1
4	Pivot Pin	79304	1	1	
5	Spring	75307	1	1	
6	Cover	75306	1	1	
7a	Operating Bar	75305	1	1	
b	Operating Bar	81566			1
8	Positioning Bar	75304	1	1	1
9a	Bushing	75322	2	2	
b	Bushing	75322-4			2
10a	Rd. Hd. Mach. Screw	59031	2	2	
b	Rd. Hd. Mach. Screw	81584-2			2
11	Spring	190155		1	
12	Spring	46029-2			1(3)
13	Spring	75310-2			1(29)
14	Spring	81565			1(5)
15	Flat Washer	37445		2	
16a	Nut	75323	1(24)	1(22)	
b	Clamping Plate	79750-2			1(30)
17	Insulator	75321	6(1,5,11,17,20,23)	5(1,9,15,18,21)	6(4,6,10,13,19,25)
18	Insulator	75321-2		2(4,5)	
19	Insulator	75321-3	3(2,8,14)	4(2,3,6,12)	6(1,2,7,16,22,28)
20	Contact Spring Assy.	75315	1(21)	1(19)	1(9)
21	Contact Spring Assy.	75316	1(18)	1(16)	
22	Contact Spring Assy.	75317	1(3)		1(27)
23	Contact Spring Assy.	75318	2(9,15)	2(7,13)	2(15,21)
24	Contact Spring Assy.	75319	1(12)	1(10)	1(18)
25	Contact Spring Assy.	75320	1(6)		1(24)
26	Contact Spring Assy.	81567			1(12)
27	Wire Assembly (SL)	75326-1	1(22)	1(20)	1(8)
28	Wire Assembly (SL-YL)	75326-2	1(19)	1(17)	1(11)
29	Wire Assembly (SL-GR)	75326-3	1(13)	1(11)	1(17)
30	Wire Assembly (SL-WH)	75326-4	1(10)	1(8)	1(20)
31	Wire Assembly (SL-BK)	75326-5	1(4)		1(26)
32	Wire Assembly (SL-BN)	75326-6	1(16)	1(14)	1(14)
33	Wire Assembly (SL-RD)	75326-7	1(7)		1(23)

# KEY SWITCH ASSEMBLY

## CONTENTS

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## 1 GENERAL DESCRIPTION

1.1 Each key switch assembly consists of a diecast frame, containing the plungers, restoring springs and interlocking and restoring slides, mounted on a bracket which carries the contact spring assemblies below a common terminal board. Mounting holes are provided on each assembly for the separate lamp strip, and plunger and retainer assemblies. The contact springs are wired to the terminals of the terminal board or provided with flexible wire leads for connection to other components in the telephone.

1.2 The assemblies are mounted to the base of the 500 type key telephones, by means of three screws, so that the terminal board locates directly underneath the dial and the plungers project through the holes at the front of the housing assembly.

1.3 Several different versions of key switch assemblies are available to meet the requirements of the different types of key telephone instrument circuits (see sections 3 and 5).

## 2 DISASSEMBLY AND ASSEMBLY

2.1 The various parts of a typical key switch assembly are identified in Fig. 2-1.

the assembly it is desired to remove. Reassemble the parts in the reverse order, referring to Fig. 3-1 to reconnect the various leads.

2.2 Disassembly of the key switch units should not normally be required unless dirt or dried lubricant is causing the key mechanism to stick. The plunger housing assembly is removed from the bracket assembly by removing the two round head screws and spring washers from underneath the items. The various plungers and slide plates may then be lifted out of the plunger housing. TAKE CAREFUL NOTE OF THE POSITIONS OF THE VARIOUS ITEMS SO THAT REASSEMBLY WILL BE FACILITATED. Reassemble the items in the reverse order, placing the plungers in position first, then the restoring springs (if fitted) and finally the various slide plates. Replace the plunger housing on the bracket and then insert the mounting screws and spring washers.

2.3 The contact spring assemblies should only be removed from the bracket when it is necessary to replace damaged contacts. First remove the two screws holding the terminal board so that it may be moved up, to allow access to the spring assembly mounting screws, then remove the two screws holding

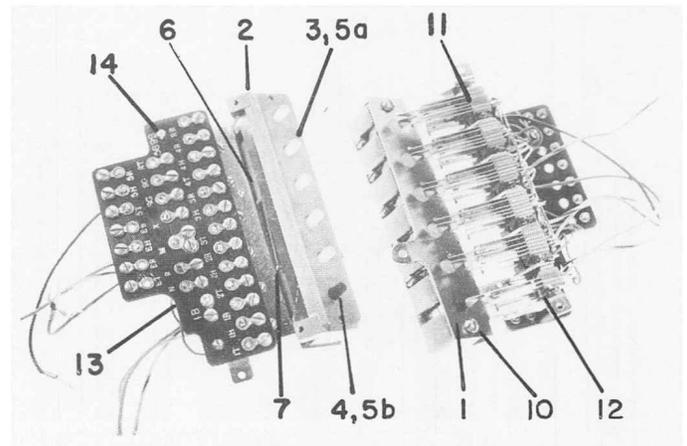


Fig. 2-1 TYPICAL KEY SWITCH

## 3 TEST AND ADJUSTMENT

3.1 The normal position of the individual contact spring assemblies is with the respective plungers in the raised position and the operated position is with the plunger depressed. The normal position of the complete key switch assembly is with all the plungers in the raised position.

3.2 The interlocking arrangements between the plungers varies with the different assemblies. The arrangements are shown for each type in Fig. 3-1. Key switch assemblies 589(B) 740 and 589(H) 740 only differ in the type of terminal board fitted and are identical in contact and wiring arrangement.



### 3.3 PUSH BUTTON ASSEMBLIES

The various slide assemblies in each plunger housing must operate freely, without binding, at any point. Replace any worn or damaged items and lubricate (Section 4) the assembly before making any adjustments to the complete unit.

#### 3.3.1 Plunger Operating Pressures

The pressures, applied to the tip of the plunger and inline with the direction of travel, required to fully depress each plunger must be within the limits given in the following table. Check for dirty, worn or damaged parts if these pressures are not met.

		588(B)740
Switch Type:	508( )740	589(B)740
		589(H)740

#### Pick-up Key:

Must Operate:	24 Ozs.	30 Ozs.
Non Operate:	6 Ozs.	8 Ozs.

#### Hold Key; with any Pick-up Key Operated:

Must Operate:	24 Ozs.	68 Ozs.
Non Operate:	6 Ozs.	40 Ozs.

Note: Pick-up key must release when Hold key:  
Depressed Released

When any operated plunger is released it must return to its normal position with a snap.

#### 3.3.2 Release Strip

Operation of the release strip must meet the conditions specified below, when the stated pressures are applied to the outside edge of the strip.

		588(B)740
Switch Type:	508( )740	589(B)740
		589(H)740

Condition:	With all hold keys depressed.	All keys normal.
------------	-------------------------------	------------------

Action to be obtained:	Release all hold keys.	Move strip to opposite stop.
------------------------	------------------------	------------------------------

Must Operate:	6 Ozs.	170 Grams.
Non Operate:	2 Ozs.	120 Grams.

### 3.4 SPRING ADJUSTMENTS

Adjust the contact springs of each individual spring assembly to meet the requirements detailed in the following paragraphs.

#### 3.4.1 Spring Pressures

The pressure between each pair of closed contacts must be at least 15 grams. This is measured at each tip of the make springs with the assembly in the operated position. The pressure between the break contacts of the make-before-break units is measured at each tip of the make springs with the assembly in the normal position.

#### 3.4.2 Spring Clearances

The clearance between each pair of open contacts, in either the normal or operated condition, must be at least 1/64".

There must be a clearance of at least 1/64" between springs not designed to make electrical contact, when the assembly is normal or operated, and between all springs and the frame assembly.

#### 3.4.3 Contact Sequence

All the make contacts of each individual multi-contact spring assembly must make at approximately the same time.

Release of any operated pick-up key by the operation of the hold key must not take place until the contacts of the hold key are fully operated and, in the case of all assemblies except the type 508( )740, the hold key is allowed to rise.

#### 3.4.4 Plunger Operation

The tip of each fully depressed plunger must overlap the ends of the lever springs by a distance of at least 5/32" but not more than 3/16".

### 3.5 CONVERSION TO SIGNALLING KEYS

Any of the convertible keys, noted in the diagrams of Fig. 3-1, may be arranged to be used as signalling keys instead of for their designated more usual function. First unscrew the special guide screw by 8 to 10 turns from the shank of the desired plunger. This prevents the plunger from operating the slides in the plunger housing. Then make the appropriate wiring changes as indicated on the circuit diagrams for the instrument. In the case of instruments using the 508( )740 type key assemblies it is also necessary to add a special spring, type 86374, between the telephone baseplate and the loosened guide screw. This spring provides the necessary force to restore the plunger after it is operated.

## 4 LUBRICATION

4.1 For lasting, trouble-free operation it is essential that all dirty or caked lubricant is removed before fresh lubricant is added. When necessary, disassemble the plunger housing assembly and thoroughly clean all the parts with a good quality, non-filming commercial solvent, using a small brush with stiff bristles.

4.2 Lubricate the assembly, using a small camel hair brush, with a small amount of high quality lubricant, such as ITTK dial lubricant 79946, to each of the rubbing surfaces of the slides, release strip, bracket, plungers and plunger guide screws. AVOID EXCESSIVE LUBRICATION. Operate all the keys for a number of times to spread the lubricant.

5 REPLACEABLE PARTS

5.1 The component parts of the various key switch assemblies are listed in Table 5-1. The positions of the various wire assemblies may be determined

from the diagrams of Fig. 3-1 where each lead is identified by the appropriate item number, from the table below, as well as its color.

Table 5-1 REPLACEABLE PARTS

Item	Description	Number	Quantity per Assembly			
			508( ) 740	588(B) 740	589(B) 740	589(H) 740
1a	Bracket Assembly	79464	1			
b	Bracket Assembly	79519		1	1	1
2a	Plunger Housing Assembly	79520-1			1	1
b	Plunger Housing Assembly	79520-2		1		
c	Plunger Housing Assembly	79520-3	1			
3a	Plunger Assembly	79420-1		3	5	5
b	Plunger Assembly	79420-2	6			
4	Plunger	79415		1	1	1
5a	Spring	79476-1		3	5	5
b	Spring	79476-2		1	1	1
6a	Release Strip	190161	1			
b	Release Strip	79493		1	1	1
7	Spring	79412		1	1	1
8	Lockout Slide	190165	2			
9a	Lockout Slide	79413-1		2	4	4
b	Lockout Slide	79413-2	3			
10	Rd. Hd. Lockwasher Screw	95777-1	2	2	2	2
11	Spring Assembly	79505	6	3	5	5
12	Spring Assembly	79531		1	1	1
13a	Terminal Board Assembly	190184	1			
b	Terminal Board Assembly	79460		1		
c	Terminal Board Assembly	79512			1	
d	Terminal Board Assembly	81794				1
14	Rd. Hd. Mach. Screw	71660	14	10	14	14
15	Wire Strap	3697-2	2		2	2
16	Wire Strap	3697-3		2		
17	Wire Strap (GN)	3697-4		1		
18	Wire Strap	3697-5	1			
19	Wire (WH)	79544-1		9	12	12
20	Wire (GN)	79544-2		3	5	5
21	Wire (RD)	79544-3			3	3
22	Wire (WH)	190189-1	6			
23	Wire (RD)	190189-2	1			
24	Wire (BL)	190189-3	2			
25	Wire (BN)	190189-4	1			
26	Wire (OR)	190189-5	2			
27	Wire (YL)	190189-6	1			
28	Wire (GN)	190189-7	3			
29	Wire (OR)	190189-8	1			
30	Wire (SL)	190189-9	1			
31	Wire (BN)	190189-10	1			
32	Wire Assembly (YL)	75326-76		1	1	1
33	Wire Assembly (BN)	75326-77			1	1
34	Wire Assembly (GN)	75326-78			1	1
35	Wire Assembly (SL-BN)	75326-79			1	1
36	Wire Assembly (YL-BK)	75326-80		1	1	1
37	Wire Assembly (YL-BN)	75326-81			1	1
38	Wire Assembly (BN)	75326-83		1		
39	Wire Assembly (GN)	75326-84		1		
40	Wire Assembly (BK)	75326-117	1			
41	Wire Assembly (BL)	75326-118	1			
42	Wire Assembly (GN)	75326-119	1			
43	Wire Assembly (OR)	75326-120	1			
44	Wire Assembly (SL)	75326-121	1			
45	Wire Assembly (BN)	75326-122	1			
46	Wire Assembly (WH-BL)	75326-132	1			
47	Wire Assembly (WH-GN)	75326-133	1			
48	Wire Assembly (WH-BK)	75326-134	1			
49	Wire Assembly (BK-GN)	75326-137			1	1

# PLUNGER SWITCH ASSEMBLIES

## CONTENTS

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1 GENERAL DESCRIPTION	1	2-1 TYPICAL PLUNGER SWITCH	1
2 DISASSEMBLY AND ASSEMBLY	1	3-1 CONTACT ARRANGEMENT	2
3 TEST AND ADJUSTMENT	1	Table	
4 REPLACEABLE PARTS	2	4-1 REPLACEABLE PARTS	2

## 1 GENERAL DESCRIPTION

1.1 Each plunger switch assembly consists of a spring nest mounted on a bracket which is loosely held to a second bracket by a spring. The assembly is mounted in a desk type telephone by a clamping screw which holds the second bracket to the cradle switch bracket of the instrument.

1.2 The spring mounting bracket has two locating tabs at each end. These engage a web inside the telephone housing and correctly locate the spring

nest assembly with respect to the left hand plunger in the housing. This plunger is of special design such that it operates normally when the handset is lifted but may then be raised further in order to operate the plunger switch spring assembly. When the handset is replaced, the plunger automatically depresses completely to release the switch contacts.

1.3 The contact springs are provided with wire leads, terminal lugs or screw terminals, as needed.

## 2 DISASSEMBLY AND ASSEMBLY

2.1 The various parts of a typical plunger switch are identified in Fig. 2-1.

2.2 Loosen the clamping screw in the mounting bracket and lift the locating tabs out of the slot in the cradle switch bracket in order to remove the assembly from the telephone. Unhook the retaining spring to allow the spring and bracket assembly to be lifted off the lugs of the mounting bracket. Reassembly is simply a reversal of these processes.

2.3 The contact spring assembly should only be disassembled from its mounting bracket, by removing the two round head screws, if it is necessary to replace a part of the assembly. Refer to Table 4-1 for the order of assembly of the various parts of the spring assembly.

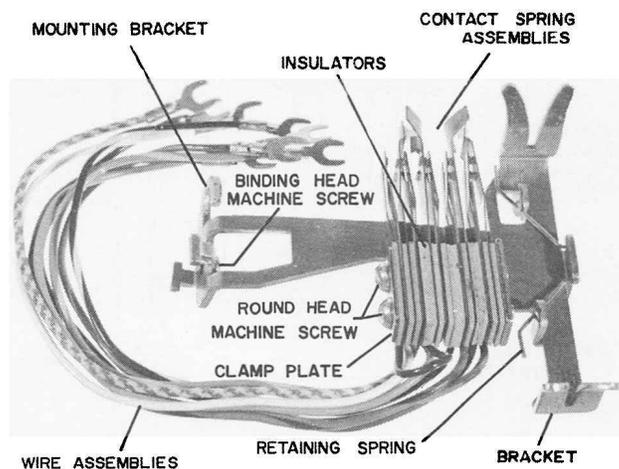


Fig. 2-1 TYPICAL PLUNGER SWITCH

## 3 TEST AND ADJUSTMENT

3.1 The special plunger in the housing assembly must pass between the innermost lever springs of the assembly and operate all contacts correctly. This may be checked by removing the spring and bracket assembly (Section 2.2) and placing it in position inside the inverted housing. Take care in

replacing the housing over the telephone as the end of the plunger must pass between the lever springs of the assembly. See also Section 3.3.

3.2 The normal position of the spring assembly is with the plunger NOT lifted.

3.3 SPRING ADJUSTMENTS

Adjust the contact springs of the assembly to meet the requirements detailed in the following paragraphs.

3.3.1 Spring Pressures

The pressure between each pair of closed contacts must be within the range noted in Fig. 3-1. This is measured at each tip of the make springs with the spring nest operated (see also paragraph 3.3.2) and at each tip of the break springs with the spring nest normal.

3.3.2 Spring Clearances and Alignment

The clearance between each pair of open contacts, in either the normal or operated condition, must be at least .025".

There must be a clearance of not more than .005" between the tip of each buffer spring and its associated make or break spring when the latter is in electrical contact with a lever spring.

There must be a clearance of at least 1/32" between springs not designed to make electrical contact when the assembly is normal or operated.

While adjusting the spring pressures and clearances, the dimensions shown in Fig. 3-1,

between the tips of the innermost lever springs and between the center lines of the spring nest assembly and the notches in the mounting bracket, must be obtained.

It will be helpful to place a small block, .430+ .005" thick, between the lever springs, in order to simulate the plunger operation of the spring nest, while adjusting the make contacts. The tips of the lever springs must spread equally about the center line of the spring nest in the operated condition.

3.3.3 Contact Sequence and Alignment

The contacts on each assembly must operate in the sequence shown by the circled numbers in Fig. 3-1 when the plunger is lifted. Contacts marked with the same number should function at approximately the same time.

The two contacts of each mating pair of springs must make and break simultaneously.

The bar contacts must mate approximately on centers.

All make and break springs must follow the lever springs for a distance of at least .010" before the contacts open.

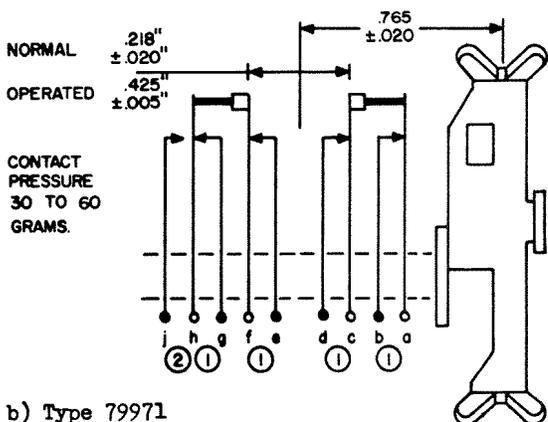
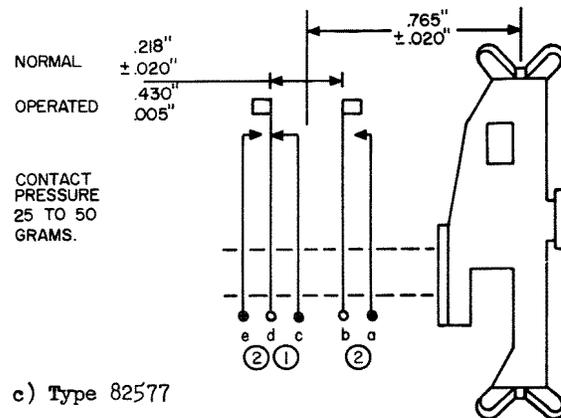
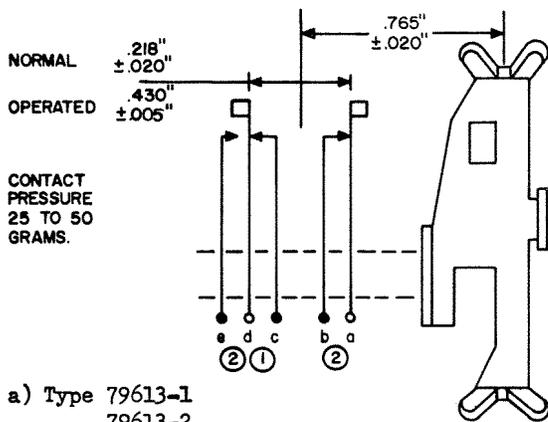


Fig. 3-1 CONTACT ARRANGEMENTS

5 REPLACEABLE PARTS

5.1 The component parts of the various plunger switch assemblies are listed in Table 5-1. The position numbers (noted in brackets) show the order of assembly, starting with the clamp plate, of the parts of the spring nest for each type of plunger switch.

Table 5-1 REPLACEABLE PARTS

Item	Description	Number	Quantity per Assembly			
			79613-1	79613-2	79971	82577
1	Mounting Bracket	79605	1	1	1	1
2	Bind. Hd. Mach. Screw	69020-3	1	1	1	1
3	Retaining Spring	79624	1	1	1	1
4a	Bracket	79604	1	1		1
b	Bracket	79969			1	
5a	Bushing	75322-2	2	2		2
b	Bushing	75322-3			2	
6a	Rd. Hd. Mach. Screw	66849	2	2		2
b	Rd. Hd. Mach. Screw	79980-2			2	
7a	Clamp Plate	79615	1(1)	1(1)	1(1)	1(1)
8	Insulator	75321	6(2,5,7, 10,14,16)	6(2,5,7 10,14,16)	8(2,5,7,12 15,19,24,26)	4(2,5,7,13)
9	Insulator	75321-2				1(16)
10	Insulator	75321-3	1(11)	1(11)	3(9,15,20)	2(10,11)
11	Buffer Spring	79620	2(8,13)	2(8,13)	5(4,8,13 18,23)	2(8,14)
12	Contact Spring Assy.	79618	3(3,9,12)	3(3,9,12)	5(3,9,14 17,22)	3(3,9,15)
13	Contact Spring Assy.	79621-1	1(6)	1(6)	1(11)	1(6)
14	Contact Spring Assy.	79621-2	1(15)	1(15)	1(20)	
15	Contact Spring Assy.	79621-3				1(12)
16	Contact Spring Assy.	79968-1			1(6)	
17	Contact Spring Assy.	79968-2			1(25)	
18	Terminal Spring	79617	1(4)	1(4)		1(4)
19	Bind. Hd. Mach. Screw	69020-3	1	1		1
20	Wire Assy. (RD-YL)	75326-85	1			
21	Wire Assy. (GR-YL)	75326-86	1		1	
22	Wire Assy. (WH)	75326-87	1	1	1	
23	Wire Assy. (BL)	75326-88	1		1	
24	Wire Assy. (BK)	75326-89	1			
25	Wire Assy. (BK)	75326-97			1	
26	Wire Assy. (GR-RD)	75326-98			1	
27	Wire Assy. (BK-WH)	75326-99			1	
28	Wire Assy. (BK-RD)	75326-100			1	
29	Wire Assy. (BN-RD)	75326-101			1	
30	Wire Assy. (BL)	75326-106				1
31	Wire Assy. (RD-YL)	75326-107				1
32	Wire Assy. (WH)	75326-108				1
33	Wire Assy. (BK)	75326-109				1

# TURN AND PUSH KEY ASSEMBLIES

## CONTENTS

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2	DISASSEMBLY AND ASSEMBLY	1	3-1 CONTACT ARRANGEMENTS	2
3	TEST AND ADJUSTMENT	1	Table	
4	REPLACEABLE PARTS	3	4-1 REPLACEABLE PARTS	3

### 1 GENERAL DESCRIPTION

1.1 Each of the various types of turn and push keys consists of a bracket and plunger assembly in which the plunger is free to slide and rotate in a bushing on the upper part of the bracket. Either one or two spring nest assemblies may be independently mounted on the lower part of the bracket; one is actuated by depressing the plunger and the other by rotating the plunger one quarter turn. The rotary action is locking in both positions while the push action is non-locking. A lucite knob is fitted to the top of the plunger.

1.2 The turn and push keys are mounted to the base of either the desk or wall type telephones so that the lucite knob projects through the housing. Various types of contact assemblies are available to meet the requirements of the various types of telephone circuits.

1.3 Each of the contact springs is provided with a flexible, plastic insulated wire lead, with bare or spade terminal end, for connection to the other components in the telephone instrument.

### 2 DISASSEMBLY AND ASSEMBLY

2.1 The various parts of a typical assembly are identified in Fig. 2-1.

2.2 Disassembly of the turn and push key will not normally be required unless it is necessary to replace the plunger. First remove the small screw holding the knob in place and then the knob. Remove the turn spring nest assembly, the push spring nest assembly and then the plunger.

2.3 Reassemble the unit in the reverse order to that described above. If the spring nests have been taken apart refer to Table 4-1 for the order of assembly of the various items. Note that the knob must be fitted to the plunger so that the top thin portion is in line with the stop tab on the plunger for all types except 79453-2 where the top of the knob must be at right angles to the stop tab. Replace the plunger if binding is observed.

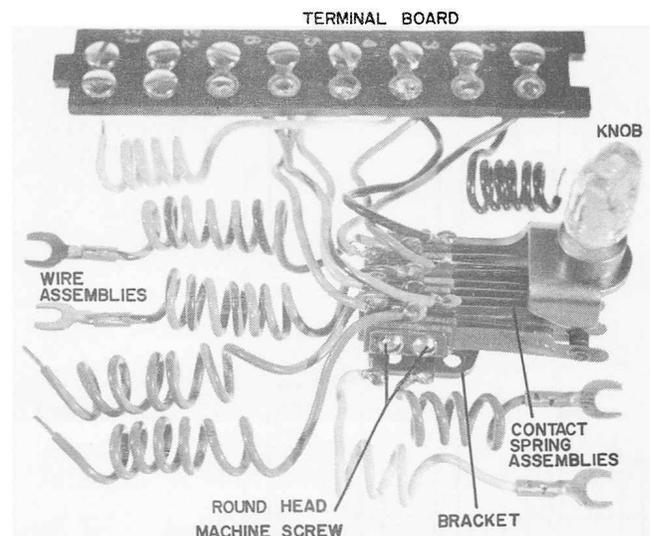


Fig. 2-1 TYPICAL TURN AND PUSH KEY

### 3 TEST AND ADJUSTMENT

3.1 When the assembly is installed on a telephone base, the housing of the instrument must pass over the stem of the turn and push key without binding. The shoulder mounting screws allow slight lateral movement of the assembly for alignment purposes.

3.2 The normal position of the turn key is with the narrow dimension of the end of the plunger in line with the length of the contact springs. The normal position of the push button is with the plunger in the raised position.

3.3 SPRING ADJUSTMENTS

Adjust the contact springs of the assembly to meet the requirements detailed in the following paragraphs.

3.3.1 Spring Pressures

The pressure of the lever springs of the turn key, against the broad, flat faces of the plunger, must be within the range of 100 to 200 grams, measured at the tips of the springs.

The pressure of the lever spring of the push key, against the end of the plunger, must be such that the plunger will be fully depressed by a force within the range of 1.1/4 to 2.1/4 pounds applied to the knob.

The pressure between each pair of closed contacts must be within the range of 35 to 65 grams. This is measured at each tip of the make springs with the turn or push key operated and at each tip of the break springs with the key in the normal position.

3.3.2 Spring Clearances

The clearance between each pair of open contacts, in either the normal or operated condition, must be at least .020" for the turn key spring nest and at least .035" for the push key spring nest.

There must be a clearance of not more than .005" between the tip of each buffer spring and its associated make or break spring when the

latter is in electrical contact with a lever spring.

There must be a clearance of at least 1/32" between springs not designed to make electrical contact when the assembly is normal or operated.

3.3.3 Contact Sequence and Alignment

The contacts in each assembly must operate in the sequence shown by the circled numbers in Fig. 3-1 when the plunger is operated from the normal position. Contacts marked with the same number should function at approximately the same time.

The two contacts of each mating pair of springs must make and break simultaneously.

The bar contacts must mate approximately on centers.

All make and break springs must follow the lever springs for a distance of at least .010" before the contacts open.

3.4 PLUNGER

The plunger must operate freely and return fully to the normal position when released slowly from the rotated and depressed positions.

A side pressure against the flat end of the plunger, in either the normal or operated condition of the turn key, must not cause any open contacts to close or any closed contacts to open.

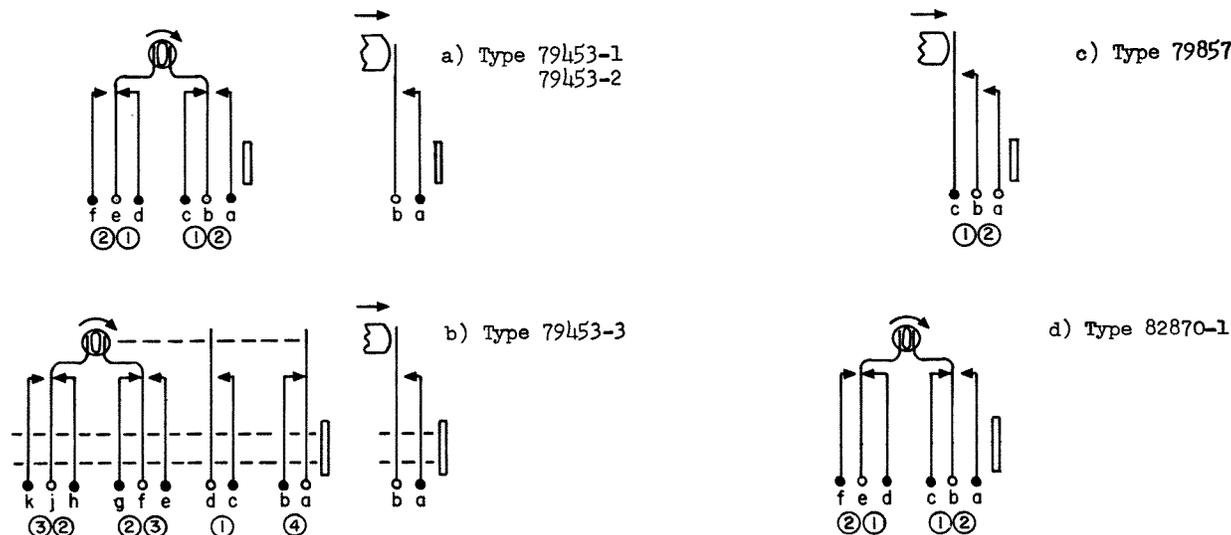


Fig. 3-1 CONTACT ARRANGEMENTS

4 REPLACEABLE PARTS

4.1 The component parts of the various turn and push key assemblies are listed in Table 4-1. The position numbers (noted in brackets) show the order of assembly, starting with the clamp washer, of the parts of the spring nest for each type of turn and push key.

Table 4-1 REPLACEABLE PARTS

Item	Description	Number	Quantity per Assembly				
			79453-1	79453-2	79453-3	79857	82870-1
1	Bracket	79446	1	1	1	1	1
2	Plunger	79449	1	1	1	1	1
3	Knob	79452	1	1	1	1	1
4	Flat Fil. Hd. Mach. Screw	79451	1	1	1	1	1
5	Bind. Hd. Mach. Screw	190332-2	2	2			2
6	Rd. Hd. Mach. Screw	82580			2		
7	Clamping Washer	79426	2(1,19)	2(1,19)	2(1,29)		2(1,19)
8	Bushing	29219	2	2			2
9	Bushing	47008			2		
10	Insulator	79422	7(2,5,7,10,13,15,18)	7(2,5,7,10,13,15,18)	11(2,4,7,10,12,15,17,20,23,25,28)		7(2,5,7,10,13,15,18)
11	Contact Spring Assy.	79425-1	1(6)	1(6)			1(6)
12	Contact Spring Assy.	79425-2	1(14)	1(14)	1(24)		1(14)
13	Contact Spring Assy.	79425-3			1(16)		
14	Contact Spring Assy.	79428	2(9,17)	2(9,17)	3(6,19,27)		2(9,17)
15	Contact Spring Assy.	79430	2(3,11)	2(3,11)	3(8,13,21)		2(3,11)
16	Contact Spring Assy.	83211-1			1(3)		
17	Contact Spring Assy.	83211-2			1(11)		
18	Buffer Spring	79423	4(4,8,12,16)	4(4,8,12,16)	6(5,9,14,18,22,26)		4(4,8,12,16)
19	Bind. Hd. Mach. Screw	79437-2	2	2			
20	Bind. Hd. Mach. Screw	79868-2				2	
21	Clamping Washer	79426	1(1)	1(1)		1(1)	
22	Bushing	47004-3	2	2			
23	Bushing	47004-4				2	
24	Insulator	79431	2(2,4)	2(2,4)		2(2,4)	
25	Insulator	79431-2				1(6)	
26	Insulator	79454	1(6)	1(6)		1(8)	
27	Contact Spring Assy.	79433	1(5)	1(5)			
28	Contact Spring Assy.	79435	1(3)	1(3)			
29	Contact Spring Assy.	79435-2				1(3)	
30	Contact Spring Assy.	79435-3				1(7)	
31	Contact Spring Assy.	79859				1(5)	

NOTE: Items 5 thru 18 are turn key spring nest parts and items 19 thru 31 are push key spring nest parts.

REGULAR TELEPHONES	A
PAYSTATION TELEPHONES	B
KEY TELEPHONES	C
<b>SELECT-O-PHONE TELEPHONES</b>	<b>D</b>
<b>SPECIAL TELEPHONES</b>	<b>E</b>

SECTION 3

**INSTRUMENTS**

INDEX

## K-500 SERIES DESK TYPE TELEPHONES

### CONTENTS

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2	ASSOCIATED PUBLICATIONS	1	3-1	COMPONENT PARTS - EXPLODED VIEW	2
3	DISASSEMBLY AND ASSEMBLY	1			
4	TEST AND ADJUSTMENT	2			

### 1 GENERAL DESCRIPTION

1.1 The K-500 series provides a full range of compact, anti-sidetone type desk telephones which operate efficiently over a wide range of loop resistance and line impedance. Each instrument consists of a pressed steel baseplate, with four protective rubber feet, on which all internal parts are mounted. A molded plastic housing covers the assembly and provides a cradle for the handset, which is connected to the internal components by a flexible plastic covered cord. A second plastic covered cord connects the instrument to a molded terminal block.

1.2 The K-500 telephone instrument is available with its internal components and circuit arranged for any class of service on any type of automatic or manual telephone system. It can be supplied in a number of different versions with various special features, as required. Specific details for each combination are given in individual sub-sections, each indexed by the instrument/special feature code (ie 500/33). A list of all the special features available is given in sub-section M1A-NUM.

1.3 All instruments in the series can be supplied in any of the colors listed in sub-section M1A-COL.



Fig. 1-1 K-500 SERIES TELEPHONE

### 2 ASSOCIATED PUBLICATIONS

2.1 General information on ordering, installation and maintenance is given in part 1 of the manual.

2.2 The various components and sub-assemblies used in each instrument are described in part 2 of the manual.

2.3 Specific descriptions, parts lists, wiring diagrams and circuit diagrams for each of the different assemblies in the K-500 series are given in individual sub-sections in part 3 of the manual. Each sub-section is indexed by the instrument and special feature code numbers.

### 3 DISASSEMBLY AND ASSEMBLY

3.1 The exploded view of Fig. 3-1 shows all the component parts and sub-assemblies of the K-500 basic instrument. Procedures for disassembly and assembly are given below. Additional parts which

are included to provide special features should be removed and replaced in any convenient order. Note that the lamp of the dial or message waiting lights may be replaced by unscrewing the lamp cap.

### 3.2 DISASSEMBLY - BASIC INSTRUMENT

- a: Loosen the cabinet lock screws (7) and remove the housing (13).
- b: Disconnect the leads, loosen the clamping screws and lift out the dial (9a), if fitted.
- c: Disconnect the leads, remove the mounting screws then remove the ringer (8).
- d: Disconnect the leads and remove the handset and cord assembly (10).
- e: Disconnect the leads and remove the desk stand cord (11).
- f: Remove the screws, washers and nuts (4,5,6) then lift out network (2) and cradle switch (3). Unsolder leads from network, if needed.

### 3.3 ASSEMBLY - BASIC INSTRUMENT

Reassemble the instrument in the reverse order to that given for disassembly, noting the points listed below.

- a: Refer to the appropriate wiring diagram to reconnect the various leads.
- b: Run the cradle switch leads through the guide hook on the right hand side of the bracket.
- c: Place the desk stand cord under the tab in the rear right hand corner of the baseplate.
- d: Place the handset cord under the flange of the ringer frame, in front of the cradle switch and underneath the dial.
- e: Locate the ringer coil leads underneath, but not trapped by, the ringer frame.
- f: Make sure that the locating pips on the dial casting locate in the holes in the tips of the bracket and that the leads do not foul the cradle switch assembly.
- g: The housing should fit freely without binding on any part.
- h: Check the reassembled unit as detailed in Section 4.

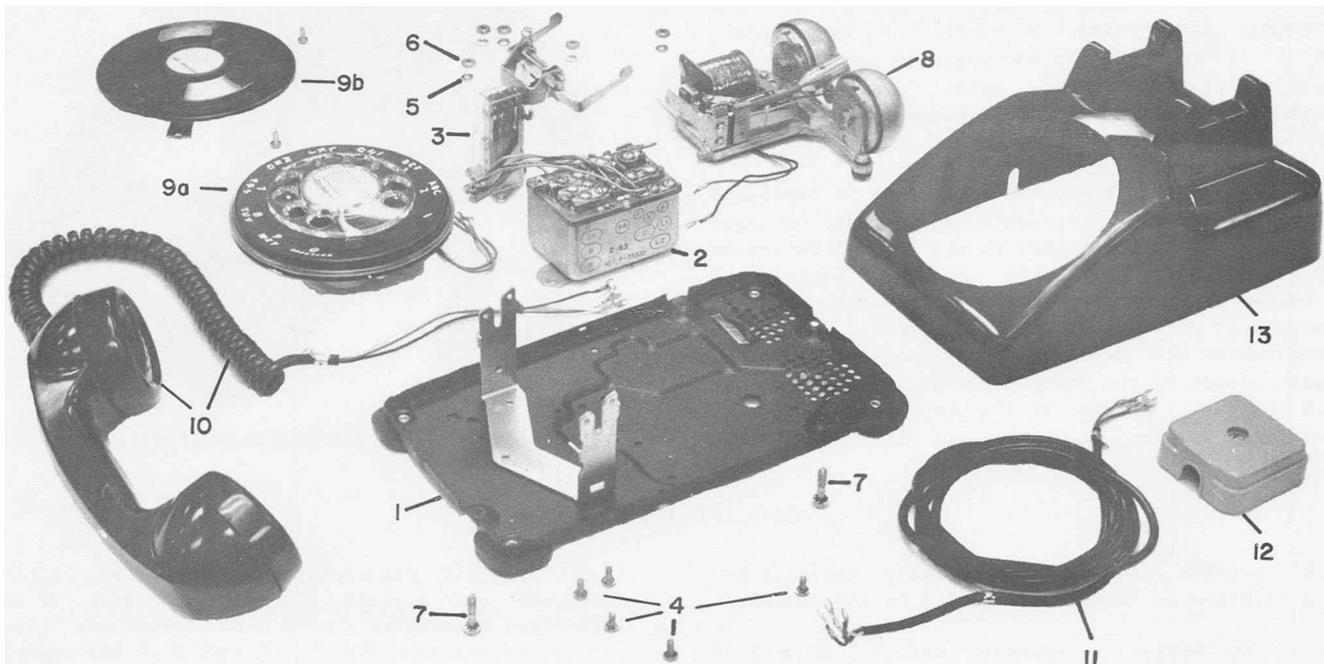


Fig. 3-1 COMPONENT PARTS - EXPLODED VIEW

## 4 TEST AND ADJUSTMENT

4.1 Tests and adjustments on the sub-assemblies are detailed in their respective sub-sections. The following checks must be made on the completely assembled instrument.

### 4.2 CRADLE SWITCH

Check that either plunger will fully operate the spring assembly before being depressed to a point 1/8" above the cradle molding and that the plungers may be lifted slightly after the handset is removed. Bend the side arms of the actuator, using two pairs of pliers, to adjust, if necessary.

### 4.3 FUNCTIONAL TESTS

Connect the telephone to a working line and check for correct operation of the following:

- a: Dial, if fitted.
- b: Transmitter and receiver.
- c: Ringer and volume control, if fitted.
- d: Cradle switch.
- e: Adequate suppression of sidetone.
- f: Correct party identification, if applicable.
- g: Absence of noise due to loose contacts when the instrument is gently bumped or shaken.
- h: Special features, if fitted.

## TYPE 500--(--)-30- DESK TELEPHONE

The 500--(--)-30- telephone is the basic type of desk instrument in the K-500 series of telephones. Options in the instrument provide for any class of service on any type of automatic or manual central office equipment. General details of the K-500 series desk instruments are given in sub-section

M3A-500/SER while specific details of each version are given in the sub-sections indexed by the type number of the instruments.

The complementary range of wall telephones is detailed in sub-sections in the 554 series.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty	Item	Description	Number	Qty
1	Base Assy. c/w items 2 thru 7	75338	1	9a	Dial Assembly	19**( $\emptyset$ )450	1
2	Network Assembly	75335	1	b	Dummy Plug Assembly	79456-*	
3	Cradle Switch Assembly	75300	1	10	Handset and Cord Assembly	65**( $\emptyset$ )410	1
4	Bind. Hd. Mach. Screw	69116-3	5	11	Desk Stand Cord (3 Cond.)	3031**(06)650	1
5	Spring Washer	54336-5	5	12	Connecting Block (4 Term.)	32( )783	1
6	Hex Nut	67093	5	13	Housing and Plunger Assembly	75401-*	1
7	Cabinet Lock Screw	75486	2	14	Gas Tube (only with TBA ringer)	75599	1
8a	Ringer Assy. Biased	130(BA)470	1				
b	Freq. Sel. with Vol. Cont.	131( $\emptyset$ )470					
c	Freq. Sel. less Vol. Cont.	133( $\emptyset$ )470					
d	Electronic	140(ER)470					

Note: Ringer, Dial and Dummy Plug Assemblies are all supplied complete with mounting screws.

Ø Replace by class code number for type required.  
\* Replace by color code suffix from series 1-16.  
\*\* Replace by color code number from series 00-16.

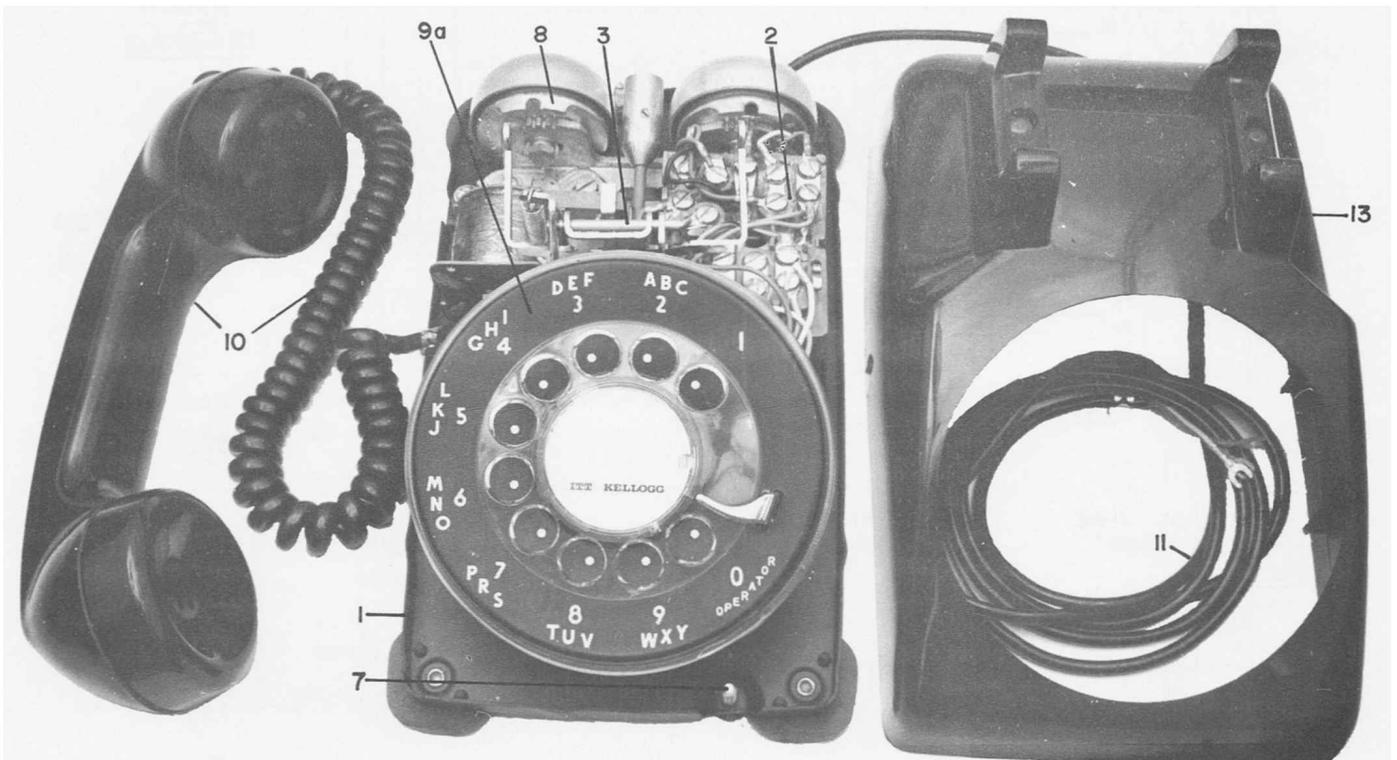
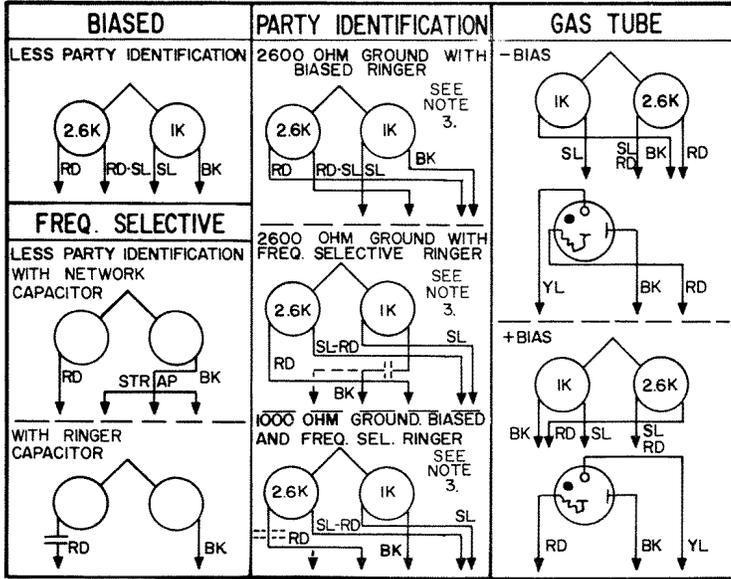


Fig. 1 TOP VIEW - HOUSING REMOVED

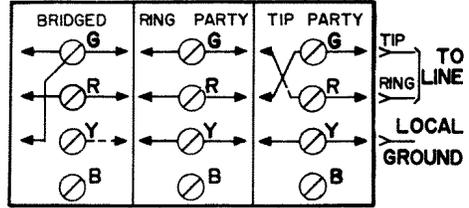
**RINGER OPTIONS**



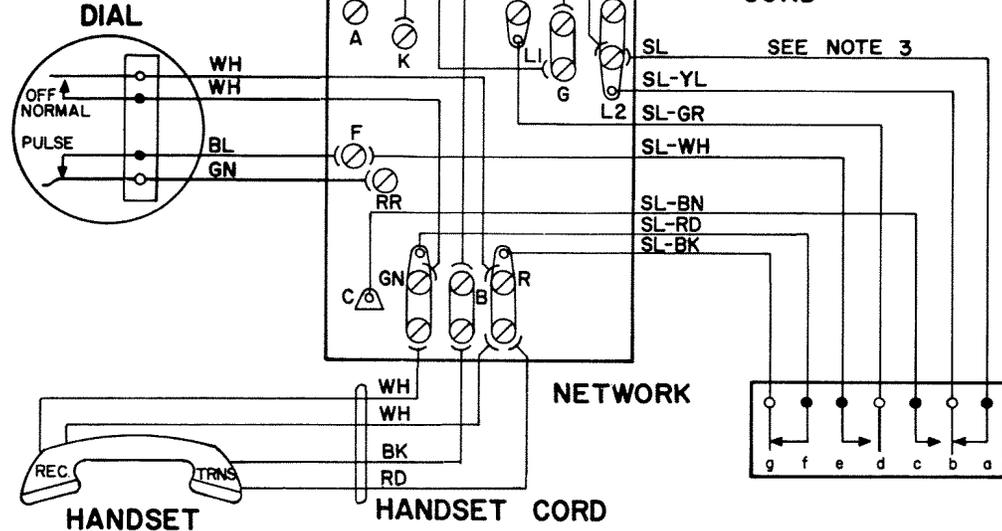
**RINGER NOTES**

- To Permanently Silence Ringer:  
Class of Ringer Transfer From To  
Biased, except 1) and 2) BK Ringer (G K  
Freq.Sel., except 1) and 3) RD Lead (L2 K  
1) 1000 Ground Ident. SL-RD on (B K  
2) 2600 Ident. Biased BK Network (B K  
3) 2600 Ident.Freq.Sel. SL
- Biased Ringer Cut-Off Control by Customer:  
Bend stop next to detent on volume control so that it clears rim of ringer frame. This provides extra control position in which ringer armature is locked.
- Party Identification:  
Transfer SL switch lead from L2 to A on network. Broken lines show connections of frequency selective ringer with coil mounted capacitor.

**CONNECTING BLOCK OPTIONS**



For Manual Service:  
Replace dial with dummy plug and transfer SL-WH cradle switch lead from F to RR on network.



**COMPOSITE WIRING DIAGRAM**

**CRADLE SWITCH**

CONTACT fg OPERATES LAST WHEN HANDSET IS LIFTED.

**TYPICAL CIRCUIT DIAGRAMS**

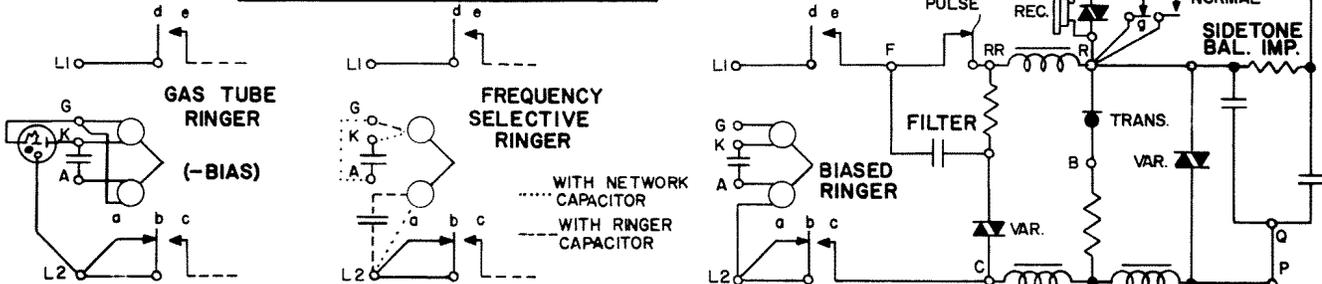


Fig. 2 DIAGRAMS 500--(--)-30- TELEPHONE

## TYPE 500--(--)-31- DESK TELEPHONE

The 500--(--)-31- telephone is a standard desk type of instrument with the addition of a dial light. It is suitable for use in dimly lighted areas where there is not sufficient light to see the characters on the dial or as a bedroom telephone. The dial light glows brightly to illuminate the dial numeral

ring whenever the handset is lifted from its cradle.

A power source of 6-8 volts AC or DC at a current of about 1/4 amps. is required to supply the lamp. A specially designed transformer, type 31( )690, is available for use on 110V AC power circuits.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty	Item	Description	Number	Qty
1	Base Assy. c/w items 2 thru 7	75338-7	1	12	Connecting Block (4 Term.)	32( )783	1
2	Network Assembly	75335	1	13	Housing and Plunger Assembly	79799-*	1
3	Cradle Switch Assembly	75300-3	1	14	Terminal Board Assembly	79467	1
4	Bind. Hd. Mach. Screw	69116-3	5	15	Mounting Plate	79468	1
5	Spring Washer	54336-5	5	16	Bind. Hd. Mach. Screw	75392-2	1
6	Hex. Nut	67093	5	17	Lamp Socket	79800	1
7	Cabinet Lock Screw	75486	2	18	Lamp Shade	79806-*	1
8a	Ringer Assy. Biased	130(BA)470	1	19	Lamp	79802	1
b	Freq. Sel. with Vol. Cont.	131(Ø)470		20	Bracket	79801	1
c	Freq. Sel. less Vol. Cont.	133(Ø)470		21	Rd. Hd. Mach. Screw	63590	2
9a	Dial Assembly	19**(Ø)450	1	22	Lockwasher	63598	2
b	Dummy Plug Assembly	79456-*		23	Wire Assembly	75326-10	2
10	Handset and Cord Assembly	65**(Ø)410	1	24	Wire Assembly	75326-95	1
11	Desk Stand Cord (4 Cond.)	3038**(13)650	1				

Note: Ringer, Dial and Dummy Plug Assemblies are all supplied complete with mounting screws.

Ø Replace by class code number for type required.  
\* Replace by color code suffix from series 1-16.  
\*\* Replace by color code number from series 00-16.

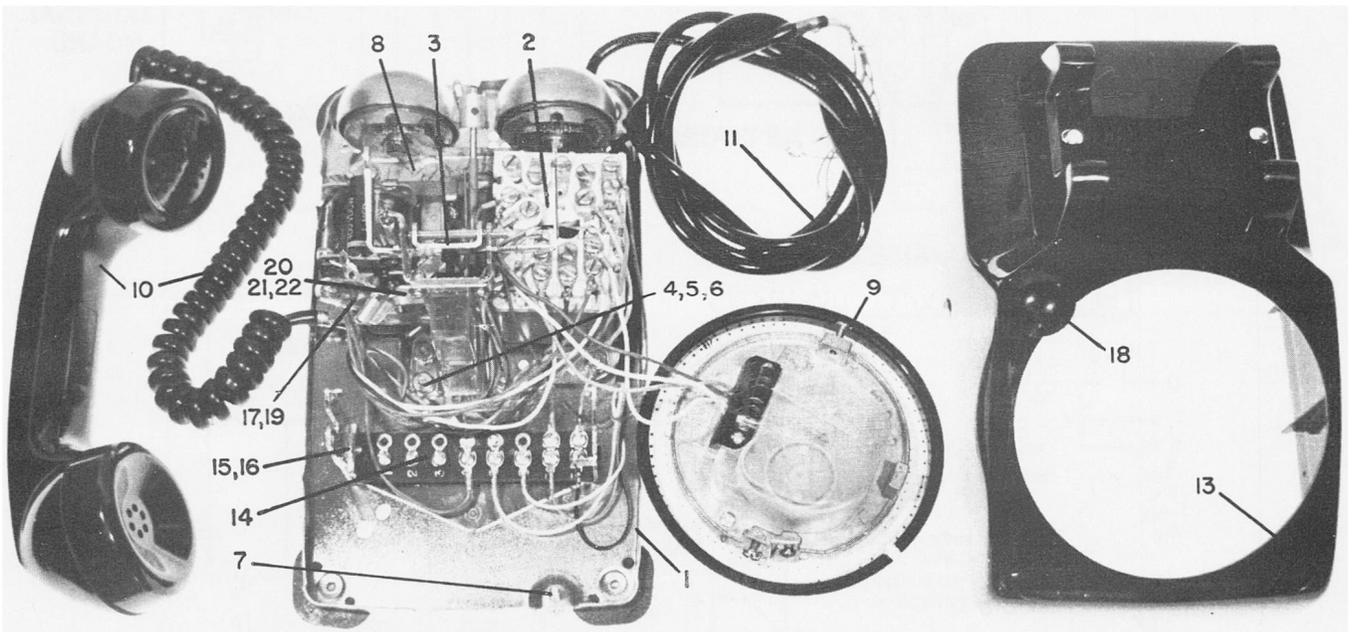
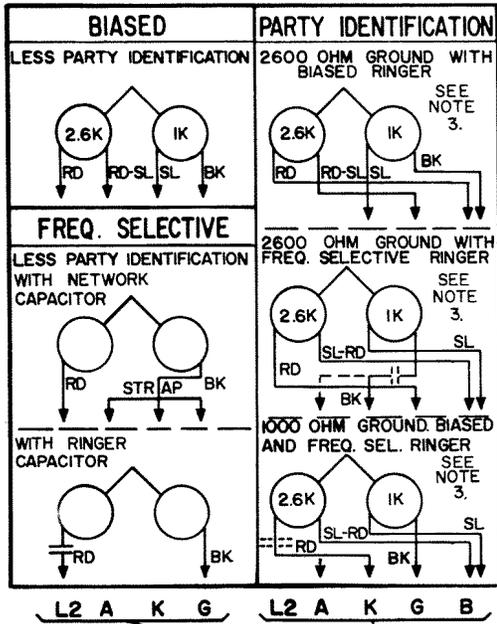
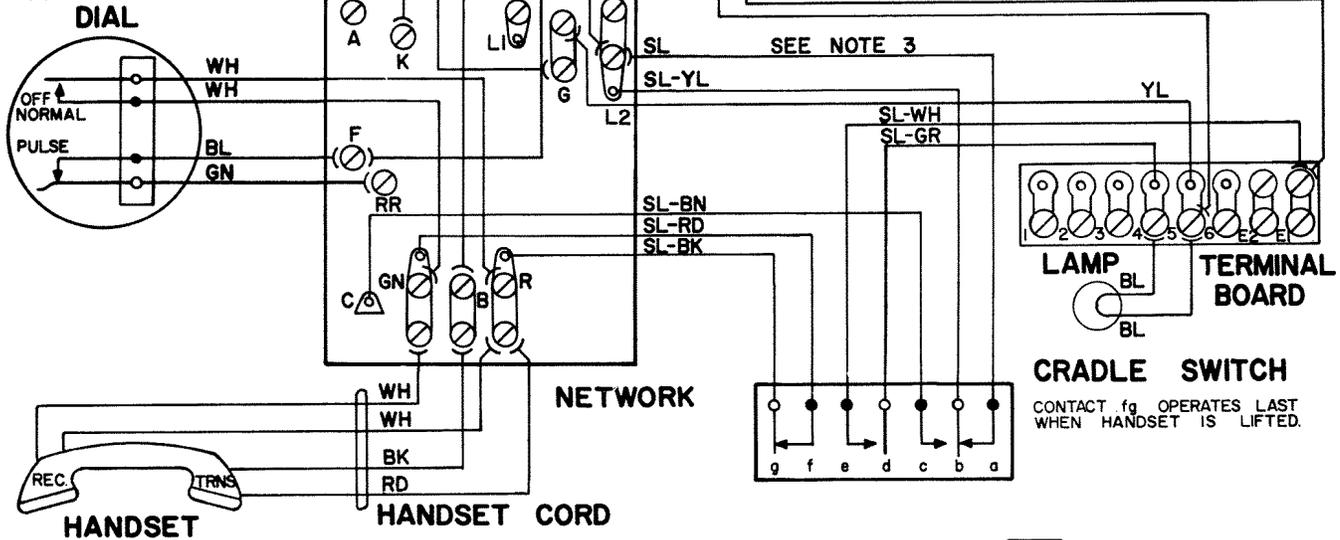


Fig. 1 TOP VIEW - HOUSING REMOVED

**RINGER OPTIONS**



For Manual Service:  
Replace dial with dummy plug and transfer Green lead from F to RR on network.

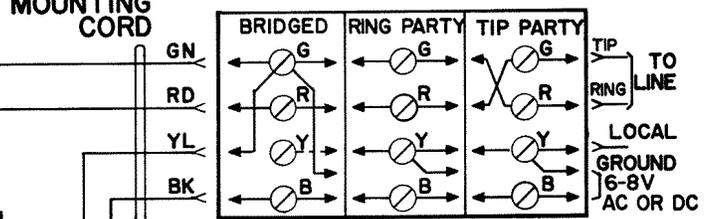


**RINGER NOTES**

- To Permanently Silence Ringer:  
Class of Ringer Transfer From To  
Biased, except 1) and 2) BK Ringer L2 K  
Freq.Sel., except 1) and 3) RD Lead L2 K  
1) 1000Ω Ground Ident. SL-RD on B K  
2) 2600Ω Ident. Biased BK on B K  
3) 2600Ω Ident.Freq.Sel. SL Network B K
- Biased Ringer Cut-Off Control by Customer:  
Bend stop next to detent on volume control so that it clears rim of ringer frame. This provides extra control position in which ringer armature is locked.
- Party Identification:  
Transfer SL switch lead from L2 to A on network. Broken lines show connections of frequency selective ringer with coil mounted capacitor.

**COMPOSITE WIRING DIAGRAM**

**CONNECTING BLOCK OPTIONS**



**TYPICAL CIRCUIT DIAGRAMS**

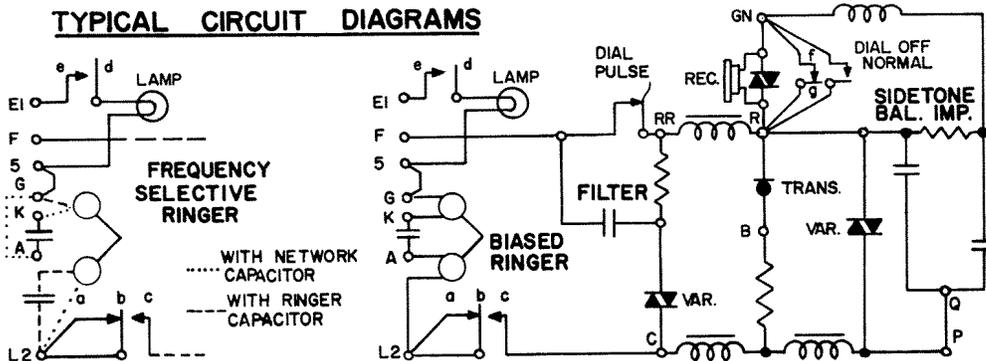


Fig. 2 DIAGRAMS 500--(--)-31- TELEPHONE

## TYPE 500--(--)-32- DESK TELEPHONE

The 500--(--)-32- telephone is a standard desk type of instrument with the addition of a combination dial and night light. A small, shrouded lamp is located to the upper left of the dial and may be switched on dimly or off by a turn-switch located to the lower left of the dial. With the switch in either of its two positions and the handset lifted,

the light glows brightly and illuminates the dial numeral ring.

A power source of 6-8 volts AC or DC at a current of about 1/4 amps. is required to supply the lamp. A specially designed transformer, type 31( )690, is available for use on 110V AC power circuits.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty	Item	Description	Number	Qty
1	Base Assy. c/w items 2 thru 7	75338-7	1	14	Terminal Board Assembly	79467	1
2	Network Assembly	75335	1	15	Mounting Plate	79468	1
3	Cradle Switch Assembly	75300-3	1	16	Bind. Hd. Mach. Screw	75392-2	1
4	Bind. Hd. Mach. Screw	69116-3	5	17	Lamp Socket	79800	1
5	Spring Washer	54336-5	5	18	Lamp Shade	79806-*	1
6	Hex. Nut	67093	5	19	Lamp	79802	1
7	Cabinet Lock Screw	75486	2	20	Bracket	79801	1
8a	Ringer Assy. Biased	130(BA)470	1	21	Rd. Hd. Mach. Screw	63590	2
b	Freq. Sel. with Vol. Cont.	131(∅)470		22	Lockwasher	63598	2
c	Freq. Sel. less Vol. Cont.	133(∅)470		23	Turn Key	82870-1	1
9a	Dial Assembly	19**(∅)450	1	24	Special Screw	79474	2
b	Dummy Plug Assembly	79456-*		25	Resistor	64342-27	1
10	Handset and Cord Assembly	65**(∅)410	1	26	Wire Assembly	75326-10	2
11	Desk Stand Cord (4 Cond.)	3038**(13)650	1	27	Wire Assembly	75326-47	1
12	Connecting Block (4 Term.)	32( )783	1	28	Wire Assembly	75326-95	1
13	Housing and Plunger Assembly	82869-*	1	29	Wire Assembly	75326-110	1

Note: Ringer, Dial and Dummy Plug Assemblies are all supplied complete with mounting screws.

∅ Replace by class code number for type required.  
\* Replace by color code suffix from series 1-16.  
\*\* Replace by color code number from series 00-16.

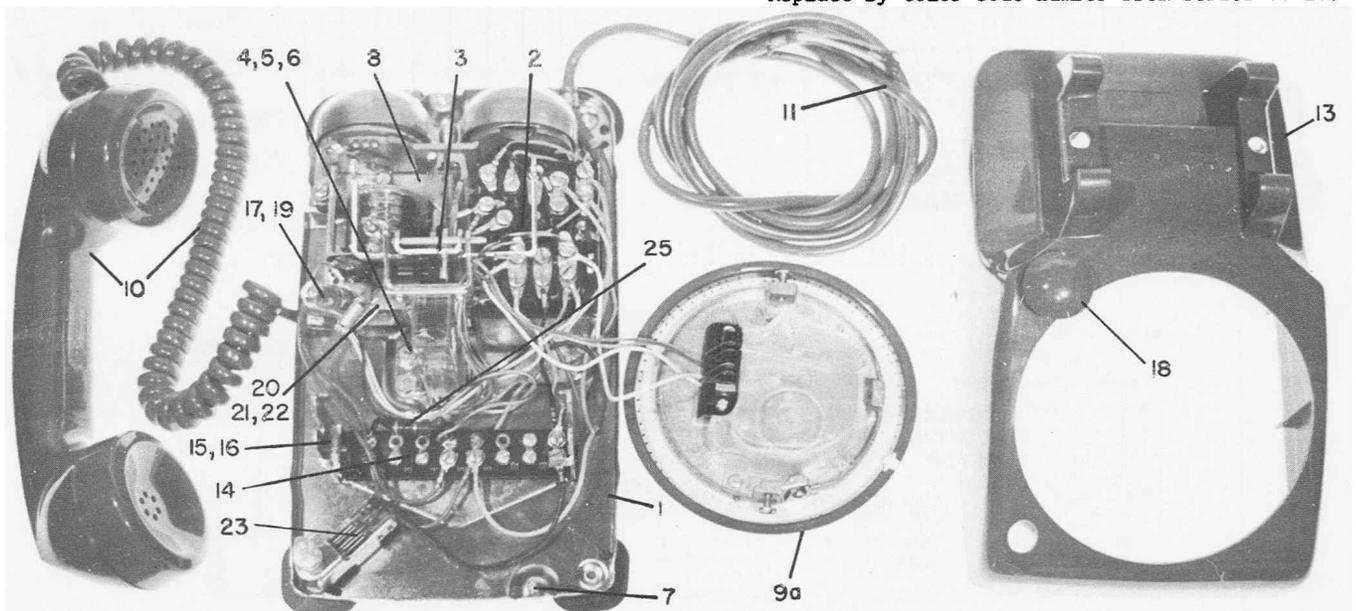
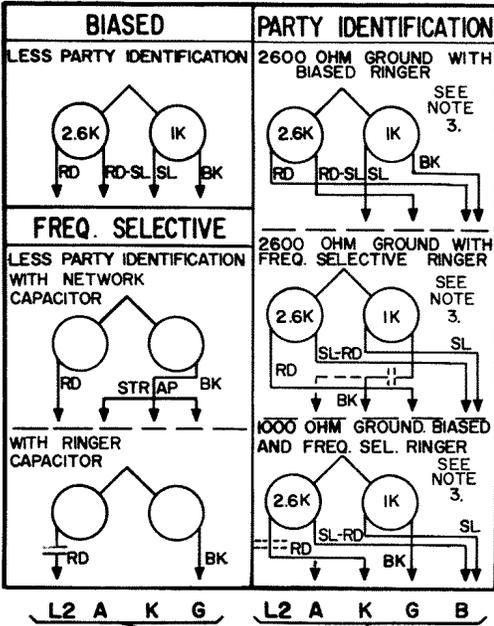


Fig. 1 TOP VIEW - HOUSING REMOVED

**RINGER OPTIONS**

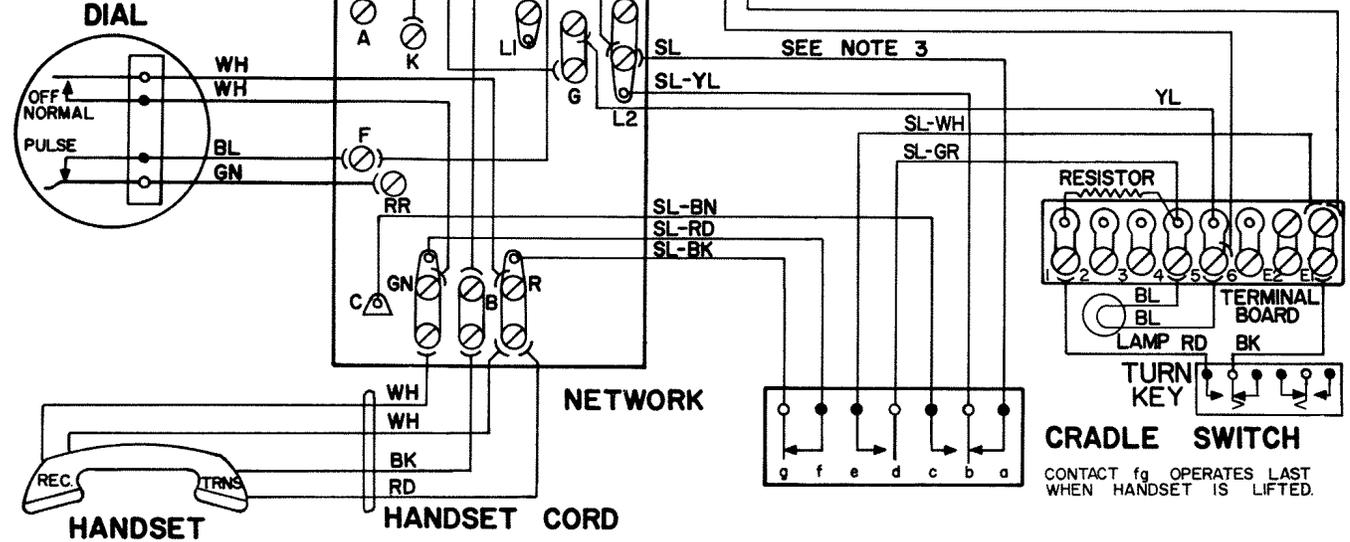


**COMPOSITE WIRING DIAGRAM**

**RINGER NOTES**

- To Permanently Silence Ringer:  
Class of Ringer Transfer From To  
Biased, except 1) and 2) BK Ringer G K  
Freq.Sel., except 1) and 3) RD Lead L2 K  
1) 1000-Ω Ground Ident. SL-RD on B K  
2) 2600-Ω Ident. Biased BK Network B K  
3) 2600-Ω Ident.Freq.Sel. SL
- Biased Ringer Cut-Off Control by Customer:  
Bend stop next to detent on volume control so that it clears rim of ringer frame. This provides extra control position in which ringer armature is locked.
- Party Identification:  
Transfer SL switch lead from L2 to A on network. Broken lines show connections of frequency selective ringer with coil mounted capacitor.

For Manual Service:  
Replace dial with dummy plug and transfer green desk stand cord lead from F to RR on network.



**TYPICAL CIRCUIT DIAGRAMS**

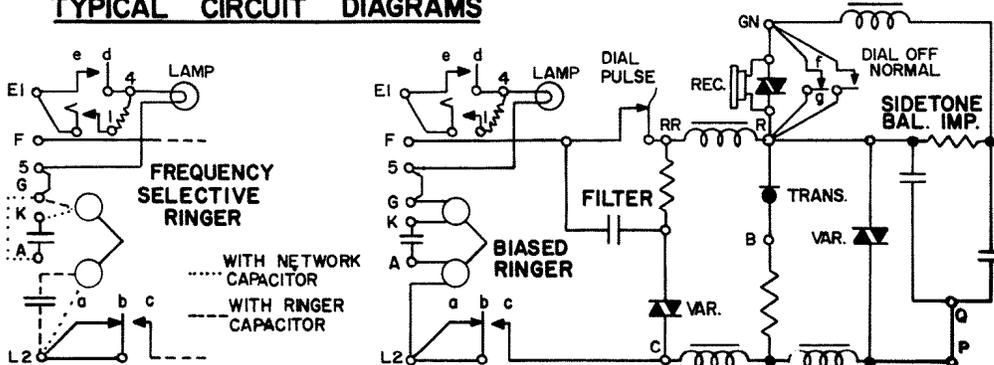


Fig. 2 DIAGRAMS 500--(--)-32- TELEPHONE

## TYPE 500--(--)-33- DESK TELEPHONE

The 500--(--)-33- telephone is a standard desk type of instrument with the addition of a switch which is actuated by raising the left hand plunger in the handset cradle. When the handset is lifted from the cradle, the network filter capacitor in series with the line prevents talking and dialing but does not affect reception. A party line subscriber can thus check if the line is in use without causing

noise to disturb any call in progress. If the line is clear, raising the special left hand plunger in the cradle switch causes a set of contacts to close to permit dialing and talking.

When the handset is replaced in the cradle at the end of the call, the left hand plunger is reset automatically.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty	Item	Description	Number	Qty
1	Base Assy. c/w items 2 thru 7	75338-5	1	9a	Dial Assembly	19**(Ø)450	] 1
2	Network Assembly	75335	1	b	Dummy Plug Assembly	79456-*	
3	Cradle Switch Assembly	75300-2	1	10	Handset and Cord Assembly	65**(Ø)410	1
4	Bind. Hd. Mach. Screw	69116-3	5	11	Desk Stand Cord (3 Cond.)	3031**(06)650	1
5	Spring Washer	54336-5	5	12	Connecting Block (4 Term.)	32( )783	1
6	Hex. Nut	67093	5	13	Housing and Plunger Assembly	79607-#	1
7	Cabinet Lock Screw	75486	2	14	Plunger Switch Assembly	79613-2	1
8a	Ringer Assy. Biased	130(BA)470	] 1	15	Wire Assembly (With 9b only)	75326-63	1
b	Freq. Sel. with Vol. Cont.	131(Ø)470		16	Gas Tube (Only with TBA ringer)	75599	1
c	Freq. Sel. less Vol. Cont.	133(Ø)470					

Note: Ringer, Dial and Dummy Plug Assemblies are all supplied complete with mounting screws.

Ø Replace by class code number for type required.  
\* Replace by color code suffix from series 1-16.  
# Replace by color code suffix from series 21-36.  
\*\* Replace by color code number from series 00-16.

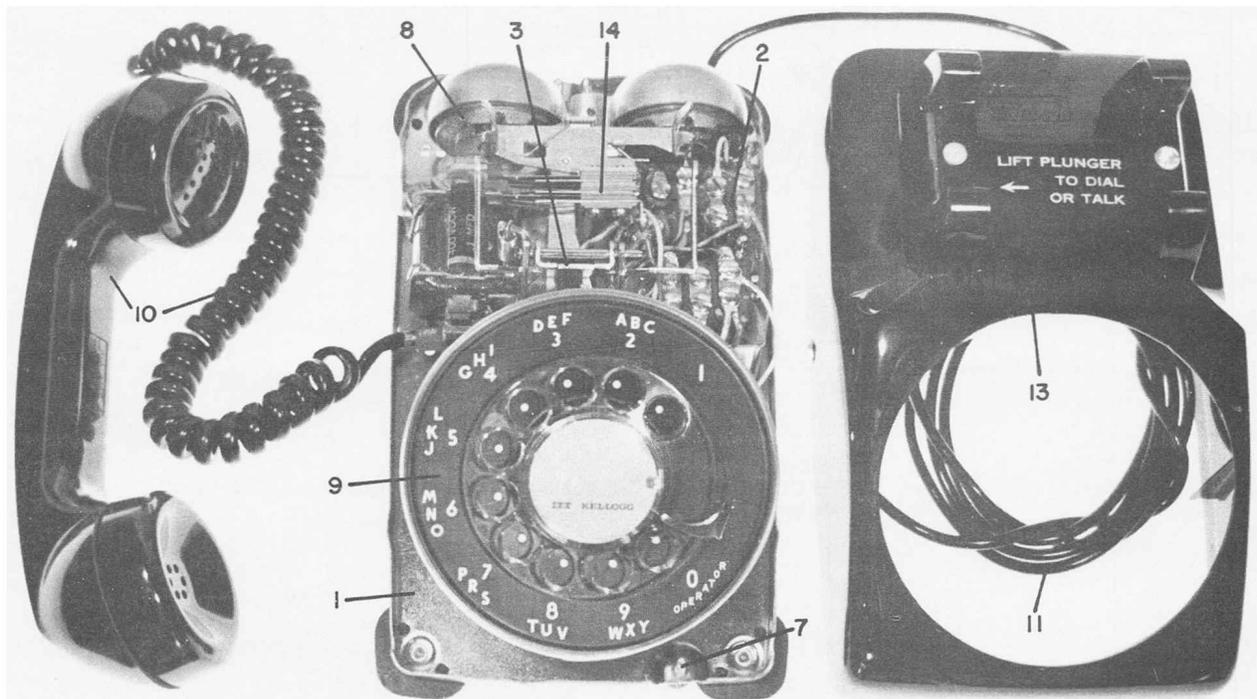
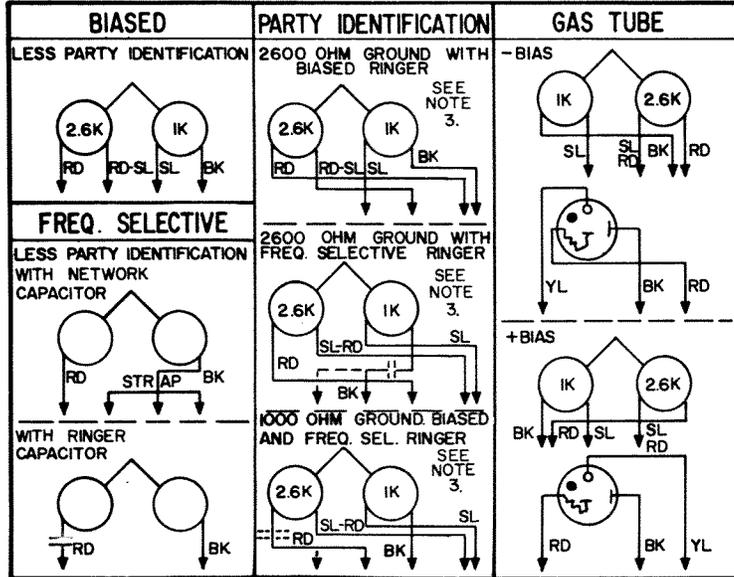


Fig. 1 TOP VIEW - HOUSING REMOVED

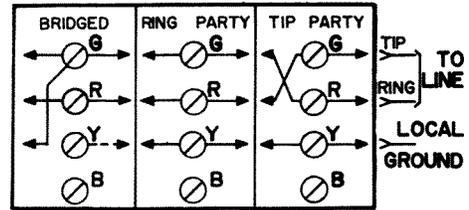
**RINGER OPTIONS**



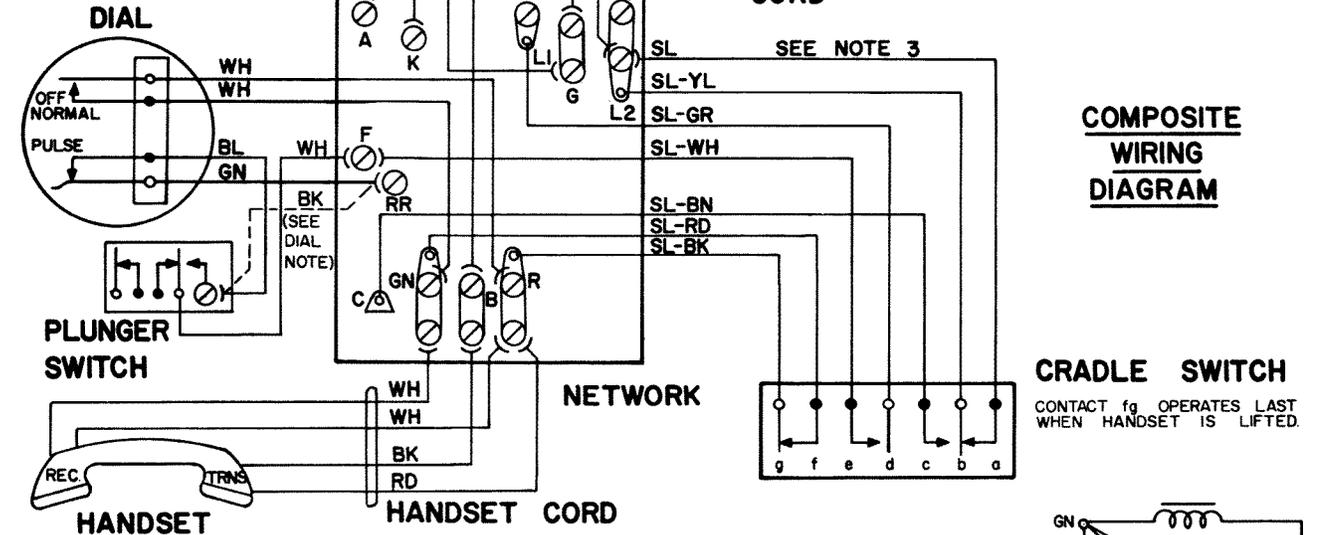
**RINGER NOTES**

- To Permanently Silence Ringer:  
Class of Ringer: Transfer From To  
Biased, except 1) and 2) BK } Ringer (G K  
Freq.Sel., except 1) and 3) RD } L2 K  
1) 1000 $\Omega$  Ground Ident. SL-RD } Lead B K  
2) 2600 $\Omega$  Ident. Biased BK } on B K  
3) 2600 $\Omega$  Ident. Freq.Sel. SL } Network B K  
Gas Tube - Tip Party YL Mtg. Cord on Y G  
Ring Party YL Conn. Block Y R
- Biased Ringer Cut-Off Control by Customer:  
Bend stop next to detent on volume control so that it clears rim of ringer frame. This provides extra control position in which ringer armature is locked.
- Party Identification:  
Transfer SL switch lead from L2 to A on network. Broken lines show connections of frequency selective ringer with coil mounted capacitor.

**CONNECTING BLOCK OPTIONS**



For manual service:  
Replace dial with dummy plug and connect black strap lead from plunger switch to RR on network.



**TYPICAL CIRCUIT DIAGRAMS**

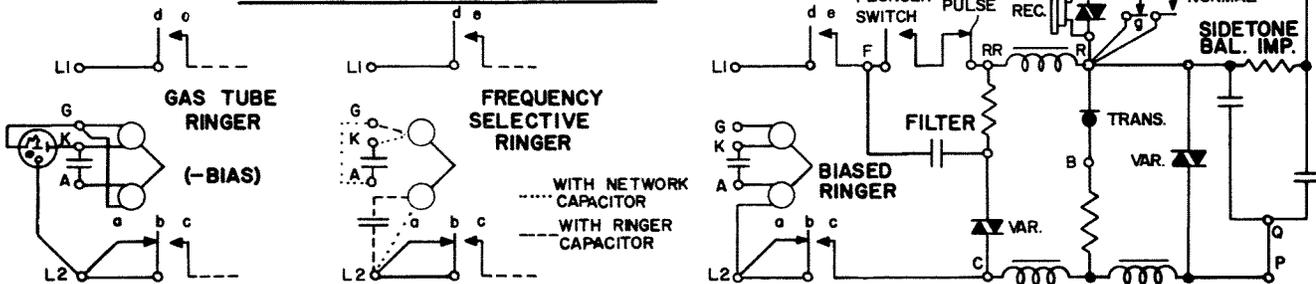


Fig. 2 DIAGRAMS 500--(--)-33- TELEPHONE

## TYPE 500--(--)-34- DESK TELEPHONE

The 500--(--)-34- telephone is a standard desk type of instrument with the addition of a push button. The push button is wired so that it will, when

depressed, connect one side of the line to a local ground at the telephone. This feature is required with certain types of PABX equipment.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty	Item	Description	Number	Qty
1	Base Assy. c/w items 2 thru 7	75338	1	9a	Dial Assembly	19**( $\emptyset$ )450	1
2	Network Assembly	75335	1	b	Dummy Plug Assembly	79456-*	
3	Cradle Switch Assembly	75300	1	10	Handset and Cord Assembly	65**( $\emptyset$ )410	1
4	Bind. Hd. Mach. Screw	69116-3	5	11	Desk Stand Cord (3 Cond.)	3031**( $\emptyset$ )650	1
5	Spring Washer	54336-5	5	12	Connecting Block (4 Term.)	32( )783	1
6	Hex. Nut	67093	5	13	Housing and Plunger Assembly	79094-*	1
7	Cabinet Lock Screw	75486	2	14	Push Button	79095	1
8	Ringer Assy. Biased	130(BA)470	1	15	Cord Assembly	79096	1

Note: Ringer, Dial and Dummy Plug Assemblies are all supplied complete with mounting screws.

$\emptyset$  Replace by class code number for type required.  
\* Replace by color code suffix from series 1-16.  
\*\* Replace by color code number from series 00-16.

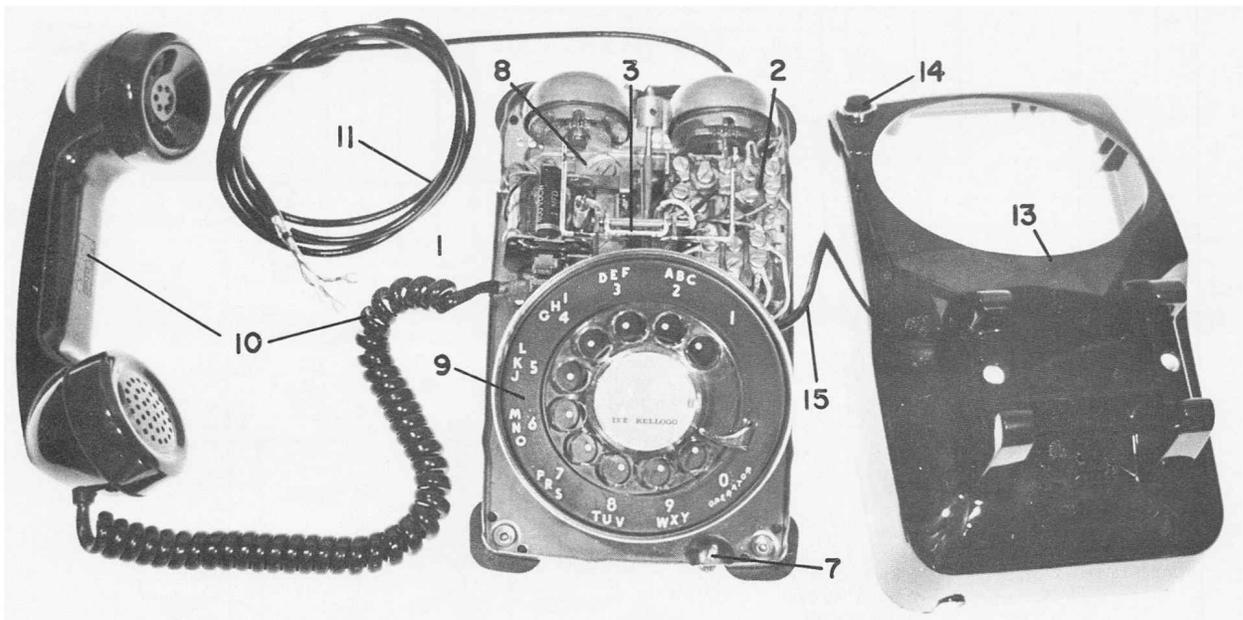
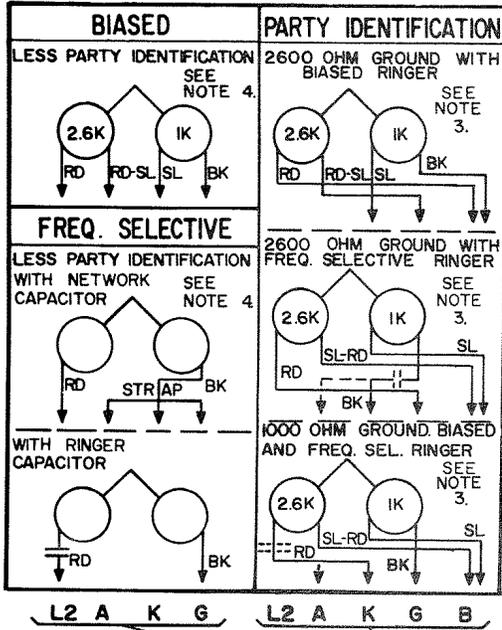


Fig. 1 TOP VIEW - HOUSING REMOVED

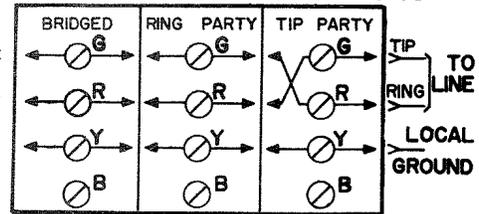
**RINGER OPTIONS**



**RINGER NOTES**

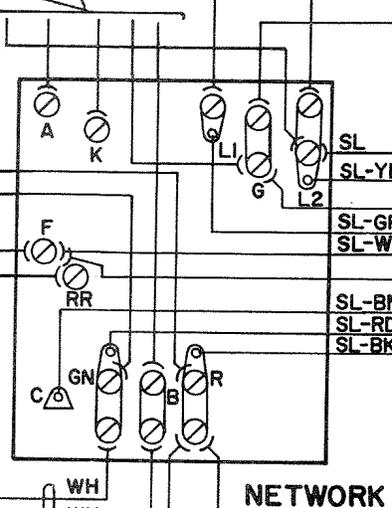
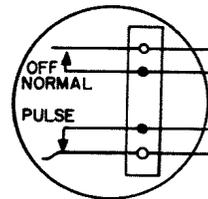
- To Permanently Silence Ringer:  
Class of Ringer Transfer From To  
Biased, except 1) and 2) BK Ringer G K  
Freq.Sel., except 1) and 3) RD Ringer L2 K  
1) 1000-Ω Ground Ident. SL-RD Lead B K  
2) 2600-Ω Ident. Biased BK on B K  
3) 2600-Ω Ident.Freq.Sel. SL Network B K
- Biased Ringer Cut-Off Control by Customer:  
Bend stop next to detent on volume control so that it clears rim of ringer frame. This provides extra control position in which ringer armature is locked.
- Party Identification:  
Transfer SL switch lead from L2 to A on network. Broken lines show connections of frequency selective ringer with coil mounted capacitor.
- Bridged Ringing:  
Transfer ringer lead from G to L1 on network.

**CONNECTING BLOCK OPTIONS**



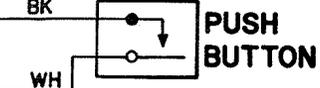
For Manual Service:  
Replace dial with dummy plug and transfer SL-WH cradle switch lead from F to RR on network.

**DIAL**



**MOUNTING CORD**

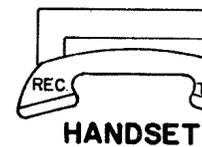
SEE NOTE 3



**COMPOSITE WIRING DIAGRAM**

**CRADLE SWITCH**

CONTACT OPERATES LAST WHEN HANDSET IS LIFTED.



**TYPICAL CIRCUIT DIAGRAMS**

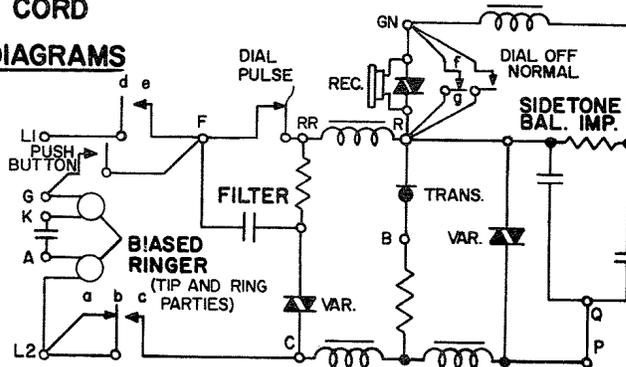
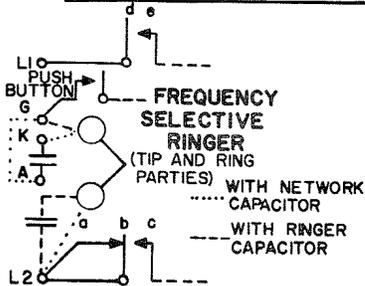


Fig. 2 DIAGRAMS 500--(--)-34- TELEPHONE

## TYPE 500--(--)-35- DESK TELEPHONE

The 500--(--)-35- telephone is a standard desk type of instrument arranged so that ringing and talking are carried out over separate two wire circuits. A biased, 20 cps, ringer is normally fitted but this

can be omitted and a buzzer kit, number 202( )904, installed in the instrument if direct current is to be used for signaling. A four conductor desk stand cord is provided.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty	Item	Description	Number	Qty
1	Base Assy. c/w items 2 thru 7	75338	1	9a	Dial Assembly	19**(Ø)450	] 1
2	Network Assembly	75335	1	b	Dummy Plug Assembly	79456-*	
3	Cradle Switch Assembly	75300	1	10	Handset and Cord Assembly	65**(Ø)410	1
4	Bind. Hd. Mach. Screw	69116-3	5	11	Desk Stand Cord (4 Cond.)	3038**(13)650	1
5	Spring Washer	54336-5	5	12	Connecting Block (4 Term.)	32( )783	1
6	Hex. Nut	67093	5	13	Housing and Plunger Assembly	75401-*	1
7	Cabinet Lock Screw	75486	2	14	Terminal Board Assembly	79467	1
8a	Ringer Assy. Biased	130(BA)470	] 1	15	Mounting Plate	79468	1
b	Buzzer Kit (Ordered separately)	202( )904		16	Bind. Hd. Mach. Screw	75392-2	1

Note: Ringer, Dial and Dummy Plug Assemblies are all supplied complete with mounting screws.

Ø Replace by class code number for type required.  
\* Replace by color code suffix from series 1-16.  
\*\* Replace by color code number from series 00-16.

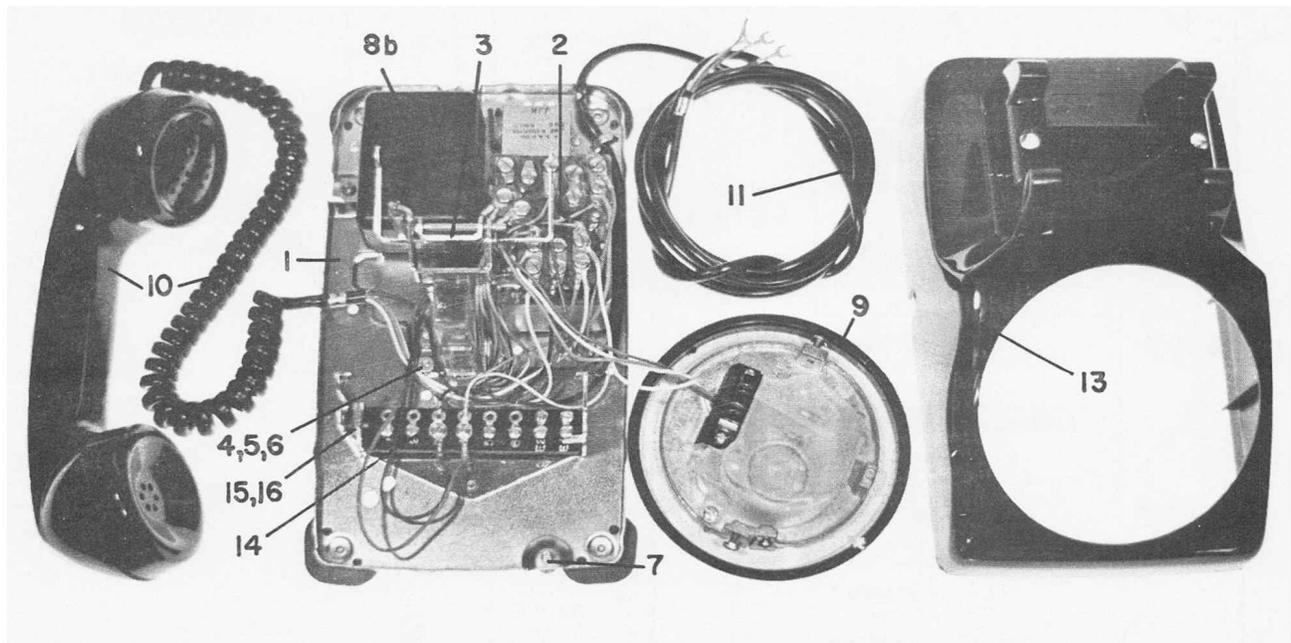


Fig. 1 TOP VIEW - HOUSING REMOVED

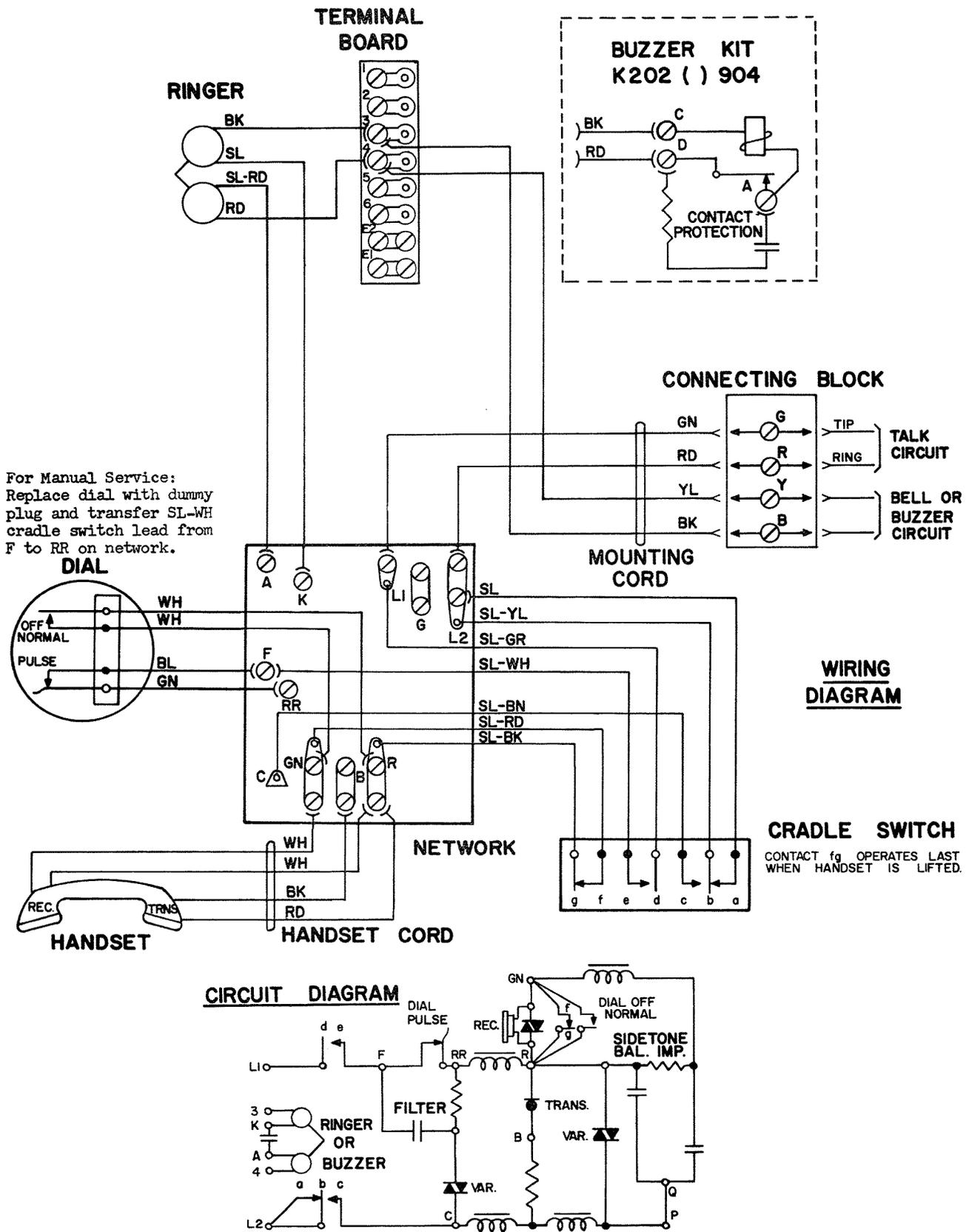


Fig. 2 DIAGRAMS 500--(--)-35- TELEPHONE

## TYPE 500--(--)-37- AND TYPE 500--(--)-38- DESK TELEPHONES

The 500--(--)-37- and 500--(--)-38- telephones are standard desk type instruments with the addition of an indicator lamp. A small neon lamp, located to the upper left of the dial, may be caused to glow by applying a DC potential of 90 volts across the line conductors at a remote point. The instruments are intended for use on PBX installations where the glowing lamp is used to indicate that a message has

been left at the switchboard in the absence of the called party.

The 500--(--)-37- instrument is only available with a low power NE51 indicator and a biased ringer. The 500--(--)-38- instrument has a higher power NE51H indicator and may be supplied with either a biased or frequency selective ringer.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty	Item	Description	Number	Qty
1	Base Assy. c/w items 2 thru 7	75338-7	1	12	Connecting Block (4 Term.)	32( )783	1
2	Network Assembly	75335	1	13	Housing and Plunger Assembly	79799-#	1
3	Cradle Switch Assembly	75300-3	1	14	Lamp Socket	95130-1	1
4	Bind. Hd. Mach. Screw	69116-3	5	15	Lamp Cap	77734	1
5	Spring Washer	54336-5	5	16a	Lamp - Code 37 instruments	79367	] 1
6	Hex. Nut	67093	5	b	Lamp - Code 38 instruments	79367-2	
7	Cabinet Lock Screw	75486	2	17	Bracket	79801	1
8a	Ringer Assy. Biased	130(BA)470	] 1	18	Rd. Hd. Mach. Screw	63590	2
b	Freq. Sel. with Vol. Cont.	131(Ø)470		19	Lockwasher	46936	2
c	Freq. Sel. less Vol. Cont.	133(Ø)470		20a	Resistor - Code 37 instruments	62948-8	] 1
9a	Dial Assembly	19**(Ø)450	b	Resistor - Code 38 instruments	62948-91		
b	Dummy Plug Assembly	79456-*	1	21	Wire Assembly	75326-88	1
10	Handset and Cord Assembly	65**(Ø)410	1				
11	Desk Stand Cord (3 Cond.)	3031**(06)650	1				

Note: Ringer, Dial and Dummy Plug Assemblies are all supplied complete with mounting screws.

Ø Replace by class code number for type required.  
\* Replace by color code suffix from series 1-16.  
# Replace by color code suffix from series 21-36.  
\*\* Replace by color code number from series 00-16.

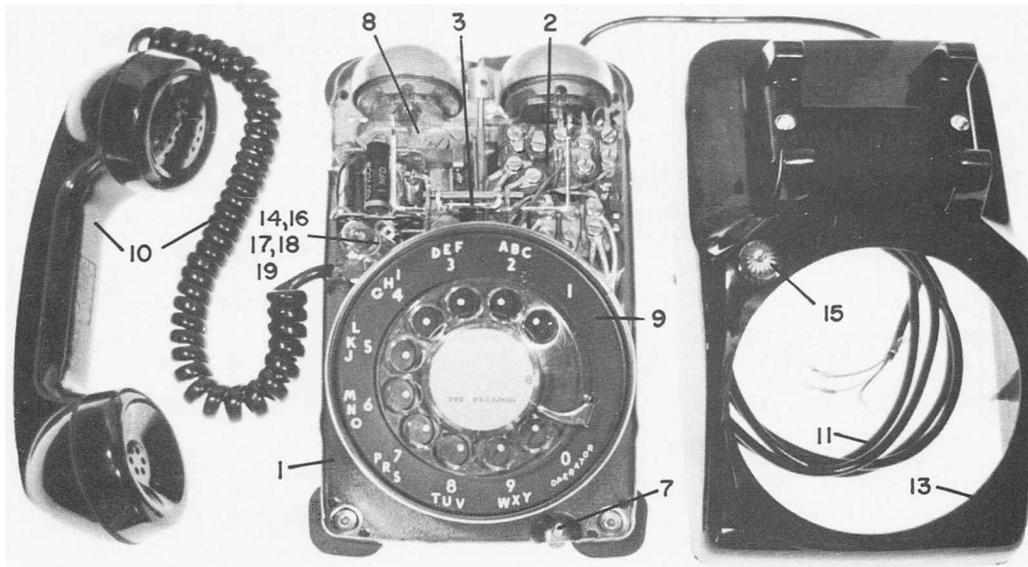
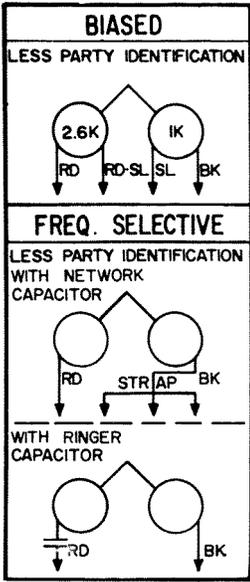


Fig. 1 TOP VIEW - HOUSING REMOVED

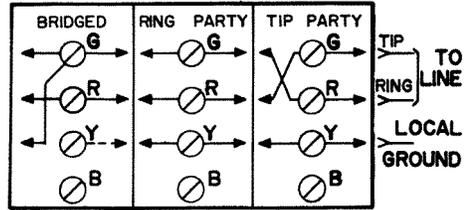
**RINGER OPTIONS**



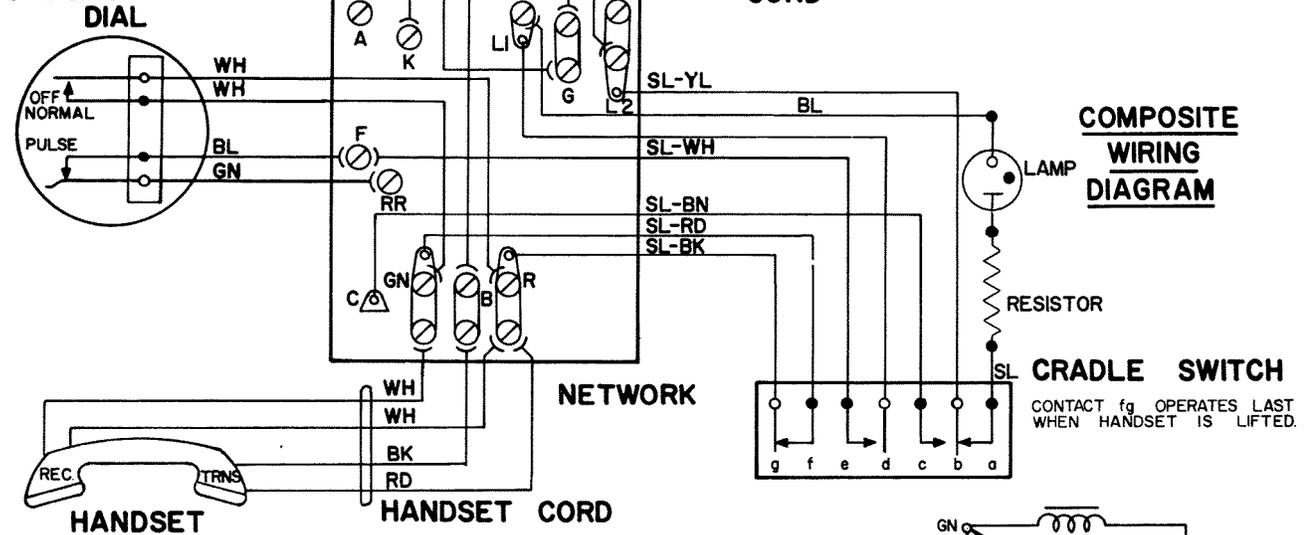
**RINGER NOTES**

- To Permanently Silence Ringer:  
Class of Ringer Transfer From To  
Biased, BK } Ringer (G K  
Freq.Sel., RD } lead (L2 K
- Biased Ringer Cut-Off Control by Customer:  
Bend stop next to detent on volume control so that it clears rim of ringer frame. This provides extra control position in which ringer armature is locked.

**CONNECTING BLOCK OPTIONS**



For Manual Service:  
Replace dial with dummy plug and transfer SL-WH cradle switch lead from F to RR on network.



**TYPICAL CIRCUIT DIAGRAMS**

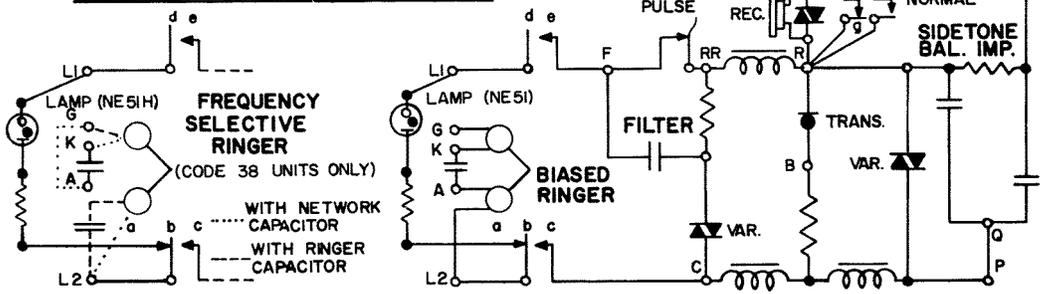


Fig. 2 DIAGRAMS 500--(--)-37- TELEPHONE AND 500--(--)-38- TELEPHONE

## TYPE 502--(--)-30- TELEPHONE

The 502--(--)-30- telephone is a standard desk type of instrument with the addition of a switch which is actuated by raising the left hand plunger in the handset cradle. Raising the plunger opens the circuit to any extension telephones on the line and

prevents overhearing of confidential conversations. Replacing the handset automatically resets the switch to the normal position. An external two wire circuit connection is provided that may be used to light a "busy" lamp at all extensions.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty	Item	Description	Number	Qty
1	Base Assy. c/w items 2 thru 7	75338-5	1	10	Handset and Cord Assembly	65** ( )410	1
2	Network Assembly	75335	1	11	Desk Stand Cord (6 Cond.)	3044**(14)650	1
3	Cradle Switch Assembly	75300-2	1	12	Connecting Block (10 Term.)	29 ( )783	1
4	Bind. Hd. Mach. Screw	69116-3	5	13	Housing and Plunger Assembly	79607-*	1
5	Spring Washer	54336-5	5	14	Plunger Switch Assembly	79613-1	1
6	Hex. Nut	67093	5	15	Wire Assembly	75326-90	1
7	Cabinet Lock Screw	75486	2	16	Wire Assembly	75326-91	2
8a	Ringer Assy. Biased	130(BA)470	1	17	Terminal Board Assembly	79467	1
b	Freq. Sel. with Vol. Cont.	131(Ø)470		18	Mounting Plate	79468	1
c	Freq. Sel. less Vol. Cont.	133(Ø)470		19	Bind. Hd. Mach. Screw	75392-2	1
9a	Dial Assembly	19**(Ø)450	1				
b	Dummy Plug Assembly	79456-*					

Note: Ringer, Dial and Dummy Plug Assemblies are all supplied complete with mounting screws.

Ø Replace by class code number for type required.  
\* Replace by color code suffix from series 1-16.  
\*\* Replace by color code number from series 00-16.

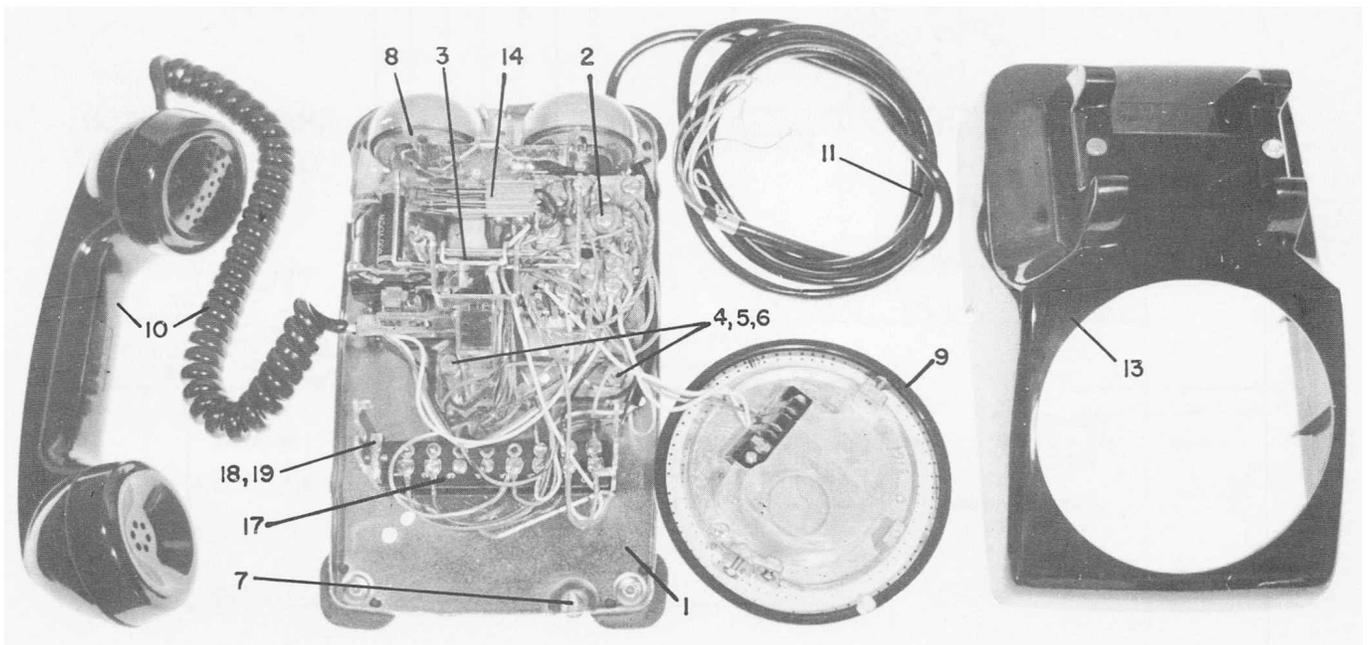
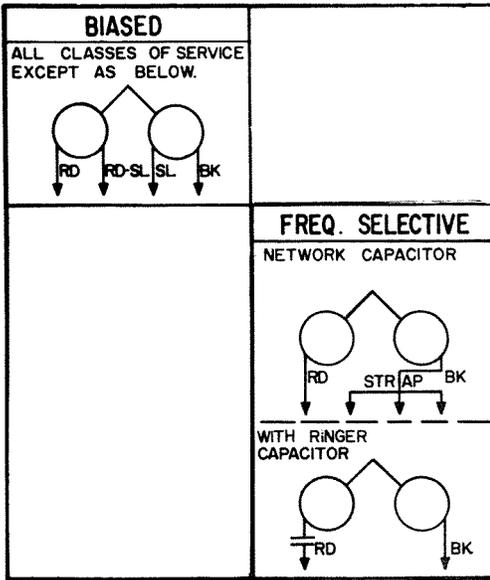


Fig. 1 TOP VIEW - HOUSING REMOVED

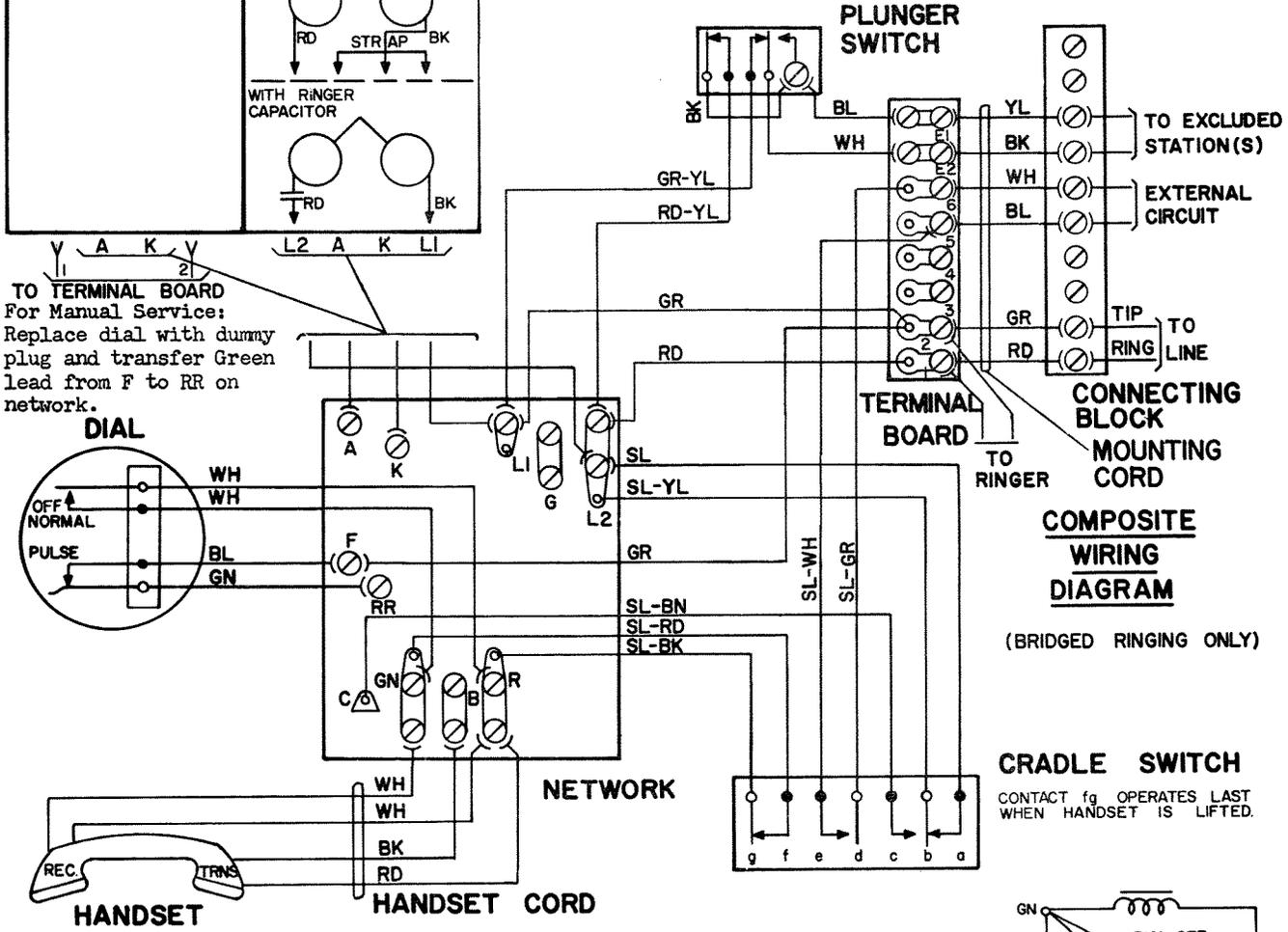
**RINGER OPTIONS**



TO TERMINAL BOARD  
For Manual Service:  
Replace dial with dummy plug and transfer Green lead from F to RR on network.

**RINGER NOTES**

- To Permanently Silence Ringer:  
Class of Ringer Transfer From To  
Biased, BK } Ringer 2 K  
Freq.Sel., RD } Lead on L2 K  
Network
- Biased Ringer Cut-Off Control by Customer:  
Bend stop next to detent on volume control so that it clears rim of ringer frame. This provides extra control position in which ringer armature is locked.



**TYPICAL CIRCUIT DIAGRAMS**

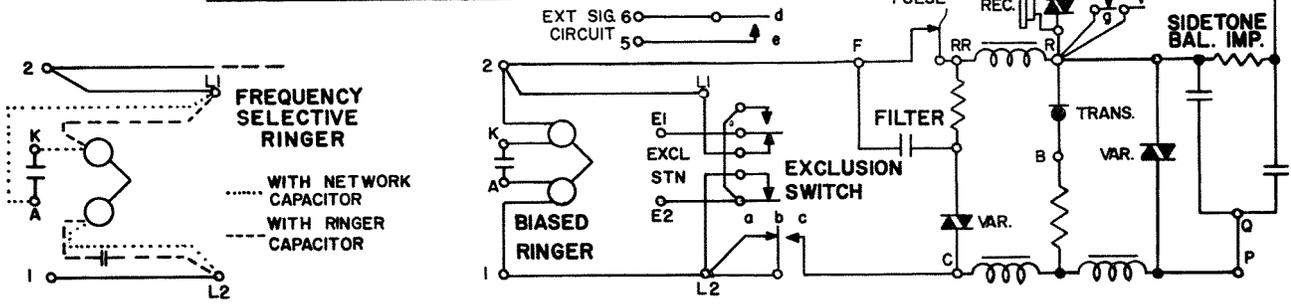


Fig. 2 DIAGRAMS 502--(--)-30- TELEPHONE

## TYPE 510--(--)-30- AND TYPE 510--(--)-36- DESK TELEPHONES

The 510--(--)-30- and 510--(--)-36- telephones are standard desk type instruments with the addition of a turn and push key which permits the instrument to be switched to either one of two lines. The ringer is permanently connected to line 1 and a separate ringer must be provided for line 2.

Both units are available with biased or frequency selective ringers for bridged ringing service. The 510--(--)-30- unit may be wired for divided ringing service if the signalling circuit is not used or if

one conductor of this circuit may be grounded.

The instruments are designed for service in small business establishments where a switchboard or key telephone system would be uneconomical. A 6-way cord and 10-way terminal block are provided with the 510--(--)-30- unit and the push section of the key is wired for an interphone signalling circuit. A 4-way cord and terminal block are provided with the 510--(--)-36- unit and the push section of the key is ineffective.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty	Item	Description	Number	Qty
1	Base Assy. c/w items 2 thru 7	75338	1	13	Housing and Plunger Assembly	79510-*	1
2	Network Assembly	75335	1	14	Turn and Push Key Assembly	79453	1
3	Cradle Switch Assembly	75300	1	15	Special Screw	79474	2
4	Bind. Hd. Mach. Screw	69116-3	5	16	Terminal Board Assembly	79467	1
5	Spring Washer	54336-5	5	17	Mounting Plate	79468	1
6	Hex. Nut	67093	5	18	Bind. Hd. Mach. Screw	75392-2	1
7	Cabinet Lock Screw	75486	2	19	Wire Assembly (Not used with 8a)	75326-65	1
8a	Ringer Assy. Biased	130(BA)470	] 1	20	Wire Assembly	75326-66	1
b	Freq. Sel. with Vol. Cont.	131(Ø)470		21	Wire Assembly	75326-67	1
c	Freq. Sel. less Vol. Cont.	133(Ø)470		22	Wire Assembly	75326-68	1
9a	Dial Assembly	19**(Ø)450	] 1	23	Wire Assembly	75326-69	1
b	Dummy Plug Assembly	79456-*		24	Wire Assembly	75326-70	1
10	Handset and Cord Assembly	65**(Ø)410	1	25	Wire Assembly	75326-71	1
11a	Desk Stand Cord (6 Cond.)	3044**(14)650	] 1	26	Wire Assembly	75326-72	1
b	Desk Stand Cord (4 Cond.)	3038**(13)650		27	Wire Assembly	75326-73	1
12a	Connecting Block (10 Term.)	29( )783	] 1				
b	Connecting Block (4 Term.)	32( )783					

Note: Ringer, Dial and Dummy Plug Assemblies are all supplied complete with mounting screws.

Ø Replace by class code number for type required.  
\* Replace by color code suffix from series 1-16.  
\*\* Replace by color code number from series 00-16.

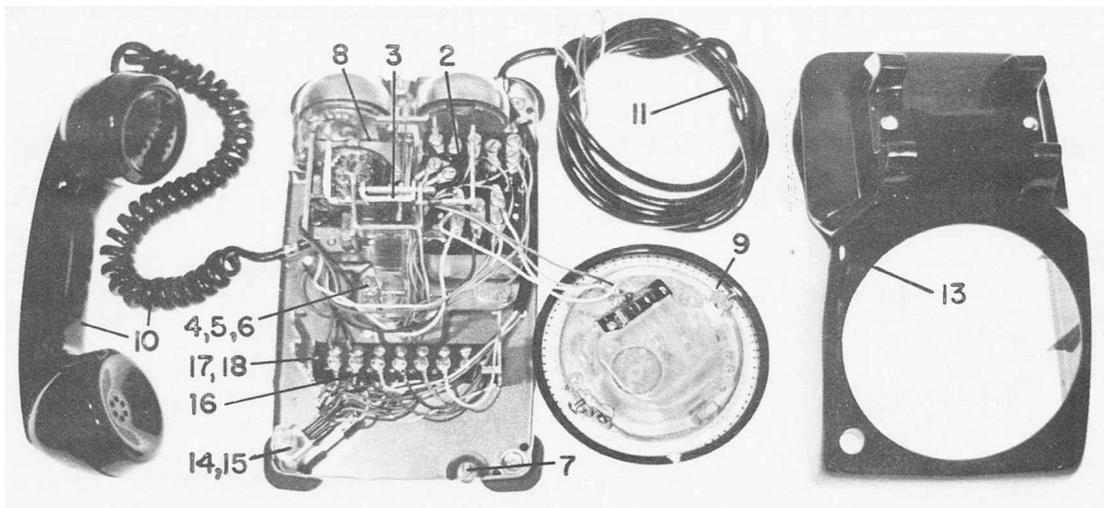
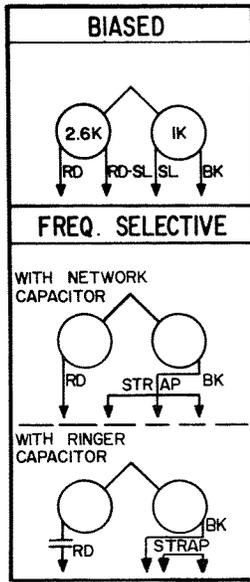


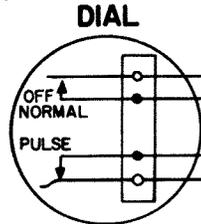
Fig. 1 TOP VIEW - HOUSING REMOVED

**RINGER OPTIONS**

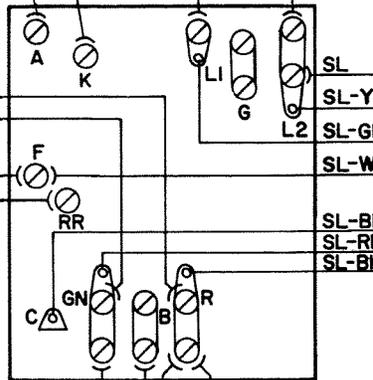


**NOTE:**  
 Internal ringer is permanently connected to Line 1. External ringer must be provided for Line 2.

**For Manual Service:**  
 Replace dial with dummy plug and transfer SL-WH cradle switch lead from F to RR on network.



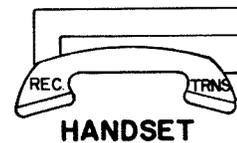
**DIAL**



**NETWORK**

**RINGER NOTES**

- To Permanently Silence Ringer:  
 Class of Ringer Transfer From To  
 Biased Ringer TB2 K  
 Freq. Selective Lead TB1 K  
 on Network
- Ringer Cut-off Control by Customer:  
 Bend stop next to detent on volume control so that it clears rim of ringer frame. This provides extra control position in which ringer armature is locked.



**HANDSET**

**HANDSET CORD**

**TYPICAL CIRCUIT DIAGRAMS**

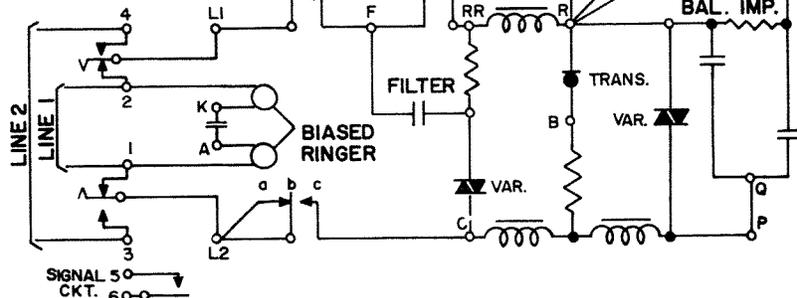
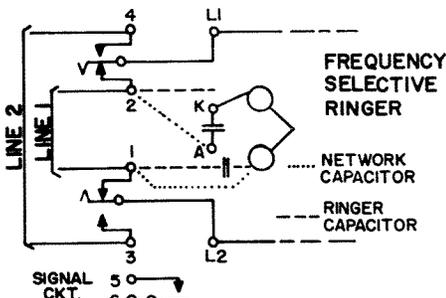
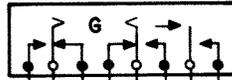


Fig. 2 DIAGRAMS 510--(--)-30- TELEPHONE  
 AND 510--(--)-36- TELEPHONE

**TURN AND PUSH KEY**

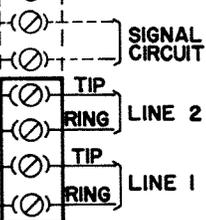


**CONNECTING BLOCK**

(4 WAY FOR CODE 36)  
 (10 WAY FOR CODE 30)



**TERMINAL BOARD**



**MOUNTING CORD**  
 (4 COND. FOR CODE 36)  
 (6 COND. FOR CODE 30)

**COMPOSITE WIRING DIAGRAM**

(BRIDGED RINGING ONLY)

**CRADLE SWITCH**

CONTACT fg OPERATES LAST WHEN HANDSET IS LIFTED.

# K-554 SERIES WALL TYPE TELEPHONES

## CONTENTS

Section		Page	Figure		Page
1	GENERAL DESCRIPTION	1	1-1	K-554 SERIES TELEPHONE	1
2	ASSOCIATED PUBLICATIONS	1	3-1	COMPONENT PARTS - EXPLODED VIEW	2
3	DISASSEMBLY AND ASSEMBLY	1			
4	TEST AND ADJUSTMENT	2			

### 1 GENERAL DESCRIPTION

1.1 The K-554 series provides a range of compact, anti-sidetone type wall mounting telephones which operate efficiently over a wide range of loop resistance and line impedance. Each instrument consists of a pressed steel baseplate on which all internal parts are mounted. A forked hook, which projects through a slot in the molded plastic housing covering the assembly, provides a support for the handset which is connected to the internal components by a flexible plastic covered cord.



Fig. 1-1 K-554 SERIES TELEPHONE

1.2 The K-554 telephone instrument is available with its internal components and circuit arranged for any class of service on any type of automatic or manual telephone system. It can be supplied in a number of different versions with various special features, as required. Specific details for each combination are given in individual sub-sections, each indexed by the instrument/special feature code (ie 554/35).

1.3 All instruments in the series can be supplied in any of the colors listed in sub-section M1A-COL.

### 2 ASSOCIATED PUBLICATIONS

2.1 General information on ordering, installation and maintenance is given in part 1 of the manual.

2.2 The various components and sub-assemblies used in each instrument are described in part 2 of the manual.

2.3 Specific descriptions, parts lists, wiring diagrams and circuit diagrams for each of the different assemblies in the K-554 series are given in individual sub-sections in part 3 of the manual. Each sub-section is indexed by the instrument and special feature code numbers.

### 3 DISASSEMBLY AND ASSEMBLY

3.1 The exploded view of Fig. 3-1 shows all the component parts and sub-assemblies of the K-554 basic instrument. Procedures for disassembly and assembly are given below. Additional parts which are included to provide special features should be removed and replaced in any convenient order.

#### 3.2 DISASSEMBLY - BASIC INSTRUMENT

##### a: Dial Telephone

Press the lower portion of the housing (10) towards the base, push the catch (located at the bottom of the housing just in front of the handset cord) upwards and pull the

lower portion of the housing away from the base to clear the catch. Lift the housing up and forward so that the handset hook passes through the dial opening.

#### Manual Telephone

Press down on the top of the number card assembly and pull away from the dummy plug assembly. Remove the center screw and the plug. Remove the housing as described for the dial telephone.

- b: Disconnect the leads, loosen the clamping screws and lift out the dial (8a), if fitted.
- c: Disconnect the leads, remove the mounting screws then remove the ringer (7).
- d: Disconnect the leads and remove the handset and cord assembly (9).
- e: Remove the screws, washers and nuts (4,5,6) then lift out the network (2) and hook switch (3). Unsolder leads from network, if needed.

### 3.3 ASSEMBLY - BASIC INSTRUMENT

Reassemble the instrument in the reverse order to that given for disassembly, noting the points listed below:

- a: Refer to the appropriate wiring diagram to reconnect the various leads.

- b: Locate the handset cord and ringer coil leads underneath the ringer frame and clear of the volume control.
- c: Make sure that the locating pips on the dial casting locate in the holes in the tips of the bracket.
- d: The housing is replaced by passing the dial opening over the handset hook, fitting the top of the housing over the tab at the top of the baseplate and pressing the lower portion of the housing to engage the spring catch at the bottom of the baseplate. The dummy plug and number card assembly is then replaced on manual type telephones. The housing should fit freely without binding on the handset hook and also the turn key if this is fitted.
- e: Check the reassembled unit as detailed in Section 4.

#### INSTALLATION NOTE:

The installation wiring will normally enter the instrument through the left hand opening in the bottom of the housing. Concealed wiring may enter through any suitable hole in the baseplate. Take care that the leads do not foul the ringer or hook switch assemblies.

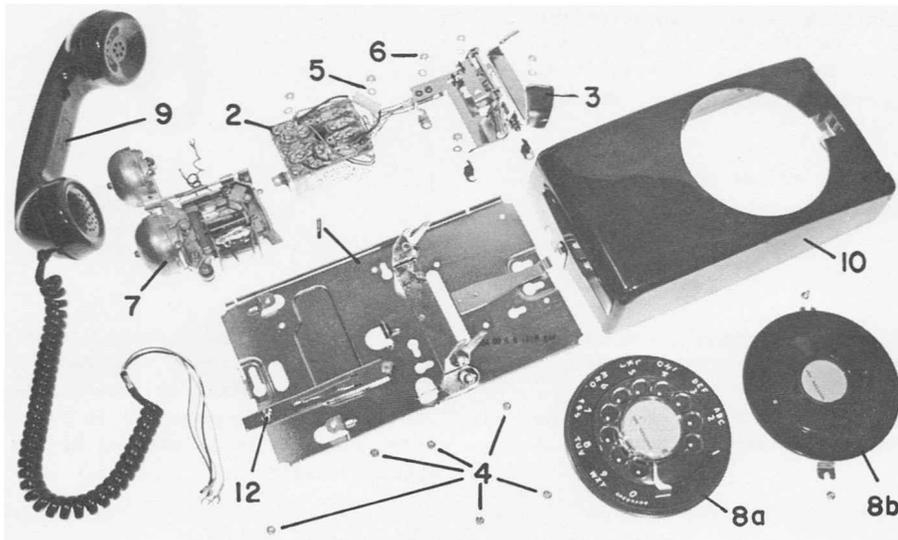


Fig. 3-1 COMPONENT PARTS - EXPLODED VIEW

## 4 TEST AND ADJUSTMENT

4.1 Tests and adjustments on the sub-assemblies are detailed in their respective sub-sections. The following checks must be made on the completely assembled instrument.

4.2 Connect the telephone to a working line and check for correct operation of the following:

- a: Dial, if fitted.

- b: Transmitter and receiver.
- c: Ringer and volume control, if fitted.
- d: Hook Switch.
- e: Adequate suppression of sidetone.
- f: Correct party identification, if applicable.
- g: Absence of noise due to loose contacts when the instrument is gently bumped or shaken.
- h: Special features, if fitted.

## TYPE 554--(--)-30- WALL TELEPHONE

The 554--(--)-30- telephone is the basic type of wall instrument in the K-554 series of telephones. Options in the instrument provide for any class of service on any type of automatic or manual central office equipment. General details of the K-554 series wall instruments are given in sub-section

M3A-554/SER while specific details of each version are given in the sub-sections indexed by the type numbers of the instruments.

The complementary range of desk telephones is detailed in sub-sections in the 500 series.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty	Item	Description	Number	Qty
1	Base Assembly	79398	1	8a	Dial Assembly	19**( $\emptyset$ )450	] 1
2	Network Assembly	75335	1	b	Dummy Plug Assembly	79456-*	
3	Hook Switch Assembly	79399	1	9	Handset and Cord Assembly	65**( $\emptyset$ )410	1
4	Bind. Hd. Mach. Screw	69116-3	6	10	Housing Assembly	79406-*	1
5	Spring Washer	54336-5	6	11	Gas Tube (Only with TBA Ringer)	75599	1
6	Hex. Nut	67093	6	12	Fastener Stud (With item 7c)	79753-2	1
7a	Ringer Assy. Biased	130(BA)470	] 1	13	Fastener Stud (With item 7b)	79753	1
b	Freq. Sel. with Vol. Cont.	131( $\emptyset$ )470		14	Adapter Link (With item 7b)	79754	1
c	Freq. Sel. less Vol. Cont.	133( $\emptyset$ )470					
d	Electronic	140(ER)470					

Note: Ringer, Dial and Dummy Plug Assemblies are all supplied complete with mounting screws.

$\emptyset$  Replace by class code number for type required.  
\* Replace by color code suffix from series 1-16.  
\*\* Replace by color code number from series 00-16.

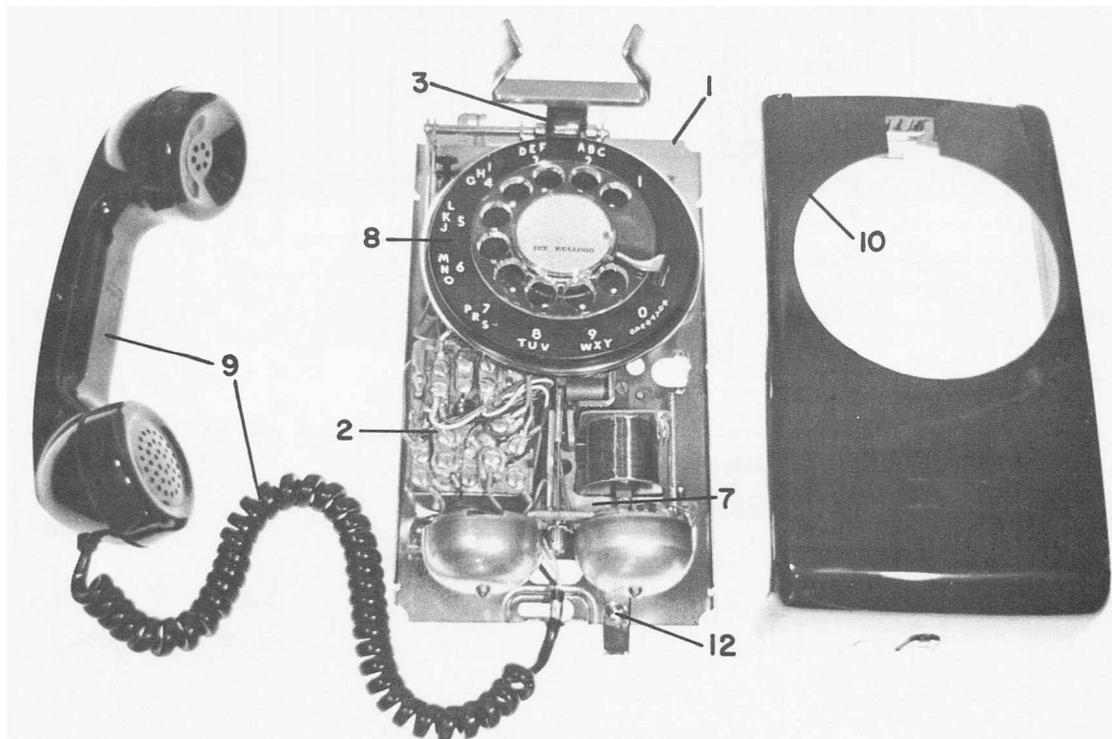
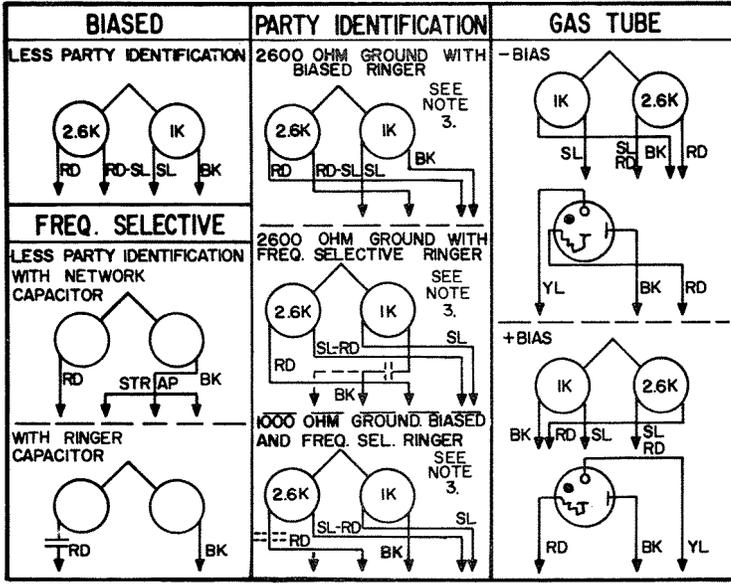


Fig. 1 TOP VIEW - HOUSING REMOVED

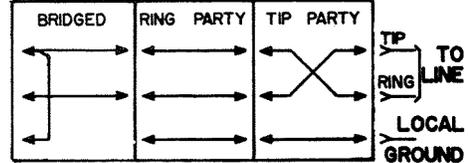
**RINGER OPTIONS**



**RINGER NOTES**

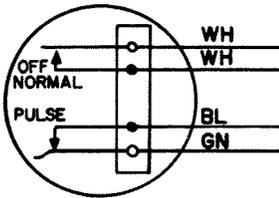
- To Permanently Silence Ringer:  
 Class of Ringer      Transfer From To  
 Biased, except 1) and 2) BK } Ringer } G K  
 Freq.Sel., except 1) and 3) RD }        } L2 K  
 1) 1000Ω Ground Ident. SL-RD } Lead } B K  
 2) 2600Ω Ident. Biased BK }        } B K  
 3) 2600Ω Ident.Freq.Sel. SL } Network } B K  
 Gas Tube - Tip Party YL Mtg. Cord on Y G  
 Ring Party YL Conn. Block Y R
- Biased Ringer Cut-Off Control by Customer:  
 Bend stop next to detent on volume control so that it clears rim of ringer frame. This provides extra control position in which ringer armature is locked.
- Party Identification:  
 Transfer SL switch lead from L2 to A on network. Broken lines show connections of frequency selective ringer with coil mounted capacitor.

**CONNECTION OPTIONS**

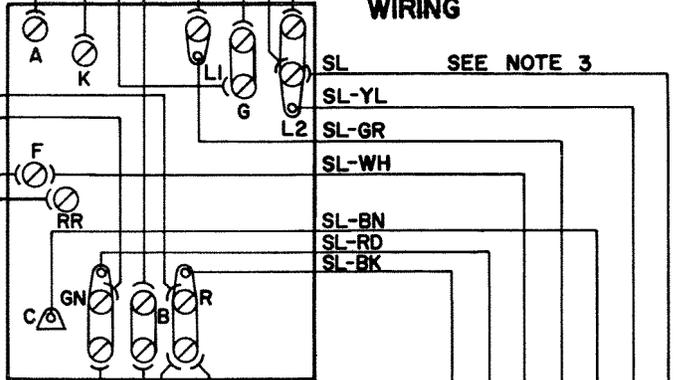


For Manual Service:  
 Replace dial with dummy plug and transfer SL-WH cradle switch lead from F to RR on network.

**DIAL**



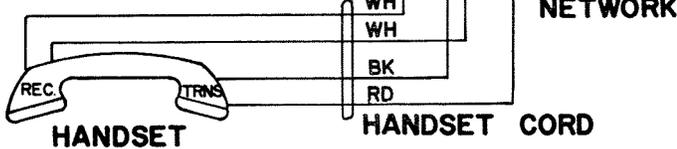
**INSTALLATION WIRING**



**COMPOSITE WIRING DIAGRAM**

**HOOK SWITCH**

CONTACT fg OPERATES LAST WHEN HANDSET IS LIFTED.



**TYPICAL CIRCUIT DIAGRAMS**

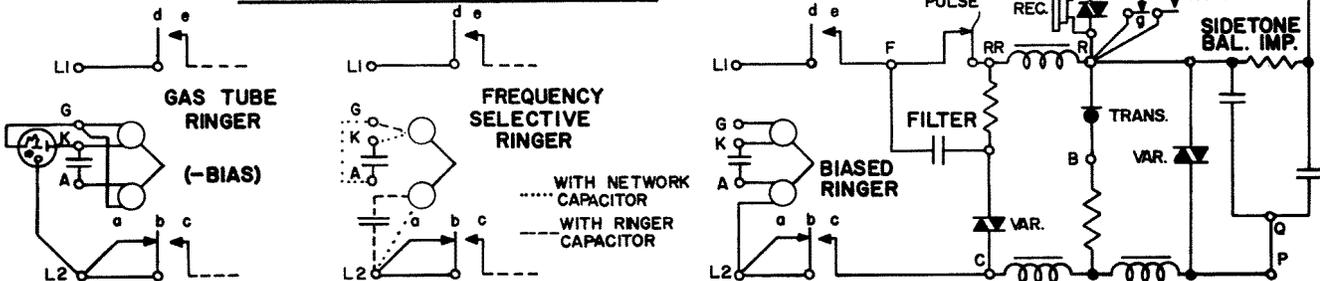


FIG. 2 DIAGRAMS 554--(--)-30- TELEPHONE

## TYPE 554--(--)-33- WALL TELEPHONE

The 554--(--)-33- telephone is a standard wall type of instrument fitted with a special detent type of hook switch. When the handset is lifted from the cradle hook the operating arm of the hook switch cannot rise completely. A capacitor in series with the line prevents talking and dialing but does not affect reception. A party line subscriber can thus check if the line is in use without causing noise to

disturb any call in progress. If the line is clear, moving the cradle hook to the left allows it to rise completely, closing additional hook switch contacts, and permit dialing and talking.

When the handset is replaced in the cradle hook at the end of the call, the cradle hook automatically moves to the right to reset the detent mechanism.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty	Item	Description	Number	Qty
1	Base Assembly	79398	1	8a	Dial Assembly	19**(Ø)450	1
2	Network Assembly	75335	1	b	Dummy Plug Assembly	79456-*	1
3	Hook Switch Assembly	190154	1	9	Handset and Cord Assembly	65**(Ø)410	1
4	Bind. Hd. Mach. Screw	69116-3	6	10	Housing Assembly	190151-*	1
5	Spring Washer	54336-5	6	11	Capacitor	78405-4	1
6	Hex. Nut	67093	6	12	Gas Tube (Only with TBA ringer)	75599	1
7a	Ringer Assy. Biased	130(BA)470		13	Fastener Stud (With item 7c)	79753-2	1
b	Freq. Sel. with Vol. Cont.	131(Ø)470	1	14	Fastener Stud (With item 7b)	79753	1
c	Freq. Sel. less Vol. Cont.	133(Ø)470		15	Adapter Link (With item 7b)	79754	1

Note: Ringer, Dial and Dummy Plug Assemblies are all supplied complete with mounting screws.

Ø Replace by class code number for type required.  
\* Replace by color code suffix from series 1-16.  
\*\* Replace by color code number from series 00-16.

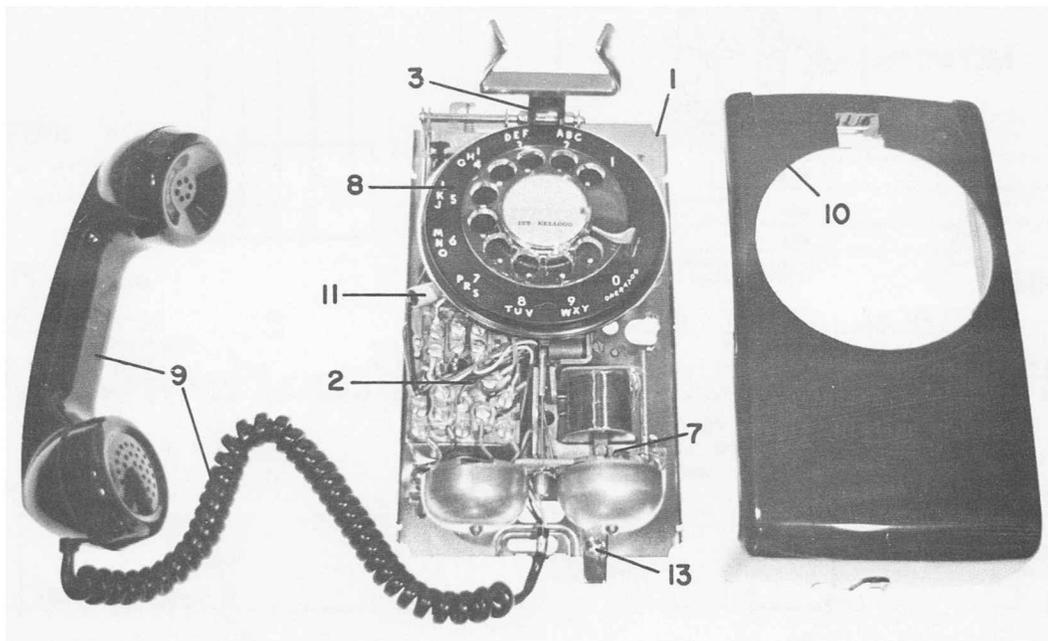
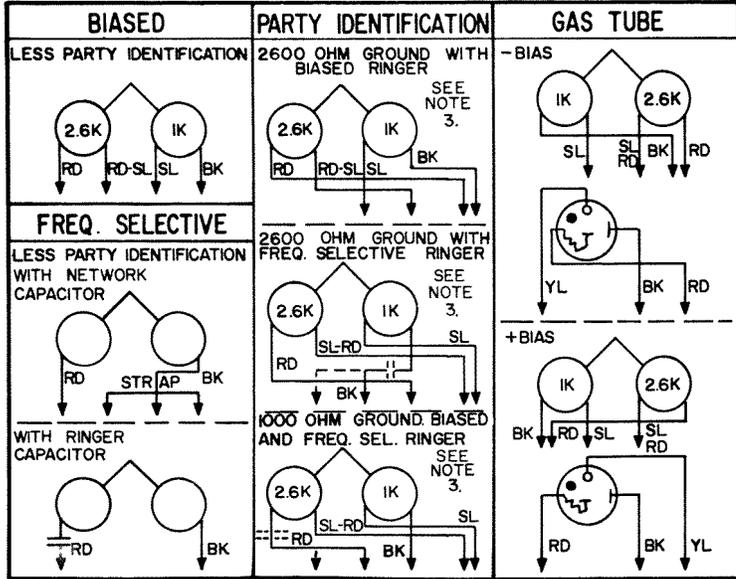


Fig. 1 TOP VIEW - HOUSING REMOVED

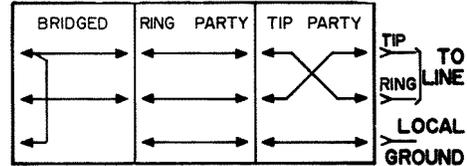
**RINGER OPTIONS**



**RINGER NOTES**

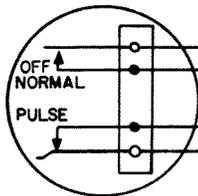
- To Permanently Silence Ringer:  
Class of Ringer Transfer From To  
Biased, except 1) and 2) BK Ringer G K  
Freq.Sel., except 1) and 3) RD Lead L2 K  
1) 1000 $\Omega$  Ground Ident. SL-RD on B K  
2) 2600 $\Omega$  Ident. Biased BK Network B K  
3) 2600 $\Omega$  Ident. Freq.Sel. SL Mtg.Cord on Y G  
Gas Tube - Tip Party YL Conn. Block Y R  
Ring Party YL
- Biased Ringer Cut-Off Control by Customer:  
Bend stop next to detent on volume control so that it clears rim of ringer frame. This provides extra control position in which ringer armature is locked.
- Party Identification:  
Transfer SL switch lead from L2 to A on network. Broken lines show connections of frequency selective ringer with coil mounted capacitor.

**WIRING OPTIONS**

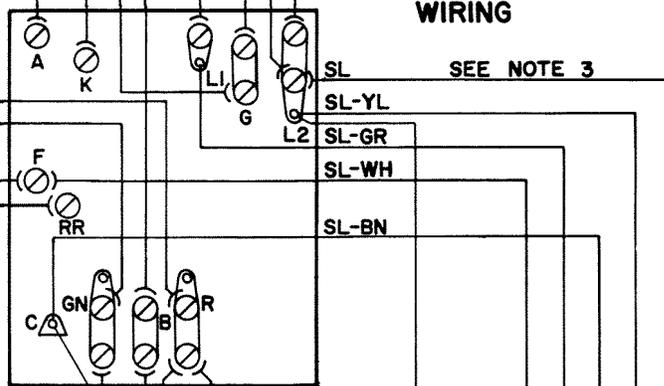


For Manual Service:  
Replace dial with dummy plug and transfer SL-WH cradle switch lead from F to RR on network.

**DIAL**



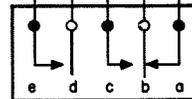
**INSTALLATION WIRING**



**COMPOSITE WIRING DIAGRAM**

**HOOK SWITCH**

HOOK SWITCH MUST BE MOVED TO TALK POSITION BEFORE CONTACTS b c CLOSE.



**TYPICAL CIRCUIT DIAGRAMS**

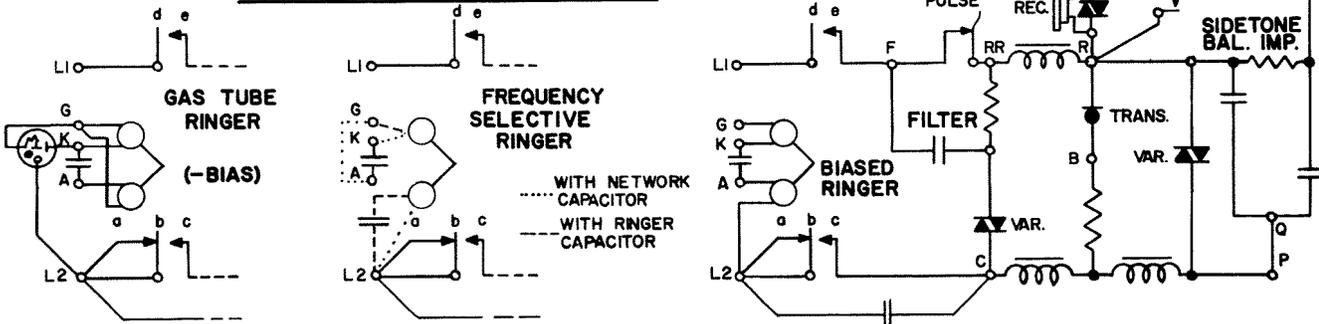


Fig. 2 DIAGRAMS 554--(--)-33- TELEPHONE

## TYPE 554--(--)-35- WALL TELEPHONE

The 554--(--)-35- telephone is a standard wall type of instrument arranged so that ringing and talking are carried out over separate two wire circuits. A biased, 20 cps, ringer is normally fitted but this

can be omitted and a buzzer kit, number 202( )904, installed in the instrument if direct current is to be used for signaling.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty	Item	Description	Number	Qty
1	Base Assembly	79398	1	8a	Dial Assembly	19**(Ø)450	1
2	Network Assembly	75335	1	b	Dummy Plug Assembly	79456-*	
3	Hook Switch Assembly	79399	1	9	Handset and Cord Assembly	65**(Ø)410	1
4	Bind. Hd. Mach. Screw	69116-3	6	10	Housing Assembly	79406-*	1
5	Spring Washer	54336-5	6	11	Terminal Board Assembly	79467	1
6	Hex. Nut	67093	6	12	Mounting Plate	79468	1
7a	Ringer Assy. Biased	130(BA)470	1	13	Bind. Hd. Mach. Screw	75392-2	1
b	Buzzer Kit (ordered separately)	202( )904					

Note: Ringer, Dial and Dummy Plug Assemblies are all supplied complete with mounting screws.

Ø Replace by class code number for type required.  
\* Replace by color code suffix from series 1-16.  
\*\* Replace by color code number from series 00-16.

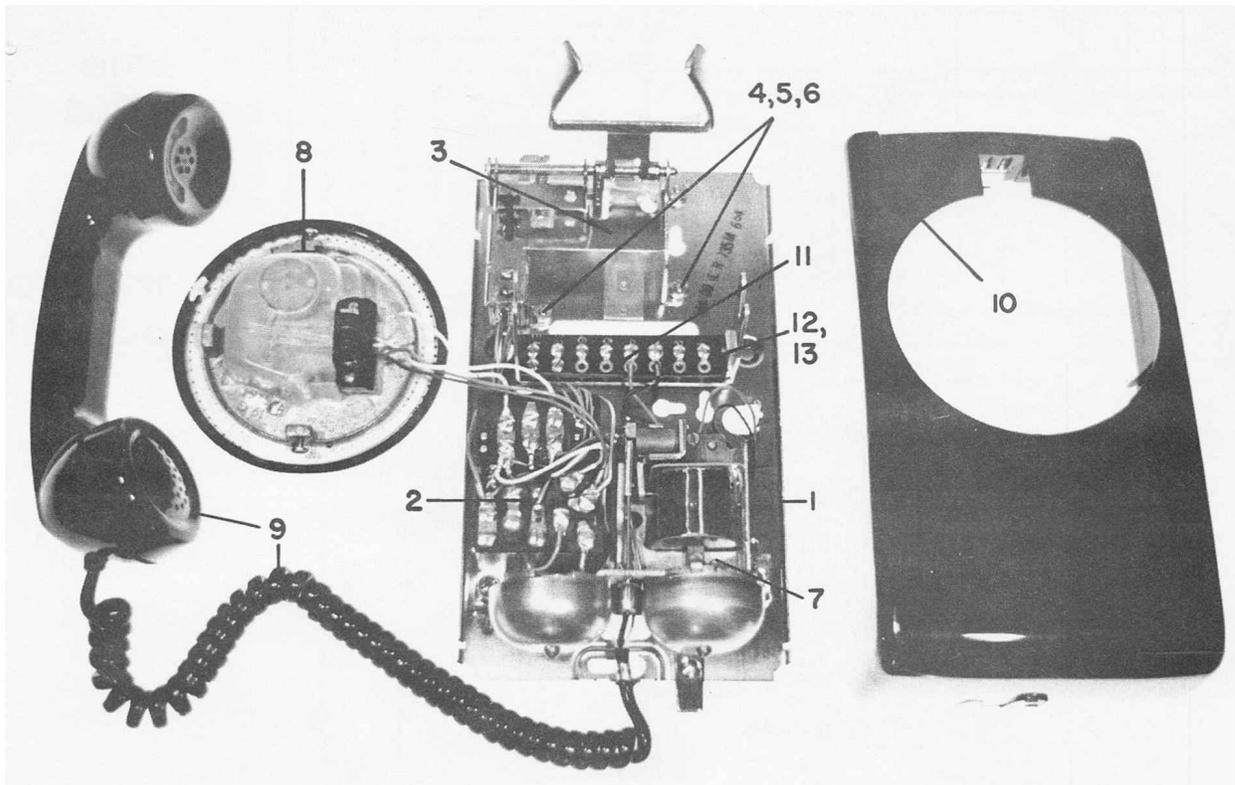
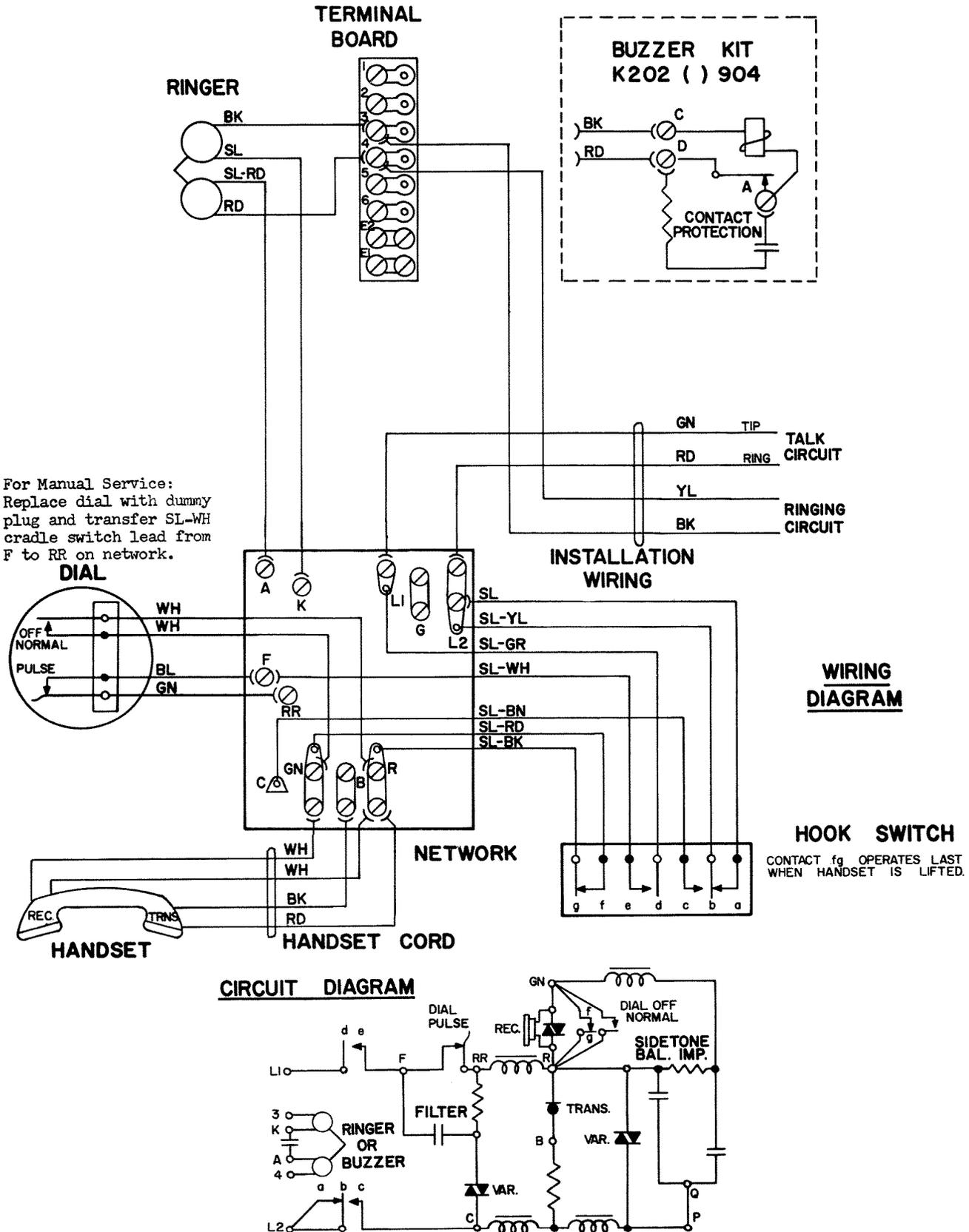


Fig. 1 TOP VIEW - HOUSING REMOVED



## TYPE 558--(--)-30- WALL TELEPHONE

The 558--(--)-30- telephone is a standard wall type instrument with the addition of a turn and push key which permits the instrument to be switched to either one of two lines. The ringer is permanently connected to line 1 and a separate ringer must be provided for line 2.

This instrument is designed for service in small business establishments where a switchboard or key telephone system would be uneconomical.

The instrument is available with biased or frequency selective ringers for bridged or divided ringing.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty	Item	Description	Number	Qty
1	Base Assembly	79398	1	14	Turn and Push Key Assembly	79453-2	1
2	Network Assembly	75335	1	15	Special Screw	79474	2
3	Hook Switch Assembly	79399	1	16	Terminal Board Assembly	79467	1
4	Bind. Hd. Mach. Screw	69116-3	6	17	Mounting Plate	79468	1
5	Spring Washer	54336-5	6	18	Bind. Hd. Mach. Screw	75392-2	1
6	Hex. Nut	67093	6	19	Bracket (Turn and Push Key)	79920	1
7a	Ringer Assy. Biased	130(BA)470	1	20	Fl. Fil. Hd. Mach. Screw	60626	1
b	Freq. Sel. with Vol. Cont.	131(Ø)470		21	Wire Assembly	75326-65	1
c	Freq. Sel. less Vol. Cont.	133(Ø)470		22	Wire Assembly	75326-66	1
8a	Dial Assembly	19**(Ø)450	1	23	Wire Assembly	75326-67	1
b	Dummy Plug Assembly	79456-*		24	Wire Assembly	75326-68	1
9	Handset and Cord Assembly	65**(Ø)410	1	25	Wire Assembly	75326-69	1
10	Housing Assembly	79877-*	1	26	Wire Assembly	75326-70	1
11	Fastener Stud (With item 7c)	79753-2	1	27	Wire Assembly	75326-71	1
12	Fastener Stud (With item 7b)	79753	1	28	Wire Assembly	75326-72	1
13	Adapter Link (With item 7b)	79754	1	29	Wire Assembly	75326-73	1

Note: Ringer, Dial and Dummy Plug Assemblies are all supplied complete with mounting screws.

Ø Replace by class code number for type required.  
\* Replace by color code suffix from series 1-16.  
\*\* Replace by color code number from series 00-16.

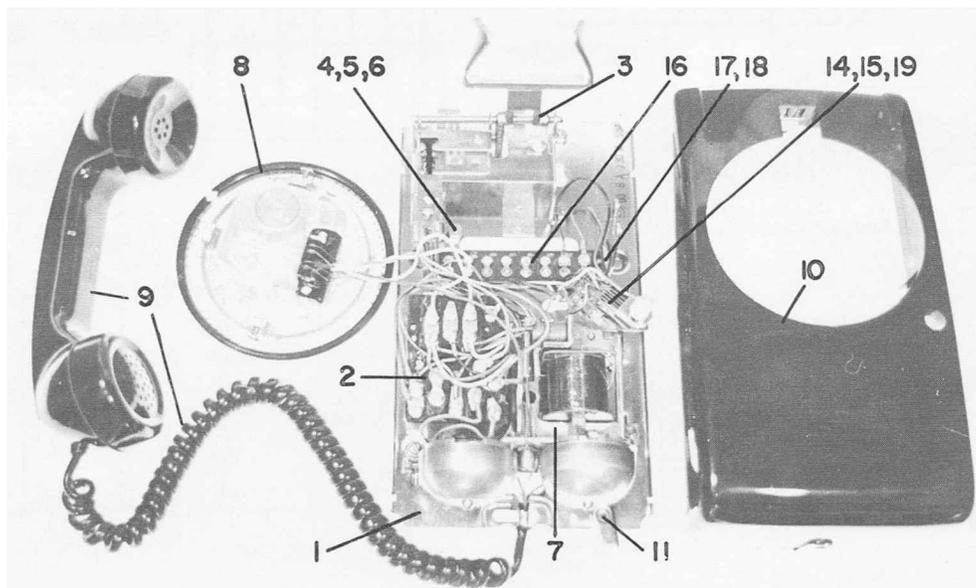


Fig. 1 TOP VIEW - HOUSING REMOVED



## TYPE 575--(--)-30- AND TYPE 575--(--)-36- DESK TELEPHONES

The 575--(--)-30- and 575--(--)-36- telephones are standard desk type instruments with the addition of a turn and push key, which permits the instrument to be switched to either one of two lines, and a plunger switch, which permits a holding loop to be placed across the opposite line to that selected by the turn and push key. The ringer is permanently connected to line 1 and a separate ringer must be provided for line 2. Both units are available with biased or frequency selective ringers for bridged ringing service. The 575--(--)-30- unit may be wired for divided ringing service if the signalling

circuit is not used or if one conductor may be grounded.

The instruments are designed for service in small business establishments where a switchboard or key telephone system would be uneconomical. A 6-way cord and 10-way terminal block are provided with the 575--(--)-30- unit and the push section of the key is wired for an interphone signalling circuit. A 4-way cord and terminal block are provided with the 575--(--)-36- unit and the push section of the key is ineffective.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty	Item	Description	Number	Qty
1	Base Assy. c/w items 2 thru 7	75338-5	1	14	Turn and Push Key Assembly	79453-3	1
2	Network Assembly	75335	1	15	Special Screw	79474	2
3	Cradle Switch Assembly	75300-2	1	16	Terminal Board Assembly	79467	1
4	Bind. Hd. Mach. Screw	69116-3	5	17	Mounting Plate	79468	1
5	Spring Washer	54336-5	5	18	Bind. Hd. Mach. Screw	75392-2	1
6	Hex. Nut	67093	5	19	Plunger Switch Assembly	82577-1	1
7	Cabinet Lock Screw	75486	2	20	Resistor	73609-13	2
8a	Ringer Assy. Biased	130(BA)470	] 1	21	Tubing (for resistor)	50551-3	4
b	Freq. Sel. with Vol. Cont.	131(∅)470		22	Wire Assembly	75326-54	1
c	Freq. Sel. less Vol. Cont.	133(∅)470		23	Wire Assembly	75326-66	1
9a	Dial Assembly	19**(∅)450	] 1	24	Wire Assembly	75326-67	1
b	Dummy Plug Assembly	79456-*		25	Wire Assembly	75326-68	1
10	Handset and Cord Assembly	65**(∅)410	1	26	Wire Assembly	75326-69	1
11a	Desk Stand Cord (6 Cond.)	3044**(14)650	] 1	27	Wire Assembly	75326-70	1
b	Desk Stand Cord (4 Cond.)	3038**(13)650		28	Wire Assembly	75326-71	1
12a	Connecting Block (10 Term.)	29( )873	] 1	29	Wire Assembly	75326-111	1
b	Connecting Block (4 Term.)	32( )873		30	Wire Assembly	75326-112	1
13	Housing and Plunger Assembly	82576-*	1	31	Wire Assembly	75326-113	1

Note: Ringer, Dial and Dummy Plug Assemblies are all supplied complete with mounting screws.

∅ Replace by class code number for type required.  
\* Replace by color code suffix from series 1-16.  
\*\* Replace by color code number from series 00-16.

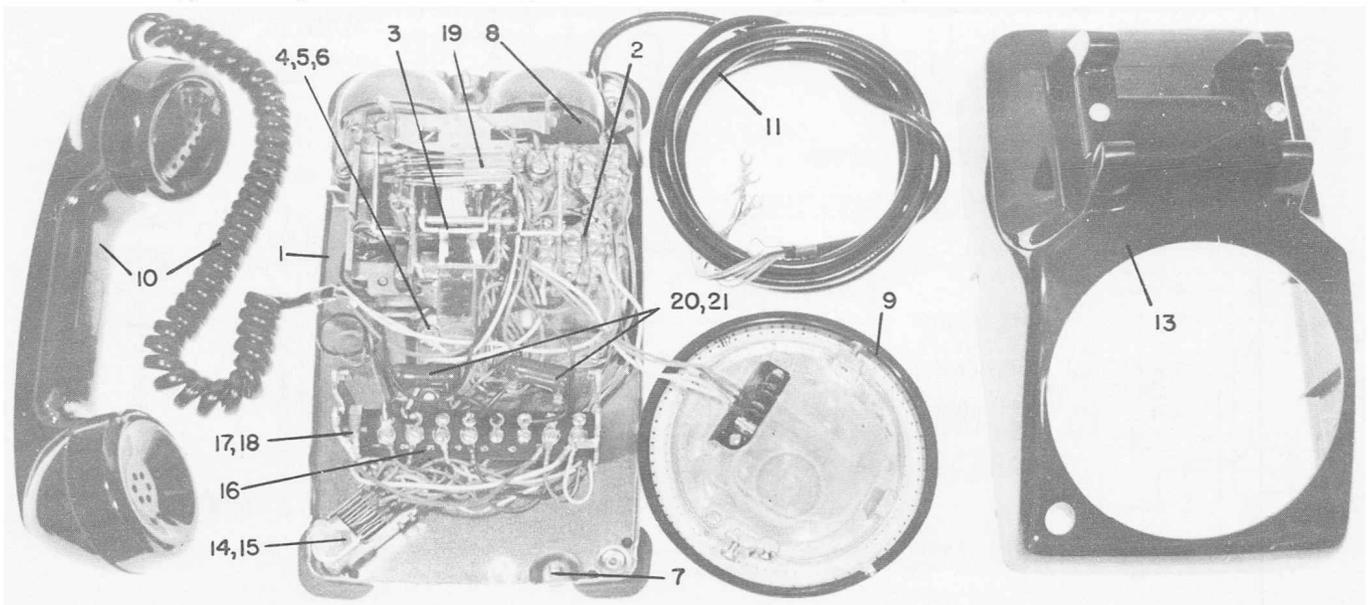
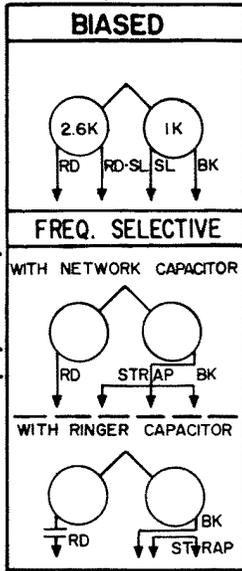


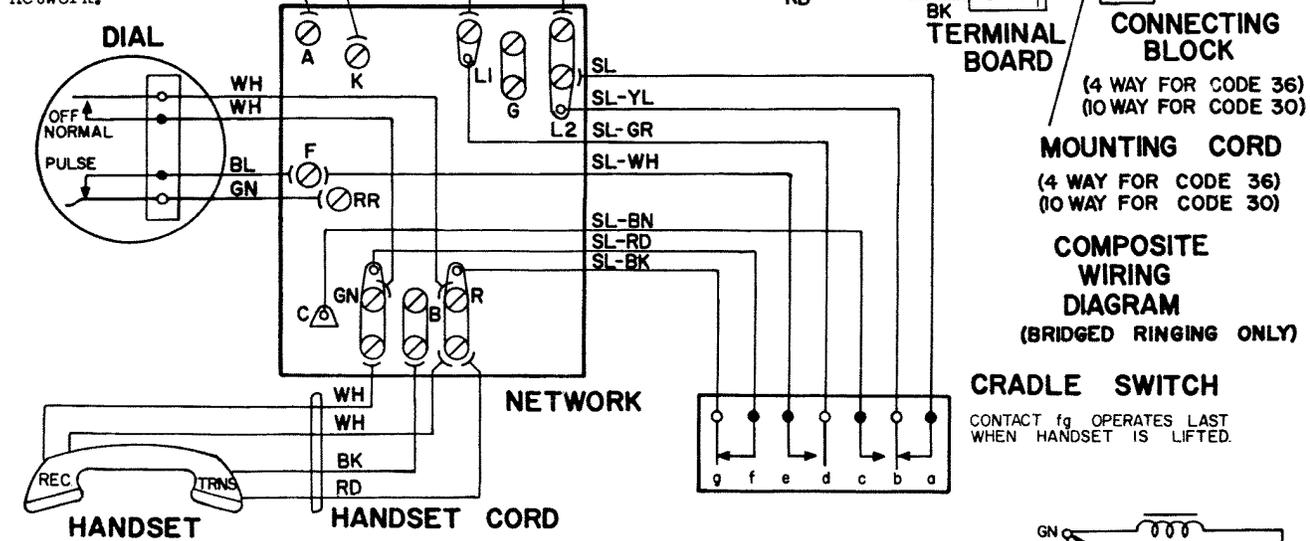
Fig. 1 TOP VIEW - HOUSING REMOVED

**RINGER OPTIONS**



**NOTE:**  
Internal ringer is permanently connected to Line 1. External ringer must be provided for Line 2.

For Manual Service: Replace dial with dummy plug and transfer Green lead from F to RR on network.



**RINGER NOTES**

- To Permanently Silence Ringer:  
Class of Ringer Transfer From To  
Biased, BK Ringer G K  
Freq.Sel., RD Lead on L2 K  
Network
- Biased Ringer Cut-Off Control by Customer:  
Bend stop next to detent on volume control so that it clears rim of ringer frame. This provides extra control position in which ringer armature is locked.

**MOUNTING CORD**  
(4 WAY FOR CODE 36)  
(10 WAY FOR CODE 30)

**COMPOSITE WIRING DIAGRAM**  
(BRIDGED RINGING ONLY)

**CRADLE SWITCH**  
CONTACT fg OPERATES LAST WHEN HANDSET IS LIFTED.

**TYPICAL CIRCUIT DIAGRAMS**

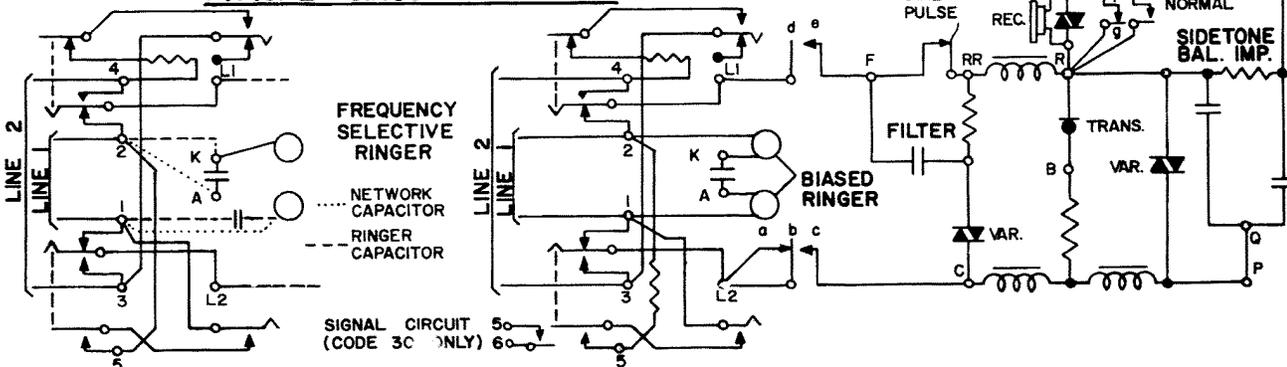


Fig. 2 DIAGRAMS 575--(--)-30- TELEPHONE AND 575--(--)-36- TELEPHONE

## K-700 SERIES DESK TYPE TELEPHONES

### CONTENTS

Section		Page	Figure	Page
1	GENERAL DESCRIPTION	1	1-1 K-700 SERIES TELEPHONE	1
2	ASSOCIATED PUBLICATIONS	1	3-1 COMPONENT PARTS - EXPLODED VIEW	2
3	DISASSEMBLY AND ASSEMBLY	1		
4	TEST AND ADJUSTMENT	2		

### 1 GENERAL DESCRIPTION

1.1 The K-700 series provides a group of compact, anti-sidetone type desk telephones which operate efficiently over a wide range of loop resistance and line impedance. The instruments are intended for use in special locations, such as bedrooms, or where desk space is at a premium. Each instrument consists of an oval pressed aluminum baseplate, with a non-skid rubber mat underneath, on which all internal parts are mounted. A molded plastic housing covers the assembly and provides a cradle for the handset, which is connected to the internal components by a flexible plastic covered cord. A second plastic covered cord connects the instrument to a molded terminal block or wall-mounted ringer unit. A separate ringer unit must always be fitted with these instruments, except when they are used as extension units, as the extremely compact design does not include an internal ringer.

1.2 The K-700 telephone instrument is available for use on any class of service on any type of automatic or manual telephone system. It may be connected to its associated ringer to provide all necessary circuitry. Some special features may be provided with the instrument: specific details for each combination are given in individual sub-sections, each indexed by the instrument/special feature code (e.g. 701/30).

1.3 Although any of the ringer units described in section M2C may be used with the K-700 telephone, types 136, 137, 138 and 139 have been designed with the requirements of this series of telephones in view. Each of these ringers provides adequate terminal block facilities for the external circuits of the instrument.

1.4 Instruments in the K-700 series can be supplied in colors of rose pink, aqua blue, light beige, light grey, sea green or white only.

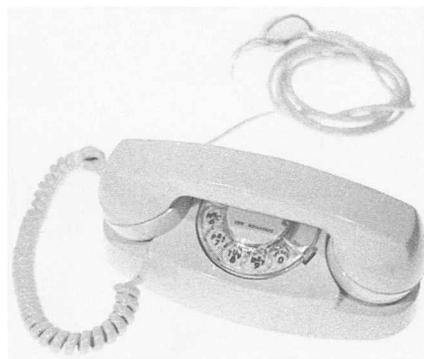


Fig. 1-1 K-700 SERIES TELEPHONE

### 2 ASSOCIATED PUBLICATIONS

2.1 General information on ordering, installation and maintenance is given in part 1 of the manual.

2.2 The various components and sub-assemblies used in each instrument are described in part 2 of the manual.

2.3 Specific descriptions, parts lists, wiring diagrams and circuit diagrams for each of the different assemblies in the K-700 series are given in individual sub-sections in part 3 of the manual. Each sub-section is indexed by the instrument and special feature code numbers.

### 3 DISASSEMBLY AND ASSEMBLY

3.1 The exploded view of Fig. 3-1 shows all the component parts and sub-assemblies of the K-700 basic instrument. Procedures for disassembly and assembly are given below. Additional parts which are included to provide special features should be removed and replaced in any convenient order. Note

that the lamp of the message waiting light may be replaced by unscrewing the lamp cap. The lamp of the dial light may be replaced by unscrewing the holder in the base of the instrument, then changing the lamp in the holder.

### 3.2 DISASSEMBLY - BASIC INSTRUMENT

- a: Loosen the lockwasher screws (18) and remove the housing (29).
- b: Loosen the clamping screws, lift out the dial (21a), if fitted, and disconnect the leads.
- c: Disconnect the leads and remove the handset and cord assembly (22).
- d: Disconnect the leads and remove the desk stand cord (23).
- e: Remove the lamp (27) and socket assembly (26).
- f: Remove spring (25) and cradle switch bracket assembly (24).

The remaining major components of the complete instrument are riveted to the baseplate. If it should become necessary to remove one of these components the rivets must be drilled out and the replacement component mounted with new rivets, if riveting equipment is available, or with suitable machine screws, spring washers and hexagonal nuts.

### 3.3 ASSEMBLY - BASIC INSTRUMENT

Reassemble the instrument in the reverse order to that given for disassembly, noting the points listed below.

- a: Refer to the appropriate wiring diagram to reconnect the various leads.
- b: Make certain that the leads of the handset and mounting cords do not interfere with the operation of the cradle switch.
- c: Make sure that the locating pips and holes mate correctly to locate the dial squarely in its mounting bracket.
- d: The housing must fit freely without binding on any part. Make sure that the dial gasket is in its correct position.
- e: Check that any screws, washers and nuts, used to replace rivets, do not interfere with any other parts of the instrument.
- f: Check the assembled unit as detailed in Section 4.

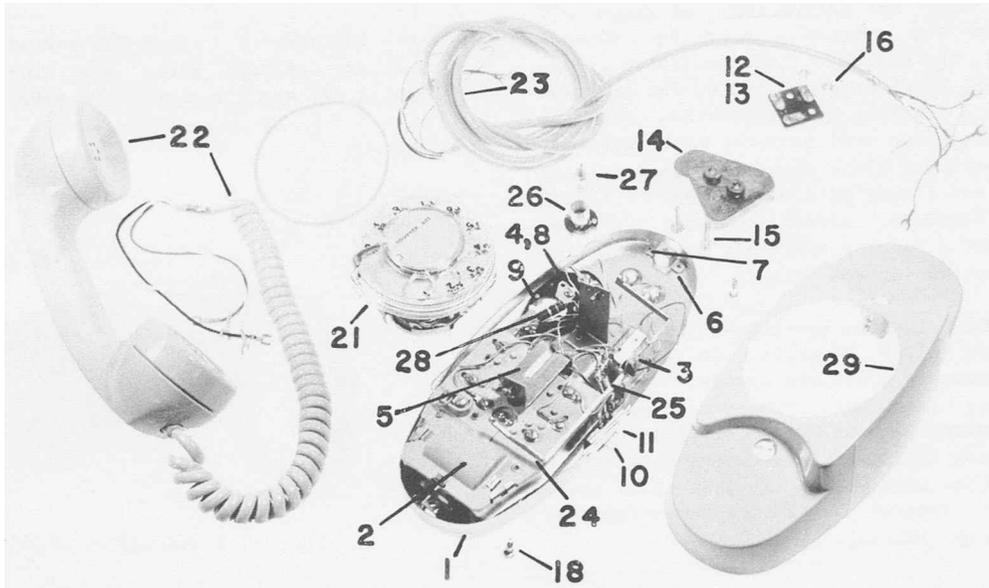


Fig. 3-1 COMPONENT PARTS - EXPLODED VIEW

## 4 TEST AND ADJUSTMENT

4.1 Tests and adjustments on the sub-assemblies are detailed in their respective sub-sections. The following checks must be made on the completely assembled instrument.

### 4.2 CRADLE SWITCH

Check that either plunger will fully operate the spring assembly before being depressed to a point 1/8" above the housing molding and that the plungers may be lifted slightly after the handset is removed. Bend the side arms of the actuator, using two pairs of pliers, to adjust, if necessary.

### 4.3 FUNCTIONAL TESTS

Connect the telephone to a working line and check for correct operation of the following:

- a: Dial, if fitted.
- b: Transmitter and receiver.
- c: Cradle switch.
- d: Adequate suppression of sidetone.
- e: Correct party identification, in conjunction with a suitable ringer, if applicable.
- f: Absence of noise due to loose contacts when the instrument is gently bumped or shaken.
- g: Special features, if fitted.

## TYPE 701--(LR)30- DESK TELEPHONE

The 701--(LR)30- telephone is a very compact desk type of instrument with a built in combination dial and night light which illuminates the numeral ring. A switch, at the rear, may be set so that the light glows dimly or is off when the handset is in the cradle. With the switch in either position the light glows brightly when the handset is lifted. A separate power source of 6-8 volts AC or DC at a

current of about 1/4 amp. is required to supply the lamp. A specially designed transformer, type 31( )690, is available for use on 110V AC power circuits.

The installed telephone must be provided with a separately mounted, external ringer. Types 136, 137, 138 and 139 are recommended.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty	Item	Description	Number	Qty
1	Base Assy. c/w items 2 thru 20	190077-1	1	16	Hex Nut	70788	2
2	Network Assembly	190107	1	17	Mat	190121	1
3	Spring Assembly (Cradle)	190092	1	18	Lockwasher Screw	190139	2
4	Insulator	190449	1	19	Wire Assembly (WH-SL-GR)	190106-10	1
5	Bracket (Dial)	190120	1	20	Wire Assembly (WH-SL-RD)	190106-11	1
6	Bracket (Housing Mtg. Screw)	190119	1	21a	Dial Assembly	24(Ø)450	1
7	Rivet	190137-2	11	b	Dummy Plug Assembly	190600-*	
8	Lamp Base Assembly	190076	1	22	Handset and Cord Assembly	65**(C2)410	1
9	Rivet	59581-17	2	23	Desk Stand Cord	3049**(19)650	1
10	Switch	190267	1	24	Cradle Switch Bracket Assy.	190090	1
11	Rivet	58581-11	2	25	Spring	75307	1
12	Connecting Block Assembly	190073	1	26	Lamp Socket Assembly	190088	1
13	Insulator	190071	1	27	Lamp	79802	1
14	(Lead) Weight	190580-1	1	28	Resistor	64342-161	1
15	Screw	75436-2	2	29	Housing and Plunger Assembly	190128-*	1

Note: Dial and Dummy Plug Assemblies are both supplied complete with mounting screws.

Ø Replace by class code number for type required.  
\* Replace by color code suffix from series 1-16.  
\*\* Replace by color code number from series 00-16.

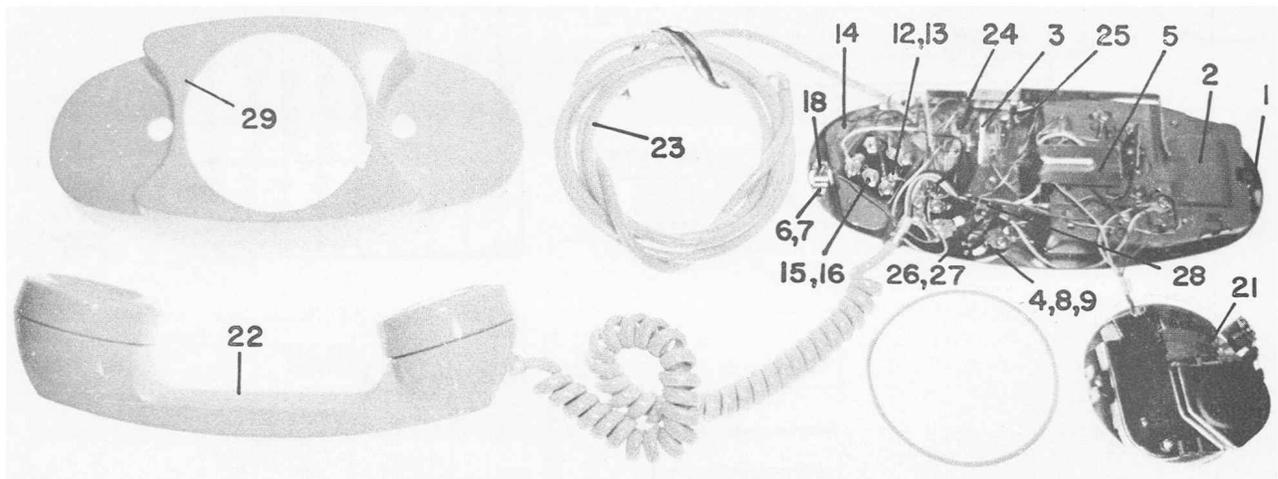


Fig. 1 TOP VIEW - HOUSING REMOVED

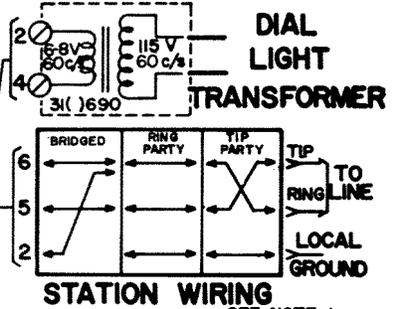
**RINGER OPTIONS**

BIASED	GAS TUBE	FREQ. SELECTIVE	PARTY IDENTIFICATION
139(--)470			
136(BA) 470	138(TBA) 470	137(--)470	--
BRIDGED RINGING 	-BIAS 	BRIDGED RINGING 	1000 OHM GROUND ---BIASED RINGER ---F.S. RINGER 
DIVIDED RINGING 	+BIAS 	DIVIDED RINGING 	2600 OHM GROUND ---BIASED RINGER ---F.S. RINGER 
4 1 5 6 2 7 3	4 1 5 6 2 7 3	4 1 5 6 2 7 3	4 1 5 6 2 7 3
4 L2 LI 3 D	4 L2 LI 3 D	4 L2 LI 3 D	4 B L2 LI 3 D

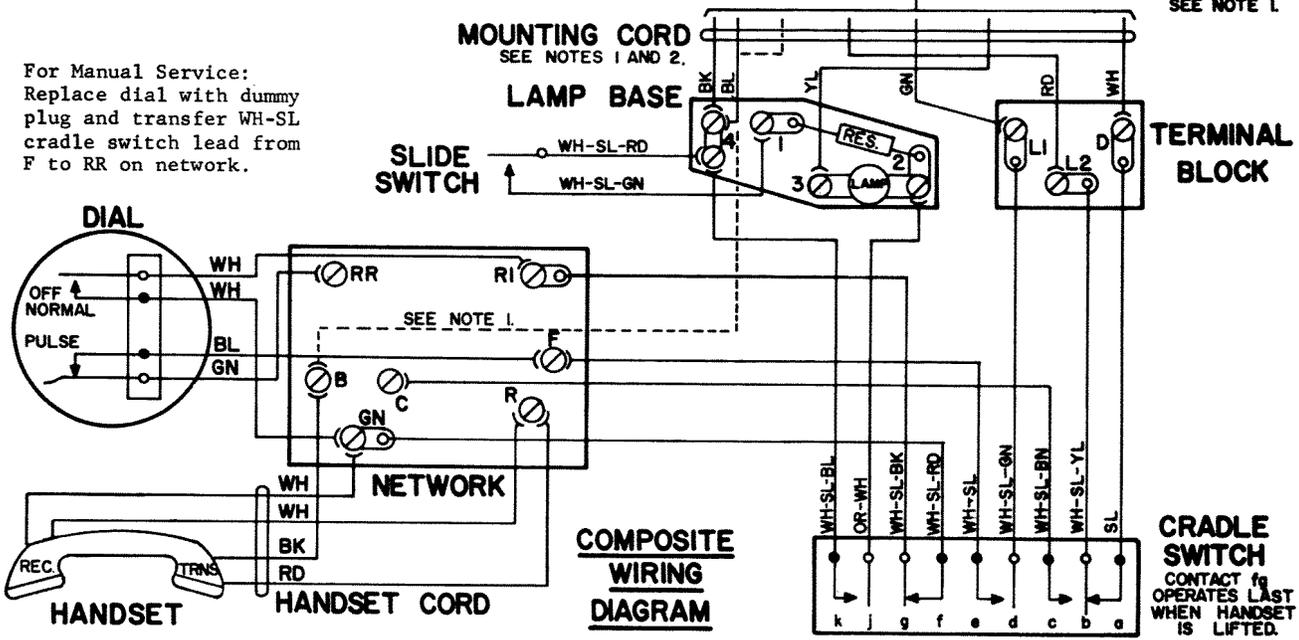
**RINGER NOTES**

1. Party Identification:  
Connect blue mounting cord lead as shown by dashed lines. Mounting cord connections shown for ring party. For tip party reverse red and green cord conductors on ringer terminal board and use ring party station wiring.

2. 6-Conductor Mounting Cord:  
Blue and black leads connected in parallel except for party identification - see note 1.



For Manual Service:  
Replace dial with dummy plug and transfer WH-SL cradle switch lead from F to RR on network.



**CIRCUIT DIAGRAM**  
(INSTRUMENT ONLY)

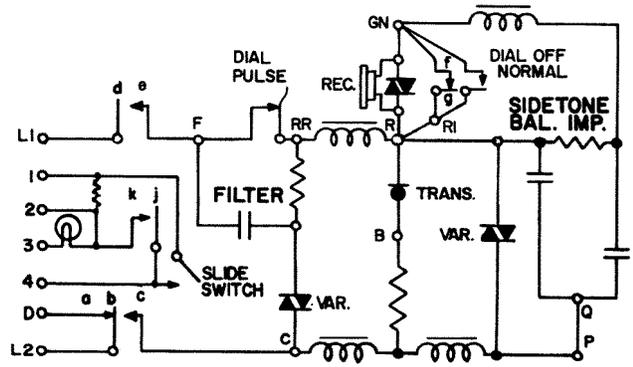


Fig. 2 DIAGRAMS 701--(LR)30- TELEPHONE

## TYPE 701--(LR)37- AND TYPE 701--(LR)38- DESK TELEPHONES

The 701--(LR)37- and 701--(LR)38- telephones are very compact desk types of instruments with built in combination dial and night lights, which illuminate the numeral rings, and separate indicator lamps. A small neon lamp, located in front of the handset, may be caused to glow by applying a DC potential of 90 volts across the line conductors at a remote point. The instruments are intended for use on PBX installations where the glowing lamp is used to indicate that a message has been left at the switchboard in the absence of the called party.

A switch at the rear of the instrument may be set so that the dial light glows dimly, for use as a night light, or is off when the handset is on the cradle. With the switch in either position the

light glows brightly when the handset is lifted. A separate power source of 6-8 volts AC or DC at a current of about 1/4 amp. is required to supply the dial lamp. A specially designed transformer, type 31( )690, is available for use on 110V AC power circuits.

The 701--(LR)37- instrument is provided with a 1/5 watt neon indicator lamp while the 701--(LR)38- is provided with a lower power 1/15 watt indicator lamp. The lamps must not be interchanged as the sockets have different built-in series resistors.

The installed telephone must be provided with a separately mounted, external ringer. Types 136, 137, 138 and 139 are recommended.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty	Item	Description	Number	Qty
1	Base Assy. c/w items 2 thru 20	190077-1	1	18	Lockwasher Screw	190139	2
2	Network Assembly	190107	1	19	Wire Assembly (WH-SL-GR)	190106-10	1
3	Spring Assembly (Cradle)	190092	1	20	Wire Assembly (WH-SL-RD)	190106-11	1
4	Insulator	190449	1	21a	Dial Assembly	24(Ø)450	]1
5	Bracket (Dial)	190120	1	b	Dummy Plug Assembly	190600-*	
6	Bracket (Housing Mtg. Screw)	190119	1	22	Handset and Cord Assembly	65**(C2)410	1
7	Rivet	190137-2	11	23	Desk Stand Cord	3049**(19)650	1
8	Lamp Base Assembly	190076	1	24	Cradle Switch Bracket Assy.	190090	1
9	Rivet	59581-17	2	25	Spring	75307	1
10	Switch	190267	1	26	Lamp Socket Assembly	190088	1
11	Rivet	59581-11	2	27	Lamp	79802	1
12	Connecting Block Assembly	190073	1	28	Resistor	64342-161	1
13	Insulator	190071	1	29	Housing and Plunger Assembly	190603-*	1
14	(Lead) Weight	190580-1	1	30a	Indicator Light - Code 37 inst.	95180-2	]1
15	Screw	75436-2	2	b	Indicator Light - Code 38 inst.	95180-1	
16	Hex Nut	70788	2	31a	Neon Lamp - Code 37 instruments	95181-2	]1
17	Mat	190121	1	b	Neon Lamp - Code 38 instruments	95181-1	

Note: Dial and Dummy Plug Assemblies are both supplied complete with mounting screws.

Ø Replace by class code number for type required.  
\* Replace by color code suffix from series 1-16.  
\*\* Replace by color code number from series 00-16.

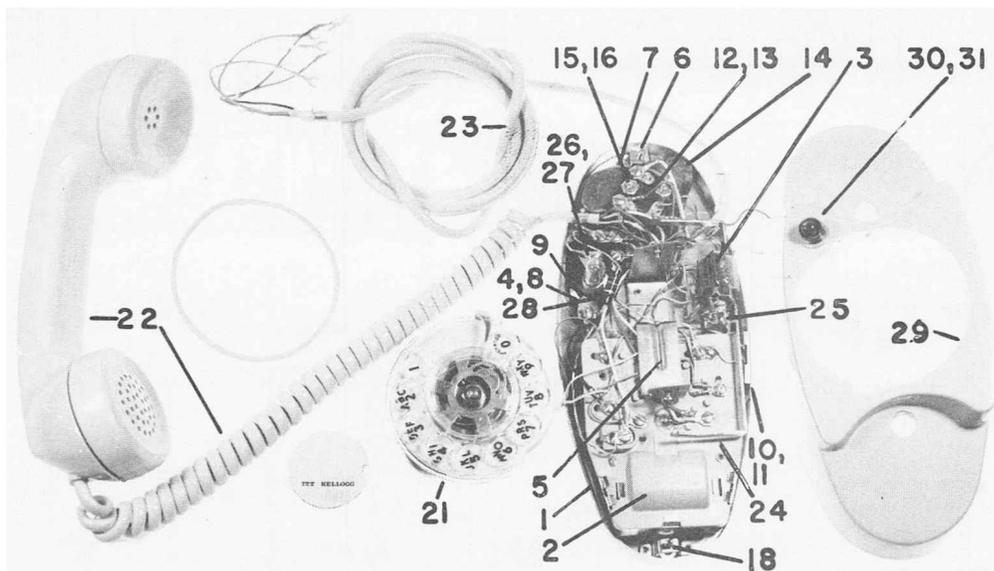
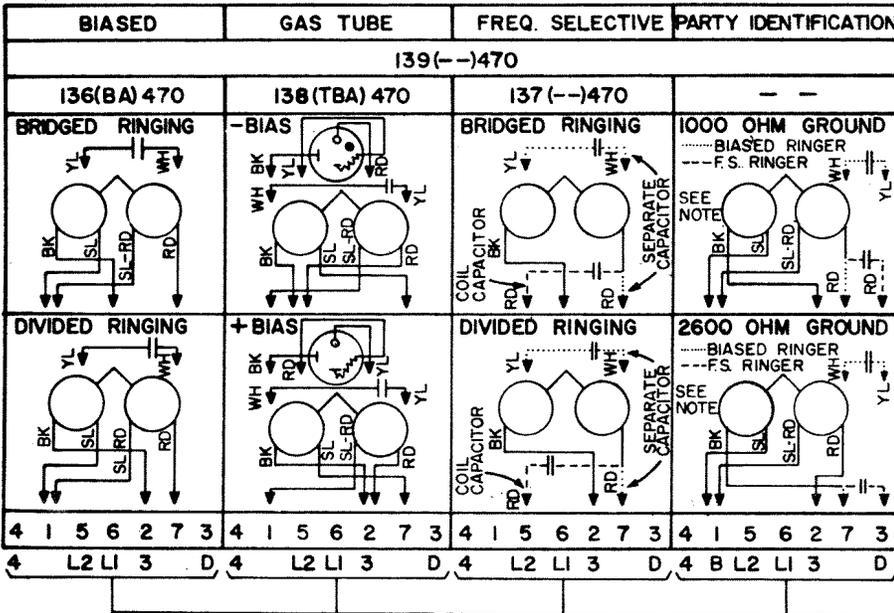


Fig. 1 TOP VIEW - HOUSING REMOVED

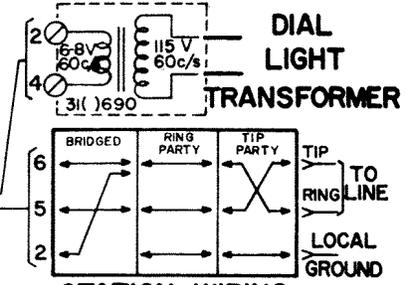
**RINGER OPTIONS**



**RINGER NOTES**

1. Party Identification:  
Connect blue mounting cord lead as shown by dashed lines. Mounting cord connections shown for ring party. For tip party reverse red and green cord conductors on ringer terminal board and use ring party station wiring.

2. 6-Conductor Mounting Cord:  
Blue and black leads connected in parallel except for party identification - see note 1.



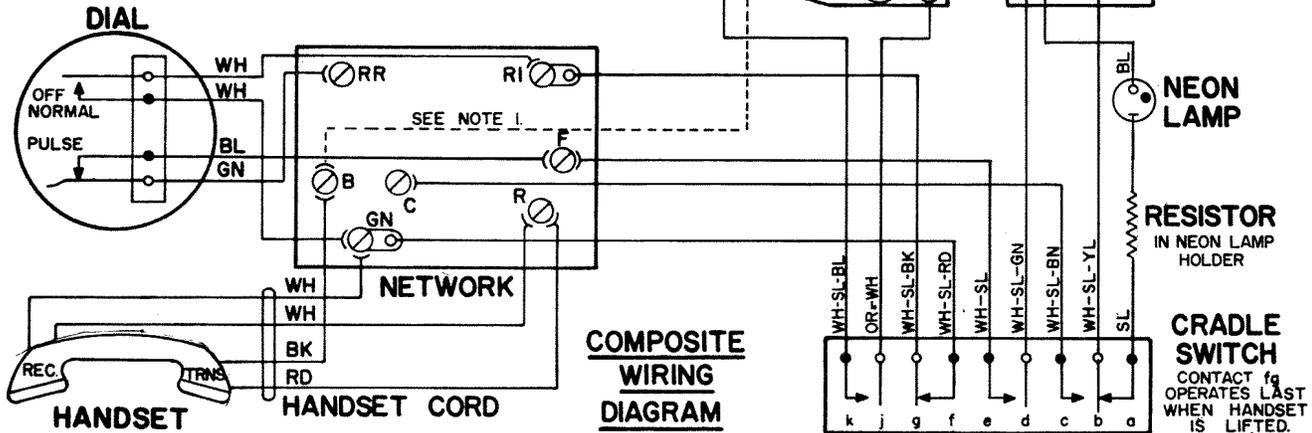
For Manual Service:  
Replace dial with dummy plug and transfer WH-SL cradle switch lead from F to RR on network.

**MOUNTING CORD**  
SEE NOTES 1 AND 2.

**LAMP BASE**

**SLIDE SWITCH**

**COMPOSITE WIRING DIAGRAM**



**CIRCUIT DIAGRAM**  
(INSTRUMENT ONLY)

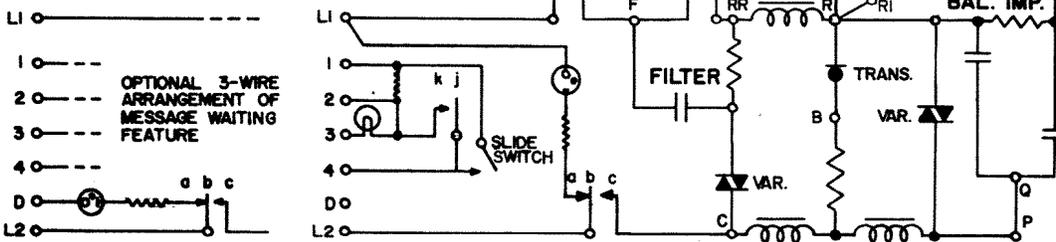


Fig. 2 DIAGRAMS 701--(LR)37- TELEPHONE AND 701--(LR)38- TELEPHONE

## TYPE 703--(LR)30- DESK TELEPHONE

The 703--(LR)30- telephone is a very compact desk type of instrument. It is identical with the type 701--(LR)30- telephone except that the built in combination dial light/night light is omitted.

The installed telephone must be provided with a separately mounted, external ringer. Types 136, 137, 138 and 139 are recommended. The wiring for these ringers is included in the diagrams of Fig. 2.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty	Item	Description	Number	Qty
1	Base Assy. c/w items 2 thru 15	190077-2	1	12	Screw	75436-2	2
2	Network Assembly	190107	1	13	Hex Nut	70788	2
3	Spring Assembly (Cradle)	190092	1	14	Mat	190121	1
4	Gasket	190261-1	1	15	Lockwasher Screw	190139	2
5	Bracket (Dial)	190120	1	16a	Dial Assembly	24(Ø)450	] 1
6	Bracket (Housing Mtg. Screw)	190119	1	b	Dummy Plug Assembly	190600-*	
7	Rivet	190137-2	11	17	Handset and Cord Assembly	65**(C2)410	1
8	Slug (Plugs Lamp Mtg. Hole)	95250	1	18	Desk Stand Cord	3051**(19)650	1
9	Connecting Block Assembly	190073	1	19	Cradle Switch Bracket Assy.	190090	1
10	Insulator	190071	1	20	Spring	75307	1
11	(Lead) Weight	190580-1	1	21	Housing and Plunger Assembly	190128-*	1

Note: Dial and Dummy Plug Assemblies are both supplied complete mounting screws.

Ø Replace by class code number for type required.  
\* Replace by color code suffix from series 1-16.  
\*\* Replace by color code number from series 00-16.

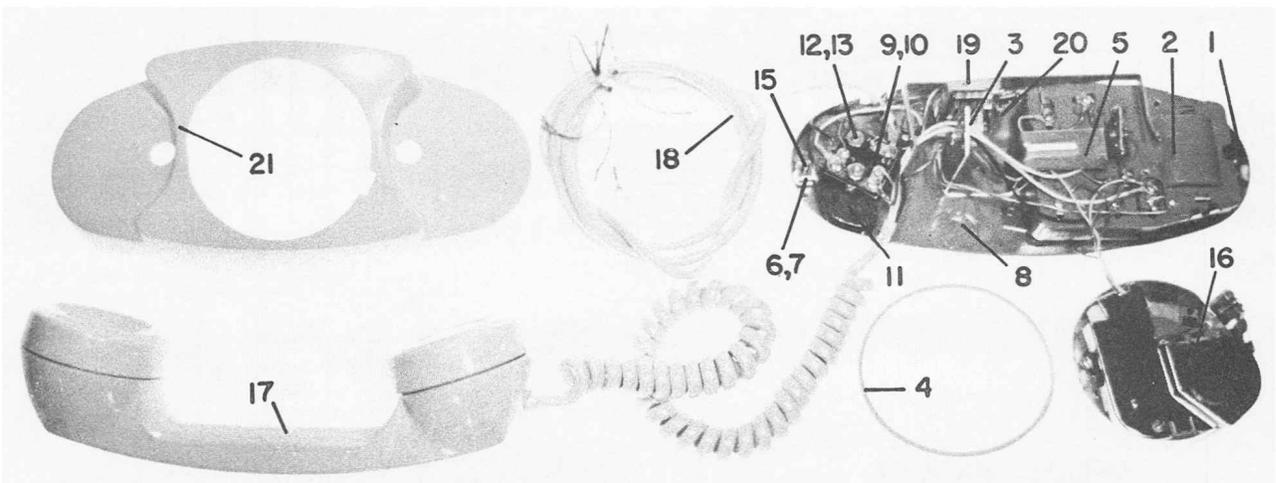


Fig. 1 TOP VIEW - HOUSING REMOVED

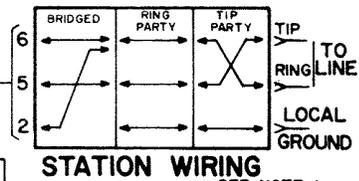
**RINGER OPTIONS**

BIASED	GAS TUBE	FREQ. SELECTIVE	PARTY IDENTIFICATION
139(-)-470			
136(BA) 470 BRIDGED RINGING	138(TBA) 470 -BIAS	137(-)-470 BRIDGED RINGING	-- 1000 OHM GROUND
136(BA) 470 DIVIDED RINGING	138(TBA) 470 +BIAS	137(-)-470 DIVIDED RINGING	-- 2600 OHM GROUND
4 1 5 6 2 7 3 L2 LI D	4 1 5 6 2 7 3 L2 LI D	4 1 5 6 2 7 3 L2 LI D	4 1 5 6 2 7 3 B L2 LI D

**RINGER NOTES**

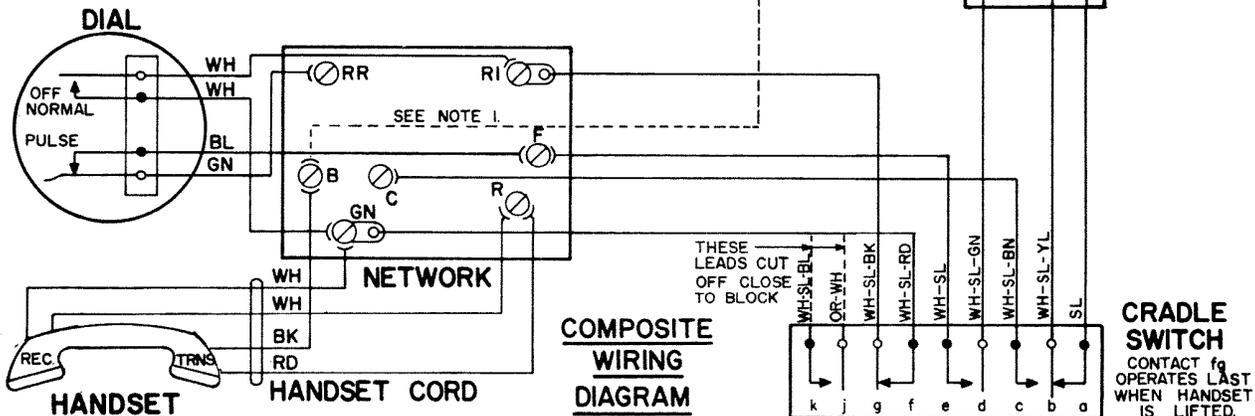
1. Party Identification:  
Connect yellow mounting cord lead as shown by dashed lines. Mounting cord connections shown for ring party. For tip party reverse red and green cord conductors on ringer terminal board and use ring party station wiring.

2. 6-Conductor Mounting Cord:  
Yellow and black leads connected in parallel except for party identification - see note 1.



**MOUNTING CORD**  
SEE NOTES 1 AND 2

For Manual Service:  
Replace dial with dummy plug and transfer WH-SL cradle switch lead from F to RR on network.



**CIRCUIT DIAGRAM**  
(INSTRUMENT ONLY)

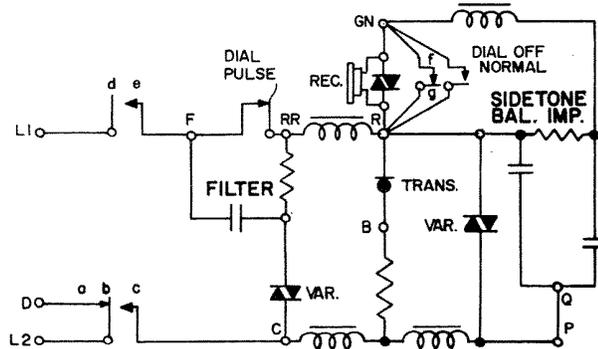


Fig. 2 DIAGRAMS 703--(LR)30- TELEPHONE

## TYPE 703--(LR)37- AND TYPE 703--(LR)38- DESK TELEPHONES

The 703--(LR)37- and 703--(LR)38- telephones are very compact desk types of instruments with the addition of indicator lamps. A small neon lamp, located in front of the handset, may be caused to glow by applying a DC potential of 90 volts across the line at a remote point. The instruments are intended for use on PBX installations where the glowing lamp is used to indicate that a message has been left at the switchboard in the absence of the called party.

The 703--(LR)37- instrument is provided with a 1/5 watt neon indicator lamp while the 703--(LR)38- is provided with a lower power 1/15 watt indicator lamp. The lamps must not be interchanged as the sockets have different built in series resistors.

The installed telephone must be provided with a separately mounted, external ringer. Types 136, 137, 138 and 139 are recommended. The wiring for these ringers is included in the diagrams of Fig. 2.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty	Item	Description	Number	Qty
1	Base Assy. c/w items 2 thru 15	190077-2	1	14	Mat	190121	1
2	Network Assembly	190107	1	15	Lockwasher Screw	190139	2
3	Spring Assembly (Cradle)	190092	1	16a	Dial Assembly	24(Ø)450	]1
4	Gasket	190261-1	1	b	Dummy Plug Assembly	190600-*	
5	Bracket (Dial)	190120	1	17	Handset and Cord Assembly	65**(C2)410	1
6	Bracket (Housing Mtg. Screw)	190119	1	18	Desk Stand Cord	3051**(19)650	1
7	Rivet	190137-2	11	19	Cradle Switch Bracket Assy.	190090	1
8	Slug (Plugs Lamp Mtg. Hole)	95250	1	20	Spring	75307	1
9	Connecting Block Assembly	190073	1	21	Housing and Plunger Assembly	190603-*	1
10	Insulator	190071	1	22a	Indicator Light - Code 37 inst.	95180-2	]1
11	(Lead) Weight	190580-1	1	b	Indicator Light - Code 38 inst.	95180-1	
12	Screw	75436-2	2	23a	Neon Lamp - Code 37 instruments	95181-2	]1
13	Hex Nut	70788	2	b	Neon Lamp - Code 38 instruments	95181-1	

Note: Dial and Dummy Plug Assemblies are both supplied complete with mounting screws.

Ø Replace by class code number for type required.  
\* Replace by color code suffix from series 1-16.  
\*\* Replace by color code number from series 00-16.

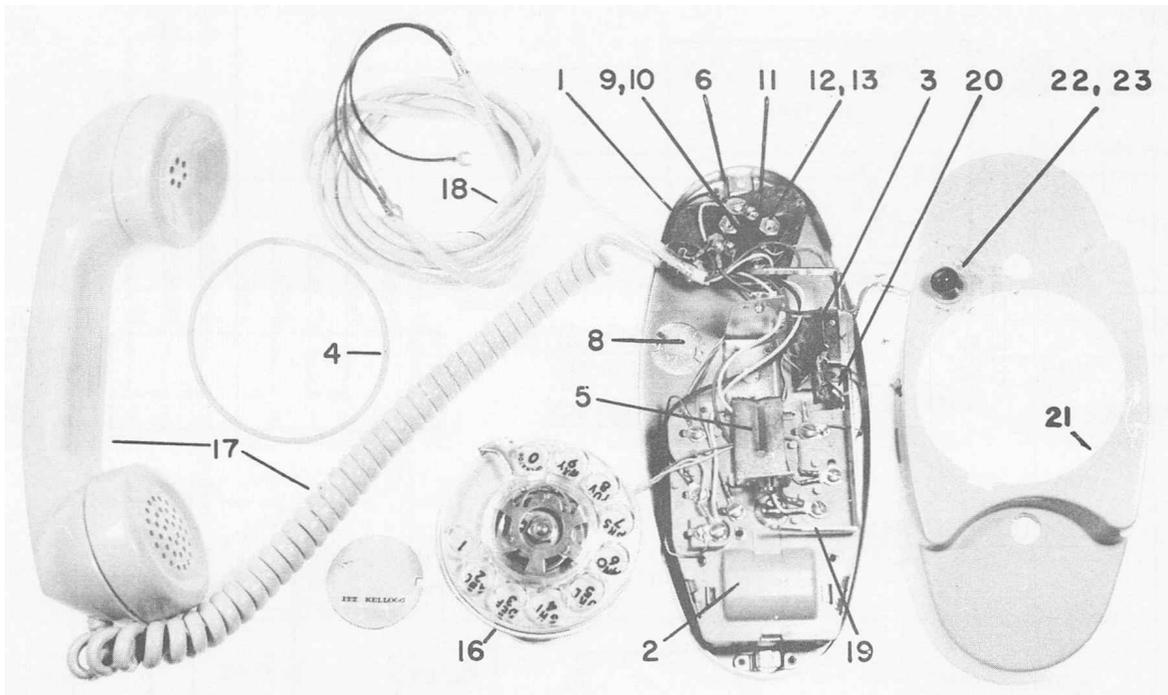
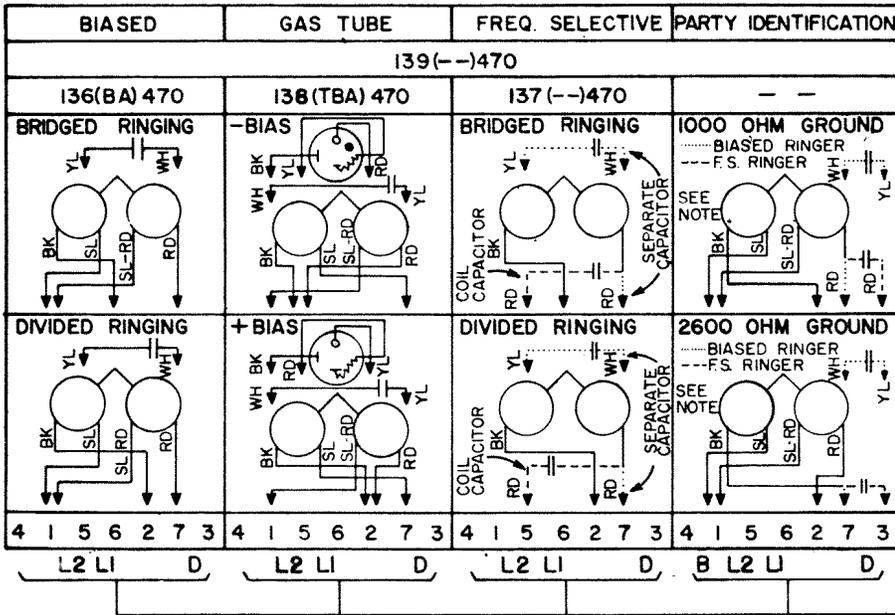


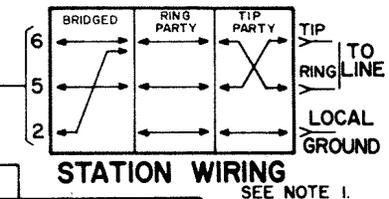
Fig. 1 TOP VIEW - HOUSING REMOVED

**RINGER OPTIONS**



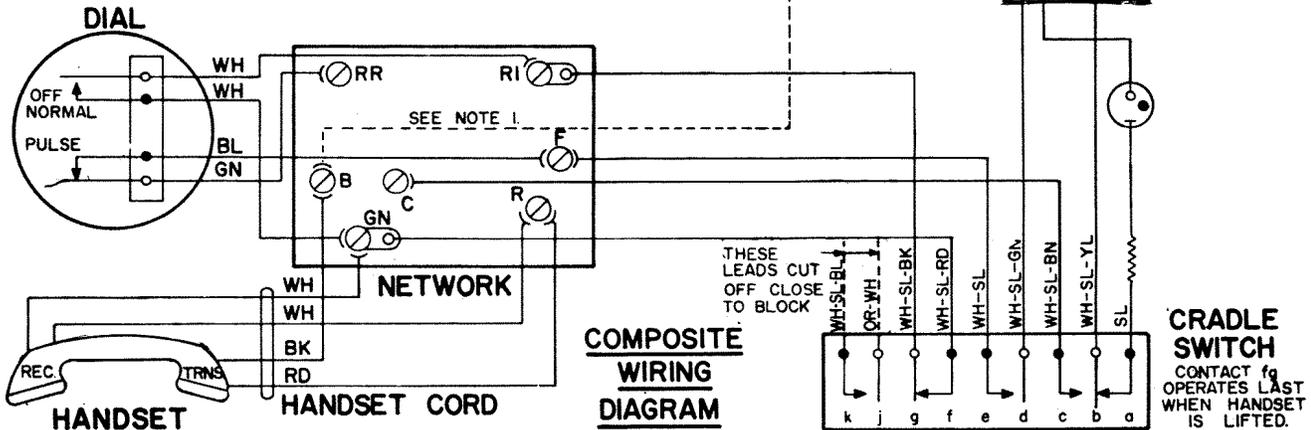
**RINGER NOTES**

1. Party Identification: Connect yellow mounting cord lead as shown by dashed lines. Mounting cord connections shown for ring party. For tip party reverse red and green cord conductors on ringer terminal board and use ring party station wiring.
2. 6-Conductor Mounting Cord: Yellow and black leads connected in parallel except for party identification - see note 1.



**MOUNTING CORD**  
SEE NOTES 1 AND 2

For Manual Service:  
Replace dial with dummy plug and transfer WH-SL cradle switch lead from F to RR on network.



**CIRCUIT DIAGRAM**  
(INSTRUMENT ONLY)

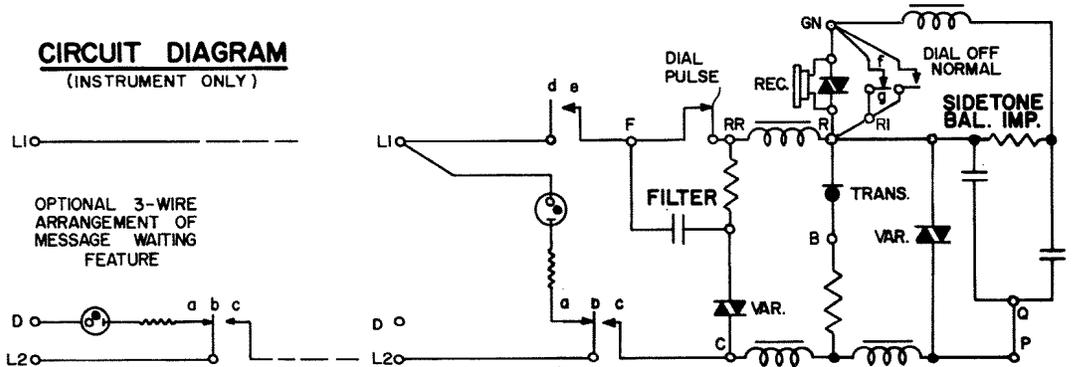


Fig. 2 DIAGRAMS 703--(LR)37- TELEPHONE AND 703--(LR)38- TELEPHONE

## TYPE 581--(--)-30- PREPAY PAYSTATION TELEPHONE

1.1 The 581--(--)-30- prepay paystation telephone is designed for counter top installation. A sturdy adaptor is available for use where wall mounting is desired.

1.2 The instrument features a case hardened steel housing, a tamper-proof cash compartment lock, self-sealing cash boxes and an anti-stuffing coin return hopper. All features are fully described in the

sub-sections detailing each item of the assembly.

1.3 The paystation circuit is arranged for use with exchanges equipped with coin control repeaters and sources of positive and negative 110 volt dc.

1.4 The instrument is available in colors of Ivory, Light Beige and Light Grey, codes 09, 13 and 14 respectively.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty	Item	Description	Number	Qty
1	Housing and Mechanism Assembly comprising items 2 thru 11	86905-*	1	15a	Ringer Assy. Biased	130(BA)470	
2	Baseplate	86956-*	1	b	Freq. Sel. with Vol. Cont.	131(Ø)470	1
3	Lower Housing Assembly	86962-*	1	c	Freq. Sel. less Vol. Cont.	133(Ø)470	
4	Upper Housing Assembly	86951-*	1	16	Rd. Hd. Lockwasher Screw	75408-2	2
5	Housing Key	190516	2	17	Washer	60629	2
6	Cash Box Assembly	86361	1	18	Screw	63587	2
7	Cash Door c/w lock and 3 keys	86953-*	1	19a	Dial Assembly	19**(Ø)450	
8	Special Screw	190568	1	b	Dummy Plug Assembly	79456-*	1
9	Coin Mechanism Assembly	86967	1	20	Nut	63986	4
10	Polar Relay Assembly	86979	1	21	Spring Washer	54336-5	4
11	Coin Storage Assembly	86984	1	22	Handset and Cord Assembly	65**(Ø)410	1
12	Network Assembly	75335-1	1	23	Desk Stand Cord (3 Cond.)	3053**(Ø)650	1
13	Fl. Fil. Hd. Mach. Screw	75386	2	24	Connecting Block	32( )783	1
14	Washer	58694	2	25	Wire Assembly	75326-10	1
				26	Wire Assembly	75326-38	1

Note: Ringer, Dial and Dummy Plug Assemblies are all supplied complete with mounting screws.

Ø Replace by class code number for type required.  
\* Replace by color code suffix from series 1-16.  
\*\* Replace by color code number from series 00-16.

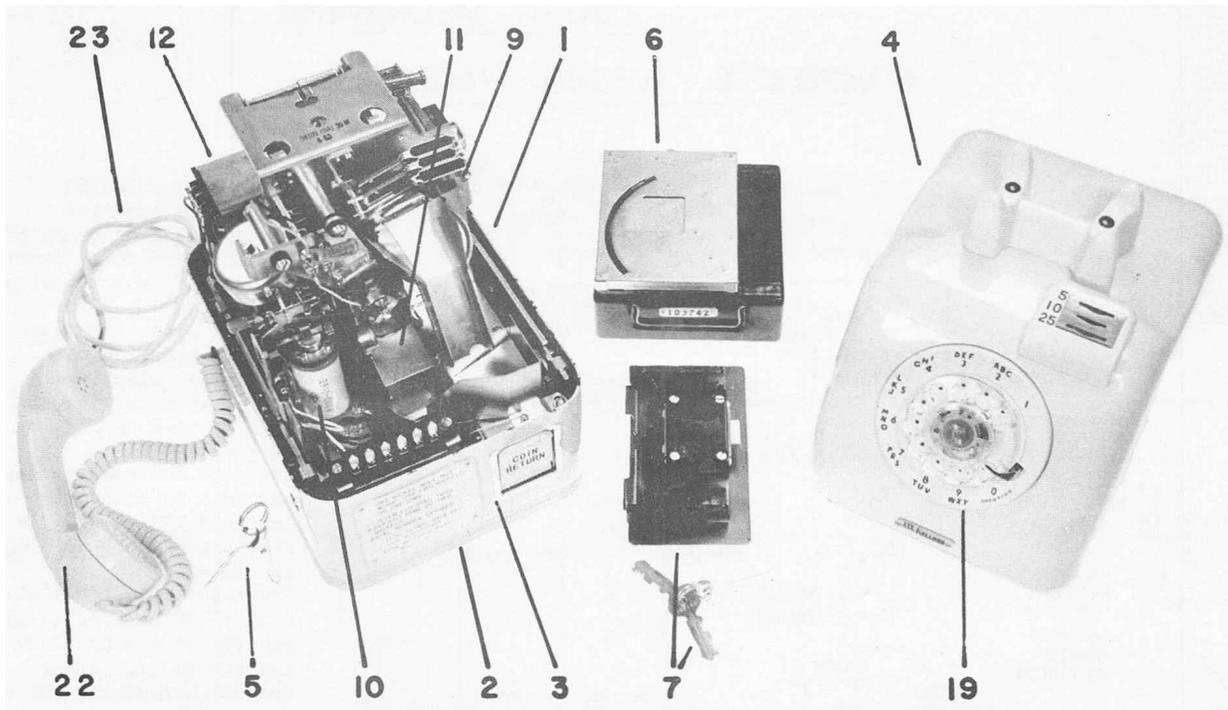
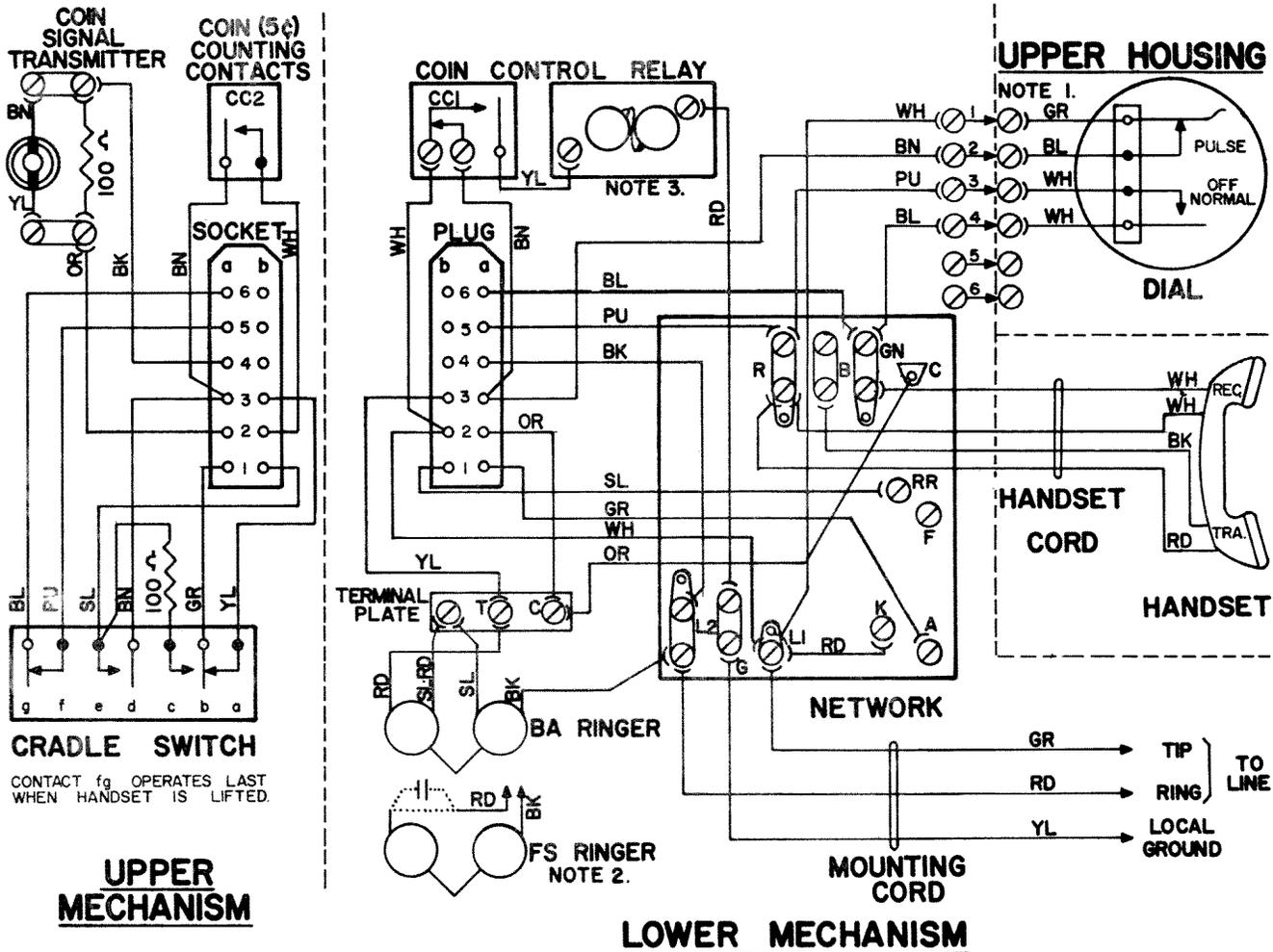


Fig. 1 FRONT VIEW - HOUSING REMOVED



**CIRCUIT DIAGRAMS**

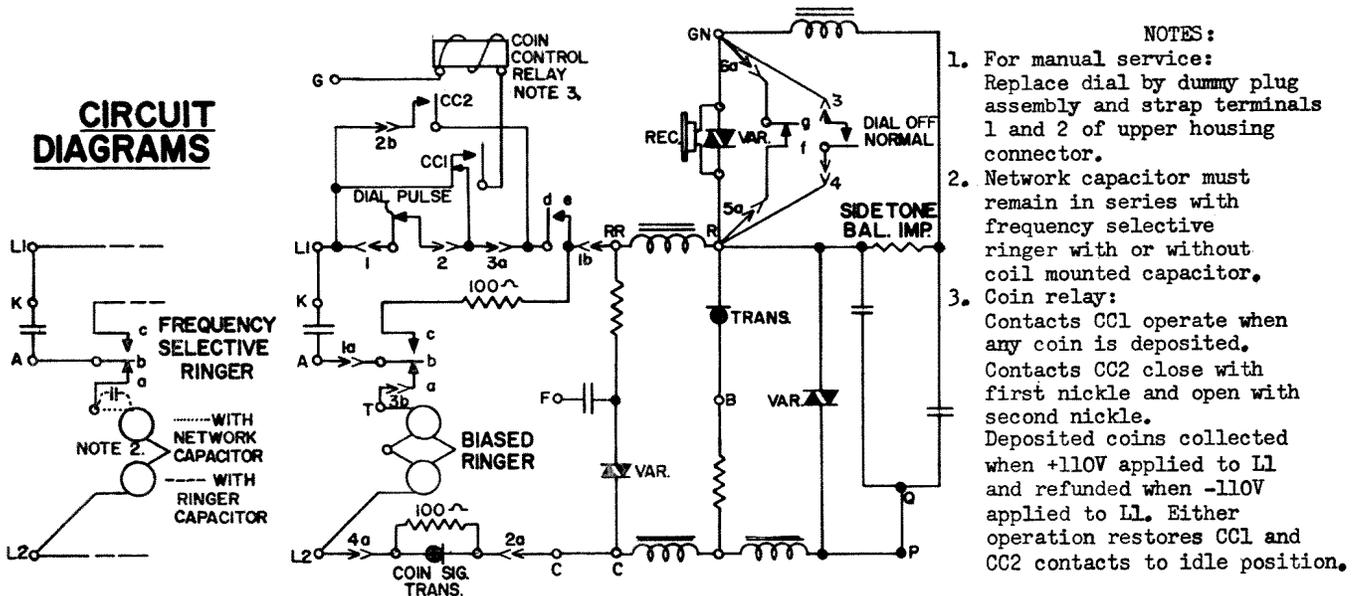


Fig. 2 DIAGRAMS 581--(--)-30- TELEPHONE

## KEY SERIES DESK TYPE TELEPHONES

### CONTENTS

Section		Page	Figure		Page
1	GENERAL DESCRIPTION	1	1-1	KEY SERIES TELEPHONE	1
2	ASSOCIATED PUBLICATIONS	1	3-1	COMPONENT PARTS - EXPLODED VIEW	2
3	DISASSEMBLY AND ASSEMBLY	1			
4	TEST AND ADJUSTMENT	2			

### 1 GENERAL DESCRIPTION

1.1 The KEY series provides a range of compact, anti-sidetone type desk telephones, with built-in multiple push-button units, which operate efficiently over a wide range of loop resistance and line impedance. Each instrument consists of a pressed steel baseplate, with four protective rubber feet, on which all internal parts are mounted. A molded plastic housing covers the assembly and provides a cradle for the handset, which is connected to the internal components by a flexible plastic covered cord. A second plastic covered cord connects the instrument to a molded terminal block.

1.2 The KEY telephone instruments are available with their internal components and circuit arranged for any class of service on any type of automatic or manual telephone system. Special features, except for the Amphenol Plug (code 40), are not available with this series of telephones. Specific details for each type of instrument are given in individual sub-sections, each indexed by the instrument/special feature code (e.g. 544/30).

1.3 All instruments in the series can be supplied in any of the colors listed in sub-section M1A-COL.



Fig. 1-1 KEY SERIES TELEPHONE

### 2 ASSOCIATED PUBLICATIONS

2.1 General information on ordering, installation and maintenance is given in part 1 of the manual.

2.2 The various components and sub-assemblies used in each instrument are described in part 2 of the manual.

2.3 Specific descriptions, parts lists, wiring diagrams and circuit diagrams for each of the different assemblies in the KEY series are given in individual sub-sections in part 3 of the manual. Each sub-section is indexed by the instrument and special feature code numbers.

### 3 DISASSEMBLY AND ASSEMBLY

3.1 The exploded view of Fig. 3-1 shows all the component parts and sub-assemblies of the KEY type of telephone instrument. Procedures for disassembly and assembly are given below. Some slight changes to these procedures may be necessary for certain of the different types of key telephones.

#### 3.2 DISASSEMBLY - BASIC INSTRUMENT

- a: Loosen the cabinet lock screws (8) and remove the housing (13).
- b: Disconnect the leads, loosen the clamping screws and lift out the dial (10a), if fitted.
- c: Disconnect the leads, loosen the mounting screws then remove the ringer (9).
- d: Disconnect the leads and remove the handset and cord assembly (11).

- e: Disconnect the leads and remove the desk stand cord (12).
- f: Disconnect the remaining leads, remove screws, washers and nuts (3,4,5) and lift out the network (2), if required.
- g: Remove the screws (18) and lift out the plunger and retainer assembly (17).
- h: Disconnect the leads, remove the screws (20) and lift out the lamp strip assembly (19).
- i: Remove the screws (15) and lift out the key assembly (14).

Note: The complete key assembly, lamp strip assembly and plunger and retainer assembly may be removed as a unit by taking out the three screws (15).

### 3.3 ASSEMBLY - BASIC INSTRUMENT

Reassemble the instrument in the reverse order to that given for disassembly, noting the points listed below.

- a: Refer to the appropriate wiring diagram to reconnect the various leads.
- b: Make sure that the cradle switch leads run through the hook on the right hand side of the bracket.
- c: Place the handset cord under the edge of the ringer frame, in front of the cradle switch and underneath the dial.
- d: Locate the ringer coil leads underneath, but

- not trapped by, the ringer frame.
- e: Place the desk stand cord under the tab in the rear right hand corner of the baseplate.
- f: Make certain that the leads of the desk stand cord do not foul any moving parts.
- g: Make sure that the locating pips on the dial casting engage in the holes in the tips of the bracket and that the leads do not foul the cradle switch assembly.
- h: The housing must fit freely without binding on any part.
- i: Check the reassembled unit as detailed in Section 4.

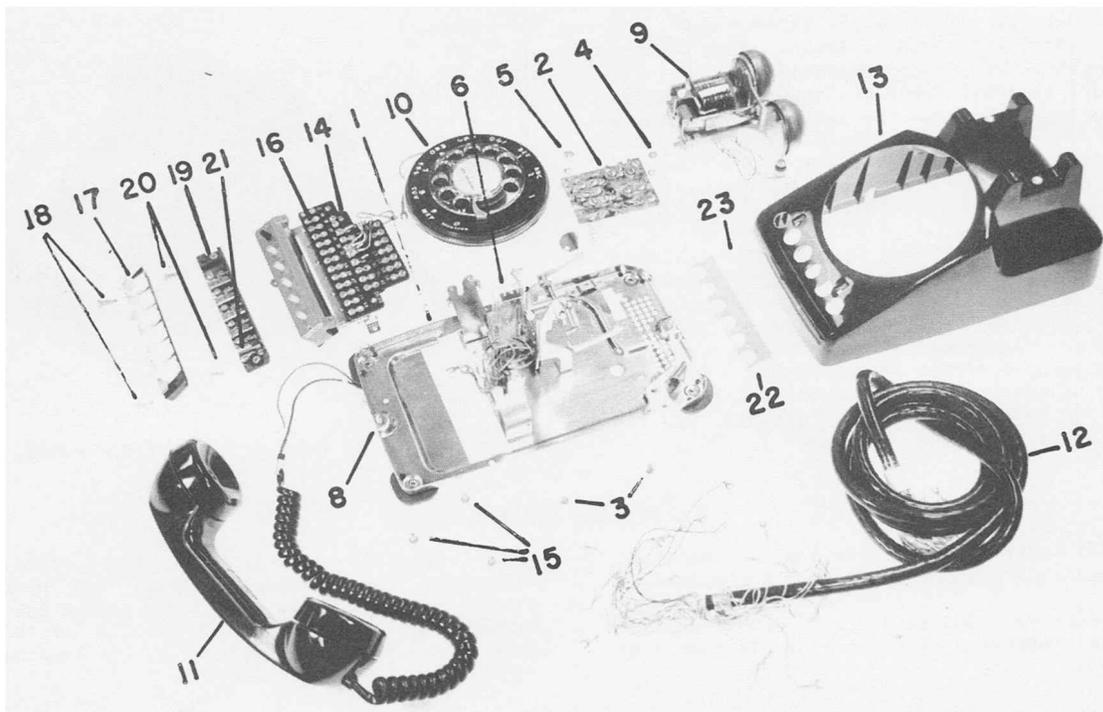


Fig. 3-1 COMPONENT PARTS - EXPLODED VIEW

## 4 TEST AND ADJUSTMENT

4.1 Tests and adjustments on the sub-assemblies are detailed in their respective sub-sections. The following checks must be made on the completely assembled instrument.

### 4.2 CRADLE SWITCH

Check that either plunger will fully operate the spring assembly before being depressed to a point 1/8" above the cradle molding and that the plungers may be lifted slightly after the handset is removed. Bend the side arms of the actuator, using two pairs of pliers, to adjust, if necessary.

### 4.3 KEY SWITCH

Check that all plungers operate freely and

that automatically restoring plungers, released by depressing another plunger (and releasing it, in some cases), release freely and correctly.

### 4.4 FUNCTIONAL TESTS

Connect the telephone to a working line and check for correct operation of the following:

- a: Dial, if fitted.
- b: Transmitter and receiver.
- c: Ringer and volume control, if fitted.
- d: Cradle Switch.
- e: Adequate suppression of sidetone.
- f: Absence of noise due to loose contacts when the instrument is gently bumped or shaken.
- g: Correct electrical functioning of all keys.

## TYPE 544--(--)-30- DESK TELEPHONE

The 544--(--)-30- desk telephone is a four button type of key instrument with the same transmission circuit as the 500 series of instruments. It is designed for use on key telephone systems, which may be installed as branch exchanges or completely private systems, of either the automatic or manual type.

The four keys are allocated for use, from left to right, as follows. The first key is a HOLD key and may be used to hold a call received on any line while another call is made on a second line. The second and third keys are individual LINE keys while the fourth key may be optionally wired as either a LINE key or an interphone SIGNAL key.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty	Item	Description	Number	Qty
1	Base Assy. c/w items 2 thru 8	79525	1	13	Housing and Plunger Assembly	79405-#	1
2	Network Assembly	75335	1	14	Key Assembly	588(B)740	1
3	Bind. Hd. Mach. Screw	69116-3	2	15	Hex. Hd. Mach. Screw	79532-2	3
4	Spring Washer	54336-5	2	16	Bind. Hd. Mach. Screw (terminal)	79485-2	13
5	Hex. Nut	67093	2	17	Plunger and Retainer Assembly	79441-2	1
6	Cradle Switch Assembly	79489	1	18	Mounting Screw	79521	2
7	Rivet	31944-2	3	19	Lamp Strip Assembly	79523	1
8	Cabinet Lock Screw	75486	2	20	Bind. Hd. Mach. Screw	74909-2	2
9	Ringer Assy., Biased	130(BA)470	1	21	Lamp	51(A)745	3
10a	Dial Assembly	19**(Ø)450	1	22	Escutcheon	79099-2	1
b	Dummy Plug Assembly	79456-*		23	Designation Card	82028	1
11	Handset and Cord Assembly	65**(C2)410	1	24	Bushing	79409	1
12a	Desk Stand Cord, Black Inst.	83900(09)650	1				
b	Desk Stand Cord, Colored Inst.	83908(09)650					

Note: Ringer, Dial and Dummy Plug Assemblies are all supplied complete with mounting screws.

Ø Replace by class code number for type required.  
\* Replace by color code suffix from series 1-16.  
\*\* Replace by color code number from series 00-16.  
# Replace by color code suffix from series 21-36.

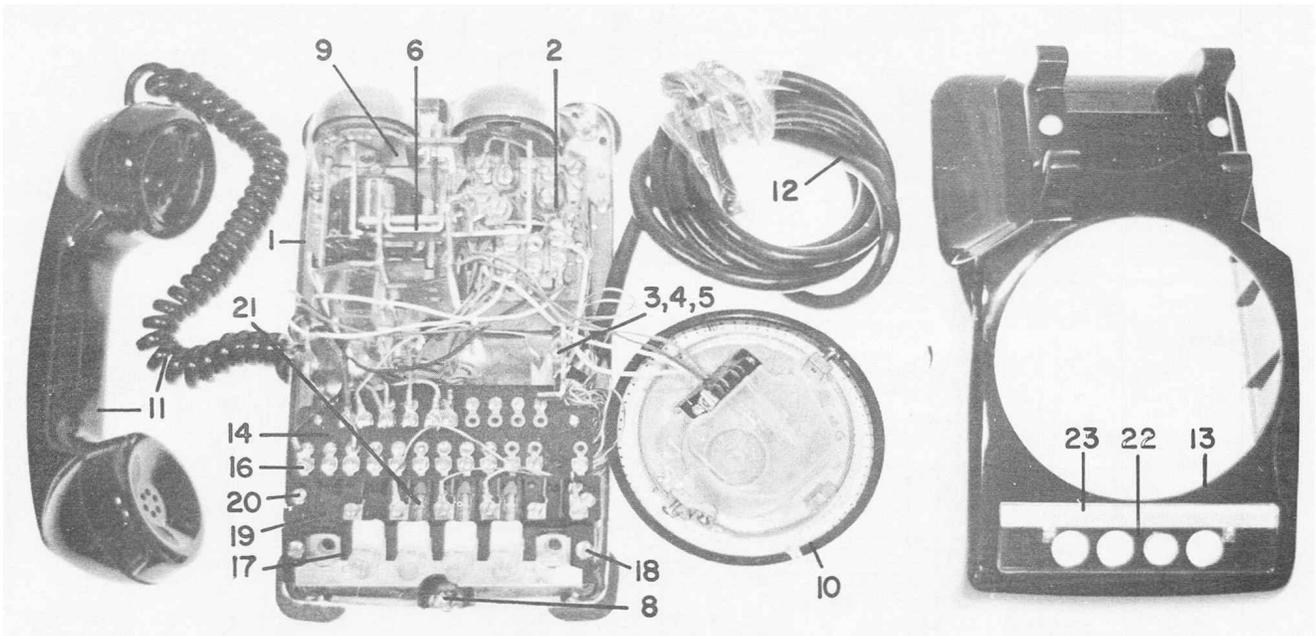


Fig. 1 TOP VIEW - HOUSING REMOVED

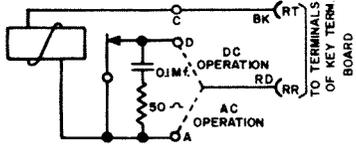
**NOTES**

1. Spare conductors of mounting cord have ends taped and stored inside telephone and connecting block.
2. Refer to Sub-section M2H-KYS-1 for method of converting third pick-up key for use as a signalling key and transfer brown key lead from M to SG on terminal board.

**BIASED RINGER**

Ringer Cut-Off Control: Bend stop beside detent on volume control to clear rim of ringer frame. This provides extra control position to lock ringer armature.

**OPTIONAL BUZZER**



For Manual Service: Replace dial with dummy plug and transfer green key switch lead from F to RR on network.

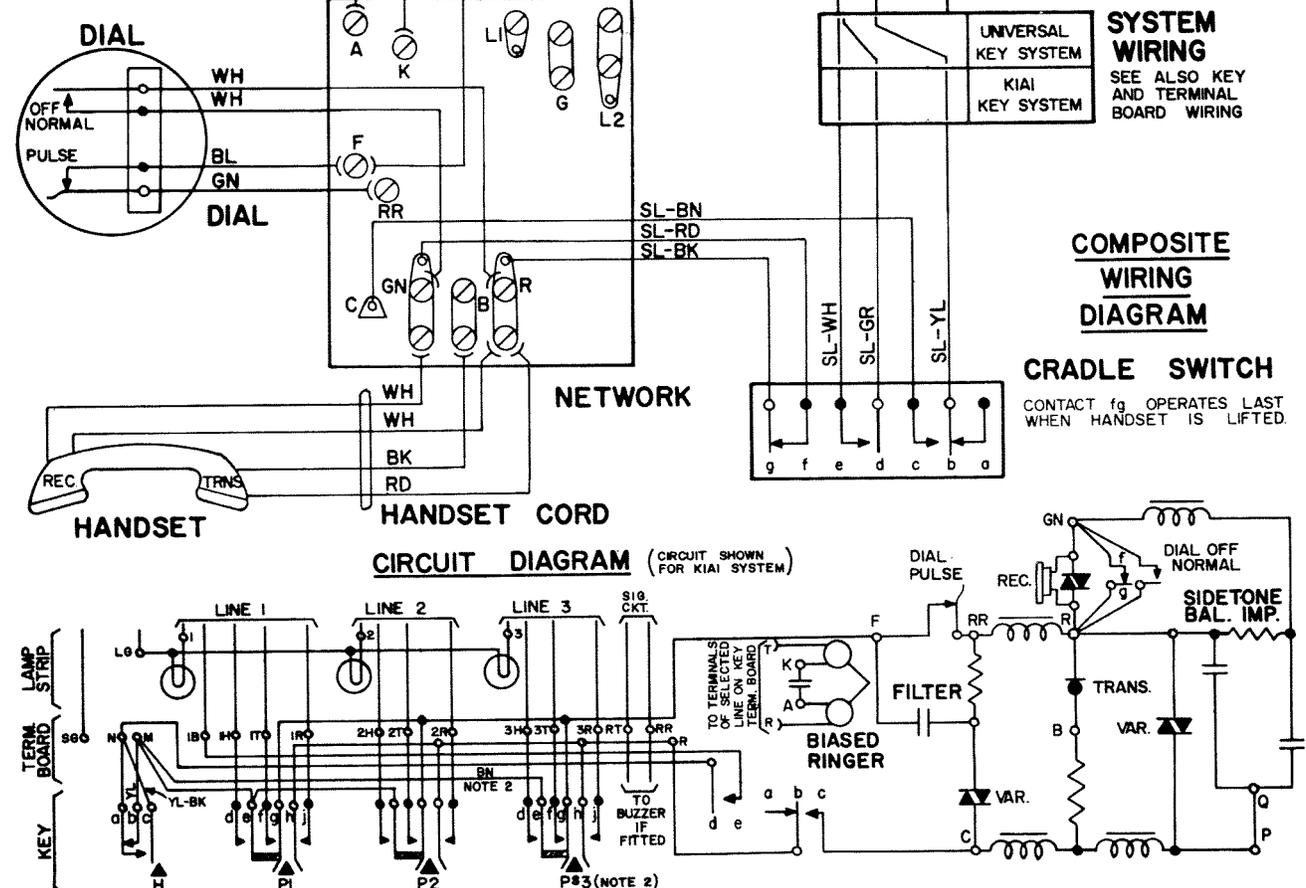


Fig. 2 DIAGRAMS 544--(--)-30- TELEPHONE

## TYPE 564--(--)-30- AND TYPE 564--(--)-40- DESK TELEPHONES

The 564--(--)-30- and 564--(--)-40- desk telephones are six button types of key instruments with the same transmission circuit as the 500 series of instruments. They are designed for use on key telephone systems, which may be installed as branch exchanges or completely private systems, of either the automatic or manual type. The only difference between the two instruments is that the 564--(--)-40- telephone has its desk stand cord terminated in an Amphenol plug. This feature allows the instrument to be changed quickly and easily should such action become necessary for maintenance purposes or system testing.

The six keys on the units are allocated for use, from left to right, as follows. The first key is a HOLD key which may be used to hold a call received on any line while another call is made on a second line. The second and third keys are individual LINE keys and the remaining three keys may each be optionally wired as either LINE or interphone SIGNAL keys. Thus a maximum of five lines may be accessed from the one instrument, with a common hold key, and up to three of these lines may be connected as private intercommunication lines to other instruments - one additional key being used for the common interphone signalling circuit.

Table I REPLACEABLE PARTS

Item	Description	Number	Qty	Item	Description	Number	Qty
1	Base Assy. c/w items 2 thru 8	79525	1	13	Housing and Plunger Assembly	79405-*	1
2	Network Assembly	75335	1	14	Key Assembly	589(B) 740	1
3	Bind. Hd. Mach. Screw	69116-3	2	15	Hex. Hd. Mach. Screw	79532-2	3
4	Spring Washer	54336-5	2	16	Bind. Hd. Mach. Screw (terminal)	79485-2	20
5	Hex. Nut	67093	2	17	Plunger and Retainer Assembly	79441	1
6	Cradle Switch Assembly	79489	1	18	Mounting Screw	79521	2
7	Rivet	31944-2	3	19	Lamp Strip Assembly	79524	1
8	Cabinet Lock Screw	75486	2	20	Bind. Hd. Mach. Screw	74909-2	2
9	Ringer Assy., Biased	130(BA)470	1	21	Lamp	51(A) 745	5
10a	Dial Assembly	19**( $\emptyset$ )450	1	22	Escutcheon	79099	1
b	Dummy Plug Assembly	79456-*	1	23	Designation Card	82028	1
11	Handset and Cord Assembly	65** (C2) 410	1	24	Bushing	79409	1
12a	Desk Stand Cord - Code 30	840** (09) 650	1				
b	Desk Stand Cord - Code 40	858** (09) 650	1				

Note: Ringer, Dial and Dummy Plug Assemblies are all supplied complete with mounting screws.

$\emptyset$  Replace by class code number for type required.  
\* Replace by color code suffix from series 1-16.  
\*\* Replace by color code number from series 00-16.

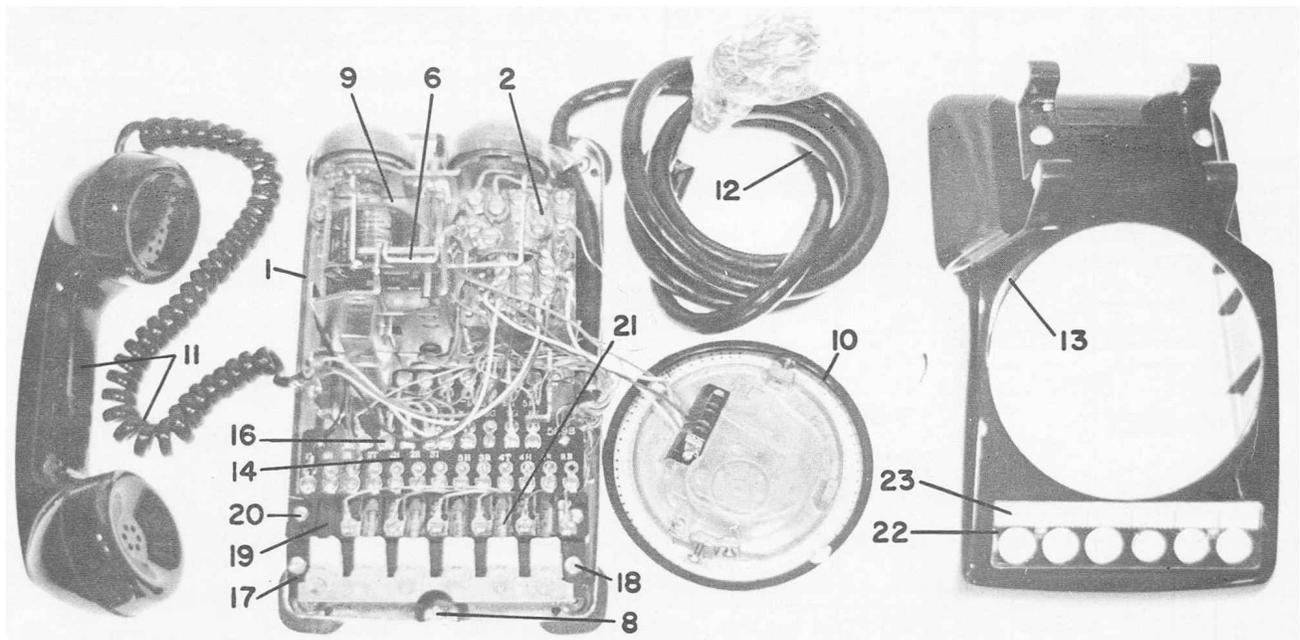


Fig. 1 TOP VIEW - HOUSING REMOVED

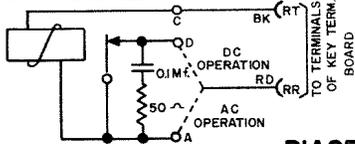
**NOTES**

1. Spare conductors of mounting cord have ends taped and stored inside telephone. Circled numbers on connecting block are Amphenol plug pin numbers.
2. Four leads, wiring from indicated points on key strip, connected to terminals as shown for five pick-up lines. Refer to Sub-section M2H-KYS-1 for method of changing convertible pick-up keys for use as signalling keys and transfer four leads as follows:

KEY	FUNCTION	TRANSFER	FROM	TO
PS5	Signal	BK-BN	X	SG
PS4 & PS5	Signal	SL-BN	M	SG
PS3	Signal	BN	M	SG
PS4*	Intercomm.	SL-BN	M	5H
PS3*	Intercomm.	BN	M	X
PS2*	Intercomm.	YL-BN	M	X

\* Keys must be converted in order shown using PS5 as a common signalling key.

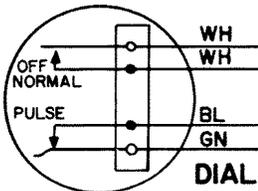
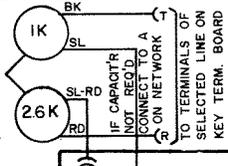
**OPTIONAL BUZZER**



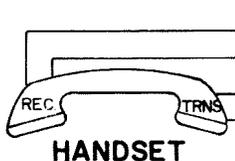
**KEY & TERM. BOARD**

**BIASED RINGER**

Ringer Cut-Off Control: Bend stop beside detent on volume control to clear rim of ringer frame. This provides extra control position to lock ringer armature.



For Manual Service: Replace dial with dummy plug and transfer green key switch lead from F to RR on network.



**CIRCUIT DIAGRAM**

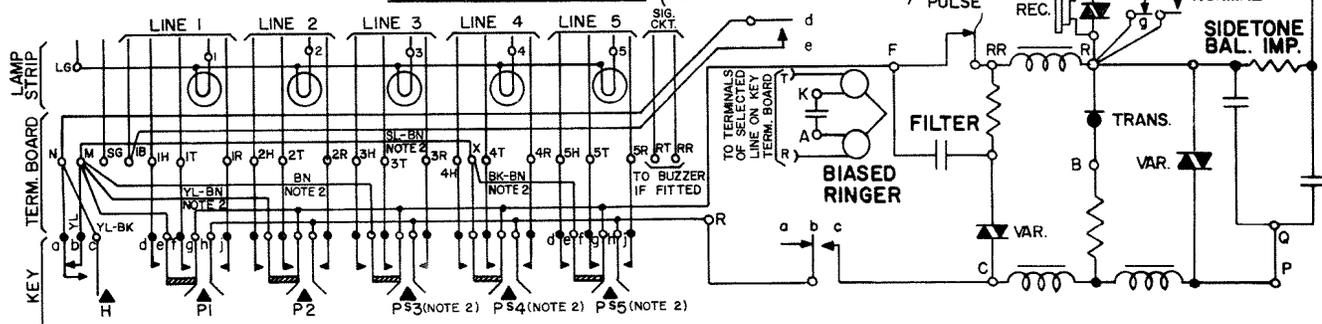
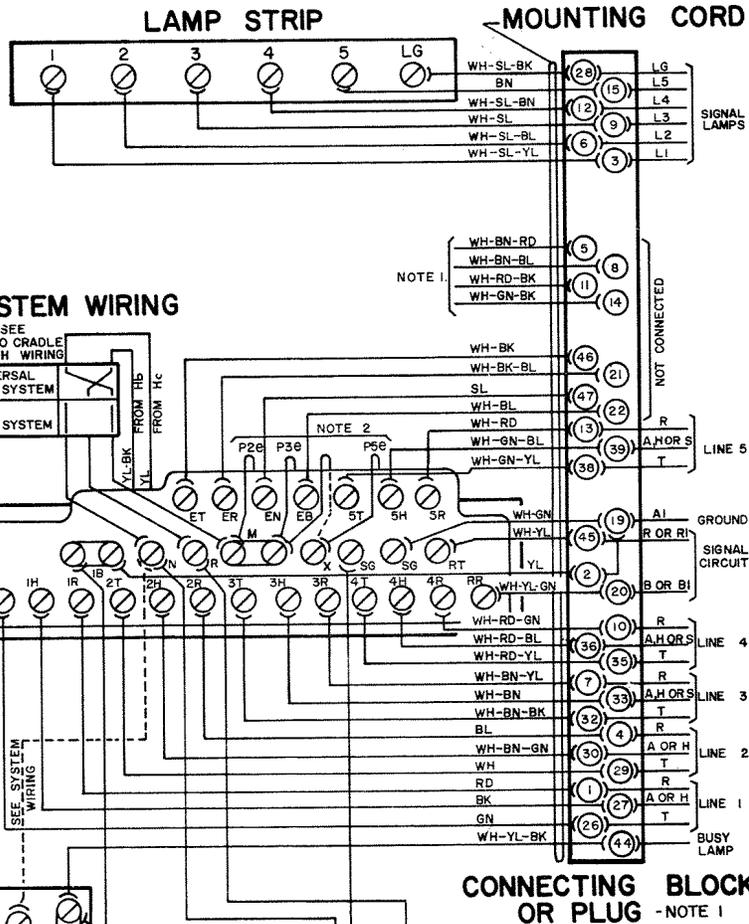


Fig. 2 DIAGRAMS 564---(---)30- AND 564---(---)40- TELEPHONES



WITH STATION BUSY LAMP	UNIVERSAL KEY SYSTEM
LESS STATION BUSY LAMP	KIAI KEY SYSTEM

**COMPOSITE WIRING DIAGRAM**

**CRADLE SWITCH**

CONTACT fg OPERATES LAST WHEN HANDSET IS LIFTED.

## TYPE 565--(--)-30- AND TYPE 565--(--)-40- DESK TELEPHONES

The 565--(--)-30- and 565--(--)-40- desk telephones are six button types of key instruments with the same transmission circuit as the 500 series of instruments. They are designed for use on key telephone systems, which may be installed as branch exchanges or completely private systems, of either the automatic or manual type. The only difference between the two instruments is that the 565--(--)-40-telephone has its desk stand cord terminated in an Amphenol plug. This feature allows the instrument to be changed quickly and easily should such action become necessary for maintenance purposes or system testing. These instruments incorporate an exclusion switch, operated by lifting the left hand plunger and automatically reset when the handset is replaced,

so that any other telephones on one of the lines may be disconnected for confidential conversations. The six keys on the units are allocated for use, from left to right, as follows. The first key is a HOLD key which may be used to hold a call received on any line while another call is made on a second line. The second and third keys are individual LINE keys and the remaining three keys may each be optionally wired as either LINE or interphone SIGNAL keys. Thus a maximum of five lines may be accessed from the one instrument, with a common hold key, and up to three of these lines may be connected as private intercommunication lines to other instruments - one additional key being used for the common interphone signalling circuit.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty	Item	Description	Number	Qty
1	Base Assy. c/w items 2 thru 8	69525-1	1	13	Housing and Plunger Assy	79937-*	1
2	Network Assembly	75335	1	14	Key Assembly	589(B)740	1
3	Bind. Hd. Mach. Screw	69116-3	2	15	Hex. Hd. Mach. Screw	79532-2	3
4	Spring Washer	54336-5	2	16	Bind. Hd. Mach. Screw	79485-2	20
5	Hex. Nut	67093	2	17	Plunger and Retainer Assy.	79441	1
6	Cradle Switch Assembly	79489-3	1	18	Mounting Screw	69521	2
7	Rivet	31944-2	3	19	Lamp Strip Assembly	79524	1
8	Cabinet Lock Screw	75486	2	20	Bind. Hd. Mach. Screw	74909-2	2
9	Ringer Assy., Biased	130(BA)470	1	21	Lamp	51(A)745	5
10a	Dial Assembly	19**(Ø)450	1	22	Escutcheon	79099	1
b	Dummy Plug Assembly	79456-*	1	23	Designation Card	82028	1
11	Handset and Cord Assembly	65**(C2)410	1	24	Bushing	79409	1
12a	Desk Stand Cord - Code 30	840**(09)650	1	25	Plunger Switch Assy.	79971	1
b	Desk Stand Cord - Code 40	858**(09)650	1				

Note: Ringer, Dial and Dummy Plug Assemblies are all supplied complete with mounting screws.

Ø Replace by class code number for type required.  
\* Replace by color code suffix from series 1-16.  
\*\* Replace by color code number from series 00-16.

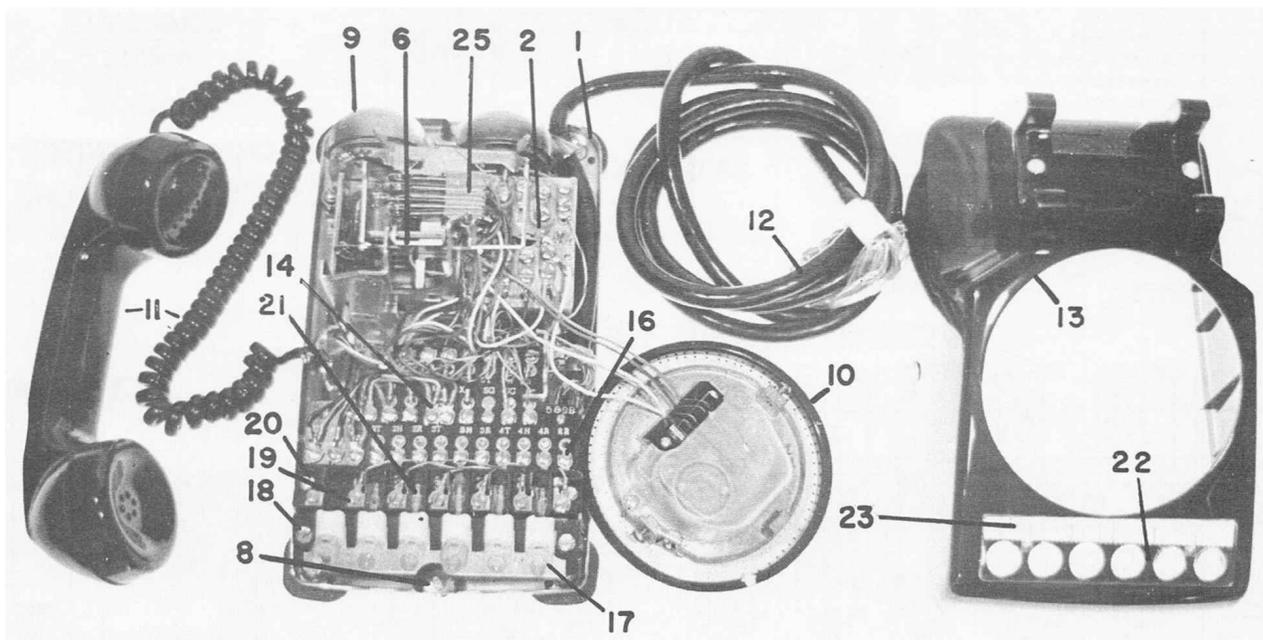


Fig. 1 TOP VIEW - HOUSING REMOVED

**NOTES**

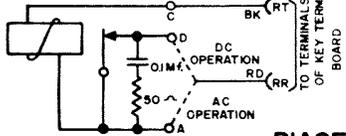
1. Spare conductors of mounting cord have ends taped and stored inside telephone. Circled numbers on connecting block are Amphenol plug pin numbers.

2. Four leads, wiring from indicated points on key strip, connected to terminals as shown for five pick-up lines. Refer to Sub-section M2H-KYS-1 for method of changing convertible pick-up keys for use as signalling keys and transfer four leads as follows:

KEY	FUNCTION	TRANSFER	FROM	TO
PS5	Signal	BK-BN	X	SG
PS4 & PS5	Signal	SL-BN	M	SG
PS3	Signal	BN	M	SG
PS4*	Intercomm.	SL-BN	M	5H
PS3*	Intercomm.	BN	M	X
PS2*	Intercomm.	YL-BN	M	X

\* Keys must be converted in order shown using PS5 as a common signalling key.

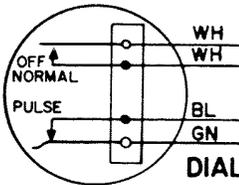
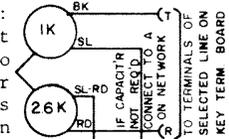
**OPTIONAL BUZZER**



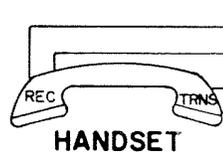
**KEY & TERM. BOARD**

**BIASED RINGER**

Ringer Cut-Off Control: Bend stop beside detent on volume control to clear rim of ringer frame. This provides extra control position to lock ringer armature.



For Manual Service: Replace dial with dummy plug and transfer green F to RR on network.



**HANDSET CORD**

**CIRCUIT DIAGRAM** (CIRCUIT SHOWN FOR KIAI SYSTEM LESS STATION BUSY LAMP)

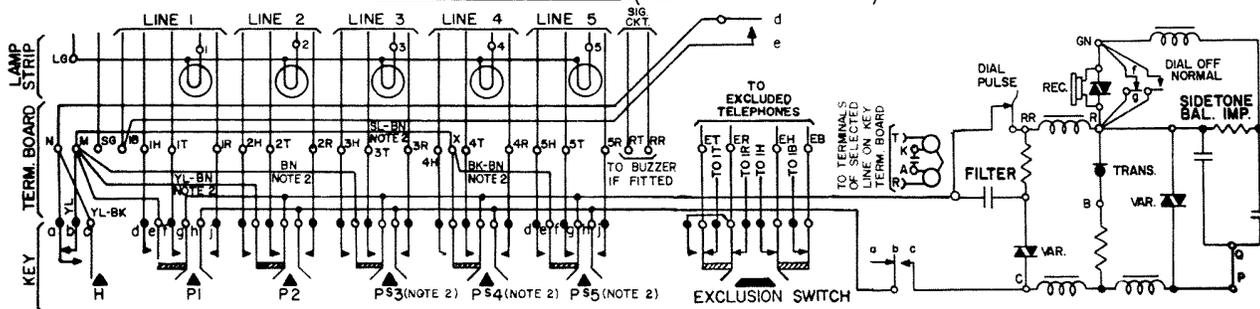
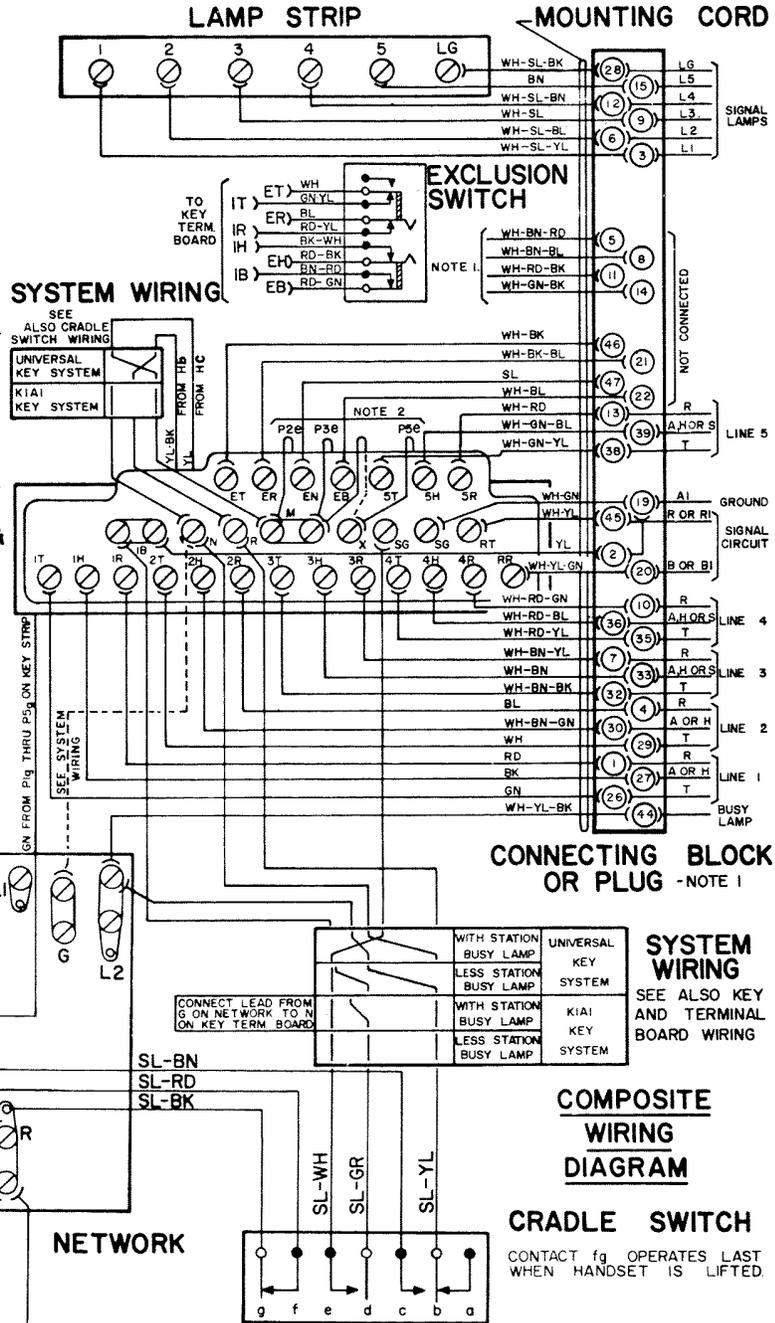


Fig. 2 DIAGRAMS 565--(--)-30- AND 565--(--)-40- TELEPHONES



## TYPE 565--(--)-39- AND TYPE 565--(--)-42- DESK TELEPHONES

The 565--(--)-39- and 565--(--)-42- desk telephones are six button types of key instruments with the same transmission circuit as the 500 series of instruments. They are designed for use on key telephone systems, which may be installed as branch exchanges or completely private systems, of either the automatic or manual type. The only difference between the two instruments is that the 565--(--)-42-telephone has its desk stand cord terminated in an Amphenol plug. This feature allows the instrument to be changed quickly and easily should such action become necessary for maintenance purposes or system testing. These instruments incorporate an exclusion switch, operated by lifting the left hand plunger and automatically reset when the handset is replaced, so that any other telephones on one of the lines may be disconnected for confidential conversations.

The instrument is also wired for use with the type 3A Speakerphone equipment. The six keys on the unit are allocated for use, from left to right, as follows. The first key is a HOLD key which may be used to hold a call received on any line while another call is made on a second line. The second and third keys are individual LINE keys and the remaining three keys may each be optionally wired as either LINE or interphone SIGNAL keys. Thus a maximum of five lines may be accessed from the one instrument, with a common hold key, and up to three of these lines may be connected as private intercommunication lines to other instruments - one additional key being used for the common interphone signalling circuit. Two wire circuits are provided for each signalling lamp thus allowing flexibility in lamp signal circuitry.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty	Item	Description	Number	Qty
1	Base Assy. c/w items 2 thru 8	79525-5	1	14	Key Assembly	589(H)740	1
2	Network Assembly	75335	1	15	Hex. Hd. Mach. Screw	79532-2	3
3	Bind. Hd. Mach. Screw	69116-3	2	16	Bind. Hd. Mach. Screw	79485-2	22
4	Spring Washer	54336-5	2	17	Plunger and Retainer Assembly	79441	1
5	Hex. Nut	67093	2	18	Mounting Screw	79521	2
6	Cradle Switch Assembly	79489-3	1	19	Lamp Strip Assembly	86403	1
7	Rivet	31944-2	3	20	Bind. Hd. Mach. Screw	79409-2	2
8	Cabinet Lock Screw	75486	2	21	Lamp	51(A)745	5
9	Ringer Assy., Biased	130(BA)470	1	22	Escutcheon	79099	1
10a	Dial Assembly	28**(Ø)450	1	23	Designation Card	82028	1
b	Dummy Plug Assembly	79456-*		24	Bushing	79409	1
11	Handset and Cord Assembly	65**(C2)410	1	25	Plunger Switch Assembly	79971	1
12a	Desk Stand Cord - Code 39	860**(09)650	1	26	Terminal Board	86405	1
b	Desk Stand Cord - Code 42	857**(09)650		27	Rd. Hd. Mach. Screw	56570	2
13	Housing and Plunger Assembly	79987-*	1				

Note: Ringer, Dial and Dummy Plug Assemblies are all supplied complete with mounting screws.

Ø Replace by class code number for type required.  
\* Replace by color code suffix from series 1-16.  
\*\* Replace by color code number from series 00-16.

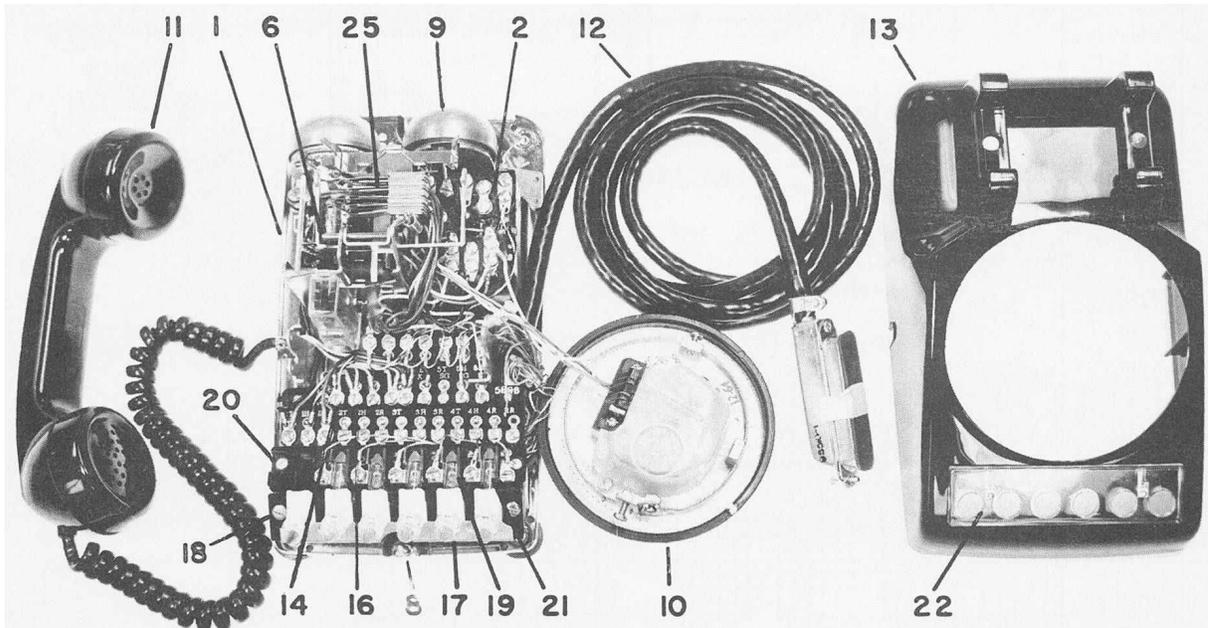


Fig. 1 TOP VIEW - HOUSING REMOVED

**NOTES**

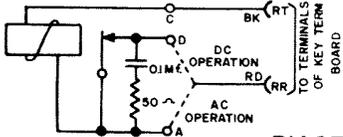
1. Spare conductors of mounting cord have ends taped and stored inside telephone. Mounting cord lead colors are shown with tracer first, body second. Circled numbers on plug indicate pin numbers.

2. Four leads, wiring from indicated points on key strip, connected to terminals as shown for five pick-up lines. Refer to Sub-section M2H-KYS-1 for method of changing convertible pick-up keys for use as signalling keys and transfer four leads as follows:

KEY	FUNCTION	TRANSFER	FROM	TO
PS5	Signal	BK-BN	X	SG
PS4 & PS5	Signal	SL-BN	M	SG
PS3	Signal	BN	M	SG
PS4*	Intercomm.	SL-BN	M	5H
PS3*	Intercomm.	BN	M	X
PS2*	Intercomm.	YL-BN	M	X

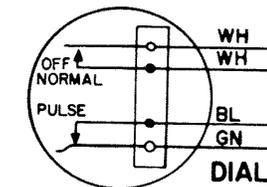
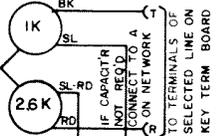
\* Keys must be converted in order shown using PS5 as a common signalling key.

**OPTIONAL BUZZER**

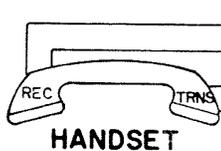


**BIASED RINGER**

Ringer Cut-Off Control: Bend stop beside detent on volume control to clear rim of ringer frame. This provides extra control position to lock ringer armature.



For Manual Service: Replace dial with dummy plug and transfer green key switch lead from F to RR on network.



**HANDSET CORD**

**CIRCUIT DIAGRAM** (CIRCUIT SHOWN FOR KIAI SYSTEM LESS STATION BUSY LAMP)

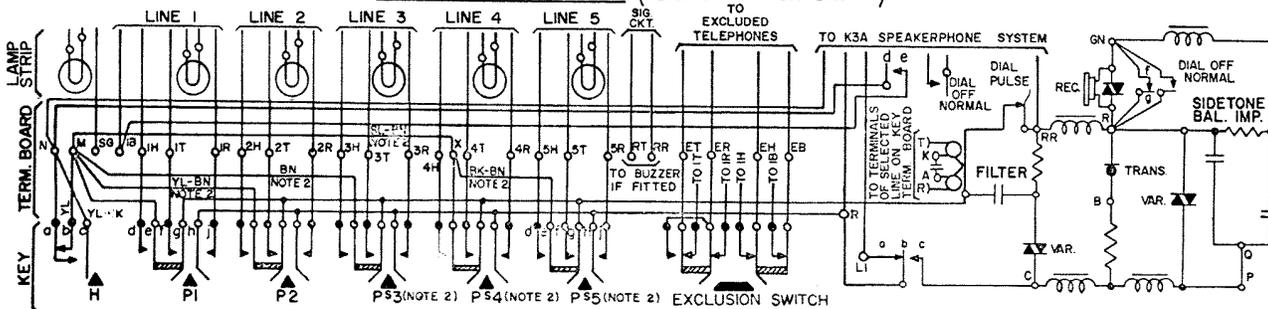
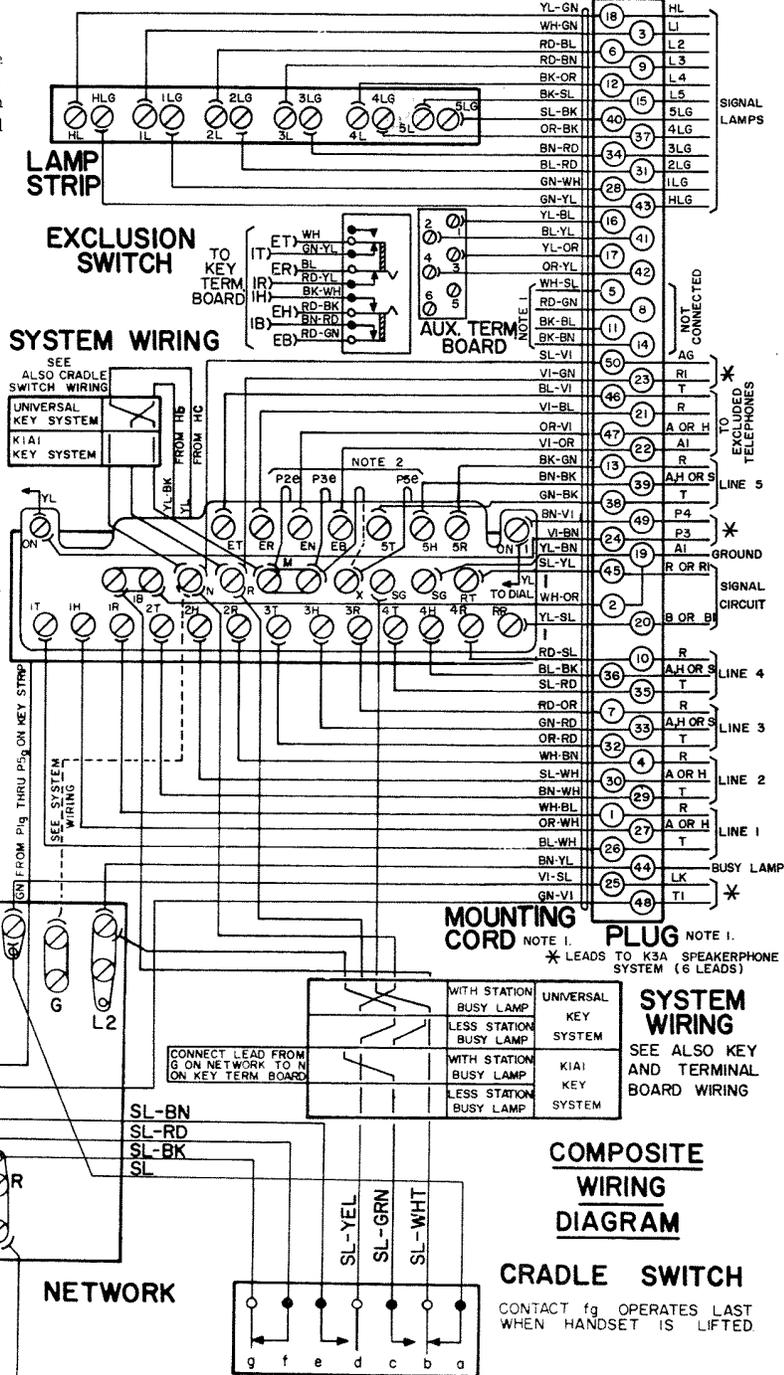


Fig. 2 DIAGRAMS 565--(--)-39- AND 565--(--)-42- TELEPHONES



**COMPOSITE WIRING DIAGRAM**

**CRADLE SWITCH**

CONTACT fg OPERATES LAST WHEN HANDSET IS LIFTED

**SYSTEM WIRING**  
SEE ALSO KEY AND TERMINAL BOARD WIRING

NOTE 1. LEADS TO K3A SPEAKERPHONE SYSTEM (6 LEADS)

## TYPE 576--(--)-30- DESK TELEPHONE

The 576--(--)-30- desk telephone is a six button type of key instrument with the same transmission circuit as the 500 series of instruments. It is designed for use on either regular exchange lines or interphone circuits in small business offices, where up to three lines are required on the one telephone. A small push (recall) button is fitted in front of the handset cradle to provide a signal circuit for PBX operation.

The six keys are arranged in pairs. The right hand key of each pair is the LINE key and the left hand key is the HOLD key. All line keys are interlocked so that only one line may be picked up at any time, although one or more lines may be held at the same time. Optionally, the third HOLD key may be modified to provide an interphone signalling circuit. All operated HOLD keys are automatically released when the handset is replaced in the cradle.

Table 1 REPLACEABLE PARTS

Item	Description	Number	Qty	Item	Description	Number	Qty
1	Base Assy. c/w items 2 thru 8	79525-4	1	16	Hex. Hd. Mach. Screw	79532-2	3
2	Network Assembly	75335	1	17	Plunger and Retainer Assembly	79441	1
3	Bind. Hd. Mach. Screw	60116-3	2	18	Mounting Screw	79521	2
4	Spring Washer	54336-5	2	19	Lamp Strip Assembly	190196	1
5	Hex. Nut	67093	2	20	Bind. Hd. Mach. Screw	74909-2	2
6	Cradle Switch Assembly	79489-2	1	21	Lamp	190191	3
7	Rivet	31944-2	3	22	Escutcheon	79099	1
8	Cabinet Lock Screw	75486	2	23	Designation Card	82028	1
9	Ringer Assy., Biased	130(BA)470	1	24	Bushing	79409	1
10	Dial Assembly	19**(Ø)450	1	25	Operating Link	190167	1
11	Handset and Cord Assembly	65**(C2)410	1	26	Shoulder Screw	190179	1
12	Desk Stand Cord	839**(09)650	1	27	Push Button	190193	1
13	Connecting Block	31( )783	1	28	Wire Assembly	75326-115	2
14	Housing and Plunger Assembly	190183-*	1	29	Wire Assembly	75326-116	1
15	Key Assembly	508( )740	1	30	Helical Compression Spring	86374	1
				31	Lamp (Optional)	51(A)745	3

Note: Ringer, Dial and Dummy Plug Assemblies are all supplied complete with mounting screws.

Ø Replace by class code number for type required.  
\* Replace by color code suffix from series 1-16.  
\*\* Replace by color code number from series 00-16.

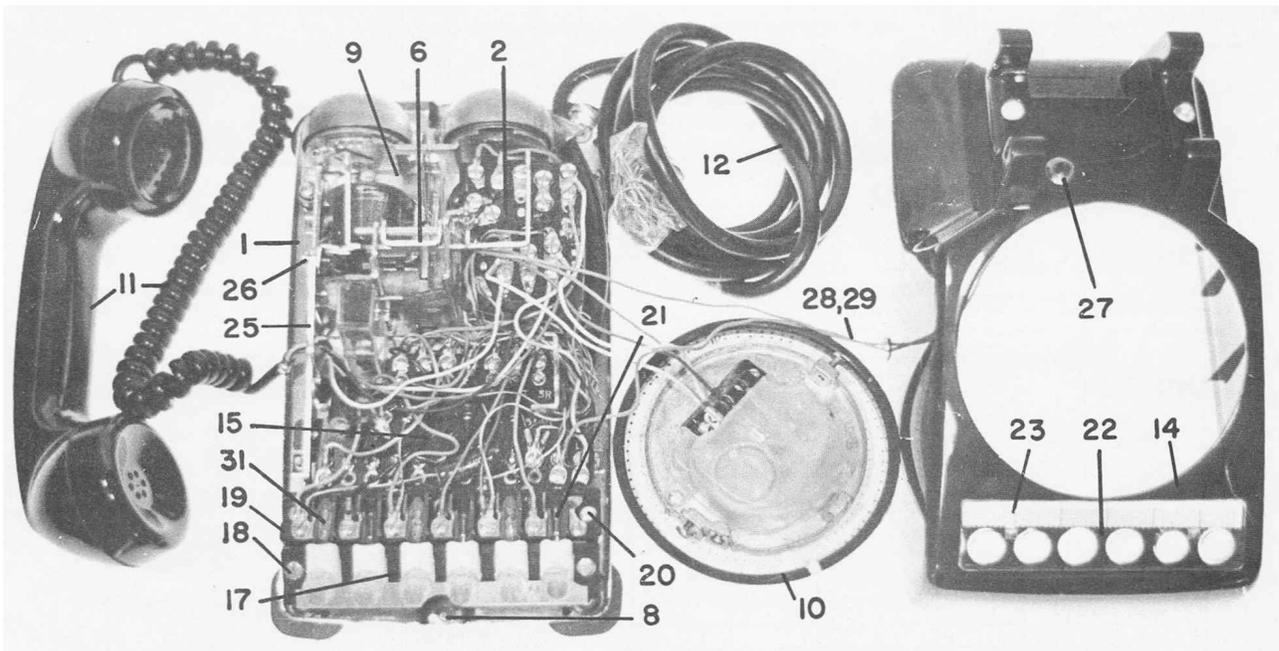


Fig. 1 TOP VIEW - HOUSING REMOVED

**NOTES**

1. Spare conductors of mounting cord have ends taped and stored inside telephone and terminal block.
2. Refer to Sub-section M2H-KYS-1 for method of converting third hold key for use as a signalling key.

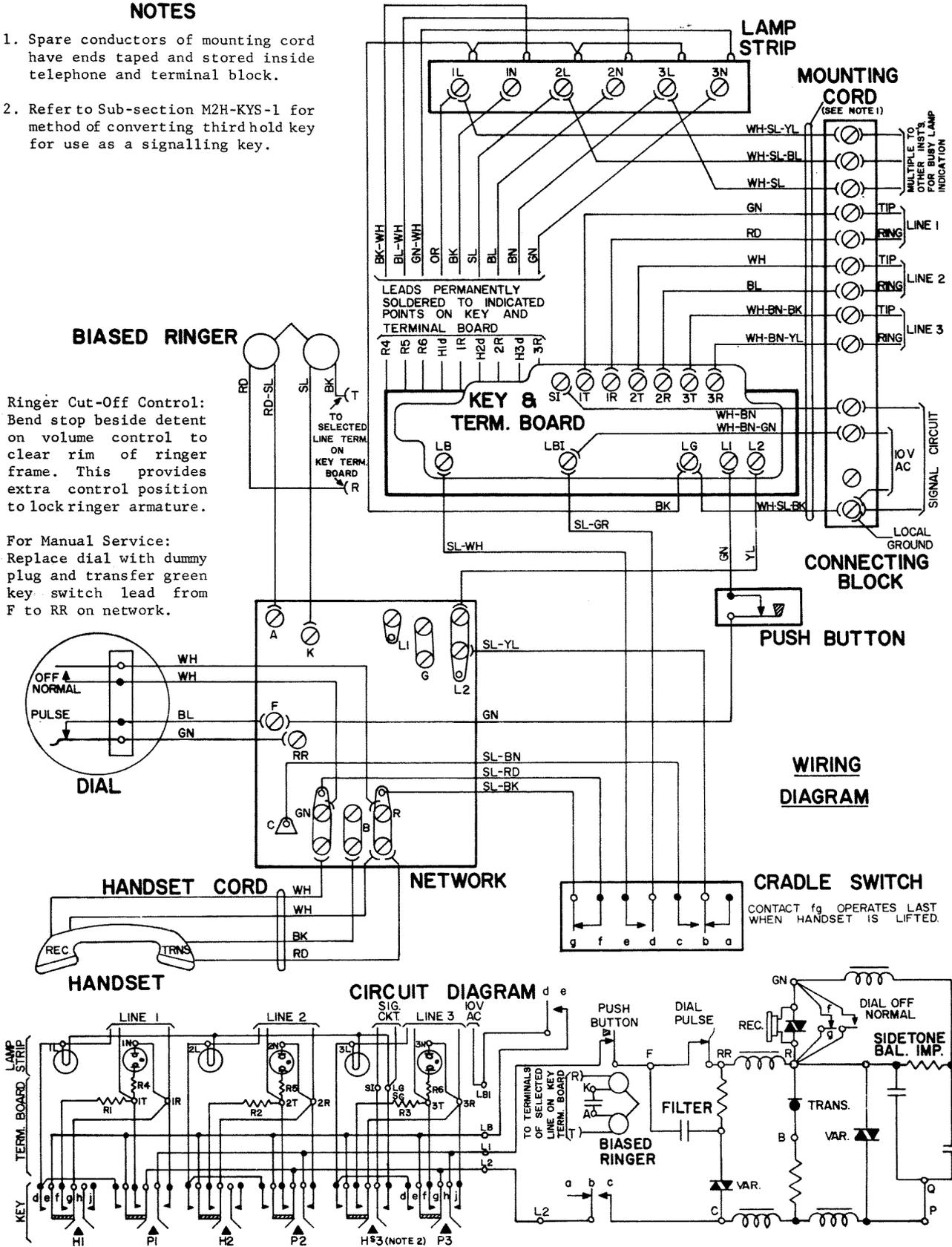


Fig. 2 DIAGRAMS 576--(--)-30- TELEPHONE