

# Technical Troubleshooting Aids

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**Western Electric Company**  
INCORPORATED

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## MAGICALL KS-19594 DIALER



This manual is designed for testing and repair of the KS-19594 MAGICALL dialer.

### COMPANY PRIVATE

The information contained in this manual is considered "Company Private" and shall be maintained confidential.

Distribution of this manual is restricted to inter-

ested Bell System personnel having a need to know.

No part of this material may be revealed to persons outside the Bell System without the written approval of the Central Region Engineering Manager.

### SPECIFICATIONS

Operating Ambient Temperature ..... 20 to 120° F.

**Power Consumption:**

During Standby ..... 11 Watts  
 During Recording ..... 31 Watts  
 During Dialing ..... 17 Watts  
 During Rapid Scan ..... 34 Watts

Power Requirements ..... 117 VAC 60 cps

**Dial Pulsing:**

Recording capacity ..... 108 pulses in 14 digits  
 per entry line ..... plus one wait for appearance of second dial tone.

Pulsing Rate ..... 9.5 to 10.5 pps.

Make-Break ..... Open Pulse (Break) between 58 to 64 percent of total pulse.

Interdigital Time ..... 0.60 second minimum.

Muting ..... Two isolated outputs, short circuit 0.1 second minimum before pulsing, continuous throughout pulsing, and 0.15 to 2.0 seconds after pulsing.

Reference Drawings:

- SD-99436-01-A1, Common Systems
- SD-99436-01-B1, Schematic FS 2
- SD-99436-01-B2, Schematic FS 1
- SD-99436-01-B3, Schematic FS 1
- SD-99436-01-C1, Parts List
- SD-99436-01-C2, Parts List
- SD-99436-01-D1, Circuit Notes 101-104
- SD-99436-01-D2, Notes 301-303, Waveforms
- SD-99436-01-D3, Note 303 continued
- SD-99436-01-F1, Circuit Requirements

Reference Specifications:

- KS-19594 ..... BTL Specification
- RS-255.73, Sec. A ..... Repair
- Sec. B ..... Repair Methods
- Sec. D ..... Modifications
- Sec. E ..... Test & Adjust
- Sec. F ..... Troubleshooting
- Sec. G ..... Warranty Information

DIALER

BEARS THE MARKING "BELL SYSTEM"

THIS MANUAL CONTAINS INFORMATION AND PHOTOGRAPHS PRESENTING PROPRIETARY DESIGN INFORMATION WHICH IS THE PROPERTY OF DASA CORPORATION, ANDOVER, MASSACHUSETTS. THIS PROPRIETARY DESIGN INFORMATION HAS BEEN REPRODUCED WITH THE PERMISSION OF DASA CORPORATION ON THE CONDITION THAT IT WILL NOT BE DISCLOSED TO ANY OTHER MANUFACTURER OR USED FOR ANY PURPOSE OTHER THAN ACCEPTANCE INSPECTION, AND MAINTENANCE OF THE SUBJECT APPARATUS.

Description

The KS-19594 dialer is a magnetic recording repertory dialer intended for use in conjunction with a telephone set. The dialer is placed in a convenient location near the telephone set and is electrically connected, although it does not interfere with normal telephone set usage. This dialer consists of three individual component items: a KS-19594 L1 dialer unit containing the record-reproduce mechanism, electronics and control circuit; a KS-19594 L2 dial-in unit for recording numbers into the repertory; and a wall-mounted KS-19594 L3 power supply. The dial-in unit connects to the dialer unit by means of a plug and cord and is to be detached and stored when not in use for recording.

The KS-19594 dialer is the same as the Model E3 MAGICALL except as authorized herein, manufactured by the DASA Corporation, Andover, Massachusetts, and is their proprietary design.

A power source of 115 volts, 60 cycles, is required for the operation of this dialer.

The dialer unit and the dial-in unit are furnished with a choice of five different colors of cover and cords. The cord on the dial-in unit (KS-19594 L7 cord) is permanently attached by means of solder connections. Two cords are provided with the dialer unit, one for connection to the power supply (KS-19594 L8 cord), the other (KS-19594 L9 cord) to the associated telephone set.

The design of the KS-19594 dialer permits complete interchangeability of all component items (dialer unit, dial-in unit, cartridges, and power supply) without requiring any readjustment.

The KS-19594 L1 dialer unit is the basic component of this dialer and contains the record-reproduce mechanism, electronics and control circuit. It includes a KS-19594 L4 cartridge providing for 400 entries, a KS-19594 L8 cord, a KS-19594 L9 cord, and a KS-19594 L11 cover. A motorized scan mechanism provides for rapid movement of the recording tape while final positioning may be done with a manually

operated knurled wheel. The cartridge is easily removable and requires merely lifting the access cover and depressing the release bar to permit the cartridge to snap out of the bottom of the dialer unit. When desired, a KS-19594 L5 cartridge may be substituted for increasing capacity to 1000 entries.

The KS-19594 L2 dial-in unit is equipped with a KS-19594 L10 cover and a KS-19594 L7 cord. This attached plug and cord provides for connection to the dialer unit during recording of numbers into the repertory. The dial-in unit is used only during the recording process and must be detached during calling. It is provided with a motor-assisted telephone-type dial and a "wait" lamp for use during the recording process.

The KS-19594 L3 power supply is a wall-mounted unit which operates from a 115-volt, 60-cycle outlet. It provides power for operation of the dialer at two voltages: 18 volts dc and 29 volts ac. A 4-conductor cord (KS-19594 L8 cord) provides for connection to the dialer unit. When required, the distance between the power supply and dialer unit may be extended by the use of a suitable 4-conductor cable such as ordinary JKT wire. This power supply is provided with an attached 3-wire power cord (18 inches long) equipped with a right angle parallel blade grounding cap. Both the power cord on the outlet side and the power supply cover are light olive gray color.

The KS-19594 L4 cartridge provides the recording tape with capacity for 400 entries. Marking on the tape is provided for alphabetical grouping of the names (and telephone numbers) with a single red line for indexing against the letters of the alphabet at the bottom of the viewing window.

The KS-19594 L5 cartridge is similar to the KS-19594 L4 cartridge but provides capacity for 1000 entries.

The KS-19594 L6 cartridge is similar to the KS-19594 L5 cartridge, except that the alphabetical grouping and red index line are not provided. This cartridge permits grouping of entries on an individual basis for special requirements.

The KS-19594 L14 cartridge is similar to the KS-19594 L6 cartridge, except that each line is numbered consecutively in sequence from 1 through 1000 on the left-hand side of the tape. A continuous thin red line is provided the length of the tape to index the line numbers on the tape with the guide numbers on a KS-19594 L15 adapter plate for rapid search of a specific entry. The tape cartridge may be provided with the telephone numbers recorded and with the names and telephone numbers printed on the writing surface in accordance with a customer-furnished list.

The KS-19594 L7 cord provides for connection of the dial-in unit to the dialer unit. This cord is terminated at one end in a plug and at the other end in tinned leads for solder connection inside the dial-in unit and is furnished in five different colors.

The KS-19594 L8 cord is a 4-conductor cord for connection between the dialer unit and the power supply. It is equipped with strain relief and spade tips on conductors at both ends and is furnished in five different colors.

The KS-19594 L9 cord is a 6-conductor cord for connection between the dialer unit and the associated telephone set. It is equipped with strain relief and spade tips on all conductors at both ends and is furnished in five different colors.

The KS-19594 L10 cover is a component part of the KS-19594 L2 dial-in unit and is furnished in five different colors.

The KS-19594 L11 cover is a component part of the KS-19594 L1 dialer unit and is furnished in five different colors.

The KS-19594 L12 cover is a component part of the KS-19594 L101 dialer and is furnished in five different colors. It is similar to the KS-19594 L11 cover except for the additions of a lamp and hood for illuminating the viewing window.

The KS-19594 L15 adapter plate provides an indexing guide for numerical listing of numbers when a KS-19594 L14 cartridge is used.

The KS-19594 L100 dialer, assigned for convenience in ordering a complete dialer assembly, consists of a KS-19594 L1 dialer unit, a KS-19594 L2 dial-in unit, a KS-19594 L3 power supply, and subscriber instruction leaflet DASA No. MIB-A65.

The KS-19594 L101 dialer, assigned for convenience in ordering a complete dialer assembly, consists of a KS-19594 L1 dialer unit (equipped with a KS-19594 L12 cover), a KS-19594 L2 dial-in unit, a KS-19594 L3 power supply, and a subscriber instruction leaflet DASA No. MIB-A65.

The KS-19594 L102 dialer, assigned for convenience in ordering an assembly, consists of a KS-19594 L1 dialer unit, a KS-19594 L3 power supply, and a subscriber instruction leaflet DASA No. MIB-A65.

The KS-19594 L103 dialer, assigned for convenience in ordering an assembly, consists of a KS-19594 L1 dialer unit, without cartridge but with a KS-19594 L15 adapter plate installed in the cover, a KS-19594 L2 dial-in unit, a KS-19594 L3 power supply, and a

subscriber instruction leaflet DASA No. MIB-A65.

The KS-19594 L104 dialer, assigned for convenience in ordering a complete dialer assembly, is similar to the KS-19594 L100 dialer except that the KS-19594 L1 dialer unit is equipped with a KS-19594 L5 cartridge.

The KS-19594 L105 dialer is assigned for convenience in ordering a KS-19594 L1 dialer unit without a cartridge.

The weight of these items is approximately as follows:

KS-19594 L1 Dialer Unit	- 5-3/4 pounds
KS-19594 L2 Dial-In Unit	- 1-3/4 pounds
KS-19594 L3 Power Supply	- 4-1/2 pounds
KS-19594 L100 Dialer	- 12-1/2 pounds

This apparatus has been listed by the Underwriters Laboratories, Incorporated.

The KS-19594 dialer shall be obtained from the DASA Corporation, Andover, Massachusetts, and is intended to be furnished on telephone company orders.

The KS-19594 dialer does not replace any product, but will probably reduce the demand for the KS-16844 RAPIDIAL.

## Ordering Information

Orders for this product shall specify the quantity, KS number, list number, and dash number required to specify color desired for following items:

UNIT, DIALER, KS-19594 L1-(\*)  
UNIT, DIAL-IN, KS-19594 L2-(\*)  
SUPPLY, POWER, KS-19594 L3  
CARTRIDGE, KS-19594 L4  
CARTRIDGE, KS-19594 L5  
CARTRIDGE, KS-19594 L6  
CORD, (DIAL-IN), KS-19594 L7-(\*)  
CORD, (POWER), KS-19594 L8-(\*)  
CORD, (TELEPHONE), KS-19594 L9-(\*)  
COVER, (DIAL-IN), KS-19594 L10-(\*)  
COVER, (DIALER), KS-19594 L11-(\*)  
COVER, (DIALER), KS-19594 L12-(\*)  
CARTRIDGE, KS-19594 L14  
ADAPTER PLATE, KS-19594 L15  
DIALER, KS-19594 L100-(\*)  
DIALER, KS-19594 L101-(\*)  
DIALER, KS-19594 L102-(\*)  
DIALER, KS-19594 L103-(\*)  
DIALER, KS-19594 L104-(\*)  
DIALER, KS-19594 L105-(\*)

\*Orders for the list 1, 2, 7 to 12 inclusive, and 100 to 105 inclusive product shall specify a dash number after the list number, which indicates the color desired, in accordance with the following:

Dash No.	Color
-3	Black
-51	Moss Green
-58	White

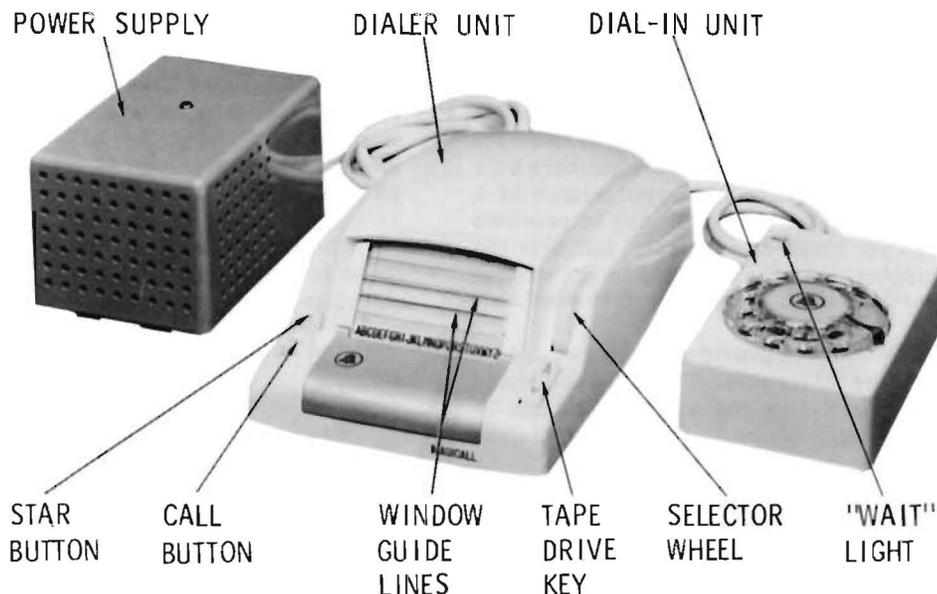


Fig. 1. Magic Dialer Operating Controls.

### OPERATING INSTRUCTIONS (See Fig. 1)

Connecting the Dial-in Unit to the MAGICALL Dialer automatically converts the Dialer for recording. Any previously recorded codes and numbers may be changed by dialing in a new number over the old one.

In recording a sequence of numbers containing trunk, access, or special codes, the Dialer can be stopped by placing an interdigital time greater than 1.0 second between the last digit of the trunk, access, or special code and the remainder of the number. This allows the user to receive an additional dial tone before proceeding with the remaining part of the sequence. In this way, the correct placing of a call is made independent of the time delay before additional dial tones are obtained, however long this delay may be.

To record a number, proceed as follows:

1. Lift the door in front.
2. Position the desired blank alphabetized space on the tape between the red markings on the writing platform by operating SELECTOR WHEEL.
3. Write name and number in pen or pencil in the plain white area. DO NOT write in grey shaded portion.
4. Place listing between guide lines on viewing window by operating the SELECTOR WHEEL. The wheel is engaged only when it is depressed. This prevents it from turning when the tape drive motor is running.
5. Plug Dial-in Unit in rear of Dialer.
6. Press CALL button. Do not proceed until WAIT light goes out.
7. Dial the number exactly as it would be dialed to place a call, including area codes, making

certain that the WAIT light on the Dial-in Unit goes out before dialing each digit.

**NOTE: DO NOT FORCE OR RETARD THE DIAL SPEED. THIS WILL CAUSE A NUMBER TO BE RECORDED INCORRECTLY.**

8. When all digits in the telephone number have been dialed, press the STAR button.
9. Disconnect the Dial-in Unit. If more than one listing is to be dialed at one time, it is not necessary to disconnect the Dial-in Unit after each telephone number is recorded. Move the tape to the next position on which a number is to be recorded, and then press the CALL button before dialing the new number. Disconnect the Dial-in Unit when all recording is completed. The MAGICALL Dialer is now ready for use.

**NOTE: PRESSING THE CALL BUTTON AFTER RECORDING WITH THE DIAL-IN UNIT CONNECTED WILL ERASE THAT NUMBER.**

10. To record numbers when access codes (such as "9") are required to obtain an additional dial tone, the procedure is essentially the same:
  - (a) Follow steps 1 through 6 as listed above,
  - (b) Dial in the code number (such as "9"),
  - (c) Press the STAR button,
  - (d) Proceed with steps 7 through 9 as outlined above.

To place a call, proceed as follows:

1. Operate TAPE DRIVE LEVER to quickly locate desired alphabetical group, with the aid of the red vertical index line on the tape.

2. Turn the SELECTOR WHEEL to place the name of the desired party between the guide lines on the viewing window.
3. Lift telephone receiver for dial tone.
4. Press CALL button, call is placed.
5. If an access code (such as "9") must first be used to obtain a second dial tone:
  - (a) Pick up telephone receiver for the first dial tone,
  - (b) Press CALL button, and listen for the second dial tone,
  - (c) Press STAR button to complete call.

If a tape has been recorded with an access code (such as "9"), and night lines or other situations

sometimes eliminate the need for using such a code, it can be by-passed. Simply select the desired party and press the CALL button before lifting the telephone receiver. The access code will be dialed but will be ineffectual because of the on-hook condition of the telephone receiver. When the code has been dialed, lift the receiver to get a dial tone and press the STAR button.

If a call is being placed from a key telephone or switchboard and an incoming call is ringing from another line, the MAGICALL Dialer can be stopped in order to answer the other call immediately. This is done by moving the SELECTOR WHEEL slightly off the existing line, or tapping the TAPE DRIVE LEVER. If it is not stopped and the incoming call is answered, the pulsing from the dialer will carry over to the incoming call.

## (RS-255.73, Section A)

### REPAIR

#### Associated Instructions(Not Filed in this Manual)

##### Specifications:

RS-255.73,	Section A
RS-255.73	Section G
RS-1002.22	Cleaning Plastic Surfaces
RS-1003.4	Buffing
RS-586.1	Cords
BSRS-350.002	Printed Wiring Boards
BSRS-470.001	General Requirements
G-77239D	DASA Corp. Contract & Warranty
G-78007D	DASA Corp. Contract & Warranty
BSP-512-100	
KS-19594	BTL Specifications
CD-99436-01	Circuit Description
SD-99436-01-B1, B2, B3	Schematic Drawing

##### Packing Instructions:

Dialers or Dialer Units	W. E. Co. #92554
Dial-In Unit	W. E. Co. #92555
Power Supply	W. E. Co. #92556
Cartridge	W. E. Co. #92557

#### 1. Application

This section outlines the methods and equipment for repair of the KS-19594 MAGICALL Dialer.

#### 2. Requirements

Repaired Magicalls shall meet the requirements of BSRS-451.919 and the applicable requirements of BSRS-350.002 and BSRS-470.001.

#### 3. General Information

Warranty - DASA Corp. will warranty for 15 months from date of shipment from DASA, all units for defective materials and workmanship. Refer to Specification RS-255.73, Section G, for shipping dates and serial number information.

Repair by Western Electric - The Distributing House Repair Shop should attempt to repair all units as covered in RS-255.73 and this manual before returning them to the Dasa Corporation for repair since:

- a. Many defects are minor (transistor, diode, capacitor) and can be located using the Schematic Diagram on page 28 and the information under "Troubleshooting" on page 13.
- b. This will avoid possible damage to units while in transit to and from DASA.
- c. This will eliminate packing and shipping cost as well as charges DASA incurs for their handling, refurbishing, and modifications.

Repair by DASA - DASA Corp. will repair complete units or individual circuit boards FS 1 or FS 2. Pack units and boards carefully.

##### DASA Repair Addresses:

DASA Corporation 163 Constitution Dr. Menlo Park, Calif.	DASA Corporation 15 Stevens Street Andover, Mass.
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## (RS-255.73, Section B)

### REPAIR METHODS AND MECHANICAL ADJUSTMENTS

#### 1. Equipment and Material

Phillips head screwdriver  
RS-255.73, Section B  
KS-6854 Screwdriver 3 1/2"  
RS-16439 Bulk Magnetic Eraser (or RS-15419 and RS-15421 Magnet Charger and Magna Treater).  
KS-14427 Cleaning Emulsion  
KS-7435 Dry-Cleaning Fluid  
RS-14312 Cloth

Thickness gauge including 0.020", 0.035", 0.045", and 0.050" sizes.  
Dow-Corning No. 560 Silicone Oil

#### 2. Repair Procedure

##### 2.1 Cords

Repair cords per Specification RS-586.1. Cords will be tested during the test of the unit.

## 2.2 Housings

### 2.2-1 Dialer Unit

Remove the dialer housing by removing four retaining screws in the base. Exercise care when removing the housing to prevent damage to the operating buttons and lever. Reverse this procedure for replacement.

Buff the housing in accordance with RS-1003.3. Volume is too low to justify a buffing shield. Use Cleaning Emulsion KS-14427 (RS-14645) to clean the plastic areas that are inaccessible by buffing, the metal flipper and both sides of the view window. Refer to RS-1002.22, Section Q, for the method of cleaning.

### 2.2-2 Dial-In Unit

Remove the dial-in unit housing by removing the four Phillips head screws from the base. Lift the cover off the unit. Reverse the procedure for replacement.

Buff the housing in accordance with RS-1003.4. Volume is too low to justify a buffing shield.

### 2.2-3 Power Supply

Remove the power supply cover by loosening the screw on the top of the housing. This is a captive screw and consequently it is not necessary to remove the screw. Lift the cover from the power supply. Reverse this procedure for replacement.

Buff the housing in accordance with RS-1003.4. It may be necessary to remove and replace the label if damaged. Volume is too low to justify a buffing shield.

## 2.3 Cartridge (See RS-255.73, pages A, 2)

## 2.4 Erase Tapes

Scan to the Z end of the writing tape. Remove the cartridge from the Dialer Unit. Connect the RS-16439 Bulk Magnetic Tape Eraser to a 110-120 volt outlet. Hold the Eraser over the top drum and press the button on the Eraser. Rotate the drum one turn exposing all the tape to the eraser.

Also pass the eraser over the tape that is not wound on the drum.

If a RS-16439 is not available, a RS-15421 Magna Treater and RS-15419 Magna Charger may be used. Connect the units per the equipment sketch and place the cartridge in the ring. The whole tape will be immediately erased.

A single line may be erased by connecting the Dial-In Unit to the Dialer Unit, pressing the Call and then Star buttons on the Dialer Unit.

## 2.5 Clutch Adjustment

Push the head drive spool (#36, Fig. 9) back against the back plate (#31, Fig. 9) while depressing the CALL button. The gap between the head drive spool and clutch (#32, Fig. 9) should be .045 inch. If not, loosen setscrew (#32A, Fig. 9) on front clutch and adjust for .045-inch gap and lightly tighten setscrew, making

certain that the setscrew is properly oriented on the flat of the shaft.

With the CALL button depressed, pull the head drive spool toward the clutch; hold in place with a light pressure and check the clutch gap. It should now be approximately .020 inch but not to exceed .035 inch.

NOTE: This check is to be made in the area nearest the setscrew only.

If the check is satisfactory, tighten setscrew securely. If not, repeat clutch adjustment procedure.

## 2.6 Start Switch Location Adjustment

Depress CALL button fully. Pull head drive spool toward clutch for .020-inch gap. Motor should not energize to rotate clutch at this point.

Release CALL button slowly. The head motor (#37, Fig. 9) must start prior to tips of clutch (#32, Fig. 9) and the head drive spool (#36, Fig. 9) teeth coming in contact with one another.

NOTE: If the above conditions are not met, the start switch (#29, Fig. 9) is adjusted by loosening the start switch mounting screw (#29A, Fig. 9) and moving the switch forward or backward as required.

## 2.7 Clean Recording Head (If Dirty)

Clean recording head with clean RS-14312 cloth moistened with KS-7435 dry-cleaning fluid.

## 2.8 Head to Tape Contact & Clearance

With a cartridge installed and CALL button depressed, the head (#41, Fig. 9) should make full contact with the tape between the points of the fluted spool. This is observed from the left-hand side. A very slight gap is permitted at the rear of the head.

Release the head (#41, Fig. 9) by pushing the head actuator (#40D, Fig. 9) toward the front of the dialer unit. A 0.040 to 0.050-inch gap should be observed between head and any point of fluted spool. Minimum clearance is 0.030 inch.

NOTE: Head alignment is a factory adjustment and should not be done in the field. Replace complete head and bracket assembly if above requirement is not met.

## 2.9 Clean Bottom Pads

Examine pads for dirt and imbedded foreign material which may mar desk surfaces. Clean if necessary using RS-14312 cloth and KS-15356 dry-cleaning fluid.

## 2.10 Lubrication

Where necessary to assure free movement of parts, lubricate bearing and sliding surfaces with Dow-Corning No. 560 silicone oil (or equivalent). Use lubricant sparingly; Excess lubricant can be detrimental to future operation of dialer since it may migrate to electrical contacts and/or attract dust.

(RS-255.73, Section D)  
MODIFICATIONS

1. Equipment and Material

RS-255.73, Section D, Repair Specification  
RS-3580 Diagonal Cutting Pliers  
RS-3581 Screwdriver  
RS-3583 Long Nose Pliers  
RS-14921 Wire Stripper  
KS-16346 L1 Soldering Iron  
RS-16306 Soldering Iron Holder  
RS-16397 Excess Solder Remover  
RS-16230 Holder Fixture for Circuit Boards  
Solder Rosin Core #18 Gage  
KS-6320 "Orange" Stick  
Lighting Fixture with Magnifier and Fluorescent  
Lamp (DAZOR Manufacturing Corporation  
Model #M-208, M-1408 optional).  
TY-RAP #TY-523M Lacing Tape  
(Thomas and Betts Company, Elizabeth,  
New Jersey, or Local Distributor).

1A. General Information

This section describes the procedures for converting old style KS-19594 MAGICALL dialers to the latest standards. These modifications include the following changes:

- a. Change R157 resistor on dialer units below serial number 950.
- b. Add two fiber washers to the mounting studs for top circuit board on dialer units below serial number 1950.
- c. Replace two delrin gears on metal shaft with a delrin gear, one piece delrin gear and shaft, and a Tinnerman nut.
- d. Secure a cork pad to covers on dialer units below serial number 950.
- e. Insert insulating strip between the C301 capacitor and printed board on List 3 power supplies manufactured prior to January 1965.
- f. On units with serial numbers less than 20,000 - add 220 ohm 1/4 watt resistor in series with C502 and replace C502 with Sprague 431P - .1 mfd @ 600V capacitor, located adjacent to motor scan switch S502. Replace the scan switch (S502) with equivalent type.

Parts Ordering Information

Above parts required for modifications may be obtained as follows:

	Source
(a) R157 Resistor 47K ohms, 1/4 watt ± 10%, Allen Bradley Company Type CB or Equivalent	Local Supplier
R157 Resistor 68K ohms, 1/4 watt ± 10%, Allen Bradley Company Type CB or Equivalent	Local Supplier
R157 Resistor 100K ohms, 1/4 watt ± 10%, Allen Bradley Company Type CB or Equivalent	Local Supplier
(b) Fiber Washer per BTL drawing B-574349	DASA Corp.

- (c) Pinion shaft per BTL  
drawing B-575159                      DASA Corp.  
(DASA #2042)  
Gear per BTL drawing  
B-575163 (DASA #2047) and  
Tinnerman nut #C12044-012.
- (d) Cork Pad, per BTL drawing  
B-573310                                  DASA Corp.
- (e) Insulating Strip per BTL  
drawing B-568866                      DASA Corp.
- (f) Capacitor C502 "Sprague  
#31P .1mfd @ 600V" and              DASA Corp. or  
resistor "220 ohm 1/4                  Local Supplier  
watt, Allen Bradley  
type CB" or equivalent.  
May be obtained as an  
assembled network, from  
DASA Corp. (approx. 1.06  
ea. network), or as individual  
components, obtained locally.  
If Sprague #31P is not available,  
use Thompson Ramo Woolridge  
X-663F or X663RR .1 mfd @ 600V.
- (g) Switch S502 Cherry Electrical  
Electrical Products                      DASA Corp. or  
Part No. E23-20A                          Local Supplier  
Unimax Switch  
Part. No. TM13B-4.

NOTE: B-drawings referred to are contained in the KS-19594 Specification.

If a MAGICALL is modified at a distributing house and then returned a second time, be careful not to modify the dialer a second time (i.e. do not change R157 a second time). You can tell if this change was made as well as the fiber washer added by examining for a white dot on the front right hand corner of the top circuit board (FS1).

KS-19594 Dialers returned to DASA Corporation under the warranty will be updated, (except for modification of motor scan circuit for addition of 220 ohm resistor and replacement of C502 capacitor) on a "no-charge" basis to include the necessary modifications.

2. Operations

Depending on the serial number or date of manufacture all or some of the following modifications will be required. Remove the housings as necessary.

The Contract Manager's Organization advises that since this dialer is strictly a commercial item all costs of modifications are billable to the customer.

2.1 Replacement of R157 Resistor

Dialer units with serial numbers below 950 must have the R157 resistor changed per the following chart.

If present value is 33K ohms change to 47K ohms  
If present value is 47K ohms change to 68K ohms  
If present value is 68K ohms change to 100K ohms

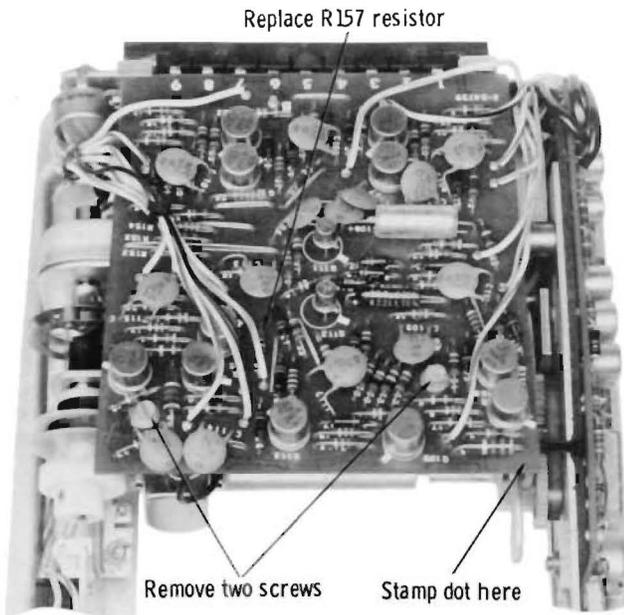


Fig. 2. Multi Board Assembly - Top View.

**Marking**

Once this change has been made, do not make it a second time. Mark those that have been modified in accordance with Specification RS-1013.1. Use No. 36 Volgers Opaque Quick Drying White Ink and a peg stamp (1/8" dot obtain locally). Stamp on the front right hand corner of the top circuit board.

Extreme care should be exercised when replacing the resistor since the conducting paths are very small and spaced very close together.

**2.2 Add Two Fiber Washers**

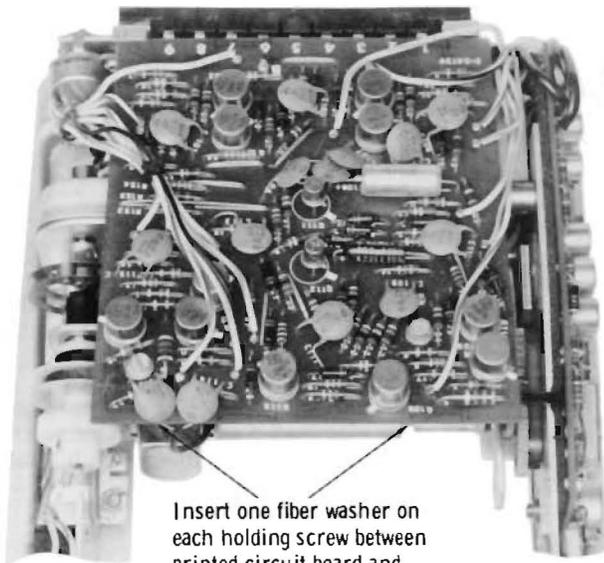


Fig. 3. Multi Board Assembly - Top View.

Two fiber washers must be added to act as spacers between the printed circuit board and insulator on dialer units with serial numbers below 1950. Loosen the two screws that hold the

printed board in place. Lift the printed board and place one (1) washer on each screw between the printed board and insulator. Then replace the board and tighten the screws. Stamp the front right hand corner of the top circuit board per paragraph 2.1 to also indicate that this change was made.

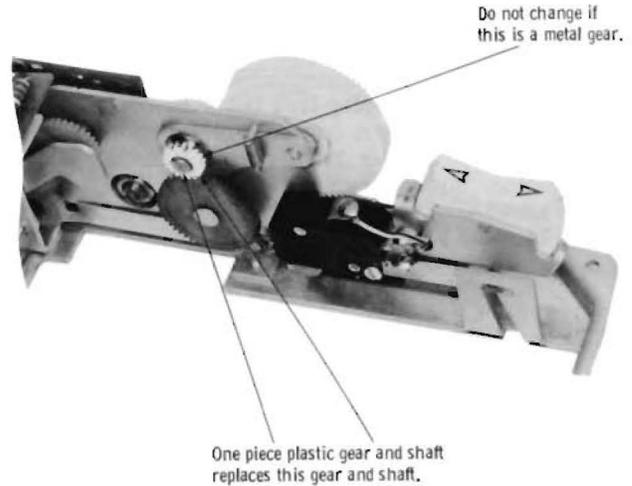


Fig. 4. Right Frame Assembly - Inside View.

Remove cartridge. Pry the delrin gear from the shaft per Figure 5. Use a screwdriver. Slide the shaft and remaining gear from the Dialer Unit. Discard these two gears and shaft.

**2.3 Replacement of Delrin Gear and Metal Shaft Assembly**

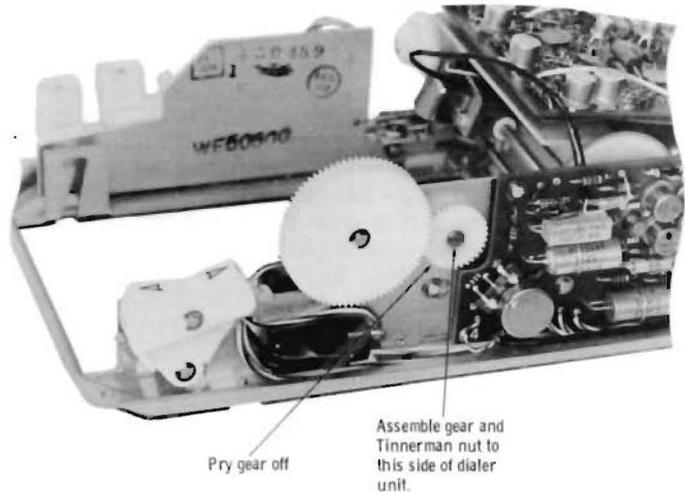


Fig. 5. Right Frame Assembly - Outside View.

Replace with the one piece delrin gear and shaft assembly. Slide the other gear over the shaft. This shaft is keyed. Lock the gear in place by forcing the tinnerman nut over the shaft.

Replace cartridge.

The manufacturer shipped some dialers with a metal gear mounted on the metal shaft. It is not necessary to modify these dialers.

**2.4 Add Cork Pad to Cover of Dialer Unit**

Remove the cover from dialer units with serial numbers below 950. Peel the backing

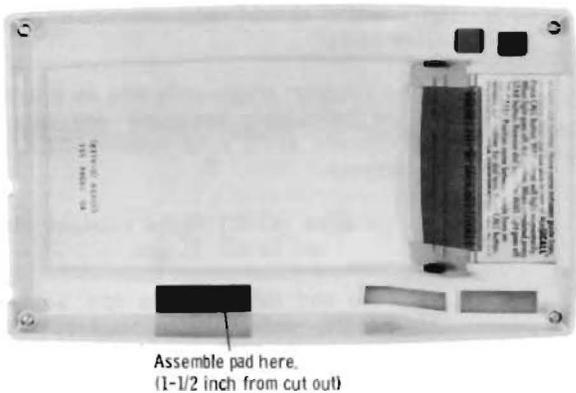


Fig. 6. Dialer Unit Cover - Inside View.

from the gummed pad and place the pad 1 1/2 inches back from the selector wheel cut out (see BTL drawing B-568698).

### 2.5 Add Insulating Strip to Power Supply

Remove the two screws that hold the printed board. Rotate the board exposing the underside. Slip the two straps off the edge of the capacitor. Then slip the insulating strip between the capacitor and printed board. Replace the two straps. To do this bend a hook in a paper clip and use this to lift the strap over the capacitor.

2.6 Add 220 ohm 1/4-watt resistor, replace capacitor C502 and scan switch S502.

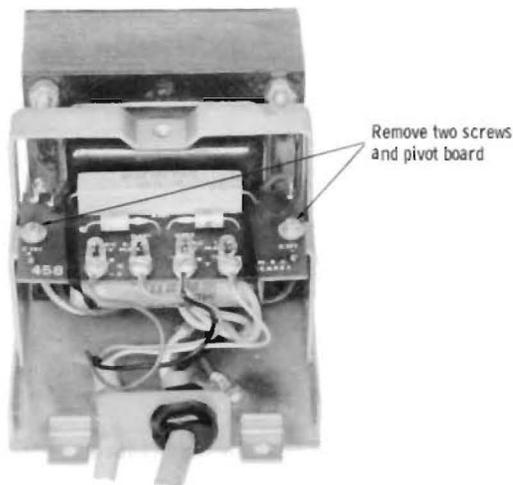


Fig. 7. Power Supply With Cover Removed.

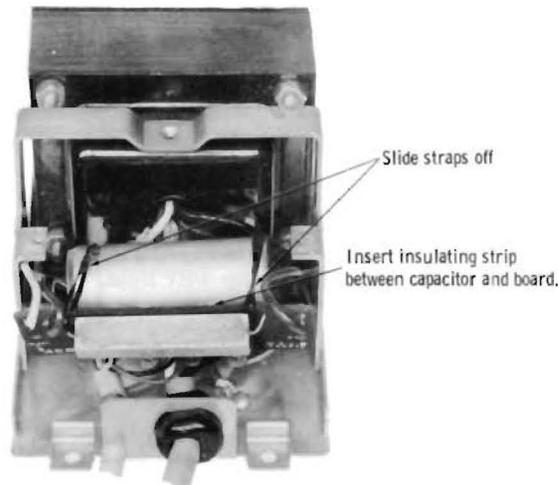


Fig. 8. Insulating Strip Installation.

(RS-255.73, Section E)  
TEST AND ADJUST  
(Using RS-16767 Test Set)

## 1. Equipment and Material

RS-255.73, Section E  
RS-2000 Breakdown Test Set  
RS-14957 Hewlett Packard Audio Oscillator  
RS-16229 Hewlett Packard Counter Model 522B  
or equivalent  
RS-16767 KS-19594 Dialer Test Set  
Glyptal (General Cement #90-2)  
Alligator Clip Leads 12"  
Hewlett Packard Voltmeter  
Model #400 or equivalent

## 2. Electrical Tests

The List 100 MAGICALL dialer is comprised of a list 1 Dialer Unit, and a list 2 Dial-In Unit, and a list 3 Power Supply. Interconnect all three of these units. If there is a failure, then each of the units must be tested separately so that the unit with the defect may be isolated. Individual units may also be tested. Tests for the list 100 series are in paragraphs 2.2-2.9.

Trouble shoot units failing to meet tests or cannot be adjusted and not covered by warranty.

(Dialers with serial numbers above 20,000 or with a 1/8-inch red dot adjacent to the serial number or nameplate contain this modification).

See paragraphs 2.61 and 2.62 before proceeding.

- 2.6.1 If no resistor is in series with capacitor C502 (located by scan button):
- Remove the C502 capacitor.
  - Connect and solder a 220 ohm 1/4 watt resistor to S502 switch terminal from which C502 was removed.
  - Connect and solder a new Sprague 31P, .1mfd @ 600V, 20% capacitor as C502, to ground terminal from which old C502 was removed.
  - Connect and solder the 220 ohm resistor and new capacitor together.

Use spaghetti or shrinkable tubing where necessary to prevent short circuits. Dress components against dialer frame.

2.6.2 On dialers with serial numbers 9000 to 15,000 and modified per paragraph 2.61, replace S502 (scan switch) with same type.

2.6.3 Stamp 1/8 inch red dot adjacent to serial number on nameplate to indicate modification in 2.61 and 2.62 completed.

## 2.1 Set Up Equipment

Plug both the RS-16229 and RS-16767 into a 110-120 volt outlet and turn each power switch on. Connect one coaxial lead from the test set to the start jack on the RS-16229 and the other coaxial lead to the input jack on the RS-16229. Plug the RS-16767 Test Set yellow cord plug (P4) into the RS-2000.

Set the Hewlett Packard #522 counter as follows. These settings will be used to count pulses.

Frequency Unit	CPS-1
Function Selector	Frequency
Trigger Input	Com
Display Time	At a minimum
Manual Gate	Open
Trigger Level	Both between +3V and ±10V
Trigger Slope	Left (-) Right (+)

Plug the MAGICALL Power Supply into the outlet on the left side of the RS-16767. Connect the telephone cord from the Dialer Unit to the six spring contacts on the RS-16767 according to the color code.

## 2.2 Mute Switch Test (Click Test)

Set the Click Time-Count Switch on the RS-16767 to "Click".

Set the A writing space between the window guide lines on the MAGICALL. Depress Call Button, record one "0", press the Star Button, record three more "0"s and press Star Button. Remove the Dial-In Unit and play back the number. Since the Dialer will stop after dialing the first "0", depress the Star Button to continue dialing.

The red click lamp shall not light during this test. Both Shunt 1 and Shunt 2 lamps should be on (K501 Shunt contacts closed) during pulsing. If not, the red click lamp will light. Both these lamps shall be out prior to pressing the Star Button to dial the last three "0"s. If Shunt 1 and/or Shunt 2 lamp do not operate, troubleshoot Dialer.

## 2.3 Pulse Count Test (0, \*, 0, 0, 0)

Set the Click Time-Count Switch to "Time-Count". Again play back the series of "0"s. The counter shall indicate 10, 20, 30, and 40. This verifies that the MAGICALL pulsed correctly.

## 2.4 Test K502 Relay Pulse Contacts Make and Break Times

Change the counter settings as follows:

Manual Gate	Not at Open
Function Selector	Time Interval
Time Unit	Millisecond - 100

The remaining settings should be as shown in paragraph 2.1.

Set the trigger slope switches to - and +. Again play back the sequence of "0"s.

The counter should read between 57.7 and 64.5 milliseconds.

Set the trigger slope switches to + and -. Play back the previously recorded sequence of "0"s. The counter shall read between 37.5 and 40.7 milliseconds.

## 2.4-1 Adjustment of (K502) Pulse Contact Make and Break Times

The Make and Break times are adjusted independently using potentiometers R501 (M) and R502 (B) respectively, on the back of the Dialer Unit, page 17.

Remove the dialer housing. Record the number "1".

Using clip leads strap test points  $\diamond A$  and  $\diamond B$  on the top circuit board to the dialer unit chassis (ground), page 22.

Press the CALL button. The dialer will pulse continually. Press the CALL button to reset the dialer before the head hits the end of the cartridge.

Set Trigger Slope to Left (+) Right (-). Adjust R501 (M) to give a Make duration of  $38.5 \pm 0.5$  milliseconds, page 17.

Set Trigger Slope to Left (-) Right (+). Adjust R502 (B) to give a Break duration of  $63.0 \pm 0.5$  milliseconds, page 17.

After adjusting either potentiometer apply a small dot of Glyptal (General Cement Catalog number 90-2) to shaft and mounting bushing.

Remove Clip Leads.

## 2.5 Measure Amplifier Signal Level of transistor Q201

Remove housing.

Record a series of zeros on an unused line of the tape cartridge.

Disconnect Dial-In Unit (List 2).

Press the CALL button, and using either an oscilloscope or a high impedance millivoltmeter, measure the amplitude of the signal at the collector of transistor Q203 (usually in the range 100 to 150 millivolts peak-to-peak). Make connection to negative terminal of C202 (CircuiTrace point **13**). Refer to Fig. 16 for location of CircuiTrace point, page 21.

Note this amplitude.

Remove the tape cartridge and connect the output of a 10 c/s oscillator (H.P. 200 series or equivalent) between ground and through a 220K resistor to the collector of Q201 (CircuiTrace point **10**), page 21.

Adjust the output of the oscillator to give a signal amplitude at Q203 collector (CircuiTrace point **13**) of 1/3 that previously observed, page 21.

Turn R222 counterclockwise (as seen from wiring side of board), page 20.

Operate CALL button, and then turn R222 clockwise until the Dialer just pulses smoothly. Do not turn R222 further than this point. (No damage would occur, but the amplifier would be more sensitive than the design center.) This adjustment is more easily made if R222 is rocked back and forth over the threshold region.

It may be necessary to reoperate the Call Button if the dialer does not pulse for one second or more, and the motor control circuit times out.

After adjusting the potentiometer, apply dot of Glyptal (General Cement Catalog number 90-2) to the shaft and mounting bushing.

## 2.6 Preparation for Remaining Tests and Drive Mechanism Test

Connect the List 2 Dial-In Unit to the MAGICALL; press Call Button, dial four "1"'s, press Star Button, and remove the Dial-In Unit. Scan to the "Z" end of the writing tape by pressing the Tape Drive Key. Return to the "A" end by pressing the Tape Drive Key in the reverse direction. The tape should move freely in both directions. Place the "A" space between the window guide lines using the selector wheel. The tape should not turn until the wheel is depressed.

## 2.7 Interdigital Time Test

Set the Trigger Slope switches to + and -. Playback this sequence of four "1"'s. The counter should read  $800 \pm 200$  milliseconds. If not, troubleshoot Dialer and/or Dial-In units.

## 2.8 Erase and Rerecord Test

The settings on the counter should be the same as shown in paragraph 2.1. Playback the previously recorded series of "1"'s. The correct indication is 1, 2, 3, 4. If not, troubleshoot Dial.

## 2.9 Breakdown Test

This test must be performed on all Power Supplies. It can be performed with a Dialer Unit either connected to or disconnected from the power supply. Be sure the power cord from the Power Supply is connected to the outlet on the left side of the RS-16767. Press the Breakdown Buttons on either side of the RS-16767. If RS-2000 Buzzer sounds, troubleshoot Power Supply.

## 2.10 Lamp Test

The List 101 Dialer is for military applications. It is equipped with a lamp assembly for illuminating the tape viewing window. This permits operation in areas of subdued lighting. The lamp should light when the List 3 Power Supply is connected to the Dialer Unit and 110-120 VAC outlet. Replace lamp if necessary, and/or troubleshoot lamp supply circuit.

## 2.11 Test List 2 Dial-In Unit

If trouble is suspected with a Dial-In Unit,

or if a loose Dial-In Unit is returned from the field, test it in conjunction with a known good list 1 Dialer. Connect the telephone set cord to the spring terminals on the RS-16767 according to the color code. Connect the cord that normally would be connected to the Power Supply to the remaining four spring terminals according to the color code. Turn MAGICALL Supply Switch to "ON." Set the counter as shown under paragraph 2.1. Press Call Button, dial four "0"'s into the Dialer Unit, press Star Button and play back this number. The correct indication shall be 10, 20, 30, and 40. Although the Dialer Unit will not pulse while it is recording a number, it is still necessary to remove the Dial-In Unit and play back the number. If the Dial-In Unit generates the right number of pulses but does not generate them at the right speeds, the Dialer Unit may or may not pulse when the number is picked up from the tape and played back.

Troubleshoot if necessary. See para. 5 in "Troubleshooting" section.

## 2.12 Test the Dialer Unit

If trouble is suspected with a List 1 Dialer Unit, or if a loose Dialer Unit is returned from the field, test it in conjunction with a known good Dial-In Unit. Connect the telephone set cord to the spring terminals on the RS-16767 according to the color code. Connect the cord that normally would be connected to the Power Supply to the remaining four spring terminals according to the color code. Turn Dialer Power Supply switch to "ON." The test equipment should be set as shown in paragraph 2.1. Perform tests in paragraph 2.2 through 2.8.

## 2.13 Power Supply Test

This test need only be performed if a loose List 3 Power Supply is returned from the field. Remove the cover from the Power Supply. Plug the Power Supply into a 120 volt outlet. If the voltage from the outlet is not approximately 120 volts, use a RS-14262 Variac to adjust that voltage. Set its voltage for 120 volts. Measure the voltage across the following terminals with an RS-16038 Triplett Meter. The nominal voltages should be the following. Nominal is defined as  $\pm 10\%$ .

	Power Supply Not Connected to Dialer
Between RED and GRN	29 volts (DC)
Between BLK and YEL	29 volts (AC)

## 2.14 Disposition

Be sure all test codes have been erased from the tape. Run the writing tape to the beginning (above the A end). Back the tape off 4 lines. This will prevent the tape head from causing wear on the usable area of the tape.

Send good MAGICALLS for packing. Packing material is available from DASA. Leaflet DASA number MIB-A65 shall be packed with List 100, List 101, List 102, and List 103 dialers.

Troubleshoot defective units.

TROUBLESHOOTING

1. Equipment and Material

Use equipment listed in Repair Section.  
RS-16767 Test Set  
RS-16038 Triplet VOM meter or equivalent  
RS-16640 DuMont Oscilloscope or Fairchild Model 701 or equivalent  
RS-14731 RCA Master Voltrohmyst Model WV98B or equivalent  
RS-255.73, Sec. F Repair Specification

2. General Information

Refer to circuit description CD-99436-01 and schematic drawing on Page 28 for detailed information of dialer operation. The Circuit Description contains both a general description of operation and a detailed description of operation which should be understood before attempting troubleshooting techniques. Oscilloscope waveforms are shown on Page 25.

Figure 9 is an exploded view and shows the assembly of the Dialer Unit.

Table I Possible Troubles and Causes

3. Theory of Operation (See CD-99436-01 for details)

3.1 Record Function

- a. Dial-In-Unit connected to Dialer Jack J501
- b. CALL Button operated once

3.1-1 Rotary Dial-In-Unit at normal (unoperated)

- a. S402 Dial Pulsing Contacts closed
- b. 3 milliamperes erase current through Magnetic Head H501

3.1-2 Call Button operated

- a. Start Switch S501 opens momentarily which operates;
- b. Head Motor Control Flip Flop circuit and Head Motor Control Timer circuit
- c. The Head Motor Control F-F operates K501 Muting Relay which applies 28VAC to Head Motor M501
- d. Approximately 1.4 seconds after the Call Button has been released, the Head Motor control timer will reset the Head Motor Control F-F and stop the Head Motor.

3.1-3 Dial rotated Off-Normal closes S403 Dial Shunt Contacts.

- a. M401 Synchronous dial motor (low torque) operates by 28VAC through S403 contacts.

3.1-4 Rotary Dial released

- a. S401 Dial Start Switch closes and actuates Head Motor Control F-F with negative pulse.
- b. K501 Muting Relay operated by Head Motor Control F-F through transistor Q104.
- c. M501 Head Motor operates by 28VAC through K501 contacts.
- d. H501 Record Head moves by M501 Head Motor.
- e. E401 Wait Lamp lights through K501 contacts.
- f. S402 Pulse Contacts encode number of pulses on magnetic tape corresponding to digit dialed. This is accomplished by changing the level of direct current through H501 head.
- g. Rotary dial returns to normal position; g-(1) WAIT Lamp extinguishes and Head stops approximately 0.6 second (interdigital time) after rotary dial stops due to a pulse generated by Head Motor Control Timer circuit.

3.2 Access Period (Star Button)

Same as Record function except:

- a. H501 Head does not reset to index position.

3.3 Call Function

- a. Dial-In-Unit disconnected from Dialer

3.3-1 Call Button depressed

- a. H501 Head comes into contact with Magnetic Tape.
- b. Head returns to its start position by having the clutch released.

3.3-2 Call Button released

- a. Head driving clutch engages with spool.
- b. S501 switch closed by switch actuator.
- c. Head Motor Control F-F operated by S501.
- d. K501 Muting Relay operated by Head Motor Control F-F.

- e. M501 Head Drive Motor operates through K501 contacts to 28VAC.
- f. K501 also removes short circuit across K502 pulsing contacts.

3.3-3 Head H501 moves across Magnetic Tape.

- a. Head detects recorded information (magnetic flux reversals).
- b. Amplifier amplifies Head output.
- c. Schmitt Trigger shapes amplifier output into rectangular pulses.
- d. Amplifier output pulses activate Pulse Reconstitution Circuit comprised of:
  - d-(1) 40 millisecond Flip - Flop (Make time)
  - d-(2) 60 millisecond Flip - Flop operates K502 Pulsing Relay (Break time)
  - d-(3) Auxiliary Flip-Flop (adjusts Make and Break times to 10 PPS rate)

- e. Head Motor Control Timer stops Head Motor if:

- e-(1) No signal is detected by Head 3.5 seconds after Call Button is released.
- e-(2) No signal detected by Head 1.0 second after last digit is generated.

3.4 Scan Function

- a. Depress Scan Button

3.4-1 The Idler Gear engaged with the Drive Gear will determine in which direction the Tape will scan.

3.4-2 Operates S502 which applies 28VAC to Scan Motor (M502).

4. Possible Major Troubles and Defects

TABLE I

Trouble	Defects
WAIT Lamp E401 doesn't extinguish	Auxiliary Flip Flop, Head Motor Control Timer (See para. 6)
Pulsing Relay K501 pulses continuously	Auxiliary Flip-Flop, 60 Millisecond Flip-Flop, 40 Millisecond Flip-Flop
Doesn't Record or Erase	Dial-In-Unit (S402), Head not in contact with Tape
Head doesn't stop 1.4 seconds after Call Button released during Record function	Auxiliary F-F, Head Motor Control Timer (See para. 6)
RS-16767 Click Lamp lights or Shunt Lamps #1 & #2 do not operate	K501 doesn't operate
Dial-In-Unit pulse speed incorrect	Dial Motor M401 doesn't operate
Cannot adjust Break time or Make time	Pulsing Timer
Head doesn't move	Head Motor M501, Relay K501, Head Motor control F-F, Start Switch S501
Doesn't pulse out	60MSEC F-F K502 pulsing relay doesn't record
0.6 second interdigital time incorrect	Head Motor Control Timer (See para. 6)
Doesn't scan	Scan Motor (M502) Scan Button Switch (S502)

## 5. Dial-In Unit Test

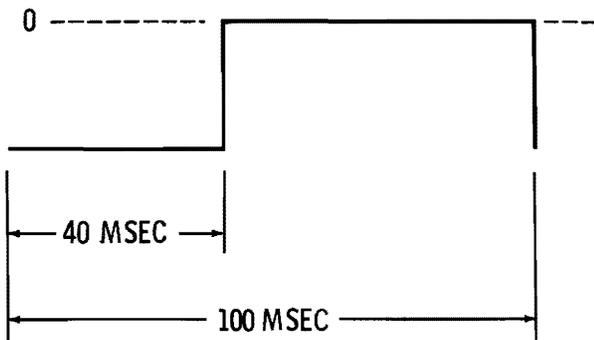
### Scope Settings

Vertical Amplifier . . 1V/cm, DC coupled  
 Slope . . . . . Negative  
 Coupling . . . . . AC slow  
 Source . . . . . Internal  
 Level . . . . . Adjust as necessary  
 Time Base . . . . . 10 msec/cm

#### 5.1 Testing procedure:

- 5.1-1 Remove cartridge
- 5.2-2 Plug Dial-In Unit into Dialer Unit receptical (J501).
- 5.3-3 Connect scope ground lead to base tray of Dialer Unit.
- 5.4-4 Connect probe to anode of CR201 (CircuiTrace point ).
- 5.4-5 Dial Zero.

Requirement - Upon release of the dial, a 100 msec square wave should appear on the scope. This pattern should be clean and have the shape shown below. The total time should not drift more than  $\pm 1$  msec (illustrated below).



NOTE: The 40 msec Break time should be set at 40 msec  $\pm 2$  msec and the 100 msec period should be set at 100 msec  $\pm 1.5$  msec.

If the 100 msec period is incorrect, replace the dial.

The 40 msec Make time is adjusted as follows:

- (a) If it is more than 40 msec, reduce the gap between the open pulsing contacts.
- (b) If it is less than 40 msec, widen the gap between the open pulsing contacts.

## 6. Motor Control Timing Circuit Test

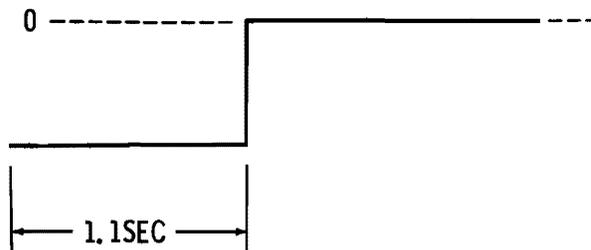
6.1 General - If a faulty head motor control timer unijunction transistor (Q111) or head motor control timing capacitor (C108) is replaced, it is necessary to check the 1.1 second (search-in) time. The following procedure outlines the 1.1 second time testing and adjustment.

### Scope Settings

Vertical Amplifier . . 10V/cm  
 Slope . . . . . Negative  
 Coupling . . . . . AC  
 Source . . . . . Internal  
 Level . . . . . Adjust as necessary  
 Time Base . . . . . .2 sec/cm

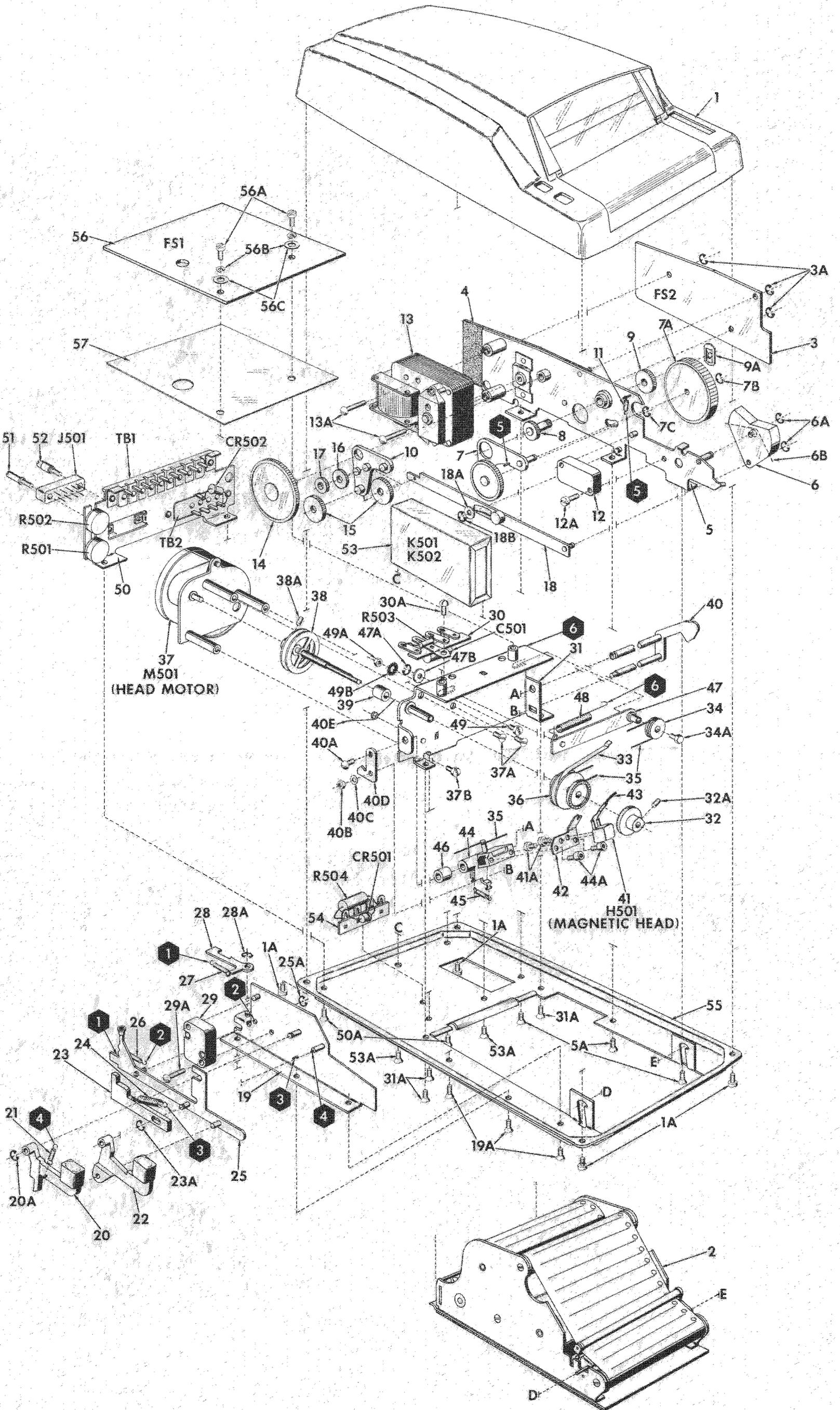
- 6.1-1 Connect scope ground lead to base tray of Dialer Unit.
- 6.2-2 Connect probe to Test Point
- 6.3-3 Remove cartridge and Dial-In Unit.
- 6.4-4 Press CALL button.

Requirement - Scope should read between 1.0 and 1.2 seconds (illustrated below).



#### 6.2 1.1 Second Time Adjustment

High . . . . . Reduce value of R154  
 Low . . . . . Increase value of R154



15

16

Fig. 19 Exploded View of Dialer Unit.

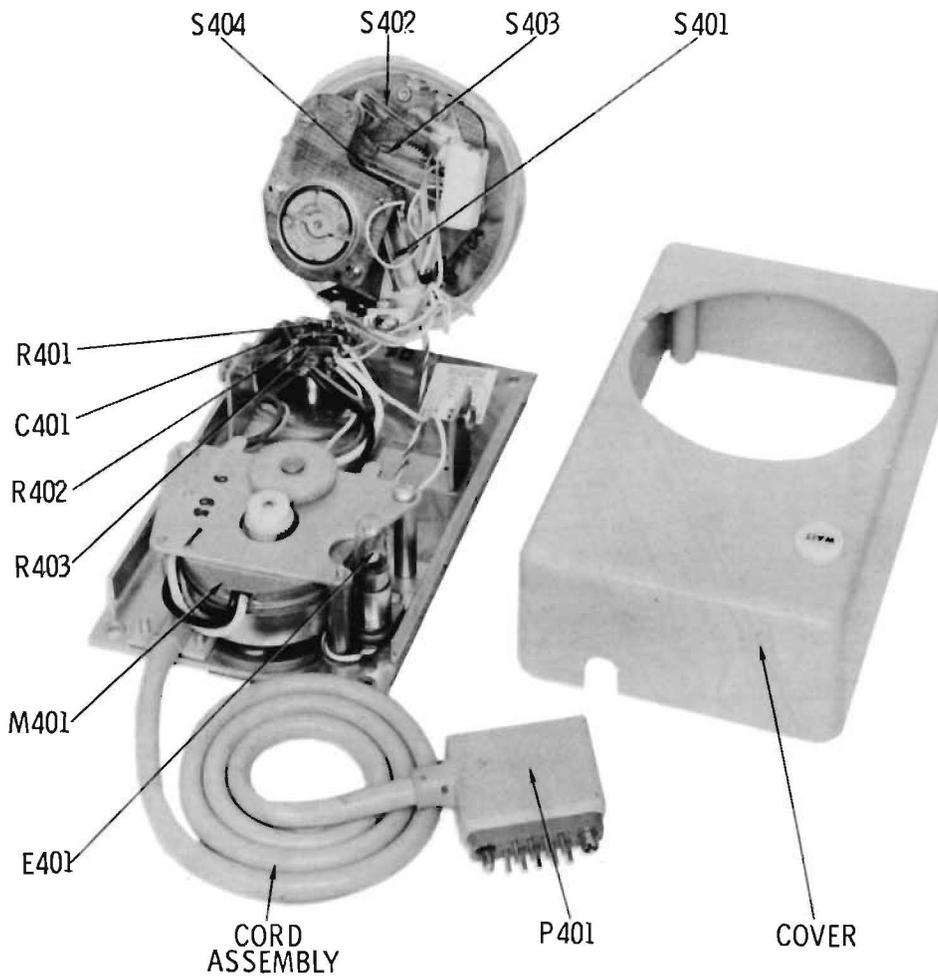


Fig. 10. Disassembled Dial-In Unit - Parts Location.

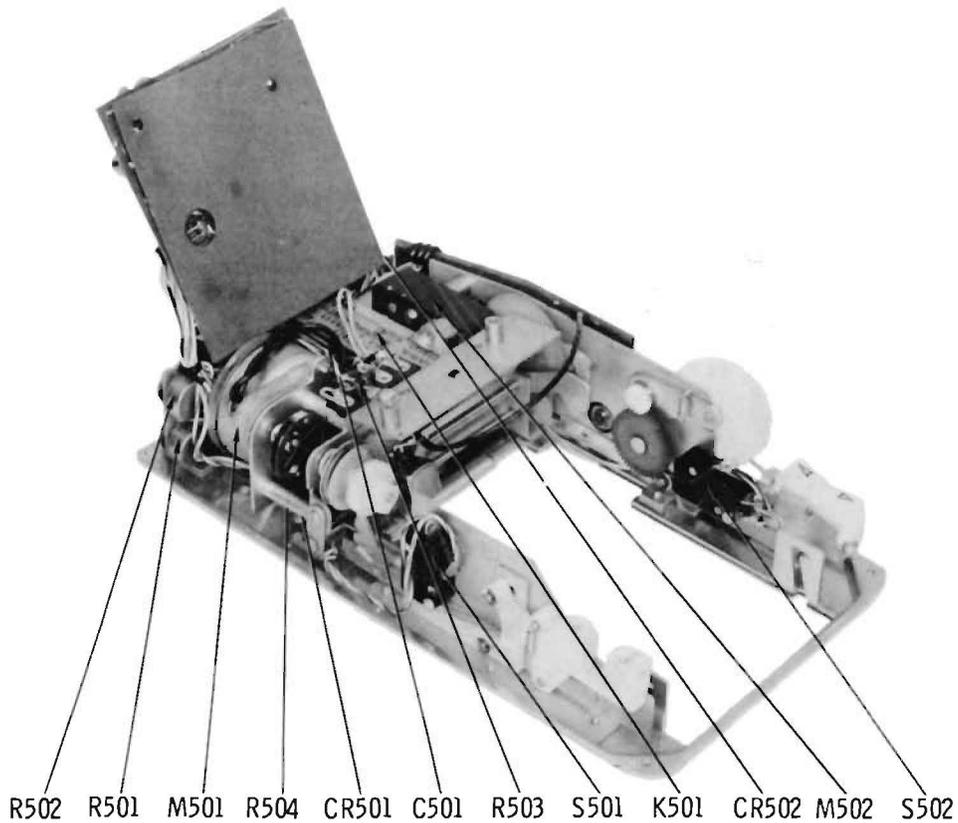


Fig. 11. Partially Disassembled Dialer Unit - Chassis Parts Location.

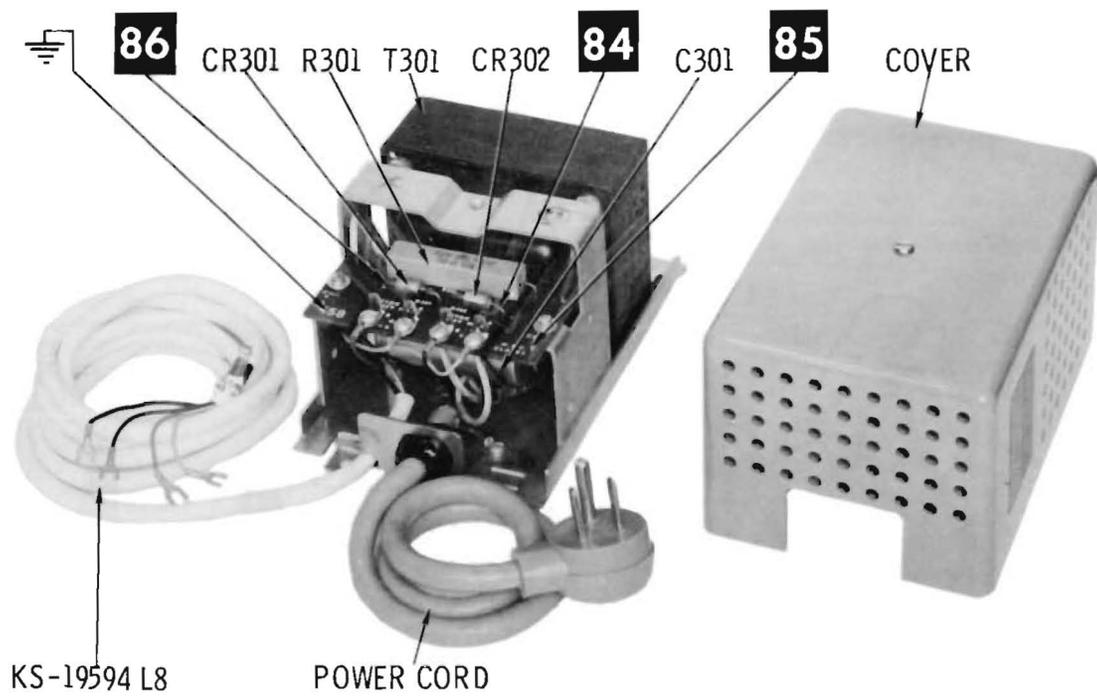


Fig. 12. Power Supply - Parts Location.

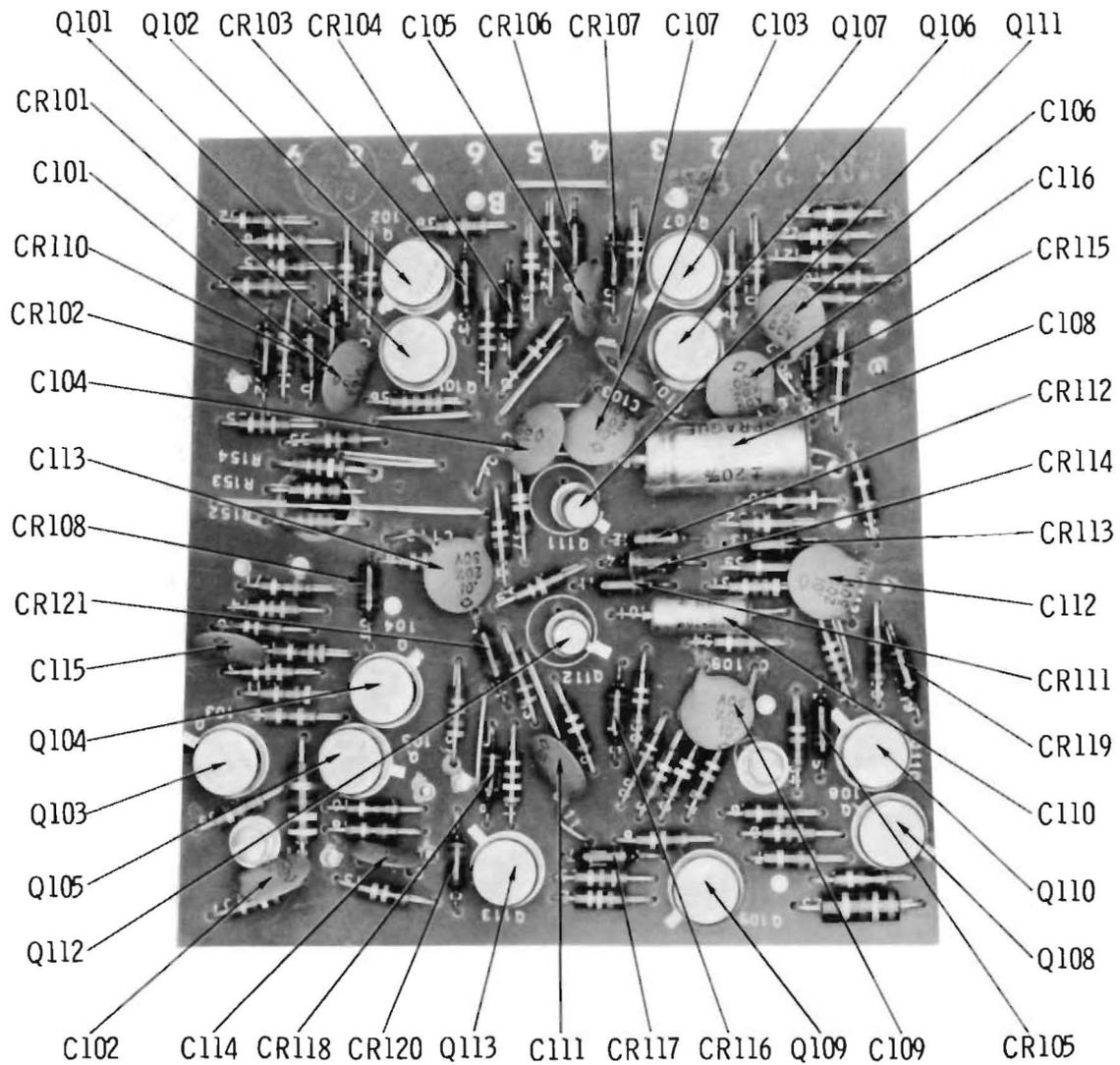


Fig. 13. Multi Board Assembly (FS1) - Transistor, Capacitor and Diode Location.

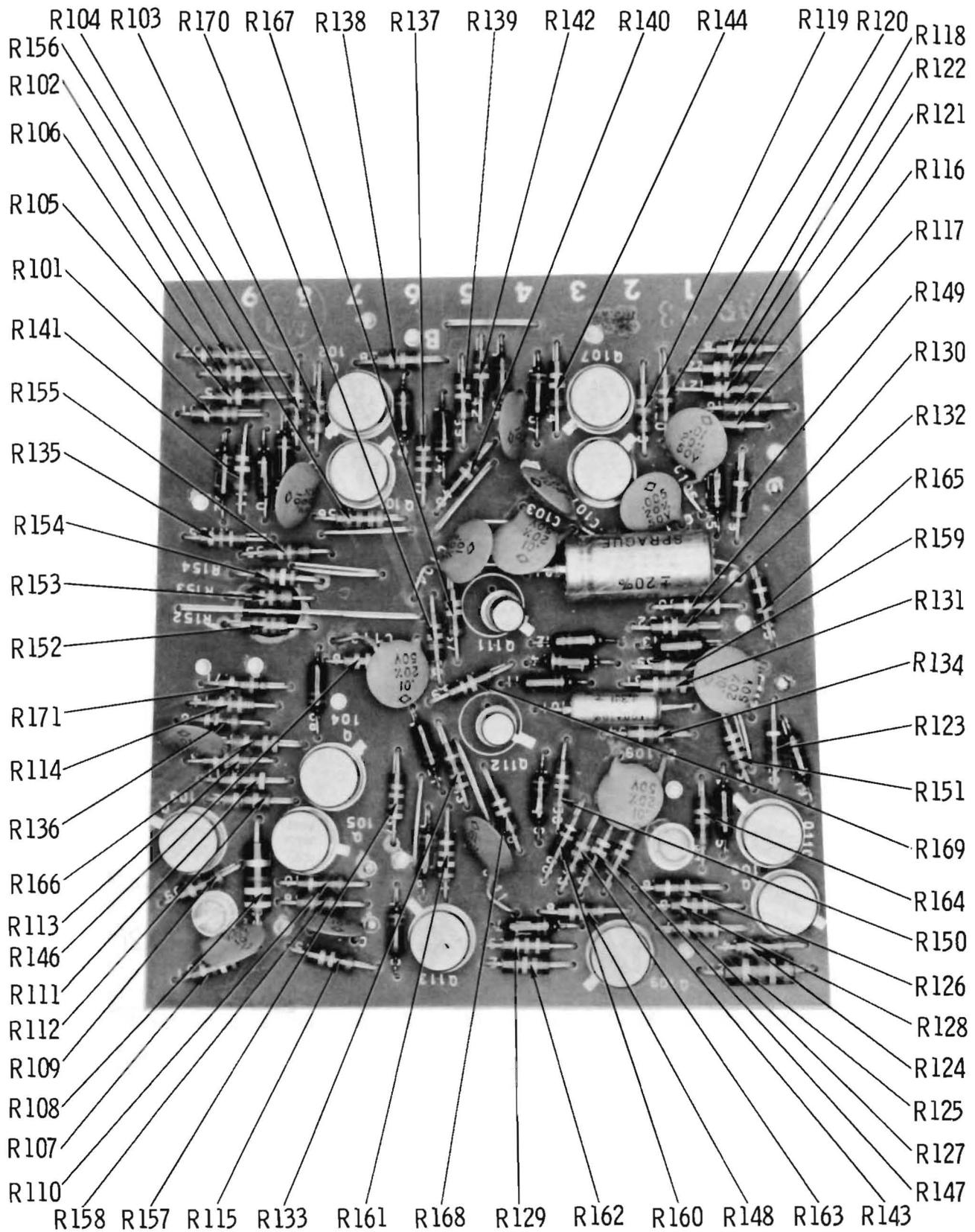


Fig. 14. Multi Board Assembly(FS1) - Resistor Location.

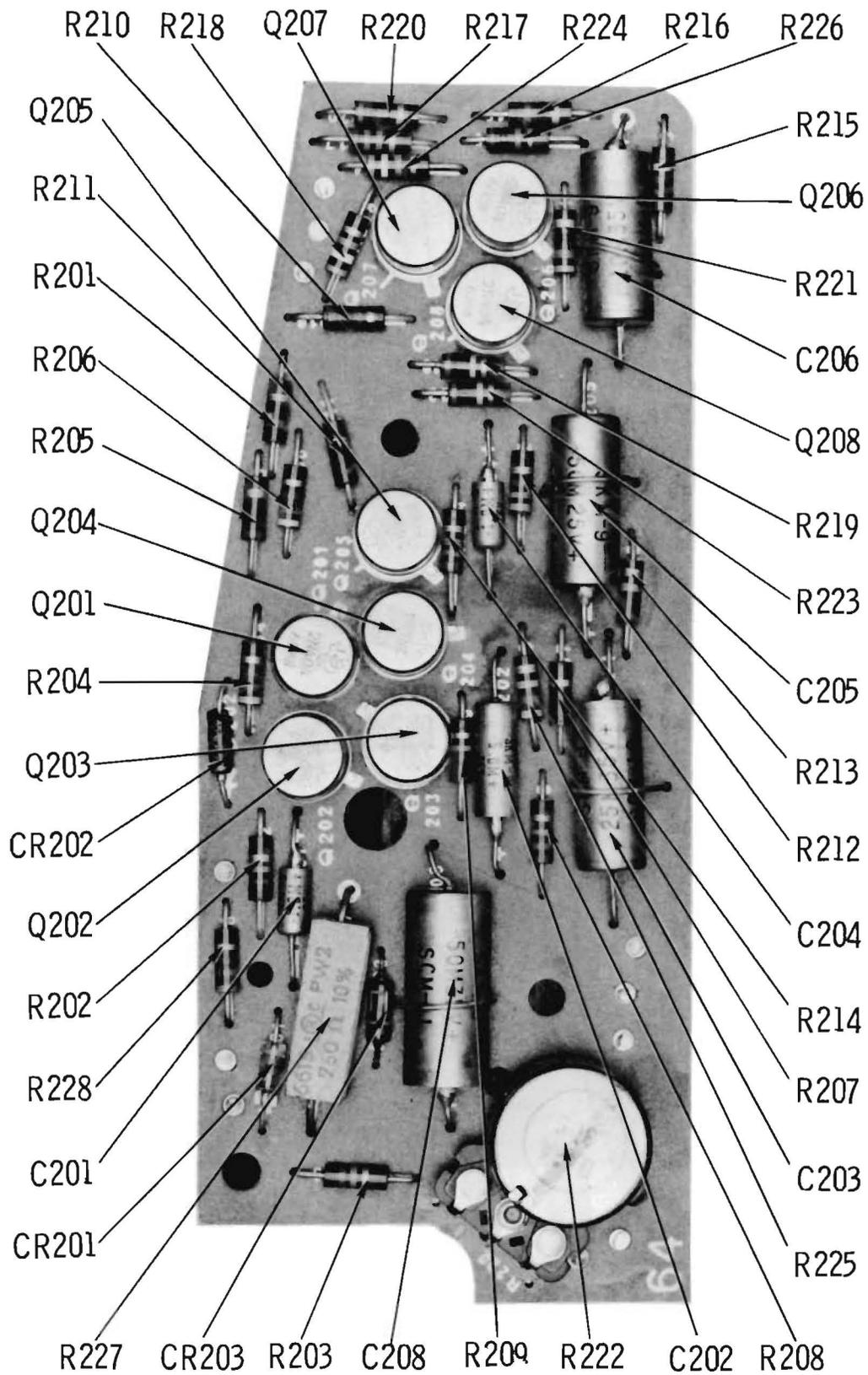
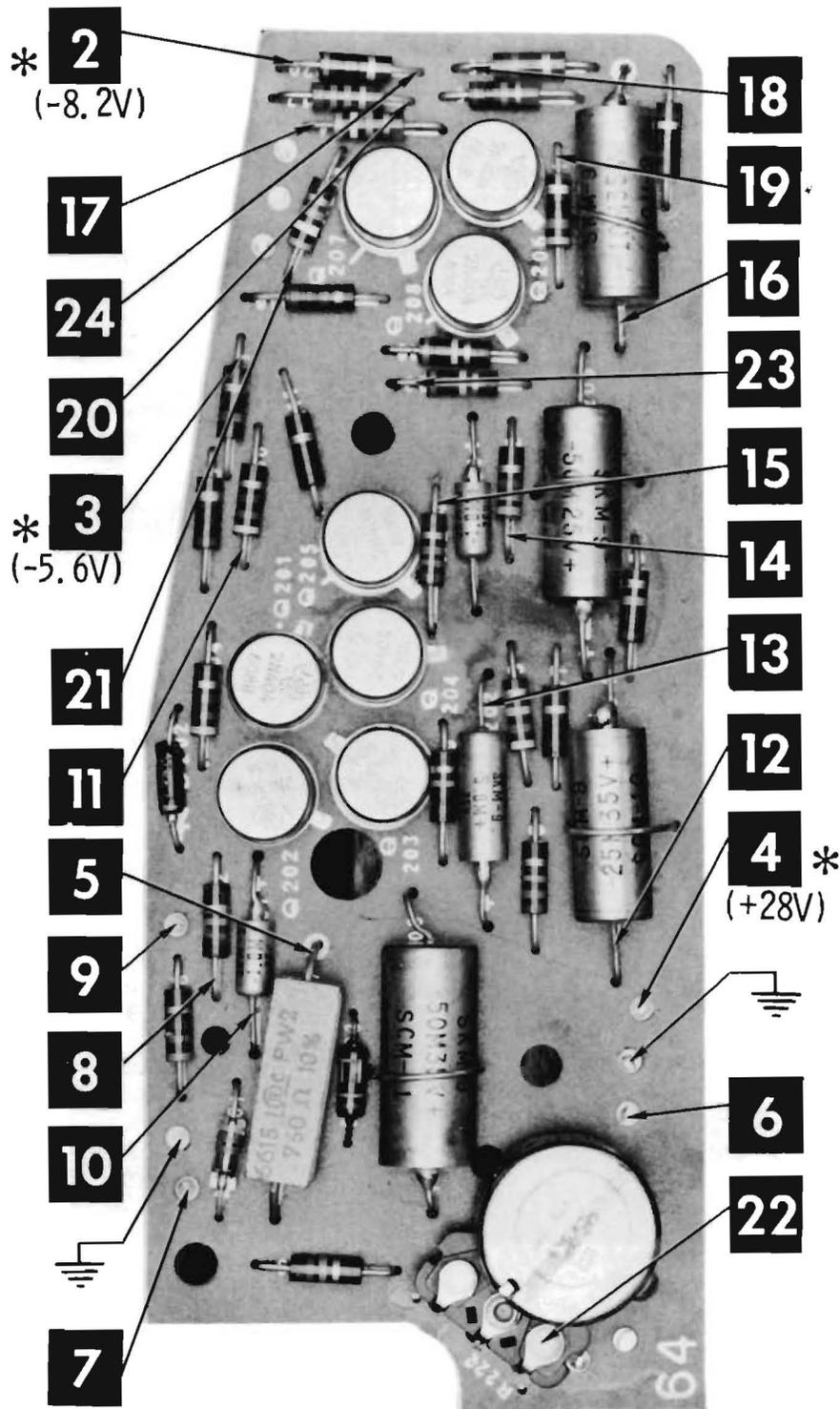
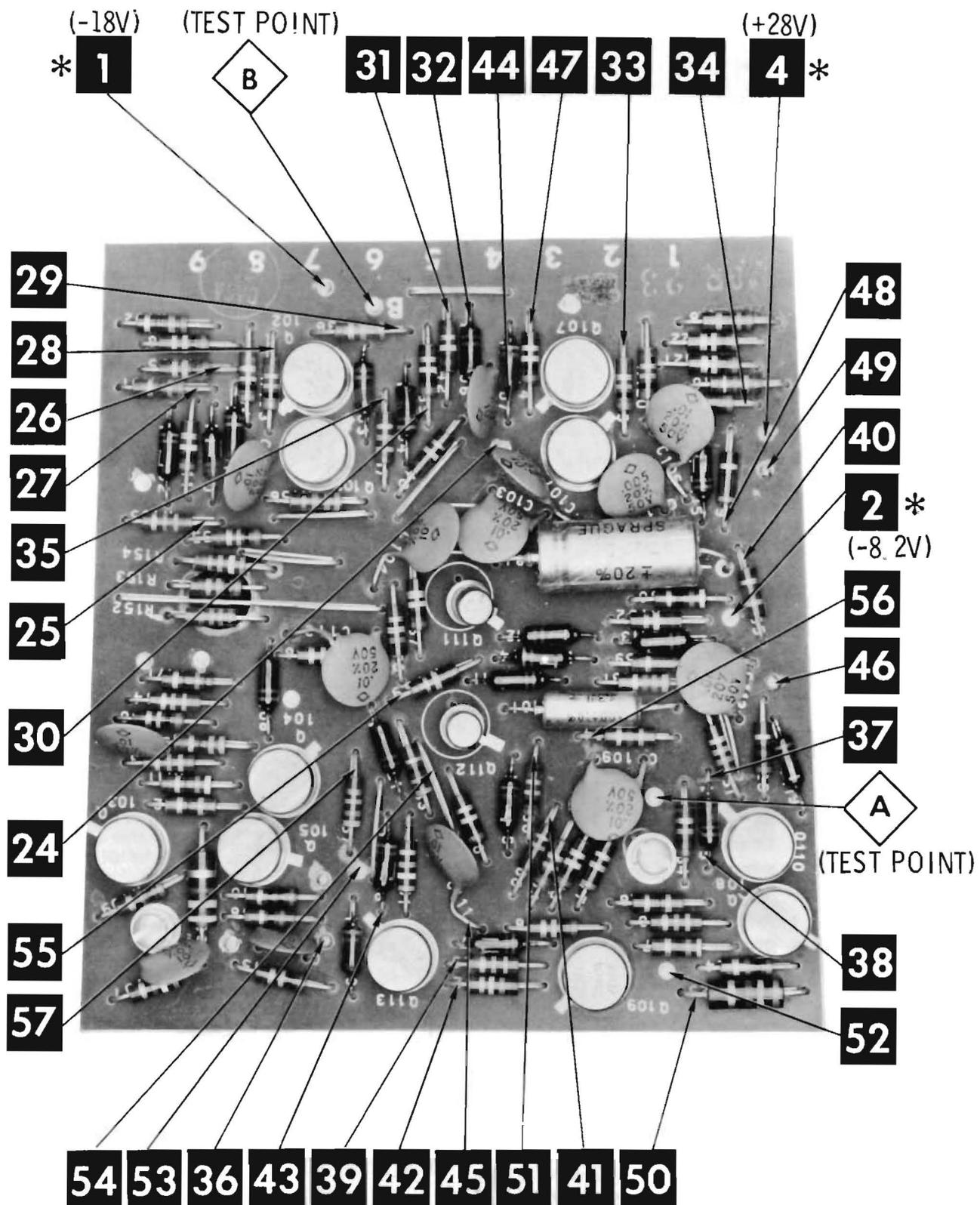


Fig. 15. Amplifier Printed Circuit Board (FS2) - Parts Location.



\* SOURCE VOLTAGE

Fig. 16. Amplifier Printed Circuit Board (FS2) - CircuiTrace Points **2** through **24**.



\* SOURCE VOLTAGE

Fig. 17. Multi Board Assembly (FS1) - CircuitTrace Points **1**, **2**, **4**, and **24** through **57**.

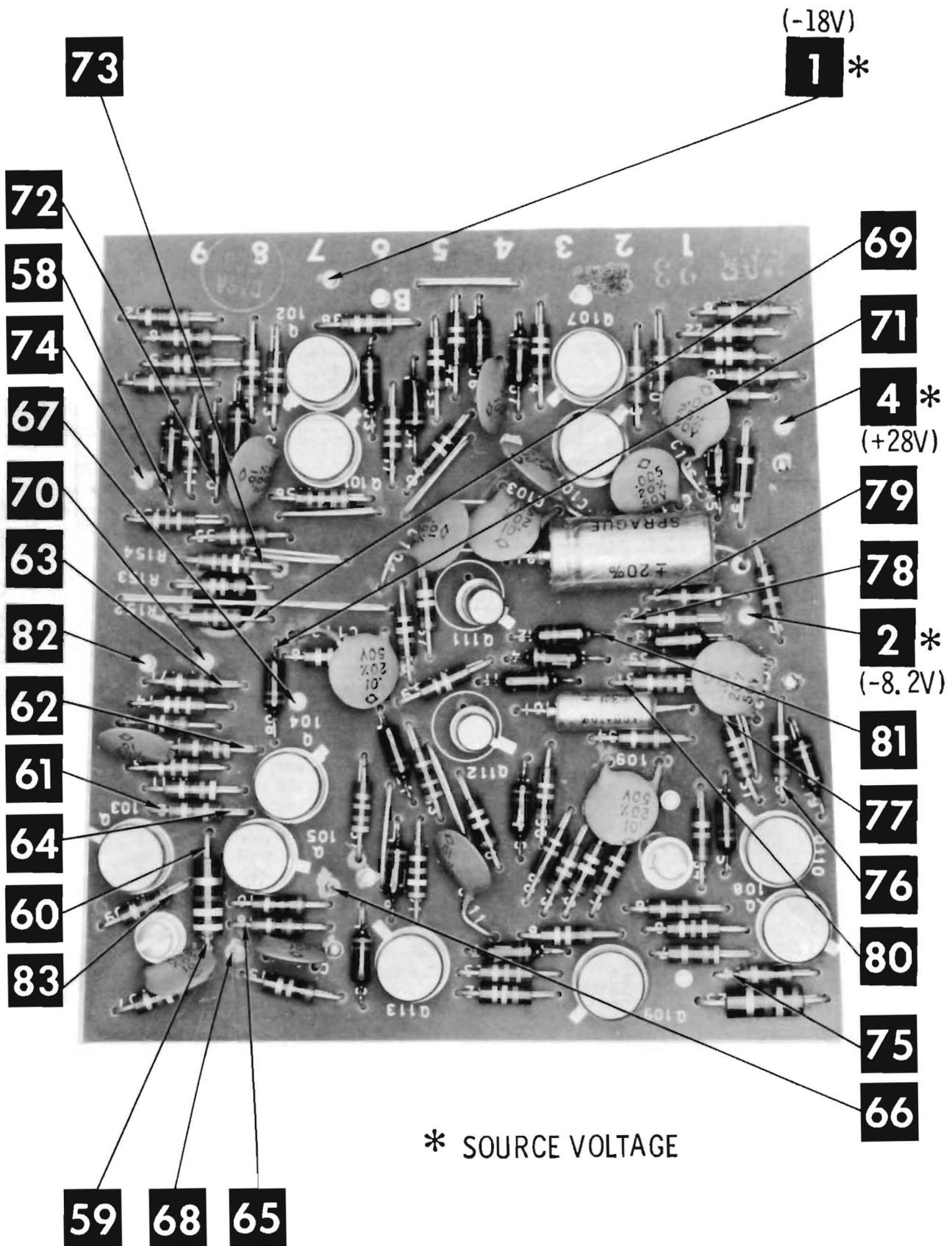


Fig. 18. Multi Board Assembly (FS1) - CircuiTrace Points 58 through 83.

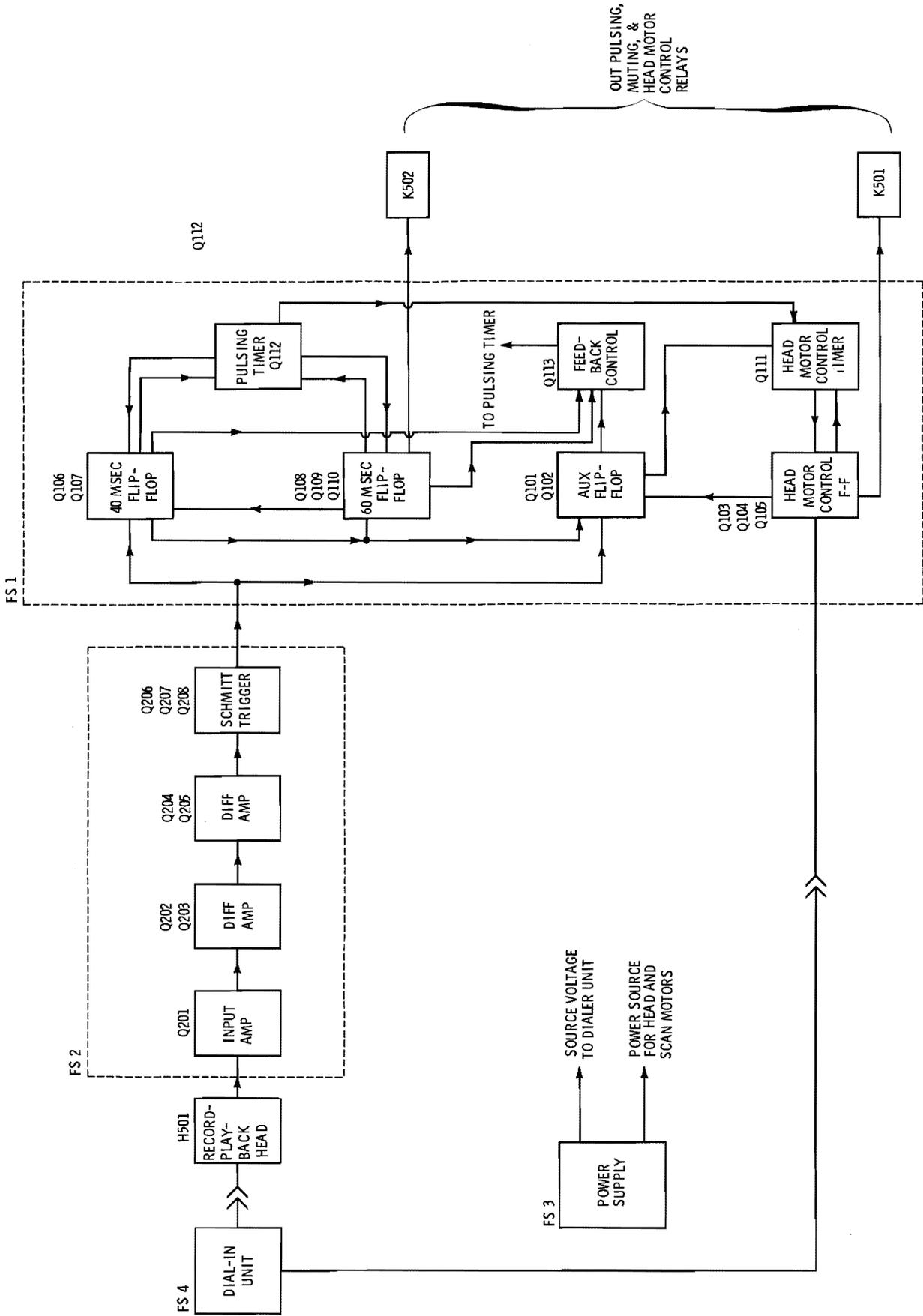


Fig. 19. Magical Dialer - Block Diagram.

Unless otherwise specified, the following waveforms are for playback of the digit "4" using a Fairchild Model 701 oscilloscope with calibrated horizontal sweep rate of 50 MSEC per division. Use direct probe and set TRIGGER SELECTOR for EXT (-) AC and adjust STABILITY and TRIGGERING LEVEL controls. Connect external trigger lead between chassis ground and CircuiTrace point 24 (Collector of Q208).



W1. CircuiTrace point 10 (Q201 Collector)



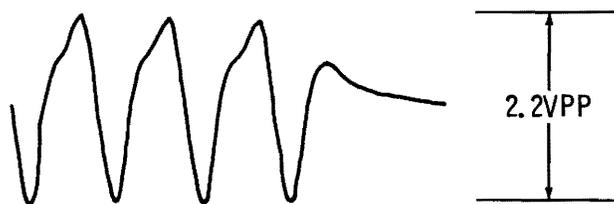
W8. CircuiTrace point 53 (Q112 Emitter).



W2. CircuiTrace point 13 (Q203 Collector)



W9. CircuiTrace point 54 (Q112, Base 1) - Taken with calibrated horizontal sweep rate of 20 MSEC/DIV.



W3. CircuiTrace point 16 (Q205 Collector)



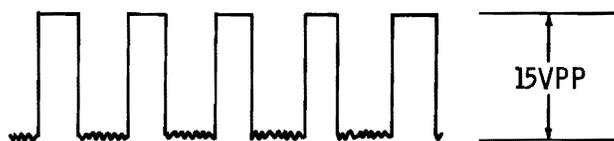
W10. Test Point



W4. CircuiTrace point 24 (Q208 Collector)



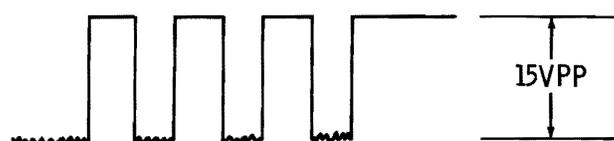
W11. CircuiTrace point 25 (Anode CR101)



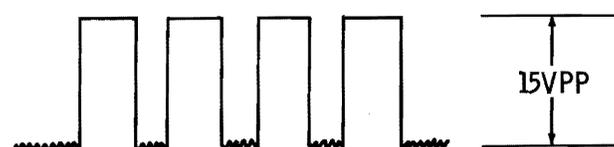
W5. CircuiTrace point 47 (Q107 Collector)



W12. CircuiTrace point 78 (Cathode CR111) - Operate CALL button) and record 4 pulses - Horizontal sweep rate of .2 SEC/DIV.



W6. CircuiTrace point 27 (Q101 Collector)



W7. CircuiTrace point 50 (Q109 Collector)



W13. CircuiTrace point 78 (Cathode CR111) - Horizontal sweep rate of .2 SEC/DIV.

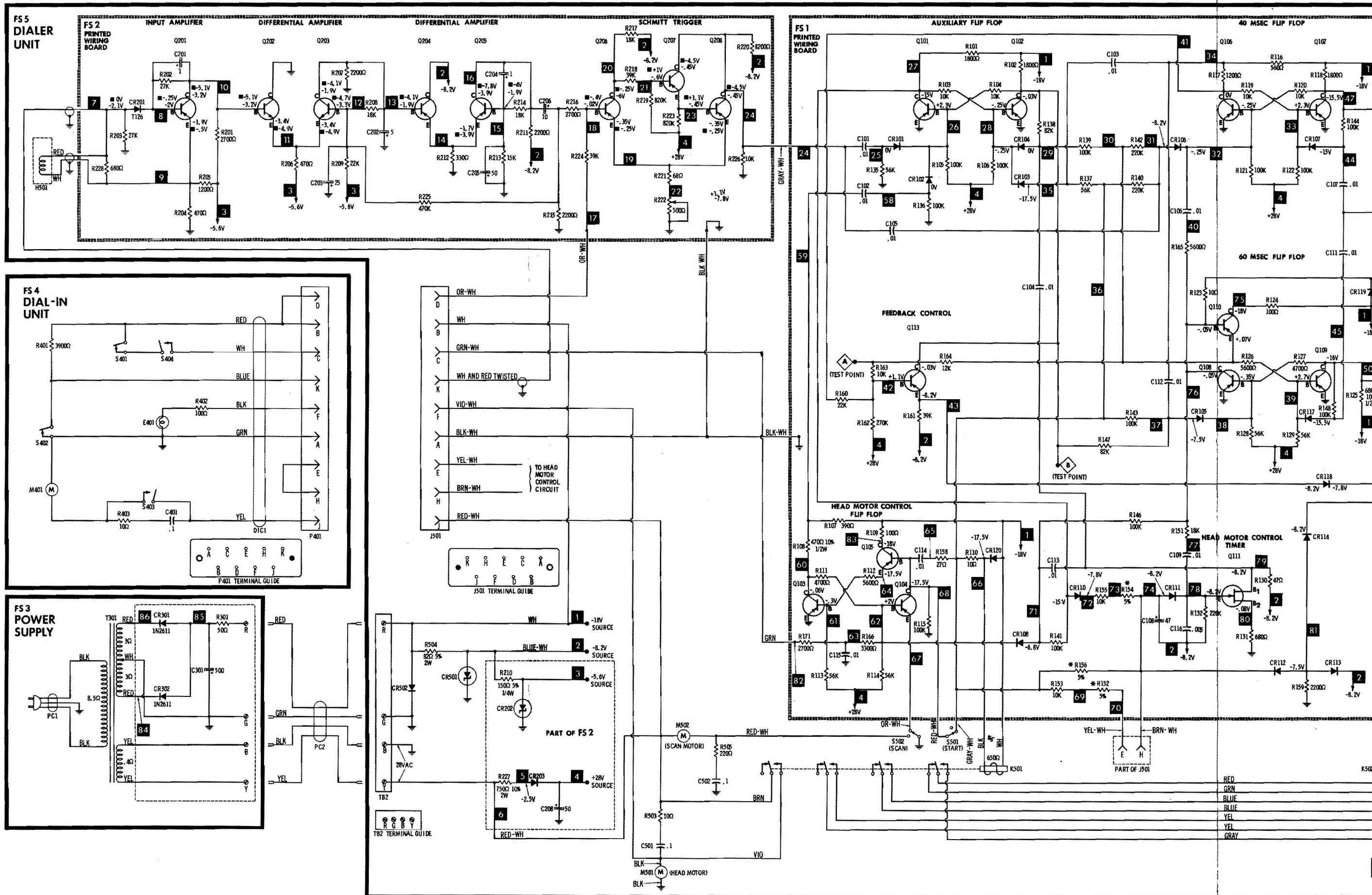
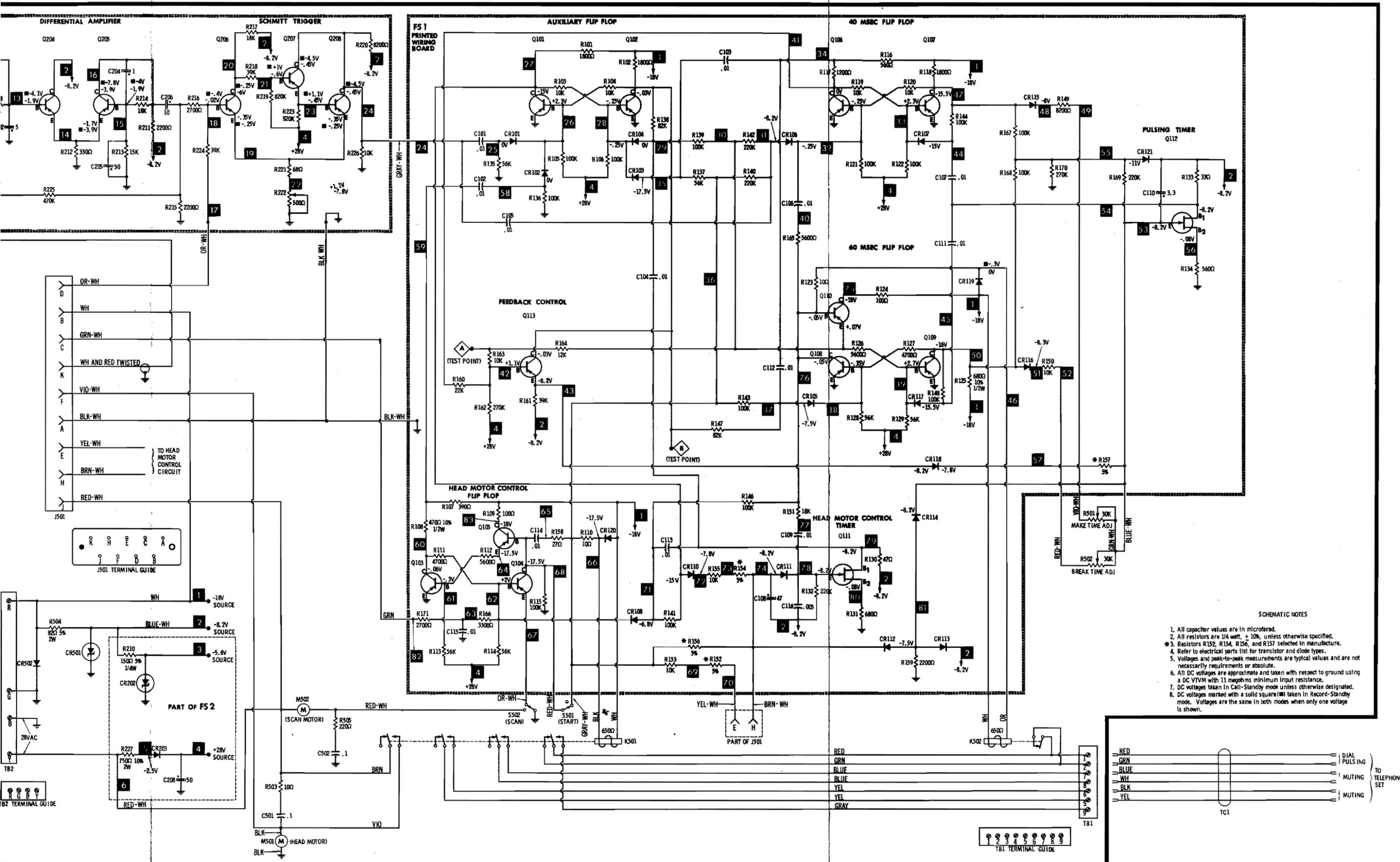


Fig. 20. Schematic Diagram - Complete Magcall Dialer.



- SCHEMATIC NOTES**
1. All capacitor values are in microfarad.
  2. All resistors are 1/4 watt, ± 10%, unless otherwise specified.
  3. Resistors R152, R154, R156, and R157 selected in manufacture.
  4. Refer to electrical parts list for transistor and diode types.
  5. Voltages and peak-to-peak measurements are typical values and are not necessarily requirements or absolute.
  6. All DC voltages are approximate and taken with respect to ground using a DC VTVM with 11 megohms minimum input resistance.
  7. DC voltages taken in Call-Standby mode unless otherwise designated.
  8. DC voltages marked with a solid square (■) taken in Record-Standby mode. Voltages are the same in both modes when only one voltage is shown.

Fig. 20. Schematic Diagram - Complete MagicalI Dialer.

# ELECTRICAL PARTS LIST AND DESCRIPTION

Multi Board Ass'y. (FS1) - Individual Components

Ref. No.	Part No. - Description	Notes
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## TRANSISTORS

Q101	General Electric 2N404, PNP	
Q102	General Electric 2N404, PNP	
Q103	General Electric 2N404, PNP	
Q104	General Electric 2N404, PNP	
Q105	General Electric 2N404, PNP	
Q106	General Electric 2N404, PNP	
Q107	General Electric 2N404, PNP	
Q108	General Electric 2N404, PNP	
Q109	General Electric 2N404, PNP	
Q110	General Electric 2N404, PNP	
Q111	General Electric 2N2646 or 2N2160, Unijunction	
Q112	General Electric 2N2646 or 2N2160, Unijunction	
Q113	General Electric 2N404, PNP	

## CAPACITORS

C101	19C21416 Sprague, .01mfd @ 50V, 20%, 5/16" Disc	
C102	19C21416 Sprague, .01mfd @ 50V, 20%, 5/16" Disc	
C103	19C21416 Sprague, .01mfd @ 50V, 20%, 5/16" Disc	
C104	19C21416 Sprague, .01mfd @ 50V, 20%, 5/16" Disc	
C105	19C21416 Sprague, .01mfd @ 50V, 20%, 5/16" Disc	
C106	19C21416 Sprague, .01mfd @ 50V, 20%, 5/16" Disc	
C107	19C21416 Sprague, .01mfd @ 50V, 20%, 5/16" Disc	
C108	150D476X9020R2 Sprague, 47mfd @ 20V, Tantalum (Electrolytic)	
C109	19C21416 Sprague, .01mfd @ 50V, 20%, 5/16" Disc	
C110	150D335X9035B2, 3.3mfd @ 35V, Tantalum (Electrolytic)	
C111	19C21416 Sprague, .01mfd @ 50V, 20%, 5/16" Disc	
C112	19C21416 Sprague, .01mfd @ 50V, 20%, 5/16" Disc	
C113	19C21416 Sprague, .01mfd @ 50V, 20%, 5/16" Disc	
C114	19C21416 Sprague, .01mfd @ 50V, 20%, 5/16" Disc	
C115	19C21416 Sprague, .01mfd @ 50V, 20%, 5/16" Disc	
C116	Sprague TO-D50, .005mfd @ 50V, 20%, 5/16" Disc	

## RESISTORS

R101	1800Ω, ±10%, 1/4 Watt, Carbon	
R102	1800Ω, ±10%, 1/4 Watt, Carbon	
R103	10K, ±10%, 1/4 Watt, Carbon	
R104	10K, ±10%, 1/4 Watt, Carbon	
R105	100K, ±10%, 1/4 Watt, Carbon	
R106	100K, ±10%, 1/4 Watt, Carbon	
R107	390Ω, ±10%, 1/4 Watt, Carbon	
R108	470Ω, ±10%, 1/2 Watt, Carbon	
R109	100Ω, ±10%, 1/4 Watt, Carbon	
R110	10Ω, ±10%, 1/4 Watt, Carbon	
R111	4700Ω, ±10%, 1/4 Watt, Carbon	
R112	5600Ω, ±10%, 1/4 Watt, Carbon	
R113	56K, ±10%, 1/4 Watt, Carbon	
R114	56K, ±10%, 1/4 Watt, Carbon	
R115	100K, ±10%, 1/4 Watt, Carbon	
R116	560Ω, ±10%, 1/4 Watt, Carbon	
R117	1200Ω, ±10%, 1/4 Watt, Carbon	
R118	1800Ω, ±10%, 1/4 Watt, Carbon	
R119	10K, ±10%, 1/4 Watt, Carbon	
R120	10K, ±10%, 1/4 Watt, Carbon	
R121	100K, ±10%, 1/4 Watt, Carbon	
R122	100K, ±10%, 1/4 Watt, Carbon	
R123	10Ω, ±10%, 1/4 Watt, Carbon	
R124	100Ω, ±10%, 1/4 Watt, Carbon	
R125	680Ω, ±10%, 1/2 Watt, Carbon	
R126	5600Ω, ±10%, 1/4 Watt, Carbon	
R127	4700Ω, ±10%, 1/4 Watt, Carbon	
R128	56K, ±10%, 1/4 Watt, Carbon	

Ref. No.	Part No. - Description	Notes
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## RESISTORS (Cont'd.)

R129	56K, ±10%, 1/4 Watt, Carbon	
R130	47Ω, ±10%, 1/4 Watt, Carbon	
R131	680Ω, ±10%, 1/4 Watt, Carbon	
R132	220K, ±10%, 1/4 Watt, Carbon	
R133	33Ω, ±10%, 1/4 Watt, Carbon	
R134	560Ω, ±10%, 1/4 Watt, Carbon	
R135	56K, ±10%, 1/4 Watt, Carbon	
R136	100K, ±10%, 1/4 Watt, Carbon	
R137	56K, ±10%, 1/4 Watt, Carbon	
R138	82K, ±10%, 1/4 Watt, Carbon	
R139	100K, ±10%, 1/4 Watt, Carbon	
R140	220K, ±10%, 1/4 Watt, Carbon	
R141	100K, ±10%, 1/4 Watt, Carbon	
R142	220K, ±10%, 1/4 Watt, Carbon	
R143	100K, ±10%, 1/4 Watt, Carbon	
R144	100K, ±10%, 1/4 Watt, Carbon	
R146	100K, ±10%, 1/4 Watt, Carbon	
R147	82K, ±10%, 1/4 Watt, Carbon	
R148	100K, ±10%, 1/4 Watt, Carbon	
R149	8200Ω, ±10%, 1/4 Watt, Carbon	
R150	10K, ±10%, 1/4 Watt, Carbon	
R151	18K, ±10%, 1/4 Watt, Carbon	
R152	Selected	1
R153	10K, ±10%, 1/4 Watt, Carbon	
R154	Selected	1
R155	10K, ±10%, 1/4 Watt, Carbon	
R156	Selected	1
R157	Selected	1
R158	27Ω, ±10%, 1/4 Watt, Carbon	
R159	2200Ω, ±10%, 1/4 Watt, Carbon	
R160	22K, ±10%, 1/4 Watt, Carbon	
R161	39K, ±10%, 1/4 Watt, Carbon	
R162	270K, ±10%, 1/4 Watt, Carbon	
R163	10K, ±10%, 1/4 Watt, Carbon	
R164	12K, ±10%, 1/4 Watt, Carbon	
R165	5600Ω, ±10%, 1/4 Watt, Carbon	
R166	3300Ω, ±10%, 1/4 Watt, Carbon	
R167	100K, ±10%, 1/4 Watt, Carbon	
R168	100K, ±10%, 1/4 Watt, Carbon	
R169	220K, ±10%, 1/4 Watt, Carbon	
R170	270K, ±10%, 1/4 Watt, Carbon	
R171	2700Ω, ±10%, 1/4 Watt, Carbon	

## DIODES

CR101	TI53 Texas Instruments or CSR5494 Clevite, or equivalent	
CR102	TI53 Texas Instruments or CSR5494 Clevite, or equivalent	
CR103	TI53 Texas Instruments or CSR5494 Clevite, or equivalent	
CR104	TI53 Texas Instruments or CSR5494 Clevite, or equivalent	
CR105	TI53 Texas Instruments or CSR5494 Clevite, or equivalent	
CR106	TI53 Texas Instruments or CSR5494 Clevite, or equivalent	
CR107	TI53 Texas Instruments or CSR5494 Clevite, or equivalent	
CR108	TI53 Texas Instruments or CSR5494 Clevite, or equivalent	
CR110	TI53 Texas Instruments or CSR5494 Clevite, or equivalent	
CR111	TI53 Texas Instruments or CSR5494 Clevite, or equivalent	
CR112	TI53 Texas Instruments or CSR5494 Clevite, or equivalent	
CR113	TI53 Texas Instruments or CSR5494 Clevite, or equivalent	
CR114	TI53 Texas Instruments or CSR5494 Clevite, or equivalent	
CR115	TI53 Texas Instruments or CSR5494 Clevite, or equivalent	
CR116	TI53 Texas Instruments or CSR5494 Clevite, or equivalent	
CR117	TI53 Texas Instruments or CSR5494 Clevite, or equivalent	
CR118	TI53 Texas Instruments or CSR5494 Clevite, or equivalent	
CR119	TI53 Texas Instruments or CSR5494 Clevite, or equivalent	
CR120	TI53 Texas Instruments or CSR5494 Clevite, or equivalent	
CR121	TI53 Texas Instruments or CSR5494 Clevite, or equivalent	

## NOTES

- Component values for R152, R154, R156, and R157 selected in manufacture. The dialer should be returned to the repair shop if necessary to replace these resistors.

# ELECTRICAL PARTS LIST AND DESCRIPTION (CONTINUED)

Printed Circuit Board Ass'y. (FS2) - Individual Components

Ref. No.	Part No. - Description	Notes
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### TRANSISTORS

Q201	General Electric 2N404, PNP	
Q202	Texas Instruments 2N1304, NPN	
Q203	Texas Instruments 2N1304, NPN	
Q204	General Electric 2N404, PNP	
Q205	General Electric 2N404, PNP	
Q206	General Electric 2N404, PNP	
Q207	General Electric 2N404, PNP	
Q208	General Electric 2N404, PNP	

### CAPACITORS

C201	150D105X9035A Sprague, 1mfd @ 35V, Electrolytic	
C202	150D505X9035BO Sprague, 5mfd @ 35V, Electrolytic	
C203	150D256X9035RO Sprague, 25mfd @ 35V, Electrolytic	
C204	150D105X9035A Sprague, 1mfd @ 35V, Electrolytic	
C205	150D506X9035SO Sprague, 50mfd @ 35V, Electrolytic	
C206	150D106X9035RO Sprague, 10mfd @ 35V, Electrolytic	
C208	150D506X9035SO Sprague, 50mfd @ 35V, Electrolytic	

### CONTROLS AND RESISTORS

R201	2700Ω, ±10%, 1/4 Watt, Carbon	
R202	27K, ±10%, 1/4 Watt, Carbon	
R203	27K, ±10%, 1/4 Watt, Carbon	
R204	470Ω, ±10%, 1/4 Watt, Carbon	
R205	1200Ω, ±10%, 1/4 Watt, Carbon	
R206	470Ω, ±10%, 1/4 Watt, Carbon	
R207	2200Ω, ±10%, 1/4 Watt, Carbon	

Ref. No.	Part No. - Description	Notes
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### CONTROLS AND RESISTORS (Cont'd.)

R208	18K, ±10%, 1/4 Watt, Carbon	
R209	22K, ±10%, 1/4 Watt, Carbon	
R210	150Ω, ±5%, 1/4 Watt, Carbon	
R211	2200Ω, ±10%, 1/4 Watt, Carbon	
R212	330Ω, ±10%, 1/4 Watt, Carbon	
R213	15K, ±10%, 1/4 Watt, Carbon	
R214	18K, ±10%, 1/4 Watt, Carbon	
R215	2200Ω, ±10%, 1/4 Watt, Carbon	
R216	2700Ω, ±10%, 1/4 Watt, Carbon	
R217	18K, ±10%, 1/4 Watt, Carbon	
R218	39K, ±10%, 1/4 Watt, Carbon	
R219	820K, ±10%, 1/4 Watt, Carbon	
R220	8200Ω, ±10%, 1/4 Watt, Carbon	
R221	68Ω, ±10%, 1/4 Watt, Carbon	
R222	500Ω, Type FV Control, Stackpole Carbon Co.	
R223	820K, ±10%, 1/4 Watt, Carbon	
R224	39K, ±10%, 1/4 Watt, Carbon	
R225	470K, ±10%, 1/4 Watt, Carbon	
R226	10K, ±10%, 1/4 Watt, Carbon	
R227	750Ω, ±10%, 2 Watt, Carbon	
R228	680Ω, ±10%, 1/4 Watt, Carbon	

### DIODES

CR201	T12G Transition or CTP-503 Clevite	
CR202	1N752-A Int. Rectifier or equivalent (5.6V Zener)	
CR203	TI56 Texas Instruments	

### Power Supply (FS3)

Ref. No.	Part No. - Description	Notes
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### ELECTRICAL PARTS

T301	Transformer, BTL Drawing No. B-573320	1
C301	34D507H030H6-4 Sprague, 500mfd @ 30V, Electrolytic	
R301	Resistor, 50Ω, ±10%, 10 Watt	

Ref. No.	Part No. - Description	Notes
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CR301	International Rectifier 1N2611 or General Instruments 1N4383	
CR302	International Rectifier 1N2611 or General Instruments 1N4383	

### NOTES

- Order from Dasa Corp. as follows: B-573320 (Part of KS-19594)

### Dial-In Unit (FS4)

Ref. No.	Part No. - Description	Notes
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### ELECTRICAL PARTS

M401	Dial Motor, BTL Drawing No. B-573301	1
S401	Dial Start Switch	
S402	Dial Pulsing Switch Part of B-573289	1, 2
S403	Dial Shunt Switch	
S404	Dial Shunt Switch	

Ref. No.	Part No. - Description	Notes
----------	------------------------	-------

C401	220P10402 Sprague, .1mfd @ 200V, Mylar Film Capacitor	
R401	3900Ω, ±10%, 1/4 Watt, Carbon Resistor	
R402	100Ω, ±10%, 1/4 Watt, Carbon Resistor	
R403	10Ω, ±10%, 1/4 Watt, Carbon Resistor	
E401	G. E. 1819 lamp	
P401	Continental 9-20-PGD or Winchester MRE9TG (Plug)	
DIC1	Cord Ass'y.	

### NOTES

- Unless otherwise specified, "B" numbers referred to are BTL drawing numbers: Order from Dasa Corp. as follows: B- \_\_\_\_\_ (part of KS-19594).
- BTL drawing number (B-573289) listed under "Miscellaneous" portion of parts list.

# ELECTRICAL PARTS LIST AND DESCRIPTION (CONTINUED)

## Dialer Unit (FS5)

Ref. No.	Part No. -- Description	Notes	Ref. No.	Part No. -- Description	Notes
H501	Magnetic Head (B-568783)	1	C502	431P10406 Sprague, .1mfd @ 600V, Mylar Film Capacitor	
M501	Head Drive Motor (B-568830)	1	R501	30K Trim Pot (Make), L-62 Stackpole Carbon Co.	
M502	Scan Motor (B-568833)	1	R502	30K Trim Pot (Break), L-62 Stackpole Carbon Co.	
K501	} Relay Ass'y. (B-568776)	1	R503	10Ω, ±10%, 1/2 Watt, Carbon Resistor	
K502		1	R504	82Ω, ±5%, 2 Watt, Carbon Resistor	
S501	Start Switch (B-573273)	1	R505	220Ω, ±10%, 1/4 Watt, Carbon Resistor	
S502	Scan Switch (B-568870)	1	CR501	1N1769A International Rectifier (8.2V Zener)	
C501	220P10402 Sprague, .1mfd @ 200V, Mylar Film Capacitor		CR502	1N2611 International Rectifier	
			J501	Jack, Continental 9-20-SGD	

### NOTES

1. Unless otherwise specified, "B" numbers referred to are BTL drawing numbers: Order from Dasa Corp. as follows:  
B- \_\_\_\_\_ (part of KS-19594).

## Miscellaneous Parts

Ref. No.	Part No. -- Description	Notes	Ref. No.	Part No. -- Description	Notes
	Dial Assembly (B-573275)	1,2	PC1	Power Cord, Power Supply (B-573331)	1
	Dial (B-573289)	1	PC2	Connecting Cord, Power Supply (KS-19594, L8)	
FS1	Multi Board Ass'y. (B-568778)	1	DIC1	Connecting Cord, Dial-In Unit (KS-19594, L7)	
FS2	Printed Circuit Board Ass'y. (B-568771)	1	TC1	Connecting Cord, Telephone (KS-19594, L9)	
FS3	Power Supply, Complete		TB1	Terminal Board	
FS4	Dial-In Unit, Complete		TB2	Terminal Board	
FS5	Dialer Unit Chassis Parts				

### NOTES

1. Unless otherwise specified, "B" numbers referred to are BTL drawing numbers: Order from Dasa Corp. as follows:  
B- \_\_\_\_\_ (part of KS-19594).
2. Includes Dial (B-573289), Switch Plate Ass'y. (B-573276), and Switch Spring Ass'y. (B-573280).

# KS-19594 DRAWING LIST

## BTL DRAWING NUMBERS AND PARTS LIST - (MECHANICAL)

### DIALER UNIT

Ref.* No.	BTL Drawing Nos.	Description	Notes	Ref.* No.	BTL Drawing Nos.	Description	Notes
1	B-568698	Cover Ass'y.			B-568765	Back Plate Ass'y.	3
1A		Screw, B. H. M., .112-40 x 1/4, Ni. Pit. (4 Req'd.)		31	B-568811	Back Plate	
2	B-568693	Cartridge Ass'y.		31A		Screw, F. H. M., Stl., .112-40x3/16 (3 Req'd.)	
3	B-568781	Printed Circuit Board Ass'y. (FS2)		32	B-568821	Clutch	
3A		Retaining Ring (3 Req'd.)		32A		Socket Hd. Setscrew, .138-32 x 3/16	
4	B-568788	Insulator Board	1	33	B-568823	Spring	
	B-568766	Right Frame Ass'y.		34	B-568826	Pulley	
5	B-568857	Right Frame Ass'y. Plate		34A		Hex Hd. Screw, .112-40 x 7/16	
5A		Screw, F. H. M., Stl., .112-40x3/16 (3 Req'd.)		35	B-568832	Cable Ass'y.	
6	B-568874	Button, Rapid Scan		36	B-568824	Spool, Head Drive	
6A		Retaining Ring		37	B-568830	Motor, Head Drive	
6B	B-568873	Spring		37A		Screw, F. H. M., Stl., .112-40x3/16 (2 Req'd)	
7	B-568836	Plate Ass'y.		37B		Screw, Fil. H.M., .112-40x1/4	
7A	B-568847	Hand Wheel Ass'y.		38	B-568803	Coupling Ass'y., Motor	
7B		Retaining Ring		38A		Socket Hd. Setscrew, Stl., .112-40x3/8	4
7C		Retaining Ring		39	B-568825	Spacer	
8	B-568841	Gear and Shaft Ass'y.		40	B-568792	Arm Ass'y., Detent	
9	B-568875	Gear		40A		Sems Screw, .086-56 x 3/16	
9A		#4 Tinnerman Nut		40B		Hex Nut, Stl., .086-56	
10	B-568850	Plate and Spring Ass'y.		40C		#2 Lockwasher	
11	B-568878	Spring		40D	B-568822	Actuator	
12	B-568870	Switch and Wire Ass'y., Scan (S502)		40E	B-568820	Spring, Detent	
12A		Screw, Binding Hd., .086-56 x 1/2			B-568783	Magnetic Head Ass'y.	
13	B-568833	Motor, Scan		41	B-568784	Magnetic Head (H501)	
13A		Screw, R. H. Brass, .138-32 x 3/4 (2 Req'd.)		41A		Fillister Hd. Screw, Brass (2 Req'd.)	
14	B-568877	Gear		42	B-568785	Bracket, Magnetic Head Mtg.	
15	B-568872	Gear		43	B-568786	Cable, Magnetic Head	
16	B-568876	Gear		44	B-568796	Carrier	
17	B-568843	Gear		44A		Socket Hd. Cap Screw, .086-56x3/16 (2 Req'd.)	
18	B-568853	Reversing Link Ass'y.		45	B-568802	Spring	
18A	B-573322	Washer		46	B-568831	Stop, Carrier	
18B		Retaining Ring		47	B-568808	Bracket Ass'y., Idler Pulley	
	B-568767	Left Frame Ass'y.		47A		Retaining Ring	
19	B-568886	Left Frame Ass'y. Plate	2	47B		#5 Flat Washer	
19A		Screw, F. H. M., Stl., .112-40x3/16 (3 Req'd.)		48	B-568829	Spring	
20	B-568882	Button Ass'y., Star		49		Screw, B. H. M., Stl., .125-40x3/16	
20A		Retaining Ring		49A		Hex Nut, .125-40	
21	B-573268	Spring		49B		#5 Lockwasher	
22	B-568879	Button Ass'y., Call			B-568768	Electrical Support Plate Ass'y.	5
23	B-573272	Actuator, Switch		50	B-568769	Plate Ass'y.	6
23A		Retaining Ring		50A		Screw, F. H. M., Stl., .112-40x3/16 (2 Req'd.)	
24	B-573270	Spring		51		Polarized Stud (Male)	
25	B-573259	Link Ass'y.		52		Polarized Stud (Female)	
25A		Retaining Ring		53	B-568776	Relay Ass'y. (K501, K502)	
26	B-573269	Spring		54	B-568777	Terminal Strip	
27	B-573271	Spring		55	B-568787	Base Tray	
28	B-573267	Latch		56	B-568778	Printed Circuit Board Ass'y. (FS1)	
28A		Retaining Ring		56A		Screw, Fil. Hd., Stl., .112-40x1/4 (2 Req'd.)	
29	B-573273	Start Switch (S501)		56B		Lockwasher (2 Req'd.)	
29A		Screw, Truss Hd., Stl., .086x1/2		56C		Flat Washer (2 Req'd.)	
30	B-568777	Terminal Strip		57	B-568788	Insulator Board	
30A		Screw, Sems, .112-40 x 1/4					

\* Refer to Exploded View, Fig. 9, page 15.

\* Refer to Exploded View, Fig. 9, page 15.

#### Notes

Order BTL drawing numbers as follows: B- \_\_\_\_\_ (part of KS-19594).

1. BTL Drawing No. B-568766 includes items #5 through #18B.
2. BTL Drawing No. B-568767 includes items #19 through #29A.
3. BTL Drawing No. B-568765 includes items #31 through #49B.
4. BTL Drawing No. B-568783 includes items #41 through #43.
5. BTL Drawing No. B-568768 includes items #50 through #54.
6. BTL Drawing No. B-568769 includes items #50, #51, #52, TB1, TB2, and J501.