

INSTALLATION, OPERATION, AND FIELD MAINTENANCE

ELECTRONIC SECRETARY<sup>®</sup> MODEL SP-2

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1. GENERAL

1.01 This Section presents a description of the Model SP-2 Telephone Answering and Recording Set (Figure 1) and instructions pertaining to the installation and field maintenance of the unit. This information is arranged in separate Parts of this Section to enable its easy access by those personnel concerned with installation and field maintenance of the unit.

2. DESCRIPTION

2.01 The Model SP-2 (short-play) is an automatic telephone answering and recording device utilizing the "bi-planar" principle as the means for recording and announcing messages. The Model SP-2 is able to answer the telephone with the customer's 15-second announcement message, then switch to record a 15-second message from the caller. The unit is able to record twelve 15-second messages. The customer records his own announcement and the recorded messages are played back through the microphone supplied with the unit.

2.02 The Model SP-2 weighs 28-pounds and is 6 1/2-inches high, 11-inches wide, and 12-inches deep. In addition to the microphone, the unit is equipped with an 8-foot power cord and a 2-prong plug for connecting to an a-c power source. A terminal block is provided on the back of the unit for making connections to the line.

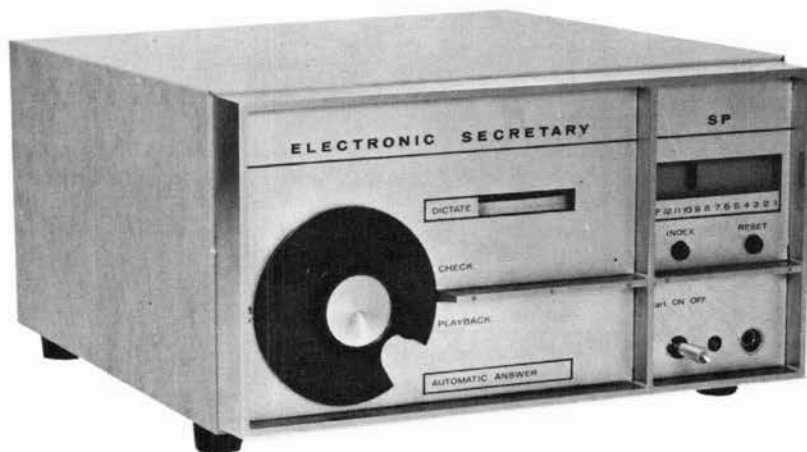


Figure 1. Model SP-2 (Front View).

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### Bi-Planar Principle

2.03 The "bi-planar" principle is a method of recording on magnetically coated material in two planes at right angles to each other. The outgoing or "Announcement" message is recorded on a strip of cushioned magnetic material laminated to the vertical flange of a phonograph-type turntable. The incoming messages are recorded in concentric circles on the flat, or disc, surface of the turntable. Each concentric circle forms a channel, or recording path. A record and playback head starts from the outside edge of the turntable and moves inward to trace 12 recording channels.

2.04 The tone arm of the Model SP-2 steps across the disc to form concentric recording paths. The stepping occurs at the end of each operating cycle and is accomplished by a cam-follower linkage switch. In "Automatic Answer" operation, the unit disables itself after the last step is reached. Further calls cannot be taken and the caller receives a "no answer" signal.

2.05 The switching to effect starting, stopping, "midcycle shift," and transmission of signaling tones is performed by a combination of conventional relays and a self-homing ratchet relay. A single cam located on the underside of the turntable, coupled with an electrical arrangement, determines a "home" position on the turntable.

2.06 The switching circuit functions as follows: When ringing current is applied, the ringing relay operates and through switching seizes the telephone line and moves the turntable off its standby position. During the first revolution of the turntable, the announcement message is delivered. As the turntable starts a second revolution, "midcycle

shift" occurs, transmitting a tone signal to the telephone line (indicating that the calling party can begin recording) and switching the amplifier and heads to allow the incoming message to be recorded.

2.07 At the completion of the second revolution, switching occurs which:

- (a) transmits a terminating tone signal,
- (b) steps the tone arm to the next channel,
- (c) releases the line-seizing relay.

### Mechanical Design

2.08 The SP-2 consists of the following principal assemblies (Figure 2):

- (a) the motorboard (turntable) assembly,
- (b) the electrical switching assembly (mounted on the underside of the motorboard assembly),
- (c) the amplifier and control panel assembly,
- (d) the cabinet assembly.

### Motorboard Assembly

2.09 The motorboard turntable, Figure 3, is driven by a four-pole induction motor through a two-step reduction system. The "ANNOUNCEMENT" is recorded onto the rim surface through the announcement record head and is erased by operation of the announcement erase magnet. Incoming messages are recorded in adjacent concentric circles on the top of the turntable by the incoming



Figure 2. Model SP-2: Principal Assemblies.

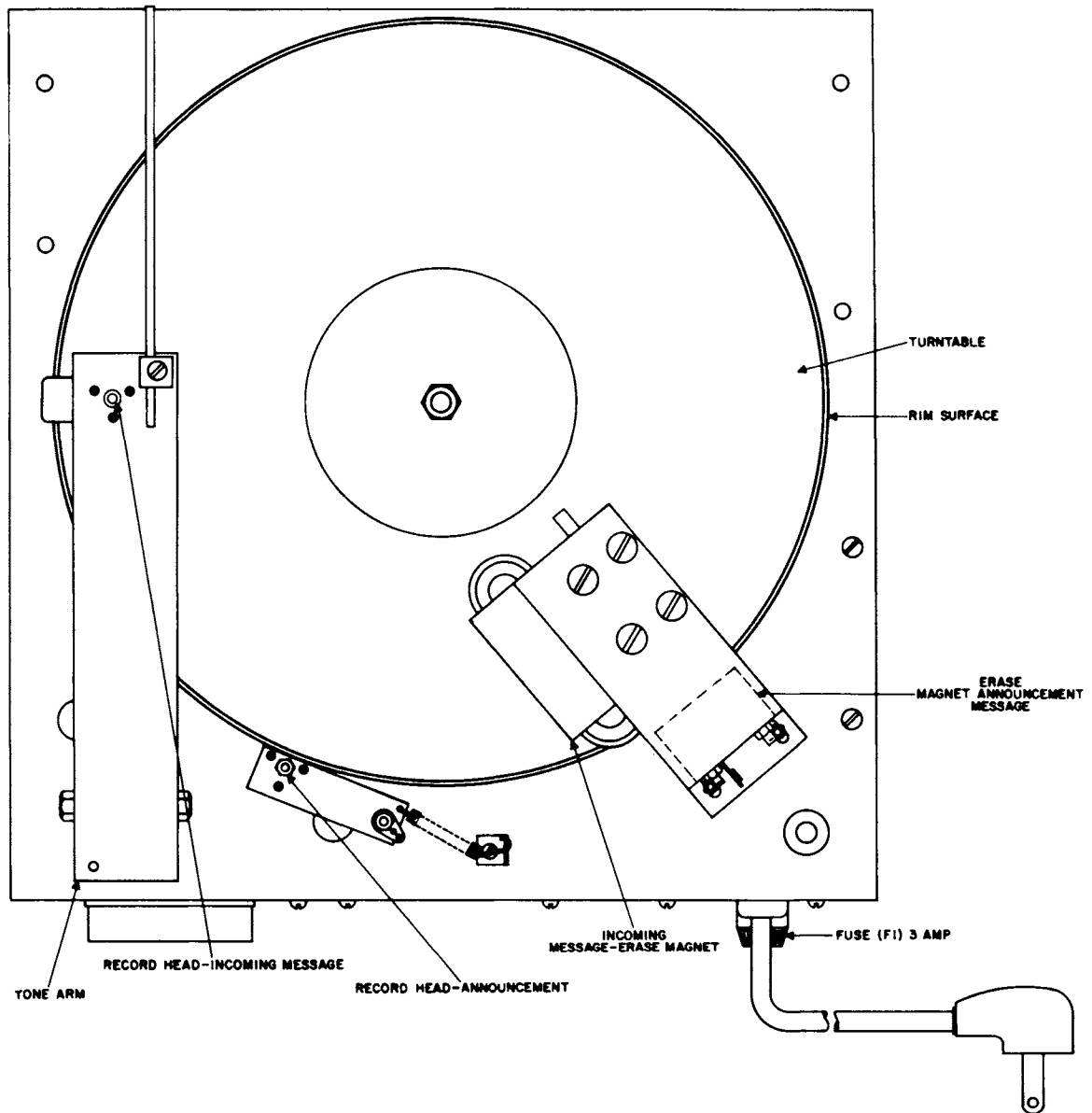


Figure 3. Motorboard (Top View).

message record head on the tone arm. All incoming messages are erased simultaneously by energizing the incoming message erase magnet.

2.10 The tone arm steps automatically, at the completion of each cycle, to the next channel. The stepper cam assembly (Figure 4) consists of a stepping magnet, a reset magnet, and a mechanical system consisting of ratchet, lever, spring and pawl to convert the reciprocating motion of the magnet armature to the rotary motion of the cam. Each time the cam advances against the spring loading, it is held in the new position by engagement of the

pawl in the ratchet wheel. The reset magnet on the stepper assembly, when energized, pulls the pawl away from the ratchet, and allows the spring loaded ratchet wheel and cam to return to their starting positions.

2.11 As shown in Figure 4, movement of the stepping cam imparts a radial movement to the tone arm follower arm because of engagement with the follower arm pin. The tone arm follows a path on the upper side of the turntable identical to that of the follower arm on the underside of the motorboard. Thus, a pulse of electrical current applied to the stepping magnet coil will advance

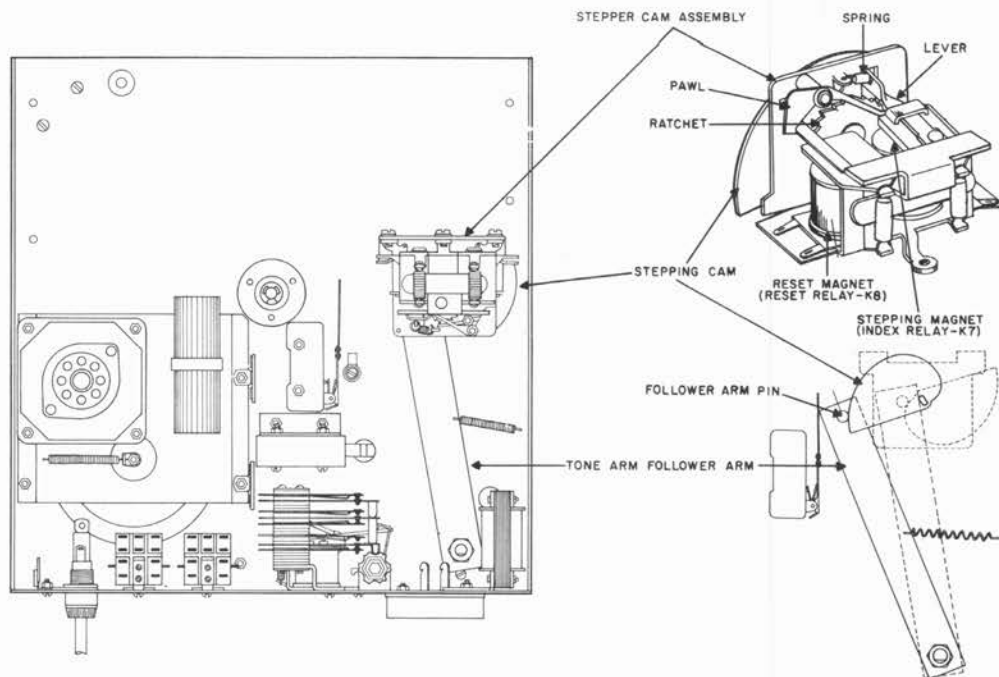


Figure 4. Motorboard (Bottom View).

the tone arm to a position closer to the center of the turntable. Likewise, energizing the reset magnet coil will release the pawl in the stepper cam assembly and will allow the stepping cam to return to the starting position. The tone arm follower, spring loaded, will follow the cam back to its initial position, returning the tone arm to its starting point.

#### Electrical Switching Assembly

2.12 The homing position of the turntable is electrically indicated by a switching operation which takes place when a bossed actuator (homing cam) at one position on the underside of the turntable operates a micro-switch which causes a secondary pulsing relay in the electrical control circuit to be operated. This raised section on the underside of the turntable (Figure 5) is the position from which starting, stopping, and "midcycle shift" switching is controlled.

#### Amplifier and Control Panel Assembly

2.13 The main electronic subassembly (Figure 6) is a printed circuit board which contains the amplifier, oscillator, rotary switch, relays and related components.

#### Assembly and Disassembly

2.14 As may be seen from Figure 2, the SP-2 is of modular construction. Any principal assembly can be removed without unwiring or disassembly. The amplifier and control panel assembly is electrically and mechanically attached to the motorboard assembly and to the electrical switching assembly with a plug and two screws. The SP-2 is held in its cabinet by two lead pins which fit into a flange in the front of the enclosure. The lead pins are secured by two retaining screws at the back of the cabinet.



Figure 5. Underside of Turntable.

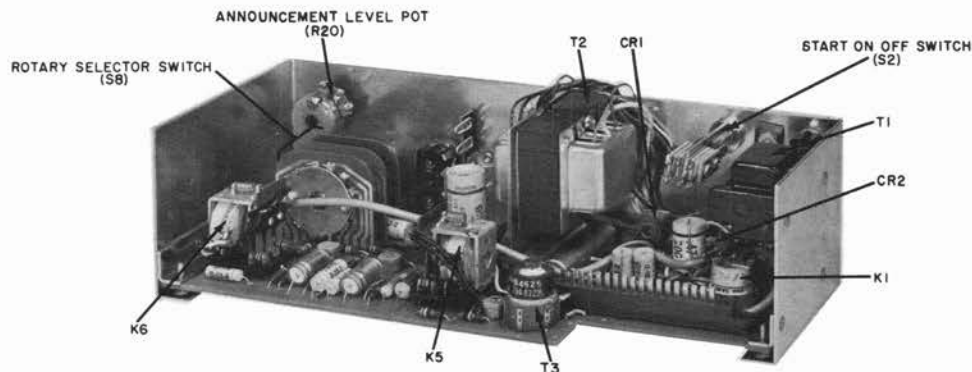


Figure 6. Main Electronic Subassembly.

### Indicators and Controls

2.15 The announcement message record time remaining is indicated directly through a count-down window. The indicating device is a band of printed tape laminated to the vertical rim of the turntable, just below the magnetic recording surface on the turntable rim. This tape not only tells the operator when to start dictating (by presenting a colored bar at the window opening), but as the turntable turns it actually counts down the seconds of remaining time for dictating; that is, 14 . . . , 13 . . . , 12 . . . , etc.

2.16 The number of messages received is indicated by a counter at the upper right of the front panel (Figure 1). As the tone arm steps across the recording disc, a pointer attached to the front of the arm moves across the face of a window. Below the pointer is a scale numbered 1 to 12 and "F" (full).

2.17 A pilot lamp, at the bottom right of the front panel, glows when the SP-2 is "on." In addition, a microphone jack is provided for plugging in the microphone-speaker.

2.18 The SP-2 is equipped with the following controls: A START-ON-OFF switch; erase buttons; a DICTATE, CHECK, PLAYBACK, and AUTOMATIC ANSWER function selector switch; and RESET, and INDEX buttons. The use of these controls and a description of operation is included in Part 4.

## 3. INSTALLATION

### Location

3.01 Locate the unit in accordance with the considerations outlined below. If the customer's wishes cannot be followed, explain the reason.

- (a) The Model SP-2 may be located within easy reach of the customer's telephone; however, this is not essential.
- (b) A satisfactory location would be a desk or table sufficiently strong to support the units weight. (The Model SP-2 is intended for desk or table installation and need not be fastened.)
- (c) A desk or table location where the ventilation is not entirely restricted is adequate. (Avoid locations that might subject the unit to excessive moisture, heat or vibration.)
- (d) Locate the unit within the restrictions of the power cord (the Model SP-2 is equipped with an 8-foot power cord and a 2-prong plug for connection to a standard power outlet). Do not connect the power cord until the installation to the telephone line is complete.

### Connections

3.02 Using a standard three-conductor line cord, connect the red lead to L1 (tip), green lead to L2 (ring), and yellow lead to G (gnd) at the connecting block on the back of the Model SP-2. Terminate the other end of the line cord at the station wiring connector block as determined by the type of service provided to the customer (Table 1).

### Power Supply

3.03 Plug the power cord into a 115-volt, 60-cycle a-c power source only.

NOTE: Polarize plug for the least amount of noise in "PLAYBACK."

Table 1. Line Connections.

TYPE OF SERVICE	L1 Red	L2 Green	G Yellow
* Individual, PBX and other Bridged Ringer Service	Ring	Tip	Tip
** 2 Party Selective Service			
Ring Party	Ring	Tip	Gnd
Tip Party	Tip	Ring	Gnd

\* On PBX trunks connect the machine ahead of any control equipment.

\*\* Remove strap between terminals L-2 and G at answering set.

3.04 An optional feature of the Model SP-2 permits its use with 1A1 key type installations. Simply connect the A and A1 terminals on the connecting block to the proper terminals on the equipment, if the unit is provided with this optional feature.

Installation Tests

3.05 Upon completion of the installation, make certain that all features of the Model SP-2 function properly by making the following tests. See Figure 1.

3.06 Dictate an announcement message:

- (1) Selector knob rotated to "DICTATE" position.
- (2) Microphone inserted into the microphone jack.
- (3) START-ON-OFF switch operated to "START."
- (4) Dictate an announcement message as the color bar passes out of view through the count-down window.

NOTE: Allotted time in seconds is indicated by numbers appearing in the countdown window.

3.07 Check the announcement message:

- (1) Selector knob rotated to "CHECK" position.
- (2) START-ON-OFF switch operated to "START."
- (3) The announcement message will be heard from the microphone.

3.08 Check the Automatic function:

- (1) START-ON-OFF switch operated to "ON."
- (2) Selector knob rotated to "AUTOMATIC ANSWER."
- (3) Place a call to the line associated with the Model SP-2.
- (4) Listen for the announcement message.

NOTE: If the announcement level is unsatisfactory, remove the selector knob to gain access to R20. Initiate another call to the Model SP-2 and adjust R20 for a suitable listening level.

- (5) Listen for the midcycle tone signal which should be heard 15-seconds after the announcement message begins.
- (6) Record a message on the unit after the midcycle tone signal is heard.
- (7) Check that the Model SP-2 delivers tone signal at end of the incoming message record time, disconnects, and returns to standby.

3.09 Check the Playback function:

- (1) START-ON-OFF switch operated to "ON."
- (2) Selector knob rotated to "PLAYBACK."
- (3) RESET button depressed to reset the message indicator.

- (4) START-ON-OFF switch operated to "START."
  - (5) Listen to the recorded messages as they are played back through the microphone.
- 3.10 Check the recording range.
- (1) Message indicator positioned to channel 10.
  - (2) Place another call to the Model SP-2.
  - (3) Record another message.
  - (4) Playback this message to determine if the unit is recording properly over the entire range of the disc.
- 3.11 Check that Model SP-2 erases the recorded announcement and incoming messages.
- (1) Selector knob rotated to "CHECK" position.
  - (2) START-ON-OFF switch operated to "START."
  - (3) Depress and hold the red erase button until the turntable stops. This will completely erase the announcement tape.
  - (4) Selector knob rotated to "PLAYBACK."
  - (5) START-ON-OFF switch operated to "START."
  - (6) Depress and hold the red erase button until the turntable stops. This will completely erase the incoming message tape.
  - (7) START-ON-OFF switch operated to "START."
  - (8) Listen at microphone to insure that incoming message has been erased.
  - (9) Selector knob rotated to "CHECK."
  - (10) START-ON-OFF switch operated to "START."
  - (11) Listen at microphone to insure that announcement message has been erased.
- 3.12 Instruct the customer on the operation of the unit.

#### 4. OPERATION

4.01 The information contained in this Part should be referred to when instructing the customer on the operation of the Model SP-2. The Model SP-2 performs the following basic functions: (1) Dictate announcement; (2) Check announcement; (3) Playback; (4) Automatic Answer; (5) Incoming Message Erase; (6) Announcement Message Erase; (7) Reset; and (8) Index. In addition, the Model SP-2 is capable of remaining in a "Standby" condition during which the unit is "on" but waiting to perform a function. The following paragraphs, in conjunction with Figure 1, explain the basic functions.

##### Dictate Announcement

4.02 Prepare the unit as follows:

- (a) START-ON-OFF switch operated to "ON."
- (b) Selector knob rotated to "DICTATE."
- (c) Microphone inserted into microphone jack.

4.03 In the "Standby" condition, the bossed actuator (homing cam) on the underside of the turntable holds the homing cam switch open which, through relay action, opens the latching path to motor B1. Thus, motor B1 does not operate to begin recording the announcement message. However, operating the START-ON-OFF switch to its "ON" position lights the ON lamp and connects a-c power to various switches and relay contacts to prepare the unit for operation in any of its functions.

4.04 Momentarily, operate the START-ON-OFF switch to its "START" position. This connects a-c power to motor B1, bypassing the homing cam actuated switch holding B1 de-energized. Motor B1 operates to drive the turntable and, in approximately one second, the homing cam on the turntable allows its associated switch to operate, completing an energizing path to a homing relay.

4.05 The homing relay functions to establish a latching path for motor B1. The motor will continue to drive the turntable for one revolution, after which the homing cam will again open the energizing circuit to the motor, and the motor will stop.

4.06 In addition to the homing relay, the homing cam actuated switch operates the dictate relay which connects the microphone to the input of the amplifier, energizes the

bias oscillator, and connects the output of the amplifier to the announcement record head.

4.07 As the word "START" passes through the count-down window, begin dictating. Dictate in a normal tone of voice, gauging your time by the indication of seconds remaining in the count-down window. You have 15-seconds to make your announcement. The announcement message, dictated into the microphone, is first amplified by a two-stage transistor amplifier and then connected to the announcement message record head. At the record head, the message is recorded on the rim of the turntable.

4.08 At the completion of the 15-second announcement recording interval (one revolution of the turntable), the homing cam switch re-opens and through relay action, stops the turntable motor, de-energizes the bias oscillator, and disconnects the input and output of the amplifier from the microphone and record head, respectively.

#### Check Announcement

4.09 Prepare the unit as follows:

- (a) START-ON-OFF switch positioned to "ON."
- (b) Selector knob rotated to "CHECK."
- (c) Microphone inserted into microphone jack. (The microphone serves as a speaker in this function.)

4.10 Momentarily operate the START-ON-OFF lever to its START position to by-pass the homing cam switch holding the motor de-energized. The motor starts driving the turntable and, in approximately one second, the homing cam switch closes and through relay action, connects a latching circuit to keep the motor operating.

4.11 With the selector switch in "CHECK" position, the input and output of a three stage transistor amplifier is connected to the announcement playback head and the microphone, respectively. The announcement message is now heard through the microphone.

4.12 At the end of the announcement message (one revolution of the turntable), the homing cam switch is mechanically released to break the operating path to the relay supplying operating potential to motor B1, returning the unit to "Standby" condition.

#### Automatic Answer

4.13 Prepare the unit as follows:

- (a) START-ON-OFF switch positioned to "ON."
- (b) Pilot lamp DS1 illuminated.
- (c) Selector knob rotated to "AUTOMATIC ANSWER."

4.14 When ringing current is applied to terminals L1 and L2, a ringing relay operates to energize motor B1. The motor drives the turntable and approximately one second later the homing cam switch closes to operate the homing relay.

4.15 The homing relay completes a latching path to the motor, pulses a ratchet relay, and operates a line seizing relay that connects a loading coil across the telephone line, loading the line and tripping the ring. The turntable is now running and the announcement message is delivered over an audio path from the announcement playback head, through a three stage transistor amplifier, through the line transformer to the telephone line.

4.16 At the end of the announcement message (15-seconds), the midcycle shift occurs. The Model SP-2 switches its function from that of delivering an outgoing announcement message to recording an incoming message.

4.17 At midcycle (the beginning of the second revolution of the turntable), the homing cam switch opens momentarily. During the transit time of the homing cam, capacitors discharge through the line seizing relay to hold the telephone line, and a temporary latch path to the motor is established. In addition, the 1,400 cps tone oscillator transmits a tone signal to the telephone line signaling the caller to begin recording his message.

4.18 After the turntable has rotated far enough to move the homing cam past the homing cam switch, the switch closes again, and, through relay action, the 1,400 cps tone is terminated, original latching paths are re-established, temporary latching circuits are opened, and the ratchet relay is pulsed again. The ratchet relay operates the incoming record relay whose contacts switch the input and output of the audio amplifier to the telephone line transformer and the incoming message record head, respectively. The turntable is now in its second revolution and the unit is prepared to record an incoming message.

4.19 The caller can now record a 15-second message over an audio path from the telephone line, through the line transformer and a one stage transistor amplifier to the incoming message record head. At the end



of the 15-second recording period, a 1,400 cps disconnect warning tone signal will be transmitted to the telephone line for one second. This will signal the end of the recording period.

4.20 At the end of the second revolution of the turntable, the homing cam again mechanically releases the homing cam switch. Upon release of this switch, relay action opens the original latch path to the motor, disconnects the incoming message record amplifier, and causes the index relay to shift the tone arm to the next channel. In addition, the tone oscillator is operated to deliver the disconnect warning tone to the telephone line held seized for one second by the discharge of capacitors. After approximately one second, the line seizing relay restores and disconnects the Model SP-2 from the telephone line, terminates the 1,400 cps disconnect tone, and releases the index relay.

#### Playback

4.21 Prepare the unit as follows:

- (a) Check the message indicator window (upper right corner of the panel). If messages have been received, depress the RESET button to return the counter to the number 1 position.
- (b) Insert microphone in microphone jack.
- (c) Selector knob rotated to "PLAYBACK."
- (d) Hold microphone to ear to hear the first message.

4.22 Momentarily operate the START-ON-OFF switch to its "START" position to energize the motor. As the motor starts the turntable rotating, the homing cam mechanically operates the homing cam microswitch and the homing relay operates. Contacts of the homing relay form a latching path to keep the motor operating.

4.23 The selector switch in "PLAYBACK" position connects the incoming message playback head to the playback amplifier and the latter to the microphone. The recorded message can now be heard through the microphone as the turntable rotates.

4.24 At the end of the message (one revolution of the turntable), the homing cam switch is mechanically released by the homing cam.

This breaks the operating path to the homing relay and motor B1, thus ending the cycle. To listen to message 1 again, operate the START-ON-OFF switch to its "START" position.

4.25 To listen to subsequent messages, depress the INDEX button which will advance the message indicator from message 1 to message 2, etc.

4.26 Depressing the INDEX button operates a stepping relay, causing a pawl attached to the armature of the relay to engage and rotate a ratchet wheel a given number of degrees, thus completing one "step." A cam is attached to the ratchet wheel shaft, and as the cam is moved, it positions (steps) the tone arm to the next channel.

#### Incoming Message Erase

4.27 Prepare the unit as follows:

- (a) Selector switch rotated to "PLAYBACK."
- (b) Red erase button should be in view.

4.28 Depress and hold the red erase button, left of the word "PLAYBACK" on the panel.

4.29 Momentarily operate the START-ON-OFF switch to its "START" position. Hold the red erase button depressed until the turntable stops. This will completely erase the incoming messages previously recorded.

4.30 Momentarily operating the START-ON-OFF switch to its "START" position energizes motor B1 to start the turntable rotating. As the turntable begins rotating, the homing cam switch is mechanically operated to energize the homing relay, which operates to complete a latch path to keep the motor operating.

4.31 Depressing the red erase button energizes the incoming message erase coil with a-c current. As the turntable rotates past the erase coil, the a-c field erases all twelve channels at once.

4.32 At the end of one revolution of the turntable, the homing cam switch is mechanically released by the homing cam, breaking the operating path to the homing relay which, in turn, opens the a-c latch path to B1, stopping the motor. The cycle ends, and the red erase button is released to de-energize the erase coil.

Announcement Erase

4.33 Prepare the unit as follows:

(a) Selector switch is rotated to "CHECK."

(b) Red erase button should be in view.

4.34 Depress and hold the red erase button, left of the word "CHECK" on the panel.

4.35 Momentarily operate the START-ON-OFF switch to its "START" position. Hold the red erase button depressed until the turntable stops. This will completely erase the previous announcement message.

4.36 Momentarily operating the START-ON-OFF switch to its "START" position energizes motor B1 to start the turntable rotating. As the turntable begins rotating, the homing cam switch is mechanically operated to energize the homing relay, which operates to complete a latch path to keep the motor operating.

4.37 Depressing the red erase button energizes the announcement message erase coil with a-c current. As the turntable rotates past the erase coil, the a-c field erases the announcement message tape.

4.38 At the end of one revolution of the turntable, the homing cam switch is mechanically released by the homing cam, breaking the operating path to the homing relay which, in turn, opens the a-c latch path to B1, stopping the motor. The cycle ends, and the red erase button is released, de-energizing the erase coil.

Reset

4.39 Prepare the unit as follows:

(a) START-ON-OFF switch positioned to "ON."

(b) Check the message indicator window (upper right hand corner of the panel).

4.40 Momentarily depress the RESET button.

4.41 Depressing the RESET button operates a relay coil (reset magnet) whose armature pulls a pawl away from a spring-loaded ratchet wheel, thus allowing the wheel and cam to return to their starting position (channel 1) along with the attached tone arm and message indicator.

Index

4.42 Prepare the unit as follows:

(a) START-ON-OFF switch positioned to "ON."

(b) Check the message indicator window (upper right hand corner of the panel).

4.43 Momentarily depress the INDEX button.

4.44 Depressing the INDEX button operates the index relay whose armature causes its attached pawl to engage and rotate a spring-loaded ratchet wheel a given number of degrees, thus completing one "step." A cam is attached to the ratchet wheel shaft, and as the cam is moved, it positions (steps) the tone arm to the next channel.

5. FIELD MAINTENANCE

5.01 To help insure good customer relations, maintenance involving dismantling of the unit should not be undertaken on the customer's premises. Check for obvious trouble sources such as loose power connections, loose telephone line terminations, or a blown fuse.

5.02 The main power fuse (F1) is located on the back panel of the unit. If the fuse is blown, replace with a 3-amp fuse of the same size.

6. MODIFICATION

6.01 A modification kit is available to update to the latest production models all Model SP-2 Telephone Answering and Recording Sets with chassis serial numbers below 41300. For additional information concerning this modification of earlier Model SP-2 Telephone Answering and Recording Sets, refer to the appropriate Section in the 997-402 series of General System Practices.