

SILENTYPE PRINTER TECHNICAL PROCEDURES

TABLE OF CONTENTS

Section 1 - Take-Apart

Removing the Cover and Base.....	1.3
Replacing the Head Cable.....	1.5
Replacing the Print Head.....	1.7
Replacing the Drive String.....	1.9
Replacing the Deserializer Card.....	1.11

Section 2 - Alignment

Alignment Procedures.....	2.3
---------------------------	-----

Section 3 - Diagnostics

Aligning the Printer Mechanism.....	3.3
Other Tests.....	3.4

Section 4 - Troubleshooting

Troubleshooting Chart.....	4.3
----------------------------	-----

Section 5 - Modifications

EMI Modifications.....	5.3
------------------------	-----

Section 6 - Illustrated Parts

Illustrated Parts List.....	6.1
-----------------------------	-----

©Apple Computer, Inc., 1985.

No part of this document may be reproduced in any form without the written permission of Apple Computer, Inc.

Apple and the Apple logo are registered trademarks of Apple Computer, Inc.

Silentype Technical Procedures

Section 1

Take-Apart

Contents:

Removing the Cover and Base.....	1.3
Replacing the Head Cable.....	1.5
Replacing the Print Head.....	1.7
Replacing the Drive String.....	1.9
Replacing the Deserializer Card.....	1.11

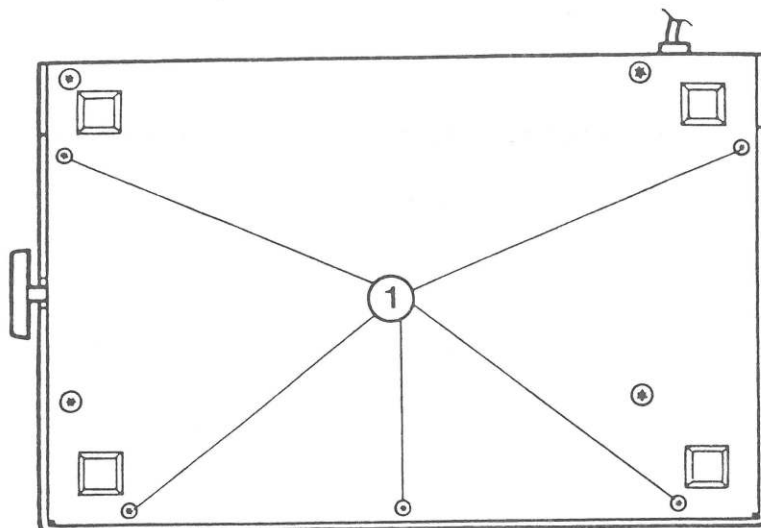


FIGURE 1

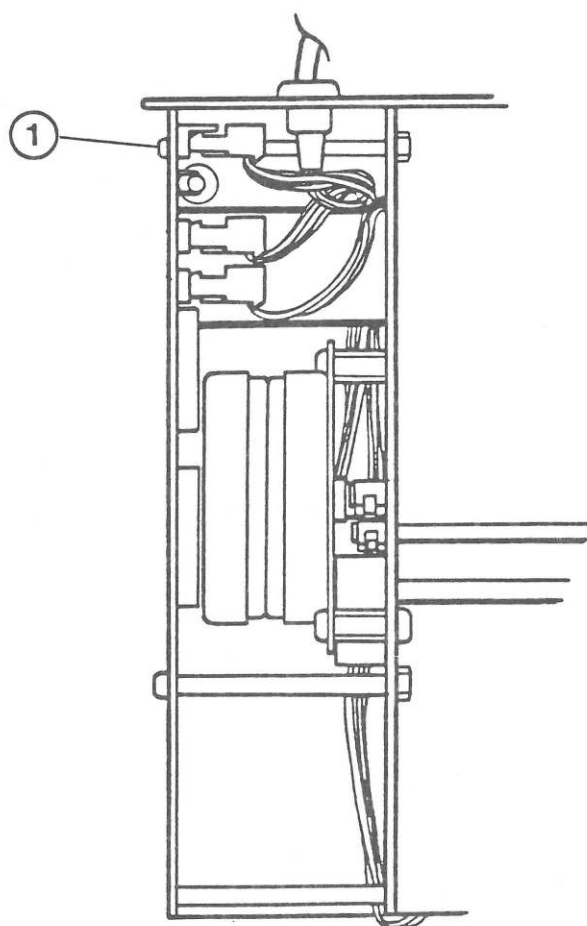


FIGURE 2

A. REMOVING THE COVER AND BASE

Removing the Cover

1. Turn the Apple off.
2. Disconnect the printer from the interface card.
3. Tip the unit up on its back.

NOTE: Do not turn the Silentype completely over. The paper roll is held in by gravity.

4. Using a Torx screwdriver, remove the five screws around the outside of the base which hold the plastic cover on (see Figure 1).
5. Remove the cover.

Removing the Base

6. While holding the chassis to the base, remove the remaining four screws.

NOTE: In general, it is a good idea to remove all nine screws every time you begin to service a Silentype, since you will nearly always have to get underneath the assembly.

7. Tip the unit back down. At the left of the unit is a printed circuit board (the deserializer card). Locate the three cables connected to it, and disconnect the rearmost cable (interface cable) from connector J3 (see Figure 2, #1). The chassis can now be lifted from the base.

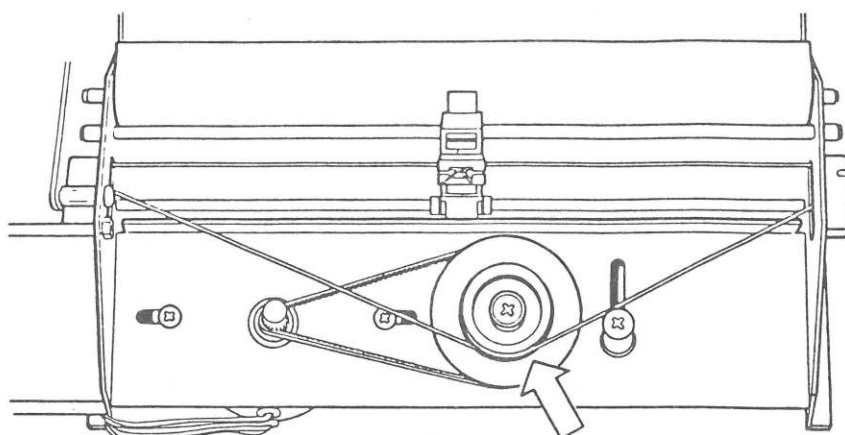


FIGURE 3

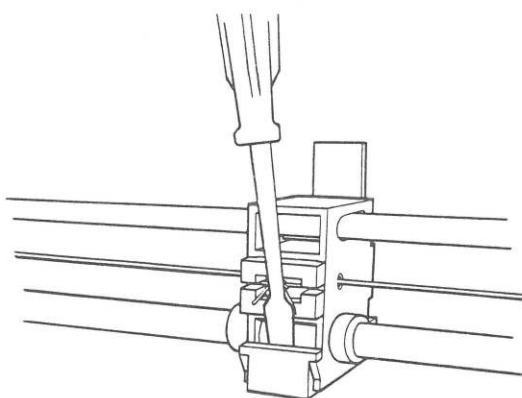


FIGURE 4

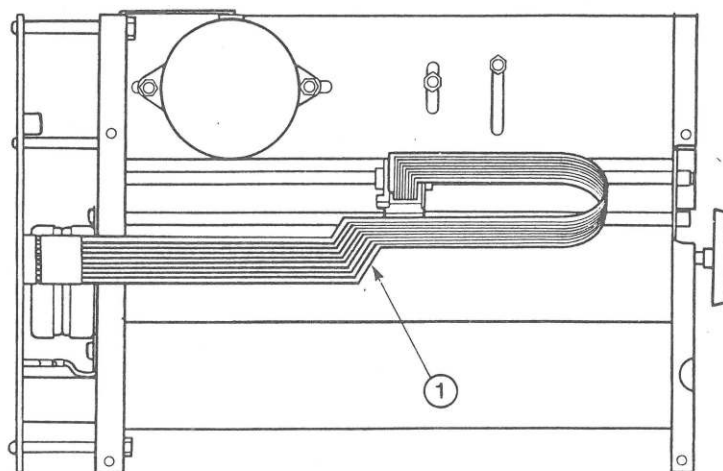


FIGURE 5

B. REPLACING THE HEAD CABLE

Removing the Cable

1. Remove the Silentye cover and base (see section A, p. 1.3).
2. Rotate the pulley (Figure 3) until the print head is in the center of the platen.
3. Using a small screwdriver, pry the cable clip away from the head carrier, forward and down (Figure 4). The cable will fall away from the head assembly.
4. Tip the chassis up so the underside faces you.
5. If the head cable is taped to the chassis, untape it.
6. Unplug the cable from the deserializer card.
7. Pull the cable clip off the other end of the cable. (Don't worry, it does come off.)

Installing the Cable

8. Hold the new cable up so the change of direction goes upward (Figure 5, #1), and carefully plug it to the deserializer card.

IMPORTANT: THE HEAD CABLE IS EASILY DAMAGED. PERFORM THE NEXT STEPS CAREFULLY AND GENTLY. In particular, make sure the cable is fully inserted into the cable clip before connecting the clip to the print head assembly; otherwise you may crimp and crack it.

9. Plug the other end to the cable clip, making sure the small rubber pad is in place between the cable connections and the clip.
10. Bend the cable without twisting, and clip it to the print head assembly (Figure 5).
11. Make certain the cable crosses the left side of the chassis at a right angle, and secure it to the left rail with cellophane tape.

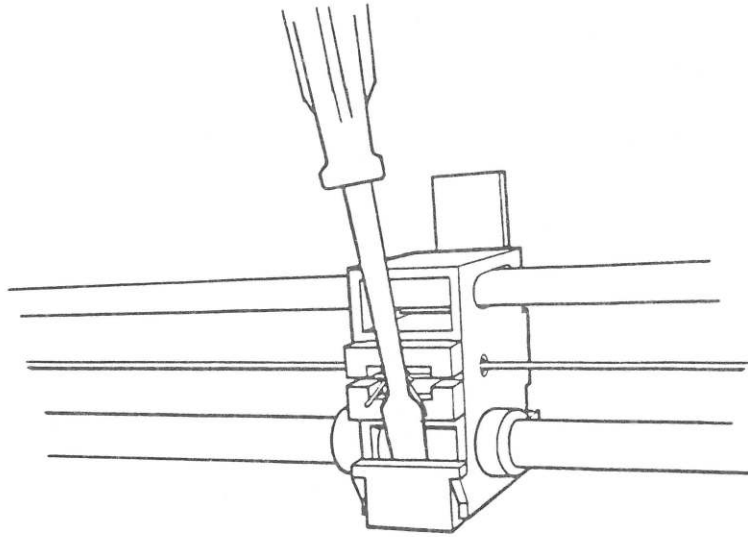


FIGURE 6

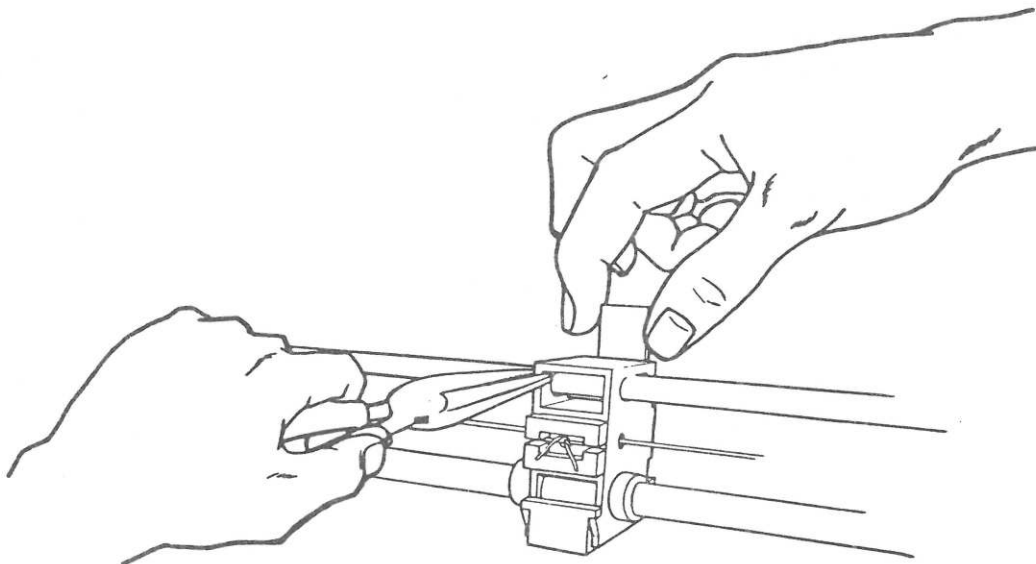


FIGURE 7

C. REPLACING THE PRINT HEAD

Removing the Print Head

1. Remove the Silentye cover and base (see section A, p. 1.3)
2. Pry the cable clip off the print head carrier, forward and down (Fig.6). The cable will fall away from the head assembly.
3. Using needlenose pliers, gently pull the head carrier toward the front of the printer (see Figure 7).

CAUTION: THE CERAMIC HEAD IS BRITTLE. THAT MEANS IT CAN SHATTER. IT ALSO CAN BE SHARP ENOUGH TO CUT FINGERS. USE CARE WITH THE NEXT OPERATION!

4. With your fingers, pull the head upward -- carefully -- sliding it out of the head carrier (see Figure 7). If you can't pull the head out with your fingers, stand the chassis on end and carefully push the head out of the carrier with a screwdriver.

INSTALLING THE PRINT HEAD

NOTE: The plastic bar that supports the paper is called the platen. It should not be necessary to remove it, but it sometimes falls out, and it is important to replace it SQUARE EDGE UP. Otherwise the print head will short out and ruin the Silentye.

5. Make sure the platen is properly seated and gently pushed back, then slide the new head in with the edge connector on the bottom and the white side facing you.
6. Push the head gently down until it is seated against the plastic stop. If it becomes caught, tilt the chassis up (to see what the problem is) and help it along. Be careful not to shear off the plastic stop at the bottom of the head carrier.

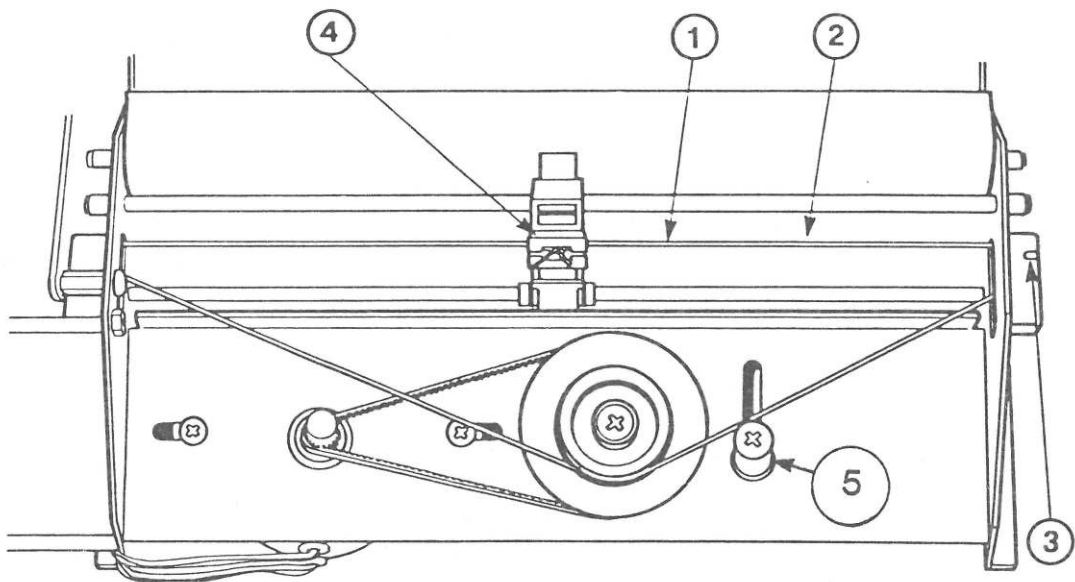


FIGURE 8

D. REPLACING THE DRIVE STRING

1. Remove the Silentye cover and base (see section A, p. 1.3).
2. Turn the pulley until the print head is in the middle of the platen.
3. Hold the pulley from beneath with a pair of pliers, and with a screwdriver, loosen the screw.
4. Push the pulley toward the printer, taking the tension off the string; then, with the pulley pushed toward the printer, tighten it back down.

IMPORTANT: If the pulley is too close to the printer, it will bind. Make sure it can turn freely when you tighten it down.
5. Hold the idler (Figure 8, #5) from beneath with a pair of pliers, and with a screwdriver, loosen the screw and move the idler towards you. The idler screw can be left loose for right now.
6. Unwind the string from the pulley.
7. Cut the old string on the right side of the print head (Figure 8, #1).
8. Tie a new string (precut to approximately 40") to the right hand portion of the old string (Figure 8, #2).
9. Pull on the old string on the left side of the print head, until the new string is threaded through the right guide (Figure 8, #3), across the front, and through the left guide.
10. Cut the knot out completely.
11. Pry the retainer (Figure 8, #4) out of the head assembly, and discard the old string.
12. Thread the new string into the small holes from the outside of both sides of the head assembly, and tie a loose knot.
13. Pull the knot straight back until the string is taut.
14. Pull the front part of the string toward you about 14 inches; then take the portion of string coming out of the left guide and, starting at the bottom front of the pulley, wrap six turns counterclockwise around the pulley.

IMPORTANT: Make sure the loops of string do not overlap; if they do, you will have alignment problems.
15. Grasp the knot and pull until the string is snug.

16. Slip the retainer in place in the print head assembly.
17. Holding the string snug, cut out the old square knot and start a new one.

NOTE: Make sure the string runs **between** the idler and the paper.

18. Tighten it, finish the square knot, and cut away the excess string.

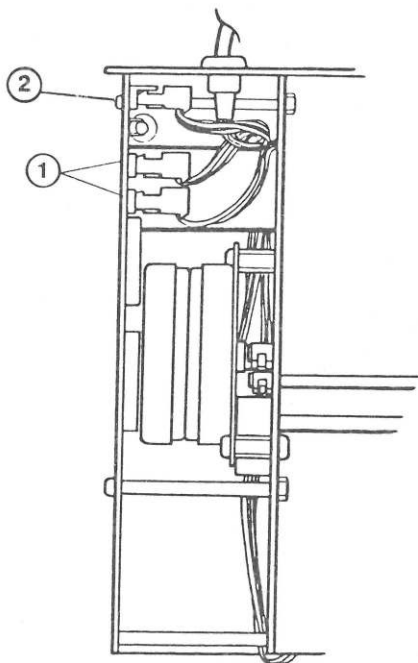


FIGURE 9

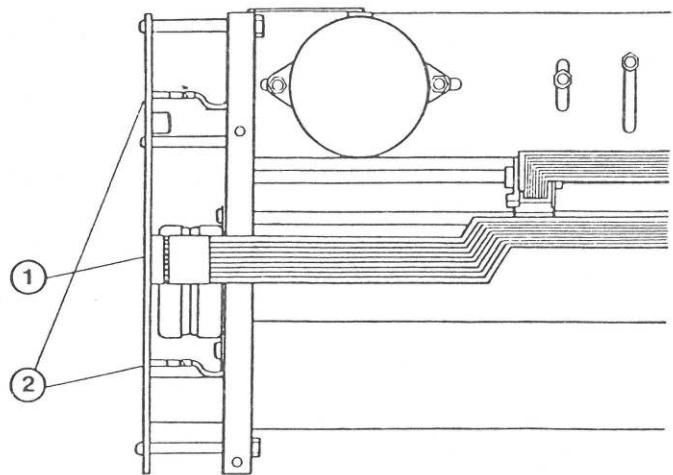


FIGURE 10

E. REPLACING THE DESERIALIZER CARD

Removing the Card

1. Remove the Silentype cover and base (see section A).
2. Locate the two motor plugs (Figure 9, #1). Put a piece of tape on the frontmost plug, to identify it.
3. Remove the two motor plugs.
4. Turn the chassis up and disconnect the print head cable (Figure 10, #1).
5. Disconnect the left margin switch connector (Figure 10, #2).

NOTE: On the EMI version of Silentype, the left margin switch consists of two wires, as shown in Figure 10. Earlier Silentypes have only one wire (the rear one).

6. Remove the three screws holding the deserializer card to the chassis.

IMPORTANT: BEFORE REPLACING THE DESERIALIZER CARD, MAKE SURE THAT THE NEW CARD IS EMI-COMPATIBLE WITH THE CHASSIS. SEE SECTION 5, SILENTYPE MODIFICATIONS.

Installing the Card

7. Put the card into position, taking care not to capture any wires behind the capacitor, and thread the bottom screw through the spacer and nut until it is "finger-tight".
8. Put in the other two screws. After checking to make sure no wires are caught beneath the spacers, tighten the three screws.
9. If you're working on a non-EMI Silentype, make sure that the bottom screw is tight enough to make good electrical contact. (It is part of the electrical continuity that forms the ground.)
10. Connect the left margin switch wire(s) and the print head cable.
11. Tip the chassis back down. Plug in the motor plugs (on each, the orange wire connects to the top pin) and the interface cable (Figure 10, #1 and 2). Remove the tape from the frontmost plug.
12. Reinstall the base and cover. Make sure all screws are tight.

NOTE: Do not apply power while the printer assembly is loose in the base; it may cause a short circuit between the base and the deserializer card.

Silentype Technical Procedures

Section 2

Alignment Procedures

Contents:

Alignment Procedures.....	2.3
---------------------------	-----

A. Silentype Alignment Procedures

Whenever you change the string on a Silentype, or when a customer complains that the print margins are misaligned, perform the following procedures.

1. Using a known-good Apple II system, make sure the power is off, then plug the Silentype interface card into Slot 1 on the motherboard. Make sure the card is properly seated, and then turn the power on.
2. Place the Apple II Product Diagnostics diskette (P/N 652-0334) in drive 1. Boot the diagnostic and select CARD TESTS from the main menu; then select SILENTYPE TEST from the secondary menu.
3. Accept "Align print head" when that option comes up on the screen. The program will cause the Silentype to print rows of capital H's until you stop it by pressing Y. The rows of H's will allow you to see if there is any misalignment. If there is serious misalignment (more than one dot to the left or right), continue with these procedures.
4. **Check the drive string where it winds around the pulley.** If the loops of string are uneven, overlapping each other, the string tension will be uneven and that will cause misalignment. If necessary, loosen the pulley and re-wrap the string around it so that the loops of string do not overlap.
5. **Check the tension on the drive string.** It should be just tight enough so that it does not slip on the pulley. To adjust it coarsely, loosen the pulley screw and move the pulley to the desired position; then tighten the screw.
6. **Check the tension on the motor belt** (between the motor and the pulley): it should be just tight enough to prevent slipping. Overtightening causes the print head to move unevenly, which makes alignment difficult. (It also causes wear on the bearings.) If necessary, loosen the two motor mounting screws very slightly (the adjustment is easiest if they are slightly tight) and move the motor. Start with a snug but not stretched belt. Print a pair of lines and notice any misalignment. Move the motor slightly to the right and observe the printing of a pair of lines. Repeat until alignment is as good as you can make it; then tighten the motor screws.
7. While the "H's" are printing, **change the position of the idler roller** by loosening the idler screw and moving the idler. This fine-tunes the tension on the string. When alignment is as good as you can make it, tighten the idler screw.

Silentype Technical Procedures

Section 3

Diagnostics

Contents:

Aligning the Silentype Printer Mechanism.....	3.3
Other Tests.....	3.4

INTRODUCTION

This diagnostic is found on the Apple II Products Diagnostics diskette (Part Number 686-0005) under the main menu selection of CARD TESTS.

A. ALIGNING THE SILENTYPE PRINTER MECHANISM

1. This test would be run whenever the print quality of the Silentye is poor or the print head does not move smoothly from one margin to the other.

2. To run the test:

- a. Install the Silentye Interface card in slot 1 and connect the Silentye to it.
- b. Boot the Apple II Product Diagnostics diskette.
- c. Use the <ESC> key to move the cursor to the CARD TESTS line on the main menu, then press <RETURN>.
- d. Use the <ESC> key to move the cursor to the SILENTYPE TEST line on the card test menu, then press <RETURN>.
- e. Type in "Y" and then press <RETURN> to the prompt:

DO YOU WISH TO ALIGN THE PRINT HEAD
DRIVE MECHANICS AT THIS TIME?

- f. The Silentye will start printing H's from the left to right margin then reverse direction and print H's from the right to the left margin.

- (1) You can suspend the printing at any time by pressing "Y" to the prompt:

DO YOU WISH TO SUSPEND PRINTING?

- (2) You can then exit the test by pressing "N" to the prompt:

DO YOU WISH TO RESUME PRINTING PATTERN?

- (a) If you answer yes by pressing "Y", the test will resume printing H's.

- g. Observe the quality of the printed characters on the paper for:

- (1) Bidirectional Printing

- (a) If the left and right margins are not even, adjust the Dacron Cord.

- (2) That the Print Head moves evenly from one margin to the other.
 - (a) If the Print Head movement is uneven, adjust the Drive Motor belt tension.
- (3) For all other print quality problems, refer to the Silentype Troubleshooting - Section 4.

B. OTHER TESTS

1. The remaining tests on the Apple II Product Diagnostics are for testing the carriage and paper drives, printing and variable intensity circuits, and bi-directional print function.
2. To run the tests:
 - a. Install the Silentype Interface card in slot 1 and connect the Silentype to it.
 - b. Boot the Apple II Product Diagnostics diskette.
 - c. Use the <ESC> key to move the cursor to the CARD TESTS line on the main menu, then press <RETURN>.
 - d. Use the <ESC> key to move the cursor to the SILENTYPE TEST line on the card test menu, then press <RETURN>.
 - e. Type in "N" and then press <RETURN> to the prompt:

DO YOU WISH TO ALIGN THE PRINT HEAD
DRIVE MECHANICS AT THIS TIME?

3. Firmware Test

The Firmware test will check the ROMs on the Silentype Interface Card and report their condition to you.

4. RAM Test

The RAM test will check the RAM on the Silentype Interface Card and report their condition to you.

5. Margin Switch

This test will check the status of the left margin switch and report to you its condition.

6. Head Movement

This test will make the print head move back and forth. Observe that the Print Head moves smoothly in both directions.

7. Line Feed

This test will send a line feed character to the Silentye. Observe that the paper exits squarely and that there are no wrinkles or creases caused by the paper feed mechanism.

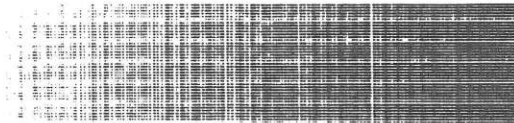
8. Print Head Dot Integrity

This test will print a series of lines on the printer paper, each one representing one of the seven dots on the Print Head. Below is an example from a good Silentye Printer:



9. Print Intensity Control Test

This test prints out 6 lines on the printer paper which vary in eight degrees of intensity. Below is an example from a good Silentye Printer:



10. Bidirectional Print Registration

This test prints parallel vertical lines to verify the Bidirectional Print Adjustment. The tolerance is +/- one dot.

* *	* *	* *
* *	* *	* *
* *	* *	* *
* *	* *	* *
* *	* *	* *
* *	* *	* *
Perfect	Good	Unacceptable

Silentype Technical Procedures

Section 4

Troubleshooting

NOTE: The Silentype printer should be tested with the Apple II Peripherals Diskette. (See **Multi-Product Diagnostics Technical Procedures, Section 1.**)

Silentype Troubleshooting Chart

Symptom	Probable Cause
Some dots are not printing.	1) Head Cable 2) Print Head 3) Deserializer Card
One or more dots print continuously.	1) Deserializer Card
Silentype prints wrong characters.	1) Deserializer Card
No print head movement or movement is erratic.	1) Belt Tension Adjustment
Print intensity test fails.	1) Deserializer Card
Silentype will not print bidirectionally.	1) Cord Tension Adjustment
Silentype prints unreadable or no characters; print head moves.	1) Print Head 2) Platen Assembly 3) Deserializer Card
Paper does not advance properly.	1) Paper Bearing Assembly 2) Deserializer Card 3) Paper drive motor

NOTE: If the troubleshooting actions listed above do not repair the problem, send the Silentype unit back to Apple for repair.

Silentye Technical Procedures

Section 5

Modifications

Contents:

EMI Modifications to the Silentye.....5.3

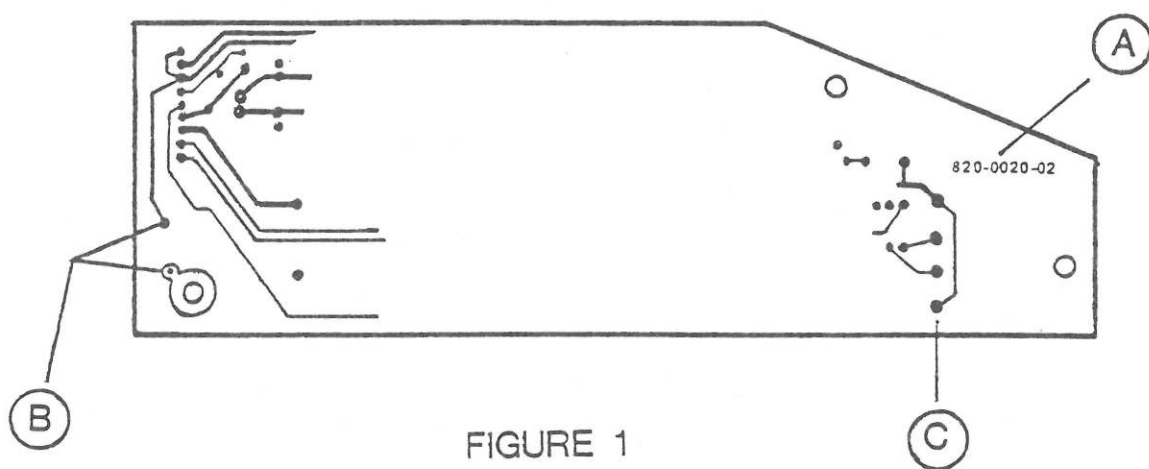


FIGURE 1

A. EMI MODIFICATIONS TO THE SILENTYPE

Like the Apple II, the Silentye has been modified to reduce the electromagnetic (radio frequency) interference produced by early models. The new versions are called EMI (or RFI) Silentyes.

Only the EMI chassis and deserializer card are now produced and available from Apple, but there are plenty of early-model Silentyes in the field. If you have to swap out the deserializer card on an old, non-EMI Silentye, you will have to replace it with an EMI card; but unless you modify it, the new card will cause the old chassis to print with an uneven left margin. Therefore you need to know how to identify the two types of chassis and deserializer card, and how to modify the EMI card to work with a non-EMI chassis.

1. IDENTIFICATION

The Chassis

The EMI Silentye chassis has a two-wire left margin switch connector where the earlier Silentye has a single-wire connector. They are also distinguishable by model number: the earlier version has model number A2M0032, the EMI version has model number A2M0036. The model number is printed on the label on the back of the case.

To summarize:

<u>Non-EMI</u>	<u>EMI</u>
Model # A2M0032	Model # A2M0036
One-wire left margin switch	Two-wire left margin switch

The Deserializer Card

The EMI card has part number 820-0020-02 printed on the trace side (see Figure 1, A). It has an additional terminal pin (J6) (Figure 1, C) for the extra EMI left margin wire switch.

The non-EMI card bears part number 820-0020-01. It has a single terminal pin (labelled J5) for the left margin switch wire.

More information on the differences between the EMI and non-EMI versions of Silentye can be found in Apple Service Bulletin #39.

2. MODIFYING THE EMI CARD

To modify the EMI card for use with a non-EMI chassis, you must solder a jumper wire across two solder pads provided on the card for that purpose (see Figure 1, B). Follow the procedure below:

1. Find the two solder pads on the deserializer card (Figure 1, B). If the holes are filled with solder, open them using a soldering iron and solder sucker.
2. Take a one-inch piece of 20- to 24-gauge insulated wire. Remove approximately 1/4 inch of insulation from each end of the wire.
3. Insert one end of the jumper through the hole in one of the solder pads (from the trace side of the board). Solder it into place. Do the same for the other end and the other solder pad.
4. Snip off any excess jumper wire that may protrude on the other side of the card.
5. Install the deserializer card in the printer as usual. Note that the left margin switch wire from the chassis should connect to post J5 on the card and that J6 (Figure 1, C) will not be used.

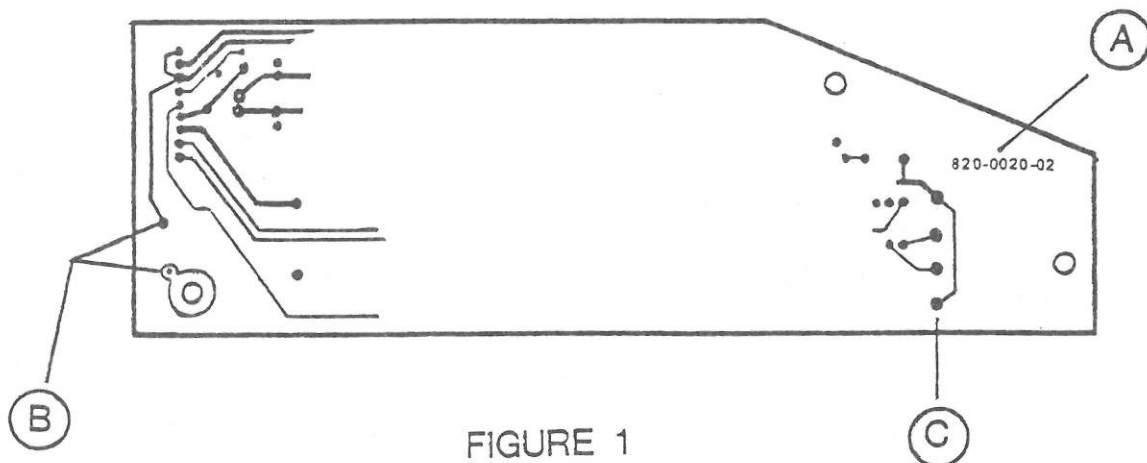


FIGURE 1

Silentype Printer Technical Procedures

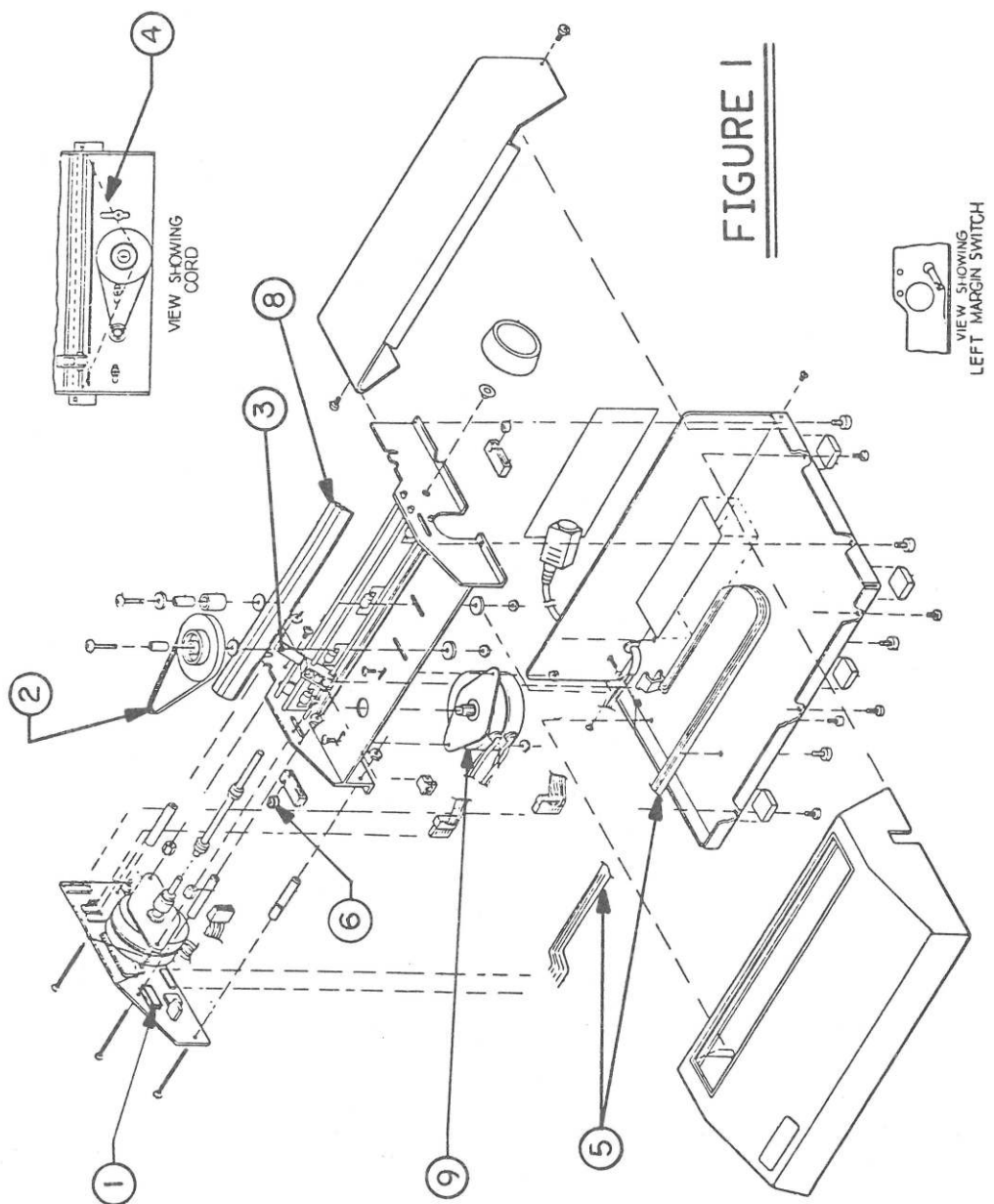
Section 6

Illustrated Parts List

The figures and lists below include all piece parts that can be purchased separately from Apple for the Silentype Printer, along with their part numbers. These are the only parts available from Apple. Refer to your Apple Service Programs manual for prices.

Contents:

Printer.....	6.3
Interface Card ICs.....	6.5



SILENTYPE PRINTER (Figure 1)

Item	Part No.	Description
1	305-0000	IC 74LS00N
2	970-0443	Head Drive Belt
3	970-0418	Print Head, Silentye
4	970-0442	Dacron Cord
5	970-0401	Head Cable
6	970-0410	Cord Pulley
7	970-0406	Paper Bearing Assembly
8	970-0402	Silentye Platen
9	970-0404	Motor, Head Assembly T200-01

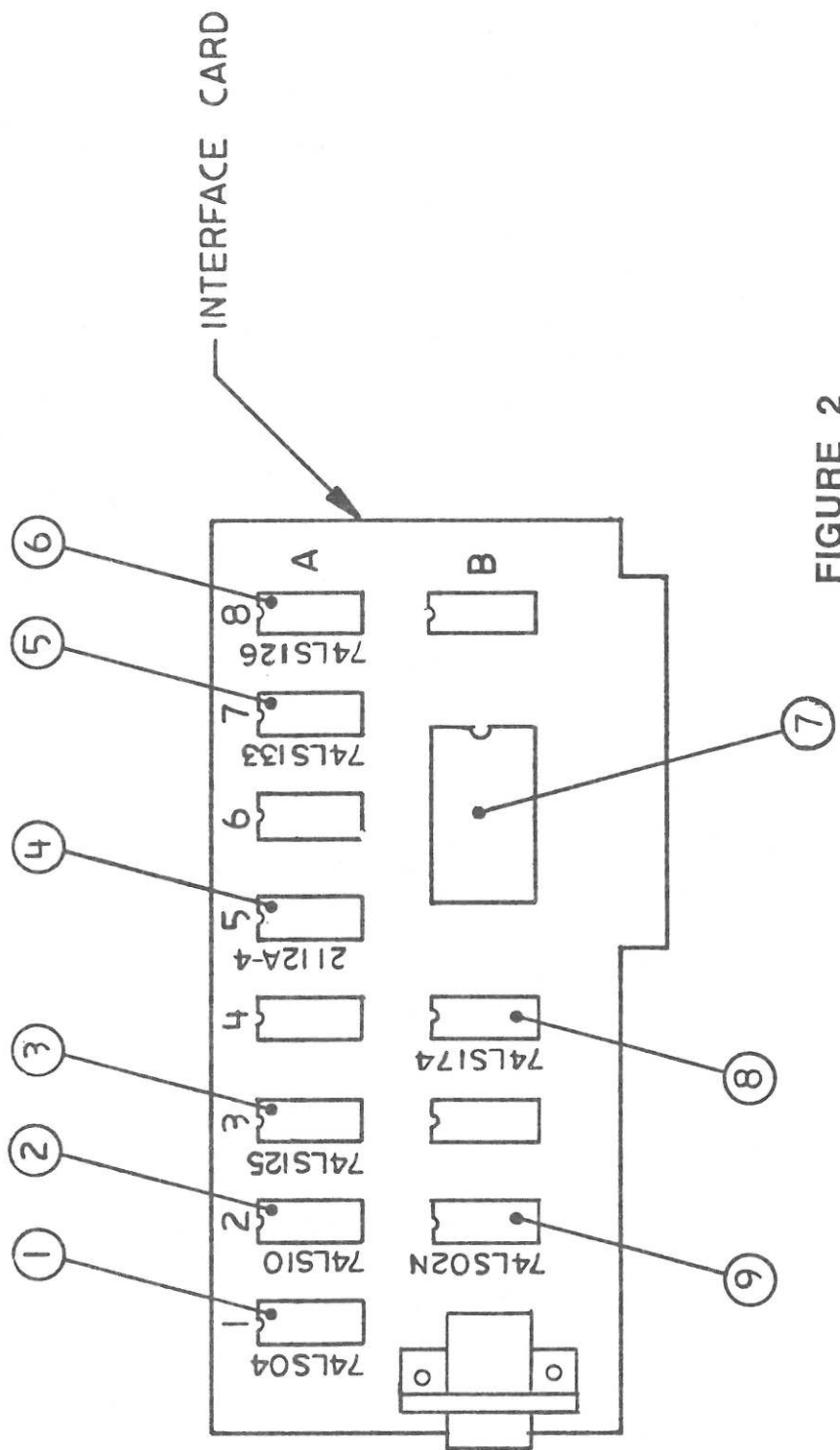


FIGURE 2

SILENTYPE PRINTER - INTERFACE CARD ICs (Figure 2)

Item	Part No.	Description
1	306-0004	IC 74LS04
2	305-0010	IC 74LS10
3	306-0125	IC 74LS125
4	334-2112	RAM 256x4 2112A-4
5	306-0133	IC 74LS133
6	305-0126	IC 74LS126
7	342-0039	ROM Silentye Control
8	306-0174	IC 74LS174
9	306-0002	IC 74LS02N