Installation Instructions

for the

ZENITH | **data systems**

DOUBLE-DENSITY DISK CONTROLLER

Model Z-89-37

INTRODUCTION

The Z-89-37 Double-Density Disk Controller interfaces the Z-89 Computer with floppy disks.* The Controller will read and write as follows to drives using soft-sectored disks.

Double-Sided (H-17-4 drives):

    96 tracks per inch
    80 tracks per side (160 tracks total)
   Single or double density

Single-Sided (H-17-1 drives):

    48 tracks per inch
    40 tracks
    Single or double density

Required software is:

    HDOS version 2.0 (updated or higher)
        or
    CP/M version 2.2.03 (or higher)

NOTE: If your Computer has a backplate like the one shown below, then you must also install the H-88-6 Backplate Modification Kit before you install this product.

HOLE MAY OR MAY NOT BE PRESENT

BACKPLATE
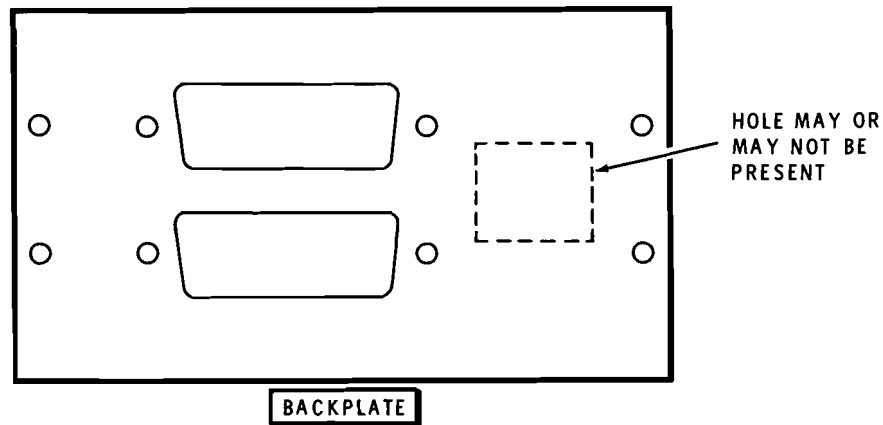
*Cassette operation is not supported.

PARTS LIST

The key numbers correspond to the numbers on the "Parts Pictorial" (Illustration Booklet, Page 1). Return any part that is packed in an individual envelope, with the part number on it, back into its envelope until that part is called for in a step. Do not throw away any packing material until you account for all the parts.

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.

INTEGRATED CIRCUITS — PLUGS

NOTE: Integrated circuits are marked for identification in one of the following four ways:

1. Part number
2. Type number. (On integrated circuits, use only those numbers and letters in **BOLD** print. Disregard any other numbers or letters.)
3. Part number and type number.
4. Part number with a type number other than the one listed.

CAUTION: Some IC's are protected against damage caused by static electricity. Do NOT remove the IC's from their foam pads until you are instructed to do so in a step.

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
A1	442-651	1	UF78H05SC or MC78T05 IC	U101
A2	444-61	1	I/O decoder ROM IC*	U550
A2	444-83	1	74S188 IC*	U516
A2	444-84	1	2732 IC*	U518
A3	100-1817	1	20-pin plug w/jumper	
A4	432-1168	2	Programming plug	

OTHER PARTS

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
B1	134-1159	1	3" wire with connectors	
B2	100-1816	1	4700 Ω resistor (yel-viol-red-gld) with connectors	
B3	6-472-12	1	4700 Ω resistor (yel-viol-red-gld)	
B4	346-1	1"	Sleeving	
B5	352-31	1	Thermal compound	
B6	215-658	3	Heat sink	
B7	206-1394	1	Ground plate	
B8	250-1319	2	4-40 × 9/16" black phillips head screw	
B9	252-2	2	4-40 nut	
B10	254-9	2	#4 lockwasher	
B11	134-1158	1	16-conductor cable with plugs	
B12	134-1074	1	Floppy cable	
B13	134-1163	1	Extension cable	
	703-73	1	Diskette holder	
	890-156	1	Diagnostic diskette (hard sectored)	
	890-157	1	Diagnostic diskette (soft sectored)	
		1	Controller circuit board	
	595-2696	1	ROM Listing Manual	
		1	Operation Manual (See front page for part number.)	
		1	Installation Instructions (See front page for part number.)	

*These IC's are only available from Heath Company and must be ordered using the Heath Part Numbers, not the Description numbers.

COMPUTER TOP REMOVAL

WARNING: Boxed-in areas show hazardous voltage locations.

CABINET TOP

TILT BACK

LATCH PLATE

PUSH BACK

—INSET—

LATCH PLATE

SLIDE TOWARD FRONT
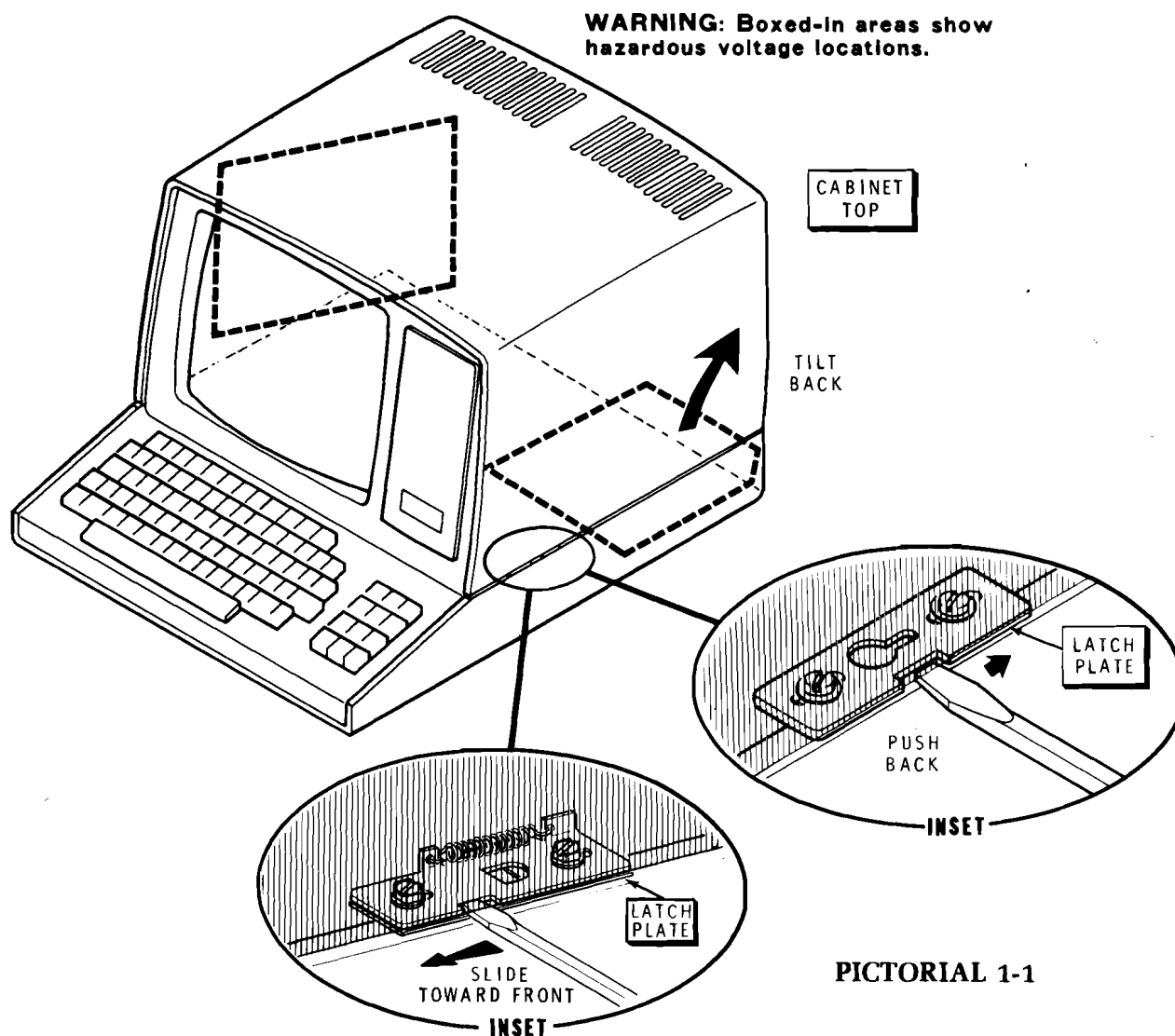
— INSET —

PICTORIAL 1-1

Whenever you need to remove the cabinet top:

- Refer to the inset drawing on Pictorial 1-1, insert the blade of a small screwdriver into the notch in the latch plate, and then slide the latch plate as shown in the inset drawings.

- Likewise, open the latch plate on the other side of the cabinet top.

- **WARNING:** When the line cord is connected to an AC outlet, hazardous voltages can be present inside your Computer. See Pictorial 1-1.

- Carefully tilt the cabinet top back. NOTE: The hinges are designed so you can easily remove the cabinet top once you have opened it completely.

- Unplug the fan.

Reverse this procedure to close and lock the cabinet top back on the Computer.

INSTALLATION

( ) Turn off the Computer, unplug the line cord, and remove the cabinet top.

Refer to Pictorial 2-1 (Illustration Booklet, Page 2) for the following steps.
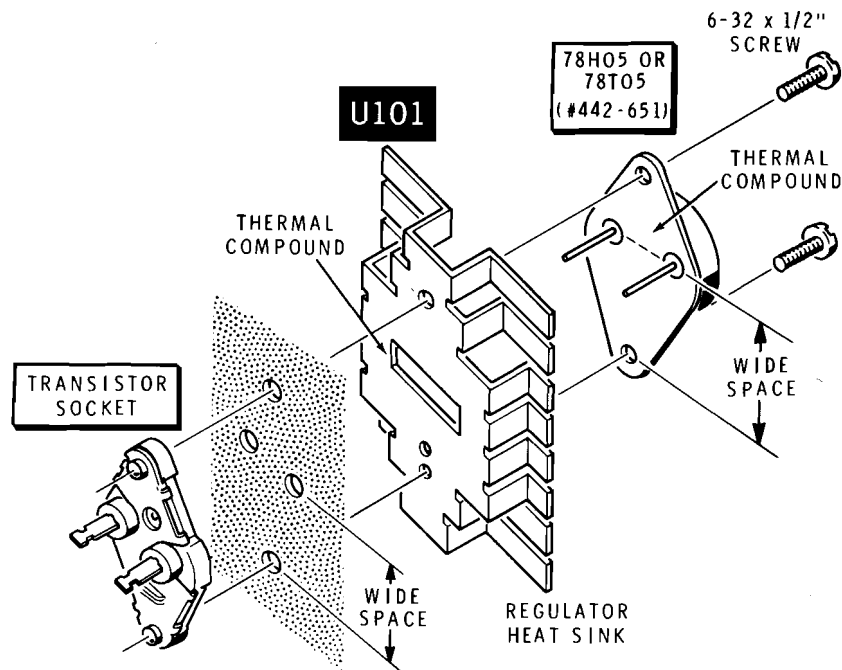
( ) Remove the two screws that hold the CPU logic circuit board in place.

( ) ( ) Disconnect the cables from the circuit board, lift the circuit board up out of the Computer, and set the board aside temporarily. (If a serial I/O board is installed, also unplug its cables.)

POWER SUPPLY

( ) Refer to Pictorial 2-3 (Illustration Booklet, Page 3) and examine your computer to see if there are heat sinks at U101, U102, and U103. If heat sinks are present, and U101 is 78H05 or 78T05 (#442-651), you may proceed to "CPU Circuit Board" on Page 7. Otherwise, perform the following steps.

Refer to Pictorial 2-2 (Illustration Booklet, Page 3) for the following steps.

( ) Disconnect the cables from the power supply circuit board. Then remove the four corner screws and set the circuit board aside.

( ) Remove the four hex spacers and lift the power supply heat sink out of the computer. Do not disconnect any wires that are soldered to the heat sink assembly.

Detail 2-3A

Refer to Pictorial 2-3 (Illustration Booklet, Page 3) and Detail 2-3A for the following steps.

( ) Remove the two screws that hold IC socket U101. Then remove and discard the IC, and set the screws aside.

WARNING: You will be using Dow Corning 340 thermal compound in the following steps. Although this compound is not caustic, it may cause temporary discomfort if it gets into your eyes. If this happens, rinse your eyes with warm water. If the compound gets on your clothing, it may require professional cleaning, so handle the compound carefully. This compound contains zinc oxides, SiO_2 and slight traces of CO_2.

( ) Locate the thermal compound pod and make a small slit in one side.

( ) Spread a small amount of thermal compound onto the UA**78H05**SC or MC**78T05** integrated circuit (#442-651). Squeeze the pod to remove the compound.

( ) Spread a small amount of thermal compound on the back of the regulator heat sink.

( ) U101: Refer to Detail 2-3A and note the wide space of the IC. Install the IC in the socket and the regulator heat sink at U101. Be sure the socket is properly seated in its mounting holes in the heat sink, and then install the two screws you removed earlier.

NOTE: If your Computer already has heat sinks at U102 and U103, proceed to "Power Supply Installation." If your Computer does not have heat sinks at these locations, proceed with the following steps.

( ) Remount the IC regulator at U102. Use a regulator heat sink and thermal compound as before.

( ) Remount the IC regulator at U103. Use a regulator heat sink and thermal compound as before.

POWER SUPPLY INSTALLATION

Again refer to Pictorial 2-2 for the following steps.

( ) Remount the power supply heat sink with the four 6-32 hex spacers you removed earlier.

( ) Remount the power supply circuit board with the four 6-32 × 1/4″ screws that you removed earlier. NOTE: If your unit had a lockwasher installed at A, you must reinstall it at A as shown.

If you have a voltmeter, make the following tests. Otherwise, proceed to "CPU Circuit Board."

( ) Connect the common voltmeter lead to the heat sink as shown.

NOTE: If you do not obtain the proper results in the following steps, immediately unplug the line cord and correct the problem before you proceed.

( ) Plug in the line cord and turn on the Computer.

( ) Measure TP1. The voltage should be +4.5 to +5.5 volts DC.

( ) Measure TP2. The voltage should be +4.5 to +5.5 volts DC.

( ) Measure TP3. The voltage should be +10.8 to +13.2 volts DC.

( ) Turn off the Computer and unplug the line cord. Then disconnect the voltmeter and set it aside.

CPU CIRCUIT BOARD

Refer to Pictorials 2-2 and 2-3 for the following step.

( ) Reconnect the four cable plugs to the power supply circuit board. (Also see Pictorial 2-3.)

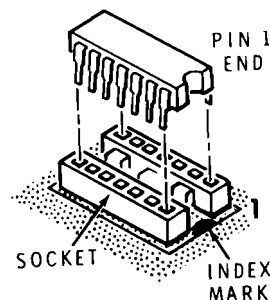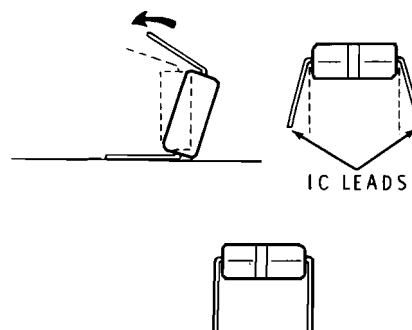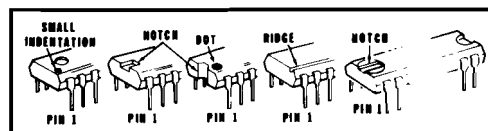Again refer to Pictorial 2-1 for the following steps.

( ) U516: Refer to inset drawing #1 on Pictorial 2-1 and remove the IC at U516. Then refer to Detail 2-1A and install the 74S188 IC (#444-83) at U516. This part is a programmed PROM, the removed part will not be needed further.

( ) U518: Remove the IC at U518. Then install the 2732 IC (#444-84) at U518. (If your Computer has the 16K adapter circuit board installed, temporarily remove it if necessary.) This part is a programmed PROM. The removed part will not be needed further.
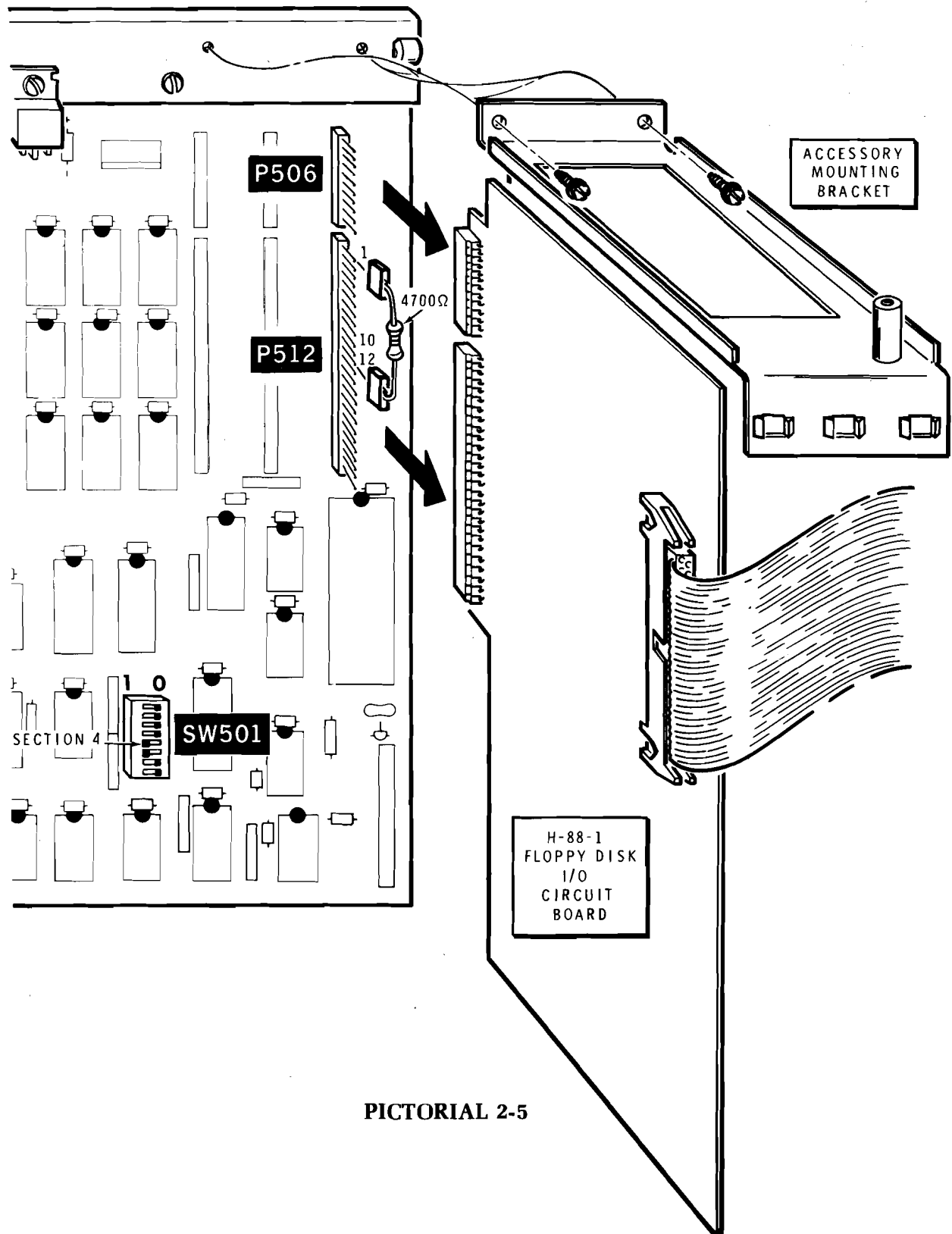
( ) U550: Remove and discard the IC. Then install the I/O decoder ROM IC (#444-61) at U550. The removed part will not be needed further.

( ) Remove and set aside the IC's at U558 and U557.

(NOTE: If you ever remove the Z-89-37, then these IC's must be reinstalled.)

IC LEADS

PIN 1
END

SOCKET

INDEX
MARK

Detail 2-1A

P506

P512

4700Ω

1
10
12

SECTION 4

SW501

1 0

ACCESSORY
MOUNTING
BRACKET

H-88-1
FLOPPY DISK
I/O
CIRCUIT
BOARD

PICTORIAL 2-5

Refer to Pictorial 2-4 (Illustration Booklet, Page 4) for the following steps.

( ) On the left side of the CPU circuit board is a row of four programming plugs as shown in the Pictorial. Remove and set aside the top plug (it will not be used). Then reposition the middle two plugs from 0 to 1. The bottom plug will not be changed.

( ) Plug one end of the 3″ wire with connectors onto the top plug near U518. (Be sure the connector plugs onto all three pins of the plug.) Plug the other end of the wire onto plug P508. Be sure the center hole of the connector is connected to pin 14 of the plug. (The plug is numbered from top to bottom.)

NOTE: The 20-pin plug with jumper has one corner cut off. This indicates pin 1 of the plug.

( ) U558: Install the 20-pin plug with jumper at U558. Be sure to position the plug with the pin 1 end properly.

( ) Plug the indicated end of the 16-conductor cable with connectors into socket U557. Be sure to position the pin 1 end (marked with a color dot or arrow) of the plug into the pin 1 end of the socket.

If you do NOT intend to use the H-88-1 floppy disk I/O circuit board in your system (needed for transferring programs and data from single-density, hard-sectored disks to double-density, soft-sectored disks), proceed with the following steps. If you do intend to use the H-88-1 floppy disk I/O, proceed to "CPU Installation" on Page 10.

( ) Refer to Pictorial 2-5 and remove the accessory mounting bracket and the H-88-1 circuit board.

If you are going to use the:

● Z-89-47 interface circuit board, proceed to "Z-89-47."
● Z-89-67 interface circuit board, proceed to "Z-89-67."

Otherwise, proceed as follows:

( ) Install the 4700 Ω resistor with connectors onto plug P512. Be sure the center hole of one connector plugs onto pin 1 and the center hole of the other connector plugs onto pin 12.

Proceed to "CPU Installation."

Z-89-47

For a system to operate properly with the Z-89-37, the Z-89-47 I/O board should be installed at plugs P506 and P512. However, before the Z-89-47 will operate properly when plugged into plugs P506 and P512, a resistor must be added to the Z-89-47 circuit board. Return the Z-89-47 circuit board (#85-2442) to Heath Company or a Zenith Data System Service Center for this modification. If you want to make the modification yourself, use the 4700 Ω, 1/4-watt resistor (yellow-violet-red), slide the length of sleeving over the resistor (see the inset drawing), and solder the resistor between pins 1 and 12 of plug P2 on the foil side (not the component side) of the Z-89-47 circuit board as shown in Pictorial 2-6 (Illustration Booklet, Page 5).

( ) Refer to Detail 2-6A and set the 170/174 programing plug to 174.

( ) Install the Z-89-47 board at plugs P506 and P512. See Pictorial 2-7 (Illustration Booklet, Page 6).

NOTE: If you ever move this board to another set of plugs, be sure to remove the 4700 Ω resistor that you just installed.

Proceed to "CPU Installation."

Z-89-67

( ) Refer to Pictorial 2-8 (Illustration Booklet, Page 6) and reposition programming plugs J1 and J2 to the indicated positions on the Z-89-67 I/O board.

( ) Install the Z-89-67 board at plugs P506 and P512. See Pictorial 2-7 (Illustration Booklet, Page 6).

CPU INSTALLATION

( ) Again refer to Pictorials 2-1 and 2-9, and reinstall the CPU logic circuit board. Secure it in place with its two screws and reconnect the cables as shown. (Be sure to reconnect P513 in the bottom right-hand corner of the board.)

CONTROLLER PROGRAMMING

Refer to Pictorial 2-10 for the following steps.

( ) Locate plug positions J4 through J7 and, if necessary, move the programming plug to position J6. This plug selects which drive is connected to plug P3. (Drive numbers are determined by how the drive programming plugs are cut. See Pictorials 2-13 and 2-14, Illustration Booklet, Page 8). J4 = DS1, J5 = DS2, J6 = DS3, and J7 = DS4 (presently not supported).

( ) Be sure plugs J1 and J2 are at 170.

( ) Position plug J3 at 1 unless any of your drives are 48TPI Wanco Model 82 drives.*.
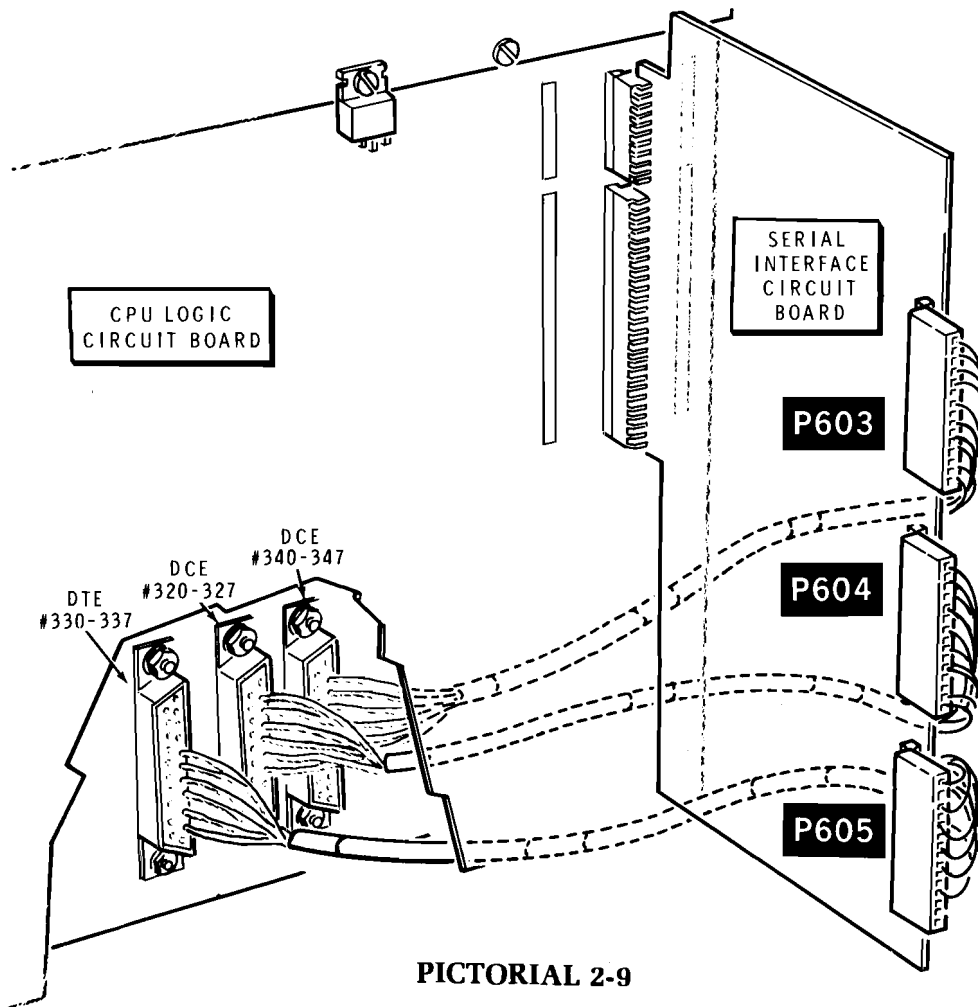
PICTORIAL 2-9

*All drives connected to a single Z-89-37 should be of the same type. If they are not, the precompensation will be wrong for at least one of the drives. This will result in reduced data integrity and poor reliability.
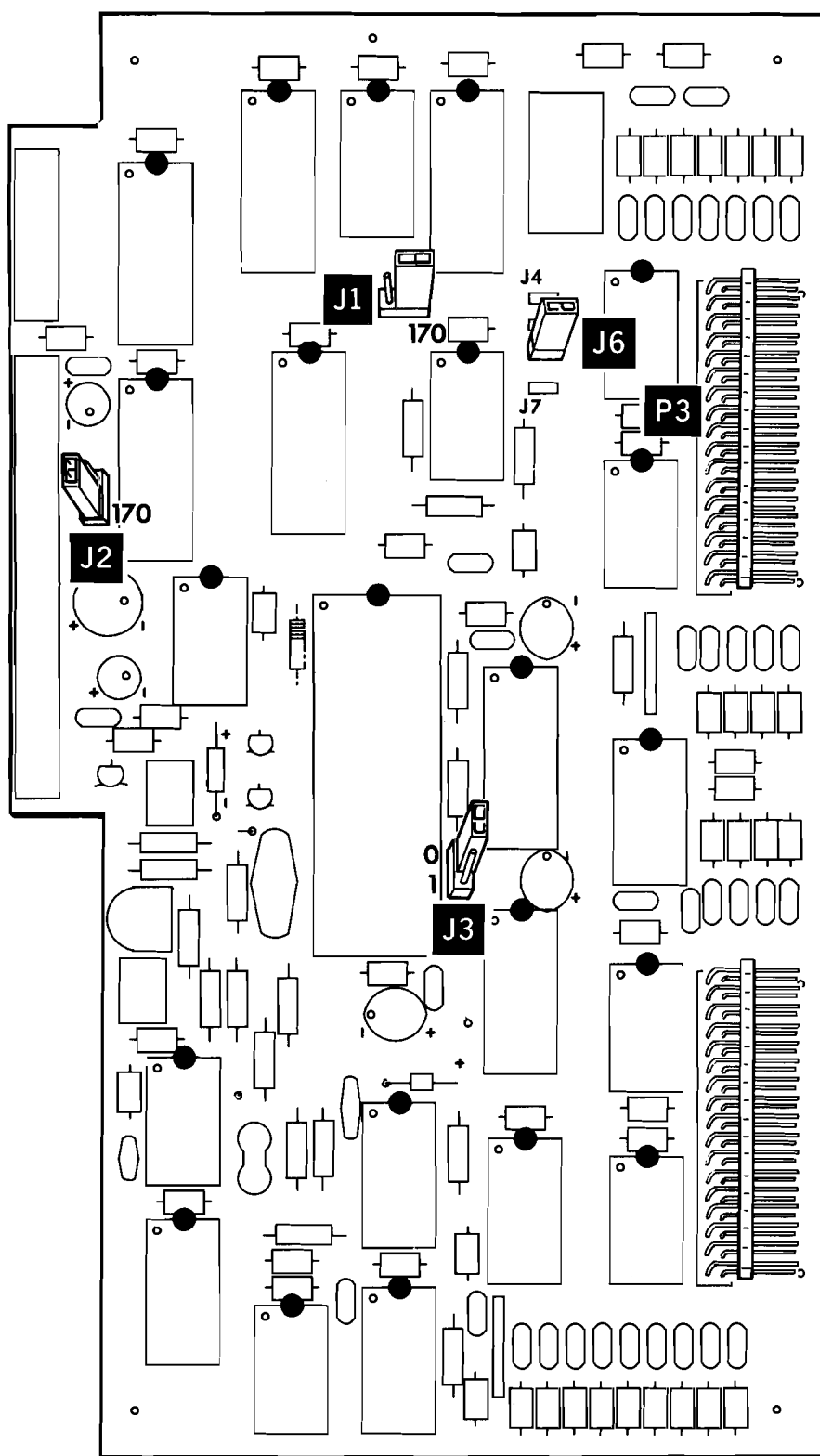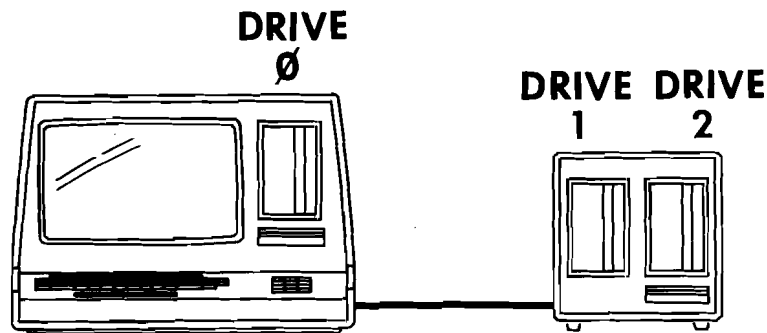
PICTORIAL 2-10

CONTROLLER INSTALLATION

Refer to Pictorial 2-11 (Illustration Booklet, Page 7) for the following steps.

( ) Remove the accessory mounting bracket by removing the two screws that hold it in place (if this has not already been done).

( ) Install the wired controller circuit board at P504 and P510.

( ) Plug the free end of the 16-wire cable with connectors into IC socket P5 with the pin 1 end as shown. Then neatly route the cable as shown.

( ) Refer to the inset drawing on Pictorial 2-11 and mount the larger connector of the extension cable to the rear panel at FR-1 as shown. Use a ground plate, two 4-40 × 9/16" black phillips head screws, two #4 lockwashers, and two 4-40 nuts. Be sure to position the marked edge of the cable as shown. (If necessary, temporarily remove the rear panel.)

( ) Route the extension cable as shown and plug it into the bottom connector of the new controller circuit board. Position the marked edge of the cable as shown.

( ) If you are using a drive in your computer, plug the smaller connector of the new floppy cable into the indicated connector of the controller circuit board (with the marked edge up) and plug the free end of the cable into your floppy drive as before.

( ) Remount the accessory mounting bracket with its two screws.

DRIVE PROGRAMMING

Refer to the following chart and Pictorial 2-12, and select the configuration that fits your situation. Configuration E is normally used for transferring data and programs from hard-sectored disks to soft-sectored disks.

	FLOPPY DISK CONTROLLER BOARD(S)	TYPES OF DRIVES: ● 48 TPI (H-17-1) ● 96 TPI (H-17-4)	Drive 0	Drive 1	Drive 2
A	H-88-1	48 TPI (H-17-1) only. Internal drive present	DS3	DS2	DS1
B	H-88-1	48 TPI (H-17-1) only Internal drive absent	No drive installed	DS3	DS2
C	Z-89-37	Either* Internal drive present	DS1 (Z-89-37 jumper installed at J4)	DS2	DS3
D	Z-89-37	Either* Internal drive absent	No drive installed (Z-89-37 jumper installed at J7)	DS1	DS2
E	H-88-1 & Z-89-37	Either* Internal drive present	DS3 [Drive 0 is 48 TPI (H-17-1) drive connected to H-88-1. Z-89-37 jumper installed at J6.]	DS1 (Drive 0 connected to Z-89-37)	DS2 (Drive connected Z-89-37)

DRIVE Ø

DRIVE 1 **DRIVE 2**

PICTORIAL 2-12

After you select the configuration you want, refer to Pictorial 2-13 (Illustration Booklet, Page 8) to program any 48TPI (H-17-1) drives, or Pictorial 2-14 (Illustration Booklet, Page 8) to program any 96 TPI (H-17-4) drives. [Pictorial 2-15 shows 48 TPI (H-17-1) drives programmed to be used with the H-88-1, single-density controller.] You can do this programming by physically interchanging preprogrammed drives, interchanging the programming plugs, cutting the programming plugs (if presently uncut); or by replacing the programming plug with a properly set dip switch. Two uncut programming plugs are supplied for use if you need them.

( ) Again refer to Pictorial 1-1 and replace the cabinet top and reconnect the fan.

Proceed to the Operation Manual. Use that Manual if:

● You want to transfer programs and data from hard sectored disks to soft sectored disks.

● You want to thoroughly test your disk system. (See the Diagnostic routines.)

● You want to "reconfigure" your system. (See the "Reconfiguration" section.)

● You want to learn more about your disk system.

● Your Computer develops a problem. (See the "In Case of Difficulty" section and the Diagnostic routines.)