SERVICE MANUAL

8087 Arithmetic Coprocessor

Z-100 Series Computers

Part Numbers 181-5060 and 181-5730

585-55-02

860-47

ZENITH data systems

The purpose of this page is to make sure that all service bulletins are entered in this manual. When a service bulletin is received, annotate the manual and list the information in the record below.

Record of Field Service Bulletins

SERVICE BULLETIN NUMBER	DATE OF ISSUE	CHANGED PAGE(S)	PURPOSE OF SERVICE BULLETIN	INITIALS

Zenith Data Systems Corporation
St. Joseph, Michigan 49085

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Abbreviations

AC	Alternating current
ALE	Address latch enable
CLK	Clock
CK	Clock
CPU	Central processing unit
CYCLE	Bus cycle
DHOLD	Delayed hold
DRV_EN	Active low drive enable
FF-1	Flip-flop 1
FF-2	Flip-flop 2
GND	Ground
HAL	Hard array logic
HLDA	Hold acknowledge
HOLD	Hold
IC	Integrated circuit
INT	Interrupt
INTA	Interrupt acknowledge
IO/$\overline{M}$	Input-output (high); memory (low)
LRST	Latched reset
MOS	Metal oxide semiconductor
NMOS	Numeric metal oxide semiconductor
NMI	Non-maskable interrupt
OC	Output control
PAL	Programmable array logic
PALCLK	PAL clock
PC	Personal computer
RD	Read
RESET	Reset
RQGT	Request grant (PAL controller)
TTL	Transistor-transistor logic
S0, S1, S2	Status lines from CPU
VCC	+5 volts
WR	Write

Chapter 1

Description and Specifications

Introduction

This accessory card improves the arithmetic functions of the Z-100 Computer. It provides extensive high speed numeric processing capabilities by adding the Intel 8087 coprocessor which performs arithmetic and comparison operations on a variety of numeric data types. In addition, it executes numerous built-in transcendental functions, including tangent and log functions.

As a processor extension to the Z-100, the Z-216 card not only extends the register and instruction set of the 8088, but adds several new data types to the computer's capabilities.

Specifications

Processor:	Intel 8088 8/16-Bit Processor (transferred from the Z-100 Main Board)
Coprocessor:	Intel 8087 Numeric Data Processor
Request/Grant Controller:	Programmed Bipolar Array Logic
Bus Controller:	Programmed Bipolar Array Logic

Chapter 2
Installation

Introduction

If the computer is an All-in-One model, as shown in Figure 2.1, proceed with "All-in-One Disassembly". For Low-Profile models, proceed to "Low-Profile Disassembly".

CAUTION: If the model to be disassembled is equipped with a Winchester drive, use the SHIP utility to make sure the drive heads are set in their correct "parked" position to avoid damage to the drive. For the same reason, handle the Winchester drive very carefully.

All-in-One Disassembly

WARNING: Hazardous voltages can be present inside the computer when the line cord is connected to an AC outlet. For your own personal safety, disconnect the line cord from the outlet before removing the top case.

- Unplug the line cord from the AC outlet.
- Refer to Figure 2.1. Use a small screwdriver to move the metal slides all the way to the front and then 1/4" toward the rear, as shown.
- Carefully lift the top case straight up and set it to one side.

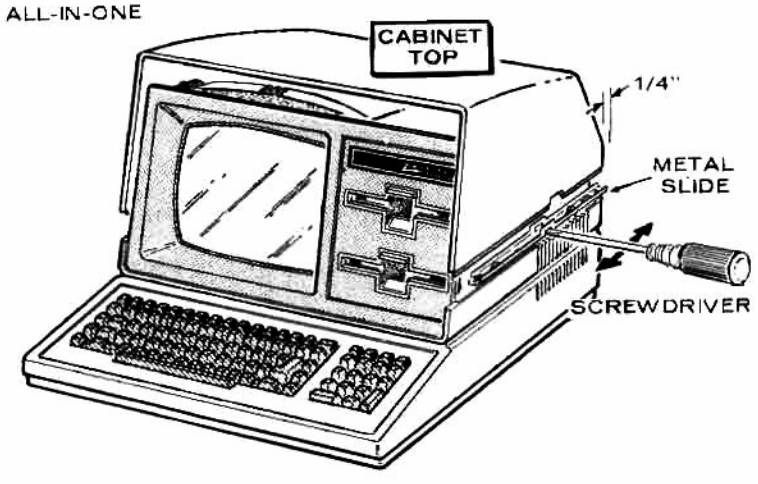

Figure 2.1. Top Case Removal

Installation

- Refer to Figure 2.2 and remove and retain the back screws that hold each latching slide at positions AA and AB.
- Pivot both slides out as shown.
- Remove and retain the five screws at positions AC, AD, AE, AF, and AG. Note the position of the ground straps at AE and AF.
- Carefully lift the drive/video subassembly up and set it down about 4 to 5 inches toward the front of the computer.

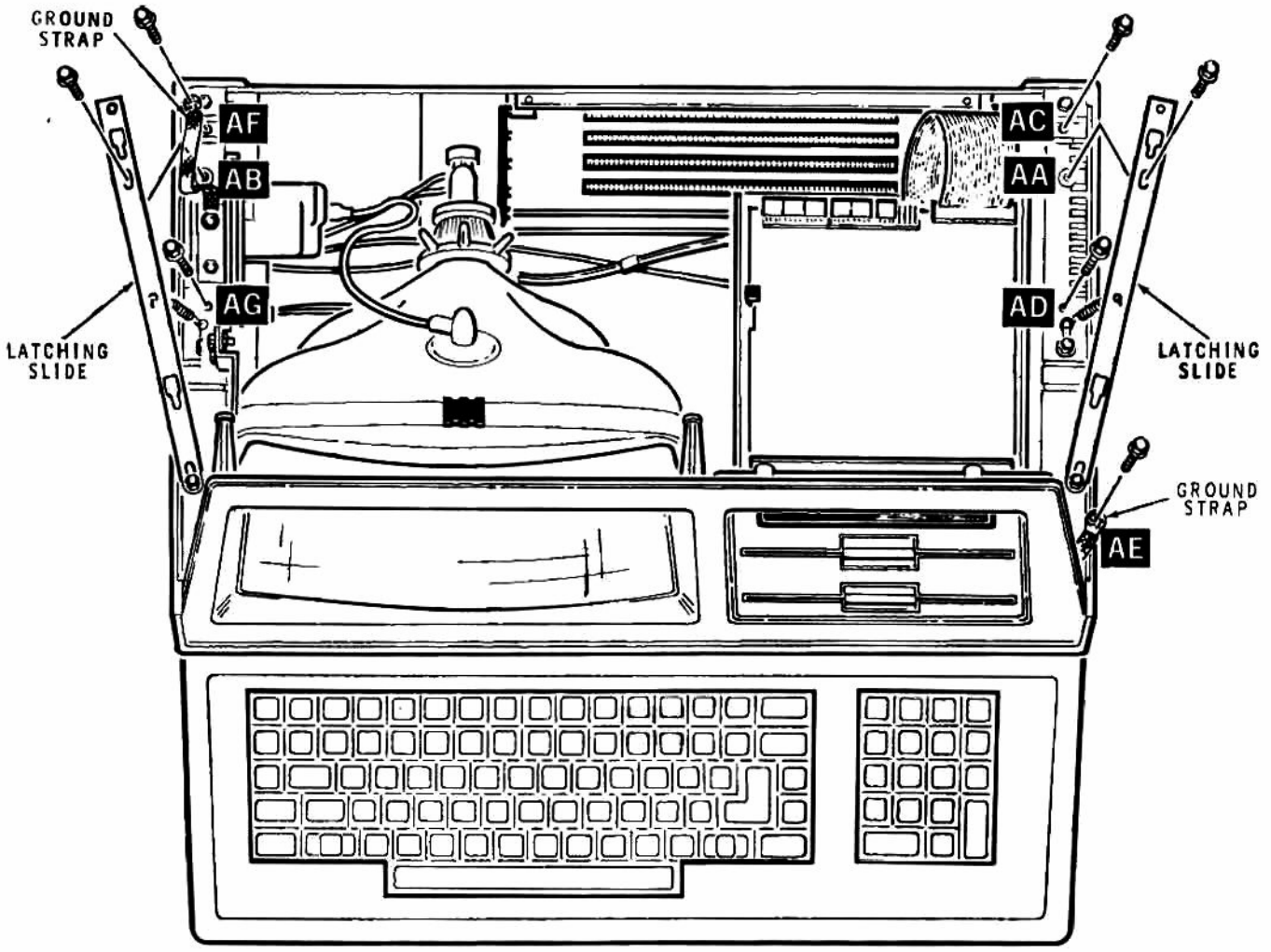

Figure 2.2. Disconnecting Slides and Straps

- Refer to Figure 2.3 and carefully unplug the signal/power cable from the video board.
- Carefully unplug the flat cable from the Z-207 Card, as shown.
- Carefully unplug the power cables from each disk drive.
- Remove the drive/video subassembly and set it to one side.

Proceed to "Final Disassembly".

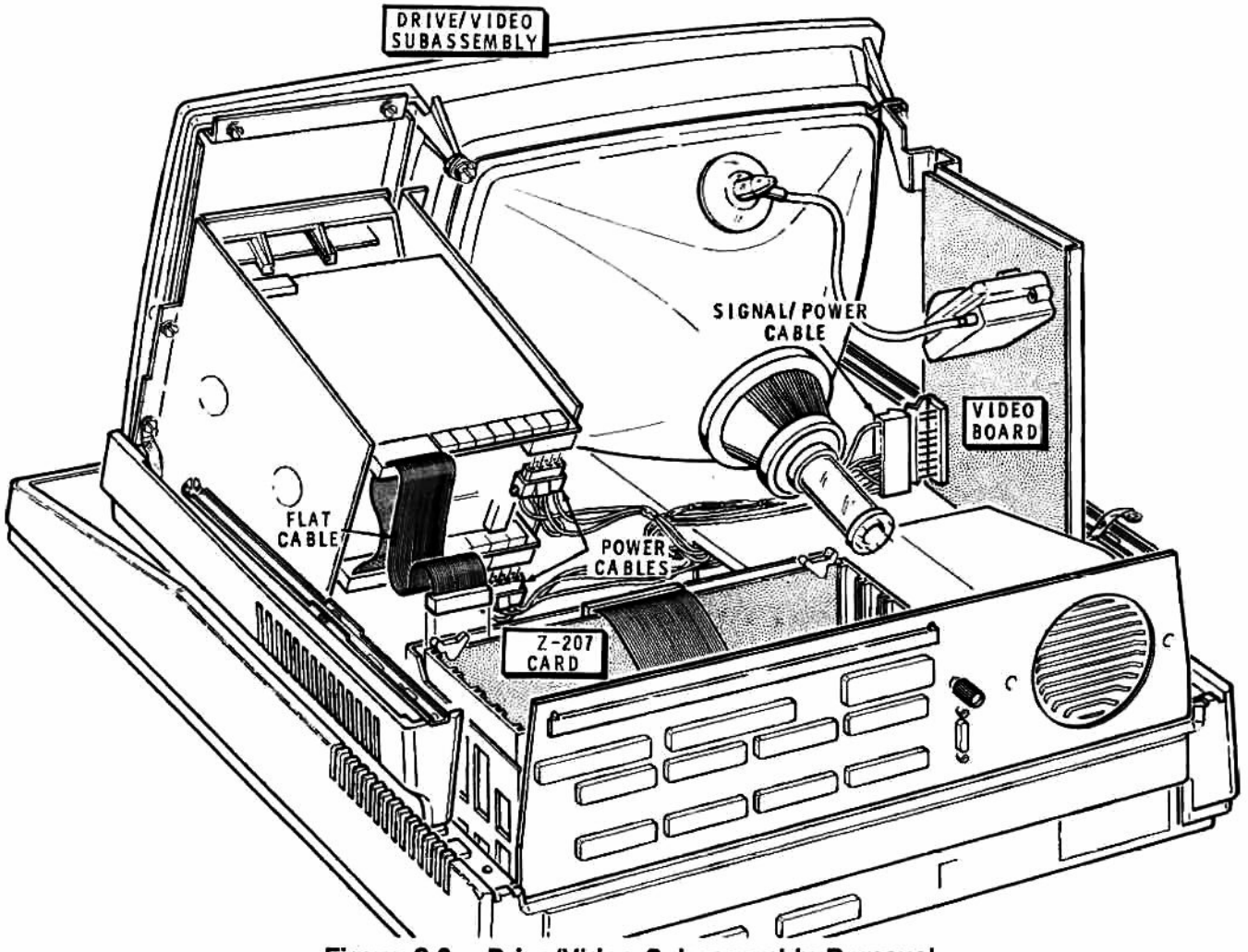

Figure 2.3. Drive/Video Subassembly Removal

Low-Profile Disassembly

CAUTION: If the model to be disassembled is equipped with a Winchester drive, use the SHIP utility to make sure the drive heads are set in their correct "parked" position to avoid damage to the drive. For the same reason, handle the Winchester drive very carefully.

WARNING: Hazardous voltages can be present inside the computer when the line cord is connected to an AC outlet. For your own personal safety, disconnect the line cord from the outlet before removing the top case.

- Unplug the line cord from the AC outlet.
- Refer to Figure 2.4. Move the metal slides all the way to the back and then slide them toward the front of the computer about 1/4", as shown.
- Carefully lift the top case straight up and set it to one side.

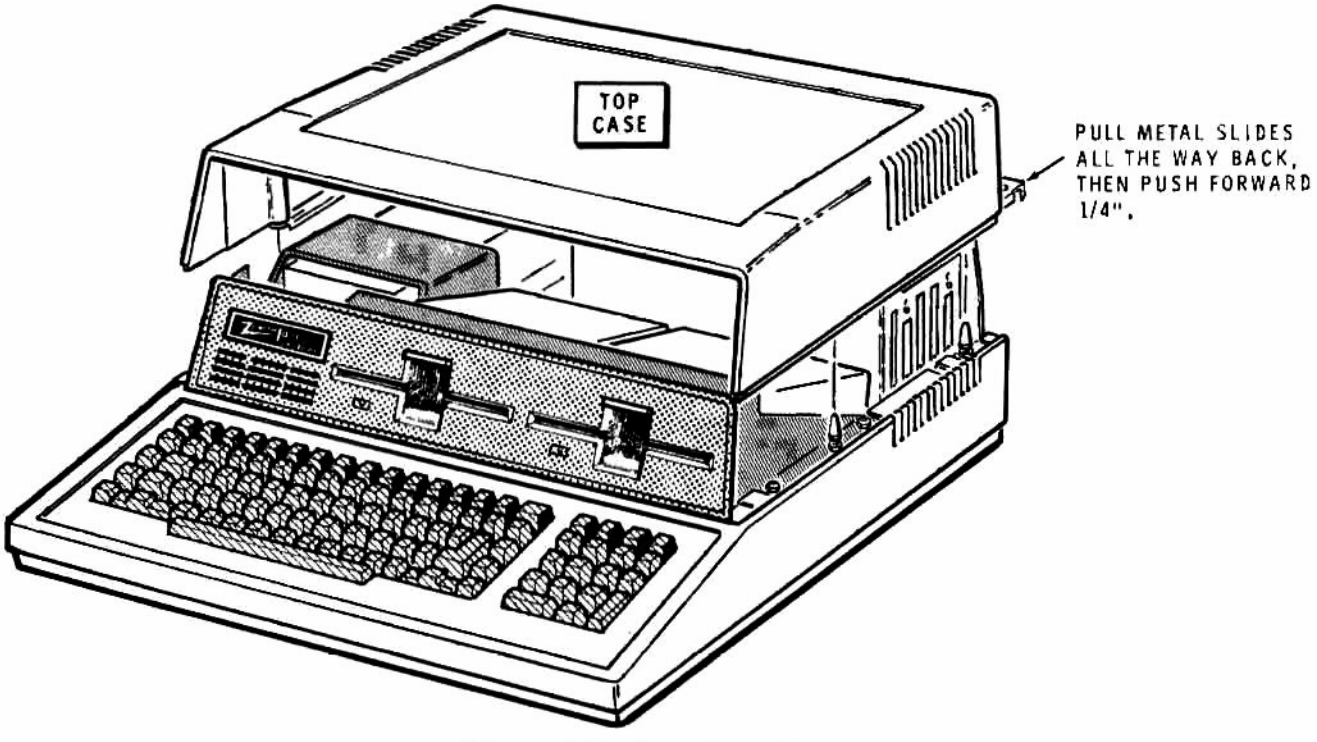

Figure 2.4. Top Case Removal

- Refer to Figure 2.5. Remove and retain the four screws at positions AA, AB, AC, and AD.
- Remove and retain the two locking pins at AE and AF.
- Carefully lift the drive subassembly up and set it down about 2 inches toward the front of the computer.

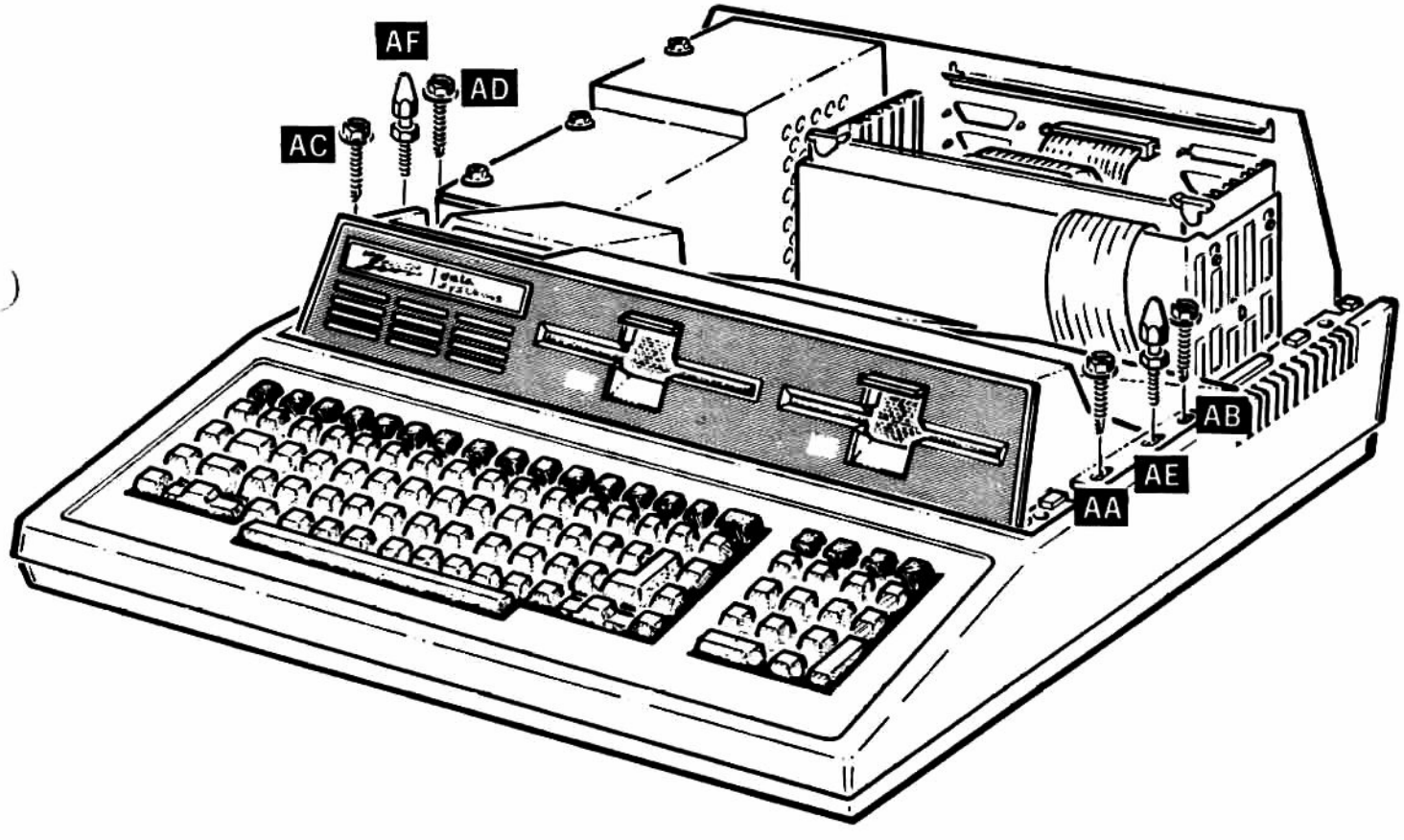

Figure 2.5. Drive Subassembly Removal

- Refer to Figure 2.6 and carefully unplug the flat cables from the disk drives, as shown.
- Carefully unplug the power cables from each disk drive.
- Remove the drive subassembly and set it to one side.

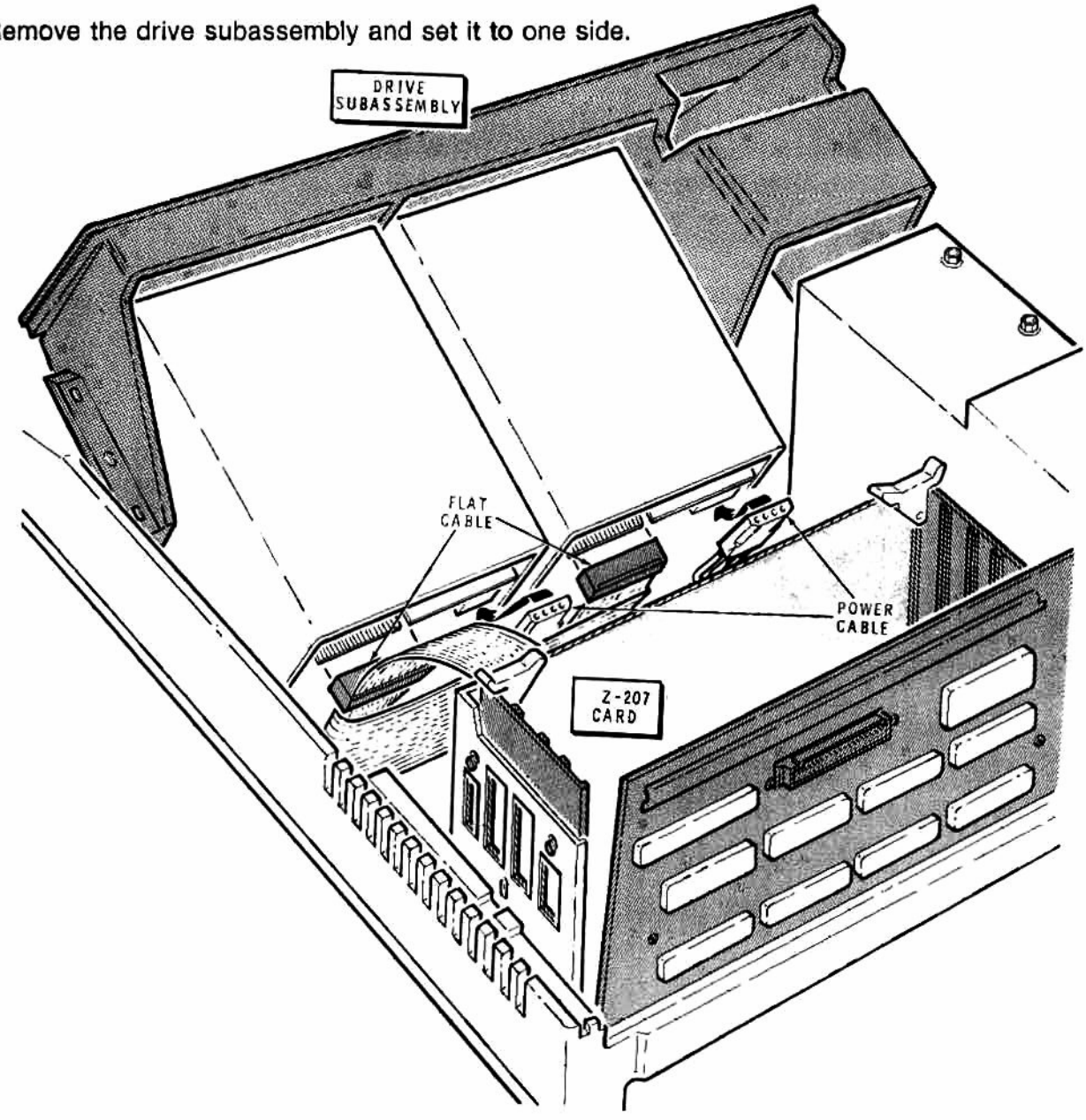

Figure 2.6. Disconnecting the Drive Subassembly

Final Disassembly

- Refer to Figure 2.7. Remove and retain the two screws from the upper front keyboard and base cover corners at positions BA and BB.
- **On Low-Profile Models only,** remove and retain the two locking pins at positions BC and BD.
- Lift the front of the base cover straight up and pivot it to the back of the computer to clear the covers, controls, and connectors on the back panel. Set it to one side.

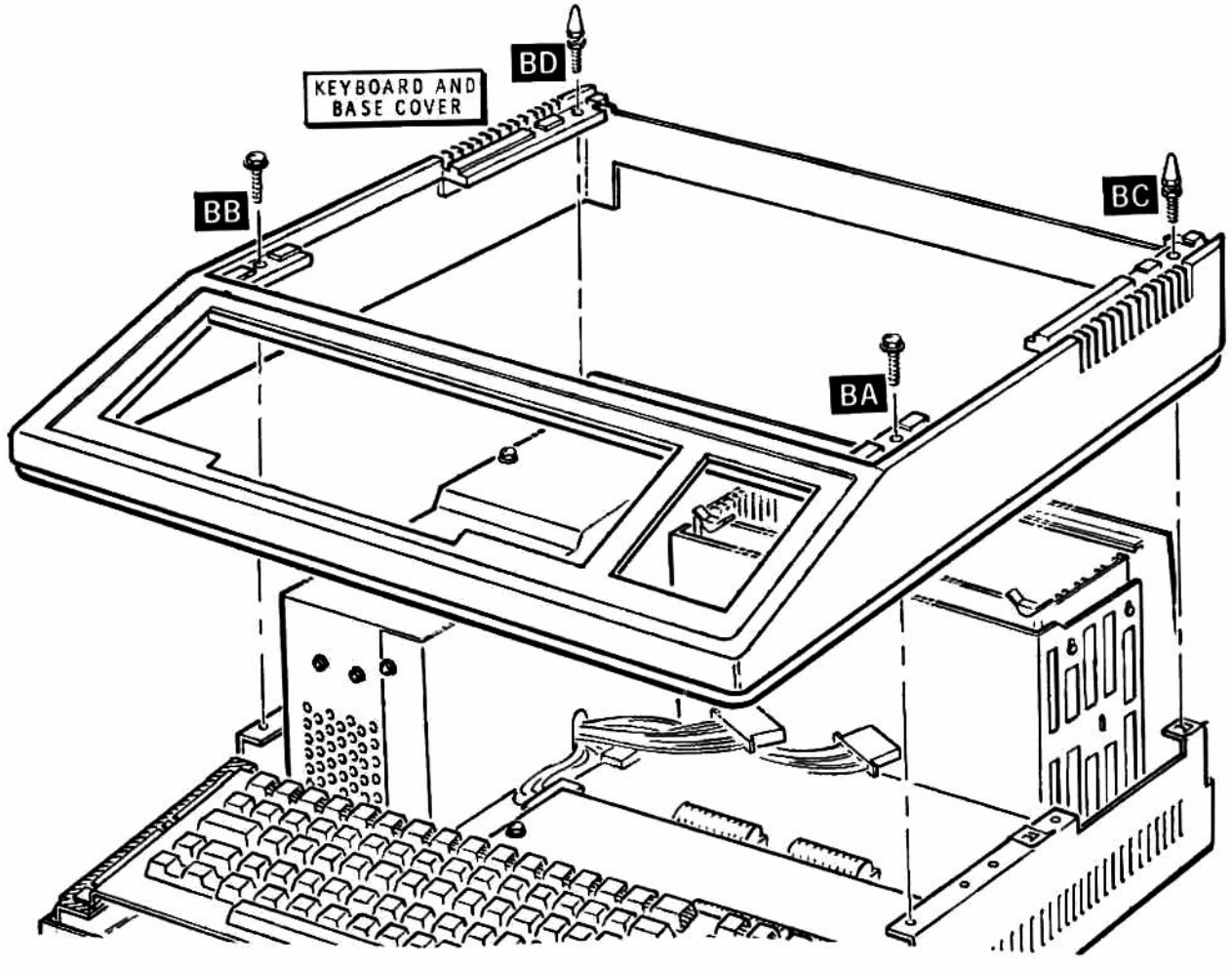

Figure 2.7. Keyboard and Base Cover Removal

- Refer to Figure 2.8. Lift the keyboard up and swing it to the front of the computer.
- Remove and retain the three screws at positions BE, BF, and BG on the video board.
- Swing the front of the video board up and to the back, as shown.

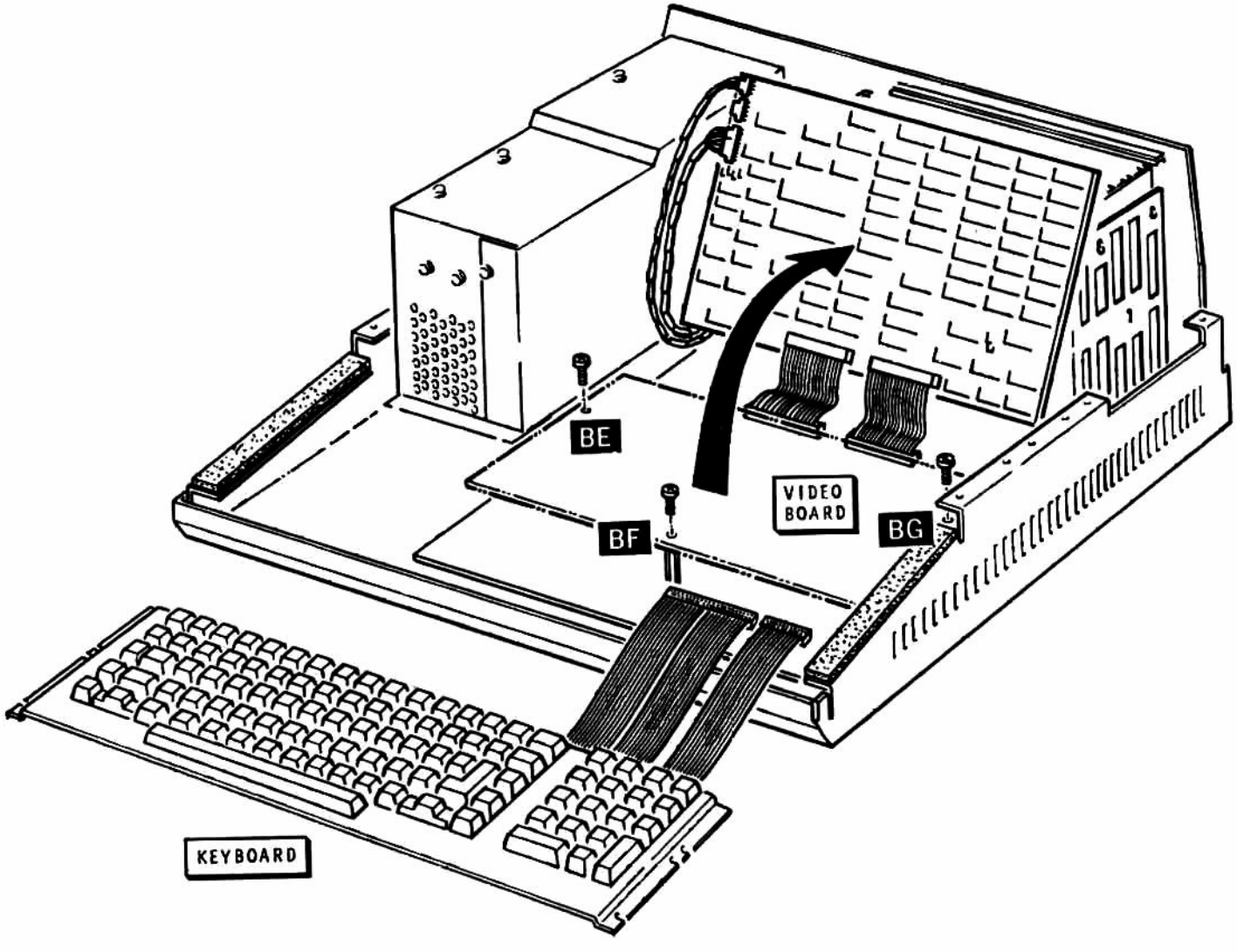

Figure 2.8. Keyboard and Video Board Removal

Installation

CAUTION: The Z-100 and the 8087 Coprocessor board contain electrostatic sensitive devices (ESD). Use extreme care when you handle any of the ICs in the Z-100 or on the card. Before you attempt to handle or install these products, use normal ESD handling procedures.

CAUTION: Use extreme care when removing the 8088 IC from its socket to avoid damage to the chip itself and/or to the printed circuits (tracks) underneath it. Use a small screwdriver, wrapped with a flexible tape, as a lever to lift first one end of the chip, and then the other, very gently from the socket.

- Refer to Figures 2.9 and 2.10. Remove the 8088 IC from its socket on the main board (U211) and install it in the empty socket at U252 on the Z-216 card. Make sure the 8088 pins are straight when you install it.

- Install a 4-40 × .470″ spacer in the hole at C near the edge of the Z-216 Card. Use a 4-40 × .25″ nut to secure spacer to the card.

- Remove and retain the screw from the hole in the center of the main board at A. Install 4-40 × .470″ spacer in the hole in the center of main board at position A.

- Refer to Figure 2.10. Carefully install the Z-216 card in the empty socket at U211 on the main board.

- Use the retained 4-40 screw (from position A) at position B to secure the Z-216 Card to the spacer.

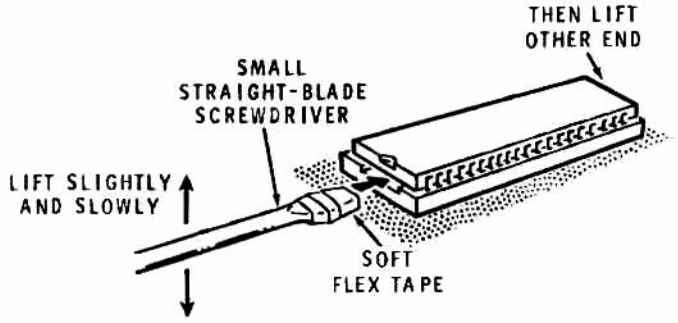

Figure 2.9. 8088 Removal

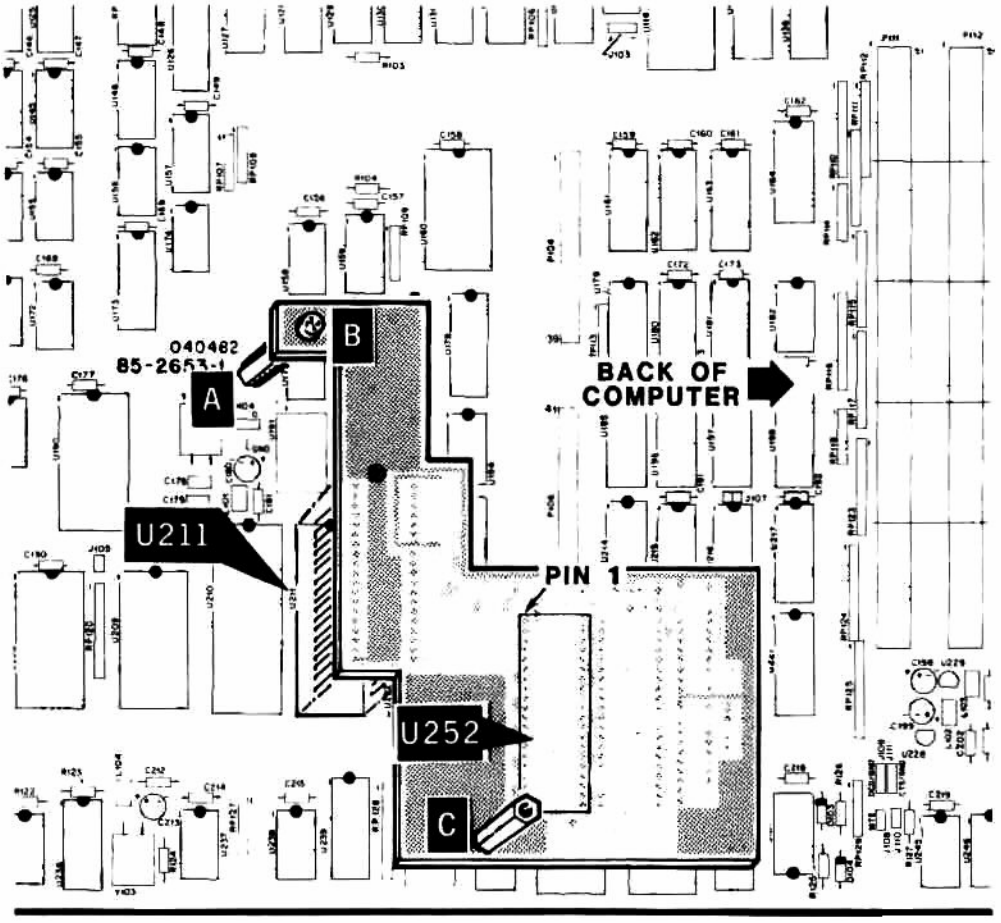

Figure 2.10. Z-216 Card Installation

Assembly

Both Models

- Check to be sure all pins are in their sockets.

- Refer to Figure 2.11 and reposition the video board as shown. Carefully pivot it forward until the hole at BF aligns with the spacer; secure the board using the previously retained screws at positions BE, BF, and BG.

- Secure the Z-216 card to the video board with a 4-40 × .25" screw at BH.

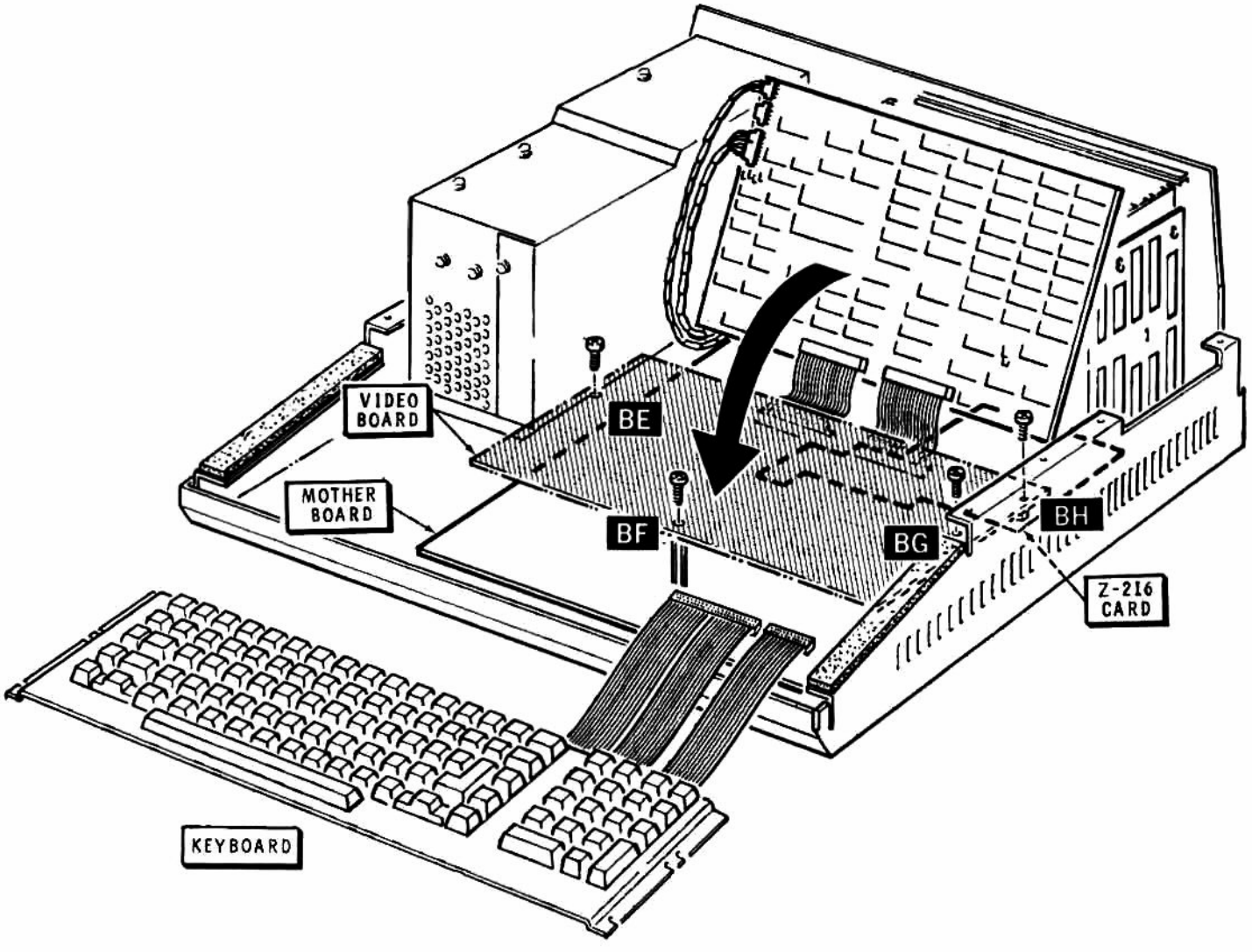

Figure 2.11. Final Z-216 Card Installation

Installation

- Refer to Figure 2.12 and position the keyboard on the base.

- Install the keyboard and base cover and install the two screws at positions BA and BB. **Make sure the keyboard is centered before tightening the two screws.** Press the keys in all four corners to check for freedom and ease of operation. Center keyboard if necessary and tighten the screws.

- On **Low-Profile Models** only, install and tighten the two locking pins at positions BC and BD.

If you are reassembling a Low-Profile model, proceed to "Low-Profile Assembly".

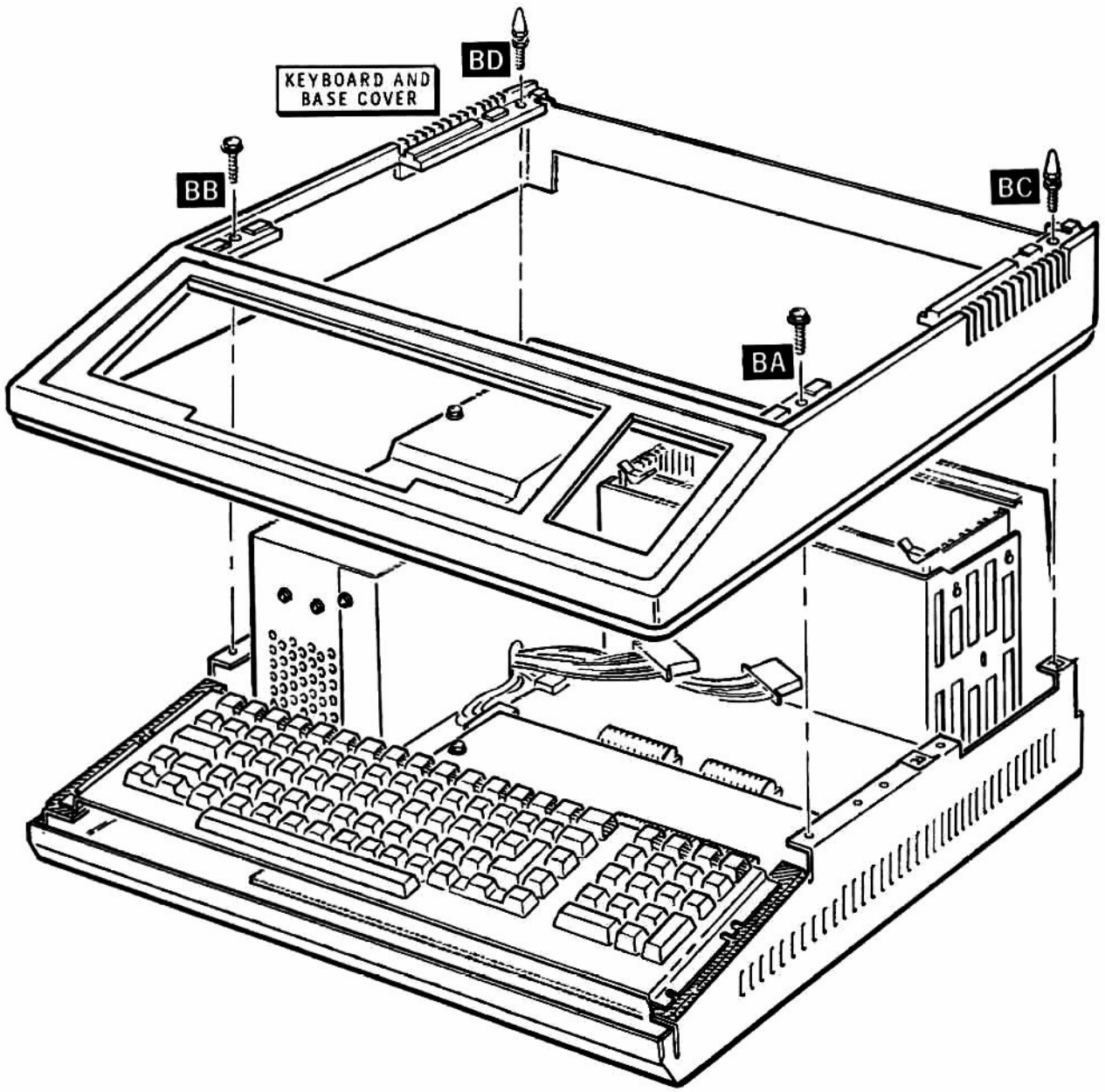

Figure 2.12. Keyboard and Base Cover Installation

All-in-One Assembly

- Refer to Figure 2.13 and position the drive/video subassembly 4 to 5 inches in front of its normal position on the base.
- Plug the signal/power cable into the video board.
- Plug the power cables into each disk drive.
- Move the drive/video subassembly into its normal position.
- Plug the flat cable from the drives into the Z-207 Card. Make sure that the connectors are aligned correctly and not offset one position either direction.

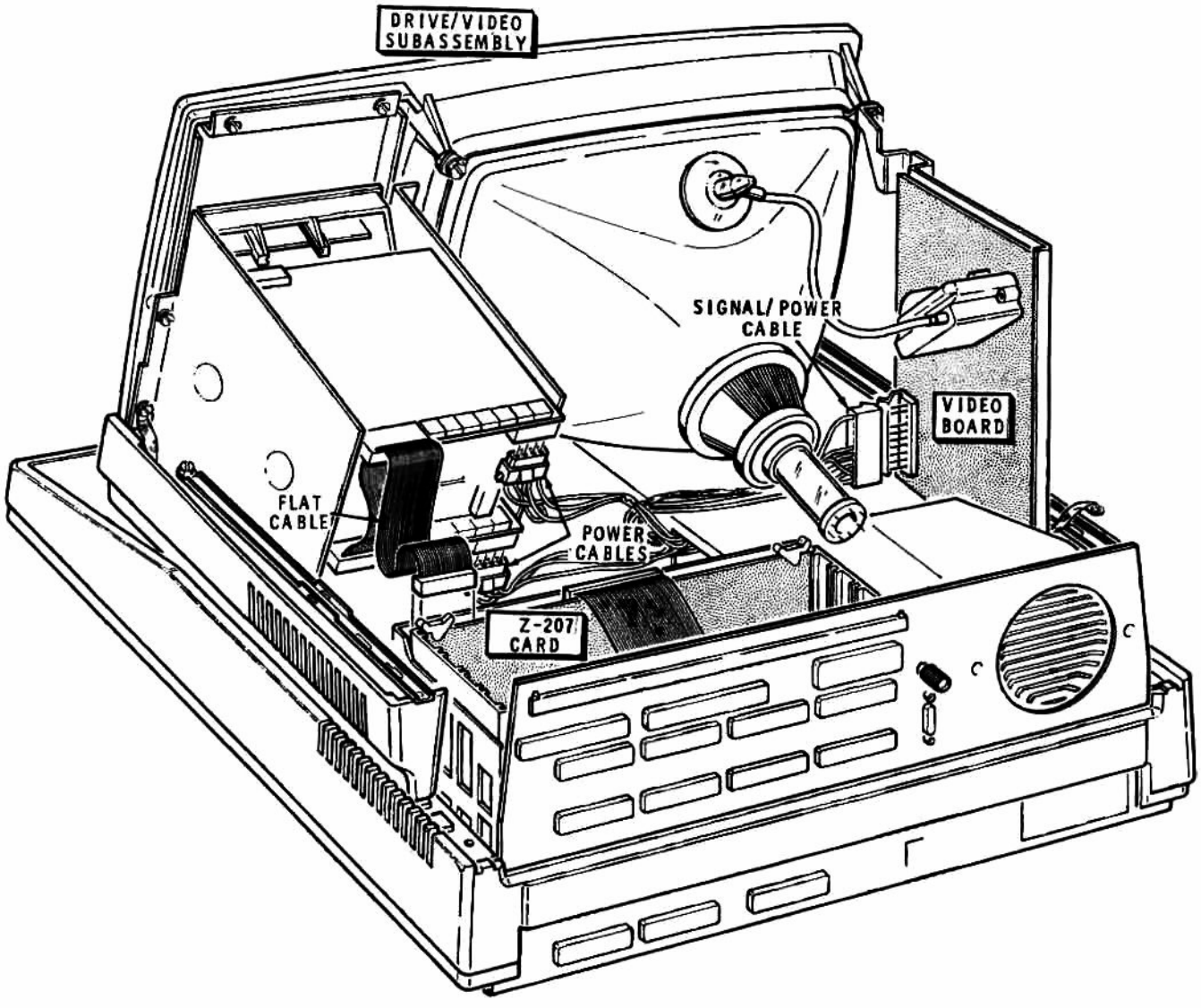

Figure 2.13. Reconnecting Video Board and Drives

- Refer to Figure 2.14. Install and tighten the five screws at positions AC, AD, AE, AF, and AG. **Install the two ground straps at positions AE and AF.**

- Pivot the latching slides to their normal positions and secure them with two screws at positions AA and AB; be sure to install the ground strap from AF **under the slide** and secure it with screw AB. Make sure the slides move freely; position them about 1/4" to the rear of the forward movement.

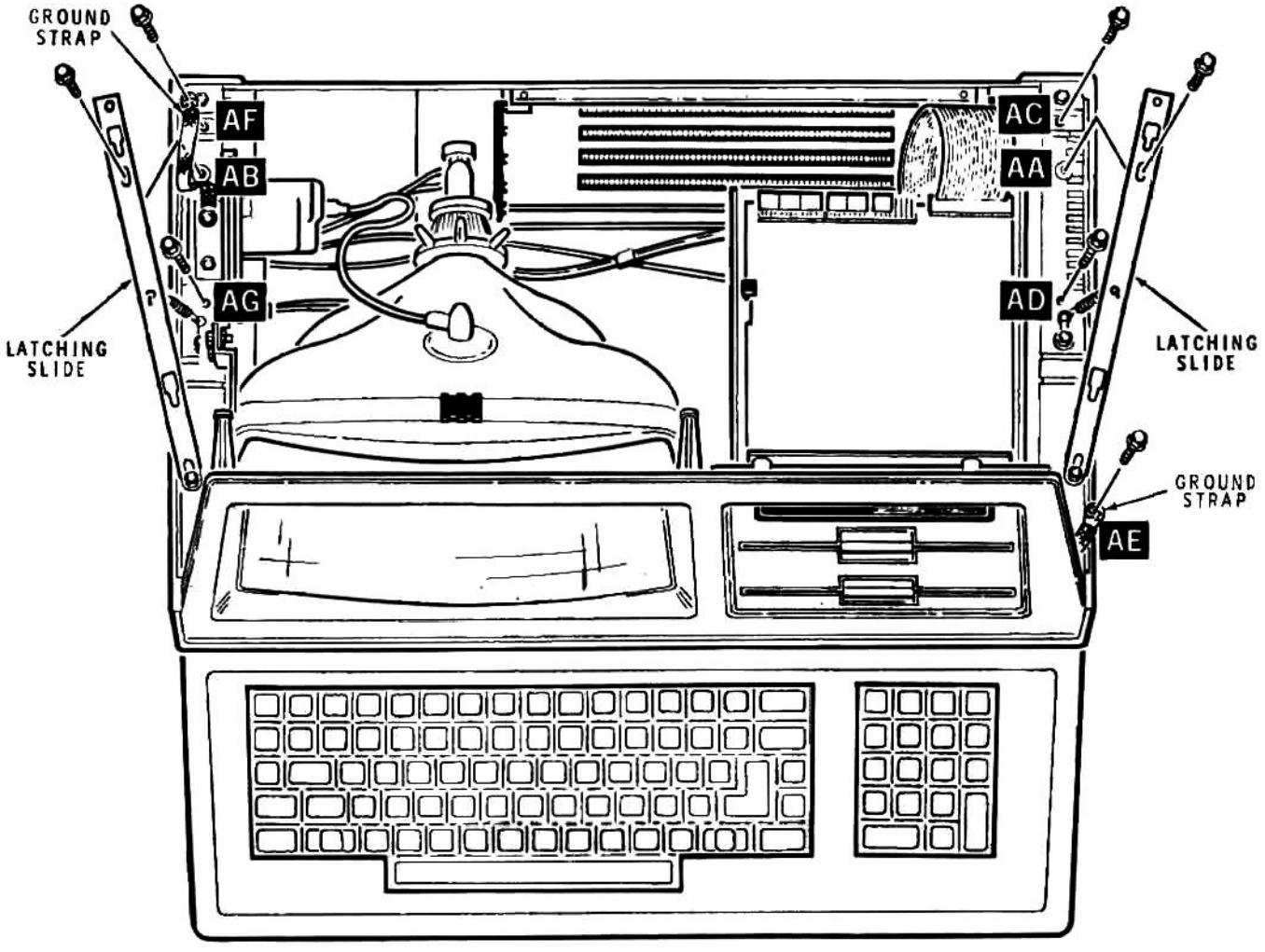

Figure 2.14. Ground Straps and Latching Slides

- Refer to Figure 2.15. Set the top case straight down on the base. Slide the latches all the way forward if they fail to snap into place.

This completes the assembly of the All-in-One Model. Proceed to "Initial Tests".

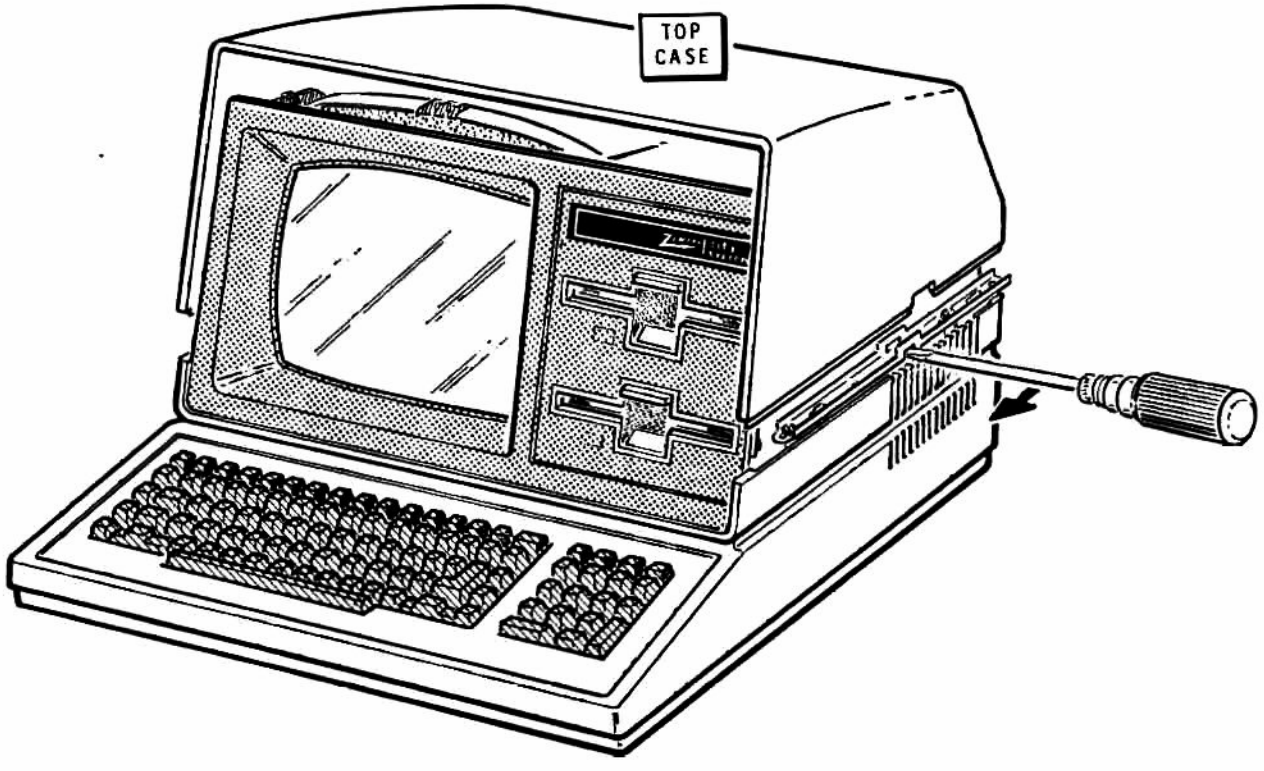

Figure 2.15. Top Case Installation

Low-Profile Assembly

- Refer to Figure 2.16 and position the drive subassembly about 2 inches in front of its normal position on the base.
- Plug the power cables into each disk drive.
- Plug the flat cables from the Z-207 Card into the drives as shown. Make sure that the connectors are aligned correctly and not offset one position either direction.
- Move the drive subassembly into its normal position.

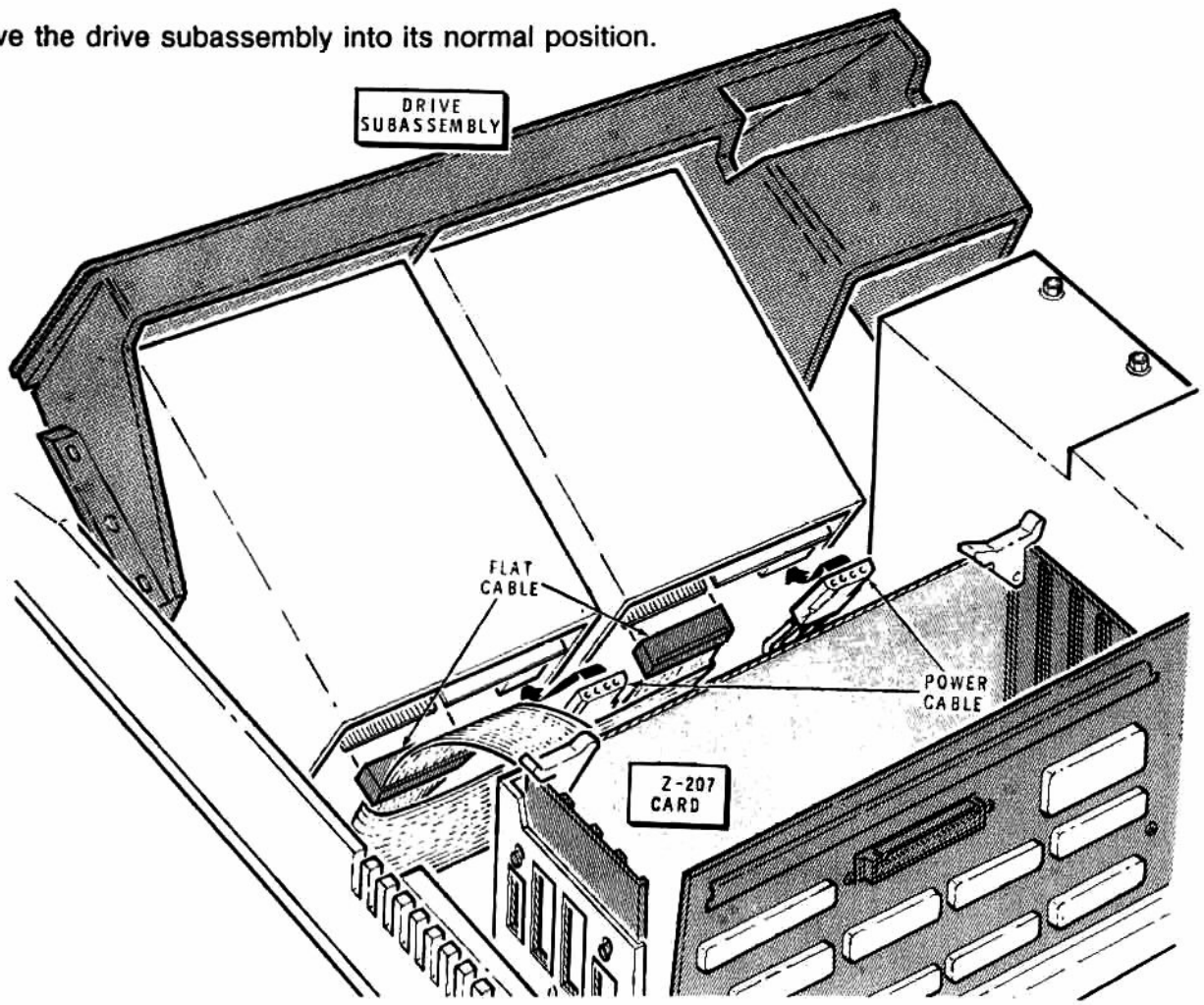

Figure 2.16. Drive Subassembly Installation

- Refer to Figure 2.17. Install and tighten four screws at positions AA, AB, AC, and AD.
- Install and tighten two locking pins at AE and AF.

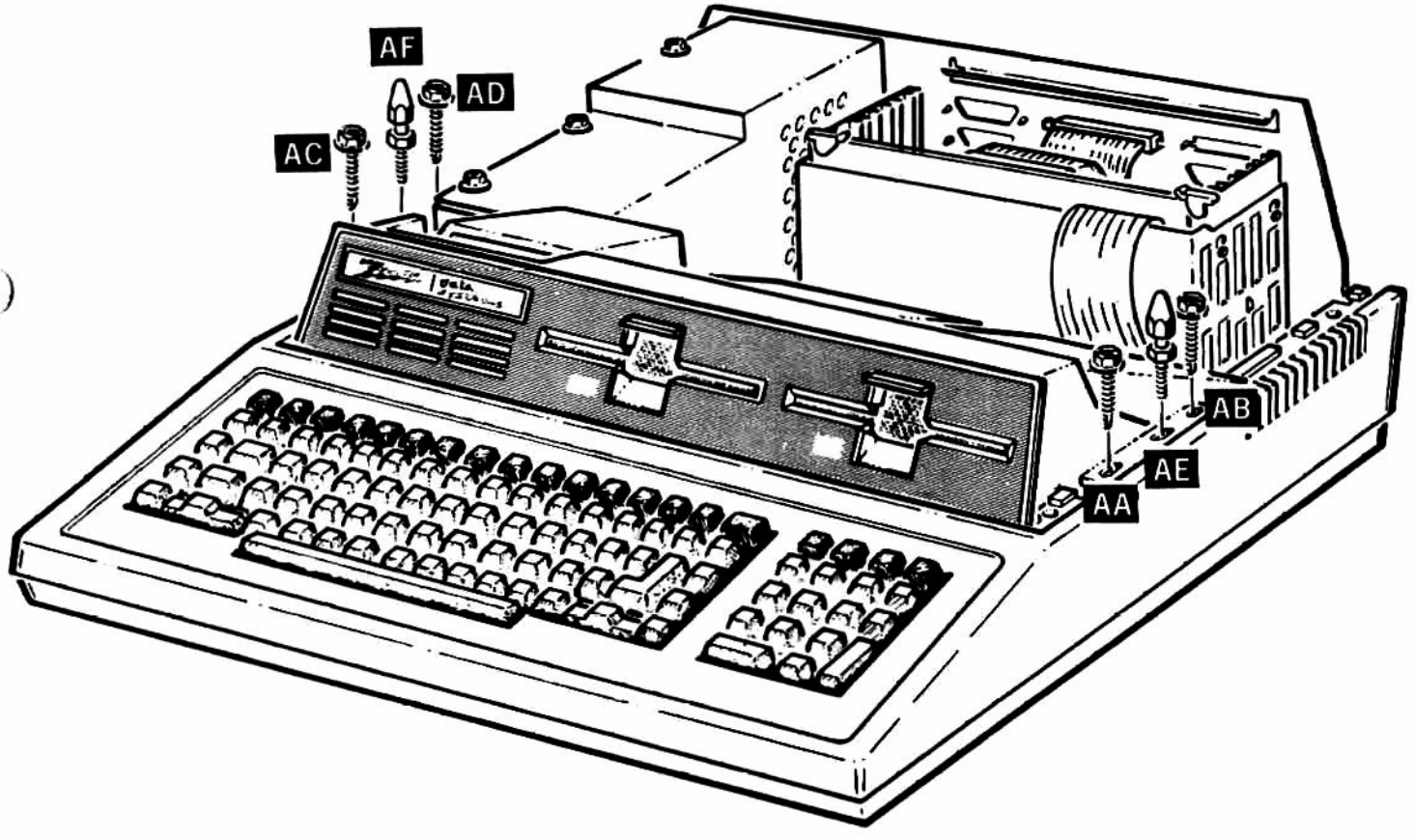

Figure 2.17. Drive Mounting Screws and Pin Installation

- Refer to Figure 2.18. Set the top case straight down on the base. Push the latches all the way to the front if they fail to snap into place.

This completes the assembly of the Low-Profile Model.

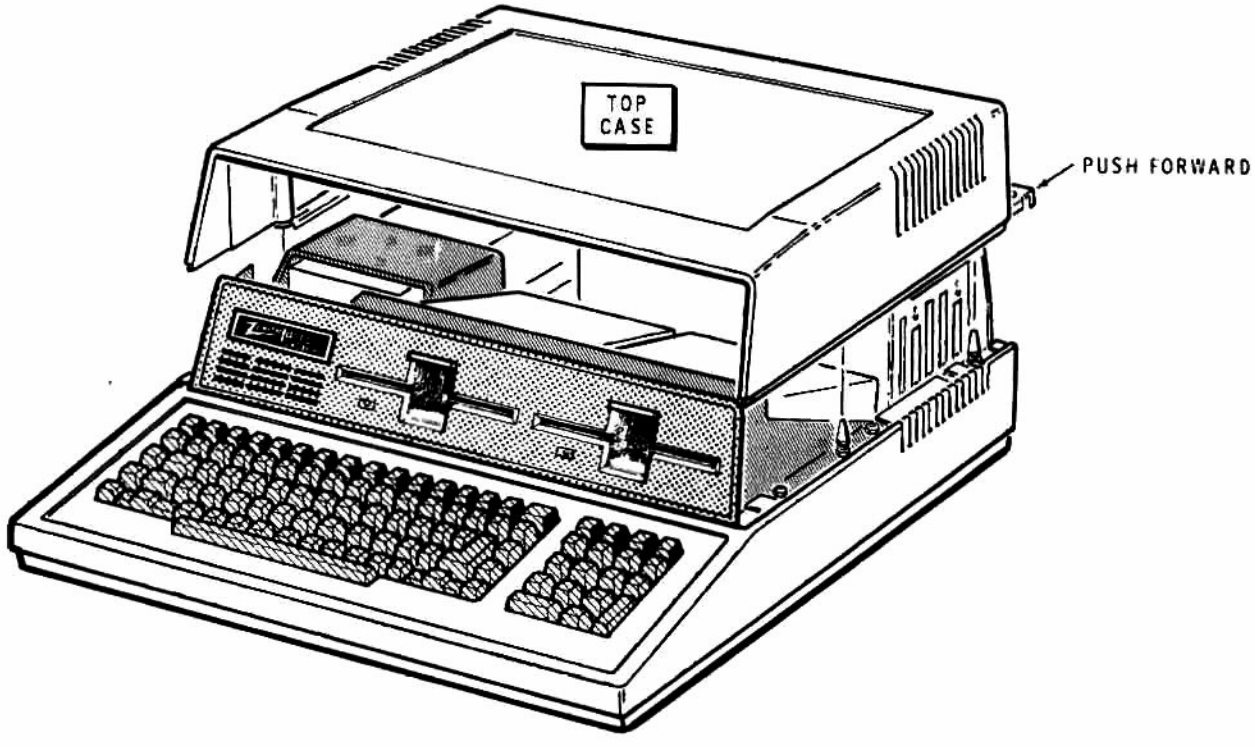

Figure 2.18. Top Case Installation

Chapter 3

Operation

Initial Tests

The operation of the Z-100 with the Z-216 Card installed is unchanged, except that any software that can take advantage of the additional mathematical capabilities will now do so. Execution with the Z-216 is much faster than when the same operations are performed by software in the 8088 CPU.

To check the installation, turn on the computer and run several programs for which you know the results.

Operation

The following BASIC routine will test the 8087 Coprocessor. It is the same test that can be used under BASICA to test the installation of the 8087 Coprocessor in the Z-100 PC Series. Successful completion of the test indicates a properly installed and functioning 8087.

To execute the test, type the following program into Z-BASIC and run it.

```
10 REM     Test the 8087 Coprocessor
20 DEFINT A-Z
30 REM     Set up integer array A() to hold machine language code
40 DIM A(43)
50 REM     Read machine language code into array A()
60 FOR C=1 TO 86 STEP 2
70 READ A,B
80 E=E+A+B
90 A$=CHR$(A)+CHR$(B)
100 D=INT(C/2)
110 A(D)=CVI(A$)
120 NEXT C
130 REM     Sumcheck test of code read
140 IF E<>6830 THEN PRINT "There is an error in your data statements"; : END
150 REM    Get beginning address of array A()
160 FUNC = VARPTR(A(0))+4
170 REM    Set the variable and call the function
180 A% = 5
190 CALL FUNC(A%,B%)
200 REM    Print the original value and the result
210 IF A%=B% THEN PRINT "The 8087 is correctly installed and functioning." : END
220 IF A%+1=B% THEN PRINT "The 8087 is not installed or is non-functional." : END
230 PRINT A%;B%;" There is an error condition in the test." : END
240 REM    The following data statements hold the machine language code
250 DATA 1, 0, 0, 0, 0, 0, 0, 0, 139, 236
260 DATA 139, 118, 6, 139, 4, 46, 163, 2, 0, 139
270 DATA 126, 4, 46, 137, 62, 4, 0, 219, 227, 232
280 DATA 46, 0, 217, 238, 232, 41, 0, 223, 22, 0
290 DATA 0, 232, 34, 0, 186, 0, 0, 46, 131, 62
300 DATA 0, 0, 0, 116, 4, 66, 235, 4, 144, 186
310 DATA 0, 0, 46, 161, 2, 0, 3, 194, 46, 139
320 DATA 62, 4, 0, 137, 5, 202, 4, 0, 185, 100
330 DATA 0, 3, 210, 226, 252, 195
```

Since it is possible to make a typographical error while entering the program, use the following troubleshooting chart to debug the program or check the Z-216 card installation.

MESSAGE OR SYMPTOM	POSSIBLE CAUSE	POSSIBLE REMEDIES
Program runs but locks up; no message is displayed.	Bad code in two or more data statements.	Closely check each number in the data statements.
"The 8087 is correctly installed and functioning."	No problem, the Z-216 is functioning properly.	
"The 8087 is not installed or is non-functional."	Installed incorrectly.	Make sure that all board and IC pins are aligned and properly seated in their respective sockets. Make sure that the 8088 IC is mounted correctly. If it was mounted backwards (pin 1 in the wrong position), remove the 8088 and coprocessor card. Reinstall the 8088 IC in its usual socket on the main board and test the computer for correct operation. If the computer functions normally, repeat the assembly procedure, making sure that the 8088 is installed correctly and then rerun the initial test routine.
	8087 malfunctions	If the 8087 appears to malfunction, remove the 8087 Coprocessor card and reinstall the 8088 IC in its usual socket on the main board. If the computer functions normally, then proceed with the next check. Test the two logic array devices (PALs) for proper input and output signal relationships (see the PAL equations in the Parts Lists). If the two devices show the correct input/output relationships, proceed with the next check. Reinstall the 8087 and repeat the assembly procedure, making sure that the 8087 chip is installed correctly; then rerun the initial test routine. If you are still experiencing difficulties, replace the board itself.
"There is an error condition in the test."	Error in data statements	Check data statements in test program.
"There is an error in your data statements."	Error in data statements	Check data statements in test program.
"Out of DATA in 70"	Error in data statements	Check data statements in test program.

Operation

The machine language code used in the BASIC program was obtained from the following assembly language program.

```
1                                       page    ,132
2
3     = 0000                    ZERO    equ     0
4     = 0001                    ONE     equ     1
5
6     0000                      prog    segment
7                                       assume  cs:prog
8     0000  0001                test_word       dw      ONE     ; At start of routine, this is 1
9     0002  ????                msi             dw      ?
10    0004  ????                mdi             dw      ?
11    0006  ????                msp             dw      ?
12
13    0008                      start:
14    0008                      func    proc    far
15    0008  8B EC                       mov     bp,sp           ; Set the BP reg equal to SP
16    000A  8B 76 06                    mov     si,[bp-6]       ; Get address of first integer
17    000D  8B 04                       mov     ax,word ptr [si]        ; put value into ax register
18    000F  2E: A3 0002 R               mov     msi,ax          ; Store value in memory
19    0013  8B 7E 04                    mov     di,[bp+4]       ; Get address of second integer
20    0016  2E: 89 3E 0004 R            mov     mdi,di          ; put address into memory
21    001B  DB E3                       db      0DBH, 0E3H      ; Imitate a 'finit'
22    001D  E8 004E R                   call    delay           ; Perform a timeout
23    0020  D9 EE                       db      0D9H, 0EEH      ; Imitate a 'fldz'
24    0022  E8 004E R                   call    delay           ; Perform a timeout
25    0025  DF 16                       db      0DFH, 016H      ; Imitate a 'fist'
26    0027  0000 R                      dw      offset word ptr test_word
27    0029  E8 004E R                   call    delay           ; Perform a timeout
28    002C  BA 0000                     mov     dx, 00H         ; Clear dx register
29    002F  2E: 83 3E 0000 R 00         cmp     test_word, 0H   ; If word is a zero
30    0035  74 04                       jz      present_8087    ; go report that fact
31    0037  42                          inc     dx              ; increment dx if 8087 not present
32    0038  EB 04 90                    jmp     done
33    003B                      present_8087:
34    003B  BA 0000                     mov     dx, 00H         ; set dx to 0
35    003E                      done:
36    003E  2E: A1 0002 R               mov     ax,msi          ; Retrieve the first integer
37    0042  03 C2                       add     ax,dx           ; Add dx to ax (first integer)
38    0044  2E: 8B 3E 0004 R            mov     di,mdi          ; Move address back into di
39    0049  89 05                       mov     word ptr [di],ax        ; Store the result back
40    004B  CA 0004                     ret     4               ; Clear the parameters and return to Z-BASIC
41    004E                      func    endp
42
43    004E                      delay   proc    near
44    004E  B9 0064                     mov     cx, 100
45    0051                      repeat:
46    0051  03 D2                       add     dx,dx
47    0053  E2 FC                       loop    repeat
48    0055  C3                          ret
49    0056                      delay   endp
50
51    0056                      prog    ends
52                                      end
```

Chapter 5
Parts List

The customer pack is listed in Table 5.1. The component layout of the card is illustrated in Figure 5.1 and the board parts are listed in Table 5.2. Array logic equations and pinouts follow the parts list.

NOTE: When ordering parts from ZDS, be sure to add the HE prefix to the Heath part numbers. When ordering parts from Heath Company, delete the HE prefix.

CAUTION: Do not substitute 5 MHz parts for 8 MHz parts in computers that are designed to run at 8 MHz. Do not attempt to use the 5 MHz Z-216 in 8 MHz computers; use the 8 MHz Z-216-8 in 8 MHz computers.

Table 5.1 Customer Pack

ZDS PART NUMBER	QUANTITY	DESCRIPTION
HE 181-5060	1	Assembled board (5 MHz — Z-216)
or		
HE 181-5730	1	Assembled board (8 MHz — Z-216-8)
HE 595-3243-1	1	Installation Manual (both kits)
HE 500-73	1	Book — *8087 Applications and Programming for the IBM PC and Other PCs*

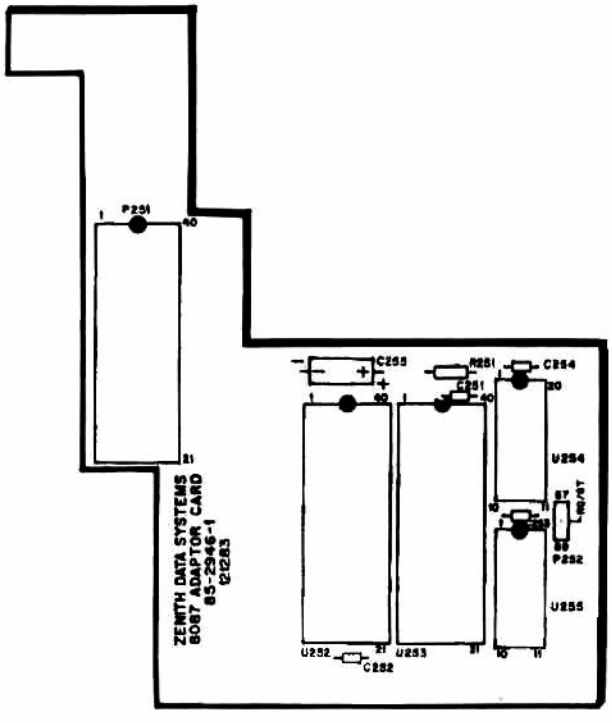

Figure 5.1. Component Location

Parts List

Table 5.2. Board Parts

CIRCUIT REFERENCE DESIGNATOR	ZDS PART NUMBER	DESCRIPTION
R251	HE 6-472-12	4700 ohm Resistor, 1/4 watt, 5%
C251	HE 21-786	0.1 µF Capacitor, ceramic
C252	HE 21-786	0.1 µF Capacitor, ceramic
C253	HE 21-786	0.1 µF Capacitor, ceramic
C254	HE 21-786	0.1 µF Capacitor, ceramic
C255	HE 25-940	22 µF Capacitor, electrolytic
	HE 85-2946-1	PC Board, Z-216
	HE 250-1411	4-40 × .250 Screw, phillips pan head
	HE 252-2	4-40 × .250 Nut, hex head
	HE 255-826	4-40 × .470 Hex spacer, threaded 1/4"
	HE 261-29	Square foot, w/adhesive
P251	HE 432-1380	20-pin Connector, SAMTC BBS-120-T-B (2 required)
U252	HE 443-1009	8088 Microprocessor (5 MHz)
	or	
	HE 443-1187	8088-2 Microprocessor (8 MHz)
	HE 434-253	40-pin Socket, IC
U253	HE 443-1168	8087 Numeric coprocessor (5 MHz)
	or	
	HE 443-1283	8087-2 Numeric coprocessor (8 MHz)
	HE 434-253	40-pin Socket, IC
U255	HE 444-269	Request grant (ROGT) controller (5 MHz)
	or	
	HE 444-269-1	Request grant (ROGT) controller (8 MHz)
	HE 434-311	20-pin Socket, IC
U254	HE 444-270	Bus controller (5 MHz)
	or	
	HE 444-270-1	Bus controller (8 MHz)
	HE 434-311	20-pin Socket, IC

Array Logic Equations

Request Grant Controller Array Logic Equations

```
Inputs:     CLK HOLD /DRV_EN CYCLE /S2 /S1 /S0 RESET CK GND /OC /IOM
            ALE DHOLD HLDA /FF2 /FF1 /RQGT /PALCLK VCC

  FF1 :=    /FF1 * /FF2 * DHOLD * /RESET          ; Set FF1 after hold
          + FF1 * /HLDA * /RESET                  ; Continue until HLDA
          + FF1 * FF2 * /RESET                    ; Clear FF1 after FF2
  FF2 :=    FF1 * /FF2 * /HLDA * /RESET           ; Set FF2 after FF1
          + FF2 * /HLDA * /RESET                  ; Continue until HLDA
          + FF2 * HLDA * DHOLD * /RESET           ; Clear FF2 after DHOLD
 /HLDA  := /FF1 + /FF2 + RESET + /HLDA * /RQGT     ; Active high HLDA
/DHOLD  := RESET + /HOLD                          ; Active high delayed
                                                    HOLD
IF (VCC) PALCLK = CK                              ; Inverted clock
IF (VCC) /ALE = CK + CYCLE = /S0 * /S1 * /S2 + HLDA ; Active high ALE
IF (FF1 * /FF2) RQGT = /RESET                     ; Assert request and
                                                    release pulses
IF (DRV_EN) IOM = /S2                             ; Invert /S2 to set IO/M
```

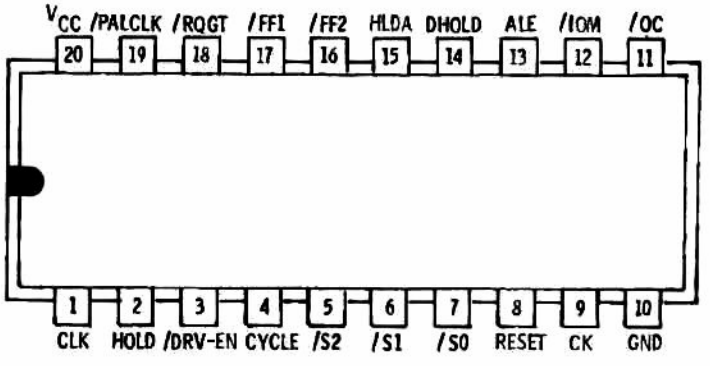

Figure 5.2. Request Grant Controller Pinout

Parts List

Bus Controller Array Logic Equations

```
Inputs:     CLK CK HLDA RESET /S2 /S1 /S0 NMI 87INT GND /OC /Y /DRV_EN
            /LRST /INTA /WR /RD 88NMI CYCLE VCC

  RD  :=   CYCLE * S1 * /S0 + CYCLE * /S2 * S1 * S0   ; Read cycle
  WR  :=   CYCLE * /S1 * S0                           ; Write cycle
INTA  :=   CYCLE * S2 * S1 * S0                       ; Interrupt acknowledge
LRST  :=   RESET + LRST * /HLDA                       ; Latch RESET until first
                                                      ; /HOLD acknowledge
IF (VCC) /88NMI = /NMI * /87INT                       ; Bus NMI OR'd with 87
                                                      ; /ERROR
IF (VCC) DRV_EN = /LRST * /HLDA                       ; Active low drive enable
IF (VCC) /CYCLE = /S2 * /S1 * /S0 + /Y + /CK * CYCLE  ; Implement positive edge
                                                      ; triggered D flip-flop
                                                      ; for CYCLE
IF (VCC) Y = /CK + Y * SO + Y * S1 + Y * S2           ; Intermediate latch for
                                                      ; the above
                                                      ; implementation
```

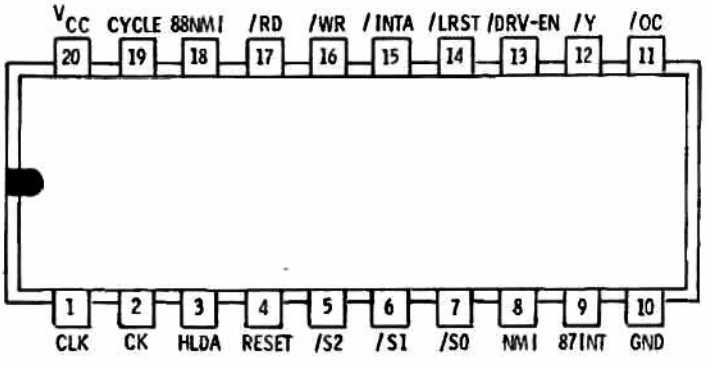

Figure 5.3. Bus Controller Pinout

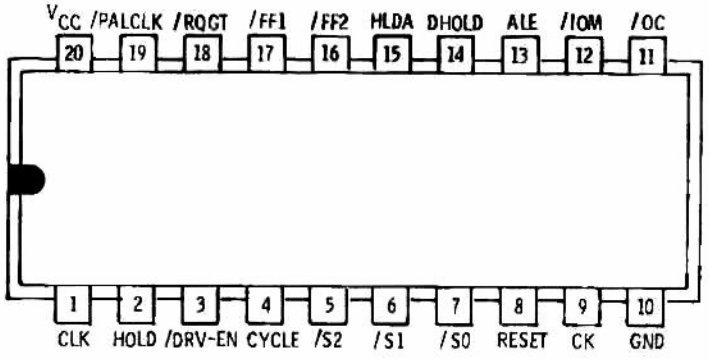

Figure 5.3. HE 444-269 Request Grant Controller Lead Configuration

Table 5.2. HE 444-269 Request Grant Controller PAL Equations

Inputs: CLK HOLD /DRV_EN CYCLE /S2 /S1 /S0 RESET CK GND /OC /IOM
ALE DHOLD HLDA /FF2 /FF1 /RQGT /PALCLK VCC

Output	Inputs	Comments
FF1 :=	/FF1 * /FF2 * DHOLD * /RESET	; Set FF1 after hold
	+FF1 * /HLDA * /RESET	; Continue until HLDA
	+FF1 * FF2 * /RESET	; Clear FF1 after FF2
FF2 :=	FF1 * /FF2 * /HLDA * /RESET	; Set FF2 after FF1
	+FF2 * /HLDA * /RESET	; Continue until HLDA
	+FF2 * HLDA * DHOLD * /RESET	; Clear FF2 after DHOLD
/HLDA :=	/FF1 +/FF2 +RESET +/HLDA * /RQGT	; Active high HLDA
/DHOLD :=	RESET +/HOLD	; Active high delayed HOLD
IF (VCC) PALCLK =	CK	; Inverted clock
IF (VCC) /ALE =	CK +CYCLE =/S0 * /S1 * /S2 +HLDA	; Active high ALE
IF (FF1 * /FF2) RQGT =	/RESET	; Assert request and release pulses
IF (DRV_EN) IOM =	/S2	; Invert /S2 to set IO/M

Appendix

For more information, consult the iAPX 88 book (supplied with the TM-100) or the book, *8087 Applications and Programming for the IBM PC and other PCs*, Richard Startz, Robert J. Brady Co., Bowie, MD 20715, supplied with the customer pack.

An 8087 data book may be purchased from:

Intel Corporation
3065 Bowers Avenue
Santa Clara, CA 95051

Additional copies of the book, *8087 Applications and Programming for the IBM PC and other PCs*, may be purchased from:

Robert J. Brady Co.
Bowie, MD 20715