Secured Computer Systems

BUENA PARK, CALIF.

2/3RDS CARD

SECURED COMPUTER SYSTEMS

2 PORTS SERIAL I/O
/ ===============
3 PORTS PARALLEL

********** CARD **********

INSTALLATION AND OPERATION MANUAL

PART NO. 90-1001.XXX 2/3^{RDS} CARD

SECURED COMPUTER SYSTEMS

8575 KNOTT AVE. SUITE D

BUENA PARK, CA 90620

2/3^{RDS} CARD DOCUMENTATION

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1.0 INTRODUCTION

This manual describes the procedures for installation and use of the Secured Computer System "2/3^{RDS}" serial and parallel interface card. Sections are included that describe the included support software for both HDOS* and CP/M**. Additional information is included to enable you to write your own custom software. The user should read all of section 2 completely prior to card installation so that you may be aware of any hazardous conditions so that short cuts may be avoided that may cause damage to the card or computer.

* HDOS is a registered trade-mark of the Heath Corporation.

** CP/M is a registered trade-mark of Digital Research Corporation

1.1 PARTS LIST

Verify that the following parts have been included with your shipment.

Quantity	Part No.	Description
1	90-1001.XXX	2/3^{RDS} CARD serial number XXX
1	90-1001-001	Serial Printer Cable
1	90-1001-002	Serial Modem Cable
1	90-1001-003	Three Port Parallel Cable
1	90-1001-70 or 90-1001-701	HDOS Parallel Driver CP/M Support Software
3	60-205817	DB-25 mounting hardware
1	90-1001-900	Installation instruction
1	Registration card	

2/3^{RDS} CARD
Inspection

After unpacking the 2/3^{RDS} CARD, verify that all the chips are securely in place and that no chips have been jarred loose during shipment. If the card is damaged in any way, contact Secured Computer Systems immediately. You may proceed to the next step once you have verified that the 2/3^{RDS} CARD is intact.

1.2 WARRANTY

Secured Computer Systems

90 Day Limited Warranty

For a period of ninety (90) days after purchase (date shipped), Secured Computer Systems will repair or replace FREE OF CHARGE any parts that are defective either in materials or workmanship. You can obtain parts directly from Secured Computer Systems by writing, using the address given below or by telephoning (714) 952-3930. We will pay all shipping charges.

We warrant that during the first ninety (90) days after purchase (date shipped), our products, when correctly assembled, and/or installed and used in accordance with our printed instruction, will meet published specifications.

If a defective part or error in design has caused your Heath/Zenith/SCS computer product to malfunction during the warranty period through no fault of yours, we will service it free upon proof of purchase and delivery at your expense to the Secured Computer Systems repair depot. You will receive FREE CONSULTATION on any problem you might encounter in the assembly or use of your Secured Computer Systems product. You may call or write to Secured Computer Systems regarding any problem at your expense.

Our warranty does not cover and we are not responsible for damage caused by incorrect assembly, installation, the use of defective tools, misuse, or uses of our product for purposes other than as advertised. Our warranty does not include reimbursement for inconvenience, loss of use, customer installation or set-up time.

This warranty covers only Secured Computer Systems products and is not extended to allied equipment or components used in conjunction with our products. **WE ARE NOT RESPONSIBLE FOR ACCIDENTAL OR CONSEQUENTIAL DAMAGES.** Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which you may have from state to state.

If you are not satisfied with our service (warranty or otherwise) or with our products, write directly to our director of Customer Service, Secured Computer Systems, at the address given below. He will make certain your problems receive immediate, personal attention.

Secured Computer Systems
8575 Knott Ave. Suite D
Buena Park Ca. 90620

The following instructions are written in a step-by-step fashion. The steps are logically arranged to enable you to proceed in an orderly fashion. Warnings, when given, are emphasized and enclosed in a box using asterisks and will have the following general form:

```
*********************************************
**                                         **
**            W A R N I N G                **
**                                         **
*********************************************
```

You will need one or more of the following tools to complete the installation of the 2/3^{RDS} CARD:

    Common (flat blade) screw driver - medium and small
    Phillips style screw driver - medium and small size
    Common pliers
    Needle nose pliers
    Nut driver set (optional)

2.1 SYSTEM REQUIREMENTS

You must have a Heath / Zenith 88, 89, 90 computer.

2.2 SOFTWARE INSTALLATION

Prior to installing of your SCS 2/3^{RDS} CARD you must perform the following software installation instructions. Each instruction given below must be terminated with a carriage return. The disk provided by Secured Computer Systems is only a data disk. **NO** system is included on the SCS provided disks.

2.2.1 HDOS Driver Installation

You will need a properly generated HDOS 2.0 disk to perform the following steps. This disk should have 6 sectors of storage free. This disk should never be the system distribution diskette. The following programs should be present on the diskette:

ONECOPY (for systems that have
        only one disk drive)

( ) Turn your computer on and boot from the system disk refer-enced above.

( ) Delete a file LP.DVD from the system disk by typing:

    DELETE LP.DVD

at the console in response to the HDOS prompt.

2.2.1 HDOS DRIVER INSTALLATION CONTINUED

```
┌─────────────────────────────┐
│          WARNING            │
│                             │
│  This disk is not supposed to│
│   be your distribution disk.│
│   It is to be a copy of your│
│       system Distribution   │
│           diskette.         │
└─────────────────────────────┘
```

Note: If LP.DVD does not exist an error message is printed at the terminal.

( )   Verify that there are 6 sectors available on the diskette with the HDOS system. This may be performed by typing 'DIR' at the terminal. The last line of the display will appear something like:

** Files, Using YYY Sectors (ZZZ Free)

where ZZZ is the number of free sectors.

( )   Delete any files required to allow sufficient room on the diskette.

For single disk drive systems:
(See below for multiple disk drive systems):

( )   Type at the console in response to the HDOS Prompt:

ONECOPY

At the prompt (:OC:) type

PARLP.DVD

When the program requests that you insert the destination disk, type a carriage return. When the program tells you to insert the

source diskette, insert the diskette provided to you in this interface package. This cycle may be repeated more than once to transfer the entire file.

( )   Type a CONTROL D at the next prompt from ONECOPY (i.e. :OC:).

( )   Type at the console in response to the next HDOS prompt:

**RENAME
LP.DVD=PARLP.DVD**

( )   Type at the console in response to the next HDOS prompt:

BYE

( )   Remove all disks from the disk drives when the reboot request appears.

( )   Turn off your computer. This concludes the single disk drive HDOS software installation. Proceed with the hardware installation section. Additional information regarding this HDOS driver may be obtained in section 4.2 of this manual.

For Multiple disk drive systems:

( )   Insert the floppy disk included with this interface kit into the appropriate auxiliary disk drive (i.e. SY1, or SY2, or DK0,DK1, or DK2).

2.2.1 HDOS DRIVER INSTALLATION CONTINUED

( )   Mount the disk using the HDOS Mount command by typing at the console in response to the HDOS prompt:

MOUNT SYX:

or

MOUNT DKx:

where x is the drive unit number that contains the SCS program disk

( )   Type at the console in response to the next HDOS prompt:

COPY

PARLP.DVD=SYX:PARLP.DVD or

COPY PARLP.DVD=DKX:PARLP.DVD

Where x is the drive unit number that contains the SCS program disk.

( )   Type at the console in response to the next HDOS prompt:

RENAME LP.DVD=PARLP.DVD

( )   Type at the console in response to the next HDOS prompt:

BYE

( )   Remove all disks from the disk drives when the reboot request appears.

( )   Turn off your computer.

This completes the HDOS software installation. Proceed with the hardware installation. Additional information regarding the HDOS driver may be obtained in section 4.2 of this manual.

2.2.2 CP/M SUPPORT SOFTWARE INSTALATION

You will need a properly generated CP/M 2.2.03 or 2.2.04 system diskette to perform the following steps. This disk should have at least 20K bytes of available space to complete the process. This diskette may be 5 1/4 or 8 inch and you may have one or more disk drives. The diskette selected must have the following programs stored on it:

> PIP.COM
> STAT.COM
> CONFIGUR.COM
> MOVCPM17.COM or
> MOVCPM37.COM or
> MOVCPM47.COM
> SYSGEN.COM

Note that all of these programs must be from the 2.2.03 or 2.2.04 versions of the CP/ M operating system. You must not mix any of these programs from the 2.2.03 version with those of the 2.2.04 version.

```
*****************************************************************
**              WARNING: The disk chosen for this operation should    **
**                    not be your system distribution diskette.  No files      **
**              should be placed on this diskette unless you have a backup  **
**                                          copy.                               **
*****************************************************************
```

( ) Turn your computer on. Boot from the system disk referenced above. This drive will be referenced as the 'A' drive.

( ) Set the BIOS.SYS file on the 'A' drive to read/ write using STAT.COM.

Type at the console in response to the CP/M prompt:

> **STAT BIOS.SYS $R/W**
> **STAT BIOS.SYS $DIR**

( ) You may delete this BIOS file or you may rename it to save your original BIOS.

To rename the original BIOS to OBIOS type at the console in response to the CP/M prompt:

> **REN OBIOS.SYS=BIOS.SYS**

To delete the original BIOS, type at the console in response to the CP/M prompt:

> **ERA BIOS.SYS**

( ) Verify that at least 20K disk storage is available on the diskette on the 'A' drive.

Type at the console in response to the CP/M prompt:

> **STAT**

The computer will respond by displaying a message such as:

Bytes remaining on A:=40K.

2.2.2 CP/M SUPPORT SOFTWARE INSTALATION

( ) Copy from the SCS provided diskette the new BIOS program. This file is stored on the diskette provided by Secured Computer Systems. Place this diskette into the 'B' drive if you have a multiple disk drive system.

The SCS provided diskette contains two ready-touse, assembled BIOS files. The first file is named SCSBIOS3.SYS and is to be used if you are working with CP/M version 2.2.03. The second file is named SCSBIOS4.SYS and is to be used with CP/M version 2.2.04. You must select which file you should use based on which version of CP/M you are using for the exercise.

To begin the copy process type at the console in response to the CP/M prompt:

**PIP
A:BIOS.SYS=B:SCSBIOS3.SYS**

if you are performing this upgrade for CP/M version 2.2.03. If you are using CP/M 2.2.04 you should type at the console prompt:

**PIP
A:BIOS.SYS=B:SCSBIOS4.SY
S**

If you have a single disk drive system the CP/M operating system will request that you place the 'B' diskette into drive A. You should place the SCS diskette into drive A in response to this request.

You will be asked to reinsert the destination diskette. This diskette is the system disk referenced above. Note that this process renames the file as it copies it.

( ) Execute Move CP/M for your system by typing at the console in response to the CP/M prompt:

MOVCPMxx * BIOS.SYS

where 'xx' should be 17, 37, or 47 for the disk drive type that you are working with.

Note: If you are using a CP/M version 2.2.04 and you have copied SCSBIOS3.SYS to the system diskette as described in the last step, the system will print the following error message:

**SYNCHRONIZATION
ERROR**

This indicates that two different versions of CP/M and BIOS are being used. This error will 'hang' your computer and will require that you reboot the system. Also if this occurs, the system diskette used above may not boot. You should start all over at this point and generate a new system diskette and restart this section for software installation. Be absolutely sure that you copy the correct BIOS for the version of the operating system that you are using.

2.2.2 CP/M SUPPORT SOFTWARE INSTALATION

( ) Execute SYSGEN by typing at the console in response to the CP/M prompt:

SYSGEN

Type a return to the next query:

SOURCE DRIVE NAME (OR RETURN TO SKIP):

Type an 'A' for the destination drive name query.

Type a 'RETURN' when the FUNCTION COMPLETE message appears.

You may have to reboot the system at the conclusion of this exercise. If the system prompt 'A>' reappears, you may continue without rebooting.

Note: A synchronization error may occur while running this program if you have the wrong version of SYSGEN on the disk. Remember that the versions of these system programs on the system diskette must be of the same version as that of the operating system.

( ) Set the file attributes for the new BIOS.SYS program on the 'A' drive to read only and system.

Type at the console in response to the CP/M prompt:

STAT BIOS.SYS $R/O

STAT BIOS.SYS $SYS

( ) Remove all disks form the disk drives when the CP/M prompt reappears

( ) Turn off your computer

This completes the Software preparation for the CP/M operating system. This disk is now a bootable disk with the new SCS provided BIOS. Once booted to, the program CONFIGUR will be executed if you are using CP/M version 2.2.03. CP/M version 2.2.04 usually does not execute CONFIGUR. You will have to CONFIGUR this BIOS in order to enable the parallel port driver for the line printer. Refer to section 4.1 for details on the configuration process. You may now proceed with the hardware installation section.

2.2.3 HARDWARE INSTALLATION

```
***********************************
**        W A R N I N G        **
**                             **
**        Before beginning to  **
**        install your 2/3^RDS  **
**        CARD you must be sure **
**        that your computer is **
**        turned off and that it **
**        is unplugged from any **
**            A.C. socket.      **
***********************************
```

CABINET REMOVAL

( ) Place your computer on a work surface large enough to hold your computer, tools, and this interface package.

( ) Remove the computer cover (cabinet) and set it aside in a safe place. Refer to pictorial 1 for instructions for cabinet removal.

INSTALLING 2/3$^{\underline{RDS}}$ CARD

Refer to pictorial 3 throughout the installation of the cables.

( ) Remove all the screws that hold the rear panel to the chassis and set them aside for now.

( ) Rotate the rear panel down so that it lays flat on the work area behind the computer.

( ) If your computer already has a serial interface card installed, Remove the cables mounted on the rear panel at the position marked DCE 340-347, DCE 320-327 and DTE 330337.

( ) Locate the cable assemblies:

   90-1001-001

   90-1001-002

   90-1001-003

( ) Using the cable marked with part number 90-1001003, mount the DB-25 connector of the parallel cable at the position marked DCE 320-327 on the rear panel. Use the hardware provided.

( ) Route the cable close to the bottom of the chassis and between the power supply and the vertical bracket holding the CPU and the terminal logic boards. Place the wires below the power supply heat sink as best as possible.

( ) Install the cable marked 90-1001-002 at the location marked DTE 330-337 and cable 90-1001-001 at location DCE 340-347 in the same manner.

( ) As before, route the cables between the power supply and the bracket holding the CPU and the terminal logic boards.

( ) Rotate the rear panel back to its original position. Route the Wires as required.

2.2.3 HARDWARE INSTALLATION CONTINUED

( ) Reattach the rear panel to the computer using the screws you removed above.

2/3^{RDS} CARD CONFIGURATION

The 2/3^{RDS} CARD is configured by setting the seven jumpers shown in pictorial 4. These jumpers are labeled as J1 thru J7.
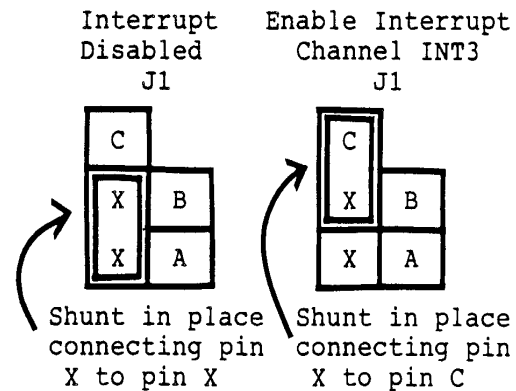
J1 Thru J4

Jumpers J1 thru J4 are used to set interrupt control. (An interrupt is a means by which a peripheral device may interrupt the computer asking for service. The most commonly used interrupt is for disk drive access and modem control. In the case of a modem, when a word is received from the phone line, the word is received by a serial port and an interrupt is generated asking that the word be processed). These jumpers allow the selecting of an interrupt channel to be enabled or disabled for each of the serial ports or the parallel port. The computer allows up to three interrupts to be defined. These are labeled INT3, INT4, and INT5. These interrupts are enabled in the following fashion. Jumper J1 selects the first serial port. This serial port is connected to P1 and is addressed at 340Q thru 347Q. A printer is usually connected to this port. This port may be selected to interrupt on any of the three interrupt channels. The interrupt is enabled by positioning the two pin shunt found on the card at J1. Thisshunt pulls off and connects two adjacent pins when in place. As can be seen in pictorial 4 there are five pins that the shunt may be placed for J1. These pins are labeled A, B, C and X. This portion of pictorial 4 is included here for your convenience.

J1
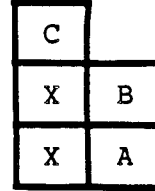
Pin A is connected to the line labeled INT5. Pin B is connected to INT4 and Pin C is connected to INT3. The two pins marked with X come from the serial port. Enabling the interrupt is performed by placing the shunt across pin A, B or C to a pin marked X. This serial port may be prevented from interrupting the computer by placing the shunt across the two pins marked with an X. The cards are shipped with the shunt across pins X thus disabling the first serial port interrupt. These config-urations can be graphically represented as follows:

Interrupt Disabled
J1
Shunt in place connecting pin X to pin X

Enable Interrupt Channel INT3
J1
Shunt in place connecting pin X to pin C

```
      Enable            Enable
    Interrupt         Interrupt
  Channel INT4      Channel INT5
       J1                J1
    ┌─────┐           ┌─────┐
    │  C  │           │  C  │
    ├─────┴──┐        ├─────┼──┐
    │  X   B │        │  X  │ B│
    ├────────┤        ├─────┴──┤
    │ X    A │        │  X   A │
    └────────┘        └────────┘
  Shunt in place    Shunt in place
 connecting pin    connecting pin
    X to pin B        X to pin A
```
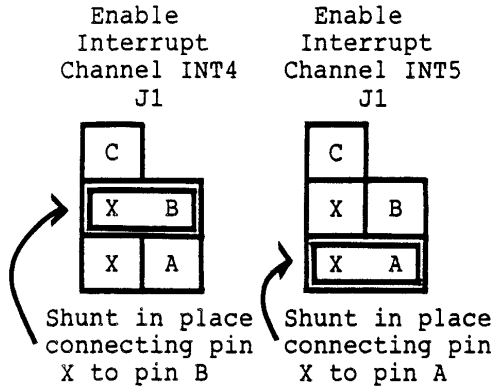
This can be stated in the form of a table as follows:

INTERRUPT SELECTED	FROM	TO
INT5	X	A
INT4	X	B
INT3	X	C

Jumper J2

The discussion for J2 follows exactly as that given for jumper J1. J2 enables or disables the interrupt for the second serial port. This port is addressed at location 330Q thru 337Q. J2 is the second grouping of five pins and is next to J1. Refer to pictorial 4 expanded view of J2 and its placement.

Jumpers J3 and J4

Jumpers J3 and J4 are used for selecting the interrupt channels for the parallel ports. Both J3 and J4 must be set to select any interrupt for the parallel port. These two jumpers are shown in pictorial 4 and included here for your reference.

```
      J3              J4
   ┌─────┐        ┌─────┬────┐
   │  C  │        │ X'  │ PB │
   ├─────┼──┐     ├─────┼────┤
   │  X  │ B│     │ X'  │    │
   ├─────┼──┤     ├─────┼────┤
   │  X  │ A│     │  X  │ PA │
   └─────┴──┘     └─────┴────┘
```
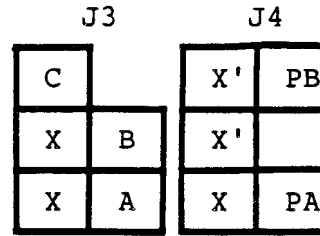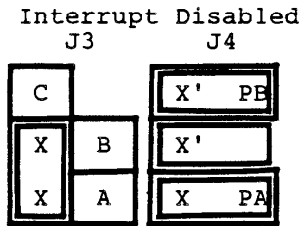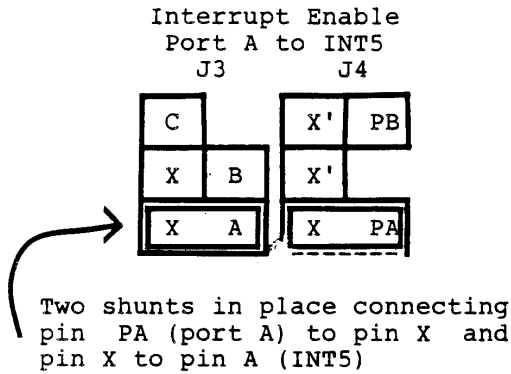
J3 is positioned next to J2 and has five pins for the positioning of the two pin shunts. The configuration is the same as that of J1 and J2. The labeling and interpretation for these five pins is the same as that for J1 and J2. J4 is configured to allow the routing of two parallel port interrupt channels, i.e. parallel port A or B to INT3, INT4, or INT5. These two jumpers are set using up to four two pin shunts. The programming is accomplished by first selecting port A or B and then selecting an interrupt channel. The pin definition for J3 are the same as described for J1 or J2. J4 is labeled with X', PA, PB and X. Pin PA connects port A of the parallel port and pin PB connects to port B. The two pins marked X' are used as intermediate connections allowing PB (port B interrupt) to be routed to jumper J3. Pin X is connected to the pin labeled X of J3. This pin is used as an intermediate connection allowing PB or PA to connect to the interrupt lines C, B, or A of J3.
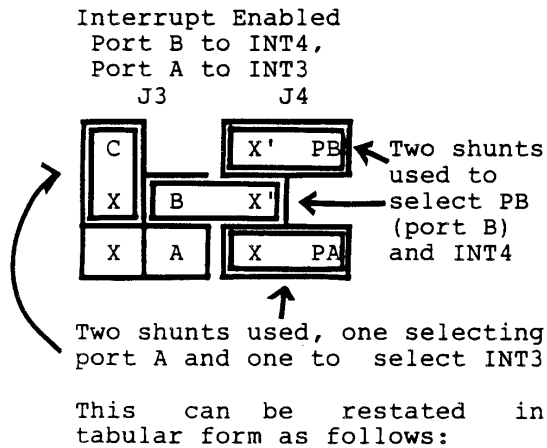
Selecting port A or B is accomplished by inserting a shunt on pins PA or PB connecting to pins X or X' respectively. The interrupt is then-selected by placing a shunt on X' or X to pins A, B or C of

J3.   Some possible arrangements are given below.

```
          Interrupt Enable
          Port A to INT5
            J3          J4
```


Two shunts in place connecting pin PA (port A) to pin X and pin X to pin A (INT5)

```
          Interrupt Disabled
            J3          J4
```


All four shunts in place but none connect to pins A, B or C, hence parallel interrupts are disabled.

```
          Interrupt Enabled
           Port B to INT4,
           Port A to INT3
            J3          J4
```


Two shunts used to select PB (port B) and INT4

Two shunts used, one selecting port A and one to select INT3

This can be restated in tabular form as follows:

PORT A

INTERRUPT

INTERRUPT SELECTED	FROM	TO
INT5	X	PA
	X	A
INT4	X	PA
	X	B
INT3	X	PA
	X	C

PORT B INTERRUPT

INTERRUPT SELECTED	FROM	TO
INT5	X1	PB
	X1	X
	X	A
INT4	X1	PB
	X1	B
INT3	X1	PB
	X1	X
	X	C

General

The $2/3^{RDS}$ CARD has four interrupting devices that may be connected to three possible interrupt channels. You should never connect more than one device to the same interrupt channel. You should never enable a device for interrupt unless you have specific software that states that you should connect an interrupt channel. Such a program is REACH offered by the Software Toolworks as a modem communi-cation program.

2.2.3 HARDWARE INSTALLATION CONTINUED

The 2/3^{RDS} CARD is shipped having all interrupts disabled. This should be the more common arrangement. Typically only one port is enabled for interrupt on a system.

Jumper J5 and J6

These two jumpers select the input clock for the serial ports. The clock may be input from an exterior device or the clock may be generated on the 2/3^{RDS} CARD. This is referred to as 'internal' clock selection. Connecting pin X to pin B selects the clock from off card or external clock. Only special equipment will be capable of providing an external clock. Most installations will use the internal clock setting. The following table reiterates the pin selection for these jumpers.

SELECTION	FROM	TO
INTERNAL	X	A
EXTERNAL	X	B

Jumper J7

This jumper is used to control the RLSD signal to the first serial port. J7 is a three pin jumper having pins labeled A, X and B. Connecting pins A with X using the two shunt allows the RLSD signal to be input from the exterior device. Placing the shunt on pins X and B forces the RLSD input to a logic 1. This is the Heath/Zenith standard configuration. The following table indicates these settings.

SOURCE SELECTION	FROM	TO
OFF CARD	X	A
ON CARD (Always Set)	X	B (Heath Compatible

Once each of these jumpers are set, you may proceed with the hardware installation.

Use pictorial 2 for the next few steps.

( ) Refer to pictorial 2 and remove the retainer bracket that holds your interface circuit cards into place on the CPU logic card.

( ) If you have a serial I/0 in the computer, remove it.

( ) Install the 2/3^{RDS} CARD at P505, P511.

```
*******************************
**    WARNING: Be very care-  **
**        ful not to bend any  **
**      pins and be especially **
**        careful that all pins **
**         are seated into the  **
**        card edge connector.  **
**       The card must not be   **
**        offset by any pin or  **
**       power supply damage    **
**          may result.         **
*******************************
```
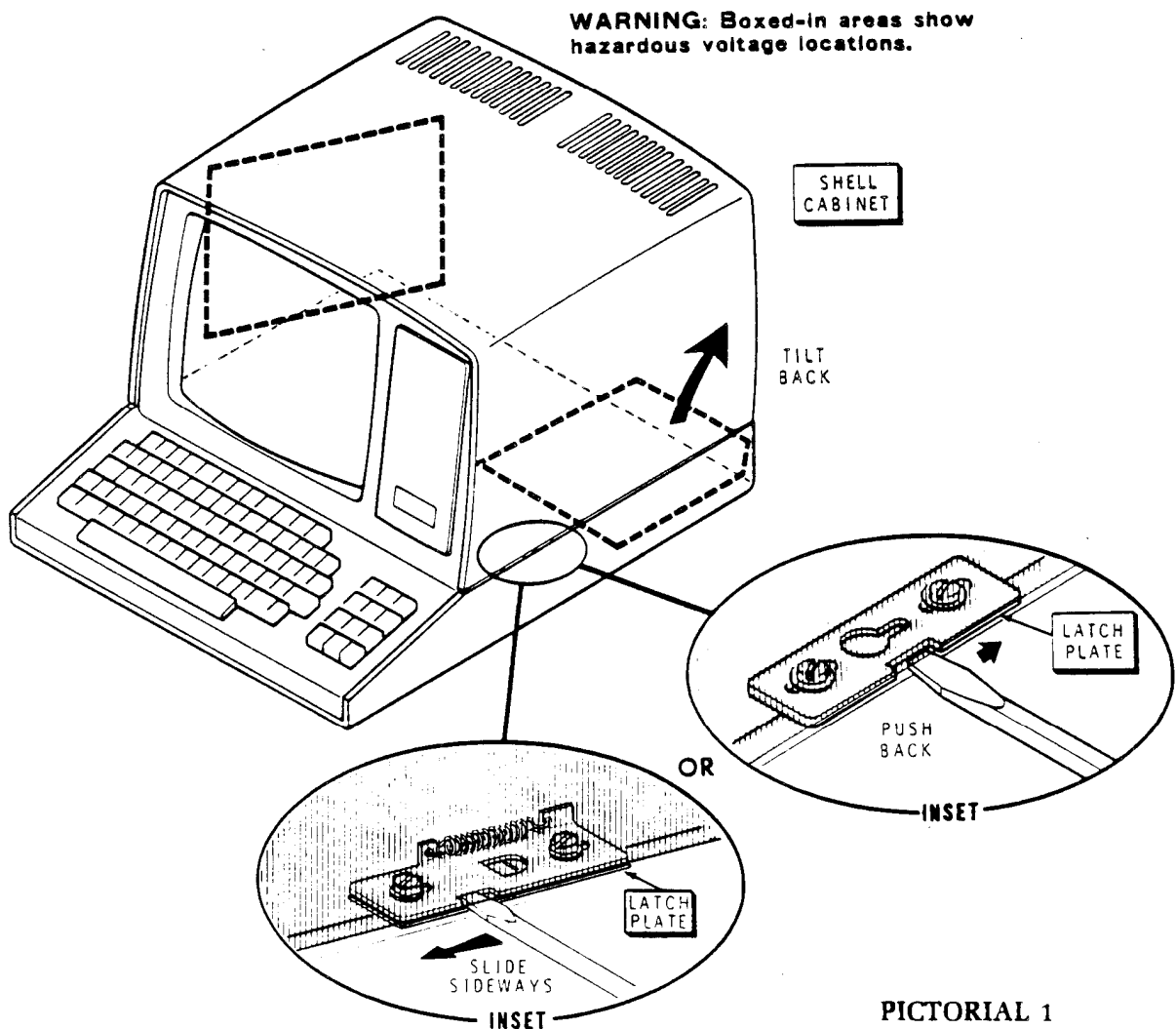
( ) Plug the double rowed 26 pin receptacle from DCE 320-327 (cable part number 90-1001-003) into P3 the double rowed pin header at the bottom of the card. Pin 1 should be up.
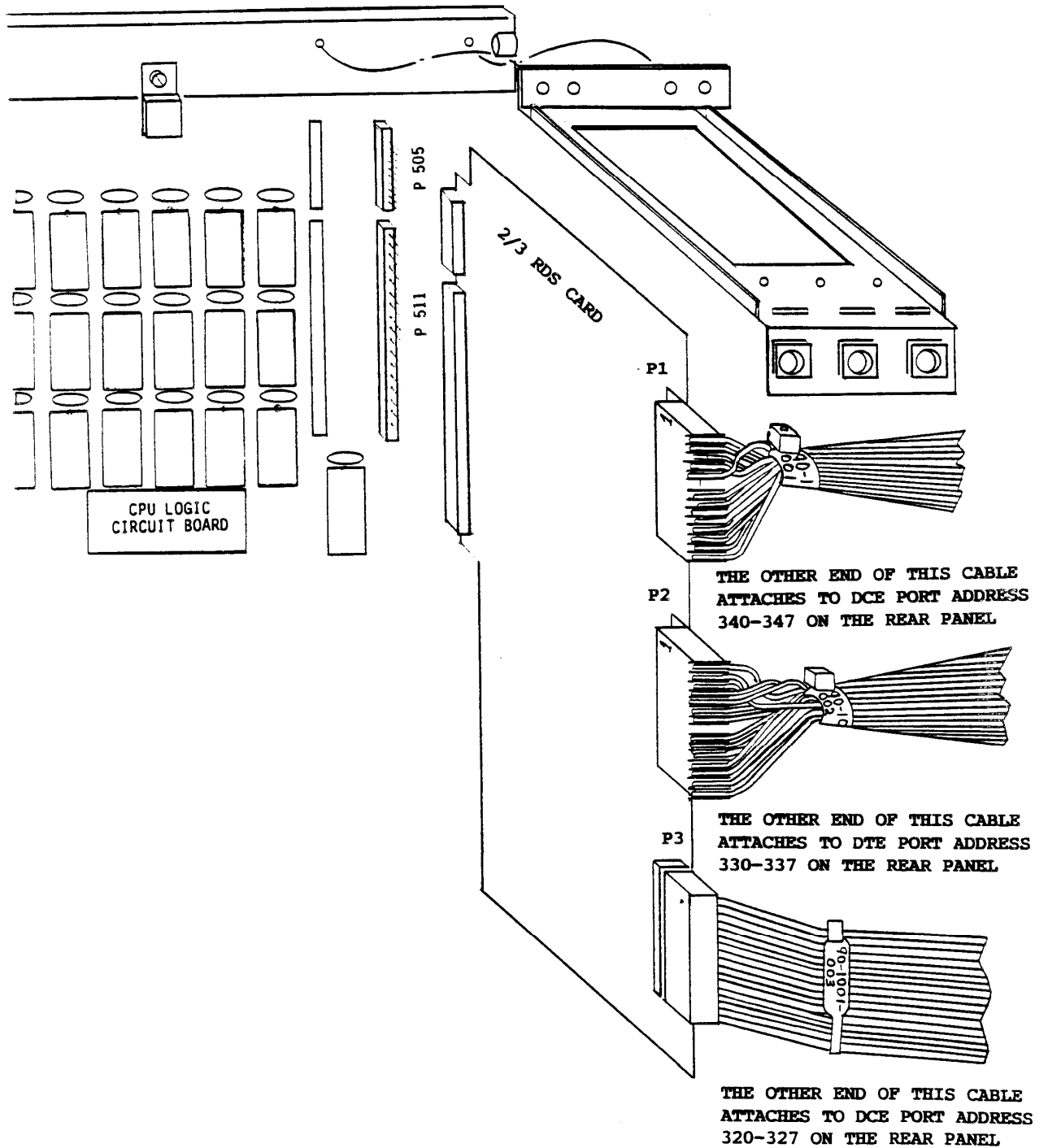
CABINET REMOVAL

Whenever you need to remove the cabinet shell:

- Refer to the inset drawing on Pictorial 1, insert the blade of a small screwdriver into the notch in the latch plate, and then slide the latch plate toward the back of the Computer about 1/2″.

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

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

- Carefully tilt the cabinet shell back. NOTE: Never allow the cabinet shell to hang unsupported. (The hinges are designed so you can easily remove the cabinet shell from the chassis once you have opened it completely.)

- Unplug the fan.

Simply reverse this procedure to close and lock the cabinet shell back on the Computer.

WARNING: Boxed-in areas show hazardous voltage locations.

SHELL CABINET

TILT BACK

LATCH PLATE

PUSH BACK

INSET

OR

LATCH PLATE

SLIDE SIDEWAYS

INSET

PICTORIAL 1

P 505

P 511

2/3 RDS CARD

CPU LOGIC
CIRCUIT BOARD

P1

P2

THE OTHER END OF THIS CABLE
ATTACHES TO DCE PORT ADDRESS
340-347 ON THE REAR PANEL

P3

THE OTHER END OF THIS CABLE
ATTACHES TO DTE PORT ADDRESS
330-337 ON THE REAR PANEL

90-1001-003

THE OTHER END OF THIS CABLE
ATTACHES TO DCE PORT ADDRESS
320-327 ON THE REAR PANEL

PICTORIAL 2

© COPYRIGHT 1983 SECURED COMPUTER SYSTEMS
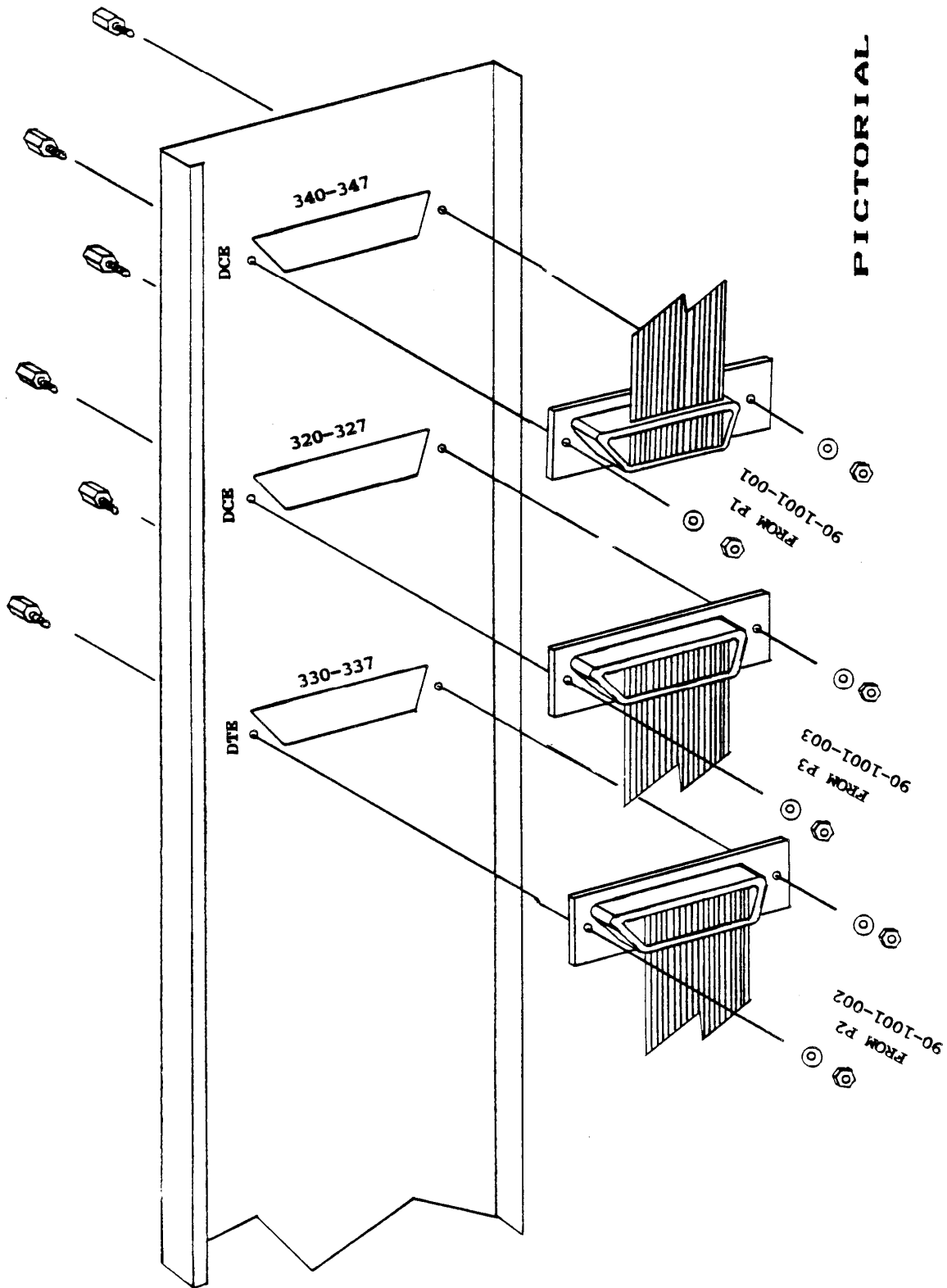
PICTORIAL 3

340-347

DCE

320-327

DCE

330-337

DTE

PROM P1
90-1001-001

PROM P3
90-1001-003

PROM P2
90-1001-002

2/3 RDS CARD
Layout
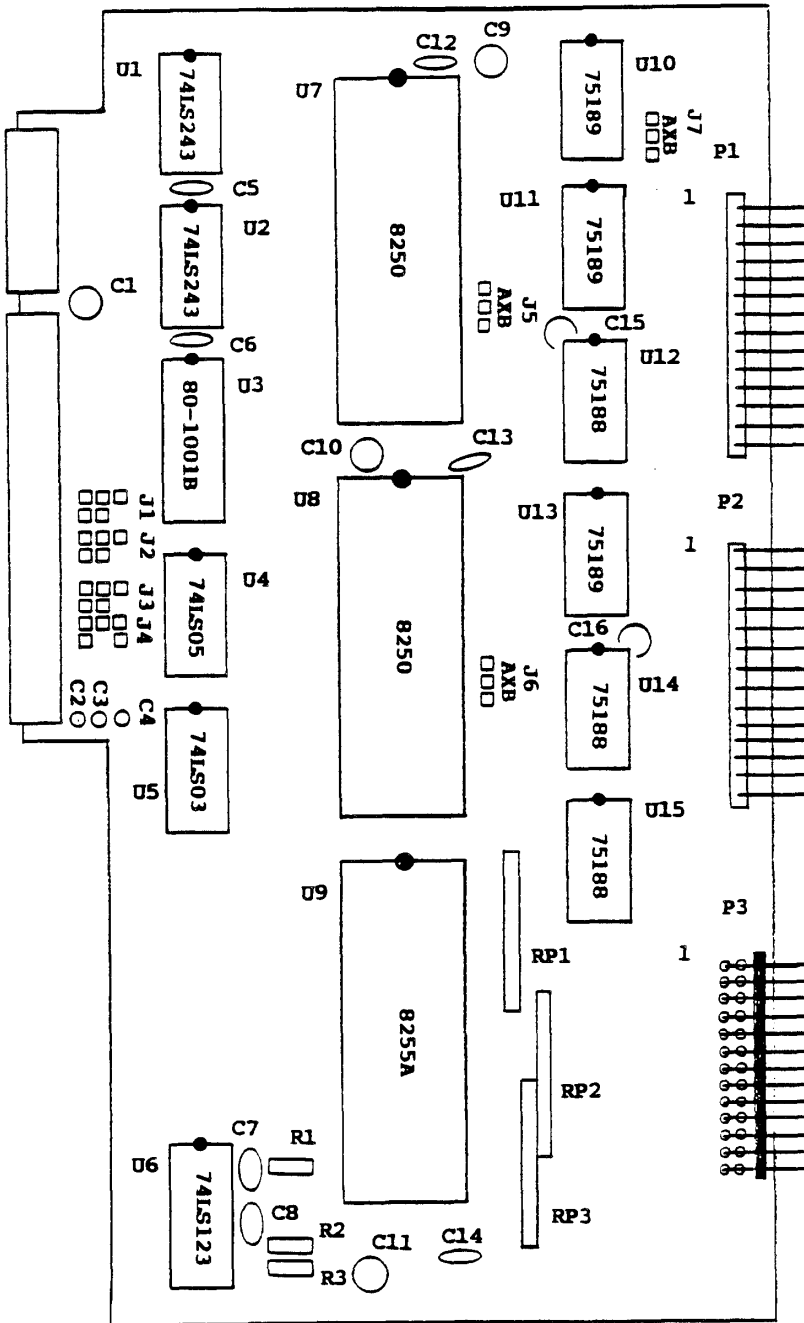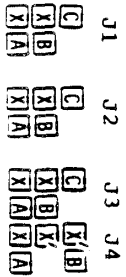
PICTORIAL   4

2.2.3 HARDWARE INSTALLATION CONTINUED

( )   Plug the single rowed receptacle from DTE 330337 (cable part number 90-1001-002) into P2, the header found in the center of the card. Pin 1 should be up. This pin is marked on the cable connector.

( )   Plug the single rowed receptacle from DCE 340-347 (cable part number 90-1001-001) into P1, the pin header at the top of the card. Pin 1 should be up. This pin is marked on the cable connector.

( )   Locate your retainer bracket and install it referring to pictorial 2.

( )   Carefully re-examine the installation instructions and double check all your work step by step.

( )   Replace the lid on the computer.

Your computer is now ready for testing.

2.3   TEST PROCEDURE

( )   Turn on your computer. Your computer should beep twice if it beeped twice on power up before the 2/3^{RDS} CARD installation. If your computer beeped only one before, it should beep only once now.

Note: The following applies to computers having the standard Heath / Zenith monitors (i.e MTR88, MTR89, MTR90)

There is a good chance that other monitors have different entry points used by these programs. Hence they may not run on systems with other monitors.

( )   At the 'H:' prompt enter the program provided below. (This is done using the substitute monitor command).

The program begins at location 42.200A. This is then the substitute and 'GO' address. To start the process type:

Substitute 42200 (CR)

where (CR) represents a carriage return, and all underlined text is typed by the monitor and not the user. The monitor responds by typing the address and the current contents of that memory location. The user may alter the data by entering the octal data given below. Typing a space bar will continue with the next memory location. When all data is entered, a carriage return should be entered rather than a space bar. If a mistake is observed you may restart with the substitute command but now enter the address in error rather than the start address of 42200. This process is not hard and will take only a couple of minutes.

ADDRESS	DATA
	START
42200	041
42201	351
42202	042
42203	371
42204	076
42205	001
42206	107
42207	323
42210	343
42211	257
42212	333
42213	343
42214	041
42215	260
42216	042
42217	026
42220	003
42221	117
42222	346
42223	007
42224	306
42225	060
42226	167
42227	053
42230	025
42231	312
42232	244
42233	042
42234	171
42235	247
42236	037
42237	037
42240	037
42241	303
42242	221
42243	042
42244	315
42245	276
42246	042
42247	104
42250	101

ADDRESS	DATA
42251	124
42252	101
42253	040
42254	075
42255	040
42256	060
42257	060
42260	060
42261	121
42262	015
42263	012
42264	044
42265	170
42266	247
42267	027
42270	322
42271	206
42272	042
42273	303
42274	322
42275	000
42276	343
42277	176
42300	043
42301	343
42302	376
42303	044
42304	310
42305	315
42306	302
42307	003
42310	303
42311	276
42312	042
42313	000CR
H:	END

Upon completion, verify each memory location. This is done using the substitute command again but now do not enter new data unless it is in error.   Step from address

2.3 TEST PROCEDURE CONTINUED

to address using the space bar. Terminate this process with a carriage return.

( ) Type at the next 'H:' prompt: (The computer will Beep when the program has completed.)

GO 42200(CR)

( ) Verify that the following text is printed on the CRT:

GO 42200 (CR)	
DATA =	001Q
DATA =	002Q
DATA =	004Q
DATA =	010Q
DATA =	020Q
DATA =	040Q
DATA =	100Q
DATA =	200Q
H:	

This test verifies communication with the UART at location U7, address 340Q-347Q. If the display is incorrect, the 2/3^{RDS} CARD installation is incorrect or the card is damaged. Refer to the trouble shooting section for hints.

( ) Reset your computer using the shift reset.

( ) Enter the following program using the substitute command as described above. This program is identical to the program given above except for locations 42210 and 42213. You should not assume that the program given above is still intact. Verify that each location given below contains the required data.

PROGRAM:

ADDRESS	DATA
	START
42200	041
42201	351
42202	042
42203	371
42204	076
42205	001
42206	107
42207	323
42210	333
42211	257
42212	333
42213	333
42214	041
42215	260
42216	042
42217	026
42220	003
42221	117
42222	346
42223	007
42224	306
42225	060
42226	167
42227	053
42230	025
42231	312
42232	244
42233	042
42234	171
42235	247
42236	037
42237	037
42240	037
42241	303
42242	221
42243	042
42244	315
42245	276
42246	042
42247	104
42250	101

2.3 TEST PROCEDURE CONTINUED

42251	124
42252	101
42253	040
42254	075
42255	040
42256	060
42257	060
42260	060
42261	121
42262	015
42263	012
42264	044
42265	170
42266	247
42267	027
42270	322
42271	206
42272	042
42273	303
42274	322
42275	000
42276	343
42277	176
42300	043
42301	343
42302	376
42303	044
42304	310
42305	315
42306	302
42307	003
42310	303
42311	276
42312	042
42313	000CR
H:	END

( )   Type at the next 'H:' prompt:

GO 42200 (CR)

This executes the program for the UART at location U8, address 330Q-337Q.

( )   Verify that the following text is typed on the CRT:

GO 42200 (CR)	
DATA =	001Q
DATA =	002Q
DATA =	004Q
DATA =	010Q
DATA =	020Q
DATA =	040Q
DATA =	100Q
DATA =	200Q
H:	

If the display is incorrect, the $2/3^{RDS}$ CARD installation is incorrect or the card is damaged. Refer to the trouble shooting section for hints.

If both of the UARTs passed this preliminary test, you may now boot your computer to either CP/M or HDOS.

2.4 TROUBLE SHOOTING SECTION

<u>Computer does not BEEP</u>

If your computer beeps only once, the on-line key may be down. If the computer does not sound at all, there is something wrong with the installation or the card. Verify that the card is inserted so that the connectors are not offset by one or more pins. Verify that no pins were bent while installing the cable connectors to the 2/3^{RDS} CARD. Verify that none of the I.C.s provided on the card have been jarred loose during shipment. If the CPU logic card was removed for this installation, verify that the three power connectors and the terminal logic board connectors are installed correctly and not offset by any pins. **Note that some power connectors once offset can cause severe damage to the CPU logic card.**

If you have programmed any of the interrupts, deselect all of them. Remove all jumpers at J1,J2,J3, and J4 if any confusion exists. Repeat the installation and test procedure given in the installation instructions. If removing the interrupt jumpers allows the computer to initialize to the monitor (H: prompt is visible) proceed with the test. If the test passes, the chips at U4,U5 or U3 may be at fault in that order. Examine these chips.

<u>Preliminary test failed</u>

If the test program, as described in section 2.3 above, failed, you may localize your failure as follows.

FAILED TEST FOR UART AT:	FAILING DEVICE
U7 but not U8	UART at U7,U1 or U2 each data byte tests a single bit. Hence DATA = 001Q tests the LSB or data bit 0 since 001Q expanded in binary is 00 000 001. Similarly DATA. =200Q tests data bit 7 the MSB since 200Q = 10 000 000 in binary (Remember Q indicates an octal number)
U8, but not U7	UART at U8, U1 or U2
U8 and U7	Any of U1,U2,U3,U6,U7,U8

After observing a failure, inspect all of the I.C.s referenced above.

ALL TESTS PASS, PRINTER/DRIVER IS NOT WORKING

SYMPTOM	POSSIBLE SOURCE OF PROBLEM
HDOS: Printer does not print at all, system is waiting to proceed (Hung).	1) Driver PARLP.DVD is not installed on the currently booted disk. You must reboot your system after the driver installation. 2) Hand shake lines or data lines are not properly connected. VERIFY CONNECTION TO:

DB25 (COMPUTER END)	LINE PRINTER
Pin 5	Strobe (active LOW)
22	Printer acknowledge (active LOW)
23	Printer Busy (active HIGH)
These must be correct for a minimal handshake system.	

SYMPTOM	POSSIBLE SOURCE OF PROBLEM
Printout prints over perforation.	Page length is incorrectly set. Refer to section 4.2
Epson printer does not recognize special functions or programming.	The driver must have been set to MX80. Refer to section 4.2
Epson printer does not print full pages or is paging incorrectly.	Page length, skip and LPI settings do not correlate. Reset these values per the discussion in section 4.2
Printer prints incorrect characters.	Verify that all eight data lines are connected correctly.
Printer prints incorrect data after the printer prints correct data, the number of correct characters being approximately equal to the size of the printer buffer.	Verify that the busy, and acknowledge signals are the correct logical sense as noted above.
Printer skips extra pages on a given listing.	This will occur when a software package (i.e. ASM.ABS) generates its own form feeds and the driver is set for a certain page length. Whenever the driver page length boundary and the software form feeds coincide, two form feeds are generated. Solution SET LP: LENGTH 0.

If these hints do not solve your problem remove the 2/3^{RDS} CARD and reinstall your original configuration for the computer. If your computer functions correctly without the 2/3^{RDS} CARD then you may repeat the installation procedure. If the installation is repeated and the computer system is still not functioning call or write to Secured Computer Systems as provided on your warranty card. If your computer failed to operate in its original configuration consult Secured Computer Systems or your nearest Heath/Zenith computer service center. Note that the 2/3^{RDS} CARD is not capable of blowing out existing computer logic or power supplies or printed circuit etches on the CPU logic card if installed correctly.

3.0 HARDWARE DESCRIPTION

The 2/3^{RDS} CARD has been engineered to be compatible with the existing Heath/Zenith hardware and software. The fully populated circuit card includes two 8250 universal asynchronous receiver/transmitter chips and one 8255A parallel input output chip. Our design reduces the data bus loading from three to one. This feature is particularly important when additional interface cards are added to the computer. The current loading of these UART(8250) and PIO(8255A Parallel input output) chips load the data bus quite heavily. Our design places an effective data bus load of less than one equivalent load of a single 8250.

An important aspect of our design includes the chip independent concept. Early designs of the Heath/Zenith computer were sensitive to the choice of the manufacture of the DART (8250) chips that were used as replacement parts. The National Semiconductor part is the recommended replacement. The problem, however, was not the manufacture of these chips but in the design of the CPU logic board of the H/Z89. Later upgraded design of the CPU board corrected the problem in a simple fashion.

The problem was that the read and write strobes were too close to the chip address select lines. This problem is inherent with designs that use prom decoder chips for device and I/0 selection. These features are important to the versatility of the H/Z89 design that have allowed expansion and system alterations for the past few years. The Heath/Zenith design though adequate for 2 MHZ operation is not adequate for 4 Mhz operation. Our design is not locked to the clock frequency. A single wait state is required for 4 Mhz operation. Our design establishes a reliable time line relation between the arrival of the chip select and the read/write strobes and is consistent regardless of CPU clock frequency. This type of design is not apparent on any other serial/parallel interface now commercially available.

Another important feature of our design is the interrupt capability of the parallel ports. Circuitry has been included to allow either the A port or the B port to interrupt using port C as the control port for either or both the A and B ports. The interrupts may be set (via jumpers) to interrupt separately on interrupt lines 3, 4 or 5. These interrupts are enabled or disabled via software by sending a single write command. This feature is not an inherent capability of the 8255A, so our circuitry provides this software control. The parallel port interrupt enable circuitry is reset upon system reset and under program control.

The inclusion of these three features necessitated circuitry for data bus directional control, interrupt circuitry and read/write strobe synchronization. The inclusion of the circuits amounted to some nine integrated circuits (I.C.s). There was little chance of fitting all nine I.C.s on the circuit card. Our design was then committed to a single I.C, a programmable logic array. This emphasizes the current state of the art design in logic circuitry.

3.0 HARDWARE DESCRIPTION CONTINUED

The remaining circuitry for the board is typical of so many other designs for serial communication. We have included jumper control for external clock lines and Heath/Zenith (original) design for printer communication. We have provided RS232 drivers and receivers for all digital control lines of the 8250. Our edge connector for these two serial ports is pin compatible with all previous Heath/Zenith designs. We place our additional signals on previously unused pins. The control lines may be used to pulse auto dialer control, multiplexing modem control on a single serial port or digital control of some new design using asynchronous communication.

4.0 SOFTWARE DESCRIPTION

Our software staff has generated two driver packages for the end user. The first driver is for HDOS operating systems. The installation of this driver is the same as any other line printer, or modem driver. The other software package supports the CP/M operating system. A new "MAKEBIOS" program has been written and is included with this driver package. A new submit file is included which allows the installation to the existing Zenith Bios programatically. Step by step instructions regarding the installation of these drivers have been given in section 2.2. This section provides a discussion of these software packages.

There was no reason to generate support software packages for the serial ports since these ports are compatible with the existing Heath/Zenith configuration. These ports correspond to the default setting for serial line printers and a modem. (The schematic references which DART is which). All existing Heath/Zenith software and modem packages converse with these ports without modification. These two serial ports are therefore software and hardware compatible with the Heath/Zenith original system. New software may be written to utilize the added flexibility and hardware enhancements of our design.

4.1 CP/M SUPPORT SOFTWARE

The support software for the CP/M operating system is provided on a diskette P/N 90-1001-701. It includes a modified Zenith BIOS, version 3, and a new make-BIOS program. The modified BIOS program is included in both source code form and assembled form. The name of the modified BIOS program is SCSBIOS.ASM. The assembled form of the BIOS is provided for CP/M version 2.2.03, and 2.2.04. The assembled version of the BIOS for CP/M 2.2.03 is named SCSBIOS1.SYS. The assembled program for CP/M version 2.2.04 is named SCSBIOS4.SYS. The makebios program is called SCSMBIOS.COM. No source is provided in this software package for SCSMBIOS. Also included is a submit file used to generate a new BIOS package.

The modified version of the BIOS, SCSBIOS, includes the code required to communicate with the 2/3^{RDS} CARD. You may obtain a listing of SCSBIOS.ASM from the 90-1001-701 diskette. Each line of code that has been added or modified contains a comment field with a date. These comments are placed at the end of the lines modified.

An example would appear thusly:

        MONTH   EQU   1   ;SCS 11-24-82

All code added has been enveloped using the conditional assembly psuedo opcodes IF and ENDIF. Two flags have been added at the top of the BIOS file that allows the inclusion or exclusion of the parallel port code and selecting the version of CP/M.

This first flag is named 'MX80'. It is set or reset using SCSMBIOS.COM. The source code for SCSBIOS is shipped with this flag reset, hence if SCSBIOS were assembled, no parallel port code would be generated. This will prevent the new BIOS from communicating with the 2/3^{RDS} CARD since the BIOS will expect to have a serial chip at the location that the parallel port is located. The modifications to the BIOS assigns the high speed punch to parallel port A. The TTY code for the list device is replaced with the parallel port code. The code for the high speed punch device and that for the list device is the same. The initialization sequence executed during the boot operation for the serial chip at 'old TTY' port, 320Q-327Q is removed. The code added initializes parallel port A for mode 0 strobed output and the port B to mode 1 strobed latched input. The data latched is ignored. For printer operation then, data is output to port A, the printer will be strobed from a bit in port C and the printer acknowledge will be latched using port B in the strobed input mode.

The code for character output examines the busy signal (connected to PC2) for a logic zero. If the signal is a logic zero the software attempts to output a character to the receiving device. The software will wait for the acknowledge interrupt available bit to be set

4.1 CP/M SUPPORT SOFTWARE CONTINUED

as seen from port C status bit number 1 (reference mode 1 programming, 8255 data sheet). If the busy signal is set to a logic one (2.4 volts to 5 volts), the software will not attempt to output any character or data. If the acknowledge signal never goes low (0 to 0.8 volts) the software will 'hang' (enter an endless loop waiting for the acknowledge).

The second flag added to the BIOS is called VERO. It is set or reset by SCSMBIOS.COM. The purpose of this flag is to add the appropriate code for CP/M version 2.2.03 or 2.2.04. This allows the same BIOS file to be used for either CP/M version.

After the new BIOS is loaded onto a CP/M disk, the software must be configured. The boot operation will initiate the CONFIGUR program provided that it is contained on the CP/M disk and you are using CP/M version 2.2.03. The use of the CONFIGUR program is described fully in the Heath/Zenith CP/M user manual. The program is not tailored to the 2/3^{RDS} CARD but performs the device assignment required. The first operation performed by CONFIGUR is to establish the hardware complement present on the system. You must specify that you do not wish to use the standard system if you wish to use the parallel port for the system list device. The port assigned to the list device (menu A field C) must be 320Q (0D0H). You should set this parameter, otherwise the serial line printer port is assigned to the list device. The baud rate assigned is not important and has no meaning for the parallel port. The ready signal polarity also has no meaning for the parallel port. The next field that must be set is the assignment of a print device to LST. To select the parallel port to the list device you must select TTY. Therefore you must set menu C field D to TTY i.e. (LST:=TTY:. You should next disable the automatic command line (set menu D field A false). Each time that you complete the setting of the menus you should select the "Y - finished, make changes option". After all fields are set you should terminate using the "Y -finished, make changes to both memory and disk". Since the CONFIGUR program was not written for the 2/3^{RDS} CARD, terminating it will attempt to initialize the device at port 320Q as a serial device. This confuses the parallel port. You should simply reboot your system (cold boot).

The CONFIGUR program for CP/M version 2.2.03 is slightly different from the version 2.2.04 CP/M CONFIGUR program. You have the choice of selecting a parallel printer using the 2.2.04 version BIOS. **You should <u>not</u> select this option in any case.** A new configure program is currently being generated by Secured Computer Systems to eliminate this problem. After rebooting you may test the list device operation by turning on the line printer and typing a control P (holding the control key down while pressing the 'P' key). This tells CP/M that all output to the terminal should also go to the list device. Typing a return a couple of times should cause "A>" to be printed onto the line printer.

4.1 CP/M SUPPORT SOFTWARE CONTINUED

You should then type DIR and observe the print out on the line printer. If the system seems to 'hang' the connection to the line printer or the polarity of the BUSY and/or ACKNOWLEDGE signal is incorrect.

There is a special way that you may configure your BIOS that will allow you to have a serial mode printer and a parallel mode printer connected at the same time. The following configuration should be done:

Menu A:

    1) Configure the LST device to port 340Q and whatever baud rate and busy polarity and pin number required.
    2) Configure the TTY device to port 320Q, the baud rate will be ignored.

Menu C:

    1) Configure the LST device to the printer type connected such as LPT, or UL1.
    2) Configure the TTY device to TTY

The TTY devices are usually set up as indicated here so you usually only have to verify their configuration. The result of this configuration selects the serial printer or device whenever you first boot up each time. You may redirect the printer output after boot up to the parallel printer by using STAT as follows:

STAT LST:=TTY:

This tells the operating system to send all information that is to be sent to the system list device (LST:) to the device described by TTY:. If you wish to change back to the serial device for output, you may simply type:

STAT LST:=LPT:

Provided you had originally assigned LST:=LPT: using CONFIGUR. You may then have different configuration of software for say a letter quality printer for high quality printout and a dot matrix printer for fast printout. We maintain two versions of WORDSTAR on most of our documentation diskettes for exactly this purpose. We have configured a WORDSTAR for a Diablo style printer and on version for a dot matrix printer. We obtain fast printouts from our 200CPS dot matrix printer by running the appropriate WORDSTAR program, and obtain our final drafts by executing STAT as shown above and then the Diablo style WORDSTAR. Our arrangement has the letter quality printer connected to the parallel port and the serial printer connected to the serial port.

You may alter SCSBIOS.ASM and regenerate a BIOS for your system using SUBMIT and SCSMBIOS. SCSMBIOS is similar to the MAKEBIOS

program provided by Zenith. Its operation is similar only in concept and not at all by content. The program is executed using the following calling sequence:

A>SUBMIT SCSMBIOS X Y <BIOS>

Where   X   is the source drive that contains the BIOS file.
                      (DO NOT include a colon in this specification)
          Y   is the destination drive that is to receive the new BIOS file.
     <BIOS>   is the name of the source BIOS file being processed. This name **MUST** be specified. It may be SCSBIOS or some modified version there of. DO NOT include an extension in the name. An '.ASM' extension is assumed.

An example would be:

A>SUBMIT SCSMBIOS A B SCSBIOS

In this case the submit file uses the A drive for all source files and generates a file named BIOS.SYS on the B drive. All processing is performed by the submit file. When the process is complete you will have a bootable disk after the disk has been 'SYSGEN'ed.   The source disk that executes the submit file must contain the following files:

        SUBMIT.COM
        ASM.COM
        PREL.COM
        STAT.COM
        SCSMBIOS.SUB

The disk designated as the source drive must contain:

        SCSMBIOS.COM (Where: <BIOS.ASM> is the name of the
        <BIOS.ASM>   BIOS being assembled. It is usually SCSBIOS.ASM. However the name may be any valid CP/M name containing the new BIOS as edited from SCSBIOS.ASM.)

The destination disk should be a blank diskette with the exception of the system and maybe CONFIGUR.COM. It is marginally conceivable that this process may be completed using a single 5 1/4" hard sector disk system. You must specify that the destination drive be⁻ in order that this process be successful. The process using a single 5 1/4" hard sector will require the insertion of the destination disk many times during the final stages of the process. The total disk storage used by this process is fully 96K. The submit process will create and delete files as required and specified by SCSMBIOS.SUB.

4.1 CP/M SUPPORT SOFTWARE
CONTINUED

Once the submit process is initiated the SCSMBIOS.COM is scheduled. The program begins by presenting the operator with a list of options that the operator may select one. The list of options allows the user to select the disk drive configuration that matches his system. The options are:

0) H/Z 17 ONLY
1) H/Z 37 ONLY
2) H/Z 47 ONLY
3) H/Z 67 ONLY
4) H/Z 17 H/Z 37 COMBINATION
5) H/Z 17 H/Z 47 COMBINATION
6) H/Z 17 H/Z 67 COMBINATION
7) H/Z 37 H/Z 47 COMBINATION
8) H/Z 37 H/Z 67 COMBINATION
9) H/Z 47 H/Z 67 COMBINATION

If an illegal option is selected an error message is displayed. This menu will be redisplayed afterwards.

SCSMBIOS will then present the operator with a second menu for printer selection. The printer option menu has two options. These are:

0) Set TTY as a serial device
1) Set TTY as an EPSON/CENTRONICS PARALLEL device

Selecting option 0 disables all parallel port code (MX80 flag will be set to zero). Option one will enable the assembly of all parallel code (MX80 flag will be set to one).

The operator is then presented with a third menu allowing him/her to select the version of the operating system that he is using. This menu has two options. They are:

0) Select BIOS version 2.2.03
1) Select BIOS version 2.2.04

Selecting option 0 will generate a BIOS compatible will CP/M 2.2.03 software. Selecting option 1 will generate a BIOS compatible with CP/M 2.2.04 software.

No other input is required of the operator from this point on. SCSMBIOS.COM is scheduled two addition times for bookkeeping purposes but no operator input is required. The new BIOS generated will have a name BIOS.SYS and will be set to SYS and readonly by the submit file. In order that you may copy the new BIOS you must use the [R] file attribute during the PIP call. You may set the file to read write using STAT. In order that you may view the file from

4.1 CP/M SUPPORT SOFTWARE CONTINUED

the directory you must set the file attribute to DIR using STAT.COM.

For example:

        STAT BIOS.SYS $R/W   (Sets the file to read write)

        STAT BIOS.SYS $DIR   (Allows the file to be seen
                                         from the DIR command.)

    After the 'make-BIOS' operation completes, you should execute MOVCPMxx referencing the diskette containing the new BIOS. To accomplish this you must set the BIOS file to DIR using STAT as described above. As an example, if the new BIOS were on drive B:, the MOVCPMxx command line would then be:

        MOVCPMxx * B:BIOS.SYS

Where xx is 17, 37, or 47 depending on the type of disk drives that you are using. You should then run SYSGEN specifying that the system is in memory and the destination drive is the one containing the new BIOS.

    The diskette provided with your $2/3^{RDS}$ CARD includes an assembled version of the SCSBIOS configured to only one type of disk drive. If you purchased the hard sector format the BIOS was assembled only for H/Z 17 disk drives. If you specified the soft sectored 5 1/4" the diskette is set only for the H/Z 37 disk drives. Similarly the 8 inch H/Z 47 format is configured for the H/Z 47 disk drives. Each diskette will be configured having the TTY set for Centronics/Epson compatibility.

    All other programs used for system generation i.e. MOVCPMxx. COM and SYSGEN.COM are unaffected by the software operation performed by SCSMBIOS. The description of these programs is given in the Heath/Zenith CP/M manual. Remember that each time that you execute SCSMBIOS and create a new BIOS.SYS you must execute MOVCPMxx and SYSGEN afterwards. You must specify Y:BIOS.SYS where Y is the disk drive that contains the new BIOS.SYS generated. This is required as noted in your Zenith CP/M manual. This step allows the BIOS to be positioned in memory correctly.

4.2 HDOS SUPPORT SOFTWARE

The HDOS support software is comprised of a driver named PARLP.DVD. (A driver is a software package that allows the operating system to converse with a piece of hardware at the request of the operator or an application software package.) The driver is written using assembly language and assembled using the HDOS assembler ASM.ABS. The operation of this driver is the same as any other driver you may have been exposed to. That is to say it is load and referenced the same. It is written to incorporate the SET function. The operation of the SET function is described quite well in the HDOS Software Reference Manual System Configuration section and the General Operations section Heath/Zenith P/N 595-2474-01 and 595-2475-01.

PARLP.DVD is written to operate in an output mode. The output mode programmed port A Model (reference 8255 data sheet, Mode 1 operation), strobed output operation. Port B is programmed for Mode 1 (reference 8255 data sheet, Mode 1 operation), strobed, latched input operation). Port C lower four bits are set for input and are used for status to the output mode. The driver may then be opened for write only.

The output mode of operation was written for line printers using the Centronics style parallel interface. The driver may be used for any device though, so long as the device utilizes a similar strobed acknowledge-busy structure of the Centronics parallel interface. The input mode may be used for monitoring any type of external device (house alarm switches) in a continuous fashion. Currently these two modes may not be opened simultaneously.

The output mode allows for both an Epson compatible and non Epson printer - Centronics style printer interfaces. The nonEpson mode allows the user to set the column width, page length, form feed at the close and the setting of the Epson mode. The Epson compatible mode of operation is selectable using the HDOS SET function. This feature allows the user to set the lines per inch, skip over perforation, emphasize and double strike features of the Epson printer as well as all of the non-Epson mode functions.

These features are selectable by typing at the HDOS prompt:

SET LP: OPTION (n)

Where OPTION   Is the option being programmed and (n) is an optional
                      qualifying parameter.

The following table describes the SET Options. The default options are noted.

OPTION   DESCRIPTION

MX80   Selects Epson compatible mode of operation

NOMX80   Deselects Epson compatible mode of operation. (Default
                  mode)

WIDTH n   Sets printer column width to *n* where 0<n<=132 (Default:
                  n=80) (See note 1 below)

FORM   Driver adds a form feed (ASCI decimal 12) at the close
                  function (at the end of the listing) (Default)

NOFORM   Cancels the addition of a form feed at the close function

LENGTH n   Set the form length to n lines, where 0<=n<=127 (Default:
                  n=66) (See note 2 below)

HELP   Prints these options listed above but not the options listed
                  below if NOMX80 has been selected. Prints all options
                  listed in this table if MX80 has been set.

MX80 Compatible Options (See note 3 below)

LPI n   Set vertical print density to 216/n lines per inch where
                  1<n<=255. (Default: n=36,6 lines per inch)

SKIP n   Sets the number of lines skipped at the perforation, where
                  0<n<=127. (Default: n=6 lines)

EMPH   Set print mode to emphasize

NOEMPH.   Deselects emphasize print mode (Default mode)

DBLST   Sets print mode to double strike

NODBLST   Deselects double strike print mode. (Default mode)

NOTES:

1) For non-Epson compatible printer, the software maintains a column count. Wherever
   the width count exceeds the value specified by n, a carriage return and line feed is
   generated. This is a software wrap around at the end of the line. Note that 'n'
   cannot be zero.

4.2 HDOS SUPPORT SOFTWARE CONTINUED

2) The SET LENGTH has slightly different interpretation while in the non-Epson compatible mode than for the Epson compatible mode.

<u>For non-Epson compatible mode:</u>

n=0   Then do not perform software paging i.e. ignore the line count. This allows either the application software or the printer to perform paging.

n>0   Allows up to n lines to be printed and then outputs a form feed. (Your printer must accept an ASCII form feed). Note that n does not equate to the form size. The form may be any size, only n lines will be printed at whatever lines per inch setting the printer may have.

      For example: The default is n=66. If the page is 11 inches and the printer is printing at 6 LPI then a full page-perforation to perforation will be printed. Setting n=60 will leave six blank lines at the end of the page. This is the same as setting a skip at perforation to 6, but this mode of operation does not acknowledge the skip set function.

<u>FOR EPSON COMPATIBLE MODE:</u>

n=0   Not allowed

0<n<=127 Set the form length to value n. You may compute the physical form size to be:
      Size = (n/LPI) inches
    For example the default LPI (=6, from 216/36) and n = 66:
      Size = 66/6 inches
        or
      = 11 inch sheet

    This setting is then the number of printable lines on a page based on LPI. This is different for the non-Epson mode.

You should experiment with these various settings and obtain listings. Observe that the HELP menus are different if you set MX80 and NOMX80. Length and width must be correct in order for paper to track correctly.

3) The Epson compatible set functions will only work on a non Epson printer if the programming sequences (escape code sequences) are exactly as described for the Epson printers.

4.3 PARALLEL PROGRAMMING CONSIDERATIONS

The three parallel ports may be configured for bidirectional, unidirectional, latched, or non latched modes. The programming of these ports is described completely in the data sheet provided in the appendix. This section is not intended to reiterate the discussion in the data sheet. This section is intended to describe the programming of the parallel port interrupt and provide a detailed description of the parallel printer configuration.

The 2/3^{RDS} CARD has both jumper configurable and software configurable interrupts. The serial port interrupts are enabled using jumpers J1 and J2 and correctly programming the serial chips. The parallel ports are both jumper configurable and software enabled. Jumpers J3 and J4 perform hardware enabling of ports A and B interrupts. The software must then enable the interrupts via software. The parallel interrupt scheme is intended to be used during mode 1 operation of the 8255A. The 8255A must be fully programmed and the interrupt handling routines must be placed into memory with proper interrupt vectors established prior to enabling the parallel interrupt lines. The interrupts are enabled by writing to I/O address 213 (decimal, 325 octal, or D5 hexidecimal). They are disabled by writing to I/O address 212 decimal. The data written is not important. Enabling the interrupts by writing to address 213 will place a logic one at pins 1 and 4 of U5. It is not hard to see from the schematic that if the 8255A is not programmed such that PC0 and PC3 are logic zero, an interrupt will occur. (Each parallel line is held at 5V, a logic one using 1K ohm pull up resistor networks RP1 thru RP3). Jumpers J3 and J4 may be set to allow either port A and port B to be connected to a single interrupt line. The interrupt service routine will have to determine which device is interrupting by reading the C status as described in the data sheet. The parallel port interrupts may also be configured to interrupt on separate interrupt lines. In any case the port C status should be read by the interrupt handler to establish that an interrupt is pending.

Upon power up all three ports will be configured for input. The parallel port interrupts will be disabled. During the CP/M boot operation the A port is configured for mode 1 strobed output. Port C has bits 6,2,1 and 0 set for input. PC5 and PC4 are in an output configuration. This configuration can be seen in figure 10 and 11 in the 8255 data sheet. The B port is configured for mode 1 input. Whatever is present at any of the B port lines can be read by inputting from the B port. If no data is present at these ports, the data read will be all ones. HDOS will leave all three ports in the input configuration until the line printer is accessed for a print operation, if the driver PARLP.DVD is being used. The HDOS configuration for the parallel port is, identical to that for CP/M.

4.3 PARALLEL PROGRAMMING CONSIDERATIONS CONTINUED

The printer configuration, as described above, also enables the interrupt function of the 8255A for channel A. The software does not enable the interrupts to the CPU. The software does not address I/0 address 213 decimal. Any user software may enable the interrupt lines by addressing port 213. The result is to put the line printer in an interrupt driven mode.

The key signals to operation of the line printer is the strobe and acknowledge. The strobe signal is active low. That is to say this line will be a logic zero when true. Whenever a word is written by the software to port A, the strobe line will go low. The receiving device must respond by bringing acknowledge low for each word transferred. The driver also examines the busy signal from the receiving device. If the BUSY signal is a logic one, the software will not attempt to output data.

If the printer driver as described above satisfies your parallel programming needs, no other software is needed. The hardware, on the other hand, is not bound or limited to this configuration. Any mode one interrupt scheme may be implemented. Any of the three ports may be configured for any mode of operation described in the data sheet for the 8255A.

APPENDIX A: 2/3^{RDS} SCHEMATIC

Print goes Here – Needs to be redrawn.

APPENDIX B: CABLE WIRE LISTS

APPENDIX B.1   DCE (Data Communication Equipment)

Serial Printer Cable PN 90-1001-001

P1 Side, 15 Pin In line receptacle				Back Panel Side DB-25 Pin Connector
1		Chassis Ground		1
2		OUT1	=>	12
3	<=	SERIAL DATA IN		2
4		BAUD OUT	=>	13
5		SERIAL DATA OUT	=>	3
6		NC		NC
7	<=	CTS		4
8	<=	RLSD		19
9		RTS	=>	5
10	<=	RI		9
11		DTR	=>	6
12	<=	RCLKL		10
13		SIGNAL GROUND		7
14	<=	DSRL		20
15		OUT2	=>	17

Where:	NC	=	No connect
.	OUT1	=	General purpose output number 1
.	OUT2	=	General purpose output number 2
.	SERIAL DATA IN	=	Receive data from serial RS232C) device
.	BAUD OUT	=	Clock output from 2/3^{RDS} CARD
.	SERIAL DATA OUT	=	Data sent to serial (RS232C) device
.	CTS	=	Clear to send data to the serial device
.	RLSD	=	Receive line signal detect (carrier detect from modem)
.	RTS	=	(Computer is) Ready to send
.	RI	=	Ring input
.	DTR	=	Data terminal ready
.	RCLKL	=	Receive clock (from serial device)
.	DSRL	=	Data set ready (serial device is ready for data)

APPENDIX B.2   DTE (Data Terminal Equipment)
                         Serial Modem Cable PN 90-1001-002

P2 Side, 15 Pin In line receptacle		To		Back Panel Side DB-25 Pin Connector
1		Chassis Ground		1
2		OUT1	=>	12
3		SERIAL DATA OUT	=>	2
4		BAUD OUT	=>	13
5	<=	SERIAL DATA IN		3
6		OUT2	=>	17
7		RTSL	=>	4
8				NC
9		CTS	=>	5
10	<=	RCLKL		10
11		DSR	=>	6
12	<=	RI		9
13		SIGNAL GROUND		7
14	<=	DTR		20
15		RLSD	=>	8

Where:

NC	=	No connect
OUT1	=	General purpose output number 1
OUT2	=	General purpose output number 2
SERIAL DATA IN	=	Receive data from serial (RS232C) device
BAUD OUT	=	Clock output from 2/3^{RDS} CARD
SERIAL DATA OUT	=	Data sent to serial (RS232C) device
CTS	=	Clear to send data to the serial device
RLSD	=	Receive line signal detect (carrier detect from modem)
RTS	=	(Computer is) Ready to send
RI	=	Ring input
DTR	=	Data terminal ready
RCLKL	=	Receive clock (from serial device)
DSRL	=	Data set ready (serial device is ready for data)

.

APPENDIX B.3   Parallel Port Cable SCS PN 90-1001-003

Parallel Port Cable

P3 Side, 26Pin ribbon receptacle	Back Panel Side DB-25 Pin Connector	
1	PA4	1
2	PA5	2
3	PA6	3
4	PA7	4
5	PC7	5
6	PC5	6
7	PC0	7
8	PB7	8
9	PB6	9
10	PB5	10
11	PB4	11
12	PB3	12
13	PB2	13
14	SIGNAL GROUND	NC
15	PB1	25
16	PB0	24
17	PC3	23
18	PC2	22
19	PC1	21
20	PC4	20
21	PC6	19
22	PA0	18
23	PA1	17
24	PA2	16
25	PA3	15
26	SIGNAL GROUND	14

Where: NC = No Connection

PAX = Port A bit X data
PBX = Port B bit X data
PCX = Port C bit X data

In all cases bit number 7 is the most significant bit in the byte.

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APPENDIX B.4.0   Centronics type (Epson) Printer

Parallel cable wire list

Computer side DB-25 Pin Connector			Epson Printer Side 36 Pin Connector (Amphenol 57-30360 or equivalent
5		STROBEL =>	1
18		DATA 1 =>	2
17		DATA 2 =>	3
16		DATA 3 =>	4
15		DATA 4 =>	5
1		DATA 5 =>	6
2		DATA 6 =>	7
3		DATA 7 =>	8
4		DATA 8 =>	9
22	<=	ACKNOWLEDGEL (PC2)	10
23	<=	BUSY (PC3)	11
		NC	12
		NC	13 – 15
14		GROUND	16
		NC	17 – 30
20		INITL (PC4) =>	31
		NC	32
		NC	33 – 35
		NC	36

Where   STROBEL   Is the active LOW strobe to the receiving device line prompt indicating that data is ready and present at the DATA X lines

ACKNOWLEDGEL   Is the active low signal from the receiving device indicating that the data has been accepted.

BUSY   Is the Active high signal indicating that the printer is busy and cannot accept data

INITL   Is the active low signal sent to the receiving device (line printer) to reset (i.e. line printer initialize to your power up configuration)

DATA1-DATA8   The digital data lines, active high, DATA1 is the least significant bit DATA8 is the most significant bit.

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APPENDIX B.4.1   Parallel Interface Cable to MPI Printer

MPI Printer wire list

Computer side DB-25 Pin Connector		MPI Printer Side 34 Pin Connector Dual in-line Connector
5	STROBEL =>	1
18	DATA 1 =>	3
17	DATA 2 =>	5
16	DATA 3 =>	7
15	DATA 4 =>	9
1	DATA 5 =>	11
2	DATA 6 =>	13
3	DATA 7 =>	15
4	DATA 8 =>	17
22	<= ACKNOWLEDGEL (PC2)	19
23	<= BUSY (PC3)	21
20	NC	26
14	NC	2
14	GROUND	16

   A keying pin in the MPI connector at pin 32 should be installed.

```
 1 |  3 |  5 |  7 |  9 | 11| 13| 15| 17| 19| 21| 23| 25| 27| 29| 31| 33
 2 |  4 |  6 |  8 | 10| 12| 14| 16| 18| 20| 22| 24| 26| 28| 30| 32| 34
```
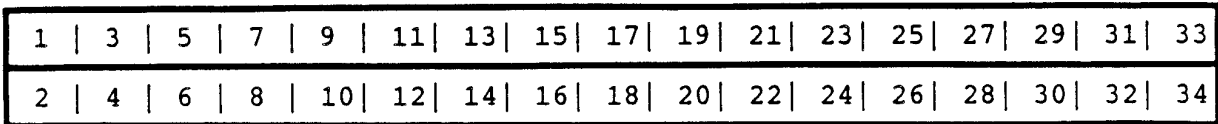
    DUAL IN-LINE CONNECTION PIN ORIENTATION

APPENDIX B.5 LINE PRINTER INTERFACE AIDES

Various manufactures of printers allow for the setting of the polarity of signals that control handshake. The hookup of these printers may require some help to connect them to the 2/3^{RDS} CARD. This section provides a little software assistance aiding in this process.
NOTE:

Most printer manufactures include "pullup" resIstors at the input lines of the printer. These are resistors that are connected to the signals from the host computer to the printer five volt supply.

The one signal that may cause an operational problem is STROBEL. Some manufactures use a relatively low resistive value for this pullup. (A low value is considered to be somewhere between 300 ohms to 600 ohms range). The 2/3^{RDS} CARD must be able to accept the resulting current for the low state. For proper operation this resistor value should be the 3000 to 10000 ohms or the resistor should not exist. Refer to figure B.5-1 for a example of how the pullup resistor may appear on your printer schematic.

At the time of this release the Centronics 700 series printer (which are also used by Radio Shack) have exhibited this condition. No Japanese printer to date has exhibited this condition.

The software examples are written using BASIC. It is assumed that the majority of users have BASIC and are somewhat familiar with its operation.

Test number one: Busy and Acknowledge State Determination

( )   Boot you system and execute BASIC
( )   Connect your printer to the parallel port 320-327Q
( )   Turn on your printer, install paper, put the printer on line
( )   Enter the following program

For Microsoft BASIC 80

```
10      PIOA%=208:PIOCNTRL%=PIOA%+3:PIOC%=PIOA%+2
20      CONTROL%=&H9B:REM 1001 1011
30      OUT PIOCNTRL%,CONTROL%
40      A%=INP(PIOC%)
50      BUSY%=A% AND 8
60      ACK%=A% AND 4
70      IF BUSY%=0 THEN PRINT "BUSY IS LOW" ELSE PRINT "BUSY IS HIGH"
80      IF ACK%=0 THEN PRINT "ACKNOWLEDGE IS LOW" ELSE PRINT
        "ACKNOWLEDGE IS HIGH "
90      END
```

S CH EM A T I C REPRESENTAT I ON OF PULL-UP R E S I S T OR

PULLUP RESISTOR

PULLUP
RESISTOR
VALUE
560

PARALLEL
CONNECTOR
ON REAR
OF PRINTER

+5 (VOLTS)

TO RECEIVING CIRCUITS

STROBEL   1

DATA 1   2

DATA 2   3

DATA 3   4

DATA 4   5

DATA 5   6
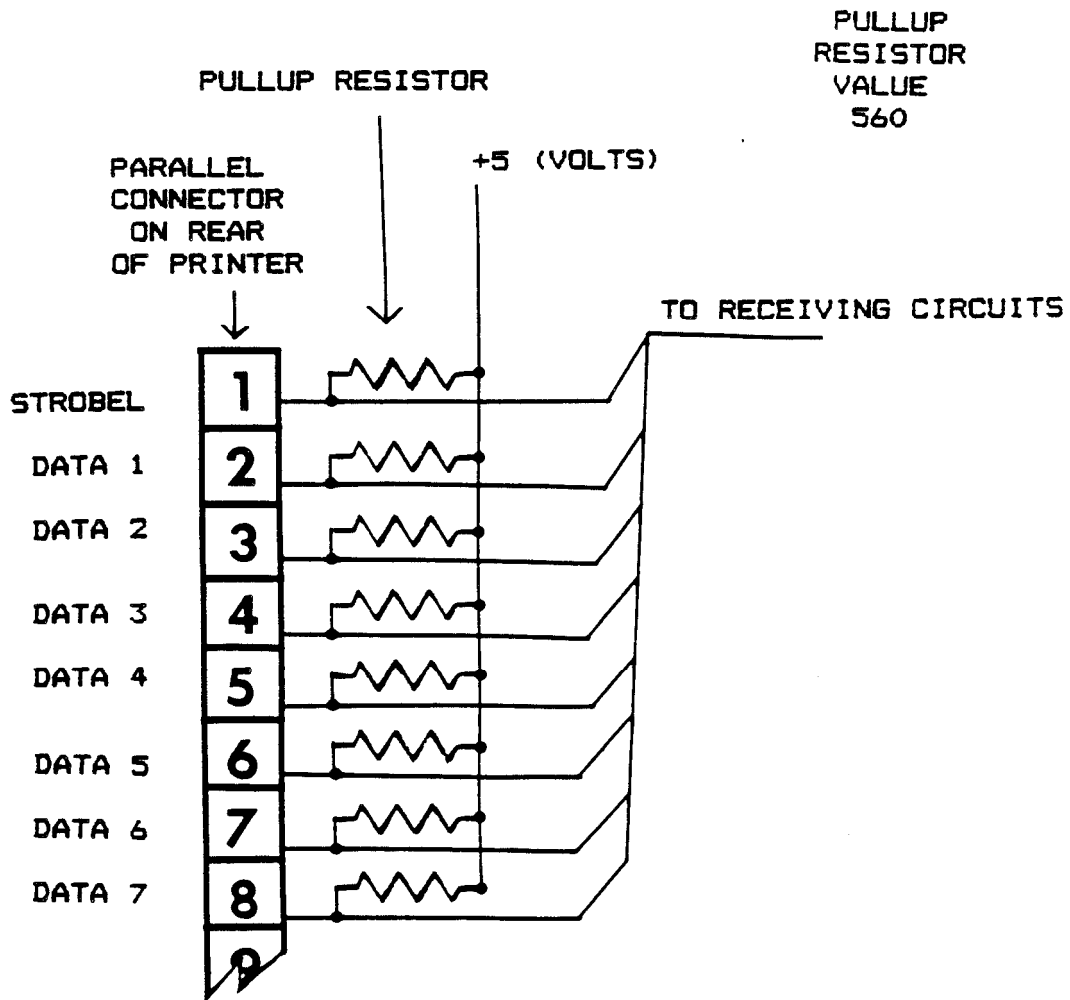
DATA 6   7

DATA 7   8

9

FIGURE B. 5-1
(c) COPYRIGHT 1983 SECURED COMPUTER SYSTEMS

APPENDIX B.5 LINE PRINTER INTERFACE AIDES CONTINUED

For Benton Harbor Basic

```
10      P1=208:P2=P1+2:P3=P1+3
20      C=155
30      OUT P3,C
40      A=PIN(P2)
50      B=A AND 8
60      A1=A AND 4
70      IF B=0 THEN PRINT "BUSY IS LOW"
80      IF B<>0 THEN PRINT "BUSY IS HIGH"
90      IF A1=0 THEN PRINT "ACKNOWLEDGE IS LOW"
100     IF A1<>0 THEN PRINT "ACKNOWLEDGE IS HIGH"
110     END
```

( )   Run the program (Type RUN and a return)
( )   Verify that the text typed states

        BUSY IS LOW
        ACKNOWLEDGE IS HIGH

    If Busy is high or Acknowledge is low, the cable may be at fault or there are some jumpers that need to be set in the printer to make it conform to the Centronics style interface. The cable may be placed on the connector on the $2/3^{RDS}$ CARD upside down or off by one pin.

( )   Set the printer to OFF LINE
( )   Run the program
( )   Verify the following print out

        BUSY IS HIGH
        ACKNOWLEDGE IS HIGH

    This tests rudimentary communication with the printer. Note: If your printer has an internal buffer toggling the ON LINE switch may not cause the Busy line to be high.

( )   Set the printer ON - LINE
( )   Run the program
( )   Verify that BUSY is LOW again

    If all of these steps pass, you may proceed with the next test step. If any step fails you must verify that the cable connected to the $2/3^{RDS}$ CARD is positioned correctly. Reversing the direction of the cable connector should not cause detrimental damage to the card. The connector is orientated on the cable such that the cable feeds towards the CRT form the top of the, card. The cable must be wrapped back toward the power supply. The blue edge should be up on the cable.

APPENDIX B.5 LINE PRINTER INTERFACE AIDES CONTINUED

Test number two: Basic output to the printer

    The following two programs function differently. The Microsoft BASIC 80
allows much more powerful instruction than does the the Benton Harbor Basic. The
Microsoft BASIC 80 will print whatever is typed on the console on the printer. The user
should always use a carriage return, line feed combinations to perform proper line
feed operations at the line printer. The Benton Harbor Basic program simply prints
lines of character A thru Z. Each program is terminated by typing a control C..

NOTE:

    If your printer specifies a maximum strobe width, (500 microseconds on some
Centronics printers) this routine may not work.

Enter the following programs:
For Microsoft BASIC 80

```
10      PIOA%=208:PIOB%=PIOA%+1:PIOCNTRL%=PIOA%+3:PIOC% PIOA%+2
20      CONTROL%=&H87:REM 1000 0111
30      OUT PIOCNTRL%,CONTROL%:OUT PIOC%,&HEF:OUT PIOC%,&HFF:OUT
        PIOCNTRL%,5
40      A%=INP(PIOC%) 50 BUSY%=A% AND 8
60      IF BUSY%>1 THEN PRINT "PRINTER IS BUSY":GOTO 40
70      A$=INKEY$
80      IF LEN(A$)=0 THEN 70 90 OUT PIOA%,ASC(A$)
100     OUT PIOC%,&H7F:OUT PIOC%,&HFF 110 PRINT A$
120     A%=INP(PIOC%) 130 ACK%=A% AND 1
140     IF ACK%=0 THEN PRINT "ACKNOWLEDGE NEVER HAPPENED":GOTO 120
150     A%=INP(PIOB%) 160 GOTO 40 170 END
```

For Benton Harbor Basic

```
10      P1=208:P2=P1+2:P3=P1+3
20      C=135
30      OUT P3,C:OUT P2,239:OUT P2,255:OUT P3,5:D=65
40      A=PIN(P2)
50      B=A AND 8
60      IF B>0 THEN PRINT "PRINTER IS BUSY":GOTO 40
70      OUT P1,D
80      OUT P2,127
```

APPENDIX B.5 LINE PRINTER INTERFACE AIDES CONTINUED

```
90      OUT P2,255
100     A=PIN(P2)
110     A=A AND 1
120     IF A=0 THEN PRINT "WAITING FOR ACK":GOTO 100
130     A=PIN(P1+1)
140     D=D+1
150     IF D>90 THEN D=10:GOTO 40
160     IF D<13 THEN D=13:GOTO 40
170     IF D<65 THEN D=65:GOTO 40
180     GOTO 40
190     END
```

( )   Run the program
( )   Verify that each character is being printed as it is being typed on the console for
      the Microsoft BASIC program.

<div align="center">-- OR --</div>

Lines of letters A thru Z are being typed on the printer for the Benton Harbor Basic
program. (Note that this program will print on the CRT that the printer is BUSY
from time to time.) If these tests pass, the drivers as provided by SCS will work on
your system. These tests verify the parallel communications.

APPENDIX C

PARTS LIST 90-1001.XXX

Circuit card:

QTY	SCS PN	NOMENCLATURE/DESCRIPTION	MANUF	REF
1	60-1MOL.S25	4455A Series Right angle Type A	Molex	J9
1	60-1MOL.S10	4455A Series Right angle Type A	Molex	J8
2	60-2MOL.P15	4094A Series Right angle Wafer	Molex	P1,P2
1	60-2RATH.P13	Right Angle Pin Header, dual row	Rathion	P3
10	60-DLOO.14	14 Pin Low Profile Dip Socket	Burndy	U1,U2,U4,U5,U10-U15
1	60-DLOO.16	16 Pin Low Profile Dip Socket	Burndy	U6
1	60-DLOO-20	20 Pin Low Profile Dip Socket	Burndy	U1,U2,U4,U5,U10-U15
3	60-DLOO.40	40 Pin Low Profile Dip Socket	Burndy	U7,U8,U9
29	60-65610.402	Jumper (65610-402)	Berg	J1-J7
9	60-65474.002	Jumper (65474-002)	Berg	J1-J7
3	65-R103.RP9	10K x 9 Resistor Pack 785-1-Rl0K	Beckman	RP1-RP3
9	65-C226.T25	Capacitor, 2.2 ufd, 25V, Tantalum	(common)	C1-C4,C9-C11, C15,C16
3	65-C104.D25	Capacitor, 0.01 ufd, 25V, DISC	(common)	C5,C6,C12,C14
1	65-C330.Dlk	Capacitor, 33pfd, 1kv, DISC	(common)	C8
1	65-C101.D1k	Capacitor, 100pfd, 1kv, DISC	(common)	C7
2	65-R104.025	Resistor, 10K, 1/4 watt, 5%	(common)	R1,R3
1	65-R204.025	Resistor, 20K, 1/4 watt, 5%	(common)	R2
1	70-74LS03	I.C. 74LS03	TI	U4
1	70-74LS05	I.C. 74LS05	TI	U5
2	70-74LS243	I.C. 74LS243	TI	U1,U2
1(3)	70-75188	I.C. 75188	TI	U12,U14,U15
1(3)	70-75189	I.C. 75189	TI	U10,U11,U13
2	70-8250	I.C. 8250	National	U7,U8
1	70-8255A	I.C. 8255A	Intel	U9
1	80-1001A	Programmable Array Logic I.C. PAL16R4	Monolethic Memories/SCS	U3
1	90-1001-800	Printed Circuit card	SCS	

Mounting Hardware:

QTY	SCS PN	NOMENCLATURE/DESCRIPTION	MANUF
3	60-205817	DB25 Mounting Hardware	AMP

APPENDIX C CONTINUED SOFTWARE:

HDOS option:

SCS PN	Nomenclature	MANUF.	COST
90-1001-700.x	PARLP.DVD: HDOS Parallel driver	SCS	$25.00

Where x =1 for H/Z 17 Format
      =2 for H/Z 37 Format
      =3 for H/Z 47 Format

CP/M option:

SCS PN	Nomenclature	MANUF.	COST
90-1001-701.x	CP/M support software	SCS	$25.00

      Including: SCSBIOS.ASM
                      SCSBIOS.COM
                      SCSMBIOS.COM
                      SCSMBIOS.SUB

      Where x =1 for H/Z 17 Format
              =2 for H/Z 37 Format
              =3 for H/Z 47 Format

Note: 90-1001-700 or 90-1001-701 is included with the initial purchase. The other software package may be purchased at the cost shown above.

Prices subject to change without notice.

APPENDIX D: ACCESSORY ITEMS (Hardware & Software)

SCS PN	Nomenclature	MANUF.	COST
1001-004	DTE test wrap-around connector	SCS	$10.00
9u-1001-005	DCE test wrap-around connector	SCS	$10.00
90-1001-006	Parallel port wrap-around connector	SCS	$15.00
90-1001-7T1.x	$2/3^{RDS}$ CARD test software (CP/M)	SCS	$25.00
	(Requires Microsoft BASIC interpretor)		
	Where x =1 for H/Z 17 Format		
	=2 for H/Z 37 Format		
	=3 for H/Z 47 Format		
94-SCSPAR-CEN	Centronics style/Epson printer parallel	SCS	$40.00
	cable, 10 feet		
94-SCSPAR-MPI	Parallel interface cable to MPI printer	SCS	$40.00
	cable, 10 feet		

Source Program

90-1001-9700	HDOS Driver Listing	SCS	$35.00
90-1001-9701	CP/M SCSMBIOS.ASM Listing	SCS	$65.00

Prices subject to change without notice.