RIDGE HARDWARE REFERENCE MANUAL

August 26, 1982

INTRODUCTION

This manual describes the controls and indicators for the Ridge processor, I/O device control and monitor programs in the disc interfaces. The hardware manual is intended to be used in conjunction with the processor reference manual for a complete hardware description.

Manual Conventions.

Hexadecimal numbers are specified by a trailing capital H: 3F000H is a hex number. The abbreviation CCB stands for CPU Control Block and is explained in the processor reference manual. Special cpu registers are abbreviated SR, and the general purpose register stored by I/O instructions is designated (R1)

CONTROLS AND INDICATORS

The front panel contains three switches:

Switch	Function
Power On/Off	Controls ac power.
Device 1/2	This is a momentary switch, and when in the rest position selects load device "1", which is the hard disc drive. Depressing the switch selects load device "2", the floppy disc drive.
Load	This is a momentary switch, and when depressed resets the cpu and loads memory from device "1" or "2". In order to load from the floppy drive, depress and hold the device switch in the "2" position. Depress and release the load switch. After two seconds the floppy disc drive head loads, lighting the activity light on the floppy disc drive. Once the floppy disc drive begins loading, the device switch may be released.

In addition to the front panel switches there are six switches mounted on the clock board, which is located at the right end of the card cage inside the main cabinet. These switches are described in the order that they are mounted on the circuit board, from high to low position:

Switch	Function
Single-Clock	This momentary switch supplies the system with one clock pulse when depressed, if either the main clock switch or never-frozen clock switch is set to the frozen position.
Main Clock	During normal operation this switch is set to the left position. When set to the right, the main system clock is frozen. Single clocks may be supplied by depressing the single-clock switch.
Never-Frozen Clock	During normal operation this switch is set to the left position. When set to the right, clock pulses supplied to refresh main memory are frozen. Single never-frozen clocks may be supplied by depressing the single clock switch.
Reset	This momentary switch resets the system hardware and loads memory from the device selected on the front panel. This switch differs from the front panel load switch in that never-frozen clocks are still provided, preserving main memory while still resetting system hardware.
Load Enable	The position of this switch can be tested by software using the ELOGR instruction. This switch is used by microcode when recovering from a power glitch. When set to the left, "load is enabled" and the cpu resumes executing. When set to the right, "load is disabled" and the cpu begins executing at the switch 0 interrupt location in the CCB.
Switch 0	This momentary switch interrupts the cpu, causing execution to begin at the location of the switch 0 interrupt in the CCB.

The system is reset whenever ac power is applied, or the reset switch or load switch is depressed.

The clock board contains five light emitting diodes (LED's) that are used as status indicators. These LED's are located below the bottom switch on the clock board, and function as follows:

LED	Function
Sync	Indicates that the clock board is generating clock signals. When the system is reset, this LED is extinguished for one-half second, then re-lit.
Lost DC	Indicates that dc power was interrupted some time previously. When the system is reset, this LED is lit until the boot command from cpu microcode is issued.
o } o } Group of o } four o }	These LED's indicate the presence of dc power. The first, third and fourth LED's are lit when the system is functioning properly.

In addition to the above switches and indicators, there is a jumper which disables the timekeeping facilities. Timer 1 and timer 2 interrupts are inhibited by placing a jumper across pins 37 and 38 of the edge connector on the clock board. The jumper is placed horizontally on the seventh from the top pair of pins.

System Boot

The system is booted whenever it is reset: by applying ac power, depressing the front panel load button, or depressing the reset button on the clock board. When the system is booted, the cpu microcode sends a boot command to the selected I/O device. If the hard disc drive is selected, 4096 bytes are read from head 0, track 0, sector 4 and placed in memory at location 3E000H. When the floppy disc drive is selected, the entire double density track of 8192 bytes is read from head 0, track 2 and placed in memory at location 3E000H. After loading memory the booting device interrupts the cpu, and the cpu begins executing in kernel mode at location 3E000H. SR11, the CCB pointer is set to 1, disabling timer 1 and timer 2 interrupts.

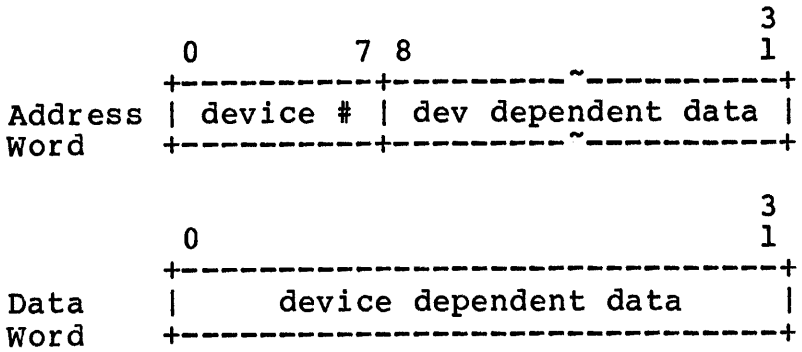
When the floppy disc is the selected boot device, and contains no floppy when sent a boot command, the system waits until a floppy is loaded, then boots. If an error occurs, the floppy disc controller will retry a maximum of three times. There is one condition that prevents the floppy disc from booting -- applying ac power to the system with a floppy disc inside the drive. The floppy disc controller cannot detect the presence of a floppy disc on power on, and should this occur, the system will boot if the door on the floppy disc drive is opened and then shut.

Self-Test

Any time the system is reset, the self-test cpu microcode is executed. When the system is working properly, the eight LED's mounted on the edge of the execute board are lit in sequence, from bottom to top. Each LED is lit for one-tenth second. All LED's are then extinguished, and the self-test continues. If there are no errors, the boot command is issued to the disc drive. Should an error be detected, the top LED is lit and remains lit.

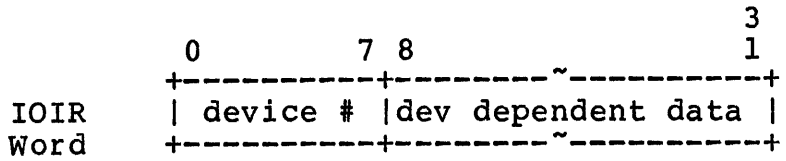
I/O DEVICES

The Ridge processor communicates to I/O interfaces using the WRITE and READ instructions, and the I/O Interrupt Read (IOIR) word on interrupts. The WRITE instruction sends an address word and a data word to a device in the following format:



The most significant byte of the address word is the device number, from 0-255. The remainder of the address word and data word contain device dependent data. The READ instruction sends an address word to the device and receives a data word from the device in reply. If the device specified in the READ or WRITE instruction does not respond in two microseconds, an I/O timeout occurs and is placed as a return indication in (R1).

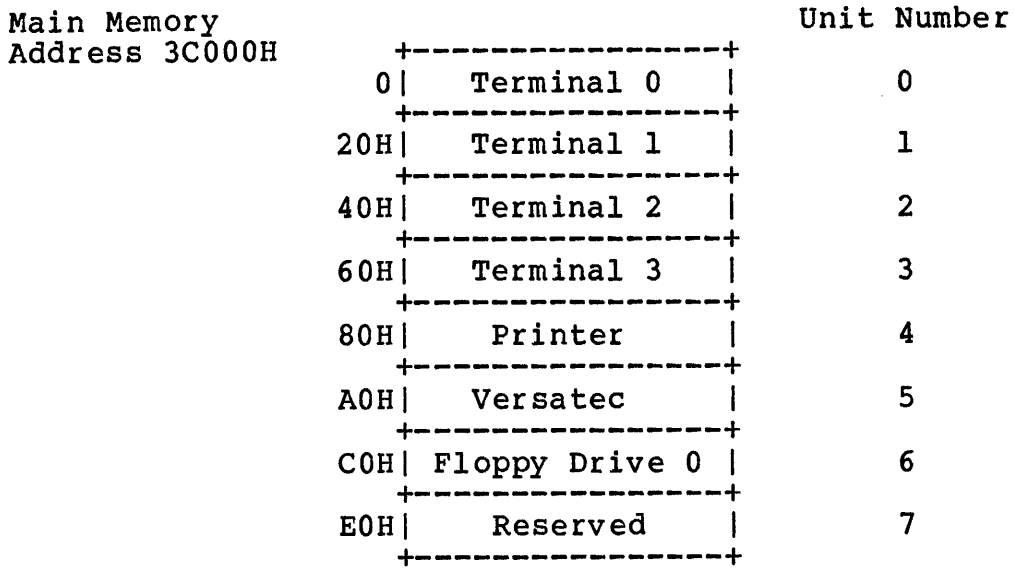
When an I/O device interrupts, the cpu microcode issues an I/O interrupt read, and receives an IOIR word. This word is placed in SR0 upon entry to the kernel. The format of the IOIR is below:



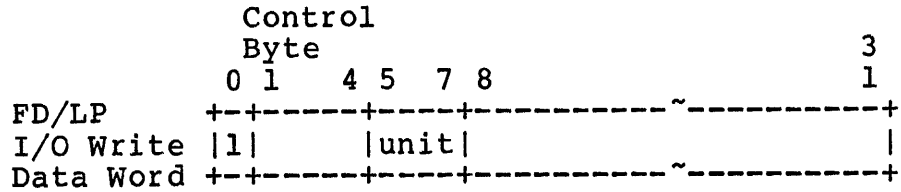
The Ridge system contains three I/O boards: floppy disc controller, hard disc controller and display interface. These interfaces are described below.

Floppy Disc Controller

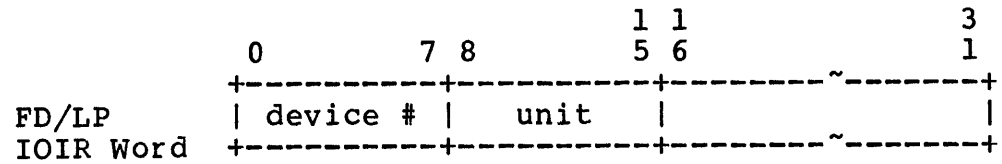
The Floppy Disc/Line Printer (FD/LP) controller can control two floppy disc drives, four RS-232 ports, a Centronics/DataProducts printer port, and a Versatec printer/plotter port. The FD/LP communicates with the Ridge cpu via Device Control Blocks (DCB's) in Ridge main memory. Each DCB is 32 bytes long and the eight control blocks for the FD/LP are laid out as follows:



By executing a WRITE instruction specifying the FD/LP's device number, the FD/LP will perform an I/O function. The FD/LP uses no information from the WRITE address word other than the device number (by convention the FD/LP is device 1), and the data word is laid out as follows:

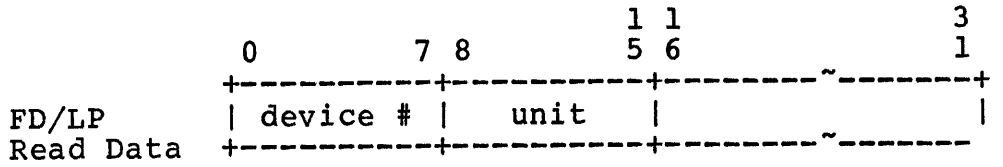


Upon receiving the I/O write command, the FD/LP indexes into the DCB's using the unit number, performs the function, and then interrupts. The format of the IOIR word is as follows:



When performing an I/O function, the FD/LP first reads information from the DCB, then modifies part of the DCB upon completion. The DCB formats for floppy disc drives, printers and plotters are described in the following sections.

A read command (READ instruction) may be sent to the FD/LP at any time. The FD/LP returns its device number and last interrupting unit in the following format:



Terminal Ports

The active pins on the four Ridge RS-232 ports are listed below:

RS-232 Pin	Name
1	Ground.
2	Transmit data.
3	Receive data.
4	Request to send.
5	Clear to send.
7	Signal ground.
8	Carrier detect.
20	Data terminal ready.
22	Ring indicator.

Floppy Discs

The Ridge floppy disc drive accepts soft-sectored, single-sided or double sided, single density or double density floppy discs. The FD/LP handles eight different formats, which are listed in the DCB table below. There are 77 tracks on a floppy disc, numbered from 0 to 76. Sectors are numbered using 1 as the first sector (1-origined). The FD/LP uses an NEC floppy disc controller to handle the details of floppy disc drive control.

The Ridge operating system accepts double-sided, double density floppy discs with 512 bytes per sector, sixteen sectors per track. Head 0, track 0 is formatted single density, with sector 1 containing format information for the remainder of the disc: single-sided or double-sided, single or double density, and number of bytes per sector. Head 1, track 0 contains a UCSD Pascal directory in sectors 1-10. File storage begins in sector 11, track 0, head 0. The capacity of a floppy disc is calculated as follows:

Track 0, head 0		0 bytes
Track 1, head 0, sectors 11-16. 6 sectors X 512 bytes/sector	=	3,072 bytes
Tracks 2-76. 16 sectors/track X 2 heads/track X 512 bytes/sector X 76 tracks	=	1,245,184 bytes
		1,248,256 bytes

Floppy Disc Device Control Block (DCB)

The layout and function of the floppy disc drive device control block is described in the table below:

Hex Addr	Name	Function
0	GORDER	Following are the eleven general orders. For the first eight orders "read" refers to data being transferred into Ridge main memory, while "write" refers to data being transferred from Ridge main memory to the FD/LP. The term "FD/LP build" refers to fact that the FD/LP will fill in the details of the NEC commands in the CMD00 - CMD08 area described below for read, write and format. Please refer to the NEC uPD765 documentation on orders that are not built by the FD/LP. 0 - Read, FD/LP build, with implied seek. 1 - Write, FD/LP build, with implied seek. This command is also used for formatting. 2 - Read, with implied seek. 3 - Write, with implied seek. 4 - Read, FD/LP build. 5 - Write, FD/LP build. 6 - Read. 7 - Write. 8 - Seek, requires only HEAD/UNIT and TRACK. 9 - Recalibrate, requires only HEAD/UNIT and TRACK. Seeks to track specified. A - Return device status (NEC STATUS3) in GSTAT.

Hex Addr	Name	Function
1	SORDER	Provides sub-order information. This byte is laid out below:

```
        7   6   5 3 2 0
      +---+---+---+---+
SORDER |DMA|R/W|DEN|LEN|
      +---+---+---+---+
```

DMA - When this bit is set, there is no DMA activity, ie, the NEC chip only returns status.

R/W - When this bit is set, this indicates a write to the NEC chip (Format is a write).

DEN - This selects density (this field is used in FD/LP build mode only).

- 0 - Double density, 512 X 16.
- 1 - Single density, 128 X 26; IBM diskette 1.
- 2 - Single density, 256 X 15; IBM diskette 2
- 3 - Double density, 256 X 26; IBM diskette 1D
- 4 - Double density, 1024 X 8; IBM diskette 2D
- 5 - Double density, 512 X 15.
- 6 - Double density, 2048 X 4.
- 7 - Double density, 4096 X 2.

LEN - NEC command length. This field must be 0 for reads and writes using FD/LP build and 6 for formatting with FD/LP build.

2 GSTAT — General status:

- 0 - Ok.
- 1 - Not ready.
- 2 - Timeout.
- 3 - Equipment fault.
- 4 - Write protected.
- 5 - Ridge double bit error in data or DCB transfer.
- 6 - Data overrun.
- 7 - Missing address mark.
- 8 - Can't find header.
- 9 - CRC error in header.
- A - CRC error in data.
- FF - Illegal parameter in DCB order.

Hex Addr	Name	Function
3	SSTAT	Special status (from msb to lsb): Bit 7 - Fault. Bit 6 - Write protected. Bit 5 - Ready. Bit 4 - Track 0. Bit 3 - Two-sided. Bit 2 - Head. Bit 1-0 Unit.
4	RETRIES	The number of retries attempted on this request.
5-7	RIDGE ADDRESS	This address must be on a word boundary. The Ridge address plus the request byte count must not cross a 64KB boundary.
8-9	REQUEST BYTE COUNT	
A-B	BYTE COUNT TRANSFERRED	
C	NEC ORDER	This is the NEC first command byte: 5 - Write single density. 6 - Read single density. D - Format a track. 45H - Write double density. 46H - Read double density. 4DH - Format a track double density. Other orders are available, please refer to NEC uPD765 documentation. The format order requires four bytes of information from Ridge main memory to write into each sector. This allows sector labels to be ordered in any fashion. The four bytes per sector are: 1. Track number. 2. Head (0 or 1). 3. Sector number (1-origined). 4. Code for number of bytes per sector: 0 - 128 1 - 256 2 - 512 3 - 1024 4 - 2048 5 - 4096

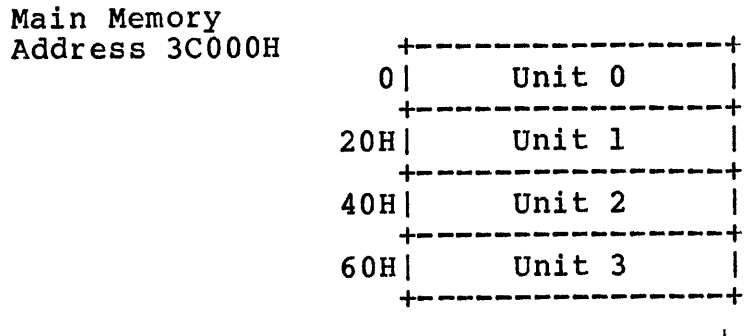
Hex Addr	Name	Function
D	HEAD/UNIT	Head 0/1 is selected by bit 2, unit number is in bits 0-1 (bits numbered 7 for most significant, 0 for least significant).
E	CYLINDER	Number from 0 to 76 (decimal).
F	SECTOR	1-origined number.
10-18	CMD00-CMD08	Please refer to NEC uPD765 documentation. These bytes are filled in by the FD/LP if the "FD/LP" build option is specified in GORDER.
19-1F	STAT00 STAT06	These are the NEC chip status bytes. Please refer to NEC uPD765 documentation. These bytes are not valid for the return device status order, for the seek and recalibrate orders, only STAT00 is valid.

Versatec and Printer Device Control Block (DCB)

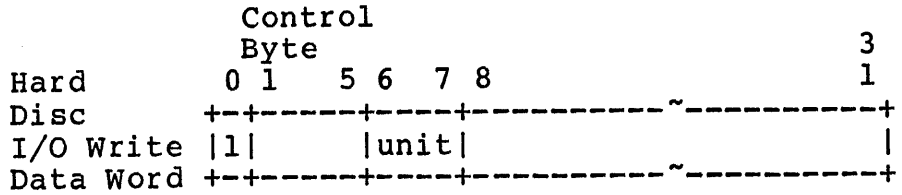
Hex Addr	Name	Function
0	GORDER	Set to 1.
1	SORDER	Sub order (from msb to lsb): Bit 7 - Plot (Versatec only). Bit 6 - SPP (Versatec only). Bit 5 - Dataproducts/Centronics mode (not for Versatec). Set to one selects Centronics. Bit 4 - Clear, done before data transfer. Bit 3 - Reset (Versatec only), done before data transfer. Bit 2 - RFFED (Versatec only), remote form feed. Done after data transfer. Bit 1 - REOTR (Versatec only), remote end of transfer. Done after data transfer. Bit 0 - RLTER (Versatec only), remote line terminate. Done after data transfer.
2	GSTAT	0 - OK. 1 - Offline. 2 - Powered down or not connected. FF - Byte count too high, or other illegal request
3	SSTAT	Not used.
4	RETRIES	Must be 0.
5-7	RIDGE ADDRESS	This address must be on a word boundary. The Ridge address plus the request byte count must not cross a 64KB boundary.
8-9	REQUEST BYTE COUNT	
A-B	BYTE COUNT TRANSFERRED	

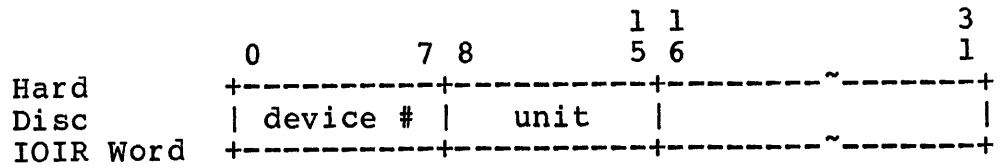
Hard Disc Controller

The hard disc controller can control from one to four hard disc drives. It communicates with the Ridge cpu as does the FD/LP, using DCB's. Each DCB is 32 bytes long and the four control blocks for the hard disc controller are laid out as follows:

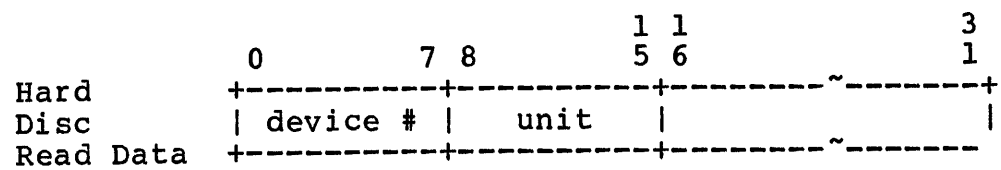


The hard disc controller functions similary to the FD/LP board: 1) a command is sent to the hard disc controller using the WRITE instruction, 2) the hard disc controller uses its device number (by convention the hard disc controller is device 2) from the I/O write address word and the unit number from the I/O write data word to index into the proper DCB, 3) performs the function, and 4) modifies the DCB and interrupts. The format of the I/O write data word and IOIR word follow:





A read command (READ instruction) may be sent to the hard disc controller at any time. The hard disc controller returns its device number and last interrupting unit in the following format:



Hard Disc Controller Device Control Block (DCB)

Hex Addr	Name	Function
0	GORDER	0 - Read. 1 - Write. 2 - Verify. Reads, but no data, transferred to Ridge memory. 3 - Format a track. 4 - Seek 5 - Return Highest Sector Address. This is the physical address of the last addressable sector in HDCYL, CYL, and sector. 6 - Read Full Sector. Data transfer is always 1040 bytes, the transfer count is ignored. The data read is a 12-byte data label, followed by 1024 data bytes, plus a 4-byte checksum. 7 - Write Full Sector. The transfer count is ignored, 1040 bytes are transferred 8 - Read with no retries or error correction. 9 - Write with no retries. A - Verify with no retries or error correction. B - Format with no retries. C - Seek with no retries. D - Spin down (Priam only). E - Read Header. Priam defect log is transferred into first 9 bytes of DATA LABELS.

Hex Addr	Name	Function
1	SORDER	Set to 0.
2	GSTAT	0 - OK. 1 - Not ready. 2 - Timeout. 3 - Equipment fault. 4 - Write protected. 5 - Ridge double bit error in data or DCB transfer. 6 - Data overrun. 7 - Missing address mark (Can't find sync byte). 8 - Can't find header that matches. 9 - CRC error in header. A - Uncorrectable error in data. FF - Illegal parameter in DCB order.
3	SSTAT	Reserved.
4	RETRIES	The number of retries attempted on this request.
5-7	RIDGE ADDRESS	This address must be on a word boundary. The Ridge address plus the request byte count must not cross a 64KB boundary.
8-9	REQUEST BYTE COUNT	
A-B	BYTE COUNT TRANSFERRED	
C		Not used.
D	HDCYL	Four bits of head number, followed by the four most significant bits of the cylinder number.
E	CYL	The least significant eight bits of the cylinder number.
F	SECTOR	Number from 1-18 on 14" Priam.
10-1B	DATA LABELS	These twelve bytes are read/written into each sector on a data transfer. This area is also modified by the read header GORDER.

FLOPPY DISC CONTROLLER (FD/LP) MONITOR PROGRAM

The floppy disc controller uses a Z-80 microprocessor to control many of its functions. It contains a monitor program in read-only memory that can be used as a diagnostic tool to debug the devices connected to the FD/LP board. The FD/LP monitor has the commands to display and modify Ridge main memory that can be used to check the functioning of the memory controller and memory array boards. The monitor program is activated on terminal 0 port whenever the system is reset, or control-Z is input to the terminal 0 port. The monitor prints a banner and a prompt, ">" when the system is reset, and a prompt without the banner when activated by control-Z. The FD/LP monitor commands are listed below.

Special Characters and Syntax Notation

The characters control-X and control-H terminate input and print "***". Control-S may be typed to suspend output from the monitor; typing any subsequent character except control-X or control-H resumes output. Control-X and control-H terminate output. In the syntax used below "[" and "]" surround optional components, "{" and "}" indicates one from the set is required, and terms enclosed by "<" and ">" are defined following the list of commands. All command names and components are separated by at least one blank. Numeric values are all in hex.

Breakpoint Command

BR codeloc	Sets a temporary breakpoint. There are a maximum of eight breakpoints. When this is exceeded, the word "FULL" is displayed, and all breakpoints are cleared.

Boot Command

BO	Boots Ridge from a floppy disc.

Floppy Disc Copy Command

COPYF	Performs a bit-for-bit copy from unit 0 to unit 1.

Display Z-80 Memory Command

D address [length]

Displays memory. Read-only memory starts at address 0. Read/write memory occupies addresses C000H through FFFFH. Typing control-S while memory is being displayed temporarily suspends the display. Typing control-X or control-S terminates the display, while typing any other character resumes displaying memory.

Display Z-80 Registers Command

DR — Displays the values of Z-80 registers at time of the last breakpoint.

Read Diagnostic Floppy Disc Command

DY <unit> {0} {1} — Reads a Dysan Digital Diagnostic Disk in double density mode if 0 is specified, single density mode if 1 is specified. The drive mounted in the Ridge cabinet is <unit> 0.

Format a Floppy Disc Command

FM <unit> <density-code>

Formats a floppy disc in the density specified. <density-code> is described below. Track 0, head 0 is always formatted single density, 128 X 26. The FD/LP senses whether the floppy disc is single-sided or double-sided and formats both sides of a double-sided floppy disc.

Format a Track Command

FT <unit> <density-code> track

Exit Breakpoint Command

G

Read a Port Command

I port-number — Prints the results of a read from the port specified.

Read a Port, Repeatedly, Command

IR port-number — Prints the results of a read from the port specified repeatedly, until carriage return is typed.

Jump to Address Command

J address — Start executing Z-80 code at the specified address.

Download Z-80 Memory Command

Laaaaccccddd...ddd

Binary data is loaded into memory at address "aaaa" for count "cccc". The address and count are binary and in Z-80 form, ie, least significant byte, most significant byte. "ddd...ddd" represents the binary data, these bytes immediately follow the eight address and data bytes.

Modify Z-80 Memory Command

M address

The byte of data at the specified address is displayed in hex. A new value may then be input, followed by carriage return. After carriage return, the next sequential address is displayed, and can then be modified. Typing carriage return leaves the value unmodified. Modify mode is ended by typing any non-hex character.

Write to a Port Command

O port-number value

Writes "value" to the port specified.

Write to a Port, Repeatedly, Command

OR port-number value

"value" is sent to the port specified repeatedly, until carriage return is typed.

Display Ridge Memory (Peek) Command

P ms-Ridge-address ls-Ridge-address length

Display Ridge memory, functions similarly to display memory command.
"ms-Ridge-address" are the 16 most significant Ridge address bits.
"ls-Ridge-address" are the 16 least significant Ridge address bits.

Modify Ridge Memory (Poke) Command

PO ms-Ridge-address ls-Ridge-address

Modifies Ridge memory, functions similarly to modify memory command.

Print Memory to DataProducts Printer Command

PD address length

Functions similarly to display memory command, but output is sent to the DataProducts printer port.

Print Memory to Versatec Printer Command

PV address length

Functions similarly to display memory command, but output is sent to the Versatec printer/plotter port.

Quiet Mode Command

Q

Puts monitor into "quiet mode", and interrupts the Ridge cpu. Characters read or written from terminal port 0 are now passed to the Ridge cpu. The quiet mode command effectively exits the monitor after entering via control-Z.

Read from Floppy Drive Command

R head/unit <density-code> length <loop-option>

Reads from a track on a floppy disc and places the data in Z-80 memory. "head/unit" is:

0 - unit 0, head 0.
1 - unit 1, head 0.
4 - unit 0, head 1.
5 - unit 1, head 1.

<density-code> and <loop-option> are described in the section following the commands. "length" is the number of bytes to be read. "length" <= 1000H results in the data being placed at location E000H. "length" > 1000H results in the data being placed at location D000H. After typing this command line the monitor prompts:

TRK REC?

The track and record (sector) number should then be typed, separated by spaces. If an error occurs, the NEC status bytes are displayed, otherwise the monitor issues a prompt.

Recalibrate Floppy Drive Command

RC <unit>

Read Floppy ID

RI <unit> Prints results of the NEC read ID command. The single-density results are printed, and if this failed, the double-density results are printed on the following line. Please refer to NEC uPD765 documentation for details on the format of this information.

Sense Floppy Drive Command

SD <unit> Prints results of the NEC sense drive command.

Seek Floppy Drive Command

SK <unit> track

Causes the selected unit to seek to the specified track.

Switch RBUG Port Command

SW terminal-port Switches the RBUG to the specified port.

Transfer Data Between Ridge Memory and Z-80 Memory Command

T ms-Ridge-addr ls-Ridge-addr Z-80-addr length direction

This command transfers a block of data either from Ridge memory to Z-80 memory or from Z-80 memory to Ridge memory. "ms-Ridge-addr" are the 16 most significant Ridge address bits. "ls-Ridge-addr" are the 16 least significant Ridge address bits. "Z-80-addr" is the Z-80 memory address. "length" is the number of byte to transfer. "direction" is 0 for read from Ridge memory, 1 for write into Ridge memory.

Exercise Printers Command

V {0 } {1 char} Sends print data to both printer ports. "0" sends 256-byte writes to the Versatec. "1" sends the Versatec "char" in 4096-byte writes.

Write to Floppy Drive Command

W head/unit <density-code> length <loop-option>

Writes data from Z-80 memory to a track on a floppy disc. Operates similarly to the read from floppy drive command.

Execute Test Programs Command

X program — There currently are no test programs for the FD/LP (The hard disc monitor does have test programs, however).

Execute Z-80 LDIR Command

Y target-addess source-address

Performs a Z-80 LDIR instruction.

Exercise Terminal Ports Command

Z — 256-byte writes are sent continuously to terminal ports 1-3.

Definition of Terms

<unit> — Unit 0 is the unit number of the unit mounted in the Ridge system.

<density-code>

0 -double density 512 X 16
1 -single density 128 X 26 IBM Diskette 1
2 -single density 256 X 15 IBM Diskette 2
3 -double density 256 X 26 IBM Diskette 1D
4 -double density 1024 X 8 IBM Diskette 2D
5 -double density 512 X 15
6 -double density 2048 X 2
7 -double density 4096 X 1

<loop-option>

0 - Do one operaton.
1 - Scan from track 1 to 76, forever.

HARD DISC CONTROLLER MONITOR PROGRAM

The hard disc controller uses a Z-80 microprocessor and a monitor program, similar to the floppy disc controller. The hard disc controller monitor is always active, using an RS-232 port located on the front edge connector P1. The monitor prints a banner and a prompt, ">" when the system is reset. The RS-232 pins are connected as follows:

P1-26	Transmit data.
P1-27	Receive data.
P1-31	Signal ground.

The hard disc controller monitor commands are listed below. Commands that are identical to the FD/LP monitor are indicated, and their description is found in the section on the FD/LP monitor. The hard disc controller varies from the FD/LP in that its read/write memory is in two discontinuous pieces, from 2000H -23FFH, and from 3000H - 33FFH, while the Z80 memory on the FD/LP is from C000H - FFFFH.

Breakpoint Command

BR codeloc — See FD/LP monitor description.

Display Z-80 Memory Command

D address length — See FD/LP monitor description.

Display Z-80 Registers Command

DR — See FD/LP monitor description.

Display FIFO Command

DF address — Dumps the contents of the Z-fifo at the address specified.

Load FIFO Command

FF address count

Loads the Z-fifo with the values from memory.

Format Command

FORMAT — Formats unit 0.

Exit Breakpoint Command

G

Read a Port Command

I port-number See FD/LP monitor description.

Read a Port, Repeatedly, Command

IR port-number See FD/LP monitor description.

Jump to Address Command

J address See FD/LP monitor description.

Download Z-80 Memory Command

Laaaaccccddd...ddd

See FD/LP monitor descripton.

Modify Z-80 Memory Command

M address See FD/LP monitor description.

Write to a Port Command

O port-number value

Writes "value" to the port specified.

Write to a Port, Repeatedly, Command

OR port-number value

See FD/LP monitor description.

Display Ridge Memory (Peek) Command

P ms-Ridge-address ls-Ridge-address length

See FD/LP monitor description.

Modify Ridge Memory (Poke) Command

PO ms-Ridge-address ls-Ridge-address length

See FD/LP monitor description.

Quiet Mode Command

Q Interrupts the Ridge cpu.

Read from Hard Disc

R unit ms-Ridge-addr ls-Ridge-addr length head cylinder

Reads "length" bytes into Ridge memory from the disc track at the specified head and cylinder.

Seek Command

SK cylinder — Causes the disc to seek to the specified cylinder.

Transfer Data Between Ridge Memory and Z-80 Memory Command

T ms-Ridge-addr ls-Ridge-addr Z-80-addr length direction

See FD/LP monitor descripton.

Transfer Data Between Ridge and Z-80 Memory, Forever, Command

U ms-Ridge-addr ls-Ridge-addr Z-80-addr length direction

This command is the same as the above command, except that the transfer is repeated forever.

Verify Hard Disc Command

V (needs two carriage returns)

This command reads the entire disc, displaying all retries and uncorrectable errors.

Write to Hard Disc Command

W unit ms-Ridge addr ls-Ridge addr length head cylinder

Writes "length" bytes from Ridge memory onto the disc track at the specified head and cylinder.

Execute Test Programs Command

X program-number Executes one of the following test programs according to the "program-number" below:

- 0 - Display device attributes for ANSI drive.
- 1 - Perform maximum length seek.
- 2 - Test parallel data path to ANSI drive.
- 3 - Seek forever.
- 4 - Verify forever.
- 5 - Read forever.
- 6 - Write forever.
- 7 - Execute a DCB forever.
- 8 - Partition track.
- 9 - Spin down a Priam drive.
- A - Seek between two cylinders.
- B - Perform all possible seeks.
- C - Perform all possible seeks, printing as each is performed.

Execute Z-80 LDIR Command

Y target-addess source-address

Performs a Z-80 LDIR instruction.

DISPLAY INTERFACE

The display interface supports one Ridge graphics display with keyboard. A 128K-byte frame buffer is located on the display interface to handle display refresh without utilizing Ridge main memory. The refresh buffer uses dynamic RAM chips that are themselves refreshed by the video sweep. The display interface can perform four memory transfer operations:

Write Buffer	- Move Data from main memory to refresh buffer.
Read Buffer	- Move data from refresh buffer to main memory.
Scroll Up	- Move data from one place to another in refresh buffer, with increasing addresses.
Scroll Down	- Similar to scroll up, except the data is moved with decreasing addresses.

All data operations are multiples of 32 bits, aligned on word boundaries. The video sweep acceses memory in increasing sequential order from 0 to the highest displayable location.

Each display is assigned two device numbers (by convention the first display interface uses 4 for the keyboard and 5 for the display).

The display interface has four registers to control memory transfers:

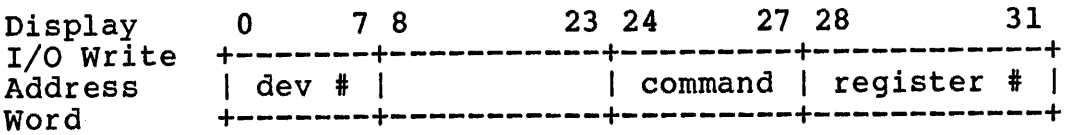
1) The memory address register (MAR) is a 24-bit register with two functions; for write/read it contains the main memory source or destination address, for scrolling it contains the destination address in the refresh buffer.

2) The display address register (DAR) is a 16-bit register that contains the refresh buffer source or destination address. For scrolling, it contains the buffer source address.

3) The count register controls the length of a transfer. A count of 0 results in no operation.

4) The status register is used to control display attributes and interrupts, and return information on the display interface's state.

The I/O address and data words to read and write these registers follows:



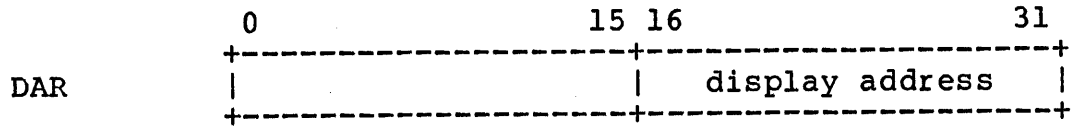
Command — Specifies the operation:

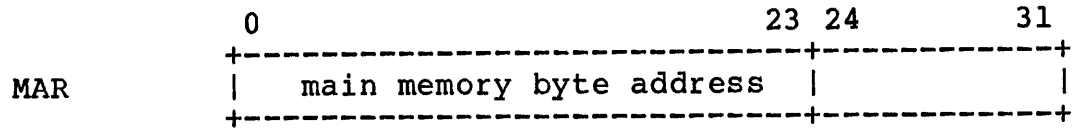
- 1F - NOP
- 0E - Write Buffer
- 0D - Read Buffer
- 0B - Scroll Up
- 07 - Scroll Down
- 0F - Terminate Operation

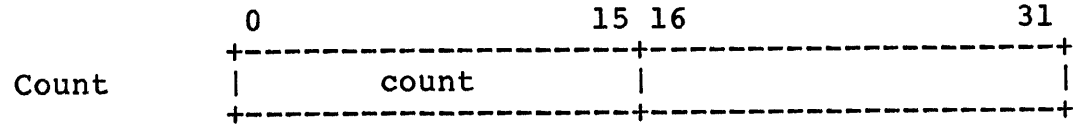
Register # — Specifies the register to be written.

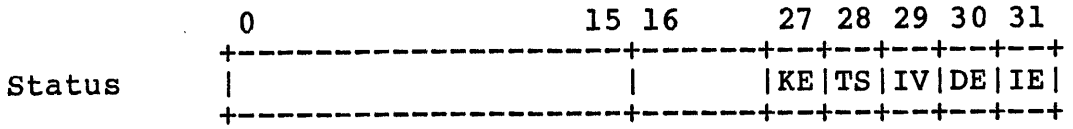
- 0 - NOP
- 1 - DAR
- 2 - MAR
- 4 - Count
- 5 - Both DAR and Count
- 8 - Status

Display I/O Write Data Word









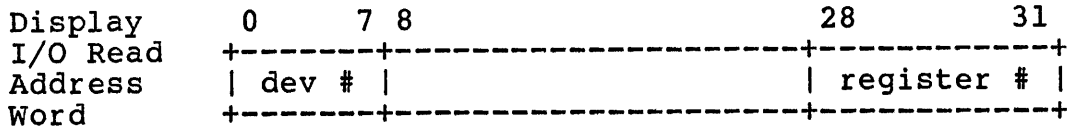
KE - Keyboard interrupt enable

TS - Top of screen interrupt enable. When set, display interrupts when beam is at top of screen (every 1/60 second).

IV - Inverse video. When set, display screen is bright and trace is dark.

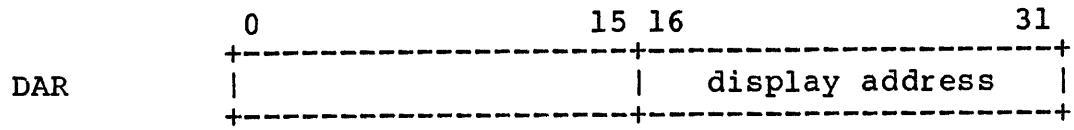
DE - Display enable. Turns display on and off. Does not affect refresh.

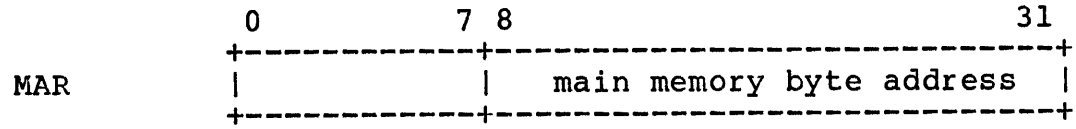
IE - Interrupts enable. Enables interrupts from both display and keyboard.

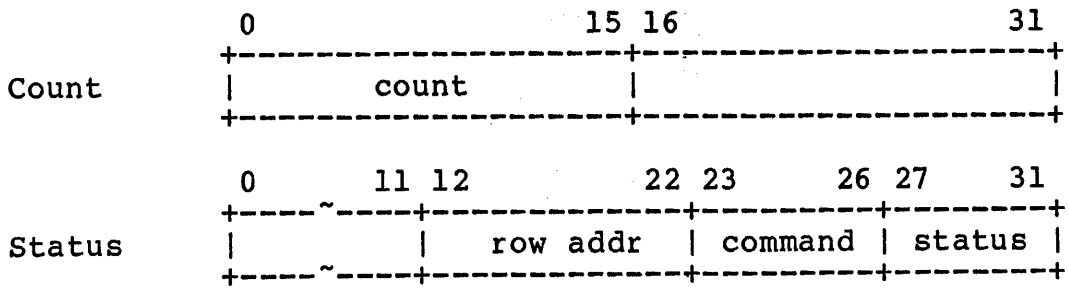


Register # - Same as for I/O write address word.

Display I/O Read Data Word







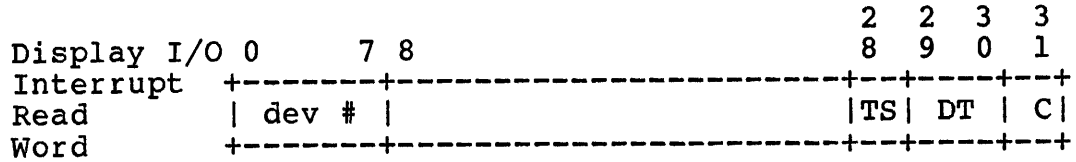
Row addr - Row address of beam.

Command - Operation currently in progress:

E - Write buffer
D - Read buffer
B - Scroll up
7 - Scroll down
F - Not busy

Status - Same as in I/O write data word.

There are two types of interrupts: display and keyboard. The format of the display and keyboard I/O interrupt read words follow below:



Dev # - The least significant bit (bit 7) indicates keyboard or display interrupt. When the display interrupts, bit 7 is set.

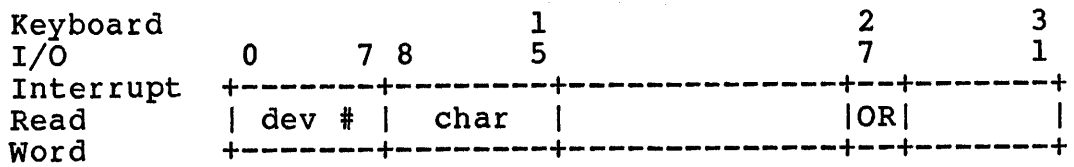
TS - Beam at top of screen.

DT - Display type:

0 - 1024 x 800 horizontal display
1 - 768 x 1024 vertical display
2 - Reserved
3 - Reserved

C - Completion.

Display I/O Interrupt Read Word -- Keyboard



Dev # - The least significant bit (bit 7) indicates keyboard or display interrupt. When the keyboard interrupts, bit 7 is clear

OR - Overrun. The display board's 3 word buffer is full, and another character has been received.