

MONITOR DYNAMICS, INC
SPECIFICATION

HDC-1013 SERIES HARD DISK CONTROLLER FOR IEEE-696 MICROCOMPUTERS

THE MONITOR DYNAMICS, INC. HDC-1013 SERIES HARD DISK CONTROLLER IS DESIGNED TO INTERFACE MOST WINCHESTER TECHNOLOGY HARD DISK DRIVES TO THE IEEE-696 (S-100) MICROCOMPUTER BUS. THE CONTROLLER SUPPORTS THREE COMMON DRIVE INTERFACES, ST506, SA1000, AND SA4000. FOR THE ST506 AND SA1000 INTERFACES THE CONTROLLER UTILIZES A PLUG-ON DATA SEPARATOR. THE CONTROLLER OCCUPIES TWO SLOTS OF AN S-100 MOTHERBOARD (.75 INCH SPACING) IF THE PLUG-ON DATA SEPARATOR IS BEING USED.

THE CONTROLLER WILL SUPPORT 4096 CYLINDERS AND 16 HEADS. IT IS SOFT SECTORED WITH SECTOR SIZES OF 256, 512, & 1024 BYTES/SECTOR.

THE CONTROLLER IS A COMMAND AND RESPONSE PORT I/O DEVICE.

I/O:

THE CONTROLLER USES 4 CONSECUTIVE PORT ADDRESSES FOR I/O:

| | READ COMMANDS | WRITE COMMANDS |
|--------|-----------------------|--|
| PORT 0 | READ STATUS REG | WRITE COMMAND REG |
| PORT 1 | NOT USED | WRITE DATA BUFFER REG |
| PORT 2 | READ DATA BUFFER REG | RESET BUFFER ADDRESS COUNTER/ SET OR CLEAR INTERRUPT MASK/ ENABLE CONTROLLER |
| PORT 3 | READ BUSY/READY FLAGS | RESET CONTROLLER |

COMMANDS:

THE CONTROLLER WILL RESPOND TO THE FOLLOWING COMMANDS:

| COMMAND CODES (BINARY) | ACTION | RESPONSE |
|------------------------|--|-------------|
| ----- | ----- | ----- |
| 01SSSSSS | SETS SECTOR 1-63 | NONE |
| CCCCCCCC | MUST BE FOLLOWED (AFTER BUSY IS FALSE) BY CYLINDER LSB (BITS 0-7) | NONE |
| AND | | |
| HHHCCCC | HEAD AND CYL MSB (BITS 8-11) | NONE |
| 00010000 | DESELECTS ALL DRIVES | STATUS BYTE |
| 00010001 | SELECTS DRIVE 1 | STATUS BYTE |
| 00010010 | SELECTS DRIVE 2 | STATUS BYTE |
| 00100000 | RESTORE DRIVE | STATUS BYTE |
| 00100001 | SEEK CYLINDER | STATUS BYTE |
| 00100010 | WRITE SECTOR(W/IMPLIED SEEK) | STATUS BYTE |
| 00100011 | READ SECTOR(W/IMPLIED SEEK) | STATUS BYTE |
| 00100100 | FORMAT TRACK(W/IMPLIED SEEK) | STATUS BYTE |
| 00100101 | RE-INITIALIZE CONTROLLER | STATUS BYTE |
| 00000000 THRU 00001111 | RESERVED | |
| 00010011 THRU 00011111 | RESERVED | |
| 00110000 THRU 00111111 | RESERVED | |

THE CONTROLLER WILL RETURN A STATUS BYTE AT THE COMPLETION OF THE COMMAND OR DRIVE SELECT.

AN INTERRUPT WILL BE GENERATED AND PLACED ON THE BUS ON THE SELECTED INTERRUPT LINE IF INTERRUPTS HAVE BEEN ENABLED.

THE STATUS REGISTER BYTE INCLUDES THE FOLLOWING INFORMATION:

- BIT 0 = DRIVE NOT READY
- BIT 1 = SECTOR BUFFER COUNTER/TRANSFER ERROR
- BIT 2 = CRC ERROR
- BIT 3 = WRITE FAULT ERROR, FROM DRIVE
- BIT 4 = RECORD NOT FOUND
- BIT 5 = SEEK ERROR, NO SEEK COMPLETE FROM DRIVE
- BIT 6 = RESERVED
- BIT 7 = CONTROLLER TIMEOUT

THE FLAG REGISTER PORT CONTAINS THE FOLLOWING INFORMATION:

- BIT 0 0 = NOT BUSY, COMMAND REGISTER EMPTY
- 1 = BUSY, COMMAND REGISTER FULL
- BIT 6 0 = DATA BUFFER TRANSFER ERROR
- 1 = DATA BUFFER TRANSFER CORRECT
- BIT 7 0 = COMMAND COMPLETE, STATUS BYTE READY. READING THE STATUS PORT CLEARS THIS FLAG
- 1 = NO STATUS BYTE PENDING

JUMPER OPTIONS:

THE FOLLOWING JUMPER OPTIONS CAN BE SELECTED BY THE USER;

BASE NUMBER OF THE CONTROLLER BOARD PORT ADDRESS (10H-F0H)
VECTORED INTERRUPT LINE (V10-V17)
SECTOR SIZE (256, 512 1024 BYTES/SECTOR)
POC, SLV/CLR, OR RESET FOR CONTROLLER INITIALIZATION

SECTOR FORMAT:

THE CONTROLLER USE THE FOLLOWING SECTOR FORMAT.

| | | | |
|--|-------|----|-----------------------------------|
| 14 | BYTES | 00 | PLL SYNC |
| 1 | BYTE | A6 | HEADER SYNC |
| 1 | BYTE | FE | HEADER MARK |
| 3 | BYTES | | SURFACE, CYLINDER, AND SECTOR NO. |
| 2 | BYTES | | HEADER CRC |
| 2 | BYTES | 00 | HEADER DATA FIELD SPLICE GAP |
| 14 | BYTES | 00 | PLL SYNC |
| 1 | BYTE | AC | DATA SYNC |
| N | BYTES | | 256, 512, OR 1024 BYTES OF DATA |
| 2 | BYTES | | DATA CRC |
| 2 | BYTES | 00 | DATA FIELD SPLICE GAP |
| 16 | BYTES | 4E | INTER-RECORD GAP |
| TOTAL = 314, 570, OR 1082 BYTES/SECTOR | | | |

PHYSICAL DIMENSIONS:

THE CONTROLLER CONFORMS TO THE IEEE-696 SPECIFICATIONS. HOWEVER WITH THE DATA SEPARATOR THE DEPTH OF THE PACKAGE BECOMES 1 INCH.

INTERFACES:

THE FOLLOWING TABLE SHOWS THE CONNECTOR CONFIGURATION FOR INTERFACING TO VARIOUS DRIVE INTERFACE TYPES:

| | STS06 | SA1000 | SA4000 (MEMOREX) |
|----|--------------------------|--------------------------|------------------------|
| P2 | 20 PIN DRIVE 0 RADIAL | 20 PIN DRIVE 0 RADIAL | NOT USED |
| P3 | 20 PIN DRIVE 1 RADIAL | 20 PIN DRIVE 1 RADIAL | NOT USED |
| P4 | 34 PIN CONTROL/DATA | 50 PIN CONTROL/DATA | NOT USED |
| P5 | NOT USED | NOT USED | 50 PIN CONTROL/DATA |

CONNECTORS:

THE 50-PIN CONTROL CABLE FOR 8 & 14 INCH DRIVES REQUIRES A MATING CONNECTOR SIMILAR TO:

AMP 1-499566-2
SPECTRA-STRIP 812-050

THE 34-PIN CONTROL CABLE CONNECTOR FOR 5.25 INCH DRIVES REQUIRES A MATING CONNECTOR SIMILAR TO:

AMP 499566-9
SPECTRA-STRIP 812-034

THE 20-PIN RADIAL CABLE CONNECTOR REQUIRES A MATING CONNECTOR SIMILAR TO:

AMP 499568-4
SPECTRA-STRIP 812-020

POWER REQUIREMENT:

THE CONTROLLER WITHOUT DATA SEPARATOR: 1.3A @ 8VDC
WITH DATA SEPARATOR: 1.9A

HDC-1013 SERIES WINCHESTER DISK CONTROLLER
 CONTROLLER COMMANDS AND RESPONSES

TERMS:

AAAA : 4 BIT CONTROLLER ADDRESS SET BY JUMPERS
 HHH : 3 BIT HEAD NUMBER (0-7)
 SSSSS : 6 BIT SECTOR NUMBER (1-MAX)
 DD : 2 BIT DRIVE NUMBER (0-2)
 MMMM : 4 BIT COMMAND CODE
 PPP : 3 BIT RECORD NUMBER
 1 : INTERRUPT MASK

PORT ADDRESSES:

AAAA0000 : WRITE CONTROLLER COMMAND PORT
 READ CONTROLLER STATUS PORT
 AAAA0001 : WRITE SECTOR BUFFER DATA PORT
 RESERVED
 AAAA0010 : WRITE RECORD NUMBER/INTERRUPT MASK/ENABLE CONTROLLER
 READ SECTOR BUFFER DATA PORT
 AAAA0011 : WRITE DATA WORD=00H TO RESET CONTROLLER
 READ CONTROLLER FLAGS PORT

FLAG PORT:

BIT 0 0=NOT BUSY, COMMAND REGISTER EMPTY
 1=BUSY, COMMAND REGISTER FULL
 BIT 6 1=BUFFER TRANSFER ERROR
 0=BUFFER TRANSFER CORRECT
 (USED TO INDICATE PROPER BUFFER TRANSFERS
 BETWEEN SECTOR BUFFER AND HOST.)
 -BIT 7 0=COMMAND COMPLETE (STATUS BYTE READY, READING
 STATUS PORT CLEARS THIS FLAG)
 1=NO STATUS BYTE PENDING

BUFFER POINTER:

1XXXXPPP : PPP = RECORD NUMBER REQUESTED.
 (PPP = 0-1 FOR 256 BYTES/SECTOR)
 (PPP = 0-3 FOR 512 BYTES/SECTOR)
 (PPP = 0-7 FOR 1024 BYTES/SECTOR)
 1 = 1 INTERRUPTS ENABLED
 0 = 0 INTERRUPTS DISABLED
 (SET INTERRUPT MASK PRIOR TO ANY COMMAND
 IN WHICH AN INTERRUPT RESPONSE IS DESIRED.
 WHEN THE CONTROLLER COMPLETES THE COMMAND
 THE INTERRUPT WILL BE SET - THE SELECTED
 VECTOR WILL BE ACTIVE LOW. THE INTERRUPT WILL
 BE CLEARED WHEN THE STATUS PORT IS READ OR
 THE MASK IS RESET.)

CONTROLLER COMMANDS:

| | | | |
|--|----------|--------------------------------|-------------|
| 41-7F | 01SSSSSS | SETS SECTOR (1 THRU MAX) | NONE |
| 00-FF | CCCCCCCC | SET 6 LSB'S OF CYLINDER | NONE |
| 00-FF | HHHCXXX | SET HEAD & 4 MSB'S OF CYLINDER | NONE |
| (THE CONTROLLER REQUIRES THE SECTOR, CYLINDER, & HEAD PARAMETERS TO BE HANDSHAKED CONSECUTIVELY WITH THE BUSY SIGNAL.) | | | |
| 00-0F | RESERVED | | |
| 10 | 00010000 | DESELECT ALL DRIVES | STATUS BYTE |
| 11 | 00010001 | SELECT DRIVE 1 | STATUS BYTE |
| 12 | 00010010 | SELECT DRIVE 2 | STATUS BYTE |
| 13-1F | RESERVED | | |
| 20 | 00100000 | RESTORE DRIVE | STATUS BYTE |
| 21 | 00100001 | SEEK CYLINDER | STATUS BYTE |
| 22 | 00100010 | WRITE SECTOR (W/IMPLIED SEEK) | STATUS BYTE |
| 23 | 00100011 | READ SECTOR (W/IMPLIED SEEK) | STATUS BYTE |
| 24 | 00100100 | FORMAT HEADERS (IMPLIED SEEK) | STATUS BYTE |
| 25 | 00100101 | INITIALIZE CONTROLLER | STATUS BYTE |
| 30-3F | RESERVED | | |

STATUS BYTE DECODED (1=ERROR CONDITION)

| | |
|-------|--|
| BIT 0 | :DRIVE NOT READY |
| 1 | :SECTOR BUFFER COUNTER/TRANSFER ERROR |
| 2 | :CRC ERROR |
| 3 | :WRITE FAULT(DRIVE PROBLEM) |
| 4 | :RECORD NOT FOUND |
| 5 | :SEEK ERROR (DRIVE PROBLEM) |
| 6 | :RESERVED |
| 7 | :CONTROLLER TIMEOUT (USUALLY NO CLOCK TO CONTROLLER BECAUSE OF INCORRECT RADIAL CABLE) |

NORMAL SEQUENCE OF CONTROLLER OPERATION:

- 1) USE UTILITY TO FORMAT A NEW DRIVE.
- 2) PLACE CONTROLLER IN RESET BY OUTPUTTING 00H TO PORT AAAA0011.
- 3) ENABLE THE CONTROLLER BY OUTPUTTING 00H TO PORT AAAA0010.
- 4) THE CONTROLLER WILL RESPOND UPON INITIALIZATION WITH STATUS BYTE = 00H. (DRIVE MUST BE READY)
- 5) TO WRITE A SECTOR;
 - A) SET RECORD POINTER, INCLUDING INTERRUPT MASK AS REQUIRED. (OUTPUT 10000PPP TO PORT AAAA0010)
 - B) MOVE DATA FROM HOST MEMORY TO SECTOR BUFFER WITH OUTPUT INSTRUCTIONS TO PORT AAAA0001. (OTIR'S IN Z-80 MNEMONICS)
 - C) ENCODE AND OUTPUT HEAD, CYL, & SECTOR NUMBERS USING SET COMMANDS.
 - D) OUTPUT A WRITE COMMAND (22H) TO PORT AAAA0000
 - E) WAIT FOR BIT 7 (ACTIVE LOW) ON FLAG PORT OR WAIT FOR INTERRUPT.
 - F) INPUT STATUS FROM PORT AAAA0000.
 - G) IF STATUS =00, THEN NO ERRORS, OTHERWISE DO AN OPTIONAL RETRY BY REPEATING E THRU G.

- 6) TO READ A SECTOR;
 - A) ENCODE & OUTPUT HEAD, CYL, & SECTOR NUMBERS TO PORT AAA0000.
 - B) OUTPUT A READ COMMAND (23H) TO PORT AAAA0000.
 - C) WAIT FOR BIT 7 (ACTIVE LOW) ON FLAG PORT, OR WAIT FOR INTERRUPT.
 - D) INPUT STATUS FROM PORT AAAA0000.
 - E) IF STATUS = 00, THEN NO ERRORS, OTHERWISE TRY AN OPTIONAL RETRY BY REPEATING B THRU D.
 - F) SET RECORD POINTER AND INTERRUPT MASK AS DESIRED. (OUTPUT 10000PPP TO PORT AAAA0010)
 - G) MOVE DATA FROM SECTOR BUFFER TO MEMORY WITH INPUT INSTRUCTIONS FROM PORT AAAA0010. (INIR'S IN Z-80 CODE)

AN EXAMPLE METHOD OF ENCODING HEAD/CYLINDER/SECTOR/RECORD IN CP/M 2.2

- 1) DEFINE OPERATING SYSTEM SECTORS AS RECORDS SO THAT LSB OF SECTOR IS A RECORD NUMBER.

EXAMPLE: WITH 256 BYTES/SECTOR AND 32 SECTORS/TRACK THERE WOULD BE 64 X 128 RECORDS.

$$256 \times 32 = 8192 \text{ BYTES}$$

$$128 \times 64 = 8192 \text{ BYTES}$$

THE 64 RECORDS WOULD BE LABELLED 00 THRU 3F IN HEX. THE LSB DEFINES RECORD 0 OR 1, AND THE 5 MSB WOULD DEFINE THE SECTOR NUMBERS, LABELLED 00 THRU 1F IN HEX.

- 2) DEFINE THE OPERATING SYSTEM TRACKS AS:

(CYLINDERS X NO. OF HEADS) + THE HEAD NUMBER

EXAMPLE: FOR 256 CYLINDERS AND 4 HEADS, THERE WOULD BE $256 \times 4 = 1024$ CYLINDERS, LABELLED 000 THRU 3FF IN HEX. THE TWO LSB'S DEFINE THE HEAD NUMBER (0-3), AND THE 8 MSB'S WOULD DEFINE THE REQUIRED CYLINDER.

- 3) COMPUTE ACTUAL SECTOR BY SHIFTING HOST SECTOR LEFT BY 1 FOR 256, 2 FOR 512, OR 3 FOR 1024 BYTE SECTORS.
- 4) USE BLOCKING/DEBLOCKING TO DETERMINE PRE-READ OR BUFFER WRITE REQUIREMENTS.
- 5) USE DRIVERS GIVEN TO OPERATE CONTROLLER

HDC-1013 SERIES WINCHESTER DISK CONTROLLER
CONNECTOR AND JUMPER CONFIGURATION

P2 : RADIAL CONNECTOR FOR DRIVE 1
P3 : RADIAL CONNECTOR FOR DRIVE 2
P4 : CONTROL CONNECTOR FOR ST-506 & SA-1000 TYPE DRIVES
P5 : CONTROL CONNECTOR FOR MEMOREX/FUJITSU TYPE DRIVES
(NOTE: JUMPER THE M101 DRIVES TO SUPPLY
DATA ON THE CONTROL CABLE)
TERM : TERMINATORS FOR 8 INCH DRIVES (INSTALL VERTICAL)
M,M- : FAULT CLEAR JUMPER (M FOR MEMOREX)
E1-E8 : I/O FOR DATA SEPARATOR
E9-E16 : SIGNALS FOR DATA SEPARATOR ONLY

NOTE: WHEN THE DATA SEPARATOR IS NOT USED AND THE SEPARATOR
CIRCUITRY ON-BOARD THE DRIVE IS IMPLEMENTED THE
CONTROLLER MUST HAVE THE FOLLOWING JUMPERS INSTALLED:

JUMPER E1 - E2
E3 - E4
E5 - E6
E7 - E8
M/M- (MEMOREX OR NOT MEMOREX)
S : JUMPER FOR CONTROLLER RESET ON SLAVE CLEAR
(SLAVE CLEAR = BUS PIN 54)
R : JUMPER FOR CONTROLLER RESET ON RESET SWITCH
(RESET = BUS PIN 75)
POC : JUMPER FOR CONTROLLER RESET ON POWER-ON-CLEAR
(POC = BUS PIN 99)
VI0-7 : VECTORED INTERRUPT 0-7
JUMPER AS REQUIRED

BOARD ADDRESS : SELECTS THE BASE ADDRESS OF THE FOUR I/O PORTS

BIT
NUMBER ADDRESS (IN HEX)
(7654)

(J=JUMPER, 0=NO JUMPER)

| | |
|------|--------------|
| JJJJ | 00H THRU 03H |
| JJJ0 | 10H THRU 13H |
| JJ0J | 20H THRU 23H |
| JJ00 | 30H THRU 33H |
| J0JJ | 40H THRU 43H |
| J0J0 | 50H THRU 53H |
| J00J | 60H THRU 63H |
| J000 | 70H THRU 73H |
| 0JJJ | 80H THRU 83H |
| 0JJ0 | 90H THRU 93H |
| 0J0J | A0H THRU A3H |
| 0J00 | B0H THRU B3H |
| 00JJ | C0H THRU C3H |
| 00J0 | D0H THRU D3H |
| 000J | E0H THRU E3H |
| 0000 | F0H THRU F3H |

SECTOR SIZE

| | |
|-----------------------------------|----------|
| ----- | ---- |
| 256 | 0-0 |
| BYTES | |
| PER | 0-0 |
| SECTOR | 0 0 |
| | ! |
| | 0 0 |
| | 0 0 |
| ----- | ----- |
| 512 | 0-0 |
| BYTES | |
| PER | 0 0 |
| SECTOR | ! |
| | 0 0 |
| | 0-0 |
| | 0 0 |
| ----- | ----- |
| 1024 | 0 0----- |
| BYTES | ! |
| PER | 0 0 !B |
| SECTOR | !C ! |
| | 0 0----- |
| JUMPER B OR C DEPENDING ON | |
| BOARD REVISION LEVEL | 0 0 |
| JUMPER B = BOARD REV B | ! ! |
| JUMPER C = BOARD REV C OR GREATER | 0 0 |

NOTE: DRIVE TYPES

NORMALLY THE CONTROLLER AND THE DATA SEPARATOR ARE CONFIGURED FOR A DESIRED DRIVE TYPE AT THE FACTORY. THE SEPARATOR IS CONFIGURED VIA 4 TYPE JUMPERS SELECTING THE DRIVE TYPE AND SECTOR SIZES. THE TYPE OF DRIVE SELECTED INDICATES TO THE CONTROLLER WHICH STEP TIMING AND MODE TO USE AND WELL AS WHAT SECTOR SIZE THE USER DESIRES. IF THE USER DECIDES TO CHANGE DRIVE TYPES OR SECTOR SIZE THE TYPE CODE NECESSARY CAN BE FOUND IN THE FOLLOWING TABLE.

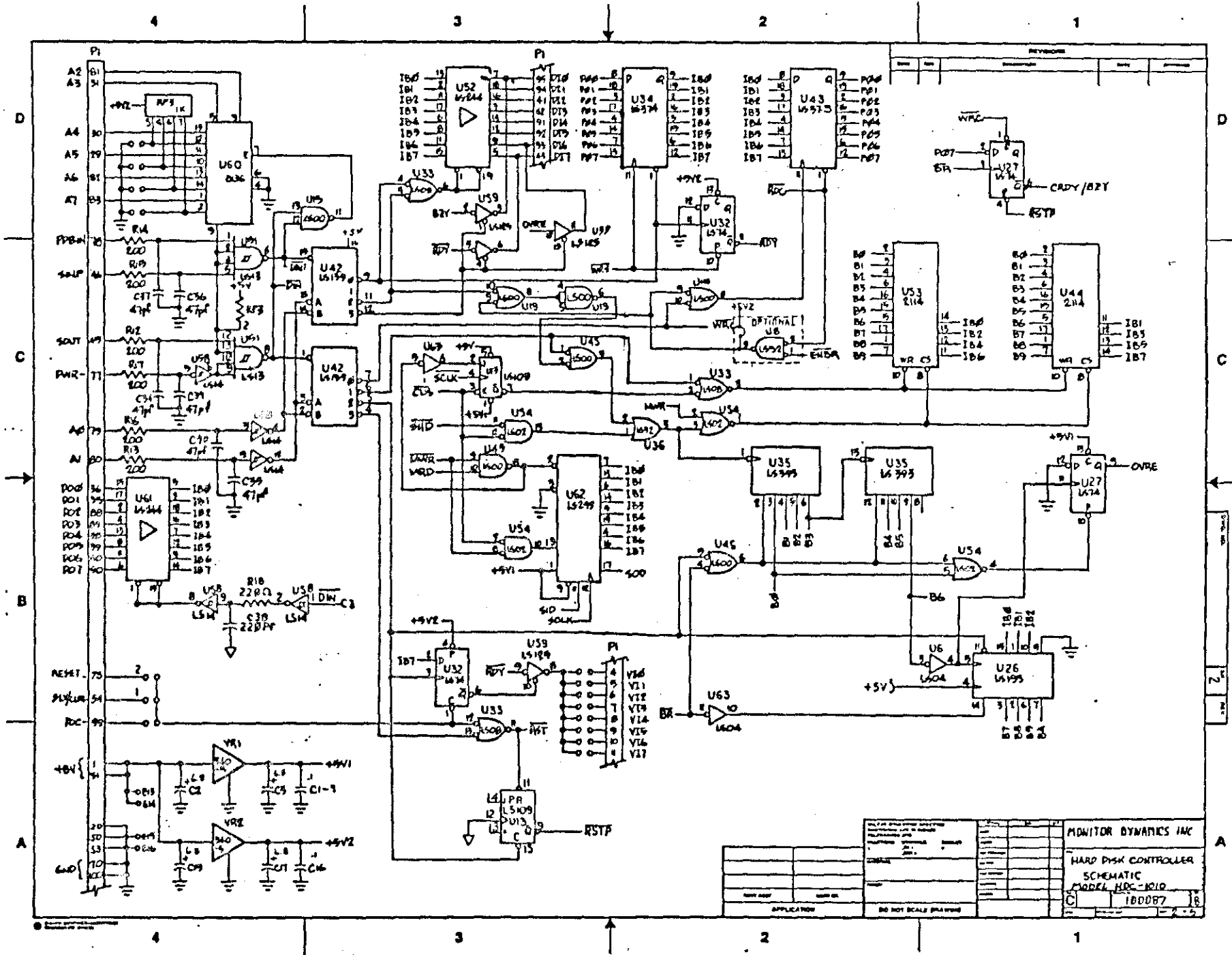
JUMPER TABLE AND PARAMETERS
 J=JUMPERED 0=NOT JUMPERED

| TYPE NUMBER | | | | | | |
|-------------|---|---|---|--------------------------------------|------------------|------------------|
| 3 | 2 | 1 | 0 | | | |
| J | J | J | J | BUFFERED STEP; | 32 SECTORS/TRACK | 256 BYTE/SECTOR |
| J | J | J | 0 | BUFFERED STEP; | 38 SECTORS/TRACK | 256 BYTE/SECTOR |
| J | J | 0 | J | ST506 HALFSTEP; | 32 SECTORS/TRACK | 256 BYTE/SECTOR |
| J | J | 0 | 0 | UNBUFFERED STEP; | 32 SECTORS/TRACK | 256 BYTE/SECTOR |
| J | 0 | J | J | BUFFERED STEP; | 17 SECTORS/TRACK | 512 BYTE/SECTOR |
| J | 0 | J | 0 | BUFFERED STEP; | 21 SECTORS/TRACK | 512 BYTE/SECTOR |
| J | 0 | 0 | J | ST506 HALFSTEP; | 07 SECTORS/TRACK | 512 BYTE/SECTOR |
| J | 0 | 0 | 0 | UNBUFFERED STEP; | 17 SECTORS/TRACK | 512 BYTE/SECTOR |
| 0 | J | J | J | BUFFERED STEP; | 9 SECTORS/TRACK | 1024 BYTE/SECTOR |
| 0 | J | J | 0 | BUFFERED STEP; | 11 SECTORS/TRACK | 1024 BYTE/SECTOR |
| 0 | J | 0 | J | ST506 HALF STEP; | 9 SECTORS/TRACK | 1024 BYTE/SECTOR |
| 0 | J | 0 | 0 | UNBUFFERED STEP; | 9 SECTORS/TRACK | 1024 BYTE/SECTOR |
| 0 | 0 | J | J | BUFFERED STEP MODE, RRC/EPC*; | 32 SECTORS/TRACK | 256 BYTE/SECTOR |
| 0 | 0 | J | 0 | BUFFERED STEP MODE, RRC/EPC*; | 17 SECTORS/TRACK | 512 BYTE/SECTOR |
| 0 | 0 | 0 | J | BUFFERED STEP MODE, RRC/EPC*; | 9 SECTORS/TRACK | 1024 BYTE/SECTOR |
| 0 | 0 | 0 | 0 | DMA CARTRIDGE OPTION, BUFFERED STEP, | 33 SECTORS | 256 BYTE/SECTOR |

* NOTE: REDUCED WRITE CURRENT/ENABLE PRE-COMPENSATION (RRC/EPC) IS NORMALLY ASSERTED ABOVE CYLINDER NUMBER 127(7F HEX). WHEN USING DRIVES WITH 512 OR GREATER CYLINDERS THE USER CAN SELECT RRC/EPC TO BE ASSERTED AT CYLINDER NUMBER 256 (FF HEX) USING THESE TYPE CODES.

AT THE PRESENT TIME, THE QUANTUM 2000 SERIES IS SUPPORTED WITH THESE JUMPERS.

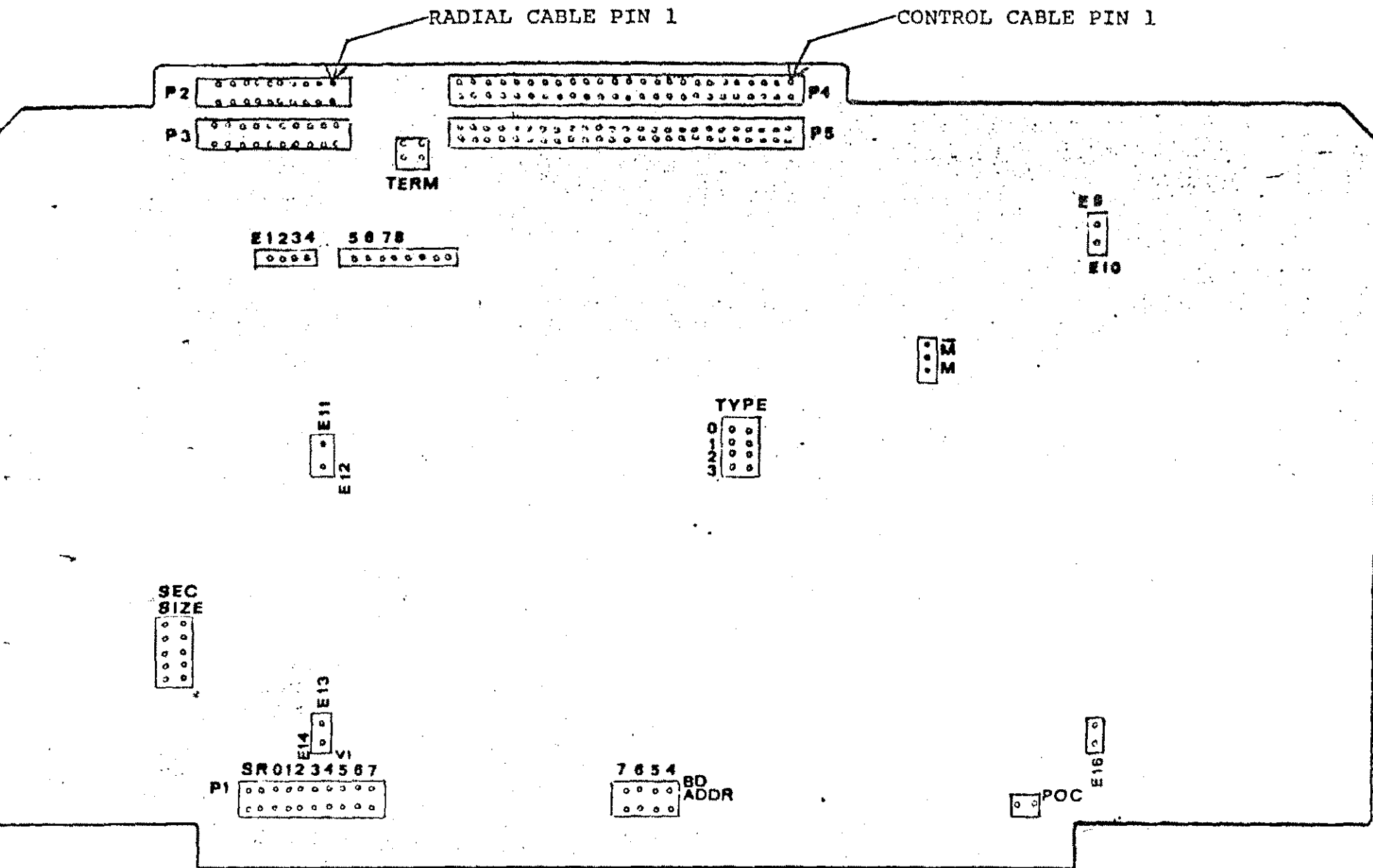
THE HDC-1016 CONTROLLER DOES NOT HAVE AN RRC/EPC OUTPUT, AND ASSUMES THE DRIVE IS RESPONSIBLE FOR THIS FUNCTION.



| | | | |
|---|--|----------------------|--|
| APPLICATION | | DO NOT SCALE DRAWING | |
| <p>MONITOR DYNAMICS INC HARD DISK CONTROLLER MODEL HDC-1010 180087</p> | | | |

HDC-1010

CONNECTOR AND JUMPER DIAGRAM



HDC-1010
S-100 PINOUTS

| | | | |
|----|-------|-----|---------|
| 01 | +8VDC | 51 | +8VDC |
| - | | - | |
| - | | - | GND |
| - | VI Ø | - | SLV CLR |
| 05 | VI 1 | 55 | |
| - | VI 2 | - | |
| - | VI 3 | - | |
| - | VI 4 | - | |
| - | VI 5 | - | |
| 10 | VI 6 | 60 | |
| - | VI 7 | - | |
| - | | - | |
| - | | - | |
| 15 | | 65 | |
| - | | - | |
| - | | - | |
| - | | - | |
| 20 | GND | 70 | GND |
| - | | - | |
| - | | - | |
| - | | - | |
| 25 | | 75 | RESET |
| - | | - | |
| - | | - | PWR |
| - | | - | PDBIN |
| - | A5 | - | AØ |
| 30 | A4 | 80 | A1 |
| - | A3 | - | A2 |
| - | | - | A6 |
| - | | - | A7 |
| - | | - | |
| 35 | DO 1 | 85 | |
| - | DO Ø | - | |
| - | | - | |
| - | DO 4 | - | DO 2 |
| - | DO 5 | - | DO 3 |
| 40 | DO 6 | 90 | DO 7 |
| - | DI 2 | - | DI 4 |
| - | DI 3 | - | DI 5 |
| - | DI 7 | - | DI 6 |
| - | | - | DI 1 |
| 45 | SOUT | 95 | DI Ø |
| - | SINP | - | |
| - | | - | |
| - | | - | |
| - | | - | POC |
| 50 | GND | 100 | GND |

HDC-1010

DRIVE CONTROL CONNECTOR PINOUTS

P4 (5¼", 8") Pins 1-34

2 Reduced Write Current
 4 Head Select 2
 6 Write Gate
 8 Seek Complete Detect
 10 Track Zero Detect
 12 Write Fault Detect
 14 Head Select Ø
 16 No Connection
 18 Head Select Ø
 20 Index Detect
 22 Drive Ready Detect
 24 Step
 26 Drive Select 1
 28 Drive Select 2
 30 No Connection
 32 No Connection
 34 Direction

8" Only - Pins 1-50

36 Step
 38 No Connection
 40 Write Gate
 42 Track Zero Detect
 44 Write Fault Detect
 46 No Connection
 48 No Connection
 50 Ground

ODD PINS GROUNDED

P5 (14" and 8" Memorex)

2 Head Select Ø
 4 Head Select 1
 6 Head Select 2
 8 No Connection
 10 Index
 12 Drive Ready Detect
 14 No Connection
 16 Drive Select 1
 18 Drive Select 2
 20 No Connection
 22 Seek Complete Detect
 24 Direction
 26 Step
 28 Reduced Write Current
 30 Write Gate
 32 Track Zero Detect
 34 Write Fault Detect
 36 Read Gate
 38 Ground
 39 Write Data +
 40 Write Data -
 42 Write Clock -
 43 Write Clock +
 44 Ground
 45 PLO Clock +
 46 PLO Clock -
 48 Read Data +
 49 Read Data -
 50 Ground

ODD PINS GROUNDED EXCEPT
39, 43 and 45 AS NOTED

HDC-1010

DRIVE RADIAL DATA CONNECTORS

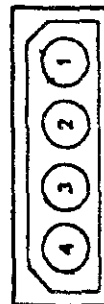
P2 Drive 1

P3 Drive 2

- 1 No Connection
- 2 Grounded
- 3 Grounded
- 4 Grounded
- 5 Grounded
- 6 Grounded
- 7 Grounded
- 8 Grounded
- 9 Timing Clock +
- 10 Timing Clock -
- 11 Grounded
- 12 Grounded
- 13 MFM Write +
- 14 MFM Write -
- 15 Grounded
- 16 Grounded
- 17 MFM Read +
- 18 MFM Read -
- 19 Grounded
- 20 Grounded

ST-506 POWER CONNECTOR

- 1 +12 VDC
- 2 Return
- 3 Return
- 4 +5VDC



A LIST OF DRIVES THAT INTERFACE WITH THE

MONITOR DYNAMICS INC. HARD DISK CONTROLLER MODEL HDC-1013

| Manufacturer | Model no. | Unformatted capacity MB. | no. heads | no. cyl's | Formatted capacity MB. | Average access MS. |
|--------------|--------------|--------------------------------|--------------|--------------|------------------------------|--------------------------|
| Atasi | 3033 | 33 | 5 | 645 | 29.72 | 30 * |
| Atasi | 3046 | 46 | 7 | 645 | 41.61 | 30 * |
| CMI | 5412 | 12 | 4 | 306 | 11.28 | 72 |
| CMI | 5619 | 19 | 6 | 306 | 16.92 | 72 |
| CMI | 6426 | 26 | 4 | 640 | 23.59 | 40 * |
| CMI | 6640 | 40 | 6 | 640 | 35.39 | 40 * |
| CDC wren | 9514-5 | 36 | 5 | 697 | 32.12 | 45 * |
| Fujitsu | M2230AS | 6 | 2 | 320 | 5.90 | 83 |
| Fujitsu | M2233AS | 13 | 4 | 320 | 11.80 | 83 |
| Fujitsu | M2234AS | 20 | 6 | 320 | 17.70 | 83 |
| Fujitsu | M2235AS | 26 | 8 | 320 | 23.60 | 83 |
| Maxstor | XT1065 | 65 | 7 | 918 | 59.22 | 30 * |
| Maxstor | XT1105 | 105 | 11 | 918 | 93.06 | 30 * |
| Maxstor | XT1140 | 140 | 15 | 918 | 126.90 | 30 * |
| Memorex | 512 | 30 | 3 | 961 | 26.57 | 25 * |
| Memorex | 513 | 50 | 5 | 961 | 44.28 | 25 * |
| Memorex | 514 | 70 | 7 | 961 | 62.00 | 25 * |
| Micropolis | 1302 | 26 | 3 | 830 | 22.94 | 30 * |
| Micropolis | 1303 | 43 | 5 | 830 | 38.24 | 30 * |
| Micropolis | 1304 | 52 | 6 | 830 | 45.90 | 30 * |
| MSI | HH612 | 12 | 4 | 306 | 11.28 | 70 |
| Quantum | Q2020 | 20 | 4 | 512 | 17.82 | 55 |
| Quantum | Q2030 | 30 | 6 | 512 | 27.74 | 60 |
| Quantum | Q2040 | 40 | 8 | 512 | 35.65 | 65 |
| Quantum | Q2080 | 80 | 7 | 1172 | 71.40 | 65 |
| Rodime/Ampex | Ro201/P07 | 5 | 2 | 320 | 5.90 | 80 |
| Rodime/Ampex | Ro202/P13 | 13 | 4 | 320 | 11.80 | 80 |
| Rodime/Ampex | Ro203/P20 | 20 | 6 | 320 | 17.70 | 80 |
| Rodime/Ampex | Ro204/P27 | 27 | 8 | 320 | 23.60 | 80 |
| Rodime | Ro203E | 40 | 6 | 640 | 35.39 | 55 * |
| Rodime | Ro204E | 53 | 8 | 640 | 47.18 | 55 * |
| Seagate | ST-212 | 12 | 4 | 306 | 11.28 | 65 |
| Seagate | ST-406 | 6 | 2 | 306 | 5.64 | 85 |
| Seagate | ST-412 | 12 | 4 | 306 | 11.28 | 85 |
| Seagate | ST-419 | 19 | 6 | 306 | 16.92 | 85 |
| Seagate | ST-506 | 5 | 4 | 153 | 5.64 | 85 |
| Shugart | SA706 | 6 | 2 | 612 | 11.28 | 99 |
| Shugart | SA712 | 12 | 4 | 612 | 22.56 | 99 |
| Syquest | SQ306R | 5 | 2 | 306 | 5.64 | 90 |
| Tandon | 501 | 6 | 2 | 306 | 5.64 | 98 |
| Tandon | 502 | 12 | 4 | 306 | 11.28 | 98 |
| Tandon | 503 | 19 | 6 | 306 | 16.92 | 98 |
| Tandon | 603SE | 14 | 6 | 230 | 12.71 | 137 |
| Tulin | 213 | 13 | 2 | 640 | 11.28 | 75 |
| Tulin | 226 | 26 | 4 | 640 | 23.60 | 75 |
| Tulin | 240 | 40 | 6 | 640 | 35.40 | 75 |

* These controllers can use the model HDC-1016 controller. This controller outputs step pulses at the fastest possible rate to take advantage of the drive's buffered step mode capability. However, this model also respecifys the reduced write current (RRC) line as the fourth head select line. Therefore these drive do not require the RRC signal. The Maxstor XT-1140 with 15 heads must use the model 1016 controller.

Monitor Dynamics also supplies controllers for the Memorex and DMA systems removable and fixed & removable winchester drives.

The HDC-1013/1016 controller has the SA4000 interface available for the older eight inch drives.

Monitor Dynamics Inc.
Microcomputer Hardware

HDC-1013 Winchester controller

Our continuing successful winchester controller supporting the ST-412, SA-1000, & SA4000 interfaces. Supports two drives with up to 8 heads, 4096 cylinders; 256, 512 or 1024 bytes per sector.

HDC-1016 Winchester controller

A hardware/firmware variant of the 1013 to support up to 16 heads and to maximize stepping speed for large, high performance drives. Seagate half-step, unbuffered step, and Reduced Write Current are not supported. Supports two drives, up to 4096 cylinders, and 256/512/1024 bytes per sector.

HDC-1017 Winchester controller

A hardware/firmware variant of the 1013 to support the removable cartridge drives such as the DMA360 or Memorex 450. These drives require the head selections be treated as seeks. Controls two 2 drives on the ST-412 interface. This allows simultaneous control of fixed and removable winchesters with one controller. Supports up to 4 heads, 4096 cylinders, and 256, 512 or 1023 bytes per sector.

1A-Z80

Z80 intercept adaptor consisting of a small Z80 intercept board and S-100 adaptor allowing and HDC-1013 controller to operate from any Z80 based system.

DRIVES

Monitor Dynamics offers selected winchester drives over a wide range of sizes and performance at very competitive prices.

SUBSYSTEMS

Complete drive, controller, and cabinet sub-systems are available.

INTEGRATION

Monitor Dynamics also supplies complete computer systems featuring multi-user networking configurations using the optimum combinations of master, slaves and mass storage.

SOFTWARE

Monitor Dynamics can supply formatting, testing, and driver software support for both CP/M and TurboDos. Other software systems support can be obtained from our users.

26 April 1983

TITLE HDC-1013 INSTALL PROCEDURE

SHEET 1 OF 1

The INSTALH programs will allow the use of the Monitor Dynamics hard disk controller with the users existing CP/M 2.2 system and CBIOS. This auto-installing 280 Bios package comes in two versions. The first version, INSTALH1, installs one hard disk drive as logical unit A. The other version, INSTALH2, installs two hard disk drives as logical units A and B. In both versions the users other logical units are displaced by the hard-disks.

Example system before INSTALH1

A = floppy disk #1
B = floppy disk #2
C = ramdisk

After INSTALH1

A = hard disk #1
B = floppy disk #1
C = floppy disk #2
D = ramdisk

The INSTALH programs are provided free to the user complete with source listings. They will not overcome the limitations of CP/M 2.2 which crashes the directory when it tries to allocate more than 8.388608 Megabytes and will not provide the user with more than one logical unit per physical unit. They are provided to allow the quick use of the Monitor Dynamics hard disk controller, and be an example BIOS that can be the model for the users composite BIOS. This implimentation requires the user to first boot their existing system and then boot the winchester BIOS using the H program. We can not supply boot proms for CP/M.

The INSTALH programs the hard disk BIOS by:

1. Relocating the CP/M by 600H (or 800H) lower in memory
2. Placing a 600H (or 800H) long "jump table intercept" bios (HBIOS) between the top of the moved CP/M and the existing CBIOS
3. Patching the boot-load program on the hard disk
4. Saving the resulting combination BIOS, CP/M, & CBIOS on the system tracks of the hard disk

The steps required in installing a working hard disk system:

1. Format the hard disk with TESTMD using the Format command. Formatting (or verifying) the hard disk generates a media defect table.
2. Use the parameter block (PB) command writes the boot-loader, disk parameter block, and media defect table on the first record of the hard disk.
3. Execute the INSTALH1 or INSTALH2 programs and answer the PORT address, and top of physical ram (RAMTOP) questions. The INSTALH program will exit through the cold-boot entry point in HBIOS.
4. To re-boot to the hard disk Bios execute the H program answering the PORT address question.

CUSTOMER SERVICE INFORMATION

It is Monitor Dynamics intention that this product provide our customers reliable operations. If additional information concerning our product is needed technical people are available at (714) 985-7214 (10:00 a.m. - 4:00 p.m. Pacific Time).

If the product fails to operate properly, it may be returned to the following address for service under the terms of the limited warranty.

Monitor Dynamics, Inc.
1149 West Ninth Street
Upland, California 91786

LIMITED WARRANTY INFORMATION

Monitor Dynamics will repair or replace, at our option, any parts found to be defective in materials or workmanship for a period of 180 days from date of invoice.

If a defective part causes a Monitor Dynamics product to operate improperly during the 180 day warranty period, we will service it at no charge to the original owner.

If Monitor Dynamics determines that improper operation is due to misuse, abuse or unauthorized modifications by the purchaser, there may be a repair charge. Purchaser will be notified of any charges.

Return to purchaser of a fully functioning unit meeting all advertised specifications in effect as of date of purchase is considered to be complete fulfillment of all warranty obligations assumed by Monitor Dynamics, Inc. This warranty covers only products marketed by Monitor Dynamics and does not cover other electronic equipment used in conjunction with our products. We are not responsible for incidental or consequential damages.

Prices and specifications are subject to change without notice..