

HSX-020

Technical Reference Manual

NOTE

This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the installation instructions, it may interfere with radio communications. The equipment has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, which users may be required to correct at their own expense.

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CONTENTS

ABOUT THIS MANUAL.....	v
Introduction.....	1
Major Components.....	2
Enclosure.....	3
Hard Disk Drive Unit.....	3
SCSI ID Cable Connection.....	3
Motherboard.....	5
DC/DC Converter.....	7
Cooling Fan.....	7
Specifications.....	8
Physical Specifications.....	8
Performance Specifications.....	8
Environmental Specifications.....	9
Electrical Specifications.....	10
Safety/Agency Specifications.....	11
Interconnect Wirelist.....	12

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1. HSX-020 Hard Disk Expansion Module.....	1
2. HSX-020 Major Components.....	2
3. Example of SCSI ID Cable Connection.....	5
4. HSX-020 Motherboard Connectors.....	7

LIST OF TABLES

<u>Table</u>	<u>Page</u>
1. HSX-020 Interconnect Wirelist.....	12

ABOUT THIS MANUAL

This manual describes the HSX-020 SCSI (Small Computer System Interface) device module. It is a companion manual to the SCSI Upgrades and Expansions manual which describes the SCSI device modules that attach to Series i and NGEN systems. The SCSI Upgrades and Expansions manual provides information common to all SCSI device modules. This manual contains information specific to the HSX-020 SCSI device module.

This manual can be ordered separately. If you do so, you may want to place it in the same binder that you use for the SCSI Upgrades and Expansions manual.

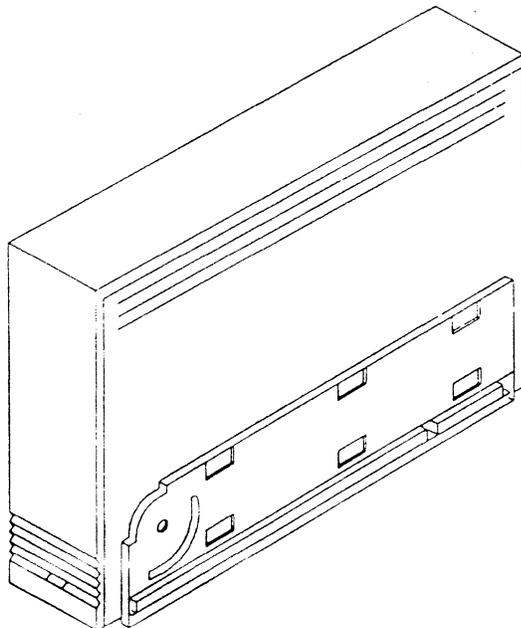
HSX-020

INTRODUCTION

The HSX-020 is a SCSI hard disk expansion module that provides up to 80M bytes of formatted data storage for Series i and NGEN processors. The HSX-020 supports automatic sequential addressing of other HSX modules and relays both the SCSI bus and the processor system bus (X-Bus) to other modules in the configuration.

The controller for the HSX-020 resides in the Series i processor or the HSD module.

Figure 1 shows the HSX-020 hard disk expansion module.



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Figure 1. HSX-020 Hard Disk Expansion Module

MAJOR COMPONENTS

The major components of the HSX-020 are shown in Figure 2 and consist of the following:

- the enclosure
- the hard disk drive unit
- the motherboard
- the dc/dc converter
- the cooling fan

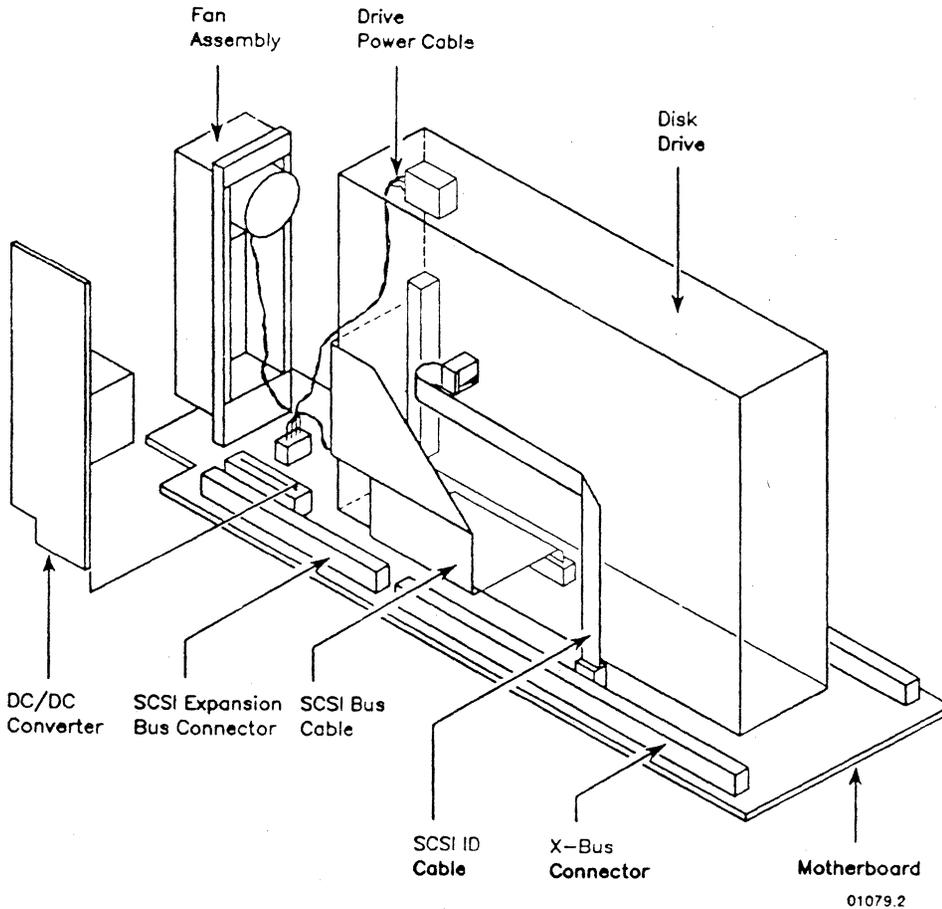


Figure 2. HSX-020 Major Components

ENCLOSURE

The enclosure consists of four units: the top/front cover, the rear assembly, and two side panels. These four units house the motherboard, the hard disk drive unit, the dc/dc converters, and the fan.

HARD DISK DRIVE UNIT

The disk drive unit contains a half-height Winchester disk drive with an average seek time of 30 ms, an average access time of 41.7 ms, and a formatted capacity of 80M bytes. In addition to the drive, the unit contains support circuitry, which includes disk control logic, a data separator, SCSI bus interface, and buffers. The buffers hold one track of data so that the drive can transfer a complete track before disconnecting from the SCSI controller (host adapter).

The 80M-byte capacity is measured using 512-byte sectors and is at least 80 million bytes. Sectors used by the drive unit firmware for bad-sector sparing or other error-correction information are not counted towards the 80M-byte minimum formatted capacity.

The drive unit mounts vertically and connects to the motherboard with two cables: the power cable and the SCSI ID cable.

SCSI ID Cable Connection

SCSI ID cable connection to the motherboard and the disk drive unit is specific to the type (manufacturer) of the disk drive installed in the HSX-020 module.

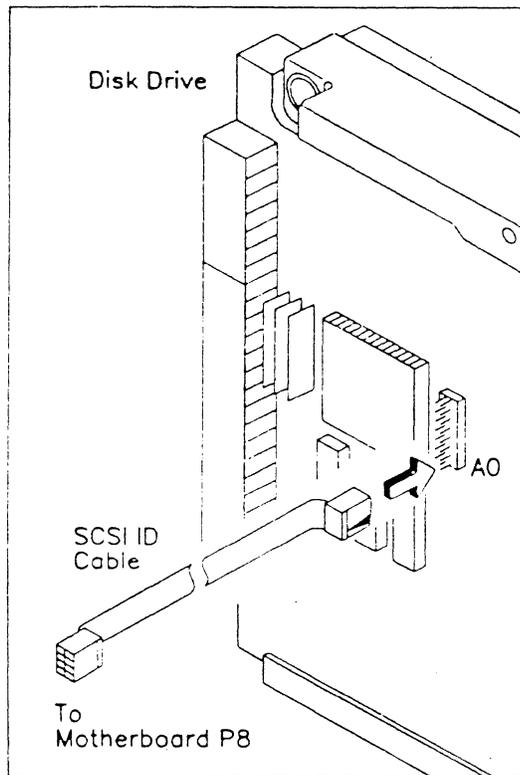
NOTE: Because of multiple manufacturers, this manual gives only guidelines for how to connect the cable. If you need to disconnect the SCSI ID cable, note the factory connections at both ends of the cable. If you replace the disk drive unit, connect the cable as shown in the installation sheet packed with the unit.

Use these guidelines for SCSI ID cable connection:

- Connect one end of the cable to motherboard connector P3 or P8, depending on the drive manufacturer.
- Connect the other end of the cable so that the cable connector pin marked with a triangle connects to the drive unit pin marked as bit 0. This marking varies with drive manufacturer and may appear as A0, ID0, etc.

As an example, Figure 3 shows the SCSI ID cable connection for a Quantum disk drive unit. In this case, the small triangle on the cable connector mates with disk drive pin A0. The other end of the cable connects to P8 on the motherboard.

Caution: The connections shown in Figure 3 are correct for a Quantum 80M-byte disk drive and may damage a drive made by a different manufacturer.



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Figure 3. Example of SCSI ID Cable Connection

MOTHERBOARD

The motherboard is a multilayer PC board that contains addressing logic, buffers, and the power-distribution network. In addition, the motherboard has the following external connectors:

- SCSI Expansion bus connectors - two 44-pin connectors, one on each side of the module.
- X-Bus connectors - two 120-pin connectors, one on each side of the module
- +36 Vdc power brick cable connector with 8 pins

The HSX-020 motherboard has the following internal connectors:

- SCSI bus connector - 50-pin header that connects the SCSI bus to the drive unit via a ribbon cable
- Disk drive power cable connector - 4-pin connector that supplies +5 Vdc and +12 Vdc to the disk drive unit
- DC/DC converter connector - 15-pin connector that holds the +5 Vdc and +12 Vdc converter board
- Fan cable connector - 3-pin connector for the cable that inputs +12 Vdc to the fan
- SCSI ID cable connectors - two 6-pin connectors for the cable that relays the SCSI ID number to the disk drive unit. For more information, see "SCSI ID Cable Connection" in the previous section and "SCSI Device Numbering" in Chapter 3 of the main manual, SCSI Upgrades and Expansions.

Figure 4 shows locations for the motherboard connectors. For more connector information, see "Connector Pinouts" in the main manual and "Interconnect Wirelist" in a following section.

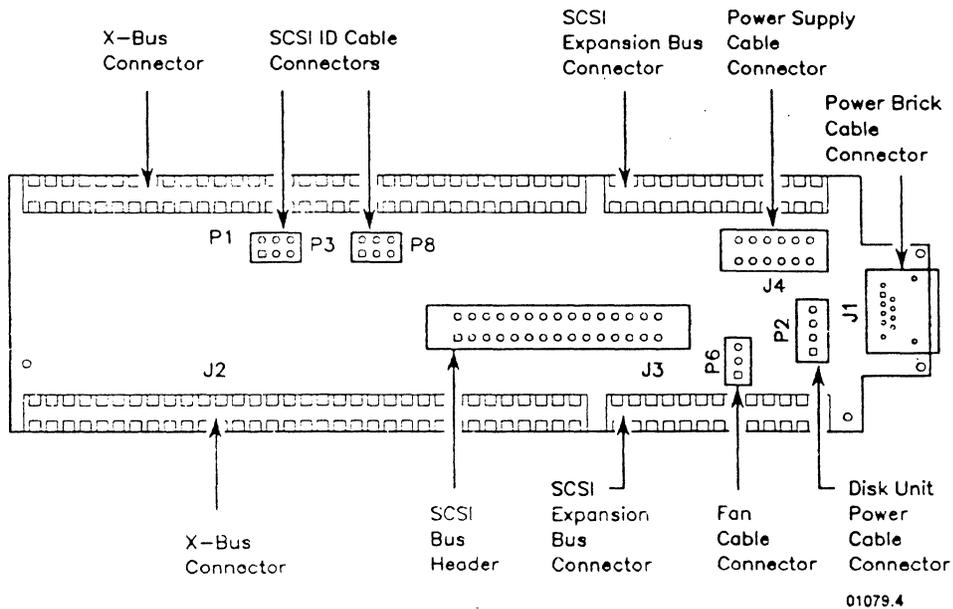


Figure 4. HSX-020 Motherboard Connectors

DC/DC CONVERTER

The power system for the HSX-020 consists of two units: the external 36 Vdc power supply and the internal dc/dc converter. The converter supplies +12 Vdc to the fan and disk drive unit and supplies +5 Vdc for logic circuits on the motherboard and the drive unit. For more information, see the Power System Manual.

COOLING FAN

The cooling fan mounts on brackets in the rear assembly and receives power through a power cable connected to the motherboard power distribution network.

SPECIFICATIONS

This section lists the following specifications:

- physical
- performance
- environmental
- electrical
- safety/agency

PHYSICAL SPECIFICATIONS

Module Dimensions

Height: 8 inches

Width: 3 inches

Depth: 12 inches

PERFORMANCE SPECIFICATIONS

Average Access Time

41.7 ms or less. Includes average seek time, average latency, and average SCSI interface overhead.

Seek Times

Track-to-Track Seek	9 ms typical
Average Seek	30 ms typical
Full-Stroke Seek	63 ms typical
Error Recovery	2 seconds worst case

Maximum Overhead

Rotational Latency (average)	8.4 ms or less
Head Switch (sequential)	3.5 ms or less
SCSI Interface	3.3 ms or less

Media Reliability

Error rates at ambient conditions do not exceed the following:

Correctable errors read	1 per 10^{12} bits
Noncorrectable errors read	1 per 10^{14} bits
Miscorrected errors read	1 per 10^{21} bits
Misdetected errors read	1 per 10^{21} bits
Seek errors	1 per 10^6 seeks
Media defects formatted bytes	1 per 10^6

Air temperature rise at the exhaust point will not exceed 14°C above ambient.

Audible noise does not exceed 51 dB at a distance of one meter.

Heat dissipation does not exceed 25 watts of heat at nominal voltages and currents when operating at 50% seek duty cycle.

During input power loss, heads are parked and locked and the spindle is stopped.

The air filter traps particles of 0.3 microns or greater.

ENVIRONMENTAL SPECIFICATIONS

Ambient Conditions

Temperature

+10°C to +50°C, operating

-40°C to +65°C, nonoperating

Temperature Gradient

+10°C/hr, operating

+20°C/hr, nonoperating

Altitude:

0-10,000 ft, operating

0-30,000 ft, nonoperating

Humidity (noncondensing):

20% to 80%, operating

10% to 90% nonoperating

Shock and Vibration, 3 Axes

Shock:

2g's for 10 ms half sine wave pulse,
operating

40g's for 10 ms half sine wave pulse,
nonoperating

Vibration:

.35g's at 5-500 Hz, 20 mils max
peak-to-peak displacement, 0.5 octaves
per minute sweep, operating

.75g's at 5-500 Hz, 100 mils max
peak-to-peak displacement, 0.5 octaves
per minute sweep, nonoperating

ELECTRICAL SPECIFICATIONS

Input Power to Module

(at +36 Vdc power brick connector)

+36 Vdc nominal

+31 to +40 Vdc voltage range

2 Amps

Input Power to Drive Unit

at dc/dc converter connector)

Voltage tolerance

+5 Vdc: +/- 5%

+12 Vdc: +/- 5%

Noise/Ripple Tolerance

+5 Vdc: 50 mVpp

+12 Vdc: 100 mVpp

Start-Up Current Load (Max)

+5 Vdc: 2.0A

+12 Vdc: 3.0A

does not exceed 15 secs

Operating Current Load (Max)

+5 Vdc: 1.5A

+12 Vdc: 1.5A

SAFETY/AGENCY SPECIFICATIONS

Underwriters Laboratories Inc.

UL 478 5th Edition, (Information Processing
and Business Equipment)

Canadian Standards Association

C22.2 No. 154M-1983 (Data Processing
Equipment)

TUV Rheinland

DIN IEC 380/VDE 0806/8.81 ZH1/618/10.81

Electromagnetic

VDE 0871 (Emission Standards), Level B FCC
Part 15, Sub-part J for Class B emissions

INTERCONNECT WIRELIST

Table 1 is an interconnect wirelist for the HSX-020 module.

Table 1
HSX-020 INTERCONNECT WIRELIST
(Page 1 of 4)

Signal	XBUS IN (P1)	XBUS OUT (J2)	SCSI BUS (P3,P7)	SCSI EXP BUS (P5,J3)	DC/DC CONV (J4)
XPWREN-	5	5			5
XDACK3-	6	6			
XDRQ3-	7	7			
XDACK2-	8	8			
XDRQ2-	9	9			
XDACK1-	10	10			
XDRQ1-	12	12			
XDRQ4-	13	13			
XADRF-	14	14			
XADRE-	15	15			
XADRD-	16	16			
XADRC-	18	18			
XADRB-	19	19			
XADRA-	20	20			
XADR17-	21	21			
XADR16-	22	22			
XADR15-	24	24			
XADR14-	25	25			
XADR13-	26	26			

Table 1
HSX-020 INTERCONNECT WIRELIST
 (Page 2 of 4)

Signal	XBUS IN (P1)	XBUS OUT (J2)	SCSI BUS (P3,P7)	SCSI EXP BUS (P5,J3)	DC/DC CONV (J4)
XADR12-	27	27			
XADR11-	28	28			
XADR10-	30	30			
XADR9-	31	31			
XADR8-	32	32			
XADR7-	33	33			
XADR6-	34	34			
XADR5-	36	36			
XADR4-	37	37			
XADR3-	38	38			
XADR2-	39	39			
XADR1-	40	40			
XADR0-	42	42			
XPIN+	44				
XPOUT+		44			
X33KHZSYNC+	46			46	12
XINTR5-	48	48			
XINTR3-	49	49			
XINTR4-	50	50			
XINTR2-	51	51			
XINTR1-	52	52			
XINTRQ-	54	54			
XMODE3-	55	55			

Table 1
HSX-020 INTERCONNECT WIRELIST
 (Page 3 of 4)

Signal	XBUS IN (P1)	XBUS OUT (J2)	SCSI BUS (P3,P7)	SCSI EXP BUS (P5,J3)	DC/DC CONV (J4)
XMEMRD-	57	57			
XMEMWR-	58	58			
XDMAEN-	60	60			
XMODE2-	61	61			
XDATF-	62	62			
XDATE-	63	63			
XDATD-	64	64			
XDATC-	66	66			
XDATB-	67	67			
XDATA-	68	68			
XDAT9-	69	69			
XDAT8-	70	70			
XDAT7-	72	72			
XDAT6-	73	73			
XDAT5-	74	74			
XDAT4-	75	75			
XDAT3-	76	76			
XDAT2-	78	78			
XDAT1-	79	79			
XDAT0-	80	80			
XSPKR-	81	81			
XACK-	82	82			
XLOCK-	84	84			

Table 1
HSX-020 INTERCONNECT WIRELIST
 (Page 4 of 4)

Signal	XBUS IN (P1)	XBUS OUT (J2)	SCSI BUS (P3,P7)	SCSI EXP BUS (P5,J3)	DC/DC CONV (J4)
XBHE-	85	85			
XRESET-	86	86			
XIOWR-	91	91			
XIORD-	92	92			
XPCLK+	93	93			
XDCLK-	95	95			
BSD0			2	3	
BSD1			4	5	
BSD2			6	7	
BSD3			8	9	
BSD4			10	11	
BSD5			12	13	
BSD6			14	15	
BSD7			16	17	
SCSIATTN-			32	23	
SCSIBSY-			36	25	
SCSIACK-			38	27	
SCSIRST-			50	29	
SCSI_DEVICE-			41	22	
MSG-			42	31	
SCSISEL-			44	33	
C_D			46	35	
REQ-			48	37	
I_O			50	39	
SCSI_ID0-				2	
SCSI_ID2-				10	
SCSI_ID3-				14	