HEWLETT PACKARD

Portable Vectra Accessories Service Manual

(Including Recharger, Dual-Serial/EMS Adapter, 1200 bps Asynchronous Modem, and 2400 bps Synchronous/Asynchronous Modem)

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Contents

Overview

This manual presents service information for accessories used with the HP Portable Vectra PC family. Each appendix includes complete information for one accessory. Within each appendix you'll find information about these topics:

1. Product information.
2. Site preparation and requirements.
3. Installation and configuration.
4. Preventive maintenance.
5. Functional description.
6. Removal and replacement.
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8. Troubleshooting and diagnostics.
9. Replaceable parts.
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Appendix A
Recharger

Contents

A.1 Product Information

The recharger used with portable Vectra computers is a sealed assembly that provides power to recharge the computer's battery module. The recharger is powered from a 120-, 220-, or 240-Vac outlet via a detachable power cord. The recharger automatically adjusts to the source voltage – it has no voltage selector switch. A power light turns on while the recharger is connected to ac power. The recharger has a built-in cable that plugs into a socket in the battery module. If the battery module is installed in the computer, the recharger cable connects to the module through a hole in the side of the computer case.

The recharger operates as a combined voltage regulator and current regulator. For a high-impedance load, the recharger provides a regulated dc output voltage. For a low-impedance load, it provides a regulated output current.

The recharger is not repairable. If a recharger is defective, replace it with a new one.

Table A-1 lists the specifications for the recharger.

Table A-1. Recharger Specifications

Physical Properties

- Dimensions: 165 by 80 by 57 mm (6.50 by 3.15 by 2.24 inches).
- Weight: 0.6 kg (1.3 pounds).

Input Power

- Voltage and frequency: 120 Vac nominal at 60 Hz.
  220 to 240 Vac nominal at 50 Hz.
- Power: 29 watts typical.

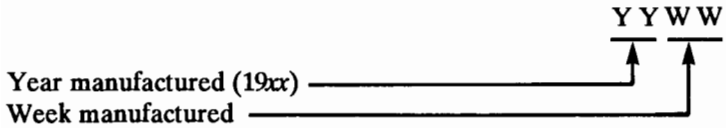
Output

- Voltage: 8.02 to 8.18 Vdc (at 0A, no load).
  7.66 to 8.18 Vdc (at 2.4A).
- Ripple: 0.1 V(p-p) maximum (at 0 to 2.4 A).
- Current limit: 2.4A to 2.6A (at 4.00 to 8.18 Vdc).

Environmental Limits

- Operating temperature: 0° to 50°C (32° to 113°F).
- Storage temperature: –20° to 65°C (–4° to 149°F).

Serial numbers are used for identifying units and determining their warranty status. The serial number for the recharger is printed on the label on the bottom. Its format is shown below.



A.2 Site Preparation and Requirements

No special site requirements are set for the recharger.

A.3 Installation and Configuration

The recharger connects directly to the battery module – the battery module may be in or out of the computer. Use the appropriate power cord to connect the recharger to a power outlet. (Power cords are listed in table A-2.)

A.4 Preventive Maintenance

No preventive maintenance is required for the recharger.

A.5 Functional Description

No functional description information is required for repairing the recharger. Section A.1 gives general information about the recharger. Specifications for the recharger are listed in table A-1.

A.6 Removal and Replacement

No special removal and replacement procedures are required to repair the recharger.

A.7 Adjustments

No adjustment are required for the recharger.

A.8 Troubleshooting and Diagnostics

The recharger is not repairable. If it tests bad in the test below, replace it.

You'll need an HP 3435A/3468A Multimeter (or equivalent, having $3^1/_2$ digits) to test the recharger.

Test the recharger using the following procedure:

1. Connect the recharger to a power outlet using a standard power cord. The source voltage should be 96 to 135 Vac or 192 to 276 Vac. Make sure the recharger output plug is *not* connected to any load.
2. Observe the power indicator light on the recharger.
   - If the light is lit, skip ahead to the next step.
   - If the light is off; (1) make sure the power is on; (2) make sure the power cord is good; if the light remains off, (3) replace the recharger and *stop testing here*.
3. Set a dc voltmeter to measure voltages in the range 4 to 10 Vdc with at least two decimal digits.
4. Measure the no-load output voltage at the recharger plug.
   - If the voltage is between 8.00 and 8.20 Vdc, the recharger is good.
   - If the voltage is outside this range, replace the recharger. *Stop testing here*.

A.9 Replaceable Parts

Table A-2 lists replaceable parts and power cords for the recharger. Order replacement parts and assemblies from Hewlett-Packard Corporate Parts Center or from Parts Center Europe.

Table A-2. Recharger Replaceable Parts

HP Part Number	Description	Quantity
5061-4335	ASSEMBLY, recharger	1
8120-1369	POWER CORD, Australia	1
8120-2956	POWER CORD, Denmark	
8120-1689	POWER CORD, Europe	
8120-2104	POWER CORD, Switzerland	
8120-1378	POWER CORD, U.S	
8120-1351	POWER CORD, U.K.	

A.10 Reference

No reference information is included for the recharger.

A.11 Product History

This section normally contains information for adapting this chapter to earlier rechargers that differ from current units. Since this chapter *does* apply to all rechargers produced as of the printing date, no change information is given here.

A.12 Diagrams

No diagrams are required to repair the recharger.

Appendix B
Dual-Serial/EMS Adapter

Contents

Table **Page**

B.1 Product Information

B.1.1 Description

The HP D1004A Dual-Serial/EMS Adapter provides two serial ports and up to 2M bytes of expanded memory. The serial ports support the RS-232-C and HP-422 interface standards. The expanded-memory capability conforms to the EMS (Expanded Memory Specification) standard.

The dual-serial/EMS adapter is available in three options that specify the amount of EMS RAM that's installed:

- Standard: No EMS RAM is installed, but the customer can install up to 2M bytes in the empty sockets.
- Option 001: 1M bytes of EMS RAM are installed, and the customer can install up to 1M bytes more in the empty sockets.
- Option 002: 2M bytes of EMS RAM are installed. All sockets are filled.

B.1.2 Specifications

Specifications for the dual-serial/EMS adapter are listed in table B-1.

Table B-1. Dual-Serial/EMS Adapter Specifications

Physical Properties

- PCA Dimensions: 179 by 93 mm (7.0 by 3.7 inches).
- Weight: 200 grams (7 ounces) without EMS RAM.

Environmental Limits

- Operating temperature: 0° to 50°C (32° to 122°F).
- Storage temperature: −20° to 65°C (−4° to 149°F).

Power Requirements

- Source: computer +5V supply (Vcc) and battery (VBAT).
- Consumption: 45 mA from Vcc (+5V) typical with 2M bytes of EMS RAM.
  35 mA from VBAT (+6V) typical with 2M bytes of EMS RAM.

Serial Capabilities

- Data formats: 5, 6, 7, and 8 data bits.
  1 start bit.
  1, 1.5, and 2 stop bits.
  Even, odd, "0", "1", and no parity.
- Data rates: 50 to 19,200 baud.
- System compatibility: IBM PC/AT and PC/XT modes.
- Port A: 9-pin D-subminiature connector.
  RS-232-C and CCITT V.28 compatibility.
- Port B: 25-pin D-subminiature connector.
  RS-232-C, CCITT V.28, and HP-422 compatibility.

Table B-1. Dual-Serial/EMS Adapter Specifications (Continued)

EMS Capabilities

- Compatibility: LIM EMS standard (published jointly by Lotus Development Corporation, Intel Corporation, and Microsoft Corporation).
- Options: Standard configuration has no EMS RAM.
  Opt. 001 configuration has 1M bytes EMS RAM.
  Opt. 002 configuration has 2M bytes EMS RAM.
  Can install up to 2M bytes per adapter.
- Page frame base address: Selectable from C4000h to E0000h.

B.1.3 Accessories

The following accessories are available for the dual-serial/EMS adapter:

- 1M-Byte EMS RAM Kit (HP D1008A). This kit adds 1M bytes of RAM to the expanded-memory portion of the dual-serial/EMS adapter. It consists of a set of eight RAM ICs that install in sockets on the adapter and expand the EMS by 1M bytes. The adapter accomodates zero, one, or two sets of RAM ICs.
- Serial cables. The following 3-meter (10-foot) cables connect the indicated types of devices to the nine-pin serial connector on the adapter:

  HP 24542G, 9-pin serial to 25-pin male RS-232, for serial printers and plotters.
  HP 24542H, 9-pin serial to 25-pin female RS-232, for serial plotters.
  HP 24542M, 9-pin serial to 25-pin male RS-232, for modems and host computers.

  The following 5-meter (17-foot) cables connect the indicated types of devices to the 25-pin serial connector on the adapter:

  HP 13242G, 25-pin serial to 25-pin male RS-232, for serial printers and plotters.
  HP 13242M, 25-pin serial to 25-pin male RS-232, for European modems.
  HP 13242N, 25-pin serial to 25-pin male RS-232, for U.S. modems.
  HP 13242P, 25-pin serial to 5-pin male ATP, for HP 3000 ATP (HP-422).
  HP 13242X, 25-pin serial to 3-pin male ATP, for HP 3000 ATP (RS-232).
  HP 17255D, 25-pin serial to 25-pin female RS-232, for serial plotters (1-meter).

B.1.4 Service Support

This manual supports repair of the dual-serial/EMS at the assembly and selective-component levels. Repair procedures (described in section B.8) involve running diagnostic tests, then replacing indicated ICs or the complete adapter.

Table B-2 lists tools and equipment needed to troubleshoot the dual-serial/EMS adapter.

Table B-2. Recommended Tools and Equipment

HP Part/Model Number	Description
D1001-60921	Disc, diagnostic.
24540-60010	Connector, 9-pin, serial loop-back.
02620-60062	Connector, 25-pin, serial loop-back, RS-232.
5061-3248	Connector, 25-pin, serial loop-back, HP-422.
8710-1415	Torx bit, T15.
8710-1413	Torx handle.
HP D1001A*	Portable Vectra CS (complete).
HP 3435A/3468A*	Multimeter, $3^1/_2$ digits (component-level repair).
HP 180C/1801A/1820C*	Oscilloscope (component-level repair).
HP 10004*	Oscilloscope probe (component-level repair).
8690-0129	Soldering tool (component-level repair).
8690-0132	Stand, soldering tool (component-level repair).

* Or equivalent.

B.2 Site Preparation and Requirements

No special site requirements are set for the dual-serial/EMS adapter.

B.3 Installation and Configuration

To configure the dual-serial/EMS adapter, you must set up the dual-serial interface and the EMS subsystem. In addition, you may install one or two sets of RAM ICs to increase the amount of memory in the EMS subsystem. You must then install the adapter in the computer. The locations of the configuration and expansion components are shown in figure B-1.

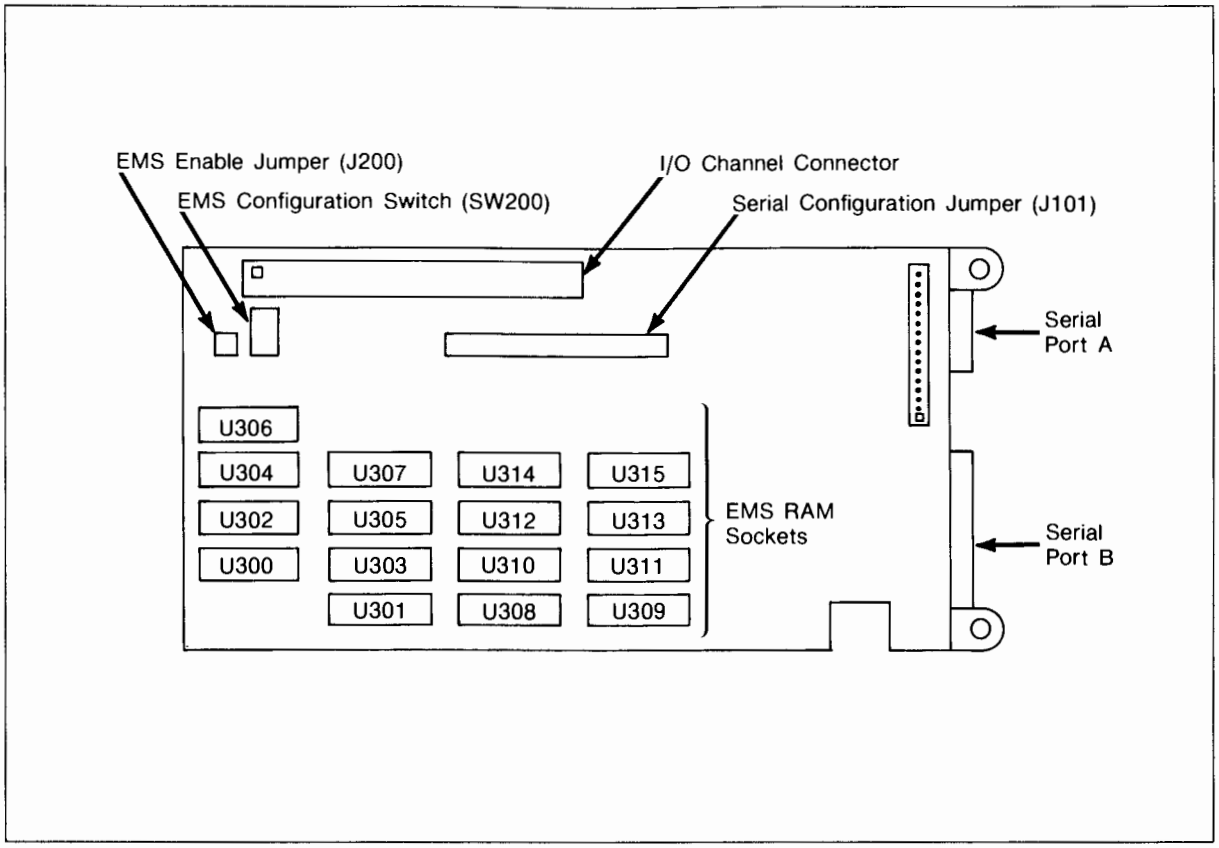


Figure B-1. Configuration and Expansion Locations

CAUTION

Be sure to take precautions against electrostatic discharge. Wear a grounded wrist strap and work either at a bench that is electrostatically protected or on a field-service grounding mat (included with part number 9300-0933). Many components are susceptible to damage by elecrostatic discharge.

B.3.1 Configuring the Dual-Serial Interface

To configure the dual-serial interface, you must set six jumpers on header J101. These jumpers enable or disable the serial interface and select its operating configuration. Use the information in table B-3 to determine the proper settings.

Table B-3. Serial Configuration Settings

Function	Position	Meaning
Enable/Disable	DISABLE	Serial interface is disabled (other jumpers have no effect).
	ENABLE*	Serial interface is enabled.
COM4 Interrupt†	IRQ7	The COM4 device, if used for port A or B, uses interrupt 7.
	IRQ5	The COM4 device, if used for port A or B, uses interrupt 5.
	IRQ2	The COM4 device, if used for port A or B, uses interrupt 2.
	NONE*	The COM4 device, if used for port A or B, uses no interrupt.
COM3 Interrupt†	IRQ7	The COM3 device, if used for port A or B, uses interrupt 7.
	IRQ5	The COM3 device, if used for port A or B, uses interrupt 5.
	IRQ2	The COM3 device, if used for port A or B, uses interrupt 2.
	NONE*	The COM3 device, if used for port A or B, uses no interrupt.
Port B (25-pin)	COM4	Serial port B uses the COM4 device (I/O address range 2E8–2EF) with the interrupt set by the COM4 INTERRUPT jumper.
	COM3	Serial port B uses the COM3 device (I/O address range 3E8–3EF) with the interrupt set by the COM3 INTERRUPT jumper.
	COM2*	Serial port B uses the COM2 device (I/O address range 2F8–2FF) with interrupt 3.
	COM1	Serial port B uses the COM1 device (I/O address range 3F8–3FF) with interrupt 4.

Table B-3. Serial Configuration Settings (Continued)

Function	Position	Meaning
Port A (9-pin)	COM4	Serial port A uses the COM4 device (I/O address range 2E8–2EF) with the interrupt set by the COM4 INTERRUPT jumper.
	COM3	Serial port A uses the COM3 device (I/O address range 3E8–3EF) with the interrupt set by the COM3 INTERRUPT jumper.
	COM2	Serial port A uses the COM2 device (I/O address range 2F8–2FF) with interrupt 3.
	COM1*	Serial port A uses the COM1 device (I/O address range 3F8–3FF) with interrupt 4.
Mode	XT*	Serial interface uses IBM PC/XT compatibility.
	AT	Serial interface uses IBM PC/AT compatibility.

* Default setting.

† This function is used only if one of the ports uses this device; otherwise, you should set this function to NONE.

B.3.2 Configuring the EMS Subsystem

To configure the EMS subsystem, you must set a jumper on header J200 and set four segments on switch SW200. These settings enable or disable the EMS subsystem and set its location in the I/O address space. Use the information in table B-4 to determine the proper settings.

Table B-4. EMS Subsystem Configuration Settings

Function	Setting	Meaning
Enable/Disable Jumper	DISABLE	Disable the EMS subsystem.
	ENABLE	Enable the EMS subsystem.
Configuration Switch	Segments: 3 2 1 0	
	0 0 0 0	EMS subsystem at I/O address 208/209.
	0 0 0 1	EMS subsystem at I/O address 218/219.
	0 1 0 1*	EMS subsystem at I/O address 258/259.
	0 1 1 0	EMS subsystem at I/O address 268/269.
	1 0 1 0	EMS subsystem at I/O address 2A8/2A9.
	1 0 1 1	EMS subsystem at I/O address 2B8/2B9.

* Default setting.

To add RAM ICs to the EMS subsystem, you should install them in the order shown in figure B-2. Normally they're installed in multiples of eight ICs (though you *may* install them in multiples of two ICs). The EMS subsystem should be enabled, as described above in table B-4.

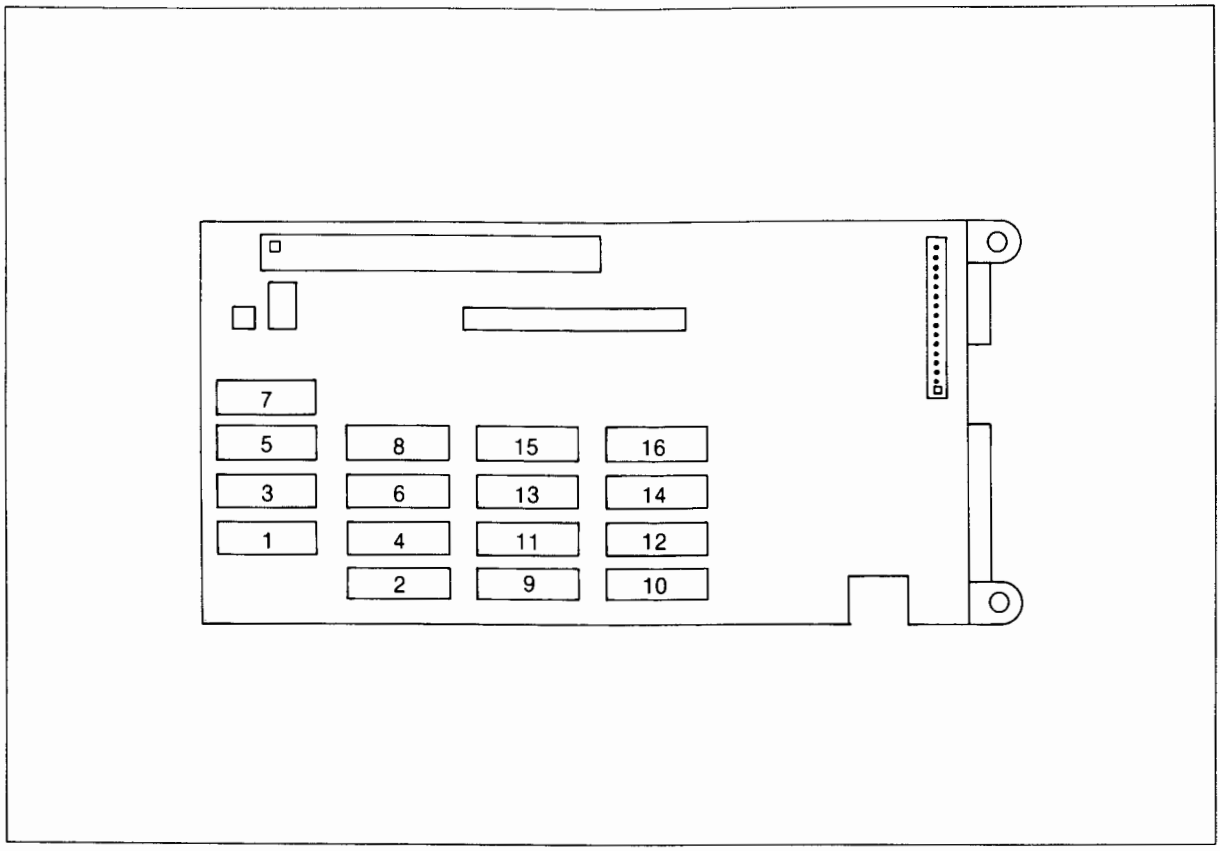


Figure B-2. Installation Order for RAM ICs

After you configure the EMS subsystem and install the adapter in the computer (described next), you must modify the CONFIG.SYS file to load the EMS manager. In addition, you can set up the system to automatically allocate parts of the expanded memory as an *electronic disc* and as a *print spooler*. These procedures are described in section B.3.4, "Setting Up the EMS Subsystem."

B.3.3 Installing the Dual-Serial/EMS Adapter

To install the dual-serial/EMS adapter in the computer, refer to chapter 3, "Installation and Configuration," in the computer service manual.

B.3.4 Setting Up the EMS Subsystem

If the adapter contains expanded memory and you've configured the EMS subsystem to be enabled, then the system must load the EMS manager each time it turns on or reboots. In addition, you can set up the system to automatically allocate parts of the expanded memory as an *electronic disc* and as a *print spooler*.

To load the EMS manager, you must add the following line to the CONFIG.SYS file:

```
DEVICE=HPEMM.SYS Mx Iz D
```

where *x* indicates the address in system memory where the expanded memory is to be located, *z* indicates the I/O address of the EMS subsystem (which you set from table B-4 and which controls the expanded

memory), and D is an optional parameter that specifies shortened diagnostics at turn-on. Table B-5 lists the values and meanings for the Mx and Iz parameters. (If two or more dual-serial/EMS adapters are installed, you need to specify the I/O address of each EMS subsystem by including in the line an Iz term for each adapter.)

Table B-5. Parameters for Loading the EMS Manager

Expanded Memory System Address*	Mx Value	EMS Subsystem I/O Address*	Iz Value
C4000-D3FFF	M0	208/209	I0
C8000-D7FFF	M1	218/219	I1
CC000-DBFFF	M2	258/259	I5
D0000-DFFFF	M3	268/269	I6
D4000-E3FFF	M4	2A8/2A9	IA
D8000-E7FFF	M5	2B8/2B9	IB
DC000-EBFFF	M6		
E0000-EFFFF	M7		

* These parameters are selected independently.

You can allocate portions of the EMS subsystem for use as an electronic disc and as a print spooler. Any portion not allocated for these purposes is available as program memory.

To allocate an electronic disc, include the following line in the CONFIG.SYS file:

```
DEVICE=RAMDISC.SYS n
```

where *n* is the number of K bytes of EMS memory that you want to allocate as the electronic disc. (The amount of memory allocated to the electronic disc and the print spooler must not exceed the total amount of EMS memory in the system.)

To set up a print spooler, include the following line in the AUTOEXEC.BAT file:

```
PRINTSPOOL n
```

where *n* is the number of K bytes of EMS memory that you want to allocate as the print spooler. (The amount of memory allocated to the electronic disc and the print spooler must not exceed the total amount of EMS memory in the system.)

B.4 Preventive Maintenance

No preventive maintenance is required for the dual-serial/EMS adapter.

B.5 Functional Description

The HP D1004A Dual-Serial/EMS Adapter provides the computer system with two RS-232-C serial ports and, optionally, up to 2M bytes of expanded memory. The following sections describe the dual-serial interface and the EMS subsystem.

B.5.1 Dual-Serial Interface

The dual-serial interface provides two asynchronous-serial ports: port A and port B. Each physical port has a back-panel connector. The physical ports are described as follows:

- Serial port A has a 9-pin, male D-subminiature connector and is classified as an RS-232-C port.
- Serial port B has a 25-pin, female D-subminiature connector and supports both the EIA RS-232-C and HP-422 interface standards. (The HP-422 interface standard is Hewlett-Packard's subset of the EIA RS-422 standard.)

The dual-serial interface is based on a controller that contains two UART (universal asynchronous receiver/transmitter) circuits – one for port A and one for port B. The UART circuits are NS16450-compatible and provide parallel-to-serial (output) and serial-to-parallel (input) data conversion. The controller also provides the following functions for each channel:

- Addition of start, stop, and parity bits to the outgoing asynchronous serial data stream, and removal of these bits from the incoming stream.
- Full double buffering in each direction.
- Programmable baud rate generation (50 to 19,200 baud).
- Programmable character format: 5 to 8 data bits; 1, 1.5, or 2 stop bits; even, odd, or no parity.
- Modem control and status registers.
- An interrupt priority system that manages the transmit, receive, error, line status, and modem status interrupts.

The dual-serial interface supports the following logical communications ports: COM1, COM2, COM3, and COM4. Each physical port (A or B) can be configured as any logical port (COM1, COM2, COM3, or COM4), provided both are not configured as the same logical port.

Serial Port A. All of the serial port A signals conform to the electrical specifications of the EIA RS-232-C and CCITT V.28 standards. Table B-6 gives the pin assignments for port A.

Table B-6. Port A Pin Assignments

Pin Number	Signal Label	Signal Name	RS-232-C Designation	Direction (I/O)
1	DCD	Data Carrier Detect	CF	I
2	RD	Receive Data	BB	I
3	TD	Transmit Data	BA	O
4	DTR	Data Terminal Ready	CD	O
5	SG	Signal Ground	AB	–
6	DSR	Data Set Ready	CC	I
7	RTS	Request To Send	CA	O
8	CTS	Clear To Send	CB	I
9	RI	Ring Indicator	CE	I

Serial Port B. All of the serial port B signals conform to the electrical specifications of the EIA RS-232-C and CCITT V.28 standards, except the RD.A, RD.B, SD.A, and SD.B signals, which are at HP-422 levels. Table B-7 gives the pin assignments for port B.

Table B-7. Port B Pin Assignments

Pin Number	Signal Label	Signal Name	RS-232-C Designation	Direction (I/O)
1	PG	Protective Ground	AA	–
2	TD	Transmit Data	BA	O
3	RD	Receive Data*	BB	I
	RD.A	HP-422 Receive Data A	–	I
4	RTS	Request To Send	CA	O
5	CTS	Clear To Send	CB	I
6	DSR	Data Set Ready	CC	I
7	SG	Signal Ground	AB	–
8	DCD	Data Carrier Detect	CF	I
9	SD.A	HP-422 Transmit Data A	–	O
10	SD.B	HP-422 Transmit Data B	–	O
11–17	–	Not Connected	–	–
18	RD.B	HP-422 Receive Data B	–	I
19	–	Not Connected	–	–
20	DTR	Data Terminal Ready	CD	O
21	–	Not Connected	–	–
22	RI	Ring Indicator	CE	I
23	SRS	Data Signal Rate Selector	CH	O
24–25	–	Not Connected	–	–

* Pin 3 (RD/RD.A) is an RS-232-C/HP-422 input. Pin 18 (RD.B) is the second HP-422 Receive Data input.

Interchange Voltages. RS-232-C signal lines operate at positive and negative voltage levels as defined by the RS-232-C interface specification. (Refer to EIA Standard RS-232-C of the Electronic Industries Association.)

RS-232-C data signals are considered to be in the *spacing* condition when the voltage on the interchange is at a positive RS-232-C level, and in the *marking* condition when the voltage is at a negative RS-232-C level. In data transmission, the spacing condition denotes the binary state "0", and the marking condition denotes "1".

RS-232-C status and control lines are considered to be ON when the voltage on the interchange is at a positive RS-232-C level, and OFF when the voltage is at a negative RS-232-C level.

The HP-422 data signal states are defined to be in the *spacing* condition when RD.A is 0.2V to 6.0V more positive than RD.B and when SD.A is 2.0V to 6.0V more positive than SD.B. They're defined to be in the *marking* condition when RD.A is 0.2V to 6.0V more negative than RD.B and when SD.A is 2.0V to 6.0V more negative than SD.B.

Signal Descriptions. The following signal descriptions apply to both serial port A (if the signal is present on that port) and to serial port B.

The RS-232-C interface standard employs single-ended drivers and receivers. (There is one Receive Data line and one Transmit Data line.) On the other hand, the HP-422 standard employs differential or "balanced" drivers and receivers. (HP-422 has two Receive Data lines and two Transmit Data lines.) The balanced system of data transmission incorporates a differential driver transmitting on balanced interconnecting lines to a receiver with differential inputs. The ability to reject common-mode voltages allows the differential system to be used over longer distances and under higher noise conditions than a single-ended system.

Table B-8 describes the serial interface signals.

Table B-8. Serial Interface Signals

Signal Name	Direction	Description
Receive Data	I	The incoming RS-232-C serial bit stream is received on this line.
Transmit Data	O	The outgoing RS-232-C serial bit stream is transmitted on this line.
HP-422 Receive Data A HP-422 Receive Data B	I I	The HP-422 differential input of the serial bit stream is received on these lines.
HP-422 Transmit Data A HP-422 Transmit Data B	O O	The HP-422 differential output of the serial bit stream is transmitted on these lines.
Data Terminal Ready	O	When ON, DTR informs the modem or data set that the controller is ready to establish the communications link and transfer data with the modem or data set.
Data Set Ready	I	When ON, DSR indicates that the modem or data set is ready to communicate.
Request To Send	O	When ON, RTS informs the modem or data set that the controller is ready to transmit data.
Clear To Send	I	When ON, CTS informs the controller that the modem or data set is ready to transmit data.
Ring Indicator	I	When ON, RI indicates that a telephone ringing signal has been received by the modem or data set.
Data Carrier Detect	I	When ON, DCD indicates that the data carrier has been detected by the modem or data set.
Data Signal Rate Selector	O	When ON, SRS indicates the selection of the higher of two ranges of data signaling rates.

Interrupts. The dual-serial controller issues hardware interrupts at four levels. The controller has an interrupt pin for each logical port (COM1, COM2, COM3, and COM4). The interrupt pin for COM1 is hard-wired to IRQ4, the interrupt pin for COM2 is hard-wired to IRQ3, and the interrupt pins for COM3 and COM4 can be jumpered to IRQ2, IRQ5, IRQ7, or no interrupt. (Refer to section B.3.1, "Configuring the Dual-Serial Interface.")

Operating Modes. In "AT" mode, the two UARTs operate in the normal, NS16450-compatible mode. Most communications software should run properly in the "AT" mode. In "XT" mode, the interrupt from the serial controller goes low (inactive) whenever the I/O channel ~IOR signal goes low (active). This prevents software compatibility problems in the XT environment.

B.5.2 EMS Subsystem

The dual-serial/EMS adapter provides an EMS subsystem that allows the expansion of memory in the computer by up to 2M bytes per adapter. This subsystem conforms to the EMS environment described in the Expanded Memory Specification, published jointly by Lotus Development Corporation, Intel Corporation, and Microsoft Corporation. The EMS subsystem employs a simple paging or bank-switching scheme to access up to 8M bytes of expanded memory through a 64K-byte page frame within the system address space.

The computer's CPU provides 1M byte of system address space (00000h – FFFFFh). The key to the EMS memory expansion system is the address space between the video/graphics and ROM BIOS address blocks. This 192K-byte block of address space (C0000h – EFFFFh) is reserved for ROM extensions, but is for the most part unused. The EMS subsystem assigns a 64K-byte page frame, consisting of four 16K-byte pages, to an address in this area. The base address of the page frame must be on a 16K-byte boundary and at the beginning of a 64K-byte block free of other memory (RAM or ROM).

The four 16K-byte pages in the page frame are used as windows into a much larger memory space. The range of processor memory addresses occupied by a single 16K-byte page is called a *physical page*. The expanded memory is accessed in 16K-byte blocks called *logical pages*. Each adapter can contain up to 2M bytes of expanded memory, which is divided into 128 logical pages.

Up to 2M bytes of expanded memory per dual-serial/EMS adapter may be added to the computer. More than one dual-serial/EMS adapter can be installed in the computer, so expanded memory may consist of more than 2M bytes (the theoretical limit is 8M bytes.)

DOS does not provide memory management for the expanded memory. DOS manages the memory between 00000h and 9FFFFh (the first 640K bytes). Because the page frame is located beyond this range, expanded memory is managed by a DOS device driver called the Expanded Memory Manager. The Expanded Memory Manager is a memory resident program (it can be running while another program is running) that controls the pages of expanded memory that may be accessed through the page frame at a given time. Application programs should gain access to the expanded memory by communicating with the Expanded Memory Manager.

The Expanded Memory Manager supplied with the dual-serial/EMS adapter is completely compatible with the Lotus/Intel/Microsoft Expanded Memory Specification. Thus, any application program that accesses expanded memory in the manner prescribed by the Expanded Memory Specification should function correctly with the EMS subsystem.

Expanded memory is installed on the dual-serial/EMS adapter in the form of RAM banks. Each bank consists of two RAM integrated circuits (128K bytes, 120 ns) mounted in adjacent sockets. Thus, each bank adds 256K bytes of RAM to the adapter. ICs U300 and U301 make up bank 0; ICs U314 and U315 make up bank 7.

B.6 Removal and Replacement

No special removal and replacement procedures are required to disassemble or repair the dual-serial/EMS adapter.

B.7 Adjustments

No adjustments are required for the dual-serial/EMS adapter.

B.8 Troubleshooting and Diagnostics

This section presents the procedure for checking the HP D1004A Dual-Serial/EMS Adapter. The procedure uses diagnostic tests contained on the diagnostic disc and indicates both assemblies and components to replace for particular failures. The repairs you make depend upon the type of repair you're performing:

- For assembly-level repair, replace the indicated assembly.
- For component-level repair, replace the indicated component or assembly.

CAUTION

Be sure to take precautions against electrostatic discharge. Wear a grounded wrist strap and work either at a bench that is electrostatically protected or on a field-service grounding mat (included with part number 9300-0933). Many components are susceptible to damage by elecrostatic discharge.

Check the dual-serial/EMS adapter by using the following steps. For a good unit, you'll proceed through the entire main sequence without branching to the diagnostic table that follows.

Certain steps have several possible outcomes. The outcomes are marked by bullets (■). The action you take is indicated for each outcome – the action may have a sequence of suggestions to try.

Problem Analysis:

1. **Read Comments.** Determine the customer's concern, if possible. Frequently, the customer includes with the unit a message describing the problem.
   - If the message indicates a problem with the computer itself, test the computer first according to its service manual.
   - If the message indicates a problem with the dual-serial/EMS adapter, continue with the steps in this procedure.
   - If the message indicates a problem with another adapter, an accessory, or a recharger (rather than with the dual-serial/EMS adapter), test the adapter, accessory, or recharger according to *its* diagnostic procedure.
   - If the message indicates a problem with a peripheral connected to a serial interface on the dual-serial/EMS adapter, test the adapter according to this section. Test the peripheral itself according to *its* service manual.
2. **Observe Symptoms.** If possible, try to observe the trouble by duplicating the situation described in the customer's message. Determine how the observed or reported behavior differs from the proper behavior. Also take note of functions that *do* work properly.
3. **Separate Problems.** Separate the observed symptoms into distinct problems. Use the troubleshooting procedure below to correct *one problem at a time*, starting with the more critical functions.
4. **Consider Causes.** Consider the possible causes for each problem. Keep them in mind as you troubleshoot.

Preparation:

5. **Note Configuration.** Make a note of the configuration of the dual-serial/EMS adapter (the jumper positions, switch settings, and RAM IC locations). You'll need this information to verify the results of the diagnostic tests and to restore the customer's configuration.

6. **Set Default Configuration.** Set the adapter's configuration to the default configuration. (You *can* test the adapter with another configuration if you're certain that no conflicting COM devices or interrupts are defined elsewhere in the system and if you use an EMS switch setting that's listed in table B-4.)

   - Serial jumpers (J101)
     ENABLE
     COM4 Interrupt – NONE
     COM3 Interrupt – NONE
     Port B – COM2
     Port A – COM1
   - EMS jumper (J200)
     ENABLE (if EMS RAM is installed)
     DISABLE (if no EMS RAM is installed)
   - EMS switch (SW200)
     0 1 0 1

7. **Remove Other Adapters.** Remove all adapters except the display/printer adapter and the dual-serial/EMS adapter you're testing. (Other adapters could be set to configurations that would conflict with the dual-serial/EMS adapter.)

Diagnostic Tests:

8. **Insert Diagnostic Disc.** Open the computer and pop up the disc drives, then insert the diagnostic disc in the left drive (drive A).

9. **Start Diagnostic Program.** Turn on the computer by sliding the power switch toward the back. The system should boot up and start the diagnostic program.

   - If the main test menu (figure B-3) appears, skip ahead to step 10.
   - If no display appears, (1) if the battery gauge shows only a "no battery" symbol, plug in a good recharger (if the gauge segments don't flash for about 10 seconds and then stop flashing, check the battery module according to the computer service manual); (2) adjust the contrast using the slide control; (3) slide the power switch again one or two times, waiting several seconds between tries; (4) check that the battery module is installed properly; (5) remove all adapters *except the dual-serial/EMS adapter and the display/printer adapter* and repeat this step. If no display appears, remove the dual-serial/EMS adapter and repeat this step again – if the test menu now appears, the dual-serial/EMS adapter is bad (replace it); if no display appears, check the computer according to its service manual.
   - If a picture shows that you should insert a disc in the left drive, (1) check that the diagnostic disc is properly inserted, then press [f1]; (2) insert a different copy of the diagnostic disc, then press [f1]; (3) check the computer according to its service manual.
   - If a picture shows that the clock isn't set, either wait a few seconds or press any key – then proceed according to one of the other outcomes for this step. No error is indicated by the clock picture.
   - If the display is active but the test menu *doesn't* appear, remove all adapters *except the dual-serial/EMS adapter and the display/printer adapter* and repeat this step. If the test menu still doesn't appear, remove the dual-serial/EMS adapter and repeat this step again – if the test menu now appears, the dual-serial/EMS adapter is bad (replace it); if the test menu still doesn't appear, check the computer according to its service manual.

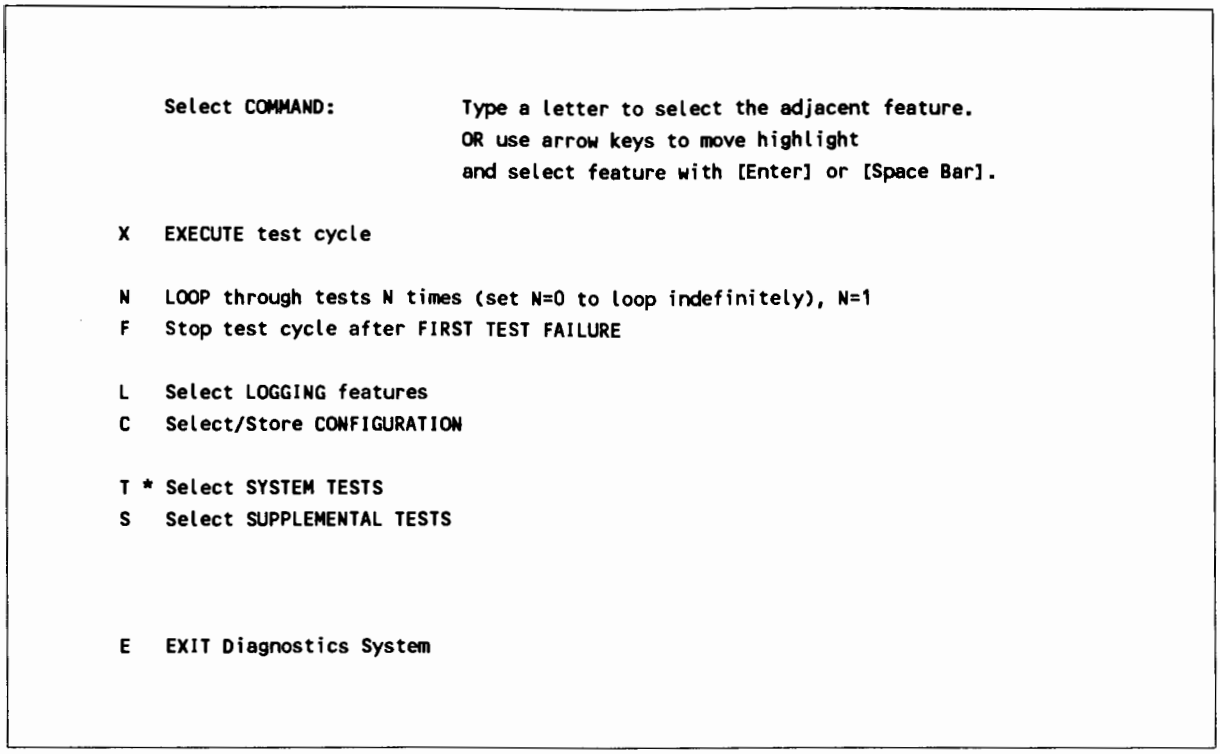


Figure B-3. Main Diagnostic Menu

10. **Turn Off System Tests.** If the SYSTEM item is selected (an * appears next to SYSTEM in the menu), press [T] to turn off the system tests.

11. **Install Two Loop-Back Connectors.** Install two serial loop-back connectors onto the two serial sockets on the dual-serial/EMS adapter. You'll repeat this step for the two types of 25-pin serial connections:

    - To test RS-232 operation, install the 25-pin RS-232 loop-back connector.
    - To test HP-422 operation, install the 25-pin HP-422 loop-back connector.

12. **Select Serial Test.** Select the dual-serial test from the supplemental test menu. (If you've already selected the serial test, skip ahead to the next step.)

    a. Press [S] to select the SUPPLEMENTAL item. (If this item is already selected, press [S] twice.) The supplemental test menu should appear.

    b. Select the "DUAL-SERIAL/EMS, Serial" test (an * in the menu indicates that the test is selected).

    c. Press [R] to select the RETURN item. This returns to the main menu.

13. **Run Serial Test.** Press [X] to select the EXECUTE item. The test you selected in the previous step should run.

14. Follow Up Serial Results. Take action according to the results of the serial test.

- If the serial interface passes and the indicated configurations for ports A and B match the settings on the adapter, the serial interface portion of the adapter is good. Go to the next step.
- If the serial test fails, take action according to the symptoms listed under "Serial Test" in table B-9, "Diagnostic Results."
- If the indicated configurations for ports A and B don't match the settings on the adapter, take action according to the symptoms listed under "Serial Test" in table B-9, "Diagnostic Results."

15. Repeat Serial Test for Other Connection. Repeat the serial test using the the other 25-pin loop-back connector. This tests the serial interface in each of its operating configurations. Go back to step 11.

16. Select RAM Test. If EMS RAM ICs are installed, select the RAM test from the supplemental test menu. (Otherwise, skip ahead to step 19.)

a. Press [S] to select the SUPPLEMENTAL item. The supplemental test menu should appear.

b. Select the "DUAL-SERIAL/EMS, RAM" test (an * in the menu indicates that the test is selected).

c. Press [R] to select the RETURN item. This returns to the main menu.

17. Run RAM Test. Press [X] to select the EXECUTE item. The test you selected in the previous step should run. *This test takes 5 to 10 minutes to test 2M bytes of RAM.* (Even if no RAM ICs are installed, this test partially checks the EMS subsystem.)

18. Follow Up RAM Results. Take action according to the results of the RAM test.

- If the RAM test passes and the indicated amount of RAM matches the amount installed on the adapter (two ICs for each 256K bytes), the EMS subsystem is good. Go to the next step.
- If the EMS subsystem doesn't pass, take action according to the symptoms listed under "RAM Test" in table B-9, "Diagnostic Results."
- If the indicated amount of RAM doesn't match the amount installed on the adapter (two ICs for each 256K bytes), take action according to the symptoms listed under "RAM Test" in table B-9, "Diagnostic Results."

Verification:

19. Verify Operation. After repairing any faults, verify that the adapter is good by repeating the two serial tests and the RAM test. (If any test doesn't pass, take action as described above, then verify the system again.)

20. Restore Original Configuration. Using your notes, restore the adapter to the customer's original configuration. If possible, check that the serial COM devices and interrupts aren't the same as those used elsewhere in the system and that the EMS switch setting is one of those listed in table B-4.

Table B-9. Diagnostic Test Results

Use this table to interpret the results of the dual-serial/EMS diagnostic tests. Two types of results can occur, as indicated by the typeface:

- `Message` – indicates a message on the LCD (and log device, if selected).
- Observation – indicates a condition that you should check for.

For certain results, you can replace either a component or an assembly. If you're set up for component-level repair, replace the indicated component; otherwise replace the indicated assembly or socketed RAM IC.

Test Result	Action
Serial Test:	
Indicated port A or B configuration doesn't match the settings on the adapter	(1) Check that the serial configuration is set properly according to table B-3, "Serial Configuration Settings"; (2) replace the adapter.*
`Dual UART test failed, replace dual-serial/EMS PCA`	(1) Check that the serial interface is configured to ENABLE according to table B-3, "Serial Configuration Settings"; (2) for component-level repair, use a scope to check for a 3.7-MHz signal at crystal Y100 (ground at C100 closest to the corner of the PCA by the I/O connector; signal at either of the two pins closest to the end plate) – if this signal isn't present, replace crystal Y100; (3) replace the adapter.*
`9-pin port serial data transfer failed, replace dual-serial/EMS PCA`	(1) Check that the loop-back connector is installed properly on the 9-pin port; (2) for component-level repair, check the continuity of fuse F100 – if it's bad, replace the fuse; (3) for component-level repair, replace transceiver U102; (4) replace the adapter.*
`9-pin port control lines open, replace dual-serial/EMS PCA`	(1) Check that the loop-back connector is installed properly on the 9-pin port; (2) replace the adapter.*
`25-pin port serial data transfer failed, replace dual-serial/EMS PCA`	(1) Check that the loop-back connector is installed properly on the 25-pin port; (2) for component-level repair, check the continuity of fuse F100 – if it's bad, replace the fuse; (3) for component-level repair, replace transceiver U105; (4) for component-level repair, replace transceiver U103 for RS-232 operation or U106 for HP-422 operation; (5) replace the adapter.*
`25-pin port control lines open, replace dual-serial/EMS PCA`	(1) Check that the loop-back connector is installed properly on the 25-pin port; (2) replace the adapter.*

Table B-9. Diagnostic Test Results (Continued)

Test Result	Action
RAM Test:	
Indicated amount of RAM doesn't match the amount installed on the adapter (two ICs for each 256K bytes)	(1) Check that the EMS subsystem is configured to ENABLE according to table B-4, "EMS Subsystem Configuration Settings"; (2) check that the RAM ICs are fully inserted in the sockets in the proper orientation and installed in pairs (see figure B-2); (3) if one or two ICs aren't listed as good *or* bad in the test output, replace those ICs; (4) replace the adapter.*
RAM IC isn't listed as good *or* bad	(1) Check that the RAM IC is fully inserted in the socket in the proper orientation; (2) if only one or two ICs aren't listed, replace the ICs; (3) replace the adapter.*
`EMS Gate Array test failed, replace dual-serial/EMS PCA`	(1) Check that the EMS subsystem is configured to ENABLE according to table B-4, "EMS Subsystem Configuration Settings"; (2) replace the adapter.*

`RAM test failed, replace RAM IC`
`Uxx, Page: yyh`
`Page Offset: zzzzh`
`Expected: aah`
`Read: bbh`
	(1) Check that the indicated ICs are fully inserted in the sockets; (2) if only one or two ICs fail, replace the indicated ICs; (3) replace the adapter.* (The reference designation and other information are given for reporting purposes only.)

* If RAM ICs are installed on the PCA, be sure to transfer them to the replacement PCA.

B.9 Replaceable Parts

Table B-10 lists replaceable parts for the HP D1004A Dual-Serial/EMS Adapter. The main assembly is listed with its replaceable component parts immediately following in the same table. The component parts are marked with "•" in front of their descriptions.

Order replacement parts and assemblies from Hewlett-Packard Corporate Parts Center or from Parts Center Europe.

Table B-10. Dual-Serial/EMS Adapter Replaceable Parts

Reference Designation	HP Part Number	Description	Quantity
	D1004-60901	ASSEMBLY, serial/EMS, service	1
F100	2110-0716	• FUSE, 0.5A	1
U102, U103, U104	1820-4666	• INTEGRATED CIRCUIT, transceiver	3
U105	1820-2417	• INTEGRATED CIRCUIT, receiver	1
U106	1820-4890	• INTEGRATED CIRCUIT, transceiver	1
W100 – W105, W200	1258-0221	• JUMPER	7
Y100	0410-1911	• CRYSTAL, 3.6864 MHz	1
U300 – U315	1818-4036	INTEGRATED CIRCUIT, RAM, plug-in	0/8/16*

* Quantity 0 for basic version, 8 for 1M-byte version, 16 for 2M-byte version.

B.10 Reference

For information about installing and operating the dual-serial/EMS adapter, refer to the *HP D1004A Dual-Serial/EMS Adapter Owner's Manual*, part number D1004-90001.

For technical information about the dual-serial/EMS adapter, refer to the Portable Vectra CS *Technical Reference Manual*, order number HP D1006A.

Files for operating the EMS subsystem are contained on the EMS disc, replacement part number D1004-60004.

For a detailed description of the EMS environment, refer to the Lotus/Intel/Microsoft *Expanded Memory Specification*, Version 3.20, part number 300275-003 from Intel Corporation, September 1985.

Figures B-4 through B-6 show the wiring for the serial loop-back connectors.

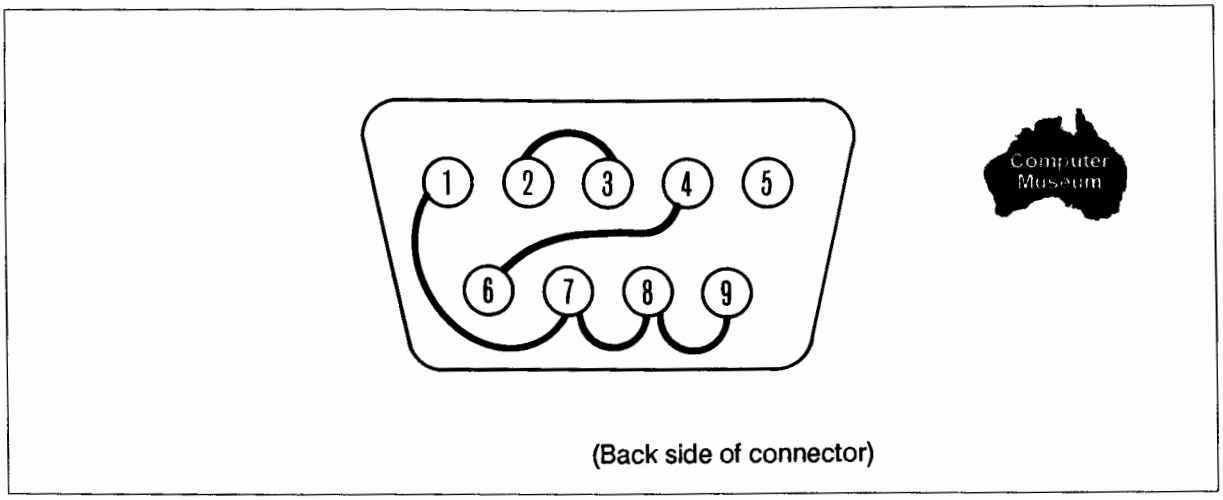


Figure B-4. Wiring Diagram for 9-Pin Serial Loop-Back Connector

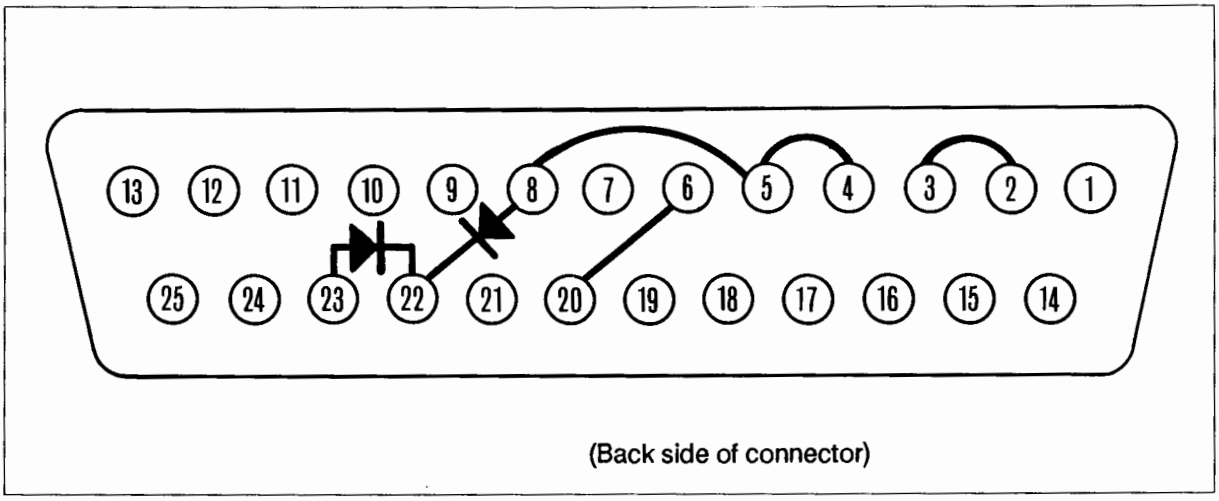


Figure B-5. Wiring Diagram for 25-Pin RS-232 Loop-Back Connector

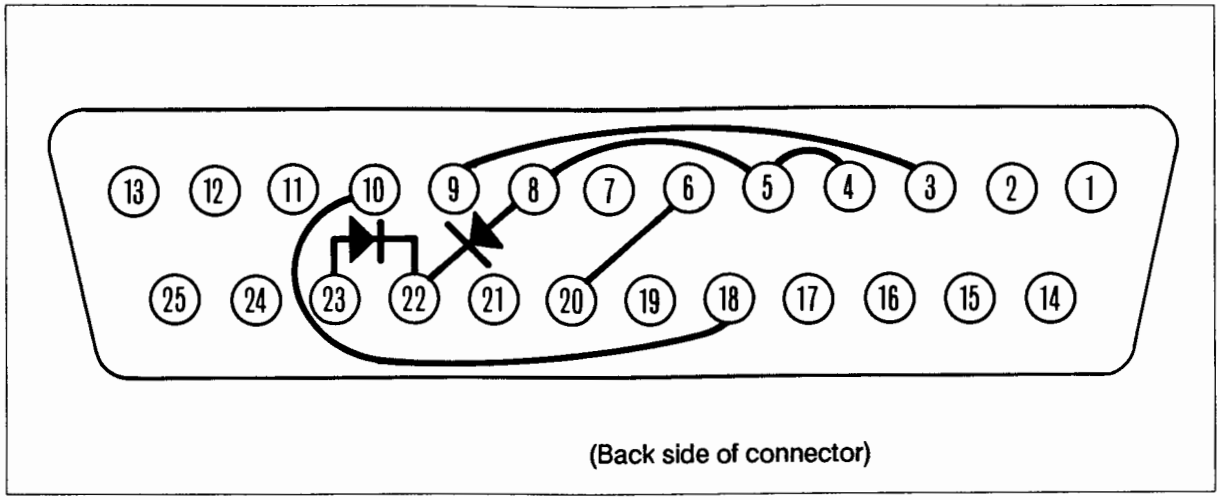


Figure B-6. Wiring Diagram for 25-Pin HP-422 Loop-Back Connector

B.11 Product History

This section normally contains information for adapting this chapter to earlier units that differ from current units. Since this chapter *does* apply to all units produced as of the printing date, no change information is given here.

B.12 Diagrams

The component-location diagram and schematic diagrams for the dual-serial/EMS adapter are shown in figures B-7 through B-10.

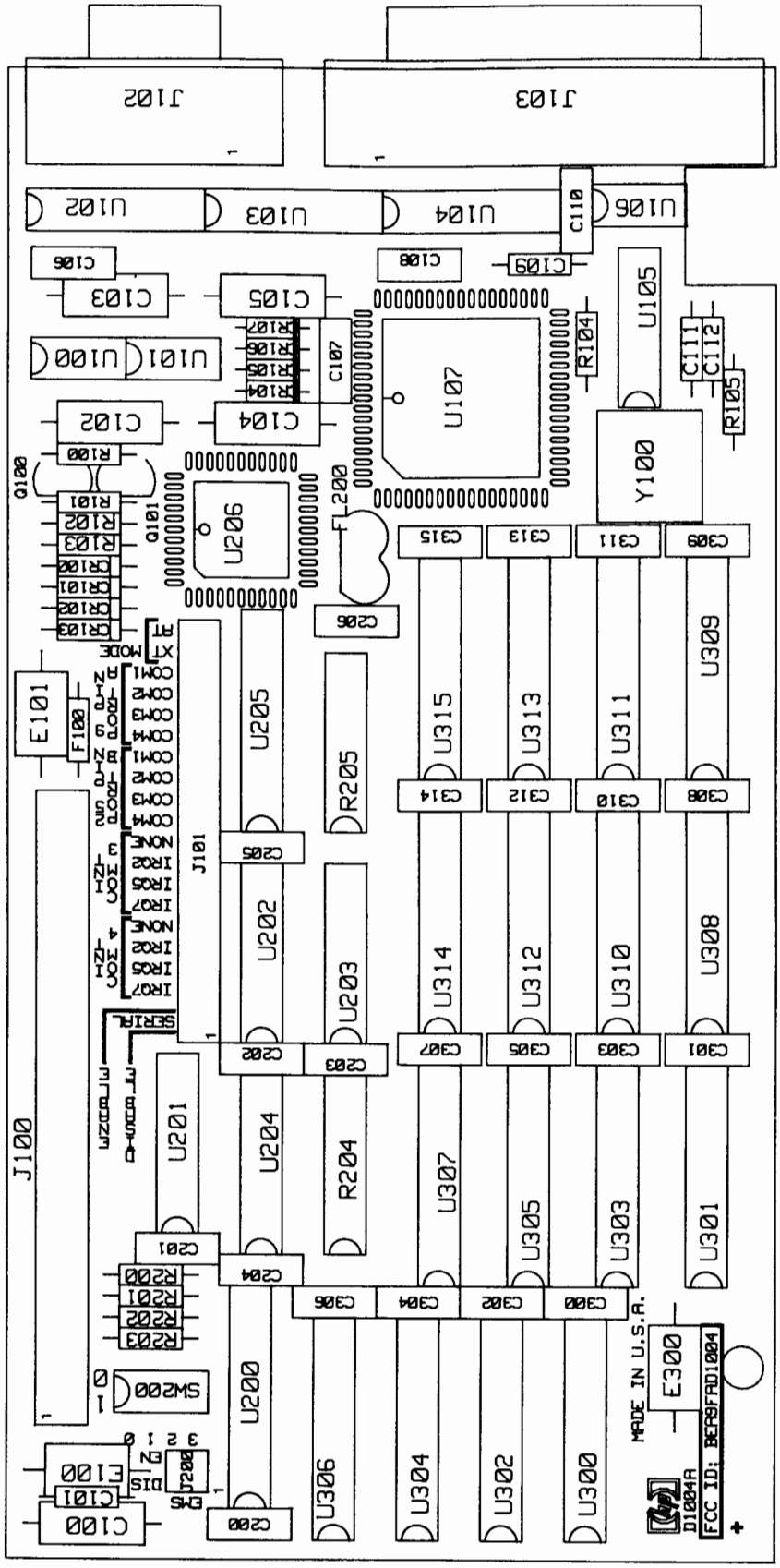


Figure B-7. Dual-Serial/EMS Adapter Component-Location Diagram

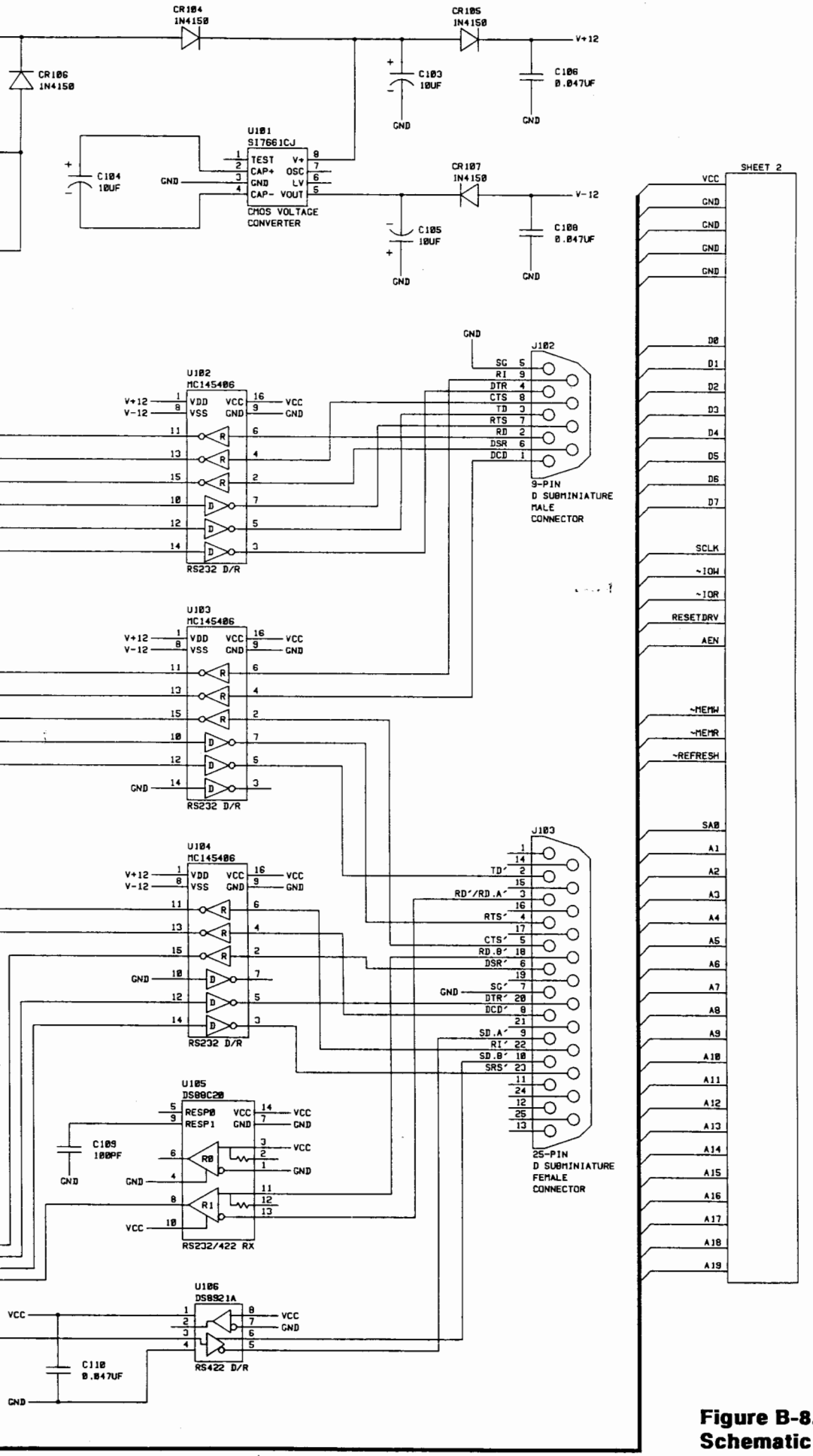
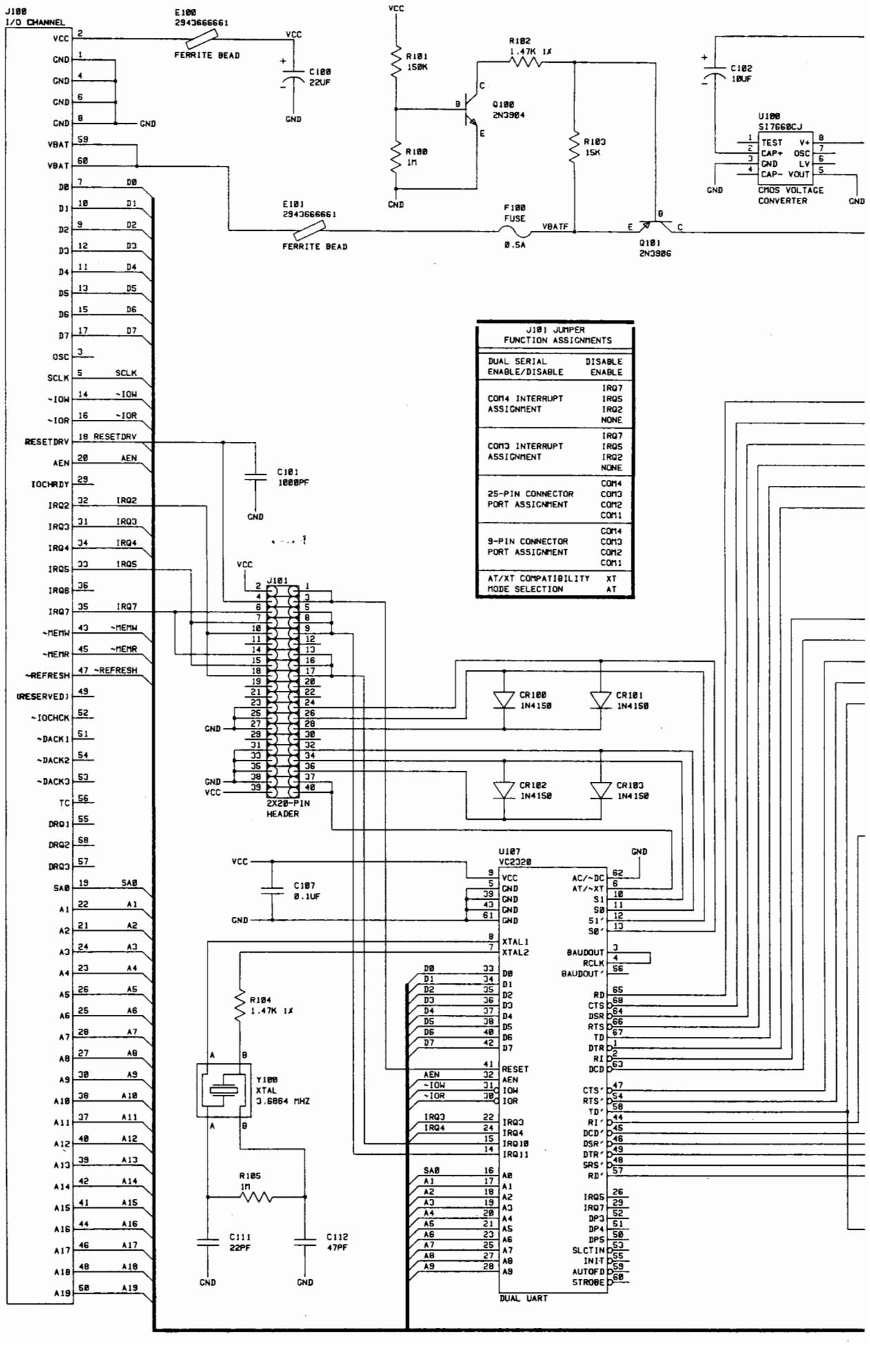


Figure B-8. Dual-Serial/EMS Adapter Schematic Diagram (1 of 3)


J100
I/O CHANNEL
E100
2943666661
FERRITE BEAD
C100
22UF
R101
150K
R102
1.47K 1%
Q100
2N3904
R100
1M
R103
15K
C102
10UF
U100
S17660CJ
TEST
CAP+
GND
CAP-
V+
OSC
LV
VOUT
CMOS VOLTAGE
CONVERTER
E101
2943666661
FERRITE BEAD
F100
FUSE
0.5A
VBATF
Q101
2N3906
J101 JUMPER
FUNCTION ASSIGNMENTS
DUAL SERIAL ENABLE/DISABLE
DISABLE
ENABLE
COM4 INTERRUPT ASSIGNMENT
COM3 INTERRUPT ASSIGNMENT
IRQ7
IRQ5
IRQ2
NONE
25-PIN CONNECTOR PORT ASSIGNMENT
9-PIN CONNECTOR PORT ASSIGNMENT
COM4
COM3
COM2
COM1
AT/XT COMPATIBILITY MODE SELECTION
XT
AT
C101
1000PF
J101
2X20-PIN
HEADER
CR100
1N4150
CR101
1N4150
CR102
1N4150
CR103
1N4150
U107
VC2320
DUAL UART
C107
0.1UF
R104
1.47K 1%
Y100
XTAL
3.6864 MHZ
R105
1M
C111
22PF
C112
47PF

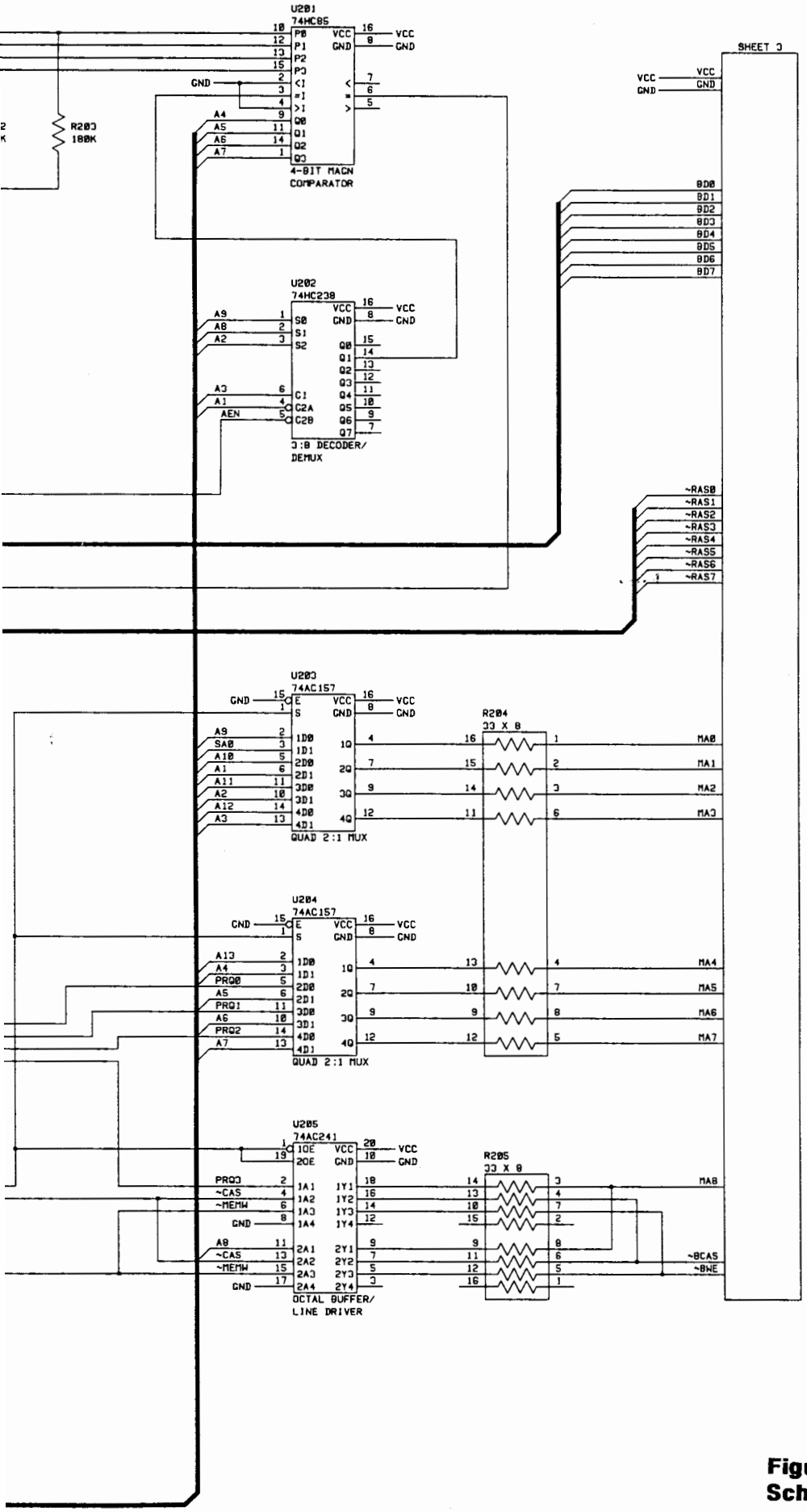
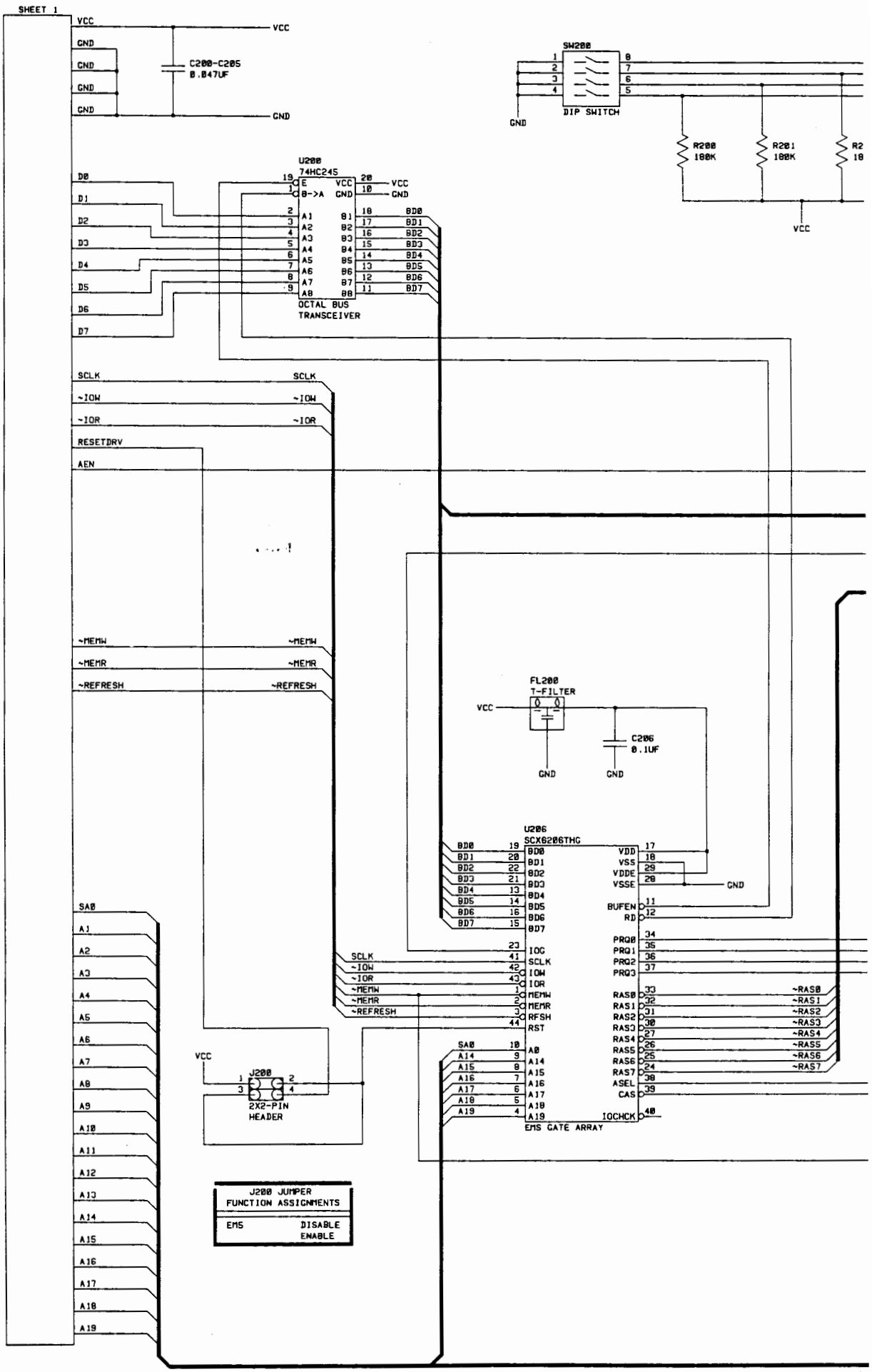


Figure B-9. Dual-Serial/EMS Adapter Schematic Diagram (2 of 3)


SHEET 1
VCC
GND
C200-C205
0.047UF
SW200
DIP SWITCH
R200
100K
R201
100K
U200
74HC245
OCTAL BUS
TRANSCEIVER
D0
D1
D2
D3
D4
D5
D6
D7
SCLK
~IOW
~IOR
RESETDRV
AEN
~MEMW
~MEMR
~REFRESH
FL200
T-FILTER
C206
0.1UF
U206
SCX6206THG
EMS GATE ARRAY
SA0
A1
A2
A3
A4
A5
A6
A7
A8
A9
A10
A11
A12
A13
A14
A15
A16
A17
A18
A19
J200
2X2-PIN
HEADER
J200 JUMPER
FUNCTION ASSIGNMENTS
EMS
DISABLE
ENABLE

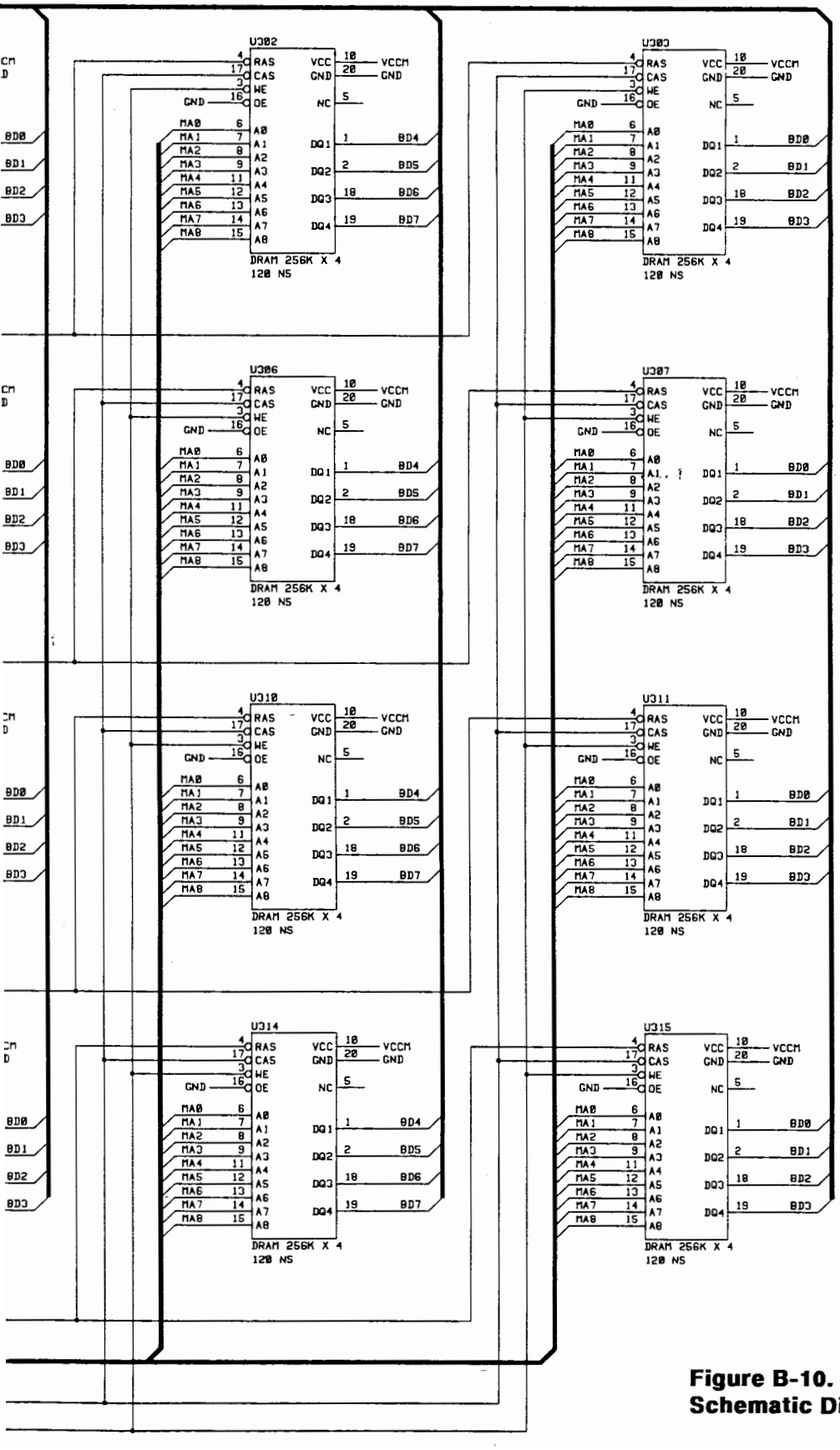
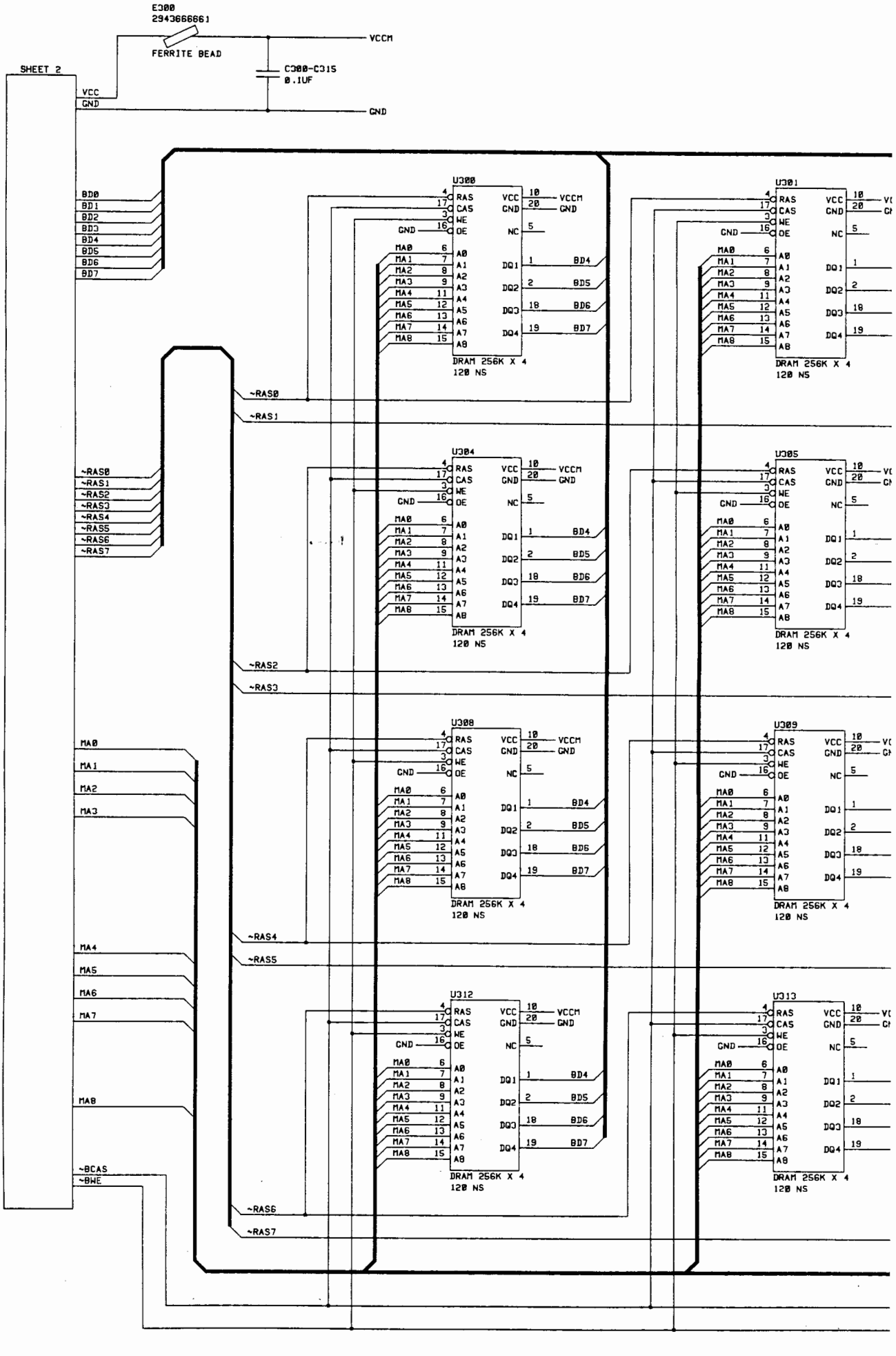


Figure B-10. Dual-Serial/EMS Adapter Schematic Diagram (3 of 3)


E300
2943666661
FERRITE BEAD
VCCM
C300-C315
0.1UF
GND
SHEET 2
VCC
GND
BD0
BD1
BD2
BD3
BD4
BD5
BD6
BD7
~RAS0
~RAS1
~RAS2
~RAS3
~RAS4
~RAS5
~RAS6
~RAS7
MA0
MA1
MA2
MA3
MA4
MA5
MA6
MA7
MA8
~BCAS
~BWE
U300
U301
U304
U305
U308
U309
U312
U313
RAS
CAS
WE
OE
NC
VCC
GND
A0
A1
A2
A3
A4
A5
A6
A7
A8
DQ1
DQ2
DQ3
DQ4
DRAM 256K X 4
120 NS

Appendix C
1200 bps Asynchronous Modem

Contents

C.1 Product Information

C.1.1 Description

The HP D1002A 1200 bps Asynchronous Modem is a plug-in adapter PCA that's compatible with the I/O bus of portable Vectra computers. The modem is compatible with Bell 103/212A and CCITT V.22 protocol standards. It's an intelligent modem with auto-answer and auto-dial capabilities using either tone (DTMF) or pulse dialing. It can communicate asynchronously at 0 to 300 bits per second and at 1200 bits per second. The modem command set is compatible with the Hayes Smartmodem 1200B command set.

C.1.2 Specifications

Specifications for the modem are listed in table C-1.

Table C-1. 1200 bps Modem Specifications

Physical Properties

- PCA Dimensions: 179 by 93 mm (7.0 by 3.7 inches).
- Weight: 200 grams (7 ounces).

Environmental Limits

- Operating temperature: 0° to 50°C (32° to 122°F).
- Storage temperature: −20° to 65°C (−4° to 149°F).

Power Requirements

- Source: computer +5V supply (Vcc).
- Consumption: 35 mA typical.

Capabilities

- Data formats: 7 and 8 data bits.
  1 start bit.
  1 and 2 stop bits.
  Even, odd, "0", "1", and no parity (parity not available at 1200-b/s transmission).
- Data rates: 0 to 300 b/s for Bell 103 protocol (frequency-shift keyed, FSK).
  1200 b/s for Bell 212A protocol (di-bit phase-shift keyed, DPSK).
  1200 b/s for CCITT V.22 protocol (di-bit phase-shift keyed, DPSK).
- Transmission modes: Originate and Answer, asynchronous.
- Carrier frequencies: Transmit 1200 Hz, receive 2400 Hz in Originate mode.
  Transmit 2400 Hz, receive 1200 Hz in Answer mode.
- Guard frequency: 1800 Hz nominal (CCITT V.22 protocol only).
- Character transmission: Full-duplex and half-duplex.
- Answering: Automatic and manual.
- Command buffer size: 40 characters.
- Audio monitor: Speaker with programmable on/off control.

Table C-1. 1200 bps Modem Specifications (Continued)

Compatibility
■ Protocol: Bell System 103 and 212A and CCITT V.22 asynchronous only.
■ Connections: Two sockets for USOC #RJ11C plugs.
■ Dialing: Tone (DTMF) and pulse.

C.1.3 Service Support

This manual supports repair of the 1200 bps modem at the assembly level. Repair procedures (described in section C.8) involve running diagnostic tests, then replacing the complete modem if indicated.

Table C-2 lists tools and equipment needed to troubleshoot the modem.

Table C-2. Recommended Tools and Equipment

HP Part/Model Number	Description
D1001-60921	Disc, diagnostic.
8710-1415	Torx bit, T15.
8710-1413	Torx handle.
HP D1001A*	Portable Vectra CS (complete).

* Or equivalent.

C.2 Site Preparation and Requirements

No special site requirements are set for the 1200 bps modem.

C.3 Installation and Configuration

To configure the 1200 bps modem, you must first turn off the computer, then set three switch segments on the modem PCA. Use the information in table C-3 to determine the proper settings.

Table C-3. 1200 bps Modem Configuration Settings

Switch Segment	Setting	Meaning
COM1/COM2	COM1*	Designates the modem as the COM1 device (I/O address range 3F8–3FF).
	COM2	Designates the modem as the COM2 device (I/O address range 2F8–2FF).
DCD Enable/Ignore	DCD Enable*	Modem detects the presence and absence of a carrier signal from the remote modem.
	DCD Ignore	Modem assumes a carrier signal is always present from the remote modem.
DTR Enable/Ignore	DTR Enable*	Modem detects the DTR signal from the computer (if DTR is not true, the modem hangs up and returns to command mode).
	DTR Ignore	Modem assumes the DTR signal is always true.

* Default setting.

To install the 1200 bps modem in the computer, refer to chapter 3, "Installation and Configuration," in the computer service manual. In addition, you should stick the FCC modem label onto the computer's bottom case in the recessed area.

To connect the modem to a phone line, plug one end of a modular phone cable into *either* socket on the back of the modem. Connect the other end to the phone line. (To also connect a telephone to the line, connect the modular plug on the telephone cable into the other modem socket.)

C.4 Preventive Maintenance

No preventive maintenance is required for the 1200 bps modem.

C.5 Functional Description

All circuitry for the 1200 bps modem is contained on a single PCA that is compatible with the I/O bus of portable Vectra computers. No special functional information is required to repair the 1200 bps modem. Specifications for the modem are listed in table C-1.

C.6 Removal and Replacement

No special removal and replacement procedures are required to disassemble or repair the 1200 bps modem.

C.7 Adjustments

No adjustment are permitted for the 1200 bps modem.

C.8 Troubleshooting and Diagnostics

This section presents the procedure for checking the HP D1002A 1200 bps Asynchronous Modem. The procedure uses diagnostic tests contained on the diagnostic disc. All repairs are made by replacing the modem assembly – no components are replaceable.

CAUTION

Be sure to take precautions against electrostatic discharge. Wear a grounded wrist strap and work either at a bench that is electrostatically protected or on a field-service grounding mat (included with part number 9300-0933). Many components are susceptible to damage by elecrostatic discharge.

Check the 1200 bps modem by using the following steps. For a good unit, you'll proceed through the entire main sequence without branching to the diagnostic table that follows.

Certain steps have several possible outcomes. The outcomes are marked by bullets (■). The action you take is indicated for each outcome – the action may have a sequence of suggestions to try.

Problem Analysis:

1. **Read Comments.** Determine the customer's concern, if possible. Frequently, the customer includes with the unit a message describing the problem.
   - If the message indicates a problem with the computer itself, test the computer first according to its service manual.
   - If the message indicates a problem with the 1200 bps modem, continue with the steps in this procedure.
   - If the message indicates a problem with another adapter, an accessory, or a recharger (rather than with the 1200 bps modem), test the adapter, accessory, or recharger according to *its* diagnostic procedure.
2. **Observe Symptoms.** If possible, try to observe the trouble by duplicating the situation described in the customer's message. Determine how the observed or reported behavior differs from the proper behavior. Also take note of functions that *do* work properly.
3. **Separate Problems.** Separate the observed symptoms into distinct problems. Use the troubleshooting procedure below to correct *one problem at a time*, starting with the more critical functions.
4. **Consider Causes.** Consider the possible causes for each problem. Keep them in mind as you troubleshoot.

Preparation:

5. **Remove Other Adapters.** Remove all adapters except the display/printer adapter and the 1200 bps modem you're testing. (Other adapters could be set to configurations that would conflict with the 1200 bps modem.)

Diagnostic Tests:

6. **Insert Diagnostic Disc.** Open the computer and pop up the disc drives, then insert the diagnostic disc in the left drive (drive A).

7. **Start Diagnostic Program.** Turn on the computer by sliding the power switch toward the back. The system should boot up and start the diagnostic program.

   - If the main test menu (figure C-1) appears, skip ahead to step 8.
   - If no display appears, (1) if the battery gauge shows only a "no battery" symbol, plug in a good recharger (if the gauge segments don't flash for about 10 seconds and then stop flashing, check the battery module according to the computer service manual); (2) adjust the contrast using the slide control; (3) slide the power switch again one or two times, waiting several seconds between tries; (4) check that the battery module is installed properly; (5) remove all adapters *except the 1200 bps modem and the display/printer adapter* and repeat this step. If no display appears, remove the 1200 bps modem and repeat this step again – if the test menu now appears, the 1200 bps modem is bad (replace it); if no display appears, check the computer according to its service manual.
   - If a picture shows that you should insert a disc in the left drive, (1) check that the diagnostic disc is properly inserted, then press [f1]; (2) insert a different copy of the diagnostic disc, then press [f1]; (3) check the computer according to its service manual.
   - If a picture shows that the clock isn't set, either wait a few seconds or press any key – then proceed according to one of the other outcomes for this step. No error is indicated by the clock picture.
   - If the display is active but the test menu *doesn't* appear, remove all adapters *except the 1200 bps modem and the display/printer adapter* and repeat this step. If the test menu still doesn't appear, remove the 1200 bps modem and repeat this step again – if the test menu now appears, the 1200 bps modem is bad (replace it); if the test menu still doesn't appear, check the computer according to its service manual.

```
    Select COMMAND:          Type a letter to select the adjacent feature.
                             OR use arrow keys to move highlight
                             and select feature with [Enter] or [Space Bar].

X   EXECUTE test cycle

N   LOOP through tests N times (set N=0 to loop indefinitely), N=1
F   Stop test cycle after FIRST TEST FAILURE

L   Select LOGGING features
C   Select/Store CONFIGURATION

T * Select SYSTEM TESTS
S   Select SUPPLEMENTAL TESTS



E   EXIT Diagnostics System
```

Figure C-1. Main Diagnostic Menu

8. **Turn Off System Tests.** If the SYSTEM item is selected (an * appears next to SYSTEM in the menu), press [T] to turn off the system tests.

9. **Select 1200-bps Local Loopback Test.** Select the 1200 bps modem local loopback test from the supplemental test menu. (If you've already selected this test, skip ahead to the next step.)

   a. Press [S] to select the SUPPLEMENTAL item. (If this item is already selected, press [S] twice.) The supplemental test menu should appear.

   b. Select the "MODEM, Local Loopback" test. (If this item is already selected, turn it off then select it again. An * in the menu indicates that the test is selected.)

   c. Select the "1200 bps" option. The supplemental test menu should now show this option.

   d. Press [R] to select the RETURN item. This returns to the main menu.

10. **Run Local Loopback Test.** Press [X] to select the EXECUTE item. The test you selected in the previous step should run.

11. **Follow Up Local Loopback Results.** Take action according to the results of the local loopback test.

   - If the local loopback test passes, the internal modem circuit is good. Go to the next step.
   - If the local loopback test fails, take action according to the symptoms listed under "Local Loopback Test" in table C-4, "Diagnostic Results."
   - If the modem isn't found, take action according to the symptoms listed under "Local Loopback Test" in table C-4, "Diagnostic Results."

12. **Connect Phone Line.** Connect the modem to a good telephone line. (You need to know the phone number for the line, and you need to have a telephone at another nearby line with a different phone number.)

13. **Select 1200-bps Line Test.** Select the 1200 bps modem line test from the supplemental test menu. (If you've already selected this test, skip ahead to the next step.)

   a. Press [S] to select the SUPPLEMENTAL item. (If this item is already selected, press [S] twice.) The supplemental test menu should appear.

   b. Select the "MODEM, Line" test. (If this item is already selected, turn it off then select it again. An * in the menu indicates that the test is selected.)

   c. Select the "1200 bps" option. The supplemental test menu should now show this option.

   d. Press [R] to select the RETURN item. This returns to the main menu.

14. **Run Line Test.** Press [X] to select the EXECUTE item. The test you selected in the previous step should run. In the first section of the test, you're prompted to enter the phone number of a nearby telephone. In the second section, you're prompted to dial the modem's phone number from the nearby telephone.

15. **Follow Up Line Results.** Take action according to the results of the line test.

   - If the modem successfully rings the telephone and indicates that it receives the incoming call, the external modem circuit is good. Go to the next step.
   - If any aspect of the line test fails, take action according to the symptoms listed under "Line Test" in table C-4, "Diagnostic Results."

Verification:

16. **Verify Operation.** Verify that the 1200 bps modem is good by repeating the local loopback and line tests. (If either test doesn't pass, take action as described above, then verify the system again.)

Table C-4. Diagnostic Test Results

Use this table to interpret the results of the 1200 bps modem diagnostic tests. Two types of results can occur, as indicated by the typeface:

- `Message` – indicates a message on the LCD (and log device, if selected).
- Observation – indicates a condition that you should check for.

CAUTION

Don't replace or adjust components on the original modem or on a new modem. No modifications or adjustments are allowed by the U.S. Federal Communications Commission and the Canadian Department of Communications.

Test Result	Action
Local Loopback Test:	
`Modem not found`	(1) Check that the modem is configured to a COM device that's not used elsewhere in the system; (2) replace the modem.
`Modem test failed, replace modem PCA`	Replace the modem.
Line Test:	
`Modem not found`	(1) Check that the modem is configured to a COM device that's not used elsewhere in the system; (2) replace the modem.
Telephone doesn't ring when called by modem	(1) Check the external phoneline connections; (2) check the phone number; (3) replace the modem.
Modem doesn't detect call from telephone	(1) Check the external phoneline connections; (2) check the phone number; (3) replace the modem.

C.9 Replaceable Parts

The replacement part number for the HP D1002A 1200 bps Asynchronous Modem is D1002-60901 (new part). No component parts are available.

Order replacement assemblies from Hewlett-Packard Corporate Parts Center.

C.10 Reference

For information about installing and operating the 1200 bps modem, refer to the *HP D1002A 1200 bps Asynchronous Modem Owner's Manual*, part number D1002-90001.

C.11 Product History

This section normally contains information for adapting this chapter to earlier modems that differ from current units. Since this chapter *does* apply to all modems produced as of the printing date, no change information is given here.

C.12 Diagrams

No diagrams are required to repair the 1200 bps modem.

Appendix D
2400 bps Synchronous/Asynchronous Modem

Contents

D.1 Product Information

D.1.1 Description

The HP D1003A 2400 bps Synchronous/Asynchronous Modem is a plug-in adapter PCA that's compatible with the I/O bus of portable Vectra computers. The modem is compatible with Bell 103/212A and CCITT V.22/V.22 bis protocol standards. It's an intelligent modem with auto-answer and auto-dial capabilities using either tone (DTMF) or pulse dialing. It can communicate asynchronously at 0 to 300 bits per second; it can communicate synchronously and asynchronously at 1200 and 2400 bits per second. The modem command set is compatible with the Hayes Smartmodem 2400 command set.

D.1.2 Specifications

Specifications for the modem are listed in table D-1.

Table D-1. 2400 bps Modem Specifications

Physical Properties

- PCA Dimensions: 179 by 93 mm (7.0 by 3.7 inches).
- Weight: 220 grams (8 ounces).

Environmental Limits

- Operating temperature: 0° to 50°C (32° to 122°F).
- Storage temperature: −20° to 65°C (−4° to 149°F).

Power Requirements

- Source: computer +5V supply (Vcc).
- Consumption: 110 mA typical.

Table D-1. 2400 bps Modem Specifications (Continued)

Capabilities

- Transmission: Asynchronous at 0 to 300 b/s, 1200 b/s, and 2400 b/s.
  Synchronous at 1200 and 2400 b/s.
- Asynchronous data formats: 7 and 8 data bits.
  1 start bit.
  1 and 2 stop bits.
  Even, odd, "0", "1", and no parity.
- Data rates: 0 to 300 b/s for Bell 103 protocol (frequency-shift keyed, FSK).
  1200 b/s for Bell 212A protocol (di-bit phase-shift keyed, DPSK).
  1200 b/s for CCITT V.22 protocol (di-bit phase-shift keyed, DPSK).
  2400 b/s for CCITT V.22 bis protocol (quadrature amplitude modulation, QAM).
- Transmission modes: Originate and Answer.
- Carrier frequencies: Transmit 1200 Hz, receive 2400 Hz in Originate mode.
  Transmit 2400 Hz, receive 1200 Hz in Answer mode.
- Guard frequency: 553.846 and 1800 Hz nominal (CCITT V.22 and V.22 bis protocols only).
- Character transmission: Full-duplex and half-duplex.
- Answering: Automatic and manual for (synchronous and asynchronous).
- Command buffer size: 40 characters.
- Audio monitor: Speaker with programmable volume control.

Compatibility

- Protocol: Bell System 103, asynchronous.
  Bell System 212A and CCITT V.22 and V.22 bis, asynchronous and synchronous.
- Connections: Two sockets for USOC #RJ11C plugs.
- Dialing: Tone (DTMF) and pulse.

D.1.3 Service Support

This manual supports repair of the 2400 bps modem at the assembly level. Repair procedures (described in section D.8) involve running diagnostic tests, then replacing the complete modem if indicated.

Table D-2 lists tools and equipment needed to troubleshoot the modem.

Table D-2. Recommended Tools and Equipment

HP Part/Model Number	Description
D1001-60921	Disc, diagnostic.
8710-1415	Torx bit, T15.
8710-1413	Torx handle.
HP D1001A*	Portable Vectra CS (complete).

* Or equivalent.

D.2 Site Preparation and Requirements

No special site requirements are set for the 2400 bps modem.

D.3 Installation and Configuration

To configure the 2400 bps modem, you must first turn off the computer, then set three switch segments on the modem PCA. Use the information in table D-3 to determine the proper settings.

Table D-3. 2400 bps Modem Configuration Settings

Jumper	Position	Meaning
Low-Power Mode (JP2)	ENABLE*	The modem can go to its low-power state.
	DISABLE	The modem can't go to its low-power state.
COM1/COM2 (JP1)	COM1*	Designates the modem as the COM1 device (I/O address range 3F8–3FF).
	COM2	Designates the modem as the COM2 device (I/O address range 2F8–2FF).

* Default setting.

To install the 2400 bps modem in the computer, refer to chapter 3, "Installation and Configuration," in the computer service manual. In addition, you should stick the FCC modem label onto the computer's bottom case in the recessed area.

To connect the modem to a phone line, plug one end of a modular phone cable into *either* socket on the back of the modem. Connect the other end to the phone line. (To also connect a telephone to the line, connect the modular plug on the telephone cable into the other modem socket.)

D.4 Preventive Maintenance

No preventive maintenance is required for the 2400 bps modem.

D.5 Functional Description

All circuitry for the 2400 bps modem is contained on a single PCA that is compatible with the I/O bus of portable Vectra computers. No special functional information is required to repair the 2400 bps modem. Specifications for the modem are listed in table D-1.

D.6 Removal and Replacement

No special removal and replacement procedures are required to disassemble or repair the 2400 bps modem.

D.7 Adjustments

No adjustment are permitted for the 2400 bps modem.

D.8 Troubleshooting and Diagnostics

This section presents the procedure for checking the HP D1003A 2400 bps Synchronous/Asynchronous Modem. The procedure uses diagnostic tests contained on the diagnostic disc. All repairs are made by replacing the modem assembly – no components are replaceable.

CAUTION

Be sure to take precautions against electrostatic discharge. Wear a grounded wrist strap and work either at a bench that is electrostatically protected or on a field-service grounding mat (included with part number 9300-0933). Many components are susceptible to damage by elecrostatic discharge.

Check the 2400 bps modem by using the following steps. For a good unit, you'll proceed through the entire main sequence without branching to the diagnostic table that follows.

Certain steps have several possible outcomes. The outcomes are marked by bullets (■). The action you take is indicated for each outcome – the action may have a sequence of suggestions to try.

Problem Analysis:

1. **Read Comments.** Determine the customer's concern, if possible. Frequently, the customer includes with the unit a message describing the problem.
   - If the message indicates a problem with the computer itself, test the computer first according to its service manual.
   - If the message indicates a problem with the 2400 bps modem, continue with the steps in this procedure.
   - If the message indicates a problem with another adapter, an accessory, or a recharger (rather than with the 2400 bps modem), test the adapter, accessory, or recharger according to *its* diagnostic procedure.
2. **Observe Symptoms.** If possible, try to observe the trouble by duplicating the situation described in the customer's message. Determine how the observed or reported behavior differs from the proper behavior. Also take note of functions that *do* work properly.
3. **Separate Problems.** Separate the observed symptoms into distinct problems. Use the troubleshooting procedure below to correct *one problem at a time*, starting with the more critical functions.
4. **Consider Causes.** Consider the possible causes for each problem. Keep them in mind as you troubleshoot.

Preparation:

5. **Remove Other Adapters.** Remove all adapters except the display/printer adapter and the 2400 bps modem you're testing. (Other adapters could be set to configurations that would conflict with the 2400 bps modem.)

Diagnostic Tests:

6. **Insert Diagnostic Disc.** Open the computer and pop up the disc drives, then insert the diagnostic disc in the left drive (drive A).
7. **Start Diagnostic Program.** Turn on the computer by sliding the power switch toward the back. The system should boot up and start the diagnostic program.
   - If the main test menu (figure D-1) appears, skip ahead to step 8.
   - If no display appears, (1) if the battery gauge shows only a "no battery" symbol, plug in a good recharger (if the gauge segments don't flash for about 10 seconds and then stop flashing, check the battery module according to the computer service manual); (2) adjust the contrast using the slide control; (3) slide the power switch again one or two times, waiting several seconds between tries; (4) check that the battery module is installed properly; (5) remove all adapters *except the 2400 bps modem and the display/printer adapter* and repeat this step. If no display appears, remove the 2400 bps modem and repeat this step again – if the test menu now appears, the 2400 bps modem is bad (replace it); if no display appears, check the computer according to its service manual.
   - If a picture shows that you should insert a disc in the left drive, (1) check that the diagnostic disc is properly inserted, then press [f1]; (2) insert a different copy of the diagnostic disc, then press [f1]; (3) check the computer according to its service manual.
   - If a picture shows that the clock isn't set, either wait a few seconds or press any key – then proceed according to one of the other outcomes for this step. No error is indicated by the clock picture.
   - If the display is active but the test menu *doesn't* appear, remove all adapters *except the 2400 bps modem and the display/printer adapter* and repeat this step. If the test menu still doesn't appear, remove the 2400 bps modem and repeat this step again – if the test menu now appears, the 2400 bps modem is bad (replace it); if the test menu still doesn't appear, check the computer according to its service manual.

```
    Select COMMAND:          Type a letter to select the adjacent feature.
                             OR use arrow keys to move highlight
                             and select feature with [Enter] or [Space Bar].

X   EXECUTE test cycle

N   LOOP through tests N times (set N=0 to loop indefinitely), N=1
F   Stop test cycle after FIRST TEST FAILURE

L   Select LOGGING features
C   Select/Store CONFIGURATION

T * Select SYSTEM TESTS
S   Select SUPPLEMENTAL TESTS



E   EXIT Diagnostics System
```

Figure D-1. Main Diagnostic Menu

8. **Turn Off System Tests.** If the SYSTEM item is selected (an * appears next to SYSTEM in the menu), press [T] to turn off the system tests.
9. **Select 2400-bps Local Loopback Test.** Select the 2400 bps modem local loopback test from the supplemental test menu. (If you've already selected this test, skip ahead to the next step.)
   a. Press [S] to select the SUPPLEMENTAL item. (If this item is already selected, press [S] twice.) The supplemental test menu should appear.
   b. Select the "MODEM, Local Loopback" test. (If this item is already selected, turn it off then select it again. An * in the menu indicates that the test is selected.)
   c. Select the "2400 bps" option. The supplemental test menu should now show this option.
   d. Press [R] to select the RETURN item. This returns to the main menu.
10. **Run Local Loopback Test.** Press [X] to select the EXECUTE item. The test you selected in the previous step should run.
11. **Follow Up Local Loopback Results.** Take action according to the results of the local loopback test.
   - If the local loopback test passes, the internal modem circuit is good. Go to the next step.
   - If the local loopback test fails, take action according to the symptoms listed under "Local Loopback Test" in table D-4, "Diagnostic Results."
   - If the modem isn't found, take action according to the symptoms listed under "Local Loopback Test" in table D-4, "Diagnostic Results."
12. **Connect Phone Line.** Connect the modem to a good telephone line. (You need to know the phone number for the line, and you need to have a telephone at another nearby line with a different phone number.)

13. **Select 2400-bps Line Test.** Select the 2400 bps modem line test from the supplemental test menu. (If you've already selected this test, skip ahead to the next step.)

    a. Press [S] to select the SUPPLEMENTAL item. (If this item is already selected, press [S] twice.) The supplemental test menu should appear.

    b. Select the "MODEM, Line" test. (If this item is already selected, turn it off then select it again. An * in the menu indicates that the test is selected.)

    c. Select the "2400 bps" option. The supplemental test menu should now show this option.

    d. Press [R] to select the RETURN item. This returns to the main menu.

14. **Run Line Test.** Press [X] to select the EXECUTE item. The test you selected in the previous step should run. In the first section of the test, you're prompted to enter the phone number of a nearby telephone. In the second section, you're prompted to dial the modem's phone number from the nearby telephone.

15. **Follow Up Line Results.** Take action according to the results of the line test.

    - If the modem successfully rings the telephone and indicates that it receives the incoming call, the external modem circuit is good. Go to the next step.
    - If any aspect of the line test fails, take action according to the symptoms listed under "Line Test" in table D-4, "Diagnostic Results."

Verification:

16. **Verify Operation.** Verify that the 2400 bps modem is good by repeating the local loopback and line tests. (If either test doesn't pass, take action as described above, then verify the system again.)

Table D-4. Diagnostic Test Results

Use this table to interpret the results of the 2400 bps modem diagnostic tests. Two types of results can occur, as indicated by the typeface:

- `Message` – indicates a message on the LCD (and log device, if selected).
- Observation – indicates a condition that you should check for.

CAUTION

Don't replace or adjust components on the original modem or on a new modem. No modifications or adjustments are allowed by the U.S. Federal Communications Commission and the Canadian Department of Communications.

Test Result	Action
Local Loopback Test:	
`Modem not found`	(1) Check that the modem is configured to a COM device that's not used elsewhere in the system; (2) replace the modem.
`Modem test failed, replace modem PCA`	Replace the modem.
Line Test:	
`Modem not found`	(1) Check that the modem is configured to a COM device that's not used elsewhere in the system; (2) replace the modem.
Telephone doesn't ring when called by modem	(1) Check the external phoneline connections; (2) check the phone number; (3) replace the modem.
Modem doesn't detect call from telephone	(1) Check the external phoneline connections; (2) check the phone number; (3) replace the modem.

D.9 Replaceable Parts

The replacement part numbers for the HP D1003A 2400 bps Synchronous/Asynchronous Modem are D1003-60901 (new part) and D1003-69901 (exchange part). No component parts are available.

Order replacement assemblies from Hewlett-Packard Corporate Parts Center.

D.10 Reference

For information about installing and operating the 2400 bps modem, refer to the *HP D1003A 2400 bps Synchronous/Asynchronous Modem Owner's Manual*, part number D1003-90001.

D.11 Product History

This section normally contains information for adapting this chapter to earlier modems that differ from current units. Since this chapter *does* apply to all modems produced as of the printing date, no change information is given here.

D.12 Diagrams

No diagrams are required to repair the 2400 bps modem.

Portable Computer Division
1000 N.E. Circle Blvd., Corvallis, OR 97330, U.S.A.

Reorder Number
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