



ClusterPort/S[™]

WORKGROUP CONCENTRATOR USER'S MANUAL

MAN-0104-01-000A
March 1992

Arnet Corporation
618 Grassmere Park Dr., Suite 6
Nashville, TN 37211-9918

Sales & Support - (800) 366-8844
Arnet Support BBS - (615) **333-0423**
Other Calls - (615) **834-8000**
FAX (615) 834-5399

This document contains the latest information available at the time of preparation. Every effort has been made to ensure accuracy. However, Arnet Corporation takes no responsibility for errors or consequential damages caused by reliance on the information contained in this document.

Arnet Corporation reserves the right to make product enhancements at any time without prior notice.

Copyright 1992 by **Arnet** Corporation

All rights reserved. No part of this publication may be reproduced in any form or by any means without the prior written permission of the publisher.

Arnet Corporation
618 Grassmere **Park Dr., Suite 6**
Nashville, TN 37211-9918

Printed in U.S.A.

Arnet and the Arnet logo are federally registered trademarks owned by Arnet Corporation. ClusterPort/S, SurgeBlock, SimulPrint, and SimulPort are trademarks of Arnet Corporation. Micro Channel[®] is a registered trademark of International Business Machines.

A Note Concerning TV and Radio Interference

FCC Information

This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio communications. It 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 in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

SHIELDED CABLE MUST BE USED TO REMAIN IN COMPLIANCE WITH FCC CLASS A.

Table of Contents

1. Introduction .....	.1
2. Protecting Your Equipment and Data	3
3. Checking Your Package Contents	7
4. Preparing and Installing the Host Adapter Card in an ISA Computer.....	9
5. Installing and Configuring the Host Adapter Card in an EISA Computer.....	13
6. Installing and Configuring the Host Adapter Card in a Micro Channel Computer.. ..	.17
7. Connecting Concentrators.....	21
8. Connecting Modems	27
9. Connecting Peripherals.. ..	.29
10. Concentrator Video Display Diagnostics	31
11. Concentrator Front Display Diagnostics .....	.37
12. Host Adapter Card Diagnostics	43
13. Concentrator Error Codes	53
Appendix A Host Adapter Specifications	55
Appendix B Concentrator Specifications	57
Appendix C Arnet Full Lifetime Warranty Details .....	..59

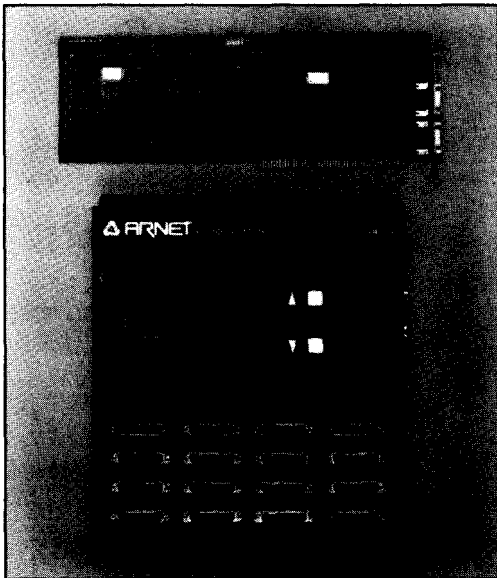
list of Figures and Tables

1.	ClusterPort/S.....	1
2.	ClusterPort/S contents .....	.
3.	ClusterPort/S I/O address switch settings.....	.9
4.	DB-15 cable connected to line 1 of host adapter card .....	.21
5.	Concentrator INPUT and OUTPUT connectors.....	.23
6.	Rotary dial and POWER connector .....	.24
7.	DB-15 pinout.....	.25
8.	8-wire cable wiring diagram.....	25
9.	4-wire cable wiring diagram.. ..	.26
10.	Host adapter/concentrator to synchronous modem wiring diagram .....	.27
11.	Synchronous modem to concentrator wiring diagram .....	.28
12.	Concentrator DB-25 to peripheral wiring diagram .....	.29
13.	DB-25 pinout.....	.30
14.	Concentrator RJ-45 to peripheral wiring diagram .....	.30
15.	RJ-45 pinout.....	.30
16.	Loopback connectors.. ..	.34
17.	Concentrator LEDs and display .....	.37
18.	DB-15 loopback cable diagram.. ..	.43
	Table 1, Hexadecimal to decimal conversion .....	.15
	Table 2, Power-Up tests.. ..	.38

Introduction

The Arnet ClusterPort/S is a Workgroup concentrator that provides multiuser capabilities for workgroups that are not in close proximity to the computer (i.e., another floor, building, city, etc.). Each of the two ports on the ClusterPort/S host adapter card can support four 16-port concentrators for a maximum of 128 devices per host adapter card. A maximum of four host adapter cards per computer provide up to 512 ports per system. Concentrators are available with either DB-25 or RJ-45 connector options. ClusterPort/S includes SurgeBlock™, which is designed to protect the host adapter and the concentrator against damage from data line surges.

Figure 1, ClusterPort/S



For future reference, record the following numbers (as instructed in Sections 4, 5, and 6):

Host Adapter Card I/O Address _____

ClusterPort/S Part Number _____

Host Adapter Card Serial Number _____

Concentrator Serial Number(s)

Protecting Your Equipment and Data

Electrical Surge and Power Protection

Lightning, electrical surges, and power fluctuations can damage your equipment and/or data through the power lines and/or the serial data lines. When electrical storms occur, the most effective method of protecting your computer system is to unplug your computer and peripherals, and disconnect all data and telephone lines.

To protect against lightning, electrical surges, and power fluctuations, Arnet recommends uninterruptible power supplies (UPS), power line filters, and surge protectors for every installation.

A UPS can provide protection from electrical surges and fluctuations in the power supplied to the computer. However, it does little good to protect the main console if you have no protection on the other devices attached to the system. Power line filters protect against electrical surges and transient spikes. Some filters even have a shutdown feature that drops power to the device if voltage drops below a preset level. This prevents the spikes and surges caused by the typical “off and on” electrical problems that occur during a thunderstorm. AC line filters should be used with all electrical devices connected to a computer system, no matter how small or simple.

The serial cables themselves present another potential danger. Nearby lightning strikes can induce high-voltage surges into RS-232 cables. Machinery, especially commercial machines with electric motors, often generates electrical noise that can be picked up by serial cables and cause data errors or equipment damage. Arnet includes “SurgeBlock” on every ClusterPort/S. SurgeBlock clips fast-rising peak voltages to protect against spikes over 25 volts caused by lightning, static, or induced voltage. For maximum protection we recommend surge suppressors on the peripheral end of all serial cables as well.

Cables running long distances and/or through electrically noisy areas are subject to noise pickup that can cause data errors or equipment damage. To minimize this danger, we recommend low capacitance shielded cable for all RS-232 connections.

RS-422 is designed to run over longer distances (up to 4000 feet maximum) at much higher data rates than RS-232. In order to gain maximum distance and throughput, we recommend the use of low capacitance, twisted pair cable for the ClusterPort/S host adapter-to-concentrator and concentrator-to-concentrator cables.

Destructive power surges can also enter through modems via telephone connections. Filters made specifically to guard against this danger should be included on all telephone line connections.

Grounding Techniques

Many terminals and computers are dependent on earth ground to set reference for signal ground. Improper grounding or differences in ground potential between your computer and terminals can damage your equipment or even create a safety hazard. Consequently, you should make sure that every component in your system is properly grounded. Note that most surge protectors and uninterruptible power supplies DO NOT protect against grounding problems.

Connect your computer, concentrators, and all terminals and other peripherals to three-pronged grounded receptacles, making sure that the receptacles are wired properly. If you must use three-prong to two-prong adapters, make sure that the adapter ground tabs are properly grounded.

Pin 1 (chassis ground) of the RS-232 data connector of your terminal or modem is connected to the frame of the terminal or modem or to earth ground. When you connect the data cables, make sure that the cable shield is connected to Pin 1 (chassis ground) on the modem or terminal side. However, in order to prevent possible ground loops, the shield must *not* be connected to Pin 1 of the connector on the concentrator side.

A proper chassis ground guarantees that no dangerous voltages exist on terminal or modem frames. Proper grounding also helps cancel noise that can otherwise be induced on the frame or equipment.

Local electrical codes may also dictate special grounding arrangements. Your electrician can make sure that your installation complies with all codes. If you have any doubt about the integrity of the grounding system in your location, have the system checked by a licensed electrician.

Static Protection

Your computer's case not only houses its family of computer components, but it also protects these sensitive electronic components from stray magnetic (EMI) and electrical (RFI, static) fields.



Using proper static control is essential whenever you use, move, or open your computer for modifications.

Make sure that you are working in a static-controlled area which includes at least a conductive benchtop mat or chair mat that is electrically connected to earth ground. Conductive wrist straps in conjunction with ground cords provide extra protection when handling electronic components. Always store and/or move individual printed circuit boards in a conductive bag. Consult your local electronics and/or office supply distributor for static control products.

If you would like an overview of grounding and static protection theories and techniques, you can obtain a copy of Federal Information Processing Standards Publication 94: Guideline on Electrical Power for ADP Installations. This booklet is available from the National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161 703/487-4650.

SECTION THREE

Checking Your Package Contents

After opening the shipping box, check the contents. The contents of the ClusterPort/S are shown in Figure 2.

ClusterPort/S (Figure 2):

- Host adapter card
- Concentrator(s) with either DB-25 or RJ-45 peripheral connectors
- External power supply (one for each concentrator ordered)
- Cable with DB-15 connectors
- DB-15 terminator plug(s)
- Diagnostic diskette
- Device driver diskette (as required)
- Information packet, including
 - User's Manual
 - Warranty card
 - “Read Me Before You Touch That Board” information sheet

Figure 2, ClusterPort/S contents





WARNING

*Leave the **ClusterPort/S** components in their protective anti-static bags until installation. **When** installing the Host Adapter Card, use adequate precautions (such as a **grounding wrist** strap that is connected to **earth ground**) to prevent electrostatic damage.*

SECTION FOUR

Preparing and Installing the Host Adapter Card in an ISA Computer

Preparing the Host Adapter Card

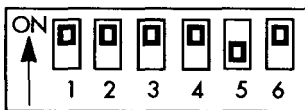
Before installing the host adapter card in your system, select an I/O address by setting the multi-segment switch located on the middle of the upper edge of the card. The switch settings for all valid addresses are shown below.

Make sure that the I/O address you choose is not used by other cards in your system. (Your device driver may limit your choices.) Write down the address you choose on Page 2 of this manual. You will need this number for the device driver software installation,

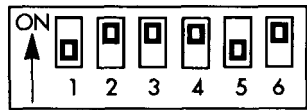


All of the I/O addresses mentioned are in hexadecimal format. Hex numbers are noted by the letter "H" following the number, e.g., 20H.

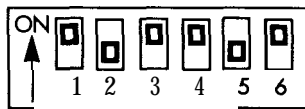
Figure 3, ClusterPort/S I/O address switch settings



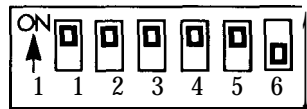
100H



110H



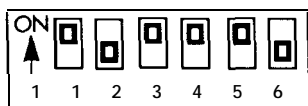
120H



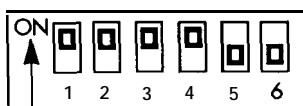
200H

Figure 3 continued →

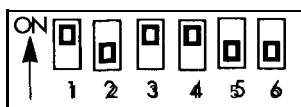
Figure 3 continued



220H



300H



320H

Installing the Host Adapter Card

When you have set the I/O address switch, install the host adapter card into one of the 16-bit expansion slots of your computer. The following steps detail the installation procedure.



*Before installing the host adapter card, locate the **part** number (printed at the top on the component side of the board) and the **serial** number (displayed on the back of the board) and write them in the space provided on Page 2 of this manual.*



WARNING

*Turn off power to your computer and disconnect the power cord. Inserting a board in the system with power applied could damage the system, the board, or both. **Such** abuse will void your warranty.*



WARNING

Leave the host adapter card in its protective anti-static bag until installation. When installing the board, use adequate precautions (such as a grounding wrist strap that is connected to earth ground) to prevent electrostatic damage.

1. Remove the cover of the computer (see computer manufacturer's instructions).
2. Determine which 16-bit slot your host adapter card will occupy (16-bit slots have double length motherboard connectors). Remove the hold-down screw and the blank card bracket of the chosen slot. The blank card bracket will not be reused.
3. Insert the host adapter card into the mating motherboard socket. Push the board firmly into place.
4. Secure the board by replacing the hold-down screw that was removed in Step 2, and replace the computer cover.

Installing and Configuring the Host Adapter Card in an **EISA** Computer

Installing the Host Adapter Card



NOTE

*Before installing the host adapter card, locate **the part number** (printed at the top on the component side of the board) and the serial number (displayed on the back of the board) and write them in the space provided on Page 2 of this manual.*



WARNING

Turn off power to your computer and disconnect the power cord. Inserting a board in the system with power applied could damage the system, the board, or both. Such abuse will void your warranty.



WARNING

*Leave the host adapter card in its protective anti-static bag until installation. When installing the board, use adequate precautions (such as a grounding wrist strap connected to **earth ground**) to **prevent** electrostatic damage.*

1. Remove the cover of the computer (see computer manufacturer's instructions).
2. Determine which EISA slot your host adapter card will occupy. Remove the hold-down screw and the blank card bracket of the chosen slot. The blank card bracket will not be reused.
3. Insert the host adapter card into the mating motherboard socket. Push the board firmly into place.
4. Secure the board by replacing the hold-down screw that was removed in Step 2 and replace the computer cover.

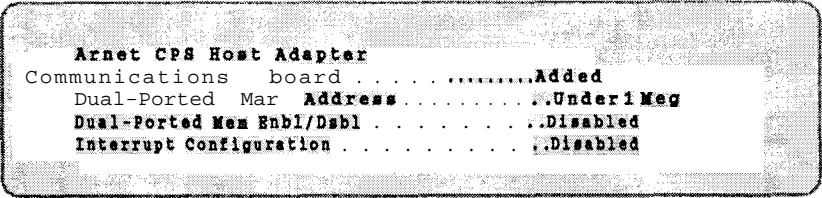
Configuring the Host Adapter Card

When you have completed the installation procedure described above, follow the steps below to configure ClusterPort/S.

1. Boot your system with the EISA Configuration Diskette. During the booting process, the system will locate the ClusterPort/S host adapter card and give you a message on the screen indicating that an unknown board is present.
2. Copy the file **!ANI0100.CFG** from the Arnet distribution disk to your EISA Configuration Diskette.
3. Run the configuration program as described in the computer user's manual to add the host adapter to your system. Follow the directions on the screen.
4. Specify that you are going to add a board to the system by selecting **Add** on the Edit menu.
5. The program will list all configuration files from the configuration disk. The Arnet CPS Host Adapter file, **!ANI0100.CFG**, should be on the list.

Use the arrow key to move the cursor to **!ANI0100.CFG** and press **ENTER** to add the Arnet CPS Host Adapter to the system.

6. Select the **View** menu and choose **Detailed by Slot**.
7. Use the arrow key to move the cursor to **Arnet CPS Host Adapter** board. You will see the following screen:



```
Arnet CPS Host Adapter
Communications board . . . . . Added
Dual-Ported Mar Address . . . . . Under 1 Meg
Dual-Ported Mem Enbl/Dsbl . . . . . Disabled
Interrupt Configuration . . . . . Disabled
```

8. Pull down the **Edit** menu and select the Change **Resource** option (or press **Ctrl-R**).
9. Select the dual-ported RAM address for ClusterPort/S. Make a note of the address you choose; you must choose the same address when you install the ClusterPort/S driver.

 **NOTE**

*When selecting the address for dual-ported memory within the EISA configuration program, it is important to note that the address selection will differ depending on selection of the **Under 1 Meg** or **Above 1 Meg** option. When selecting an address under 1 Meg, address selection is listed in hexadecimal format, while the listing for addresses above 1 Meg is in decimal format. Refer to the following table when selecting an address above 1 Meg for dual-ported memory. All address selection within the Arnet Device Driver installation is in hexadecimal format.*

Table 1, Hexadecimal to decimal conversion

Hexadecimal ...Decimal	Hexadecimal....Decimal
0xF000000 .....3840M	0xF800000.....3968 M
0xF100000 .....3856 M	0xF900000.....3984 M
0xF200000 .....3872 M	0xFA00000 .....4000 M
0xF300000 .....3888 M	0xFB00000 .....4016 M
0xF400000 .....3904 M	0xFC00000 .....4032 M
0xF500000 .....3920 M	0xFD00000 .....4048 M
0xF600000 .....3936 M	0xFE00000 .....4064 M
0xF700000 .....3952 M	

10. Leave the **Dual-Ported Mem Enbl/Dsbl** and the **Interrupt Configuration** at **Disabled**.

11. Pull down the **System** menu and choose **Exit**. Be sure to Save the new configuration.

Installing and Configuring the Host Adapter Card in a Micro Channel Computer

Installing the Host Adapter Card



WARNING

Turn off power to your computer and disconnect the power cord. Inserting a board in the system with power applied could damage the system, the board, or both. Such abuse will void your warranty.



WARNING

Leave the host adapter card in its protective anti-static bag until installation. When installing the board, use adequate precautions (such as a grounding wrist strap that is connected to earth ground) to prevent electrostatic damage.

1. Remove the cover of the computer (see computer manufacturer's instructions).
2. Determine which slot your host adapter card will occupy. Loosen the hold-down screw and remove the blank card bracket of the chosen slot. The blank card bracket will not be reused.
3. Insert the host adapter card into the mating motherboard socket. Push the board firmly into place.
4. Secure the board by tightening the hold-down screw that was loosened in Step 2 and replace the computer cover.

Configuring the Host Adapter Card

When you have completed the installation procedure described above, follow the steps below to configure ClusterPort/S.

1. Boot your system with the backup copy of your computer system's reference diskette. During the booting process, the system will locate the ClusterPort/S host adapter card and give you a message on the screen indicating that an unknown board is present.
2. The computer will show error 165 and beep twice. Continue as instructed.
3. Follow the instructions shown on the screen to select the mode necessary to manually set the configuration—do **not use the automatic configuration**. (The instructions for manual configuration will vary for computers made by different manufacturers.)
4. When you are prompted to copy the new adapter files, insert the Arnet Diagnostics Diskette.
5. Press **ENTER**. The computer will read the **@6D77.ADF** file.
6. At the prompt, remove the diagnostics diskette and reinsert the reference diskette.
7. Press **ENTER**. The file **@6D77.ADF** copies to the reference diskette.
8. Follow the instructions shown on the screen to set or change the configuration for the Arnet ClusterPort/S.

-
9. **Choose** the starting memory address and the I/O Port Address, (These selections must not conflict with any other boards in the system and must match those addresses you choose with the Arnet ClusterPort/S driver.) Disable the interrupt vectors.
 10. Follow the instructions to save the configuration and exit the program.
 11. Remove the copy of the reference diskette.
 12. Install the driver using the procedure described in your ClusterPort/S driver manual or operating system manual.



*The Arnet ClusterPort/S driver supports multiple host **adapters** at the same memory address. However, some Micro Channel machines do not allow such a **configuration**. Check your computer user's **manual** if you suspect a problem.*

Connecting Concentrators

You may daisy-chain up to four concentrators to each of the two connectors of the host adapter card. Write down the serial number of each concentrator. A space is provided on Page 2 of this manual for this purpose.



WARNING

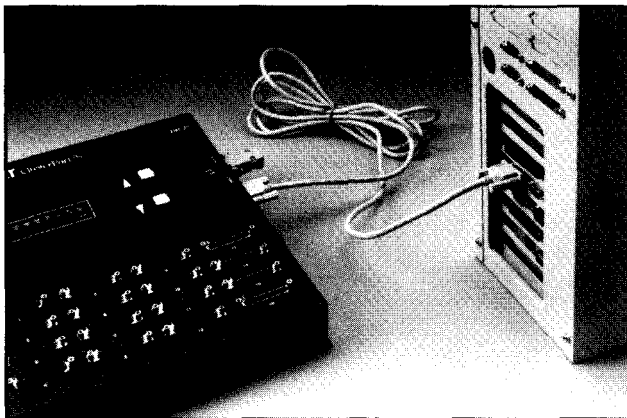
Leave the concentrator in its protective anti-static bag until installation.

Daisy-Chaining the Concentrators

Make sure the system power is off, and any cables are unplugged. Then complete the following steps:

1. Plug the male end of the DB-15 cable supplied with ClusterPort/S into one of the connectors on the host adapter card. The bottom (left in a tower computer) connector is Line 1 and the top (right) connector is Line 2. (Refer to Figure 4.)

Figure 4. DB-15 cable connected to Line 1 of the host adapter card



-
2. Attach the female end of the cable to the concentrator at the connector labeled INPUT. (Refer to Figure 5.)
 3. Use a small straight screwdriver to set the rotary dial on the left edge of this concentrator to 0. This 0 indicates the first position on the daisy-chain and is the ID for this concentrator. (Refer to Figure 5.)



NOTE

Because the dial is difficult to read, you may wish to wait to set the dial until you have attached the power cable and started the concentrator. Test 0 of the Front Panel Diagnostics (refer to Section 11) shows the ID number on the concentrator display. You can turn the dial and watch the display to easily verify the setting on the dial.

If you are including more than one concentrator on the daisy-chain, continue with Step 5.

4. If this is the only concentrator on this host adapter card line, insert the terminator plug into the OUTPUT connector. (Refer to Figure 5.)
5. Plug another DB-15 cable into the connector labeled OUTPUT on the first concentrator and plug the other end of that cable into the next concentrator at the INPUT connector. Set the dial of this concentrator to 1. The 1 indicates the second position on the daisy-chain and is the ID for this concentrator. (Refer to Figure 5.)
6. Continue the daisy-chain with concentrator 3 and 4 (if desired) in the same manner, making sure that the dial on each box is set appropriately (i.e., 3rd box set to 2; 4th box set to 3).

-
7. Insert the DB-15 terminator plug into the OUTPUT connector of the last concentrator in the daisy-chain. (Refer to Figure 5.)
 8. Plug the cable from the power supply included with the concentrator into the connector labeled POWER on the left edge of the concentrator (Figure 6). If you have not set the ID for each concentrator as described in Step 2, do so at this time. Refer to Steps 2, 5, and 6 for the correct number for each concentrator.
 9. If you are connecting concentrators to the top connector (Line 2) on the host adapter card, repeat Steps 1 through 8 for the second daisy-chain.
 10. Plug all concentrator power supplies into AC power receptacles and verify that the concentrators are on.

Figure 5, Concentrator INPUT and OUTPUT connectors

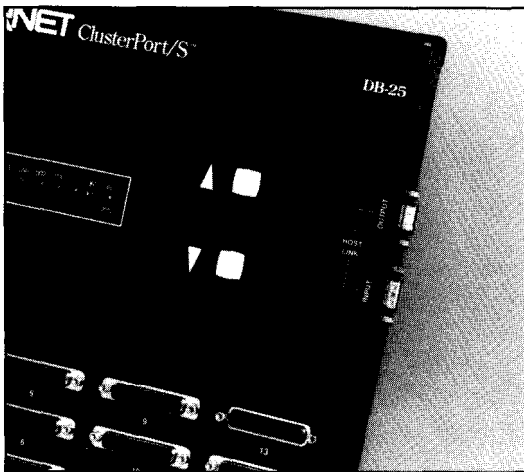


Figure 6, Concentrator rotary dial and POWER connector



11. Install the Arnet driver if you received one with your ClusterPort/S. Follow the instructions in the Driver Manual. If your operating system supplies the driver, refer to the operating system manual for driver installation instructions (the driver may already be installed).

Cable Description

Although ClusterPort/S supports both 4-wire and 8-wire cabling, S-wire is preferred due to maximum signal availability and higher data rates. 8-wire cabling allows a maximum speed of 1.2 Mbit/sec while 4-wire is limited to 460 Kbit/sec. If the building is pre-wired with 4-wire cabling, it may be preferable to use 4-wire cabling. For greatest noise immunity, use a twisted wire pair within the cable for each pair of signals (e.g., 'IXD+ and TXD-).

Figure 7, Host Adapter/Concentrator DB-15 male connector pinout

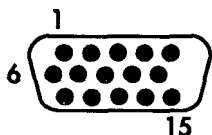
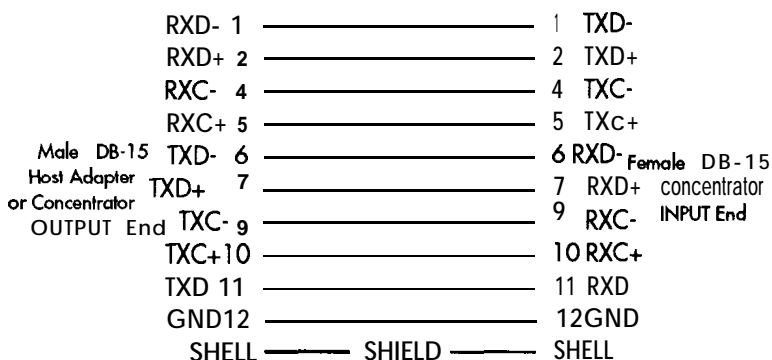


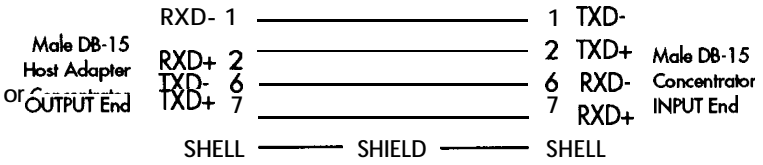
Figure 8, 8-wire cable wiring diagram



 **NOTE**

This same cable and wiring scheme is used for host adapter card-to-concentrator and concentrator-to-concentrator connections in a daisy chain. (You cannot, however, use this wiring scheme together with a 4-wire cable in the same host adapter card daisy chain.)

Figure 9, **4-wire cable** wiring diagram



 **NOTE**

This same cable and wiring scheme is used for host adapter card-to-concentrator and concentrator-to-concentrator connections in a daisy chain. (You cannot, however, use this 8-wire scheme together with a 4-wire cable in the same host adapter card daisy chain.)

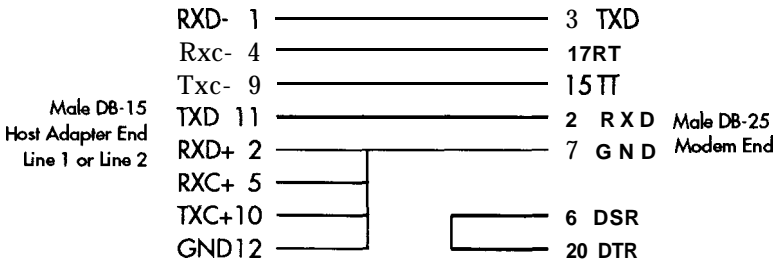
Connecting Modems

ClusterPort/S is designed so that the host adapter card may be connected to RS-422 or RS-232 high-speed synchronous modems, enabling the concentrators to communicate via a phone line. Cabling must be 8-wire to accommodate all necessary modem signals.

Host Adapter/Concentrator-to-Modem Cabling

Use a straight through cable with DB-15 connectors at each end (see Figure 8, Page 25) in conjunction with a male-to-male DB-15 to DB-25 adapter (Arnet part number ADP-0200-XX-0001). The adapter provides the wiring shown in Figure 10. You may make a cable with a DB-15 male connector on one end and a DB-25 male connector at the other end to accomplish the same wiring.

Figure 10, Host adapter/concentrator to synchronous modem wiring diagram

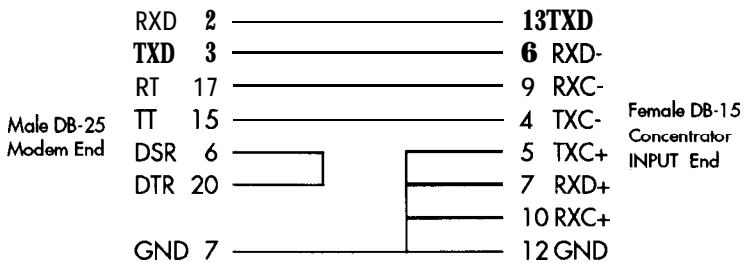


The adapter configuration from host-to-modem (or concentrator OUTPUT-to-modem) is different from the adapter configuration for modem-to-concentrator INPUT.

Modem-to-Concentrator Cabling

Use a straight through cable with DB-15 connectors at each end (see Figure 7, Page 25) in conjunction with a female-to-male DB-15 to DB-25 adapter (ADP-0200-XX-0002). The adapter provides the wiring shown in Figure 11. You may make a cable with a DB-15 female connector on one end and a DB-25 male connector at the other end to accomplish the same wiring.

Figure 11, Synchronous modem to concentrator wiring diagram



Connecting Peripherals

To ensure reliable operation and prevent damage to the ClusterPort/S and connected peripherals, follow the precautions below.

- The ClusterPort/S is an RS-232 device; peripherals connected to it must meet RS-232C specifications (length of run, voltage levels, etc.).
- Ensure that the peripheral cable is wired properly; inputs connected only to outputs, etc.
- The peripheral device must be properly grounded. (“Floating” terminals are a particular source of trouble.) If the peripheral device is powered by a different source than the host system, a short haul modem may be required; if you are unsure, call Arnet Customer Support.
- Make sure that the host computer and peripherals are turned OFF and the concentrators are unplugged before making connections between the peripherals and ClusterPort/S.

DB-25 Cabling and Connectors

Use RS-232 shielded cable (30pF or less capacitance per foot) with 25-pin D-subminiature connectors at each end.

Figure 12, Concentrator DB-25 to peripheral **wiring diagram**

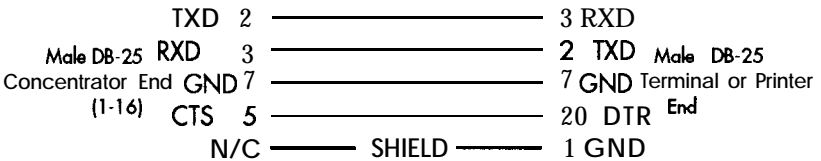
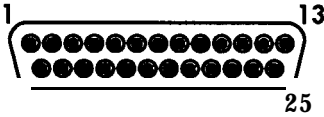


Figure 13, Male DB-25 pinout



RJ-45 Cabling and Connectors

Use an RJ-45 to DB-25 adapter at the peripheral end.

Figure 14, Concentrator RJ-45 to peripheral wiring diagram

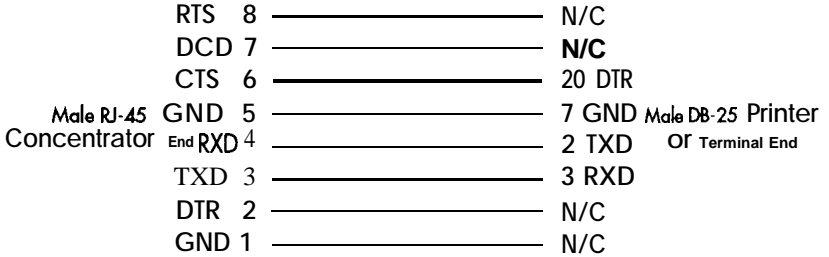
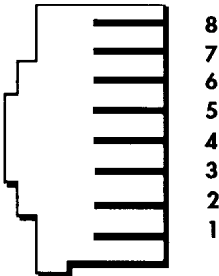


Figure 15, Female RJ-45 adapter pinout



Concentrator Video Display Diagnostics

You can test Ports 2 through 16 of the concentrator by using the video display diagnostics on the terminal connected to Port 1 of the concentrator. (Port 1 must be functioning properly to use the video display diagnostics. If it is not, then you must use the front panel diagnostics as described in Section 11.) Set the terminal to VT-100 mode, 9600 baud, 8 data bits, 1 stop bit, and no parity. Enter the video display diagnostics when the concentrator is reset and starts power-up display. To invoke the video display diagnostics, press the Shift and **V** keys (upper case v) on the terminal connected to Port 1, when **ln** is displayed on the concentrator. You must enter the video display diagnostics before **Hl** shows on the concentrator.

A test menu will appear on the terminal connected to Port 1. The top portion of the screen displays test information, and the bottom of the screen shows operator information. The screen will look similar to the one shown below.

```
Diagnostics                                     EPROM Version: ??

      Test Name      Passes      ERRORS

A) - ALL TESTS
1) - Panel light test
2) - Memory test
3) - Memory/DMA test
4) - Async internal test
5) - Async external test
6) - Sync/DMA test
7) - Watchdog timer test

Enter test selection:

*****
Operator information
  Stop on 1st error - <Y>/ <N> = Y
  <ESC>ape - Stop the test in progress
  <H>elp - Displays HELP screen
  <D>ump - Dumps the BIOS data segment
```

To start any test, press the appropriate test number. The message will change from **Enter test selection:** to **Test in progress-**. The appropriate test information will begin updating in the Passes and Errors columns on the screen.

When you see the results on the screen or you want to stop a test, press **ESC**. The screen message will change from **Test in progress -** to **Test stopped, press any key to continue**. You can record test results at this time. Press any key to clear the pass and error information, and return to the **Enter test selection:** message.

If you want to cycle through all the tests, press **A**. (The watchdog timer test is not included.) Tests will begin cycling and the screen updates for each test will appear.

Press **Y** to choose **Stop on 1st error. Any** or all tests will run until an error is detected or until you stop the test with an **ESC**. (You may continue the test by pressing any key as instructed.) If you press **N** at the **Stop on 1st error** prompt, all errors will be logged and only an **ESC** will stop the test. The default condition for this option is **Y**.

Press **H** to display the **HELP** screen. This screen gives a brief description for each test as well as other operator information. Pressing any key will return to the main diagnostic screen.

Press **D** to display the **BIOS** data segment. Press another key to stop this display. This data is provided by the **BIOS** and is used during factory testing.

Anytime the diagnostics are at the primary prompt: **Stop on 1st error -<Y>/<N> - Y**, the seven segment display of the concentrator shows the ID for this concentrator as selected by the rotary dial. This value tracks the setting of the rotary dial; if you change the setting, the display shows the new value.

Test 1 - Panel Light Test

This test cycles the concentrator LEDs and digit display segments ON and OFF in one second intervals. The test writes 1's to the front panel I/O port, reads back and verifies the bits, and then repeats the procedure with 0's. If either verification fails, the entire test fails. Make a visual check of the concentrator LEDs and alphanumeric digit displays to ensure that they all cycle correctly.

Test 2 - Memory Test

This test performs a pattern test and an address tag test on DRAM memory. The byte pattern is incremented for each pass and is displayed on LEDs 0-7 (TXD through the unmarked LED). The test writes the pattern to two different 32K byte blocks and then compares the 32K blocks to determine pass or fail status.

The address tag test writes a tag pattern to two different 32K byte blocks and then compares the 32K blocks to determine pass or fail status.

Test 3 - Memory/DMA Test

This test uses DMA to move data from one memory location to another. The byte pattern is incremented for each pass and is displayed on LEDs 0-7 (TXD through the unmarked LED). The test writes the pattern to 32K bytes beginning at address 08000H. DMA is used to move 32K of data from 08000H to 10000H. When the move is complete, the test compares the two 32K blocks to determine pass or fail status. If the DMA transfer is not completed within two seconds, a timeout error causes the test to fail.

Test 4 - Async Internal Test

This test checks the async ports by putting the UARTs in internal loop-back mode. The four output signals—DTR, RTS, OUT1, and OUT2—are looped back to the four input signal lines—CTS, DSR, RI, and DCD. The test checks these signals for high and low conditions. The UARTs are initialized to 9600 baud, 8 data bits, 1 stop bit, and no parity. Data is transmitted and received at the same UART. Received data is compared to the transmitted data. A failure on one or more ports is considered a test failure.

Test 5 - Async External Test

This test checks the drivers and receivers of async Ports 2 through 16. The diagrams for the required loopback connectors are shown below. (Port 1 can be tested only from the front panel since it is used for the diagnostics display terminal.) Two control signals-DTR and RTS-are used to test the three input signals on the UART. The UARTs are initialized to 9600 baud, 8 data bits, 1 stop bit, and no parity. Data is transmitted and received by the connected UART. Received data is compared to the transmitted data. A failure on one or more ports is considered a test failure.

Install the loopback connector as shown below.

Figure 16, Loopback connectors

Male DB-25 Connector

Male RJ-45 Connector

2 
3

3 
4

5 
20

2 
6

A

7 
8

Ⓟ 3

Test 6 - Sync/DMA Test

This test uses DMA and the sync port to transmit, receive, and verify data. Install standard 8-wire cable connecting the port marked INPUT and the port marked OUTPUT to provide loopback for testing.

The byte pattern is incremented for each pass and is displayed on LEDs O-7 (TXD through the unmarked LED). The test writes the pattern to 32K bytes beginning at address 08000H and uses DMA1 (TXD), DMA0 (RXD), and the sync port to move 32K of data from 08000H to 10000H at 800K baud. When the move is complete, the two 32K blocks are compared to determine pass or fail status. If the DMA transfer via the sync port is not completed within two seconds, a timeout error causes the test to fail.

Test 7 - Watchdog Timer Test

This test checks out the watchdog timer, a hardware feature that is used to ensure system reliability. When the watchdog timer is loaded and enabled, the timer begins counting down. If the system is running, it keeps reloading the timer to prevent it from expiring. If the timer expires, the hardware forces the CPU to jump to the reset vector @ 0FFFF0H, forcing the power-up and post-diagnostic sequence to begin.

This test allows the timer to expire. Normal test execution causes the user diagnostics to jump to the reset vector and begin the power-up and post-diagnostic sequence. The test will fail after one second if the timer has not expired.

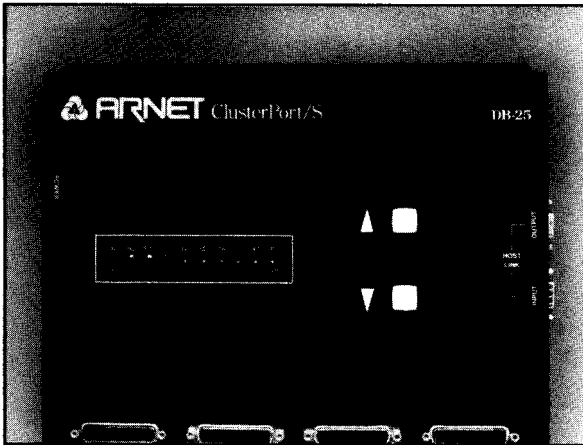
Concentrator Local Diagnostics

There are four sets of concentrator local diagnostics:

1. Power-up and download
2. Front panel diagnostics
3. Concentrator active
4. Concentrator failure

The local diagnostics use the 10 LEDs, 2 seven-segment displays with decimal point segments, and the two pushbuttons on the concentrator for an operator interface. (Refer to Figure 17.) Each diagnostic set, described on the following pages, displays its own specific information on the front panel.

Figure 17, **Concentrator LEDs and digit displays**



Power-up and Download

The power-up diagnostics program executes after the concentrator is reset. The ten single LEDs on the concentrator cycle on and off upon successful completion of each of ten tests. If an error occurs, the corresponding LED will not light. All LEDs should light up together for one second upon the completion of the power-up and post-diagnostic sequence before continuing to the Command Mode. Each segment on the display also cycles on and off at power-up.

Table 2 lists in order each test performed on power-up and the corresponding LED that lights upon the successful completion of the test.

Table 2, Power up task

BIOS Tests/Events	LED
Far jump from FFFFOH to FFCOOH Enable upper memory - EPROM (16K) Set peripheral chip select base address and PCS 0-3 Enable lower memory - DRAM Enable mid-range memory base address - DRAM Set mid-range memory size and PCS 4-6 Processor flag test Processor register test Set enhanced mode for the 80186 Perform light and display test Clear all lights and display Charge memory cells	TXD
Test 64K DRAM from 00000H - 0FFFFH	RXD
Set temporary stack @ 00400H Data segment now available (00800H) Test 64K DRAM from 1 0000H - 1 FFFFH	RTS

Table 2 continued →

Table 2 continued

BIOS Tests/Events	LED
Set BIOS stack @ 1 FCOOH Disable all hardware interrupts Transfer interrupt vectors from EPROM to DRAM	CTS
Check for 16 async ports	DSR
Check for sync port	DCD
Set board configuration Start real time clock (timer 0)	DTR
Initialize sync port and async ports	unmarked
Move data from EPROM to DRAM data segment (00800 H)	OFC
Enable interrupts, initialization complete	IFC

The display proceeds From power-up to the download procedure. The following codes are displayed briefly on the digit display and may not be noticed.

- In. (INitialization)
- 00-15.** (concentrator ID awaiting PING from Host)
- 0.0-1.5.** (concentrator ID PING received)
- PO. (awaiting PO11 packet from Host)
- P.O.** (PO11 received)
- dL.** (request DownLoad)
- dP.** (awaiting Download Packet)
- d.P.** (Download Packet received)
- go** (firmware received)

The Command Mode automatically begins after the one second delay at the end of the power up and post diagnostics sequence. The display will proceed from **In** to **HI** and three lights (DTR, blank, and OFC) will begin cycling as the Command Mode listens for synchronous packets from the host adapter card. You may continue the diagnostics from the Command Mode.

HI (concentrator is active)

Front Panel Diagnostics

The front panel diagnostics provide the same tests as the video diagnostics described in Section 10 but with the following differences:

- The front panel diagnostics test all the ports, **1** through **16**. The video diagnostics use Port **1** to test Ports 2 through 16, and assume that Port 1 functions properly.
- There is no “all tests” option. You must select and run each test separately.
- Unlike the video diagnostics, the front panel diagnostics Test 7 for the watchdog timer resets the system after a short timeout.
- The front panel diagnostics include Test 0 which is described below.

Enter the front panel diagnostics by pressing either the up or down pushbutton on the front panel while **In** is visible (before **HI** is displayed). At this time, all the LEDs go OFF, the left digit display is blank, and the-right digit display reads **0**. **The** right decimal point blinks at a 1 second rate, automatically selecting Test 0.

Test 0 displays the current concentrator ID number as selected by the rotary dial. This displayed value tracks the setting of the dial so that as you change it, the display shows the new ID. This feature allows you to check the current ID and select a new ID more easily than just looking at the dial.

To select another test (refer to test numbers and descriptions given in Section 10), press the down arrow pushbutton. The right digit display will cycle through the possible test numbers. When the number corresponding to the desired test appears, press the up arrow pushbutton to start the test. The left decimal point will light when the test starts and the appropriate test information begins updating via the LEDs and/or digit displays. The test you select will continue to cycle until an error is detected, or until you stop the test by pressing the up arrow pushbutton. Any failure stops the test and displays an **F** in the left digit display.

To stop the test, press and hold the up arrow pushbutton and wait for the left decimal point to go off. Then release the up arrow pushbutton, and the test will stop.

The left digit display will show either a **P** for pass or an **F** for fail. The right digit display will show the test number that was just executed.



NOTE

The Async External Test - Test 5 - tests one port at a time in the front panel diagnostics instead of all ports at once as in video diagnostics. This allows testing of all 16 ports with a single loopback connector.

Concentrator Active

Whenever the concentrator is active (**HI** is visible on the digit displays), you can use the front panel to check the status of concentrator parameters. To select the parameter you want to check, press the up or down arrow pushbuttons until the digit displays indicate the proper choice. The ten LEDs will show the status of the parameter indicated on the digit displays.

LU - Line utilization - Percentage of the RS-422 link bandwidth being used (The LEDs indicate the percentage.)

PU - processor utilization - Percentage of the concentrator processor bandwidth being used

PC - Packet count - Number of packets passing through the concentrator (The LEDs show a binary count.)>

EC - Error count - Number of packets in error, averaged over time (a binary count)

Flashing number - Concentrator ID number

Steady number - 01 to 16 -LEDs indicate status for the port whose number is displayed. Select the port by pressing the down arrow key.

Concentrator Failure

If the concentrator detects an internal error, it executes a panic routine. This routine closes the relays to allow pass-through of communications between the host and other concentrators. The panic routine then repeatedly scrolls a message across the display with the format HELP ####, where #### is a four-digit hexadecimal error code. The user can acknowledge the error and reset the concentrator which has failed by pushing either the up or down arrow on the front panel. The error codes displayed by the concentrator are shown in Section **13**.

 Host Adapter Card Diagnostics

The host adapter card diagnostics are DOS-based and menu-driven. To use these diagnostics, copy the program CPUSEREXE from the Arnet diskette to a DOS formatted system (bootable) diskette or to an appropriate directory on your hard disk. Install the loop-back cable between the two DB-15 connectors (Line 1 and Line 2) on the host adapter card. Refer to Figure 18.

Figure 18, Loopback cable diagram



Type **CPUSEREXE** at the DOS prompt. The initial screen prompts you for board parameter information as shown in the example below.

```
Arnet ClusterPort/S Host Adapter User Diagnostics Version x.x.x  
(C) Copyright Digi International, Inc. 1991
```

CURRENT DIAGNOSTIC CONFIGURATION

```
Board Type:  ISA  
Memory Addr: D0000H  
IRQ #: 3  
Port Base:  200H  
Board #: 1 of 2  
Mode:  Current Brd  
Err Action:  Quit
```

```
A)dd  D)elate  C)hange  N)ext  P)rev  M)ode  R)un  Q)uit
```

```
Select Parameter:
```

This screen shows the diagnostic configuration. This information depends on the type of machine in use (EISA, ISA, or Micro Channel).

Menu Choices

Menu choices are described below.

A)dd: This selection allows you to enter new boards into the diagnostic configuration record. Respond to the prompts shown below.

If you are running on an EISA machine, specify the type of board you are testing by using the following menu:

```
Select Board Type:  
E)isa  I)sa
```

Next, choose the board's memory address from a set of possible memory locations under the 1 megabyte boundary.

Select Memory Start Address:

A) 60000 B) 68000 C) 90000 D) 58000 E) A0000 F) A8000
G) B0000 H) B8000 I) C0000 J) C8000 K) D0000 L) D8000
M) E0000 N) E8000 O) F0000 P) F8000

Be sure that you select the starting address of a memory block that is at least 32K bytes in size and that is not used by another device in your system. You may select an address used by another ClusterPort/S.

After selecting the board's address, select the board's IRQ using the following menu:

Select Board IRQ #:

A) 3 B) 5 C) 7 D) 10 E) 11 F) 15 G) Disabled

On EISA and ISA bus machines, select an IRQ that is not used by another device in your system unless that device is another ClusterPort/S adapter card.

Select the board's slot and I/O address using the following prompts:

Enter New Slot # (1-8):

(Only EISA and Micro Channel show this prompt.)

Select Board's Port Base:

A) 100h B) 110h C) 120h D) 100h E) 220h F) 300h G) 320h

(ClusterPort/S might detect that another card is using a particular address. If it does, that address will not be shown as an option.)

Select the I/O address that you chose when you set the switch on your Host Adapter Card. Refer to Page 2 of the ClusterPort/S User's Manual. Depending on the machine type, you will see one or more of the prompts on the following pages.

D)delete: Deletes the board whose configuration is currently displayed.

C)hange: Allows you to make changes to the diagnostic configuration information displayed on the screen. You will be able to change the boards type, address, IRQ #, I/O port, and/or slot.

N)ext: Allows you to page forward through the diagnostic configuration record, viewing the other boards and their configurations.

P)rev: Allows you to page backwards through the diagnostic configuration record, viewing the other boards and their configurations.

M)ode: Allows you to choose the way in which the diagnostics are executed. You will be shown the following menu:

```
Select Mode
C)urrent Brd      A)ll Brds
```

C)urrent Brd: Causes the diagnostics to be run only on the board whose configuration is currently displayed on the screen.

A)ll Brds: Causes the diagnostics to be run on all the boards listed in the diagnostic records, starting with the board whose configuration is currently displayed on the screen.

R)un: Ends the software configuration session and starts test execution. If you modified the diagnostic configuration, you will see this prompt:

```
Save Configuration? (Y/*)
```

Responding with a Y to this prompt saves the configuration records to a file in your current directory called **CXDIAGS.CNF** and then executes the diagnostics based on this information. If you respond with any other keystroke, the choices you make will be used for testing but will not be saved to disk for subsequent use. In this case, the original configuration file will remain available for future diagnostic testing.

Quit: Allows you to exit the diagnostics completely with the option of saving any configuration changes you made.

Diagnostic Tests

There are eight different types of diagnostic tests. Each test is described below and on the following pages.

I/O Ports Test: These tests check the computer-to-host adapter I/O interface. If these tests fail, check the diagnostic configuration. If a slot number is specified, check that it matches the slot in which the board is actually installed. Next, if an I/O port address is specified, be sure that there is not another port in your system at the same address. On ISA boards, be sure that the I/O switch settings match the I/O port shown in the diagnostics configuration. If the configuration is correct and the failure persists, the board may be defective.

IRQ Test: This test checks the ability of the host adapter card to interrupt the host computer using each of its software-selectable IRQ lines. When the IRQ test fails, a list of all the IRQ's tested and their status (pass or fail) appears on the screen. Check your system to ensure that there is no conflict on the IRQ(s) that failed. If there is no conflict and the IRQ test failure persists, the board may be defective.

Memory Select Test: This test checks the boards ability to have its memory address programmed to different memory locations. The board is programmed to locations both below and above the 1 megabyte boundary and checked for its appearance there. If the board cannot be found at one of the test locations, a failure is posted.

**NOTE**

*This test is not foolproof since it **may** post failures when none **really** exist. Most of these failures will be due to conflicts with other memory already residing in the test area (other memory-mapped devices whose presence the diagnostics did not detect).*

Host-Side Dual-Ported Memory Tests: These are a series of tests that check the addressing and data integrity of the ClusterPort/S memory as accessed by the host computer.

Test 1 - Host Side Address Select Test:

This test checks the ability of the host adapter card to present all of its memory to the host through its 32K memory address range. The test fails if each 32K segment of the cards memory cannot be viewed.

Test 2 - Host Side Retention Test:

The purpose of this test is to check for poor memory integrity or memory that does not reliably hold contents. These kinds of errors are harder to detect with the standard memory tests.

Test 3 - Host Verify RAM With Offset:

This test is an address tag test which ensures that each word of the ClusterPort/S memory is uniquely addressable.

Test 4 - Host Double Word RAM Test With Offset:

This test is an address tag test which ensures that each double word of ClusterPort/S memory is uniquely addressable. This test is only executed on host computers with 80386 or greater processors.

Test 5 - Host Write Byte:

This test checks to see that data written to the host adapter card in bytes can be read back correctly in bytes, words, or double words.

Test 6 - Host Write Word:

This test checks to see that data written to the host adapter card in words can be read back correctly in bytes, words, and double words.

Test 7 - Host Write Double Word:

This test checks to see that data written to the host adapter card in double words can be read back correctly in bytes, words, and double words.

Test 8 - Host Test Stuck Bit:

This test writes eight different data patterns to each byte in memory and checks that the data can be read back correctly.

SmartPort Mode Tests: These tests check the SmartPort emulation features including I/O latches, extended I/O latch, **80186** interrupts 3 and 0, dual-port address and interrupt read, dual-ported RAM enabled read, and A15 read.

Board-Side Dual-Ported Memory Tests: These memory tests check all the boards memory from the **80186** side. The host adapter's 80186 executes these tests.

Test 1 -Board Test Segment Addressing:

This test checks to ensure that the **80186** can correctly and uniquely access each 64K segment.

Test 2 -Board Test Address Tag:

This is an address tag test run over 64K bytes of memory (the host test was run over 32K bytes).

Test 3 - Board Test Complementary Address Tag:

This is a complementary address tag test run over 64K bytes of memory.

Test 4 - Board Test Even Bytes:

This test checks the Even bytes of dual-ported memory.

Test 5 - Board Test Odd Bytes:

This test checks the Odd bytes of dual-ported memory.

Test 6 - Board Test Words:

This test checks that word data can be written on all byte boundaries and read back as bytes.

Host/FEP Arbitration Test: This test checks the ability of both the Host and the FEP to simultaneously read from and write to memory without interfering with each other.

DMA/TXD/RXD Test: This test checks that the four DMA channels interface properly with the 8530 UART to transmit and receive data synchronously through the two DB-15 I/O connectors. The test is executed at five different baud rates (38.4K, 153.6K, 307.2K, 614.4K, and 1.2M) with data packet sizes proportional to each speed.

Command Line Parameters

The diagnostics also support the use of command line parameters to further enhance system flexibility. If you want to customize your diagnostic testing for certain applications, these features may be of value to you. Following is a list of available parameters.

/nfname:

This parameter allows you to specify a different configuration file. The diagnostics will use this file instead of **CPDIAGS.CNF**.

/r: This parameter specifies that you wish to run the diagnostics immediately, by-passing all menus and eliminating the need for user interaction.

/i: This parameter indicates that you wish to exclude the IRQ test.

/iX: This parameter allows you to specify an IRQ that you do not want tested. This is helpful if you know a failure will occur because there is another device in your system using the same IRQ line. X specifies the IRQ number. The IRQs normally tested are 3, 5, 7, 10, 11, and 15.

/msXXX: This parameter allows you to specify a hex memory address for the Memory Select Test. You may use this parameter more than once. If you use this parameter, only addresses that are specified will be tested in the Memory Select Test. The address may be up to eight hex digits in length.

/pXXX: This parameter specifies the number of passes the DMA test will make when the diagnostics mode is set to test ALL boards. If you do not use this parameter, the number of passes executed will default to 30. This parameter will have no effect if you are running the diagnostics to test only the current board.

Concentrator Error Codes

If the concentrator detects an internal error, it executes a panic routine. This routine closes the relays to allow pass-through of communications between the host and other concentrators. The panic routine then repeatedly scrolls a message across the front display with the format **HELP ####**, where **####** is one of the four-digit hexadecimal error codes described below. The user can acknowledge the error and reset the concentrator which has failed by pushing either the up or down arrow pushbutton on the front panel. Error codes displayed by the concentrator are as follows:

E000 - Main processing loop exited

E001 - SCC interrupt routine detected mutual exclusion error

E002 - Non-maskable interrupt (NMI) occurred

E003 - Watchdog timer expired

E004 - Firmware attempted a call via `tc_jmp` before the pointer was set

EExx - Interrupt `xx` unexpectedly occurred

Range: EEOO - EE20

AFxx - Runtime assertion `xx` failed (an inconsistent and supposedly impossible internal state was detected)

Range: AF01 - AF1A

Host Adapter Specifications

Bus Type:

ISA (IBM AT standard), EISA, Micro Channel

Port Type, Number:

Two RS-422 synchronous

Processor:

10 MHz 80C186

Connectors:

DB-15 female

Dual-Ported RAM:

128K standard (512 optional)

RS-422 Signals Supported:

TXD \pm , RXD \pm , TXC \pm , RXC \pm , CTS \pm , RTS \pm

I/O Address:

Switch selectable

Memory and Interrupt:

Software configurable

FCC Approval:

Class A

Power Requirements:

+5V @ 1.5A (nominal)

Additional Features:

SurgeBlock surge protection

Concentrator Specifications

Peripheral Port Type, Number:

Sixteen **RS-232** serial

Processor:

16 MHZ 80C186

Connectors:

DB-25 female (**RJ-45** optional)

Baud Rate:

up to 57.6K

Port Signals Supported:

TX, RX, DTR, DSR, CTS, RTS, DCD

FCC Approval:

Class A

Nominal Power Requirements:

+5V @ **550** mA

+12V @ **95** mA

-12V @ **20** mA

Additional Features:

SurgeBlock surge protection

Fault-tolerant operation

Arnet Full lifetime Warranty Details

I. Length of Warranty:

The Arnet Lifetime Warranty extends to the original purchaser of the product as well as all subsequent owners. The warranty is a full lifetime warranty that is in existence for the life of the computer equipment in which the Arnet product is originally installed.

II. What the Warranty Will Cover:

Any and all defects, malfunctions, or failures of the Arnet product, including electrical and mechanical components that fail, defects in software supplied with the boards, and any and all defects in material or workmanship.

III. What the Warranty Will Not Cover:

Defects, malfunctions, or failure of any warranted product if caused by damage (not resulting from a defect or malfunction of product) while in the consumer's possession or caused by an unreasonable use of the product. Such causes may include:

- A. Damage by acts of God (such as flood, fire, etc.), damage caused by other external forces such as power line disturbances, host computer malfunction, plugging the board in under power, or incorrect cabling, and damage caused by misuse, abuse, or otherwise failing to follow instructions.
- B. Modification of any type without authorization from the Arnet Customer Support Department.
- C. Use with unapproved operating system software or computers.
A list of approved operating systems and hardware can be obtained from the Arnet Customer Support Department.
- D. Use in research and development of new software products.
- E. Installation in a computer different from the unit in which it was originally installed.

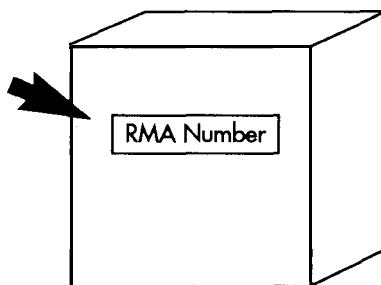
-
- IV. What **Arnet** Will Do Under Warranty **Claims**: In the event of a defect, malfunction, or failure to perform to written specifications, Arnet at its option will repair, replace, or refund the original purchase price of the item. If a product still fails after a reasonable number of attempts to remedy the defect or malfunction, you may elect for a full refund of your purchase price. Generally, boards returned from within the U.S. are repaired or replaced within two working days of receipt by the factory. International returns require from three to five days. In any event Arnet will notify you as quickly as possible if your repair will exceed these periods. For customers in the U.S., Arnet will pay for return shipping by standard air carrier. If you want repaired or replacement boards shipped by some other method, you must pay the shipping charges.
- V. What To Do In The Event Of A Claim: First, contact the dealer from whom you originally purchased the board for his advice and assistance. Arnet dealers are authorized to perform warranty obligations. If you bought the product directly from Arnet, call Arnet Customer Support at (800) 366-8844 for an RMA number. Then send the unit postage paid to the following address:

Attention: Customer Support Dept.
Arnet Corporation
618 Grassmere Park Drive, #6
Nashville, Tennessee 37211

Include the following information with the return:

- Your name and address
- Daytime telephone number
- A written explanation of the defect(s) and the circumstances under which it arose.

**THE RMA NUMBER MUST
APPEAR ON THE OUTSIDE
OF THE PACKAGE.**



VI. Disclaimer: Arnet's remedies and obligations are only to repair, replace, or refund the purchase price of the Arnet product. Arnet disclaims and shall not be liable for any incidental or consequential damages in connection with any Warranty claim and/or product defect or malfunction. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations for exclusion may not apply to you. This Warranty gives you specific legal rights, and you may also have rights that vary from state to state.