Software Manual

**Digi AccelePort EPC/X, C/X, PC/Xr
and Xem Systems**

UNIX System V/386, Release 3.2

DBI 92000133E

Table of Contents

Be sure to read the *Release Notes* that may be included with this software device driver. The *Release Notes* contain information not available at this manual's press time.

Introduction

The Digi device driver software for System V/386 is an installable device driver; the software development system is *not* required to create a new kernel. The link kit, however, must be installed.

This manual also contains instructions for the following features:

- DigiPRINT transparent printing (page 41)

- DigiSCREEN, Digi's multiple screen utility (page 45)

- Digi Port Authority, a port monitoring and diagnostic tool (page 54)

Once you have completed the hardware installation described in the Digi hardware *Installation Guide*, you may proceed with the software device driver installation instructions starting on the following page.

Software Installation

Installation of the device driver software for System V/386 is a four-part procedure. In **Part One**, a new kernel is linked. In **Part Two**, the new devices are created. In **Part Three**, a back-up copy of the current kernel is made and the new kernel is copied into the root directory. Finally in **Part Four** you boot the new kernel and enable the communications ports for use with terminals, modems, etc.

Note: Software changes more rapidly than printed documentation can keep up. For this reason, some of the screens or prompts may not appear exactly as shown.

Part One: Linking a New Kernel

1. Log onto the console as super-user (root).

2. Enter the starting command that is appropriate to your operating system:

EURIX System V/386   **Everex ESIX V/386**   **Intel System V/386**

To begin the installation, enter the command:

```
installpkg
```

This will run the System Administration program designed to assist in Add On Package installation.

Refer to the Operations/System Administrator's Guide for more information on `installpkg`

AT&T UNIX

To begin the installation, enter:

```
face
```

When asked by the software, select **System Administration**.   Select **Software Setup**, then select **Install UNIX System Application**.

This will run the System Administration program designed to assist in Add On Package installation.

Refer to the Operations/System Administrator's Guide for more information.

Interactive UNIX

To begin the installation, enter:

```
sysadm
```

When asked by the software, select **Softwaremgmt**, then select **installpkg**.

This will run the System Administration program designed to assist in Add On Package installation. Answer the on-screen questions about diskette location and type.

Refer to the Operations/System Administrator's Guide for more information.

---

3. Insert the DigiWARE device driver diskette into the diskette drive. The system will ask you to confirm that this is the package you wish to install, with a screen similar to this:

```
Confirm

Please insert the floppy disk.

If the program installation requires more than one floppy disk, be sure to insert the
disks in the proper order, starting with disk number 1.

After the first floppy disk, instructions will be provided for inserting the remaining
floppy disks.

Strike ENTER when ready
or ESC to stop.
```

4. Press <Enter> to start the installation process. After the copyright notices, you will see the following screen:

```
This script installs the Digi EPC/X, C/X, Xem, and Xr driver for:

                UNIX System V/386 Release 3.2


This script also installs the information needed by UNIX to use
these additional ports.  This driver supports up to 7 asynchronous
serial boards.

By default, dial-in ports are installed with the basename "tty".
Dial-out ports are installed with the basename "cu".
DigiPRINT ports are installed with the basename "pr".

                Is this acceptable (y or n)?
```

If you answer "no" to the question, you will be prompted for new base names to use. In either case, the installation script will then scan the /dev directory to find out what port names have already been defined, to avoid conflicts with existing nodes.

5. The system displays:

```
The port names (in the /dev directory) will look like:

     /dev/ttya01


where `tty' is the basename you picked above, `a' is an ID letter
that can be different for each port box, and `01' is the port number.

Systems with a large number of ports may need to use some letters more
than once.  When this occurs, the first box to use an ID letter will
get port numbers 01-16, the second box to use that letter will get
port numbers 17-32, and so on.

You can have the install script pick ID letters for you, assigning
letters consecutively (a,b,c,d,...) and starting over from the
beginning when it runs out of letters; or you can choose them manually.
Manual ID selection is recommended for larger systems, where it can be
used to help keep port names more organized.

   Do you want ID letters picked for you (y/n)?
```

If you answer "y", ID letters will be automatically picked. If you answer "n", you will be asked (later in the procedure) to specify an ID letter for each PORTS module.

6. Now the system will ask:

```
How many boards do you wish to install (1-7)? 2
```

Enter the number of boards you have installed in your computer.

Steps 7-11 will be repeated for each EPC/X, C/X, Xr or Xem host adapter installed in your system.

7. You will see the display:

```
Configuring board 1.


      Boards supported:

      ISA Boards                              (PC/AT Compatible Bus)
                1) Digi Xem (or PC/Xm)
                2) ISA Digi C/X Host Adapter
                3) ISA Digi EPC/X Host Adapter
                4) ISA Digi Xr Host Adapter
      EISA Boards
                5) EISA Digi Xem (or EISA/Xm)
                6) EISA Digi C/X Host Adapter
                7) EISA Digi EPC/X Host Adapter
      MC boards                               (IBM PS/2 Micro Channel bus)
                8) MC Digi Xem (or MC/Xm)
                9) MC Digi C/X Host Adapter
                10) MC Digi EPC/X Host Adapter

      What type is board 1?
```

Choose the applicable board type.

8. (*ISA boards only—EISA boards skip to Step 9; Micro Channel boards skip to Step 10*)

You will now be asked to specify the I/O port address for the board being configured. You will see the screen:

```
 Configuring board 1.
 Board type is ISA Digi EPC/X Host Adapter.

Selecting the I/O port:
 The I/O port choice must match the setting of the dip switches on the
 board, and must not conflict with other devices in the system.
 Problems with the I/O port selection should be checked for if your
 system fails to find the board or your system locks up.

    The I/O port address choices, in hexadecimal, are:

         108     208     308
         118     228     328
         128

    Please enter selection (108-328): 108
```

Select the address that corresponds to the setting of the DIP switches on your board (see the *Installation Guide* for your board). Note that the actual addresses vary depending on which type of board you are configuring.

9. (*EISA and ISA boards only; Micro Channel boards skip to Step 10.*)

ISA Boards (see following page for EISA boards):

Next, you need to specify a starting address for the dual-ported memory on your board. If you are installing multiple boards, the same address may be used for all boards that are supported by this driver. You will see the screen:

```
 Configuring board 1.
 Board type is Digi Xem.
 I/O port is 104.

Selecting the memory address:
 The memory address choice must not conflict with other devices in the
 system.  Problems with the memory address selection should be checked
 for if your system fails to find "board memory" or your system
 locks up.

        The memory address choices, in hexadecimal, are:

  *80) 0x00080000 *A0) 0x000A0000  C0) 0x000C0000  E0) 0x000E0000
  *88) 0x00088000 *A8) 0x000A8000  C8) 0x000C8000  E8) 0x000E8000
  *90) 0x00090000 *B0) 0x000B0000  D0) 0x000D0000  F0) 0x000F0000
  *98) 0x00098000 *B8) 0x000B8000  D8) 0x000D8000  F8) 0x000F8000

        *NOTE: selections 80-98 usually conflict with system memory.
                selections A0-B8 usually conflict with video boards.

        Please enter selection code (80-F8):
```

Enter the two-digit code to the left of the address you wish to use.

*NOTE—Although there are 16 choices offered for memory start addresses, a limited number of these choices are likely to be available. Of the 16, the best choices are probably **D0** and **D8**. Systems with 512K of base memory (instead of 640K) may be able to use the options **80-98**. See the appendix on memory conflicts in the hardware* Installation Guide *for more information.*

EISA Boards (see previous page for ISA Boards):

Next, you need to specify a starting address for the dual-ported memory on your board. If you are installing multiple boards, the same address may be used for all boards that are supported by this driver. You will see the screen:

```
 Configuring board 1.
 Board type is EISA Digi EPC/X Host Adapter.

Selecting the memory address:
 The memory address choice must not conflict with other devices in the
 system.  Problems with the memory address selection should be checked
 for if your system fails to find "board memory" or your system
 locks up.

        The memory address choices, in hexadecimal, are:

  *80) 0x00080000 *A0) 0x000A0000  C0) 0x000C0000  E0) 0x000E0000
  *88) 0x00088000 *A8) 0x000A8000  C8) 0x000C8000  E8) 0x000E8000
  *90) 0x00090000 *B0) 0x000B0000  D0) 0x000D0000  F0) 0x000F0000
  *98) 0x00098000 *B8) 0x000B8000  D8) 0x000D8000  F8) 0x000F8000

        *NOTE: selections 80-98 usually conflict with system memory.
               selections A0-B8 usually conflict with video boards.

 F000) 0xF0000000  F400) 0xF4000000  F800) 0xF8000000  FC00) 0xFC000000
 F100) 0xF1000000  F500) 0xF5000000  F900) 0xF9000000  FD00) 0xFD000000
 F200) 0xF2000000  F600) 0xF6000000  FA00) 0xFA000000  FE00) 0xFE000000
 F300) 0xF3000000  F700) 0xF7000000  FB00) 0xFB000000  FF00) 0xFF000000

        Please enter selection code (80-F8 or F000-FF00):
```

Enter the two or four digit code to the left of the address you wish to use (the four digit codes yield addresses in the fourth gigabyte). The address must be the one you specified when you ran the EISA configuration program.

*NOTE—Although there are 16 choices offered for memory start addresses below 1 megabyte, a limited number of these choices are likely to be available. Of the 16, the best choices are probably **D0** and **D8**. Systems with 512K of base memory (instead of 640K) may be able to use the options **80-98**. See the appendix on memory conflicts in your hardware* Installation Guide *for more information.*

10. This step is different depending upon whether you are installing Xr, Xem or (EP)C/X host adapters. Follow the appropriate procedure for your board.

Xem Host Adapters

If you are installing an Xem host adapter, you will now be asked for the number of PORTS modules to be connected to the board:

```
 Configuring board 2.
 Board type is Digi Xem.
 I/O port is 104.
 Memory Addr. is 0x000D0000.

PORTS/16em or PORTS/8em(p) modules:
 This board can have 1 to 4 modules connected.

       How many modules are connected to this board (1 - 4)?
```

Select the appropriate number for your installation.

If you answered "n" to the question "Do you want ID letters picked for you?" back in Step 6, you will also be prompted at this time for the ID letters to be assigned to each of the PORTS modules.

You will also be asked for the number of ports (8, 9 or 16) on each PORTS module. Answer "8" for PORTS/8em modules, "9" for PORTS/8emp modules or "16" for PORTS/16em modules.

Now proceed to Step 11, on page 20.

PC/Xr Boards

If you are installing a PC/Xr board, you will now be asked to choose between the PC/8r (8 ports) and the PC/4r (4 ports):

```
Configuring board 1.
 Board type is ISA Digi Xr.
 I/O port is 104.
 Memory Address is 0x000D0000.

 Choose from the following boards:
       1) Digi 4r
       2) Digi 8r

       Which board would you like to configure (1 or 2)?
```

Select the appropriate board for your installation.

Now proceed to Step 11, on page 20.

C/X, EPC/X Host Adapters

If you are installing a C/X or EPC/X host adapter, you will be asked for configuration information for the two synchronous lines. This determines how the host adapter will communicate with the attached concentrator(s).

There are two methods for setting the line configuration: basic and *custom*. In the basic configuration, the sync lines are set to 8-wire direct and either 1228K bps or 10M bps (10M bps is applicable only to the EPC/X host adapter). The custom configuration allows you to select the wiring method and data rate for each sync line. You will see:

```
 Configuring board 1.
 Board type is ISA Digi EPC/X Host Adapter.
 I/O port is 108.
 Memory Addr. is 0x000D0000.

Line Configuration:
 The sync lines may be configured two ways.  The basic method has all
 connections wired "8 wire direct" at a speed of either 1228K bps or
 10M bps, and can be used for quick set-up for most situations.  The
 custom method allows you to choose speeds and wiring methods
 individually.

        Do you want to use the basic installation method (y/n)?
```

Basic Configuration: C/X, EPC/X (for Custom Configuration, see page 19)

10a. If you are installing an EPC/X host adapter, you will see the following screen (if you are installing a C/X host adapter, skip to Step **10b**):

```
 Configuring board 1.
 Board type is ISA Digi EPC Host Adapter.
 I/O port is 108.
 Memory Addr. is 0x000D0000.

Basic Configuration:

 One of two line speeds must be chosen for the basic configuration
 method.  The choices are 1228K bps and 10M bps.  Running the sync
 lines at 1228K bps maintains compatibility with C/CON-16
 concentrators.  Running the sync lines at 10M bps allows higher
 performance, but is not compatible with C/CON-16 concentrators and
 restricts the length of the sync cable.  For more information, see
 the manual.

        1) 1228K bps
        2) 10M bps

Which speed do you wish to run the sync lines at?
```

Important!

Select 10M bps *only* if:

- all attached concentrators are EPC/CON-16 concentrators, and

- the *cumulative* length of all daisy chain cables on either sync line is 30 feet or less.

See the EPC/CON-16 *Installation Guide* for more detailed information about data rates versus cable lengths.

10b. Now you will be asked how many concentrators are attached to each sync line. For EPC/X host adapters, you will also be asked how many EBI modules are attached to each concentrator (this refers to PORTS/16em, PORTS/8em or PORTS/8emp modules connected to the "EBI Out" port of EPC/CON-16 concentrators), and how many ports (8, 9 or 16) are on each EBI module (answer "8" for PORTS/8em modules, "9" for PORTS 8emp modules and "16" for PORTS/16em modules).

Important!

EPC/CON-16 and newer C/CON-16 Concentrators

EPC/CON-16 and newer C/CON-16 concentrators (which have a plastic case) must have their node numbers set manually at installation (see the concentrator *Installation Guide* for instructions). When asked for the number of concentrators, enter the *node number* of the last concentrator in each sync line (which may be different from the actual number of concentrators). Normally concentrator node numbers are assigned sequentially, beginning with 1; however, if you are planning to add more concentrators later, and want to configure the driver and create the devices in /dev to support the future concentrators, you may skip node numbers to allow for later insertion of concentrators. For example, if you have three concentrators attached to a sync line, but are planning to add three more, the node number of the last concentrator in the chain should be set to "6", and you should enter "6" for the number of concentrators (it is important that these numbers match, because the driver uses them to set the communication mode of the last concentrator to enable it to return data to the host adapter).

Older C/CON-16 Concentrators

Older C/CON-16 concentrators (which have a metal case) are always assigned node numbers sequentially, beginning with 1. If all of the concentrators on a sync line are older models, enter the actual number of concentrators (which will correspond to the node number of the last concentrator in the chain).

Mixed Older and Newer Concentrators

When mixing older and newer concentrators on a sync line, the older concentrators must be attached closest to the host adapter, and newer concentrators must be at the end of the chain. In this case, use the *node number* that has been set in the last concentrator in the chain (which may be different from the actual number of concentrators).

Now proceed to Step 11, on page 20.

Custom Configuration: C/X, EPC/X

The custom configuration requires you to specify the wiring method and the data rate for each host adapter synchronous line. The wiring options are:

   1) 4-wire direct
   2) 8-wire direct
   3) 8-wire synchronous modem
   4) EIA-232 synchronous modem

The supported data rates are:

4-wire direct
   1) 230K   2) 460K   3) 921K*   4) 1843K*

8-wire direct
   1) 2400   5) 38.4K   9) 230K   13) 1843K*   17)10M*
   2) 4800   6) 57.6K   10) 460K   14) 2458K*
   3) 9600   7) 76.8K   11) 921K   15) 3686K*
   4) 19.2K   8) 115K   12) 1228K   16) 7373K*

8-wire synchronous modem
   1) 2400   6) 38.4K   10) 460K
   2) 4800   7) 57.6K   11) 921K
   3) 9600   8) 76.8K   12) 1228K
   4) 14.4K   9) 115K
   5) 19.2K   10) 230K

8-wire EIA-232 synchronous modem
   1) 2400   4) 14.4K   7) 57.6K
   2) 4800   5) 19.2K   8) 64.1K
   3) 9600   6) 38.4K   9) 76.8K

*   Rates with an asterisk are incompatible with C/CON-16 concentrators. These data rates can only be used if *all* concentrators on a given sync line are EPC/CON-16 concentrators. Also, see *Restrictions on Cable Lengths* in the EPC/CON-16 *Installation Guide*.

11. You will now be asked to confirm the configuration for the board:

If you have installed an Xem host adapter with four PORTS modules, you will see something like this:

```
You have selected the following configuration for board 2:
        Board Type:     Digi Xem. I/O address:    104.
        Memory address: 0x000D0000.


        Module   Port Names
       -------------------------
        1        ttya01 - ttya16
        2        ttyb01 - ttyb09
        3        ttyc01 - ttyc08
        4        ttyd01 - ttyd16

 Is this configuration acceptable (y or n)?
```

If you have installed an EPC/X host adapter, you might see something like this:

```
You have selected the following configuration for board 1:
   ISA EPC Host Adapter. I/O address: 108. Memory Address: 0x000D0000.

          Connections     Speed   Cabling           Port Names
          -------------------------------------------------------
            Line 1
          Concentrator 1   10M    8 wire direct     ttya01 - ttya16
            EBI Module 1                             ttyb01 - ttyb08
            EBI Module 2                             ttyc01 - ttyc09
            EBI Module 3                             ttyd01 - ttyd16
          Concentrator 2   10M    8 wire direct     ttye01 - ttye16
            Line 2
          Concentrator 1   9600   EIA-232 modem     ttyf01 - ttyf16
          Concentrator 2   9600   8 wire direct     ttyg01 - ttyg16
            EBI Module 1                             ttyh01 - ttyh16
          Concentrator 3   9600   8 wire direct     ttyi01 - ttyi16
          Concentrator 4   9600   8 wire direct     ttyj01 - ttyj16

 Is this configuration acceptable (y or n)?
```

If you accept the configuration, Steps 7-11 will be repeated for each additional board specified in Step 6. Otherwise, you will be returned to Step 7 (page 11) to re-enter the configuration for the current board.

12. Next, you need to select the **altpin** setting. This allows alternate wiring of the RJ-45 modular connectors. The default for **altpin** is OFF, giving you the standard Digi RJ-45 pinouts. Setting **altpin** to ON enables the alternate RJ-45 pinouts. (This is useful for 8-pin RJ-45 connectors. See the *Installation Guide* for your board, and page 37 of this manual for more details.)

The software asks:

```
The default setting for altpin is off.
Is this acceptable (y or n)?
```

Answer y or n as appropriate.

Note that answering "n" here activates the **altpin** configuration for *all* ports. Individual ports can be set with ditty (see page 37).

13. Installing DigiSCREEN

DigiSCREEN is Digi's multiple screen utility that allows a single physical terminal to be connected to several virtual terminal sessions (*screens*) at one time. The software installation script gives you the option of installing it.

If you have already installed DigiSCREEN with another Digi product, there is no need to install it again, unless you wish to change the number of DigiSCREEN devices.

The software asks:

```
Do you wish to install DigiSCREEN (y or n)?
```

If you answer "n", proceed to page 23, *Creating New Devices*.

14. The software continues:

```
Each session under DigiSCREEN requires a DigiSCREEN device.

How many DigiSCREEN devices do you wish to have installed?
(max. is 256, default is 32)
```

Answer with the number of DigiSCREEN devices you think will be adequate for all connected terminals. Note that the default value will change according to the number of previously created DigiSCREEN devices you may have. See page 45 for a complete description of the DigiSCREEN multiple screen utility.

15. Finally, the software asks:

```
Do you wish to update /etc/ttytype (y or n)?
```

For a new installation, answer "y" (yes). For updates, answer "n" to preserve the current setup. If you are not sure, answer "y".

Part Two: Creating New Devices

This portion of the installation procedure creates devices in /dev, giving System V/386 the information to use the additional ports.

The Digi driver will support up to seven EPC/X, C/X, Xr and/or Xem host adapters.

C/X host adapters can have up to eight concentrators attached, for a total of 128 asynchronous ports per host adapter, or 896 ports per system (seven host adapters).

EPC/X host adapters can each have up to fourteen concentrators and/or PORTS/em modules attached for a total of 1568 asynchronous ports per system (seven host adapters). The maximum number of concentrators per synchronous line is eight. PORTS/em modules may be attached to the concentrators, as long as the total number of boxes (concentrators and PORTS modules) does not exceed fourteen.

Xem host adapters can each have four PORTS modules attached, for up to 64 ports per board or 448 asynchronous ports per system.

The devices are named according to the following conventions:

Format used for port names

tty   Default base name. You may have defined a different one (in Step 5 of Part 1). These ports require DCD (Data Carrier Detect) to be asserted before they can transmit data.

pr   Default base name for DigiPRINT transparent printing.

cu   Base name for dial-out ports. You may have defined a different one. These ports do *not* require DCD (Data Carrier Detect) to be asserted before they can transmit data.

a-z   Concentrator or PORTS module letter I.D. Legal letters are a-z.

01-96   Port number on the individual concentrator or PORTS module.

For example, if "**tty**" is the base name, Port 4 on concentrator or PORTS module "**b**" will be **ttyb04**. The same port with modem control enabled would be named **ttyB04**.

Part Three: Installing the New Kernel

The device driver software installation is now complete, and the new kernel must be installed.

You will see the following (or similar) message:

```
The UNIX Operating System will now be rebuilt.
This will take a few minutes.  Please wait.
```

When the rebuild is completed, the following message will be displayed:

```
To complete the install/remove process a shutdown is now being initiated automatically.

Make sure your floppy drive is empty.  If you are installing or removing controller
boards, you may power down the system after shutdown is completed.

Strike ENTER when ready
or ESC to stop.
```

Press <Enter> to proceed with the shutdown.

Note: Some versions of System V/386 do not automatically initiate a shutdown. In this case, perform the shutdown manually with the following command:

```
shutdown -y -g0
```

When the computer reboots, you should see messages which indicate the board is functioning. Your screen will look something like this:

```
device     address     vector   dma        comment
-------------------------------------------------------------
%epca      0x0208      -        -          mem=0x000D0000
                                           Ports=32
                                           PC/Xem V x.x.x
```

Watch for error messages for up to a minute after this screen appears—if there is a memory contention with some other device, such as a SCSI controller, it may not manifest immediately (it will only show up when both devices attempt to access the same memory addresses at the same time). See the appendix on memory conflicts in the appropriate Digi hardware *Installation Guide* for more information about memory problems.

After multi-user mode has been entered, you will see this message (it may scroll by too quickly to notice):

```
Digi software download started.
```

If there is a problem with the board or the driver configuration, you may see error messages after this screen—see page 72 for explanations of the error messages that may occur.

If no errors are detected, C/X and EPC/X host adapters will proceed to download the operating software to the C/CON-16 and/or EPC/CON-16 concentrators. Once the concentrators are running, their displays will show "**AC**".

Now proceed to Part Four to enable the new ports.

Part Four: Enabling the New Ports

Connect terminals to the ports (using a null modem, if necessary) and test the connections to each terminal by entering the following command for *each* port added:

```
date > /dev/cua01
```

(Assuming the terminal is connected to `ttya01`.)

Please note that in the above, the "date" command is used as a simple test, to provide text output that can be redirected; there is no other significance to "date" in this test.

Also note that the default settings for terminals is 300 baud, 7 data bits, even parity and 1 stop bit.

- If the date appears on the terminal's screen, the device is properly connected.

- If the date *does not* appear on the terminal's screen, then that terminal is not receiving data; check the power, cables, connections, etc.

- If nonsense characters are printed on the terminal's screen, check the baud rates, data bits, stop bits, and parity setting on your terminal. (UNIX default parameters are 300 baud, 7 data bits, 1 stop bit, and even parity.)

Another test you can perform will verify that a port can both transmit and receive data:

Connect the port's transmit and receive lines together (pins 2 and 3 of a DB-25 connector, or the middle two pins of an RJ-45 connector), and enter the following commands:

```
cat </dev/cua01 &
cat /etc/termcap > /dev/cua01
```

The first command runs in the background, and directs all input from `cua01` to `stdout` (your screen). The second command transmits the `termcap` file to `cua01`. If the port is working, the data is sent out the port, received back by the same port and displayed on your screen.

If the port fails, check another port. If more than one port fails, the problem is probably due to memory contention, rather than defective hardware. Try reinstalling the device driver with a different memory start address.

Once you can redirect output to your screen with the test above, perform the following steps to enable that port.

Important! If the port tests above work, but you still can't respawn a `getty`, it is probably because DCD is not asserted.

Remember that ports with the `tty` prefix must have Data Carrier Detect (DCD) asserted before they can function. If DCD is not connected to an active output line of the peripheral device, it must be defeated, either by "tying it high" (e.g. connecting it to the same port's DTR line) or by issuing the command `ditty forcedcd ttya01` (assuming that the port in question is `ttya01`).

Another way to bypass the DCD requirement is to use the `cu` devices instead of the `tty` devices. `cu` devices function identically to `tty` devices, except that they do not require DCD to be asserted in order to function.

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1. Use `vi` to enable the new terminal entries in the `/etc/inittab` file. The following entries have been automatically added for the boards (and ports) installed:

   ```
   Xx01:23:off:/etc/getty ttya01 9600
   Xx02:23:off:/etc/getty ttyb02 9600...
   ```

   and so on.

   - Change the word "`off`" to "`respawn`" for each terminal you want to be enabled.

   - The numbers associated with each "tty" represent the board and port number ("`ttya01`" is Board 1 Port 1, "`ttya08`" is Board 1 Port 8).

   - The last number is an entry into the `/etc/gettydefs` file, which may be set to any of the allowable baud rates. (Check your operating system's manual.) In this case, "9600" specifies 9600 baud, 7 data bits, 1 stop bit, and even parity.

2. Finally, enter the following command to get the login prompt on the screen:

   ```
   init q
   ```

AT&T UNIX

Refer to the *Peripherals Setup* section of your AT&T Operating System Guide for details on how to enable serial ports. The following is an example of how to set up one serial port for terminal usage:

1. Log onto the console as super-user (root).

2. Enter:

   ```
   face
   ```

   When asked by the software, select **System Administration**. Select **Peripherals Setup**, and then select **Serial Ports Setup**.

3. With the cursor "Serial Port Number," enter the port number, or strike CHOICES to obtain a list of the valid ports. If you struck CHOICES, the Port Number pop-up menu appears. Highlight the port number related to `/dev/` and press the ENTER key. The port number now appears in the "Serial Port Number" field.

4. Move the cursor to the "Device Type" field and enter `terminal`

5. Move the cursor to the "Device Speed" field and enter the device speed, or strike CHOICES to obtain a list of the valid device speeds. For example, enter `9600` as your desired device speed.

6. Strike SAVE. Now the device `/dev/` is available for use with a terminal.

Interactive UNIX

---

1. To enable the ports, use the System Administration command **sysadm**. Then select **7** to access the **tty management menu**.

2. At the next menu, choose **modtty** to show and modify characteristics of the tty lines.

3. The software will list the current ports. Enter the name of one of the listed ports. The options you can then change for that port are:

   > **State:**
   > **Hangup Delay:**
   > **Line Setting:**
   > **Description:**

   • Change the state from off to on.

   • Change the hangup delay from off to the desired delay (in seconds).

   • Choose the Line Setting from the list of supported devices/baud rates. (This list comes from `/etc/gettydefs`.) If in doubt, choose 9600. Refer to your UNIX documentation for more information.

   • Add a description of the port if desired.

   Repeat Step 3 for each added port.

4. Select **Quit**, and the ports will automatically be enabled.

Serial Printers

To prepare a port for connection to a printer, enter the following command:

    ditty printer [*baud rate and flow control options*] ttya01

This command forces the specified port to stay open, thus preserving any "non-sticky" options (see *Setting Terminal Options with ditty*, beginning on page 35, for complete descriptions of all ditty parameters) for that port.

This command is recommended for any port that has a printer connected to it.

The command may be placed in `/etc/rc.d/8/userdef` so that it is automatically executed whenever the system is booted.

Un-Installing the System V/386 Device Driver

Removing the driver from the kernel is a two-part process. First, the driver references are removed from the system configuration files. Secondly, a new kernel is linked, and copied to the root directory.

Enter the following commands to *un-install* the device driver software:

1.   Log onto the console as super-user (root).

2.   Follow the appropriate instructions for the operating system you are using:

AT&T UNIX

Enter the following command:

```
face
```

When asked by the software, select **System Administration**. Then select **Software Setup**, and finally select **Remove Installed Software**.

From the on-screen display, select the label corresponding to the EPC/X, C/X, Xr and Xem device driver.

It will take some time for the new kernel to be built. When it is finished, perform a system shutdown.

EURIX System V/386   Everex ESIX V/386   Intel System V/386

Enter the following command:

```
removepkg
```

The system will ask which package you wish to remove. Choose the Digi EPC/X, C/X, Xr and Xem async driver. It will take some time for the new kernel to be built. When it is finished, perform a system shutdown.

Interactive UNIX

Enter the following command:

    sysadm

When asked by the software, select **Softwaremgmt**, and then select **re-movepkg**. When the system asks which package to remove, choose the Digi EPC/X, C/X, Xr and Xem async driver. It will take some time for the new kernel to be built. When it is finished, perform a system shutdown.

---

3. Next, the software asks:

```
Removing DigiSCREEN devices will affect ALL Digi Drivers.
Do you wish to remove DigiSCREEN devices (y or n)?
```

Answer "y" or "n".

4. The software asks:

```
Do you wish to remove EPC/X, CX, Xr and Xem entries from /etc/ttytype (y or n)?
```

Answer "y" if these entries are no longer needed (or if you are in doubt), or answer "n" if you wish to preserve the old entries.

Setting Terminal Options with ditty

`ditty` is a utility program that sets and displays the terminal options for the Digi concentrators and/or PORTS modules.

The format is:

   `ditty` [-a] [-p] [-n *ttyname*] [*option(s)*] [*ttyname*]

With no options, `ditty` displays all Digi special driver settings, modem signals, and all standard parameters displayed by `stty(1)` for the tty device referenced by standard input.

Command options are provided to change flow control settings, set transparent print options, force modem control lines, and display all tty settings. Any unrecognized options are passed to `stty(1)` for interpretation.

The options are:

`-a`	Display all of the unique Digi option settings, as well as all of the standard tty settings reported by `stty -a`.
`-p`	Interpret the port as a parallel printer port. This flag should only be used for the ninth port of a PORTS/8emp module.
`-n` ***ttyname***	Set and display options for the given tty device, instead of standard input. This option may be specified multiple times to perform the same operation on multiple ttys.
ttyname	Set and display options for the given tty device, instead of standard input. This form can be used with a tty pathname prefixed by `/dev/` or with a simple tty name beginning with `tty` (or the basename you selected during installation, if different). This option may be used on a modem control line when no carrier is present.

The following options specify transient actions to be performed immediately:

`break`	Send a 250 MS break signal out on the tty line.
`flush`	Immediately flush (discard) tty input and output.
`flushin`	Flush tty input only.
`flushout`	Flush tty output only.

The following options specify actions which are not "sticky," meaning that the changes are reset when the device is closed, and that the device will use the default values the next time it is opened.

stopout	Stop output exactly as if an **xoff** character was received.
startout	Restart stopped output exactly as if an **xon** character was received.
stopin	Activate flow control to stop input.
startin	Release flow control to resume stopped input.
[-]dtr	Raise [drop] the DTR modem control line, unless DTR hardware flow control is selected.
[-]rts	Raise [drop] the RTS modem control line, unless RTS hardware flow control is selected.

The following options are "sticky"—the effects continue until the system is rebooted or until the options are changed.

[-]printer	Forces port to stay open so that non-sticky parameters such as baud rate and flow control are not reset to default values.
[-]fastcook	Perform cooked output processing on the intelligent card to reduce host CPU usage, and increase raw mode input performance.
[-]fastbaud	Alter the baud rate tables, so 50 baud becomes 57,600 baud, 75 baud becomes 76,800 baud and 110 baud becomes 115,200 baud.
[-]rtspace	Enable [disable] RTS hardware input flow control, so RTS drops to pause remote transmission.
[-]ctspace	Enable [disable] CTS hardware output flow control, so local transmission pauses when CTS drops.
[-]dsrpace	Enable [disable] DSR hardware output flow control, so local transmission pauses when DSR drops.
[-]dcdpace	Enable [disable] DCD hardware output flow control, so local transmission pauses when DCD drops.
[-]dtrpace	Enable [disable] DTR hardware input flow control, so DTR drops to pause remote transmission.
[-]forcedcd	Disable [re-enable] carrier sense, so the tty may be opened and used even when carrier is not present.

[-]altpin   Switches the function of the DSR and the DCD inputs on the interface connector, so that DCD is available when using an 8-pin RJ-45 connector instead of a 10-pin RJ-45 connector.

startc *c*   Sets the XON flow control character. The character may be given as a decimal, octal or hexadecimal number. Octal numbers are recognized by the presence of a leading zero, and hexadecimal numbers are denoted by a leading "0x". For example, the standard XON character, <CTRL-Q>, can be entered as "17" (decimal), "021" (octal) or "0x11" (hexadecimal).

stopc *c*   Sets the XOFF flow control character. The character may be given as a decimal, octal, or hexadecimal number (see startc, above, for format of octal and hexadecimal numbers).

astartc *c*   Sets auxiliary XON flow control character. The character may be given as a decimal, octal, or hexadecimal number (see startc, above, for format of octal and hexadecimal numbers).

astopc *c*   Sets auxiliary XOFF flow control character. The character may be given as a decimal, octal, or hexadecimal number (see startc, above, for format of octal and hexadecimal numbers).

[-]aixon   Enables auxiliary flow control, so that two unique characters are used for XON and XOFF. If both XOFF characters are received, transmission will not resume until both XON characters are received.

[-]2200flow   Use 2200 style flow control on the port. The 2200 terminals support an attached printer and use four flow control characters: terminal XON (0xF8), printer XON (0xF9), terminal XOFF (0xFA) and printer XOFF (0xFB).

[-]2200print   The 2200print flag determines how these flow control characters (see 2200flow, above) are interpreted. If 2200print is set, run independent flow control for terminal and transparent print devices. Otherwise, terminal and printer flow control are logically tied together, so if either XOFF character is received, all output is paused until the matching XON character is received.

maxcps *n*   Sets the maximum Characters Per Second (CPS) rate at which characters are output to the transparent print device. The rate chosen should be just below the average print speed. If the number is too low, printer speed will be reduced. If the number is too high, the printer will resort to flow control, and user entry on the terminal will be correspondingly impaired. Default is 100 CPS.

maxchar *n*   Sets the maximum number of transparent print characters the driver will place in the output queue. Reducing this number increases system overhead; increasing this number delays operator keystroke echo times when the transparent printer is in use. Default is 50 characters.

bufsize *n*   Sets the driver's estimate of the size of the transparent printer's input buffer. After a period of inactivity, the driver bursts this many characters to the transparent printer before reducing to the maxcps rate selected above. Default is 100 characters.

onstr *s*   Sets the terminal escape sequence to turn transparent printing on. The string *s* can be composed of standard ASCII printing and non-printing characters; control (non-printing) characters must be entered by their octal values, and must consist of three digits preceded by a back-slash ("\") character. For example, the "Escape" character <Esc>, 33 octal, should be entered as "\033". Thus, if transparent printing is turned on by the string "**<Esc>[5i**" (ANSI standard), *s* should be entered as "\033[5i".

offstr *s*   Sets the terminal escape sequence to turn transparent printing off. See "onstr", above, for the format of the string *s*.

term *t*   Sets the transparent printer on/off strings to values found in the internal default table. Internal defaults are used for the following terminals: **adm31**, **ansi**, **dg200**, **dg210**, **hz1500**, **mc5**, **microterm**, **multiterm**, **pcterm**, **tvi**, **vp-a2**, **vp-60**, **vt52**, **vt100**, **vt220**, **wyse30**, **wyse50**, **wyse60**, or **wyse75**. If the terminal type is not found in the internal default table, then ditty reads the terminfo entry for the terminal type and sets transparent print on/off strings to values given by the **mc5**/**mc4** attributes found there.

Also see stty(1), ioctl(2), termio(4), and terminfo(5).

Using the ditty Command with Parallel Ports

The `ditty` command features a special mode for use with the parallel port on Digi PORTS/8emp modules. When the `-p` flag is included in the `ditty` command, certain flags and functions are interpreted differently than for serial ports. Following is an example of the output of the command `ditty -p ttye09`:

```
parallel output port
pulse width 0.8 us -noack hupcl
BUSY-  IP0+  IP1-  IP2-  OP+
-opost -olcuc -onlcr -ocrnl -onocr -onlret
```

Pulse Width defines how long the data is strobed; the default is 0.8 microseconds, which is the fastest supported strobe. To change the strobe length, use the `ditty` command as follows:

```
ditty 1 ttya09
```

The above example sets a 1.0 microsecond pulse width.

Valid pulse widths are: `0.8`, `1`, `1.2`, `1.6`, `2`, `3`, `4`, `5`, `10`, `20`, `30`, `40` and `50`.

The "baud rate" of the port is used to control the pulse width—9600 baud or faster translates to 0.8 microseconds; 4800 baud is 1 microsecond, 2400 is 1.2 microseconds, etc. The `-p` flag is implied, and need not be included in the command.

`[-]noack`

When `noack` is specified (`ditty noack ttya09`), the device driver will not wait for an ACK pulse from the receiving device before transmitting another character; only the BUSY signal will stop data transmission.

When `noack` is turned off (`ditty -noack ttya09`), an ACK pulse is expected after each character is transmitted.

The `dsrpace` control is mapped to `noack` for parallel ports. The `-p` flag is implied, and need not be included in the command.

`hupcl` has the usual meaning: "hang up on close". Since DTR is mapped to the parallel port's SELECTIN line (`OP`; see below), dropping and raising DTR (which happens when a port is closed and then opened again) will have the effect of strobing the RESET line of the parallel device connected to the port. `-hupcl` prevents the device from being reset when it is reopened.

BUSY shows the state of the BUSY line. BUSY is not asserted (–) when the input device can accept data, and asserted (+) when it cannot. BUSY is mapped to DSR for parallel ports.

IP0, IP1 and IP2 are device dependent inputs. They provide information only, and do not affect the flow of data. They are typically used for signals like Paper Out, On/Off Line, etc. IP0, IP1 and IP2 are mapped to CTS, DCD and RI, respectively.

OP is the SELECTIN line, which is mapped from DTR. When OP changes from LOW to HIGH, the parallel port's RESET line is strobed. Normally, the RESET function is handled by the driver; however, a RESET can be forced by issuing the command "ditty OP- ttya09" followed by "ditty OP+ ttya09", or by the command "ditty reset ttya09". The -p flag is implied, and need not be included in the command.

[-]opost, [-]olcuc, [-]onlcr, [-]ocrnl, [-]onocr, [-]onlret

These flags have the usual meaning (see stty(1)).

DigiPRINT Transparent Print Feature

Description & Theory of Operation

Most terminals have an auxiliary port that can be connected to a serial printer. These terminals support two print modes, Auxiliary and Transparent. If both print modes are OFF, data received by the terminal is simply displayed on the screen. With Auxiliary print mode ON, data received by the terminal is displayed on the screen, and is also transmitted to the printer. With Transparent Print Mode ON, the terminal transmits data received directly to the printer, without displaying it on the screen.

DigiPRINT allows you to use your terminal in a normal manner, while information is also being sent *over the same serial connection from the host* to the printer connected to the terminal's auxiliary printer port. This is "transparent printing." The DigiPRINT software determines whether packets of data are bound for the screen or for the printer, and precedes data bound for the printer with the Transparent Print Mode ON command, and follows it with the Transparent Print Mode OFF command.

Data for the terminal screen has the highest priority, and DigiPRINT sends data to the printer only if there is a break in information being sent to the screen. If continuous data is being transmitted to the terminal device, nothing gets sent to the printer.

Whenever an auxiliary printer port is used, flow control to the printer becomes an issue. If the printer falls behind and invokes flow control, output to both the printer and the terminal is stopped: this is aggravating to the terminal user. The `ditty` command provides three parameters to limit printer output and avoid this situation. (See *Setting Terminal Options with ditty* on page 35 for a complete description of the `ditty` command.)

The parameter `maxcps` limits the maximum printer port character-per-second data rate. This number should be set to the minimum character rate the printer can sustain in typical use.

The parameter `maxchar` limits the number of characters queued to the printer ahead of terminal output. Lower numbers increase system overhead, higher numbers result in keystroke echo delays. A value of 50 is generally a good compromise at 9600 baud.

The parameter `bufsize` should be set to a value just below the printer's buffer size. After a period of inactivity, the driver will burst up to this many characters to the printer to fill the print buffer before slowing to the maxcps rate.

The printer on/off strings are also set using `ditty`.

DigiPRINT will be available for use after the Digi device driver software for your operating system is installed, and the transparent print options are activated with the `ditty` program.

A cable must be connected between the auxiliary port of the terminal and the printer. The baud rate on the terminal auxiliary port and the printer must be the same, and the printer and the auxiliary port of the terminal must use the same handshaking mode. The auxiliary port must also be enabled. If your terminal is not one of those directly supported, you must know the escape sequence of your terminal.

Refer to your terminal and printer manuals for connection information, escape codes, and to see what handshaking modes are supported (i.e. xon/xoff, busy/ready, rts/cts, etc.).

Printer devices (`pra01`, etc.) must not be in either the `/etc/inittab` or `/etc/ttys` files, and must not be enabled.

Transparent Print Activation

DigiPRINT is activated with `ditty`. The `ditty` program configures the Digi tty device driver for transparent print options. (See *Setting Terminal Options with ditty* for a complete description of the `ditty` command.) The `ditty` command must be run each time the machine is booted. Usually, the best way to do this is by adding `ditty` commands to your `etc/rc` system initialization file. (Put them in a text file in the directory `/etc/rc.d/8`—See your System Administrators Guide for details.) Alternatively, you may include the `ditty` command sequence in your `.login` or `.profile` files, to ensure that DigiPRINT is activated when you log in. Your System Administrator can help you edit these files. The pathname for `ditty` is `/usr/bin/ditty`

DigiPRINT transparent print options are set using the `ditty` program in the following manner:

> `ditty` [`-a`] [*option(s)*] *port*

The command line options are:

`maxcps` *n*	Sets the maximum Characters Per Second (CPS) rate at which characters are output to the transparent print device. See *Setting Terminal Options with ditty* (page 35) for more information.
`maxchar` *n*	Sets the maximum number of transparent print characters the driver will place in the output queue. See *Setting Terminal Options with ditty* for more information.
`bufsize` *n*	Sets the driver's estimate of the size of the transparent printer's input buffer. See *Setting Terminal Options with ditty* for more information.
`onstr` *s*	Sets the terminal escape sequence to turn the transparent printer on. An arbitrary octal character *xxx* may be given as *xxx*.
`offstr` *s*	Sets the terminal escape sequence to turn the transparent printer off. An arbitrary octal character *xxx* may be given as *xxx*.
`term` *t*	Specifies the terminal type. See *Setting Terminal Options with ditty* for more information.
`port`	Specifies the tty device.

Now data can be sent to your printer via the printer devices.

Example: cat *filename* > `/dev/pra01`

ditty Examples for Transparent Printing

Example 1:

The following command configures the DigiPRINT options for a DEC VT100 terminal connected to `/dev/ttya01`. (Note that the printer uses `/dev/pra01`). `maxcps`, `maxchar` and `bufsize` are left to defaults. Type:

```
ditty term vt100 /dev/ttya01
```

Example 2:

The following example uses `onstr` and `offstr` arguments. (This sets the terminal to use ANSI Standard.) Again `maxcps`, `maxchar`, and `bufsize` are defaults. Type:

```
ditty onstr "\033[5i" offstr "\033[4i" /dev/ttya01
```

Example 3:

This example command sets the DigiPRINT option for a WYSE30 terminal, with `maxcps` of 75, a `maxchar` of 100, and a printer buffer size, `bufsize`, of 1000. Type (all on one line, with a carriage return at the end only):

```
ditty term wyse30 maxcps 75 maxchar 100 bufsize 1000 /dev/ttya01
```

DigiSCREEN Multiple Screen Utility

Description and Theory of Operation

DigiSCREEN is a utility that allows a single physical terminal to be connected to several virtual terminal sessions (*screens*) at one time. It is mainly intended for use with terminals that have two or more pages of screen memory. With such terminals, switching between virtual screens will also switch between physical terminal screen pages, allowing each virtual screen's image to be saved and restored. On terminals without multiple pages of screen memory, DigiSCREEN can still be used to switch among virtual screen sessions, although the appearance of the screen will not be maintained when switching screens.

Note: For full support of DigiSCREEN, your terminal must be able to switch internal screen pages on command *and must remember the cursor position for each page*. While DigiSCREEN will work on both smart and dumb terminals, screen images are not saved during screen changes on dumb terminals. Digi-SCREEN also supports terminals connected to two or more computers through separate serial ports.

Options

DigiSCREEN is called with the following format:

    dscreen[-i *infofile*] [-t *termtype*]

If *infofile* is specified, it will be used as the source of terminal configuration information. Otherwise, if the environment variable DSINFO is defined, it specifies the name of the file to be used as the source of terminal configuration information. If neither *infofile* nor DSINFO is specified, the configuration information is read from the file /etc/dsinfo. This option is used to define a different set of keys to be used with DigiSCREEN, e.g. when the originally defined DigiSCREEN keys conflict with an application one wishes to use.

The terminal type is used to select which entry in the *infofile* (default /etc/dsinfo) is used to describe the terminal. If the desired terminal type does not match the setting of the TERM environment variable (again, for alternate key mappings), it can be specified as *termtype* with the -t option.

Using DigiSCREEN

When DigiSCREEN is run, it starts up one virtual screen. Some of the keys on the terminal keyboard will not be passed through to the virtual screen; instead, DigiSCREEN will intercept these keys and perform certain actions when they are pressed. The actions include select a specific screen, block all input and output, start a new screen, end DigiSCREEN (exit code 0), quit DigiSCREEN (exit code 1), switch to the previous screen, and list the DigiSCREEN keys and what they do. Which function each key performs is dependent upon the terminal and the terminal description in the dsinfo file.

When a new virtual screen is created, it is assigned to a select key. When this key is pressed, DigiSCREEN will switch the physical terminal to the video page associated with the particular virtual screen and direct all input and output to go between the physical terminal and the virtual screen. Each virtual screen must have a select key; once all of the select keys defined in the dsinfo file have virtual screens assigned to them, no more screens may be created. Individual screen sessions will end when the original shell process exits, and this will free the associated select key for use with another virtual screen. DigiSCREEN exits when there are no more active screens.

Block keys can be used to stop output (in a fashion similar to <Ctrl-S> when using "ixon" flow control). However, the true purpose of these keys is to allow for transparently setting up terminal sessions on two computers using a terminal that has two serial ports. See dsinfo (page 49) for more information.

Pressing a new screen key will create a new screen and assign it to one of the select keys, unless one of the necessary resources is exhausted. Each new screen requires a select key as defined in the dsinfo file, a DigiSCREEN pseudo terminal device, enough memory for the various structures used to keep track of the screen, and a process to run the shell. If any of these are not available, the new screen operation will fail and print a message indicating the reason for the failure.

Pressing an end key will send a SIGHUP signal to all the screen sessions, clean up, and exit with a status of 0. Pressing a quit key will perform the same actions, but will exit with a status of 1.

Pressing a previous key will switch the terminal to the screen that was last displayed.

Pressing a list key will cause a list of the keys recognized by DigiSCREEN and their actions to be displayed on the terminal. When DigiSCREEN starts a new screen, it will display the message "Press *KEY* for help" (where *KEY* is the name of the list key) if there is a list key defined.

Dynamic Screen Assignment

Normally, the terminal description entry in the `dsinfo` file will have the same number of screen selection keys as the terminal has physical screen pages. However, if more screen selection keys are defined than the number of physical screen pages defined, DigiSCREEN will dynamically assign physical screen pages to virtual screens. When a virtual screen that doesn't have an associated page of screen memory in the terminal is selected, DigiSCREEN assigns the least recently used physical screen to the virtual screen. When this occurs, some sort of indication is given that the physical screen is connected to a different virtual screen; for instance, the screen may be cleared. Using a terminal that has only one physical screen is the simplest case of this; the one screen is shared between all virtual screens.

Notes:

- You shouldn't switch screens when the screen is being written to; you may interrupt an escape sequence and leave the terminal in an unknown state.

- Even if your terminal saves the cursor position for individual screens, it may not save other states such as insert mode, inverse video, etc. If this is the case in your situation, make sure you are not in any such mode when you switch screens.

DSINFO DigiSCREEN Information File

Description

`dsinfo` is a database of terminal descriptions used by `dscreen` (Digi-SCREEN). The information in the descriptions include what keys are to be used by DigiSCREEN and what functions they perform, how many pages of screen memory the terminal has, and what code sequences are sent/received to use these features.

Entry Format

Entries in `dsinfo` consist of a number of comma separated fields. The first field is a list of alternate names for the terminal, separated by "|" characters.

The remaining fields are strings describing the capabilities of the terminal to DigiSCREEN. Within these strings, the following escape codes are recognized:

`\E,\e`	escape character
`\n,\l`	newline (a.k.a. linefeed) character
`\r`	carriage return
`\t`	tab character
`\b`	backspace character
`\f`	formfeed character
`\s`	space character
`\`*nnn*	character with octal value *nnn*
`^`*x*	<Ctrl-*x*> for any appropriate *x*

Any other character preceded by a backslash will yield the character itself. The strings are entered as *type=string*, where *type* is the type of string as listed below, and *string* is the string value.

String Types

The string types are as follows:

dsk*x*   A string type that starts with "dsk" describes a key. The type must be four letters long, and the fourth letter *x* indicates what action is taken when the key is received. The key types are:

Type	Action
dsks	Switch Screens
dskb	Block Input and Output
dske	End DigiSCREEN
dskq	Quit DigiSCREEN (non-zero exit status)
dskc	Create New Screen
dskp	Switch to Previous Screen
dskl	List Keys and Actions

Any other key type (a string type dsk*x* that doesn't end in s, b, e, q, p, or l) will cause no internal dscreen action, but will show up in the key listing and will be recognized and acted upon (see below). A type of dskn (n for No Operation) is guaranteed not to be used for any function in future versions; it is recommended that this be used when no internal dscreen action is desired. The value string for each key has three substrings, which are separated by "|" characters (use "\|" to include the "|" character in one of the substrings). The first substring is the sequence of characters that the terminal sends when the key is pressed. The second substring is a label for the key that is printed when a list of the keys is presented (for example, "Shift-F1"). The third substring is a sequence of characters that DigiSCREEN sends to the terminal when this key is pressed, before performing the action this key requests.

dsp   A string type of "dsp" describes a physical screen in the terminal. One dsp string should be present for each physical screen in the terminal. The value string for each physical screen has two substrings, which are separated by a "|" character (again, use "\|" to include the "|" character in one of the substrings). The first substring should be the sequence of characters to send to the terminal to display and output to the particular physical page on the terminal. The second substring is sent to the terminal any time the page is used for something new. This second substring is usually set to the clear screen sequence. It is sent under two conditions. The first condition is when a new virtual terminal session is being created. The second condition occurs when the user is running more virtual terminals than there are physical

screens; if the user selects a virtual terminal such that DigiSCREEN has to re-use one of the physical screens, it will send this sequence to the screen to indicate to the user that the screen contents don't match the output of the virtual terminal to which it is connected. Note that running with more virtual terminals than physical screens can be quite confusing and is not particularly recommended; it can be avoided by defining no more screen selection keys ("dsks=...") than physical screens ("dsp=...") in the dsinfo entry.

dst   A string with a type of "dst" adjusts DigiSCREEN's input timeout. The value of the string should be a decimal number. The timeout value is in tenths of a second, and has a maximum value of 255. The default timeout value is 1 (or .1 seconds). When DigiSCREEN recognizes a prefix of an input key sequence but doesn't have all the characters of the sequence, it waits for more characters. If the timeout occurs before more characters are received, the characters are sent on to the virtual screen and DigiSCREEN will not consider these characters as part of an input key sequence. It may be necessary to raise this value if one or more of the "keys" DigiSCREEN is to trigger on is actually a number of keystrokes (i.e. assigning Ctrl-Z 1, Ctrl-Z 2, Ctrl-Z 3, etc. for screen selection, Ctrl-Z N for new screen and so on).

Example 1

The following example entry is for a Wyse 60 with three screens:

```
wy60|wyse60|wyse model 60,
        dsks=^A`^M|Shift -F1|,
        dsks=^Aa^M|Shift -F2|,
        dsks=^Ab^M|Shift -F3|,
        dskc=\200|Ctrl -F1|,
        dske=\201|Ctrl -F2|\Ew0\E+,
        dskl=\202|Ctrl -F3|,
        dsp=\Ew0|\E+,
            dsp=\Ew1|\E+,
            dsp=\Ew2|\E+,
```

With this entry, <Shift-F1> through <Shift-F3> are used for selecting screens 1 through 3, respectively. <Ctrl-F1> will create a new screen, <Ctrl-F2> will send "<ESC> w 0 <ESC> +" to the screen (switching to window 0 and clearing the screen) and then end dscreen, and <Ctrl-F3> will list the keys and their functions. The three physical screens are displayed by sending "<ESC> w 0", "<ESC> w 1", and "<ESC> w 2." Each time a physical screen is used for a new screen, the sequence "<ESC> +" will be sent to the terminal, which will clear the screen.

Example 2

This example is, again, for a Wyse 60 with three screens, but one of the screens is on a second computer communicating through the second serial port on the terminal:

```
wy60-1|wyse60-1|wyse model 60  - first seri al port,
            dsks=^A`^M|Shift -F1|,
            dsks=^Aa^M|Shift -F2|,
            dskb=^Ab^M|Shift -F3|\Ed#^Ab\r^T\Ee9,
            dskc=\200|Ctrl -F1|,
            dske=\201|Ctrl -F2|\Ed#\201^T\Ew0\E+,
            dskl=\202|Ctrl -F3|,
            dsp=\Ew0|\E+,dsp=\Ew1|\E+,

wy60-2|wyse60-2|wyse model 60  - second se rial port,
            dskb=^A`^M|Shift -F1|\Ed#^A`\r^T\Ee8,
            dskb=^Aa^M|Shift -F2|\Ed#^Aa\r^T\Ee8,
            dsks=^Ab^M|Shift -F3|,
            dskc=\200|Ctrl -F1|,
            dske=\201|Ctrl -F2|\Ed#\201^T\Ew0\E+,
            dskl=\202|Ctrl -F3|,
            dsp=\Ew2|\E+,
```

For this setup to work, DigiSCREEN must be run on both computers, with terminal type `wy60-1` on the first computer and terminal type `wy60-2` on the second computer (using the `-t` option to DigiSCREEN). The `wy60-1` entry will be examined first.

The first two key entries are unchanged from the original wy60 entry. The third key, however, has type "`dskb`," which means block both input and output. When this key is pressed, the sequence "<ESC> d # <Ctrl-A> b <CR> <Ctrl-T> <ESC> e 9" is sent to the terminal; after this output is blocked and DigiSCREEN continues scanning input for key sequences but discards all other input.

The effects caused by the sequence sent to the terminal contain the real magic here. The sequence "**<ESC> d #**" puts the terminal in "Transparent Print Mode," which echoes all characters up to a **<Ctrl-T>** out the other serial port. The characters "**<Ctrl-A> b <CR>**" are sent out the other serial port, informing the `dscreen` process on the other computer that it should activate the window associated with the **<Shift-F3>** key. The "**<Ctrl-T>**" takes the terminal out of the Transparent Print mode, and the sequence "**<ESC> e 9**" tells the terminal to switch to the other ("AUX") serial port for data communications.

At this point the other computer takes over and sends an "**<ESC> w 2**" to switch to the third physical screen, and then resumes normal communication.

The wy60-2 entry follows the same general pattern for keys **<Shift-F1>** and **<Shift-F2>**: switch to transparent print mode; send function key string to other computer; switch transparent print off; and switch to the other serial port. The end key (**<Ctrl-F2>**) works the same for both computers; it sends the end key sequence to the other computer through the transparent print mechanism, switches the terminal to window 0, clears the screen, then exits.

Digi Port Authority

Introduction

The Digi Port Authority (DPA) program is a software tool which provides a means to monitor the status of the Front End Processor/Operating System (FEP/OS), which is the on-board software run by Digi intelligent serial communications products.

The DPA software also shows the status of the individual ports on a concentrator or PORTS module by displaying a simulated concentrator front panel. Each of the eight supported EIA-232 signals is displayed, along with input and output flow control status and the status of the host adapter to concentrator connection status.

The DPA program can be run from any terminal on the system, and supports the following Digi hardware and device drivers:

Hardware: Digi C/X, EPC/X and Xem systems
Software: UNIX System V Release 3.2 device driver version 5.3.0 and up

The DPA software is installed automatically when you install this device driver.

Note: Be sure to read the *Release Notes* that may be included with this software. The *Release Notes* contain information not available at this manual's press time.

Using the DPA Software

To run the Digi Port Authority software, enter the following command from any terminal, or the system console:

```
dpa [-l logfile]
```

The `-l` *logfile* option specifies the file path for screen dumps. If this option is not specified, the default log file path is `/tmp/dpalog`

The DPA Main Screen

After reading the initial information screen, press any key to see the DPA main screen, which will be similar to the following:

```
                    * Digi Port Authority *

      Type         State     I/O Addr    Mem Addr    Mem Size    #Ports
1    ISA - EPC/X   OK        108         d8000       32K           32
2    EISA - Xem    OK        4005        c8000       32K           16
3    EISA - C/X    OK        1005        d8000       32K          128


     Space Bar = (Accept)  Arrow Keys = (Change Selection)
                        'Q' = Quit
```

The fields in the above screen have the following meanings:

Type: The bus type (EISA, ISA, MC) and board type (C/X, Xem, Xr EPC/X) detected by the Digi device driver.

State: The current state of the board. Possible values are:

OK	Indicates the adapter is functioning normally.
NOT FOUND	The device driver could not identify this type of board.
NO IO	The device driver was unable to communicate with the board via the I/O port. Switch settings could be incorrect.
NO MEMORY	The device driver was unable to allocate the necessary memory for this board.
NO BIOS	Unable to download the BIOS image. Possible hardware failure.
NO FEP/OS	Unable to download the FEP/OS image. Possible hardware failure.
HD/W FAIL	An unrecoverable error with the FEP/OS has been detected. Possible hardware failure.
NO PORTS	(Xem system only) The BIOS on the Xem host adapter could not detect any ports. Possible hardware failure.

I/O Addr: The adapter's I/O port address (hexadecimal).

Mem Addr: The starting address of the adapter's dual ported memory (hexadecimal).

Mem Size: The size of the adapter's dual ported memory.

#Ports   The number of ports for which the device driver has been configured (this may be different than the actual number of ports physically attached).

To get more information about one of the displayed adapters, use the up and down arrow keys to move the highlighted bar to the desired board, then press the space bar.

NOTE: If the arrow keys do not map correctly, the DPA program will display the following message:

```
Invalid Key.   (Key Number)
```

If this occurs, substitute the standard UNIX cursor movement keys for the up and down arrows: Down = J or j; Up = K or k.

Viewing the Adapter Configuration

After you press the space bar, you will see the current configuration of the selected board.

Xem Adapters:

```
                    * DigiBoard Port Authority *


 Adapt XEI Line  ——[16em]—[8em]—[8emp]




       Space Bar = (Accept)  Arrow Keys = (Change) '-' Key = (Return)
                          'Q' Key = Quit
```

The above display shows the status of the selected Xem host adapter. Attached PORTS modules are identified by [16em] for PORTS/16em modules, [8em] for PORTS/8em modules and [8emp] for PORTS/8emp modules.

C/X and EPC/X Host Adapters:

```
                    * DigiBoard Port Authority *


 Adapt Line 1  ——[AC]——[AC]——[AC]——[AC]
 Line 1 Configuration:
  Adapt  to Node 1   Speed = 10M, 8 wire internal clock, Direct Connection
  Node 1 to Node 2   Speed = 10M, 8 wire internal clock, Direct Connection
  Node 2 to Node 3   Speed = 10M, 8 wire internal clock, Direct Connection
  Node 3 to Node 4   Speed = 10M, 8 wire internal clock, Direct Connection


 Adapt Line 2  ——[AC]——[AC]
                        [32]

 Line 2 Configuration:
  Adapt  to Node 1   Speed = 10M, 8 wire internal clock, Direct Connection
  Node 1 to Node 2   Speed = 10M, 8 wire internal clock, Direct Connection

       Space Bar = (Accept)  Arrow Keys = (Change) '-' Key = (Return)
                 'S' Key = Host Status   'Q' Key = Quit
```

The above display shows the status of the selected host adapter. Concentrators are represented by [AC] if active, or [DN] if inactive (turned off, defective, etc.). In this case, the board is an EPC/X host adapter, with four concentrators connected to line 1, and two concentrators on line 2. Note the number [32]

below the second concentrator on Line 2. This indicates that the second concentrator has a PORTS/16em module (or two PORTS/8em modules) attached, for a total of 32 ports on that concentrator.

The display also shows the speed and wiring method between the host adapter and the first concentrator (node), and between subsequent interconnected concentrators.

To see a C/X or EPC/X host adapter's configuration string, use the arrow keys (or **H**, **J**, **K** and **L** keys, if your arrow keys aren't correctly mapped) to highlight either Adapter Line box, and press the space bar. You will see the following display:

```
                    * DigiBoard Port Authority *


Config String........ = 00 4a10 4a10 4a10 4a10 4a00 4a10 4a10 4aff

Line 1 Configuration:
 Adapt  to Node 1   Speed = 10M, 8 wire internal clock, Direct Connection
 Node 1 to Node 2   Speed = 10M, 8 wire internal clock, Direct Connection
 Node 2 to Node 3   Speed = 10M, 8 wire internal clock, Direct Connection
 Node 3 to Node 4   Speed = 10M, 8 wire internal clock, Direct Connection

Line 2 Configuration:
 Adapt  to Node 1   Speed = 10M, 8 wire internal clock, Direct Connection
 Node 1 to Node 2   Speed = 10M, 8 wire internal clock, Direct Connection

                    Press Any Key To Continue
```

The configuration string shown is what the FEP/OS has stored in memory during system configuration. The FEP/OS uses this string to determine line speeds and connection types between the host adapter and concentrators, and between interconnected concentrators. This is useful for diagnosing configuration problems.

Monitoring Channel Activity

The Digi Port Authority program allows the user to view the current activity of any C/X, EPC/X, Xr or Xem port in the system. To view a channel's activity, use the arrow keys (or **H**, **J**, **K** and **L** keys, if your arrow keys aren't correctly mapped) to highlight the desired concentrator or PORTS module (represented by [AC], [16em], [8em] or [8emp]), and press the space bar. The software will display a graphic simulation of the concentrator's front panel, as shown below:

```
                    * DigiBoard Port Authority *

Adapter Config:
     Line 1 - 4                                    Sync Packets TxD: \
     Line 2 - 2                                    Sync Packets RxD: -

                   Line 2, Concentrator 1, Channel 1

     ┌──────────────────────────────────────────────────────┐
     │ TxD  RxD  RTS  CTS  DSR  DCD  DTR  RI  OFC  IFC   (AC) │
     │  -    X    ░    ░    ░    ▓    ░    -   -    -         │
     └──────────────────────────────────────────────────────┘

                  Signal Active = ░  Inactive = -

  Input Modes  :BRKINT:INPAR:IXON:IXOFF:
  Output Modes :OWE1:OWE2:OWE3
 Control Modes :115.2 Baud:No Stop Bits:No Parity:Fast Baud:

 Arrow Keys = (Change)   '-' Key = (Return)   'N' Key = (Line)   'T' Key = (LB Test)
                        'Q' Key = Quit
```

This screen is dynamically updated at half second intervals, and shows the current status of the channel selected.

Activity on the synchronous channel is indicated by "helicopters" after the terms "Sync Packets TxD:" and "Sync Packets RxD:", in the upper left-hand corner of the screen (helicopters are rotating lines, made by successively displaying the "/", "-", "\" and "|" characters).

The box in the center of the screen shows the state of the EIA-232 signals TxD, RxD, RTS, CTS, DSR, DCD, DTR and RI, plus input and output flow control states (IFC and OFC, respectively). An inactive signal is indicated by a dash (-) under its name. An active signal is indicated by a block under its name. If data is currently being transmitted or received, a blinking "X" will appear under the signal name (TxD or RxD, respectively). Finally, the status of the concentrator appears at the right-hand end of the box (AC, 16em, 8em or 8emp) if the connection to the host adapter is good, or DN if the communication to the host adapter is down).

The display for the parallel port of a PORTS/8emp module will appear as shown below:

```
                    * DigiBoard Port Authority *

Adapter Config:
     Number of EEI Modules = 1


                         EEI 1, Channel 9

        ┌─────────────────────────────────────────────────────────┐
        │                                                           │
        │  TxD  RxD      IP1       IP2  OP   IP3  OFC  IFC    8emp   │
        │   -    ▓        ▒         ▒    -    ▒    -    -            │
        └─────────────────────────────────────────────────────────┘
                    Signal Active = ▒   Inactive = -

    Input Modes :
   Output Modes :XCASE:ONLCR:ONLRET
  Control Modes :8 Char Bits:1 Stop Bits:No Parity:Fast Baud:

 Arrow Keys = (Change)  '-' Key = (Return)  'N' Key = (Line)  'T' Key = (LB Test)
                          'Q' Key = Quit
```

IP1, IP2 and IP3 reflect the state of Input Ports 1-3 (usually ERROR, SELECT and FAULT, respectively); OP reflects the state of Output Port 2 (usually SELECTIN); OFC or IFC reflect BUSY status (depending on whether the port is in output or input mode, respectively). An inactive signal is indicated by a dash (-) under its name. An active signal is indicated by a block under its name. If data is currently being transmitted or received, a blinking "x" will appear under the signal name (TxD or RxD, respectively).

Input, Output and Control Modes

Beneath the line status box are the input, output and control modes in effect for that channel. These are UNIX style flags, and have the following meanings:

Input Modes

`IGNBRK`	Ignore Break
`BRKINT`	Interrupt on Break
`IGNPAR`	Ignore parity errors
`PARMRK`	Mark parity errors
`INPCK`	Input parity check
`ISTRIP`	Strip input characters
`ITOSS*`	Toss IXANY characters
`IXON`	Enable start/stop output
`IXANY`	Restart output on any character
`IXOFF`	Enable start/stop input
`IXONA*`	Enable start/stop output Auxiliary

*Not a standard UNIX flag

Output Modes

`XCASE*`	Canonical upper/lower display
`OLCUC`	Map lower case to upper
`ONCLR`	Map NL to CR/NL
`OCRNL`	Map CR to NL
`ONOCR`	No CR output at column 0
`ONLRET`	NL performs CR function
`OFILL`	Use fill characters for delay
`OFDEL`	Fill character is DEL; otherwise NUL
`NLDLY`	NL delay is selected
`CR1`	Carriage Return delay type 1
`CR2`	Carriage Return delay type 2
`CR3`	Carriage Return delay type 3
`TAB1`	Tab delay type 1
`TAB2`	Tab delay type 2
`TAB3`	Tab delay type 3
`BS1`	Backspace delay
`VT1`	Vertical tab delay
`FF1`	Form feed delay

*Not a standard UNIX flag

Control Modes

`Baud Rate`	50, 75, 110, 134, 150, 200, 300, 600, 1200, 1800, 2400, 4800, 9600, 19200, 38400. If Fast Baud is set (see below), baud rates of 50, 75 and 110 are translated to 57600, 75600 and 115200, respectively. For parallel ports, the baud rate defines the pulse width of the data strobe.
`Char Bits`	5, 6, 7, 8 or None.
`Stop Bits`	2, 1 or None.
`Parity`	Enabled, Odd or None.
`Fast Baud`*	Use fast baud rates (see `ditty fastbaud` on page 36).

*Not a standard UNIX flag

From the channel monitoring screen, channels on any concentrator or PORTS module may be monitored without returning to the previous screen. The following single keystroke commands are available:

↑, K, k	Increment concentrator number. If the currently selected concentrator is the last one on the synchronous line, then the concentrator number wraps around to #1.
↓, J, j	Decrement concentrator number. If the currently selected concentrator is the first one on the synchronous line, then the concentrator number wraps around to the last one on the line.
→, L, l	Increment channel number. If the currently selected channel is the last one on the concentrator, then the channel number wraps around to #1. Note that an EPC/CON-16 concentrator with attached PORTS (EBI) modules is treated as a single concentrator with 32, 48 or 64 channels.
←, H, h	Decrement channel number. If the currently selected channel is #1, then the channel number wraps around to the last one on the concentrator. Note that an EPC/CON-16 concentrator with attached PORTS (EBI) modules is treated as a single concentrator with 32, 48 or 64 channels.
1-9, a-g	Select a specific channel. Press **1-9** for channels 1-9, respectively, and **a-g** for channels 10-16, respectively. Note that on PORTS/8emp modules, channel 9 is the parallel printer port.
N	Switch between host adapter line 1 and line 2.
T	Execute loop back test on the selected channel. The loop back test transmits 128 bytes and attempts to read them back via the same port. A loop back plug is required. See the following section for information on the loopback test.
Print Screen	Dumps the current screen contents to the log file. The default log filename is /tmp/dpalog. A different file may be specified by using the -l *logfile* command line option. If the Print key does not map correctly, use **^P** (Ctrl-P) instead.
- (Minus)	Return to the previous (Host Adapter Configuration) screen.
Q	Quit the Digi Port Authority program.

Loop Back Test

A loop back diagnostic test can be run against any selected channel by pressing the **T** (or **t**) key from the channel monitoring screen (see page 59). A loop back plug (Digi part number 60000401 for RJ-45, or 60000442 for DB-25) must be installed in the channel to be tested.

The loop back test consists of five phases:

Phase 1 Verify that the channel is not currently in use. All signals must be low.

If the port is busy, a message similar to the following will appear:

```
**** Port is Busy :DTR:CD:DSR:RTS
```

Probable cause of failure:
- Port is open by some process (e.g. getty).
- Incorrect loop back connector or cable.

Phase 2 128 bytes of test data (the letter **A** is used) are put into the transmit buffer.

If the write operation fails, a message similar to the following will appear:

```
**** Loop Back Test Failure #1
```

After the write operation is complete, the FEP/OS is notified that data is available for transmission. At this time, the 128 bytes of data is transmitted. If the transmission fails, the following message will appear:

```
**** Loop Back Test Failure #2
```

Probable cause of failure:
- Hardware failure.
- FEP/OS or driver failure.

Phase 3 At this point, the FEP/OS should have received 128 bytes of data. If not, the following message will appear:

```
**** Loop Back Test Failure #3
**** Data Not Transferred to RX.
```

Probable cause of failure:
- Hardware failure.
- Loop back connector not installed, or incorrectly wired.
- FEP/OS or driver failure.

Phase 4 128 bytes of data are read from the receive buffer. If the read operation fails, the following message will appear:

```
**** Loop Back Test Failure #4
```

Probable cause of failure:
- Hardware failure.
- FEP/OS or driver failure.

Phase 5 The data that was transmitted is compared with the data that has been read from the receive buffer. If the comparison fails, the following message will appear:

```
**** Loop Back Test Failure #5
```

Probable cause of failure:
- Hardware failure.
- FEP/OS or driver failure.

If all test phases pass, the following message will appear:

```
Loop Back Test Passed.
```

After test completion, the input and output data can be viewed. Press the **I** key to see the last 128 bytes of data that were put into the receive (input) buffer. Press the **O** key to see the last 128 bytes of data that were put into the transmit (output) buffer. The display shows the hexadecimal value of each character above the character itself. If the character is a non printing character, "|" is displayed in its place.

NOTE: For security reasons, the receive buffer contents will only be displayed if the loop back test passes.

Press the **Q** key to return to the channel monitoring screen.

Loop Back Plug Specification

The loopback plug for RJ-45 versions consists of a single 10-pin RJ-45 plug wired as follows:

Pin 3 connected to pins 1 and 8 (RTS to RI and CTS);
Pin 5 connected to pin 6 (TxD to RxD);
Pin 9 connected to pins 2 and 10 (DTR to DSR and DCD).

For DB-25 versions, the loopback plug consists of a female DB-25 connector wired as follows:

Pin 4 connected to pins 22 and 5 (RTS to RI and CTS);
Pin 2 connected to pin 3 (TxD to RxD);
Pin 20 connected to pins 6 and 8 (DTR to DSR and DCD).

Host Status (C/X and EPC/X Systems Only)

The DPA program provides several status and error counters to aid you in monitoring activity between the host adapter and concentrators, and diagnosing possible communication problems.

Each status counter is described on the following pages. Several of the counters increment steadily under normal conditions. An incrementing counter does not necessarily indicate a problem. For example, if a concentrator is turned off, several counters will increment. When the concentrator is turned back on, those counters will stop incrementing.

If any counters that are usually idle begin to increment steadily, perform the recommended tests described for that counter. Call Digi Technical Support if the counters continue to increment steadily after performing the recommended tests.

From the adapter configuration screen (see page 57), press "s". You will see the following:

```
                      HOST STATUS

Activity Counters:
RECEIVE1  RECEIVE2  RECEIVE3  RECEIVE4  RECEIVE5  TRANSMIT
  24382        0         0         0         0     300477

Sync Counters:
ERR_UFRAM  ERR_ABSTAT  ERR_INC  ERR_CRC  ERR_DATA  ERR_NACK
       0           0        0        0         0         0

Saturation Counters:
ERR_TBUF   ERR_FIFO  ERR_ORUN  ERR_TBUSY  ERR_RITEM
      0          0         0          0          0

FEP/OS Counters:
ERR_REC0  ERR_ADDR  ERR_MTYPE  ERR_MSIZE  ERR_RID  ERR_TID  ERR_PING
      0         0          0          0        0        0        0

Hardware Counters:
ERR_ABREC  ERR_URUN  ERR_CONC  ERR_CHECK
       0         0         0         0
```

The counters are reset during system initialization (boot-up).

Activity Counters

RECEIVE1
The number of times the host adapter processed a request from a concentrator, and one packet was received.

Under idle conditions, RECEIVE1 will increment, representing the "heartbeat" of the concentrators communicating with the host.

RECEIVE2 through RECEIVE4
The number of times the host adapter processed a request from a concentrator, and two, three or four packets were received.

RECEIVE5
The host adapter is 100% busy if RECEIVE5 is incrementing. Users may experience slower response time. Monitor **EC** (Error Count) on the concentrator front panel.

The Digi product in use is being maximized. Consider adding another host adapter, or advance to the EPC/X system if you are currently using the standard C/X product.

TRANSMIT
The number of data packets transmitted from the host.

Under idle conditions, the TRANSMIT counter will increment. This is the heartbeat of the host checking the status of communications to the concentrators.

Under normal operating conditions, the TRANSMIT counter will increment.

Sync Counters

ERR_UFRAM   The host adapter received an incomplete packet. Check the physical hardware configuration to ensure a stable environment. Check for other incrementing counters.

ERR_ABSTAT   The host adapter received a bad data packet, and discarded it. Check for concentrator "down" `[DN]` status (see the previous screen). Check the physical hardware configuration. If the ERR_ABSTAT counter is constantly incrementing, run the concentrator diagnostics (see the concentrator *Installation Guide*). Call Digi Technical Support.

ERR_INC   The host adapter received an incomplete data packet. Check the physical hardware configuration. If this counter is constantly incrementing, call Digi Technical Support.

ERR_CRC   The host adapter received a packet with a CRC error. Run the concentrator sync line diagnostic tests (see the concentrator *Installation Guide*). If this counter is constantly incrementing, call Digi Technical Support.

ERR_DATA   The host adapter received a packet with an error found in the data. This will cause other counters to increment. Check sync line connections. Run the concentrator sync line diagnostic tests (see the concentrator *Installation Guide*). If this counter is constantly incrementing, call Digi Technical Support.

ERR_NACK   The host adapter received a negative acknowledgement from the concentrator for one of its messages. Check sync line connections. Run C/X host adapter diagnostics. If this counter is constantly incrementing, call Digi Technical Support.

Saturation Counters

ERR_TBUF   The transmit buffers on the host adapter are full. The data is not getting out to the ports fast enough. Also monitor RECEIVE1 through RECEIVE5 and TRANSMIT counters.

ERR_FIFO   The host adapter is receiving more data than it can handle. Also monitor RECEIVE5.

ERR_ORUN   The host adapter is receiving too much data; the host is 100% busy.

The Digi product in use is being maximized. Consider adding another host adapter, or advance to the EPC/X system if you are currently using the standard C/X product.

ERR_TBUSY   The number of times the host adapter tried to transmit data when the transmitter was busy. Also monitor RECEIVE counters.

ERR_RITEM   The receive buffer on the host adapter is full; the host adapter is 100% busy. Also monitor the ERR_ORUN counter.

FEP Counters

ERR_REC0   The number of times the host adapter received a request from a concentrator, but no packets were received. If the environment is stable and no other counters are incrementing, call Digi Technical Support.

ERR_ADDR   The host adapter received a message that contains an invalid node number. This is *not* a physical node number error, but a software node number error. If this counter is constantly incrementing, call Digi Technical Support.

ERR_MTYPE   The host adapter received a message with a bad message type. If this counter is constantly incrementing, call Digi Technical Support.

ERR_MSIZE   The host adapter received a message with a bad length. If this counter is constantly incrementing, call Digi Technical Support.

ERR_RID   The host adapter received a message with an out-of-sequence message ID. This is *not* a physical node number error, but a software node number error. If this counter is constantly incrementing, call Digi Technical Support.

ERR_TID   The host adapter sync line transmit sequence number is out of sequence. If this counter is constantly incrementing, call Digi Technical Support.

ERR_PING   The host adapter received a sync line ping message when not in ping mode. If this counter is constantly incrementing, call Digi Technical Support.

Hardware Counters

ERR_ABREC   The host adapter aborted receiving a packet. Run C/X host adapter diagnostics. If a hardware problem is detected, try a different host adapter.

ERR_URUN   The host adapter transmitted an incomplete packet. Run C/X host adapter diagnostics. If a hardware problem is detected, try a different host adapter.

ERR_CONC   A message sent to the concentrators was sent back to the host adapter. A concentrator is down. Back up one screen in DPA to check for "DN" status on a concentrator. Check the power on the concentrator and reset the concentrator. If the counter is still incrementing, try a different concentrator.

ERR_CHECK   The host adapter received an incomplete status packet. Run concentrator diagnostics. If a hardware problem is detected, try a different concentrator.

Error Messages

The following error messages are generated by the driver:

```
WARNING Driver memory allocation failed for EPC/X Host Adapter at port
0x0108
```

What it means:

The operating system would not allocate memory to the driver.

Action to take:

Adjust kernel resources.

```
WARNING PC/Xem at port 0x0104 not resetting, check switch settings

%epca - board 1 not found

%epca - no host adapters found
```

What it means:

The board doesn't respond to reset, or, in EISA and Micro Channel machines, cannot be detected. Board may not be installed, or may be installed incorrectly.

Action to take:

Make sure the board is fully seated in the slot. Make sure the board settings and the driver settings match. Potential hardware problem.

```
WARNING No memory at 0xd8000 for PC/Xem at port 0x0104, check con    figuration
```

What it means:

The driver cannot read the board's dual ported memory.

Action to take:

Make sure the board is fully seated in the slot. Make sure the board settings and the driver settings match. Make sure there is no memory contention with other devices. Potential hardware problem.

```
WARNING C/X Host Adapter at port 0x0108 failed diagnostics
```

What it means:

The driver encountered an error executing on-board BIOS.

Action to take:

Make sure there is no memory contention with other devices. Potential software problem. Potential hardware problem.

```
WARNING FEPOS for EPC/X Host Adapter at port 0x0108 not function   ing
```

What it means:

The driver encountered an error executing on-board FEPOS. Seen after system goes into multi-user mode.

Action to take:

Make sure there is no memory contention with other devices. Potential software problem. Potential hardware problem.

```
WARNING PC/Xem at port 0x0104 failure
```

What it means:

The driver discovered the FEPOS has encountered non-recoverable errors. Seen after boot time, during normal operation of the system.

Action to take:

Make sure there is no memory contention with other devices. Potential software problem. Potential hardware problem.

Reboot the machine. If the host adapter has suffered a catastrophic error, it will probably fail diagnostics during reboot.

If the problem is transient, the board may function correctly for a period of time before this message recurs. Please make a note of the conditions that cause this error and report them to Digi Technical Support at (612) 943-9020 (in Europe, call 49-2203-81083).

```
xxevent (000000) cmd 00000000, port 00000002, b0 00000000,
b1 00000000

epcaassert (Digi) line=nnnn *various messages*
```

What it means:

The driver has encountered a situation that is not supposed to be possible.
Possible hardware problem. Possible software problem.

Action to take:

Write down the exact error message, and call Digi Technical Support at
(612) 943-9020 (in Europe, call 49-2203-81083).

Digi Support Services

The Digi Bulletin Board System

Digi provides an electronic bulletin board service (BBS) for our customers. This bulletin board provides general and technical information about Digi's products.

The Digi BBS allows users to download software drivers as soon as they become available. There is also a feature to allow users with problems or questions about Digi products to leave messages to Digi Technical Support.

Using the Digi BBS is easy. Simply dial **(612) 943-0550**. In Europe, dial **+49 221 9205211**; in Asia, dial **+65 735 2460**. The bulletin board accepts calls at 1200, 2400, 9600 and 14.4K baud. V.32, HST 14.4, V.42 and V.42*bis* standards are supported, with full MNP class 1-5 error correction and data compression.

The recommended modem communications parameters are 8 bits, no parity and one stop bit (**8 N 1**). Other settings may also work.

Download protocols include Zmodem, Xmodem, Ymodem, Kermit and others.

Internet FTP Server

Digi has set up an Anonymous FTP server for those with access to the Internet network. The address is `ftp.digibd.com`. Log in as `anonymous`, and enter your E-mail address when asked for a password. Drivers and installation tips are located in the `/drivers` directory. A text file, `download.doc`, gives information on uncompressing the files after downloading. Tip: Be sure to enter "`bin`" before downloading, to ensure binary transfer of files.

World Wide Web Server

Product information, manuals, new product announcements, programs, application stories and more can be obtained through the World Wide Web. Our address is `http://www.digibd.com`

DigiFACTs FaxBack Server

Manuals and technical information can also be obtained by FAX. To use the FaxBack server, simply call (612) 943-0573 on a touch tone phone.

Information About Your System

Serial number of your Digi product: _____

Make, model and clock speed of your computer: _____

_____

How much RAM does your computer have? _____

Hard disk controller: Type: _____ Memory addressed at: _____

I/O port used: _____ IRQ: _____

LAN card: Type: _____ Memory addressed at: _____

I/O port used: _____ IRQ: _____

Other: Type: _____ Memory addressed at: _____

I/O port used: _____ IRQ: _____

Operating system: _____ Version: _____

Digi device driver version: _____

Technical Support

At Digi, we are proud of our products, and support them. Our dealers and distributors are fully trained on our product line, so that they can help you on a technical level should assistance be needed.

Your first level of support is your Digi dealer, the place where you purchased your Digi product. Your dealer has the training to help you with any installation questions or difficulties you might have.

If you still experience difficulties (after contacting your first level of support), Digi has a staff of Technical Support Specialists that can assist you. They can be reached at **(612) 943-0578**. In Europe, call **+49 221 920520**, and in Asia, call **+65 732 1318**. FAX numbers are: (612) 943-0579 (USA), +49 221 9205210 (Europe) and +65 732 1312 (Asia).

When you call Digi Technical Support, please call from a position where you can operate your system. Also, please fill out the form on the facing page before calling, so your Technical Support representative can have a clear picture of your system and any potential conflicts between devices.

Digi Technical Support can also be reached via Internet E-mail. Please send correspondences to `support@digibd.com`, and include your voice and FAX phone numbers.

Customer Service

Digi also has a staff of Customer Service representatives to help you with software and documentation update requests, as well as Returned Merchandise Authorizations (RMAs) in case you need to return your Digi product for repair (see page *79*). They can be reached at **(612) 943-0577**.

Digi Customer Service can also be reached via Internet E-mail. Please send correspondences to `cust_serv@digibd.com`, and include your voice and FAX phone numbers.

Return Procedures

All Digi products have a five-year parts and labor warranty, and we are ultimately responsible for any defective parts, according to the limits specified in the warranty. However, many of the reported problems are due to factors other than defects in the product itself. To save you time and possibly additional cost, Digi asks that you *first* try to resolve any difficulties by contacting our Technical Support representatives at **(612) 943-0578.**

Important!   *Be sure to have the serial number of your Digi product at hand before calling Technical Support.*

Returns should be directed to the dealer or distributor from whom you purchased the product. If you need to return your Digi product for repair, it is first necessary to obtain an RMA (Returned Merchandise Authorization) number from Digi, by speaking to a Digi Customer Service representative. Authorized returns should be shipped to Digi International, 10000 West 76th Street, Eden Prairie, MN 55344. The RMA number should appear on the shipping carton, on or near the address label.

Note: *Products received without an RMA number clearly marked on the outside of the package will be returned, unopened, to the sender*