ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *Curtiss-Wright / Synergy Microsystems Power Hawk 920* at our website: ***Click HERE***

Power Hawk™ Series 900
Console Reference Manual



0830060-120
January 2006

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CAUTIONARY NOTICE

While the manufacturer has attempted to detail in this manual all areas of possible danger to personnel in conjunction with the use of this equipment, personnel should use caution when installing, checking out, operating and servicing this equipment, especially when power is on. As with all electronic equipment, care should be taken to avoid electrical shock in all circuits where substantial currents or voltages may be present either through design or short circuit. Caution should be observed in hoisting equipment, especially regarding large structures during installation.

The Manufacturer is specifically not liable for any damage or injury, arising out of a worker's failure to follow the instructions contained in this manual, or in his failure to exercise due care and caution in the installation, operation, checkout and service of this equipment.

PROPRIETARY DATA

This document, the design contained herein, the detail and invention are considered proprietary to Concurrent Computer Corporation. As the property of Concurrent Computer Corporation it shall be used only for reference, contract or proposal work by this corporation, or for field repair of Concurrent products by Concurrent Computer Corporation service personnel, customers, or end users.

Copyright 2006 by Concurrent Computer Corporation. All rights reserved. This publication or any part thereof is intended for use with Concurrent products by Concurrent Computer Corporation personnel, customers, and end–users. It may not be reproduced in any form without the written permission of the publisher.

The information contained in this document is believed to be correct at the time of publication. It is subject to change without notice. Concurrent Computer Corporation makes no warranties, expressed or implied, concerning the information contained in this document.

To report an error or comment on a specific portion of the manual, photocopy the page in question and mark the correction or comment on the copy. Mail the copy (and any additional comments) to Concurrent Computer Corporation, 2881 Gateway Drive, Pompano Beach, FL 33069. Mark the envelope **"Attention: Publications Department**." This publication may not be reproduced for any other reason in any form without written permission of the publisher.

Night Hawk, Power Hawk, PowerStack II and PowerMAX OS, are trademarks of Concurrent Computer Corporation
Synergy, VAFQ, VAFS. VYFD, VGM5 and VSS4 are trademarks of Synergy Microsystems, Inc.
UNIX is a registered trademark of the Open Group.

Printed in U. S. A.

Revision History:	Date:	Level:	Effective With:
Original Release	July 2003	000	New Product Release of Series 900
Previous Release	February 2004	100	PowerMAX 6.1
Previous Release	November 2004	110	PowerMAX 6.2
Current Release	January 2006	120	PowerMAX 6.3

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Preface

Scope of Manual

This manual describes the console for Concurrent Computer Corporation's Power Hawk Series 900 system. This manual provides information on how to use the console to debug the system. Series 900 systems use the following single board computers (SBC) manufactured by Synergy Microsystems, Inc.

Concurrent System Platform	Motherboard Type	Number of Processors	Form Factor
Power Hawk 910	VYFD -Single	1	VME 6U
Power Hawk 920	VYFD - Dual	2	VME 6U
Power Hawk 940	VAFQ - Quad	4	VME 6U

Structure of Manual

This manual consists of a title page, this preface, a master table of contents, three chapters, three local tables of contents for the chapters, two appendixes, and an index. A brief description of the chapters and appendixes follows:

- Chapter 1 explains where the console fits in a system and describes the hardware of the console.
- Chapter 2 describes what occurs during system initialization and the console interface.
- Chapter 3 contains an alphabetical listing of the console debugging commands. Each command listing contains the purpose of the command, its syntax, an explanation of the command parameters, and examples of the command syntax and usage.
- Appendix A is a quick reference guide that lists the console commands and their meanings, as well as an explanation of the command parameters.
- Appendix B lists the possible error codes that may appear executing console commands. There is also a short description of the error and a possible cure to the problem.

The index has an alphabetical list of all paragraph formats, character formats, cross reference formats, table formats, and variables.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Syntax Notation

The following notation is used throughout this guide:

italic	Books, reference cards, and items that the user must specify appear in italic type. Special terms may also appear in italic.
`bold`	User input appears in bold type and must be entered exactly as shown. Names of directories, files, and commands also appear in bold type.
`list`	Operating system and program output such as prompts and messages and listings of files and programs appears in list type.
`[]`	Brackets enclose command options and arguments that are optional. You do not type the brackets if you choose to specify such option or arguments.

Vendor Documentation

Synergy commercial off-the-shelf (COTS) documentation applicable to the various Synergy Single Board Computers (SBC), are listed below. You may contact your local Synergy sales office to purchase Synergy manuals not provided with the system. See the table below for a list of Synergy manual names and document numbers.

Manual Name	Synergy Document Number
Raptor DX VMEbus Dual G4, Dual PMC & StarFabric PowerPC SBC User Guide	02-0426/UG-VYFD-<REV>
MantaQX3/VAFQ VMEBus Quad G4 Single PMC and Star Fabric PowerPC SBC User Manual	815138 - Version <VER>
Synergy Microsystems STAR User Guide	03-0072/UG-STAR-<REV>
Synergy Microsystems ASTRix User's Guide	03-0076/UG-ASTX-<REV>

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Contents

Preface iii

Chapter 1 Introduction to the Console

Overview of Console 1-1

Chapter 2 Startup

System Initialization 2-1
STAR Initialization 2-1
ASTRix initialization 2-5
STAR/ASTRix Automatic initialization 2-5
Console Initialization 2-7
System Boot 2-9
Console Interface 2-11
System Entry to Console 2-11
Reset/SMI 2-12
LEDs 2-13
Lamp Test Feature 2-13
Front Panel LEDs 2-13

Chapter 3 Console Debugging Commands

Summary of Commands 3-1
Syntax Conventions 3-2
Command Format 3-5
Command Specifier 3-5
Data Size and Format 3-5
Global Options 3-6
Local Options 3-6
Numeric Values 3-6
Address Value 3-7
Command Manipulators 3-7
Command Editing 3-9
Console Commands 3-9

Appendix A Console Command Summary A-1

Appendix B Error Codes B-1

Index Index-1

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

List of Illustrations

Figure 2-1. Reset and SMI Toggle Switch on VYFD 2-12
Figure 2-2. Reset Pushbutton on VAFQ 2-12
Figure 2-3. Front Panel LEDs for VYFD 2-14
Figure 2-4. Front Panel LEDs for VAFQ 2-14

List of Tables

Table 2-1. Description of Reset and SMI 2-13
Table 2-2. Description of Front Panel LEDs. 2-15
Table 3-1. Console Debugging Commands - Summary 3-3
Table 3-2. Console Special Key Functions 3-9
Table 3-3. Effect of pboot on Boot Process 3-24
Table 3-4. General–Purpose Registers 3-32
Table 3-5. Processor Registers Accessed via p Command 3-41
Table 3-6. y Command Flag Bits 3-63
Table A-1. Command Parameter Definitions A-9

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1
Introduction to the Console

Overview of Console 1-1

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1
Introduction to the Console

Overview of Console

The console for the Power Hawk 900 Series system allows the operator to initialize the system and perform certain diagnostic procedures. An overview of this product is provided in the following paragraphs.

The Power Hawk Series 900 platform uses two monitor ROM programs called **STAR** (**S**elf **T**est **A**nd **R**un) and **ASTRix** (**A**dvanced **S**elf **T**est **R**eboot **I**nitialize e**X**ecute) that provide basic board initialization, configuration and diagnostic capability. The **STAR** utility will execute whenever the system is powered up or reset. **STAR** and **ASTRix** are used to configure the basic system as well as loading the initial boot image from distribution media. The individual commands used in **STAR** and **ASTRix** are documented in the Synergy Microsystem STAR User Guide, and the Synergy Microsystem ASTRix User Guide respectively. The user should be familiar with STAR and ASTRix commands found in these manuals.

The Power Hawk 900 Series system normally begins execution in the **`STAR`** program that is located in flash memory. **STAR**/**ASTRix** can be configured to automatically boot the Power Hawk 900 Series system console off of the appropriate boot media. The console is provided in a 'loadable' format at the front of bootable media. The**STAR**/**ASTRix** internal ROM bootstrap code reads the console into RAM, where it then relocates itself to higher memory locations and begins execution.

The exact mode of operation depends upon the operator action and NVRAM settings during the start-up. If the operator interrupts the boot sequence or has set up NVRAM setting to prevent the boot sequence from auto starting, a console prompt will be output and console commands may be used for debugging or system start-up as described later in this manual. If the boot is not interrupted, the system bootstrap is fully automatic and the PowerMAX OS kernel will be brought up to the multi-user system level specified in the file **`/etc/inittab`** .

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2
Startup

System Initialization 2-1
STAR Initialization. 2-1
ASTRix initialization 2-5
STAR/ASTRix Automatic initialization. 2-5
Console Initialization. 2-7
System Boot 2-9
Console Interface 2-11
System Entry to Console 2-11
Reset/SMI. 2-12
LEDs. 2-13
Lamp Test Feature. 2-13
Front Panel LEDs 2-13

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2
Startup

System Initialization

System initialization can be separated into four distinct areas: STAR Initialization, ASTRix Initialization, Console Initialization and System Boot. These occur as described in the following paragraphs. The screen examples shown below are typical. They may vary due to particular system settings and/or firmware versions.

STAR Initialization

STAR (Self Test And Run) is the monitor ROM that provides basic board initialization, diagnostic and a boot capability. STAR capabilities and commands are documented in the *Synergy Microsystems S.T.A.R. User Guide*

A Power Hawk 900 board as shipped from the factory is likely on powerup to stop at the **STAR** prompt. **STAR** is a ROM-based program from which standalone board diagnostics can be executed. An example of a **STAR** boot sequence from a VYFD board power on is shown below.

```
--- Curtiss-Wright Controls, Embedded Computing S.T.A.R. Diagnostics ---
                  --- Rev: 1.01.42  Oct 19 2004 11:12:30 ---

Reset Cause: VME Reset      User Switch: 0x00

X: CPU 0 running - Temp: -1 - L3 initialized
Y: CPU 1 running - Temp: -1 - L3 initialized

Board: VYFD-C  ECO:      6   Special Mod.    :      0   Serial# : 1501782
Number of CPUs    :      2   Bus Speed (MHz) :   133   BootLoc : Boot Flash
CPU Type          :   7457   Rev             :  0102   Speed   : 1000 MHz
BackSide Cache Sz :    2MB   Cache Ratio     :   6:1
Memory Bank Size  :  256MB   Number of Banks :     2   H-Bridge: Discovery-B
Memory Size       :  512MB   Type            : SDRAM, CL=3, Flow-Thru
Shared Console    :    Yes   I2C found (hex) : 4D
PCI0 Config       :  768MB   Start Address   : 0x80000000
PCI1 Config       :  768MB   Start Address   : 0xC0000000

Bus IdSel ConfigAdr VendID DevID Rev Class Sub Int  Vendor       Part
_____________________________________ PCI0 ____________________________________
 0  20    80005000  1000   0021  01   01    00  10   LSI          Ultra160
_____________________________________ PCI1 ____________________________________
 1  11    80010800  10E3   0000  02   06    80  12   Tundra       Universe2
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

An example of VAFQ board power on is shown below.

```
--- Curtiss-Wright Controls, Embedded Computing S.T.A.R. Diagnostics ---
                  --- Rev: 1.01.50  Oct 31 2005 14:37:10 ---

 Reset Cause: VME Reset      User Switch: 0x00      Reset Count: 0

 X: CPU 0 running - Temp: -1 - L3 initialized
 Y: CPU 1 running - Temp: -1 - L3 initialized
 Z: CPU 2 running - Temp: -1 - L3 initialized
 W: CPU 3 running - Temp: -1 - L3 initialized

 Board: VAFQ-A  ECO:      3   Special Mod.    :     0   Serial# : 3044576
 Number of CPUs    :      4   Bus Speed (MHz) :   100.  BootLoc : Boot Flash
 CPU Type          :   7457   Rev             :  0102   Speed    : 1000 MHz
 BackSide Cache Sz :    2MB   Cache Ratio     :   6:1   NAND     : none
 Memory Bank Size  :  512MB   Number of Banks :     2   H-Bridge: Discovery III
 Memory Size       : 1024MB   Type            : SDRAM, CL=2.0, Flow-Thru
 Shared Console    :    Yes   I2C found (hex) : 4C
 PCI0 Config       :  768MB   Start Address   : 0x80000000
 PCI1 Config       :    1GB   Start Address   : 0xB0000000

 Bus IdSel ConfigAdr VendID DevID Rev Class Sub Int  Vendor       Part
 ____________________________________ PCI0 ____________________________________
  0  12    80001000  9902   0002  02   06    80  10   StarGen      Path Route
  0  14    80002000  1000   0021  01   01    00   8   LSI          Ultra160
  0  14.1  80002100  1000   0021  01   01    00   9   LSI          Ultra160
 ____________________________________ PCI1 ____________________________________
  1  13    80011800  10E3   0000  02   06    80  16   Tundra       Universe2
  1  18    80014000  104C   8023  00   0C    00  23   TI           TSB43AB22
```

The user can change various parameters that effect the way **STAR** boots using the **config** command**.** An example of the **config** command is shown below. STAR initialization commands can be automated using a *post* script file which is discussed later in this chapter.

An example of the **config** command on VYFD is shown below:

```
STAR0> config
Enter a new value or a return to skip, '-' to back up, or '.' to exit:

 **** BOOT Configs (reset when defaults set) ****
 Port 0 baudrate:                          9600 =
 Port 1,2,3 baudrate:                      9600 =
 Share console port:                       Y =
 PCI Enum powerup delay (milliseconds):    1007 =
 Enable quiet boot mode:                   N =
 Enable ASTRix autoboot:                   N =
 Enable "post" script:                     Y =
 Skip PCI Enumeration:                     N =
 Skip PMC Configuration:                   N =
 L1 Miss Queue Depth (1,3,6):              3 =
 L3 Size L3 (1, 2 MB):                     2 =
 Enable Built-in self tests:
    1= at powerup only
    2= at all hard resets
    3= at all resets                       0 =

 **** USER Configs (unchanged when defaults are set) ****
 Board serial number:                      0x1501782 =
 Target IP address:                        129.134.32.67 =
 Host IP address:                          129.134.30.26 =
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

```
 Print Boot Banner:                        Y =
 Init mem ECC:                             N =
 Legacy Mode Input:                        N =
 Enable ChangeLog Message:                 Y =
 Clear SysFail:
    0= Before "post" script
    1= After "post" script                 0 =
 Copy NVRAM from Flash on power-up:
    0= None
    1= BOOT parameters (last 12KB)
    2= BOOT and FILE area (last 32KB)
    3= ALL NVRAM (128KB)                   0 =
 PCI 0 Start Addr (ex. 0x80000000):        0x80000000 =
 PCI 0 Size (ex. 0x30000000 (768GB)):      0x30000000 =
 PCI 1 Start Addr (ex. 0xB0000000):        0xC0000000 =
 PCI 1 Size (ex. 0x10000000    (256MB)): 0x30000000 =
 Hit Enter to finish (or exec, pci, flash, nopci, spec):  =

STAR0>
```

An example of the **config** command on VAFQ is shown below:

```
STAR0> config
Enter a new value or a return to skip, '-' to back up, or '.' to exit:

 **** BOOT Configs (reset when defaults set) ****
 Port 0 baudrate:                          9600 =
 Port 1,2,3 baudrate:                      9600 =
 Share console port:                       Y =
 PCI Enum powerup delay (milliseconds):    1007 =
 Enable quiet boot mode:                   N =
 Enable ASTRix autoboot:                   N =
 Enable "post" script:                     Y =
 Skip PCI Enumeration:                     N =
 Skip PMC Configuration:                   N =
 L3 Size L3 (1, 2 MB):                     2 =
 Enable Built-in self tests:
    1= at powerup only
    2= at all hard resets
    3= at all resets                       0 =

 **** USER Configs (unchanged when defaults are set) ****
 Board serial number:                      0x1502944 =
 Target IP address:                        129.134.32.68 =
 Host IP address:                          129.134.30.26 =
 Print Boot Banner:                        Y =
 Init mem ECC:                             N =
 Legacy Mode Input:                        N =
 Enable ChangeLog Message:                 Y =
 Clear SysFail:
    0= Before "post" script
    1= After "post" script                 0 =
 Copy NVRAM from Flash on power-up:
    0= None
    1= BOOT parameters (last 12KB)
    2= BOOT and FILE area (last 32KB)
    3= ALL NVRAM (128KB)                   0 =
 PCI 0 Start Addr (ex. 0x80000000):        0x80000000 =
 PCI 0 Size (ex. 0x30000000 (768GB)):      0x30000000 =
 PCI 1 Start Addr (ex. 0xB0000000):        0xB0000000 =
 PCI 1 Size (ex. 0x10000000    (256MB)): 0x40000000 =
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

```
 Hit Enter to finish (or exec, pci, flash, nopci, spec):  =

STAR0>
```

The items shown by the **config** command are documented in the *Synergy Microsystems S.T.A.R. User Guide*.

The STAR **config** command's PCI Memory Space parameters directly control the range and size of PCI Memory Space used by the PowerMAX OS kernel. It is highly recommended that you set these **config** command parameters to the following default values before attempting to boot a PowerMAX OS kernel:

PCI 0 Start Addr (ex. 0x80000000): 0x80000000 =
PCI 0 Size (ex. 0x40000000 (1GB)): 0x30000000 =
PCI 1 Start Addr (ex. 0x80000000): 0xB0000000 =
PCI 1 Size (ex. 0x10000000 (256MB)): 0x40000000 =

The PCI Bus 0 Memory Space, from 0x80000000 to 0xAFFFFFFF, is used by PMC devices, and the PCI Bus 1 Memory Space, from 0xC0000000 to EFFFFFFF, is used for VMEBus A32 address space.

Note that unlike previous Power Hawk platforms that used kernel tunables to control the layout of VME A32 address space, Power Hawk Series 900 platforms directly and dynamically use these STAR **config** parameter PCI Bus 1 settings for determining the layout of VME A32 address space.

After the PowerMAX OS kernel boots successfully, you may want to modify these default settings if you happen to have a need for more (or less) VME A32 address space or PMC device PCI Memory Space.

When modifying these PCI parameter values, the following restrictions should be followed:

- The PCI 0 and PCI 1 Memory Space ranges may not overlap.
- The PCI 0 Start Addr parameter MUST remain set to a value of 0x80000000.
- The ending address of the PCI 1 Memory Space range MUST be 0xEFFFFFFF.

NOTE

If the PowerMAX OS kernel detects that the PCI 0 start address is not 0x80000000, or that the ending address for PCI 1 Memory Space is not 0xEFFFFFFF, the kernel will halt and return back to the console processor.

For example, to change the A32 address range to 0xA0000000 – 0xEFFFFFFF and the PCI Bus 0 Memory Space range to 0x80000000 – 0x9FFFFFFF, set the STAR **config** parameters to the following values:

PCI 0 Start Addr: 0x80000000
PCI 0 Size: 0x20000000
PCI 1 Start Addr: 0xA0000000
PCI 1 Size: 0x50000000

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

ASTRix initialization

ASTRix is a flash based diskless operating system based on Linux. It is designed to boot quickly and provide users with tools to create NVRAM *post* scripts, boot the PowerMAX console software from disk, and set up automatic STAR/ASTRix/PowerMAX Console initialization.

To start ASTRix from STAR enter:

STAR0>**astrix**

The prompt issued by ASTRix is an asterisk, e.g. “*”.

When the ASTRix prompt (*) appears the set of ASTRix commands documented in the *Synergy Microsystems ASTRix User Guide* may be used. STAR and ASTRIX are used to set up the initialization and configuration of the Power Hawk Model 920/940. Users familiar with general unix commands will find ASTRix relatively easy to use.

To return to STAR from the ASTRix prompt, simply enter the command:

* **star**

STAR0>

STAR/ASTRix Automatic initialization

Using STAR and ASTRix the user can set up automatic initialization to load the PowerMAX Console software from the flash file system. The use of the STAR *config* command, and other ASTRix commands enables this function. Follow the procedure below to load the PowerMAX Console software from the boot disk and place it into Flash Filesystem 3. At that point the PowerMAX Console can be booted from the flash file system.

1. From the STAR prompt.

```
STAR0> config
Enter a new value or a return to skip, '-' to back up, or '.' to exit:

 **** BOOT Configs (reset when defaults set) ****
 Port A baudrate:                          9600 =
 Port B baudrate:                          9600 =
                                                          (115200 on VAFQ)
 Share console port:                       Y =
 PCI Enum powerup delay (milliseconds):    1007 =
 Enable quiet boot mode:                   N =
 Enable ASTRix autoboot:                   N =
 Enable "post" script:                     Y =
 Skip PCI Enumeration:                     N =
 Skip PMC Configuration:                   N =
 L1 Miss Queue Depth (1,3,6):              3 =
 L3 Size L3 (1, 2 MB):                     2 =
 Enable Built-in self tests:
    1= at powerup only
    2= at all hard resets
    3= at all resets                       0 =

 **** USER Configs (unchanged when defaults are set) ****
 Board serial number:                      0x1301892 =
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

```
Target IP address:                      129.134.32.80 =
Host IP address:                        129.134.32.81 =
Print Boot Banner:                      Y =
Init mem EDC:                           N =
Clear SysFail:
   0= Before "post" script
   1= After "post" script               0 =
Copy NVRAM from Flash on power-up:
   0= None
   1= BOOT parameters (last 12KB)
   2= BOOT and FILE area (last 32KB)
    3= ALL NVRAM (128KB)                 0 =

Legacy Mode Input:                      N =
Enable ChangeLog Message:               Y =
PCI 0 Start Addr (ex. 0x80000000):      0x80000000 =
PCI 0 Size (ex. 0x40000000 (1GB)):      0x30000000 =
PCI 1 Start Addr (ex. 0x80000000):      0xC0000000 =
PCI 1 Size (ex. 0x10000000 (256MB)):    0x30000000 =
Hit Enter to finish:                      =
```

NOTE

If the “Target IP address” field contains 0.0.0.0 the board will use DHCP to obtain the IP address. If DHCP is not configured, an IP address must be entered for automatic initialization to complete.

```
STAR0> astrix
```

2. On Power Hawk 940 systems, it may be necessary to add the Boot Flash Write Enable Jumper (JP01 Pins 9-10) in order to allow writing to the boot flash. This must be done before proceeding; otherwise, you may not be able to successfully complete the following steps.

3. In vi, insert the following lines in the file */nvram/update.flash*:
   * **vi /nvram/update.flash**
   scsi-drivers
   dd if=/dev/sda1 of=/cp1
   ffsw /cp1 3
   boot 5 -n ffs3:cp1 -s -c
   :wq
   *** chmod 755 /nvram/update.flash**
   *** /nvram/update.flash**

WARNING

The use of /dev/sda1 in the *dd* command above implies the first partition on the first drive. If the system disk is not the first disk, then the use /dev/sd<*c*>1, where *c* is the character for the “nth” disk to use. The number 1 denotes the partition on the disk where the use of /dev/sda (without the partion number) specifies the entire disk. Failure to follow this convention will have indeterminate results.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4. To enable ECC. (Skip this step if ECC is not to be enabled.)

   In vi, insert the following lines in the file */nvram/post*:

```
* vi /nvram/post
        if (cpuid == 0) {
          printf("\nInitializing and Enabling SDRAM ECC\n") ;
          serialok=0 ;
          imedc 0 0 1 ;
          serialok=1 ;
          sleep 1 ;
          boot 5 ;
        }
:wq
```

   Go to Step 4.

5. Perform this step only if ECC is **NOT** to be enabled.

   In vi, insert the following lines in the file */nvram/post*:

```
* vi /nvram/post
        if (cpuid == 0) {
          sleep 2 ;
          boot 5 ;
        }
:wq
```

NOTE

The sleep command is to give the user time to abort the startup of the console processor from STAR.

6. Start the PowerMAX Console, enter

   * **star**

   to return to STAR, and immediately boot the console processor.
   Use <ctrl>c to abort boot and stay in STAR.

Console Initialization

NOTE

The following assumes the PowerMAX OS has been previously installed. If the OS has not been installed on your system, please refer to the appropriate version of the *Power Hawk Series 900 PowerMAX OS Release Notes* (Pubs No. 0891089-6.n) for installation instructions.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The PowerMAX OS Console startup sequence for a VYFD board appears below:

```
   --- Curtiss-Wright Controls, Embedded Computing S.T.A.R. Diagnostics ---
                --- Rev: 1.01.42  Oct 19 2004 11:12:30 ---

 Reset Cause: VME Reset      User Switch: 0x00

 X: CPU 0 running - Temp: -1 - L3 initialized
 Y: CPU 1 running - Temp: -1 - L3 initialized

 Board: VYFD-C  ECO:      6   Special Mod.    :     0   Serial# : 1501782
 Number of CPUs    :      2   Bus Speed (MHz) :   133   BootLoc : Boot Flash
 CPU Type          :   7457   Rev             :  0102   Speed   : 1000 MHz
 BackSide Cache Sz :    2MB   Cache Ratio     :   6:1
 Memory Bank Size  :  256MB   Number of Banks :     2   H-Bridge: Discovery-B
 Memory Size       :  512MB   Type            : SDRAM, CL=3, Flow-Thru
 Shared Console    :    Yes   I2C found (hex) : 4D
 PCI0 Config       :  768MB   Start Address   : 0x80000000
 PCI1 Config       :  768MB   Start Address   : 0xC0000000

 Bus IdSel ConfigAdr VendID DevID Rev Class Sub Int  Vendor       Part
 ____________________________________ PCI0 ____________________________________
  0  20    80005000  1000   0021  01   01   00  10   LSI          Ultra160
 ____________________________________ PCI1 ____________________________________
  1  11    80010800  10E3   0000  02   06   80  12   Tundra       Universe2


STAR0> boot 8
Y: CPU 1 standing by.


PowerMAX_OS Synergy Console (6.3-20051122), located at 01faf000 to 02000000.
- Board vyfd-c eco 6 pl 0, 512MB, 2 1000MHz PPC-7457s each with 512KB L2 Cache
  and 2MB L3 Cache, 133MHz bus, sitting in vme slot 1 (autodetected).
- CPU 0 stats: chip major rev 1, minor rev 2, chipmaker IBM.
- Boot parms: fd -sw dsk(0,3,0,0,0), y0, p -sw boot 80, p aboot 0.
CPUs 0 1 up.

Type '?' for help.
#0>
```

The PowerMAX OS boot sequence on VAFQ board is as follows:-

```
 --- Curtiss-Wright Controls, Embedded Computing S.T.A.R. Diagnostics ---
                --- Rev: 1.01.50  Oct 31 2005 14:37:10 ---

 Reset Cause: VME Reset      User Switch: 0x00      Reset Count: 0

 X: CPU 0 running - Temp: -1 - L3 initialized
 Y: CPU 1 running - Temp: -1 - L3 initialized
 Z: CPU 2 running - Temp: -1 - L3 initialized
 W: CPU 3 running - Temp: -1 - L3 initialized

 Board: VAFQ-A  ECO:      3   Special Mod.    :     0   Serial# : 3044576
 Number of CPUs    :      4   Bus Speed (MHz) :   100.  BootLoc : Boot Flash
 CPU Type          :   7457   Rev             :  0102   Speed   : 1000 MHz
 BackSide Cache Sz :    2MB   Cache Ratio     :   6:1   NAND    : none
 Memory Bank Size  :  512MB   Number of Banks :     2   H-Bridge: Discovery III
 Memory Size       : 1024MB   Type            : SDRAM, CL=2.0, Flow-Thru
 Shared Console    :    Yes   I2C found (hex) : 4C
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

```
PCI0 Config       :  768MB   Start Address   : 0x80000000
PCI1 Config       :    1GB   Start Address   : 0xB0000000

Bus IdSel ConfigAdr VendID DevID Rev Class Sub Int  Vendor       Part
_____________________________________ PCI0 ____________________________________
 0  12    80001000  9902   0002  02   06   80  10   StarGen      Path Route
 0  14    80002000  1000   0021  01   01   00   8   LSI          Ultra160
 0  14.1  80002100  1000   0021  01   01   00   9   LSI          Ultra160
_____________________________________ PCI1 ____________________________________
 1  13    80011800  10E3   0000  02   06   80  16   Tundra       Universe2
 1  18    80014000  104C   8023  00   0C   00  23   TI           TSB43AB22
```

```
STAR0> boot 8
Y: CPU 1 standing by.
Z: CPU 2 standing by.
W: CPU 3 standing by.
```

```
PowerMAX_OS Synergy Console (6.3-20051113), located at 01faf000 to 02000000.
- Board vafq-a eco 3 pl 0, 1024MB, 4 1000MHz PPC-7457s each with 512KB L2 Cache
  and 2MB L3 Cache, 100MHz bus, sitting in vme slot 2 (autodetected).
- CPU 0 stats: chip major rev 1, minor rev 2, chipmaker IBM.
- Boot parms: fd -sw dsk(0,3,0,0,0), y0, p -sw boot 80, p aboot 0.
CPUs 0 1 2 3 up.

Type '?' for help.
```

At this point the console waits at most five seconds before continuing. If an exclamation point (**!**) is entered the console automatically starts the boot sequence without waiting the full five seconds. If, however, the operator enters the pound sign (**#**) during those five seconds, the system boot procedure is cancelled and the console prompt '#>' is displayed. When the #> prompt is displayed, any command described in Chapter 3 of this manual may be entered. Of particular importance is the **fb** command which causes the boot program to execute and load system programs, and the **pboot** register command, which specifies the boot options.

The **paboot** register may also be changed to lengthen or shorten the time, on future autoboots, the console will wait before autobooting a PowerMAX OS. If **paboot** is set to zero, autobooting is disabled and the console prompt '#>' is displayed immediately upon console startup.

System Boot

If the console system boot procedure was not cancelled, then the system boot mode is entered.

The boot sequence on a VYFD board is:

```
PowerMAX_OS Synergy Console (6.3-20051122), located at 01faf000 to 02000000.
- Board vyfd-c eco 6 pl 0, 512MB, 2 1000MHz PPC-7457s each with 512KB L2 Cache
  and 2MB L3 Cache, 133MHz bus, sitting in vme slot 1 (autodetected).
- CPU 0 stats: chip major rev 1, minor rev 2, chipmaker IBM.
- Boot parms: fd -sw dsk(0,3,0,0,0), y0, p -sw boot 80, p aboot 0.
CPUs 0 1 up.
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The boot sequence on a VAFQ board is:

```
PowerMAX_OS Synergy Console (6.3-20051113), located at 01faf000 to 02000000.
- Board vafq-a eco 3 pl 0, 1024MB, 4 1000MHz PPC-7457s each with 512KB L2 Cache
  and 2MB L3 Cache, 100MHz bus, sitting in vme slot 2 (autodetected).
- CPU 0 stats: chip major rev 1, minor rev 2, chipmaker IBM.
- Boot parms: fd -sw dsk(0,3,0,0,0), y0, p -sw boot 80, p aboot 0.
CPUs 0 1 2 3 up.

Type '#' to cancel boot, '!' to boot immediately (5 seconds).....
ncr0)0...2.3.......................
Set Run Mode
CPUs 0 1 2 3 up.
dsk(0,3,0,0,0)/.
dsk(0,3,0,0,0)/stand/boot
pboot 00000080
PowerMAX OS Boot Loader
Boot
: /stand/unix
3048712+415479+913045 start 0x6000
symbol table loaded

Concurrent PowerMAX_OS Release 6.3

Global Memory: 1073410048 bytes

Initialize I/O level  0 interface: SYS.PCI0
Initialize I/O level  1 interface: SYS.PCI1.VME0
dmac:   Tundra Universe DMA Controller (Revision 2)
vp driver initialized
ncr0:   on SYS.PCI0
ncr1:   on SYS.PCI0
mve0:   100BaseT FDX
mve0:   on MV64460
mve1:   1000BaseT FDX
mve1:   on MV64460

SDRAM ECC support is enabled.

The system is coming up.  Please wait.


   SCSI device @ID 0 on ncr adapter 0: disk
   SCSI device @ID 2 on ncr adapter 0: disk
   SCSI device @ID 3 on ncr adapter 0: disk
Checking root filesystem
Node: curtis
Checking /var filesystem

Checking file systems:


File system check complete.


UX:hrtconfig: INFO:  /dev/rrtc/0c0 configured as HRT callout queue RTC
The system is ready.

The system's name is curtis.
Welcome to Synergy PowerMAX_OS Release 6.3
Console Login:
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The 'Boot params:' line in the above example gives real console commands that were executed for you when the console started up. They came from the area of RAM reserved for the console. See Chapter 3, Console Debugging Commands, for detailed description of these and all the other console commands.

Console Interface

Unlike **STAR/ASTRix**, the PowerMAX console understands several PowerMAX OS file-system types, and hence is able to reach into and load into memory whatever files the console user desires to be loaded (see the **fl**, **fr** and **fb** commands). However, the console understands only one file format - that of a raw, executable image. That is, it is able to load a file bit-for-bit into a default or designated memory location, and if to be executed, will jump to the load location of the file, in effect assuming that is the first instruction which is to be executed. If the desired file to be executed is not in this format, then a helper program that is in this format must first be loaded. One such program is provided with a PowerMAX OS installation: **/stand/boot**. This bootstrap understands the **ELF(3E)** file format created by the PowerMAX OS **cc(1)** command. Since the PowerMAX OS kernel is in ELF format, **/stand/boot** must be used when loading and executing a PowerMAX OS kernel.

/stand/boot is loaded and executed automatically by the **fb** command. The **fB** command is identical to **fb** except that it allows the operator to specify a different **/stand/boot** file (assuming one exists). The **fl** command allows the operator to load a **/stand/boot**-like file but not automatically execute it. The **fc** command gives the operator **ls(1)**-like listings of directory contents on the root filesystem.

/stand/boot will automatically boot and execute **/stand/unix**, the actual PowerMAX OS kernel, unless it has been told to ask for an alternate filename to boot, via a **pboot** flags setting.

The console makes breakpoint, trace, and other debug services available once a PowerMAX OS kernel, or standalone program such as **/stand/boot**, has started execution.

System Entry to Console

Any entry from a program to the console is performed via exceptions. These exceptions consist of breakpoint, trace, halt, and error. Upon entry to the console, the current context, system and user registers, and operating modes are saved and the #> prompt is output. Commands described in Chapter 3 of this manual may then be input. Control is also transferred to the console if the operator enters the sequence '**<CR>~i**' at the system console while the PowerMAX OS kernel is in operation.

Control may be returned to the executing program by entering the **r** (Run) command. Note that if File (**f**) commands are used, it is no longer possible to return to the operating system at the point it entered the console.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Reset/SMI

The VYFD motherboard has a RESET and SMI toggle switch. The VAFQ motherboard has a reset pushbutton only. See Figure 2-1, Figure 2-2 and Table 2-1 for more information.

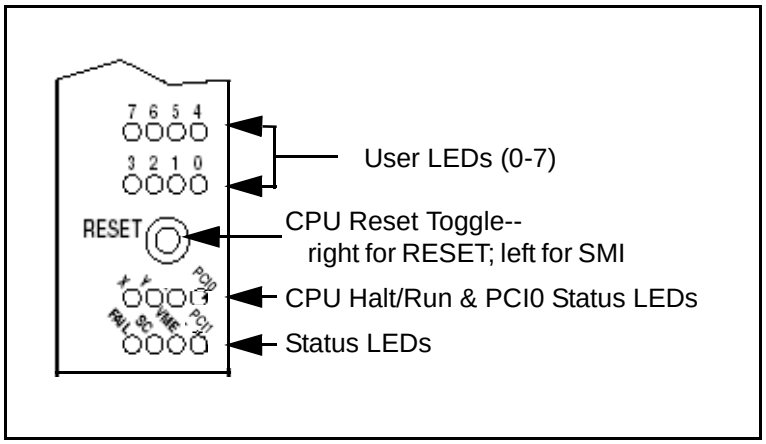


Figure 2-1. Reset and SMI Toggle Switch on VYFD

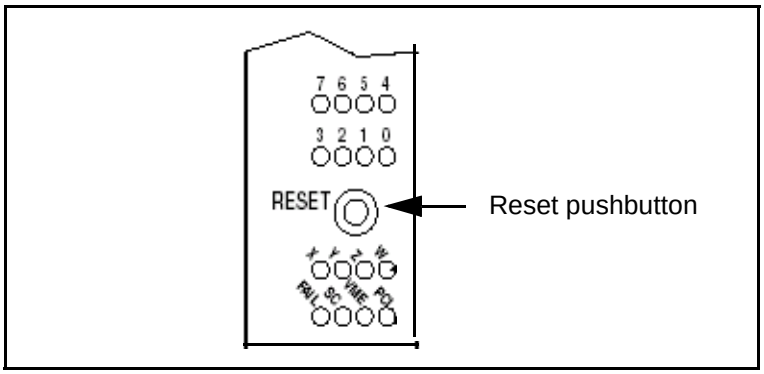


Figure 2-2. Reset Pushbutton on VAFQ

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 2-1. Description of Reset and SMI

RESET	Pushing the reset switch to the **right** (910/920) or pushing the reset pushbutton (940) asserts a board-level RESET which: • Resets the CPU(s). • Resets all on-board components that have such a function and clears all on-board control registers. • Asserts a VME RESET if the board is serving as the System Controller.
SMI	(910/920 only) Pushing a switch to the **left** asserts an SMI interrupt to the CPUs.

LEDs

The VYFD and VAFQ each have front panel LEDs (see Figure 2-2 and Figure 2-4) for quick indication of board activity.

Lamp Test Feature

During board level reset, all LEDs are illuminated. To confirm proper operation of the LED indicators, observe the LEDs while pressing the CPU reset switch to the right. LEDs remain lit for as long as the reset switch is held in the reset position.

Front Panel LEDs

Figure 2-3 shows the front panel LEDs for the VYFD board. Figure 2-4 shows the front panel LEDs for the VAFQ board.

Refer to Table 2-2 for a description of the function of the front panel LEDs on both boards.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

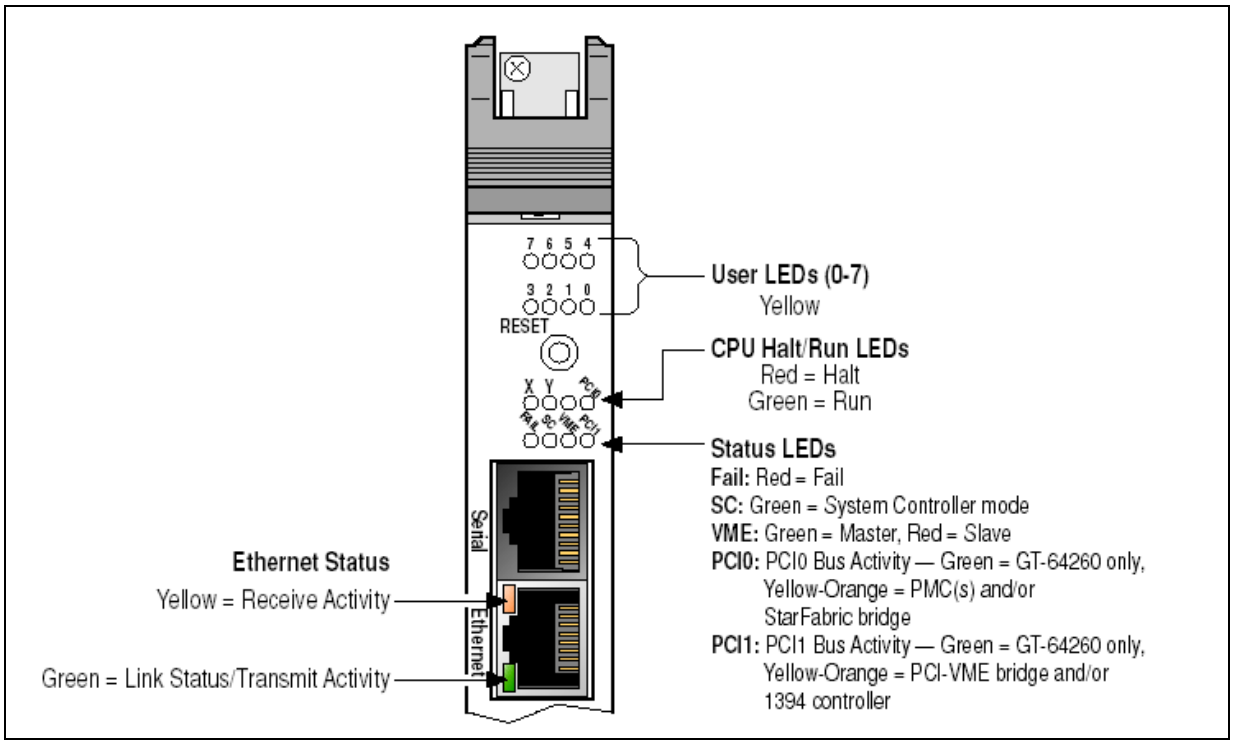


Figure 2-3. Front Panel LEDs for VYFD

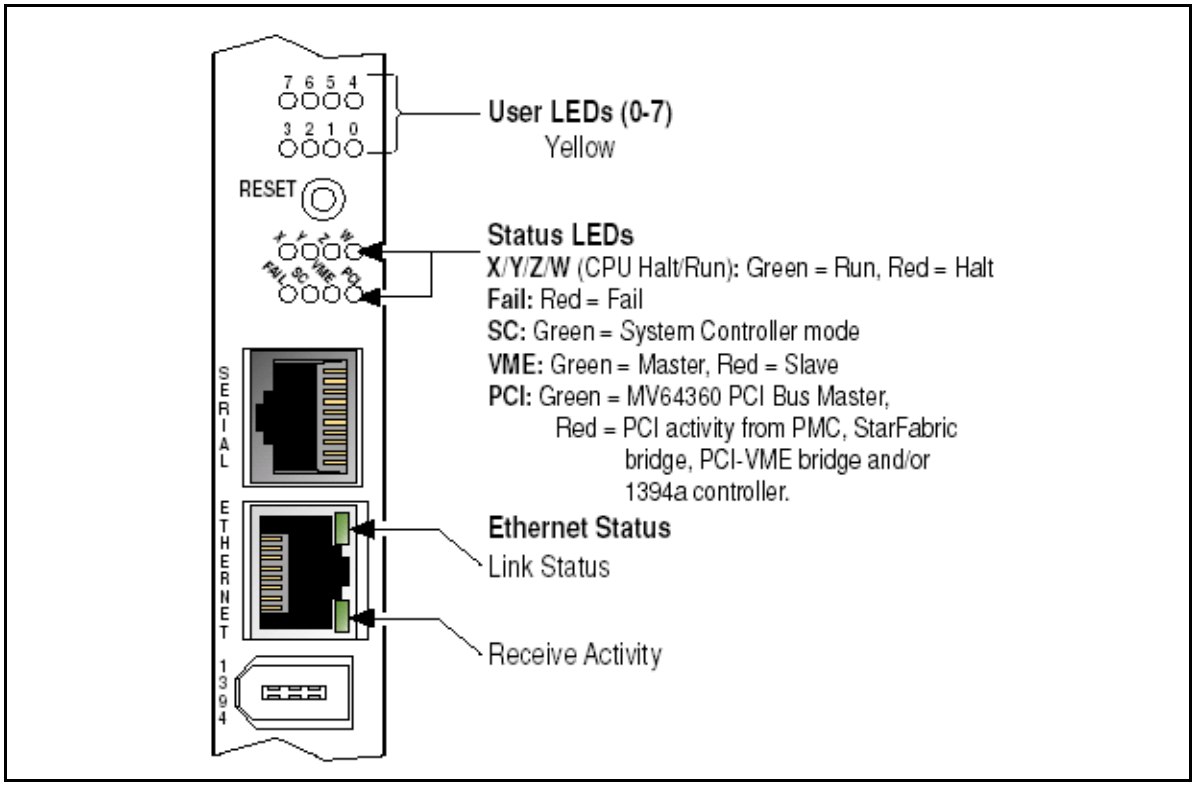


Figure 2-4. Front Panel LEDs for VAFQ

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 2-2. Description of Front Panel LEDs

User LEDs The eight **User LEDs** indicate application events.		
0 - 7	Software-programmable LEDs are controlled by the USER LED registers. They indicate the current operating mode of the board as defined by the software currently running.	
CPU Halt/Run LEDs The X, Y, Z, and W dual-colored LEDs indicate the run status of the indicated processor.		
LED Label	**Indication**	
X, Y (VYFD)	Green (Run)	Red (Halt)
	Flickers green in response to PowerPC bus activity by the indicated CPU. If not on, indicates CPU is not executing bus cycles as it executes instructions in cache or waits for an interrupt.	Lights red when CPU has halted.
X, Y, Z, W (VAFQ)	Green (Run)	Red (Halt)
	Flickers green in response to PowerPC bus activity. Lights yellow-orange for prolonged bus idle (>150 ms).	Lights red when CPU is reset or halted (check stopped).
Status LEDs The Status dual-colored LEDs indicate various status items.		
LED Label	**Indication**	
FAIL	Red	
	When on, indicates a condition that caused the CPU to reset (VMEbus SysRst\ line or the front panel RESET toggle). During normal operation, the system boot software clears this condition shortly after RESET.	
SC	Green	
	When on, indicates System Controller function assumed by board.	
VME	Green (VME Master)	Red (VME Slave)
	Flickers green in response to VME Master activity. When the VMEbus interface is idle, lights up green on the last release-on-request (ROR) VMEbus master to have used the bus.	Flickers red in response to VME Slave activity. (See Note 1)
PCI	Green (PCI Bus)	Red (PCI Expansion)
	Flickers green in response to PCI bus (master) activity.	Flickers red in response to PCI expansion (PMC) activity. (See Note 1)
Continued on next page		

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 2-2. Description of Front Panel LEDs (Cont.)

Ethernet LEDs Two LEDS on the Ethernet RJ-45 connector indicate Ethernet port status.	
VYFD	
Green	Link OK - lit when 10Base-T/100Base-TX cable is properly plugged into a functioning Ethernet network and onboard software has initialized the Ethernet interface.
Yellow	Receive Activity - Flickers whenever data is being received. If connected to a repeater-type hub instead of a switch-type hub, may still flicker even when the board is not the intended recipient since packets sent over the network to other nodes will also be sent to this board.
VAFQ	
Link	Lights when the port is plugged into a functioning Ethernet network and software has initialized the Ethernet interface. Also indicates the Ethernet operating mode as follows: • Slow blink (2 Hz) for 10Base-T • Fast blink (4 Hz) for 100Base-T • Solid ON for 1000Base-TX (Gigabit Ethernet)
Activity	Flickers whenever data is being received. If connected to a repeater-type hub instead of a switch-type hub, may still flicker even when the board is not the intended recipient since packets sent over the network to other nodes will also be sent to this board.
Note 1. Dual color green/red LED typically lights up yellow-orange as the two conditions quickly alternate.	

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3
Console Debugging Commands

Summary of Commands 3-1
Syntax Conventions 3-2
Command Format 3-5
Command Specifier 3-5
Data Size and Format 3-5
Global Options 3-6
Local Options 3-6
Numeric Values 3-6
Address Value 3-7
Command Manipulators 3-7
Command Editing 3-9
Console Commands 3-9

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3
Console Debugging Commands

Summary of Commands

A summary of the console command set is shown in Table 3-1. This command set not only supports booting, but also the debugging of standalone programs (including the PowerMAX OS kernel) through the use of breakpoint services and the ability to examine and change registers and memory locations on command.

When the console is ready for a new command, it will display one of several prompts:

```
#>
```

is displayed for uniprocessor systems.

```
#0>
```

is the most common display for multiprocessor systems. The numeric value (0) is the CPU the console is running on (called the master CPU), AND the CPU whose registers will be examined, modified, or stepped by default when no CPU is specified on the command line (the attentive CPU).

```
#0:1>
```

This prompt is displayed when the master CPU (0) is different from the attentive CPU (1).

By default the master CPU is always CPU 0. This can be changed with the **tm** (configure master CPU) command. Sometimes the CPU that is currently the master CPU will be changed automatically; this can occur for example, if the master CPU ceases to respond. The attentive CPU can be changed with either the **tm** or the **o** (global command options) command. When changing the master CPU, be aware that although the console runs fine with any CPU being the master, some booted programs (notably the PowerMAX OS kernel) will not run if booted with any other then CPU 0 being the master.

The console provides an online help facility through the**?** command. The various forms of help are:

?	a short help overview
??	a more detailed help overview
?e	help on the '**e**' command (substitute any other command name for '**e**')
?-	help on the most common command line options
?*	help on the command line editor

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Finally, it is possible to exit the console and restart **STAR** by executing the **<CR>~b** command. This command performs a 'soft reset' of the system. Other commands are available that can reset a system by 'yanking' on the various 'hard reset' lines. For example, **<CR>~h** yanks on the VME bus reset line while **<CR>~p** yanks on the PCI bus reset line. When any of these lines are 'yanked', all devices that listen to a given line will undergo a hardware reset. These commands are unique from all others in that they must be preceded by a carriage return **<CR>** in order to be recognized. They can also be typed-in and acted upon by the console while console output is being generated.

Syntax Conventions

The following conventions are used in the command syntaxes:

<a>	**a** is mandatory
[a]	**a** is optional
a|b	either **a** or **b** but not both. The **a** option or **b** option can be used with the command but the **a** option cannot be used along with the **b** option. Note that there may be a string of **OR** options (i.e., **a|b|c|d|e**) in this case you can only have one option, either **a** or **b** or **c** etc.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 3-1. Console Debugging Commands - Summary

Command	Definition	See Page No.
a	ASCII Dump	3-10
b	List Breakpoints	3-13
b	Set Breakpoints	3-14
bk	Clear Breakpoints	3-15
c	Copy Memory	3-16
d	Display Memory in Hexadecimal	3-18
di	Disassemble Memory	3-21
e	Examine/Change Memory	3-22
fb	Boot Operating System	3-24
fc	Display Directory	3-26
fd	Display/Set Default Device	3-27
fh	Display Mounted File Systems	3-29
fl	Load Program	3-30
fr	Load and Execute a Program	3-31
g	General Register Display/Modify	3-32
i	Initialize Memory to Value (Fill)	3-34
k	Kick CPUs	3-36
m	Memory Test	3-37
o	Global Command Options	3-38
p	Processor Register Display/Modify	3-39
qa	Query Address	3-41
qb	Query Backplane	3-44
qp	Display SPR register	3-45
qs	Query Stack	3-46
qv	Query Virtual Address	3-47
qy	Query Current Boot Options	3-48
r	Execute Run	3-50
ra	Execute Run to Address	3-51
rd	Run Without Breakpoints	3-52
rn	Run to Next Instruction	3-53
rr	Run to Return Address	3-54
s	Search Memory for Data	3-55

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 3-1. Console Debugging Commands - Summary (Cont.)

Command	Definition	See Page No.
sr	Search Memory Range for Data	3-57
td	Configure CPU Down (multiprocessor SBCs only)	3-59
tm	Configure Master CPU	3-60
tu	Configure CPU Up (multiprocessor SBCs only)	3-61
w	Write Data to Memory	3-62
y	Initialize Boot Options/Flags	3-63
z	Single–Step Processor	3-64
~	Various forms of soft and hard system resets	3-65
?	Help Command	3-65

Some options are specified by a dash (**-**) followed by the option character. Command, options, and data must be entered in lower case. In this manual, parameters which must be entered are enclosed in < >. Optional parameters are enclosed in brackets **[]**. Optional parameters include such items as ending addresses for display commands. In general, the command syntax is shown below:

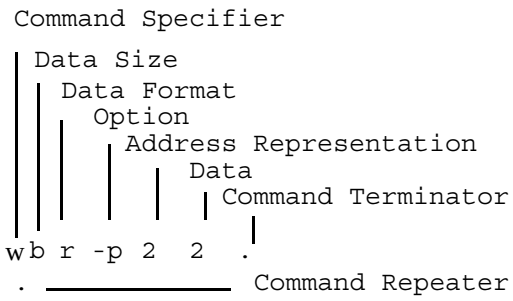
```
command -options start_address ending_address data
                        OR
command -options start_address:byte_count data
```

Most commands are terminated in one of two ways: by typing a period or by entering a carriage return **<CR>**. If a command is terminated via a period, the command executes immediately and then displays the prompt. If the command is terminated via a carriage return the command executes and then allows the use of one of the repeater commands. Repeater commands are discussed later in this chapter under the *Command Manipulators* heading.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Command Format

Although there is no format common to all the commands described in this chapter, most of the commands have one or more of the features listed in the sample command shown below.



Command Specifier

Table 3-1 briefly described each of the console debugging commands. These are the basic commands without their optional parameters.

Data Size and Format

The range of values for formatted data:

b Formatted as a byte – transfers data via eight–bit transfers,

w Formatted as a word (two bytes) – transfers data via 16–bit transfers, or

l Formatted as longwords (four bytes) – transferred in a single 32–bit transfer. This is the default.

r Reverse byte order. Controls byte ordering of 16-bit or 32-bit number. If **r** is not specified, byte ordering begins with the highest order byte as Byte 0 (Big-Endian). If **r** is specified, byte ordering begins with the lowest order byte as Byte 0 (Little-Endian). If the '**r**' suffix is present, it must follow any '**b**', '**w**', or '**l**' suffix that is present.

The data formats described above are depicted in the console command syntax conventions illustrated in the following example.

e[format][-b<n>][-p|-i|-n][start_address[data]]

Where **[format]** has the following syntax convention:

[b|w|l][r]

Therefore, for data formats you may specify at most one of **b** or **w** or **l** followed by an optional **r** to reverse the retrieval and storage of bytes by the command.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Global Options

Some commands look at or can set various global options. See the '**o**' command on page 3-38 for more information on command options).

-b<n> Specify program base address. The base address, represented by the address value *n*, is added to all addresses entered from the command line. The address value *n* is zero by default. Numeric address values are discussed later in this chapter.

-c<n> Specify the attentive CPU**<n>** for this command.

-r<n> execute *n* times (o = infinite times)

Local Options

The following 'local' options are commonly available on many commands.

-n<addr>
Address arguments are with respect to the NVRAM address space.

-p<addr>
Address arguments are with respect to the PCI configuration space.

-i<addr>
Address arguments are with respect to the VME I/O space.

-s Store into NVRAM when appropriate.

-w When storing into NVRAM, don't ask 'are you sure?'.

Numeric Values

A numeric value may be entered in any of the following formats.

'cccc'	ASCII value.
hex digits	Hexadecimal number.
$	Value of last entered address parameter.
%	Contents of the program counter of the default processor.
%regname	Contents of the specified processor register of the default processor.
BnBnBn	Hex value of all the specified bits added together (e.g., **B2B0 = 5)**.
[\]symbol	Console or program symbol (operating system or diagnostic) name. Leading backslash required when a symbol doesn't contain a leading underscore (_).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Address Value

An address may be entered in any of the following formats.

numeric value	Physical address by default. If the **o+v** option is set, and virtual memory is enabled then the address defaults to virtual; otherwise, the address is physical.
[numeric value]	A physical address is specified by enclosing a numeric value within square brackets.
(numeric value)	A virtual address is specified by enclosing a numeric value within parenthesis. The SDR0 and SDR1 registers for the processor contain the address of the translation tables.
***numeric value:size**	An indirect address is specified by placing an asterisk (*****) before a numeric value. Note that specifying indirection is valid only for memory reference options. The optional size parameter specifies the size of the indirect memory reference and must be in the range 1 through 4.
***[numeric value]:size**	Indirect physical address. The optional size parameter specifies the size of the indirect memory reference and it must be in the range 1 through 4.
***(numeric value):size**	Indirect virtual address. The optional size parameter specifies the size of the indirect memory reference and it must be in the range 1 through 4.

Command Manipulators

There are two categories of command manipulators: terminators and repeaters. Most commands can be terminated (exited) in one of two ways: by pressing the **<CR>** key or by typing a period (**.**).

If a command line is terminated by typing just a period, the command executes immediately and then the prompt is displayed, sometimes on the same line as the command results. Note that typing another period after the command has terminated causes that command to repeat.

If a command line is terminated by pressing the **<CR>** key, the command executes and then allows a repeat of the command (or a version of the command) via one of the following **repeaters.** (Note that not all repeaters are valid for all commands.).

-	When a dash (**-**) is used as a repeater the current data is displayed in ascii and as binary bits (e.g. **B26 B5 B0**). Note that this repeater is only valid for the **e**, **g**, and **p** commands.
<n><CR>	Change address to <*n*>.
@	Keep same address.
<SP>	Increment address to next page.
<CR>	Increment address to next line.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

/ Decrement address to previous page.

. Repeat or exit current command.

Any command can be aborted by typing **CTRL-C**. This action causes a soft reset of the console. Any commands typed but not yet executed are ignored.

The following example shows the effect of the various command terminators.

```
 #0>db 0:10<CR>
00000000 36 03 63 38 53 60 50 41 17 C0 FF EE D0 C0 02 37,
00000010 73 20 0C 0D EE FF 0C 71 14 05 06 35 83 36 30 63 /

00000000 36 03 63 38 53 60 50 41 17 C0 FF EE D0 C0 02 37 @
00000000 36 03 63 38 53 60 50 41 17 C0 FF EE D0 C0 02 37 <SP>
00000010 73 20 0C 0D EE FF 0C 71 14 05 06 35 83 36 30 63 <CR>
00000020 45 33 07 01 00 AC DC FE 98 48 42 43 16 41 44 FF70<CR>
00000070 FF 44 14 61 34 24 84 89 EF CD CA 00 10 70 33 54.
 #0>
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Command Editing

Table 3-2 lists the character sequences that you may enter to edit the commands discussed in this chapter.

Table 3-2. Console Special Key Functions

As an aid to the creation of command lines to be executed, the console remembers a number of previously executed command lines and provides their contents for viewing, editing, and possible re-execution. The command line editor functions and their invoking keystrokes are listed below:

CTRL-f, **CTRL-b**	- move forward/backward one character
CTRL-a, **CTRL-e**	- move to beginning/end of line
del, **CTRL-d**	- delete character under the cursor
CTRL-h	- delete previous character
CTRL-n	- move forward to the next input line in the history buffer
CTRL-p	- move to the previous line in the history buffer
CTRL-r, **CTRL-l**	- re-display input line
CTRL-k	- delete to end of input line
CTRL-u	- delete entire input line

The console, at all the times it is actually running, monitors all keystrokes entered, looking for special ones that it is to act upon right away. The single-keystroke versions of these are:

CTRL-c	- kill the currently running console command, return immediately back to the console prompt.
CTRL-s	- (XOFF) pause console output display
CTRL-q	- (XON) restart paused console output display

The console also monitors and acts upon the following keystroke triplets whenever they occur.

<CR>~b	- hard reset of only this board (PCI bus reset)
<CR>~p	- hard reset of only this board (PCI bus reset)
<CR>~h	- hard reset of all boards in this rack (uses a watchdog timer reset on Series 900 boards)

Finally, while not properly the subject of the console, PowerMAX OS watches for several console-like keystroke triplets while it is running:

<CR>~b	- soft reset of only this board.
<CR>~i	- save PowerMAX OS state and enter the console
<CR>~k	- save PowerMAX OS state, enter the kernel debugger **kdb(1)** if it has been configured; otherwise enter the console.

Console Commands

The remaining part of this chapter describes each of the console commands, with one or more examples of each command.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

a **ASCII DUMP** **a**

Purpose: This command displays a portion of memory, NVRAM address space or PCI configuration space beginning at the specified location. The displayed data is in ASCII format and grouped by byte (**b**), word (**w**), or longword (**l**). This command has options (preceded by dashes) which are listed below. For a more detailed description of the options refer to the options paragraph in this chapter.

Syntax: **a[format][-b<n>][-p|-i|-n][start_address [end_address]]**

a[format][-b<n>][-p|-i|-n][start_address [:byte_count]]

format	Determines whether the data appears in byte, word, or longword [**b**, **w,** or **l**] format or is to be byte reversed (**r**). If none specified, defaults to byte. (Note that for this command, a size greater than a byte makes little sense.)
-b<n>	Specifies program base address. The base address <*n*> is added to all addresses entered from the command line (<*n*> is zero by default).
-p	Address arguments are with respect to the PCI configuration space.
-i	Address arguments are with respect to VME I/O space.
-n	Address arguments are with respect to the NVRAM address space.
start_address	The hexadecimal address at which the operation starts. The default value is 0.
end_address	The hexadecimal address at which the operation ends.
:byte_count	Number (in hexadecimal) of bytes displayed. The default is a page (256 bytes). Note that if you specify word format, **byte_count** should be a multiple of two. If you specify longword format, **byte_count** should be a multiple of four.
repeaters	See the command manipulators paragraph for explanation.

Examples: The following are valid commands.

a B0	Displays a page of data starting at location **B0.**
ab 0	Displays a page of data starting at location **0.**
al 100:10.	Displays the right–most byte of each of the four longwords of data starting at location 100. In other words, it displays the byte of data at memory locations 103, 107, 10B, and 10F.
aw 0.	Displays right–most byte in each word starting at location 0.
a0.	Displays from byte 0.
ab 0 10.	Displays contents of addresses 0 through 10.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

a **ASCII DUMP (Continued)** **a**

Sample ASCII dumps are shown below.

ASCII Dump by Byte with an Initial Address of 0

```
#0>ab 0.
  00000000      H  C-  1  .  .  .  .  .  .  .  .  .  .  +  u
  00000010      .  .  .  .  .  .  .  .  .  .  T  [  .  .  .  .
  00000020      .  .  .     .  .  .  .  .  .  d  .  R  C  S  .
  00000030      .  .  .  0  .  .  .  .  .  .  .  .  2  .  o  .
  00000040      .  .  .  @  .  .  .  .  .  .  .  .  .  .  .  .
  00000050      .  .  .  P  .  .  .  .  .  .  .  .  .  .  +  .
  00000060      .  .  .  \  .  .  .  .  .  .  .  .  .  .  +  .
  00000070      .  .  .  p  .  .  .  .  .  .  .  .  .  .  +  .
  00000080      .  .  .  .  .  .  .  .  .  .  .  .  .  .  +  .
  00000090      .  .  .  .  .  .  .  .  .  .  T  [  .  .  +  .
  000000A0      .  .  .  .  .  .  .  .  .  .  d  .  .  .  +  .
  000000B0      .  .  .  0  .  .  .  .  .  .  .  .  .  .  +  .
  000000C0      .  .  .  @  .  .  .  .  .  .  .  .  .  .  +  .
  000000D0      .  .  .  P  .  .  .  .  .  .  .  .  .  1  9  7
  000000E0      .  .  .  \  .  .  .  .  .  .  .  .  .  2  8  9
  000000F0      .  .  .  p  .  .  .  .  .  .  .  .  .  o  .  4
```

ASCII Dump of Right–Most Byte in Each Word — Initial Address of 0

```
#0>aw 0.
 00000000       C  1  .  .  .  .  .  u
 00000010       .  .  .  .  .  [  .  .
 00000020       .     .  .  .  .  C  .
 00000030       .  0  .  .  .  .  .  .
 00000040       .  @  .  .  .  .  .  .
 00000050       .  P  .  .  .  .  .  .
 00000060       .  \  .  .  .  .  .  .
 00000070       .  p  .  .  .  .  .  .
 00000080       .  .  .  .  .  .  .  .
 00000090       .  .  .  .  .  [  .  .
 000000A0       .     .  .  .  .  .  .
 000000B0       .  0  .  .  .  .  .  .
 000000C0       .  @  .  .  .  .  .  .
 000000D0       .  P  .  .  .  .  1  7
 000000E0       .  \  .  .  .  .  2  9
 000000F0       .  p  .  .  .  .  o  4
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

a **ASCII DUMP (Continued)** **a**

ASCII Dump by Longword

```
 #0>al 0.
00000000        1   .   .   u
00000010        .   .   [   .
00000020        .   .   .   .
00000030        0   .   .   .
00000040        @   .   .   .
00000050        P   .   .   .
00000060        \   .   .   .
00000070        p   .   .   .
00000080        .   .   .   .
00000090        .   .   [   .
000000A0        .   .   .   .
000000B0        0   .   .   .
000000C0        @   .   .   .
000000D0        P   .   .   7
000000E0        \   .   .   9
000000F0        p   .   .   4
```

ASCII Dump in Various Formats

```
#0>ab 0 :10.
00000000      H  C  P  1  .  .  .  .  .  .  .  .  .  .  +  u
#0>ab 0 :4.
00000000      H  C  P  1
#0>aw 0 :4.
00000000      C  1
#0>al 0 :4.
00000000      1
#0>ab 0 f.
00000000      H  C  P  1  .  .  .  .  .  .  .  .  .  .  +  u
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

b **LIST BREAKPOINTS** **b**

Purpose: This command lists breakpoints for all of the processors.

Function: Some of the breakpoint commands have options (preceded by dashes) which are listed below. For a more detailed description of the options refer to the options paragraph in this chapter. Up to eight breakpoint entries are kept in an internal break address table.

Syntax: **b**

A sample list breakpoint command is shown below.

```
#0>b.
00 00001000 CPU physical
01 00002000 CPU physical
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

b **SET BREAKPOINTS** **b**

Purpose: This command sets breakpoints.

Function: When the processor hits a breakpoint, the console removes the breakpoints from memory before accepting any commands. Some of the breakpoint commands have options (preceded by dashes) which are listed below. A more detailed description of options is provided earlier in this chapter.

Up to eight breakpoint entries are kept in an internal break address table. Overflow of the break address table generates an error message. When a program begins executing the system enters the breakpoints into the code.

Syntax: **b[-a][-o]<address>**

-a Immediately inserts all breakpoints into memory (that is, do not wait until a '**r**'un command is executed before inserting the breakpoint set).

-o Breakpoint is temporary. Temporary breakpoints are removed once they are hit.

address The address to which a breakpoint is assigned. If you want to get a breakpoint at a processor address enter that particular address after the **b** command. If the **address** is already defined, an error message appears on the screen. If the address cannot be written, an error is generated.

Examples: The following are valid commands.

b1000. Set breakpoint at 0x1000

b hat_icachesync.
Set breakpoint at the entry point to the kernel routine 'hat_icachesync'.

b.or b<CR> Displays breakpoint

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

bk **CLEAR BREAKPOINTS** **bk**

Purpose: This command clears (removes) breakpoints.

Syntax: **bk <address>|<all>**

address	The address to which a breakpoint is assigned. If you want to clear a breakpoint at a processor address enter that particular address after the **bk** command.
all	Remove all breakpoints
Examples:	The following are valid commands.
bk1000.	Remove breakpoint at 0x1000.
bk start	Remove the breakpoint at the address when the label "start" is at.
bk all	Removes all breakpoints.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

c **COPY MEMORY** **c**

Purpose: This command moves the data located at the **source_start_address** through **source_end_address** (inclusive) to the locations starting at the **destination_start_address**. This command also moves the data located at the **source_start_address** to the locations starting at the **destination_start_address** for the number of bytes specified in the **byte_count**. This command has options (preceded by dashes) which are listed below. See the options paragraph in this chapter for more information.

Note: When virtual addressing is used, translation is performed in 'data' space.

Syntax: **c[format][-b<n>][-p|-i|-n]**
<source_start_address><source_end_address>
<destination_start_address>

c[format][-b<n>][-p|-i|-n]
<source_start_address><:byte_count><destination_start_address>

format Determines whether the data is to be copied in byte, word, or longword [**b**, **w**, or **l**] format (defaults to **l** if not specified). Though the byte ordering modifier **r** can be specified, it is basically a NOP for this command as the bytes will be reversed on each read, then re-reversed when written to the new memory location.

-b<n> Specifies program base address. The base address <*n*> is added to all addresses entered from the command line (<*n*> is zero by default).

-p Address arguments are with respect to the PCI configuration space.

-i Address arguments are with respect to VME I/O space.

-n Address arguments are with respect to the NVRAM address space.

source_start_address
This is the address at which the memory to be copied starts.

source_end_address
This is the address at which the memory to be copied stops.

destination_start_address
This is the destination address.

:byte_count Number (in hexadecimal) of bytes copied. Note that if you specify word format, **byte_count** should be a multiple of two. If you specify longword format, **byte_count** should be a multiple of four.

Examples: The following are valid commands.

c B0 C0 D0 Moves data at locations **B0** through **C0** to location **D0**.

cb 0 C0 D0 Moves values at locations **0** through **C0** to location **D0**.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

c **COPY MEMORY(Continued)** **c**

Sample copy commands are shown below.

Move values byte by byte between 0 and 400 to 1000.

```
#0>cb0 400 1000. #0> d1000:10.
00001000 00000000 00000004 00000008 0000000C
```

Move values word by word between 1000 and 1400 to 2000.

```
#0>cw1000 1400 2000. #0> d2000:10.
00002000 00000000 00000004 00000008 0000000C

#0>cw2000:400 3000. #0>d3000:10.
00003000 00000000 00000004 00000008 0000000C
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

d **DISPLAY MEMORY IN HEXADECIMAL** **d**

Purpose: This command displays a portion of memory, NVRAM address space or PCI configuration space beginning at the specified location. The displayed data is in hexadecimal format and grouped by byte, word, or longword.

Note: When virtual addressing is used, translation is performed in 'data' space.

Syntax:
```
d[format][-b<n>][-p|-i|-n]
[start_address[end_address]]

d[format][-b<n>][-p|-i|-n]
start_address[:byte_count]]
```

format Determines whether the data is displayed in byte, word, or long-word [**b**, **w**, or **l**] format (defaults to **l** if not specified). The default value is **w** in console mode and **l** in CPU mode (**o+p**). The byte ordering modifier **r** is only effective on **w** or **l** data formats and has no effect when reading PCI configuation space (see **-p** option below).

-b<n> Specifies program base address. The base address <*n*> is added to all addresses entered from the command line (<*n*> is zero by default).

-p Address arguments are with respect to the PCI configuration space.

-i Address arguments are with respect to VME I/O space.

-n Address arguments are with respect to the NVRAM address space.

start_address The hexadecimal address at which the operation starts. The default value is the last s**tart_address** specified.

end_address The hexadecimal address at which the operation ends.

:byte_count Number of bytes displayed. The default is a page (256 bytes). Note that if you specify word format, **byte_count** should be a multiple of two. If you specify longword format, **byte_count** should be a multiple of four.

repeaters See the command manipulators paragraph for explanation.

Examples: The following are valid commands.

d Displays a page of data starting at location 0 in longword format (assumes CPU mode).

d b0 Displays a page of data starting at location **B0.**

db 0 Displays a page of data starting at location **0** in byte format.

dw 0 4 Displays the first three words.

d -n 1C000:a0 Displays the Console portion of the NVRAM.

d -p 6100:30 Displays ethernet PCI configuration space register values.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

d DISPLAY MEMORY IN HEXADECIMAL (Continued) d

A sample of a hexadecimal memory display is shown below.

HEXADECIMAL DISPLAY BY BYTE STARTING AT ADDRESS 0

```
#0>db 0.
00000000 00 00 00 00 00 00 00 00 00 00 00 00 00 00 AB 75
00000010 00 00 00 10 00 00 00 00 1B 9D D4 5B 00 0C 00 02
00000020 00 00 00 20 00 00 00 00 1B 9D E4 0C 52 43 53 00
00000030 00 00 00 30 00 00 00 00 00 00 00 00 32 2E 6F 00
00000040 00 00 00 40 00 00 00 00 00 00 00 00 00 00 14 00 08
00000050 00 00 00 50 00 00 00 00 00 00 00 00 00 00 00 AB 8D
00000060 00 00 00 60 00 00 00 00 00 00 00 00 00 00 00 AB 8E
00000070 00 00 00 70 00 00 00 00 00 00 00 00 00 00 00 AB 8F
00000080 00 00 00 80 00 00 00 00 00 00 00 00 00 00 00 AB 90
00000090 00 00 00 90 00 00 00 00 1B 9D D4 5B 00 00 AB 84
000000A0 00 00 00 A0 00 00 00 00 1B 9D E4 0C 00 00 AB 92
000000B0 00 00 00 B0 00 00 00 00 00 00 00 00 00 00 AB 93
000000C0 00 00 00 C0 00 00 00 00 00 00 00 00 00 00 AB 94
000000D0 00 00 00 D0 00 00 00 00 00 00 00 00 00 31 39 37
000000E0 00 00 00 E0 00 00 00 00 00 00 00 00 00 32 38 39
000000F0 00 00 00 F0 00 00 00 00 00 00 00 00 2E 6F 00 34
```

HEXADECIMAL DISPLAY BY WORD STARTING AT ADDRESS 1000

```
#0>dw 1000.
00001000 0000 0000 0000 0000 0000 0000 0000 0000
00001010 0000 0000 0000 0000 0000 0000 1B9E 0E4C
00001020 0000 0000 0000 0000 0000 0000 1B9E 0E4C
00001030 0000 0000 0000 0000 0000 0000 0000 0000
00001040 0000 0000 0000 0000 0000 0000 0000 0000
00001050 0000 0000 0000 0000 0000 0000 0000 0000
00001060 0000 0000 0000 0000 0000 0000 0000 0000
00001070 0000 0000 0000 0000 0000 0000 0000 0000
00001080 0000 0000 0000 0000 0000 0000 0000 0000
00001090 0000 0000 0000 0000 0000 0000 1B9D CEBB
000010A0 0000 0000 0000 0000 0000 0000 1B9E 0E4B
000010B0 0000 0000 0000 0000 0000 0000 0000 0000
000010C0 0000 0000 0000 0000 0000 0000 0000 0000
000010D0 0000 0000 0000 0000 0000 0000 0000 0000
000010E0 0000 0000 0000 0000 0000 0000 0000 0000
000010F0 0000 0000 0000 0000 0000 0000 0000 0000
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

d DISPLAY MEMORY IN HEXADECIMAL (Continued) d

HEX DISPLAY STARTING AT ADDRESS 1000 — NO DATA SIZE SPECIFIED

#0>**d1000.** <——— *Defaults to longword*

```
00001000 00000000 00000000 00000000 00000000
00001010 00000000 00000000 00000000 1B9E0E4C
00001020 00000000 00000000 00000000 1B9E0E4C
00001030 00000000 00000000 00000000 00000000
00001040 00000000 00000000 00000000 00000000
00001050 00000000 00000000 00000000 00000000
00001060 00000000 00000000 00000000 00000000
00001070 00000000 00000000 00000000 00000000
00001080 00000000 00000000 00000000 00000000
00001090 00000000 00000000 00000000 1B9DCEBB
000010A0 00000000 00000000 00000000 1B9E0E4B
000010B0 00000000 00000000 00000000 00000000
000010C0 00000000 00000000 00000000 00000000
000010D0 00000000 00000000 00000000 00000000
000010E0 00000000 00000000 00000000 00000000
000010F0 00000000 00000000 00000000 00000000
```

COMPARE ASCII DISPLAY TO HEXADECIMAL DISPLAY

#0>**wl 0 48 43 50 31.** #0>**ab 0 :10.** <— *Write hexadecimal data to memory.*

```
00000000 .  .  .  H  .  .  .  C  .  .  .  P  .  .  .  1
```

#0>**al 0 :10.**

```
00000000 H  C  P  1
```

#0>**db 0 :10.**

```
00000000 00 00 00 48 00 00 00 43 00 00 00 50 00 00 00 31
```

HEXADECIMAL DISPLAY BY WORD AT ADDRESS 1000

#0>**dw 1000:10.**

```
00001000 7c51 43a6 3c40 fff0 8842 fe20 5442 07be
```

HEXADECIMAL DISPLAY BY WORD AT ADDRESS 1000
WITH LITTLE-ENDIAN BYTE ORDERING

#0>**dwr 1000:10.**

```
00001000 517C a643 403c f0FF 4288 20Fe 4254 be07
```

HEXADECIMAL DISPLAY BY LONGWORD AT ADDRESS 1000

#0>**dl 1000:10.**

```
00001000 7c5143a6 3c40fff0 8842fe20 544207be
```

HEXADECIMAL DISPLAY BY LONGWORD AT ADDRESS 1000
WITH LITTLE-ENDIAN BYTE ORDERING

#0>**dlr 1000:10.**

```
00001000 a643517c f0ff403c 20fe4288 be074254
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

di **DISASSEMBLE MEMORY** **di**

Purpose: This command disassembles instructions beginning at the specified address. Note that when virtual addressing is used, translation is performed in 'instruction' space.

Syntax: **di[-b<n>][-p|-i|-n][start_address[:byte_count]]**

di[-b<n>][-p|-i|-n][start_address [end_address]]

-b<n>	Specifies program base address. The base address <*n*> is added to all addresses entered from the command line (<*n*> is zero by default).
-p	Address arguments are with respect to the PCI configuration space.
-i	Address arguments are with respect to VME I/O space.
-n	Address arguments are with respect to the NVRAM address space.
start_address	The hexadecimal address at which the operation starts. The default value is the last **start_address** specified.
end_address	The hexadecimal address at which the operation ends.
:byte_count	Number of bytes displayed. The default is 16 longwords (64 bytes).

Sample disassembly commands are shown below. Note that the symbol table must be loaded (bit 7 of register pboot i.e. :#0>**pboot 80**), and a PowerMAX OS kernel or other bootable program booted to obtain the symbols shown in this display.

#0>di %pc–10.

```
000187b4 [000187b4] halt+34          70c31010 andi. r3,r6,1010
000187b8 [000187b8] halt+38          7c600124 mtmsr r3
000187bc [000187bc] halt+3c          4c00012c isync
000187c0 [000187c0] halt+40          4ea00421 bctrl
000187c4 [000187c4] halt+44        % 7cc00124 mtmsr r6
000187c8 [000187c8] halt+48          4c00012c isync
000187cc [000187cc] halt+4c          7ca803a6 mtlr r5
000187d0 [000187d0] halt+50          4ea00020 blr
000187d4 [000187d4] halt+54          48000004 b halt+0x58
000187d8 [000187d8] halt+58          48000004 b halt+0x5c
000187dc [000187dc] halt+5c          48000004 b consbkpt
000187e0 [000187e0] consbkpt         80801ff0 lwz r4,0x1ff0(r0)
000187e4 [000187e4] consbkpt+4       2c040000 cmpwi crf0,r4,0
000187e8 [000187e8] consbkpt+8       4082000c bne- crf0,consbkpt+0x14
000187ec [000187ec] consbkpt+c       38600001 li r3,1
000187f0 [000187f0] consbkpt+10      4ea00020 blr
```

Note that % implies the program counter of the default CPU and * implies break.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

e **EXAMINE/CHANGE MEMORY** **e**

Purpose: This command displays a byte, word, or longword of memory beginning at the specified memory location, NVRAM address space or PCI configuration space. This command can also change the data at that location and subsequent locations via the data specified. The format of the data written is controlled by the format and command options specified.

Syntax: **e[format][-b<n>][-p|-i|-n][start_address[data]]**

format	Determines whether the data is displayed in byte, word, or longword [**b**, **w**, or **l**] format (defaults to **l** if not specified). The default value is **w** in console mode and **l** in CPU mode. The byte ordering modifier **r** is only effective on **w** or **l** data formats and has no effect even then if the **-p** option is specified.
-b<n>	Specifies program base address. The base address <*n*> is added to all addresses entered from the command line (<*n*> is zero by default).
-p	Address arguments are with respect to the PCI configuration space.
-i	Address arguments are with respect to VME I/O space.
-n	Address arguments are with respect to the NVRAM address space.
start_address	The hexadecimal address at which the operation starts. The default value is 0.
data	The new value to be entered at **start_address**.
repeaters	See the command manipulators paragraph for explanation.

Examples: The following are valid commands.

e B0.	Displays a longword of data starting at location **B0**.
eb 0.	Displays the byte of data at location **0**.
ew0 5.	Displays the current word of data at location 0 and then changes the contents to 5.

Sample examine and change commands are shown below.

```
EXAMINE ONE BYTE AT ADDRESS 0

#0>eb 0.
00000000 00
```

EXAMINE ONE WORD AT ADDRESS 0

```
#0>ew 0.
00000000 0000
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

e **EXAMINE/CHANGE MEMORY (Continued)** **e**

EXAMINE MEMORY STARTING AT ADDRESS 0 – NO DATA SIZE SPECIFIED

```
#0>e0 <CR><—— Defaults to longword.
00000000 00000000,<—— The comma shows next longword.
00000004 AB0007FF.<—— The period terminates command.
```

EXAMINE LONGWORD AT LOCATION 1000

```
#0>e 1000.

00001000 7c5143a6
```

EXAMINE WORD AT LOCATION 1000

```
#0>ew 1000.

00001000 7c51
```

EXAMINE WORD AT LOCATION 1000 IN LITTLE-ENDIAN BYTE ORDERING

```
#0>ewr 1000.

00001000 517c
```

EXAMINE WORD WITH VIRTUAL ADDRESS SPECIFIED

```
#0>e (BFFF8000) <CR>
BFFF800 [00018000] 00000000.
```

DEPOSIT A LONGWORD IN MEMORY AND VERIFY THAT THE VALUE WAS STORED

```
#0>e10 <CR>
00000010 7FFAB001 50 <—— The user enters 50 and the console writes 50 to
                        location 10 and verifies that the value is actually
00000014 00000432       stored at 10.
#0>e10 <CR>
00000010 00000050.<—— The user enters a period.
```

DEPOSIT A WORD OF DATA WITH THE BYTE PARAMETER

```
#0>eb 10 <CR>
00000010 00 123@<—— The console displays an error message
error 0009: memory doesn't match
0000010 23.<—— The period terminates the command.
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

fb, fB **BOOT OPERATING SYSTEM** **fb, fB**

Purpose: This command boots the operating system (OS) of the computer. The contents of CPU boot register determine how the system boots. Table 3-3 lists the possible values for **pboot** and the effect of those values on the boot process.

Note: The pboot values can be added together. For example, a value of 1 in **pboot** causes the system to prompt for the boot OS file, a value of 2 automatically boots the user into single–user mode, and a value of 3 boots into single–user mode and prompts for the boot file. To change the value of CPU boot register, use the **p** command.

Table 3-3. Effect of pboot on Boot Process

pboot Value (Hex)	Effected File	Effect on Boot Process
0		Boots automatically without option.
1	**/stand/boot**	Requests file name for boot. Asks user to specify the program to load.
2	**unix**	Boots OS to single–user mode.
4	**unix**	Do not synchronize before reboot.
8	**unix**	Do not reboot, just halt
80	**unix**	Debug option (load symbol table).
100	**unix**	Load OS and then halt. If resumed, the OS will halt again after enabling Virtual Memory.
200	**unix**	Force a dump on reboot.
400	**unix**	Load then halt in kernel debugger
800	**unix**	Do not initialize kernel debugger.

The **fb** command invokes a helper program **/stand/boot** which understands **ELF(3E)** file format. The **fB** command is identical to **fb**, except with **fB** the user can specify another helper program in place of **/stand/boot**.

Syntax:
```
fb [-c<n>][-q]
fB [-c<n>][-q] bootfile
```

-c<n> Specifies the CPU**<n>** on which the **fb** or **fB** command is to run on. If none specified, defaults to the master CPU.

-q Option **-q** (quick). If set, only one attempt is made to find the **/stand/boot** or specified file system.

bootfile The filename of the helper boot program to be used, by default, **/stand/boot** is used. (This option is generally reserved for developers who are creating their own '/stand/boot' programs for development purposes.)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

A sample system boot listing is shown below.

```
#0>fb <CR>

 dsk(3,0,0,0)/.
Initialize VME
 dsk(3,0,0,0)/stand/boot

 Boot
: unix
 747336+61360+597388 start 0x4000
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

fc **DISPLAY DIRECTORY** **fc**

Purpose: This command lists the contents of the specified directory.

Note: Never append a period to this command. After the command, you must press **<CR>.** (Periods are valid syntax in pathnames.)

Syntax: **fc [dir_name]**

dir_name A directory name. If the **m** option of the **o** command is set (**o+m**) you must provide the device on which the directory is located.

Examples:

The following are valid commands.

fc/usr/d <CR>

fc/ <CR>

A sample root directory listing is shown below.

#0>**fc / <CR>**

```
.
..                lost+found        usr               var
tmp               dev               sbin              etc
unix              bck               bin               export
home              install           installr          lib
mnt               opt               proc              save
shlib             stand             system            .profile
boot              idle              spare             tmp_rex
.sh_history       x.c               x
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

fd **DISPLAY/SET THE DEFAULT DEVICE** **fd**

Purpose: This command sets or displays the default device.

Note: Never append a period to this command. After the command, you must press a **<CR>.** (Periods are valid syntax in parameters.)

Syntax: **fd [-l] [-s[w]] [dev]**

-l List the logical device table. If this option is entered, do not enter **dev**. This option displays all of the available boot devices (tapes and disks) along with the logical device numbers. See examples below.

-s In addition to changing the default device locally, also save the selection in NVRAM. This makes the selection available across system resets to all future boots.

-w If saving to NVRAM, don't ask 'are you sure?'.

dev The device that is to be chosen as the default device. Two formats are available depending upon the number of fields in **dev.** The two field version is either **dsk(d,p)** or **mt(d,p)** where **d** is a logical device number and p is the partition number (0 through 6). Logical device numbers always run from 0 to n and correspond to the available boot devices found by the system during a search of all available SCSI controllers. The table of logical device numbers may be displayed via the **-l** option. The second format for **dev** provides an absolute hardware address and is input as **dsk(c,u,p,b,l)** or **mt(c,u,p,b,l)** where **c** is the controller number within the particular bus, **u** is the drive ID, **p** is the partition number (0 through 6), **b** is the bus number (0 is normally the internal PCI bus, 1 is the VME bus) and **l** is the logical unit number. By default, **l** is zero. If **l** is not specified, it is treated as zero. To use the absolute mode, all four fields must always be entered. If you do not specify a device, the console assumes the two field version and selects **dsk(0,0).**

Examples: The following are valid commands.

fd mt(0) Set the default device to the first tape device found on the various SCSI bus controllers in the system. Partition zero is selected by default.

fd dsk(0,0,0,0) Set the default device to the disk on SCSI ID 0 of the internal PCI bus SCSI controller.

fd dsk(0,0,0,0,1) Set the default device to the disk on SCSI ID 0, LUN 1 of the internal PCI bus SCSI controller.

fd dsk(0,0,2,0) Set default to 'usr' partition.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

fd -l List the available devices and logical device numbers:

```
>fd -l
------------------------------------------------------------------
fd                    disk                        tape
0   (2,0,x,1,0) FUJITSU M2624S-512(0,5,x,0,0) ARCHIVE VIPER 15021247
1   (2,2,x,1,0) FUJITSU M2624F-512
------------------------------------------------------------------
```

Examples using the -s option:

The following are valid commands using the **-s** option.

fd -s with no parameters specified, clears the default device

fd -s dsk(1) causes the second disk listed under **fd-l** to be used as the default boot device on subsequent system boots.

Example of changing the default disk from drive 0 to drive 1:

```
#0>fd
.............................
dsk(0,0,0,0)
#0>fd -s dsk(1)
Update NVRAM (Y/N) ? y
NVRAM updated
```

Example of reverting back to drive 0 (default):

```
#0>fd -s
Clearing default boot device.
Update NVRAM (Y/N) ? y
NVRAM updated.
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

fh **DISPLAY MOUNTED FILE SYSTEMS** **fh**

Purpose: This command gives the default input device.

Note: Never append a period to this command. After the command, you must press **<CR>.** (Periods are valid syntax in parameters.)

Syntax: **fh**

A sample display from the **fh** command is shown below.

```
#0>fh <CR>
Default:        dsk (5,0,0,0)
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

fl **LOAD A PROGRAM** **fl**

Purpose: This command loads a program. The file loaded must be a bit-for-bit binary image of what is to appear in memory, and its entry point is assumed to be the first word of the file. The command can be followed by an optional list of arguments that are to be passed to the program.

Note: Never append a period to this command. After the command, you must press **<CR>.** (Periods are valid syntax in parameters.)

Syntax: **fl [-c<n>]<file_name>[base]**

-c<n> Specifies the CPU**<n>** on which the **fl** command is to run on. If none specified, defaults to the master CPU.

file_name A file specification, in the following format: **[dev] pathname**. This file contains the file to be loaded. If the **m** option of the **o** command is set (**o+m**), you must provide the device on which the directory is located via a **fd** command or by specifying **dsk/**.

base The address into which the program is loaded. Programs are loaded at 0x4000 as a default. If, however, you specify a **base,** the load address and start address are set to the **base** value.

Example: A sample load the boot program.

```
#0>fl /stand/boot
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

fr **LOAD AND EXECUTE A PROGRAM** **fr**

Purpose: This command loads and executes a program. The file loaded must be a bit-for-bit binary image of what is to appear in memory, and its entry point is assumed to be the first word of the file. The command can be followed by an optional list of arguments that are to be passed to the program.

Note: Never append a period to this command. After the command, you must press **<CR>.** (Periods are valid syntax in parameters.)

Syntax: **fr [-c<n>]<file_name>[base]**

-c<n> Specifies the CPU**<n>** on which the **fr** command is to run on. If none specified, defaults to the master CPU.

file_name A file specification, in the following format: **[dev] pathname**. This file contains the file to be loaded. If the **m** option of the **o** command is set (**o+m**), you must provide the device on which the directory is located via a **fd** command or by specifying **dsk/**.

base The address into which the program is loaded. Programs are loaded and run at 0x4000 as a default. If, however, you specify a **base,** the load address and start address are set to the **base** value.

Example:

A sample load the boot program and boot the system sequence is shown below.

#0>**fr /stand/boot <CR>**

```
Boot
: /stand/unix
2683832+297207+508045 start 0x4000
symbol table loaded

Concurrent PowerMAX_OS Release 6.3
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

g **GENERAL REGISTER DISPLAY/MODIFY** **g**

Purpose: This command displays and/or modifies the contents of the 40 general–purpose registers of the default CPU as shown in Table 3-4. If no parameters are specified, this command displays all of the general purpose registers (e.g. pc, r0 through r3, etc.). If a register name with no **data** parameter is specified, the contents of that specific register is displayed. If the **data** parameter is included, the console changes the value in the register. Subsequent registers can be modified by specifying new data for that particular register. To display the registers, the CPU must be halted. After the CPU is halted, the data displayed is that obtained at the last CPU halt.

Note: This command is identical to the **p** command, except that if no register list is specified, the default set of registers listed is different.

Syntax: **g [-c<n>]<register_name>[data]**

Table 3-4. General–Purpose Registers

REGISTER N	ACRONYM	TYPE
Program Counter	pc	R/W
Machine Status Register	msr	R/W
Register 0	r0	R/W
Register 1	r1	R/W
.	.	.
.	.	,
.	.	.
Register 31	r31	R/W
Condition Register	cr	R/W
Link register	lr	R/W
Count Register	ctr	R/W
Extension Register	xer	R/W
System CPU Level	spl	R/W

-c<n> Specifies the CPU**<n>** on which the command is to run on. If none specified, defaults to the attentive CPU.

register_name The general–purpose register to be examined or changed.

data The new hexadecimal value to be entered at **register_name.**

repeaters See the command manipulators paragraph for explanation.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Examples: The following are valid commands.

gpc. Display contents of the program counter.

gr1. Display contents of data register r1.

g. Displays contents of all general registers.

An examine all general register values example is shown below.

```
#0>g
pc  = 000187C4    msr = 00001010     cr = 48800000    spl = 00000061
r0  = 0000F084     r1 = FFD040B8     r2 = 00000000     r3 = 00001010
r4  = 00002000     r5 = 0021E554     r6 = 00009032     r7 = C22DE4F5
r8  = 00000001     r9 = 00000001    r10 = 002F2D19    r11 = 002F2D19
r12 = C22DE475    r13 = 0021E140    r14 = 002F2D19    r15 = 00000069
r16 = 003EFE48    r17 = 00000069    r18 = 00000069    r19 = 00000000
r20 = 00000001    r21 = FFD041FA    r22 = 00000001    r23 = 00000061
24  = 0000006C    r25 = 00009032    r26 = 00000000    r27 = 00000094
r28 = DEADBEEF    r29 = 00000020    r30 = 81818181    r31 = 0BADC0DE
lr  = 000187C4     ctr = 01FC7ED8    xer = 00000004
```

An examine and change register values example is shown below.

```
#0>gr1 <CR>          <——Displays contents of register r1.
r1 = C002F7F2,       <——Entering the comma displays r2.
r2 = 00000000,       <——Entering the comma displays r3.
r3 = 81A40001        <——Entering the period finishes command.
#0>gr2 23.81A40001   <——Change contents of r2 to 23.
#0>gr1 <CR>          <——Display register r1.
r1 = C002F7F2
r2 = 00000000,
r3 = 00000023.
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

i **INITIALIZE MEMORY TO VALUE (FILL)** **i**

Purpose: This command writes the **data** into all locations between the **start_address** and **end_address.** The format of the data is controlled via the options entered. Memory addresses before 0x6000 are used by the console and should not be initialized.

Note: When virtual addressing is used, translation is performed in 'data' space.

Syntax:

```
i[format][-b<n>][-p|-i|-n]
<start_address><end_address> [fill_value]

i[format][-b<n>][-p|-i|-n]
<start_address>:<byte_count> [fill_value]
```

format Determines whether the data is displayed in byte, word, or long-word [**b**, **w**, or **l**] format (defaults to **l** if not specified). The default value is **w** in console mode and **l** in CPU mode.The byte ordering modifier **r** is only effective on **w** or **l** data formats. The **r** modifier flag has no effect if the **-p** option is also specfied.

-b<n> Specifies program base address. The base address <*n*> is added to all addresses entered from the command line (<*n*> is zero by default).

-p Address arguments are with respect to the PCI configuration space.

-i Address arguments are with respect to VME I/O space.

-n> Address arguments are with respect to the NVRAM address space.

start_address The address at which the loading of memory starts. This address may not be a virtual address.

end_address The address at which the loading of memory ends. If the **end_address** is not supplied or is a location before the **start_address**, you get a syntax error. This address may not be a virtual address.

:byte_count Number (in hexadecimal) of bytes initialized. Note that if you specify word format, **byte_count** should be a multiple of two. If you specify longword format, **byte_count** should be a multiple of four.

fill_value The hexadecimal word that is loaded into each memory location. The fill value defaults to zero.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

i INITIALIZE MEMORY TO VALUE (FILL) (Continued) i

Examples: The following are valid commands.

i b -n 1C000:10 0
Fill with zero part of the console area of the NVRAM.

i10 20 10101010. Loads each longword from 10 to 20 with the hexadecimal word 10101010.

ib10 20 F. Loads each byte from 10 to 20 with the hexadecimal value F.

Sample memory initialization procedures are shown below.

INITIALIZE MEMORY BETWEEN ADDRESSES 1000 AND 2000

#0>**i1000 2000 10101010. #0>d1000 :10.** <— *Defaults to longword hexadecimal display starting at address 1000.*

```
00001000 10101010 10101010 10101010 10101010
```

INITIALIZE MEMORY BETWEEN ADDRESSES 1000 AND 2000 (LOAD A WORD)

#0>**iw1000 2000 ff.** #0>**d1000:10.**

```
00001000 00FF00FF 00FF00FF 00FF00FF 00FF00FF
```

INITIALIZE MEMORY BETWEEN ADDRESSES 10 AND 20 (LOAD A BYTE)

#0>**ib10 20 f.** #0>**d10:10.**

```
00000010 0F0F0F0F 0F0F0F0F 0F0F0F0F 0F0F0F0F
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

k **Kick CPUs** **k**

Purpose: This command is used on multiprocessor systems to kick nonresponsive CPUs back into the console.

A CPU may be nonresponsive, for example, if it has blocked out interrupts.

The '**k**' command functions by resetting (yanking on the SysReset pin) of the errant CPUs. There is always the risk the application state of "kicked" CPUs may be lost.

Syntax: **k**

Examples:

k

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

m **MEMORY TEST** **m**

Purpose: This command performs a combination of tests (ones, zeroes, and unique address) that checks memory, NVRAM address space or PCI configuration space between the **start_address** and **end_address.** Any errors which occur appear listed on the console screen.

Note: When virtual addressing is used, translation is performed in 'data' space.

Syntax: **m[format] [-b<n>] [-p | -i | -n]**
[start_address] [end_address>

m[format] [-b<n>] [-p | -i | -n]
[start_address] [:byte_count]

format: Determines whether the data is displayed in byte, word, or long-word [**b, w,** or **l**] format (defaults to **l** if not specified). The byte ordering modifier **r** is only effective on **w** or **l** data formats.

-b<n> Specifies program base address. The base address <*n*> is added to all addresses entered from the command line (<*n*> is zero by default).

-p Address arguments are with respect to the PCI configuration space.

-i Address arguments are with respect to VME I/O space.

-n Address arguments are with respect to the NVRAM address space.

start_address The first address tested. This address may not be a virtual address.

end_address The last address tested. This address may not be a virtual address.

:byte_count Number (in hexadecimal) of bytes tested. Note that if you specify word format, **byte_count** should be a multiple of two. If you specify longword format, **byte_count** should be a multiple of four.

Example: The following is a valid command.

```
m1000 2000.
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

o **GLOBAL COMMAND OPTIONS** **o**

Purpose: This command sets conditions under which the console operates. These conditions are stored as options in an options word.

Syntax: **o [+|-] [a] [e] [m] [r] [v] [-b<n>] [-c<n>]**

+ or - A plus (**+**) adds and a minus (**-**) removes the specified options from the options word, effectively enabling or disabling that option. If you do not use a plus or minus, the command sets the options word to the options specified. The options are the conditions under which the console operates. If you do not specify any options, the console displays the current options.

a Permit auto-rebooting of kernel on certain PowerMAX OS failures.

e Disable Non-Zero SCSI Bus probes.

m Disables automatic translation and 'mount' of directory names to the corresponding file system devices. These devices allow system files to be available from the console across all system disks by system–wide pathnames.

r Enable the handling of the reset button.

v Defaults to virtual addresses whenever virtual memory is enabled. Brackets or parentheses may be used to override the default address mode.

-c<n> Change the attentive CPU to CPU**<n>**.

-b<n> Specifies program base address. The base address <*n*> is added to all addresses entered from the command line (<*n*> is zero by default).

Examples: The following are valid commands.

o. Display options that are set.

o+r Add r option.

o-vm Disable v and m options.

Sample set and remove options commands are shown below.

*#0>***o.**<——*Display current options*.
```
mr -b 0
```

#0>**o+v.**<—— *Add v option.*
```
o. mrv -b 0
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

p **PROCESSOR REGISTER DISPLAY/MODIFY** **p**

Purpose: This command displays and changes the contents of the 44 processor registers and the two pseudo-registers ‘boot’ and ‘aboot’ (see Table 3-5). If no parameters are specified, this command displays all of the processor registers. If a register name with no data is given, the contents of the specified register is displayed. If you specify the **data** parameter, the console changes the value in the register to the value specified. Processor registers and their attributes were discussed under the processor registers paragraph in this manual.

Note: This command is an alternative version of the **g** command.

Syntax:
```
p [-c<n>][<register_name>[data]]
p [-s[w] boot <flags>
paboot<seconds>
```

-c<n> Specifies the CPU**<n>** on which the command is to run on. If none specified, defaults to the master CPU.

register_name The processor register to be examined or changed. The value of the **register_name** is the symbolic register name.

data The hexadecimal data to be placed in the processor register.

seconds Where ‘seconds’ is the number of seconds to delay when autobooting an OS.

flags pboot values shown in Table 3-3 on 3-24. Values can be added together.

Note: The pseudo-registers ‘boot’ and ‘aboot’ are not real machine registers; they are memory locations within the console which can be viewed and/or changed with the ‘**p**’ command.

Examples: The following are valid commands.

p. Displays all processor registers.

pboot Displays contents of processor boot register (see **fb** command).

pdar. Displays contents of the Data Address Register.

An examine of all VYFD processor register values example is shown below.

```
#0>p.

  dsisr  = 0A000000     dar = 3003B288   sdr1 = 01E0000F  fpscr = 000000D0
    sr0  = 20000000     sr1 = 20DE2989    sr2 = 20DE298A    sr3 = 20DE298B
    sr4  = 20DE298C     sr5 = 20DE298D    sr6 = 20DE298E    sr7 = 20DE298F
    sr8  = 20DE2990     sr9 = 20DE2991   sr10 = 20DE2992   sr11 = 20DE2993
   sr12  = 20DE2994    sr13 = 20DE2995   sr14 = 20000001   sr15 = 20000002
  sprg0  = 002F0000   sprg1 = 20DEE9DE  sprg2 = FFD05000  sprg3 = FFD04400
 ibat0u  = 0000007E  ibat1u = 00000000 ibat2u = 00000000 ibat3u = 00000000
 ibat0l  = 00000003  ibat1l = 00000000 ibat2l = 00000000 ibat3l = 00000000
 dbat0u  = 0020003E  dbat1u = 00000000 dbat2u = 00000000 dbat3u = 00000000
 dbat0l  = 00200012  dbat1l = 00000000 dbat2l = 00000000 dbat3l = 00000000
   dabr  = 00000000    iabr = 00000000   hid0 = 00000000   l2cr = 00000000
   l3cr  = 00000000   ictrl = 00000000
   boot  = 00000982   aboot = 00000000
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

p PROCESSOR REGISTER DISPLAY/MODIFY (Continued) p

An examine of all VAFQ processor register values example is shown below.

#0>p.

```
  dsisr  = 00000000    dar = 00000000   sdr1 = 00000000  fpscr = 00000000
    sr0  = 00000000    sr1 = 00000000    sr2 = 00000000    sr3 = 00000000
    sr4  = 00000000    sr5 = 00000000    sr6 = 00000000    sr7 = 00000000
    sr8  = 00000000    sr9 = 00000000   sr10 = 00000000   sr11 = 00000000
   sr12  = 00000000   sr13 = 00000000   sr14 = 00000000   sr15 = 00000000
  sprg0  = 00000000  sprg1 = 00000000  sprg2 = 00000000  sprg3 = 00000000
 ibat0u  = 00000000 ibat1u = 00000000 ibat2u = 00000000 ibat3u = 00000000
 ibat0l  = 00000000 ibat1l = 00000000 ibat2l = 00000000 ibat3l = 00000000
 dbat0u  = 00001fff dbat1u = 80001fff dbat2u = 10001fff dbat3u = f0001fff
 dbat0l  = 0000001a dbat1l = 8000002a dbat2l = 1000001a dbat3l = f000002a
 ibat4u  = 00000000 ibat5u = 00000000 ibat6u = 00000000 ibat7u = 00000000
 ibat4l  = 00000000 ibat5l = 00000000 ibat6l = 00000000 ibat7l = 00000000
 dbat4u  = 00000000 dbat5u = 00000000 dbat6u = 00000000 dbat7u = 00000000
 dbat4l  = 00000000 dbat5l = 00000000 dbat6l = 00000000 dbat7l = 00000000
   dabr  = 00000000   iabr = 00000000   hid0 = 0481c0bc   l2cr = 40000000
   l3cr  = 73818000  ictrl = 00000000 l3ohcr = 00000000 l3itc0 = 00000000
  3itc1  = 00000000 l3itc2 = 00000000 l3itc3 = 00000000   boot = 00000081
  aboot  = 00000000
```

Sample commands that examine and change the processor registers are shown below.

EXAMINE THE CONTENTS OF PROCESSOR REGISTER **dar**

#0>p dar <CR>
dar = 00002000**,**
#0>

CHANGE THE CONTENTS OF PROCESSOR BOOT REGISTER

#0>**p boot 982. 00000982**
#0>**p boot.00000982**

CHANGE THE CONSOLE BOOT DELAY TO 9 SECONDS

#0>**paboot 9**
00000009
NVRAM updated

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 3-5. Processor Registers Accessed via p Command

REGISTER NAME	ACRONYM	TYPE
aboot Register	aboot	R/W
Boot Register	boot	R/W
Data Storage Interrupt Status Register	dsisr	R/W
Data Address Register	dar	R/W
Floating Point Status Register	fpscr	R/W
Segment Register 0	sr0	R/W
Segment Register 1	sr1	R/W
Segment Register 2	sr2	R/W
Segment Register 3	sr3	R/W
Segment Register 4	sr4	R/W
Segment Register 5	sr5	R/W
Segment Register 6	sr6	R/W
Segment Register 7	sr7	R/W
Segment Register 8	sr8	R/W
Segment Register 9	sr9	R/W
Segment Register 10	sr10	R/W
Segment Register 11	sr11	R/W
Segment Register 12	sr12	R/W
Segment Register 13	sr13	R/W
Segment Register 14	sr14	R/W
Segment Register 15	sr15	R/W
Storage Description Register 1	sdr1	R/W
Special Register G0	sprg0	R/W
Special Register G1	sprg1	R/W
Special Register G2	sprg2	R/W
Special Register G3	sprg3	R/W
Instruction Batch Register 0 Upper	ibat0u	R/W
Instruction Batch Register 0 Lower	ibat0l	R/W
Instruction Batch Register 1 Upper	ibat1u	R/W
Instruction Batch Register 1 Lower	ibat1l	R/W
Instruction Batch Register 2 Upper	ibat2u	R/W
Instruction Batch Register 2 Lower	ibat2l	R/W
Instruction Batch Register 3 Upper	ibat3u	R/W
Instruction Batch Register 3 Lower	ibat3l	R/W
Instruction Cache/Interrupt Control Reg	ictrl	R/W
Data Batch Register 0 Upper	dbat0u	R/W
Data Batch Register 0 Lower	dbat0l	R/W
Data Batch Register 1 Upper	dbat1u	R/W
Data Batch Register 1 Lower	dbat1l	R/W
Data Batch Register 2 Upper	dbat2u	R/W
Data Batch Register 2 Lower	dbat2l	R/W
Data Batch Register 3 Upper	dbat3u	R/W
Data Batch Register 3 Lower	dbat3l	R/W
Data Address Breakpoint Register	dabr	R/W
Instruction Address Breakpoint Register	iabr	R/W
Hardware Implementation Dependent Reg 0	hid0	R/W
L2 Cache Control Register	l2cr	R/W
L3 Cache Control Register	l3cr	R/W

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 3-5. Processor Registers Accessed via p Command (Cont.)

REGISTER NAME	ACRONYM	TYPE
Additional Registers for VAFQ board follow:		
L3 Cache Output Hold and Control Register	l3ohcr	R/W
L3 Cache Input Timing Control Register 0	l3itc0	R/W
L3 Cache Input Timing Control Register 1	l3itc1	R/W
L3 Cache Input Timing Control Register 2	l3itc2	R/W
L3 Cache Input Timing Control Register 3	l3itc3	R/W

Purpose: This command allows either the symbolic name of a specified address or the address of a specified symbolic name to be queried. The symbols table must have been previously loaded by setting bit 7 in the pboot register (e.g. **`pboot 80.`**) and issuing a **`fb`** command.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

qa **QUERY ADDRESS** **qa**

Syntax: **qa<address>**

address The address for which a symbol name is to be displayed.

Example: The following are valid commands.

```
#0>qa C0066000 <CR>
hdioctl+2A0 (C0065D60+2A0)

#0>qa \hdioctl <CR>
 hdioctl (C0065D60)
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

qb **QUERY BACKPLANE** **qb**

Purpose: This command displays processor status information.

Syntax: **qb**

A VYFD sample display from the **qb** command is shown below.

```
#0>qb
cpu    alive   down   runable  halted   stuck
---    -----   ----   -------  ------   -----
0        y       -       -        y       -     master attentive
1        y       -       -        y       -
```

A VAFQ sample display from the **qb** command is shown below

```
#0>qb
cpu    alive   down   runable  halted   stuck
---    -----   ----   -------- -------  -------
0        y       -       -        y       -     master attentive
1        y       -       -        y       -
2        y       -       -        y       -
3        y       -       -        y       -
```

Note:

alive	CPU is available for applications to use
down	user has marked CPU as unavailable
runable	CPU has application state associated with it
halted	CPU is idling in or executing Console code
stuck	CPU is stuck in uninterruptable application code
master	CPU Console does its best to run on
attentive	CPU whose application state Console is focused on

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

qp **DISPLAY SPECIAL PURPOSE REGISTERS** **qp**

Purpose: Displays the actual values of either every special purpose (SPR) register of some CPU, or displays selected SPRs across all CPUs.

Syntax: **qp [-c<n>]**

qp reg reg ...

-c<n> Specifies the CPU**<n>** whose entire SPR register set is to be displayed.

Examples:

The following are valid commands.

qp -c0 Display s all the SPRs for CPU 0.

qp msscr0 msscr1 Displays the value of these two SPRs for all CPUs.

Note: A special purpose register is any register given a SPR number by the PowerPC Architecture and can be referenced by the **mtspr** and **mfspr** instructions. This set includes some rather common registers, such as CTR lR, which are also reported by other console commands such as '**g**' and '**p**'.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

qs **QUERY STACK** **qs**

Purpose: This command displays the stack of a program that has been booted by the console. The stack of the attentive CPU is displayed.

Syntax: **qs[-c<n>]**

-c<n> Specifies the CPU**<n>** whose stack is to be displayed. If none specified, defaults to the attentive CPU.

Examples:

The following is a valid command.

```
#0>qs.

      --------- KERNEL STACK ---------

         _cnputs() at C00639E6(_cnputs+6)
BFFFE9E2 _cnproc() at C0063908(_cnproc+200)
BFFFEA46 _ttwrite() at C006ACDA(_ttwrite+31E)
BFFFEA8A _raw_rw() at C0050416(_raw_rw+526)
BFFFEACA _write() at C002C680(_write+140)
BFFFEB66 _syscall() at C004F2D2(_syscall+1F6)
BFFFEBB2 _Xtrap0() at C000C58E(_Xtrap0+1E)
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

qv **QUERY VIRTUAL ADDRESS** **qv**

Purpose: This command decodes and prints a virtual address.

Syntax: **qv <virtual address>**

virtual address The virtual address in question.

Examples: The following are valid commands.

NOTE

Page tables should be loaded before expecting complete translations. This action may be accomplished via loading PowerMAX OS

```
#0>qv 187b4
** Fnd in ibat0 u=0x0000007e, l=0x00000003   (000187b4)    pp=11
 Vaddr = 0x000187b4    SID=0x0
**1-PTE(0) @ 0x01e00600 = 80000000 00018010   (000187b4)    pp=00
  1-PTE(1) @ 0x01e00608 = 00000000 00000000
  1-PTE(2) @ 0x01e00610 = 00000000 00000000
  1-PTE(3) @ 0x01e00618 = 00000000 00000000
  1-PTE(4) @ 0x01e00620 = 00000000 00000000
  1-PTE(5) @ 0x01e00628 = 00000000 00000000
  1-PTE(6) @ 0x01e00630 = 00000000 00000000
  1-PTE(7) @ 0x01e00638 = 00000000 00000000
  2-PTE(0) @ 0x01eff9c0 = 00000000 00000000
  2-PTE(1) @ 0x01eff9c8 = 00000000 00000000
  2-PTE(2) @ 0x01eff9d0 = 00000000 00000000
  2-PTE(3) @ 0x01eff9d8 = 00000000 00000000
  2-PTE(4) @ 0x01eff9e0 = 00000000 00000000
  2-PTE(5) @ 0x01eff9e8 = 00000000 00000000
  2-PTE(6) @ 0x01eff9f0 = 00000000 00000000
  2-PTE(7) @ 0x01eff9f8 = 00000000 00000000

#0>qv a00000
 Vaddr = 0x00a00000    SID=0x0
  1-PTE(0) @ 0x01e28000 = 00000000 00000000
  1-PTE(1) @ 0x01e28008 = 00000000 00000000
  1-PTE(2) @ 0x01e28010 = 00000000 00000000
  1-PTE(3) @ 0x01e28018 = 00000000 00000000
  1-PTE(4) @ 0x01e28020 = 00000000 00000000
  1-PTE(5) @ 0x01e28028 = 00000000 00000000
  1-PTE(6) @ 0x01e28030 = 00000000 00000000
  1-PTE(7) @ 0x01e28038 = 00000000 00000000
  2-PTE(0) @ 0x01ed7fc0 = 00000000 00000000
  2-PTE(1) @ 0x01ed7fc8 = 00000000 00000000
  2-PTE(2) @ 0x01ed7fd0 = 00000000 00000000
  2-PTE(3) @ 0x01ed7fd8 = 00000000 00000000
  2-PTE(4) @ 0x01ed7fe0 = 00000000 00000000
  2-PTE(5) @ 0x01ed7fe8 = 00000000 00000000
  2-PTE(6) @ 0x01ed7ff0 = 00000000 00000000
  2-PTE(7) @ 0x01ed7ff8 = 00000000 00000000
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

qy **QUERY BOOT OPTIONS** **qy**

Purpose: This command displays processor cache status

Syntax: **qy**

Examples: The following is a valid command.

On a VYFD board:

```
#0>y0.

#0>qy.
yflags = 0
ybit description               CPU 0 1 y  comments
---- -----------               --- - - -  --------
   1 L1 data cache OFF             n n n
   2 L1 insn cache OFF             n n n
   4 br history tbl OFF            n n n
   4 br prediction OFF             n n n
   8 L2 cache OFF                  y y n  (1)
  10 L2 copyback OFF               n n n
  20 L2 data only ON               n n n
  40 L2 instructions only ON       n n n
  80 store gathering OFF           n n n
  80 i&d speculative reads OFF     n n n
 100 L2 parity OFF                 n n n
 200 L3 cache OFF                  y y n  (*)
 400 L3 data only ON               n n n
 800 L3 instructions only ON       n n n
1000 L3 parity OFF                 n n n
2000 Link Register Stack OFF       n n n
4000 Branch Folding OFF            n n n

1) The L2, if it supposed to be on, will be enabled later by the OS.
3) The L3, if it supposed to be on, will be enabled later by the OS.
*) This yflag bit is not reflected in the hid0/l2cr regs of one or more CPUs.
```

On a VAFQ board:

```
#0>qy
yflags = 0
ybit description               CPU 0 1 2 3 y  comments
---- -----------               --- - - - - -  --------
   1 L1 data cache OFF             n n n n n
   2 L1 insn cache OFF             n n n n n
   4 br history tbl OFF            n n n n n
   4 br prediction OFF             n n n n n
   8 L2 cache OFF                  y y y y n  (1)
  10 L2 copyback OFF               n n n n n
  20 L2 data only ON               n n n n n
  40 L2 instructions only ON       n n n n n
  80 store gathering OFF           n n n n n
  80 i&d speculative reads OFF     n n n n n
 100 L2 parity OFF                 n n n n n
 200 L3 cache OFF                  y y y y n  (*)
 400 L3 data only ON               n n n n n
 800 L3 instructions only ON       n n n n n
1000 L3 parity OFF                 n n n n n
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

```
2000 Link Register Stack OFF       n n n n n
4000 Branch Folding OFF            n n n n n

1) The L2, if it supposed to be on, will be enabled later by the OS.
3) The L3, if it supposed to be on, will be enabled later by the OS.
*) This yflag bit is not reflected in the hid0/l2cr regs of one or more CPUs.
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

r **EXECUTE RUN** **r**

Purpose: This command starts the processor executing code. The initial program counter is either specified by the starting address or is taken to be the current value of the program counter.

Function: The **r** command inserts breakpoints and starts the processor executing at the **[start_address]**. If **[start_address]** is not specified, use the current program counter value as the starting address.

Syntax: **r[-c<n>][start_address]**

-c<n> Specifies the CPU**<n>** on which the command is to run on. If none specified, defaults to the attentive CPU.

start_address The address the processor jumps to. If you do not specify a **start_address,** the value of the program counter is used.

Example: The following is a valid command.

r4000 Runs the program whose first instruction presumably is at location 0x4000.

Additional examples of the run command are shown below.

```
#0>b \cnputs (breakpoint at _cnputs)
#0>r

Processor 0 breakpoint <CR>
C0083DE0 [00083DE0] \cnputs %*67FFF040 subu r31,r31,0x40
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

ra **EXECUTE RUN TO ADDRESS** **ra**

Purpose: This command starts the processor executing code. The initial program counter value is taken to be the current value of the program counter.

Function: The **ra** command creates a temporary breakpoint at **<address>**, inserts breakpoints, and starts the processor executing from current program counter.

Syntax: **ra [-c<n>] <address>**

-c<n>	Specifies the CPU**<n>** on which the command is to run on. If none specified, defaults to the attentive CPU.
address	The address of the application program the processor runs to.

Example: The following is a valid command.

```
#0>ra \cnrint2ecx  (run to address of cnrint2ecx)

CPU 0 breakpoint
C008251C [0008251C] cnrint2ecx %67FFF0480 subu r31,r31,0x480
#0>
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

rd **RUN WITHOUT BREAKPOINTS** **rd**

Purpose: This command starts the processor executing code. The initial program counter is either specified by the starting address or is taken to be the current value of the program counter.

Function: The **rd** command starts the processor executing at [**start_address**] without inserting breakpoints. If [**start_address**] is not specified use the current program counter value as the starting address.

Syntax: **rd [-c<n>][start_address]**

-c<n> Specifies the CPU**<n>** on which the command is to run on. If none specified, defaults to the attentive CPU.

start_address The address of the application program the processor jumps to. If you do not specify a **start_address,** the value of the program counter is used.

Example: The following is a valid command.

`#0>` **rd** Resumes execution of the program.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

rn **RUN TO NEXT INSTRUCTION** **rn**

Purpose: This command starts the processor executing code. The initial program counter is either specified by the starting address or is taken to be the current value of the program counter.

Function: The **rn** command creates a temporary breakpoint at the address following the current instruction, insert breakpoints, and starts the processor executing at **[start_address]**. If **[start_address]** is not specified use the current program counter value as the starting address.

Syntax: **rn [-c<n>] [start_address]**

-c<n> Specifies the CPU**<n>** on which the command is to run on. If none specified, defaults to the attentive CPU.

start_address The address of the application program the processor jumps to. If you do not specify a **start_address,** the value of the program counter is used.

Example: The following is a valid command.

```
#0> rn
CPU 1 breakpoint
C0082520 [00082520]    cnrint2ecx+4%    21DF0020    st.d
r14,r31,0x20
#0>
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

rr **RUN TO RETURN ADDRESS** **rr**

Purpose: This command starts the processor(s) executing code. The initial program counter is either specified by the starting address or is taken to be the current value of the program counter.

Function: The **rr** command creates a temporary breakpoint at the return address of the current C procedure, inserts breakpoints, and starts the processor(s) executing at **[start_address]**. If **[start_address]** is not specified use the current program counter value as the starting address.

Warning: In order to have this instruction function properly you must have executed the first (link) instruction.

Syntax: rr [-c<n>] [start_address]

-c<n> Specifies the CPU**<n>** on which the command is to run on. If none specified, defaults to the attentive CPU.

start_address The address of the application program the processor jumps to. If you do not specify a **start_address,** the value of the program counter is used.

Example: The following is a valid command.

```
#0> rr
breakpoint: C00908F4

CPU 1 breakpoint
C00908F4 [000908F4] _lock_driv_sema+A4% F440580F or r2,r0,0x14
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

s **SEARCH MEMORY FOR DATA** **s**

Purpose: This command displays a range of 256 bytes of memory, NVRAM address space or PCI configuration space in hexadecimal beginning at **start_address.** If the search routine locates the requested **pattern** in this page, it encloses the **pattern** with asterisks. Otherwise, it indicates that there is no match.

Syntax: **s[format] [-b<n>][-p|-i|-n][r]<start_address> <pattern>[mask]**

format Determines whether the data to be searched is in byte, word, or longword [**b**, **w**, or **l**] format (defaults to **l** if not specified). If you specify a byte format and have a longword pattern, the routine searches memory but does not find a match. The byte ordering modifier **r** is only effective on **w** or **l** data formats, and is ignored if the **-p** option is specified.

Note: Note that '**sr**' will be interpreted as the '**sr**' command, not as the '**s**' command with an '**r**' suffix.

-b<n> Specifies program base address. The base address <*n*> is added to all addresses entered from the command line (<*n*> is zero by default).

-p Address arguments are with respect to the PCI configuration space.

-i Address arguments are with respect to the VME I/O space.

-n Address arguments are with respect to the NVRAM address space.

start_address The address at which the search starts.

pattern The pattern for which memory is searched. The pattern can be a byte, word, or longword.

mask The bit mask, which is a hexadecimal value that determines the part of each longword to be compared with the **pattern.** The mask can be any hexadecimal value from 00000000 to FFFFFFFF. Default is FFFFFFFF. Bit 1 sets the mask.

Examples: The following are valid commands.

sb0 4 Search for a byte with pattern 4 starting at address 0.

Note: In the following examples, pattern matches are highlighted in bold type for illustration purposes.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Sample search procedures are shown below.

SEARCH FOR A BYTE WITH PATTERN 4 STARTING AT ADDRESS 0

```
#0>i 0 1000 0. #0>wb 15 4. #0>sb 0 4.

00000000 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00000010 00 00 00 00 00*04*00 00 00 00 00 00 00 00 00 00
00000020 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00000030 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00000040 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00000050 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00000060 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00000070 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00000080 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00000090 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
000000a0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
000000b0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
000000c0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
000000d0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
000000e0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
000000f0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
#0>
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

sr **SEARCH MEMORY RANGE FOR DATA** **sr**

Purpose: This command searches a range of memory and displays the addresses of all those locations that contained a matching pattern.

Note: When virtual addressing is used, address translation is performed in 'data' space.

Syntax: **sr[format] [-b<n>] [-p|-i|-n] <start_address> <end_address> <pattern>[mask]**

sr[format][-b<n>] [-p|-i|-n] <start_address>:<byte_count> <pattern> [mask]

format Determines whether the data to be searched is in byte, word, or longword [**b**, **w**, or **l**] format. If you specify a byte format and have a longword pattern, the routine searches memory but does not find a match. The byte ordering modifier **r** is only effective on **w** or **l** data formats (defaults to **l** if not specified), and is ignored if the **-p** option is specified.

-b<n> Specifies program base address. The base address <*n*> is added to all addresses entered from the command line (<*n*> is zero by default).

-p Address arguments are with respect to the PCI configuration space.

-i Address arguments are with respect to the VME I/O space.

-n Address arguments are with respect to the NVRAM address space.

start_address The address at which the search starts.

end_address The hexadecimal address at which the operation ends.

:byte_count Number (in hexadecimal) of bytes searched. Note that if you specify word format, **byte_count** should be a multiple of two. If you specify **longword format**, **byte_count** should be a multiple of four **pattern.** The pattern for which memory is searched. The pattern can be a byte, word, or longword.

mask The bit mask, which is a hexadecimal value that determines the part of each longword to be compared with the pattern. The mask can be any hexadecimal value from 00000000 to FFFFFFFF. Default is FFFFFFFF. Bit 1 sets the mask.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Examples: The following are valid commands.

sr0 1000 70 Search for the pattern 70 at addresses 0 through 1000.

srb0 100 4 Search for a byte with pattern 4 at addresses 0 through 100.

An example search for a byte with a pattern F0 starting at address 0 is shown below.

```
#0>i 0 1000 0.
#0>w 4FC F0.
#0>sr0 500 F0.
000004FC 000000F0
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

td **CONFIGURE CPU DOWN** **td**

Purpose: This command is used on multiprocessor SBCs to mark down the specified CPUs. The **td** command with no arguments may be used to display the current set of 'up' and 'down' CPUs.

Syntax: td [-s[w]] <cpu list> | all

-s	Save latest down state into NVRAM.
-w	Save without asking 'are you sure?'
all	Mark all but the master CPU down.

Example: The following is a valid command.

td 1	Disable processor 1.
td -sw 2	Disable processor 2, save list of all disabled processors into NVRAM and save without asking 'are you sure?'.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

tm **CONFIGURE MASTER CPU** **tm**

Purpose: This command changes the CPU the console prefers to run on.

Syntax: **tm masterCPU [attentiveCPU]**

masterCPU	The numeric id of the CPU that is to be the new master CPU.
attentiveCPU	The numeric id of the CPU that is to be the new attentive CPU. If missing, the attentive CPU is unchanged.

Example: The following is a valid command.

tm 1	Make CPU 1 the master CPU.
tm 2 3	Make CPU 2 the master CPU and CPU 3 the attentive CPU.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

tu **CONFIGURE CPU UP** **tu**

Purpose: This command is used on multiprocessor SBCs to mark up CPUs. The **tu** command with no arguments may be used to display the current set of 'up' and 'down' CPUs.

Syntax: **tu [-s[w]] all**

tu <CPU list>

-s	Save latest down state into NVRAM.
-w	Save without asking 'are you sure?'
all	Enables all processors.

Example: The following is a valid command.

tu 1	Enable CPU 1.
tu -sw 2 3	Mark CPU 2 and CPU 3 as 'up' and save the complete list of 'up' and 'down' CPUs into NVRAM.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

w **WRITE DATA TO MEMORY** **w**

Purpose: This command writes the specified hexadecimal data to memory, NVRAM address space or PCI configuration space beginning at the **start_address**. The format of the data written is controlled by the options used.

Note: When virtual addressing is used, translation is performed in 'data' space.

Syntax: **w[format] [-b<n>] [-p | -i | -n]**
<start_address><data0>[data1]...

format	Determines whether the data is written in byte, word, or longword [**b**, **w**, or **l**] format (defaults to **l** if not specified). Default is **w** in console mode, in processor mode. The byte ordering modifier **r** is only effective on **w** or **l** data formats, and is ignored if the **-p** option is specified.
-b<n>	Specifies program base address. The base address <*n*> is added to all addresses entered from the command line (<*n*> is zero by default).
-p	Address arguments are with respect to the PCI configuration space.
-i	Address arguments are with respect to the VME I/O space.
-n	Address arguments are with respect to the NVRAM address space.
start_address	The hexadecimal address at which the writing starts.
data0, data1	The data to be written to memory. The data must be hexadecimal. Note that multiple data locations can be specified.

Examples: The following are valid commands.

w1 -p 6104 0	Disables the onboard ethernet.
wb0 2.	Writes a 2 to byte 0 of memory.
w10 3.	Writes a 3 to longword 0 of memory.

Sample write commands are shown below.

WRITE BYTES TO MEMORY STARTING AT ADDRESS 0

```
#0>wb0 1 2 3 4 5 6 7 8 9 a. #0>d0 10.
00000000 01020304 05060708 090A0000 00000000
00000010 00000000
```

WRITE WORDS TO MEMORY STARTING AT ADDRESS 0

```
#0>ww0 1 2 3 4 5 6 7 8 9 a. #0>d0 10.
00000000 00010002 00030004 00050006 00070008
00000010 0009000A
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

y **INITIALIZE** **y**

Purpose: This command initializes all and selects certain processor-specific configuration options. The flag bits for the **y** command are shown in Table 3-6.

Syntax: **y flags**

flags A numerical value which is the sum of the flag values shown in Table 3-6. below.

Note 1: The **y** command always saves its result into NVRAM.

Note 2: The y command also does a partial soft reset. After its execution, no application state is valid.

Table 3-6. y Command Flag Bits

Bit	Flag	Effect
B0	001	Disable data cache
B1	002	Disable instruction cache
B2	004	Disable branch history table
B3	008	Disable L2 cache
B4	010	Disable L2 copyback/Enable write through
B5	020	Disable use of L2 by instructions
B6	040	Disable use of L2 by data (PPC 7400 only)
B7	080	Disable store gather and speculative reads
B8	100	Disable L2 parity generation/checking
B9	200	Disable L3 cache (MPC7455/7457 only)
B10	400	Enable L3 data-only mode (MPC7455/7457 only)
B11	800	Enable L3 instruction only mode (MPC7455/7457 only)
B12	1000	Disable L3 data parity check (MPC7455/7457 only)
B13	2000	Disable link register stack (MPC7455/7457 only)
B14	4000	Disable branch folding (MPC7455/7457 only)

Sample initialization commands are shown below.

`#0>`**y0** Initializes system with all caches enabled on all processors.

`#0>`**yb** Initializes system and disables data, instruction, and L2 caches on all processors.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

z **SINGLE–STEP PROCESSOR** **z**

Purpose: This command single–steps a single processor one instruction at a time. Breakpoints are inserted into memory. Any pending interrupts are executed before returning control to the console.

Syntax: **z [-c<n>] [start_address]**

-c<n> Single step the specified CPU**<n>**. If not specified, the attentive CPU will be stepped.

start_address The address of the instruction to single step. If you omit the **address**, the value of the program counter is used.

Examples:

The following are valid commands.

```
#0>z
CPU 0 single step
C0082520 [00082520] _cnrint2ecx+4% 21DF0020 st.d r14,r31,0x20
(Note that C0082520 is the next instruction to execute.)

#0>z
CPU 0 single step
C0082524 [00082524] _cnrint2ecx+8% 221F0028 st.d r16,r31,0x28

#0>z
CPU 0 single step
C0082528 [00082528] _cnrint2ecx+C% 225F0030 st.d r18,r31,0x30

#0>z -c1
CPU 1 single step
000473dc [0004D3dc] 1cad+4 % 7da80206 mflr r13
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

? **HELP COMMAND** **?**

Purpose: The help command displays a basic list of all the console commands. You can obtain more information about a command by following the question mark (**?**) with the command letter or another **?**. The help command is available immediately following power–up. Examples of the help command are shown below. The **?** command displays help and/or global dash options.

Syntax: **?** List of commands.

?	a short help overview
??	a much longer help overview
?e	help on the ‘e’ command (substitute any other command name for ‘e’)
?-	help on th most common command line options
?*	help on the most common command line editor

Example: The following are valid commands.

```
a(scii dump)
b(reakpoint)
c(opy memory)
d(isplay memory in hex)
di(sassemble memory)
e(xamine/change memory)
f(ile operations): fb(oot) fl(oad) fr(un) fc(directory list) etc
g(eneral register display/modify)
i(nitialize memory to value)
k(ick CPUs)
m(emory test)
o(ptions)
p(rocessor register display/modify)
q(uery)
r(un)
s(earch memory)
t(configure)
w(rite data to memory)
y(initialize)
z(single step)
~(various forms of hard and soft system resets)
?(help) ??(more help) ?-(option help) ?*(cmd line editor help)


 #0>?a
 a(scii dump)
 a[b|w|l][r][-b][-p|-i|-n][start_address [end_address]]
 a[b|w|l][r][-b][-p|-i|-n][start_address [:byte_count]]
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

? HELP COMMAND (Continued) ?

```
#0>??
?(help)

An expression can be one or more numeric values separated by
the arithmetic operators: plus(+) or minus(-).

numeric value
    hex digits - hexadecimal number
    $          - last address value
    %          - contents of program counter
    %regname   - contents of processor register
   `regname    - address of processor register
    [\]symbol  - address of symbol
    BnBn       - binary bits
    'n'        - ascii value

address value
    value         - address
    [value]       - physical address
    (value)       - virtual address
    *value:size   - indirect address
    *[value]:size - indirect physical address
    *(value):size - indirect virtual address

?<cmd> - help on <cmd>
?-     - help on command options

#0>?-
-(local per command options)
-p    - perform in pci cfg space
-i    - perform in vme io space
-n    - perform in nvram space
-s    - store into nvram where appropriate
-w    - when storing, don't ask `are you sure?'
-c<n> - execute on cpu 'n'
-r<n> - execute 'n' times (0 = infinite times)



#0>?*
*(command line editor keystrokes)
^f,^b  - move forward/backward one character
^a,^e  - move to beginning/end of line
del,^d - delete one character
^h     - delete prev character
^n     - recall next input line
^p     - recall previous input line
^r,^l  - redisplay input line
^k     - delete to end of input line
^u     - delete entire input line
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

? HELP COMMAND (Continued) ?

```
#0>?~
~(system and board reset functions)
  ~b - soft boot of only this board.
  ~p - hard reset of only this board (local PCI bus reset).
  ~h - hard reset of all boards in the system.  For VGM5
       boards the reset is confined to the local board if it
       is not the VMEbus system controller.
  ~o - hard reset of all boards excluding the calling board.
       Available only to VGM5 VME bus system controller boards.

The above are not commands, they are character pairs watched
for during terminal input processing.  They may be typed in,
for example while command output is occuring.  A carriage
return must preceed these keystrokes.

  ^C  stop current command output & return to console prompt.
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Appendix A
Console Command Summary

The following is an alphabetical list of the console commands along with their definition and syntax.

-A-

ASCII Dump

a[b|w|l][r][-b<n>][-p|-i|-n][start_address [end_address]]
a[b|w|l][r][-b<n>][-p|-i|-n][start_address [:byte_count]]

–B–

Breakpoints (List)

b

Breakpoints (Set)

b [-a] [-o] <address>

Breakpoints (Clear)

bk <address> | <all>

–C–

Copy Memory

c[b|w|l][r][–b<n>][-p|-i|-n]<source_start_address><source_end_address>
<destination_start_address>

c[b|w|l][r][–b<n>][-p|-i|-n]<source_start_address>:<byte_count>
<destination_start_address>

-D-

Display Memory in Hexadecimal

d[b|w|l][r][–b<n>][-p|-i|-n][start_address [end_address]]
d[b|w|l][r][–b<n>][-p|-i|-n][start_address [:byte_count]]

Disassemble Memory

di [-b<n>][-p|-i|-n][start_address [end_address]]
di [-b<n>][-p|-i|-n][start_address [:byte_count]

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

–E–

Examine/Change Memory

e[b|w|l][r][–b<n>][-p|-i|-n][start_address[data]]

-F-

Boot Operating System

fb [-c<n>][-q]
fB [-c<n>][-q] bootfile

Display Directory

fc [dir_name]

Display/Set the Default Device

fd [dev]

fd [-l]

fd [-s[w]][dev]

Display Mounted File Systems

fh

Load a Program

fl [-c<n>] <filename>

Load and Execute a Program

fr [-c<n>] <filename>[address]

–G–

General Register Display/Modify

g [-c<n>][<register_name>[data]]

–I–

Initialize Memory to Value (Fill)

i[b|w|l][r][-q][-b<n>][-p|-i|-n]<start_address><end_address>[fill_value]
i[b|w|l][r][-q][-b<n>][-p|-i|-n]<start_address>:<byte_count>[fill_value]

–K–

Kick CPUs
k

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

–M–

Memory Test

m[b|w|l][r][-b<n>][-p|-i|-n]<start_address><end_address>
m[b|w|l][r][-b<n>][-p|-i|-n]<start_address>:<byte_count>

–O–

Global Command Options

o [+|-][a][e][m][r][v][-b<n>][-c<n]

–P–

Processor Register Display/Modify

p [-c<n>][<register_name>[data]]
p [-s[w]] boot <flags>

–Q–

Query Address

qa <address>

Query Backplane

qb

Query Stack

qs[-c<n>]

Query Virtual Address

qv <virtual address>

Query Boot Options

qy

–R–

Run (Execute)

r [-c<n>][start_address]

Run (Execute to Address)

ra [-c<n>]<address>

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Run Without Breakpoints

rd [-c<n>][start_address]

Run to Next Instruction

rn [-c<n>][start_address]

Run to Return Address

rr [-c<n>][start_address]

–S–

Search Memory for Data

s[b|w|l][r][-b<n>][-p|-i|-n][r]<start_address><pattern>[mask]

Search Memory Range for Data

sr[-b|w|l][r][-b<n>][-p|-i|-n]<start_address> <end_address><pattern>[mask]
sr[-b|w|l][r][-b<n>][-p|-i|-n]<start_address>:<byte_count><pattern>[mask]

-T-

Configure CPU Down (Multiprocesor SBCs Only)

td <cpu>

Configure Master CPU

tm masterCPU [attentiveCPU]

Configure CPU Up (Multiprocesor SBCs Only)

tu [-s[w]] <cpu>

tu [-s[w]] all

–W–

Write Data to Memory

w[b|w|l][r][-b<n>][-p|-i|-n]<start_address><data0>[data1]

-Y-

Initialize

y [-c<n>]flags

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

–Z–

Single–Step Processor

z [address][-c<n>]

–?–

Help Command

?	a short help overview
??	a much long help overview
?e	help on the ‘e’ command
?-	help on command line options
?*	help on the command line editor
–	help on global options.

The following is a list of the console commands by function.

REGISTER AND MEMORY MANIPULATION

ASCII Dump

a[b|w|][|r][-b<n>][-p|-i|-n][start_address [end_address]]
a[b|w|l][r][-b<n>][-p|-i|-n][start_address [:byte_count]]

Copy Memory

c[b|w|l][r][–b<n>][-p|-i|-n]<source_start_address><source_end_address>
<destination_start_address>
c[b|w|l][r][–b<n>][-p|-i|-n]<source_start_address>:<byte_count>
<destination_start_address>

Display Memory in Hexadecimal

d[b|w|l][r][–b<n>][-p|-i|-n][start_address [end_address]]
d[b|w|l][r][–b<n>][-p|-i|-n][start_address[:byte_count]]

Disassemble Memory

di [-b<n>][-p|-i|-n][start_address [end_address]]
di [-b<n>][-p|-i|-n][start_address [:byte_count]]

Examine/Change Memory

e[b|w|l][r][–b<n>][-p|-i|-n][start_address[data]]

General Register Display/Modify

g [-c<n>][-s[w]][<register_name>[data]]

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Initialize Memory to Value (Fill)

i[b|w|l][r][-q][-b<n>][-p|-i|-n]<start_address><end_address>[fill_value]
i[b|w|l][r][-q][-b<n>][-p|-i|-n]<start_address>:<byte_count>[fill_value]

Memory Test

m[b|w|l][r][-b<n>][-p|-i|-n]<start_address><end_address>
m[b|w|l][r][-b<n>][-p|-i|-n]<start_address>:<byte_count>

Processor Register Display/Modify

p [-c<n>][-s[w]][<register_name>[data]]
p [-s[w]] boot <flags>

Search Memory for Data

s[b|w|l][r][-b<n>][-p|-i|-n]<start_address><pattern>[mask]

Search Memory Range for Data

sr[-b|w|l][r][-b<n>][-p|-i|-n]<start_address> <end_address><pattern>[mask]
sr[-b|w|l][r][-b<n>][-p|-i|-n]<start_address>:<byte_count><pattern>[mask]

Write Data to Memory

w[b|w|l][r][-b<n>][-p|-i|-n]<start_address><data0>[data1]

FILE OPERATIONS

Boot Operating System

fb [-c<n>][-q]
fB [-c<n>][-q] bootfile

Display Directory

fc [dir_name]

Display/Set the Default Device

fd [dev]
fd [-l]
fd [-s[w]] [dev]

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Display Mounted File Systems

fh

Load a Program

fl [-c<n>]<filename>[address]

Load and Execute a Program

fr [-c<n>]<filename>[address]

EXECUTION

List Breakpoints

b

Set Breakpoints

b [–a] [–o] [–b<n>] <address>

Clear Breakpoints

bk <address> | <all>

Execute Run

r[start_address]

Execute Run To Address

ra <address>

Run Without Breakpoints

rd [start_address]

Run To Next Instruction

rn [start_address]

Run to Return Address

rr [start_address]

Single–Step Processor

z [address]

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

HELP

Help Command

?	a short help overview
??	a much long help overview
?e	help on the ‘e’ command
?-	help on command line options
?*	help on the command line editor
?~	help on system and board reset functions
–	help on global options.

MISCELLANEOUS

Global Command Options

o [+|–] [a] [-c<n>] [e] [m] [r] [v] [–b<n>]

Query Address

qa<address>

Query Backplane

qb

Query Stack

qs[-c<n>]

Query Virtual Address

qv<virtual address>

Query Boot Options

qy

Configure CPU Down (Multiprocessor SBCs Only)

td [-s][-w]<CPU list>

Configure CPU Up (Multiprocessor SBCs Only)

tu [-s[w] all

Configure Master CPU (Multiprocessor SBCs Only)

tm masterCPU [attentiveCPU]

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Initialize

y flags

Table A-1 lists the command parameters, range and their definitions.

Table A-1. Command Parameter Definitions

Parameter	Range	Comment
address		Can be any valid physical or virtual address (if the **o+v** option is set), including the device address.
base		The address into which the program is loaded. Default is 2000
byte_count		Number of bytes displayed.
data	[00000000–FFFFFFFF]	Data to be passed to the program. This data is format dependent.
dev	mt(c,u,p,b,l) dsk(c,u,p,b,l) where c = slot number; u = unit on controller 'c'; p = partition number (0–7); b = bus number where 0 = PCI and 1 = VME l = logical unit number	The device that is used by the command.
dir_name		The directory name.
destination_start_address		The address where the destination is started
end_address		The address at which the operation stops.
fill_value	[00000000–FFFFFFFF]	The value that is loaded into each memory location.
format	[**b**, **w**, or **l**] [r]	The amount of bits that the data appears in. Formats are byte, word, or longword (**b**, **w**, or **l**) Default is Big-Endian display; **r** specifies Little-Endian display.
mask		The bit mask is a hexadecimal value that determines which part of each longword is to be compared with the pattern.
options	**-b<n>,-c<n>,-n** **-p,-o,-s -w**	The conditions the console operates under.
pattern	[00000000–FFFFFFFF]	The pattern for which memory is searched.
Continued on next page		

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table A-1. Command Parameter Definitions (Cont.)

Parameter	Range	Comment
register_name	pc, msr, cr, spl, r0– r31, lr, ctr, xer, mq, tid, dsisr, dar, fpscr, sr0-sr15, sdr0, sdr1, eim0, eim1, eis0, eis1, 23	The name of a register.
spec		A file specification, in the following format: **`[dev] pathname`**. This file contains the file to be loaded. If the **m** option of the **o** command is set **(o+m)**, you must provide the device on which the directory is located via a **`fd`** command or by specifying **`dsk/`**.
start_address		The address at which the operation starts.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Appendix B
Error Codes

The following is a numerical list of the console error codes that may appear on the screen whenever a console command is executed and an error is detected.

Debugger Error Codes

error 0001: syntax error

The command entered contained a syntax error. Use the help command to obtain the correct syntax (e.g., **?d**).

error 0002: undefined symbol

The symbol name used is not defined or the symbols are not loaded. If trying to reference a processor symbol, ensure that the console is in the processor mode (**o+p**) and the processor symbol table has been loaded. To load processor symbols, bit 7 of the pboot register must be set (e.g., **pboot 80.**) before issuing the **fb** or **fr** command.

error 0003: starting address must be less than ending address

When specifying an address range, the second address must be greater than the first address. To specify a byte count instead of an ending address use a colon '**:**' (e.g., **d 100:10**).

error 0004: illegal CPU number

The processor number used is not a valid processor. Ensure that the processor number is a processor and the processor is marked 'up'. The **qb** command may be used to query the current configuration.

error 0005: invalid stack frame

The **rr** command requires that a valid stack frame exists to enable a return address to be extracted. Ensure that the processor has executed the link instruction of the current C procedure.

error 0006: date/time format: y/m/d h:m:s

When setting the time of century clock, the format of the date and time was incorrect. The correct format is: *y/m/d h:m:s.*

error 0007: duplicate breakpoint

An attempt was made to set a breakpoint at an address that already contained a breakpoint. To correct this situation, remove the old breakpoint first with a **bk** command.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

error 0008: breakpoint table full

An attempt was made to set a breakpoint when eight breakpoints already exist. A maximum of eight breakpoints may be set at any one time. To correct this situation remove an existing breakpoint before setting the new one.

error 0009: memory doesn't match

While using the **e** command, data read does not match data written. The **e** command always verifies that it can read any data that it writes.

error 000B: illegal option

An illegal option letter was specified on the **o** command. A list of legal options may be displayed by typing **?o**.

error 000C: illegal register

The register name specified after the '%' was not a valid register name. Use the **g** and **p** command to obtain a complete list of valid register names. If trying to reference a processor register, ensure that the console is in the processor mode (**o+p**).

error 000D: no symbol for address

An address was specified on a command that did not correspond to a symbol name. Ensure that the correct mode processor (**o+p**) or **CP** (**o-p**) is set. Also ensure that the symbol table is loaded. To load processor symbols, bit 7 of the pboot register must be set (e.g., **pboot 80**.) before issuing the **fb** or **fr** command.

error 000F: illegal option '-n'

An illegal option **n** was used on a command. Use the help command to obtain a list of legal options for the command.

error 0010: option '-n' requires an argument

The option n requires an argument. Ensure that there is no space between the option letter and the argument (e.g., **-c3** is correct, **-c 3** is wrong). Use the help command to get a list of legal options for the command.

error 0011: console locked

An attempt was made to use the console when it was disabled at the control panel switch. Before using the console, it must be enabled at the control panel switch.

error 0012: unable to access memory using backplane

The console is unable to access system memory using the backplane. Most likely system memory is not functional. Use the **m** command to verify system memory.

error 0013: failed to load/boot

The **fb** command was unable to load the program "boot" from the default boot device. Ensure that the correct boot device is selected with the **fd** command.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

error 0014: low tocc battery

When accessing the time of century clock (TOCC), the console detected a low battery. To correct this problem, replace the TOCC battery.

error 001B: bad device or pathname

An invalid device name or pathname was specified on one of the **f** commands. Ensure that the pathname starts with a slash **/**. Use the help command **?f** to verify the correct syntax is being used. The device must be either **dsk(c,u,p,b,l)** or **mt(c,u,p,b,l)** (e.g., **fd dsk(0), fd mt(0)**.

Where: **c** – controller number
u – unit number (optional)
p – partition number (optional)
b – bus number (optional) (0 = primary).
l - logical unit number (default = 0)

error 0020: read failed, offset x

A disk or tape read at byte offset *x* failed. To correct this problem, try a different disk or tape drive.

error 0021: open failed

The open of a disk or tape failed.

error 0022: n in open

An illegal bus was specified on a **f** command. Use a **0** to specify the primary bus, and a **1** for the secondary bus. Ensure that the bus exists. Use the **qb** command to query the system configuration.

error 0022: n in open

A device type other than ‘dsk’ or ‘mt’ was used.

error 0023: not a directory

Either an I/O error occurred or the device does not contain a valid file system. Verify that the disk or tape contains valid data and retry the command.

error 0027: CPU x failed to single step

The console single steps a processor by setting the trace bit in the **sr** register and running that particular processor. If the processor does not take a trace exception within one second, the single step fails. This error most frequently occurs with the **z** command, but it can also occur with the **r** command. The **r** command uses single stepping to skip over breakpoints.

error 0029: a: expected n, actual m

A memory test detected an error at address a. The value *n* was written to memory and the value *m* was read back.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

error 002A: All CPUs must be halted

An **f** command was attempted when one or more processors where running. All of the processors must be halted with the **h** command before initiating an **f** command.

error 002E: invalid memory destination

An internal error occurred in the console which caused it to perform an invalid memory reference. Reset the console with **<CR>~b** and retry the command.

error 002F: register 'n' is read only

An attempt was made to modify processor register *n*. Register *n* is a read only register and may not be modified.

error 0030: CPU must be running

A command was attempted that expected a running processor. If a **tu** command (applicable to multiprocessor SBCs only) was being attempted use the **r** command instead.

Console Debugger Error Codes

error 0201: boot script missing

A script by the name 'boot' should always exist. The 'boot' script gets executed at power up and should contain commands to boot the operating system. The default 'boot' script contains the command **fb**.

error 0202: slot n is not valid

A command referenced slot *n* that was either empty or did not contain a board of the proper type. Use the **qb** command to display the hardware configuration of the system.

error 020F: invalid segment descriptor, vaddr=n

While translating virtual address *n* to a physical address, the console referenced an invalid segment descriptor in system memory. Ensure that the crp and segment descriptor are valid.

error 0210: page not in memory, vaddr=n

While translating virtual address *n* to a physical address, the console detected that the page containing the virtual address was not in system memory. Since the page is not in memory the data in this page is not accessible to the console. Ensure that the virtual address is within the bounds of the memory allocated to be accessed by the console.

error 0264: CPU n marked down

For multiprocessor SBCs only. Processor *n* was marked down due to either a **td** command or the detection of an error. The up/down status of a processor can be checked via the **qb** command.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

error 0265: CPU n is not valid

A command referenced a processor that does not exist. Use the **qb** command to display the system hardware configuration.

error 0267: vaddr (n) is supervisor protected

An attempt was made to perform a virtual address translation in user space, and that address was marked as supervisor – protected.

error 0268: (batc) probe operation failed on CPU n

The console instructed a secondary processor to perform a memory management unit probe operation to check for BATC valid translation at a given address. No response was received.

error 0280: CPU n failed to acknowledge DCB request

The console could not communicate with processor *n*.

error 0281: CPU n failed to set DCB done bit

Processor *n* did not complete a console request.

I/O Error Codes

error 0601: null path

An internal console error occurred when the console was opening a file. Reset the console with **<CR>~b** and retry the command.

error 0602: file not found

An attempt was made to open a file that does not exist. Ensure that a valid pathname was specified. Use the **fc** command to verify that the file exists. Reset system via the **fd** command to ensure that the media is properly partitioned. Suspect corrupt file, rerun from a back–up file.

error 0603: block number negative

The device being read does not contain a valid file system. Verify that the disk or tape contains valid data and retry the command. Reset system via the **fd** command to ensure that the media is properly partitioned. Suspect corrupt file, rerun from a back–up file.

error 0604: block number overflow

The device being read does not contain a valid file system. Verify that the disk or tape contains valid data and retry the command. Reset system via the **fd** command to ensure that the media is properly partitioned. Suspect corrupt file, rerun from a back–up file.

error 0605: indirect block number void

The device being read does not contain a valid file system. Verify that the disk or tape contains valid data and retry the command. Reset system via the **fd** command to ensure that the media is properly partitioned. Suspect corrupt file, rerun from a back–up file.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

error 0606: block number void

The device being read does not contain a valid file system. Verify that the disk or tape contains valid data and retry the command. Reset system via the **fd** command to ensure that the media is properly partitioned. Suspect corrupt file, rerun from a back–up file.

error 0607: not a directory

The device being read does not contain a valid file system. Verify that the disk or tape contains valid data and retry the command. Reset system via the **fd** command to ensure that the media is properly partitioned. Suspect corrupt file, rerun from a back–up file.

error 0608: zero length directory

The device being read does not contain a valid file system. Verify that the disk or tape contains valid data and retry the command. Reset system via the **fd** command to ensure that the media is properly partitioned. Suspect corrupt file, rerun from a back–up file.

error 060E: cannot write files

An attempt was made to write a file. The console does not support device writes. This error code should not occur under normal operating conditions and therefore it indicates an operator error. Reset the console with **<CR>~b** and retry the command.

error 060F: no more file slots

An internal console error occurred while opening a file. Reset the console with **<CR>~b** and retry the command. If error still occurs, suspect a corrupted file.

error 0610: no more disk buffers

An internal console error occurred while allocating a disk buffer. This error code should not occur under normal operating conditions and therefore it indicates an operator error. Reset the console with **<CR>~b** and retry the command.

error 0611: super block read error

The device being read does not contain a valid file system. Verify that the disk or tape contains valid data and retry the command. Reset system via the **fd** command to ensure that the media is properly partitioned. Suspect corrupt file, rerun from a back–up file.

error 0612: read error

An I/O read error occurred. Previous message should indicate type of error.

error 0613: zero length directory record

The device being read does not contain a valid file system. Verify that the disk or tape contains valid data and retry the command. Reset system via the **fd** command to ensure that the media is properly partitioned. Suspect corrupt file, rerun from a back–up file.

error 0614: bad magic number in super block

The device being read does not contain a valid file system. Verify that the disk or tape contains valid data and retry the command. Reset system via the **fd** command to ensure that the media is properly partitioned. Suspect corrupt file, rerun from a back–up file.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

error 0615: CP system device unavailable, retrying

The console was unable to open the boot device during a **fb** command. The console attempts 12 retries then stops trying. Ensure that at least one Generic Disk (GD) disk controller exists in the primary I/O bus and the disk is spun up and ready.

640 Series Console Errors

These error codes (0640 through 064F) apply to the Concurrent SCSI Adapters, Generic Disk (GD), and Generic Tape (GT) devices, and the definition of the symptom will reflect which controller is displaying the error code. For example, if **error 0645: NCR Controller not found** is displayed on the console terminal, then the NCR controller is the source of the error code. However, if the generic disk controller is indicating this same error: **error 0645: GD:Controller not found** is displayed on the console terminal.

error 0640: ___: No error

This error can only result from an internal hardware or software error.

error 0641: ___: Interface not configured

This error results from selecting a disk or tape device that is not valid for this machine type. Use the **fd** command to select an appropriate device type.

error 0642: ___: Invalid Command

This error can only result from an internal hardware or software error.

error 0643: ___: Unsupported command

This error can only result from an internal hardware or software error.

error 0644: ___: Bad device specification

This error results from selecting a disk or tape device that is not valid. Use the **fd** command to select an appropriate device type.

error 0645: ___: Controller not found

This error results when an invalid controller number has been provided as part of a device specification. Use the **fd** command to select an appropriate controller number (0 through 9).

error 0646: ___: Device not found

This error results when the device was not found at the specified hardware address. Use the **fd** command to select a new device address.

error 0647: ___: Device type mismatch

This error results when the device specification referred to a disk (tape) when the real device found at that address was a tape (disk). Ensure that the correct address was used with the **fd** command.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

error 0648: ___: Controller timed out

This error results when a I/O controller (NCR or IS) or device malfunctions, or an internal software error occurs. Suspect the I/O controller or device malfunction. Reset the system and retry the command.

error 0649: ___: Controller reports fatal error

This error results when a I/O controller (NCR or IS) or device malfunctions, or an internal software error occurs. Suspect the I/O controller or device malfunction. Reset the system and retry the command.

error 064A: ___: Unrecovered device error

This error results when a I/O controller (NCR or IS) or device malfunctions, or an internal software error occurs. Suspect the I/O controller or device malfunction. Reset the system and retry the command.

error 064B: ___: Device not ready

This type of error occurs when the device is off–line, disk is not up to speed, or malfunctioning. Ensure that the device is off–line and operational. Reset the system and retry command.

error 064C: ___: Unit attention condition

This type of error occurs for an unexpected SCSI device/bus reset, device power loss, or media change. Ensure that the device is on–line and operational. Reset the system and retry command.

error 064D: ___: Device hit a filemark

This type of error occurs for an unexpected filemark or the End–Of–Valid–Data indicator was hit during tape operations. Probable tape read error. Reset the system and retry the command. If subsequent attempts also fail, secure a new tape and retry command. If, with a new tape, the attempt fails, suspect the device is malfunctioning and should be replaced.

error 064E: ___: Device reports end-of-medium

This type of error occurs for an unexpected filemark or the End–Of–Valid–Data indicator was hit during tape operations. Probable tape read error. Reset the system and retry the command. If subsequent attempts also fail, secure a new tape and retry command. If, with a new tape, the attempt fails, suspect the device is malfunctioning and should be replaced.

error 064F: ___: Device busy

This error occurs when an unexpected “BUSY” condition is reported by the SCSI device. Reset the system and retry the command. If the error condition still exists, suspect a device malfunction and replace suspected device.

650 Series Console Errors

These error codes (0650 through 065A) apply to the SCSI Adapter and the definition of the symptom will reflect which controller is displaying the error code. For example, if **error 0650: Bad NCR module id** is displayed on the console terminal then the NCR controller is the source of the error code.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

error 0650: Bad ___ module id

A probe for a controller returned a bad module id code. Ensure that a controller exists in the slot being probed. If a controller exists suspect the controller.

error 0651: Bad ___ bus no

An open of a device was attempted with a bad bus number. Ensure that a valid bus number (**0** = primary) is specified on the **fd** command.

error 0652: Bad ___ slot no

An open of a device was attempted with a bad slot number. Ensure that a valid slot number (2 through 9) is specified on the **fd** command.

error 0653: Bad ___ ctrl no

An open of a device was attempted with a bad controller number. Ensure that a valid controller number (2 through 9) is specified on the **fd** command.

error 0654: Bad ___ unit no

An open of a device was attempted with a bad drive number. Ensure that a valid unit number (0 through 7) is specified on the **fd** command.

error 0655: Bad ___ partition no

An open of a device was attempted with a bad partition number. Ensure that a valid partition number (0 through 7) is specified on the **fd** command.

error 0657: ___: SCSI request sense failed

This type of error occurs when a NCR or SCSI device is malfunctioning. Reset the system and retry the command. If the error still occurs, suspect a device or controller malfunction. Attempt to run the I/O diagnostic programs.

error 0658: ___: SCSI inquiry failed

This type of error occurs when a NCR or SCSI device is malfunctioning. Reset the system and retry the command. If the error still occurs, suspect a device or controller malfunction. Attempt to run the I/O diagnostic programs.

error 0659: ___: SCSI test unit ready failed

This type of error occurs when a NCR or SCSI device is malfunctioning. Reset the system and retry the command. If the error still occurs, suspect a device or controller malfunction. Attempt to run the I/O diagnostic programs.

error 065A: ___: SCSI load tape command failed

This type of error occurs when a NCR or SCSI device is malfunctioning. Reset the system and retry the command. If the error still occurs, suspect a device or controller malfunction. Attempt to run the I/O diagnostic programs.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

6B0 Series Console Errors

These error codes (06B0 through 06B4) apply to the Generic Disk (GD) and Generic Tape (GT) devices, and the definition of the symptom will reflect which controller is displaying the error code. For example, if **error 06B0:GT:Interface not found** is displayed on the console terminal, the generic tape controller is the source of the error code. However, if the generic disk controller is indicating this same error: **error 06B0: GD: Interface not found** is displayed on the console terminal.

error 06B0: ___: Interface not found

This error can only result from an internal hardware or software error.

error 06B1: ___: Device not initialized

This error can only result from an internal hardware or software error.

error 06B2: ___: Read failed

This error results when a I/O controller or device malfunctions, or an internal software error occurs. Suspect the I/O controller or device malfunction. Reset the system and retry the command. If the operation still fails, ensure that the I/O controller and device are all the current revision and run the diagnostic programs to validate the hardware.

error 06B3: ___: Write unsupported

This error can only result from an internal hardware or software error.

error 06B4: ___: Bad request size

This error can only result from an internal hardware or software error.

error 06C0: GD: Can't read disk status

This error results when a I/O controller or device malfunctions, or an internal software error occurs. Suspect the I/O controller or device malfunction. Reset the system and retry the command. If the operation still fails, ensure that the I/O controller or device are all the current revision and run the diagnostic programs to validate the hardware.

error 06C2: GD: Drive off-line

An I/O request to the GD controller returned drive off–line status. Ensure that the drive is on–line and retry the command.

error 06C3: GD: Can't read geometry block

Either an I/O error occurred or the disk has not been formatted. Verify that the disk has been properly formatted. Suspect a medium fault. Restore file and reformat.

error 06C4: GD: Bad geometry block header

Either an I/O error occurred or the disk has not been formatted. Verify that the disk has been properly formatted. Suspect a medium fault. Restore file and reformat.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

error 06C5: GD: Bad geometry block checksum

Either an I/O error occurred or the disk has not been formatted. Verify that the disk has been properly formatted. Suspect a medium fault. Restore file and reformat.

error 06C6: GD: Null partition

A null length partition was specified on the **fd** command. To correct this situation, select a different partition with the **fd dsk(n,n,partition no.)** command and retry the command. Suspect media.

error 06D0: GT: Seek failed

This type of error occurs when a SCSI device is malfunctioning. Reset the system and retry the command. If the error still occurs, suspect a device malfunction. Attempt to run the I/O diagnostic programs and replace board(s) indicated.

error 06D1: GT: Load command failed

This type of error occurs when a SCSI device is malfunctioning. Reset the system and retry the command. If the error still occurs, suspect a device malfunction. Attempt to run the I/O diagnostic programs and replace board(s) indicated.

error 06D2: GT: Unload command failed

This type of error occurs when a SCSI device is malfunctioning. Reset the system and retry the command. If the error still occurs, suspect a device malfunction. Attempt to run the I/O diagnostic programs and replace board(s) indicated.

error 06D3: GT: Rewind command failed

This type of error occurs when a SCSI device is malfunctioning. Reset the system and retry the command. If the error still occurs, suspect a device malfunction. Attempt to run the I/O diagnostic programs and replace board(s) indicated.

error 06D4: GT: Space fwd file command failed

This type of error occurs when a SCSI device is malfunctioning. Reset the system and retry the command. If the error still occurs, suspect a device malfunction. Attempt to run the I/O diagnostic programs and replace board(s) indicated.

error 06D5: GT: Space back rec command failed

This type of error occurs when a SCSI device is malfunctioning. Reset the system and retry the command. If the error still occurs, suspect a device malfunction. Attempt to run the I/O diagnostic programs and replace board(s) indicated.

error 06D6: GT: Space fwd rec command failed

This type of error occurs when a SCSI device is malfunctioning. Reset the system and retry the command. If the error still occurs, suspect a device malfunction. Attempt to run the I/O diagnostic programs and replace board(s) indicated.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

error 06D7: GT: Cannot seek to partition

This type of error occurs for an unexpected filemark or the End–Of–Valid–Data indicator was hit during tape operations. Probable tape read error. Reset the system and retry the command. If subsequent attempts also fail, secure a new tape and retry command. If, with a new tape, the attempt fails, suspect the device is malfunctioning and should be replaced.

error 0972: CPU n failed interrupt reset: RHAC = X

Processor *n* could not reset all interrupt requests.

error 0973: CPU n IGA configuration ram xxx: expected xx received xx

Processor *n* interrupt configuration RAM failed test.

error 0974: CPU n IGA level decode programming failed

Processor *n* failed the level decode programming.

error 0975: CPU n IGA ipl decode programming failed

Processor *n* failed the ipl decode programming.

error 0976: CPU n IGA vector table programming failed

Processor *n* failed the vector table programming.

error 0980: CPU n exception: vector x ("description") epsr x exip x enip x

Processor *n* had an unexpected exception, a register dump follows to aid in debugging

error 0981: CPU n cannot be disabled

Processor *n* can not be disabled via normal procedures.

error 0983: Cannot single-step across a trap/rte instruction, pc = x

A trap or rte instruction at pc location x cannot be single-stepped.

0984: exception x occurred while processing exception y

Another exception *x* occurred during the processing of exception *y*.

error 0990: board in slot n failed to report board configuration

The processor board in slot *n* did not power up/reset correctly.

error 0991: CPU n failed to report status after reset

Processor *n* did not report its error status after a reset.

error 0992: CPU n reported error code x (description)

Processor *n* reported error *x* which is described here.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

`error 0993: Global memory x failed RAM test`

The global memory *x* failed RAM test during reset, and is currently not being used by the console.

`error 0999: Backplane reset aborted`

An error condition was detected which caused the reset of the backplane to be aborted.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Index

Numerics

640 Series error codes B-7
650 Series Error Codes B-8
6B0 Series Error Codes B-10

A

Address Value 3-7
Alphabetical List of Commands A-1

C

Command Editing 3-9
Command Format 3-5
  Command Manipulators 3-7
Command Manipulators 3-7
Command Parameter Definitions A-9
Command Specifier 3-5
Console Commands 3-9
  ASCII DUMP 3-10
  BOOT OPERATING SYSTEM 3-24
  CLEAR BREAKPOINTS 3-15
  CONFIGURE CPU DOWN 3-59
  CONFIGURE CPU UP 3-61
  CONFIGURE MASTER CPU 3-60
  COPY MEMORY 3-16
  DISASSEMBLE MEMORY 3-21
  DISPLAY DIRECTORY 3-26
  DISPLAY MEMORY IN HEXADECIMAL 3-18
  DISPLAY MOUNTED FILE SYSTEMS 3-29
  DISPLAY SPECIAL PURPOSE REGISTERS 3-45
  EXAMINE/CHANGE MEMORY 3-22
  EXECUTE RUN 3-50
  EXECUTE RUN TO ADDRESS 3-51
  GENERAL REGISTER DISPLAY/MODIFY 3-32
  GLOBAL COMMAND OPTIONS 3-38
  HELP COMMAND 3-65
  INITIALIZE 3-63
  INITIALIZE MEMORY TO VALUE (FILL) 3-34, 3-35
  KICK CPUs 3-36
  LIST BREAKPOINTS 3-13
  LOAD A PROGRAM 3-30
  LOAD AND EXECUTE A PROGRAM 3-31
  MEMORY TEST 3-37
  PROCESSOR REGISTER DISPLAY/MODIFY 3-39, 3-40
  QUERY ADDRESS 3-43
  QUERY BACKPLANE 3-44
  QUERY BOOT OPTIONS 3-48
  QUERY STACK 3-46
  QUERY VIRTUAL ADDRESS 3-47
  RUN TO NEXT INSTRUCTION 3-53
  RUN TO RETURN ADDRESS 3-54
  RUN WITHOUT BREAKPOINTS 3-52
  SEARCH MEMORY FOR DATA 3-55
  SEARCH MEMORY RANGE FOR DATA 3-57
  SET BREAKPOINTS 3-14
  SINGLE-STEP PROCESSOR 3-64
  WRITE DATA TO MEMORY 3-62
Console Debugger Error Codes B-4
Console Debugging Commands--Summary 3-3
Console Initialization 2-7
Console Special Key Functions 3-9
Console Terminal Selection 1-1

D

Data Size and Formats 3-5
Debugger Error Codes B-1
display/set the default device 3-27

E

Execution Commands A-7

F

FDiag Initialization 2-1
File Operations Commands A-6

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

G

Global Options 3-6

H

Help Command A-8

I

I/O Error Codes B-5

L

Local Options 3-6

M

Miscellaneous Commands A-8

N

Numeric Values 3-6

P

program counter 3-50

R

Register and Memory Minipulation Commands A-5

S

Summary of Commands 3-1
    Command Editing 3-9
Syntax Conventions 3-2
System Boot 2-9
System Entry to Console 2-11
System Initialization 2-1

V

VAFQ Reset Pushbutton 2-12
VYFD Reset Switch 2-12
VYFD SMI Switch 2-12

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Spine for 1/2” Binder

Product Name: 0.5" from top of spine, Helvetica, 36 pt, Bold

Volume Number (if any): Helvetica, 24 pt, Bold

Volume Name (if any): Helvetica, 18 pt, Bold

Manual Title(s): Helvetica, 10 pt, Bold, centered vertically within space above bar, double space between each title

Bar: 1" x 1/8" beginning 1/4" in from either side

Part Number: Helvetica, 6 pt, centered, 1/8" up



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP