Sun™ StorEdge™ A7000 VME Quad Block Mux Channel Diagnostics Reference Manual

THE NETWORK IS THE COMPUTER™

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Preface

Sun StorEdge A7000 VME Quad Block Mux Channel Diagnostics Reference Manual is specific to the Extended Diagnostic provided for testing the Quad Block Mux Channel Adapter boards. This manual contains the following information:

- Program initialization procedures
- Test descriptions
- Descriptions of messages produced by this program

Note – This manual does not address the power up diagnostics for the Quad Block Mux Channel Adapter boards. The power up diagnostics are described in the *Quad Block Mux Channel (QBMC) Adapter Engineering Summary.*

How This Book Is Organized

Chapter 1 “Diagnostic Overview” describes the Extended Diagnostic used for testing the Quad Block Mux Channel Adapter boards.

Chapter 2 “Program Initialization” describes the initialization options provided when running this diagnostic in interactive mode.

Chapter 3 “Program Tests” describes the individual diagnostic tests.

Chapter 4 “Program Messages” describes the messages produced by the diagnostic during program execution.

Typographic Conventions

TABLE P-1 Typographic Conventions

Typeface or Symbol	Meaning	Examples
AaBbCc123	The names of commands, files, and directories; on-screen computer output.	`Do you need help? Enter Y or N (CR)`
AaBbCc123	What you type, when contrasted with on-screen computer output.	`Enable milestone messages = N ;[cr,?,^,Y,N]?`**`Y`**
AaBbCc123	Book titles, new words or terms, words to be emphasized. Variable expressions; replaced with a real name or value.	Read Chapter 2 in the *Sun StorEdge A7000 ROM Monitor Reference Manual.* `slot` *`n`*`:Loading extended image qbmcdiag`
[ ]	In system output examples, brackets indicate optional values. If several values are placed inside brackets, any or none of them can be displayed. Brackets are also used in system prompts to enclose the response choices.	In the following example, displaying the slot number is optional: `[Slot` *`n`*`:]`

Related Documentation

TABLE P-2 Related Documentation

Type	Title
User interface	*Sun StorEdge A7000 ROM Monitor Reference Manual*
Diagnostic reference	*Sun StorEdge A7000 Diagnostics Reference Manual*
Hardware reference	*Quad Block Mux Channel (QBMC) Adapter Engineering Summary*

Note – The *Quad Block Mux Channel (QBMC) Adapter Engineering Summary* provides additional information about the hardware, software, and diagnostics. Refer to this manual before running diagnostics to verify that the board jumpers and switch settings are correct.

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CHAPTER 1

Diagnostic Overview

Introduction

The VME Quad Block Mux Channel Diagnostic is an Extended Diagnostic used to verify the functionality of the Quad Block Mux Channel Adapter boards. This program verifies the:

- Ability of the board to execute a Reset Channel command.
- Operation of the VME interrupt lines.
- Ability to run on-board diagnostic tests on the board in internal loopback mode.
- VME DMA functions to expansion memory.
- BTI to tailgate in internal loopback mode.
- BTI to tailgate in external loopback mode.
- Failover feature.
- Ability to download data and microcode into the board.

This is a disk based diagnostic normally executed during the power up testing sequence. If configured, the program is automatically called from the ROM Monitor after the Built-in Self Tests (BISTs) are executed. You may also use individual ROM Monitor commands to execute this diagnostic. Refer to the *Sun StorEdge A7000 Diagnostics Reference Manual* for extended diagnostic commands and execution procedures.

Testing Considerations

- Use Control-C to terminate an operation in interactive mode. Any environment variable changes made under the control of this diagnostic are preserved when the Control-C sequence is initiated.
- Use the Escape key to abort an Extended Diagnostic and return control to the Interactive Mode Options Menu. Any environment variable changes made under the control of this diagnostic are preserved when the escape sequence is initiated.

CHAPTER 2

Program Initialization

Initialization Options

When running in interactive mode, the VME Quad Block Mux Channel Diagnostic provides initialization options for:

- Enabling and disabling the BTI to Tailgate Internal Loopback test
- Enabling and disabling the BTI to Tailgate External Loopback test
- Displaying milestone messages

Select the `Initialize Diag.` option from the Interactive Mode Options Menu to initialize the diagnostic. The interactive mode options are described in the *Sun StorEdge A7000 Diagnostics Reference Manual*.

Initialization Procedure

Once you select `Initialize Diag.` from the Interactive Mode Options Menu, the program displays a series of initialization prompts. The following responses are standard for all initialization prompts:

TABLE 2-1 Standard Prompt Responses

Response	Description
`cr`	Press the return key to select the default response displayed in the prompt.
`?`	Display help information.
`^`	Return to the Interactive Mode Options Menu.

1. The diagnostic first displays the following help information prompt:

```
Do you need help? Enter Y or N (CR)
```

   Enter `Y` to display a help message. Enter `N` or press the Return key to bypass displaying help information. The default response is `N`.

2. The program then displays:

```
Do you wish to run Tailgate Internal Loopback test = N  ;[cr,?,^,Y,N]?
```

   Enter one of the following or a standard response:

Response	Description
`Y`	Enables running the BTI to Tailgate Internal Loopback test.
`N`	Inhibits running the BTI to Tailgate Internal Loopback test.

   If you enter `Y`, the program displays:

```
*** Attach tailgate cable. Press RETURN when ready. ***
```

Note – Tailgate Internal Loopback testing requires operator intervention to install a tailgate cable.

3. The program displays:

```
Do you wish to run Tailgate External Loopback tests = N  ;[cr,?,^,Y,N]?
```

Enter one of the following or a standard response:

Response	Description
Y	Enables running the BTI to Tailgate External Loopback tests.
N	Inhibits running the BTI to Tailgate External Loopback tests.

If you enter Y, the program displays:

```
*** Install tailgate cables, external loopback terminators, ***
*** & tailgate board jumpers. Press RETURN when ready.   ***
```

Note – Tailgate External Loopback testing requires operator intervention.

4. The program displays:

```
Enable milestone messages = N  ;[cr,?,^,Y,N]?
```

Enter one of the following or a standard response:

Response	Description
Y	Enables displaying all milestone messages.
N	Inhibits displaying milestone messages.

5. The program displays:

```
Do you wish to change default subtest selection = N  ;[cr,?,^,Y,N]?
```

Enter one of the following or a standard response:

Response	Description
Y	Enables looping on a specific subtest.
N	Inhibits looping on a subtest.

If you enter Y, the program displays:

```
Enter subtest selection(s) = a  ;[cr,?,^,(c c...)]?
```

Enter the characters associated with the desired subtests or enter one of the standard responses. Valid subtests range from a through z.

Note – To run tests in interactive mode, use the a, e, or t option from the Interactive Mode Options Menu to select the desired tests. Then use the r option to start test execution. The interactive mode options are described in the *Sun StorEdge A7000 Diagnostics Reference Manual*.

CHAPTER 3

Program Tests

Test Summary

The VME Quad Block Mux Channel Diagnostic contains the following tests:

Test	Test Name
1	Channel Reset
2	Interrupt Testing
3	On-board Diagnostics
4	VME/DMA Data Transfer
5	VME/DMA Variable Transfer Size
6	BTI to Tailgate Internal Loopback
7	BTI to Tailgate External Loopback
8	Failover (One Node Configuration)
9	Failover (Two Node Configuration)
10	Download, Init, & Ring Testing

Note – Only Tests 1 through 4 and 10 are run during the power up testing sequence or in automatic mode. All tests can be run in interactive mode.

Milestone messages may be displayed during test execution. Refer to Chapter 4 for descriptions of the milestone messages.

Test 1 Channel Reset

This test issues a `Reset Channel` command to the board and verifies that the board resets successfully. The test first verifies that the board is ready to receive commands. If not, resynchronization is attempted. If resynchronization fails, testing is terminated. If resynchronization is successful, testing continues.

The test displays the following message to identify the channel under test:

```
Testing Channel x
```

Variable	Description
x	Specifies the channel under test (0, 1, 2 or 3).

The test then sets the interrupt enable bit in register CR1 to enable the board interrupts (workstation interrupts). It writes the `Reset Channel` command into register CR0, one byte at a time. After the board has processed a byte, it generates an interrupt. If no interrupt is generated or a timeout occurs, an error is reported.

If an interrupt is generated, the test checks the Interrupt Status Vector. If it is correct, the test then checks the OK and ERR bits in register CR2. If the OK bit is set, the test proceeds to write the next byte of the `Reset Channel` command into the CR0 register. If the ERR bit is set, the test reports an error.

After sending the last byte of the `Reset Channel` command message, the test checks the DIAG_OK bit in register CR2. If the bit is set, the channel reset was successful. If the bit is not set, an error is reported.

The test then disables the interrupt enable bit in register CR1.

Test 2 Interrupt Testing

This test verifies six VME interrupt levels and different combinations of status ID. The test issues a `Reset Channel` command to the board and verifies that the board resets successfully. It first verifies that the board is ready to receive commands. If not, resynchronization is attempted. If resynchronization fails, testing is terminated. If resynchronization is successful, testing continues.

The test displays the following message to identify the channel under test:

```
Testing Channel x
```

Variable	Description
x	Specifies the channel under test (0, 1, 2 or 3).

The test then starts testing the interrupts. It sets the workstation interrupts and writes the `Reset Channel` command into register CR0, one byte at a time. If no interrupt is generated, a timeout occurs and an error is reported. If an interrupt is generated, the test checks the interrupt status vector. If the status vector is correct, the test then verifies the status. Any error is reported.

After checking all interrupt levels, the test disables the interrupt enable bit in register CR1 (work-station interrupts) and restores the original interrupt request level. The test then sends a `Reset Channel` command and verifies the result in the status register. If no response is received from the channel reset, an error is reported. After testing is completed, the test restores the default interrupt states and ID levels.

Test 3 On-board Diagnostics

This test verifies the ability to run the on-board diagnostics and verifies that the diagnostics execute successfully.

Once started, the test displays the following message to identify the channel under test:

```
Testing Channel x
```

Variable	Description
x	Specifies the channel under test (0, 1, 2 or 3).

The test issues a `Reset Channel` command to the board and verifies that the board resets successfully. It first verifies that the board is ready to receive commands. If not, resynchronization is attempted. If resynchronization fails, testing is terminated. If resynchronization is successful, testing continues.

The test then performs the following operations:

- Enables interrupts.
- Enables workstation interrupts.
- Sends a `Diag` command to the board, one byte at a time.

If no interrupt is generated, a timeout occurs and an error is reported. If an interrupt is generated, the test checks the interrupt status vector. If the vector is correct, the test verifies the status. If an error occurs, the test reports the error.

The test then sends a `Reset Channel` command and verifies the result in the status register. If no response is received from the channel reset, an error is reported.

Test 4 VME/DMA Data Transfer

This test verifies the ability to run the VME/DMA on-board diagnostic using different data patterns and verifies that the diagnostic executes successfully. The test includes the following subtests:

Subtest	Data Pattern
a	All Ones
b	All Zeros
c	A's and 5's (0x`AA55AA55`)
d	Address in Address

The test issues a `Reset Channel` command to the board and verifies that the board resets successfully. It first verifies that the board is ready to receive commands. If not, resynchronization is attempted. If resynchronization fails, testing is terminated. If resynchronization is successful, testing continues.

The test displays the following message to identify the channel under test:

```
Testing Channel x
```

Variable	Description
x	Specifies the channel under test (0, 1, 2 or 3).

The test then performs the following operations:

- Enables workstation interrupts.
- Fills the output buffer with a data pattern.
- Initializes the input buffer.
- Enables interrupts.
- Sends a `Diag` command to the board, one byte at a time.

If no interrupt is generated, a timeout occurs and an error is reported. If an interrupt is generated, the test checks the interrupt status vector. If the vector is correct, the test verifies the status. If an error occurs, the test reports the error.

The test verifies the data transferred correctly. It then sends a `Reset Channel` command and verifies the result in the status register. If no response is received from the channel reset, an error is reported.

For the 501-5113-02 board, the test verifies that the checksum was returned correctly. If an error occurs, the checksum error is reported with the following message:

```
checksum data exp: exp, act: act, at addr: addr
```

Variable	Description
exp	Specifies the expected checksum data.
act	Specifies the actual checksum data received.
addr	Specifies the address of the checksum data.

Test 5 VME/DMA Variable Transfer Size

This test verifies the ability to run the VME/DMA on-board diagnostic using variable transfer sizes and verifies that the diagnostic executes successfully. The test includes the following subtests:

Subtest	Address Boundary
a	Boundary 0
b	Boundary 1
c	Boundary 2
d	Boundary 3
e	Boundary 4
f	Boundary 5
g	Boundary 6
h	Boundary 7

The test issues a `Reset Channel` command to the board and verifies that the board resets successfully. It first verifies that the board is ready to receive commands. If not, resynchronization is attempted. If resynchronization fails, testing is terminated. If resynchronization is successful, testing continues.

The test displays the following message to identify the channel under test:

```
Testing Channel x
```

Variable	Description
x	Specifies the channel under test (0, 1, 2 or 3).

The test then performs the following operations:

- Enables workstation interrupts.
- Fills the output buffer with a binary progression pattern.
- Initializes the input buffer.
- Enables interrupts.
- Initializes the `Diag` command with the VME write/read buffer address at a specific boundary. The boundary is changed for each subtest.
- Sends the `Diag` command to the board, one byte at a time.

If no interrupt is generated, a timeout occurs and an error is reported. If an interrupt is generated, the test checks the interrupt status vector. If the vector is correct, the test verifies the status. If an error occurs, the test reports the error.

The test verifies that the data transferred correctly. It then sends a `Reset Channel` command and verifies the result in the status register. If no response is received from the channel reset, an error is reported.

For the 501-5113-02 board, the test verifies that the checksum was returned correctly. If an error occurs, the checksum error is reported with the following message:

```
checksum data exp: exp, act: act, at addr: addr
```

Variable	Description
exp	Specifies the expected checksum data.
act	Specifies the actual checksum data received.
addr	Specifies the address of the checksum data.

Test 6 BTI to Tailgate Internal Loopback

This test verifies the ability to run the internal loopback on-board diagnostic and verifies that the diagnostic executes successfully. The test verifies the channel interface between the BTI chip and the Tailgate board. This test requires that the QBMC channel to be tested is cabled to the Tailgate board.

This test displays the following message:

```
WARNING: Do not run Test 6 if tailgate cable is not attached.
```

The test issues a `Reset Channel` command to the board and verifies that the board resets successfully. It first verifies that the board is ready to receive commands. If not, resynchronization is attempted. If resynchronization fails, testing is terminated. If resynchronization is successful, testing continues.

The test displays the following message to identify the channel under test:

```
Subtest x: Testing Channel y
```

Variable	Description
x	Specifies the subtest. Each subtest checks a different channel.
y	Specifies the channel under test (0, 1, 2 or 3).

The test then performs the following operations:

- Enables interrupts.
- Enables workstation interrupts.
- Sends a `Diag` command to the board, one byte at a time.

If no interrupt is generated, a timeout occurs and an error is reported. If an interrupt is generated, the test checks the interrupt status vector. If the vector is correct, the test verifies the status. If an error occurs, the test reports the error.

The test then sends a `Reset Channel` command and verifies the result in the status register. If no response is received from the channel reset, an error is reported.

Note – This test is bypassed unless you enabled Tailgate Internal Loopback testing during program initialization.

To test a specific channel, initialize the program to change the subtest selection, and then select the subtest associated with the channel you want to test.

Test 7 BTI to Tailgate External Loopback

This test verifies the ability to run the external loopback on-board diagnostic and verifies that the diagnostic executes successfully. The test verifies the channel interface between the BTI chip and the Tailgate board. This test requires that the QBMC channel to be tested is cabled to the Tailgate board and the external loopback connectors are installed on the Tailgate board.

The test issues a `Reset Channel` command to the board and verifies that the board resets successfully. It first verifies that the board is ready to receive commands. If not, resynchronization is attempted. If resynchronization fails, testing is terminated. If resynchronization is successful, testing continues.

This test displays the following message:

```
WARNING:  Test 7 requires that the channels to be tested are cabled
          to the tailgate board, & the tailgate board jumpers are
          installed. Connect external loopback terminators to channels
          under test.
```

The test displays the following message to identify the channel under test:

```
Subtest x: Testing Channel y
```

Variable	Description
x	Specifies the subtest. Each subtest checks a different channel.
y	Specifies the channel under test (0, 1, 2 or 3).

The test then performs the following operations:

- Enables interrupts.
- Enables workstation interrupts.
- Sends a `Diag` command to the board, one byte at a time.

If no interrupt is generated, a timeout occurs and an error is reported. If an interrupt is generated, the test checks the interrupt status vector. If the vector is correct, the test verifies the status. If an error occurs, the test reports the error.

The test then sends a `Reset Channel` command and verifies the result in the status register. If no response is received from the channel reset, an error is reported.

Note – This test is bypassed unless you enabled Tailgate External Loopback testing during program initialization.

To test a specific channel, initialize the program to change the subtest selection, and then select the subtest associated with the channel you want to test.

Test 8 Failover (One Node Configuration)

This test verifies the ability to run the BTI to Tailgate external loopback on-board diagnostics and verifies that the diagnostics execute successfully when the failover feature is enabled in a one node configuration. The test requires that the QBMC channel to be tested is cabled to the Tailgate board and the Tailgate board jumpers are installed. This test includes one subtest for each channel under test.

The test performs the following operations for the 501-5292 board:

- Displays the following message:

```
WARNING:  Test 8 requires that the channel to be tested is cabled
          to the tailgate board, & the tailgate board jumpers are
          installed.
```

- Issues a `Reset Channel` command to the board and verifies that the board resets successfully. It first verifies that the board is ready to receive commands. If not, resynchronization is attempted. If resynchronization fails, testing is terminated. If resynchronization is successful, testing continues.

- Displays the following message to identify the channel under test:

```
Subtest x: Testing Channel y
```

Variable	Description
x	Specifies the subtest. Each subtest checks a different channel.
y	Specifies the channel under test (0, 1, 2 or 3).

The test then performs the following operations:

- Displays the following message:

```
This subtest requires the external loopback connector on the tailgate
board to be disconnected on channel x and connected on channel y.

Press RETURN when ready.
```

Variable	Description
x	Specifies the channel under test.
y	Specifies a channel not under test.

- Enables VME and workstation interrupts.
- Enables failover.
- Sends a `Diag` command to the board, one byte at a time.

If no interrupt is generated, a timeout occurs and an error is reported. If an interrupt is generated, the test checks the interrupt status vector. If the vector is correct, the test verifies the status. If an error occurs, the test reports the error.

The test disables failover and workstation interrupts and then sends a `Reset Channel` command and verifies the result in the status register. If no response is received from the channel reset, an error is reported.

The test performs the following operations for the 501-5113 board:

- Displays the following message:

```
WARNING:  Test 8 requires that the channels to be tested are cabled
          to the tailgate board, & the tailgate board jumpers are
          installed. Connect the external loopback terminators on the
          tailgate board of channels under test.
```

- Issues a `Reset Channel` command to the board and verifies that the board resets successfully. It first verifies that the board is ready to receive commands. If not, resynchronization is attempted. If resynchronization fails, testing is terminated. If resynchronization is successful, testing continues.
- Displays the following message to identify the channel under test:

```
Subtest x: Testing Channel y
```

Variable	Description
x	Specifies the subtest. Each subtest checks a different channel.
y	Specifies the channel under test (0, 1, 2 or 3).

The test performs the following operations to verify that both pairs of channels have external loopback terminators connected:

- Disables failover.
- Sends a `Diag` command to the board, one byte at a time, to both pairs of channels. If the command is unsuccessful, the test reports an error:

```
This subtest requires the external loopback connector on the tailgate
board to be connected to channel n and nn.
```

Variable	Description
n	Specifies the channel under test.
nn	Specifies the adjacent channel.

The test then verifies the failover feature with the following operations:

- Enables VME and workstation interrupts.
- Enables failover.
- Sends a `Diag` command to the board, one byte at a time.

If no interrupt is generated, a timeout occurs and an error is reported. If an interrupt is generated, the test checks the interrupt status vector. If the vector is correct, the test verifies the status. If an error occurs, the test reports the error.

The test verifies that failover is blocked by performing the following operations:

- Sends a `Diag` command to the board, one byte at a time, to the adjacent channel. If the command completes successfully, the test reports an error:

```
Failover Failed!
```

- Sends a `Reset Channel` command to disable failover and verifies the result in the status register. If no response is received from the channel reset, an error is reported.

Note – This test is bypassed unless you enabled Tailgate External Loopback testing during program initialization.

To test a specific channel, initialize the program to change the subtest selection, and then select the subtest associated with the channel you want to test.

Test 9 Failover (Two Node Configuration)

This test verifies the ability to run the BTI to Tailgate external loopback on-board diagnostics and verifies that the diagnostics execute successfully when the failover feature is enabled in a two node configuration. The test requires that both QBMC boards are cabled to the Tailgate board and the Tailgate board jumpers are installed. This test includes one subtest for each channel under test.

The test performs the following operations:

- Displays the following message:

```
NOTE:  Test 9 requires operator intervention.
       This test requires that both QBMC boards are cabled to the
       tailgate board, & the tailgate board jumpers are installed.
       Repeat this test for all channels on the QBMC under test.
       Repeat this test for all QBMC Controllers to be tested.
```

- Issues a `Reset Channel` command to the board and verifies that the board resets successfully. It first verifies that the board is ready to receive commands. If not, resynchronization is attempted. If resynchronization fails, testing is terminated. If resynchronization is successful, testing continues.

- Displays the following message to identify the channel under test:

```
Subtest x: Testing Channel y
```

Variable	Description
x	Specifies the subtest. Each subtest checks a different channel.
y	Specifies the channel under test (0, 1, 2 or 3).

- Displays the following message:

```
Disconnect external loopback terminator from the tailgate board
on the channel to be tested and connect loopback on the opposite
channel of the other QBMC board.

Press RETURN when ready.
```

The test then performs the following operations:

- Disables failover.
- Sends a `Diag` command to the board, one byte at a time. If the command completes successfully, the test reports the error:

```
This subtest requires the external loopback connector on the tailgate
board to be disconnected on channel x and connected on channel x of
the other node.
```

Variable	Description
x	Specifies the channel number (0, 1, 2 or 3).

- Enables VME and workstation interrupts.
- Enables failover.
- Sends a `Diag` command to the board, one byte at a time, to verify Failover.
- If no interrupt is generated, a timeout occurs and an error is reported. If an interrupt is generated, the test checks the interrupt status vector. If the vector is correct, the test verifies the status. If an error occurs, the test reports the error.
- Sends a `Reset Channel` command to disable failover and verifies the result in the status register. If no response is received from the channel reset, an error is reported.

Note – This test is bypassed unless you enabled Tailgate External Loopback testing during program initialization.

To test a specific channel, initialize the program to change the subtest selection, and then select the subtest associated with the channel you want to test.

Test 10 Download, Init, & Ring Testing

This test verifies the ability to download microcode and initializes and tests the ring structures. The test issues a `Reset Channel` command to the board and verifies that the board resets successfully. It first verifies that the board is ready to receive commands. If not, resynchronization is attempted. If resynchronization fails, testing is terminated. If resynchronization is successful, testing continues.

The test displays the following message to identify the channel under test:

```
Testing Channel x
```

Variable	Description
x	Specifies the channel under test (0, 1, 2 or 3).

The test then performs the following operations:

- Enables interrupts.
- Downloads the appropriate microcode and sets up the ring structures. If no interrupt is generated, a timeout occurs and an error is reported. If an interrupt is generated, the test checks the interrupt status vector. If the vector is correct, the test then verifies the status. If an error is detected, the test reports the error.
- Enables channel interrupts.
- Sends a `Reset` command. If no interrupt is generated, a timeout occurs and an error is reported. If an interrupt is generated, the test checks the interrupt status vector. If the vector is correct, the test then checks the status.
- Sends an `Init` command to initialize application parameters. If no interrupt is generated, a timeout occurs and an error is reported. If an interrupt is generated, the test checks the interrupt status vector. If the vector is correct, the test then checks the status.

- Sends a `Define Rings` command to establish ring definitions. If no interrupt is generated, a timeout occurs and an error is reported. If an interrupt is generated, the test checks the interrupt status vector. If the vector is correct, the test then checks the status.
- Enables channel interrupts.
- Sends an `Offline Ring` command and verifies that the Offline operation was successful. If no interrupt is generated, a timeout occurs and an error is reported. If an interrupt is generated, the test checks the interrupt status vector. If the vector is correct, the test then checks the status.
- Enables channel interrupts.
- Sends a `Halt Ring` command and verifies that the Halt operation was successful. If no interrupt is generated, a timeout occurs and an error is reported. If an interrupt is generated, the test checks the interrupt status vector. If the vector is correct, the test then checks the status.
- Enables channel interrupts.
- Sends a `Reset` command. If no interrupt is generated, a timeout occurs and an error is reported. If an interrupt is generated, the test checks the interrupt status vector. If the vector is correct, the test then verifies the status.
- Disables workstation interrupts.

CHAPTER 4

Program Messages

Introduction

The following types of messages are associated with the VME Quad Block Mux Channel Diagnostic:

- Monitor
- Start
- Cleanup
- Milestone
- Pass and Error Count
- Error

Monitor Messages

If this diagnostic is configured during automatic testing, the ROM Monitor displays the following program information on the operator's console before calling the diagnostic:

```
Slot n: Loading extended image qbmcdiag
```

Variable	Description
n	Specifies the slot number of the Quad Block Mux Channel Adapter board.

Note – The ROM Monitor cannot identify the slot associated with an extended diagnostic running in interactive mode.

Start Messages

Once called by the ROM Monitor or loaded interactively, the VME Quad Block Mux Channel Diagnostic displays its start message on the operator's console in the following format:

```
Extended Quad Block Mux Channel Diagnostic
Diagnostic Revision: y.y
[Slot: s,] Board CSR Addr: 0xaaaaaaaa - 0xbbbbbbbb
[Copyright year Sun Microsystems, Inc.]
```

Variable	Description
y.y	Specifies the current revision of the diagnostic.
s	Specifies the slot number of the board under test. The slot number is displayed only when the diagnostic is running in automatic mode.
aaaaaaaa	Specifies the default starting address of the memory address range assigned to this board.
bbbbbbbb	Specifies the default ending address of the memory address range assigned to this board.
year	Specifies the year the program was copyrighted. The copyright message is displayed only when the diagnostic is running in interactive mode.

If the diagnostic is running in interactive mode, it then displays the Interactive Mode Options Menu.

If the board CSR address was changed during program initialization, the program then displays the selected value in the following format:

```
Board CSR Addr: 0xaaaaaaaa - 0xbbbbbbbb
```

Variable	Description
aaaaaaaa	Specifies the selected starting address of the memory address range assigned to this board.
bbbbbbbb	Specifies the selected ending address of the memory address range assigned to this board.

Before testing is started, the program displays the board information with one of the following messages:

```
Board Id: id, Rev: rev, Date: date, Serial No: number

Invalid Board Id: id
```

Variable	Description
id	Specifies the board identification mnemonic (QBMC) or a hexadecimal value read from the Id PROM.
rev	Specifies the board revision letter.
date	Specifies the board revision date.
number	Specifies the board serial number.

Note – The Online switches on the tailgate panel must be in the ON position.

Cleanup Messages

Cleanup messages are displayed if you entered q or Control-C to exit the diagnostic in interactive mode and you enabled milestone messages during program initialization. The program first displays:

```
cleaning up -
```

If cleanup is required, the program appends one or more periods (.) to the message during the cleanup sequence. When the cleanup sequence is completed, the following is appended to the message:

```
- exiting
```

Milestone Messages

Milestone messages are displayed only when the diagnostic is running in interactive mode and you enabled milestone messages during program initialization. The milestone messages for this diagnostic are grouped into the following categories:

- Initialization
- Test Startup
- Resynchronization
- Test Specific
- Command Related

Initialization Milestone Messages

During its initialization sequence, the diagnostic obtains the VMEbus base address and displays it with the following milestone message:

```
vme base address: 0x vbus
```

Variable	Description
vbus	Specifies the VMEbus base address.

Test Startup Milestone Messages

As each test starts execution, the diagnostic displays a test milestone message:

```
Running Test tt: testname
```

Variable	Description
tt	Specifies the test number.
testname	Specifies the name of the test.

If the test contains subtests, the diagnostic displays a subtest milestone as each subtest starts:

```
Subtest x: name
```

Variable	Description
x	Specifies the subtest letter.
name	Specifies either the name of the subtest or information identifying the channel under test.

Each test first verifies that the board is ready to receive commands. If resynchronization is required, the diagnostic displays a series of Resynchronization milestone messages.

Resynchronization Milestone Messages

If the board under test is not ready to receive commands, resynchronization is attempted. During resynchronization, the test displays a milestone message in the following format:

```
Attempting resynchronization -
```

The test appends one or more periods (.) to the message while waiting for resynchronization to complete. If resynchronization is unsuccessful, the following is appended to the message and testing is terminated:

```
- Resynchronization Failed!
```

If resynchronization is successful, the following is appended to the message and testing continues:

```
- Resynchronization Successful
```

Test Specific Milestone Messages

Tests 2 through 10 display additional milestone messages that are test specific.

Test 2 Milestone Messages

The following milestone messages are displayed during Test 2:

```
.     Testing interrupt status I.D.'s and levels.
      Level = lvl
```

Variable	Description
lvl	Specifies the interrupt level under test. During testing, one or more periods (.) are appended to the `Level` message.

Test 3 Milestone Messages

The following Test 3 milestone messages are associated with the on-board diagnostic tests.

```
.     Running on-board micro-code tests.
      .  Uart Local Loopback Test ..........................PASSED
      .  VIC Write/Read Register Test ......................PASSED
      .  BTI_0 Write/Read Register Test ....................PASSED
      .  BTI_1 Write/Read Register Test ....................PASSED
      .  Buffer Memory Write/Read Test .....................PASSED
      .  BTI_0 Buffer Memory DMA Test ......................PASSED
      .  BTI_1 Buffer Memory DMA Test ......................PASSED
      .  Interrupt Test ....................................PASSED
      .  Timer Test ........................................PASSED
```

Note – The test displays either `PASSED` or `FAILED` for each microcode test.

Tests 4 and 5 Milestone Messages

The following Tests 4 and 5 milestone messages are associated with the on-board VME DMA diagnostic test.

- While running the VME DMA test, the diagnostic displays:

```
.    Running on-board micro-code tests.

    output addr: outaddr, size: outsize
     input addr: inaddr,  size: insize
      . VME DMA Test ..................................PASSED
     outaddr: outwd0, outaddr1: outwd1
     inaddr:  inwd0,  inaddr1:  inwd1
```

Note – The test displays either PASSED or FAILED after executing the microcode test.

Variable	Description
outaddr	Specifies the starting address of the output buffer.
outsize	Specifies the number of bytes to be written.
inaddr	Specifies the starting address of the input buffer.
insize	Specifies the number of bytes to be read.
outwd0	Specifies the contents of output word 0.
outaddr1	Specifies the starting address of the output buffer plus one word.
outwd1	Specifies the contents of output word 1.
inwd0	Specifies the contents of input word 0.
inaddr1	Specifies the starting address of the input buffer plus one word.
inwd1	Specifies the contents of input word 1.

- Before the checksum is verified, the diagnostic displays:

```
Board Id: 0xaaaa
```

Variable	Description
aaaa	Specifies the board ID value.

■ After the checksum is verified, the diagnostic displays:

```
checksum data exp: exp, act: act, at addr: addr
```

Variable	Description
exp	Specifies the expected checksum data.
act	Specifies the actual checksum data received.
addr	Specifies the address of the checksum data.

Test 6 Milestone Messages

The following Test 6 milestone messages are associated with the on-board Internal Loopback diagnostic test:

```
.    Running on-board micro-code tests.
     .  BTI_0 to Tailgate Internal Loopback Test ..........PASSED
     .  BTI_1 to Tailgate Internal Loopback Test ..........PASSED
```

Note – The test displays either PASSED or FAILED for each microcode test.

Tests 7 and 8 Milestone Messages

The following Tests 7 and 8 milestone messages are associated with the on-board External Loopback diagnostic tests:

```
.    Running on-board micro-code tests.
     .  BTI_0 to Tailgate External Loopback Test ..........PASSED
     .  BTI_1 to Tailgate External Loopback Test ..........PASSED
```

Note – The test displays either PASSED or FAILED for each microcode test.

Test 9 Milestone Messages

The following milestone messages are displayed during Test 9:

```
Testing Channel x
.     Failover disabled
.     Running on-board micro-code tests.
.     BTI_0 to Tailgate External Loopback Test ...
      External Loopback Terminator disconnected on channel x
Testing Channel x
.     Failover enabled
.     Running on-board micro-code tests.
.     BTI_0 to Tailgate External Loopback Test ...
      Failover Successful
.     Sending reset command.
```

Variable	Description
x	Specifies the channel under test.

Test 10 Milestone Messages

The following milestone messages are displayed during Test 10:

- When the test begins downloading microcode, it displays:

```
.     Downloading microcode.
```

- When the test sends an `Init` command, it displays:

```
.     Initializing application parameters.
```

- When the test sends the `Define Rings` command, it displays:

```
.     Establishing ring definitions.
```

Command Related Milestone Messages

The following type of milestone message is displayed during any test each time a command that is not reported with a test specific milestone message is issued to the board:

```
.     Sending cmd command.
```

Variable	Description
cmd	Specifies the command sent to the board.

Pass and Error Count Messages

If the diagnostic is running during the automatic testing sequence, it displays PASS when the program executes successfully. If the program fails, the diagnostic displays FAIL.

If the diagnostic is running in interactive mode, the following message is displayed after each pass is completed:

```
Pass Count: pppppppp
```

Variable	Description
pppppppp	Specifies the number of program passes completed.

If an error occurs, the program displays the number of errors at the end of each pass in the following format:

```
Pass Count: pppppppp, Error Count: eeeeeeee
```

Variable	Description
pppppppp	Specifies the number of program passes completed.
eeeeeeee	Specifies the number of errors encountered since the program started execution.

Error Messages

If an error is detected during interactive mode testing, the diagnostic displays an error header and message in the following format:

```
Extended Quad Block Mux Channel Diagnostic Failed  Time:hh:mm:ss
Board CSR Addr: 0xaaaaaaaa - 0xbbbbbbbb
Error: Slot s: CPU n: BMC: Test t:  test name
error message
```

Variable	Description
hh:mm:ss	Specifies the system elapsed time when the error occurred.
aaaaaaaa	Specifies the starting address of the memory address range assigned to this board.
bbbbbbbb	Specifies the ending address of the memory address range assigned to this board.
s	Specifies the slot number of the board under test. When the diagnostic is running in interactive mode, the board slot number is always reported as 0.
n	Specifies the number of the CPU running the diagnostic.
t	Specifies the number of the failing test. If an error occurs during the initialization sequence, the test number is reported as 0.
test name	Specifies the name of the failing test.
error message	Specifies one of the following types of error messages: Initialization Interrupt Command Execution Reset Channel Checksum Data Onboard Diagnostic Cleanup Data

Initialization Error Messages

If the Control/Status Register (CSR) address is not a multiple of 0x100 during the program initialization sequence for automatic testing, the diagnostic displays:

```
Invalid board CSR address
```

If the board is installed in slot 0, the diagnostic displays:

```
slot 0, Invalid slot number
```

If the ROM Monitor revision is not equal to the expected value, the diagnostic displays:

```
*** WARNING: Invalid ROM Monitor Version ***
```

If the program is unable to read the ROM Monitor revision, it displays:

```
MSC Read Monitor Revision Error
```

Interrupt Error Messages

If no interrupt is generated when a command byte is sent to the board, the diagnostic displays:

```
Interrupt timed out on VME level n
```

Variable	Description
n	Specifies the expected VME interrupt level from 1 to 7.

If the Interrupt Status ID contains the incorrect value, the diagnostic displays:

```
Interrupt Status I.D. error, exp: ee  act: aa
```

Variable	Description
ee	Specifies the expected Interrupt Status ID value.
aa	Specifies the actual Interrupt Status ID value.

If no interrupt is generated by a `Halt Ring` command, the diagnostic displays:

```
Interrupt timed out waiting for halt ring response on VME level n
```

Variable	Description
n	Specifies the expected VME interrupt level.

Command Execution Error Messages

If an error occurs when the board is receiving a command message byte, the diagnostic displays an error message in one of the following formats:

```
Error receiving byte, Status code: code

Error receiving byte d of n, Status code: code
```

Variable	Description
d	Specifies the failing command byte.
n	Specifies the number of bytes sent.
code	Specifies an error code associated with the board's error status. The error codes are described in the *Quad Block Mux Channel (QBMC) Adapter Engineering Summary.*

Reset Channel Error Messages

If an error occurs during the execution of the `Reset Channel` command, the diagnostic displays:

```
Reset not accepted or error on reset, Status code: code
```

Variable	Description
code	Specifies an error code associated with the board's error status. The error codes are described in the *Quad Block Mux Channel (QBMC) Adapter Engineering Summary.*

If an error occurs after a `Reset Channel` command, the diagnostic displays:

```
VME Interface test error, Status code: code
```

Variable	Description
code	Specifies an error code associated with the board's error status. The error codes are described in the *Quad Block Mux Channel (QBMC) Adapter Engineering Summary.*

Checksum Data Error Messages

If a checksum data error occurs, the diagnostic displays:

```
Checksum Error, Exp: exp, Act: act
```

Variable	Description
exp	Specifies the expected checksum data.
act	Specifies the actual checksum data received.

On-board Diagnostic Error Messages

If the response ring parameters received from a `Ring` command are incorrect, the diagnostic displays:

```
SENT:       command (0xcode)
RECEIVED:  Response ring command   = cmd
           Error code              = xx
```

Variable	Description
command	Specifies the name of the failing command.
code	Specifies the hexadecimal command code value.
cmd	Specifies the hexadecimal response ring command code value.
xx	Specifies an error code associated with the board's error status. The error codes are described in the *Quad Block Mux Channel (QBMC) Adapter Engineering Summary.*

Cleanup Error Messages

If an error results from the Master Reset during the cleanup sequence, the diagnostic displays:

```
Resynchronization Failed!
```

If an error occurs while reading the real-time clock during the cleanup sequence, the diagnostic displays:

```
MSC Read Real Time Clock Error
```

Data Error Messages

If a data error is detected, the diagnostic displays:

```
Data Error(s)
Data exp: 0xexp, rcvd: 0xact, at addr 0xaddr
```

Variable	Description
exp	Specifies the expected data value.
act	Specifies the actual data received.
addr	Specifies the address of the actual data.