2108-G07/R03 Firmware &

2108 G07 Extended DDF Memory Testing (Data Path Protection Firmware)

1. Background

The Data Path Protection firmware is intended to provide a method for confirming the integrity of the data path through the SAN Data Gateway. This test uses pattern data moved through various memory interfaces to insure that all data paths into and out of command processing memory and data flow memory (DDF) are correctly functional.

Current tests in use are already verifying the integrity of the memories, and are testing the memory interfaces in short transactions. This additional test uses long burst transfers to more completely test the function of the interfaces on the data path.

The Data Path Protection firmware executes while the SAN Data Gateway is in operation, without affecting on-going transactions. The Data Path Protection firmware can run periodically or be executed on demand.

1.1 SAN Data Gateway and SAN Data Gateway Router

The Data Path Protection Firmware is designed to test data paths to and from the DDFM card of the SAN Data Gateway. This card has 2 independent data paths, one from the Primary PCI Bus and one from the Secondary PCI bus. The Data Path Protection Firmware executes transfer over both these paths, to explicitly verify integrity on both.

The SAN Data Gateway Router has no DDFM card. Data buffer space is located in the same memory used for the central processor. This memory is accessed through a single path, regardless of the bus location of the device accessing the memory (FC adapters on the Primary PCI Bus, SCSI adapters on the Secondary PCI Bus, or the Central Processor).

In both the SAN Data Gateway and the SAN Data Gateway Router, a memory integrity test, called the Memory Scrubber, is executed. In the case of the SAN Data Gateway, the Memory Scrubber runs on a single interface to the DDFM. The Data Path Protection Firmware extended this test to provide a check on the other data path. In the SAN Data Gateway Router, the Memory Scrubber already tests the one and only interface to the memory, so a further Data Path Protection is not needed.

In addition to memory testing, the SAN Data Gateway and SAN Data Gateway Router periodically test connections between the central processor and the I/O controllers. These tests further assure the integrity of the PCI buses and the PCI interface components.

2. Test Coverage

The SAN Data Gateway uses 2 PCI buses to pass data between I/O controllers (Fibre Channel and SCSI), command processing memory, DDF memory and the system processor. The test will write and read patterned data through the interfaces, to insure proper operation on all memory interfaces and on both PCI buses. All memory interfaces are tested with both reads and writes.

3. On Demand Test for Tape

When a SAN Data Gateway is used in tape backup applications, the Software Data Path Test is used to confirm integrity of the data paths. This test runs on demand as the result of host software issuing one of the commands in the list below immediately after the host issues a WRITE command:

- WRITE FILE MARK
- REWIND
- LOAD/UNLOAD
- ERASE
- SPACE
- LOCATE

If an error is found on the data path, the tape command will fail, and there will be a Hardware Error. See “Hardware Error Actions”, below.

4. Hardware Error Actions

1. Following detection of a hardware error due to a~~a~~ data path fault, a message will appear in the SAN Data Gateway Event log, with the following codes:

```
CLASS: CS_EVCLASS_SYSTEM_FAULT        0x07

CODE: CS_EVCODE_IBF                   0x0A

ERROR NUM:DATA FLOW_FAULT             0x1010
```

2. The SAN Data Gateway will be reset into an un-bootable state. The "**RDY**" LED will be on, and not blinking.

5. Corrective Actions

1. Make sure that all I/O is stopped.
2. Unplug the ethernet cable, as well as all FC and SCSI cables.
3. Connect the null modem cable (and the 9- to 25-pin adapter if applicable) between the computer serial (COM) port and the SAN Gateway Service Port. If the Service Terminal is already connected, skip to Step 10, below.
4. Turn on the service terminal.
5. On the service terminal, select the HyperTerminal icon and double-click on it. This example uses HyperTerminal, but other terminal emulation packages are available. Follow instructions that come with the application, if you are not using HyperTerminal.
6. In the New Connection dialog enter SAN Gateway for the name and click **OK**.
7. In the Connect To dialog, for the Connect using field select the COM Port number that you have chosen and click **OK**.
8. In the COM Properties dialog select the following:
   Bits per second: 19200
   Data bits: 8
   Parity: None
   Stop bits: 1
   Flow Control: Xon/Xoff
9. Click **OK**.
10. Enter the `@` command at the VxWorks Boot prompt:

```
[VxWorks Boot]: @
```

11. The SAN Gateway will partially start, and the "**RDY**" LED will flash rapidly.
12. From the service terminal, type the `diagBoot` command and press **Enter**:

```
diagBoot
```

13. Wait for the SAN Gateway to reboot.

14. At the `diagmode >` prompt, diagnostic tests may be executed. If the only error recorded in the SAN Gateway Event Log is "Data Flow Fault", use the `ddfc` command.

```
diagmode > ddfc
```

If “ddfc” returns a failure status, and no other errors are indicated, replace the DDF memory card.

15. If other errors are indicated, follow the instructions in Chapter 3, "Maintenance Action Plans" and Appendix C, "Diagnostic Command Reference" in the *SAN Gateway Service Guide*.

6. Returning the SAN Data Gateway to Use

1. Type the `normalBoot` command and press **Enter**.

```
diagmode > normalBoot
```

2. Wait for the SAN Gateway to begin its reboot.

3. The SAN Data Gateway is still unbootable. At the `[VxWorks Boot]:` prompt, begin editing the boot parameters by entering the `c` command:

```
[VxWorks Boot]: c
```

The boot parameters will display, line by line. Press **Enter** to move to the next field:

```
'.' = clear field;  '-' = go to previous field;  ^D =
quit

boot device          : lnPci

processor number     : 0

host name            : brewmaster2

file name            : ffs0:vxWorkst.Z

inet on ethernet (e) : 192.168.30.201
```

```
inet on backplane (b):
host inet (h)         : 192.168.30.19
gateway inet (g)      : 192.168.30.1
user (u)              : agent
ftp password (pw) (blank = use rsh): agent99
flags (f)             : 0x4
target name (tn)      : MyGateway
startup script (s)    :
other (o)             :


Write complete
[VxWorks Boot]:
```

4. Press **Enter** to move through all fields that do not need to be changed. The first field that needs to be changed will be the `flags(f)` field. Change the `flags (f)` field to `0x8`:

```
flags (f): 0x8
```

5. Press **Enter** again to continue moving through fields that do not need to be changed. Then ~~4~~change the `startup script (s)` field to `ffs0:sna.rc`:

```
startup script (s): ffs0:sna.rc
```

6. When the `[VxWorks Boot]:` prompt is seen again, reboot the system:

```
[VxWorks Boot]: @
```

7. System should boot normally:

```
[VxWorks Boot]: @

boot device          : lnPci
processor number     : 0
host name            : brewmaster2
file name            : ffs0:vxWorkst.Z
inet on ethernet (e) : 192.168.30.201
host inet (h)        : 192.168.30.19
gateway inet (g)     : 192.168.30.1
user (u)             : agent
ftp password (pw)    : agent99
flags (f)            : 0x8
target name (tn)     : MyGateway
startup script (s)   : ffs0:sna.rc

Attaching network interface lnPci0... done.
Attaching network interface lo0... done.
Initializing ffs0:
AutoSync disabled
Mounting ffs0: succeeded.
done.
Loading ffs0:vxWorkst.Z ... Inflating
ffs0:vxWorkst.Z...
Read data into 0xc1abf160, len 0x000bb586
Inflate to 0xc1b7a6f0
Inflated
entry = 0xc0012bc0
```

```
1639616 + 380636 + 293796
Starting at 0xc0012bc0...

Initializing Flash
Initializing ffs0:
Mounting ffs0: AutoSync disabled
succeeded.
ffs0: already initialized

Adding 6823 symbols for standalone.
Attached TCP/IP interface to lnPci unit 0
Attaching network interface lo0... done.
NFS client support not included.


 -------------------------------------------
 | SAN Gateway Firmware Version 0341
 | Copyright Pathlight Technology, Inc, 1997-1999
 |
 | VxWorks version: 5.3.1
 | KERNEL: WIND version 2.5
 | Copyright Wind River Systems, Inc., 1984-1997
 |
 | CPU: Pathlight (i960RD).  Processor #0.
 | Memory Size: 0x2000000
 | BSP version 1.3/0
 -------------------------------------------
```

```
ffs0:/  - disk check in progress ...

System clock is set to SUN FEB 06 06:28:15 2106

instead of THU JAN 01 00:00:00 1970

ffs0:/  - Volume is OK


          total # of clusters:  1,784

           # of free clusters:  771

            # of bad clusters:  0

             total free space:  789,504

     max contigous free space:  187,392 bytes

                   # of files:  18

                 # of folders:  5

         total bytes in files:  1,018,121

             # of lost chains:  0

   total bytes in lost chains:  0

Executing startup script ffs0:sna.rc ...

#! /bin/csh -f

sna_monitor_init


SAN Gateway Version 0341.38 Built Mar 16 2001,
14:03:12

value = -1040893472 = 0xc1f539e0

dbgInit

value = 0 = 0x0

CNFinit

value = 0 = 0x0

csSrvcInit

Attempt to add User Name pathlight  failed,
errno=3538946
```

```
SAN Gateway Version 0341.38 Built Mar 16 2001,
14:03:12

MyGateway

Clock set to Up-time count

value = 0 = 0x0

amemInit

Testing DDF - PCI 0DMA PageX Testing DDF - PCI 1DMA
PageX  Test PASSED

Amem interrupt handler installed

value = -1041049120 = 0xc1f2d9e0

scsintInit

NOTICE: Memory board found

VPS Enabled, License is Valid

0xc1f595f0 (tShell): VPS: Node name conversion enabled
for 1 nodes

Data Mover Disabled, License is Valid

VPM Enabled, License is Valid

SCSI 3 - DE - Terminated

SCSI 1 - DE - Terminated - TERM Disabled

SCSI 4 - DE - Terminated

SCSI 2 - DE - Terminated

USCSI 5  - HVD Term Enabled

USCSI 2  - HVD Term Enabled

USCSI 6  - LVD Term Enabled

USCSI 3  - LVD Term Enabled

0xc1f595f0 (tShell): Disable Terminator for Channel 1

interrupt: Disable Terminator for Channel 1

SRS Enabled, License is Valid
```

```
MyGateway
value = -1054014160 = 0xc12d0530


Done executing startup script ffs0:sna.rc
- Service Port Reflected Signal Test
Starting shell
MyGateway >
```