Gigabit Ethernet Consortium
Clause 31 Flow Control Conformance Test Suite v1.3 Report

Company Rep.   February 8, 2006
Company Name   Report Rev. 1.0
Address Line 1
Address Line 2

Enclosed are the results from the Clause 31 Flow Control Conformance testing performed on:

Device Under Test (DUT):	Gigabit Router 9000
Hardware Version:	10/100/1000Mb/s 24-Port expansion module
Firmware Version:	N/A
Software Version:	N/A
Miscellaneous:	Tested on Ports 1, 24

The test suite referenced in this report is available at the UNH-IOL website:

ftp://ftp.iol.unh.edu/pub/ethernet/test_suites/CL31_FC/flow_control_testsuite_v1.3.pdf

Issues Observed While Testing
31.1.3 – Receive PAUSE frame with Unicast address: The DUT was not observed to pause upon reception of a PAUSE frame with the destination address equal to the unicast address of the DUT.

For specific details regarding issues please see the corresponding test result.

Testing Completed 02/08/2006   Review Completed 02/08/2006

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Result Key

The following table contains possible results and their meanings:

Result	Interpretation
PASS	The Device Under Test (DUT) was observed to exhibit conformant behavior.
PASS with Comments	The DUT was observed to exhibit conformant behavior however an additional explanation of the situation is included, such as due to time limitations only a portion of the testing was performed.
FAIL	The DUT was observed to exhibit non-conformant behavior.
Warning	The DUT was observed to exhibit behavior that is not recommended.
Informative	Results are for informative purposes only and are not judged on a pass of fail basis.
Refer to Comments	From the observations, a valid pass or fail could not be determined. An additional explanation of the situation is included.
Not Applicable	The DUT does not support the technology required to perform these tests.
Not Available	Due to testing station or time limitations, the tests could not be performed.
Borderline	The observed values of the specified parameters are valid at one extreme, and invalid at the other.
Not Tested	Not tested due to the time constraints of the test period.

GROUP 1: Reception of Valid PAUSE Frames

Test # and Label	Part(s)	Result(s)
31.1.1 – Reception of PAUSE Frames	**a**	**PASS**
Expected Results and Procedural Comments		

Purpose: To verify that the device under test (DUT) inhibits the transmission of MAC client frames when a PAUSE frame is received.

Comments on Test Results

a)   The DUT was observed to pause transmission of MAC Client frames for approximately (pause_time * 512 bit times).

Pause_Time in PAUSE Frame	Time (in µs) that the DUT paused	Expected Time (in µs)
0x0000	~ 0	0
0x3FFF	~ 8,388.096	8,388.096
0x8000	~ 16,777.216	16,777.216
0xFFFF	~ 33,553.920	33,553.920

Test # and Label	Part(s)	Result(s)
31.1.2 – Reception of Multiple PAUSE Frames	**a**	**PASS**
	b	**PASS**
	c	**PASS**
Expected Results and Procedural Comments		

Purpose: To verify that the device under test (DUT) either resumes the transmission of or continues to inhibit transmission of MAC Client frames when pause_timer is non-zero and it receives an additional PAUSE frame.

a)   The reception of a PAUSE frame with a pause_time of 0x0000 0x3FFF pause_quanta after the reception of PAUSE frame with a pause_time 0xFFFF should cause the DUT to pause for 0x3FFF pause_quanta (8388.096 µs)
b)   The reception of a PAUSE frame with a pause_time of 0xFFFF 0x3FFF pause_quanta after the reception of PAUSE frame with a pause_time 0xFFFF should cause the DUT to pause for 0x13FFE pause_quanta (41,942.016 µs)
c)   The reception of a PAUSE frame with a pause_time of 0x7FFF 0x3FFF pause_quanta after the reception of PAUSE frame with a pause_time 0xFFFF should cause the DUT to pause for 0xBFFE pause_quanta (25,164.800 µs)

Comments on Test Results

a)   The DUT was observed inhibit the transmission of MAC Client frames for approximately 8388.096 µs after the reception of part a (as described above).
b)   The DUT was observed inhibit the transmission of MAC Client frames for approximately 41,942.016 µs after the reception of part a (as described above).
c)   The DUT was observed inhibit the transmission of MAC Client frames for approximately 25,164.800 µs after the reception of part a (as described above).

Test # and Label	Part(s)	Result(s)
31.1.3 – Receive PAUSE frame with Unicast address	**a**	**FAIL**
Expected Results and Procedural Comments		

Purpose: To verify that the device under test (DUT) inhibits the transmission of MAC client frames when a PAUSE frame with the Destination Address set to the unicast address of the DUT is received.

| **Comments on Test Results** | | |

a)   Upon reception of a well-formed PAUSE frame with a destination address equal to the Unicast address of the DUT (00-00-00-00-00-00), the DUT was not observed to inhibit the transmission of MAC Client frames.

Test # and Label	Part(s)	Result(s)
31.1.4 – Commencement of Pause	**a**	**Under Development**
Expected Results and Procedural Comments		

Purpose: To verify that the DUT does not begin to transmit a new MAC Client frame more than the allowable number of pause_quantum bit times after the complete reception of a valid PAUSE frame that contains a non-zero value of pause_time. For Gigabit Ethernet the allowable number of pause_quantum bit times is 1024, as measured at the MDI.

| **Comments on Test Results** | | |

This test is currently under development.

Test # and Label	Part(s)	Result(s)
31.1.5 – Commencement of Pause while Transmitting a Frame	**a**	**PASS**
Expected Results and Procedural Comments		

Purpose: To verify that DUT does not commence PAUSE until after completing the transmission of a frame already in progress.

| **Comments on Test Results** | | |

a)   The DUT was observed to complete transmission of the MAC Client frame before commencing pause.

GROUP 2: Reception of invalid PAUSE Frames

Test # and Label	Part(s)	Result(s)
31.2.1 – Invalid MAC Control Frame Reception and Handling	**a**	**PASS**
	b	**PASS**
	c	**PASS**
	d	**PASS**

Expected Results and Procedural Comments

Purpose: To verify that the device under test (DUT) rejects invalid MAC Control PAUSE frames.

a) The DUT should not pause upon reception of an otherwise well-formed MAC Control PAUSE frame with a destination address other than the multicast address (01-80-C2-00-00-01) or the Unicast address of the DUT. This frame should also be discarded.
b) The DUT should not pause upon reception of an otherwise well-formed MAC Control PAUSE frame with a type value other than 0x8808.
c) The DUT should not pause upon reception of an otherwise well-formed MAC Control PAUSE frame with an opcode other than 0x0001. This frame should also be discarded.
d) The DUT should not pause up reception of an otherwise well-formed MAC Control PAUSE frame, with a VLAN tag inserted between the source address and the Length/Type field.

Comments on Test Results

a) MAC Control PAUSE frames with a destination address that is not the well-known multicast address (01-80-C2-00-00-01) or unicast address (00-00-00-00-00-00) of the DUT were discarded and did not cause the DUT to inhibit transmission of MAC client frames. The following addresses were tested: 01-80-C2-00-00-02, FF-FF-FF-FF-FF-FF and 00-00-00-00-00-00.
b) MAC frames with a Length/Type value of to 0x8809, 0x0800 and 0x002E and the destination address equal to the well-known multicast address (01-80-C2-00-00-01) were discarded and did not cause the DUT to inhibit transmission of MAC client frames.
c) MAC Control frames with an opcode equal to 0x0002 through 0x0007 and 0xFFFF and the destination address equal to the well-known multicast address (01-80-C2-00-00-01) were discarded and did not cause the DUT to inhibit transmission of MAC client frames. According to subclause 31.5.2 Control frame reception, frames that do not contain an opcode that is supported by the DUT should be discarded.
d) A MAC Control PAUSE frame with a VLAN tag and the destination address equal to the well-known multicast address (01-80-C2-00-00-01) was discarded and did not cause the DUT to inhibit transmission of MAC client frames.

Test # and Label	Part(s)	Result(s)
31.2.2 – Receive MAC Control PAUSE Frames with incorrect CRC	**a**	**PASS**

Expected Results and Procedural Comments

Purpose: To verify that the device under test rejects PAUSE frames with FCS errors.

a) The DUT should detect the PAUSE frames with invalid FCS fields, and log a FCS error for each invalid frame in the statistics of the DUT. These frames should be discarded, and not passed to the MAC Control. The reception of the valid request frames should not be affected.

Comments on Test Results

a) The DUT was not observed to pause upon reception of pause frames with an invalid CRC.

Test # and Label	Part(s)	Result(s)
31.2.3 – Receive oversized MAC Control PAUSE frames	**a**	**PASS**

Expected Results and Procedural Comments

Purpose: To determine how the device under test (DUT) handles PAUSE frames that are greater than minFrameSize in length.

a)   The DUT may either truncate and act upon or discard PAUSE frames greater than minFrameSize in length.

Comments on Test Results

a)   The DUT was observed to accept and act upon PAUSE frames up to 1518 bytes in length. PAUSE frames greater than 1518 bytes in length were discarded and not acted upon.

Test # and Label	Part(s)	Result(s)
31.2.4 – Receive runt MAC Control PAUSE frames	**a**	**PASS**

Expected Results and Procedural Comments

Purpose: To determine how the device under test (DUT) handles PAUSE frames that are less than minFrameSize in length.

a)   The DUT should discard and not act upon all PAUSE frames less than minFrameSize in length.

Comments on Test Results

a)   MAC Control frames that were less than minFrameSize with a destination address equal to the multicast address (01-80-C2-00-00-01) were discarded and did not cause the DUT to inhibit transmission of MAC client frames.

GROUP 3: Transmission of PAUSE Frames

Test # and Label	Part(s)	Result(s)
31.3.1 – PAUSE frame transmission	a	**PASS**
	b	Not Applicable
Expected Results and Procedural Comments		

Purpose: To verify that the device under test (DUT) transmits properly encapsulated PAUSE frames.

a)   The DUT should transmit valid PAUSE frames.
b)   If the DUT is DCE it should not forward a valid PAUSE frame.

Comments on Test Results

a)   The DUT was observed to transmit a well-formed PAUSE frame, with a Destination Address equal to the multicast address (01-80-C2-00-00-01), a Source Address of (00-00-00-00-00-00), a type value of 0x8808, an opcode value of 0x0001, a pause_time equal to 0xFFFF and a valid CRC-32 value in the FCS field.
b)   This test is not applicable because the DUT was a DTE.

Test # and Label	Part(s)	Result(s)
31.3.2 – PAUSE frame transmission while being paused	a	Not Applicable
Expected Results and Procedural Comments		

Purpose: To verify that the ability of the device under test (DUT) to transmit properly encapsulated PAUSE frames is not inhibited by the PAUSE operation.

a)   The DUT should be able to transmit a PAUSE frame while pause_timer is not equal to zero.

Comments on Test Results

a)   The DUT was not observed to transmit PAUSE frames while paused.

GROUP 4: System Issues

Test # and Label	Part(s)	Result(s)
31.4.1 – Allocation of Proper Buffer Space (Informative)	a	**PASS**
Expected Results and Procedural Comments		

Purpose: To observe if the device under test (DUT) allocates enough buffer space such that when it transmits a PAUSE frame, it will not need to discard frames that are in the process of being sent by its link partner before the link partner receives and responds to the PAUSE frame.

a)   The DUT should be able to receive a 279 byte frame and a 1518 byte frame after it transmits a PAUSE frame; as, for 1000BASE-T devices, 100 meters of Cat5 UTP is supported and a 279 byte frame and a 1518 byte frame each separated by the minimum interFrameGap (96 bit times) can be transmitted by a device before it has completely received and responded to the PAUSE frame from the DUT.

Comments on Test Results

a)   The DUT was observed to buffer and reply to all frames sent after the transmission of a PAUSE frame.

Test # and Label	Part(s)	Result(s)
31.4.2 – PAUSE mode configuration	a	**Refer to Comments**
Expected Results and Procedural Comments		

Purpose: To verify the ability of the device under test (DUT) to be properly configured with various flow control modes.

a)   The DUT should behave in the manner indicated in the device's management or registers, which may be Transmit and Receive PAUSE frames, Transmit PAUSE frames only, Receive PAUSE frames only, or no flow control.

Comments on Test Results

This test was performed in test Clause 28 and 40 Auto-Negotiation Management System Test Suite as Test 2.3.

Annex A: Test Setup

Test Equipment

The following test equipment was used in performing all Clause 31 Flow Control testing:

Testing Equipment	Brand and Version Information
PC Requirements	Microsoft Win2K
Software	Spirent SmartWindows v8.50
Traffic Generator/Sniffer	Spirent SMB-2000 Chassis with GX-1420B 1000BASE-T module

Test Configuration

The following configuration was used in performing all Clause 31 Flow Control testing: