University of New Hampshire InterOperability Laboratory
Fast Ethernet Consortium

Superseded

As of August 27, 2004 the Fast Ethernet Consortium Clause 24 100Base-X PCS Conformance Test Suite version 3.10 has been superseded by the release of the Clause 24 100Base-X PCS Conformance Test Suite version 3.2. This document along with earlier versions, are available on the Fast Ethernet Consortium test suite archive page.

Please refer to the following site for both current and superseded test suites:

http://www.iol.unh.edu/testsuites/ethernet/archive.html

Fast Ethernet Consortium
100BASE-X PCS Test Suite

Revision 3.10

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Test #24.1.1 - End of Stream Delimiter Test

Purpose: To verify that RX_ER is asserted when there is no stream termination sequence, ESD (/T/R/), following the SSD.

References:

- IEEE 802.3 Standard, 1998 - sections 22.2.1.5, 24.2.4.4.4, and Figure 24-11: Receive state diagram.

Resource Requirements:

- A testing station capable of encoding (decoding) data nibbles to (from) five-bit code groups as specified in clause 24 and sending (receiving) these code groups using the signaling method described in clause 25 or clause 26.

Last Modification: May 5, 1999

Discussion: Following detection of the SSD, the signal RX_DV is asserted. The RX_ER signal is asserted upon decoding any symbol following the SSD which is not either a valid data symbol or a defined stream termination sequence. Simultaneous assertion of RX_DV and RX_ER will cause the Reconciliation sublayer to force the MAC to detect a FrameCheckError. Refer to subclause 22.2.1.5 and Figure 24-11: Receive state diagram. The DUT is sent valid frames with the ESD (/T/R/) removed. The DUT is also sent frames with an invalid ESD is placed at the end of the frame. These two circumstances should cause the reception of idle symbols while RX_DV is asserted, thus causing RX_ER to occur. In the third case, a valid ESD terminates the frame and is followed by each of the 32 code groups before idle resumes. These frames should be properly accepted.

Test Setup: Connect the device under test (DUT) to the testing station (transmit to receive, receive to transmit) with the appropriate medium (i.e. balanced copper, multi-mode fiber, etc.).

Procedure:

Description of Test Frames:

NO_ESD test frame: The test frame is comprised of an SSD, a 64-byte ARP request frame with proper checksums and 32-bit CRC values, but no ESD (/T/R/).
VALID_ESD test frames: The test frames are comprised of an SSD, a 64-byte ARP request frame with proper checksums and 32-bit CRC values, a valid ESD (/T/R/) and an additional code group immediately following the frame. This is repeated to include each code group as defined by the 802.3u standard for a total of 32 frames.
INVALID_ESD test frames: The test frames are comprised of an SSD, a 64-byte ARP request frame with proper checksums and 32-bit CRC values, and an invalid ESD. The invalid ESDs are (/H/H/), (/H/J/), (/H/K/), (/H/R/), (/H/T/), (/J/H/), (/J/J/), (/J/K/), (/J/R/), (/J/T/), (/K/H/), (/K/J/), (/K/K/), (/K/R/), (/K/T/), (/R/H/),

(/R/J/), (/R/K/), (/R/R/), (/R/T/), (/T/H/), (/T/J/), (/T/K/), (/T/T/). Each frame with an invalid ESD should be dropped by the DUT.

1. The testing station is instructed to transmit a properly encapsulated, valid, 64-byte ARP request frame. This will cause the DUT to transmit an ARP reply, indicating that the DUT is functioning properly.
2. The testing station is instructed to transmit the NO_ESD test frame to the DUT. The output and statistics of the DUT are observed.
3. The testing station retransmits the NO_ESD test frame to the DUT. A valid ICMP request is retransmitted minimum inter-frame gap (96 bit-times) before and after the NO_ESD test frame. The output and statistics of the DUT are observed.
4. The testing station is instructed to transmit the VALID_ESD test frames. Each of these frames is placed between two valid ICMP echo requests.
5. The testing station is instructed to transmit the INVALID_ESD test frames. Each of these frames is placed between two valid ICMP echo requests.

Observable Results:

a. The DUT should not respond to the NO_ESD test frame. The reception of preceding and following valid frames should be unaffected.
b. The DUT should respond to each of the VALID_ESD test frames. The reception of preceding and following valid frames should be unaffected.
c. The DUT should not respond to each of the INVALID_ESD test frames. The reception of preceding and following valid frames should be unaffected.

Possible Problems: None.

Test #24.1.2 - Invalid Data Symbol Test

Purpose: To verify that an error (RX_ER) is detected when an invalid data symbol is sent following the transmission of the SSD (/J/K/)

References:

- IEEE 802.3 Standard, 1998 - sections 4.2.4.1.2, 4.2.4.1.3, 24.2.4.4.3, 24.2.2.1.6 and 22.2.1.4.2

Resource Requirements:

- A testing station capable of encoding (decoding) data nibbles to (from) five-bit code groups as specified in clause 24 and sending (receiving) these code groups using the signaling method described in clause 25 or clause 26. The testing stations should be capable of transmitting violation code groups.

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Discussion: Following detection of the SSD, the signal RX_DV is asserted. The RX_ER signal is asserted upon decoding any symbol following the SSD which is not either a valid data symbol or a defined shell termination sequence. Simultaneous assertion of RX_DV and RX_ER will cause the Reconciliation sublayer to force the MAC to detect a FrameCheckError. Refer to subclause 22.2.1.5 and Figure 24-11: Receive state diagram. In this test, all valid data symbols will be replaced with all combinations of the invalid symbols. This is done to ensure that when an invalid symbol is detected, RX_ER is asserted rather than arbitrarily replacing the invalid symbols with valid data symbols.

Test Setup: Connect the device under test (DUT) to the testing station (transmit to receive, receive to transmit) with the appropriate medium (i.e. balanced copper, multi-mode fiber, etc.).

Procedure:

Test Frame Description:

In this test, the testing station sources a valid ARP request with a data field containing all valid data symbols (0 thru F). Each data symbol is individually replaced with each of the following invalid codes: 00000, 00001, 00010, 00011, 00100, 00101, 00110, 01000, 01100, 10000, 11001 as well as the 5 Control Codes /J/, /K/, /T/, /R/, and /I/. Thus, 231 different invalid frames are tested.

1. The testing station is instructed to transmit a properly encapsulated, valid, 64-byte ARP request frame. This will cause the DUT to transmit an ARP reply, indicating that the DUT is functioning properly.
2. The testing station transmits one test frame to the DUT. The output and statistics of the DUT are observed.
3. The testing station retransmits the test frame to the DUT. After a minimum inter-frame gap (96 bit-times), the valid ARP request is retransmitted. The output and statistics of the DUT is observed.
4. Steps 1 through 3 are repeated for all remaining test frames.

Observable Results:

a. The DUT should not respond to frames with an invalid symbol.
b. The reception of subsequent valid frames should be unaffected.
c. The DUT should report the reception of an FCS error for each test frame.

Possible Problems: None.

Test #24.1.3 - False Carrier Detect

Purpose: To verify that the device under test can detect false carrier events.

References:

- IEEE 802.3 Standard, 1998 – sections 22.2.2.6, 22.2.2.7, 22.2.2.8, Table 22-2, sections 24.2.2.1.4, 24.2.4.4.2, 24.3.4.3, and figure 24-14.

Resource Requirements:

- A testing station capable of encoding (decoding) data nibbles to (from) five-bit code groups as specified in clause 24 and sending (receiving) these code groups using the signaling method described in clause 25 or clause 26.

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Discussion: After channel activity is detected, the Receive process first aligns the incoming code-bits on code-group boundaries for subsequent data decoding. This is achieved by scanning the rx_bits vector for a SSD (/J/K/). Detection of the SSD causes the Receive process to enter the START OF STREAM J state.

Well-formed streams contain SSD (/J/K/) in place of the first 8 preamble bits. In the event that something else is sensed immediately following the detection of carrier, a False Carrier Indication is signaled to the MII by asserting the RX_ER and setting RXD to 1110 while RX_DV remains deasserted.

Test Setup: Connect the device under test (DUT) to the testing station (transmit to receive, receive to transmit) with the appropriate medium (i.e. balanced copper, multi-mode fiber, etc.).

Procedure:

1. The testing station transmits a valid frame to ensure that the stations are functioning properly.
2. Let bad_ssd be a vector of 10 code-bits and let bad_ssd[0] be fixed at ZERO. Initialize bad_ssd[9:2] to the code-bit pattern "1111110". Command the testing station to send bad_ssd (most significant bit first) followed by the remainder of a valid test frame (excluding the SSD). The testing station will monitor transmit activity from the device under test.
3. Shift bad_ssd[9:2] left one code-bit, discarding the carry bit and setting bad_ssd[2] to ONE. Command the testing station to send bad_ssd followed by the remainder of a valid test frame (excluding the SSD). The testing station will monitor transmit activity from the device under test.
4. Repeat step 2 until bad_ssd[9:2] contains the pattern "11111111".
5. Set bad_ssd[9:5] to the /J/ code group and set bad_ssd[4:0] to the code-bit pattern "00000". Command the testing station to send bad_ssd followed by the remainder of a valid frame (excluding the SSD). The testing station will monitor transmit activity from the device under test.

6. Increment bad_ssd[4:0]. Command the testing station to send bad_ssd followed by the remainder of a valid frame (excluding the SSD). The testing station will monitor transmit activity from the device under test.
7. Repeat step 5 until bad_ssd[4:0] exceeds “11111”. Skip the iteration in which bad_ssd[4:0] equals “10001” as this is the /K/ code-group (this makes bad_ssd[9:0] /J/K/, the valid start of shell delimiter).
8. Various valid frames separated by the minimum inter-frame gap are sent preceding and following one of the Test Frames to ensure that the reception of a false carrier event does not affect the reception of valid frames.

Observable Results:

a. The DUT should not reply to the Test Frame.
b. The reception of valid frames preceding and following the test frame should not be affected.

Possible Problems: None.