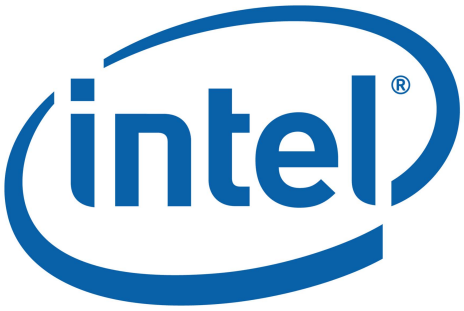


Intel® 82599 10 GbE Controller

Specification Update

Networking Division (ND)

July 2016

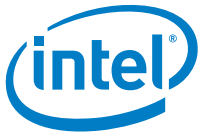
Revision 3.7
331521-006

Revision History

Revision	Date	Comments
3.7	July 14, 2016	**Specification Changes added or updated:** • 12. LINKS Bit 7 is Reserved (Added) **Errata added or updated:** • 67. LLC Packet without SNAP Header (Added) **Miscellaneous Updates:** • General formatting.
3.6	March 25, 2016	**Errata added or updated:** • 65. PCIe Advanced Error Reporting: First Error Pointer (Added) • 66. IPv4 Checksum Error Might be Reported for a Fragmented Packet (Added) **Software Clarifications added or updated:** • 6. Spurious Link Report Filter (Added)
3.5	March 11, 2016	**Specification Clarifications added or updated:** • 19. FCOE_PARAM Field (Added)
3.4	October 28, 2015	**Specification Changes added or updated:** • 11. WTHRESH=0 Mode (Added)
3.3	February 2, 2015	**Specification Clarifications added or updated:** • 18. Rx Statistics Counters Do Not Count Runt Frames or Fragments Smaller Than 12 Bytes (Added)
3.2	November 14, 2014	**Specification Clarifications added or updated:** • 17. CRCERRS Statistic Counter (Added) **Specification Changes added or updated:** • 10. ETQF[19:16] are Reserved (Added) **Errata added or updated:** • 64. PCIe SR-IOV Reserved Bits are Writable (Added) **Miscellaneous Updates:** • Section 1.2, "Marking Diagrams" — Text added in reference to Figure 1-1 to explain the meaning of the dash mark (-) in the illustration.
3.1	March 27, 2014	**Miscellaneous Updates:** • Marking Diagram in Figure 1-1 updated to reflect new substrate.
3.0	January 8, 2014	**Specification Clarifications added or updated:** • 15. VLAN Anti-Spoof Filter of an Untagged Packet (Added) • 16. SR-IOV Prefetchable Address Space (Added) **Errata added or updated:** • 63. Clearing RXEN During VM-to-VM Loopback Traffic Might Cause Rx Hang (Added)

Revision	Date	Comments
2.9	June 21, 2013	**Specification Clarifications added or updated:** • 12. Selecting a Rx Pool Using VLAN Filters (Added) • 13. 82599 SFP+ Receiver Specification Conforms to SFF-8431 (Added) • 14. SR-IOV and Jumbo Frames Support in the 82599 (Added) **Specification Changes added or updated:** • 1. PBA Number Module — Word Address 0x15-0x16 (Updated) • 2. Updates to PXE/iSCSI EEPROM Words (B0 Stepping) (Updated) • 4. Bit 16 of CTRL_EXT Register Must be Set (Updated) • 6. RXMTRL.*UDPT* Initial Value (Added) • 7. Flow Director Registers Update (Added) • 8. EEPROM Device Size (Added) • 9. The Flow Director FDIRErr(0) Bit in the Rx Descriptor is Valid Only if the FLM Bit is Set (Added) **Errata added or updated:** • 5. Flow Director Statistics Inaccuracy (Updated) • 33. The EEPROM *Core Clocks Gate Disable Setting Impacts Link Status During D3 State* (Updated) • 47. PCIe: N_FTS Value is Too Small when Common Clock Configuration is Zero (Updated) • 58. 82599 LAN Port #1 SFI Link Instability (Added) • 59. NC-SI: Get NC-SI Pass-Through Statistics Response Might Contain Incorrect Packet Counts (Added) • 60. IPv4 Checksum Error Might be Reported for Multicast Frames Over 12 KB (Added) • 61. RXMEMWRAP Register Content is Inaccurate (Added) • 62. Flow Director: Collision Indication Can be Cleared by Adding a New Filter (Added)
2.87	September 5, 2012	**Specification Clarifications added or updated:** • 2. PCIe Completion Timeout Value Must be Properly Set (Updated) **Specification Changes added or updated:** • 5. MAC Link Setup and Auto-Negotiation (Added) **Errata added or updated:** • 55. XAUI Interface Might Not be Able to Link After a Specific Reset Sequence (Added) • 56. ETS Resolution (Added) • 57. Flow Control and Missed Packets Counters Limitation (Added)
2.86	April 24, 2012	**Specification Clarifications added or updated:** • 11. 82599EN EEPROM Image File (Added) **Specification Changes added or updated:** • 4. Bit 16 of CTRL_EXT Register Must be Set (Added) **Errata added or updated:** • 53. Flow Director Filters Configuration Issue (Added) • 54. PF's MSI TLP Might Contain the Wrong Requester ID when a VF Uses MSI-X (Added) **Software Clarifications added or updated:** • 4. Identify Network Adapter Port by Blinking LED (Added) • 5. PF/VF Drivers Should Configure Registers That are Not Reset by VFLR (Added)
2.85	February 3, 2012	**Specification Clarifications added or updated:** • 10. Padding on Transmitted SCTP Packets (Added) **Errata added or updated:** • 53. Flow Director Filters Configuration Issue (Updated)
2.84	December 7, 2011	**Specification Clarifications added or updated:** • 5. SFP+ (SFI) Connection Clarification (Updated — Reference made to workaround available under NDA.)

Revision	Date	Comments
2.83	October 28, 2011	**Miscellaneous Updates:** • Updated Table 1-1, "Markings" — S-Specification names were incorrect. These have been corrected.
2.82	September 14, 2011	**Errata added or updated:** • 5. Flow Director Statistics Inaccuracy (Updated) • 52. NC-SI: Get NC-SI Pass-Through Statistics Response Format (Added) **Miscellaneous Updates:** • L82599EN (Single Port; SFI Only). Port 1 disabled. See device information tables; for example, Table 1-1, "Markings".
2.81	August 15,2011	**Specification Clarifications added or updated:** • 6. AN 1G TIMEOUT Only Works when the Link Partner is Idle (Updated) • 8. PCIe Timeout Interrupt (Added) • 9. Master Disable Flow (Added) **Errata added or updated:** • 48. FCoE: Exhausted Receive Context is Not Invalidated if Last Buffer Size is Equal to User Buffer Size (Updated Windows* driver information in workaround.) • 50. LED Does Not Blink in Invert Mode (Added) • 51. LEDs Cannot be Configured to Blink in LED_ON Mode (Added) **Software Clarifications added or updated:** • 3. Serial Interfaces Programmed by Bit-Banging (Added)
2.7	March 2011	Updates include the following: • Revised Specification Change #2. • Added Specification Change #3. • Added Errata #47, #48, #49, and #50. • Added Software Clarification #2.
2.6	January 2011	Updates include the following: • Added Specification Clarification #7 and #8. • Added Specification Change #2. • Added Errata #45 and #46.
2.5	October 2010	Updates include the following: • Added Specification Clarification #6 and #7. • Added Software Clarification #1.
2.4	September 2010	Updates include the following: • Added Specification Change #1. • Added Errata #34, #45, and #56. • Added Errata #41, #42, #43, and #44.
2.3	March 2010	Updates include the following: • Added Errata #38, #39, and #40.
2.2	January 2010	Updates include the following: • Added Specification Clarification #4. • Added Device ID for CX4 and combined backplane. • Added Erratum #37.
2.1	October 2009	Updates include the following: • Added Specification Clarification #2. • Updated Erratum #13. • Added Erratum #36.



Revision	Date	Comments
2.0	July 2009	Initial release (Intel Public).

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1. Introduction

This document applies to the Intel® 82599 10 GbE Controller.

This document is an update to the *Intel® 82599 10 GbE Controller Datasheet*. It is intended for use by system manufacturers and software developers. All product documents are subject to frequent revision and new order numbers will apply. New documents may be added. Be sure you have the latest information before finalizing your design.

References to PCI Express* (PCIe*) in this document refer to PCIe V2.0 (2.5GT/s or 5.0GT/s).

1.1 Product Code and Device Identification

Product Codes: JL8259EB, JL82599ES, JL82599EN (lead free)

The following tables and drawings describe the various identifying markings on each device package:

Table 1-1 Markings

Device	Stepping	Top Marking	S-Specification[1]	Description
82599 (Performance; XAUI)	B0	JL82599EB	SLGWG SLGWH	Production (Lead Free)
82599 (Performance; XAUI + Serial; KR/SFI)	B0	JL82599ES	SLGWE SLGWF	Production (Lead Free)
82599EN (Single Port SFI Only; Port 1 disabled)	B0	JL82599EN	SLJFT SLJFU	Production (Lead Free)

1. For Tray, Tape and Reel Data, see Table 1-3.

Table 1-2 Device IDs

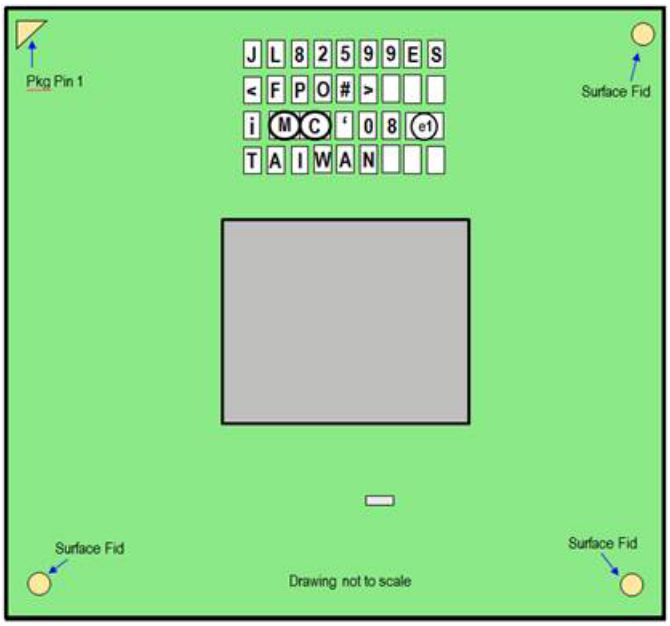
Device ID Code	Vendor ID	Device ID
82599 (KX/KX4)	0x8086	0x10F7
82599 (combined backplane; KR/KX4/KX)	0x8086	0x10F8
82599 (CX4)	0x8086	0x10F9
82599 (SFI/SFP+)	0x8086	0x10FB
82599 (XAUI/BX4)	0x8086	0x10FC
82599 (Single Port SFI Only)	0x8086	0x1557

Table 1-3 MM Numbers

Product	Tray MM #	Tape and Reel MM#
JL82599 (Lead Free) B0 Production (Performance; XAUI)	903143	903142
JL82599 (Lead Free) B0 Production (Performance; XAUI + Serial; KR/SFI)	903140	903139
JL82599EN (Single Port SFI Only); Port 1 disabled. B0 Production	917842	917841

1.2 Marking Diagrams

Figure 1-1 Example with Identifying Marks

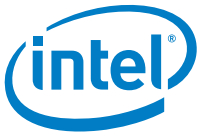


Lead-free parts will have "JL" as the prefix for the product code.

The "S" designator refers to the specification number. See Table 1-1.

Devices can also have a "GB" marking, instead of "EB or ES". These are functionally equivalent and only used on Intel network interface adapters.

Intel incorporates an internal designator of a dash mark (–) that is visible on the die side of the package, and is approximately 300 x 1000 mm in size. The actual location may differ from the example pictured. This mark is intended for internal purposes only and does not affect the product performance as designed. The customer's visual inspection system should be updated to allow for this feature.



1.3 Nomenclature Used in This Document

This document uses specific terms, codes, and abbreviations to describe changes, errata, and/or clarifications that apply to silicon/steppings. See Table 1-4 for a description.

Table 1-4 Terms, Codes, Abbreviations

Name	Description
Specification Changes	Modifications to the current published specifications. These changes will be incorporated in the next release of the specifications.
Errata	Design defects or errors. Errata may cause device behavior to deviate from published specifications. Hardware and software designed to be used with any given stepping must assume that all errata documented for that stepping are present on all devices.
Specification Clarifications	Greater detail or further highlights concerning a specification's impact to a complex design situation. These clarifications will be incorporated in the next release of the specifications.
Documentation Corrections	Errors, or omissions in current published specifications. These changes are incorporated in the next release of the applicable document and then dropped from the specupdate. Check for a complete list of changes in revision history of specific documents.
Software Clarifications	Applies to Intel drivers, EEPROM loads.
Yes or No	If the errata applies to a stepping, "Yes" is indicated for the stepping (for example: "A0=Yes" indicates errata applies to stepping A0). If the errata does not apply to stepping, "No" is indicated (for example: "A0=No" indicates the errata does not apply to stepping A0).
Doc	Document change or update that will be implemented.
Fix	This erratum is intended to be fixed in a future stepping of the component.
Fixed	This erratum has been previously fixed.
NoFix	There are no plans to fix this erratum.
Eval	Plans to fix this erratum are under evaluation.
(No mark) or (Blank box)	This erratum is fixed in listed stepping or specification change does not apply to listed stepping.
DS	Data Sheet
AP	Application Note

2. Hardware Clarifications, Changes, Updates and Errata

See Section 1.3 for an explanation of terms, codes, and abbreviations.

Table 2-1 Summary of Specification Clarifications

Specification Clarification	Status
1. SFP+ Statement	N/A
2. PCIe Completion Timeout Value Must be Properly Set	N/A
3. NC-SI Set Link Command Support	N/A
4. Use of Wake on LAN Together with Manageability	N/A
5. SFP+ (SFI) Connection Clarification	N/A
6. AN 1G TIMEOUT Only Works when the Link Partner is Idle	N/A
7. Link Establishment State Machine (LESM)	N/A
8. PCIe Timeout Interrupt	N/A
9. Master Disable Flow	N/A
10. Padding on Transmitted SCTP Packets	N/A
11. 82599EN EEPROM Image File	N/A
12. Selecting a Rx Pool Using VLAN Filters	N/A
13. 82599 SFP+ Receiver Specification Conforms to SFF-8431	N/A
14. SR-IOV and Jumbo Frames Support in the 82599	N/A
15. VLAN Anti-Spoof Filter of an Untagged Packet	N/A
16. SR-IOV Prefetchable Address Space	N/A
17. CRCERRS Statistic Counter	N/A
18. Rx Statistics Counters Do Not Count Runt Frames or Fragments Smaller Than 12 Bytes	N/A
19. FCOE_PARAM Field	N/A

Table 2-2 Summary of Specification Changes

Specification Change	Status
1. PBA Number Module — Word Address 0x15-0x16	N/A
2. Updates to PXE/iSCSI EEPROM Words (B0 Stepping)	N/A

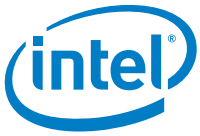


Table 2-2 Summary of Specification Changes (Continued)

Specification Change	Status
3. Flow Director: Update Filter Flow Limitation	N/A
4. Bit 16 of CTRL_EXT Register Must be Set	N/A
5. MAC Link Setup and Auto-Negotiation	N/A
6. RXMTRL.*UDPT* Initial Value	N/A
7. Flow Director Registers Update	N/A
8. EEPROM Device Size	N/A
9. The Flow Director FDIRErr(0) Bit in the Rx Descriptor is Valid Only if the FLM Bit is Set	N/A
10. ETQF[19:16] are Reserved	N/A
11. WTHRESH=0 Mode	N/A
12. LINKS Bit 7 is Reserved	N/A

Table 2-3 Summary of Documentation Updates

Documentation Update	Status
None	N/A

Table 2-4 Summary of Errata; Errata Include Steppings

Erratum	Status
1. Cause of Interrupt Might Never be Cleared	B0=Yes; NoFix
2. Flow Director: Length-Error Bit Not Updated on Remove Operation	B0=Yes; NoFix
3. Flow Director: Filter Might Lose Length-Error Attribute in Perfect-Match Mode	B0=Yes; NoFix
4. Flow Director: L4Packet Type Might Give Wrong Indication	B0=Yes; NoFix
5. Flow Director Statistics Inaccuracy	B0=Yes; NoFix
6. No Length Error on VLAN Packets with Bad Type/Length Field	B0=Yes; NoFix
7. GPRC and GORCL/H Also Count Missed Packets	B0=Yes; NoFix
8. Incorrect Behavior in the Switch Security Violation Packet Count (SSVPC) Statistic Register	B0=Yes; NoFix
9. FCoE: To Read DMA-Rx FCoE context, CSRs Need to Add a Dummy Write	B0=Yes; NoFix
10. In 100M Link Mode, CSR Access to DMA-Rx Might Reach Internal Timeout	B0=Yes; NoFix
11. MACSec: When PN=0, Packet is Not Dropped	B0=Yes; NoFix
12. MACSec: LSECRXUC, LSECRXNUSA and LSECRXUNSA Statistics Counters Not Implemented According to Specification	B0=Yes; NoFix
13. Issues in Clock Switching of MAC Clocks	B0=Yes; NoFix
14. FEC: Correctable and Uncorrectable Counter Read Mechanism is Malformed	B0=Yes; NoFix
15. Clause 37 AN: 82599 Will Not Restart AN if Receiving Invalid Idle Codes During Configuration State	B0=Yes; NoFix

Table 2-4 Summary of Errata; Errata Include Steppings (Continued)

Erratum	Status
16. Does Not Meet the Timing Requirements for PAUSE Operation at 1G Speed	B0=Yes; NoFix
17. Device Does Not Meet the Timing Requirements for PAUSE Operation at 100 MB Speed	B0=Yes; NoFix
18. SGMII 100M: 82599 Might Need a SW-Reset when Link-Mode Enters/Exits 100M	B0=Yes; NoFix
19. DFT: Rx-to-Tx Loopback (XGMII LPBK) in 1Gb\100Mb with Low IPG May Cause Chopped Packet	B0=Yes; NoFix
20. DFT: JTDO Output is Disabled During HIGHZ Instruction	B0=Yes; NoFix
21. MACSec: Tx Octets Protected (LSECTXOCTP) Increment More Than Required	B0=Yes; NoFix
22. The 82599 Might Reach Block-Lock After 63 Sync_Headers Instead of 64	B0=Yes; NoFix
23. ERR_COR Message TLPs are Not Sent for Advisory Errors in D3	B0=Yes; NoFix
24. PCIe Bandwidth in Non-Optimal Gen1 2.5GT/s Conditions Might be Limited in Single Port Configuration	B0=Yes; NoFix
25. Bus Number and Device Number are Not Preserved Through PCIe Reset	B0=Yes; NoFix
26. 82599 Might Not be Recognized by PCIe in EEPROM-Less Mode	B0=Yes; NoFix
27. Device Might Fail to Establish Link when Multiple Link Numbers are Advertised by the Upstream Device	B0=Yes; NoFix
28. Re-Enabling a Port Using the Rising Edge of LAN_DIS_N Requires a LAN_PWR_GOOD Reset	B0=Yes; NoFix
29. BMC Receives Non-MACSec Packets from the LAN without an Indication Regarding to Received Packet Type (With/Without MACSec Header)	B0=Yes; NoFix
30. NC-SI: Additional Multicast Packets May be Forwarded to the BMC	B0=Yes; NoFix
31. SMBus: Unread Packets Received on One Port May Cause Loss of Ability to Receive on Other Port	B0=Yes; NoFix
32. NC-SI: Packet Loss when the BMC Sends Packets to Both Ports and One Port Has Its Link Down	B0=Yes; NoFix
33. The EEPROM *Core Clocks Gate Disable Setting Impacts Link Status During D3 State*	B0=Yes; NoFix
34. Priority Flow Control (PFC) to Some Traffic Classes (TCs) Might Impact Traffic on Other Traffic Classes	B0=Yes; NoFix
35. SR-IOV: PCIe Capability Structure in VF Area is Incorrectly Implemented	B0=Yes; NoFix
36. SR-IOV: Incorrect Completer ID for Config-Space Transactions	B0=Yes; NoFix
37. PCIe: PM_Active_State_NAK Message Might be Ignored	B0=Yes; NoFix
38. PCIe: Incorrect PCIe De-Emphasis Level Might be Reported	B0=Yes; NoFix
39. APM Wake-Up Might be Blocked if System is Shut Down Before Driver Load	B0=Yes; NoFix
40. PME_Status Might Fail to Report a Wake-Up Event	B0=Yes; NoFix
41. DMA: QBRC and VFGORC Counters Might Get Corrupted if Receiving a Packet Bigger Than 12 KB	B0=Yes; NoFix
42. PCIe: 82599 Transmitter Does Not Enter L0s	B0=Yes; NoFix
43. Integrity Error Reported for IPv4/UDP Packets with Zero Checksum	B0=Yes; NoFix

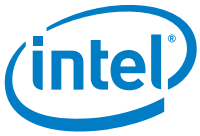


Table 2-4 Summary of Errata; Errata Include Steppings (Continued)

Erratum	Status
44. Header Splitting Can Cause Unpredictable Behavior	B0=Yes; NoFix
45. PCIe Compliance Pattern is Not Transmitted when Connected to a x4/x2/x1 Slot	B0=Yes; NoFix
46. PCIe: Correctable Errors Reported when Using Rx L0s in a x1 Configuration	B0=Yes; NoFix
47. PCIe: N_FTS Value is Too Small when Common Clock Configuration is Zero	B0=Yes; NoFix
48. FCoE: Exhausted Receive Context is Not Invalidated if Last Buffer Size is Equal to User Buffer Size	B0=Yes; NoFix
49. KR TXFFE Coefficient Update is Not Possible if Middle Coefficient is at Maximum Value	B0=Yes; NoFix
50. LED Does Not Blink in Invert Mode	B0=Yes; NoFix
51. LEDs Cannot be Configured to Blink in LED_ON Mode	B0=Yes; NoFix
52. NC-SI: Get NC-SI Pass-Through Statistics Response Format	B0=Yes; NoFix
53. Flow Director Filters Configuration Issue	B0=Yes; NoFix
54. PF's MSI TLP Might Contain the Wrong Requester ID when a VF Uses MSI-X	B0=Yes; NoFix
55. XAUI Interface Might Not be Able to Link After a Specific Reset Sequence	B0=Yes; NoFix
56. ETS Resolution	B0=Yes; NoFix
57. Flow Control and Missed Packets Counters Limitation	B0=Yes; NoFix
58. 82599 LAN Port #1 SFI Link Instability	B0=Yes; NoFix
59. NC-SI: Get NC-SI Pass-Through Statistics Response Might Contain Incorrect Packet Counts	B0=Yes; NoFix
60. IPv4 Checksum Error Might be Reported for Multicast Frames Over 12 KB	B0=Yes; NoFix
61. RXMEMWRAP Register Content is Inaccurate	B0=Yes; NoFix
62. Flow Director: Collision Indication Can be Cleared by Adding a New Filter	B0=Yes; NoFix
63. Clearing RXEN During VM-to-VM Loopback Traffic Might Cause Rx Hang	B0=Yes; NoFix
64. PCIe SR-IOV Reserved Bits are Writable	B0=Yes; NoFix
65. PCIe Advanced Error Reporting: First Error Pointer	B0=Yes; NoFix
66. IPv4 Checksum Error Might be Reported for a Fragmented Packet	B0=Yes; NoFix
67. LLC Packet without SNAP Header	B0=Yes; NoFix

2.1 Specification Clarifications

1. SFP+ Statement

It is important to note that the SFP+ Specification (SFF-8431) is a system level specification and performance varies as a function of a board design and connector vendor. When designing a system to meet this specification, it is important to take these system level functions into account.

The performance measured for 82599 was captured in a board design as described in the Design Considerations section of the *Intel® 82599 10 GbE Controller Datasheet*. Reference this material for detail.

2. PCIe Completion Timeout Value Must be Properly Set

The 82599 Completion Timeout Value[3:0] must be properly set by the system BIOS in the PCIe Configuration Space Device Control 2 register (0xC8; W). Failure to do so can cause unexpected completion timeouts.

The 82599 complies with the PCIe 2.0 specification for the completion timeout mechanism and programmable timeout values. The PCIe 2.0 specification provides programmable timeout ranges between 50 µs to 64s with a default time range of 50 µs - 50 ms. The 82599 defaults to a range of 16 ms – 32 ms.

The completion timeout value must be programmed correctly in PCIe configuration space (in Device Control 2 register); the value must be set above the expected maximum latency for completions. This ensures that the 82599 receives completions for the requests it sends out. Failure to properly set the completion timeout value can result in the device timing out prior to a completion returning.

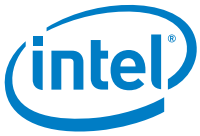
The 82599 can be programmed to resend a completion request after a completion timeout (the original completion is assumed lost). But if the original completion arrives after a resend request, two completions may arrive for the same request; this can cause unpredictable behavior. Intel EEPROM images set the resend feature to off. Intel recommends that you do not change this setting.

For details on completion timeout operation, refer to the *Intel® 82599 10 GbE Controller Datasheet*.

3. NC-SI Set Link Command Support

The NC-SI Set Link command is used to configure the LAN interface with specific provided settings. The settings include link speed, duplex, pause capability, and other vendor specified settings.

The command fields have enough flexibility to configure a 10/100/1000 Mb/s LAN port, but the support for 10 GbE is not fully defined in the NC-SI specification. Different 10 GbE options as defined by LMS, *10G_PMA_PMD_PARALLEL* and *KR_support* fields of the AUTOC register cannot be defined by the NC-SI Set Link command. Due to this limitation, the 82599 LAN ports cannot be configured by the NC-SI Set Link command.



4. Use of Wake on LAN Together with Manageability

The Wakeup Filter Control Register (WUFC) contains the *NoTCO* bit, which affects the behavior of the wakeup functionality when manageability is in use. Note that if manageability is not enabled, the value of *NoTCO* has no effect.

When *NoTCO* contains the hardware default value of 0b, any received packet that matches the wakeup filters will wake the system. This could cause unintended wake-ups in certain situations. For example, if Directed Exact Wakeup is used and the manageability shares the host's MAC Address, IPMI packets that are intended for the BMC wakes the system, which might not be the intended behavior.

When *NoTCO* is set to 1b, any packet that passes the manageability filter, even if it also is copied to the host, is excluded from the wakeup logic. This solves the previous problem since IPMI packets do not wake the system. However, with *NoTCO*=1b, broadcast packets, including broadcast magic packets, do not wake the system since they pass the manageability filters and are therefore excluded.

Table 2-5 Effects of *NoTCO* Settings

WoL	NoTCO	Share MAC Address	Unicast packet	Broadcast Packet
Magic Packet	0b	N/A	OK	OK
Magic Packet	1b	Y	No wake	No wake.
Magic Packet	1b	N	OK	No wake.
Directed Exact	0b	Y	Wake even if MNG packet. No way to talk to the BMC without waking host.	N/A
Directed Exact	0b	N	OK	N/A
Directed Exact	1b	N/A	OK	N/A

Note: Intel Windows* drivers set *NoTCO* by default.

5. SFP+ (SFI) Connection Clarification

The 82599 configuration is optimized to set link with an external partner. If the two ports of the 82599 are connected back-to-back in SFP+ (SFI) mode, link might fail to establish. Similarly, if transmit and receive are connected together within the same port in SFP+ (SFI) mode, link might fail to establish.

This does not impact end users. This configuration would typically be encountered in a manufacturing or test environment to verify link establishment and perform basic functionality checks. In this environment, Intel recommends the use of a separate standalone link partner.

Note: There is a document that discusses the workaround for special cases. This document is available under NDA. Contact your Intel representative for access.

6. AN 1G TIMEOUT Only Works when the Link Partner is Idle

The auto-negotiation timeout mechanism (PCS1GLCTL.*AN_1G_TIMEOUT_EN*) only works if the 1G partner is sending idle code groups continuously for the duration of the timeout period, which is the usual case. However, if the partner is transmitting packets, an auto-negotiation timeout will not occur since auto-negotiation is restarted at the beginning of each packet. If the partner has an application that indefinitely transmits data despite the lack of any response, it is possible that a link will not be established. If this is a concern, the auto-negotiation timeout mechanism may be considered unreliable and an additional software mechanism could be used to disable auto-negotiation if sync is maintained without a link being established (PCS1GLSTA.*SYNC_OK_1G*=1b and LINKS.*LINK_UP*=0b) for an extended period of time.

7. Link Establishment State Machine (LESM)

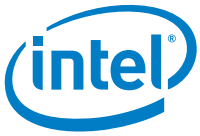
"Legacy" XAUI-based switches developed prior to the IEEE 802.3ap standard will Tx only in one lane (Lane 0) during link detection. Typically, these devices will only transition to a XAUI-like 10 GbE link when all 4 pairs of their receivers are active. Additionally, IEEE 802.3ap compliant devices such as the 82599 controller are required to transmit auto-neg only on Lane 0 per Clause 73.3 and the Intel device will also only parallel-detect a XAUI-like 10 GbE link when all 4 pairs of their receivers are active. Therefore, a speedlock condition can occur when the 82599 device is connected to a legacy XAUI-based switch since both devices are capable of 10 GbE XAUI-like parallel detection but only the lane 0 transmitters on each device are active. One device needs to turn on all 4 transmitters in order for the other device to see 10 GbE XAUI-like mode; otherwise, either no link or a 1 GbE link is observed in the system, depending on the specific behavior of the switch link state machine.

LESM was developed by Intel to break the speedlock condition described above. The feature can be implemented in the 82599 controller with on-chip firmware and is used to switch the link-mode-select setting in the AUTOC register to try a different configuration after timeout. For example, after trying CL 73 AN and Parallel Detect, it might change to XAUI-mode (which turns on all 4 lane transmitters) and check link status.

If you are experiencing link issues with the 82599 when configured to Backplane Auto Negotiation and connected to a XAUI-based switch, please contact your Intel representative to get an EEPROM file with LESM enabled.

8. PCIe Timeout Interrupt

The PCIe Timeout Exception (TO) bit in the PCIe Interrupt Cause (PICAUSE) register is set when a timeout occurs on an access to the address space of this port. This includes accesses initiated by the EEPROM auto-load function, JTAG, and manageability firmware, in addition to accesses from the PCIe interface. This interrupt bit does not necessarily indicate a problem with a PCIe transaction and further analysis would be required to determine the source of the problem.



9. Master Disable Flow

During the "Master Disable" flow, the device driver should set the PCIe Master Disable bit and then poll the PCIe Master Enable Status bit to determine if any requests are pending. There are cases where this bit will not be released (such as flow control or link down), even if the PCIe Transaction Pending bit is cleared in the Device Status register. In such cases, the recommendation (see the *Intel® 82599 10 GbE Controller Datasheet*, and search for "Master Disable") is to issue two consecutive software resets with a delay larger than 1 microsecond between them.

The data path must be flushed before a software resets the 82599. The recommended method to flush the transmit data path is:

1. Inhibit data transmission by setting the HLREG0.LPBK bit and clearing the RXCTRL.*RXEN* bit. This configuration avoids transmission even if flow control or link down events are resumed.
2. Set the GCR_EXT.*Buffers_Clear_Func* bit for 20 microseconds to flush internal buffers.
3. Clear the HLREG0.*LPBK* bit and the GCR_EXT.*Buffers_Clear_Func*.
4. It is now safe to issue a software reset.

10. Padding on Transmitted SCTP Packets

When using the 82599 to offload the CRC calculation for transmitted SCTP packets, software should not add Ethernet padding bytes to short packets (less than 64 bytes). Instead, the HLREG0.*TXPADEN* bit should be set so that the 82599 pads packets after performing the CRC calculation.

11. 82599EN EEPROM Image File

The 82599EN SKU (the single-port variant of the product) requires the usage of Dev_Starter EEPROM v4.21 or higher. Please contact your Intel representative to obtain updated EEPROM images.

12. Selecting a Rx Pool Using VLAN Filters

Rx Pool selection is described in the *Intel® 82599 10 GbE Controller Datasheet*, Section 7.10.3.2. Note that pools are first selected by MAC Address filtering, and then by VLAN filtering. If the application is aiming to map packets to pools exclusively by their VLAN tags, it needs to replicate all incoming packets to all the different pools by their MAC Address.

To achieve the packet replication, PFVTCTL.*Rpl_En* should be set and the relevant MAC Address filtering bits should be set:

- MPSAR, PFUTA, MTA and VFTA tables.
- Relevant bits in PFVML2FLT registers – *ROMPE*, *ROPE*, *BAM* and *MPE*.

Pool selection by VLAN is then controlled by the PFVLVF and PFVLVFB registers.

13. 82599 SFP+ Receiver Specification Conforms to SFF-8431

The 82599 SFI interface supports the electrical specification defined in the SFI+ MSA (SFF Committee SFF-8431). The 82599 SFI receiver is conformant with the SFI receiver specification, and expects the transmitted signal to comply with the SFF-8431 electrical specification listed in SFF-8431 3.51 Table 11 and Table 12. Establishing an SFI link with a link partner whose transmitter is non-conformant with this specification might result in link issues, such as link instability and/or Bit Error Rate (BER) failures.

If link issues are observed, it might be due to violations of the Eye Mask electrical specifications in Table 12 by the link partner of the 82599. In this case, Intel recommends tuning the Link Partner's SFI Transmitter signal to be within the range allowed in the SFF-8431 specification. If the Link Partner's SFI Transmitter is not tunable and exceeds the amplitude specification, Intel recommends the use of a lossier medium (such as a longer Direct Attach cable) to provide additional attenuation and thereby attempt to provide a recoverable signal to the 82599 receiver.

14. SR-IOV and Jumbo Frames Support in the 82599

To enable Jumbo Frame support with SR-IOV enabled, the Physical Function (PF) and the Virtual Function (VF) must be configured to the same maximum frame size. Additionally, the jumbo frame has a maximum size of 9 KB. Software drivers requiring support for Jumbo Frames in SR-IOV must account for this. SR-IOV and Jumbo Frames are supported in the 82599 on both Linux and Microsoft Windows Server operating systems with Intel software drivers.

- Linux Support: Support started with PF (ixgbe 3.15.1) and VF (ixgbevf 2.8.7) drivers available from Intel's Open Source Driver site (http://sourceforge.net/projects/e1000/files/) and the Linux kernel version 3.2 or newer.
- Microsoft Windows Server Support: Supported with Microsoft Windows Server 2012 family starting with Intel Driver Release 18.3 available at http://support.intel.com.

15. VLAN Anti-Spoof Filter of an Untagged Packet

The VLAN anti-spoofing capability insures that a VM always uses a VLAN tag that is part of the set of VLAN tags defined on the Rx path. A Tx packet with a non-matching VLAN tag is dropped, preventing spoofing of the VLAN tag.

Note: An untagged packet is dropped.

16. SR-IOV Prefetchable Address Space

In SR-IOV mode, memory space should be allocated to the multiple VFs enabled. To accommodate the full extent of possible memory allocation, 64-bit addressing should be used. The PCI bridge specification requires that a 64-bit BAR be prefetchable.

The "prefetchable" bit at IOV Control Word has been set in the NVM Dev Starter releases since Revision 3.13. To obtain an updated EEPROM image, please contact your Intel representative.

17. CRCERRS Statistic Counter

A packet counted by the ILLERRC or the ERRBC statistics counter is not counted by the CRCERRS counter.

18. Rx Statistics Counters Do Not Count Runt Frames or Fragments Smaller Than 12 Bytes

TPR, RFC, and RUC statistics counters do not count runt frames or fragments smaller than 12 bytes.

19. FCOE_PARAM Field

The FCOE_PARAM field reported in the Rx descriptor indicates the size of the entire exchange only when the *Relative Offset Present* bit is set in the F_CTL field. If the bit is clear, software can conclude the size of the DDP data by reading the DDP buffer pointers FCPTRL, FCPTRH and the DDP buffer offset FCBUFF.*Offset*.

Intel implementation on Linux/ESX/Windows for the 82599 is using DDP only for solicited data. In solicited data the *Relative Offset Present* bit is always set. As such, with Intel implementation, the FCOE_PARAM field reported in the Rx descriptor reflects the size of the DDP data.

2.2 Specification Changes

1. PBA Number Module — Word Address 0x15-0x16

This information now appears in the *Intel® 82599 10 GbE Controller Datasheet*, Revision 2.8.

2. Updates to PXE/iSCSI EEPROM Words (B0 Stepping)

This information now appears in the *Intel® 82599 10 GbE Controller Datasheet*, Revision 2.8.

3. Flow Director: Update Filter Flow Limitation

Parameters update of an existing Flow Director filter can be done by the Update Filter Flow as described in the *Intel® 82599 10 GbE Controller Datasheet*.

It should be noted that the Update Filter Flow process requires internal memory space used to store temporary data until the update concludes. Therefore, Update Filter Flow can be used only if the maximum number of allocated flow director filters (as defined by FDIRCTRL.*PBALLOC*) is not fully used.

For example, if FDIRCTRL.*PBALLOC*=01b, memory is allocated for 2K-1 perfect filters. In this case, the Update Filter Flow can be used only if not more than 2K-2 filters were programmed.

4. Bit 16 of CTRL_EXT Register Must be Set

This information now appears in the *Intel® 82599 10 GbE Controller Datasheet*, Revision 2.8.

5. MAC Link Setup and Auto-Negotiation

According to the *Intel® 82599 10 GbE Controller Datasheet* (see Section 3.7.4.2), Link is configured by setting the speed in the AUTOC.*LMS* field, selecting the appropriate physical interface in AUTOC.*1G_PMA_PMD*, AUTOC.*10G_PMA_PMD_PARALLEL*, and AUTOC2.*10G_PMA_PMD_Serial* and is completed by restarting auto-negotiation by setting AUTOC.*Restart_AN* to 1b.

Note that auto-negotiation logic will reset the data pipeline on *Restart_AN* assertion only if LMS mode is changed. If the user wants to change link configuration parameters with the same AUTOC.*LMS* field value, link configuration should take these steps:

1. Read AUTOC register. Write back AUTOC register content with *LMS*[2] bit inverted (AUTOC bit 15) and *Restart_AN* bit asserted.
2. Read ANAS field in ANLP1 register. Check that it is not zero (or idle), indicating that auto-negotiation was restarted.
3. Write AUTOC register with original *LMS* field and *Restart_AN* bit asserted.

If the LESM feature is enabled (see Specification Clarification #7), the 82599 Device Firmware may access AUTOC register in parallel to software driver and a synchronization between them is needed (described in the *Intel® 82599 10 GbE Controller Datasheet*, Section 10.5.4). To check that the LESM feature is enabled, note that Word Offset 0x2 of NVM FW Module will not be 0x0000 or 0xFFFF.

Note: Failure to follow this sequence can result in unpredictable link issues, including failure to establish link.

Intel Drivers follow this updated sequence starting with Release 17.4.

6. RXMTRL.*UDPT* Initial Value

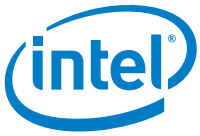
If the Time Sync (IEEE 1588) feature is used, the RXMTRL.*UDPT* field should be initialized to 0x13F.

This is fixed in ixgbe v3.11.20.

7. Flow Director Registers Update

- Flow Director Filters Free - FDIRFREE (0x0000EE38) - Bits 30:16 - Reserved
- Flow Director Filters Length - FDIRLEN (0x0000EE4C) - Bits 30:16 - Reserved
- Flow Director Filters Failed Usage Statistics - FDIRFSTAT (0x0000EE54) - Bits 7:0 - FADD field definition

  Number of filters addition events that do not change the number of free (non programmed) filters in the flow director filters logic (FDIRFREE.FREE). These events can be either filters update, filters collision, or tentative of filter additions when there is no sufficient space remaining in the filter table.



8. EEPROM Device Size

The following EEPROM device size updates will be included in the next *Intel® 82599 10 GbE Controller Datasheet* release.

Section 12.6.2.1 - Minimum EEPROM Sizes

- No manageability - 16 KB (128 Kb)
- SMBus/NC-SI - 32 KB (256 Kb)

Section 12.6.2.2 - Recommended EEPROM Sizes

- No manageability - 32 KB (256 Kb)
- SMBus/NC-SI - 32 KB (256 Kb)

Note: These EEPROM device sizes are required when using Dev_Starter image v4.25 or later.

9. The Flow Director FDIRErr(0) Bit in the Rx Descriptor is Valid Only if the FLM Bit is Set

The FDIRErr(0) bit in Rx descriptor (length error) is valid only if the FLM bit is set (a packet matches a flow director filter) in the Extended Status of the Advanced Receive Descriptor.

10. ETQF[19:16] are Reserved

Bits 19:16 of the EType Queue Filter (ETQF) registers are reserved and should not be set by software.

11. WTHRESH=0 Mode

The following note in the *Intel® 82599 10 GbE Controller Datasheet*, Section 8.2.3.9.10 should be updated.

Current text: “When WTHRESH is set to zero, the software driver should set the RS bit in the last Tx descriptors of every packet (in the case of TSO it is the last descriptor of the entire large send).”

Updated text: “When WTHRESH is set to zero, the software device driver should set the RS bit in the Tx descriptors with the EOP bit set and at least once in the 40 descriptors.”

12. LINKS Bit 7 is Reserved

Bit 7 of Link Status Register (LINKS - offset 0x42A4) is reserved and should not be used.

2.3 Documentation Updates

None.

2.4 Errata

Note: If the errata applies to a stepping, "Yes" is indicated for the stepping (for example: "B0=Yes" indicates errata applies to stepping B0). If the errata does not apply to the stepping, "No" is indicated (for example: "B0=No" indicates the errata does not apply to stepping B0).

1. Cause of Interrupt Might Never be Cleared

Problem:

If the cause of an interrupt is set by the Extended Interrupt Cause Set (EICS) register writing just before the interrupt line is set, then it might not be cleared. This means that there might be a deadlock that prevents the interrupt line from rising.

This erratum only occurs when all three modes referenced are used at the same time: non-PBA mode, Auto Clear (of the cause), No Auto Mask.

PBA is Pending Bit Array mode. During this mode the device is able to capture additional interrupts during the interval between initial interrupt and driver access to the device.

Implication:

The device stops issuing interrupts.

Workaround:

When operating using the above configurations, software should manually clear the cause by writing a 1b to the specific bit in the relevant EICR/EICR1/EICR2/VTEICR0-63 register (after the interrupt occurs and the EICS was written). This workaround is included in Intel drivers.

Status: B0=Yes; NoFix

2. Flow Director: Length-Error Bit Not Updated on Remove Operation

Problem:

To avoid high latency, the length of the Flow Director (FD) filters linked list is limited. The length limit is programmable (FDIRCTRL.*Max-Length* field). If a linked list exceeds this limit, a length error is reported in the FDIRErr.*Length* field in the Rx descriptor.

This erratum exists because once a filter is assigned to have the length-error attribute, it stays with this attribute even if an error condition doesn't exist anymore (such as a previous filter was removed from the list).

Implication:

When the FD table is programmed with many filters while dynamic filter removal is used, the driver might get an indication for over length lists (FDIRErr.*Length*) even though the linked lists are not too long. This indication could be used by the software driver to remove filters from the table. Note that the current software driver does not use the dynamic filter removal option.

Workaround:

Software - Reset Flow Director (FD) tables when max-length indication is observed, or hold image of all the FD table and update the FD table (holding the image is less recommended).

The FD table is the hardware internal memory structure. Clearing this table means that the packet buffer memory of FD is cleared and linked to the empty link-list and head/tail CSRs are initialized. All other CSR are re-configured by software (see the *Intel® 82599 10 GbE Controller Datasheet*)

Status: B0=Yes; NoFix

3. Flow Director: Filter Might Lose Length-Error Attribute in Perfect-Match Mode

Problem:

To avoid high latency, the length of the Flow Director (FD) filters linked list is limited. The length limit is programmable (FDIRCTRL.*Max-Length* field). If a linked list exceeds this limit, a length error is reported in the FDIREr*r.Length* field in the Rx descriptor.

In some rare cases a filter that has the length-error attribute might change the attribute to No-Length-Error. As a result, the FD table includes long lists, which are not reported to software. Once a packet matches these filters it causes a slightly higher latency in the device.

Implication:

There is no expected impact. In the cases where this indication is important, we expect other filters to indicate length-error.

FD tables are reset, which lowers the probability of reaching this case.There is also no impact to packet counters.

Workaround:

None.

Status: B0=Yes; NoFix

4. Flow Director: L4Packet Type Might Give Wrong Indication

Problem:

The MSB of the L4 Packet Type (L4TYPE) field in the Flow Director Filters Command Register (FDIRMC[6]) might give a wrong value during read access. The flow director filters operate with the correct parameters.

Implication:

No impact on functionality. Software should ignore the read result of this bit.

Workaround:

None. Make sure that in a read to verify successful write, this bit is ignored.

Status: B0=Yes; NoFix

5. Flow Director Statistics Inaccuracy

FDIRMATCH should count the number of packets that matched any flow director filter.

FDIRMISS should count the number of packets that missed matching any flow director filter.

Implication:

The counters cannot be used for exact statistics. Counters should be used as an approximate indication on miss/match of filters.

Workaround:

None.

Status: B0=Yes; NoFix

6. No Length Error on VLAN Packets with Bad Type/Length Field

Problem:

Device will not assert length error for VLAN packets that have a bad type/length field in the MAC header.

Implication:

No impact on system level performance. The packets are posted to the host as any other packets.

Workaround:

None.

Status: B0=Yes; NoFix

7. GPRC and GORCL/H Also Count Missed Packets

Problem:

GPRC (Good Packets Received Count) and GORCL/H (Good Octets Received Count) count missed packets and missed packets bytes; this is not consistent with previous products.

Implication:

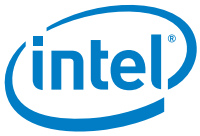
None.

Workaround:

Statistics are available indirectly for these registers. This workaround is included in Intel drivers.

- For GPRC — Subtract MPC (Missed Packet Count) from GPRC. Alternatively, use QPRC.
- For GORCL/H — use QBRCL/H (Quad Bytes Received).

Status: B0=Yes; NoFix



8. Incorrect Behavior in the Switch Security Violation Packet Count (SSVPC) Statistic Register

Problem:

During VM Migration (or other VFLR scenarios), VM-to-VM packets that should be forwarded to a VM that is currently in migration might be dropped; they may not forwarded to the VM internally and not forwarded to the network.

These packets are counted both as bad packets in the SSVPC counter and also as good packets in the DMA-TX good-packet counter.

Implication:

The statistic is not reliable for VFLR cases.

Workaround:

None.

Status: B0=Yes; NoFix

9. FCoE: To Read DMA-Rx FCoE context, CSRs Need to Add a Dummy Write

Problem:

There is a need to add a dummy write before the read of an FCoE context CSRs (FCDMARW) to avoid context corruption.

Implication:

No impact.

Workaround:

Write FCDMARW twice while having the required FCoE read index valid and '0’ in the RE and WE bits.

Status: B0=Yes; NoFix

10. In 100M Link Mode, CSR Access to DMA-Rx Might Reach Internal Timeout

Problem:

In 100 Mb/s link mode, internal clocks are slower, and access of an internal register can lead to timeout.

Implication:

An unknown value will be returned on PCIe interface.

Workaround:

SW - in 100 Mb/s link mode we need to disable aggregation in DMA-Rx (set RDRXCTL.*AGGDIS*=1) and to extend the PCIe timeout extension to 32 µs (set PCIEMISC.*TO_extension* to 011).

When aggregation is disabled, expect an impact on performance for packets below 128B in length.

Do not increase the timeout extension beyond 32 µs to avoid system issues.

Status: B0=Yes; NoFix

11. MACSec: When PN=0, Packet is Not Dropped

Problem:

According to the MACSec specification, frames with PN=0 (packet number) in the sectag should be counted as bad tags/packets. The 82599 will consider these packets as late packets and they will be incorrectly identified as a late packets instead of a bad tag/packets. So they are dropped, but for the wrong reason (late packet instead of bad tagged).

Implication:

MACSec Rx statistic counters might report inaccurate values.

Workaround:

None.

Status: B0=Yes; NoFix

12. MACSec: LSECRXUC, LSECRXNUSA and LSECRXUNSA Statistics Counters Not Implemented According to Specification

Problem:

InPktsUnchecked (LSECRXUC) statistic is not provided- the LSECRXUC does not count correctly.

InPktsNotUsingSA (LSECRXNUSA) and InPktsUnusedSA (LSECRXUNSA) should be defined per SA. In this implementation, these are captured by a single counter.

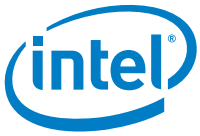
Implication:

Statistics defined in the MACSec standard cannot be provided.

Workaround:

None.

Status: B0=Yes; NoFix



13. Issues in Clock Switching of MAC Clocks

Problem:

During changes in the internal link-speed, the timing of the clock-switch might cause problems in the transmit path.

Implication:

The transmit path might hang.

Workaround:

In SW, set bit 19 of the AUTOC2 register to 1b as part of init flow (through EEPROM/SW). This delays the link-up flow by 10 µs, allowing a safe clock-switch. Note that Intel drivers expect bit 19 of the AUTOC2 register to be set by EEPROM.

Status: B0=Yes; NoFix

14. FEC: Correctable and Uncorrectable Counter Read Mechanism is Malformed

Problem:

The FEC counters (FECS1 and FECS2) return values only after the read transaction is done.

Implication:

The read result of these counters is available only on the next read request. Since these are set to clear on read, an extra dummy read causes clearing of the counter without getting the result.

Workaround:

For an independent read: perform two read transactions and ignore the data returned in the first read transaction.

For continuous reading: keep track of the result (each read will return the result of the previous read of the CSR).

Status: B0=Yes; NoFix

Bug Links: 2609913
Affected: EV, SV

15. Clause 37 AN: 82599 Will Not Restart AN if Receiving Invalid Idle Codes During Configuration State

Problem:

According to clause 37, DUT should restart AN (auto-negotiation) if it receives invalid idle codes. If the device receives bad idle codes in the configuration state of the PCSRX AN SM, it will not restart AN.

Implication:

Specification conformance to 1G clause 37.

Workaround:

None.

Status: B0=Yes; NoFix

16. Does Not Meet the Timing Requirements for PAUSE Operation at 1G Speed

Problem:

While in SGMII, KX, or BX mode, and running at 1 GbE speed, the device responds to a received pause frame after a longer time than defined in the IEEE 802.3 specification.

Implication:

Specification conformance. The response gap is small.

Workaround:

None.

Status: B0=Yes; NoFix

17. Device Does Not Meet the Timing Requirements for PAUSE Operation at 100 MB Speed

Problem:

While in SGMII, KX, or BX mode, and running at 100 Mb/s speed, the device responds to a received pause frame after a longer time than defined in the IEEE 802.3 specification.

Implication:

Specification conformance. No system impact with low traffic.

Workaround:

None.

Status: B0=Yes; NoFix

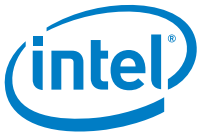
18. SGMII 100M: 82599 Might Need a SW-Reset when Link-Mode Enters/Exits 100M

Problem:

On speed changes to or from 100 Mb/s and for specific traffic timing, clock switching might occur during traffic resulting in issues in Tx path.

Implication:

When transmit path appears un-responsive following a entry/exit to 100M speed, a SW reset is required.



Workaround:

When working with SGMII 100M enabled and after link-mode changes if there's an indication transmit is not working, SW should give SW-reset to release the device.

Status: B0=Yes; NoFix

19. DFT: Rx-to-Tx Loopback (XGMII LPBK) in 1Gb\100Mb with Low IPG May Cause Chopped Packet

Problem:

In XGMII loopback and 1GbE/100 Mb/s speeds, if the IPG is low (the accurate number depends on XGMII-MUX threshold and system PPM), Tx packets will be chopped.

Implication:

Testing using this mode while in 1GbE/100 Mb/s modes may encounter this problem.

Workaround:

A safe IPG to run with should be higher than 55 bytes.

Status: B0=Yes; NoFix

20. DFT: JTDO Output is Disabled During HIGHZ Instruction

Problem:

The 82599 disables JTDO outputs during a HIGHZ instruction. According to IEEE Std 1149.1-2001, “The HIGHZ instruction shall select the bypass register to be connected for serial access between TDI and TDO in the Shift-DR controller state.”

Implication:

If multiple devices are chained in the board, the tester won't be able to check devices behind the 82599 when it is in HIGHZ.

Workaround:

Operate in BYPASS mode and avoid any 82599 output contention.

Status: B0=Yes; NoFix

21. MACSec: Tx Octets Protected (LSECTXOCTP) Increment More Than Required

Problem:

The 82599 is required to count in this statistic the user data only. The counter currently includes bytes outside the user data (DA, SA, and SECTAG fields).

Implication:

Statistic does not provide the required data. Specification compliance issue.

Workaround:

None. Software can calculate the extra bytes counted in the counter (multiply number of packets by 20 or 28 according to SecTAG length — selected by LSECTXCTRL.*AISCI*.

Status: B0=Yes; NoFix

22. The 82599 Might Reach Block-Lock After 63 Sync_Headers Instead of 64

Problem:

The 82599 10 GbE serial PCS might reach a valid block-lock after receiving 63 sync_headers instead of 64 as required by the Clause 49 specification.

Implication:

Specification compliance of Clause 49. No functional impact.

Workaround:

None.

Status: B0=Yes; NoFix

23. ERR_COR Message TLPs are Not Sent for Advisory Errors in D3

Problem:

If the 82599 is in D3 state, and if set to advisory non-fatal, an ERR_COR message is not sent for the following errors: Unexpected Completion, Poisoned TLP, Completer Abort, and Unsupported Request.

Implication:

The 82599 is required by the PCIe specification to send error messages for all errors caused by a received TLP when in D3hot. The 82599 violates this requirement.

Workaround:

Use ERR_NONFATAL instead of ERR_COR by not using advisory non-fatal. If advisory non-fatal is required, no workaround is available.

Status: B0=Yes; NoFix

24. PCIe Bandwidth in Non-Optimal Gen1 2.5GT/s Conditions Might be Limited in Single Port Configuration

Problem:

In systems configured to Gen1 2.5GT/s link-speed and to Max Payload Size of 128 bytes, the bandwidth for upstream traffic is lower than expected. The problem is limited to single-port Rx traffic.

Implication:

With this combination, the receive traffic might suffer from bandwidth degradation.

Workaround:

Set Max Payload Size to 256 bytes in the platform/system BIOS.

Status: B0=Yes; NoFix

25. Bus Number and Device Number are Not Preserved Through PCIe Reset

Problem:

A function supporting wake-up functionality from D3Cold must maintain its PME context. The 82599 does not maintain its requester ID, thus the PM_PME message sent after wake up has this field set to zero.

Implication:

In case of a wakeup packet, the system will be awakened by the 82599, but it will not be aware of the source of the wake up event if it relies on the *Requestor ID* field in the PM_PME message.

Workaround:

None.

Status: B0=Yes; NoFix

26. 82599 Might Not be Recognized by PCIe in EEPROM-Less Mode

Problem:

The 82599 without an EEPROM or with a blank EEPROM might not be recognized on some PCIe system implementations. This issue is not consistent and is unit/board/system sensitive. It is caused because the hardware default configuration might incorrectly start an internal PLL calibration before the PCIe reference-clock becomes stable.

Implication:

The 82599 is not recognized by some system implementations.

Workaround:

There are systems on which the 82599 appears less likely to suffer from this issue. In particular for systems where the PCIe reference clock is stable well before PERST_N is de asserted, the 82599 has a higher probability of instantiating on the PCIe interface. If possible the most straight forward workaround for this particular erratum is to ensure a valid and accurate EEPROM image has been loaded.

Status: B0=Yes; NoFix

27. Device Might Fail to Establish Link when Multiple Link Numbers are Advertised by the Upstream Device

Problem:

The 82599 might fail to establish link when multiple link numbers are advertised by the Upstream device

Implication:

Successful link might not be established if multiple link numbers are advertised by Upstream device on a bifurcated port.

Workaround:

None.

Status: B0=Yes; NoFix

28. Re-Enabling a Port Using the Rising Edge of LAN_DIS_N Requires a LAN_PWR_GOOD Reset

Problem:

To re-enable a port using the rising edge of LAN_DIS_N (after it was disabled through the pin) it is required to go through a LAN_PWR_GOOD reset. PERST# (PCIe reset) cannot be used to re-enable a port.

Implication:

This limitation requires a cold boot in order for the LAN_DIS_N rise to take effect.

Workaround:

Reset the 82599 using LAN_PWR_GOOD (cold reboot).

Status: B0=Yes; NoFix

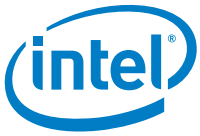
29. BMC Receives Non-MACSec Packets from the LAN without an Indication Regarding to Received Packet Type (With/Without MACSec Header)

Problem:

When operating in MACSec strict mode, all non-received packets pass the MACSec logic and are forwarded to the BMC. In NC-SI mode, the BMC does not get the packet descriptor so it cannot know if the packet is a trusted packet that was processed by the MACSec logic or non-trusted packet that skipped over the MACSec logic (this is indicated in the *SECP* bit in the descriptor status).

Implication:

NC-SI BMC cannot differentiate between MACSec and non-MACSec packets.



Workaround:

None.

Status: B0=Yes; NoFix

30. NC-SI: Additional Multicast Packets May be Forwarded to the BMC

Problem:

If the BMC enables multicast filtering for IPv6 neighbor advertisement and/or IPv6 router advertisement, additional multicast packets are forwarded to the BMC. The additional packets forwarded are:

- Packets with ICMPv6 header message type: 135,137.
- IPv6 neighbor advertisement.
- IPv6 router advertisement.

Implication:

Additional packets might be forwarded to the BMC.

Workaround:

BMC should filter the different multicast packets.

Status: B0=Yes; NoFix

31. SMBus: Unread Packets Received on One Port May Cause Loss of Ability to Receive on Other Port

Problem:

The device’s two ports share an internal memory. When packets are received by one of the ports and not read by the BMC, they are stored in the shared memory. When this memory fills up, no more packets may be received from either ports.

Implication:

Loss of packets. The BMC should be aware of the above behavior.

Workaround:

Do the following:

1. Make use of a SMBus alert timeout mechanism.
2. Momentarily disable receives by the other port.

Status: B0=Yes; NoFix

32. NC-SI: Packet Loss when the BMC Sends Packets to Both Ports and One Port Has Its Link Down

Problem:

NC-SI Rx (BMC-to-LAN) FIFO is shared between both ports. When one of the LAN port's Tx buffer is congested because of link failure or flow control, the NC-SI Rx FIFO gets congested and as a result the packets for the second port also gets dropped and are not sent to the LAN.

Implication:

Loss of packets. The BMC should be aware of the problem.

Workaround:

The BMC should monitor the link status and stop sending packets to a specific port if link is down.

Status: B0=Yes; NoFix

33. The EEPROM *Core Clocks Gate Disable* Setting Impacts Link Status During D3 State

Problem:

Setting EEPROM bit Core Clocks Gate Disable has side effects when both manageability and Wake on LAN (WoL) are disabled for a port. The Link and LEDs are both active in D3 when they should be disabled.

The *Core Clocks Gate Disable* bit is set in 82599's manageability EEPROM images. Starting from EEPROM Dev Starter, Revision 4.25 and later it is set for all images.

Also see Erratum#58, "82599 LAN Port #1 SFI Link Instability".

Implication:

Link is kept up and the LEDs remain active.

A link partner might see the link and think that the 82599 is up and running.

LEDs might indicate a link, though no entity (software/firmware/WoL) requires the link.

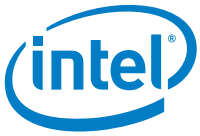
Workaround:

Configure the link settings to an incompatible mode when entering D3 and re-configure to correct the link setting when moving back to D0.

Disable link when entering D3 by configuring setting AUTOC2.*FASM* and AUTOC2.*PDD* bits (bits 30 and 28). Enable link back when moving back to D0 by clearing these bits.

Status: B0=Yes; NoFix

Workaround Implemented in Intel SW Drivers starting with Release 18.3 (ixgbe v3.15.1)



34. Priority Flow Control (PFC) to Some Traffic Classes (TCs) Might Impact Traffic on Other Traffic Classes

Problem:

DMA-Tx stops processing new transmit requests on all TCs if the following scenario happens:

- The 82599 is configured to DCB mode with PFC enabled.
- One or more TCs receive a per-priority pause.
- There is no data to be transmitted in the descriptor queues that belong to TCs other than the one being flow controlled (exposure to this combination is only on the specific clock cycle that the internal pause related full indication rises).

To recover, new transmit requests are processed when the pause timer expires, and transmit on a paused TC is re-enabled.

Implication:

Latency of packets might increase (a new packet might wait extra time until the pause timer expires). Overall throughput is not expected to be impacted, since this issue happens only when Tx is empty. Note that there is no violation in the paused TCs.

Workaround:

Keep a dummy Tx queue active in a reserved, lowest priority TC, transmitting packets that are dropped by an internal IOV related configuration (requires partial internal IOV configuration. Does NOT require real IOV). This avoids an empty condition, which avoids the issue.

Status: B0=Yes; NoFix

35. SR-IOV: PCIe Capability Structure in VF Area is Incorrectly Implemented

Problem:

SR-IOV Specification 1.0 section 3.5, 3.5.2, 3.5.3, 3.5.6, and 3.5.9 requires that the virtual function's PCIe Capability Structure inherits its basic values from its matching physical function, including Device Capabilities, Link Capabilities and Device Capabilities 2 registers. Currently, the 82599 is returning zeros when reading those registers, as well as the PCIe version field.

Implication:

SR-IOV might be unsupported by VMM, or by VF drivers. There is no implication for Microsoft* and VMware ESX* SR-IOV solutions.

Workaround:

VMM needs to be aware of this issue, and return relevant PF capability registers.

Status: B0=Yes; NoFix

36. SR-IOV: Incorrect Completer ID for Config-Space Transactions

Problem:

According to PCIe Spec 2.0 clause 2.2.9, the PCIe hardware must include a Completer-ID field in all completions for incoming NP requests, using the address specified in each incoming Type 0 CfgWr transaction. However, the 82599 replies for incoming SR-IOV configuration transactions (CfgRd/CfgWr) with a false Completer-ID having a wrong function ID, which violates the PCIe specification.

Implication:

Software should be able to operate successfully without any impact. Although the specification requires sending completions with Completer-ID, comparing it upstream is implicit. This is because the PCIe Transaction-ID includes the Requester-ID and the Transaction Tag (and does not relate the Completer-ID). Furthermore, responses to Config Accesses are always Dword size, and their completions arrive in order.

Workaround:

Ignore the Completer-ID where referred.

Status: B0=Yes; NoFix

37. PCIe: PM_Active_State_NAK Message Might be Ignored

Problem:

A PM_Active_State_NAK message received by the 82599 might be ignored under the following conditions:

- The 82599 configuration for ASPM L1 is enabled, and L0s is disabled. Note that this configuration is possible only if an upstream device also supports ASPM L1.
- The 82599 initiates APSM L1 transition by sending PM_Request_L1 DLLPs upstream.
- Upstream device tries to terminate ASPM L1 transition by sending a single PM_Active_State_NAK message.

After ignoring the PM_Active_State_NAK message, the 82599 continues the ASPM L1 transition by sending PM_Request_L1 DLLPs endlessly.

Implication:

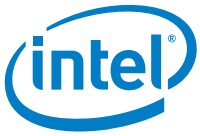
Device hang, which eventually could lead to a system hang.

Workaround:

To avoid the erratum condition do one of the following:

- Disable ASPM L1 in the 82599 EEPROM image (default).
- Enable both ASPM L1 and L0s in the 82599 configuration space.
- Verify that the upstream device never sends PM_Active_State_NAK when configured to support ASPM L1.

Status: B0=Yes; NoFix



38. PCIe: Incorrect PCIe De-Emphasis Level Might be Reported

Problem:

Current De-emphasis Level status bit in the Link Status 2 register in the PCIe configuration space should reflect the level of de-emphasis configured by the upstream device.

By default, this bit shows the correct status of -6 db. If the upstream device requests the change of de-emphasis during link training according to the PCIe 2.0 specification, the status shows correctly the change to -3.5 db.

If the upstream device is incorrectly requesting a de-emphasis change late in the link training, after a speed change (such as due to a BIOS misbehavior), the 82599 remains at the default -6 db as expected. However, in this case, the Current De-emphasis Level status bit incorrectly shows -3.5 db.

Implication:

Incorrect de-emphasis level might be reported in Link Status 2 register.

Workaround:

None.

Status: B0=Yes; NoFix

39. APM Wake-Up Might be Blocked if System is Shut Down Before Driver Load

Problem:

When the system is powered up and APM mode is enabled in the 82599 EEPROM, the device is able to wake correctly from a power saving state even before the software driver is loaded for the first time. According to APM specification, the 82599 is expected to be armed for further wake events even without software driver intervention.

In the 82599 implementation upon a wake event, the *Magic Packet Received* bit is set in the WUS register. Also, this register needs to be cleared by the software driver before arming APM for a new wake event.

If an awake system is shutdown again before a software driver load, the *Magic Packet Received* bit that was not cleared might block further WoL events.

Implication:

If the following events occur, in this order, this erratum might be observed:

1. WoL event.
2. Software driver does not successfully load.
3. System transitions to S3/S5 state.

For example, if after a WoL event, a BSOD occurs during system boot and the system is shutdown manually, a magic packet might not be able to wake the system.

Workaround:

If a system is requested to operate under this specific scenario, a custom EEPROM image can be provided to clear the WUS register each time it is set.

Note: A custom EEPROM image can be provided to workaround this issue. To obtain a custom EEPROM image, contact your Intel representative.

Status: B0=Yes; NoFix

40. PME_Status Might Fail to Report a Wake-Up Event

Problem:

During a wake-up event, the *PME_Status* bit is set in both PMCSR and WUC registers.

When waking up from Dr State, an error condition might happen and the *PME_Status* bit is reset by hardware.

Implication:

The BIOS and/or operating system cannot detect what device asserted the PME.

Workaround:

A custom EEPROM image can be provided that sets the *PME_Status* bit after waking up from Dr State.

Status: B0=Yes; NoFix

Note: A custom EEPROM image can be provided to workaround this issue. To obtain a custom EEPROM image, contact your Intel representative.

41. DMA: QBRC and VFGORC Counters Might Get Corrupted if Receiving a Packet Bigger Than 12 KB

Problem:

DMA-Rx statistics Queue Bytes Received Counter (QBRC[n]) and VF Good Octets Received Counter VFGORC[n]) might get corrupted in a rare case of Rx aggregating of descriptors for packets with overall size bigger than 16 KB. This occurs only if the first aggregated packets are smaller than 4 KB and the last aggregated packet of the same transaction is bigger than 12 KB.

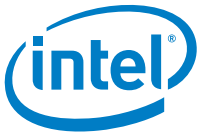
Implication:

In a rare usage model of receiving 12 KB jumbo packets, QBRC[n] and VFGORC[n] might return a false value.

Workaround:

None.

Status: B0=Yes; NoFix



42. PCIe: 82599 Transmitter Does Not Enter L0s

Problem:

According to the PCIe specification "Ports that are enabled for L0s entry must transition their transmit lanes to the L0s state if the defined idle conditions are met for a period of time not to exceed 7 μs". Due to how the 82599 was designed, the idle counter does not initiate a L0s transition.

Implication:

PCIe specification compliance issue. The 82599 transmitter does not enter L0s, causing a small increase in power consumption.

Workaround:

None.

Note: The 82599 EEPROM images have the *L0s Entry Supported* bit set, since some systems use this configuration as a condition for Tx L0s enablement in the upstream device transmit side.

Status: B0=Yes; NoFix

43. Integrity Error Reported for IPv4/UDP Packets with Zero Checksum

Problem:

According to the UDP specification "an all zero transmitted checksum value means that the transmitter generated no checksum (for debugging or for higher level protocols that don't care)", these packets should be received without a checksum error notation. The 82599 reports an L4 integrity error if such packets are received.

Implication:

UDP packets without a checksum will have an L4 integrity error indication in the Rx descriptor.

Workaround:

If bits L4E and L4I are set in the Rx descriptor, the software driver should check if the checksum is zero and then ignore this error.

Status: B0=Yes; NoFix

44. Header Splitting Can Cause Unpredictable Behavior

Problem:

Header Splitting mode (SRRCTL.*DESCTYPE*=010b or 101b and PSRTYPE[11:0]≠0) might cause unpredictable behavior and should not be used.

Implication:

Unpredictable behavior.

Workaround:

Header Splitting should not be enabled. Starting with Intel® driver Release 16.0, Header Splitting cannot be enabled.

Status: B0=Yes; NoFix

45. PCIe Compliance Pattern is Not Transmitted when Connected to a x4/ x2/x1 Slot

Problem:

If the PCIe compliance pattern is activated by setting the *Enter Compliance* bit in the Link Control 2 register, the 82599 is able to transmit the compliance pattern only if it's connected to a x8 slot. If it is connected to a x4, x2 or x1 slot, the unconnected lanes falsely cause a premature exit from the compliance state and the pattern is not transmitted.

If a passive test load is applied on all lanes, the 82599 goes to a compliance state and transmits the pattern accordingly, regardless of the internal lane width configuration.

Implication:

A PCIe compliance pattern cannot be transmitted if the 82599 is connected to an x4 or narrower PCIe slot.

Workaround:

None.

Status: B0=Yes; NoFix

46. PCIe: Correctable Errors Reported when Using Rx L0s in a x1 Configuration

Problem:

When using Rx L0s in an x1 configuration, the 82599 reports receiver errors at a rate of more than one per minute on some platforms.

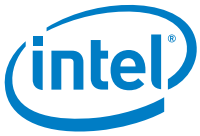
Implication:

Correctable errors are reported at a higher rate than can be explained by random bit errors. These errors should be ignored by the system.

Workaround:

None.

Status: B0=Yes; NoFix



47. PCIe: N_FTS Value is Too Small when Common Clock Configuration is Zero

Problem:

When the *Common Clock Configuration* bit in the Link Control register is 0b, the value of the N_FTS advertised by the 82599 is taken from internal configuration registers, with separate values used for Gen1 and Gen2 speeds. The hardware default values are too small to guarantee a clean exit from L0s in all cases.

As a result, link recovery procedures might be performed and correctable errors might be reported: Bad TLP, Bad DLLP, and Replay Timer Timeout.

Note that even on platforms where the *Common Clock Configuration* bit is set to 1b, this bit is cleared by hot reset or D3-to-D0 transitions, and the previous situation can still occur until the configuration space programming has been restored.

Implication:

The correctable errors can generally be ignored. the link recovery procedures and replayed packets result in a small reduction of effective bandwidth on the PCIe link.

However, in certain circumstances on some platforms, the repeated loss of packets can lead to a completion timeout error, which might cause the application and/or the system to stop working.

Workaround:

Three workarounds are available:

1. Disable L0s on the upstream device.
2. Disable L0s on the upstream device before putting the 82599 in hot reset or D3 states.
3. Upgrade EEPROM image:
    - Use EEPROM version 4.09 or newer.

Status: B0=Yes; NoFix

48. FCoE: Exhausted Receive Context is Not Invalidated if Last Buffer Size is Equal to User Buffer Size

Problem:

If the last buffer of an FCoE context does not have sufficient room for the FC payload, the context is considered exhausted and must be invalidated by hardware.

The FCoE context is not invalidated as required under the following scenarios:

- FCoE last buffer size (FCDMARW.*LASTSIZE*) equals the exact user buffer size (FCBUFF.*BUFFSIZE*).
- FCoE DDP last payload byte in a mid packet written to the last byte of the last allocated buffer (the packet fills in the exact buffer value).
- Extra FCoE packet(s) are received in the problematic context.

Implication:

- Invalid host memory access.
- Hardware does not invalidate FCoE context when exhausted and does not assert error status to software.

Workaround:

FCoE context last buffer must be smaller than the context buffer size.

If it is necessary to configure a last buffer to equal buffer size, the following flow should be used:

- Allocate the extra user-buffer in the context list. Set it in the context buffer list and then increment FCBUFF.*BUFFCNT* to reflect a possible usage of an additional buffer.
- Set FCDMARW.*LASTSIZE* = 0x1.
- If flow ends and the extra buffer is used, the flow is invalid and exhausted.

If FCDMARW.*LASTSIZE* = FCBUFF.*BUFFSIZE*, the number of used DDP buffers is limited to 255. The FCBUFF.*BUFFCNT* value should be programmed for less than 256.

Note: The workaround is included in ixgbe v3.2.10 and in our Windows* drivers, starting with Release 16.4 version 2.9.66.0.

Status: B0=Yes; NoFix

49. KR TXFFE Coefficient Update is Not Possible if Middle Coefficient is at Maximum Value

Problem:

During the KR interface startup sequence, the link partner may request the PRESET setting of the TXFFE coefficients, which sets the maximum value of the middle coefficient c(0). The coefficients are set correctly, but further requests to adjust the coefficients will fail. The condition is indicated by the “max, max, max” status response. Any other response from the 82599, including “updated, max, max”, “max, max, updated” and “updated, max, updated” means that at least one of c(-1) and c(+1) coefficients are non-zero; this means that c(0) is non-maximum and thus the condition has not been encountered. The “max” status for c(0) in these responses means that c(0) could not be increased since it would have violated the PTP requirements.

Normal operation is restored after an INIT request.

Implication:

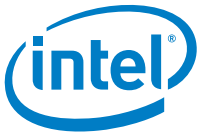
KR link establishment may fail, or alternatively link may be established but not in the best condition, if the link partner issues a PRESET request during KR startup.

Workaround:

An updated EEPROM image can be used to enable further adjustments after PRESET by setting a non-maximum value for c(0) = MAX. Intel recommends that link partner adaption algorithms, which issue PRESET requests, do not rely on MAX coefficient status response, and never request a c(0) coefficient increment after a PRESET request.

Workaround implemented in the 82599 Dev_Starter EEPROM v4.09. Contact your Intel representative to obtain updated EEPROM images.

Status: B0=Yes; NoFix



50. LED Does Not Blink in Invert Mode

Problem:

The *LEDx_IVRT* bit in LEDCTL register (offset 0x00200) is ignored if the respective *LEDx_BLINK* bit is set. This issue is relevant only if *LEDx_MODE* is programmed to one of the modes where *LEDx_BLINK* is used (MAC_ACTIVITY, FILTER_ACTIVITY, LINK_UP, LINK_1G, and LINK_10G).

Implication:

LED stays lit during idle time.

Workaround:

If *LEDx_IVRT* must be set together with a blink effect, use *LINK_ACTIVITY* mode instead of the modes using *LEDx_BLINK* (MAC_ACTIVITY, FILTER_ACTIVITY, LINK_UP, LINK_1G, and LINK_10G).

Status: B0=Yes; NoFix

51. LEDs Cannot be Configured to Blink in LED_ON Mode

Problem:

When the *LEDx_Mode* field of a specific LED is set to 1110b in the LEDCTL register (0x00200), the respective LED is in LED_ON mode. This LED should be always asserted when the mode is set to LED_ON. The LED should also blink based on the *LEDx_BLINK* setting; however, due to a device limitation, the LED does not blink regardless of the *LEDx_BLINK* value.

Implication:

LEDs cannot be configured to blink in LED_ON mode.

Workaround:

The software driver should switch between LED_ON and LED_OFF mode to make the LED blink.

Status: B0=Yes; NoFix

52. NC-SI: Get NC-SI Pass-Through Statistics Response Format

Problem:

The NC-SI Specification, version 1.0.0a defines the Pass-through Tx Packets counter contained in the Get NC-SI Pass-through Statistics Response Packet to be an 8-byte field. The 82599 provides this counter as a 4-byte field.

Implication:

A BMC that uses the Get NC-SI Pass-through Statistics command and expects the response format as described in the NC-SI Specification will not parse the response as intended by the 82599 and will obtain inaccurate statistics.

Workaround:

The BMC can account for the different format provided by the 82599 and parse the response accordingly.

Status: B0=Yes; NoFix

53. Flow Director Filters Configuration Issue

Problem:

Before an 82599 receive path enable, the default value of both RXCTRL.*RXEN* and SECRXCTL.*RX_DIS* is zero. If the flow director filters are configured in this state, the receive data buffer might not be configured correctly.

Implication:

Receive hang.

Workaround:

If RXCTRL.*RXEN* is clear, set SECRXCTL.*RX_DIS* and wait for a SECRXSTAT.*SECRX_RDY* indication before configuring the flow director filters.

This workaround is implemented in the Intel ixgbe driver 3.8.21.

Status: B0=Yes; NoFix

54. PF's MSI TLP Might Contain the Wrong Requester ID when a VF Uses MSI-X

Problem:

When using IOV, if a PF uses MSI interrupts and one or more VFs use MSI-X interrupts, some of the MSI TLPs for the PF might contain the wrong Requester ID.

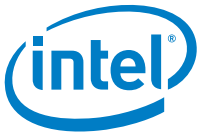
Implication:

There could be missing interrupts on the PF since the incorrect Requester ID could result in the virtualization mechanism mis-routing or dropping TLPs.

Workaround:

If any VFs use MSI-X, all PFs should also use MSI-X.

Status: B0=Yes; NoFix



55. XAUI Interface Might Not be Able to Link After a Specific Reset Sequence

Problem:

When the 82599 is programmed to XAUI link (AUTOC.*LMS* = 001b, AUTOC.*10G_PMA_PMD_Parallel* = 00b), its internal clocks are set to 10 GbE speed mode. If AUTOC.*Restart_AN* is asserted before link is achieved (such as when link partner is still in idle) the device is momentarily put in 1 GbE speed and then returns to 10 GbE. There is an internal mechanism to synchronize this speed switching. Due to a design issue, a specific circuit in the MAC/PHY interface area might miss this synchronization and the transmitter might start to transmit unaligned data on one or more lanes. This scenario might occur when the 82599 software device driver is initialized before enabling the link partner XAUI transmitter. Even after the previous scenario, the link can be restored by issuing a Link Reset (CTRL.*LRST*).

The issue does not happen if using one of the following procedures:

1. Assert AUTOC.*Restart_AN* according to the procedure described in Specification Change #5, "MAC Link Setup and Auto-Negotiation".
2. Enable the link partner XAUI transmitter before enabling the 82599.
3. Hold the Auto Neg internal state machine in idle state at power on from the EEPROM and release it during software device driver initialization.

Implication:

XAUI interface might not be able to establish a link.

Workaround:

This issue is resolved by the 82599 EEPROM Dev Starter rev 4.22 or newer.

Status: B0=Yes; NoFix

56. ETS Resolution

Problem:

IEEE802.1Qaz specification, a.k.a. Enhanced Transmission Selection (ETS) for Bandwidth Sharing Between Traffic Classes, requires ETS resolution of 1% with max allowed deviation of ±10% of link bandwidth.

ETS resolution is defined as the minimum percent of link bandwidth that can be allocated to a specific traffic class.

In the 82599, if 9.5 KB Jumbo Frames are enabled, the ETS resolution is 12.5%. If 9.5 KB Jumbo Frames are disabled, ETS resolution is 3.3%.

Implication:

ETS bandwidth allocation limitation and specification conformance.

Workaround:

None.

Status: B0=Yes; NoFix

57. Flow Control and Missed Packets Counters Limitation

Problem:

When performing back-to-back registers read accesses, the following counters might retrieve an incorrect value:

- RXMPC[n]
- LXONTXC
- LXOFFTXC
- PXONTXC[n]
- PXOFFTXC[n]

Implication:

Incorrect statistics collection.

Workaround:

Add one microsecond delay before/after these registers access.

Status: B0=Yes; NoFix

58. 82599 LAN Port #1 SFI Link Instability

Problem:

If the PCIe Function #0 is moved to D3 state, it might affect the link of Port #1. For example, when the Windows driver is disabled for this function.

This issue might happen only under the following conditions:

- Both ports are configured to SFI Link mode.
- Manageability is not enabled.
- APM (WoL) is not enabled.
- Port #0 has no link before disabled.

Implication:

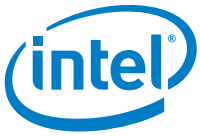
Port #1 link instability.

Workaround:

Set *Core Clocks Gate Disable* bit in EEPROM Control Word 2.

Status: B0=Yes; NoFix

Fixed in EEPROM Dev Starter revision 4.25 or later.



59. NC-SI: Get NC-SI Pass-Through Statistics Response Might Contain Incorrect Packet Counts

Problem:

The 82599 maintains packet counters that are used in the Get NC-SI Pass-Through Statistics Response. These counters are halted during PCIe reset.

Implication:

If a PCIe reset has occurred since the previous Get NC-SI Pass-Through Statistics Response, the packet count values could be lower than the actual packet counts.

Workaround:

The packet counts in the Get NC-SI Pass-Through Statistics Response may be used for debug purposes, but they should not be used for maintaining reliable statistics.

Status: B0=Yes; NoFix

60. IPv4 Checksum Error Might be Reported for Multicast Frames Over 12 KB

Problem:

IPE (IPv4 Checksum Error) might rarely be set in the Rx descriptor of multicast frames over 12 KB even though their checksum is valid.

Implication:

An IPE (IPv4 Checksum Error) error can incorrectly be reported by the 82599.

Workaround:

To avoid the erratum condition, limit the size of jumbo frames to less than or equal to 12 KB.

If using jumbo frames over 12 KB, software should re-calculate the IPV4 Header Checksum if RDESC.*IPE* is set.

The Intel Windows* and Linux* drivers limit the size of jumbo frames to less than or equal to 9 KB and are not exposed to this erratum.

Status: B0=Yes; NoFix

61. RXMEMWRAP Register Content is Inaccurate

Problem:

RXMEMWRAP register (0x03190) content is inaccurate:

- Rx Buffer Wrap Around Counter values could be inaccurate.
- Rx Buffer Empty bits are not reliable in the presence of FCoE or TCP-no-payload packets.

Implication:

Incorrect status read.

Workaround:

Use the RXUSED register for an indication as to whether or not the Rx buffer is empty.

Status: B0=Yes; NoFix

62. Flow Director: Collision Indication Can be Cleared by Adding a New Filter

Problem:

A Flow Director collision indication of the last Signature filter can be unintentionally cleared by adding a subsequent Signature filter.

Implication:

Flow Director collision indication is missing.

Workaround:

None.

Status: B0=Yes; NoFix

63. Clearing RXEN During VM-to-VM Loopback Traffic Might Cause Rx Hang

Problem:

If the RXCTRL.*RXEN* bit is cleared during the reception of VM-to-VM loopback data traffic, the Rx path might hang.

Implication:

Rx hang.

Workaround:

The PFDTXGSWC.*LBE* bit should be cleared before clearing RXCTRL.*RXEN*, and can be set again after setting RXCTRL.*RXEN*.

Status: B0=Yes; NoFix

64. PCIe SR-IOV Reserved Bits are Writable

Problem:

According to PCIe Specification, RsvdP register fields must be read only and must return 0 (all 0's for multi-bit fields) when read.

In this device the following reserved bits are writable:

- SR-IOV Capability Structure offset 0x08 - SR-IOV Control/Status Register (0x168), bits 15:5.
- SR-IOV Capability Structure offset 0x13 (0x173), bits 7:0.

Implication:

No functional implication. Software should not write reserved bits.

Workaround:

None.

Status: B0=Yes; NoFix

65. PCIe Advanced Error Reporting: First Error Pointer

Problem:

The First Error Pointer in the Advanced Error Capabilities and Control Register (PCIe register 0x118 bits 4:0) is a field that identifies the bit position of the first error reported in the Uncorrectable Error Status register. In the 82599 implementation, the following bits of the Uncorrectable Status Register are not covered by this field:

- Bit 4 — Data Link Protocol Error Status.
- Bit 13 — Flow Control Protocol Error Status.
- Bit 14 — Completion Timeout Status.
- Bit 21 — ACS Violation Status

Implication:

PCIe specification compliance issue.

Workaround:

None.

Status: B0=Yes; NoFix

66. IPv4 Checksum Error Might be Reported for a Fragmented Packet

Problem:

In rare cases, IPE (IPv4 Checksum Error) might be set in the Rx descriptor of a fragmented packet even though the checksum is valid.

The issue can happen only in a packet with the IPv4 header followed by payload data with no TCP/UDP header, and the first payload bytes looks like the SNAP packet header – AA AA 03 00 00 00.

Implication:

An IPE (IPv4 Checksum Error) error can incorrectly be reported by the device.

Workaround:

If an IPv4 checksum error is reported by the device, the software driver should validate the checksum if the first payload bytes looks like the SNAP packet header – AA AA 03 00 00 00.

Status: B0=Yes; NoFix

67. LLC Packet without SNAP Header

Problem:

If FCoE filtering is enabled, and an LLC Header is recognized in the packet, the 82599 always skips the 3 bytes of the presumed SNAP Header and looks for the FCoE Ether-Type (0x8906). If a SNAP Header is not present, and the data at this offset is 0x8906, the packet is falsely recognized as FCoE.

Implication:

In general, a valid LLC packet incorporates a SNAP Header and there is no impact. The problematic packet might be seen in vendor-specific traffic. In this case, the packet is dropped and FCCRC counter is incremented.

Workaround:

None.

Status: B0=Yes; NoFix

3. Software Clarifications

Table 3-1 Summary of Software Clarifications

Software Clarification	Status
1. While in TCP Segmentation Offload, Each Buffer is Limited to 64 KB	N/A
2. RSC Performance Trade-Off	N/A
3. Serial Interfaces Programmed by Bit-Banging	N/A
4. Identify Network Adapter Port by Blinking LED	N/A
5. PF/VF Drivers Should Configure Registers That are Not Reset by VFLR	N/A
6. Spurious Link Report Filter	N/A

1. While in TCP Segmentation Offload, Each Buffer is Limited to 64 KB

The 82599 supports 256 KB TCP packets; however, each buffer is limited to 64 KB since the data length field in the transmit descriptor is only 16 bits. This restriction increases driver implementation complexity if the operating system passes down a scatter/gather element greater than 64 KB in length. This can be avoided by limiting the offload size to 64 KB.

Investigation has concluded that the increase in data transfer size does not provide any noticeable improvements in LAN performance. As a result, Intel network software drivers limit the data transfer size in all drivers to 64 KB.

Please note that Linux* operating systems only support 64 KB data transfers.

2. RSC Performance Trade-Off

The RSC feature is used to merge receive frames into the same descriptor structure with a shared header, improving receiving packet performance.

It should be noted that if small Rx data buffers are used (2 KB), RSC may involve a high rate of partial cache line PCIe transactions, which have a performance penalty from a memory access perspective.

In overloaded systems (more than 2 x 10 Gb/s LAN ports traffic load) the use of RSC may adversely affect Rx data throughput. Therefore, there is a performance trade-off regarding the usage of the RSC feature.

To improve throughput in overloaded systems, the user can use large receive data buffers (larger than 2 KB or may opt to turn of RSC.

3. Serial Interfaces Programmed by Bit-Banging

When bit-banging on a serial interface (such as SPI, I^2C, or MDIO), it is often necessary to perform consecutive register writes with a minimum delay between them. However, simply inserting a software delay between the writes can be unreliable due to hardware delays on the CPU and PCIe interfaces. The delay at the final hardware interface might be less than intended if the first write is delayed by hardware more than the second write. To prevent such problems, a register read should be inserted between the first register write and the software delay, i.e. “write”, “read”, “software delay”, “write”.

4. Identify Network Adapter Port by Blinking LED

Intel device drivers and supported tools include a feature that provides network adapter port identification by blinking LED2. This feature assumes that LED2 is connected as the Link/Activity LED as recommended in the reference schematics.

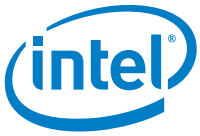
5. PF/VF Drivers Should Configure Registers That are Not Reset by VFLR

The following registers are not reset by VFLR and need to be configured by PF or VF in case of a change to a new configuration (such as VF OS transition):

- VFRDH/T
- VFTDH/T
- VFPSRTYPE
- VFSRRCTL
- VFRXDCTL
- VFTXDCTL
- VFTDWBAL/H
- VFDCA_RXCTRL
- VFDCA_TXCTRL

6. Spurious Link Report Filter

A noise induced in an empty SFP+ cage might cause a momentary link indication. The software driver should filter any link report when SFP+ cage is empty.



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