

Troubleshooting Input and Output Errors on PA–A3 ATM Port Adapters

Document ID: 8631

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Introduction

Cisco offers three ATM port adapters for 7500 and 7200 series routers. The PA–A3 port adapter is designed for use on WAN links that need to implement traffic shaping to control bandwidth on the virtual circuits.

The PA–A3 is also known as ATM Deluxe or Enhanced PA. You can determine whether you have a PA–A3 port adapter with the use of the `show diag` or `show interface atm` commands. For example, when you use the `show interface atm` command, you can see this output:

```
router#show interface atm1/0/0
ATM1/0/0 is up, line protocol is up
  Hardware is cyBus ENHANCED ATM PA
  MTU 4470 bytes, sub MTU 4470, BW 44209 Kbit, DLY 190 usec,
    reliability 255/255, load 1/255
  Encapsulation ATM, loopback not set, keepalive not set
  Encapsulation(s): AAL5 AAL3/4
  4096 maximum active VCs, 1 current VCCs
  VC idle disconnect time: 300 seconds
  Last input never, output 00:03:14, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    8 packets input, 743 bytes, 0 no buffer
    Received 0 broadcasts, 0 runts, 0 giants
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
  5 packets output, 560 bytes, 0 underruns
  0 output errors, 0 collisions, 0 interface resets
  0 output buffers copied, 0 interrupts, 0 failures
```

This document explains what the PA–A3 input and output error counters displayed in the output of the `show interface atm` command mean. When these errors increment, they affect the reliability counter, which indicates the likelihood that a packet is successfully transmitted or received. The value is expressed as a fraction of 255, with a value of 255 that indicates a totally reliable link.

```
router#show interface atm 10/1/0
```

```
ATM10/1/0 is up, line protocol is up
Hardware is cyBus ENHANCED ATM PA
MTU 1500 bytes, sub MTU 1500, BW 149760 Kbit, DLY 80 usec,
    reliability 249/255, txload 1/255, rxload 1/255
[snip]
```

Reliability is calculated with the use of this formula:

$$\text{reliability} = \text{number of errors} / \text{number of total frames}$$

The **show interface** output displays the average reliability. Refer to Understanding the Definition of bits per second (bits/sec) from the show interfaces Command Output for more information.

Note: Refer to Troubleshooting Input Drops on ATM Router Interfaces for more information on how to troubleshoot input drops on ATM router interfaces.

Prerequisites

Requirements

There are no specific requirements for this document.

Components Used

This document is not restricted to specific software and hardware versions.

Conventions

Refer to Cisco Technical Tips Conventions for more information on document conventions.

PA–A3 Architecture

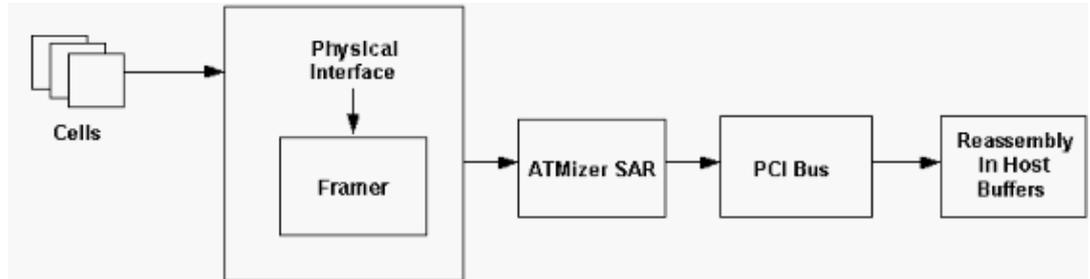
The PA–A3 uses an ATMizer II segmentation and reassembly (SAR) chip. The output of **show controllers atm** command displays the name of the SAR, in this example:

```
7200-2#show controller atm 3/0
Interface ATM3/0 is up
Hardware is ENHANCED ATM PA - DS3 (45Mbps)
Lane client mac address is 0030.7ble.9054
Framer is PMC PM7345 S/UNI-PDH, SAR is LSI ATMIZER II
Firmware rev: G119, Framer rev: 1, ATMIZER II rev: 3
    idb=0x61499630, ds=0x6149E9C0, vc=0x614BE940
    slot 3, unit 2, subunit 0, fci_type 0x005B, ticks 73495
    400 rx buffers: size=512, encap=64, trailer=28, magic=4
Curr Stats:
    rx_cell_lost=0, rx_no_buffer=0, rx_crc_10=0
    rx_cell_len=0, rx_no_vcd=0, rx_cell_throttle=0, tx_aci_err=0
[snip]
```

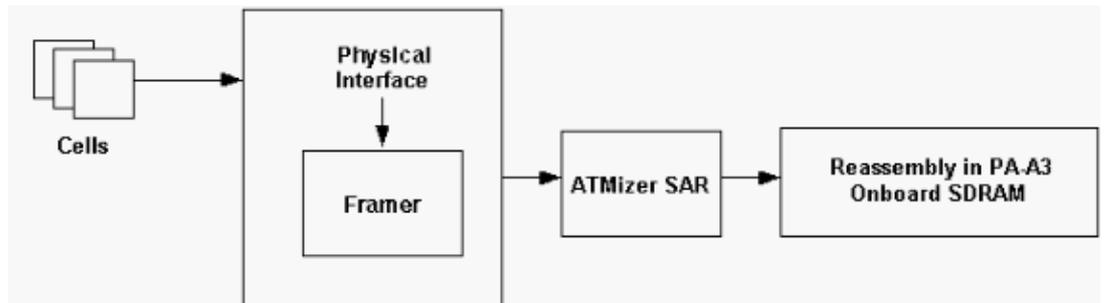
The router stores a cell or a reassembled packet in various memory locations. Look at this process in more detail, with the use of diagrams in order to illustrate the path bits take when they are received from the physical wire at the PA–A3:

1. When a cell arrives, the framer chip stores the cell in its first–in–first–out (FIFO) memory, which can contain four 48–byte cells.

2. The cell then moves to the ATMizer SAR cell buffers, which consist of 4 MB transmit (Tx) and 4 MB receive (Rx) onboard memory or local static random-access memory (SRAM).
3. At this point, the cells take a different path that depends on the hardware version of the PA-A3.
 - ◆ With hardware revision 1.0, the PA-A3 uses the onboard SRAM only as additional cell storage and forwards the cells across the Peripheral Component Interconnect (PCI) to the Versatile Interface Processor (VIP) or Network Processing Engine (NPE) host memory, where it reassembles them.



- ◆ With hardware revision 2.0, the PA-A3 reassembles the cells in its own memory, rather than the host memory.



In other words, revision 2.0 uses frame mode and transfers packets from the port adapter to the host memory, while revision 1.0 uses cell mode and transfers cells to host memory.

Use the **show diag** command in order to determine the hardware revision of your PA-A3:

```
router#show diag
```

```

          PA Bay 1 Information:
    ENHANCED ATM OC3 MM PA, 1 ports
    EEPROM format version 1
    HW rev 2.00, Board revision A0
    Serial number: 11535651  Part number: 73-2430-04
  
```

Input Errors That Use show interface atm Command

In some cases, incoming cells can be dropped or corrupted, which leads to input errors as displayed in the output of the **show interface atm** command. This table explains what each input error counter means.

Error	Explanation
overrun	This is the number of times the FIFO memory of the framer overruns because of a lack of SAR buffers.
frame	This is the number of times a cell is bad or is dropped when the framer flushed its overrun FIFO.
abort	This is the number of packet drops caused by cell

	throttling at the microcode level to alleviate framing overruns.
ignored	This is the number of packets dropped because a packet memory buffer was not available or because the port adapter microcode throttled the virtual circuit (VC) and stopped accepting new packets. The receive host buffer can fill when a fast ATM interface feeds a slower outbound interface.
no buffer	This is the number of times the ATM interface runs out of transmit SAR buffers when transmitting packets over a large number of slow VCs.
CRC	<p>This is the number of times that a reassembled packet fails the AAL5 (ATM adaptation layer) trailer CRC-32 (cyclic redundancy check), usually because some cells of the packet are lost due to one of these reasons:</p> <ul style="list-style-type: none"> • FIFO overrun • Microcode throttling • CRC-10 generated via operation, administration, and maintenance (OAM) • Network congestion in the ATM switch cloud • Real line noise that produces a bit error <p>Refer to CRC Troubleshooting Guide for ATM Interfaces for more information.</p>
runts	This is the number of packets that are smaller than a single cell. Cell corruption by framer Rx FIFO flush causes this condition.
giants	This is the number of packets that are larger than the VC maximum transmission unit (MTU). A giant can be formed when the last cell of a packet is dropped, so two consecutive packets are concatenated.

Input Errors That Use show controllers atm Command

The output of **show controllers atm** command displays several input error counts that also can be used in order to troubleshoot performance issues on your ATM interface. These counters are highlighted in bold:

```

7200-2#show controller atm 3/0
Interface ATM3/0 is up
Hardware is ENHANCED ATM PA - DS3 (45Mbps)
Lane client mac address is 0030.7ble.9054
Framer is PMC PM7345 S/UNI-PDH, SAR is LSI ATMIZER II
Firmware rev: G119, Framer rev: 1, ATMIZER II rev: 3
  idb=0x61499630, ds=0x6149E9C0, vc=0x614BE940
  slot 3, unit 2, subunit 0, fci_type 0x005B, ticks 73495
  400 rx buffers: size=512, encap=64, trailer=28, magic=4
Curr Stats:
  rx_cell_lost=0, rx_no_buffer=0, rx_crc_10=0
  rx_cell_len=0, rx_no_vcd=0, rx_cell_throttle=0, tx_aci_err=0

```

[snip]

Counter	Explanation
rx_cell_lost	<p>This is the number of times the SAR detects lost or mis-inserted cells with the comparison of the actual or accumulated payload length to the value of the payload length field in the AAL5 trailer of the reassembled packet. The PA-A3 calculates the accumulated payload length by multiplying 48 by the number of received cells since the last cell with the end-of-AAL5-PDU bit set to one. The third bit of the payload type identifier [PTI] field indicates whether the cell is the final cell of a higher-layer data frame.</p> <p>Note: This counter currently increments under very rare circumstances. Cells that are lost in the ATM network triggers CRC errors only. Cisco bug ID CSCdu88572 (registered customers only) fixes this.</p>
rx_no_buffer	<p>This is the number of times that no packet buffer was available to store an incoming cell. In this condition, the router drops the complete packet inside the onboard memory of PA-A3. Note that the packet never makes it to the host memory on the NPE or VIP.</p>
rx_crc_10	<p>This is the number of times an ATM cell fails the CRC-10 checksum used by OAM cells, resource management (RM) cells and AAL3 or AAL4 packets.</p>
rx_cell_len	<p>This is the number of times that the received cell payload length is less than 48 bytes.</p>
rx_no_vcd	<p>This is the number of times that the PA-A3 received a cell without a corresponding virtual circuit descriptor (VCD) in its local VC table.</p>
rx_cell_throttle	<p>This is the number of times that the PA-A3 microcode does not handle the incoming cell rate and proactively dropped cells. The PA-A3 starts throttling the interface if the total cell buffer usage exceeds a preset high water mark.</p>

Output Errors That Use show interface atm Command

The output errors counter increments for a PA-A3 interface under these conditions:

- A packet is scheduled for transmission on a VC which is not in the UP status.
- A packet has an invalid or unrecognized virtual circuit descriptor (VCD) number.
- SAR fails to transmit cells to the framer.
- A non-OAM packet uses a VCD value of 0, which is reserved for OAM packets only. The output counter no longer increments in this condition (CSCdp86348).
- Other miscellaneous reasons, such as interaction with a particular feature

Use the **debug atm error** command in order to troubleshoot incrementing output errors. Also capture several outputs of the **show controller atm** command.

Note: The command **debug atm error** prints debug output only when it detects an error and normally is not disruptive to a functioning production router.

When you use a PA-A3 on the 7500 series, you must capture **debug atm error** and **show controller atm** from the console of the Versatile Interface Processor (VIP). Use the **if-con** command to enter the VIP console and **if-quit** in order to exit.

Report Interface Errors to the Cisco TAC

Collect this information before you report input errors to the Cisco Technical Assistance Center:

- Output from the **show tech-support** command in enable mode so that the running configuration is included
- Several captures of the **show interface atm** and **show atm vc** commands and evidence of the specific error
- Prepare answers to these questions:
 - ◆ How long has the ATM interface experienced the errors?
 - ◆ When do the input errors increment: throughout periods of high traffic or throughout the day?
 - ◆ Did you add any new protocols or hardware to the router recently?
 - ◆ Did you upgrade the Cisco IOS® software recently?

Related Information

- [Troubleshooting Input Queue Drops and Output Queue Drops](#)
- [Performance Tuning Basics](#)
- [VIP CPU Running at 99% and Rx-Side Buffering](#)
- [ATM Technology Support Pages](#)
- [More ATM Information](#)
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Updated: Aug 25, 2006

Document ID: 8631
