To: T10 Technical Committee
From: Robert Sheffield (Robert.L.Sheffield@intel.com), Intel Corporation
Date: May 5, 2004
Subject: T10/04-030r1, SAS-1.1: Fix SP Hang States

Revision History

Revision 0 (January 7, 2004) first revision
Revision 1 (May 5, 2004) SP0 transition on COMINIT from DWS Lost states, and add separate SATA_SpinupHold state.

Related Documents

SAS1.1-r04 – Serial Attached SCSI-1.1 revision 04

Overview

The SP state machine does not account very well for the possibility that attached target devices (SSP, STP, or SATA) may under certain conditions revert to the initial reset state transmitting COMINIT. There are several states in the SP state machine that do not monitor COMINIT Detected and will never advance to another state if the attached device reverts to transmitting COMINIT. SAS revision 5 does provide that when a phy receives COMINIT while in an SP state that is not monitoring COMINIT Detected, it should send a RESET request to the management application (which presumably would then issue a RESET causing the SP to revert to the SP0:OOB_COMINIT state). However this does not provide the level of concise control that should be provided at the phy-layer of SAS.

Also, the current SP state machine discusses the SATA spinup-hold state, but defines no such state to reflect the condition. It is loosely identified as a condition in SP7:OOB_AwaitCOMSAS when no explicit reset has been issued.

This proposal suggests adding state transitions in the SP state machine, triggered by COMINIT Detected, to each state that currently does not monitor COMINIT Detected and does not have a outbound transition defined based on an event initiated by the immediate phy (e.g. COMINIT Transmitted) to define the specific behavior of the SP state machine when the attached device reverts to transmitting COMINIT. The proposal also adds a formal SATA_SpinupHold state along with clearly defined conditions for entry and exit reflecting explicit control through the application client.

Suggested Changes

In subclause 6.7.1 SP state machine overview, modify the second set of bullets on page 121 as follows:

The SP state machine shall start in the SP0:OOB_COMINIT state after:
a) a power on;
b) a hard reset; or
c) receiving a Management Reset request from the management layer (e.g., from the SMP PHY CONTROL function in an expander device). ~~Receipt of a COMINIT in any state that does not have an exit transition triggered by receipt of COMINIT should cause a Management Reset request.~~

The SP state machine shall maintain an auxiliary state variable, MgmtReset, to indicate whether SP0:OOB_COMINIT was last entered due to a Management Reset, or a defined transition from another state (see subclause 6.7.3.2.1). If SP0:OOB_COMINIT was last entered due to a Management Reset, it shall set MgmtReset to one. If SP0:OOB_COMINIT was last entered by a defined transition from another state, it shall set MgmtReset to zero.

Replace figure 61 in section 6.7.3.1 OOB sequence states overview with the following figure:

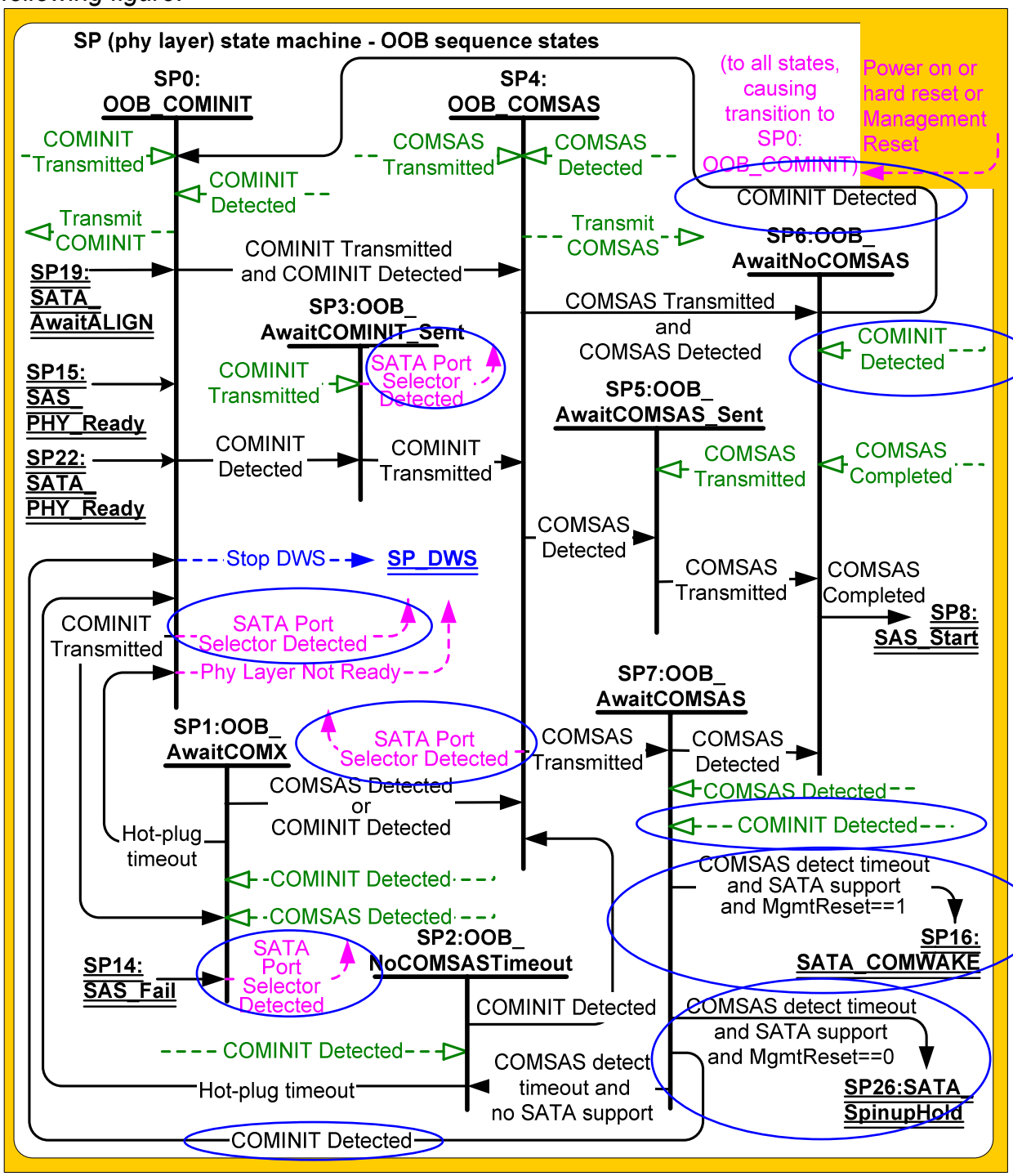


Figure 68 — SP (phy layer) state machine - OOB sequence states

Modify subclause 6.7.3.2.1 State description as follows:

6.7.3.2.1 State description
This state is the initial state for this state machine.

Upon entry into this state, this state shall:

a) send a Transmit COMINIT message to the SP transmitter;
b) send a Stop DWS message to the SP_DWS state machine; and
c) send a Phy Layer Not Ready confirmation to the link layer.

This state machine waits for receipt of a COMINIT Transmitted message and/or a COMINIT Detected message.

Any transition to this state shall set the ATTACHED SATA PORT SELECTOR bit in the DISCOVER response to zero. Auxiliary state variable MgmtReset shall be set to one if this state is entered due to a Management Reset request or SMP Reset request. MgmtReset shall be set to zero if this state is entered due to a power on, a hard reset, DWS Lost timeout, or COMINIT received.

If this state receives a COMWAKE Detected message and the phy supports attachment to a SATA device (i.e. the phy is attached to an STP/SATA bridge) and also supports attachment to a SATA port selector, it shall set the ATTACHED SATA PORT SELECTOR bit in the DISCOVER response to one.

Add a new subclause in subclause 6.7.3.8 to define the transition from SP6 to SP0:

6.7.3.8.3 Transition SP6:OOB_AwaitNoCOMSAS to SP0:OOB_COMINIT
This transition shall occur after receiving a COMINIT Detected message.

Modify subclause 6.7.3.9 as shown to define COMINIT Detected as a trigger for the transition to SP0, and the transition to SP26 for spinup-hold:

6.7.3.9.2 Transition SP7:OOB_AwaitCOMSAS to SP0:OOB_COMINIT
~~This state shall send a SATA Spinup Hold confirmation to the link layer and perform this transition if.~~
~~a) this phy is in an expander device;~~
~~b) this phy supports attachment to a SATA device;~~
~~c) the COMSAS Detect Timeout timer expires;~~
~~d) this expander device implements SATA spinup hold; and~~
~~e) the SP0:OOB_COMINIT state was not originally entered because of an SMP Reset request (i.e., SMP PHY CONTROL-based requests to reset the phy bypass spinup hold).~~
This state shall perform this transition after receiving a COMINIT Detected message.

6.7.3.9.3 Transition SP7:OOB_AwaitCOMSAS to SP26:SATA_SpinupHold
This state shall send a SATA Spinup Hold confirmation to the link layer and perform this transition if.
a) this phy is in an expander device;
b) this phy supports attachment to a SATA device;
c) the COMSAS Detect Timeout timer expires;
d) this expander device implements SATA spinup hold; and
e) the value of the MgmtReset auxiliary state variable is zero.

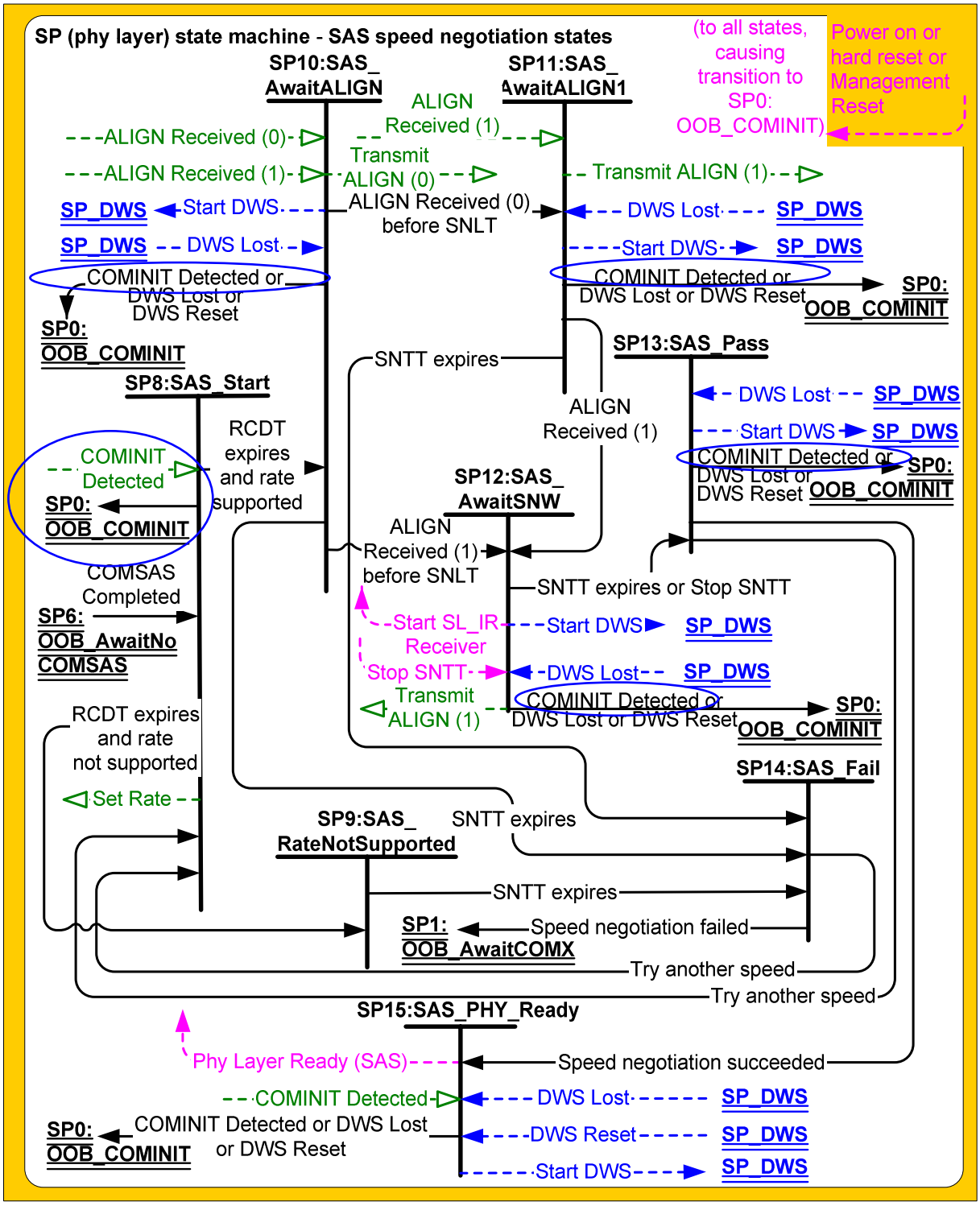
6.7.3.9.~~3~~ 4 Transition SP7:OOB_AwaitCOMSAS to SP6:OOB_AwaitNoCOMSAS
This transition shall occur after receiving a COMSAS Detected message.

6.7.3.9.~~4~~ 5 Transition SP7:OOB_AwaitCOMSAS to SP16:SATA_COMWAKE

This transition shall occur if:
a) the phy supports attachment to SATA devices; and
b) the COMSAS Detect Timeout timer expires~~.~~; and
c) the value of the MgmtReset auxiliary state variable is one.

6.7.3.9.~~5~~ 6 Transition SP7:OOB_AwaitCOMSAS to SP2:OOB_NoCOMSASTimeout
This transition shall occur if the phy does not support SATA and the COMSAS Detect Timeout timer expires.

Replace figure 69 – SP (phy layer) state machine – speed negotiation states with the following figure:



Add subclause 6.7.4.2.4 describing the new transition to SP0 as follows:

6.7.4.2.4 Transition SP8:SAS_Start to SP0:OOB_COMINIT
This state shall perform this transition after receiving a COMINIT Detected message.

Modify subclause 6.7.4.4.2 to add COMINIT Detected as a transition trigger:

6.7.4.4.2 Transition SP10:SAS_AwaitALIGN to SP0:OOB_COMINIT
This transition shall occur after receiving a DWS Lost message if this state does not send a Start DWS message. This transition shall occur after receiving a COMINIT Detected message.

Modify subclause 6.7.4.5.2 to add COMINIT Detected as a transition trigger:

6.7.4.5.2 Transition SP11:SAS_AwaitALIGN1 to SP0:OOB_COMINIT
This transition shall occur after receiving a DWS Lost message if this state does not send a Start DWS message. This transition shall occur after receiving a COMINIT Detected message.

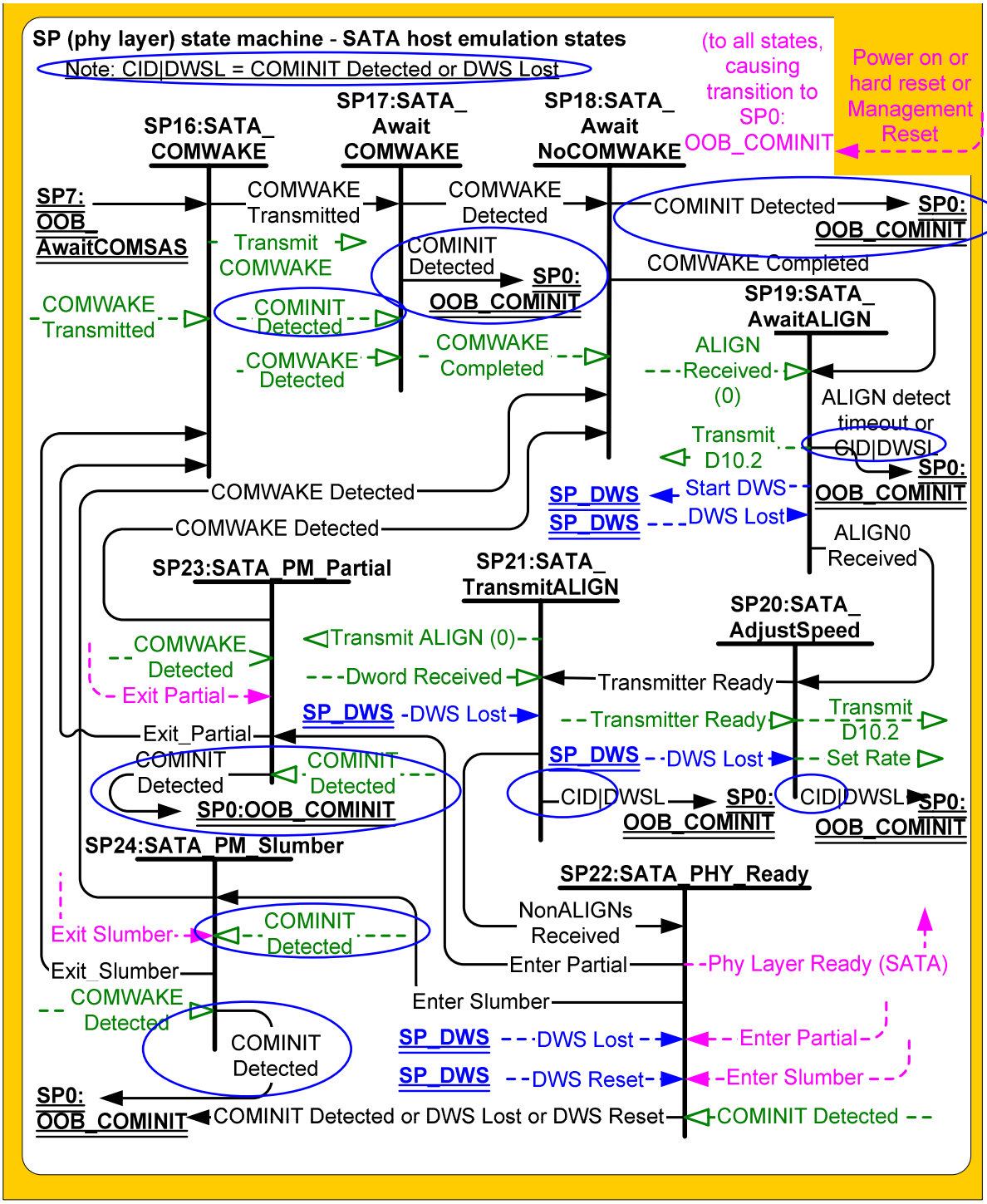
Modify subclause 6.7.4.6.2 to add COMINIT Detected as a transition trigger:

6.7.4.6.2 Transition SP12:SAS_AwaitSNW to SP0:OOB_COMINIT
This transition shall occur after receiving a DWS Lost message if this state does not send a Start DWS message. This transition shall occur after receiving a COMINIT Detected message.

Modify subclause 6.7.4.7.2 to add COMINIT Detected as a transition trigger:

6.7.4.7.2 Transition SP13:SAS_Pass to SP0:OOB_COMINIT
This transition shall occur after receiving a DWS Lost message if this state does not send a Start DWS message. This transition shall occur after receiving a COMINIT Detected message.

Replace figure 70 – SP (phy layer) state machine – SATA emulation states with the following figure:



Add subclause 6.7.5.3.3 describing the new transition to SP0 as follows:

6.7.5.3.3 Transition SP17:SATA_AwaitCOMWAKE to SP0:OOB_COMINIT
This state shall perform this transition after receiving a COMINIT Detected message.

Add subclause 6.7.5.4.3 describing the new transition to SP0 as follows:

6.7.5.4.3 Transition SP18:SATA_AwaitNoCOMWAKE to SP0:OOB_COMINIT
This state shall perform this transition after receiving a COMINIT Detected message.

Add subclause 6.7.5.9.4 describing the new transition to SP0 as follows:

6.7.5.9.4 Transition SP23:SATA_PM_Partial to SP0:OOB_COMINIT
This state shall perform this transition after receiving a COMINIT Detected message.

Add subclause 6.7.5.10.4 describing the new transition to SP0 as follows:

6.7.5.10.4 Transition SP23:SATA_PM_Slumber to SP0:OOB_COMINIT
This state shall perform this transition after receiving a COMINIT Detected message.

Add subclause 6.7.7 describing the new SATA Spinup Hold state as follows:

6.7.7 SATA Spinup Hold state

6.7.6.1 State description
Figure 72 shows the SP26:SATA_SpinupHold state. This state shall be entered from the SP7:OOB_AwaitComsas state upon detection of a COMSAS detect timeout if the phy supports SATA, the phy supports Spinup Hold, and the MgmtReset auxiliary state variable has a value of zero. This state shall persist until a Power on, hard reset, or Management Reset occurs. Any such reset shall cause a transition to SP0:OOB_COMINIT.

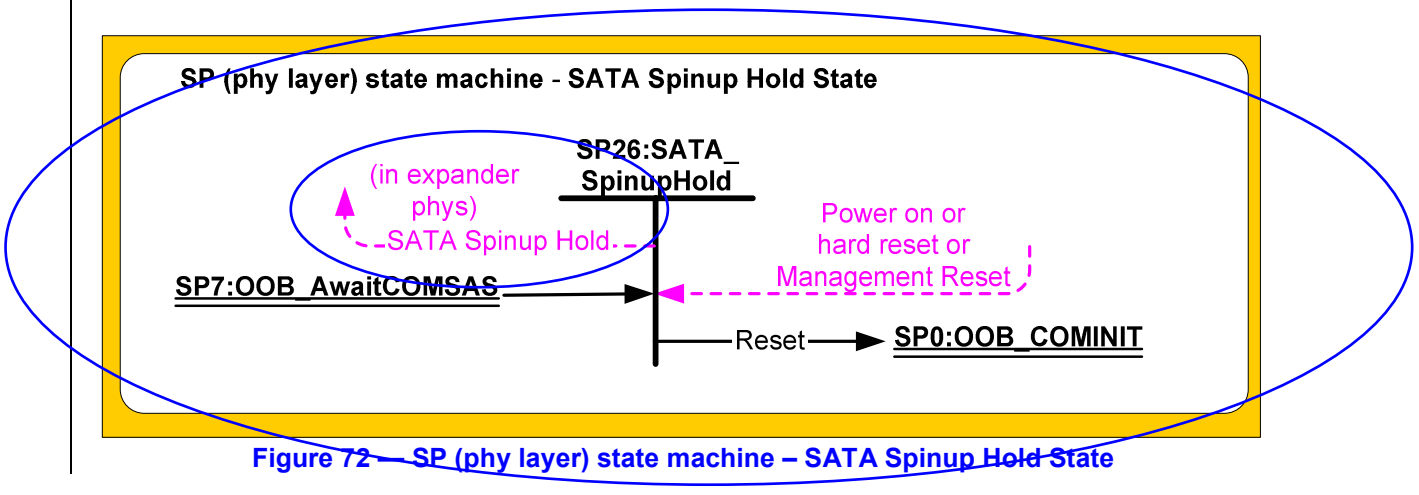


Figure 72 — SP (phy layer) state machine – SATA Spinup Hold State