INTERRUPTS ON RESUME
(Plus Two Other Corrections)
98-019r1

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There are three items that are presently broken in the C code or state diagrams within P1394a draft 2.0. Through comment these probelms will most likely be fixed during balloting. These problems with solutions have been public on the P1394a reflector. The topics are “No tpBias While Connecting”, “Concatenation is Broken”, and “Interrupts on Resume”.

No tpBias While Connecting

A 1394a PHY would not be generating tpBias while connecting. A peer PHY would not transmit BUS_RESET on a connection with bias equal to FALSE. Therefore if a PHY detected BUS_RESET while connecting it would be a false signal and must be ignored. The proposed fix:

Recommended Changes to Table 7-25, Draft 2.0

```
boolean reset_detected() { // Qualify BUS_RESET with port status / history
    int i;
    if (PHY_state == R0 || PHY_state == R1) // Ignore while in reset states themselves
        return(FALSE);
    for (i = 0; i < NPORT; i++)
        if (disabled[i]) // Ignore completely if disabled
            continue;
        else if (bias[i] && portR(i) == BUS_RESET) // More than 20 ns (transient DS == 11)
            if (connection_in_progress[i]) {
                reset_time = 0;
                if (isolated_node)
                    reset_time = SHORT_RESET_TIME;
                else if (connect_timer >= RESET_DETECT)
                    reset_time = RESET_TIME;
                if (reset_time != 0) {
                    connection_in_progress[i] = FALSE;
                    connected[i] = TRUE
                    return(TRUE);
                }
            } else if (active[i]) {
                reset_time = (PHY_state == RX) ? SHORT_RESET_TIME : RESET_TIME;
                return(TRUE);
            } else if (resume[i]) {
                reset_time = (boundary_node) ? RESET_TIME : SHORT_RESET_TIME;
                return(TRUE);
            }
    return(FALSE);
}
```

Concatenation is Broken

Presently draft 2.0 defines detecting RX_DATA_END as an unexpected end of data and doesn’t allow concatenation. The fix for this is to make certain that the packet is in fact a null packet:

Recommended Changes to Table 7-29, Draft 2.0

```
    } while (!end_of_data);
    if (!ack && (breq == FAIR_REQ || breq == PRIORITY_REQ)) {
        breq = NO_REQ; // Fly-by impossible
        PH_ARB.confirmation(LOST); // Advise the link
    }
    if (bit_count < 8)  {  // Any count less than 8 is considered a null packet
        if (portR(receive_port) == BUS_RESET || portR(receive_port) == IDLE) { // No data?
            ack = FALSE; // Disable fly-by acceleration
```

```
            return;
        } else if (portR(receive_port) == RX_DATA_END) { // Unexpected end of data...
            ack = FALSE; // Disable fly-by acceleration
            for (i = 0; i < NPORT; i++)
            if (active[i] && i != receive_port)
                portT(i, TX_DATA_END);
            wait_time(DATA_END_TIME);
            return;
        }
    )
    switch(portR(receive_port)) { // Send appropriate end of packet indicator
        case RX_DATA_PREFIX:
            concatenated_packet = TRUE;
            PH_DATA.indication(DATA_PREFIX); // Concatenated packet coming
            stop_tx_packet(DATA_PREFIX, rx_speed);
            break;
        case RX_DATA_END:
            if (fly_by_OK())
                stop_tx_packet(DATA_PREFIX, tx_speed); // Fly-by concatenation
            else {
                PH_DATA.indication(DATA_END); // Normal end of packet
                stop_tx_packet(DATA_END, tx_speed);
            }
            break;
    }
```

Interrupts on Resume

There appears to be general agreement that the generation of interrupts during resume is broken in two places. One is in the case of a resume command and the other is in the case of a fault. The problem is that an interrupt could be generated with no change in a port's connected, bias, fault or diabled bits. The upper layers would not have any indication of which port generated the interrupt. The following are the recommended changes to fix these two problems.

Recommended Changes to Table 6-2, Draft 2.0

Fault	1	rw	0	Set to one if an error is detected during a suspend or resume operation.- Clearing this bit, clears both the resume and suspend error. A write of one to this bit clears it to zero.

Recommended Changes to Table 7-17, Draft 2.0

```
boolean resume_fault[NPORT];  // Set when its peer port does not participate in resume.
boolean suspend_fault[NPORT]; // Set when its peer port does not participate in suspend.
```

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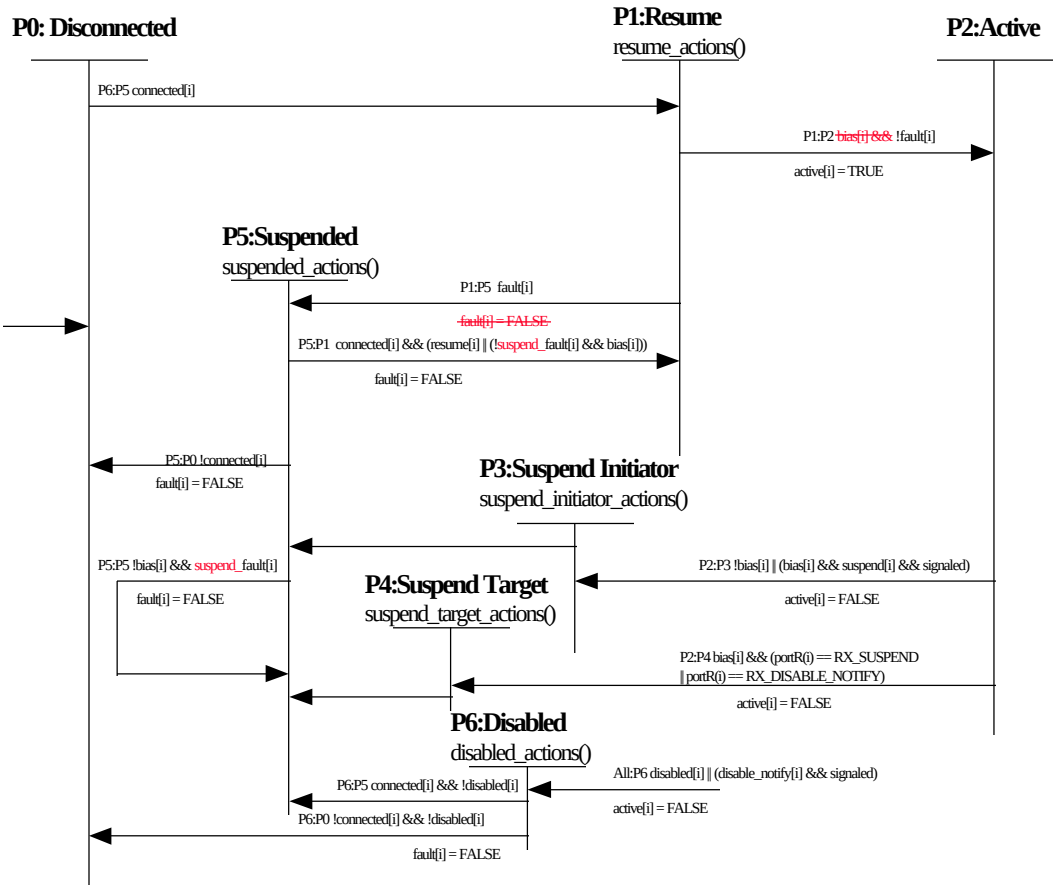
PORT SUSPEND/RESUME STATE DIAGRAM

Recommend Changes to Figure 7-20, Draft 1.5



Recommended Changes to Clause 7.10.4.1, Draft 2.0

Transition P1:P2. If the PHY port ~~is both connected,~~ did not fault during the resume handshake ~~and observes TpBias~~, it transitions to the active state.

Transition P1:P5. A resuming PHY port that ~~remains connected to its peer PHY port but fails to observe TpBias~~ faults during the resume handshake transitions to the suspended state. ~~The fault condition is cleared so that subsequent detection of TpBias may cause the port to resume.~~

Transition P5:P1. Either of two conditions cause a suspended PHY port to transition to the resuming state: a) a nonzero value for the port's *resume* variable or b) the detection of *bias* if the port~~'s~~ has not faulted during the preceding suspend transaction ~~Fault bit is zero~~. A port's *resume* variable may be set indirectly as the result of the resumption of other PHY ports.

Transition P5:P5. If the port transitioned from the active state to ~~entered~~ the suspended state in a faulted condition (*i.e.*, TpBias was still present), the fault is cleared if and when TpBias is removed by the peer PHY.

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Recommended Changes to Table 7-32, Draft 2.0

```
resume_actions(int i) {
    while (suspend_in_progress()) // Let any other suspensions complete
        ; // (we'll resume those ports)
    connect_timer = 0;
    if ((int_enable[i] || resume_int) && !port_event) {
        port_event = TRUE;
        if (link_active && LPS)
            PH_EVENT.indication(INTERRUPT);
        else
            PH_EVENT.indication(LINK_ON);
    }

    connect_detect_valid[i] = FALSE; // Bias renders connect detect circuit useless
    tpBias(i, 1); // Generate TpBias
    if (resume[i] == 0 && !boundary_node)
        for (j = 0; j++; j < NPORT)
            if (!active[j] && !disabled[j] && connected[j])
                resume[j] = TRUE; // Resume all other suspended ports
    else
        resume[i] = TRUE; // Guarantee resume_in_progress() returns TRUE
    while (((connect_timer < BIAS_HANDSHAKE) && !bias[i]) || bus_initialize_active)
        ; // Wait for peer PHY to generate TpBias
    resume_fault[i] = ~bias[i]; // Resume attempt failed if TpBias is absent
        if (resume_fault[i])
            activate_connect_detect(i, 0); // restore usefulness of connect detect circuit
        else {                  // Connection restored to active state
            if ((int_enable[i] || resume_int) && !port_event) {
                // Notify LINK of port going active soon
                port_event = TRUE;
            if (link_active && LPS)
                PH_EVENT.indication(INTERRUPT);
            else
                PH_EVENT.indication(LINK_ON);
    if (bias[i]) { // Connection restored to active state?
            while ((connect_timer < 3 * RESET_DETECT) && !bus_initialize_active)
                ;
            if (!bus_initialize_active) { // No other node initiated reset?
                if (boundary_node) // Can we arbitrate?
                    isbr = TRUE; // Yes, don't wait any longer
                else {
                    while ((connect_timer < 7 * RESET_DETECT) && !bus_initialize_active)
                        ; // Let's wait a little longer...
                    if (!bus_initialize_active)
                        ibr = TRUE; // Sigh! We'll have to use long reset
                }
            }
        }
    }
    fault[i] = ~bias[i]; // Resume attempt failed if TpBias is absent
    if (fault[i]) // If so, restore usefulness of connect detect circuit
        activate_connect_detect(i, 0);
    resume[i] = FALSE; // Resume attempt complete
}

void suspend_initiator_actions(int i) {
    connect_timer = 0;          // Used to debounce bias or for bias handshake
    if (!suspend[i]) {          // Unexpected loss of bias?
        suspend[i] = TRUE;      // Insure suspend_in_progress() returns TRUE
        if (child[i])           // Yes, parent still connected?
            isbr = TRUE;        // Arbitrate for short reset
        else
            ibr = TRUE;         // Transition to R0 for reset
        while (connect_timer < BIAS_DEBOUNCE)
            ; // Time for bias to stabilize
    }
    while ((connect_timer < BIAS_HANDSHAKE) && bias[i])
        ; // Wait for suspend target to deassert bias
    suspend_fault[i] = bias[i]);      // Suspend handshake refused by target?
    activate_connect_detect(i, BIAS_HANDSHAKE); // Also guarantees handshake timing
}
```