Lou Fasano -- Justification for SID State Machine Change Made at 10/97 PHY Review
Was originally raised as an issue on the reflector 7/25/97, and was discussed (without any objections) at the 9/26/97 1394a Meeting in Natick, MA.

Subject: Potential Self-ID Problem between S100 & S400 PHYs

When a PHY is transmitting an S400 speed signal, it is possible for the common mode voltage on the TPB arbitration comparators to drop below its operating range. Therefore, the PHY should not sample its own TPB arbitration comparator while speed signalling at S400. This creates a potential problem in Self-ID when a child node is an S400 PHY, and its parent node is an S100 PHY. Here is the sequence of events:

Child Node (400Mb PHY):
- State S4: Transmits SID Packet, Transmits Data_End,
  Signals IDENT_DONE to parent while transmitting S400
  Speed_Signal for Speed_Signal_Length (100-120ns).
  Monitor Speed Signal from parent, and look for
  Data_Prefix (S4:A0)
- State A0: Detect Data_Prefix and transition to RX (formerly state A5 in 1394-1995)
- State RX: Receive Packet (SID Packet of parent)

Parent Node (S100):
- State S2: Receiving Self-ID packet followed by Data_End from child.
  Receives IDENT_DONE and takes S2:S0b branch to state S0.
- State S0: Immediate transition to S1 (assume parent is root)
- State S1: Immediate transition to S4
- State S4: Begin Transmit SID Packet

After a child node sends its self-id packet, it sends the IDENT_DONE signal along with its S400 speed signal (for 100-120ns) to its parent. Since the parent node is an S100 Phy, it immediately takes the S2:S0b branch and skips the S3 (Send Speed Capability) state. The parent node (If root) can quickly take the S0:S1 and S1:S4 transitions and begin sending the data prefix for its own self-id packet. The child node must be able to recognize the data prefix from its parent to take the S4:A0 transition; and subsequent A0:RX transition to receive the parent's self-id packet. The problem is that while a Phy is transmitting its S400 speed signal, the common mode voltage on its TPB arbitration comparators may be pulled down below its operating range. So it can not determine if its parent is sending Data_Prefix. It must wait until it is done sending its own speed signal before it can look for the data_prefix from its parent. If the S100 parent, upon detecting IDENT_DONE from its child, makes the transitions quickly from S2 --> S0 --> S1 --> S4 and uses a relatively short data_prefix time, the child node may not have time to:

1. Put out its own S400 speed for Speed_Signal_Length (100-120ns),
2. wait for arb comparator to put out valid data (approx 20-40ns),
3. then recognize the data_prefix from its parent,
4. then transition to A0, transition to RX and successfully receive the SID packet.

The result would be the child node may not successfully receive its parent's self-id packet. This problem can be avoided if the S100 Phy either:

1. puts out a long data prefix (>240ns ??) in SID transmit, or
2. takes the S2:S3 branch and spends the SPEED_SIGNAL_LENGTH time in state S3.

Option-2 was chosen, as it also simplifies the SID state diagram. Just remove the S2:S0b transition, and make the S2:S3 transition independent of speed.