To: T10 Technical Committee
From: Rob Elliott, HP (elliott@hp.com)
Date: 3 March 2005
Subject: 05-100r0 SAS-1.1 Compact cable sideband usage

Revision history
Revision 0 (3 March 2005) First revision

Related documents
05-084r0 SAS-1.1 compact connectors (internal and external) (Jay Neer, Molex)
SFF-8086 Revision 0.7 - Compact Multilane Connector Mating Interface (Jay Neer, Molex)
SFF-8087 Revision 0.7 - Compact Multilane Unshielded Connector (Jay Neer, Molex)
SFF-8088 Revision 0.7 - Compact Multilane Shielded Connector (Jay Neer, Molex)
sas1r08 - Serial Attached SCSI 1.1 revision 8

Overview
05-084 and SFF-8086, SFF-8087, and SFF-8088 proposes a new set of internal wide and external connectors/cables for SAS (TBD whether this makes it into SAS-1.1 or SAS-2). These would be alternatives to the SFF-8470 external connector and SFF-8484 internal wide connectors already defined.

If a new connector is going to be defined while existing solutions are in place, then it should improve as many shortcomings of the existing solutions as possible.

One problem with the current solutions is that it is difficult to tune transceivers to operate with good BERs in all possible environments. External and internal connectors generally lead to very different environments, and phys can be easily tuned based on the connector type (e.g. large amplitudes for external and lower amplitudes for internal). However, within each of those environments, there is still a lot of possible variation. For example, an external cable could range from 0 m to 6 m; the best settings for 6 m increase crosstalk/reflections with the 0.25 m cable, and the best settings for 0.25 m result in weak signal levels if a 6 m cable is used.

To help, the cable assembly could provide information to the transceiver indicating roughly what kind of cable it is - e.g., short, medium, long. This can be done by adding one sideband pin to the external connector called CABLE_PROP. This signal is not wired from end-to-end; it is terminated locally in the cable assembly paddle card at each end. The cable assembly would provide a simple resistor/capacitor circuit tied to one of the grounds. The controller or backplane to which the cable is attached can measure the resistor and adjust its SAS transceivers accordingly.

The PCI-X bus uses a technique like this to indicate the speed and protocol capabilities of an add-in card (using the PCIXCAP pin).

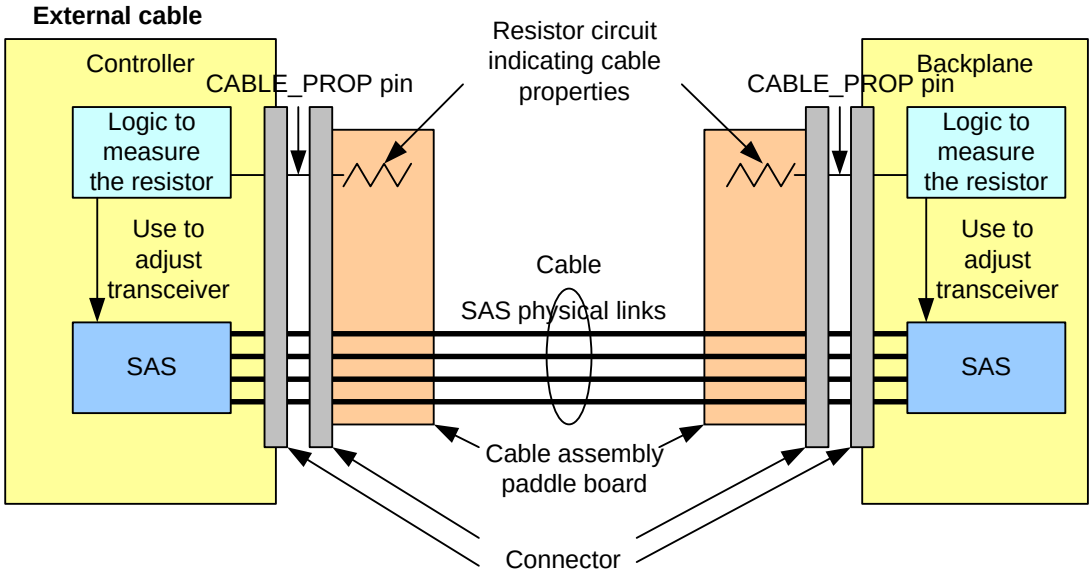
For the internal cable (which currently has 8 sidebands defined), define two of the sidebands as:

a) a CABLE_PROP pin could be used to indicate cable properties (like the external cable); and
b) a BP_PROP pin could be wired through (from controller to backplane) like the other sideband signals. The backplane connector would include a circuit behind the pin to indicate backplane properties (like the external cable paddle board). The controller connector would include circuitry behind the pin to measure the resistor of the remote backplane.

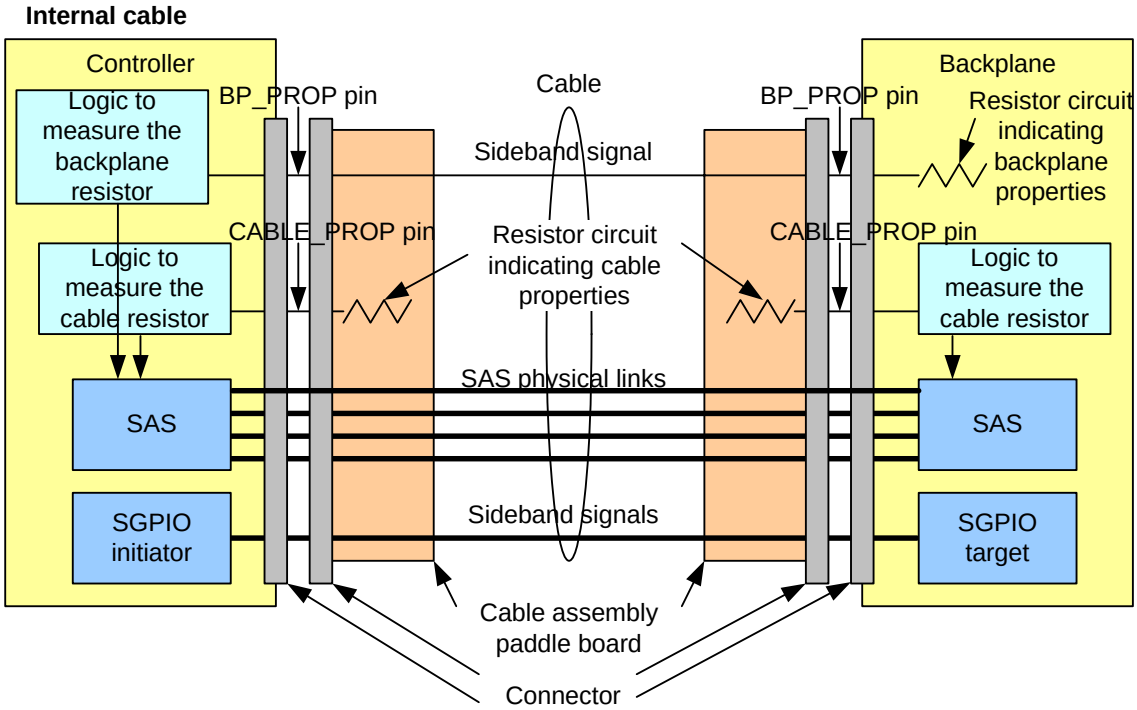
For these circuits, one pin terminated with a signal ground probably suffices. Two pins would also work (the measurement circuit would apply a voltage at one end and ground on the other end).

These pins could also be used for presence detect circuitry to determine if a cable has been attached.

Figure 1 depicts the proposed sideband usage.



CABLE_PROP indicates the properties of the cable.



CABLE_PROP indicates the properties of the cable (not as important as for external cables).
BP_PROP indicates the properties of the backplane.

Figure 1 — Compact connector sideband usage example

The actual characteristics being indicated would be defined in SAS-2. They would indicate some combination of characteristics like:

c) cable length (e.g., short/medium/long);
d) cable wire gauge (e.g., AWG)
e) frequency (e.g., 6 Gbps cable vs. a 3 Gbps cable)

f) loss (e.g., define a set of S-parameters representing low/medium/high loss)
g) backplane complexity (e.g., how many connectors does the signal go through before reaching the destination?)

Table 1 shows an example of possible CABLE_PROP usage.

Table 1 — Possible CABLE_PROP usage

Value	Meaning
0 ohm (short to ground)	short/low loss cable (0 to 1 m)
1.02 Kohm	short medium cable (>1 to 2 m)
3.16 Kohm	long medium cable (>2 to 4 m)
10 Kohm	long/high-loss cable (>4 to 6 m)
Open	no information available

Suggested changes

In SFF-8086 and SFF-8088 (external), add at least one cable-assembly terminated sideband signal.

In SFF-8086 and SFF-8087 (external), terminate one of the sideband signals at the cable-assembly rather than wire it through.

In SAS-1.1 or SAS-2, define the signal assignments for CABLE_PROP and BP_PROP, define the circuit and set of resistor values, and the define the meaning of each of those resistor values.