

To: T10 Technical Committee  
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 Date: 23 December 2004  
 Subject: 05-023r0 SAS-1.1 Connector figures

### **Revision history**

Revision 0 (23 December 2004) First revision

### **Related documents**

sas1r07 - Serial Attached SCSI 1.1 revision 7

### **Overview**

This adds figures depicting each of the SAS connectors, kindly provided by Molex.

### **Suggested changes**

## **5.2.3 Connectors**

### **5.2.3.1 Connectors overview**

Table 1 summarizes the connectors defined in this standard.

**Table 1 — Connectors**

Type of connector	Physical links	Reference	Attaches to		
			Type of connector	Physical links	Reference
SAS plug	2	5.2.3.2	SAS internal cable receptacle	1 or 2	5.2.3.3
			SAS backplane receptacle	2	5.2.3.4
SAS internal cable SATA-style signal cable receptacle	1	ATA/ATAPI-7 V3	SATA-style host plug	1	ATA/ATAPI-7 V3
SAS internal cable receptacle	1 or 2	5.2.3.3	SAS plug	2	5.2.3.2
			SATA device plug	1	ATA/ATAPI-7 V3
SAS backplane receptacle	2	5.2.3.4	SAS plug	2	5.2.3.2
			SATA device plug	1	ATA/ATAPI-7 V3
SAS external cable plug	4	5.2.3.6	SAS external receptacle	4	5.2.3.7
SAS external receptacle	4	5.2.3.7	SAS external cable plug	4	5.2.3.6
SAS internal wide plug	4	5.2.3.9	SAS internal wide cable receptacle	4	5.2.3.10
SAS internal wide cable receptacle	4	5.2.3.10	SAS internal wide plug	4	5.2.3.9

The SATA device plug connector (e.g., used by a SATA device) may be attached to a SAS backplane receptacle connector or a SAS internal cable receptacle connector, connecting the primary signal pairs and leaving the secondary signal pairs unconnected.

See SFF-8223, SFF-8323, and SFF-8523 for the connector locations on common form factors.

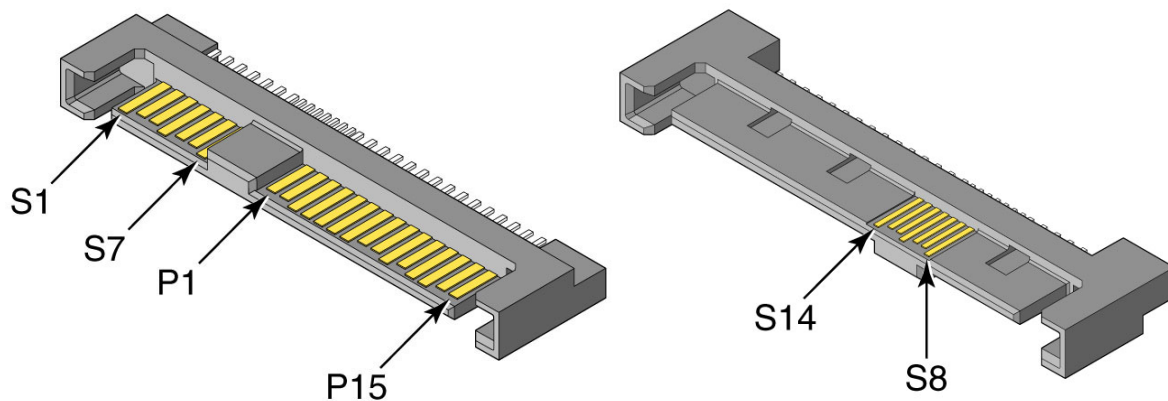
SAS connectors should be marked with the SAS icon (see Annex L).

### 5.2.3.2 SAS plug connector

SAS target devices supporting internal environments shall use the SAS plug connector. The SAS plug connector is defined in SFF-8482. It attaches to a SAS internal cable receptacle connector or a SAS backplane receptacle connector.

Table 2 (see 5.2.3.5) defines the pin assignments.

[Figure 1 shows the SAS plug connector.](#)



**[Figure 1 — SAS plug connector](#)**

### 5.2.3.3 SAS internal cable receptacle connector

SAS internal cables shall use a SAS internal cable receptacle connector on the SAS target device end. The SAS internal cable receptacle connectors are defined in SFF-8482.

The single-port version attaches to either:

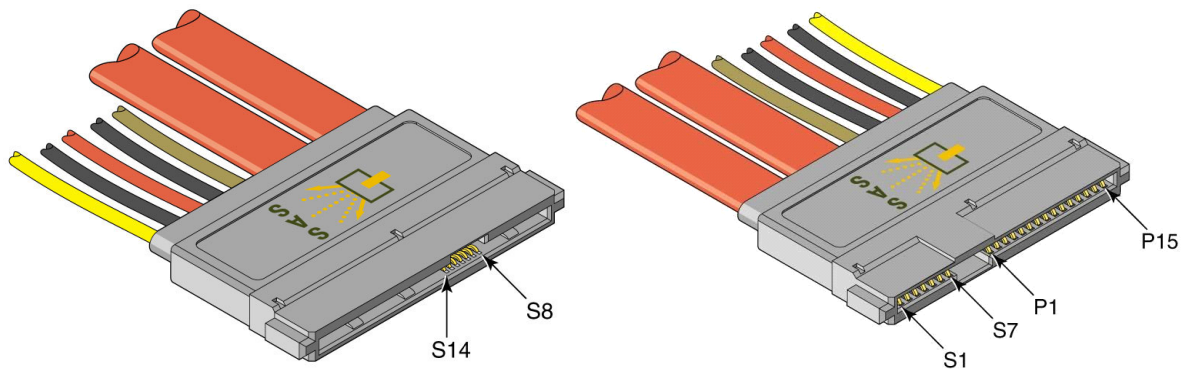
- a) a SAS plug connector, providing contact for the power pins and only the primary physical link; or
- b) a SATA device plug connector, providing contact for the power pins and the primary physical link.

The dual-port version attaches to:

- a) a SAS plug connector, providing contact for the power pins and only the primary physical link;
- b) a SAS plug connector, providing contact for the power pins and both the primary and secondary physical links; or
- c) a SATA device plug connector, providing contact for the power pins and the primary physical link.

Table 2 (see 5.2.3.5) defines the pin assignments. The secondary physical link (i.e., pins S8 through S14) is not supported by the single-port internal cable receptacle.

[Figure 2 shows the SAS plug connector.](#)



**[Figure 2 — SAS internal cable receptacle connector](#)**

#### 5.2.3.4 SAS backplane receptacle connector

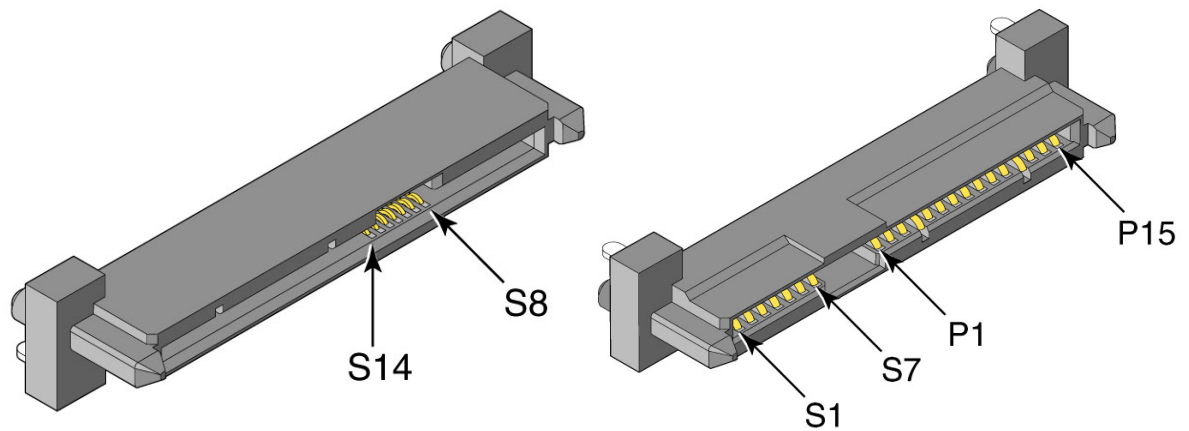
SAS backplanes shall use the SAS backplane receptacle connector.

The SAS backplane receptacle connector (see SFF-8482) attaches to either:

- a SAS plug connector, providing contact for the power pins and both primary and secondary physical links; or
- a SATA device plug connector, providing contact for the power pins and the primary physical link.

Table 2 (see 5.2.3.5) defines the pin assignments.

[Figure 3 shows the SAS backplane receptacle connector.](#)



**[Figure 3 — SAS backplane receptacle connector](#)**

### 5.2.3.5 SAS internal connector pin assignments

Table 2 defines the SAS target device signal assignments for pins in the SAS plug connector (see 5.2.3.2), the SAS internal cable receptacle connector (see 5.2.3.3), and the SAS backplane receptacle connector (see 5.2.3.4).

**Table 2 — SAS internal connector pin assignments**

Segment	Pin	Name
Primary signal	S1	GROUND
Primary signal	S2	RP+
Primary signal	S3	RP-
Primary signal	S4	GROUND
Primary signal	S5	TP-
Primary signal	S6	TP+
Primary signal	S7	GROUND
Secondary signal <sup>b</sup>	S8	GROUND
Secondary signal <sup>b</sup>	S9	RS+
Secondary signal <sup>b</sup>	S10	RS-
Secondary signal <sup>b</sup>	S11	GROUND
Secondary signal <sup>b</sup>	S12	TS-
Secondary signal <sup>b</sup>	S13	TS+
Secondary signal <sup>b</sup>	S14	GROUND
Power <sup>a</sup>	P1	V <sub>33</sub>
Power <sup>a</sup>	P2	V <sub>33</sub>
Power <sup>a</sup>	P3	V <sub>33</sub> , precharge
Power <sup>a</sup>	P4	GROUND
Power <sup>a</sup>	P5	GROUND
Power <sup>a</sup>	P6	GROUND
Power <sup>a</sup>	P7	V <sub>5</sub> , precharge
Power <sup>a</sup>	P8	V <sub>5</sub>
Power <sup>a</sup>	P9	V <sub>5</sub>
Power <sup>a</sup>	P10	GROUND
Power <sup>a</sup>	P11	READY LED
Power <sup>a</sup>	P12	GROUND
Power <sup>a</sup>	P13	V <sub>12</sub> , precharge
Power <sup>a</sup>	P14	V <sub>12</sub>
Power <sup>a</sup>	P15	V <sub>12</sub>
<sup>a</sup> Behind a SAS plug connector, the precharge pin and each corresponding voltage pin shall be connected together on the SAS target device (e.g., the V <sub>5</sub> , precharge pin P7 is connected to the two V <sub>5</sub> pins P8 and P9). <sup>b</sup> S8 through S14 are no-connects on single port implementations.		

SAS target device signal assignments, except for the addition of the secondary physical link when present, are in the same locations as they are in a SATA device. On cable assemblies, backplanes, or any other connection media, the Tx signal from one internal connector pair shall be connected to the corresponding Rx signal of the other internal connector pair (i.e., the TP+ signal pin of connector 1 shall connect to the RP+ signal pin of connector 2) if there is an internal connector at both ends of the transmission media.

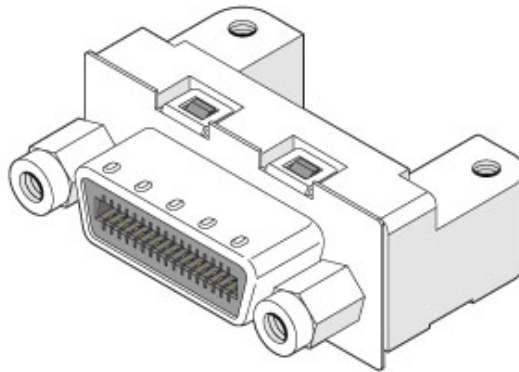
The TP+, TP-, RP+, and RP- signals are used by the primary physical link. The TS+, TS-, RS+, and RS- signals are used by the secondary physical link.

#### 5.2.3.6 SAS external cable plug connector

SAS external cables shall use the SAS external cable plug connector. The SAS external cable plug connector is defined in SFF-8470 as the four lane free (plug) connector with jack screws. The SAS external cable plug connector shall not include keys and may include key slots. Key slots are not defined by this standard. The SAS external cable plug connector attaches to a SAS external receptacle connector, providing contact for up to four physical links.

Table 3 (see 5.2.3.8) defines the pin assignments.

[Figure 4 shows the SAS external cable plug connector.](#)



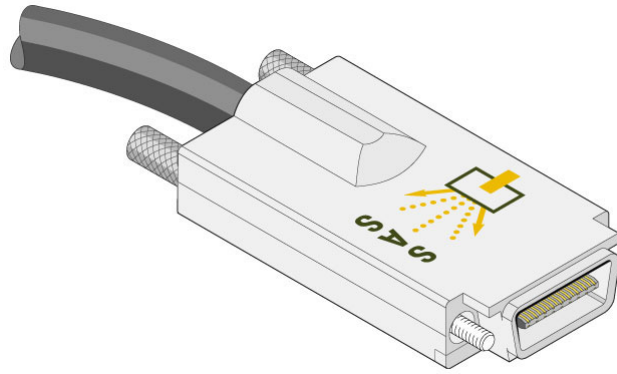
**[Figure 4 — SAS external cable plug connector](#)**

#### 5.2.3.7 SAS external receptacle connector

SAS devices with external ports shall use the SAS external receptacle connector. The SAS external receptacle connector is defined in SFF-8470 as the four lane fixed (receptacle) connector with jack screws. The SAS external cable receptacle connector shall not include keys and may include key slots. Key slots are not defined by this standard. The SAS external receptacle connector attaches to a SAS external cable plug connector, providing contact for up to four physical links.

Table 3 (see 5.2.3.8) defines the pin assignments.

[Figure 5 shows the SAS external receptacle connector.](#)



**[Figure 5 — SAS external receptacle connector](#)**

#### **5.2.3.8 SAS external connector pin assignments**

Table 3 defines the signal assignments for pins in SAS external cable plug connectors (see 5.2.3.6) and SAS external receptacle connectors (see 5.2.3.7) for applications using one, two, three, or four of the physical

links. External cables should be labeled to indicate how many physical links are included (e.g., 1X, 2X, 3X, and 4X on each connector's housing).

**Table 3 — SAS external connector pin assignments and physical link usage**

Signal	Signal pin to use based on number of physical links supported by the cable			
	One	Two	Three	Four
Rx 0+	S1	S1	S1	S1
Rx 0-	S2	S2	S2	S2
Rx 1+	N/C	S3	S3	S3
Rx 1-	N/C	S4	S4	S4
Rx 2+	N/C	N/C	S5	S5
Rx 2-	N/C	N/C	S6	S6
Rx 3+	N/C	N/C	N/C	S7
Rx 3-	N/C	N/C	N/C	S8
Tx 3-	N/C	N/C	N/C	S9
Tx 3+	N/C	N/C	N/C	S10
Tx 2-	N/C	N/C	S11	S11
Tx 2+	N/C	N/C	S12	S12
Tx 1-	N/C	S13	S13	S13
Tx 1+	N/C	S14	S14	S14
Tx 0-	S15	S15	S15	S15
Tx 0+	S16	S16	S16	S16
SIGNAL GROUND	G1 - G9			
CHASSIS GROUND	Housing			
Key: N/C = not connected				

SIGNAL GROUND shall not be connected to CHASSIS GROUND in the cable connector.

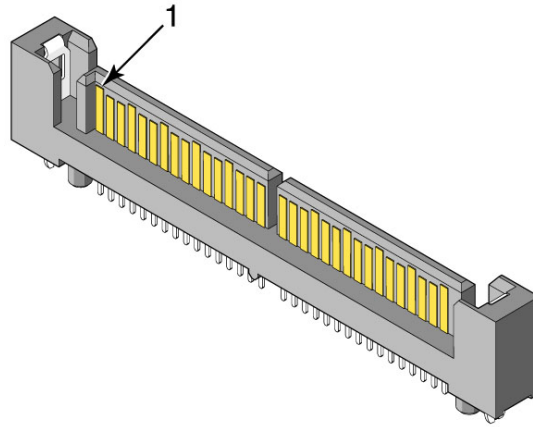
#### 5.2.3.9 SAS internal wide plug connector

SAS internal wide cables shall use the SAS internal wide plug connector. The SAS internal wide plug connector is defined in SFF-8484.

The SAS internal wide plug connector attaches to a SAS internal wide cable receptacle connector, providing contact for up to four physical links and six sideband signals.

Table 4 and table 5 (see 5.2.3.11) define the pin assignments.

[Figure 6 shows the SAS internal wide plug connector.](#)



**[Figure 6 — SAS internal wide plug connector](#)**

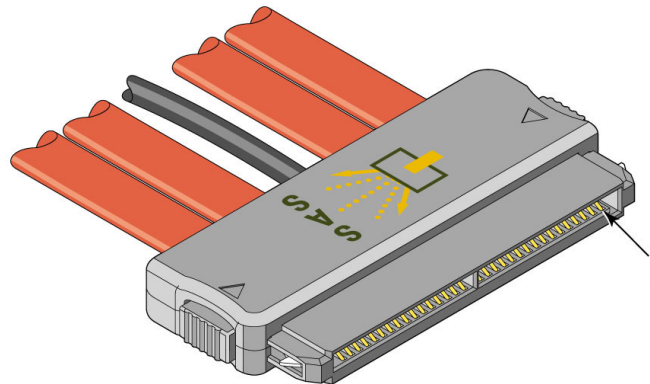
#### 5.2.3.10 SAS internal wide cable receptacle connector

The SAS internal wide cable receptacle connector is defined in SFF-8484.

The SAS internal wide cable receptacle connector attaches to a SAS internal wide plug connector, providing contact for up to four physical links and six sideband signals.

Table 4 and table 5 (see 5.2.3.11) define the pin assignments.

[Figure 7 shows the SAS internal wide cable receptacle connector.](#)



**[Figure 7 — SAS internal wide cable receptacle connector](#)**

#### 5.2.3.11 SAS internal wide connector pin assignments

Table 4 defines the signal assignments for pins in SAS internal wide plug connectors (see 5.2.3.9) and SAS internal wide cable receptacle connectors (see 5.2.3.10) for controller applications using one, two, three, or



four of the physical links. SAS internal wide cables should be labeled to indicate how many physical links are included (e.g., 1X, 2X, 3X, and 4X on each connector's housing).

**Table 4 — Controller SAS internal wide connector pin assignments and physical link usage**

Signal	Signal pin to use based on number of physical links supported by the cable <sup>a</sup>			
	One	Two	Three	Four
Rx 0+	2	2	2	2
Rx 0-	3	3	3	3
Tx 0-	5	5	5	5
Tx 0+	6	6	6	6
Rx 1+	N/C	8	8	8
Rx 1-	N/C	9	9	9
Tx 1-	N/C	11	11	11
Tx 1+	N/C	12	12	12
Sideband 0	14	14	14	14
Sideband 1	15	15	15	15
Sideband 2	16	16	16	16
Sideband 3	17	17	17	17
Sideband 4	18	18	18	18
Sideband 5	19	19	19	19
Rx 2+	N/C	N/C	21	21
Rx 2-	N/C	N/C	22	22
Tx 2-	N/C	N/C	24	24
Tx 2+	N/C	N/C	25	25
Rx 3+	N/C	N/C	N/C	27
Rx 3-	N/C	N/C	N/C	28
Tx 3-	N/C	N/C	N/C	30
Tx 3+	N/C	N/C	N/C	31
SIGNAL GROUND	1, 4, 7, 10, 13, 20, 23, 26, 29, 32			
<sup>a</sup> N/C = not connected				

The use of the sideband signals by a controller is vendor-specific. One implementation of the sideband signals by a controller is an SGPIO initiator interface (see SFF-8485). Other implementations shall be compatible with the signal levels defined in SFF-8485.

Table 5 defines how the signal assignments for pins in SAS internal wide plug connectors (see 5.2.3.10) and SAS internal wide cable receptacle connectors (see 5.2.3.10) for backplane applications using one, two,

three, or four of the physical links. Internal wide cables should be labeled to indicate how many physical links are included (e.g., 1X, 2X, 3X, and 4X on each connector's housing).

**Table 5 — Backplane SAS internal wide connector pin assignments and physical link usage**

Signal	Signal pin to use based on number of physical links supported by the cable <sup>a</sup>			
	One	Two	Three	Four
Rx 3+	N/C	N/C	N/C	2
Rx 3-	N/C	N/C	N/C	3
Tx 3-	N/C	N/C	N/C	5
Tx 3+	N/C	N/C	N/C	6
Rx 2+	N/C	N/C	8	8
Rx 2-	N/C	N/C	9	9
Tx 2-	N/C	N/C	11	11
Tx 2+	N/C	N/C	12	12
Sideband 5	14	14	14	14
Sideband 4	15	15	15	15
Sideband 3	16	16	16	16
Sideband 2	17	17	17	17
Sideband 1	18	18	18	18
Sideband 0	19	19	19	19
Rx 1+	N/C	21	21	21
Rx 1-	N/C	22	22	22
Tx 1-	N/C	24	24	24
Tx 1+	N/C	25	25	25
Rx 0+	27	27	27	27
Rx 0-	28	28	28	28
Tx 0-	30	30	30	30
Tx 0+	31	31	31	31
SIGNAL GROUND	1, 4, 7, 10, 13, 20, 23, 26, 29, 32			
<sup>a</sup> N/C = not connected				

The use of the sideband signals by a backplane is vendor-specific. One implementation of the sideband signals by a backplane is an SGPIO target interface (see SFF-8485). Other implementations shall be compatible with the signal levels defined in SFF-8485.