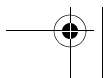
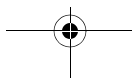
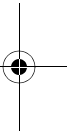
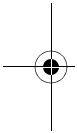


# 10. SSP Trace Examples

This chapter contains several basic traces of SSP operations to enable you to see how the information presented in this chapter relates to actual activity on a SAS link. Because some of these traces were created using a traffic generator rather than real devices, the observed behavior may differ slightly from actual devices.



## 10.1 Test Unit Ready Command Trace

Figure 10-1 and Figure 10-2 on page 157 show a trace of a Test Unit Ready command. In this example, the target returns CHECK CONDITION status and accompanying sense information.

H->D Data	H->D Count	Host->Device D->H Data	Device D->H Count	Description	Timestamp
BC181E81		SOAF			0 ns
9108FFFF	0	AF01 - OPEN Address Frame			16 ns
		Sending port is an Initiator Protocol= SSP Features = 0x0 Connection Rate = 1.5 Gbps Initiator Connection Tag = 0xFFFF			
5000C500	1	Destination SAS Address:			12 ns
00100F6D	2	0x5000C50000100F6D			12 ns
50000000	3	Source SAS Address:			16 ns
00000000	4	0x5000000000000000			12 ns
00000000	5	Compatible Features = 0x00 Pathway Blocked Count = 0x00 Arbitration Wait Time = 0x0000			12 ns
00000000	6	More Compatible Features = 0x00000000			16 ns
E40E537B	7	CRC (Good)			12 ns
BC18679F		EOAF			12 ns
		BC9B9B9B		AIP (NORMAL)	488 ns
		BC9B1EFD		AIP (WAITING ON DEVICE)	292 ns
		BCF0F0F0		OPEN ACCEPT	180 ns
		BC8118F0		RRDY	12 ns
		BC8118F0		RRDY	28 ns
BC8118F0		RRDY			1.580 us
BC18E467		SOF			52 ns
06AF7C65	0	IU 06 - SSP Command			28 ns
		Hashed Destination SAS Address = 0xAF7C65 Hashed Source SAS Address = 0xA00000 Retransmitted Frame = False Number of Fill Bytes = 0x00			
00A00000	1	Reserved			28 ns
00000000	2	Tag = 0x0000			24 ns
00000000	3	Target Port Transfer Tag = 0xFFFF			28 ns
0000FFFF	4	Data Offset = 0x00000000			28 ns
00000000	5	Logical Unit Number = 0x0000000000000000			28 ns
00000000	6	Task Attribute = (0x00) SIMPLE			28 ns
00000000	7	Additional CDB Length = 0x00 dwords			28 ns
00000000	8	SCSI Command = (0x00) TEST UNIT READY			28 ns
00000000	9	Control: 0x00			28 ns
00000000	10	*** PADDED DWORD ***			28 ns
00000000	11	*** PADDED DWORD ***			28 ns
00000000	12	CRC (Good)			28 ns
14782906	13	EOF			28 ns
BC18F09B		BC818181		ACK	208 ns
		BC8118F0		RRDY	24 ns
BC1E1E1E		DONE (NORMAL)			64 ns
		BC1E1E1E		DONE (NORMAL)	152 ns
		BC021E9B		CLOSE (NORMAL)	24 ns
		BC021E9B		CLOSE (NORMAL)	28 ns
		BC021E9B		CLOSE (NORMAL)	12 ns
BC021E9B		CLOSE (NORMAL)			1.580 us
BC021E9B		CLOSE (NORMAL)			16 ns
BC021E9B		CLOSE (NORMAL)			12 ns

Figure 10-1. SSP Test Unit Ready Command (Part 1: COMMAND Frame)

H->D Data	H->D Count	Host->Device D->H Data	Device D->H Count	Description	Timestamp
		BC181E81		SOAF	138.556 us
		1108FFFF	0	AF01 - OPEN Address Frame Sending port is a Target Protocol= SSP Features = 0x0 Connection Rate = 1.5 Gbps Initiator Connection Tag = 0xFFFF	16 ns
		50000000	1	Destination SAS Address:	12 ns
		00000000	2	0x5000000000000000	12 ns
		5000C500	3	Source SAS Address:	16 ns
		00100F6D	4	0x5000C50000100F6D	12 ns
		00000000	5	Compatible Features = 0x00 Pathway Blocked Count = 0x00 Arbitration Wait Time = 0x0000	12 ns
		00000000	6	More Compatible Features = 0x00000000	16 ns
		19F1595F	7	CRC (Good)	12 ns
		BC18679F		EOAF	12 ns
BCF0F0F0		OPEN_ACCEPT			1.228 us
BC8118F0		RRDY			80 ns
		BC8118F0		RRDY	60 ns
		BC8118F0		RRDY	28 ns
		BC18E467		SOF	156 ns
		07A00000	0	IU 07 - SSP RESPONSE Hashed Destination SAS Address = 0xA00000	28 ns
		00AF7C65	1	Hashed Source SAS Address = 0xAF7C65	28 ns
		00000000	2	Retransmitted Frame = False Number of Fill Bytes = 0x00	24 ns
		00000000	3	Reserved	28 ns
		00001FAC	4	Tag = 0x0000 Target Port Transfer Tag = 0x1AFC	28 ns
		00000000	5	Data Offset = 0x00000000	24 ns
		00000000	6	Reserved	28 ns
		00000000	7	Reserved	28 ns
		00000202	8	DataPres = SENSE DATA Status = 0x02	24 ns
		00000000	9	Reserved	28 ns
		00000012	10	Sense Data List Length = 0x00000012	28 ns
		00000000	11	Response Data List Length = 0x00000000	24 ns
		70000600	12	Sense Data = 0x70000600	28 ns
		0000000A	13	Sense Data = 0x0000000A	28 ns
		00000000	14	Sense Data = 0x00000000	24 ns
		29010100	15	Sense Data = 0x29010100	28 ns
		000053FA	16	Sense Data = 0x000053FA	28 ns
		8094674D	17	CRC (Good)	24 ns
		BC18F09B		EOF	
BC818181		ACK			1.512 us
BC8118F0		RRDY			28 ns
		BC1E1E1E		DONE (NORMAL)	192 ns
BC1E1E1E		DONE (NORMAL)			1.540 us
BC021E9B		CLOSE (NORMAL)			132 ns
BC021E9B		CLOSE (NORMAL)			12 ns
BC021E9B		CLOSE (NORMAL)			16 ns
		BC021E9B		CLOSE (NORMAL)	8 ns
		BC021E9B		CLOSE (NORMAL)	24 ns
		BC021E9B		CLOSE (NORMAL)	16 ns

Figure 10-2. SSP Test Unit Ready Command (Part 2: RESPONSE Frame)

## 10.2 Read (10) Command

Figure 10-3 shows the COMMAND frame portion of an SSP read operation. This read command requests the transfer of one logical block beginning at LBA 00 00 00 00h.

H->D Data	H->D Count	Host->Device D->H Data	Device->Host D->H Description	Timestamp
BC8118F0			RRDY	28 ns
EC18E467			SOF	187.129 ms
066F1C98	0		IU 06 - SSP Command	28 ns
			Hashed Destination SAS Address = 0x6F1C98	
00DAD332	1		Hashed Source SAS Address = 0xDAD332	24 ns
00000000	2		Retransmitted Frame = False	28 ns
			Number of Fill Bytes = 0x00	
00000000	3		Reserved	28 ns
0000FFFF	4		Tag = 0x0000	24 ns
			Target Port Transfer Tag = 0xFFFF	
00000000	5		Data Offset = 0x00000000	28 ns
00000000	6			24 ns
00000000	7		Logical Unit Number = 0x0000000000000000	28 ns
00000000	8		Task Attribute = (0x00) SIMPLE	28 ns
			Additional CDB Length = 0x00 dwords	
28000000	9		SCSI Command = (0x28) READ(10)	24 ns
			Relative Address = 0x00	
			Force Unit Access = 0x00	
			Disable Page Out = 0x00	
			Logical Block Address:	
			(MSB) 0x0000	
00000000	10		(LSB) 0x0000	28 ns
			Transfer Length	
			(MSB) 0x00	
01000000	11		(LSB) 0x01	28 ns
			Control Byte: 0x00	
00000000	12		*** PADDED DWORD ***	
8C754148	13		CRC	24 ns
			CRC - Good	
EC18F09B			EOF	28 ns
		BC818181	ACK	480 ns
		BC8118F0	RRDY	24 ns

Figure 10-3. SSP Read Command (Part 1: COMMAND Frame)

Figure 10-4 shows the DATA and RESPONSE frames for the read operation.

H->D Data	H->D Count	Host->Device D->H Data	Device->Host D->H Count	Description	Timestamp
		BC18E467		SOF	280.310 ms
		01DAD332	0	IU 01 - SAS Data	24 ns
				Hashed Destination SAS Address = 0xDAD332	
		006F1C98	1	Hashed Source SAS Address = 0x6F1C98	28 ns
		00080000	2	Retransmitted Frame = False	28 ns
				Number of Fill Bytes = 0x00	
		00000000	3	Reserved	24 ns
		0000FFFF	4	Tag = 0x0000	28 ns
				Target Port Transfer Tag = 0xFFFF	
		00000000	5	Data Offset = 0x00000000	28 ns
		00010203	6	DATA	24 ns
		04050607	7	DATA	28 ns
		08090A0B	8	DATA	24 ns
		0C0D0E0F	9	DATA	28 ns
		10111213	10	DATA	28 ns
		14151617	11	DATA	24 ns
		18191A1B	12	DATA	28 ns
		1C1D1E1F	13	DATA	28 ns
		- - - - - (Data entries deleted) - - - - -			
		F8F9FAFB	132	DATA	24 ns
		FCFDFFFF	133	DATA	28 ns
		808D35E6	134	CRC	28 ns
		BC18F09B		EOF	24 ns
BC818181		ACK			476 ns
BC8118F0		RRDY			24 ns
		BC18E467		SOF	480 ns
		07DAD332	0	IU 07 - SSP RESPONSE	28 ns
				Hashed Destination SAS Address = 0xDAD332	
		006F1C98	1	Hashed Source SAS Address = 0x6F1C98	24 ns
		00000000	2	Retransmitted Frame = False	28 ns
				Number of Fill Bytes = 0x00	
		00000000	3	Reserved	28 ns
		0000FFFF	4	Tag = 0x0000	24 ns
				Target Port Transfer Tag = 0xFFFF	
		00000000	5	Data Offset = 0x00000000	28 ns
		00000000	6	Reserved	24 ns
		00000000	7	Reserved	28 ns
		00000000	8	DataPres = NO DATA	28 ns
				Status = 0x00	
		00000000	9	Reserved	24 ns
		00000000	10	Sense Data List Length = 0x00000000	28 ns
		00000000	11	Response Data List Length = 0x00000000	28 ns
		02A01029	12	CRC	24 ns
		BC18F09B		EOF	28 ns
BC818181		ACK			484 ns
BC8118F0		RRDY			28 ns
BC1E1E1E		DONE (NORMAL)			1.149 sec
		BC1E1E1E		DONE (NORMAL)	480 ns
		BC021E9B		CLOSE (NORMAL)	28 ns
		BC021E9B		CLOSE (NORMAL)	24 ns
		BC021E9B		CLOSE (NORMAL)	28 ns
BC021E9B		CLOSE (NORMAL)			392 ns
BC021E9B		CLOSE (NORMAL)			28 ns
BC021E9B		CLOSE (NORMAL)			28 ns

Figure 10-4. SSP Read Command (Part 2: DATA and RESPONSE Frames)

### 10.3 SSP Write (10) Command

Figure 10-5 shows the COMMAND and XFER\_RDY portion of an SSP write operation. This command transfers one logical block beginning at LBA 00 00 00 00h.

H->D Data	H->D Count	Host->Device D->H Data	Device->Host D->H Count	Description	Timestamp
BC8118F0				RRDY	24 ns
BC18E467				SOF	468.619 ms
066F1C98	0	IU 06 - SSP Command			24 ns
		Hashed Destination SAS Address = 0x6F1C98			
00DAD332	1	Hashed Source SAS Address = 0xDAD332			28 ns
00000000	2	Retransmitted Frame = False			24 ns
		Number of Fill Bytes = 0x00			
00000000	3	Reserved			28 ns
0000FFFF	4	Tag = 0x0000			28 ns
		Target Port Transfer Tag = 0xFFFF			
00000000	5	Data Offset = 0x00000000			24 ns
00000000	6				28 ns
00000000	7	Logical Unit Number = 0x0000000000000000			24 ns
00000000	8	Task Attribute = (0x00) SIMPLE			28 ns
		Additional CDB Length = 0x00 dwords			
2A000000	9	SCSI Command = (0x2A) WRITE(10)			28 ns
		Relative Address = 0x00			
		Erase by-pass = 0x00 default to normal write operation.			
		Force Unit Access = 0x00			
		Disable Page Out = 0x00			
		Logical Block Address:			
		(MSB) 0x0000			
00000000	10	(LSB) 0x0000			24 ns
		Transfer Length			
		(MSB) 0x00			
01000000	11	(LSB) 0x01			28 ns
		Control Byte: 0x00			
00000000	12	*** PADDED DWORD ***			28 ns
00038F82	13	CRC			24 ns
BC18F09B		EOF			24 ns
		BC818181		ACK	480 ns
		BC8118F0		RRDY	28 ns
		BC18E467		SOF	655.312 ms
		05DAD332	0	IU 05 - SSP XFER_READY	28 ns
		Hashed Destination SAS Address = 0xDAD332			
		006F1C98	1	Hashed Source SAS Address = 0x6F1C98	24 ns
		00000000	2	Retransmitted Frame = False	28 ns
		Number of Fill Bytes = 0x00			
		00000000	3	Reserved	28 ns
		0000FFFF	4	Tag = 0x0000	24 ns
		Target Port Transfer Tag = 0xFFFF			
		00000000	5	Data Offset = 0x00000000	28 ns
		00000000	6	Requested Offset = 0x00000000	24 ns
		00000200	7	Write Data Length = 0x00000200	28 ns
		00000000	8	Reserved	28 ns
		318B20EB	9	CRC	24 ns
		BC18F09B		EOF	28 ns
BC818181		ACK			484 ns

Figure 10-5. SSP Write Command (Part 1: COMMAND and XFER\_RDY Frames)

The DATA and RESPONSE frames for the write command are shown in Figure 10-6.

H->D Data	H->D Count	Host->Device Description	D->H Data	D->H Count	Device->Host Description	Timestamp
BC8118F0		RRDY				28 ns
BC18E467		SOF				653.894 ms
016F1C98	0	IU 01 - SAS Data				28 ns
		Hashed Destination SAS Address = 0x6F1C98				
00DAD332	1	Hashed Source SAS Address = 0xDAD332				28 ns
00000000	2	Retransmitted Frame = False				24 ns
		Number of Fill Bytes = 0x00				
00000000	3	Reserved				28 ns
0000FFFF	4	Tag = 0x0000				28 ns
		Target Port Transfer Tag = 0xFFFF				
00000000	5	Data Offset = 0x00000000				24 ns
00010203	6	DATA				28 ns
04050607	7	DATA				24 ns
08090A0B	8	DATA				28 ns
0C0D0E0F	9	DATA				28 ns
10111213	10	DATA				24 ns
14151617	11	DATA				28 ns
18191A1B	12	DATA				28 ns
1C1D1E1F	13	DATA				24 ns
20212223	14	DATA: ASCII = !"#				28 ns
24252627	15	DATA: ASCII = \$%&'				24 ns
28292A2B	16	DATA: ASCII =()*+*				28 ns
2C2D2E2F	17	DATA: ASCII = ,-./				28 ns
30313233	18	DATA: ASCII = 0123				24 ns
- - - - - (Some data has been deleted) - - - - -						
E8E9EAE8	128	DATA				28 ns
ECEDEEEF	129	DATA				24 ns
FOF1F2F3	130	DATA				28 ns
F4F5F6F7	131	DATA				28 ns
F8F9FAFB	132	DATA				24 ns
FCFDFEFF	133	DATA				28 ns
DBA2F483	134	CRC				24 ns
BC18F09B		EOF				28 ns
		BC818181	ACK			480 ns
		BC8118F0	RRDY			24 ns
		BC18E467	SOF			487.206 ms
		07DAD332	0	IU 07 - SSP RESPONSE		28 ns
				Hashed Destination SAS Address = 0xDAD332		
		006F1C98	1	Hashed Source SAS Address = 0x6F1C98		24 ns
		00000000	2	Retransmitted Frame = False		28 ns
				Number of Fill Bytes = 0x00		
		00000000	3	Reserved		28 ns
		0000FFFF	4	Tag = 0x0000		24 ns
				Target Port Transfer Tag = 0xFFFF		
		00000000	5	Data Offset = 0x00000000		28 ns
		00000000	6	Reserved		24 ns
		00000000	7	Reserved		28 ns
		00000000	8	DataPres = NO DATA		28 ns
				Status = 0x00		
		00000000	9	Reserved		24 ns
		00000000	10	Sense Data List Length = 0x00000000		28 ns
		00000000	11	Response Data List Length = 0x00000000		24 ns
		02A01029	12	CRC		28 ns
		BC18F09B		EOF		28 ns
BC818181		ACK				472 ns

Figure 10-6. SSP Write Command (Part 2: DATA and RESPONSE Frames)

