SMALL COMPUTER SYSTEMS INTERFACE

SE-HVD INTERFACE CONVERTER

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1 Introduction

An Introduction To SCSI

SCSI (Small Computer Systems Interface) is a local I/O bus that can be operated over a wide range of data rates. The primary aim of the interface is to provide host computer systems with device independence within a class of devices. Thus, different disk drives, tape drives, printers, optical media drives and other devices can be added to the host computer system without requiring modifications to generic system hardware or software.

The interface uses logical rather than physical addressing for all data blocks. For direct-access devices, each logical unit may be interrogated to determine how many blocks it contains. A logical unit may coincide with all or part of a peripheral device.

The interface protocol includes provision for the connection of multiple host computer systems (initiators) and multiple peripheral devices (targets) to execute and complete specific tasks and instructions between them.

The SCSI Interface

The SCSI protocol incorporates three individual types of interface: Single-Ended (SE), Differential (HVD) and Low Voltage Differential (LVD). Single-ended and differential devices are electrically incompatible and cannot be mixed on the same SCSI bus. While single-ended and low voltage differential devices may be mixed on the same SCSI bus, they will all work under the single-ended protocol. Therefore, the LVD devices will not work to there full potential. Each interface has its own individual characteristics that determine transfer rates, bandwidth, power consumption etc

Single-Ended

Single-ended SCSI allows a bus length of up to 6 meters. When higher transfer rates than 5 Mbytes/sec are used, this limits the length to 3m. When more than 4 devices are connected, the bus must not exceed 1.5m long. Within an enclosure, the single-ended interface is adequate for most applications.

Differential

Differential SCSI is used mostly in applications that require cable lengths greater than 6 meters. Differential interfaces are far more resistant against external interference and allow cable lengths of up to 25m. Due to the high power consumption, the differential drivers cannot be integrated onto the SCSI protocol chip. For this reason they are more expensive.

Low Voltage Differential

LVD is supposed to bring the advantages of single-ended and differential interfaces together. Namely, low cost and high stability combined with long cable length. Its power consumption is so low it can be integrated into the SCSI protocol chip. It is also so immune to interference that cable lengths of up to 12 meters are possible.

NOTE: for all SCSI interfaces, the total cable length includes internal cabling within the units and the tracks on the PCB boards of all the devices on the SCSI bus.

2 Getting Started

Unpacking the SE-HVD Converter

It is recommended that the SE-HVD Converter packaging be retained. If the need arises to return the SE-HVD Converter, the original packaging will avoid the risk of damaging the unit while in transit.

- **To unpack the SE-HVD Converter:**
  1. Place the box in front of you.
  2. Break open the outer seals.
  3. Slide out the foam packaging.
  4. Pull out the antistatic bag containing the SE-HVD Converter.
  5. Break open the antistatic seal.
  6. Pull out the SE-HVD Converter.

NOTE: DIL recommend that antistatic precautions be adhered to when handling the SE-HVD Converter.

SE-HVD Converter Accessories

- **The SE-HVD Converter includes the following accessories:**
  - 1 x SE-HVD Converter Product Manual (this document).
  - 1 x bag of Jumper Switches.

The SE-HVD Converter

Introduction

The SCSI SE-HVD Converter is a high-performance SCSI interface converter supporting either Wide or Narrow SCSI devices with data rates up to 40M bytes/sec. The SE-HVD Converter is capable of converting the Single-Ended SCSI Interface (SE) into the High Voltage Differential SCSI Interface (HVD) and as a bi-directional device is also capable of converting the High Voltage Differential SCSI Interface into the Single-Ended SCSI Interface.

The SE-HVD Converter complies with the specifications in the ANSI draft standard X3T10/855D - SCSI 3 Parallel Interface - section 5 and includes support for SCAM. Host and peripheral devices may be connected to either the SE or HVD interface. It does not use any SCSI ID and as such is totally transparent to any SCSI device connected to it.

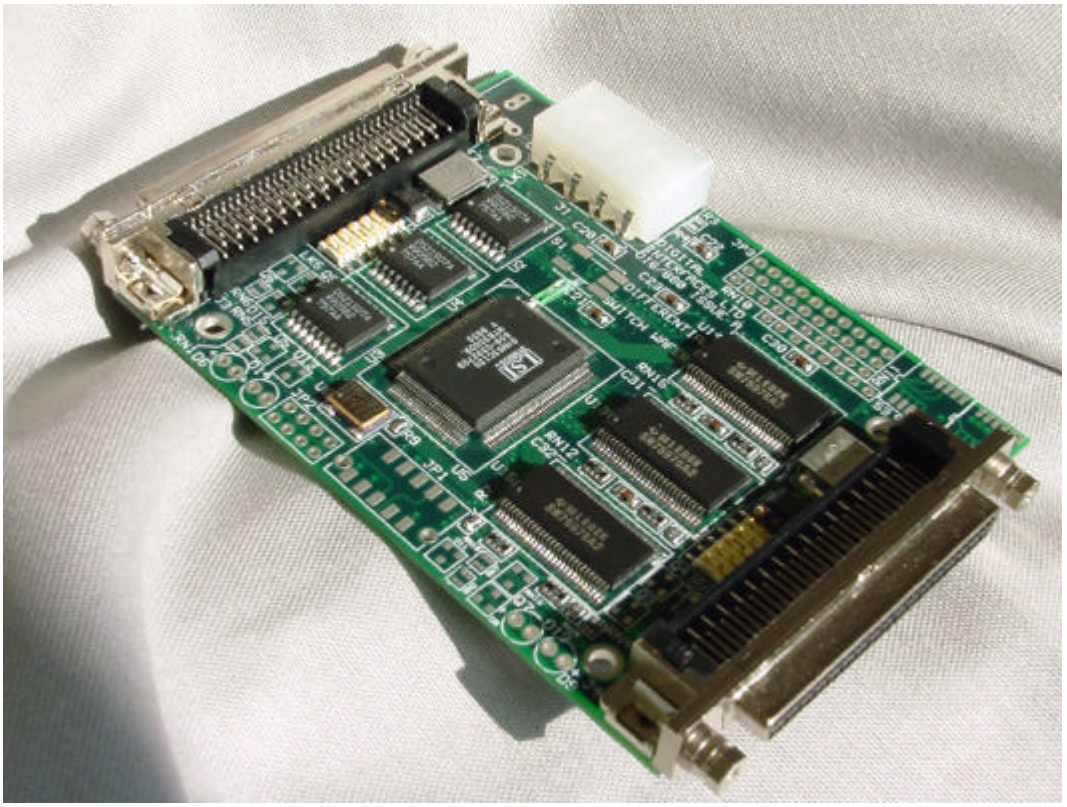
Both SE and HVD interfaces have built in switchable terminators so external terminators are unnecessary. The internal terminators are powered internally and either interface may be configured to supply terminator power to its relevant SCSI bus. All terminator power connections to the SCSI buses are protected by self-resetting fuses and reverse voltage protection diodes. The built in terminators may be disabled if the SCSI bus configuration requires no termination on a particular interface and 8 data bits are separately switchable to enable the connection of 8-bit SCSI devices.

The SE-HVD Converter also acts as a Bus-Repeater so it is possible to increase the overall length of the SCSI Bus making systems integration simpler.

Features

- Wide or Narrow SCSI data transfer.
- 40M bytes/sec, Fast 20 compatible.
- Bi-directional.
- Host or peripheral devices may be connected to either interface.
- Does not use a SCSI ID.
- Transparent to connected SCSI devices.
- Built-in switchable terminators on both the SE and HVD interface.
- Acts as a Bus-Repeater

Figure 1 - SE-HVD Interface Converter



The SE Interface is connected to the left-hand-side whilst the HVD Interface is connected to the right-hand-side.

Figure 2 - Board Description

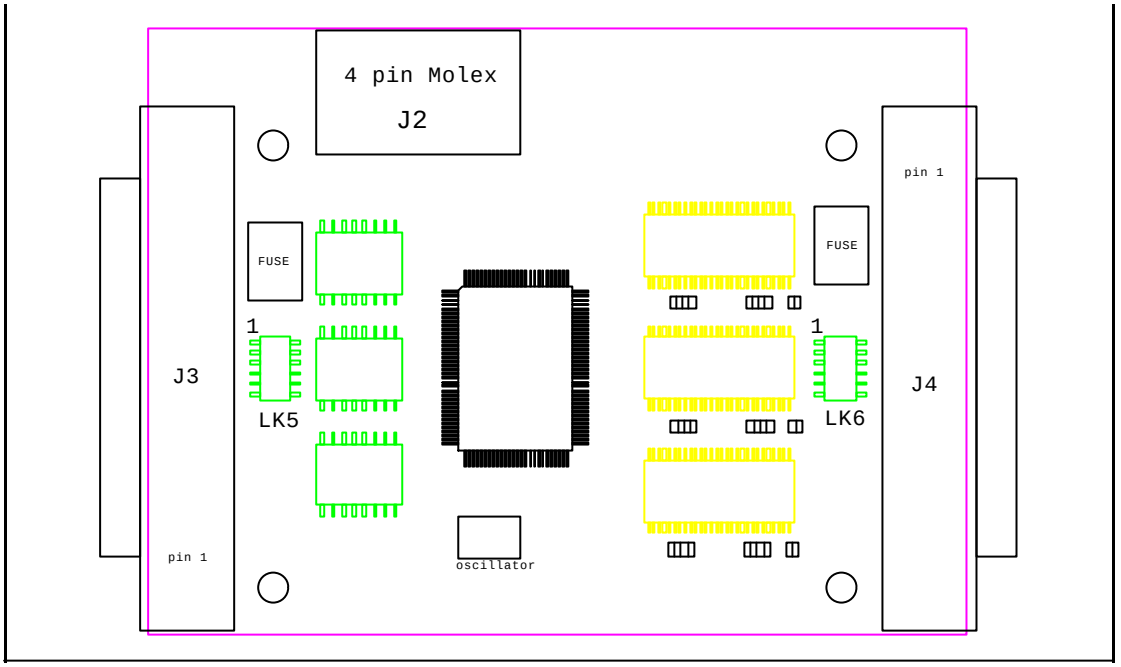


Figure 2 shows the major components of the SE-HVD Converter unit.

- The SE SCSI interface connector (J3) on the left-hand-side.
- The HVD SCSI interface connector (J4) on the right-hand-side.
- The 4-pin Molex Power Connector (J2) at the top towards the left.
- Link Block LK5 on the left, used to configure the terminators and terminator power connections for the SE Interface.
- Link Block LK6 on the right, used to configure the terminators and terminator power connections for the HVD Interface.
- Above the two Link Blocks are the self-resetting fuses for the terminator and terminator power supplies.
- To the right of Link Block LK5 are the three switchable terminators for the SE interface.
- To the left of Link Block LK6 are the three HVD drivers.
- On the underside of the board below the HVD Drivers are the three HVD switchable terminators.
- In the centre of the board is the device responsible for the conversion of the SE SCSI signals to HVD SCSI and vice versa.
- Power.
  - 5 volts.
  - 400mA (typical).

The 4-pin Molex connector (J2) is compatible with the supply power to the majority of PC peripheral devices in use today.

4 Termination

Both interfaces on the SE-HVD Converter have configurable switchable Terminators and Termpwr connections for maximum flexibility.

The Terminators on each interface are powered internally and may be fully enabled, partly enabled or fully disabled depending on the interface. The Figure 3 below shows the arrangement of the links for Terminator and Termpwr control.

Terminator Control

Each of the interfaces on the SE-HVD Converter has built in switchable Terminators, which can be enabled or disabled as required by the particular system configuration. Each interface has three switchable Terminator Chips, one each for the SCSI control signals (ATN, BSY etc.), the lower data byte (SD0-7) and the upper data byte (SD8-15).

The Terminators for the SCSI control signals and the Lower Data Byte are enabled/disabled using the Lower Byte/Control link and the Terminator for the Upper Data Byte is controlled by the Upper Byte link. Closing a link disables the Terminators. The separate link for the Upper Data Byte enables the SE-HDV Converter to be used with 8-bit (Narrow) SCSI devices as well as 16-bit (Wide) SCSI devices.

To use the Internal Terminators both the Upper Byte and Lower Byte/Control links should remain open. To use External Terminators with 16-bit SCSI devices both the Upper Byte and Lower Byte/Control links should be closed and an external 16-bit Terminator used. To use external Terminators with 8-bit SCSI devices the Upper Byte link should be open to internally terminate the unused Upper Data Byte and the Lower Byte/Control link should be closed and an External 8-bit Terminator used.

SCSI Termpwr

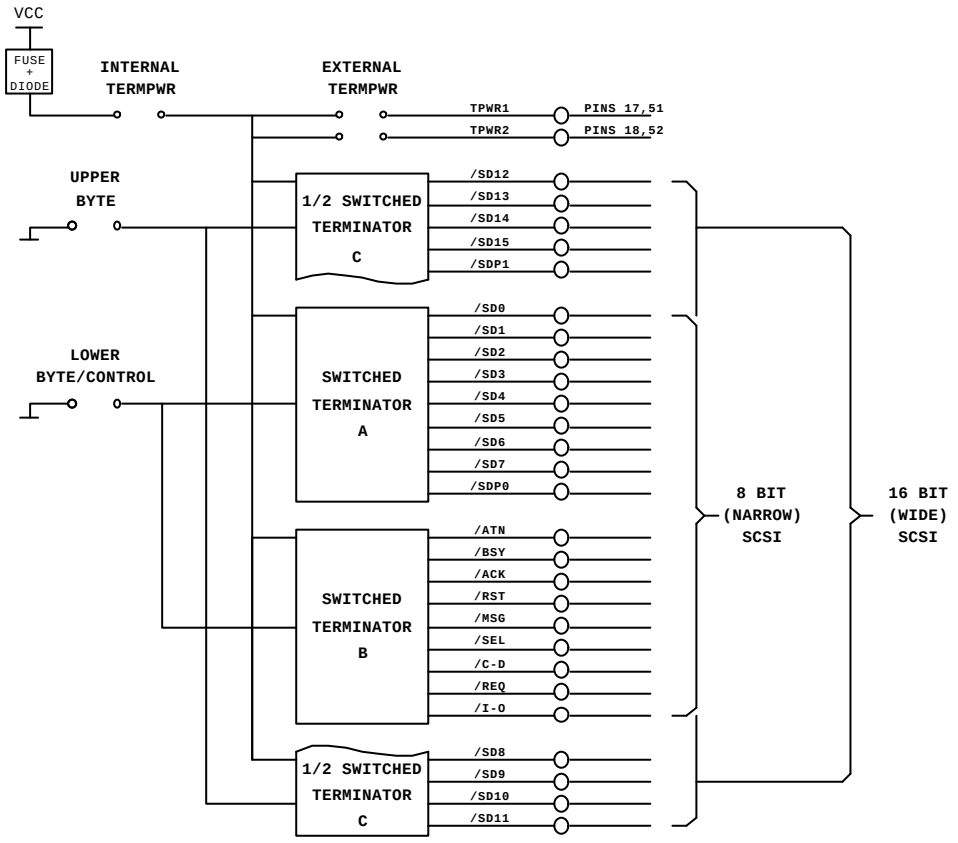
The SCSI Switch may supply Termpwr to the SCSI bus or receive Termpwr from the SCSI bus. To supply Termpwr to the SCSI bus both the Internal Termpwr link and at least the External Termpwr (TPWR1) link must be closed. The External Termpwr (TPWR2) link should also be closed if all the devices on the particular SCSI bus use the connector pinout defined by the SCSI 3 draft standard which specifies 4 Termpwr connections. For SCSI 2 devices the pins used by External Termpwr (TPWR2) may be either Termpwr, open circuit or connected to Ground. It is important to check the Termpwr connections for all the devices on the SCSI bus before closing the External Termpwr (TPWR2) link especially if they are not described as conforming to the SCSI 3 draft standard. Check the SCSI bus Termpwr connections in your SCSI device documentation.

NOTE: Damage may occur to the SE-HVD Converter or the attached SCSI devices if the Termpwr links are incorrectly set.

Internal Terminator Power

The built in terminators **must** have power supplied to them, either internally or externally, whether they are enabled or disabled. This requires that **at least one** of the Termpwr links be closed. As a minimum requirement either the Internal Termpwr link **must** be closed, or the External Termpwr (TPWR1) link **must** be closed and Termpwr supplied from the SCSI bus.

Figure 3 – Terminator And Termpwr Link Arrangements



Each interface has a similar arrangement of Terminator and Termpwr links. These make it possible to select all possible combinations required by the various SCSI standards and to cater for both 16-bit (Wide) and 8-bit (Narrow) SCSI devices.

5 Connector Assignments

Functions selected by closing a link.

Connectors

Connector	Description
J2	Power - 4 pin Molex
J3	SCSI SE Interface
J4	SCSI HVD Interface

Links

Links	Description
LK5	SE Interface Terminator and Termpwr Control
LK6	HVD Interface Terminator and Termpwr Control

SE Terminator Control – LK5

LK5 J3	Terminator link function
1	Internal Termpwr
2	External Termpwr (TPWR1)
3	External Termpwr (TPWR2)
4	Lower Byte/Control (disable)
5	Upper Byte (disable)
6	Not Used

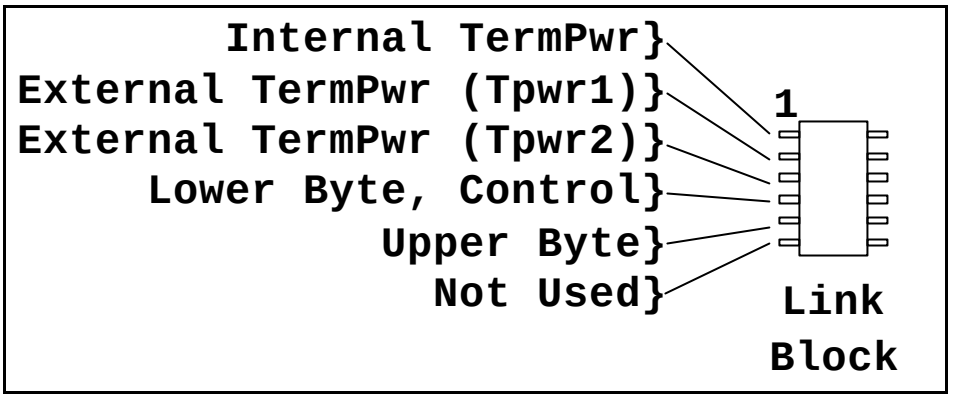
HVD Terminator Control – LK6

LK6 J4	Terminator link function
1	Internal Termpwr
2	External Termpwr (TPWR1)
3	External Termpwr (TPWR2)
4	Lower Byte/Control (disable)
5	Upper Byte (disable)
6	Not Used

Molex Power Connector (J2)

Contact No.	Signal name
1	not connected
2	0V
3	0V
4	5V

Figure 4 - Link Block Pin Assignments



6 Pin Assignments

SE Interface – J3

Signal Name	Connector Contact Number	SCSI Bus Conductor Number	SCSI Bus Conductor Number	Connector Contact Number	Signal Name
Ground	1	1	2	35	-DB(12)
Ground	2	3	4	36	-DB(13)
Ground	3	5	6	37	-DB(14)
Ground	4	7	8	38	-DB(15)
Ground	5	9	10	39	-DB(P1)
Ground	6	7	12	40	-DB(0)
Ground	7	13	14	41	-DB(1)
Ground	8	15	16	42	-DB(1)
Ground	9	17	18	43	-DB(3)
Ground	10	19	20	44	-DB(4)
Ground	11	21	22	45	-DB(5)
Ground	12	23	24	46	-DB(6)
Ground	13	25	26	47	-DB(7)
Ground	14	27	28	48	-DB(P)
Ground	15	29	30	49	Ground
Ground	16	31	32	50	Ground
Termpwr	17	33	34	51	Termpwr
Termpwr	18	35	36	52	Termpwr
Reserved	19	37	38	53	Reserved
Ground	20	39	40	54	Ground
Ground	21	41	42	55	-ATN
Ground	22	43	44	56	Ground
Ground	23	45	46	57	-BSY
Ground	24	47	48	58	-ACK
Ground	25	49	50	59	-RST
Ground	26	51	52	60	-MSG
Ground	27	53	54	61	-SEL
Ground	28	55	56	62	-C/D
Ground	29	57	58	63	-REQ
Ground	30	59	60	64	-I/O
Ground	31	61	62	65	-DB(8)
Ground	32	63	64	66	-DB(9)
Ground	33	65	66	67	-DB(10)
Ground	34	67	68	68	-DB(11)

HVD Interface – J4

Signal Name	Connector Contact Number	SCSI Bus Conductor Number	SCSI Bus Conductor Number	Connector Contact Number	Signal Name
+DB(12)	1	1	2	35	-DB(12)
+DB(13)	2	3	4	36	-DB(13)
+DB(14)	3	5	6	37	-DB(14)
+DB(15)	4	7	8	38	-DB(15)
+DP(P1)	5	9	10	39	-DB(P1)
Ground	6	7	12	40	Ground
+DB(0)	7	13	14	41	-DB(0)
+DB(1)	8	15	16	42	-DB(1)
+DB(2)	9	17	18	43	-DB(1)
+DB(3)	10	19	20	44	-DB(3)
+DB(4)	11	21	22	45	-DB(4)
+DB(5)	12	23	24	46	-DB(5)
+DB(6)	13	25	26	47	-DB(6)
+DB(7)	14	27	28	48	-DB(7)
+DB(P)	15	29	30	49	-DB(P)
DiffSense	16	31	32	50	Ground
Termpwr	17	33	34	51	Termpwr
Termpwr	18	35	36	52	Termpwr
Reserved	19	37	38	53	Reserved
+ATN	20	39	40	54	-ATN
Ground	21	41	42	55	Ground
+BSY	22	43	44	56	-BSY
+ACK	23	45	46	57	-ACK
+RST	24	47	48	58	-RST
+MSG	25	49	50	59	-MSG
+SEL	26	51	52	60	-SEL
+C/D	27	53	54	61	-C/D
+REQ	28	55	56	62	-REQ
+I/O	29	57	58	63	-I/O
Ground	30	59	60	64	Ground
+DB(8)	31	61	62	65	-DB(8)
+DB(9)	32	63	64	66	-DB(9)
+DB(10)	33	65	66	67	-DB(10)
+DB(11)	34	67	68	68	-DB(11)

7 Board Profile And Mountings