
7 SCSI

7.1 GENERAL

The ETRAX 100 has two SCSI ports, SCSI0 and SCSI1. The SCSI controller is compatible with SCSI-2 and SCSI-3 Fast-20. It is configurable as either two 8-bit wide SCSI interfaces or one 16-bit wide SCSI interface. It supports synchronous and asynchronous data transfer. Only initiator (host) mode can be used. The controller requires external bus drivers.

7.2 SCSI AND INTERNAL DMA

During normal transfers the internal DMA channels are used for transferring data. SCSI port 0 uses the DMA channels 2 and 3, and SCSI port 1 uses the DMA channels 4 and 5. DMA descriptors in a linked list are used to transfer data and commands, see 5.1.3 "DMA linked lists" on page 49.

7.3 SCSI CONTROLLER MODES

The SCSI controller has three basic modes. One fully automatic, one fully manual (where each byte must be transferred by software) and one semi automatic mode. The most common command sequences can be run automatically, but processing is transferred to and continued in manual mode if the sequences in any way differ from what is expected. While in manual mode data can be transferred automatically with DMA, thus giving the semi automatic mode.

7.3.1 Automatic Sequencer Mode

In the automatic mode a command is run without software intervention from start of arbitration to either a disconnect or the completion of the command.

When a command is going to be executed a list of DMA descriptors are set up. The command is started by writing to a register and is processed entirely by hardware.

The automatic mode can not handle all possible phase sequences involved in a SCSI command. Only the most common sequences are handled. These include:

- Normal command sequence
- Disconnect sequence
- Reselection sequence

If an automatic sequence runs into something unexpected, it will defer the rest of the processing to software and the processing must continue in manual mode. Examples of what must be handled in manual mode are parity errors and message rejects.

7.3.2 Manual Mode

In manual mode each byte is transferred one at a time by reading or writing data to a register and then starting a single handshaking cycle by writing to the SCSI command register.

7.3.3 Semi Automatic Mode

This mode is intended to speed up the data phases when running in manual mode. DMA is used to transfer all data automatically during a data in or data out phase. In this way it is possible to combine manual mode with full speed synchronous/asynchronous transfers. However, this is limited to the data phases.

7.4 EXTERNAL SCSI BUFFERS

The ETRAX 100 SCSI interface requires external bus drivers.

The SCSI signals can be divided in three groups, OR-tied, unidirectional, and bidirectional. The OR-tied signals must use open collector buffers. The other signals may use open collector buffers or active negation buffers, but if Fast-20 is used only active negation buffers are allowed for the non OR-tied signals.

Signal type	SCSI standard signals	Buffers
OR-tied	-BSY, -RST, and -SEL	Compatible to 74F38 open collector buffer
Unidirectional	-ATN, -ACK, -MSG, -C/D, -REQ, and -I/O	Compatible to 74ABT244
Bidirectional	-DB0, -DB1, -DB2, -DB3, -DB4, -DB5, -DB6, -DB7, and -DBP	Compatible to 74ABT245 transceivers

Table 7-1 Recommended buffers for SCSI external bus drivers

7.4.1 Transceiver control

When the SCSI interface is not using the bus, the active negation transceivers should be set in tristate mode. In ETRAX 100 this is done by setting $s0oe$ to GND, and $s0en$ to VDD, as shown in the schematics and the timing diagrams included in this section.

During arbitration the SCSI interface first drives -BSY and the data bus bit corresponding to its SCSI ID, and listens on the other data bus bits. This is accomplished by setting $s0oe$ to GND, and $s0bsy$ to VDD. The SCSI ID can

either be selected by a strap or by software. In the latter case a Quick Switch, QS3251 (or compatible), has to be added.

When the interface wins arbitration it drives $\overline{\text{SEL}}$. In ETRAX 100 this is done by setting s0sel to VDD. All other units on the bus then release the SCSI bus. The winner drives the $\overline{\text{ATN}}$ signal, its own ID and the target ID bits on the data bus. This is accomplished by setting s0oe , and s0bsy to VDD, and $\overline{\text{s0en}}$, and $\overline{\text{s0atn}}$ to GND. This gives the interface full control over its signals and all signals on the data bus have the same direction.

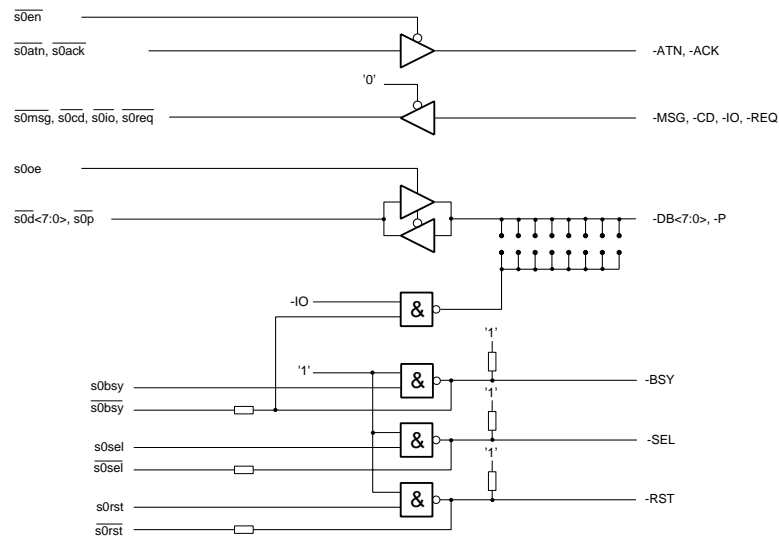


Figure 7-1 8-bit SCSI external buffer with strapped ID

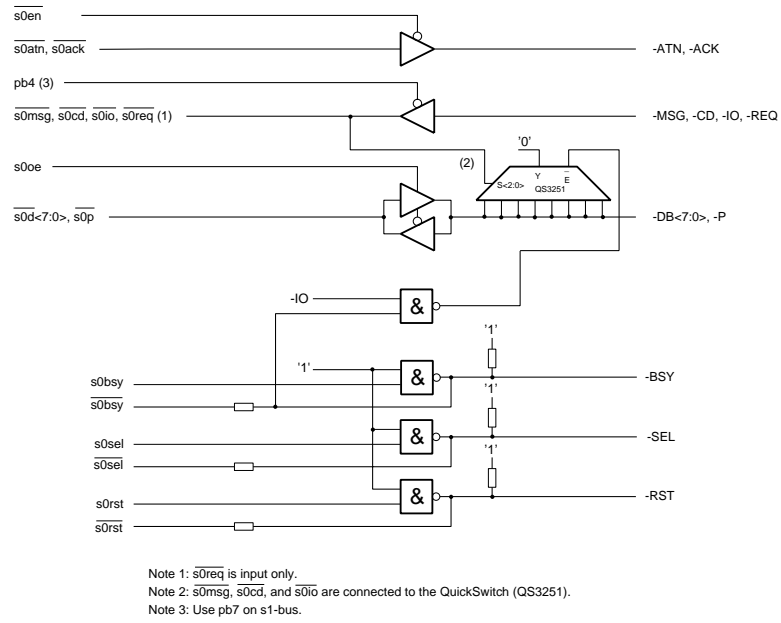


Figure 7-2 8-bit SCSI external buffer with software selectable ID

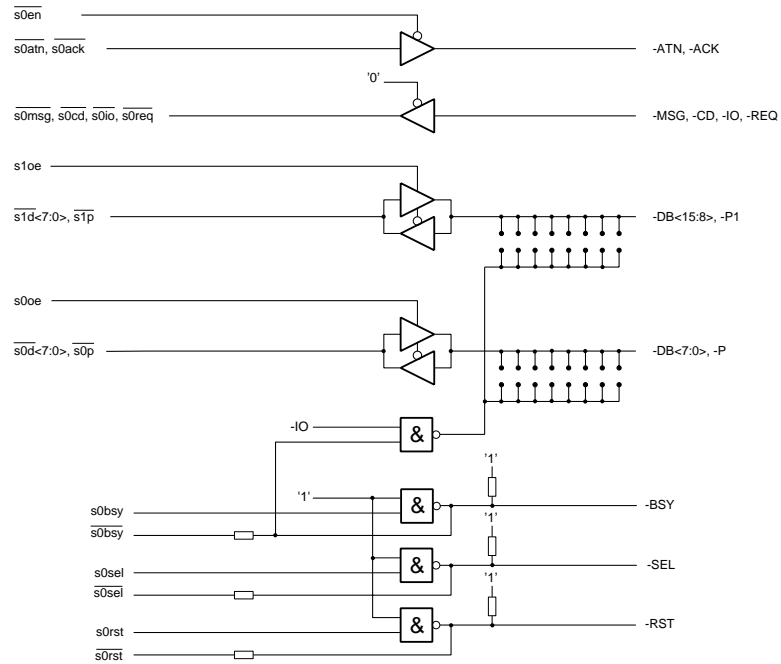
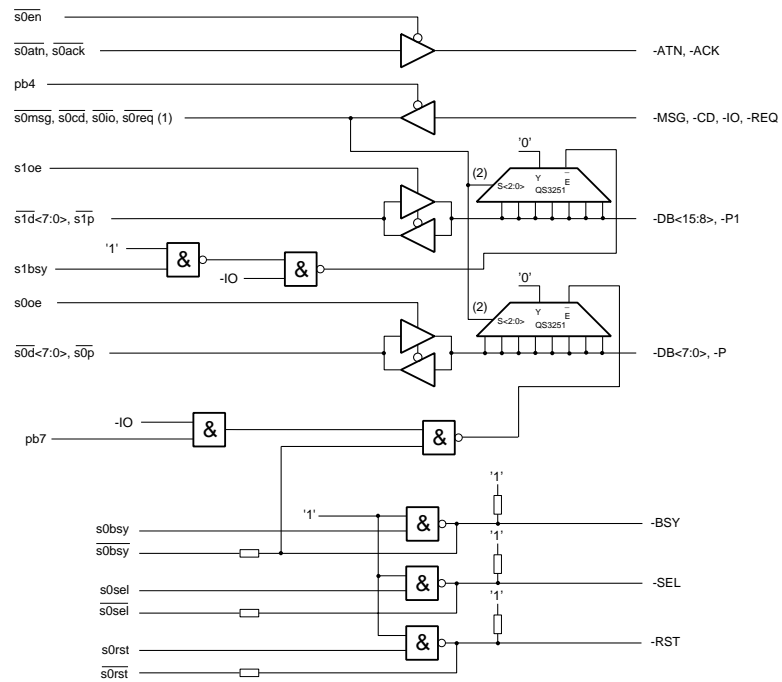


Figure 7-3 16-bit SCSI external buffer with strapped ID



Note 1: $\overline{s0req}$ is input only.
 Note 2: $s0msg$, $s0cd$, and $s0io$ are connected to the QuickSwitches (QS3251)

Figure 7-4 16-bit SCSI external buffer with software selectable ID

7.4.2 External SCSI Buffer Timing

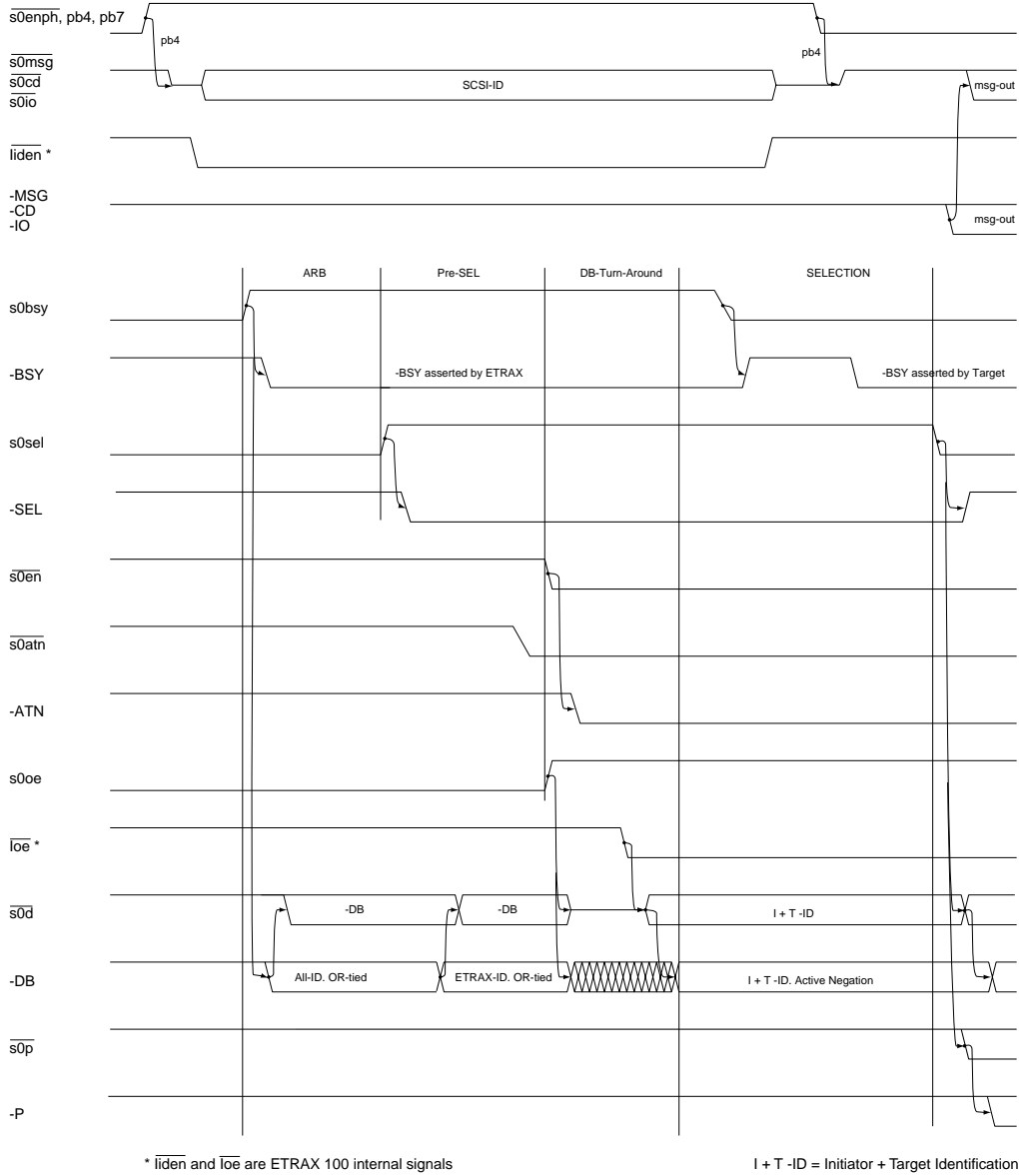
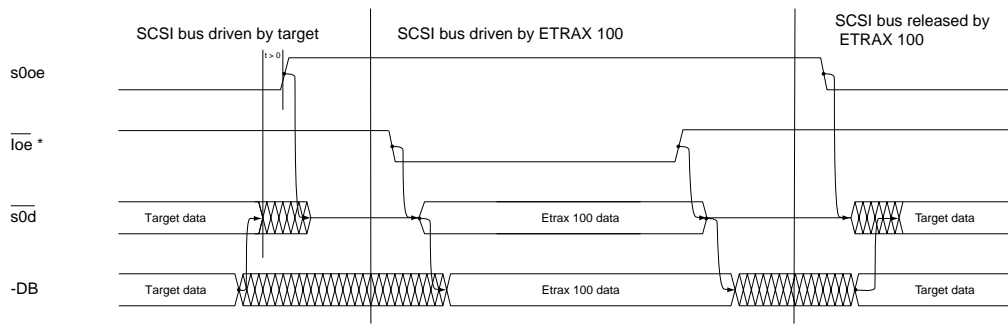


Figure 7-5 SCSI timing



* \overline{loe} is an ETRAX 100 internal signal

Figure 7-6 SCSI bus timing

