

# SuperH Interfaces Guide

Paul Mundt <lethal@linux-sh.org>

---

# SuperH Interfaces Guide

by Paul Mundt

Copyright © 2008-2010 Paul Mundt

Copyright © 2008-2010 Renesas Technology Corp.

Copyright © 2010 Renesas Electronics Corp.

This documentation is free software; you can redistribute it and/or modify it under the terms of the GNU General Public License version 2 as published by the Free Software Foundation.

This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU General Public License for more details.

You should have received a copy of the GNU General Public License along with this program; if not, write to the Free Software Foundation, Inc., 59 Temple Place, Suite 330, Boston, MA 02111-1307 USA

For more details see the file COPYING in the source distribution of Linux.

---

---

# Table of Contents

1. Memory Management .....	1
SH-4 .....	1
Store Queue API .....	1
SH-5 .....	4
TLB Interfaces .....	4
2. Machine Specific Interfaces .....	14
mach-dreamcast .....	14
mach-x3proto .....	16
3. Busses .....	20
SuperHyway .....	20
Maple .....	23

---

# Chapter 1. Memory Management

## SH-4

### Store Queue API

## Name

`sq_flush_range` — Flush (prefetch) a specific SQ range

## Synopsis

```
void sq_flush_range (unsigned long start, unsigned int len);
```

## Arguments

*start*    the store queue address to start flushing from

*len*      the length to flush

## Description

Flushes the store queue cache from *start* to *start* + *len* in a linear fashion.

## Name

`sq_remap` — Map a physical address through the Store Queues

## Synopsis

```
unsigned long sq_remap (unsigned long phys, unsigned int size, const  
char * name, pgprot_t prot);
```

## Arguments

*phys* Physical address of mapping.

*size* Length of mapping.

*name* User invoking mapping.

*prot* Protection bits.

## Description

Remaps the physical address *phys* through the next available store queue address of *size* length. *name* is logged at boot time as well as through the sysfs interface.

## Name

`sq_unmap` — Unmap a Store Queue allocation

## Synopsis

```
void sq_unmap (unsigned long vaddr);
```

## Arguments

*vaddr* Pre-allocated Store Queue mapping.

## Description

Unmaps the store queue allocation *map* that was previously created by `sq_remap`. Also frees up the pte that was previously inserted into the kernel page table and discards the UTLB translation.

# SH-5

## TLB Interfaces

## Name

`sh64_tlb_init` — Perform initial setup for the DTLB and ITLB.

## Synopsis

```
int sh64_tlb_init ( void );
```

## Arguments

*void* no arguments



## Name

`sh64_next_free_dtlb_entry` — Find the next available DTLB entry

## Synopsis

```
unsigned long long sh64_next_free_dtlb_entry ( void );
```

## Arguments

*void* no arguments

## Name

`sh64_get_wired_dtlb_entry` — Allocate a wired (locked-in) entry in the DTLB

## Synopsis

```
unsigned long long sh64_get_wired_dtlb_entry ( void );
```

## Arguments

*void* no arguments

## Name

`sh64_put_wired_dtlb_entry` — Free a wired (locked-in) entry in the DTLB.

## Synopsis

```
int sh64_put_wired_dtlb_entry (unsigned long long entry);
```

## Arguments

*entry*    Address of TLB slot.

## Description

Works like a stack, last one to allocate must be first one to free.

## Name

`sh64_setup_tlb_slot` — Load up a translation in a wired slot.

## Synopsis

```
void sh64_setup_tlb_slot (unsigned long long config_addr, unsigned long  
eaddr, unsigned long asid, unsigned long paddr);
```

## Arguments

<i>config_addr</i>	Address of TLB slot.
<i>eaddr</i>	Virtual address.
<i>asid</i>	Address Space Identifier.
<i>paddr</i>	Physical address.

## Description

Load up a virtual<->physical translation for *eaddr*<->*paddr* in the pre-allocated TLB slot *config\_addr* (see `sh64_get_wired_dtlb_entry`).

## Name

`sh64_tearardown_tlb_slot` — Teardown a translation.

## Synopsis

```
void sh64_tearardown_tlb_slot (unsigned long long config_addr);
```

## Arguments

*config\_addr*    Address of TLB slot.

## Description

Teardown any existing mapping in the TLB slot *config\_addr*.

## Name

`for_each_dtlb_entry` — Iterate over free (non-wired) DTLB entries

## Synopsis

```
for_each_dtlb_entry ( tlb );
```

## Arguments

*tlb*    TLB entry

## Name

`for_each_itlb_entry` — Iterate over free (non-wired) ITLB entries

## Synopsis

```
for_each_itlb_entry ( tlb );
```

## Arguments

*tlb*    TLB entry

## Name

`__flush_tlb_slot` — Flushes TLB slot *slot*.

## Synopsis

```
void __flush_tlb_slot (unsigned long long slot);
```

## Arguments

*slot* Address of TLB slot.



---

## **Chapter 2. Machine Specific Interfaces**

**`mach-dreamcast`**

## Name

`aica_rtc_gettimeofday` — Get the time from the AICA RTC

## Synopsis

```
void aica_rtc_gettimeofday (struct timespec * ts);
```

## Arguments

*ts* pointer to resulting timespec

## Description

Grabs the current RTC seconds counter and adjusts it to the Unix Epoch.

## Name

`aica_rtc_settimeofday` — Set the AICA RTC to the current time

## Synopsis

```
int aica_rtc_settimeofday (const time_t secs);
```

## Arguments

`secs` contains the `time_t` to set

## Description

Adjusts the given `tv` to the AICA Epoch and sets the RTC seconds counter.

## **mach-x3proto**

## Name

`ilssel_enable` — Enable an ILSEL set.

## Synopsis

```
int ilssel_enable (ilssel_source_t set);
```

## Arguments

*set* ILSEL source (see `ilssel_source_t` enum in `include/asm-sh/ilssel.h`).

## Description

Enables a given non-aliased ILSEL source ( $\leq$  ILSEL\_KEY) at the highest available interrupt level. Callers should take care to order callsites noting descending interrupt levels. Aliasing FPGA and external board IRQs need to use `ilssel_enable_fixed`.

The return value is an IRQ number that can later be taken down with `ilssel_disable`.

## Name

`ilssel_enable_fixed` — Enable an ILSEL set at a fixed interrupt level

## Synopsis

```
int ilssel_enable_fixed (ilssel_source_t set, unsigned int level);
```

## Arguments

*set*      ILSEL source (see `ilssel_source_t` enum in `include/asm-sh/ilssel.h`).

*level*    Interrupt level (1 - 15)

## Description

Enables a given ILSEL source at a fixed interrupt level. Necessary both for level reservation as well as for aliased sources that only exist on special ILSEL#s.

Returns an IRQ number (as `ilssel_enable`).

## Name

`ilssel_disable` — Disable an ILSEL set

## Synopsis

```
void ilssel_disable (unsigned int irq);
```

## Arguments

*irq* Bit position for ILSEL set value (retval from enable routines)

## Description

Disable a previously enabled ILSEL set.

---

# **Chapter 3. Busses**

## **SuperHyway**

## Name

`superhyway_add_device` — Add a SuperHyway module

## Synopsis

```
int superhyway_add_device (unsigned long base, struct superhyway_device  
* sdev, struct superhyway_bus * bus);
```

## Arguments

*base*    Physical address where module is mapped.

*sdev*    SuperHyway device to add, or NULL to allocate a new one.

*bus*    Bus where SuperHyway module resides.

## Description

This is responsible for adding a new SuperHyway module. This sets up a new struct `superhyway_device` for the module being added if `sdev == NULL`.

Devices are initially added in the order that they are scanned (from the top-down of the memory map), and are assigned an ID based on the order that they are added. Any manual addition of a module will thus get the ID after the devices already discovered regardless of where it resides in memory.

Further work can and should be done in `superhyway_scan_bus`, to be sure that any new modules are properly discovered and subsequently registered.



## Name

`superhyway_register_driver` — Register a new SuperHyway driver

## Synopsis

```
int superhyway_register_driver (struct superhyway_driver * drv);
```

## Arguments

*drv* SuperHyway driver to register.

## Description

This registers the passed in *drv*. Any devices matching the id table will automatically be populated and handed off to the driver's specified probe routine.

## Name

`superhyway_unregister_driver` — Unregister a SuperHyway driver

## Synopsis

```
void superhyway_unregister_driver (struct superhyway_driver * drv);
```

## Arguments

*drv* SuperHyway driver to unregister.

## Description

This cleans up after `superhyway_register_driver`, and should be invoked in the exit path of any module drivers.

## Maple

## Name

`maple_driver_register` — register a maple driver

## Synopsis

```
int maple_driver_register (struct maple_driver * drv);
```

## Arguments

*drv* maple driver to be registered.

## Description

Registers the passed in *drv*, while updating the bus type. Devices with matching function IDs will be automatically probed.

## Name

`maple_driver_unregister` — unregister a maple driver.

## Synopsis

```
void maple_driver_unregister (struct maple_driver * drv);
```

## Arguments

*drv* maple driver to unregister.

## Description

Cleans up after `maple_driver_register`. To be invoked in the exit path of any module drivers.

## Name

`maple_getcond_callback` — setup handling MAPLE\_COMMAND\_GETCOND

## Synopsis

```
void maple_getcond_callback (struct maple_device * dev, void (*callback)  
(struct mapleq *mq), unsigned long interval, unsigned long function);
```

## Arguments

<i>dev</i>	device responding
<i>callback</i>	handler callback
<i>interval</i>	interval in jiffies between callbacks
<i>function</i>	the function code for the device

## Name

`maple_add_packet` — add a single instruction to the maple bus queue

## Synopsis

```
int maple_add_packet (struct maple_device * mdev, u32 function, u32
command, size_t length, void * data);
```

## Arguments

<i>mdev</i>	maple device
<i>function</i>	function on device being queried
<i>command</i>	maple command to add
<i>length</i>	length of command string (in 32 bit words)
<i>data</i>	remainder of command string