

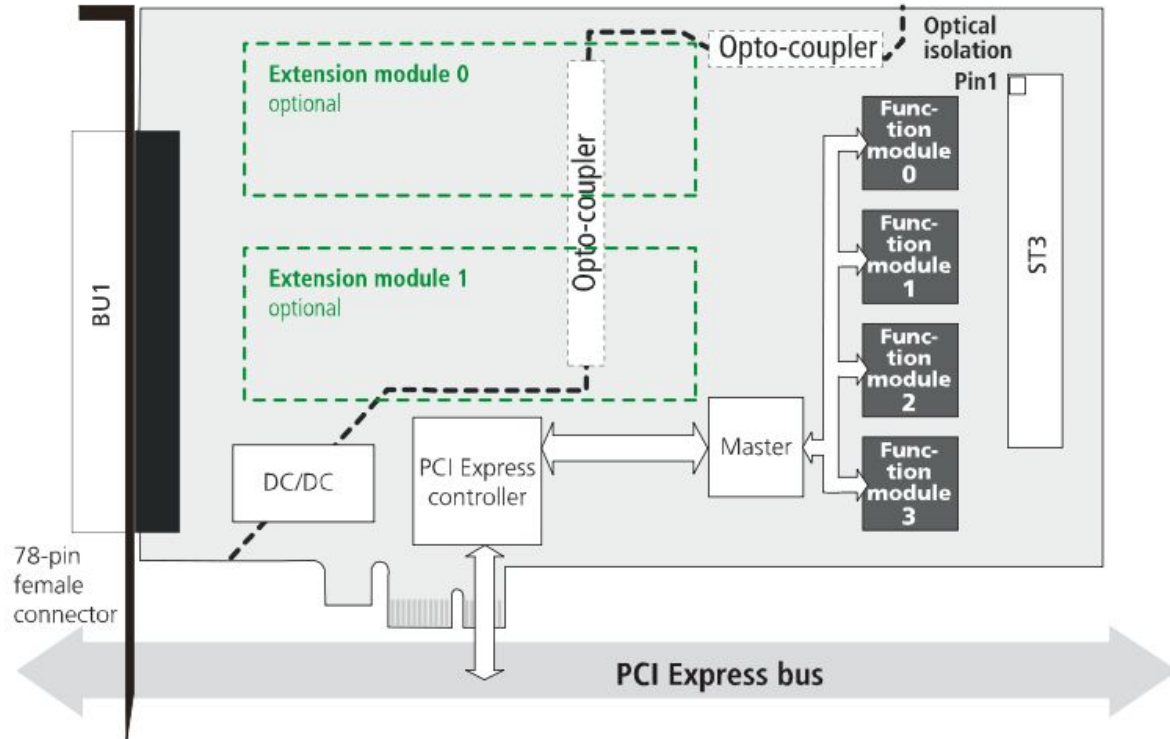
ADDI-DATA Kernel Module Review

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ADDI-DATA APCLe-1711 Block Diagram



ADDI-DATA APCLe-1711 Versions

7.3 Versions and options

The boards **APCLe-1711** and **CPCIs-1711** are available in the following versions:

Table 7-1: Versions and options

Version	Features
APCLe-1711	Multifunction counter board, optically isolated
APCLe-1711-24V	24 V inputs instead of RS422/TTL inputs/outputs (A, B, C, D)
APCLe-1711-5V-I	5 V inputs instead of 24 V inputs (E, F, G)
APCLe-1711-10MHz	Input frequency 10 MHz, inputs (A, B, C, D)
CPCIs-1711	Multifunction counter board, optically isolated
CPCIs-1711-24V	24 V inputs instead of RS422/TTL inputs/outputs (A, B, C, D)
CPCIs-1711-5V-I	5 V inputs instead of 24 V inputs (E, F, G)

The specific version name can be found on the type label at the slot bracket or front panel of your board.

apci1710 Driver Entry Points

Character device interface:

open: `apci1710_open_lookup()`

ioctl: `apci1710_ioctl_lookup()`

release: `apci1710_release_lookup()`

fasync: `apci1710_fasync_lookup()`

Kernel API:

See following slides

Proc dir interface:

Not supported for kernel ver \geq 3.10

Module interface:

module_init: `apci1710_init()`

module_exit: `apci1710_exit()`

ADDI-DATA Kernel API: Incremental Counter

```
i_APCI1710_InitCounter  
i_APCI1710_ClearCounterValue  
i_APCI1710_ClearAllCounterValue  
i_APCI1710_LatchCounter  
i_APCI1710_ReadLatchRegisterStatus  
i_APCI1710_ReadLatchRegisterValue  
i_APCI1710_EnableLatchInterrupt  
i_APCI1710_DisableLatchInterrupt  
i_APCI1710_Read16BitCounterValue  
i_APCI1710_Read32BitCounterValue  
i_APCI1710_Write16BitCounterValue  
i_APCI1710_Write32BitCounterValue  
i_APCI1710_InitCompareLogic  
i_APCI1710_EnableCompareLogic  
i_APCI1710_DisableCompareLogic  
i_APCI1710_SetCompareValue  
i_APCI1710_SetComparePort  
i_APCI1710_InitCompareWatchdog  
i_APCI1710_GetCompareWatchdogStatus  
i_APCI1710_ClearCompareFIFO  
i_APCI1710_ChangeCounterDirection  
i_APCI1710_SetDigitalChlOn  
i_APCI1710_SetDigitalChlOff  
i_APCI1710_GetInterruptUDLatchedStatus  
i_APCI1710_InitIndex  
i_APCI1710_EnableIndex  
i_APCI1710_DisableIndex  
i_APCI1710_GetIndexStatus  
i_APCI1710_SetIndexAndReferenceSource  
i_APCI1710_InitReference  
i_APCI1710_GetReferenceStatus  
i_APCI1710_SetInputFilter
```


Code Robustness Observations

29 C files ... 9 header files ... 30,000+ lines of code

No libraries, but samples provided for both user-mode and kernel APIs

Linux 3.18 issue: /proc interface **not supported** for kernel ver \geq 3.10

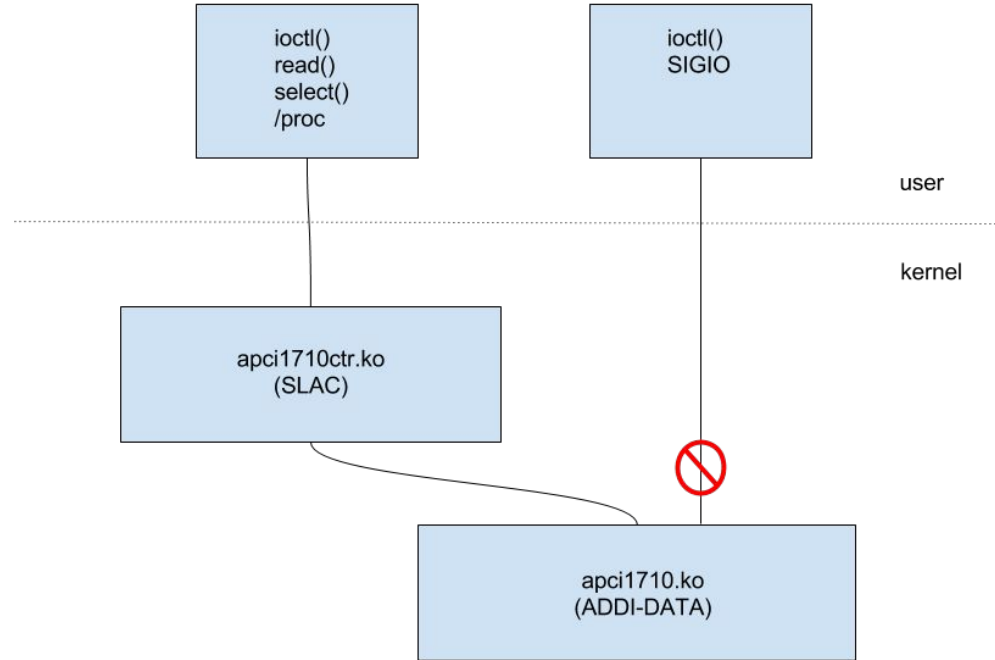
User-mode samples won't work as-is with kernel ver 3.18

Locking: *spin_lock_irqsave()* used heavily

No top and bottom halves

Code is relatively well commented

Proposal: Use the ADDI-DATA Kernel API



Proposal: SLAC Module /proc Interface

Read current counter value

```
$ cat /proc/driver/apci1710ctr0/count
```

Display driver status

```
$ cat /proc/driver/apci1710ctr0/status
```

Set value of digital output (useful for testing)

```
$ echo 1 > /proc/driver/apci1710ctr0/digout
```

Proposal: SLAC Module Ring Buffers

Each channel has a ring buffer in kernel memory

Small amount of data per interrupt...

Written to ring buffer by interrupt callback routine (ADDI-DATA kernel API)

Copied to user memory by read() (character device interface)

ADDI-DATA Source Code

Kernel module source directory:

```
/afs/slac/g/lcls/package/linuxKernel_Modules/apci1710drv/r1439/src
```

Kernel API sample code source directory:

```
/afs/slac/g/lcls/package/linuxKernel_Modules/apci1710sample/trunk/src
```

For Additional Information

ADDI-DATA Driver Development on Confluence:

<<https://confluence.slac.stanford.edu/display/~caf/ADDI-DATA+Driver+Development>>

ADDI-DATA Contact:

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