**Library manual for CALTCB**

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34. USB3 initialize

| void USB3Init(void) |
| --- |

<Description>

initialize libusb. it is necessary to do this when starting the daq and tcb board.

<Arguments>

None.

<Return value>

None.

1. USB3 exit

| void USB3Exit(void) |
| --- |

<Description>

exit libusb. turn off the usb socket. it is necessary to do this when stopping the daq and tcb board

<Arguments>

None.

<Return value>

None.

1. open CALTCB

| int CALTCBopen(int sid) |
| --- |

<Description>

open TCB board. It is necessary to do this before using other functions of CALTCB.

<Arguments>

sid : module number of TCB board

<Return value>

0 : DAQ board is well running

-1 : some errors occurred.

<error list>

<speed>

1. close CALTCB

| void CALTCBclose(int sid) |
| --- |

<Description>

close TCB board.

<Arguments>

sid : module number of TCB board

<Return value>

None.

1. reset timer of CALTCB

| void CALTCBresetTIMER(int sid) |
| --- |

<Description>

Reset timer on all DAQ boards that are connected with TCB boards.

<Arguments>

sid : module number of TCB board

<Return value>

None.

1. reset CALTCB

| void CALTCBreset(int sid) |
| --- |

<Description>

Reset all DAQ boards that are connected with TCB boards.

<Arguments>

sid : module number of TCB board

<Return value>

None.

1. start DAQ in CALTCB

| void CALTCBstart\_DAQ(int sid) |
| --- |

<Description>

start DAQ board. After using this function the DAQ board is running

<Arguments>

sid : module number of TCB board

<Return value>

None.

1. stop DAQ in CALTCB

| void CALTCBstop\_DAQ(int sid) |
| --- |

<Description>

Stop DAQ board. After using this function the DAQ board is not running.

<Arguments>

sid : module number of TCB board

<Return value>

None.

1. read run in CALTCB

| unsigned long CALTCBread\_RUN(int sid) |
| --- |

<Description>

read whether the DAQ board is running or not.

<Arguments>

sid : module number of TCB board

<Return value>

run status data 1 : DAQ is run

0 : DAQ is not run

1. read link

| void CALTCBread\_LINK(int sid, unsigned long \*data) |
| --- |

<Description>

read which socket linked with the DAQ board.

<Arguments>

sid : module number of TCB board

data : 0 means that the socket does not link, 1 means that the socket links.

[0] addr : 1 ~ 32 channels

[1] addr : 33 ~ 40 channels

<Return value>

None.

1. read mid

| void CALTCBread\_MID(int sid, unsigned long \*data) |
| --- |

<Description>

read all module numbers of connected DAQ board by TCP/IP socket

<Arguments>

sid : module number of TCB board

data : all module numbers of connected DAQ board by TCP/IP socket

<Return value>

None.

1. write coincidence width

| void CALTCBwrite\_CW(int sid, unsigned long mid, unsigned long data) |
| --- |

<Description>

Sets trigger output width for individual channels.To define the timing relationship between

channels the trigger output of each channel should have a given output width(coincidence

width). A TCB board and DAQ boards define coincidence width individually.

<Arguments>

sid : module number of TCB board

mid : module number of DAQ board

data : coincidence width value.

0 ~ 15 \* 1000/90 ns

<Return value>

None.

1. read coincidence width

| unsigned long CALTCBread\_CW(int sid, unsigned long mid) |
| --- |

<Description>

read coincidence width setting

<Arguments>

sid : module number of TCB board

mid : module number of DAQ board

<Return value>

coincidence width value. unit is clock (1000/90 ns)

1. send trigger to DAQ

| void CALTCBsend\_TRIG(int sid) |
| --- |

<Description>

send a software trigger.

<Arguments>

sid : module number of TCB board

<Return value>

None.

1. write pedestal trigger interval

| void CALTCBwrite\_PEDESTAL\_TRIGGER\_INTERVAL(int sid, unsigned long data) |
| --- |

<Description>

set pedestal trigger interval. pedestal trigger interval means time interval for measuring the pedestal.

<Arguments>

sid : module number of TCB board

data : pedestal trigger interval value.

0~ 65535 ms, 0 means that turn off this function

<Return value>

None.

1. read pedestal trigger interval

| unsigned long CALTCBread\_PEDESTAL\_TRIGGER\_INTERVAL(int sid) |
| --- |

<Description>

read pedestal trigger interval

<Arguments>

sid : module number of TCB board

<Return value>

pedestal trigger interval value. time unit is (ms)

1. write trigger enable

| void CALTCBwrite\_TRIGGER\_ENABLE(int sid, unsigned long data) |
| --- |

<Description>

setting of trigger enable

in TCB board setting file, express this parameter

unsigned long trigger\_enable = 0xF; (0xff is 4 bit)

<Arguments>

sid : module number of TCB board

data : trigger enable data value

mode : external & software & pedestal & self

self = 1, pedestal = 2, software = 4, external = 8

<Return value>.

None

1. read trigger enable

| unsigned long CALTCBread\_TRIGGER\_ENABLE(int sid) |
| --- |

<Description>

read trigger enable value

<Arguments>

sid : module number of TCB board

<Return value>.

trigger enable value of setting that write value

output data that external & software & pedestal & self

self = 1, pedestal = 2, software = 4, external = 8

1. write multiplicity threshold

| void CALTCBwrite\_MULTIPLICITY\_THR(int sid, unsigned long mid, unsigned long data) |
| --- |

<Description>

setting multiplicity threshold. multiplicity threshold is a trigger that turns on when a number of channels higher than setting value turn on.

<Arguments>

sid : module number of TCB board

mid : module number of DAQ board

data : multiplicity channel number

<Return value>.

None

1. read multiplicity threshold

| unsigned long CALTCBread\_MULTIPLICITY\_THR(int sid, unsigned long mid) |
| --- |

<Description>

read multiplicity threshold setting

<Arguments>

sid : module number of TCB board

mid : module number of DAQ board

<Return value>.

threshold value

1. write high voltage

| void CALTCBwrite\_HV(int sid, unsigned long mid, unsigned long ch, float data) |
| --- |

<Description>

setting HV(high voltage) that input gain voltage

<Arguments>

sid : module number of TCB board

mid : module number of DAQ board

ch : channel of DRS chip that 1 DAQ board(1~4 channel)

data : HV setting value 0 ~ 60 V

<Return value>.

None

22. read high voltage

| float CALTCBread\_HV(int sid, unsigned long mid, unsigned long ch) |
| --- |

<Description>

read TCB board HV setting

<Arguments>

sid : module number of TCB board

mid : module number of DAQ board

ch : channel of DRS chip that 1 DAQ board(1~4 channel)

<Return value>.

HV value that input data setting & calibration data value (unit : V)

23. write threshold

| void CALTCBwrite\_THR(int sid, unsigned long mid, unsigned long ch, unsigned long data) |
| --- |

<Description>

threshold setup for channels.

<Arguments>

sid : module number of TCB board

mid : module number of DAQ board

ch : channel of DRS chip that 1 DAQ board(1~32 channel)

data : threshold setting value (0.5 ~ 2047.5 mV)

<Return value>.

None

24. read threshold

| unsigned long CALTCBread\_THR(int sid, unsigned long mid, unsigned long ch) |
| --- |

<Description>

read threshold setup value

<Arguments>

sid : module number of TCB board

mid : module number of DAQ board

ch : channel of DRS chip that 1 DAQ board(1~32 channel)

<Return value>.

threshold value (0.5 ~ 2047.5 mV range)

25. read temperature

| float CALTCBread\_TEMP(int sid, unsigned long mid) |
| --- |

<Description>

read the temperature of the module.

<Arguments>

sid : module number of TCB board

mid : module number of DAQ board

<Return value>.

Return that temperature value (fval)

fval = (data - 2048) \* 0.0625; (data : digit temperature value of DAQ board)

fval return

26. write trigger delay

| void CALTCBwrite\_TRIGGER\_DELAY(int sid, unsigned long mid, unsigned long data) |
| --- |

<Description>

setting of trigger delay, shift the trigger timing information, delay mode.

<Arguments>

sid : module number of TCB board

mid : module number of DAQ board

data : trigger delay value (0~15) \* 1000 / 90 ns

<Return value>.

None

27. read trigger delay

| unsigned long CALTCBread\_TRIGGER\_DELAY(int sid, unsigned long mid) |
| --- |

<Description>

read trigger delay setting value.

<Arguments>

sid : module number of TCB board

mid : module number of DAQ board

<Return value>.

trigger delay value that (0~15) \* 1000 / 90 ns

unit is clock (1000/90 ns)

28. write trigger latency

| void CALTCBwrite\_TRIGGER\_LATENCY(int sid, unsigned long mid, unsigned long data) |
| --- |

<Description>

setting trigger latency

All module`s triggers have offset latency, but this value sets arbitrary value setting of latency .

<Arguments>

sid : module number of TCB board

mid : module number of DAQ board

data : trigger latency value 0~255 \* 1000 / 90 ns

<Return value>.

None

29. read trigger latency

| unsigned long CALTCBread\_TRIGGER\_LATENCY(int sid, unsigned long mid) |
| --- |

<Description>

read trigger latency value

<Arguments>

sid : module number of TCB board

mid : module number of DAQ board

<Return value>.

trigger latency value that (0~255) \* 1000 / 90 ns

unit is clock (1000/90 ns)

30. write run number

| void CALTCBwrite\_RUN\_NUMBER(int sid, unsigned long mid, unsigned long data) |
| --- |

<Description>

setting of Run number, run number operation value

Please check the run\_CAL.c & set\_CAL.c data operation file that runs the number part.

<Arguments>

sid : module number of TCB board

mid : module number of DAQ board

data : run number of individual board

<Return value>.

None

31. read run number

| unsigned long CALTCBread\_RUN\_NUMBER(int sid, unsigned long mid) |
| --- |

<Description>

read TCB & DAQ Run number

<Arguments>

sid : module number of TCB board

mid : module number of DAQ board

<Return value>.

run number of individual board

32. write DRS calibration

| void CALTCBwrite\_DRS\_CALIB(int sid, unsigned long mid, unsigned long data) |
| --- |

<Description>

setting of calibration DRS chip values, calibration turn on/off

<Arguments>

sid : module number of TCB board

mid : module number of DAQ board

data : calibration turn on or off that 1 = calibration, 0 = normal mode.

<Return value>.

None

33. DRS initialize

| int CALTCB\_DRSinit(int sid, unsigned long mid) |
| --- |

<Description>

initialized of DRS chip

return below process using above functions.

setting ADC & DRS offset setup

DRS stop and restart process, align DRAM & check DRS PLL locked

finalize DRS chip calibration

<Arguments>

sid : module number of TCB board

mid : module number of DAQ board

<Return value>.

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