

# EPICS Device and Driver Support for SNS Timing Master Modules

Johnny Tang

A U.S. Department of Energy Multilaboratory Project

S P A L L A T I O N   N E U T R O N   S O U R C E

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# EPICS Device and Driver Support for SNS Timing Master (Beta Release)

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# EPICS Device and Driver Support for SNS Timing Master (Beta Release)

## 1. Introduction

This EPICS software supports the following VME boards used for SNS Timing master IOC:

VME Board ID	Description
V106	RTDL Input Module
V105S	RTDL Encoder Module
V101	Event Input Module
V123s	Event Encoder Module

## 2. EPICS device support Definitions for SNS Timing Master Modules

```
# EPICS Device Support for EVENT Input Module
device(bi,INST_IO,devBiEventInput,"EventInput")
device(bo,INST_IO,devBoEventInput,"EventInput")
device(waveform,INST_IO,devWfEventInput,"EventInput")

# EPICS Device Support for EVENT Encoder Module
device(stringin,INST_IO,devStringinEventEncoder,"EventEncoder")
device(bi,INST_IO,devBiEventEncoder,"EventEncoder")
device(bo,INST_IO,devBoEventEncoder,"EventEncoder")

# EPICS Device Support for RTDL Input Module
device(stringin,INST_IO,devStringinRtdlInput,"RtdlInput")
device(longin,INST_IO,devLiRtdlInput,"RtdlInput")
device(longout,INST_IO,devLoRtdlInput,"RtdlInput")
device(bi,INST_IO,devBiRtdlInput,"RtdlInput")
device(bo,INST_IO,devBoRtdlInput,"RtdlInput")

# EPICS Device Support for RTDL Encoder Module
device(stringin,INST_IO,devStringinRtdlEncoder,"RtdlEncoder")
device(longin,INST_IO,devLiRtdlEncoder,"RtdlEncoder")
device(bi,INST_IO,devBiRtdlEncoder,"RtdlEncoder")
device(bo,INST_IO,devBoRtdlEncoder,"RtdlEncoder")
```

## 3. Driver Initialization

Before using Beam Sync Event master or RTDL master drivers, bsyncDrv() and rtdlDrv() must be called directly to install the drivers in the VxWorks I/O system. BsyncDevCreate() and RtdlDevCreate() must then be called to initialize and install each device.

```
#install rtdl driver
rtdlDrv()

#init rtdl devices
rtdlDevCreate <device name>, base-address, <module-type>, <Int #>, <Int Level>

#where <module-type> is 1 for Encoder (v105)
          0 for Input (v106)
```

Example:

```
rtdlDevCreate "/dev/rtdlE", 0x200, 1, 0x1a, 3
rtdlDevCreate "/dev/rtdlIA", 0xfe00, 0, 0x1b, 3
```

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```
#install event master driver
bsyncDrv()

#init event devices
bsyncDevCreate <device name>, base-address, <module-type>, <Int #>, <Int
Level>

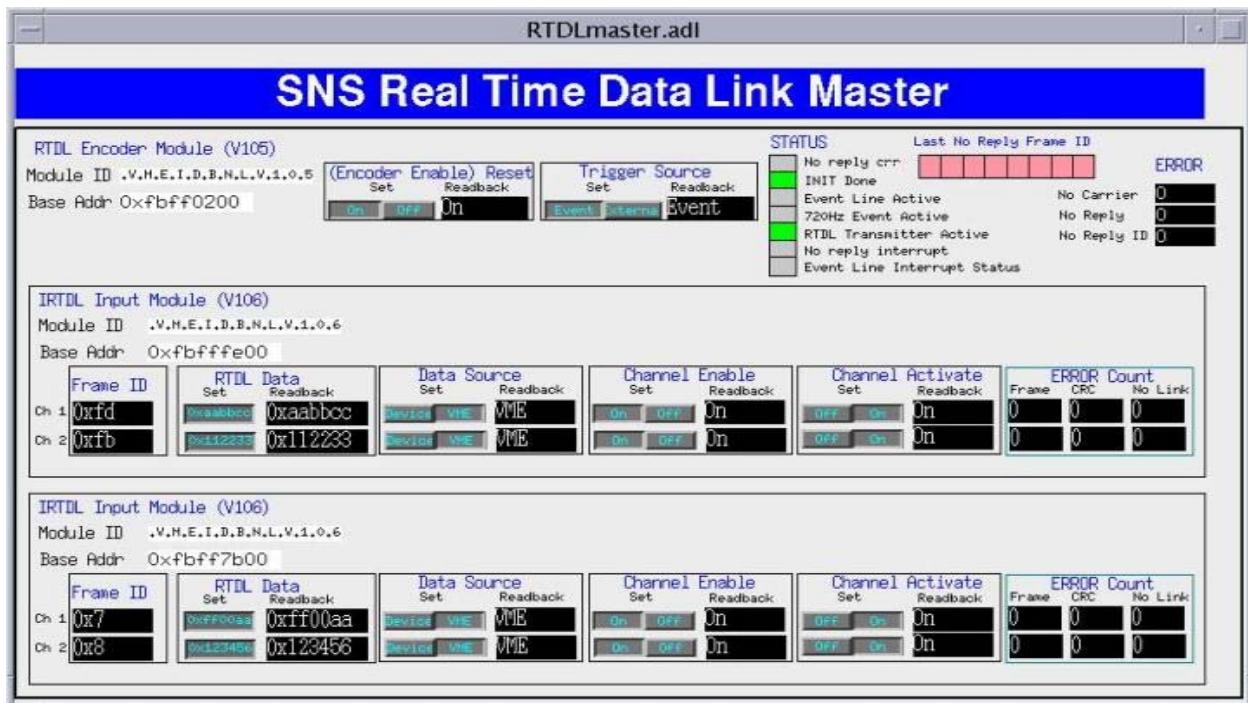
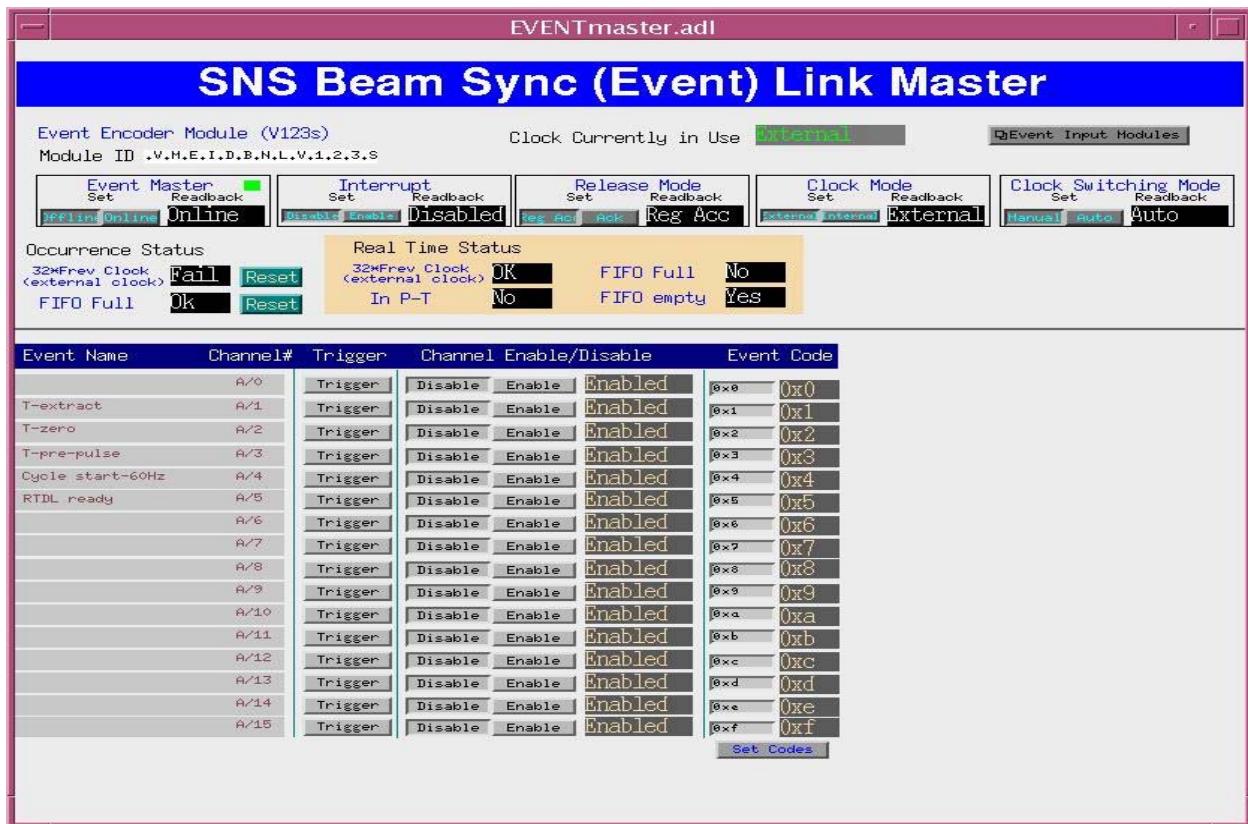
#where <module-type> is -1 for Encoder (v123s)
    0 for 1st Input Module (v101)
    1 for 2nd Input Module (v101)
    2 for 3rd Input Module (v101)
    3 for 4th Input Module (v101)
```

Example:

```
bsyncDevCreate "/dev/eventE", 0x1000, -1, 0x2a, 3
bsyncDevCreate "/dev/eventIA", 0x1000, 0, 0x2b, 3
bsyncDevCreate "/dev/eventIB", 0x1000, 1, 0x2b, 3
bsyncDevCreate "/dev/eventIC", 0x1000, 2, 0x2b, 3
bsyncDevCreate "/dev/eventID", 0x1000, 3, 0x2b, 3
```

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## 4. Operator Screen Samples



# EPICS Device and Driver Support for SNS Timing Master (Beta Release)

## 5. Sample EPICS database for using SNS Timing Master EPICS Support

```
# EPICS database for Beam Sync Encoder Module
record(stringin,eventE_BOARD_ID_G) {
    field(SCAN,"Passive")
    field(DTYP,"EventEncoder")
    field(INP, "INST_IO @/dev/eventE 0")
}

record(bi,eventE_ONL_G) {
    field(SCAN,"1 second")
    field(DTYP,"EventEncoder")
    field(INP,"INST_IO @/dev/eventE 0")
    field(ZNAM,"Offline")
    field(ONAM,"Online")
}

record(bi,eventE_INT_G) {
    field(SCAN,"1 second")
    field(DTYP,"EventEncoder")
    field(INP,"INST_IO @/dev/eventE 1")
    field(ZNAM,"Disabled")
    field(ONAM,"Enabled")
}

record(bi,eventE_CLK_G) {
    field(SCAN,"1 second")
    field(DTYP,"EventEncoder")
    field(INP,"INST_IO @/dev/eventE 2")
    field(ZNAM,"External")
    field(ONAM,"Internal")
}

record(bi,eventE_KOA_G) {
    field(SCAN,"1 second")
    field(DTYP,"EventEncoder")
    field(INP,"INST_IO @/dev/eventE 3")
    field(ZNAM,"Reg_Acc")
    field(ONAM,"Ack")
}

record(bi,eventE_FF_G) {
    field(SCAN,"1 second")
    field(DTYP,"EventEncoder")
    field(INP,"INST_IO @/dev/eventE 4")
    field(ZNAM,"Ok")
    field(ONAM,"Full")
}

record(bi,eventE_ACS_G) {
    field(SCAN,"1 second")
    field(DTYP,"EventEncoder")
    field(INP,"INST_IO @/dev/eventE 5")
    field(ZNAM,"Manual")
    field(ONAM,"Auto")
}
```

## EPICS Device and Driver Support for SNS Timing Master (Beta Release)

```
record(bi,eventE_BCF_G) {
    field(SCAN,"1 second")
    field(DTYP,"EventEncoder")
    field(INP,"INST_IO @/dev/eventE 6")
    field(ZNAM,"OK")
    field(ONAM,"Fail")
}

record(bi,eventE_BCF_RT_G) {
    field(SCAN,".1 second")
    field(DTYP,"EventEncoder")
    field(INP,"INST_IO @/dev/eventE 7")
    field(ZNAM,"OK")
    field(ONAM,"Fail")
}

record(bi,eventE_FF_RT_G) {
    field(SCAN,".1 second")
    field(DTYP,"EventEncoder")
    field(INP,"INST_IO @/dev/eventE 8")
    field(ZNAM,"No")
    field(ONAM,"Yes")
}

record(bi,eventE_PT_RT_G) {
    field(SCAN,".1 second")
    field(DTYP,"EventEncoder")
    field(INP,"INST_IO @/dev/eventE 9")
    field(ZNAM,"No")
    field(ONAM,"Yes")
}

record(bi,eventE_FE_RT_G) {
    field(SCAN,".1 second")
    field(DTYP,"EventEncoder")
    field(INP,"INST_IO @/dev/eventE 10")
    field(ZNAM,"No")
    field(ONAM,"Yes")
}

record(bi,eventE_CLK_RT_G) {
    field(SCAN,".1 second")
    field(DTYP,"EventEncoder")
    field(INP,"INST_IO @/dev/eventE 11")
    field(ZNAM,"External")
    field(ONAM,"Internal")
}

record(bo,eventE_ONL_S) {
    field(SCAN,"Passive")
    field(DTYP,"EventEncoder")
    field(OUT,"INST_IO @/dev/eventE 0")
    field(ZNAM,"Offline")
    field(ONAM,"Online")
}

record(bo,eventE_INT_S) {
```

## EPICS Device and Driver Support for SNS Timing Master (Beta Release)

```
        field(SCAN,"Passive")
        field(DTYP,"EventEncoder")
        field(OUT,"INST_IO @/dev/eventE 1")
        field(ZNAM,"Disable")
        field(ONAM,"Enable")
    }

record(bo,eventE_CLK_S) {
    field(SCAN,"Passive")
    field(DTYP,"EventEncoder")
    field(OUT,"INST_IO @/dev/eventE 2")
    field(ZNAM,"External")
    field(ONAM,"Internal")
}

record(bo,eventE_KOA_S) {
    field(SCAN,"Passive")
    field(DTYP,"EventEncoder")
    field(OUT,"INST_IO @/dev/eventE 3")
    field(ZNAM,"Reg Acc")
    field(ONAM,"Ack")
}

record(bo,eventE_FF_S) {
    field(SCAN,"Passive")
    field(DTYP,"EventEncoder")
    field(OUT,"INST_IO @/dev/eventE 4")
    field(ZNAM,"CLEAR")
    field(ONAM,"CLEAR")
}

record(bo,eventE_ACS_S) {
    field(SCAN,"Passive")
    field(DTYP,"EventEncoder")
    field(OUT,"INST_IO @/dev/eventE 5")
    field(ZNAM,"Manual")
    field(ONAM,"Auto")
}

record(bo,eventE_BCF_S) {
    field(SCAN,"Passive")
    field(DTYP,"EventEncoder")
    field(OUT,"INST_IO @/dev/eventE 6")
    field(ZNAM,"CLEAR")
    field(ONAM,"CLEAR")
}
```

## EPICS Device and Driver Support for SNS Timing Master (Beta Release)

```
# EPICS data base for Beam Sync Input Module
record(bi,eventIA_CHAN0_ENABLE_G) {
    field(SCAN,"1 second")
    field(DTYP,"EventInput")
    field(INP,"INST_IO @/dev/eventIA 0 0")
    field(ZNAM,"Disabled")
    field(ONAM,"Enabled")
}

record(bo,eventIA_CHAN0_ENABLE_S) {
    field(SCAN,"Passive")
    field(DTYP,"EventInput")
    field(OUT,"INST_IO @/dev/eventIA 0 0")
    field(ZNAM,"Disable")
    field(ONAM,"Enable")
}

record(bo,eventIA_CHAN0_TRIG_S) {
    field(SCAN,"Passive")
    field(DTYP,"EventInput")
    field(OUT,"INST_IO @/dev/eventIA 0 1")
    field(ZNAM,"")
    field(ONAM,"Trigger")
}

record(bi,eventIA_CHAN1_ENABLE_G) {
    field(SCAN,"1 second")
    field(DTYP,"EventInput")
    field(INP,"INST_IO @/dev/eventIA 1 0")
    field(ZNAM,"Disabled")
    field(ONAM,"Enabled")
}

record(bo,eventIA_CHAN1_ENABLE_S) {
    field(SCAN,"Passive")
    field(DTYP,"EventInput")
    field(OUT,"INST_IO @/dev/eventIA 1 0")
    field(ZNAM,"Disable")
    field(ONAM,"Enable")
}

record(bo,eventIA_CHAN1_TRIG_S) {
    field(SCAN,"Passive")
    field(DTYP,"EventInput")
    field(OUT,"INST_IO @/dev/eventIA 1 1")
    field(ZNAM,"")
    field(ONAM,"Trigger")
}

record(bi,eventIA_CHAN2_ENABLE_G) {
    field(SCAN,"1 second")
    field(DTYP,"EventInput")
    field(INP,"INST_IO @/dev/eventIA 2 0")
    field(ZNAM,"Disabled")
    field(ONAM,"Enabled")
}
```

# EPICS Device and Driver Support for SNS Timing Master (Beta Release)

```
record(bo,eventIA_CHAN2_ENABLE_S) {
    field(SCAN,"Passive")
    field(DTYP,"EventInput")
    field(OUT,"INST_IO @/dev/eventIA 2 0")
    field(ZNAM,"Disable")
    field(ONAM,"Enable")
}

record(bo,eventIA_CHAN2_TRIG_S) {
    field(SCAN,"Passive")
    field(DTYP,"EventInput")
    field(OUT,"INST_IO @/dev/eventIA 2 1")
    field(ZNAM,"")
    field(ONAM,"Trigger")
}

record(bi,eventIA_CHAN3_ENABLE_G) {
    field(SCAN,"1 second")
    field(DTYP,"EventInput")
    field(INP,"INST_IO @/dev/eventIA 3 0")
    field(ZNAM,"Disabled")
    field(ONAM,"Enabled")
}

record(bo,eventIA_CHAN3_ENABLE_S) {
    field(SCAN,"Passive")
    field(DTYP,"EventInput")
    field(OUT,"INST_IO @/dev/eventIA 3 0")
    field(ZNAM,"Disable")
    field(ONAM,"Enable")
}

record(bo,eventIA_CHAN3_TRIG_S) {
    field(SCAN,"Passive")
    field(DTYP,"EventInput")
    field(OUT,"INST_IO @/dev/eventIA 3 1")
    field(ZNAM,"")
    field(ONAM,"Trigger")
}

record(bi,eventIA_CHAN4_ENABLE_G) {
    field(SCAN,"1 second")
    field(DTYP,"EventInput")
    field(INP,"INST_IO @/dev/eventIA 4 0")
    field(ZNAM,"Disabled")
    field(ONAM,"Enabled")
}

record(bo,eventIA_CHAN4_ENABLE_S) {
    field(SCAN,"Passive")
    field(DTYP,"EventInput")
    field(OUT,"INST_IO @/dev/eventIA 4 0")
    field(ZNAM,"Disable")
    field(ONAM,"Enable")
}
```

## EPICS Device and Driver Support for SNS Timing Master (Beta Release)

```
record(bo,eventIA_CHAN4_TRIGGER_S) {
    field(SCAN,"Passive")
    field(DTYP,"EventInput")
    field(OUT,"INST_IO @/dev/eventIA 4 1")
    field(ZNAM,"")
    field(ONAM,"Trigger")
}

record(bi,eventIA_CHAN5_ENABLE_G) {
    field(SCAN,"1 second")
    field(DTYP,"EventInput")
    field(INP,"INST_IO @/dev/eventIA 5 0")
    field(ZNAM,"Disabled")
    field(ONAM,"Enabled")
}

record(bo,eventIA_CHAN5_ENABLE_S) {
    field(SCAN,"Passive")
    field(DTYP,"EventInput")
    field(OUT,"INST_IO @/dev/eventIA 5 0")
    field(ZNAM,"Disable")
    field(ONAM,"Enable")
}

record(bo,eventIA_CHAN5_TRIGGER_S) {
    field(SCAN,"Passive")
    field(DTYP,"EventInput")
    field(OUT,"INST_IO @/dev/eventIA 5 1")
    field(ZNAM,"")
    field(ONAM,"Trigger")
}

record(bi,eventIA_CHAN6_ENABLE_G) {
    field(SCAN,"1 second")
    field(DTYP,"EventInput")
    field(INP,"INST_IO @/dev/eventIA 6 0")
    field(ZNAM,"Disabled")
    field(ONAM,"Enabled")
}

record(bo,eventIA_CHAN6_ENABLE_S) {
    field(SCAN,"Passive")
    field(DTYP,"EventInput")
    field(OUT,"INST_IO @/dev/eventIA 6 0")
    field(ZNAM,"Disable")
    field(ONAM,"Enable")
}

record(bo,eventIA_CHAN6_TRIGGER_S) {
    field(SCAN,"Passive")
    field(DTYP,"EventInput")
    field(OUT,"INST_IO @/dev/eventIA 6 1")
    field(ZNAM,"")
    field(ONAM,"Trigger")
}

record(bi,eventIA_CHAN7_ENABLE_G) {
```

## EPICS Device and Driver Support for SNS Timing Master (Beta Release)

```
        field(SCAN,"1 second")
        field(DTYP,"EventInput")
        field(INP,"INST_IO @/dev/eventIA 7 0")
        field(ZNAM,"Disabled")
        field(ONAM,"Enabled")
    }

record(bo,eventIA_CHAN7_ENABLE_S) {
    field(SCAN,"Passive")
    field(DTYP,"EventInput")
    field(OUT,"INST_IO @/dev/eventIA 7 0")
    field(ZNAM,"Disable")
    field(ONAM,"Enable")
}

record(bo,eventIA_CHAN7_TRIG_S) {
    field(SCAN,"Passive")
    field(DTYP,"EventInput")
    field(OUT,"INST_IO @/dev/eventIA 7 1")
    field(ZNAM,"")
    field(ONAM,"Trigger")
}

record(bi,eventIA_CHAN8_ENABLE_G) {
    field(SCAN,"1 second")
    field(DTYP,"EventInput")
    field(INP,"INST_IO @/dev/eventIA 8 0")
    field(ZNAM,"Disabled")
    field(ONAM,"Enabled")
}

record(bo,eventIA_CHAN8_ENABLE_S) {
    field(SCAN,"Passive")
    field(DTYP,"EventInput")
    field(OUT,"INST_IO @/dev/eventIA 8 0")
    field(ZNAM,"Disable")
    field(ONAM,"Enable")
}

record(bo,eventIA_CHAN8_TRIG_S) {
    field(SCAN,"Passive")
    field(DTYP,"EventInput")
    field(OUT,"INST_IO @/dev/eventIA 8 1")
    field(ZNAM,"")
    field(ONAM,"Trigger")
}

record(bi,eventIA_CHAN9_ENABLE_G) {
    field(SCAN,"1 second")
    field(DTYP,"EventInput")
    field(INP,"INST_IO @/dev/eventIA 9 0")
    field(ZNAM,"Disabled")
    field(ONAM,"Enabled")
}

record(bo,eventIA_CHAN9_ENABLE_S) {
    field(SCAN,"Passive")
```

## EPICS Device and Driver Support for SNS Timing Master (Beta Release)

```
        field(DTYP,"EventInput")
        field(OUT,"INST_IO @/dev/eventIA 9 0")
        field(ZNAM,"Disable")
        field(ONAM,"Enable")
    }

record(bo,eventIA_CHAN9_TRIG_S) {
    field(SCAN,"Passive")
    field(DTYP,"EventInput")
    field(OUT,"INST_IO @/dev/eventIA 9 1")
    field(ZNAM,"")
    field(ONAM,"Trigger")
}

record(bi,eventIA_CHAN10_ENABLE_G) {
    field(SCAN,"1 second")
    field(DTYP,"EventInput")
    field(INP,"INST_IO @/dev/eventIA 10 0")
    field(ZNAM,"Disabled")
    field(ONAM,"Enabled")
}

record(bo,eventIA_CHAN10_ENABLE_S) {
    field(SCAN,"Passive")
    field(DTYP,"EventInput")
    field(OUT,"INST_IO @/dev/eventIA 10 0")
    field(ZNAM,"Disable")
    field(ONAM,"Enable")
}

record(bo,eventIA_CHAN10_TRIG_S) {
    field(SCAN,"Passive")
    field(DTYP,"EventInput")
    field(OUT,"INST_IO @/dev/eventIA 10 1")
    field(ZNAM,"")
    field(ONAM,"Trigger")
}

record(bi,eventIA_CHAN11_ENABLE_G) {
    field(SCAN,"1 second")
    field(DTYP,"EventInput")
    field(INP,"INST_IO @/dev/eventIA 11 0")
    field(ZNAM,"Disabled")
    field(ONAM,"Enabled")
}

record(bo,eventIA_CHAN11_ENABLE_S) {
    field(SCAN,"Passive")
    field(DTYP,"EventInput")
    field(OUT,"INST_IO @/dev/eventIA 11 0")
    field(ZNAM,"Disable")
    field(ONAM,"Enable")
}

record(bo,eventIA_CHAN11_TRIG_S) {
    field(SCAN,"Passive")
    field(DTYP,"EventInput")
```

## EPICS Device and Driver Support for SNS Timing Master (Beta Release)

```
        field(OUT, "INST_IO @/dev/eventIA 11 1")
        field(ZNAM, "")
        field(ONAM, "Trigger")
    }

record(bi, eventIA_CHAN12_ENABLE_G) {
    field(SCAN, "1 second")
    field(DTYP, "EventInput")
    field(INP, "INST_IO @/dev/eventIA 12 0")
    field(ZNAM, "Disabled")
    field(ONAM, "Enabled")
}

record(bo, eventIA_CHAN12_ENABLE_S) {
    field(SCAN, "Passive")
    field(DTYP, "EventInput")
    field(OUT, "INST_IO @/dev/eventIA 12 0")
    field(ZNAM, "Disable")
    field(ONAM, "Enable")
}

record(bo, eventIA_CHAN12_TRIG_S) {
    field(SCAN, "Passive")
    field(DTYP, "EventInput")
    field(OUT, "INST_IO @/dev/eventIA 12 1")
    field(ZNAM, "")
    field(ONAM, "Trigger")
}

record(bi, eventIA_CHAN13_ENABLE_G) {
    field(SCAN, "1 second")
    field(DTYP, "EventInput")
    field(INP, "INST_IO @/dev/eventIA 13 0")
    field(ZNAM, "Disabled")
    field(ONAM, "Enabled")
}

record(bo, eventIA_CHAN13_ENABLE_S) {
    field(SCAN, "Passive")
    field(DTYP, "EventInput")
    field(OUT, "INST_IO @/dev/eventIA 13 0")
    field(ZNAM, "Disable")
    field(ONAM, "Enable")
}

record(bo, eventIA_CHAN13_TRIG_S) {
    field(SCAN, "Passive")
    field(DTYP, "EventInput")
    field(OUT, "INST_IO @/dev/eventIA 13 1")
    field(ZNAM, "")
    field(ONAM, "Trigger")
}

record(bi, eventIA_CHAN14_ENABLE_G) {
    field(SCAN, "1 second")
    field(DTYP, "EventInput")
    field(INP, "INST_IO @/dev/eventIA 14 0")
```

## EPICS Device and Driver Support for SNS Timing Master (Beta Release)

```
        field(ZNAM,"Disabled")
        field(ONAM,"Enabled")
    }

record(bo,eventIA_CHAN14_ENABLE_S) {
    field(SCAN,"Passive")
    field(DTYP,"EventInput")
    field(OUT,"INST_IO @/dev/eventIA 14 0")
    field(ZNAM,"Disable")
    field(ONAM,"Enable")
}

record(bo,eventIA_CHAN14_TRIGGER_S) {
    field(SCAN,"Passive")
    field(DTYP,"EventInput")
    field(OUT,"INST_IO @/dev/eventIA 14 1")
    field(ZNAM,"")
    field(ONAM,"Trigger")
}

record(bi,eventIA_CHAN15_ENABLE_G) {
    field(SCAN,"1 second")
    field(DTYP,"EventInput")
    field(INP,"INST_IO @/dev/eventIA 15 0")
    field(ZNAM,"Disabled")
    field(ONAM,"Enabled")
}

record(bo,eventIA_CHAN15_ENABLE_S) {
    field(SCAN,"Passive")
    field(DTYP,"EventInput")
    field(OUT,"INST_IO @/dev/eventIA 15 0")
    field(ZNAM,"Disable")
    field(ONAM,"Enable")
}

record(bo,eventIA_CHAN15_TRIGGER_S) {
    field(SCAN,"Passive")
    field(DTYP,"EventInput")
    field(OUT,"INST_IO @/dev/eventIA 15 1")
    field(ZNAM,"")
    field(ONAM,"Trigger")
}

record(waveform,eventIA_CODES_G) {
    field(SCAN,"1 second")
    field(PINI,"YES")
    field(FTVL,"UCHAR")
    field(DTYP,"EventInput")
    field(INP,"INST_IO @/dev/eventIA 0")
    field(NELM,"16")
}

record(waveform,eventIA_CODES_S) {
    field(SCAN,"Passive")
    field(FTVL,"UCHAR")
    field(DTYP,"EventInput")
```

## EPICS Device and Driver Support for SNS Timing Master (Beta Release)

```
        field(INP,"INST_IO @/dev/eventIA 1")
        field(NELM,"16")
    }

record(longout,eventIA_CODES_G_b0) {
    field(SCAN,"Passive")
}
record(longout,eventIA_CODES_G_b1) {
    field(SCAN,"Passive")
}
record(longout,eventIA_CODES_G_b2) {
    field(SCAN,"Passive")
}
record(longout,eventIA_CODES_G_b3) {
    field(SCAN,"Passive")
}
record(longout,eventIA_CODES_G_b4) {
    field(SCAN,"Passive")
}
record(longout,eventIA_CODES_G_b5) {
    field(SCAN,"Passive")
}
record(longout,eventIA_CODES_G_b6) {
    field(SCAN,"Passive")
}
record(longout,eventIA_CODES_G_b7) {
    field(SCAN,"Passive")
}
record(longout,eventIA_CODES_G_b8) {
    field(SCAN,"Passive")
}
record(longout,eventIA_CODES_G_b9) {
    field(SCAN,"Passive")
}
record(longout,eventIA_CODES_G_b10) {
    field(SCAN,"Passive")
}
record(longout,eventIA_CODES_G_b11) {
    field(SCAN,"Passive")
}
record(longout,eventIA_CODES_G_b12) {
    field(SCAN,"Passive")
}
record(longout,eventIA_CODES_G_b13) {
    field(SCAN,"Passive")
}
record(longout,eventIA_CODES_G_b14) {
    field(SCAN,"Passive")
}
record(longout,eventIA_CODES_G_b15) {
    field(SCAN,"Passive")
}

record(longin,eventIA_CODES_S_b0) {
    field(SCAN,"Passive")
}
```

## EPICS Device and Driver Support for SNS Timing Master (Beta Release)

```
record(longin,eventIA_CODES_S_b1) {
    field(SCAN,"Passive")
}
record(longin,eventIA_CODES_S_b2) {
    field(SCAN,"Passive")
}
record(longin,eventIA_CODES_S_b3) {
    field(SCAN,"Passive")
}
record(longin,eventIA_CODES_S_b4) {
    field(SCAN,"Passive")
}
record(longin,eventIA_CODES_S_b5) {
    field(SCAN,"Passive")
}
record(longin,eventIA_CODES_S_b6) {
    field(SCAN,"Passive")
}
record(longin,eventIA_CODES_S_b7) {
    field(SCAN,"Passive")
}
record(longin,eventIA_CODES_S_b8) {
    field(SCAN,"Passive")
}
record(longin,eventIA_CODES_S_b9) {
    field(SCAN,"Passive")
}
record(longin,eventIA_CODES_S_b10) {
    field(SCAN,"Passive")
}
record(longin,eventIA_CODES_S_b11) {
    field(SCAN,"Passive")
}
record(longin,eventIA_CODES_S_b12) {
    field(SCAN,"Passive")
}
record(longin,eventIA_CODES_S_b13) {
    field(SCAN,"Passive")
}
record(longin,eventIA_CODES_S_b14) {
    field(SCAN,"Passive")
}
record(longin,eventIA_CODES_S_b15) {
    field(SCAN,"Passive")
}
record(bo,eventIA_CODES_UPDATE) {
    field(SCAN,"Passive")
}
```

```
# EPICS database for RTDL Encoder Module
record(longin,rtdlE_NO_REPLY_ERROR_G) {
    field(SCAN,"1 second")
    field(DTYP,"RtdlEncoder")
    field(INP, "INST_IO @/dev/rtdlE 0")
}
```

## EPICS Device and Driver Support for SNS Timing Master (Beta Release)

```
record(longin,rtdlE_NO_REPLY_ERROR_ID_G) {
    field(SCAN,"1 second")
    field(DTYP,"RtdlEncoder")
    field(INP, "INST_IO @/dev/rtdlE 1")
}

record(longin,rtdlE_NO_CARRIER_ERROR_G) {
    field(SCAN,"1 second")
    field(DTYP,"RtdlEncoder")
    field(INP, "INST_IO @/dev/rtdlE 2")
}

record(longin,rtdlE_STATUS_G) {
    field(SCAN,"1 second")
    field(DTYP,"RtdlEncoder")
    field(INP, "INST_IO @/dev/rtdlE 3")
}

record(stringin,rtdlE_BOARD_ID_G) {
    field(SCAN,"Passive")
    field(DTYP,"RtdlEncoder")
    field(INP, "INST_IO @/dev/rtdlE 0")
}

record(stringin,rtdlE_BASE_ADDRESS_G) {
    field(SCAN,"Passive")
    field(DTYP,"RtdlEncoder")
    field(INP, "INST_IO @/dev/rtdlE 1")
}

record(bi,rtdlE_TRIGGER_SOURCE_G) {
    field(SCAN,"1 second")
    field(DTYP,"RtdlEncoder")
    field(INP,"INST_IO @/dev/rtdlE 0")
    field(ZNAM,"Event")
    field(ONAM,"External")
}

record(bo,rtdlE_TRIGGER_SOURCE_S) {
    field(SCAN,"Passive")
    field(DTYP,"RtdlEncoder")
    field(OUT,"INST_IO @/dev/rtdlE 0")
    field(ZNAM,"Event")
    field(ONAM,"External")
}

record(bi,rtdlE_RESET_G) {
    field(SCAN,"1 second")
    field(DTYP,"RtdlEncoder")
    field(INP,"INST_IO @/dev/rtdlE 2")
    field(ZNAM,"On")
    field(ONAM,"Off")
}

record(bo,rtdlE_RESET_S) {
    field(SCAN,"Passive")
    field(DTYP,"RtdlEncoder")
```

## EPICS Device and Driver Support for SNS Timing Master (Beta Release)

```
        field(OUT, "INST_IO @/dev/rtdlE 2")
        field(ZNAM, "On")
        field(ONAM, "Off")
    }

# EPICS database for RTDL Input module
record(stringin,rtdlIA1_BOARD_ID_G) {
    field(SCAN,"Passive")
    field(DTYP,"RtdlInput")
    field(INP, "INST_IO @/dev/rtdlIA/1 0")
}

record(stringin,rtdlIA1_BASE_ADDRESS_G) {
    field(SCAN,"Passive")
    field(DTYP,"RtdlInput")
    field(INP, "INST_IO @/dev/rtdlIA/1 1")
}

record(longin,rtdlIA1_FRAME_ID_G) {
    field(SCAN,"Passive")
    field(DTYP,"RtdlInput")
    field(INP, "INST_IO @/dev/rtdlIA/1 0")
}

record(longin,rtdlIA2_FRAME_ID_G) {
    field(SCAN,"Passive")
    field(DTYP,"RtdlInput")
    field(INP, "INST_IO @/dev/rtdlIA/2 0")
}

record(longin,rtdlIA1_VME_DATA_G) {
    field(SCAN,"1 second")
    field(DTYP,"RtdlInput")
    field(INP, "INST_IO @/dev/rtdlIA/1 1")
}

record(longin,rtdlIA2_VME_DATA_G) {
    field(SCAN,"1 second")
    field(DTYP,"RtdlInput")
    field(INP, "INST_IO @/dev/rtdlIA/2 1")
}

record(longin,rtdlIA1_FRAME_ERROR_G) {
    field(SCAN,"1 second")
    field(DTYP,"RtdlInput")
    field(INP, "INST_IO @/dev/rtdlIA/1 2")
}

record(longin,rtdlIA2_FRAME_ERROR_G) {
    field(SCAN,"1 second")
    field(DTYP,"RtdlInput")
    field(INP, "INST_IO @/dev/rtdlIA/2 2")
}

record(longin,rtdlIA1_CRC_ERROR_G) {
    field(SCAN,"1 second")
    field(DTYP,"RtdlInput")
```

# EPICS Device and Driver Support for SNS Timing Master (Beta Release)

```
        field(INP, "INST_IO @/dev/rtdlIA/1 3")
    }

record(longin,rtdlIA2_CRC_ERROR_G) {
    field(SCAN,"1 second")
    field(DTYP,"RtdlInput")
    field(INP, "INST_IO @/dev/rtdlIA/2 3")
}

record(longin,rtdlIA1_LINK_ERROR_G) {
    field(SCAN,"1 second")
    field(DTYP,"RtdlInput")
    field(INP, "INST_IO @/dev/rtdlIA/1 4")
}

record(longin,rtdlIA2_LINK_ERROR_G) {
    field(SCAN,"1 second")
    field(DTYP,"RtdlInput")
    field(INP, "INST_IO @/dev/rtdlIA/2 4")
}

record(longout,rtdlIA1_VME_DATA_S) {
    field(SCAN,"Passive")
    field(DTYP,"RtdlInput")
    field(OUT, "INST_IO @/dev/rtdlIA/1 0")
}

record(longout,rtdlIA2_VME_DATA_S) {
    field(SCAN,"Passive")
    field(DTYP,"RtdlInput")
    field(OUT, "INST_IO @/dev/rtdlIA/2 0")
}

record(bi,rtdlIA1_MODE_G) {
    field(SCAN,"1 second")
    field(DTYP,"RtdlInput")
    field(INP,"INST_IO @/dev/rtdlIA/1 0")
    field(ZNAM,"Device")
    field(ONAM,"VME")
}

record(bi,rtdlIA2_MODE_G) {
    field(SCAN,"1 second")
    field(DTYP,"RtdlInput")
    field(INP,"INST_IO @/dev/rtdlIA/2 0")
    field(ZNAM,"Device")
    field(ONAM,"VME")
}

record(bi,rtdlIA1_Enable_G) {
    field(SCAN,"1 second")
    field(DTYP,"RtdlInput")
    field(INP,"INST_IO @/dev/rtdlIA/1 1")
    field(ZNAM,"On")
    field(ONAM,"Off")
}
```

## EPICS Device and Driver Support for SNS Timing Master (Beta Release)

```
record(bi,rtdlIA2_Enable_G) {
    field(SCAN,"1 second")
    field(DTYP,"RtdlInput")
    field(INP,"INST_IO @/dev/rtdlIA/2 1")
    field(ZNAM,"On")
    field(ONAM,"Off")
}

record(bo,rtdlIA1_MODE_S) {
    field(SCAN,"Passive")
    field(DTYP,"RtdlInput")
    field(OUT,"INST_IO @/dev/rtdlIA/1 0")
    field(ZNAM,"Device")
    field(ONAM,"VME")
}

record(bo,rtdlIA2_MODE_S) {
    field(SCAN,"Passive")
    field(DTYP,"RtdlInput")
    field(OUT,"INST_IO @/dev/rtdlIA/2 0")
    field(ZNAM,"Device")
    field(ONAM,"VME")
}

record(bo,rtdlIA1_Enable_S) {
    field(SCAN,"Passive")
    field(DTYP,"RtdlInput")
    field(OUT,"INST_IO @/dev/rtdlIA/1 1")
    field(ZNAM,"On")
    field(ONAM,"Off")
}

record(bo,rtdlIA2_Enable_S) {
    field(SCAN,"Passive")
    field(DTYP,"RtdlInput")
    field(OUT,"INST_IO @/dev/rtdlIA/2 1")
    field(ZNAM,"On")
    field(ONAM,"Off")
}

record(bi,rtdlIA1_ACTIVATE_G) {
    field(SCAN,"1 second")
    field(DTYP,"RtdlEncoder")
    field(INP,"INST_IO @/dev/rtdlE 1 /dev/rtdlIA/1")
    field(ZNAM,"Off")
    field(ONAM,"On")
}

record(bi,rtdlIA2_ACTIVATE_G) {
    field(SCAN,"1 second")
    field(DTYP,"RtdlEncoder")
    field(INP,"INST_IO @/dev/rtdlE 1 /dev/rtdlIA/2")
    field(ZNAM,"Off")
    field(ONAM,"On")
}

record(bo,rtdlIA1_ACTIVATE_S) {
```

## EPICS Device and Driver Support for SNS Timing Master (Beta Release)

```
field(SCAN,"Passive")
field(DTYP,"RtdlEncoder")
field(OUT,"INST_IO @/dev/rtdlE 1 /dev/rtdlIA/1")
field(ZNAM,"Off")
field(ONAM,"On")
}

record(bo,rtdlIA2_ACTIVATE_S) {
    field(SCAN,"Passive")
    field(DTYP,"RtdlEncoder")
    field(OUT,"INST_IO @/dev/rtdlE 1 /dev/rtdlIA/2")
    field(ZNAM,"Off")
    field(ONAM,"On")
}
```