dag_irigb Software Guide

EDM04-33

Protection Against Harmful Interference

When present on equipment this document pertains to, the statement "This device complies with part 15 of the FCC rules" specifies the equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the Federal Communications Commission [FCC] Rules.

These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction document, may cause harmful interference to radio communications.

Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

Extra Components and Materials

The product that this manual pertains to may include extra components and materials that are not essential to its basic operation, but are necessary to ensure compliance to the product standards required by the United States Federal Communications Commission, and the European EMC Directive. Modification or removal of these components and/or materials, is liable to cause non compliance to these standards, and in doing so invalidate the user's right to operate this equipment in a Class A industrial environment.

Disclaimer

Whilst every effort has been made to ensure accuracy, neither Endace Technology Limited nor any employee of the company, shall be liable on any ground whatsoever to any party in respect of decisions or actions they may make as a result of using this information.

Endace Technology Limited has taken great effort to verify the accuracy of this document, but nothing herein should be construed as a warranty and Endace shall not be liable for technical or editorial errors or omissions contained herein.

In accordance with the Endace Technology Limited policy of continuing development, the information contained herein is subject to change without notice.

Website

http://www.endace.com

Copyright 2011 Endace Technology Ltd. All Rights reserved.

Contents

dag_irigb

`dag_irigb` is an application which retrieves time data from an external IRIG-B (Inter Range Instrumentation Group mod B) device connected to a compatible DAG card. The `dag_irigb` application can:

- Set the host system clock to the IRIG-B time.
- Decode and print the IRIG-B data to the screen.
- Provide a reference clock to ntpd via its shared memory driver.

Terminology used in this document

This document uses the following acronyms:

Acronym	Description
API	Application Programming Interface
GPS	Global Positioning System
IRIG-B	Inter Range Instrumentation Group mod B
NZST	New Zealand Standard Time
PPS	Pulse Per Second
TAI	Time Atomic International
UTC	Coordinated Universal Time
DUCK	DAG Universal Clock Kit
NTP	Network Time Protocol

What is IRIG-B?

IRIG-B is a 100 Pulse Per Second (PPS) timecode providing the time of day information. This information is updated every second.

IRIG standard and IRIG-B frame format

The most up to date IRIG standard is available at www.irigb.com.

Requirements

The requirements to run IRIG-B are:

- A DAG card with IRIG-B compatible firmware.
- DAG software 4.1.0 or greater.
- IRIG-B time source or receiver.
- An IRIG-B signal connection to the DAG card's time synchronization port (an Endace TDS product may be required to achieve this).

Note:
DAG cards support 'unmodulated' DCLS (Direct Current Level Shift) IRIG-B signals only, e.g. IRIG B00x.

Checking IRIG-B is supported

To check IRIG-B is supported in your DAG card's firmware, run daginf. An error is reported if the firmware does not support IRIG-B.

Displaying dag_irigb statistics

To display `dag_irigb` statistics, type the following command:

```
dag_irigb -dX
```

Where X is the device number of the DAG card you want to configure.

The following is a description of the output.

Option	Description
INPUT SOURCE	Defines the current input source for this DAG card.
HOST: LOCAL	Displays the current host time in the local time. ***Note:*** *Only displayed if Input Source is set to IRIG-B.*
HOST: UTC	Displays the current host time in UTC time. ***Note:*** *Only displayed if Input Source is set to IRIG-B.*
IRIG-B	This is made up of three pieces of information • The first groups is the decoded IRIG-B day of the year. For example Nov 11, 2009 is the 314 day of 2009. • The second group of digits represent the current decoded IRIG-B time. The format is HH:mm:ss. • The last group is the current IRIG-B delta from UTC in seconds ***Note:*** *Only displayed if Input Source is set to IRIG-B.*
HOST_IRIG	Displays the current time difference between the displayed host time and IRIG-B time. ***Note:*** *Only displayed if Input Source is set to IRIG-B.*

dag_irigb options

The following `dag_irigb` options are available:

Short Option	Long Option	Description
-b <delta>	--sec <delta>	Set the difference between UTC and the IRIG-B device time in seconds.
-d <device>	--device <device>	Use the DAG device referred to by `<device>`. Supported syntax to refer to DAG cards includes: `0`, `dag1`, and `/dev/dag3`
-D	--duck	Sets DUCK time as the ntp shared memory reference clock. The default is IRIG-B time.
-h -?	--help --usage	Display usage (help) information.
-i	--irigb	Year information provided by IRIG-B. See Getting the year information from IRIG-B (page 4).
-m	--daemon	Used to set the host clock to IRIG-B time (via NTP). NTP can be configured to accept time from a reference clock via a 'Shared Memory' driver 'Unit'. For further information, see Running as a daemon to set the reference clock for ntpd (page 5).
-r <delta_hour>	--hour <delta_hour>	Set the difference between UTC and the IRIG-B device time in hours. See -r option (page 4).
-s	--set	Set host time to IRIG-B time.
-t	--host	Year information provided by host (default). See Getting the year information from IRIG-B (page 4).
-u <shm_unit>	--ntp-shm-unit <shm_unit>	This option sets dagirig_b to update a shared memory driver (unit 0 by default) with the IRIG-B time once per second. The range is 0 to 3.
-v	--verbose	Increase output verbosity.
-V	--version	Display version information.

Setting the host system clock to IRIG-B

To set the host system clock time to the IRIG-B device, run the following command:

```
dag_irigb -dX -s
```

Where X is the device number of the DAG card you want to configure.

The system clock is adjusted to match the IRIG-B time immediately. Adjustment is performed only once and the clock rate is not adjusted.

Time standard differences

If the IRIG-B device uses a different time standard to the host system clock then you must specify the difference in time (the `delta`).

The delta value is the difference (in seconds) between:

- the time standard of the host (TZ(host)), and
- the offset used by the time standard on the IRIG-B device (D(ST-UTC)).

The formula for the delta value is:

```
delta = TZ(host) - D(ST-UTC)
```

For the different time standards, the D(ST-UTC) value is the following:

IRIG-B timezone	D(ST-UTC) value (in seconds)
UTC → UTC	0
GPS → UTC	15 *
TAI → UTC	34 *

* At the time of writing this document.

Note:
Most GPS receivers perform the GPS-UTC conversion internally and output UTC time.

To set the delta value in `dag_irigb`:

1. Calculate the delta using the above formula.
2. Set the delta using the following command:
   ```
   dag_irigb -dX -b <delta> -s
   ```
   (Where X is the device number of the DAG card you want to configure)

Time standard difference example

If your IRIG-B device is configured to the TAI (page 1) time standard then calculate the time delta as follows:

- IRIG-B time offset TAI -> UTC = 34 seconds

Set the host system clock time and specify the delta value as follows:

```
dag_irigb -dX -b 34 -s
```

-r option

In the example above, the `-b <delta>` option is used to set the delta in seconds. Alternatively, the `-r` option can be used to specify the delta in hours and in seconds. This option is useful if the IRIG-B device and the host system clock time are configured to significantly different time standards.

Using the -r option:

```
dag_irigb -dX -b <delta_sec> -r <delta_hour>
```

So, the command for 12 hours and 34 seconds is (using the `-b` and `-r` options):

```
dag_irigb -dX -b -34 -r 12
```

Getting the year information from IRIG-B

By default `dag_irigb` gets year information from the system clock. If you are using an IRIG-B format which includes year information (For example; B004, B005, B006, B007) you need to use the following command each time to set the year source to IRIG-B.

```
dag_irigb -i
```

Reading IRIG-B data using the DAG API

The IRIG-B device time and the status of the input source can be read into a custom application using the Config and Status API. However, the IRIG-B component does not support setting the host time, this is because the delta value cannot be set by the user in the Config and Status API. To display all Config and Status API attributes for the DAG card, run the following command:

```
dagconfig -dX -T -v2
```

The attribute `irigb_time` gives the last read IRIG-B time from the IRIG-B source. It is of type `kAttributeUint64` and represents time in 64-bit fixed point value, similar to the ERF timestamps.

Running as a daemon to set the reference clock for ntpd

`dag_irigb`, in daemon mode, can be used to provide reference clock information to ntpd. This allows ntpd to keep the system clock synchronized to the time provided by the IRIG-B source. The `dag_irigb` daemon receives the IRIG-B time frame and packages it with the current system time and writes it to an NTP shared-memory segment. If ntpd has been properly configured to receive this message, it will be used to correct the system clock.

Here is an example ntp.conf stanza to use ntpd's shared memory segment.

```
#for SHM segment 2
server 127.127.28.2
fudge 127.127.28.2  refid SHM
```

With this configuration, ntpd reads the timestamps written to unit 2. For more information please check ntp documentation at http://doc.ntp.org/4.2.6/drivers/driver28.html.

Use the following command to run `dag_irigb` as a daemon to read the IRIG-B time and write to shared memory unit 2. The program updates the time every second.

```
dag_irigb -dX -m -u 2
```

If the DAG card has a 1 PPS reference clock connected instead of an IRIG-B reference clock, absolute date and time information is not available. The `-D` flag can be used to provide the raw DAG time to ntpd as a reference clock.

Note:
In this case the initial date and time are loaded from the system clock and may not be accurate.

```
dag_irigb -dX -m -u 2 -D
```

After restarting ntpd, we can use the utility ntpq to monitor operations. A sample output for 'ntpq -p' is shown below

```
     remote           refid      st t when poll reach   delay   offset  jitter
==============================================================================
+liveweb1.insure 131.203.16.10    2 u   36   64  377    4.819    1.506   1.963
+203-97-109-165. .PPSa.           1 u   41   64  377   22.876    1.777  32.136
-203-97-255-68.c 131.203.16.6     2 u   37   64  377   21.387   -0.115  32.560
*SHM(2)          .SHM.            0 l    6   64  377    0.000    0.020   0.049
```

The '*' in the first column means SHM unit 2 is currently preferred by the NTP daemon as the reference time source. For more information please check ntp documentation at http://doc.ntp.org/4.2.6/drivers/driver28.html.

Version History

Version	Date	Reason
1	October 2009	First release.
2	December 2009	Added `dag_irigb` statistics.
3	December 2011	DAG 4.7.0 Updated branding. Removed reference to DAG 8.1SX. Removed daginf output (card specific). Updated dag_irigb options list. updated examples

endace.com