

The AD16_TOOL User Guide.

Introductions

The ad16_tool is a GUI to the Industrial Computer Sources AdIO1600 Analog & Digital IO board (or ad16 for short). The ad16 board features the following IO:

- 8 differential or 16 single ended 12-bit channels of analog input.
- 2 12-bit analog output channels
- 32 bits of digital IO (16 outputs and 16 inputs)

This application displays the values of all the IO channels using a text or graphical format. You may also modify any output channel using the widget in the parameters window.

Starting Application

These tools are installed on the IRTF bigdog and guidedog computers. To start the program, just type the command 'ad16_tool'. To export the display to another X server, don't forget xhost (for displaying remote clients) and setting your DISPLAY environment.

Here is an example for remotely displaying to myhost:

```
myhost% xhost +
myhost% rlogin bigdog
bigdog% setenv DISPLAY myhost:0.0
bigdog% ad16_tool
```

The following should appear on your screen.

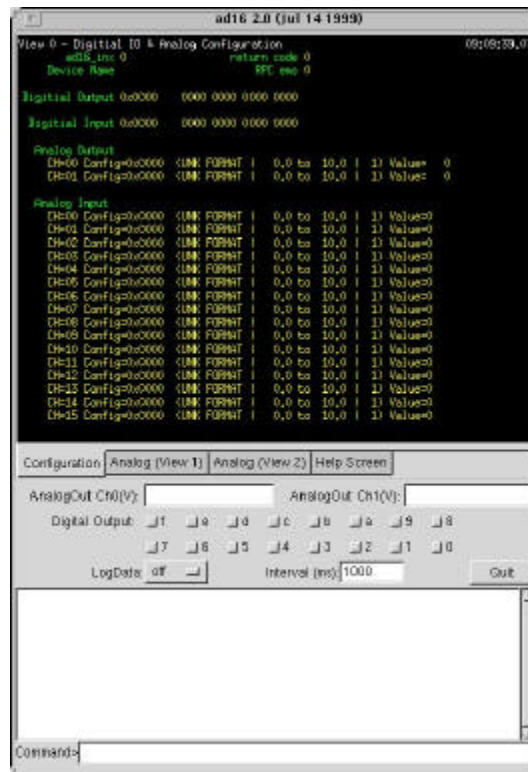


Figure 1 – ad16_tool

Display formats

There are 4 status display formats: Configuration, Analog (View 1), Analog (View 2), and Help Screen. Use the tabs under the status display select the format.

The **Configuration** format displays all the digital and analog values using a text format:

- The Digital Output bits are displayed in hex and binary.
- The Digital Input bits are displayed in hex and binary.
- The Analog Output configuration is displayed in Hex and Text. Value is the digital binary value for the AD conversion.

The **Analog (View 1)** format displays the 2 analog output channels and channels 0 through 7 of the analog inputs using a graphical form.

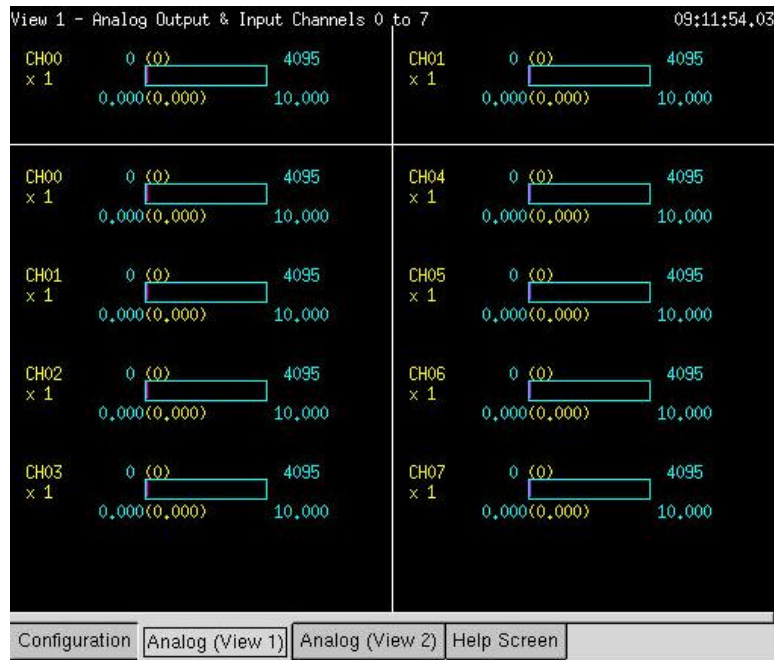


Figure 2 – Analog (View 1)

The top values on the bar graph are digital hardware value. The max and min values are display in blue. The yellow value is the actually value of the analog channel.

The bottom values on the bar graph display the same information, but the units are convert to voltages.

The **Analog (View 2)** format is similar View 1, but the analog input channels 8 to 15 are displayed.

The **Help Screen** give a brief summary of the application.

Parameters Window

The parameters window provides widgets to modify the analog and digital outputs. Also some application related widget are available.

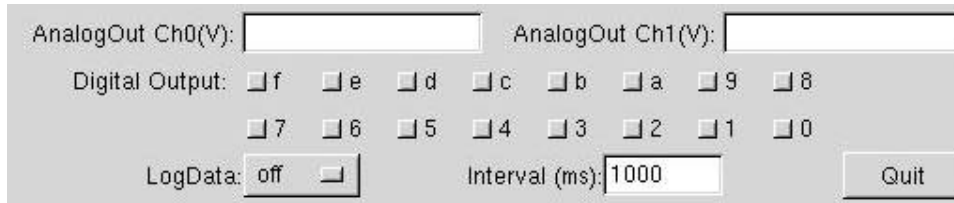


Figure 3 – Parameters Window

AnalogOut Ch0(V): Inputting a voltage generate a SetAO command to change the output voltage on Channel 0.

AnalogOut Ch1(V): Inputting a voltage generate a SetAO command to change the output voltage on Channel 1.

Clicking on the various **Digital Output** toggle buttons generates a SetDO to set/clear digital output bits.

The **LogData** menu issues the log data command to turn off/on the login function.

The **Interval (ms):** entry issues the Interval command to control the sample period.

The **Quit** button exits the applications.

Feedback Area

The feedback widget is a text window used to display the commands and return codes processed by the program. Also any user message are printed in this area.

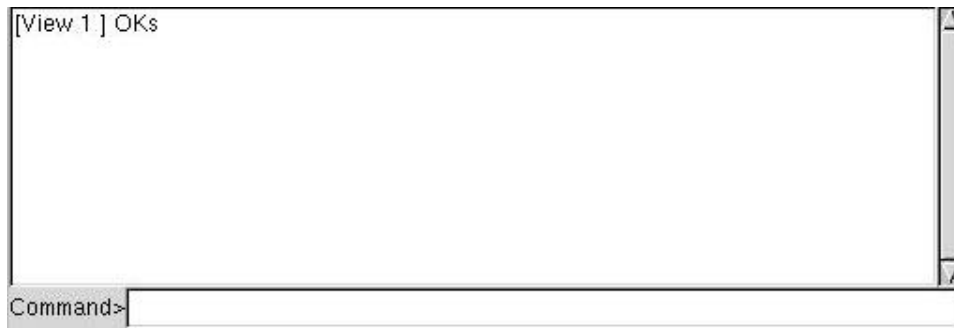


Figure 4 – Feedback Area

The **Command** entry widget allows you to type in any valid ad16 command.

Dealing with the data log.

When LogData is set to ON, the application will write it sample to a file name ad16.log. This section documents the data format, and gives some advice on dealing with this data. Here is a sample of the logged data. The column headings are not included in the actual data set, but are resent here for documentation purposes.

Date	Time	D_out	D_in	Aout_0	Aout_1	Ain0	Ain_1	Ain_2	Ain_3	Ain_4	Ain_5	Ain_6	Ain_7
07/14/99	11:45:40	0x0000	0x0000	-10.000	-10.000	1.647	1.598	1.569	1.601	1.637	1.613	1.635	1.618
07/14/99	11:45:50	0x0000	0x0000	-10.000	-10.000	1.652	1.598	1.564	1.601	1.637	1.620	1.623	1.618
07/14/99	11:46:00	0x0000	0x0000	-10.000	-10.000	1.650	1.603	1.564	1.603	1.637	1.620	1.625	1.620

Date & Time – Time stamp of this sample.

D_out – Digital IO output bits in hex format.

D_in – Digital IO input bits in hex format.

Aout_0/1 – Analog Output voltages.

Ain0-7 – Analog Input voltages.

In order to graph the data, it may be convenient to convert the time stamp to a elapsed time. A small utility exist that converts the time stamp from the mm/dd/yy hh:mm:ss to elapsed hours x.xxx format. This utility is called `date2ehour`. To run, type **date2ehour** at the command line. The new data file will have an `.e` file extension. Here is an example:

```
% date2ehour ad16.log
% cat ad16.e
0.000 0x0000 0x0000 -10.000 -10.000 1.647 1.598 1.569 1.601 1.637 1.613 1.635 1.618
0.003 0x0000 0x0000 -10.000 -10.000 1.652 1.598 1.564 1.601 1.637 1.620 1.623 1.618
0.006 0x0000 0x0000 -10.000 -10.000 1.650 1.603 1.564 1.603 1.637 1.620 1.625 1.620
0.008 0x0000 0x0000 -10.000 -10.000 1.650 1.608 1.564 1.603 1.640 1.623 1.625 1.620
```

Finally, I'll give an example to graph this data using `gnuplot`:

```
%gnuplot
gnuplot> plot 'ad16.e' using 1:6 with lines,
           'ad16.e' using 1:7 with lines,
           'ad16.e' using 1:8 with lines
```

These commands produce the following graph:

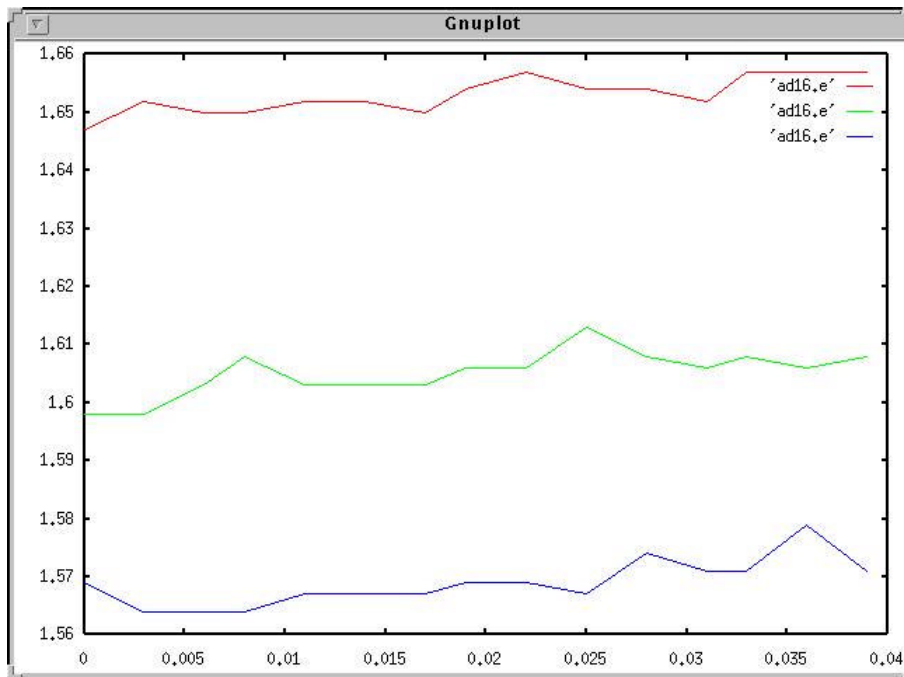


Figure 5 – gnuplot example.

Command Syntax

This section describes the command set of the `ad16_tool` application.

Interval – Specifies the sampling interval in milliseconds.

Prompt	Interval(ms)
Range	250 to 100,000 msec (or 0.25 to 100 seconds).
Initial	N/A
Syntax	Interval msec

LogData – When ON, the sampled data is written to a text file. Each sample is append to the file ad16.log using the following format:

Prompt LogData option menu.
Range
 Off – Data not saved.
 on – Save data to text file.
Initial off
Syntax LogData { *off* | *on* }

Quit – Exits the application.

Prompt Quit button
Syntax Quit

SetAO – Set a analog output channel.

Prompt AnalogOut ChX(V):
Range channel is 0 or 1
 Voltage depends on configuration. i.e.: -5 to 5, or -10 to 10 volts.
Syntax SetAO *ch voltage*

SetDO – Set the Digital Out Bits.

Prompt Digital Output toggle buttons
Range bits range is 0 to 65535. The binary value is used to determine which bits are turned off or on.
Initial N/A
Syntax SetDO *bits*

SetGain – Sets the gain for the analog output channel.

Prompt N/A
Range channel ranges from 0 to 15.
 Gain can be: 1, 10, 100, or 1000
Initial The gain is initially set to 1.
Syntax SetGain *ch gain*

Development

This application was developed for the NASA IRTF (<http://irtf.ifa.hawaii.edu>) for the Spex project (<http://irtf.ifa.hawaii.edu/spex>).

Written by Tony Denault (denault@irtf.ifa.hawaii.edu) and K. M. Hawarden-Ogata.