

# AH401D

## Oscilloscope

## Quick Start Guide





**CAEN ELS s.r.l.**

Via Karl Ludwig Von Bruck 32– 34144 Trieste (TS)

Italy

Mail: [info@caenels.com](mailto:info@caenels.com)

Web: [www.caenels.com](http://www.caenels.com)



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1.0	November 5 <sup>th</sup> 2013	First release of document
1.1	October 29 <sup>th</sup> 2014	Guide graphics changed
2	August 7 <sup>th</sup> 2024	Updated address and revision numbering



# 1. Introduction

The free software *AH401D Oscilloscope* makes it easy to set the picoammeter and visualize or save the acquired data. AH401D Oscilloscope software is available only for Windows platform. The system requirements are as follows:

-  Windows minimum system requirements:
  - Windows® XP/Windows Vista®/Windows® 7/Windows® 8
  - Intel® or equivalent AMD Athlon® processor
  - 110 MB available HD space
  - Ethernet network card

## 2. Quick start

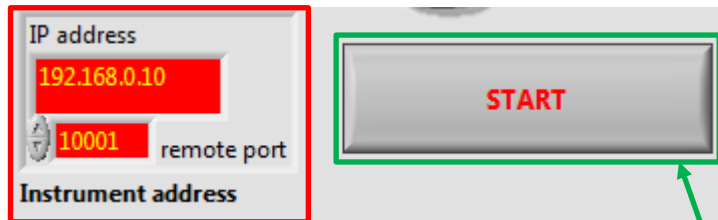
The following chapters describe the main functionality of the AH401D Oscilloscope software. The main window of the program is divided in the following sections:

The screenshot shows the AH401D Oscilloscope software interface. The main window is divided into several sections, each with specific settings and data displays.

- Acquisition settings:** Located at the top left, this section includes controls for Charge Range (350pC), Integration Time (1 ms), Full Scale Range (350n A), Acquisition (HALF), and Data type (Raw, Current).
- Graph settings:** Located on the right side, this section includes Signal select (Ch, BP), Autoscale, and Inst. Error. It also features four channel-specific settings (CH1, CH2, CH3, CH4) for Gain, Shift, and On/Off, along with a table of statistics and FFT data.
- Channel/BPM and FFT graphs:** The main display area shows a waveform graph (Amplitude vs. Point) and a histogram graph (Amplitude vs. Hz). The histogram shows a peak around 45 Hz.
- Connection settings:** Located at the bottom right, this section includes Enable FFT, Autoscale FFT, CH1 offset, CH2 offset, CH3 offset, CH4 offset, and buttons for POINTS, Append to file, and SAVE. It also displays the Address (192.168.0.10) and Instrument address (10001).

## 2.1 Connection setting

Remote communication is guaranteed by means of an Ethernet 10/100 auto-sensing socket present on each AH401D module rear panel. To establish a connection it is necessary to set the IP address of the instrument and its TCP/IP communication port using the *Connection settings* section present in the main window.



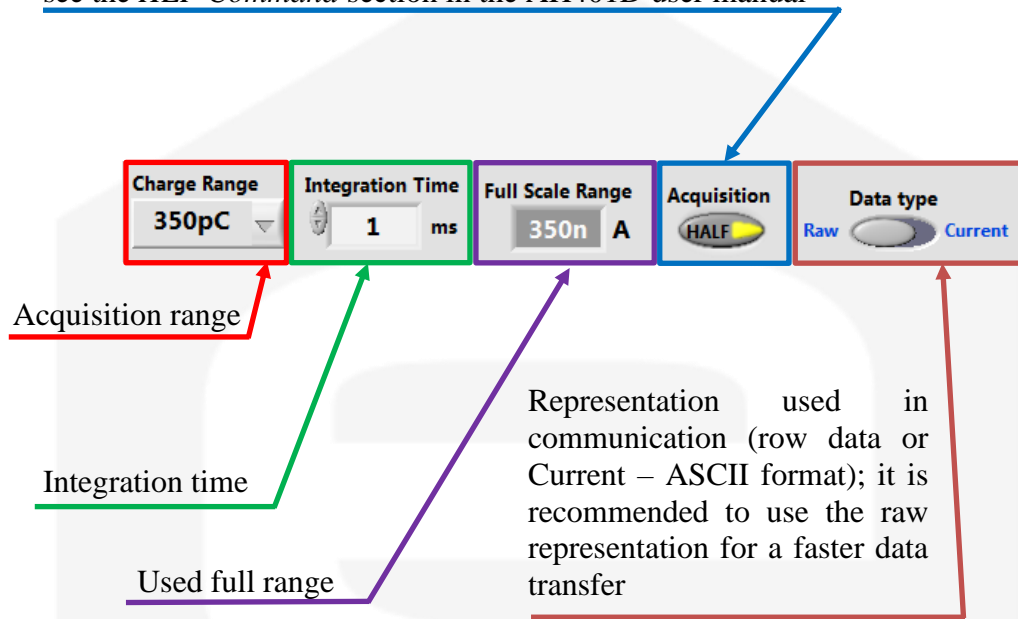
First it is necessary to set the module IP address and port to communicate with the AH401D. This operation can be made by using the module IP address/port section (the default communication port is 10001).

The communication with the instrument can be established by clicking on the *START* button.

## 2.2 Acquisition settings

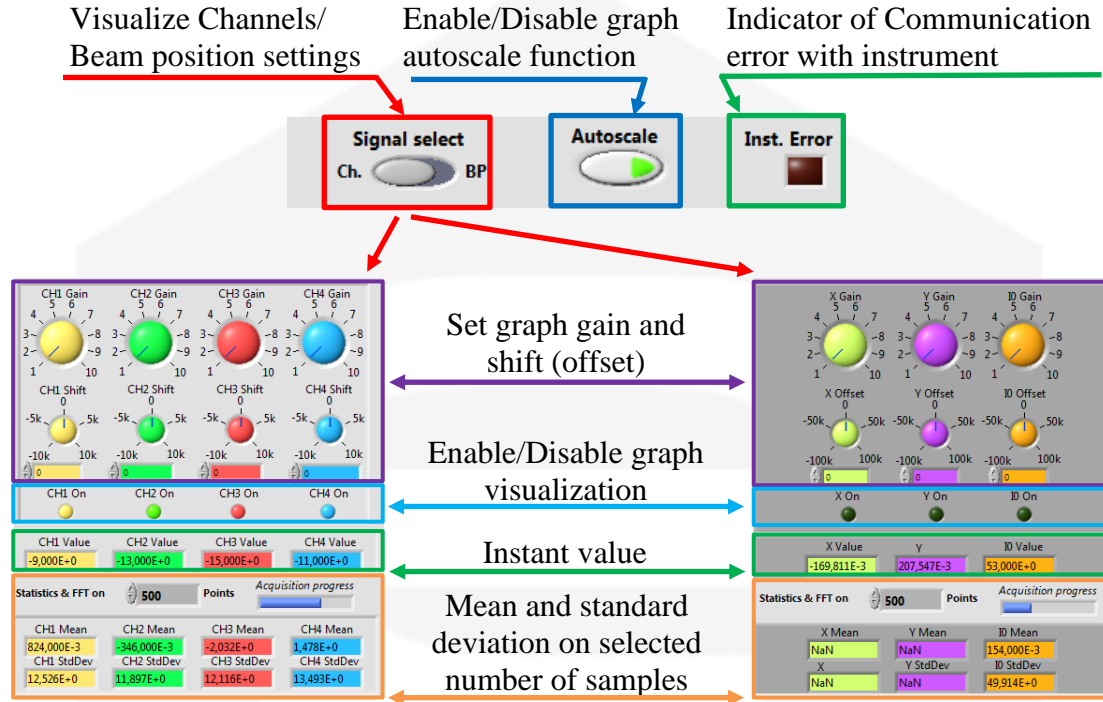
In the upper part of the main window it is possible to configure the *Acquisition settings*:

The purpose of the Acquisition type section is to select whether to process data from both integrator circuits (FULL) - i.e. maximum speed - or only from one integrator circuit (HALF) – i.e. best noise performance. For more information see the *HLF Command* section in the AH401D user manual



## 2.3 Graph settings

In the upper-right part of the main window it is possible to configure the *Graph settings*. There are two possible graph options sections: one relative to the Channels visualization and one relative to the Beam position. The Channels graph visualization options are relative to the acquired data from the four input connectors; the Beam Position graph visualization options are relative to the X-Y Beam position and its Intensity ( $I_o$ ):



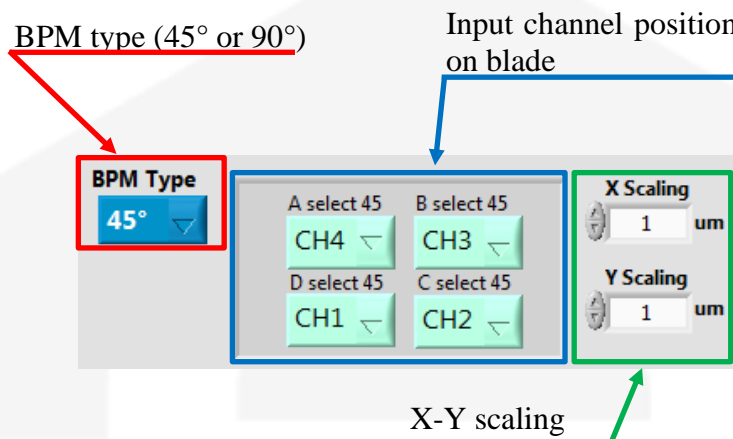
In a standard 90° blade BPM system, the X-Y and Intensity ( $I_o$ ) of the Beam are calculated with the following formulas ( $I_A, I_B, I_C$  and  $I_D$  represent the acquired input channels values):

$$\begin{cases} X = \frac{I_B - I_D}{I_B + I_D} \\ Y = \frac{I_A - I_C}{I_A + I_C} \\ I_o = I_A + I_B + I_C + I_D \end{cases}$$

In some cases, where a second BPM is installed on the same beamline, the blade system is rotated CW by 45° in order not to get shadowed by the first blade set and the computation needs to be modified. The equation used in a 45° rotated blade BPM system are the following:

$$\begin{cases} X = \frac{I_B + I_C - (I_A + I_D)}{I_A + I_B + I_C + I_D} \\ Y = \frac{I_A + I_B - (I_C + I_D)}{I_A + I_B + I_C + I_D} \\ I_o = I_A + I_B + I_C + I_D \end{cases}$$

The *Beam Position options* section allows to select the type of BMP blade (45° or 90°), the connection with the four input channels and the X-Y scaling:



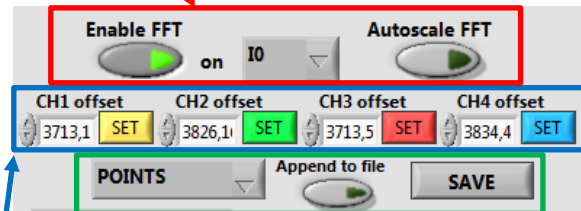
## 2.4 FFT, Offset Calibration and Save Data settings

In the bottom-right part of the main window it is possible to configure some other settings like:

- *FFT visualization section*: those options allow to enable or disable the FFT visualization; select the channel on which the FFT is calculated and to enable/disable the autoscale in FFT graph (to improve the calculation of FFT it is necessary to increase the number of acquired samples);
- *Offset calibration section*: this section allows to compensate the offset of the acquired data; the offset could be compensated manually or it is possible to use the *SET* button, which takes the mean value of the last acquisition as channel offset. For more information about the offset calibration please see the *Offset Calibration* chapter in the AH401D User Manual;
- *Save data section*: this section allows to save the acquired data. It is possible to select the type of saved data: *POINTS* – to save the acquired data and *STATISTIC* – to save only the mean and standard deviation of acquired data. If append option is disabled every

acquisition will open a save data window; otherwise the data will be “appended” to previous saved data. Two files are created when *SAVE* option is selected: one with saved data and the second with the acquisition settings.

FFT visualization section



Offset calibration section

Save data options