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Software Manual:

IN Control User Guide

Document Part Number: 34-2200 R2

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1.0 Preface

This manual describes the installation and use of the IN Control user interface designed for commissioning and operation of controllers, servo drives, and motor/drive combinations manufactured by Allied Motion Technologies, Inc.

Every effort has been made to ensure the accuracy of information in this manual. However, Allied Motion assumes no responsibility for any errors or omissions. The information contained within this document is regularly reviewed and we welcome your critical evaluation and suggestions for improvement. Allied Motion reserves the right to modify all documentation without prior notice. Be sure to download the most recent revision of this manual from the company website.

Table 1: Applicable Allied Motion Products

PRODUCT FAMILY	PART NUMBER	DESCRIPTION
EnduraMax iDrive	EMI-065xxxxx EMI-075xxxxx EMI-095xxxxx	65mm, 75mm, 95mm EnduraMax motors with integrated drive and encoder
Housed Megaflux motor with drive	MFH-xxxxxx	110mm, 140mm, 170mm Megaflux motors with integrated drive and high resolution optical encoder
AC xDrive	XDA-xxxxxxxx	AC powered brushless servo drive
SX Drives	SXD-xxxxxxxx	DC powered brush-brushless servo drive
SX Controllers	SXC-xxxxxxxx	DC powered brush-brushless single axis servo controller
MX Controllers	MXC-xxxxxxxx	DC powered brush-brushless multiple axis servo controller

2.0 Safety

Read all provided documentation before assembly and commissioning. Failure or incorrect or improper use of this equipment can cause death, personal injury, and consequential damage. The final responsibility for the safe use of Allied Motion products is solely that of the user.

Do not wire the drive and apply full power to it without checking it first at low power levels for correct operation.

When drives or motors are powered, high voltages are present on the connector and elsewhere in the drive and can be dangerous. The drive cover should not be removed with the power on, and then only by a competent and trained engineer. It is important that all system components be properly grounded.

3.0 Tables

4.0 Figures

5.0 Overview

Many Allied Motion controllers, drives, and motor/drive combinations are fully digital and so include a series of software parameters (read/write access) and variables (read only) which can be set and/or observed for specific motion applications. See "Document No. 34-2202 Software Manual: Parameters and Control Structure" for complete listing and explanation of all available parameters and variables. The IN Control user interface is designed to access these parameters/variables and to assist the user in the setup and operation of Allied Motion devices.

The major difference between Allied Motion drives and controllers is that controllers can store and execute user-defined programs while drives cannot. Therefore, the programming functionality (e.g. AML Editor) of IN Control applies to Allied Motion controller products only.

6.0 Requirements and Installation

A PC running Windows XP (SP3), Vista, Windows 7 or 8 is required to run IN Control. Download the latest version of IN Control from the company website. Once downloaded, double-click the executable file "IN Control Install.exe" from your download destination to initiate the installation process.

IN Control uses and requires the latest version of Microsoft's .NET 4.0 Framework. If needed, the installation software will automatically prompt you to download the latest .NET version during installation.

For Allied Motion motor-drive combinations, communication with a PC is through an RS-232 serial port. SX drives also communicate through RS-232. SX controllers communicate through RS-232 and/or Ethernet. Ethernet is recommended for full-functionality. It is highly recommended that users communicating over Ethernet use a non-Windows XP platform to run IN Control. Windows XP does not properly support Ethernet for IN Control.

7.0 Connecting to a Device

Before starting IN Control, link device to PC using an appropriate serial or Ethernet cable. When IN Control is started, it looks for communication devices that are available to the PC. These devices will show up as either COM ports or Ethernet ports. Non-Allied Motion devices can show up as available ports depending upon the configuration of your PC. One of these communication devices will be the available drive/controller. To connect to the drive/controller, double-click on the appropriate port:

Figure 1: Project Tree

When connecting, the message "Reading Dictionary" will appear in the status bar (located at the bottom of the window):

Figure 2: Status Bar, Reading Dictionary

When successfully connected the status bar then indicates the connected port, connection status, fault status, enable status, and device firmware version.

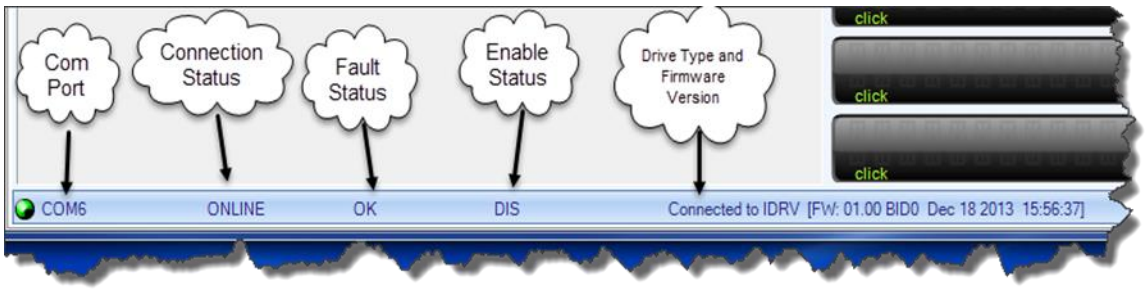


Figure 3: Status Bar

Clicking the red "X" at the top of the IN Control window allows a user to close a connection to a drive. Clicking the blue arrow will reload data from the drive/controller or reconnect and recover from a communication error:

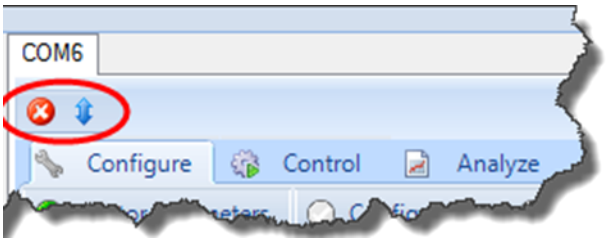


Figure 4: Close/Reload Connection

8.0 Operation Buttons

8.1 Enable/Disable

When the device is configured for software enable mode **EM=SWE**, the enable/disable buttons activate and deactivate the power stage of the connected device.

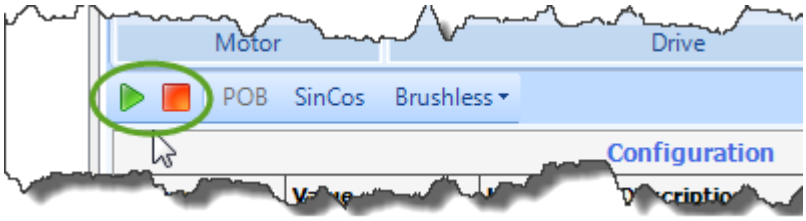


Figure 5: Software Enable/Disable Buttons

8.2 POB

Reserved for Allied Motion Engineering.

8.3 Sin/Cos

Reserved for Allied Motion Engineering.

8.4 Brushless

8.4.1 Auto RM/LM

Selecting the "Auto RM/LM" button will initiate the drive to automatically measure and set the motor's terminal-to-terminal resistance and inductance. These parameters are required in order to tune the drive's current control loop. These values can also be entered manually by accessing the parameters **LM** and **RM**. Then, be sure to input the appropriate current loop gains by clicking on the "Calc I-Loop Gains" button on the "Configure" tab menu.

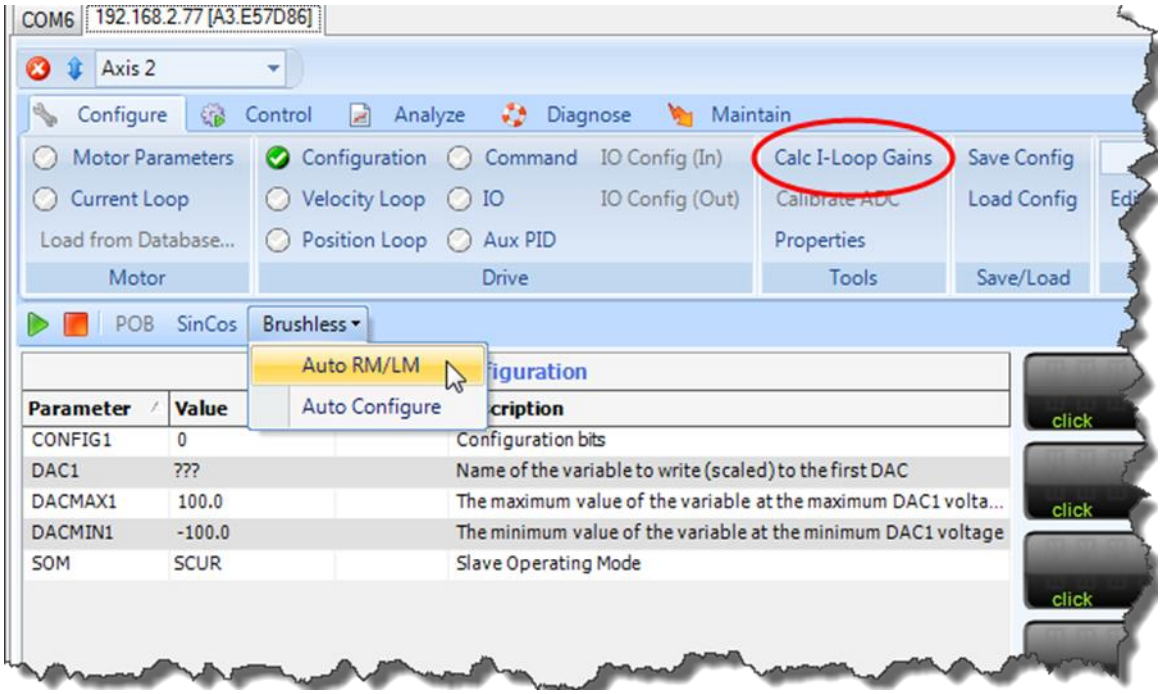


Figure 6: Brushless Button

8.4.2 Auto Configure

Selecting the "Auto Configure" button will initiate the drive to automatically detect and set the motor phasing parameters which include **COFF** (motor commutation angle) and **CONFIG1** (configuration bits for a controller) or **C1.INVE**, **C1.INVF** and **C1.INVH** (configuration bits for a drive).

9.0 Configure Tab

This tab enables access to all parameters needed to configure the motor-drive system. "Document No. 34-2202 Software Manual: Parameters and Control Structure" defines each of these parameters.

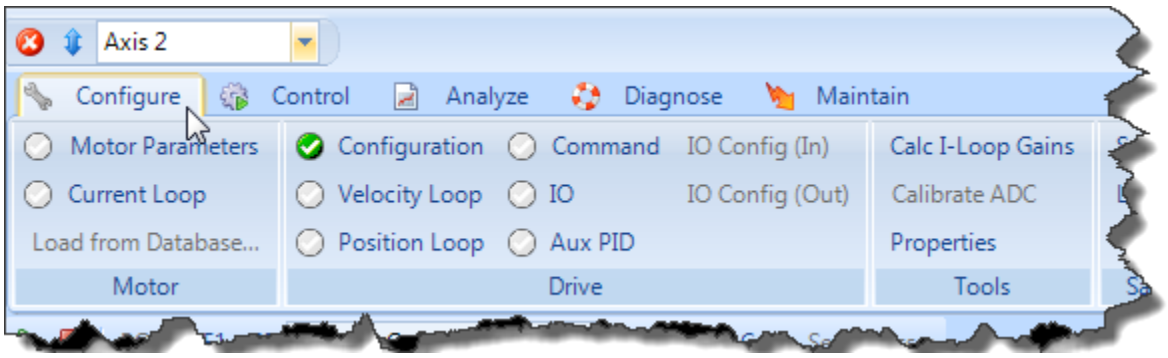
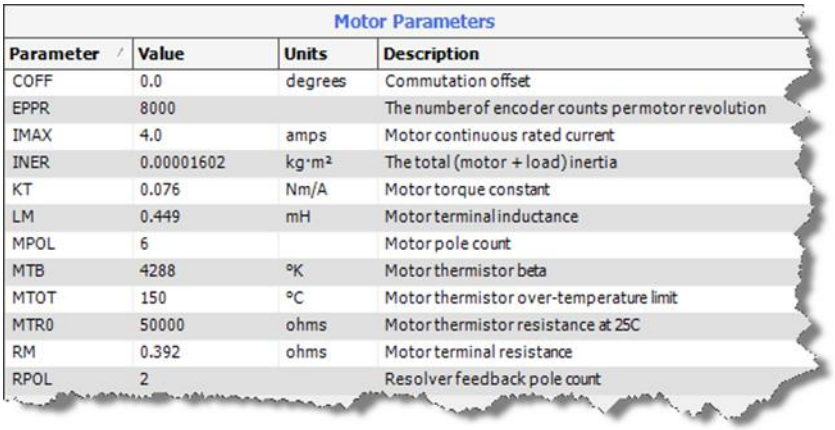


Figure 7: Configure Tab Overview

Pages that contain parameters display them in a four-column format.

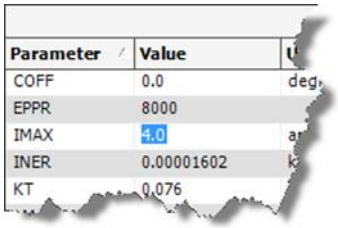


Motor Parameters

Parameter	Value	Units	Description
COFF	0.0	degrees	Commutation offset
EPPR	8000		The number of encoder counts per motor revolution
IMAX	4.0	amps	Motor continuous rated current
INER	0.00001602	kg·m²	The total (motor + load) inertia
KT	0.076	Nm/A	Motor torque constant
LM	0.449	mH	Motor terminal inductance
MPOL	6		Motor pole count
MTB	4288	°K	Motor thermistor beta
MTOT	150	°C	Motor thermistor over-temperature limit
MTR0	50000	ohms	Motor thermistor resistance at 25C
RM	0.392	ohms	Motor terminal resistance
RPOL	2		Resolver feedback pole count

Figure 8: Parameter Display

The "Value" column contains the present value of the parameter and is an editable item. In some cases the value is a number. The number is changed by clicking on it and then typing in a new numerical value.



Parameter	Value
COFF	0.0
EPPR	8000
IMAX	4.0
INER	0.00001602
KT	0.076

Figure 9: Edit Numeric-Valued Parameter

When a parameter has only specific values to which it can be set, clicking on the current value will open a drop-down window containing valid settings for the parameter. Clicking on the desired value sets the parameter to that value.

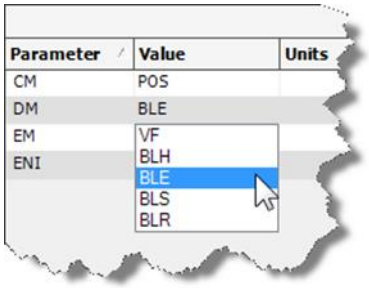


Figure 10: Edit Specific-Valued Parameter

Almost all parameters are non-volatile; once set, they retain their value without having to be saved. Volatile parameters are indicated in "Document No. 34-2202 Software Manual: Parameters and Control Structure".

9.1 Tools

9.1.1 Calc I-Loop Gains

After parameters **LM** and **RM** are set manually or using the "Auto RM/LM" function, the "Calc I-Loop Gains" button can be used to calculate the correct current loop gains for the drive. Calculating current loop gains is not necessary in a motor/drive combination as these values are set properly at the factory.

9.1.2 Calibrate ADC

With zero volts applied to the drive's analog input, this function can be used to zero out any offsets in the analog input circuitry.

9.1.3 Properties

Reserved for Allied Motion Engineering.

9.2 Save/Load

Parameters can be saved to or loaded from a .DCF file using "Save Config" or "Load Config" buttons. It is advisable to save parameters to .DCF file before changing them since once changed they otherwise cannot be restored to their default values. Saving a configuration file is also a good way to allow easy setup of multiple devices with the same configuration.

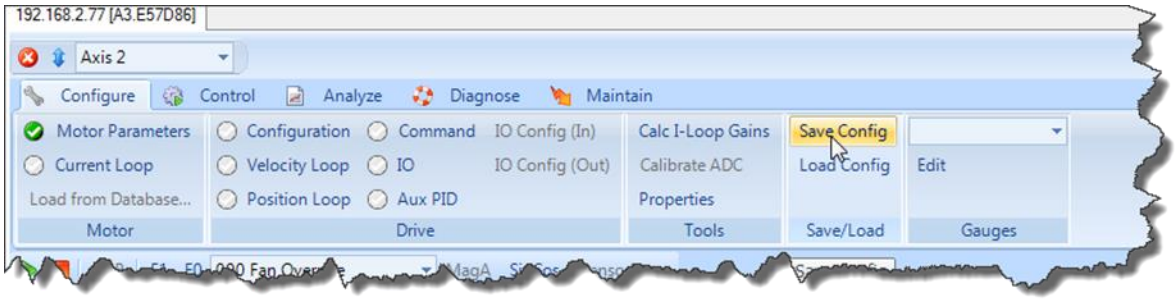


Figure 11: Save/Load Configuration Buttons

9.3 Gauges

There are seven user-defined gauges on the right side of the IN Control window which can display variables in real-time. Clicking on a gauge will bring up a list of variables from which to select. Variables can be searched by moving up and down the list. Also, if a variable name is known, typing in the first letters of its name will narrow the list to only variables starting with the typed letters. For example, to display the voltage across the DC bus **VBUS**, begin typing "V-B-U-S" then scroll to VBUS and click on that variable.

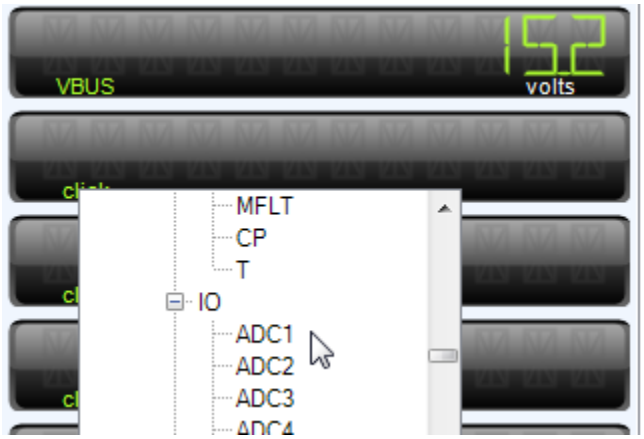


Figure 12: Select Gauges

Alternatively, a predefined set of gauges can be displayed by selecting the desired set from the available drop-down menu.

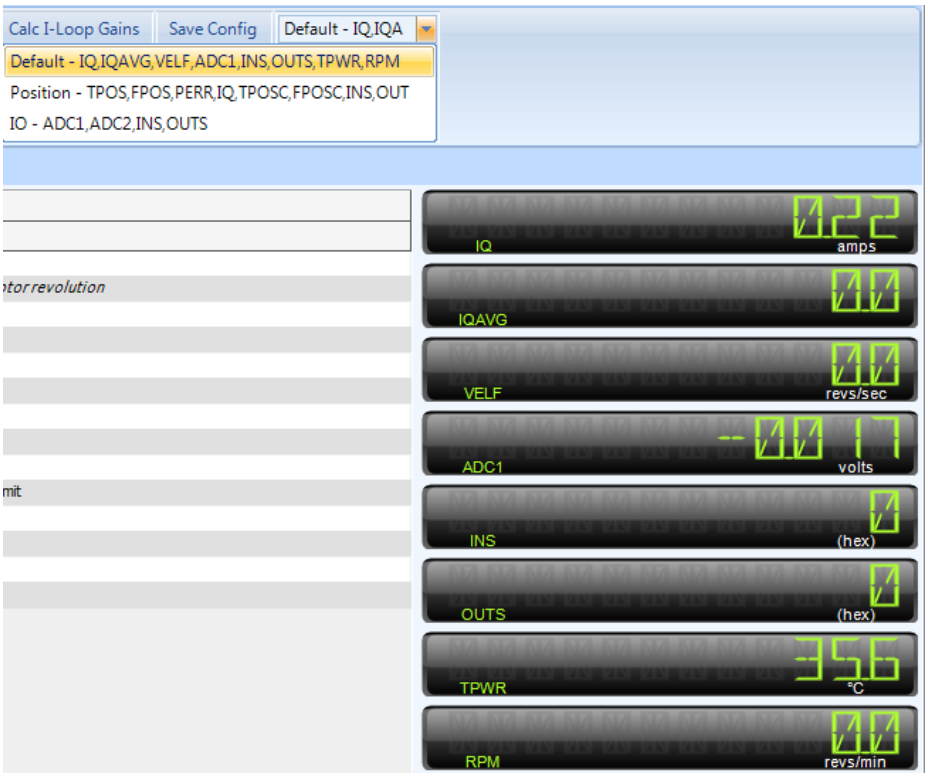


Figure 13: Select Predefined Gauges

10.0 Control Tab

This tab provides access to drive parameters and four real-time displays of selected variables. Using the "Capture" function, drive parameters can be adjusted while observing the response variable in real-time. This function is particularly useful for control loop tuning.

At the bottom of the window, use the "Time-Base" selector to choose the rate at which points are captured. For higher resolution data capture, utilize the "Analyze" tab.

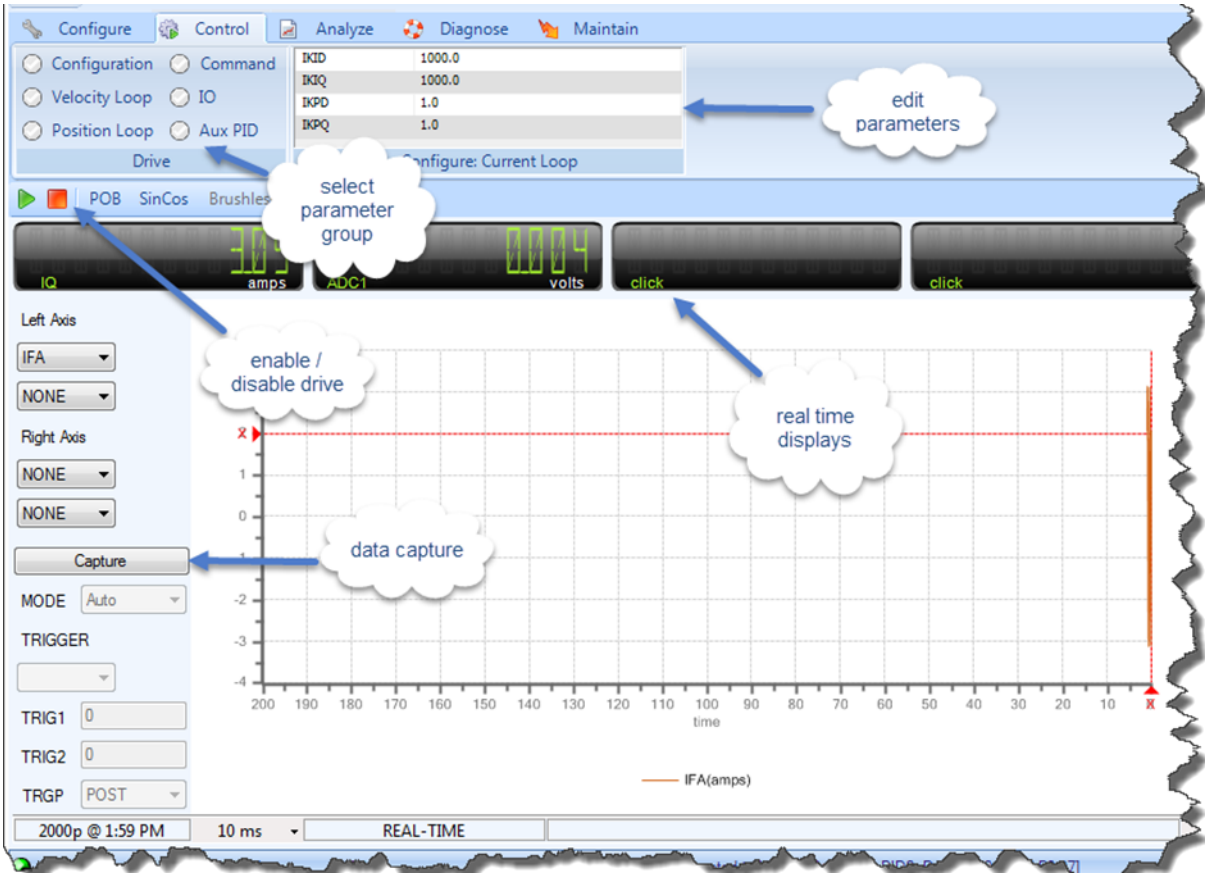


Figure 14: Control Tab Overview

11.0 Analyze Tab

This tab provides access to drive parameters and four high resolution displays of selected variables. Using the "Capture" function, drive parameters can be adjusted while observing the response variable.

At the bottom of the window, the "Time-Base" and "Capture Depth" selectors choose how often and how many points are captured.

Once data is captured and displayed, the user can select an area in the graph and drag a rectangle to zoom into the data for closer analysis. Use the scroll-bar to scroll left-and-right in time when zoomed in. Double-click in the graph area to zoom out.

The captured data can be saved in .CSV format by clicking "Save As CSV" or as a .PDF using "Save As PDF".

11.1 Mode

"AUTO" starts capture immediately after the "Capture" button is clicked.

"TRIG >= TRIG1" starts capture when the selected "TRIG" variable is above or equal to

the limit specified in the “TRIG1” field.

“TRIG <= TRIG1” starts capture when the selected “TRIG” variable is below or equal to the limit specified in the “TRIG1” field.

“Outside a range” starts capture when the selected “TRIG” variable is outside the bounds specified in the “TRIG1” and “TRIG2” fields.

“Within a range” starts capture when the selected “TRIG” variable is within the bounds specified in the “TRIG1” and “TRIG2” fields.

“FG1” starts capture when the function generator is close to commanding **FGC1** (pre-triggered before switching from **FGC2** to **FGC1**).

“FG2” starts capture when the function generator is close to commanding **FGC2** (pre-triggered before switching from **FGC1** to **FGC2**).

“UTRIG” triggers off of a command in a POB (Program Object Block).

“TRGP” (trigger position) allows the data to be captured in time with respect to the trigger event.

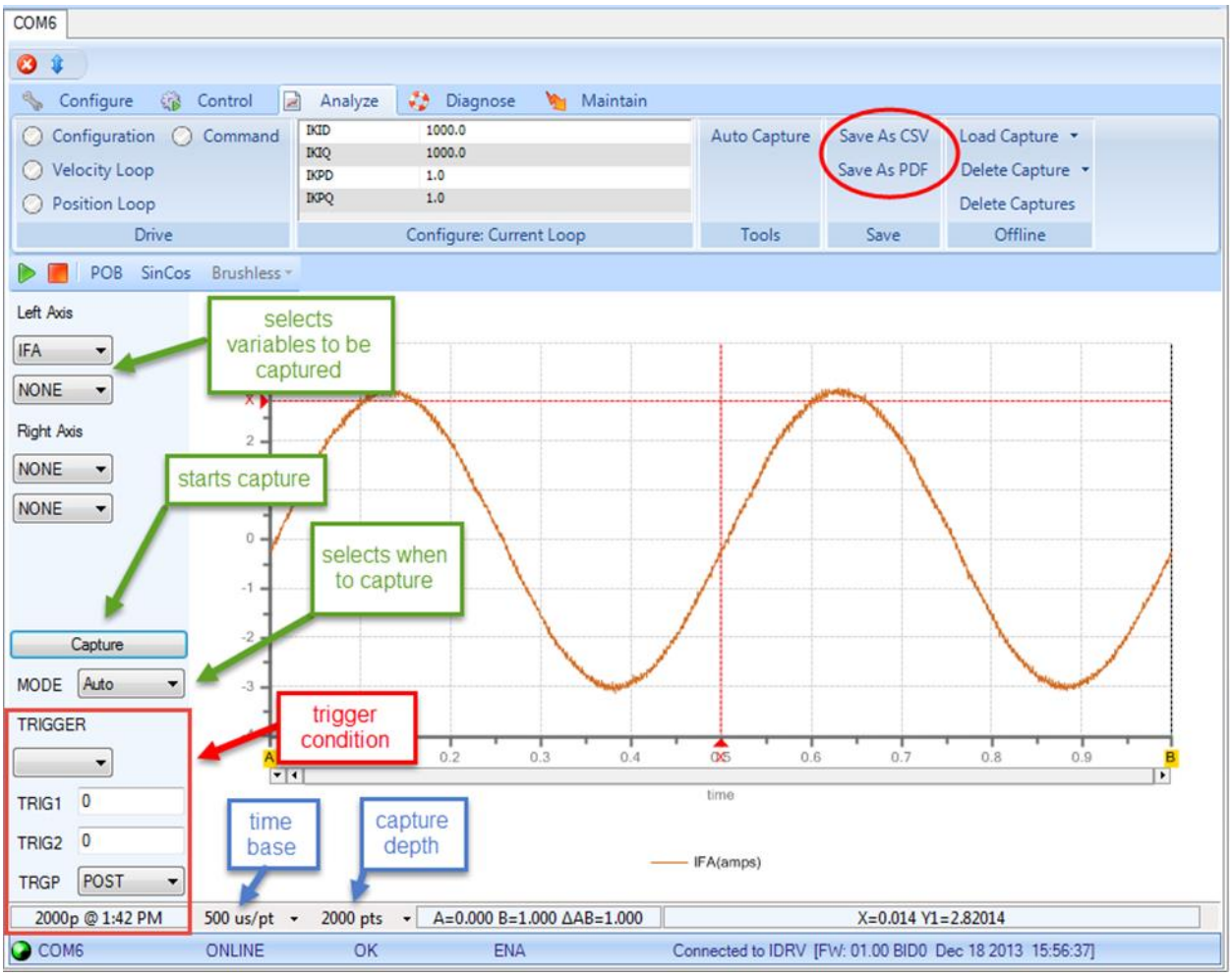


Figure 15: Analyze Tab Overview

12.0 Diagnose Tab

This tab allows the user to view and clear drive faults.

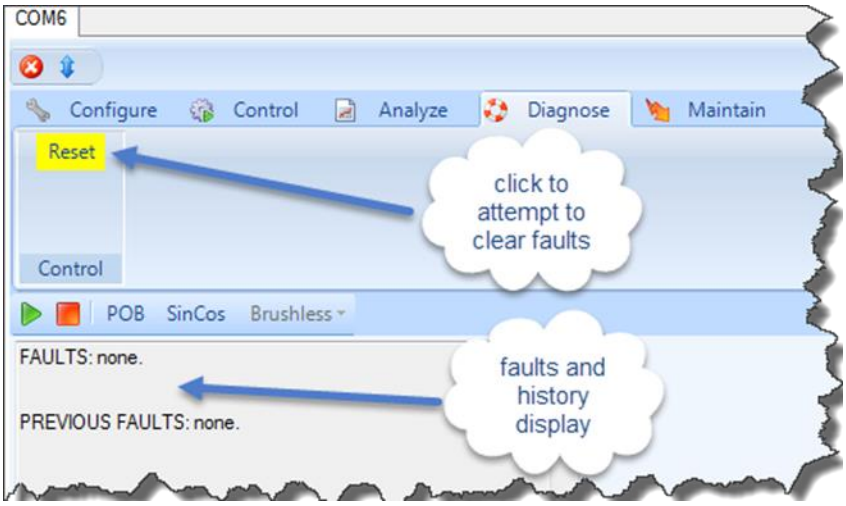


Figure 16: Diagnose Tab Overview

13.0 Maintain Tab

This tab is used to update device firmware and stored programs. Files must be saved locally on your PC in order to upload them to a device using IN Control.

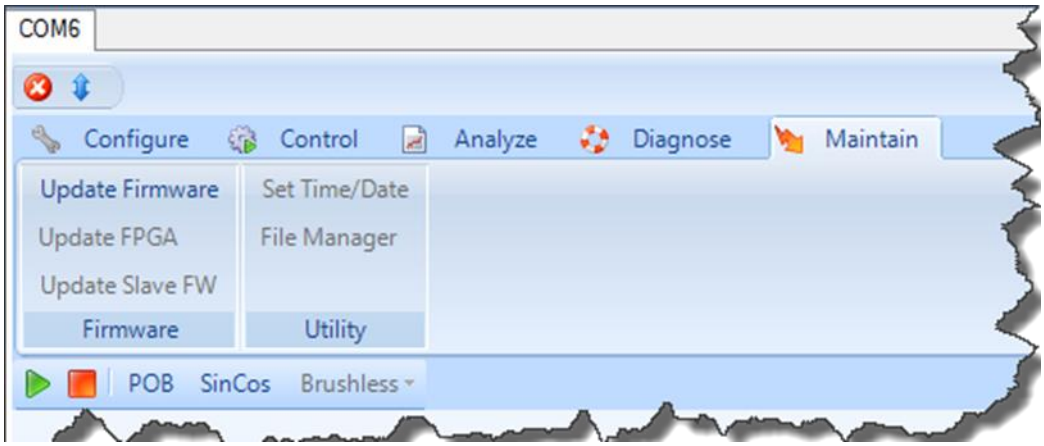


Figure 17: Maintain Tab Overview

13.1 Update Firmware

Clicking on this button allows the user to choose a firmware file to load into a drive or controller. Download the latest operating firmware for your drive from the company website.

13.2 Update FPGA

Clicking this button allows the user to choose an .FPGA file to load into a controller only.

13.3 Update Slave Firmware

Clicking this button allows the user to choose a slave firmware file to load into each and every slave axes of a multi-axis controller only.

13.4 Set Time/Date

Clicking this button sets the time and date of a controller.

13.5 File Manager

Clicking this button allows files to be stored and/or deleted from the flash memory of a controller. Any type of file (program, documentation, etc.) can be stored in the controller flash memory.

14.0 AML Editor

Allied Motion Language (AML) is a programming language for controllers manufactured by Allied Motion. See "34-2201 Software Manual: AM Programmability Standard" for details on how to program using AML.

Clicking on the "AML IDE" button opens a new window which is used to edit and run POBs (Program Object Blocks) in a controller.

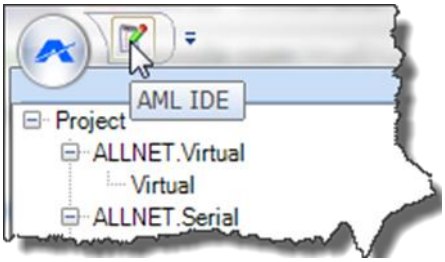


Figure 18: AML IDE Button

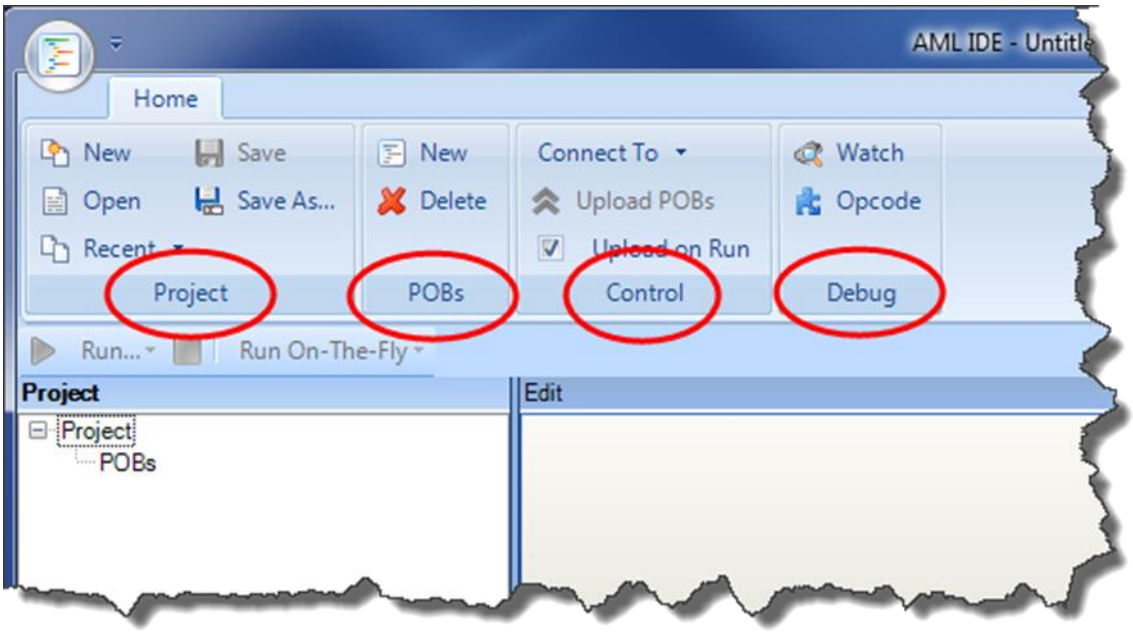


Figure 19: AML Editor Overview

14.1 Project

This group includes buttons to start new projects, open existing projects, and save projects.

14.2 POBs

This group contains buttons to open a new POB and delete an existing POB. A project can contain multiple POBs.

14.3 Control

This group allows a connection to the target controller. Once connected to a controller, POBs can be uploaded and run. When the "Upload on Run" checkbox is checked, IN Control will automatically upload all POBs when the "Run MAIN" (green 'start' button) is clicked.

14.4 Debug

This group allows a watch window to be opened which allows a programmer to watch and change global AML variables.

14.5 Run MAIN/Stop

The green "Run MAIN" button starts the POB named MAIN in background on the supervisory axis (axis 0).

The red “Stop” button stops all POBs that are currently running on the controller.

14.6 Run…

This button allows a user to quickly execute and test a POB by executing it on a particular axis.

14.7 Run On-The-Fly

This button allows a user to quickly develop, execute and test a POB in the AML IDE where the POB will ultimately be used for on-the-fly operation using the ALLNET and associated frameworks

15.0 Revision History

Revision	Description of Change	Date
R1	Initial release.	June 9, 2014
R2	Renumbered document sections.	August 22, 2014