DESIGN
CONTROL
DRIVE
CONNECT

Ensemble

The Power to Differentiate Your Process

The Ensemble Motion Composer Suite is the development solution your motion control application needs. Part of the Ensemble multi-axis motion control platform, the Motion Composer Suite allows you to deploy advanced automation solutions to outpace your competitors. The suite includes the following products:

- Ensemble Configuration Manager
- Ensemble Motion Composer IDE
- Ensemble Digital Scope

Powerful Technology, Simply Integrated

The Ensemble is a powerful performance tool. The Motion Composer Suite gives you more precision at your fingertips through a user-friendly interface. Using the Motion Composer Suite, you can deploy real-time application code to a controller that easily communicates to your larger automation control system.

Connect and Go

With Aerotech, setting up your motion control solution is easy. Quickly set up drives, motors, and stages with the Configuration Manager application. This is one of several tools integrated in the Motion Composer Suite that makes controller and servo drive configuration fast and effective. You can quickly develop a new solution or work from an existing configuration by using advanced parameter importing and exporting tools.

Setting up process automation is also quick and easy. The Ensemble Motion Composer Suite allows you to deploy a controller that can talk over EtherNet/IP, Ethernet TCP/IP, RS-232, RS-485, and Modbus TCP.

Fieldbus I/O and expandable I/O on Aerotech drive hardware is directly accessible within the AeroBasic real-time programming language.

Develop and Test Real-Time Applications

The Ensemble Motion Composer Suite includes a powerful environment for real-time developers. With the

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PRODUCT HIGHLIGHTS

Development software; part of the Ensemble platform

Deploy complex multi-axis machine and motion control processes

Connect to and deploy programs to a variety of Ensemble controller/drive hardware products

Manage the connection and configuration of interface to EtherNet/IP industrial fieldbus networks

Powerful tools for setting up and configuring Ensemble drive solutions

Deploy powerful real-time application solutions

Integrate motion and process tool control with the AeroBasic programming language

AEROTECH

Motion Composer IDE you can develop, debug, and deploy real-time application code to the controller.

For developers who aren't working at the real-time level and prefer a standard programming language, the controller can be accessed via .NET, C, and C++ libraries; a REST API; a MATLAB library; and LabVIEW VIs.

Tune and Optimize Your Process

Optimize motor setup and servo performance with the Digital Scope application's optimization tools. Ensure that your motor is phased and commutating correctly and that the encoder is optimized for performance. Continue to optimize by evaluating the servo loop and using powerful loop shaping tools to maximize performance.

Or take the easy route. Use Aerotech's EasyTune one-button servo optimizer that makes tuning simple.

Getting Results

The Motion Composer Suite can optimize applications that use different types of motion, including point-to-point, contoured, and holding position. It can optimize your application no matter the level of precision. Run your motion program on the controller while the Digital Scope collects position, velocity, and acceleration commands, feedback, and error. The results are plotted in multi-dimensional views, and Fourier transforms are performed to identify any troublesome frequency content.

Relationship-Driven Support

During each phase of your development process and your machine's operational life cycle, we have a team ready to support your needs. Our Field Sales and Application team is an extension of your design team even while you are still considering solution options for your system.

When engineering your solution, Aerotech serves as a resource. We can be brought on as a design partner, or we can offer a simple consultation. Customers use our system engineering expertise to expand upon their own capabilities.

As you build, commission, operate, and service your system, Aerotech's global technical support team supports and guides your efforts. We have technology experts that can optimize your process and develop code for your machine.

Motion Control Software for Your Challenging Application

Set Up Your Devices

Use the Configuration Manager to set up and manage all of the devices in your automation solution. Parameters that are stored on the controller and servo drives are set up and managed with the Configuration Manager.

Help is easy to access. Simply click on the item you are setting up and the help screen updates with detailed, relevant content.
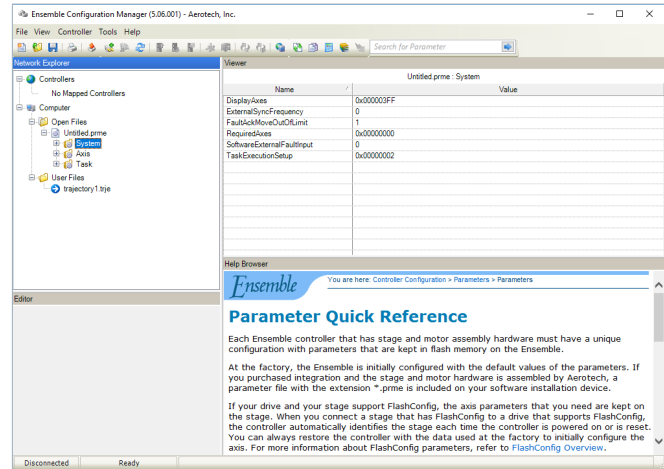
Don't Guess. Calculate!

Aerotech makes setting up a motion control solution simple. Quickly set up your system's motors and stages with the Axis Parameter Calculator. All of Aerotech's mechanical stage and motor drive products are included in a detailed database accessible through simple drop-down menus. Choose your mechanics and verify the load, motor, drive, programming units, feedback type, servo-loop target performance, and (optional) current loop target performance. Click "apply" and you're done. Your system is now ready for detailed tuning and optimization.

AEROTECH
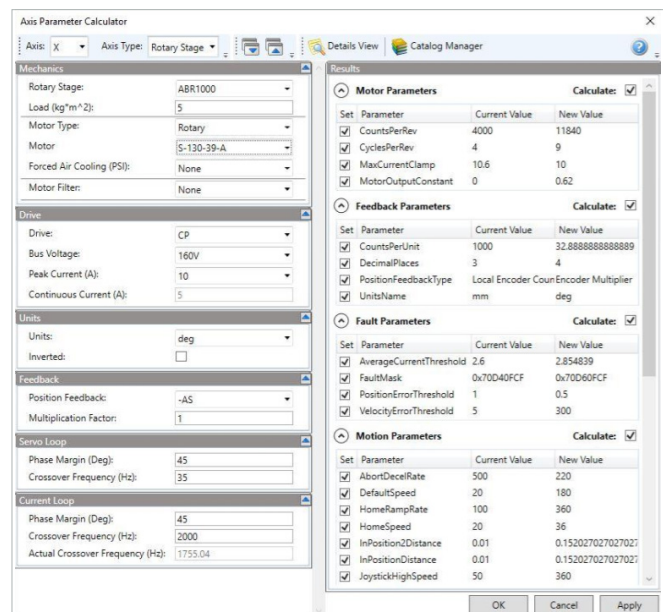
Single Button Simplicity

Simplify the process of tuning and optimizing your motor through a series of single push-button tools. Some of the tools' functionalities include:

- Setting up proper motor phasing
- Correcting Lissajous errors from analog encoders
- Tuning the motor
- Running a loop transmission
- Best-fitting filters based on a loop transmission

Know What You're Working With

Aerotech's Motor Phasing Calculator is used to verify incorrectly wired motors. With the push of a button, this calculator identifies and compensates for unexpected motor power wiring and misalignment between the motor phasing and the feedback device. These corrections are accessible through the push of a button and are required checks for AC brushless motors with and without Hall effect switches.
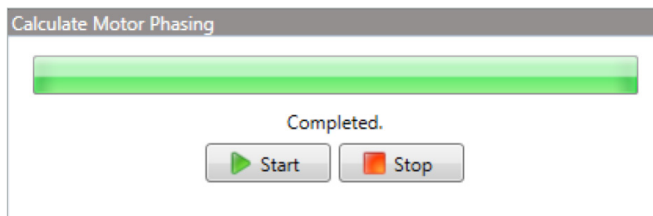


Feedback You Can Trust

Performance of an analog sine-wave encoder is optimized when the Lissajous pattern is corrected. A process that once required an oscilloscope is now performed with a single click of a mouse. The Feedback Tuning tool applies a simple move to the stage and graphically displays a Lissajous pattern with the correct phase and amplitude adjustments.
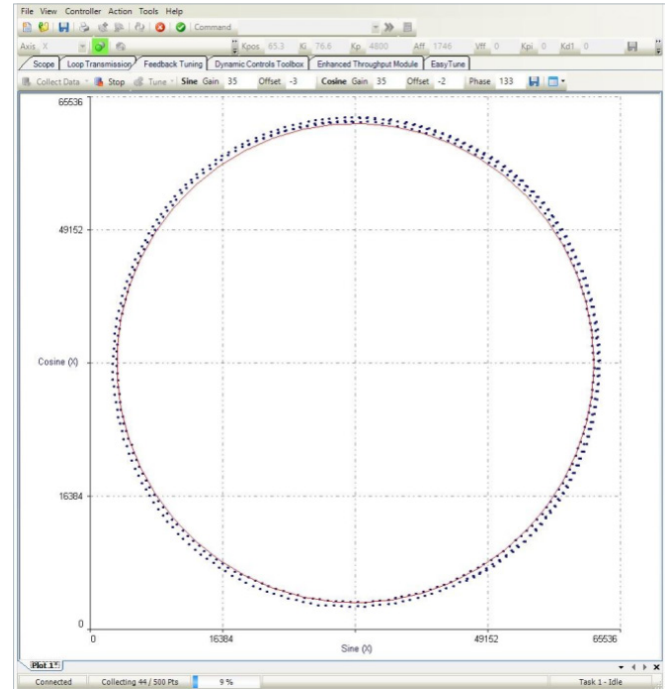
EasyTune

EasyTune® is the most advanced autotuning tool available. Entirely data-driven, the algorithm mimics the process followed by an experienced controls engineer. EasyTune begins with a system identification operation. It continues with the development of a baseline stabilizing controller followed by progressively more sophisticated compensation via loop-shaping procedures.

In just minutes, the system has the highest bandwidth practical, all with no input from the user!
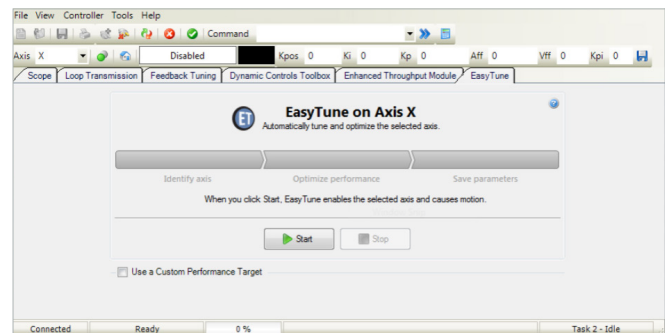
Advanced Tuning for Advanced Users

For users who prefer or who want to become more familiar with servomotor tuning, advanced tuning tools are available.

Aerotech supports 11 different response types, five different digital filter types plus the ability to autofit digital filters, two different excitation methods, pole-zero plots, quick loop shaping tools, and many more advanced features.

These advanced tools make it simple to evaluate and optimize complicated systems.

Aerotech can work with you to optimize your system. Not only do we have powerful tools, but we also have motion control experts that are partners in your success.
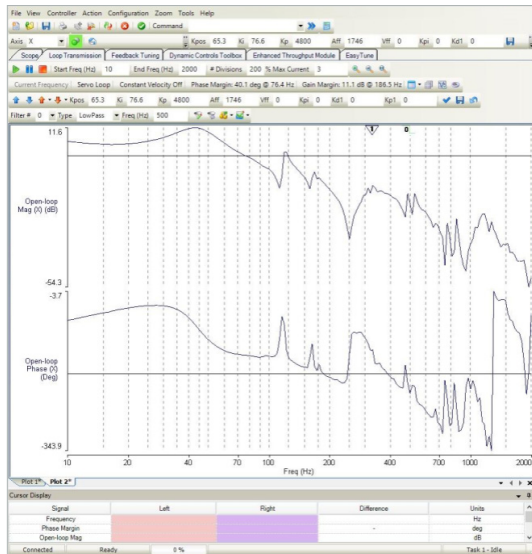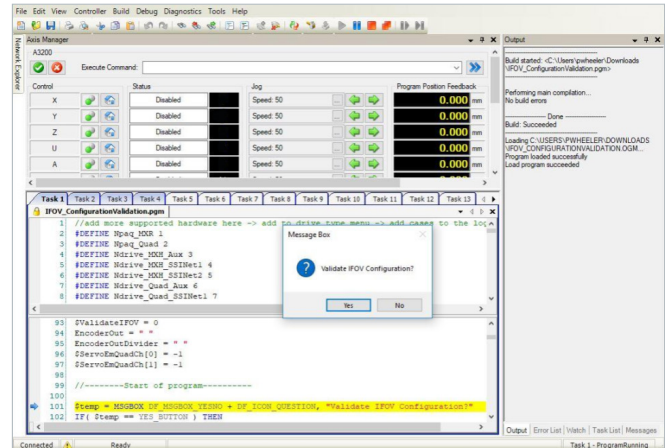

Powerful Programming

The Ensemble Motion Composer IDE is a powerful part of the software suite for developing a motion control program. With the Motion Composer IDE you can write and debug programs using standard program execution controls (start, stop, pause, compile, etc.), and standard debugging controls (breakpoints, step into, step over, and syntax highlighting).
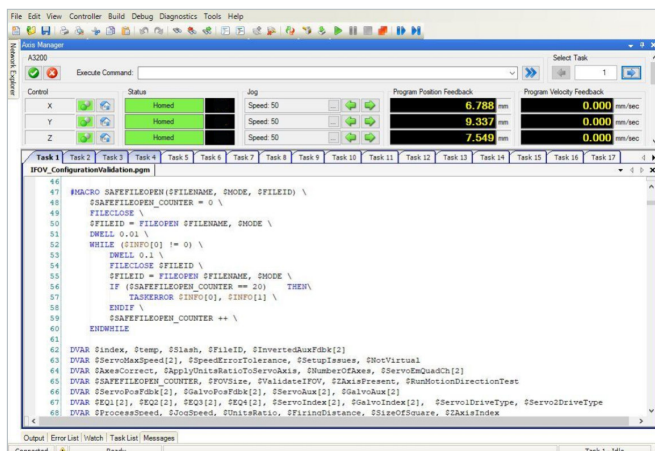
More than Motion

The ability to combine motion control with process tool and automation makes the AeroBasic™ programming language the motion control industry's most powerful tool. Access language features such as program flow control, a TCP/IP communication library, math functions, I/O commands, file and serial port communications commands, and several advanced controller features.

Additional features include detailed error explanation in error list, full diagnostic instrumentation while debugging, a watch window that shows variable values for easy debugging, a link to the help file for a description of the error, and a full featured CNC-style axis manager.

Debugging and Optimizing

Debug Your Automation Programs

The Motion Composer IDE includes powerful tools to help you review and debug your programs. You can insert breakpoints, run and pause your program, step into or step over subroutines, and toggle breakpoints.

All of these debug features are easily accessible on a top-level menu bar in the IDE.
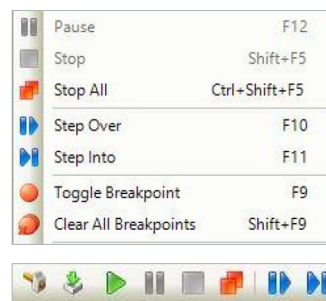
Optimize Your Motion

Building a motion control solution requires that your motion is optimized. In the motion control world, throughput and accuracy are two important considerations.

The Digital Scope application has tools to detect how well the system is moving. Collect and analyze more than 60 standard axes signals and 10 standard task signals with a software oscilloscope capable of 2D graphs and FFT analysis.

Seeing this feedback allows you to visualize how well your motion system is following the desired path, how fast it is settling into position, or how well it is holding a target position. When things aren't working the way intended, you can monitor signals such as velocity feedback and current command feedback to get an idea of what could be causing the error.

Use the Scope tab in the Digital Scope in combination with Aerotech's different tuning tools to optimize motor and motion performance.
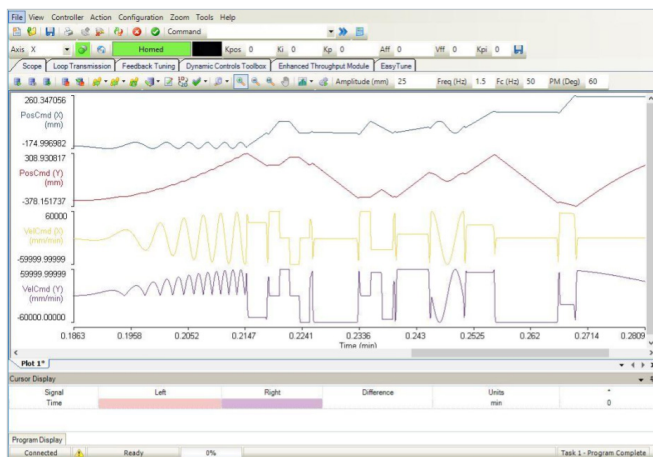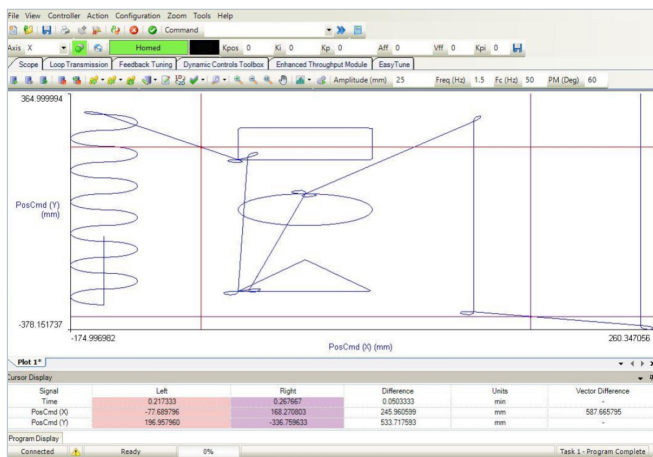
Tools, Tools, and More Tools

Built for Expansion

Want to add a device to your database? No problem. The Catalog Manager lets you add an unlimited number of devices to your library. Use the Axis Parameter Calculator to quickly set up the motors and stages that you added to your device database.
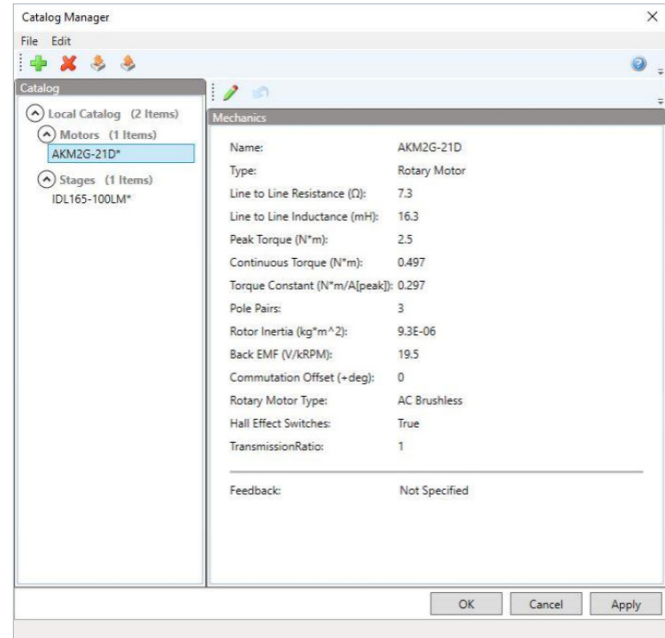
Programming Libraries

.NET, C, and C++ Libraries Plus REST Interface

Aerotech's standard controllers are flexible enough to handle almost any control application. From simple motion to coordinating and synchronizing the motion of multiple axes in your machine, Aerotech motion controllers provide the flexibility and power required for today's automation challenges, and it is all accessible through powerful programming libraries.

MATLAB® Library and LabVIEW® VIs

Users who program in MATLAB and LabVIEW can benefit from Aerotech's powerful motion control tools. Integrate into your native environment with well-documented libraries.

Ensemble Motion Composer Suite **Minimum PC Requirements**

Option	Requirements
Processor	Intel Pentium 4 or faster
RAM	1 GB or more
Operating System	32-bit or 64-bit version of one of the following: • Microsoft Windows 10 • Microsoft Windows 8.1 (any Service Pack) • Microsoft Windows 7 (any Service Pack) Other operating systems are not supported
Graphic Display	1024 × 768 pixels or higher resolution
Hard Disk Space	500 MB available disk space
Microsoft Internet Explorer	Internet Explorer 6 or later[1]
Required Peripherals	Keyboard, mouse and CD-ROM drive

1   Internet Explorer is not included as part of the Ensemble installation. If it is not installed on your computer, you must manually install it before you continue with the Ensemble installation.

Ensemble Motion Composer Suite **Software License Specifications**

Option	Configuration	Description
Ensemble	Order Entry Point	Full installation of the Ensemble Motion Composer Suite and unlocks certain features on the Ensemble drive-based controllers Pricing is summation of selected products. Maintenance (software update) included in price for one year from date of purchase. The Ensemble Motion Composer Suite is intended for deployment on desktop or industrial PCs Includes: • Ensemble Configuration Manager • Ensemble Motion Composer IDE • Ensemble Digital Scope • Ensemble Help • Programming Help The Ensemble is not multilingual and cannot be used in applications that require a native-language user interface
License	Machine	Contains both the **Ensemble Motion Composer Suite** and options that enable features on an Ensemble Drive-Based Controller Provides the ability to: • Write, compile, execute, debug programs in AeroBasic • Full access to .NET, C, and C++ libraries • Access full diagnostics, fault, and status information • Access and set I/O, registers, and variables • Collect, analyze, and save data • View files from machine for analysis and record keeping • Connect PC to machine through Ethernet TCP/IP or USB • Upgrades can be installed (firmware or controller) using loader
	Machine Upgrade	• Use to change configuration options on an existing machine license • Requires the current license ID from customer • Price is based on the new options added • Maintenance extension is a separate line item
	Machine Addition	Increases the number of licenses associated with an existing key
	License Extension	• Extends the maintenance period on an existing license • Can be purchased in yearly increments
	Media Only	License ID distributed on the specified media

Ensemble Configuration Manager **Features**

Use the Configuration Manager to create and modify parameter files, set the active parameter file, establish the correct connection settings, and load program automation files to the controller.

The main menu and toolbars give you access to almost all of the features that are available in the application. Below the main menu, the Configuration Manager has four window panes or sections:

- **Network Explorer:** Set up the controller and organize files.
- **Viewer:** Shows contextual information about the current selection in the Network Explorer. For example, when you select a parameter category, all of the parameters in that category show in the Viewer.
- **Editor:** Modify the values of different items such as the name of a controller or the value of a parameter.
- **Help Browser:** Shows the help topic for the subject that you select in the viewer.

Configuration Manager includes the following tools/wizards:

Item	Tools/Wizards
Catalog Manager	Create a catalog of motors and stages that are not standard Aerotech motors and stages
Connection Settings	Use the Connection Settings dialog to configure the connection settings of individual controllers and to map and un-map controllers
Axis Naming Tool	Simple tool to assign customized axis names to controller axes 1 through 10. An axis name can be any string of letters, numeric digits, and underscores.
AbsoluteFeedbackOffset Calculator	Calculate the correct value for the AbsoluteFeedbackOffset Parameter on piezo stages
Analog and Digital Filter Calculators	Calculate coefficients for the two filters on analog and digital inputs that are available on each axis
Axis Parameter Calculator	The primary calculator to use to configure an axis. You can use this calculator to configure axis types that include ball-screw stage, linear stage, rotary stage, voice-coil stage, and no stage (motor only). For each axis, you can specify information about the mechanics, drive, units, feedback, servo loop, and current loop.
Encoder Resolution Changed Calculator	Helps users to manage changes in encoder devices and encoder resolutions. This calculator comes into view when you change certain encoder and feedback parameters.
Gantry Home Offset Calculator	Calculates the correct value for the HomeOffset Parameter on the gantry slave
Motor Phasing Calculator	Calculates the correct values for parameters that allow you to compensate for motor wiring problems
Scaling Factors Changed Calculator	Scales other parameters that are entered in user units to match a new CountsPerUnit value

Ensemble Motion Composer IDE **Features**

Ensemble Motion Composer IDE is an environment for developing and debugging AeroBasic programs for Ensemble controllers. It has a feature-rich program editor with the following features:

- Line number indicators (for each line)
- Breakpoints (indicated by a breakpoint icon)
- Current Line indicator (indicates the next line to be executed)
- Status bar (indicates the file path, line, column, and character number)
- Syntax highlighting:
  - Commands: Blue
  - G-Codes and M-Codes: Dark Blue
  - Strings: Red
  - Variables and Registers: Brown
  - Parameters: Purple
  - Constants: Gray
  - Comments: Green

It also functions as a basic interface and can be used to do the following tasks.

- Command basic motion
- Inspect diagnostic information
- Do basic configuration (for advanced configuration options, use Configuration Manager)

Editing Programs

Each controller task is identified by a tab. You can open files in a specific task tab and use the files to debug programs that are running in that task. If you open files in multiple task tabs, the files are linked together. If you make changes to one file, the changes are applied to all linked files.

Building and Loading Programs

When building programs, the build file is always the active file and is always a .pgm program. The Compiler output is sent to the Output Window, and errors are shown in the Error List. The loading program builds the current AeroBasic program, loads it onto the controller, and sets the task to the Program Ready state. You can then execute the program.

Running and Debugging Programs

In the Motion Composer IDE, you can take advantage of a full suite of tools to run and debug a program.

The following actions are available for running and debugging a program:

- Run the selected AeroBasic program
- Pause the active program
- Stop the program associated with the active task
- Stop all programs (on all tasks)
- Toggle a breakpoint
- Clear all breakpoints
- Toggle line highlighting
- Variable Watch
  - View and edit the value of Global Variables, Task Variables, Program Variables, Virtual Binary I/O Bits, and Virtual I/O Registers
- Load Symbols
  - Tries to load symbolic information for the current program
- Step Over
  - Executes one line of the program that is associated with the active task
  - For a subroutine call (CALL or FARCALL), it executes all of the subroutine and moves to the next program line
- Step Into
  - Executes one line of the program that is associated with the active task
  - If the program line is a subroutine call (CALL or FARCALL), it steps one level into the subroutine
- Step Out
  - Runs the program until it exits the function that is currently running

Issue Immediate Commands

An immediate command is a one-line AeroBasic program that executes on a task. These commands are issued from the Command Box or by using the IMMEDIATE EXECUTE AeroBasic command from a program. This functionality is perfect for simple commands such as:

- Asynchronous motion commands
- Setting parameters via AeroBasic commands
- Setting variables
- Setting modes (for example, absolute/incremental programming modes)

Most immediate commands can execute on a task at the same time a program is running on that task. Some of the more complicated commands require that the task program is stopped.

Ensemble Digital Scope **Features**

The Ensemble Digital Scope is a system analysis and tuning application that lets you optimize system performance using a collection of advanced tuning tools and features. With system analysis tools, you can plot and graphically analyze system data. With tuning tools, you can automatically calculate servo-loop and feedback device parameters.

The Digital Scope application includes a variety of utilities that let you perform analysis and tuning operations.

Scope: A Powerful Digital Oscilloscope

The Scope Tool is used to collect and view 1D or 2D data. A Configure Data Collection tool gives you access to all Axis, System, and Task data items. Customize the signals that you are interested in seeing, the resolution of collection, the number of points, and how the signals will appear on your visual plotter. Enjoy zoom in/out/extents control and dual cursor control as you evaluate your data in 1D or 2D format. Quickly switch between 1D and 2D and perform Fourier Transforms on collected signals.

Integrate data collection when using Step Forward, Step Back, and Auto Step controls. These tools allow you to configure simple axis motion and coordinates data collection, as configured, with that motion.

The Scope Tool also provides the capability to autotune the servo loop of an axis. Use autotune to calculate a set of servo loop gains. Simply excite the axis by using a predefined input. The output is measured and new servo loop gains are calculated by the autotune feature.

EasyTune: More Automatic than Autotuning

EasyTune is a one-button tool that automatically tunes and optimizes an axis. When EasyTune is finished, the optimized servo gains and servo filters are committed to the controller.

Loop Transmissions: For Those Who Analyze

Use the Loop Transmission utility to analyze the characteristics of the servo loop and the associated mechanical system. The Loop Transmission measures the response of the servo loop. Signals are sampled and displayed for magnitude and phase analysis.

Powerful "loop shaping" tools are available to the user. These tools work with the existing data and show a prediction of an updated loop transmission response plot should new servo gains and parameters be applied. These loop shaping tools include:

- Warnings for feedback data that indicate unstable behavior
- Single button optimization of the servo loop gains and digital filters
- Single button assignment of all digital filters
- Graphical shifts of the predicted open-loop magnitude and phase
- Graphical additions of Low Pass, Notch, Lead Lag, and Resonant filters
- Direct editing of the digital filters in the frequency response plotter utility
- The ability to overlap multiple loop transmission plots

Feedback Tuning: Removing Error from Precision Feedback Devices

Tune the feedback device signals so that optimum performance can be achieved. This utility can only be used with analog feedback devices. The goal of the feedback tuning utility is to tune the feedback device so that the Lissajous pattern received from the feedback device closely matches the ideal Lissajous circle pattern. This tuning is applicable to sine-wave encoders and resolvers. It can also be applied to situations that use dual loop sine-wave (position and velocity) tuning.

Add-On: Dynamic Controls Toolbox

The Dynamic Controls Toolbox includes a collection of controller-level algorithms designed to improve machine positioning, increase throughput, and reduce cycle times. These tools include: Harmonic Cancellation, Command Shaping, and Cross-Axis Feedforward.

Add-On: Enhanced Throughput Module

The Enhanced Throughput Module (ETM) is a physical sensor that is added to your mechanical motion system. It can improve machine throughput by measuring base or frame vibration directly and using this information in the servo control algorithm. The Enhanced Throughput Module interface in the Digital Scope allows this sensor and its input to be configured on the controller.

Ensemble **Ordering Information**

Ensemble

Ensemble	Ensemble Motion Composer Suite

License Options

License	
-Machine	Ensemble software installation on a single PC
-Machine upgrade	Ensemble software configuration change of license
-Machine addition	Ensemble software increase license count for existing key
-License extension	Ensemble software extend maintenance period of license
-Media only	Ensemble software distribute current license on media

Media	
-Download	Installation media provided for download only
-USB	Installation media provided on a USB drive
-CD	Installation media provided on compact disk

Version	
-Default	Current version of software/controller
-Legacy	Legacy version of software/controller

Maintenance	
-Maintenance-X-00	Software/controller maintenance for x year(s) after purchase where X is one through seven. One year is default.

Software-Based Controller Configuration

Dynamic Controls Toolbox	
-Dynamic Controls Toolbox	Aerotech Advanced Controls

Enhanced Throughput Module	
-Enhanced Throughput Module	Setup and monitoring screens for ETM modules

Enhanced Tracking Control	
-Enhanced Tracking Control	Reduced dynamic following error and settling times

EtherNet/IP	
-EtherNet/IP	EtherNet/IP class 1 I/O, ASCII command, and register interface objects

Motion Designer	
-Motion Designer	Trajectory creation and evaluation software

LabVIEW	
-LabVIEW	Includes LabVIEW 2010 (forward compatible) VI samples

MATLAB Libraries	
-MATLAB	MATLAB library for motion, parameters, and data collection

Ensemble Controller Connection Cable (Items Ordered Separately)

PC to Ensemble Drive/Controller Cable	
ENET-XOVER-xx	Ethernet crossover cable (available in length xx where xx = 9, 15, 30, 45, 60, 75, or 150 dm)
USB-AMBM-xx	USB A-Male to B-Male cable (available in length xx where xx = 5, 10, 30, 50, or 200 dm)

AeroNet Communication Network (Items Ordered Separately)

Ensemble Drive-to-Drive Cable	
ENET-CAT6-xx	Shielded Ethernet CAT6 cable (available in length xx where xx = 3, 6, 10, 20, 30, 45, 76, or 90 dm)