

SPIiPlus ADK Suite 3.14

Release Notes

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PATENTS

Israel Patent No. 235022

US Patent Application No. 14/532,023

Europe Patent application No.15187586.1

Japan Patent Application No.: 2015-193179

Chinese Patent Application No.: 201510639732.X

Taiwan(R.O.C.) Patent Application No. 104132118

Korean Patent Application No. 10-2015-0137612

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1. Introduction

1.1 Document Scope

This document describes new features and changes that were introduced since the previous SPiiPlus ADK Suite version release. For a description of all common features, refer to the documentation included in the SPiiPlus ADK Suite v3.14 installation package.

This document is intended for the use of all persons interested in ACS products.

1.2 ADK Suite Components Overview

This release includes the following components:

- > SPiiPlus Firmware version 3.14
- > SPiiPlus Simulator version 3.14
- > SPiiPlus MMI Application Studio version 3.14
- > SPiiPlus Upgrader version 7.4.0.0
- > SPiiPlus .NET Library version 3.14
- > SPiiPlus User-Mode Driver version 7.4.0.0
- > SPiiPlus C Library version 7.4.0.0
- > SPiiPlus COM Library version 7.4.0.0
- > SPiiPlus MATLAB Library version 3.14
- > SPiiPlus Linux Library version 3.14
- > SPiiPlus Python Library version 3.14
- > ACS Communication Service version 3.14

2. SPiiPlus ADK Suite Compatibility

2.1 Backward Compatibility

SPiiPlus ADK Suite Version 3.14 is compatible with previous SPiiPlus versions.

- > Most ACSPL+ applications and host applications, prepared for previous versions, can be used with SPiiPlus ADK Suite Version 3.14 with no changes.
- > The user interface of the SPiiPlus MMI Application Studio has been upgraded.
- > Axis adjustment using previous versions do not require re-adjustment with SPiiPlus ADK Suite Version 3.14; hardware changes, however, may require re-adjustment.
- > After updating firmware to Version 3.14, the controller must be reconfigured with System Setup in the MMI 3.14.



System configurations saved to database using MMI V3.14 cannot be used in MMI 2.30 and lower versions.

2.2 Windows Platform Support

SPiiPlus ADK Suite Version 3.14 supports the following Microsoft® Windows environments:

- > Windows 10 (x64)
- > Windows 11 (x64)
- > Windows Server 2016 R2 (x64)
- > Windows Server 2019 (x64)
- > Windows Server 2022 (x64)

2.3 Firmware Support

Firmware version 3.14 should only be used with hardware revisions listed in the following table, or higher.

Product Name	Revision Supported
SPiiPlusCMhp/ba	E
SPiiPlusCMxa	A
SPiiPlusCMhv	F
SPiiPlusCMnt	D
IDMsa/ECMsa	A
IDMsm/ECMsm	A
IDMma/ECMma	A
IDMdx/ECMdx	A
SPiiPlusEC	B
SPiiPlusES	D
MC4U (SPiiPlusNT controller)	FA
MP4U (MPU3U controller)	C

3. New ACS Product Support

3.1 SPiiPlusSC for Linux PCs

The SPiiPlusSC platform has been enhanced to include support for Linux operating systems, enabling customers to select the operating system that aligns with their preferences and meets their specific demands and system requirements.

Ubuntu v22.04 distributions are supported.

See *SPiiPlusSC Installation and Setup Guide* documentation for details.

3.2 Updated Ordering Options for ECMdx, IDMdx and UDMdx

- > New 1 axis 30/60A configuration option for 100-240VAC or 400VAC
- > Mandatory XDMdx-ACC2 motor connector kit accessory required

4. MMI Studio Enhancements

For more comprehensive information on the additional features and improvements of the new MMI Applications Studio, please refer to the *SPiiPlus MMI Application Studio User Guide*.

4.1 Program Buffer Shortcut Key Configuration

The MMI Application Studio Program buffer now includes a newly implemented keyboard shortcut configuration panel, which enables users to personalize their own shortcut keys and mouse combinations to improve efficiency and productivity.

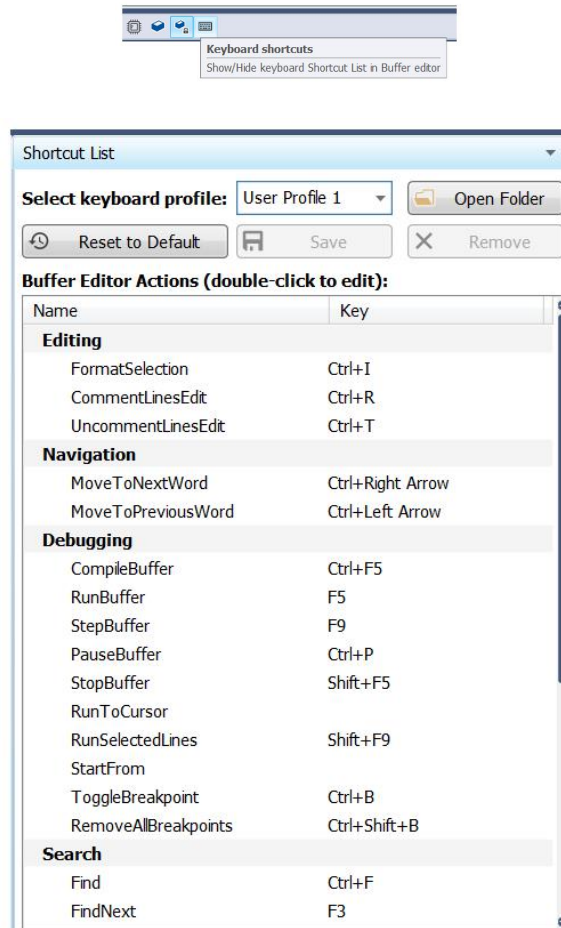


Figure 2-1. Buffer Editor Shortcuts Window

4.2 Protection Wizard Enhancements

An additional layer of security has been added to The Protection Wizard with the implementation of a secondary password-protected function. The optional secondary password protection complements the primary password protection and supports the encryption of additional unprotected buffers and system configurations using a second unique password.

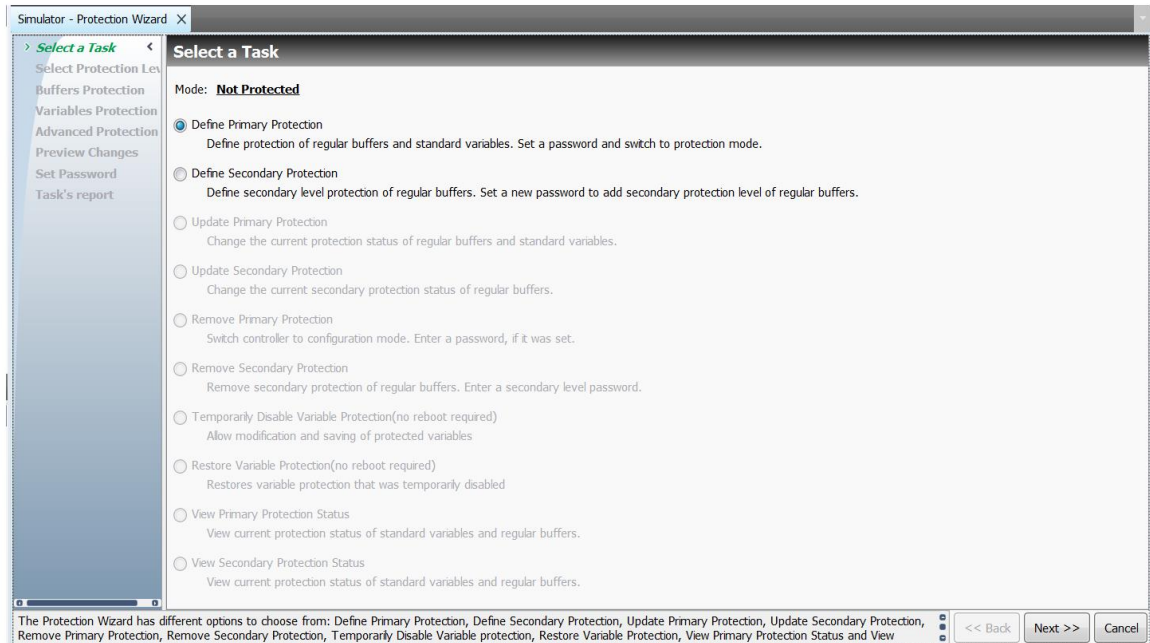


Figure 2-2. Protection Wizard Initial Screen

4.3 MMI Scope Enhancements

The new enhancements will streamline and simplify the MMI Scope configuration options, allowing users to easily set up the Scope, collect data, and compare data..

These enhancements include:

- > An improved user-friendly interface for setting up data collection configurations
- > Multi-graph plotting with improved comparative features and tools
- > Minimized interface complexity by using intuitive icon buttons

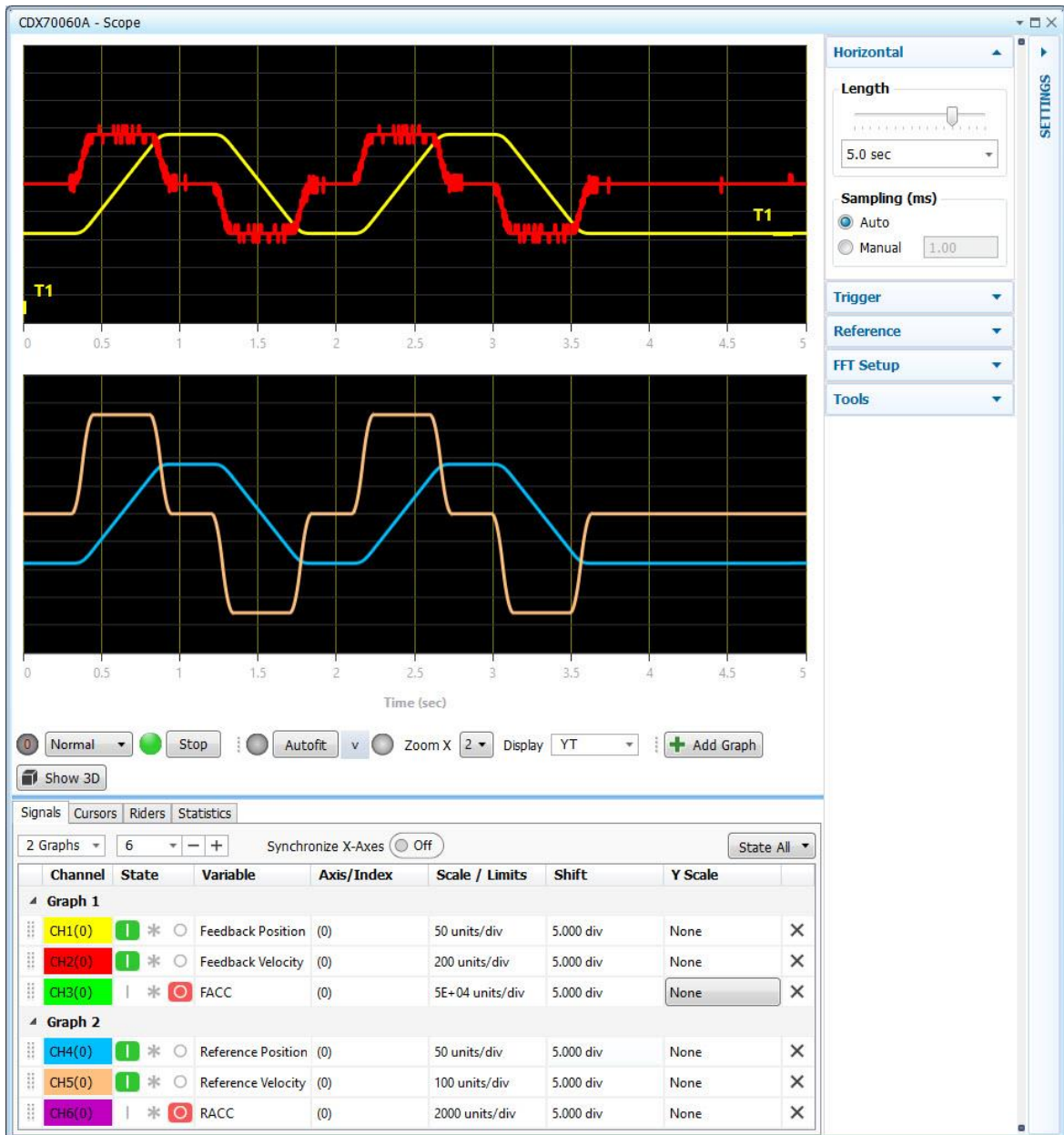


Figure 2-3. Scope with Two Plots

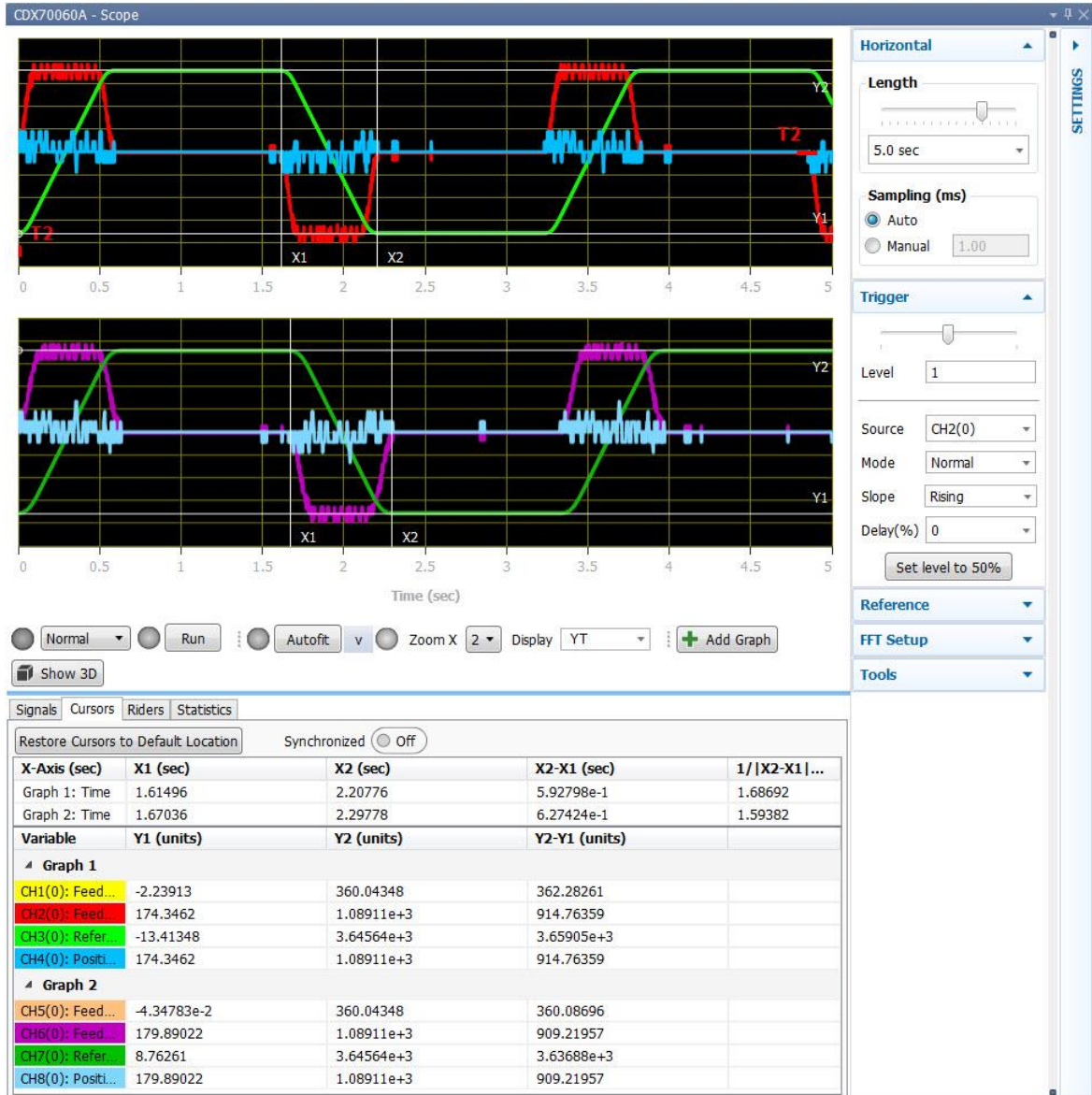


Figure 2-4. Comparison With Cursors

4.4 FRF Analyzer Enhancements

The enhanced FRF Analyzer will provide users with a more comprehensive user interface for system improvement and optimization.

- > Perform multiple measurements and display multiple FRF plots to facilitate comparison and optimization.
- > Enhanced with comparison tools for adjacent multiplot analysis.
- > In Design mode, servo parameters can be modified and their effects observed across multiple FRF graphs of the same system.

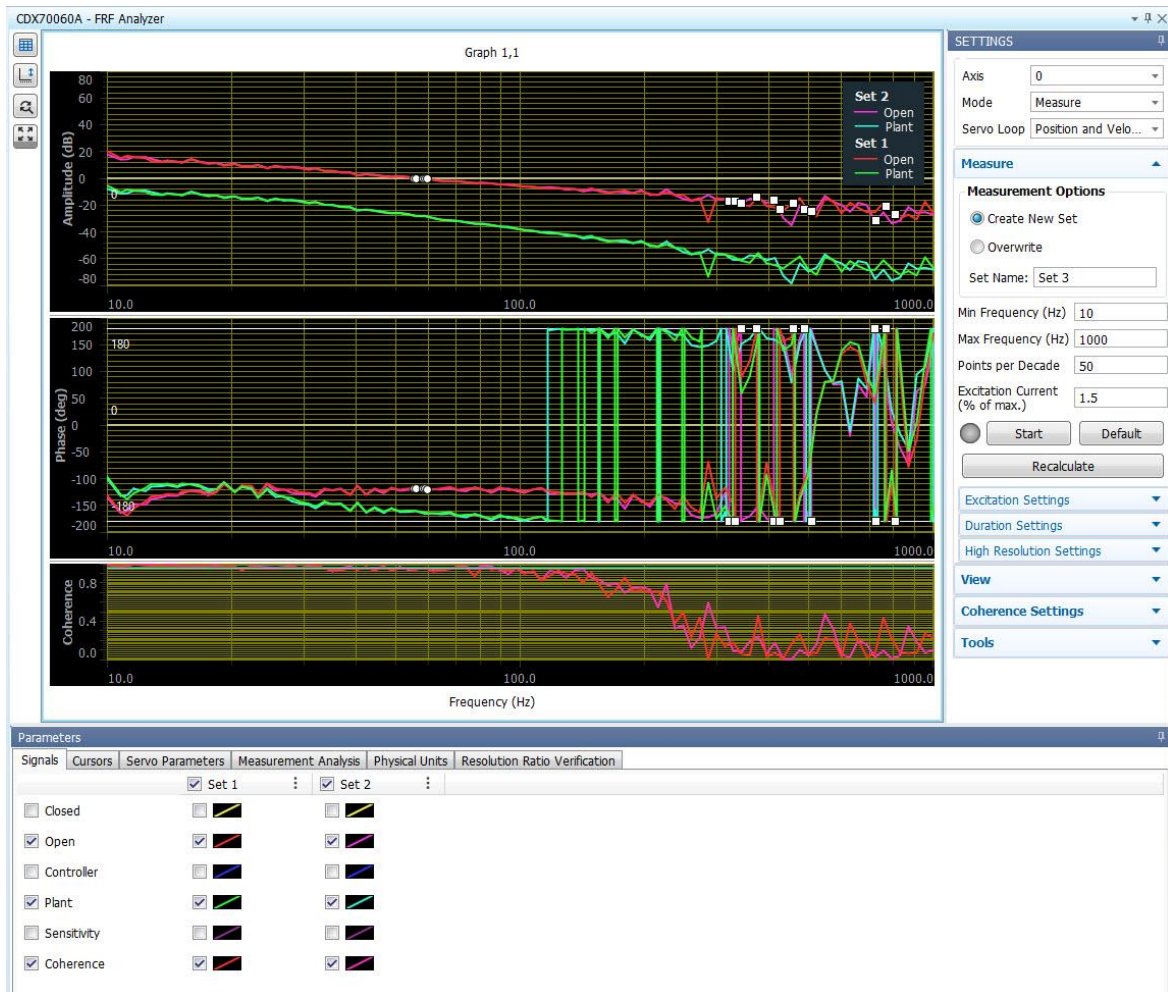


Figure 2-5. FRF General View

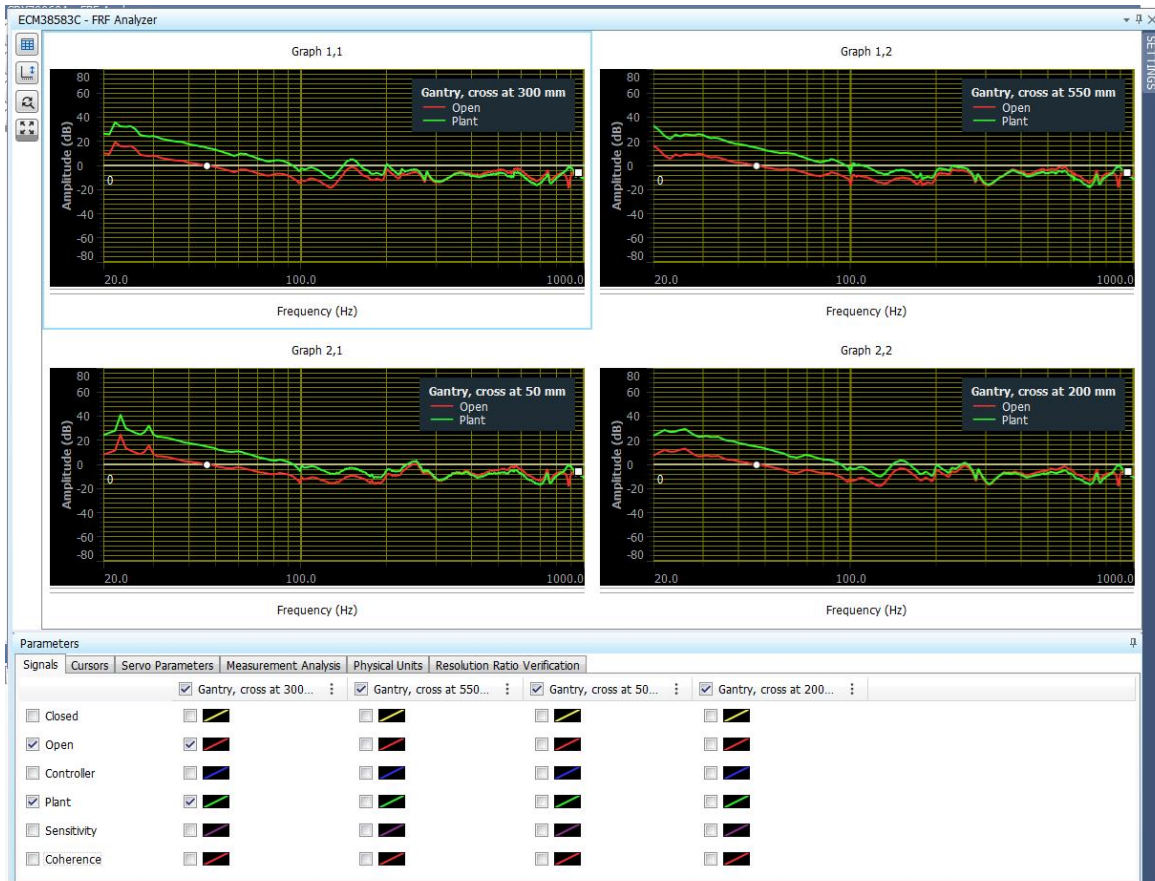


Figure 2-6. FRF Two-plot Comparison

4.5 Dynamic Error Compensation Wizard Enhancements

The Dynamic Error Compensation Wizard has been streamlined to make it easier for users to import single and multiple error mapping tables and generate optimized code, while retaining the flexibility for advanced users who require additional processing.

New 3D mapping functionalities have also been incorporated into the updated wizard.

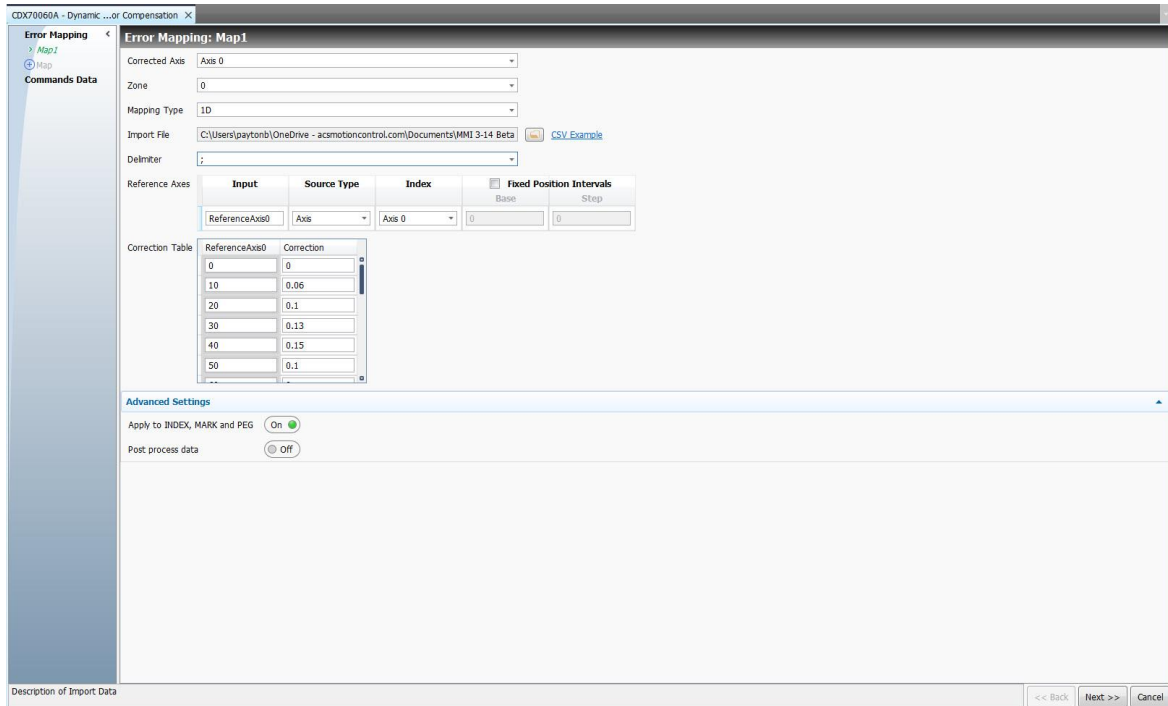


Figure 2-7. Error Map Creation

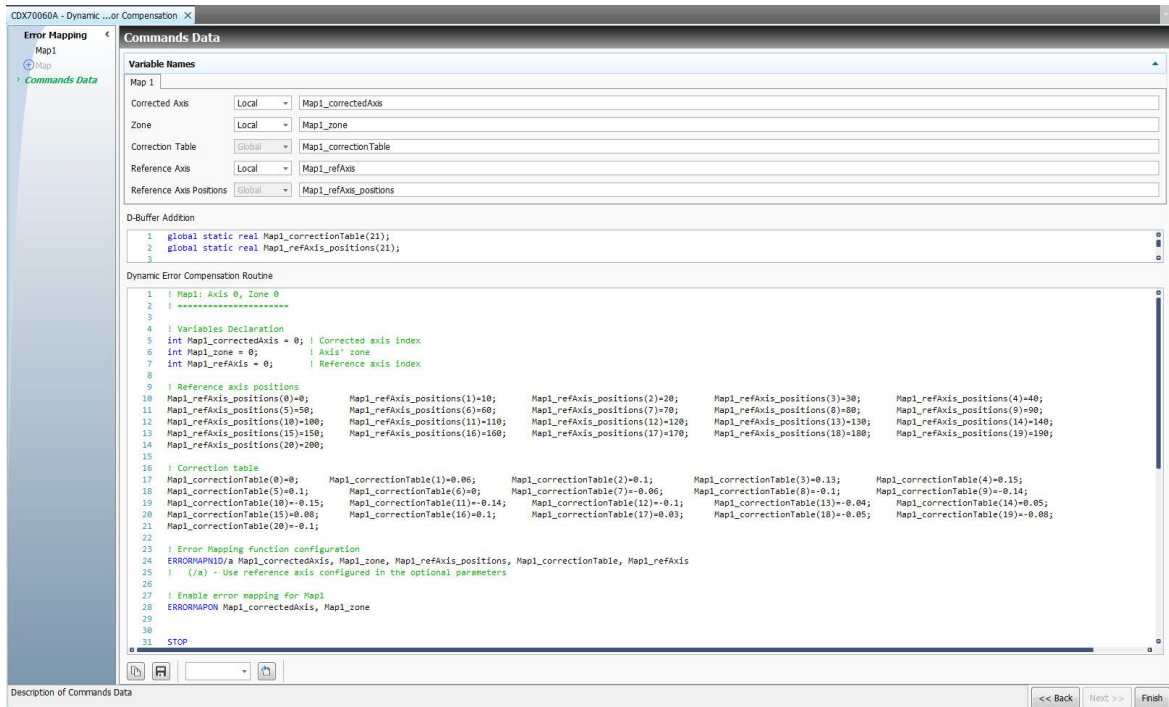


Figure 2-8. Error Map Code Output

4.6 Stiff Gantry Yaw Error Measurement Support

ACS offers Stiff Gantry Yaw Compensation through the Dynamic Error Compensation Wizard as a means to decrease motor current caused by mechanical stress and enhance the repeatability of stiff gantry systems.

It is now possible to construct a Yaw correction array through utilizing measurements and generating ACSPL+ code with the Dynamic Error Compensation Wizard.

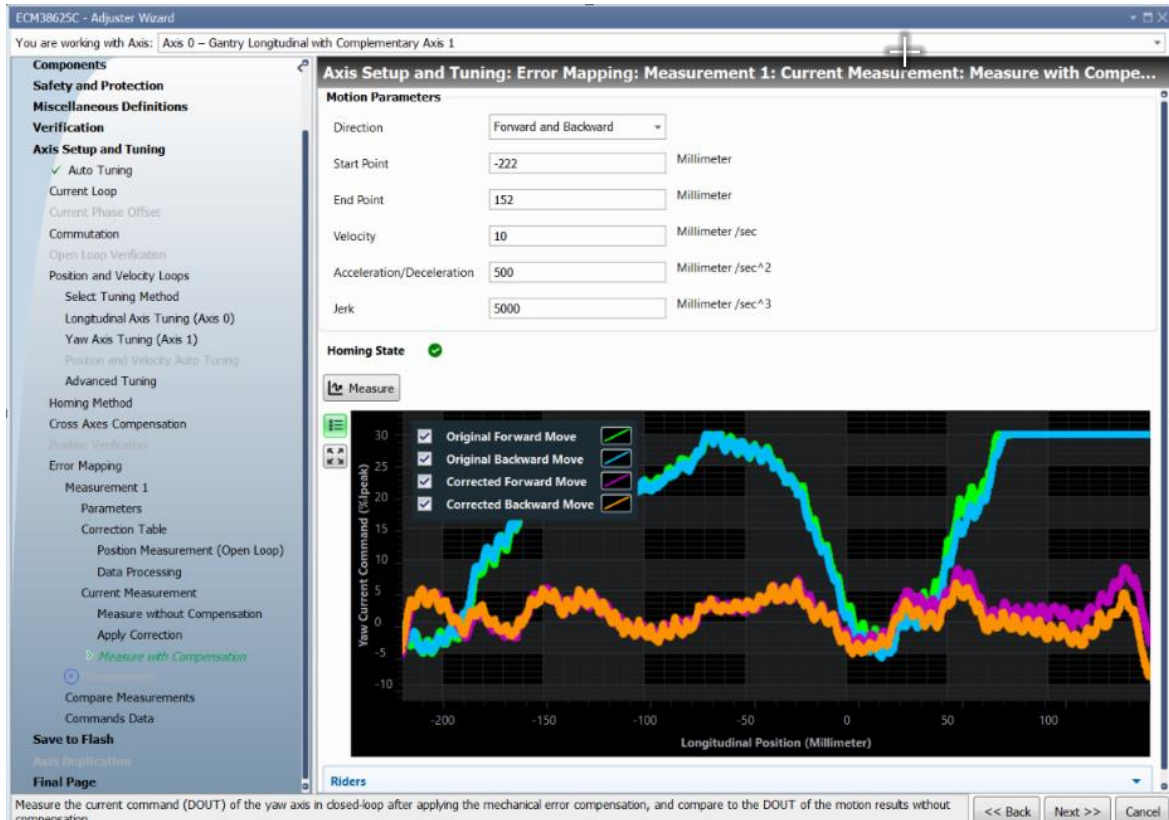


Figure 2-9. Measure and Display Corrected Motion in Stiff Gantry

4.7 Non-ACS EtherCAT Devices

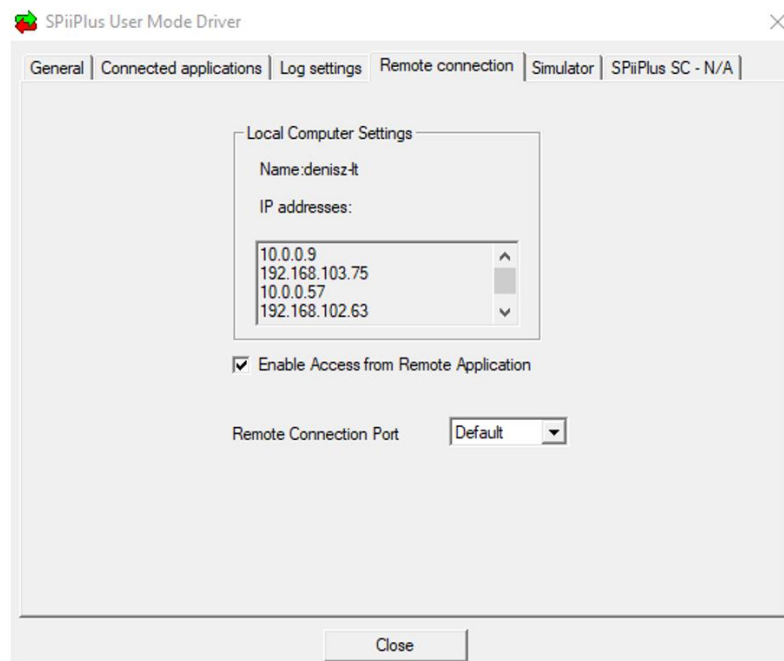
As of version 3.14, non-ACS EtherCAT drives that have undergone qualification process can take advantage of ACSPL+ motion commands and functionalities.

- > This enhances the identification and verification of Non-ACS EtherCAT devices during setup.
- > Access to a code snippet for PDO mapping as well as an easy-to-understand configuration for selecting the mode of operation for Qualified Non-ACS EtherCAT DS402 devices during installation.
- > Reduce Non-ACS EtherCAT DS402 setup challenges by deactivating unnecessary fields and sections in the Adjuster Wizard.
- > Non-ACS EtherCAT drives that haven't been qualified can use low-level programming, such as writing code to directly set parameters like speed, acceleration, or position values in the DS402 drive controller's memory, but cannot employ ACSPL+ motion commands and functionalities.

See the *Qualified Non-ACS EtherCAT Product List* for more details.

4.8 SPiiPlus User-Mode Driver

When a user installs the SPiiPlus C library on their computer, it can run applications both locally and remotely, as long as there is a TCP/IP connection between the two computers. The SPiiPlus User Mode Driver's Remote Connection window now displays the console with the connected network addresses of all available hosts.



5. New Libraries and Files

5.1 ACS Python Library

The ACS Python library is a significant addition that bridges the gap between the ACS motion control platform and the open-source data processing tools available in the Python programming language.










Python is an open-source language, which means it's free to use, modify, and distribute. This fosters a collaborative environment and encourages the sharing of knowledge and tools.

The ACS Python Library will support ACSPL+ Functions equivalent to the functions in the existing SPiiPlus .NET, C/C++ & MATLAB Libraries

See the *ACS Python Library Reference - Programmers Guide* for details.

5.2 New C Library Functions

See the *SPiiPlus C Library Reference Programmer's Guide* for details about these functions

acsc_SPDataCollectionStart 	This function performs fast data collection and accumulates data about the specified Servo Processor variable with a constant maximum sampling rate of 20kHz.
acsc_SPDataCollectionStop 	This function immediately terminates the data collection of acsc_SPDataCollectionStart for the specified servo processor.
acsc_GetSPAddress 	Reads a value from the specified SP address.
acsc_WaitSPDataCollectionEnd 	Waits for the end of Servo Processor data collection.
acsc_ReadStructVariable 	Retrieves Struct values from ACSPL+ Struct variables or arrays.
acsc_WriteStructVariable 	Writes struct values to ACSPL+ struct variables or arrays
acsc_RemoveControllerProtection 	Removes protection, reboots controller, and waits for process completion
acsc_TemporarilyDisableVariableProtection 	Allows modification and saving of protected variables Relevant to primary protection only
acsc_RestoreVariableProtection 	Restores variable protection that was temporarily disabled

5.3 New .NET Library Methods

See the *SPiiPlus .NET Library Programmer's Guide* for details about these methods.

SPDataCollectionStart 	This function performs fast data collection and accumulates data about the specified Servo Processor variable with a constant maximum sampling rate of 20kHz.
SPDataCollectionStop 	This function immediately terminates the data collection of SPDataCollectionStart) for the specified servo processor.
GetSPAddress 	Reads a value from the specified SP address.
WaitSPDataCollectionEnd 	Waits for the end of Servo Processor data collection.
ReadStruct 	Retrieves Struct values from ACSPL+ Struct variables or arrays.
WriteStruct 	Writes struct values to ACSPL+ struct variables or arrays.
DefineControllerProtection 	Applies protection for controller, reboots controller and waits for process completion
RemoveControllerProtection 	Removes protection, reboots controller, and waits for process completion
TemporarilyDisableVariableProtection 	Allows modification and saving of protected variables Relevant to primary protection only
RestoreVariableProtection 	Restores variable protection that was temporarily disabled
ReadString 	Changed function parameters
WriteString 	Changed function parameters

5.4 ServoBoost Files

Starting with v3.14, ServoBoost files are included in the installation package.

6. New and Updated ACSPL+ Commands and Variables

For more comprehensive information about ACSPL+ commands and variables, please refer to the documentation titled ACSPL+ Commands & Variables Reference Guide.

6.1 PEG Standard Structure

The PEG structure provides a rich program interface, allowing simplified PEG programming. Users can define the structure and access the fields and functions of the structure. The PEG structure keeps all relevant data inside its internal database and provides a simple, user-friendly user interface. The drive database should be loaded when calling the initialization function. See the PEG Structure section in the *ACSPL+ Commands & Variables Reference Guide* for more details.

Table 2-1. PEG Structure Fields

Field Name	Description
TimeBasedPulseNum	Time-based pulses number
TimeBasedPulsePeriod	Default time-based pulses period in msec. Must be at least Pulse Width + 26.6667 nsec (minimum distance between two pulses).
PulseWidth	Default pulse width in msec
AsynchMode	Nonzero means that PEG definition operations (SetIncrementalPEG, SetRandomPEG) are realized asynchronously. The Completion field indicates operation completion.
Completion	Nonzero means that PEG operation (SetIncrementalPEG, SetRandomPEG) completed.
ModuloMode	Nonzero means that SetRandomPEG function defines the Random PEG in the Modulo Mode. The Modulo Mode definition requires assignment PEG engine to Modulo axis.
Suspend	Nonzero means that that PEG definition operations (SetIncrementalPEG, SetRandomPEG) don't start the PEG operation immediately. Users should call EnablePEG function for activation.
OutputMode	The bit mask defines the Random PEG State Output behavior (identical to the PEG_R OutputMode argument). The default is 0x4444.

Table 2-2. PEG Structure Functions

Name	Description
Init	The Init function links the PEG structure to the driver node, loads appropriate data(assign table, pinouts etc.) and sets PEG engines to default state if required.
GetPulseCounter	Returns the number of fired pulses.
EnablePEG	Enable the PEG engine.
DisablePEG	Disable the PEG engine.
AssignEngineByCode	Set PEG engines to axes assignment by code, like ASSIGNPEG function.
DisplayAvailableAssign	Display in the communication terminal window all possible assignments for a specified axis. Can be run only from a buffer.
AssignEngines	Assign PEG engines to controller axes.
DisplayCurrentAssign	Display current Engine to Axis assignment for node. Can only be run from a buffer.
DisplayAvailablePEGPulseOuts	Display available outputs for PEG Pulse signal for the specified engine.
DisplayAvailablePEGStateOuts	Display available outputs for PEG STATE signal for specified engine.
DisplayAvailableAqBOuts	Display available outputs for AqB (A or B) encoder signal .
DisplayAvailableGPOUTOuts	Display available outputs for General Purpose output.
AssignPEGOutByCode	Route PEG pulse signal to General Propose Outputs. Like last parameter in ASSIGNPEG function.
AssignOutPEGPulse	Route the PEG Pulse signal of the specified engine to the defined Output.
AssignOutPEGState	Route the PEG State signal of the specified engine to the defined Output.
AssignOutAqB	Route the AqB encoder phase to the defined Output
AssignOutGPOUT	Route the specifies output to the defined GP Output.




Name	Description
SetIncrementalPEG	The function defines the incremental PEG on the specified engine.
SetRandomPEG	The function defines the Random PEG on specified engine.
SetPulseDelay	The function defines the PEG Pulse signal delay for specified PEG engine.
SetStateDelay	The function defines the PEG State signal delay for specified PEG engine.
EnableErrorMap1D	The function defines the incremental PEG on specified engine.
EnableErrorMap2D	The function enables 2D error support on specified PEG engine.
EnableErrorMap3D	The function enables 3D error support on specified PEG engine.
DisableErrorMap	The function cancels error mapping support on specified PEG engine.

6.2 Secondary Application Protection

The new level of protection will allow the user to protect buffers with a second password (from viewing/changing), completely separately from the first level. The new level of protection will require a second password and new flags (S_SETUP bits) that will specify which buffers will be protected by this feature. See [Protection Wizard Enhancements](#).

6.3 Servo Loop Feedback Routing Commands

The following commands help the user set the feedback routing for a given axis.

SLPROUT 	A new mode for SLPROUT allows the user to disable position feedback.
SLVROUT 	A new mode for SLVROUT allows the user to disable velocity feedback.
SLCROUT 	A new mode for SLCROUT allows the user to disable velocity commutation.


6.4 CSDESTROY

New values are defined for the restore_flag argument.

Restore_flag	(Optional) Set to 1 to restore the previous LCS Set to 2 to completely destroy the LCS and remove it from memory Setting 0 or omitting the parameter restores the MCS
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6.5 Synchronous SPDC and SPINJECT Commands

Servo Processor variables can be synchronously started and stopped using the following commands.

SPDC 	A new switch, /w, allows synchronous data collection.
STARTSPDC 	Starts SP Data Collection
SPINJECT 	A new switch, /w, allows synchronous data injection
STARTINJECT 	New values are defined for the restore flag argument.
NST 	New bits, #SPDCW (SPDC is waiting) and #SPRTW (SPRT is waiting)

6.6 Cross Axis Position Compensation

New field added to the Cross Axis Position Compensation Struct for supporting gantry systems.

InitialForceRatio	A flag that holds the initial force ratio
SLGCAIFR 	Contains the value of the Initial Cross Axis Force Ratio

6.7 LCI New Support Features

Table 2-3. Enhancements to LCI capabilities

SPATH/NURBS 	Now supported within LCI
PathCalcMethod Field 	An integer field defining the method of traveled distance calculation.

6.8 Read and Write Struct Variables to Files

Read/Write file functionality is extended to struct type variables in version 3.14. Additionally, the Read function verifies that the data imported from the file is of the correct type for the variable being updated.

6.9 STRUCT Array Data Type

ACSPL+ now supports defining one dimensional arrays of structs.

7. G-Code Update

7.1 G207 Cylindrical Transformation

Intended for cases where the machine rotational axis direction is opposite to one that implied by CAM postprocessor. The radius (R address) value should be specified with a minus sign.

Syntax

```
G207 <linear axis> <rotational axis> R<negative value>
```

8. CiA402 Profile CSP Mode Behavior Updates

Starting with version 3.14, as a safety feature, the firmware will stop the path profile motion under certain circumstances.

The behavior affects the following products when they are set to Cyclic Synchronous Position mode and controlled by an external EtherCAT master (e.g. Beckhoff TwinCAT):

- > IDMXx family
- > SPIIPlusES

9. EDS Ethernet\IP Specification

EDS is a configuration file that facilitates the establishment of an Ethernet-IP connection between a PLC and an Ethernet-IP adapter, such as an ACS controller.

By importing this file into an Ethernet-IP project, the adapters that the EDS intends to utilize are identified, allowing for the automatic establishment of a connection.

While the implicit connection is established in the EDS file, the explicit component must be inserted manually, as it was previously.

Two new EDS files were implemented to support ACS controllers: "ACS_NT_Based.eds" for the SPIIPlus Platform and "ACS_ECMxx.eds" for the ECMxx Series.

10. Maintenance, Bug Corrections, and Known Issues

- > ACSPL+ Delimiter enforcement

Compiler enforcement of a delimiter separation between adjacent statements requires a separator between every two ACSPL statements. Either a new line or a separator ';' should be used.



Developers should examine ACSPL+ code from previous versions to ensure backwards compatibility when upgrading to version 3.14.

- > .NET ReadString and WriteString functions below have been corrected; for further details, see *SPiiPlus .NET Library Programmers Guide*.
 - > Object.ReadString([ProgramBuffer nBuf], string var, int from1, int to1, int from2, int to2)
 - > Object.WriteString(object obj, ProgramBuffer nBuf, string var, int from1, int to1, int from2, int to2)
- > .NET Transaction function bug fixed from version 3.13.01.

Using the Transaction function caused memory (RAM) usage of the application to increase indefinitely. Eventually RAM was depleted and the application crashed.
- > UDMcb and UDMpa known issue with specific FPGA version which limits Biss-C to 32 bits of data (position + status bits)
 - > FPGA details (shown in #SI Command)
 - > FPGA ID: 0x0E83
 - > FPGA Revision: 7
 - > A solution is being developed for the next release.
- > Commutation through the Adjuster Wizard for Short Stroke with Absolute Encoder has been corrected.
 - > Following a successful operation, the commutation buffer program failed to activate the appropriate **MFLAG** bit, preventing the saving of the commutation angle when utilizing an absolute encoder.

Appendix A. SPiiPlus Product Support

SPiiPlus ADK Suite v3.14 is intended for use with the following products. New products in this release are marked with a flag.

- > PC Based Soft Motion Controller & EtherCAT Master
 - > SPiiPlusSC Soft Controller
- > Motion Controller and EtherCAT Master
 - > SPiiPlusEC (EtherCAT master)
 - > SPiiPlusES (EtherCAT master and DS402 drive)
- > Integrated Controller and EtherCAT Master
 - > MC4Unt (SPiiPlusNT-LT/HP/LD/NP EtherCAT master)
 - > MP4U (EtherCAT master with up to 8 built-in drives)
 - > MP4U (EtherCAT master with up to 8 built-in drives and DS402 drive)
 - > SPiiPlusCMhv (EtherCAT master with 2 built-in drives)
 - > SPiiPlusCMnt (EtherCAT master with 2 built-in drives)
 - > SPiiPlusCMxa (EtherCAT master)
- > Universal Drive Modules
 - > MC4Udc (SPiiPlusDC-LT/HP/LD/NP EtherCAT slave only)
 - > MP4U (EtherCAT slave only)
 - > UDMcb (EtherCAT slave only)
 - > UDMdx (EtherCAT slave only)
 - > UDMhp / UDMba (EtherCAT slave only)
 - > UDMxa (EtherCAT slave only)
 - > UDMhv (EtherCAT slave only)
 - > UDMlc (EtherCAT slave only)
 - > UDMma (EtherCAT slave only)
 - > UDMmc (EtherCAT slave only)
 - > UDMnt (EtherCAT slave only)
 - > UDMpa (EtherCAT slave only)
 - > UDMpc (EtherCAT slave only)
 - > UDMpm (EtherCAT slave only)
 - > UDMsd (EtherCAT slave only)
 - > SDMnt (EtherCAT slave only)
 - > UDMsm (EtherCAT slave only)
 - > UDMsa (EtherCAT slave only)
- > Motor Drive Interface / Laser Control

- > LCM (EtherCAT slave only)
- > PDIdl (EtherCAT slave only)
- > PDMnt (EtherCAT slave only)
- > UDIt/UDIhp (EtherCAT slave only)
- > Digital and Analog /O Modules
 - > IOMnt (EtherCAT slave only)
 - > IOMps (EtherCAT slave only)
- > Nano PWM Drive Modules
 - > NPMpm / NPMpc (EtherCAT slave only)
 - > NPAppm / NPAppc (EtherCAT slave only)
 - > NPArm (EtherCAT slave only)
- > Intelligent Drive Modules (DS402 EtherCAT Based Drives)
 - > IDMsm
 - > IDMsa
 - > IDMma
 - > IDMdx
- > Economical Control Modules (with Integrated Servo Drives)
 - > ECMsm
 - > ECMsa
 - > ECMma
 - > ECMdx

Smarter



Motion

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