



# RTAC R152 Technical Note

With the addition of firmware version R152-V0 to the RTAC product line, the following are some notes and additional comments about new additions or changes in the firmware. These items are compiled from the release notes found in *Appendix A: Firmware and Manual Versions* of the ACSELERATOR RTAC® SEL-5033 Software Instruction Manual. Please note that this document does not discuss each release note, but rather just those with additional context or conversation points. This information can also be found in the SEL-5033 instruction manual in the appropriate sections for the new or modified behavior.

Some new features or enhancements to existing features in R152-V0 include the following:

- Added Continuous Recording Groups.
- [Cybersecurity Enhancement] Enhanced the web interface dashboard with the addition of a Firmware Hash value representing the SHA-256 hash value of the last firmware upgrade file to be sent to the RTAC.
- Enhanced the web interface to allow updating the RTAC HMI Runtime binary file and uploading, listing, and deleting of projects without the use of ACSELERATOR Diagram Builder™ SEL-5035 Software.
- Enhanced firmware upgrade functionality to allow remote users (via LDAP or RADIUS) to perform the upgrade using the web interface or ACSELERATOR RTAC.
- Enhancements to C37.118 clients and servers to allow configuration and mapping of Phasor Types and Phasor Components into CFG3 frames.
- Enhanced Axion I/O support to allow customized channel names in COMTRADE records produced by analog modules and improved record generation speed on SEL-3350 and SEL-3555 hardware.
- Enhanced Recording Group support for more calculations and vector\_t custom channels.
- Enhanced the IEC 60870-5-101/104 server to support as many as 256 sector maps per server.
- Enhanced the DNP Server Secure Authentication to improve Aggressive Mode behavior.

ACSELERATOR RTAC enhancements include the following:

- Added support for Windows 11, Windows Server 2019, and Windows Server 2022.
- [Cybersecurity Enhancement] Added an Advanced user preference category and added an option to control the notification type when an unsigned extension is detected in the project. Choices include an Error notification message (default value), a Warning notification message, or to Ignore (i.e., no notification).
- Enhanced ACSELERATOR RTAC to run as a 64-bit application. 32-bit versions of Windows are no longer supported.

- Enhanced XML Import functionality to preserve folder paths from the original directory and file structure.
- Enhanced performance of Set IEC 61850 Configuration operations when an SCD file is applied iteratively to a project of version R148 or later.

Library Extension additions and enhancements:

- Added the Digital Fault Recorder Extension.
- Enhanced FTP Sync configuration of monitored IEDs.
- Enhanced EmailPlus with Event Emailer functions.
- Enhanced GridConnect functionality.

The following are additional comments on new features and changes in the RTAC product line.

### Continuous Recording Groups

Continuous Recording Groups are a new high-resolution data historian feature supported on SEL-3555, SEL-3560, and SEL-3350 model RTACs. Configure the following items to be logged at varying data rates:

- Axion Protection CTPT I/O and Digital Input modules logged at 3 kHz
- C37.118 PMUs logged at rate of PMU update (typically 60 or 50 Hz)
- Logic Engine tags logged at the main task cycle time

Continuous Recording Groups allow for a customizable data retention period, measured in days, to allow record retrieval for compliance with requests for information such as those mandated by PRC-002. Individual Analog and Digital channels from the data sources above are enabled and named by the configuration in the RTAC settings:

ContinuousRecording					
Settings	Drag a column header here to group by that column				
CRG EtherCAT Modules	Enable	Device	Channel	Channel Name	Source Type
PMUs	True	Bus1_PMU	Frequency	Bus1_FREQ_PM	PMU
Digital Channels	True	Bus1_PMU	Dfrequency	Bus1_ROCOF_PM	PMU
Analog Channels	False	Bus1_PMU	TriggerReason	TriggerReason1	PMU
Custom Channels	False	Bus1_PMU	TimeQuality	TimeQuality1	PMU
Calculations	False	Bus1_PMU	UnlockedTime	UnlockedTime1	PMU
POU Pin Settings	True	Bus1_PMU	V2	Bus1_V2_PM	PMU
Channels	True	Bus1_PMU	V1	Bus1_V1_PM	PMU
Tags	True	Bus1_PMU	V0	Bus1_V0_PM	PMU
Controller	True	Bus1_PMU	VC	Bus1_VC_PM	PMU
	True	Bus1_PMU	VB	Bus1_VB_PM	PMU
	True	Bus1_PMU	VA	Bus1_VA_PM	PMU
	True	Line1_PMU	Frequency	Line1_FREQ_PM	PMU
	True	Line1_PMU	Dfrequency	Line1_ROCOF_PM	PMU
	False	Line1_PMU	TriggerReason	TriggerReason2	PMU
	False	Line1_PMU	TimeQuality	TimeQuality2	PMU
	False	Line1_PMU	UnlockedTime	UnlockedTime2	PMU
	True	Line1_PMU	I2	Line1_I2_PM	PMU
	True	Line1_PMU	I1	Line1_I1_PM	PMU
	True	Line1_PMU	I0	Line1_I0_PM	PMU

Figure 1 Continuous Recording Group Channel Configuration

Records are retrieved via the RTAC web interface by selecting a start date/time, an end date/time or duration, and what particular channels are of interest:

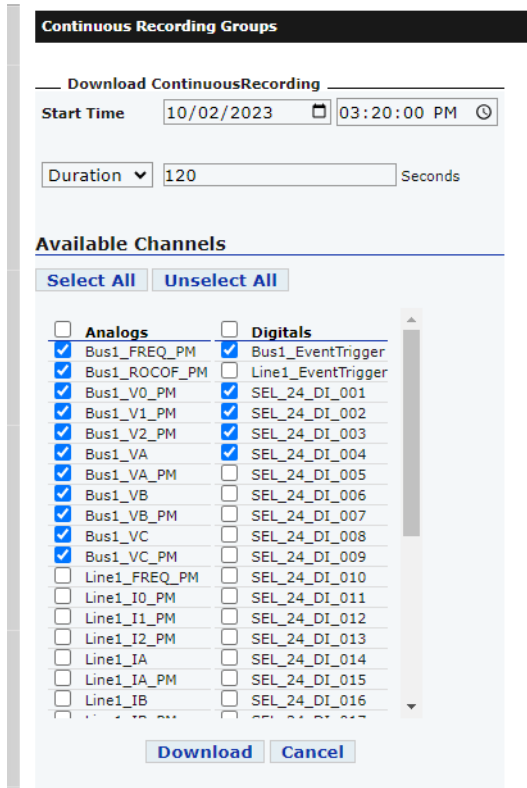


Figure 2 Continuous Recording Groups Download

Records are downloaded in zipped COMTRADE format and are easily viewable in SEL-5601-2 SYNCHROWAVE® Event Software:

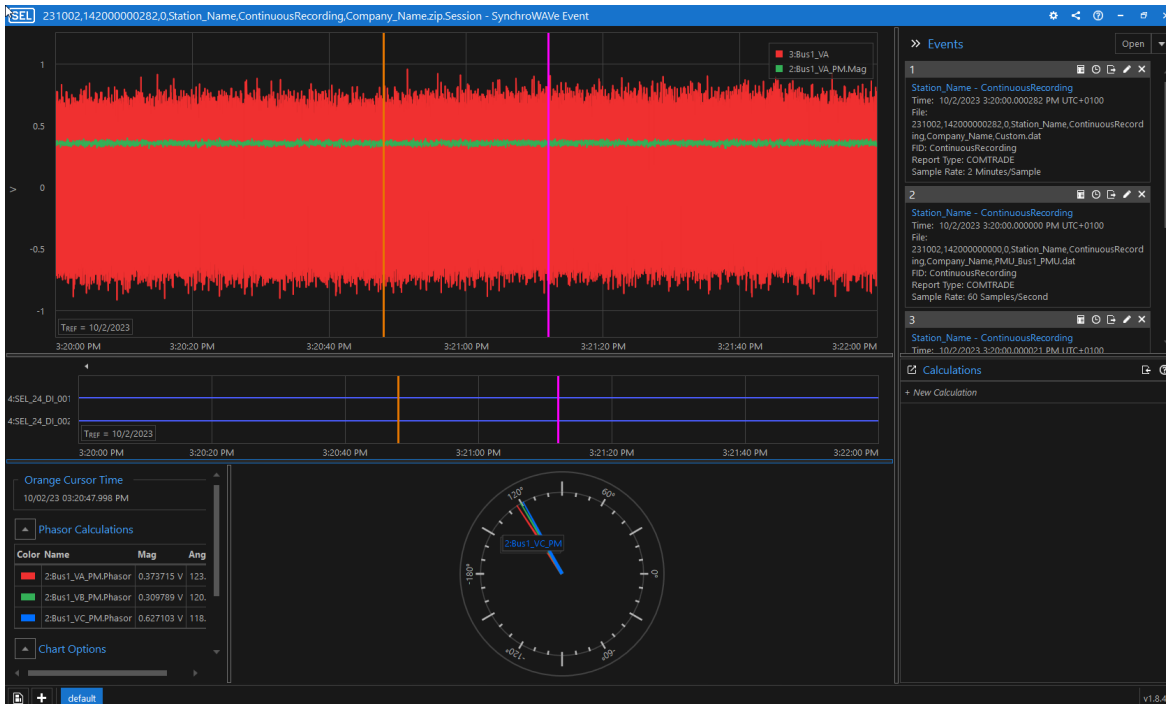


Figure 3 Continuous Recording Group COMTRADE Record

### Firmware Hash on Web Interface Dashboard

A hash refers to the output of a cryptographic mathematical function. In the cybersecurity field, file hashes are often used to verify and validate that the content of a particular sensitive file has not been modified during an end-to-end file transfer. On the SEL website, file hashes are available for each firmware release so a customer can verify the content of a firmware update once they receive it through their support channels. The RTAC now has the ability to display the SHA-256 calculated file hash of the last firmware upgrade it received. To enable this feature on an RTAC upgraded from a previous firmware version, send the R152 upgrade file twice.

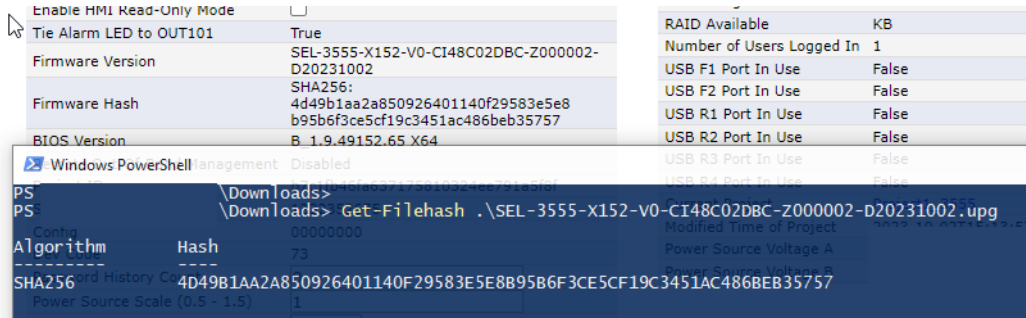


Figure 4 RTAC Web Dashboard Firmware Hash

### RTAC HMI Loading Via Web Interface

R152 provides integration enhancements with the optional RTAC HMI.

RTAC HMI features and functionality are updated with a package known as the *HMI Runtime Binary*. This file has traditionally been sent to the RTAC using the standalone ACSELERATOR Diagram Builder™ SEL-5035 Software. R152 adds the ability to update this runtime version using the Device Management feature of the RTAC web interface:

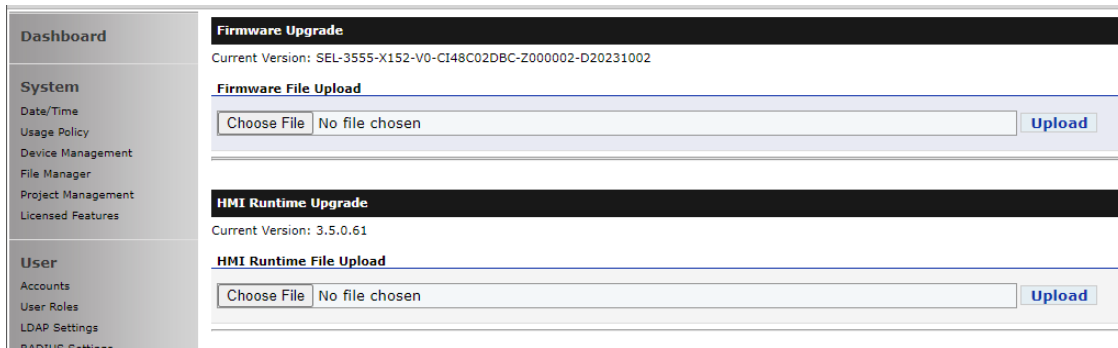


Figure 5 RTAC HMI Runtime Binary Upgrade

The Project Management section of the web interface provides facilities to list, upload, and delete RTAC HMI projects that were saved by Diagram Builder in **hprjson** format.

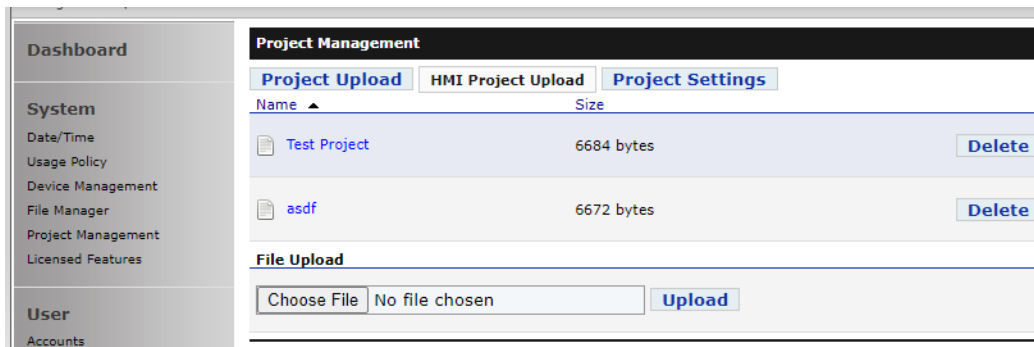


Figure 6 RTAC HMI Project Upload

## Digital Fault Recorder Extension

For several years, RTAC hardware has been combined with Axion I/O modules have been combined to create robust Digital Fault Recorder (DFR) applications. However, until now, these applications have required manual configuration of large RTAC projects, which could be time consuming and difficult to create or troubleshoot. The Digital Fault Recorder extension automates the process of creating an RTAC project for a DFR application by presenting a simple settings interface (as shown in *Figure 7*) to configure the following:

- Overall DFR parameters (e.g., Station Name or Nominal Frequency)
- Axion nodes with chassis and module layout
- Substation assets representing buses (voltage-only) or lines (voltage and current) with associated Protection CT/PT modules
- Customized trigger conditions on each asset for voltage, current, sequence component, frequency, and power quantities
- Optional Digital Input triggers via SEL\_24DI Axion I/O modules or external triggers via custom user logic

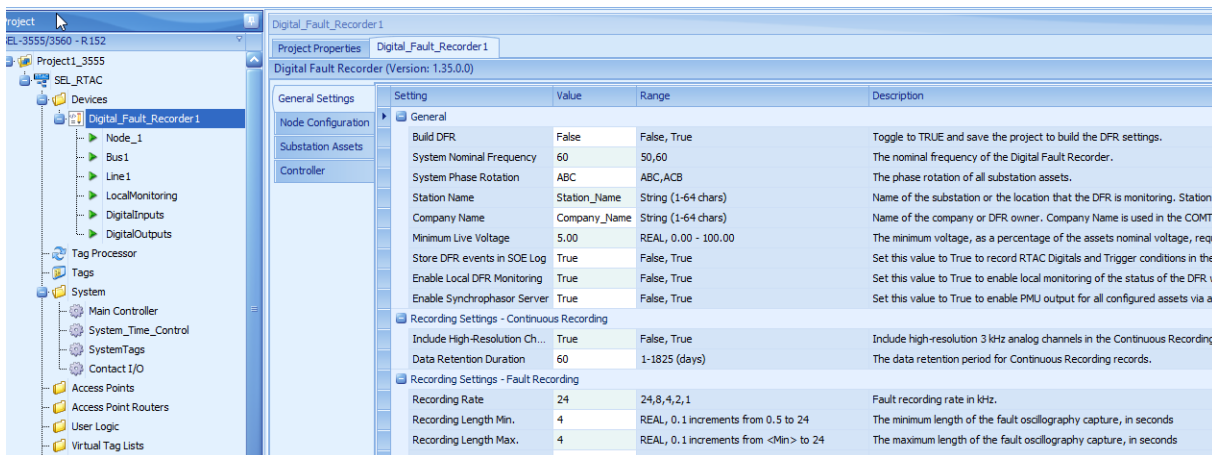
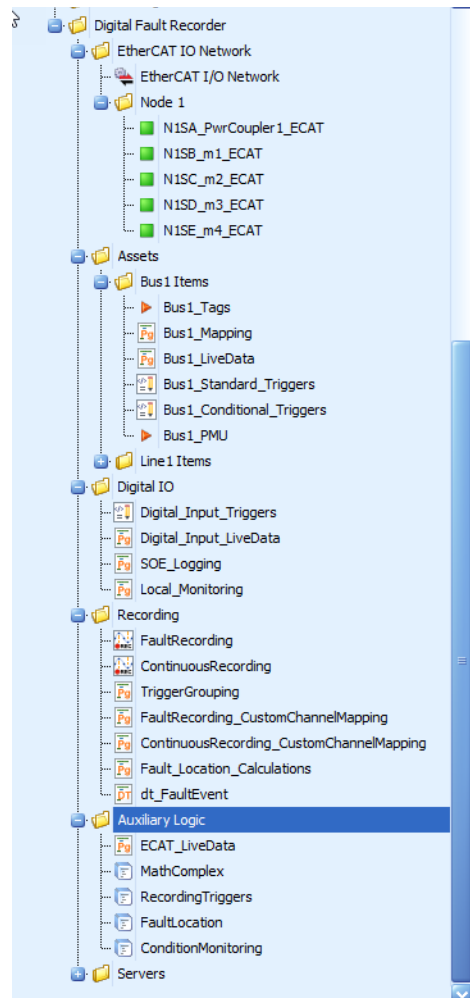


Figure 7 Digital Fault Recorder Extension Configuration Panel

After you configure the general DFR settings, a “Build DFR” operation automatically configures other aspects of the project, including the following:

- Axion EtherCAT modules and I/O network
- Protection CT/PT modules with selected CT/PT ratios and appropriately enabled tags
- Tag Lists for bus and line assets, with addition to live data view on the web interface

- ▶ Recording Trigger instances for all assets with enabled power system triggers
- ▶ A Continuous Recording Group instance for long-term data logger applications
- ▶ Logic to provide local monitoring and annunciation of various DFR states
- ▶ SOE logging of all digital data
- ▶ Fault locating logic to automatically perform a single-ended fault location calculation when a new event is detected
- ▶ A C37.118 server to stream out PMU data for all substation assets
- ▶ Organization of all project content into a managed Digital Fault Recorder folder (see *Figure 8*)

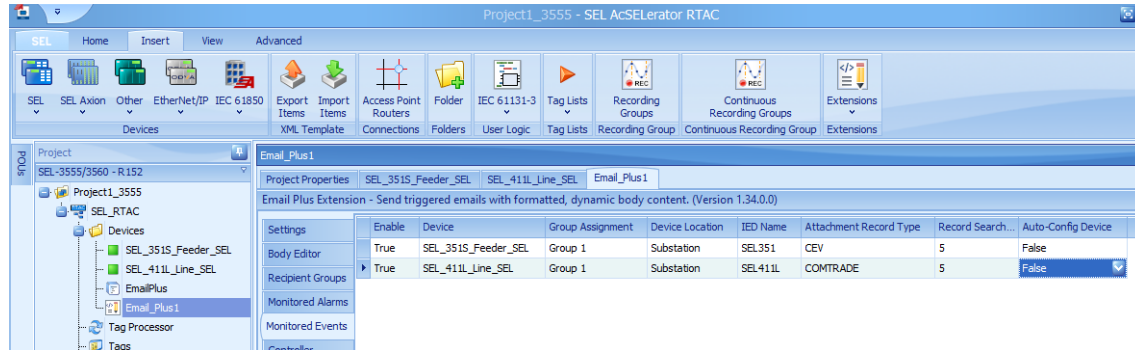


**Figure 8 Digital Fault Recorder Extension Generated Content**

### EmailPlus Extension “Monitored Event” Enhancement

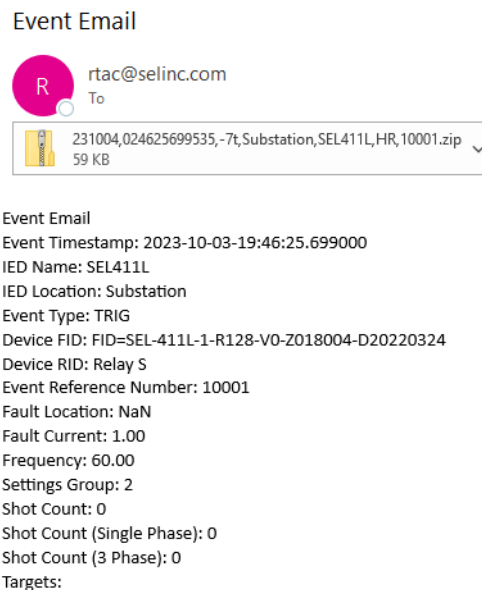
EmailPlus version 3.5.3.0 contains an enhancement for project versions R151 and later that allows it to monitor for CEV and COMTRADE events collected from SEL Client protocol devices and send formatted emails with the event itself as an attachment. This built-in feature now supersedes the existing “Event Emailer” extension described in Application Guide AG2018-30 and exceeds the

functionality of that version. The configuration interface for the extension offers an auto-configuration option to configure an existing SEL Client device for the required event retrieval settings and tags:



**Figure 9 EmailPlus Monitored Events Configuration**

Once the SEL Client detects and collects a new event, a formatted email including all information available from that particular IED is automatically sent to all enabled recipients:



**Figure 10 Email Received From Monitored Event Feature**

## Grid Connect Enhancements

With the release of GridConnect version 3.5.7.0, three major features have been added:

1. The ability to run in islanded mode
2. Grouping of generation assets in priority groups in grid-connected mode
3. Automatic DDR configuration for logging in both islanded and grid-connected operation

Islanded mode only supports a single grid-forming asset (either BESS or generator) that is capable of carrying the entire load. GridConnect manages PV set points to operate the grid-forming asset at a user-defined utilization. Islanded functionality is limited; refer to the *GridConnect* section in the SEL RTAC Pro-

gramming Reference manual (available at [selinc.com/products/5033/docs/](http://selinc.com/products/5033/docs/)) for details on islanded capability. The simulator function blocks have also been enhanced to support simulating limited-islanding operation.

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