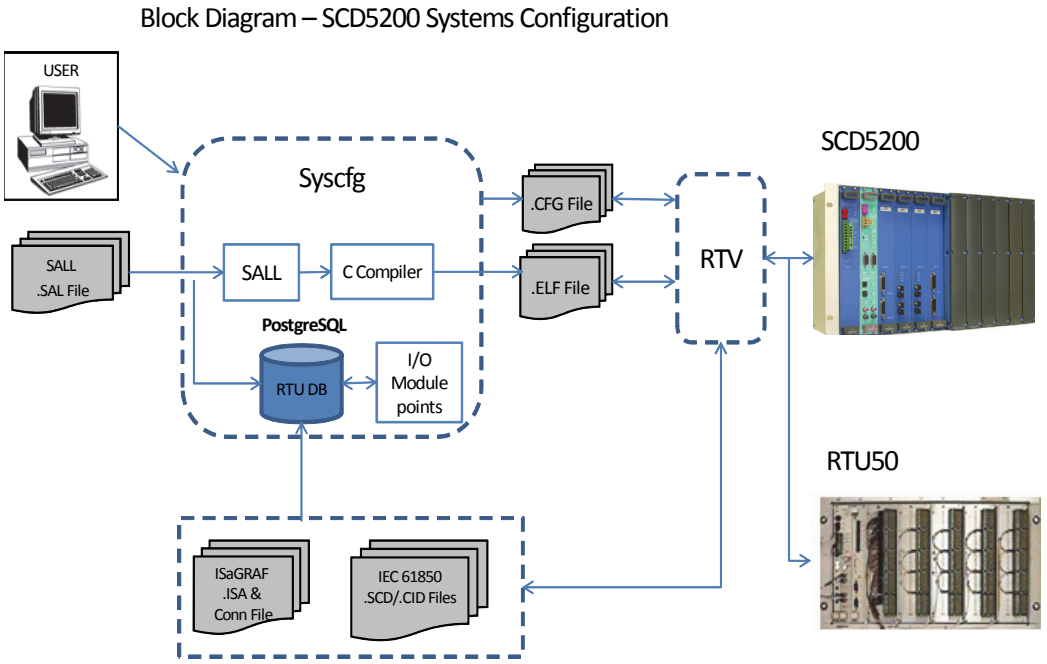
I/A Series® Remote Terminal Unit (RTU) System Configurator



BACKGROUND

The SCD5200, a third millennium Station Computing Device, inherits the pedigree and function of the I/A Series® Remote Terminal Unit RTU50. The SCD5200 utilizes the RTU50's field proven software and uses latest generation processes and fabrication techniques to achieve more compact hardware with higher performance.

The SCD5200 combines the features and benefits of RTU50 Series components with higher levels of integration and state-of-the-art configuration and diagnostic packages. CPU, OptoNet, Power, and dual Ethernet (COPE - Refer to PSS 21H-8G3 B4) are integrated into a compact main processor board. Repackaging allows up to ten input/output modules (Refer to PSS 21H-8G2 B4) in a single file. The COPE and 100 W power supply (Refer to PSS 21H-8G4 B4) operate from station batteries from 24 to 129 V dc nominal.

The SCD5200 architecture (Refer to PSS 21H-8G1 B3) allows a full spectrum of configurations from small single device stations through to redundant power supply, redundant processor, and redundant input output systems with redundant (duplicated and path diverse) communications networks.

INTRODUCTION

The System Configurator is an off-line utility which allows full configuration of all field I/O and communications assignments of the RTU. The System Configurator supports general data entry, editing and validity checking of an offline database,

through a windowed graphical user interface (GUI).

The System Configurator generates an RTU configuration definition (.CFG file) for all I/O communications and calculation data points. This file can then be loaded into the RTU Flash File System through the Remote Terminal Viewer (RTV) diagnostics utility (Refer to PSS 1S-2M4 B3). When the RTU is on-line, all input modules are polled for data, which is processed according to the configuration definition and is used to update the RTU database. The distributed processing architecture of the RTU ensures that these updates are done efficiently even at times of high I/O or communications activity, and regardless of the size of the RTU.

FEATURES

- Operates on Windows® 7 Professional (32 bit and 64 bit) SP1 and Windows 2008 Server (64 bit) Operating Systems
- Provides user-friendly navigation with pull-down menus and tree-type functional display
- Easily configures and views configurations of stand-alone RTUs, or OptoNet networks of multiple RTUs
- With right-click pop-up menus provides easy access to commonly used operations (such as generating CFG, creating/editing a module)
- With a Windowed Graphical User Interface (GUI) provides user-friendly data entry and editing
- Provides full validity checking for data entry
- Identifies all I/O points by a user-assigned name, not by index numbers
- Allows import of CFG file(s) to populate the configuration database
- Allows the configuration database to be exported and imported as CSV files
- Allows the configuration and compilation of Intrinsic Database Functions (IDF) and State And Logic Language (SALL) calculations
- Provides easily accessible and readable (contextual) help
- Simplifies upgrading the System Configurator to a newer version by retaining the existing configuration database
- Supports configuration of IEC 61131-3 compliant ISaGRAF® applications

  ISaGRAF is supported only on the Windows 7 (32 bit) Operating System

FUNCTIONAL DESCRIPTION

System Configurator is an off-line utility designed to allow technical staff and system engineers to configure and maintain RTU50 and SCD5200 Station Computing Devices and associated plant.

Main Screen (Overview)

The main screen is divided vertically into two windows: the left and right panes. The left pane displays the configuration tree. Users can navigate through the tree by using the familiar metaphor of expanding the tree elements. A node in the tree can represent a Site, RTU, File, CPU Card, I/O Card, Calculation, IED or any other module. Each tree node is provided with a pop-up menu having some common options and some node specific options. Tree nodes in the System Configurator can be of two types: Dynamic and Static. A dynamic node is created by a user action such as creating a Site, RTU, etc. Static tree nodes are base constructs that cannot be edited or deleted, e.g., RTU Configuration (the root node of the configuration tree), Equipment (for configuring IEDs), and Calc Sources (for ISaGRAF®). Each dynamic node is associated with windows that allow the editing of its configuration

parameters. These windows appear in the right pane of the main screen.

The user can configure or view the parameters of a module through this window. The main screen also has a menu bar providing pull-down menus. A status bar at the bottom of the main screen displays the operation that is currently in progress.

Figure 1 shows the layout of the System Configurator main screen, demonstrating the configuration tree, pop-up menus, windowed GUI (on the right pane), menu bar and status bar.

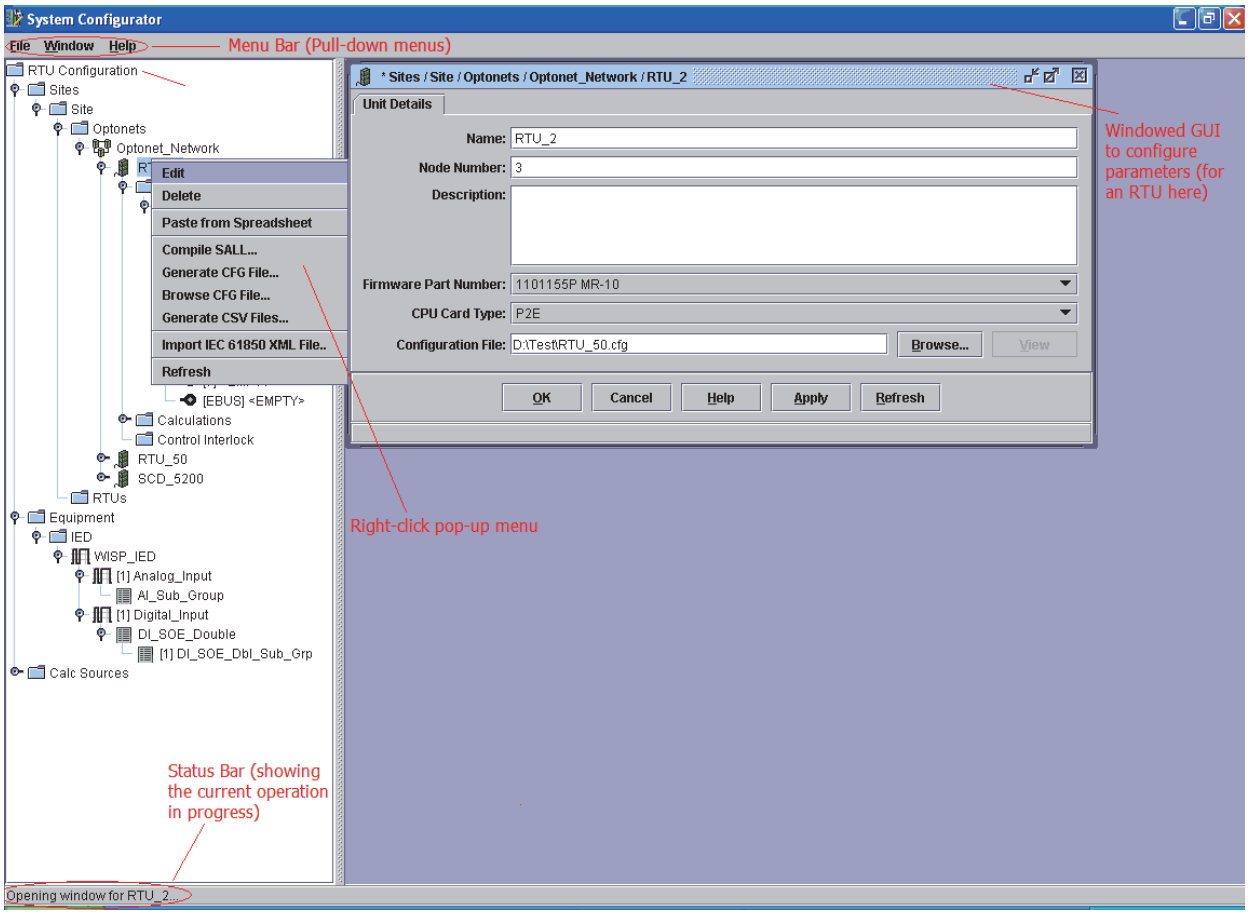


Figure 1. Main Screen

Each dynamic node that is configured by the user supports the following common actions in addition to the node specific options.

Table 1. Menu Actions

Menu Name	Submenu	Action
Create	Shows all possible modules under the selected node	Create the selected sub module under the selected module.
Edit	None	Opens a configuration window for the selected module
Delete	None	Deletes the selected device or module and all sub modules configured under that node.
Refresh	None	Updates the selected node structure from the database

Generating Configuration File(s)

Once the user has created the configuration of an RTU (either as a stand-alone RTU or member of an OptoNet network of RTUs), the .CFG file for that RTU can be generated by right-clicking on that node and selecting “Generate CFG File…” option from the pop-up menu. This is shown in Figure 2. The content of the CFG file can be viewed in the window after the generation process is complete.

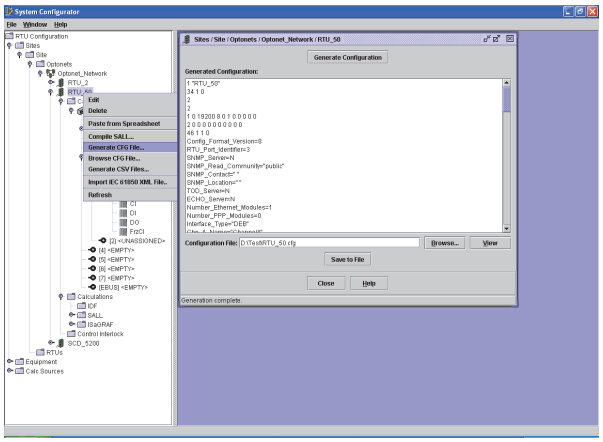


Figure 2. Generating the Configuration File

The user can also generate the CFG files for all the RTUs in an OptoNet or all stand-alone RTUs at a site. A table of all the RTUs is presented to the user to allow selection of the RTUs for which the CFG file is to be generated.

Importing Configuration File(s)

The configuration of an existing RTU can be loaded for modification in System Configurator by reading the existing CFG file(s). Some parameters that are configurable in System Configurator do not appear in the CFG file. On importing a .CFG file, the application leaves such parameters (which cannot be read from the CFG file) empty or provides default value. The normal validation check on each parameter is also carried out during the creation of the configuration database from the .CFG file(s). Figure 3 shows a view of the .CFG import process.

In a similar manner to the bulk generation of CFG files, multiple CFG files for an OptoNet or site can be imported through a single command.

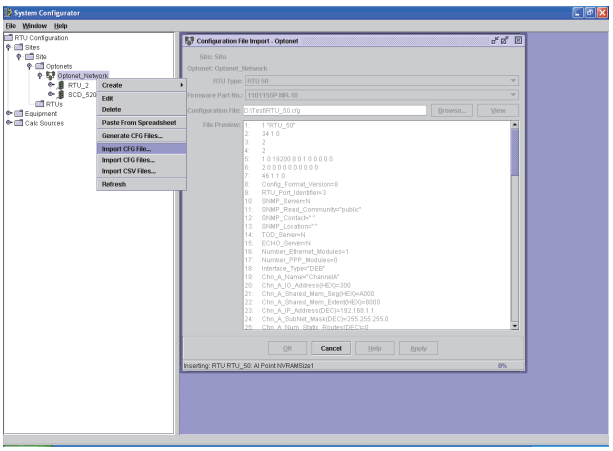


Figure 3. CFG File Import

Bulk Import and Export

The configuration database can be exported in the form of CSV files and these files later imported to recover the database. These CSV files provide a mechanism for bulk data modification or creation through the use of external tools.

The CSV file data can be imported in two ways, one by directly specifying the files to import and other by copying the content from the CSV file and pasting it into the System Configurator. Figure 4 shows an example.

The CSV import/export feature is limited since not all IO modules or protocols are supported. Refer to Table 3, Table 4, and Table 5 for the list of hardware modules, protocols, and functions that support CSV Import.

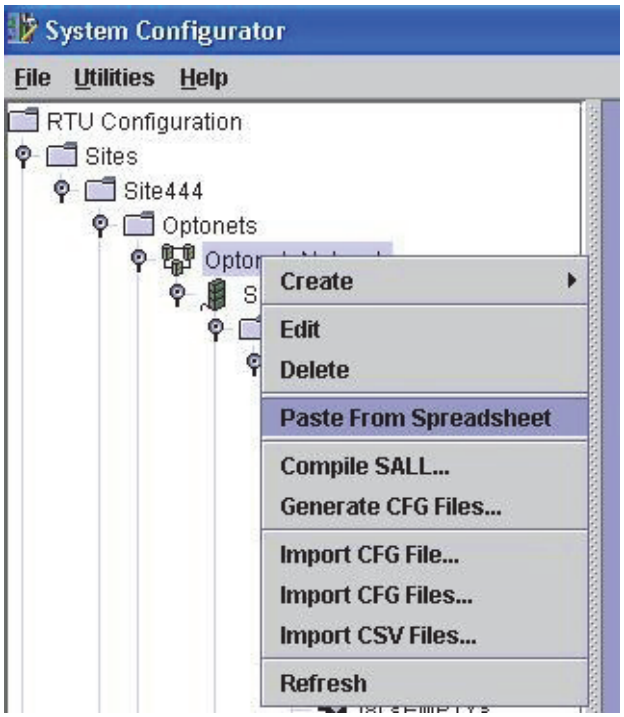


Figure 4. Pasting From Spreadsheet

Configuring a Module Using the GUI

All modules (protocols, cards, calculations, etc.) are configured by right-clicking on the tree node where they are to be created and then configuring the parameters for that module in the window associated with it. Figure 4 illustrates configuring a DNP3 slave protocol on V.28 DCB. After the parameters shown in the window have been edited, pressing the “Apply” or “OK” button will save any changes and create the module.

When configuring an I/O card, all I/O points are identified by a user-assigned name and not by index numbers. Alternatively, default names can be accepted for accelerated configuration entry.

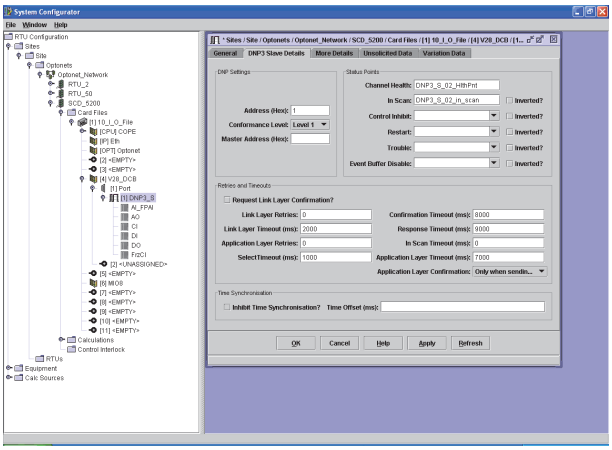


Figure 5. Configuring a Module (DNP3 Slave Protocol)

Configuring IEC 61850

System Configurator allows the incorporation of both IEC 61850 Client/GOOSE Subscriber and IEC 61850 Server/GOOSE Publisher. The System Configurator also allows the incorporation of the IEC 61850 files (.SCD and .CID) which are created using third party IEC 61850 IED and System Configuration tools such as, Substation Automation Configuration, which is part of Invensys ArchestrA System Platform (PSS 21S-10G4).

Configuring IEC 61850 in System Configurator is accomplished by importing IEC 61850 Substation Configuration Language (CID and SCD) XML files. The System Configurator creates the IEC 61850 database object definitions from this file, after which the RTU50 or SCD5200 configuration can be generated.

Help

Help is available through a content index available from the Help menu on the main form.

In addition, context sensitive help is available for each level of the tree and display windows by pressing Help button on that window.

Window Manipulation

The main and right-hand panel windows can be brought into focus, sized, minimized, maximized, and closed through the familiar window operations.

Utilities

The Database Backup Utility that is bundled with the System Configurator installation can be used to take the backup of the database configuration and also restore any database configuration.

Calculation Tasks

The System Configurator program performs many tasks, which include the following:

- Enables the RTU to perform calculations (SALL tasks) by linking the calculation source files (.SAL) to the configuration file (.CFG)
- Creates calculated database points that are defined in the linked .SAL files
- Allows access to a text editor that allows editing of .SAL files
- Configures and compiles Intrinsic Database Functions (IDF) and State And Logic Language (SALL) calculations.

File Names and Types

System Configurator uses or generates the files shown in Table 2.

Table 2. Files Supported by System Configurator

File Name and Suffix	Function	Input/Output
.CFG	Configuration file	Output
.CID	Configured IED Description (For IEC 61850)	Input
.CNX	Connection File	Input
.CSV	Comma Separated Values	Input/Output
.ELF	SALL logic executable file	Output
.ISA	IsaGraF logic source file	Input
.SAL	SALL logic source file	Input
.SCD	Substation Configuration Description (For IEC 61850)	Input

System Requirements

The System Configurator application is supported on Windows 7 Professional (32 bit and 64 bit) SP1 and Windows 2008 Server (64 bit) Operating Systems.

Java Runtime Environment V 1.5 is supplied with the System Configurator.

The System Configurator includes the PostgreSQL 9.2.4 ORDBMS (Object Relational Database Management System) which is used as the backend database.

The System Configurator supports the SCD5200 and RTU50 using any version of firmware SY-1101205 or firmware SY-1101155 Rev K or later.

Some communications protocols and input output modules available in the RTU50 and SCD5200 are not supported by System Configurator (Refer to the Version release notes for the modules supported by that version).

System Configurator SY-1101191 supports the hardware modules in Table 3, the software modules in Table 4, and the functions in Table 5.

Table 3. SCD5200 RTU Hardware Modules Supported by System Configurator

Part Number	Subsystem	CSV Import Support
AC Transducer Modules		
SY-0399142	3 Phase AC Transducer Module 5 Amp Module Assembly	No
SY-0399140	3 Phase AC Transducer Module 1 Amp Module Assembly	No
Multiple I/O Modules		
SY-0399095	SCD5200 Multi Input Output Module 129 V8 Mini Pilot Relay	No
SY-0399094	SCD5200 Multi Input Output Module 48 V8 Mini Pilot Relay	No

Table 3. SCD5200 RTU Hardware Modules Supported by System Configurator (Continued)

Part Number	Subsystem	CSV Import Support
SY-0399088	SCD5200 Multi Input Output Module 24 V8 Mini Pilot Relay	No
SY-0399097	SCD5200 Multi Input Output Module 129 V6 Paired Pilot Relay	No
SY-0399096	SCD5200 Multi Input Output Module 48 V6 Paired Pilot Relay	No
SY-0399089	SCD5200 Multi Input Output Module 24 V6 Paired Pilot Relay	No
Analog Input Module		
SY-0399085	SCD5200 20 Channel Analog Input Module (Isolated)	No
Analog/Digital Input Module		
SY-0399160	SCD5200 4 Analog/32 Digital Input Module (24 V to 129 V)	Yes
Digital Output Modules		
SY-0399086	SCD5200 12 Pilot Relay Digital Output Module	Yes
SY-0399087	SCD5200 12 Magnetically Latched Relay Digital Output Module	Yes
SY-0399136	SCD5200 8 Digital Output 10 Amp Module	Yes
Analog Output Module		
SY-0399084	SCD5200 4 Channel Analog Output Module	No
Processor Modules		
SY-0399143	SCD5200 CPU OptoNet Power Supply Ethernet (COPE) Module	NA
SY-0399144	SCD5200 CPU OptoNet Ethernet (COE) Module	NA
SY-0399151	SCD5200 CPU OptoNet Ethernet (COE) Module with 64 MB SDRAM	NA
SY-0399152	SCD5200 CPU OptoNet Power Supply Ethernet (COPE) Module with 64 MB SDRAM	NA
8 Channel Serial Module		
SY-0399132	SCD5200 8CH Serial Module RS-485/RS-232	No
Dual Communications Modules		
SY-0399122	DCB DNP Glass Optical supporting DNP3 Master/Slave	No
SY-0399127	DCB IEC 60870-5-103 Glass Optical supporting IEC 60870-5-103 Master	No
SY-0399163	DCB DNP V.11 supporting DNP3 Master/Slave	No
SY-0399192	SCD5200 Communications Module V.28 Conitel C2020/C2025 Master/Slave, C300/C3000 Slave	No

Table 3. SCD5200 RTU Hardware Modules Supported by System Configurator (Continued)

Part Number	Subsystem	CSV Import Support
SY-0399194	SCD5200 Communications Module V.28 DNP3 Master/Slave	NA
SY-0399196	SCD5200 Communications Module V.28 IEC 60870-5-101 Slave	NA
SY-0399198	SCD5200 Communications Module V.28 WISP+ Master/Slave	NA
SY-0399122	SCD5200 Comms Module Glass Optical DNP3	NA
SY-0399127	SCD5200 Comms Module Glass Optical IEC103	NA

Table 4. SCD5200 Communication Protocols

Subsystem	System Configurator Support	CSV Import Support
C2025 Conitel Master	Yes	Yes
C2025 Conitel Slave	Yes	Yes
C300 Conitel Slave	Yes	Yes
DNP3 Master	Yes	Yes
DNP3 Slave	Yes	Yes
Harris 5000/5500/6000 Slave	No	No
IEC 60870-5-101 Master	Yes	No
IEC 60870-5-101 Slave	Yes	No
IEC 60870-5-103 Master	Yes	Yes
IEC 60870-5-104 Slave	Yes	No
IEC 61850 Client / GOOSE Subscriber	Yes	No
IEC 61850 Server / GOOSE Publisher	Yes	No
LN57-3	No	No
Modbus Master	Yes	No
Modbus Slave	Yes	No
OptoNet	Yes	No
SNTP	Yes	NA
TCP/IP	Yes	NA

Table 4. SCD5200 Communication Protocols (Continued)

Subsystem	System Configurator Support	CSV Import Support
WISP + Master	Yes	Yes
WISP + Slave	Yes	Yes

Table 5. Functions Supported by SCD5200

Feature	System Configurator Support	CSV Import Support	Function
Calculations:			
Intrinsic Database Functions	Yes	Yes	Intrinsic Database Functions (IDF) allow the user to produce Analog and Digital values (Result Points) through the manipulation of the previously specified Analog and Digital Inputs (Source Points). IDF enable the user to implement several kinds of calculations within the RTU configuration, without the need to create application programs using SALL or ISaGRAF.
SALL Calculations	Yes	Yes	State and Logic Language (SALL) allows the users to implement their own control and data processing logics for execution on the Invensys RTU's. A SALL program defines a sequence of instructions that is executed from the beginning to end. This sequence is executed either at regular intervals (at a periodic rate stipulated by the programmer) or on demand, whenever there is a change in an input value referenced by the program.
IEC 61131-3 (ISaGRAF)	Yes	No	The supported version is ISaGRAF Workbench V3.xx (3.32 or higher, but lower than 4.00)
Miscellaneous:			
Analog Logger	Yes	No	Analog Logger allows the users to configure the analog input logs, that are to be created in RTU, before and after a change in the digital input point. This configuration occurs at a configurable sample Interval and for a configurable time period. The sampled values are dumped into the Flash File System in the CSV format.

Table 5. Functions Supported by SCD5200 (Continued)

Feature	System Configurator Support	CSV Import Support	Function
Control Interlock	Yes	Yes	Control Interlock is responsible for safety controlling and the supervision of control points according to its dependencies. Additionally, interlocking schemes prevent dangerous operations that might otherwise damage primary equipment. Only authorized users can override interlocking and other locked operations.
Serial Event Logger	Yes	No	Event Logger allows the users to record all the events related to a configured set of Digital Sequence-of-Events (SOE) points.The recorded events may be saved to a file in the remote device's Flash File System or written to a serial port either in real-time or when requested by the user.
IRIG-B Serial Time Code Generator	No	No	
System Monitor (SysMon)	Yes	No	System Monitor provides the System Information on different status such as, battery status, System configuration, and Memory statistics. This data can be telemetered to the Master station using SCADA protocol.

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