Foxboro™ SCADA

SCD6000 and SCD6000-SVX Power Supply, I/O, and Communication Modules

PSS 41H-8S6KMOD

Product Specification

February 2024

Schneider Electric

Legal Information

The information provided in this document contains general descriptions, technical characteristics and/or recommendations related to products/solutions.

This document is not intended as a substitute for a detailed study or operational and site-specific development or schematic plan. It is not to be used for determining suitability or reliability of the products/solutions for specific user applications. It is the duty of any such user to perform or have any professional expert of its choice (integrator, specifier or the like) perform the appropriate and comprehensive risk analysis, evaluation and testing of the products/solutions with respect to the relevant specific application or use thereof.

The Schneider Electric brand and any trademarks of Schneider Electric SE and its subsidiaries referred to in this document are the property of Schneider Electric SE or its subsidiaries. All other brands may be trademarks of their respective owner.

This document and its content are protected under applicable copyright laws and provided for informative use only. No part of this document may be reproduced or transmitted in any form or by any means (electronic, mechanical, photocopying, recording, or otherwise), for any purpose, without the prior written permission of Schneider Electric.

Schneider Electric does not grant any right or license for commercial use of the document or its content, except for a non-exclusive and personal license to consult it on an "as is" basis.

Schneider Electric reserves the right to make changes or updates with respect to or in the content of this document or the format thereof, at any time without notice.

To the extent permitted by applicable law, no responsibility or liability is assumed by Schneider Electric and its subsidiaries for any errors or omissions in the informational content of this document, as well as any non-intended use or misuse of the content thereof.

Important Safety Instructions

Read these instructions carefully and look at the equipment to become familiar with it before trying to install, operate, service, or maintain it. The following safety messages might appear throughout this manual or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a "Danger" or "Warning" safety message indicates that an electrical hazard exists that results in personal injury if the instructions are not followed.

This safety alert symbol that lets you know about potential personal injury hazards. Obey all safety messages with this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

Failure to follow these instructions will result in death or serious injury.

⚠ WARNING

WARNING indicates a hazardous situation that, if not avoided, **could result in** death or serious injury.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

⚠ CAUTION

CAUTION indicates a hazardous situation that, if not avoided, **could result in** minor or moderate injury.

Failure to follow these instructions can result in injury or equipment damage.

NOTICE

NOTICE is used to address practices not related to physical injury.

Failure to follow these instructions can result in equipment damage.

Please Note

Electrical equipment should only be installed, operated, serviced, and maintained by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction, installation, and operation of electrical equipment and has received safety training to recognize and avoid the hazards involved.

Overview

EcoStruxure™ Foxboro™ SCADA remote devices, EcoStruxure™ Foxboro™ SCADA SCD6000 and EcoStruxure™ Foxboro™ SCADA SCD6000-SVX use various modules to monitor and control industrial plants.

These modules are installed to Foxboro SCADA remote devices to achieve real-time data collection and transfer the collected data to the Human Machine Interface (HMI) software for analysis and supervision of the plant.

The various types of modules are:

- Input/Output Modules

  The SCD6000/SCD6000-SVX Input/Output Modules connect a wide range of field equipment and devices to SCD6000and SCD6000-SVX.

- Dual Communication Modules

  The SCD6000/SCD6000-SVX Dual Communication Modules are used with SCD6000, SCD6000-SVX, SCD5200, RTU50 SVX, and RTU50. They help provide reliable, stable, and consistent communication over a wide range of system configurations when used in Greenfield and Retrofit SCADA sites.

- Wide Range Input Power Supply Modules

  The SCD6000 Wide Range Input Power Supply Module is used with larger SCD6000 configurations that have more than five input/output or communication modules. The integrated power supply of the COPE module is used in other configurations. The SCD6000-SVX Wide Range Input Power Supply Module is used with RTU50/SCD6000-SVX/RTU50 SVX.

- Remote Terminal Unit (RTU) 3 Phase Digital Transducer Module, also referred to as Alternating Current Transducer Type 2 card (ACT).

  The RTU 3 Phase Digital Transducer Module is used with SCD6000 and SCD6000-SVX to provide a direct interface to voltage and current transformers, replacing the need for external transducers.

- 8 Channel Serial Module

  The SCD6000 8 Channel Serial Module provides multiple configurable communication ports with protocol support for DNP3 Controlling Station and DNP3 Outstation, Modbus Client and Modbus Server, and IEC 101 Master for SCD6000. You can configure proprietary protocols using the State and Logic Language High Level Serial Interface (SALL HLSI) functions. See *EcoStruxure™ Foxboro™ SCADA SCD6000 State And Logic Language (SALL)* (PSS 41S-2S6KSAL).

  NOTE:

  - The form and fit of the 8 Channel Serial Module, 8 Channel Digital Output Module, Multi I/O Module, and Conitel (C2025, C300, C3000) are applicable only for SCD6000. However, you can use these modules with SCD6000-SVX with the SCD6000 form/fit card.

  - SCD6000-IOX modules are designed for SCD6000-SVX products. These are RoHS-compliant modules.

Insensitive Terms Replaced in this Document

We have replaced these terms in this document. However, the product's user interface and ordering information might still use old terms.

Old Term	New Term
DNP3 Master	DNP3 Controlling station
DNP3 Slave	DNP3 Outstation
Modbus Master	Modbus Client
Modbus Slave	Modbus Server

Input/Output Modules

The Input/Output modules include:

- Analog/Digital Input (ADI) Module
- 20 Channel Analog Input Module
- 4 Channel Analog Output Module
- 12 Channel Digital Output Module
- 8 Channel Digital Output Module
- Multi I/O Module

Figure 1 - SCD6000 Input/Output Modules

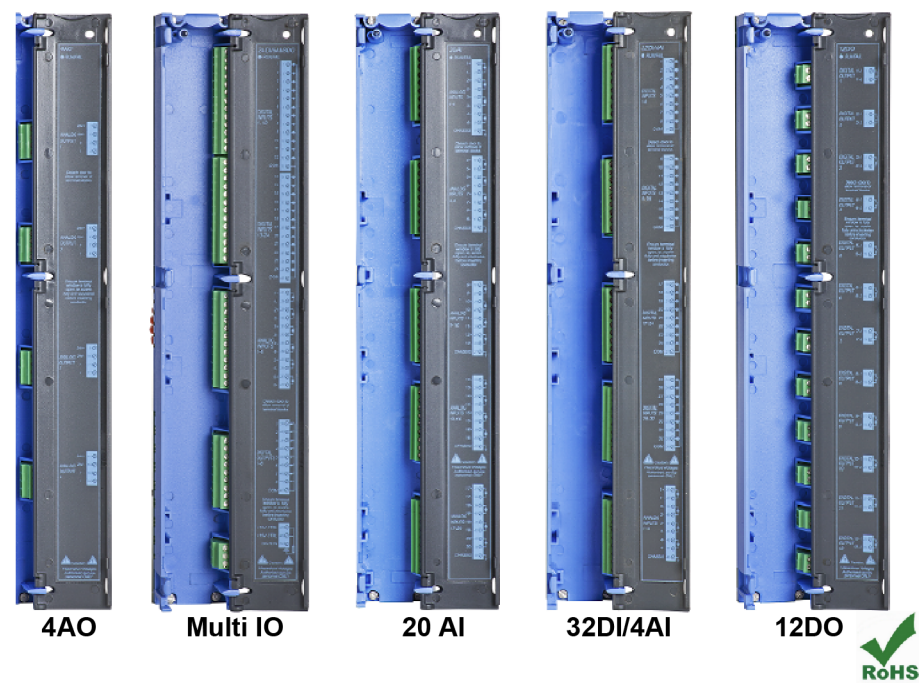**Figure 2 - SCD6000 I/O Module Front Termination Assembly**

| 4AO | Multi IO | 20 AI | 32DI/4AI | 12DO |

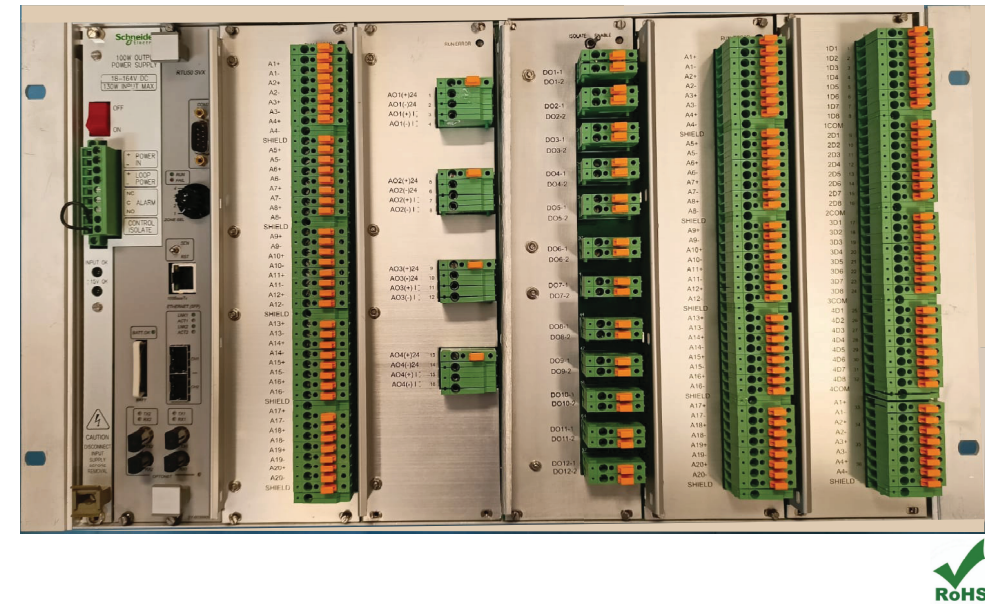**Figure 3 - SCD6000-IOX Input/Output Modules**

Figure 4 - SCD6000-IOX Front Termination Assembly

The Multi I/O Module provides the highest I/O density, a combination of digital input, analog input, and digital output (24 DI, 6 AI, and 6 or 8 DO).

The ADI Module (32 DI and 4 AI) supports high density input-only configurations. The digital input voltage range for the Field Interrogation Power Supply (FIPS) is nominal 24 V to 129 V, which can be selected through jumper settings.

The Analog/Digital Input (ADI) module and 20 Channel Analog Input module provide 1 kV isolation for analog inputs.

SCD6000 Digital Outputs include latched and non-latched relay options, and SCD6000-SVX Digital Outputs include only pilot relay options.

Through flexible I/O configurations and options, the I/O modules can be matched to a wide range of applications.

The Analog Input modules, Analog Output modules, and Digital Output modules can be combined with the high-density Multi I/O and ADI modules for SCD6000/ SCD6000-SVX. There is a greater flexibility for configuration, connection, and isolation. I/O Module Front Termination Assembly shows the front termination assembly of all the I/O modules.

The combination of a ten I/O module capacity file of SCD6000 and the combination of a 6 slot and 7 slot module file of SCD6000-SVX, integrated local network capability, and high I/O density modules can accommodate large to very large I/O counts, at minimal cost.

The one I/O card file, three I/O card file, and five I/O card file options (see *EcoStruxure™ Foxboro™ SCADA SCD6000 RTU Architectural Overview* (PSS 41H-8S6KAOV) aim to meet the needs of small I/O and space limited applications. The software complements the I/O module hardware.

Analog/Digital Input (ADI) Module

Features - ADI Module

- Removable plug-connected terminal board for SCD6000
- Removable terminal board for SCD6000-SVX
- Plug-in current loop resistors
- Software configurable digital inputs (SOE, Inverted, Non Volatile, Enable/Disable Chatter Filtering, and Set Chatter Filter Count)
- Optical isolation on digital inputs
- Galvanic isolation on analog inputs
- Common voltage inputs (+ve or –ve) that are selectable in groups of eight digital inputs
- Digital input bounce elimination circuitry
- Individually configurable chatter filters
- Diagnostic LED

Digital Inputs - ADI Module

The digital input subsystem processes 32 contact inputs. The module optically isolates, filters, and helps to protect against surge transients. It interfaces the contact state to the on-board microprocessor.

Digital input circuits employ contact bounce elimination circuitry, which rejects noisy contact transitions until the input signal becomes steady for.

The digital inputs are categorized into four groups of eight, with a common terminal for each group. Each group accepts common positive or common negative terminal.

The SCD6000/SCD6000-SVX digital input modules SY-0399160/SY-0399160R, SY-0399222/SY-0399222R, and SY-0399161R provide a standard debounce time of 2 ms whereas SY-6039935R, SY-6039937R and SY-60399011R provide a configurable debounce time range of 2 ms to 25 ms.

The status of digital inputs is provided by scanning every millisecond. For Sequence of Events with one millisecond resolution, time-tagging is available. Each of the digital inputs support Accumulators and the Momentary Change Detection functionality.

Analog Inputs - ADI Module

The analog input subsystem consists of individually isolated amplifiers and analog-to-digital converters for each input. Each input is measured and converted to a 12-bit value, and has automatic zero drift correction and calibration scale checking.

The conversion provides a nominal range of values from -4000 to +4000 for inputs from -2 V to +2 V with over range capability of ±2.0475 V.

The plug-in current loop termination resistor value, for each input is selected to provide a 2 V signal for the nominal full-scale current loop range.

Functional Description - ADI Module

The Analog/Digital Input module provides flexible data collection and input monitoring facilities through 32 individually configured digital inputs and 4 high resolution analog inputs. The Analog/Digital Input module has 1 kV isolation on the analog inputs.

The module supports digital inputs over the nominal ranges of 24 V to 48 V and 48 V to 129 V. A jumper for each digital input can be individually set to select either of these ranges. The factory default setting is for 48 V to 129 V operation.

To use the Analog/Digital Input module within the digital input voltage ranges of 60 VDC – 129 VDC or 72 VAC RMS – 144 VAC RMS, jumpers J3 to J34 must be removed.

⚡⚠ **DANGER**
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH
Disconnect the digital input power from the module while inserting or removing jumpers J3 to J34.
Failure to follow these instructions will result in death or serious injury.

NOTE: (For SCD6000 only)

- The Analog/Digital Input module is available in four variants:
  - ◦ Two variants are created to support programmable debouncing.
  - ◦ Two variants are created for different wire sizes in the terminal assembly.

  The size of the wire is based on insulation requirements. Thicker wires are required to support higher insulation requirements.
- SY-0399160R accommodates wire size of 0.5 sq. mm (20 AWG) and SY-0399222R accommodates wire size of 1 sq. mm (17 AWG).
- The thickest wire size supported for a fully populated I/O count [45 wires] is 0.75 sq. mm (18 AWG) for SY-0399160R and 1 sq. mm (17 AWG) for SY-039922R. In all other scenarios, SY-0399222R is identical to SY-0399160R.

Functional Specifications - ADI Module

4 Analog/32 Digital Input Module (1 kV Isolated)	
Number of Channels	• 4 Analog field inputs • 32 Status inputs

Analog Inputs	• Input Circuit
	  4 differential inputs per input module
	• Analog-to-Digital Converter Type
	  Sigma Delta
	• Analog-to-Digital Conversion Time
	  20 ms
	• Resolution
	  12-bits
	• Input Update Rate (Data Age)
	  20 ms
	• Input Signal Range
	  ±2 VDC

4 Analog/32 Digital Input Module (1 kV Isolated)	
	• Input Signal Scaling Dropping resistor for current inputs or voltage inputs • Full Scale Range ±4000 counts (over range ±4095 counts) • Maximum Error at 25°C and 0 V Common Mode ±0.1% full scale • Common Mode Error 0.0001% per Volt to a maximum of 1000 VAC (120 dB) • Temperature Error 0.002% per °C over temperature range • Maximum Error Over Temperature and Common Mode Range ±0.25% full scale • Differential Mode Rejection 60 dB minimum at 50/60 Hz • Differential Mode Voltage Without Damage ±24 VDC or peak AC • Common Mode Rejection 120 dB at 1000 VAC, dc to 60 Hz balanced input • Maximum Common Mode Voltage Operating in spec 1000 VAC • Reference Voltages Auto calibration on individual channels does not require external check voltages

Digital Inputs	• Input Circuit
	32 per input module, divided in 4 groups of 8 inputs
	• Input Types
	Any input can be used for Status, Momentary Change Detect, Sequence of Events, and Accumulator (1 or 2 inputs per accumulator)
	• Circuit Types
	  ◦ Common return per group of 8 inputs
	  ◦ Common positive or common negative
	• Input Voltage
	24 V to 129 V, selected individually per input by jumper setting; factory default range is 48 V to 129 V; field configurable to 24 V-48 V; AC Voltage range is 96 VAC to 120 VAC ±20%
	• Input Current
	5 mA per input (nominal)
	• Isolation Type
	Opto-coupler
	• Insulation
	2 kV RMS for 1 minute input to frame (ground)

4 Analog/32 Digital Input Module (1 kV Isolated)

	• ON/OFF Time
	
	  ◦ Standard debounce time of 2 ms for SY-0399160/SY-0399160R, SY-0399222/SY-0399222R, and SY-0399161R
	
	  ◦ Configurable debounce time range of 2 ms to 25 ms for SY-6039935R, SY-60399011R, and SY-60399037R

4 Analog/32 Digital Terminal Assembly	
Printed Circuit Board	For SCD6000: • The frame with dimensions 261.8 mm (10.307087 inches) x 35 mm (1.377953 inches) attached to the frame using screws. For SCD6000-SVX: • The frame with dimensions 261.8 mm (10.307087 inches) x 70 mm (2.755906 inches) is attached using screws.
Terminals	• 8 Digital Input Channels with common grounding • 2 terminals for 1 analog input point • 1 chassis terminal per four analog input channels
Monitors/Indicators	Green/Red Diagnostic LED

20 Channel Analog Input Module

Features - 20 Channel Analog Input Module

- Removable plug-connected termination assembly for SCD6000
- Removable termination assembly for SCD6000-SVX
- Plug-in current loop resistors
- Galvanic isolation on analog inputs
- 20 analog inputs
- 12-bit analog-to-digital converter
- ±2 V ranges
- Diagnostic LED

Functional Description - 20 Channel Analog Input Module

The 20 Channel Analog Input Module provides an accurate 12-bit resolution over wide temperature ranges. A 1 kV isolation provides individually isolated channels. The module utilizes a self-calibrating analog-to-digital converter. The Analog Input Module provides a cost-effective method for gathering a large volume of analog information from the field.

Functional Specifications - 20 Channel Analog Input Module

20 Channel Analog Input Module (1 kV Isolated)	
Number of Channels	• 20 Analog field inputs • 2 Internal check analog inputs
20 Channel Analog Terminal Assembly	
Printed Circuit Board	For SCD6000: • The frame with dimensions 261.8 mm (10.307087 inches) x 35 mm (1.377953 inches) is attached using screws. The terminals are sized for 1.5 sq. mm(16 AWG) wire For SCD6000-SVX: • The frame with dimensions 261.8 mm (10.307087 inches) x 70 mm (2.755906 inches) is attached using screws. The terminals are sized for 1.5 sq. mm(16 AWG) wire
Terminals	• 2 terminals per point • 1 chassis terminal per four input channels • Loop drop resistor mounted on rear side of the terminal board
Monitors/Indicators	Green/Red Diagnostic LED

Analog Inputs	• Input Circuit 20 separately isolated analog inputs • Analog-to-Digital Converter Type Sigma Delta • Resolution 12-bits • Input Update Rate (Data Age) <600 ms includes calibration cycle • Input Signal Range ±2 VDC • Input Signal Scaling Current loop resistor • Full Scale Range ±4000 counts (over range ±4095 counts) • Maximum Error at 25°C ±0.1% full scale • Common Mode Error 0.0001% per Volt to a maximum of 1000 VAC (120 dB) • Temperature Error 0.002% per °C • Maximum Error Over Temperature and Common Mode Range ±0.25% full scale • Differential Mode Rejection 60 dB minimum at 60 Hz • Differential Mode Voltage Without Damage ±24 VDC or peak AC • Common Mode Rejection 120 dB at 1000 VAC, DC to 60 Hz balanced input • Maximum Common Mode Voltage Operating in spec 1000 VAC RMS • Reference Voltages Auto calibration on individual channels does not require external check voltages

4 Channel Analog Output Module

Features - 4 Channel Analog Output Module

- Removable plug-connected termination assembly for SCD6000
- Removable termination assembly for SCD6000-SVX
- Four channel analog output
- 12-bit resolution
- 4 mA to 20 mA, 0 mA to 10 mA, and 0 mA to 16 mA ranges
- Optical isolation of output circuits
- Internal alarms for External voltage failure detected and Current loop open circuit

Optical Isolation - 4 Channel Analog Output Module

The Digital-to-Analog converters are serially linked to the rest of the module through optical isolators. Power is supplied from an external source, which results in an electrically isolated interface to the external devices.

If the RTU or the module has a detected failure, the design still sustains the outputs if external loop power is maintained.

Internal Monitoring - 4 Channel Analog Output Module

Each channel has two internal alarm points associated with it. If the external voltage source has a detected failure, or the current loop is open circuit to the output, the on-board processor is notified via optically isolated digital inputs. These inputs are then passed to the main processor module, that are made available for scanning, if required by the SCADA Client Station.

An operator can be notified if an analog device has been disconnected from the RTU, or if the external voltage source has a detected failure, enabling problems in the field to be identified remotely.

Functional Description - 4 Channel Analog Output Module

The 4 Channel Analog Output Module provides four isolated current outputs. Outputs of 4 mA to 20 mA, 0 mA to 10 mA and 0 mA to 16 mA are independently configurable. Two-pass operation with built-in hardware checking helps to verify that consistent control of equipment is maintained. Each analog output can be scaled independently for the selected output current range as part of the RTU database configuration.

The 4 Channel Analog Output Module (SY-0399084R) operates in Last Good Output Value (LGV) mode. When the RTU loses power, the module retains setpoints and operates with the last good output value until power is restored.

The 4 Analog Output Module for Electrodynamic Controllers (SY-60399016R) has two operating modes: LGV and Fail to Zero (FtZ). In FtZ mode, when the RTU loses power, the module operates at a zero value until power is restored. We recommend using LGV mode for simplex configurations and FtZ mode for High Availability configurations. These modes are configured using the LK9 jumper. For more information, see *EcoStruxure™ Electrodynamic Controller* (PSS 41S-2EDC).

> **NOTE:** The 4 Analog Output Module for Electrodynamic Controllers (SY-60399016R) is available in early 2024. For more information, contact Global Customer Support at https://pasupport.se.com (registration required).

Functional Specifications - 4 Channel Analog Output Module

4 Channel Analog Output Module	
Channels	Four
Outputs	Each output is configurable as per this table:

Range	Counts	Output Steps
4 mA to 20 mA	0 to 4000	4000
4 mA to 20 mA	800 to 4000	3200
0 mA to 10 mA	0 to 4000	2560
0 mA to 16 mA	0 to 4000	4000
4 mA to 20 mA	0 to 2000	2000
4 mA to 20 mA	400 to 2000	1600
0 mA to 10 mA	0 to 2000	1280
0 mA to 16 mA	0 to 2000	2000

NOTE: For outputs where the count range is greater than the number of output steps, some changes in counts might not result in a corresponding step change.

Accuracy (4 mA to 20 mA)	• ±0.1% full scale at 25°C • ±0.25% full scale over temperature range
Accuracy (0 mA to 16 mA)	±1% full scale over temperature range
External Loop Power	24 V (maximum 36 V, minimum 19 V)
Loop Load Resistance	0 ohms minimum, 600 ohms maximum
Channel Isolation	• 50 VDC channel to chassis • 50 VDC channel to channel
4 Channel Analog Output Termination Assembly	
Printed Circuit Board	For SCD6000: • The frame with dimensions 261.8 mm (10.307087 inches) x 35 mm (1.377953 inches) attached to the frame using screws For SCD6000-SVX: • The frame with dimensions 261.8 mm (10.307087 inches) x 70 mm (2.755906 inches) using screws
Terminals	Four terminal blocks as given in this table:

Terminal 1	+Loop power
Terminal 2	Loop power common
Terminal 3	+I (current out)
Terminal 4	–I (current return)

Monitors/ Indicators	Green/Red Diagnostic LED

12 Channel Digital Output Module

Features - 12 Channel Digital Output Module

- Removable plug-connected termination assembly for SCD6000
- Removable termination assembly for SCD6000-SVX
- 12 independent relays
- Optional magnetically latched relays
- Configurable output types (latch, variable pulse, trip/close pairs, raise/lower pairs, and multiple relays)
- Module operating condition available as the RTU database point
- Control output logic with two pass check-before-operate
- Built-in hardware and software monitoring of control operations
- Individually configurable control output duration
- Diagnostic LED

Digital Output Subsystem -12 Channel Digital Output Module

The 12 Channel Digital Output module contains source and sink drivers for 12 relays. Each relay can be driven as fixed length pulse outputs, variable length pulse outputs, or latched outputs. SCD6000 digital output subsystem provides security and control to twelve electrical or magnetically latched relays and SCD6000-SVX digital output subsystem provides security and control only to twelve electrical latched relays.

Two-Pass Operation - 12 Channel Digital Output Module

During pass 1, the on-board microprocessor accepts command data from the main processor (COPE/COE). The validity of the command is confirmed and then the hardware is checked on the output driver circuits. If tests succeed, feedback of the command is sent to the main processor.

During pass 2, the main processor sends the execute command and the control relays are operated. Pulse output controls are automatically timed and independently checked.

Functional Description - 12 Channel Digital Output Module

A 12 Pilot Relay Output module is available for SCD6000 and SCD6000-SVX. For SCD6000, an additional 12 Magnetically Latched Relay Output module is also available.

The 12 Channel Digital Output module offers different configuration possibilities. Relay outputs can be configured as individual relays, pairs, or multiples of set point combinations. Two-pass operation with built-in hardware checking helps to ensure reliable control over equipment. The module consists of an on-board microprocessor and security circuits mounted on a logic board with a plug-in relay and terminal assembly. Configuration data from the main processor determines the control of each output relay by the on-board processor.

Functional Specifications - 12 Channel Digital Output Module

12 Channel Digital Output Module (Pilot relay)	
Number of Channel	Twelve
Output Types	Outputs can be configured as: Multiple relays set point, Pulse, Trip/Close (in pairs), Raise/Lower (in pairs), and Latching
Security	One or more relay energized tests
Pilot Relay Output Module	
Number of Relays	Twelve
Relay Coil Current	27 mA
Contact Arrangement	Two-pole N/O relays with contacts connected in series to boost dc rating (output is single pole)

Contact Rating	• 5 A 250 VAC cos Φ = 0.4 (30,000 operations)
	• D.C. make capacity
	5 A 129 VDC (30,000 operations)
	• D.C. break capacity
	   ◦ 1 A 50 VDC L/R 40 ms (30,000 operations)
	   ◦ 200 mA 129 VDC L/R 40 ms (30,000 operations)
	• Isolation
	   ◦ 2 kV RMS for 1 minute output to frame
	   ◦ 1 kV RMS for 1 minute across open contact
	   ◦ 2 kV RMS for 1 minute between outputs

12 Channel Digital Output Module (Magnetically latched relay) (For SCD6000 only)	
Number of Channel	Twelve
Output Types	Supports only latch type control
Security	One or more relay energized tests
Magnetically Latched Relay Output Module (For SCD6000 only)	
Number of Relays	Twelve
Relay type	Latching
Relay Coil Current	27 mA while latching
Contact Arrangement	Two-pole N/O relays with contacts connected in series to boost dc rating (output is single pole)

Contact Rating	• 5 A 250 VAC cos Φ = 0.4 (30,000 operations)
	• D.C. make capacity
	5 A 129 VDC (30,000 operations)
	• D.C. break capacity
	   ◦ 1 A 50 VDC L/R 40 ms (30,000 operations)
	   ◦ 200 mA 129 VDC L/R 40 ms (30,000 operations)
	• Isolation
	   ◦ 2 kV RMS for 1 minute output to frame
	   ◦ 1 kV RMS for 1 minute across open contact
	   ◦ 2 kV RMS for 1 minute between outputs

Control Output Termination Assembly	
Printed Circuit Board	For SCD6000: • The frame with dimensions 261.8 mm (10.307087 inches) x 35 mm (1.377953 inches) attached to the frame using screws. For SCD6000-SVX: • The frame with dimensions 261.8 mm (10.307087 inches) x 70 mm (2.755906 inches) attached using screws.
Terminals	2 terminals per relay for connection to 1.5 sq. mm (16 AWG) wire
Monitors/Indicators	Green/Red Diagnostic LED

8 Channel Digital Output Module

Features - 8 Channel Digital Output module

- Removable plug-connected termination assembly
- Built-in hardware and software monitoring of control operations
- Two power relays in series that provide high current DC inductive load break capacity
- Eight independent single pole normally open digital outputs
- Configurable output types (latch, variable pulse, trip/close pairs, raise/lower pairs, and multiple relays set point)
- Module operating condition available as the RTU database point
- High security control output logic with two pass check-before-operate and one-of-N check on paired outputs
- Screw terminals for loop connection of up to 16 gauge cable
- Individually configurable control output duration
- Diagnostic LED indicator

Functional Description - 8 Channel Digital Output module

The 8 Channel Digital Output 10 A module provides high current AC and DC control outputs at voltages up to 129 VDC and 110 VAC. High switching capacity relays are used to provide long contact life while controlling inductive loads up to 129 VDC nominal. The digital output subsystem provides security and control for electrical or magnetically latched relays.

The Digital Output modules consist of an on-board microprocessor and security circuits mounted on a logic board. Configuration data from the main processor determines the control of each output relay by the on-board processor. The relays are mounted on the logic board. The plug-in terminal assembly carries screw terminals for loop termination of heavy gauge wire.

Functional Specifications - 8 Channel Digital Output Module

8 Channel Digital Output 10A Module (Heavy duty non-latched relay)	
Number of Channels	Eight
Output Types	Outputs can be configured as: Multiple relays set point, Pulse, Trip/Close (in pairs), Raise/Lower (in pairs), Latching
Security	One or more relay energized tests
Heavy Duty Non-Latched Relay Output Module	
Number of Relays	16 single pole N/O relays with contacts connected in series to boost dc rating
Relay Coil Current	75 mA for two coils associated with each output
Contact Arrangement	Output is single pole normally open
Contact Rating	• 16 A at 250 VAC Resistive, 85°C, 30,000 operations • 10 A at 250 VAC Resistive, 105°C, 100,000 operations • 10 A at 400 VAC Resistive, 105°C, 100,000 operations

Isolation	• 2 kV rms for 1 minute output to frame
	• 1 kV rms for 1 minute across open contact
	• 2 kV rms for 1 minute between outputs
Control Output Termination Assembly	Printed circuit board 261.8 mm (10.307087 inches) x 35 mm (1.377953 inches) attached to the frame using screws
Terminals	Two terminals per relay. Plastic encased wire loop screw terminals sized for 1.5 sq. mm (16 AWG) wire
Monitors/Indicators	Green/Red Diagnostic LED

Multi I/O Module

Features - Multi I/O Module

- Removable plug-connected terminal assembly
- Diagnostic LED
- Availability of module operating conditions as database points
- Digital Inputs have:
  - 24 software configurable digital inputs
  - Individually configurable chatter filters
  - Digital input bounce elimination circuitry
  - Optical isolation on digital inputs
  - Digital input common might be positive or negative
- Analog Inputs have:
  - 6 analog inputs
  - Plug-in current loop resistors
  - 12-bit analog-to-digital converter
  - ±2 V range
  - Continuous automatic input calibration/check
- Digital Outputs have:
  - 8 mini-pilot relays or 6 paired-pilot relays
  - Configurable output types (latch, variable pulse, trip/close pairs, raise/lower pairs, and multiple relays)
  - Built-in hardware and software monitoring of control operations
  - Control output logic with two pass check-before-operate
  - Configurable control output duration

Digital Inputs - Multi I/O Module

This subsystem optically isolates, filters, and helps to protect against surge transients, and processes 24 Status inputs. Digital input circuits reject contact noise by using the contact debounce circuitry.

The on-board microprocessor identifies the chattering contacts.

The digital inputs share a pair of common terminals, which can be connected to a positive or a negative supply.

Digital input status is provided by scanning every millisecond. Sequence of Events with one millisecond resolution time-tagging is available.

In addition, each of the digital inputs support the Accumulators and the Momentary Change Detection functionality.

Analog Inputs - Multi I/O Module

The analog input circuitry within the Multi I/O Module performs the data sampling and processing for the analog input points.

This subsystem provides protection against surge transients, high frequency noise, and mains frequency noise.

A multiplexed analog-to-digital converter provides high resolution and high-speed update of the analog values.

These values are stored in the shared memory for the main processor to access them using the Electrobus interface.

The on-board microprocessor provides automatic zero drift correction. Zero and full-scale voltage references are available as internal database points accessible by the SCADA Client Station.

Digital Outputs - Multi I/O Module

The digital output subsystem of the Multi I/O Module helps to provide secure control for the digital outputs. Eight mini pilot or six paired-pilot relay options are available.

Outputs can be driven as fixed or variable length pulse, or can be electrically latched. Independent source and sink drivers control each output relay.

Two-Pass Operation - Multi I/O Module

During pass 1, the on-board microprocessor accepts command data from the main processor. The validity of the command is confirmed and then the hardware is checked on the output driver circuits. If tests succeed, feedback of the command is sent to the main processor.

During pass 2, the main processor sends the execute command and the control relays are operated. Pulse output controls are automatically timed and independently checked.

Functional Description - Multi I/O Module

The Multi I/O module provides a cost effective solution for applications utilizing a combination of Status inputs, Analog inputs, and Control outputs.

The Multi I/O module combines the technology of the Analog Digital Input Module and the 12 Digital Output Module within one module. These are the number of channels available in the Multi I/O module.

- 24 Digital Inputs
- 6 Analog Inputs
- 8 Mini-pilot relay or 6 Paired-pilot relay outputs

Variants of the Multi I/O Module are:

- 129 V Digital Input 8 Digital Output Mini-pilot relay
- 48 V Digital Input 8 Digital Output Mini-pilot relay
- 24 V Digital Input 8 Digital Output Mini-pilot relay
- 129 V Digital Input 6 Digital Output Paired-pilot relay
- 48 V Digital Input 6 Digital Output Paired-pilot relay
- 24 V Digital Input 6 Digital Output Paired-pilot relay

Functional Specifications - Multi I/O Module

Multi I/O Module	
Multi I/O Module	24 Status Inputs, 6 Analog Inputs, and 8 Mini-pilot or 6 Paired-pilot relay. (24 V, 48 V, or 129 V)
Number of Channels	• 24 Status inputs • 6 Analog field inputs • 2 Internal check analog inputs • 8 Mini-pilot relay controls or 6 paired pilot relay controls
Analog Inputs	• Input Circuit 6 differential inputs • Analog-to-Digital Converter Type Sigma-Delta • Resolution 12-bits • Input Update Rate (Data Age) <600 ms • Input Signal Range ±2 VDC • Input Signal Scaling Dropping resistor for current inputs • Full Scale Range ±4000 counts (over range ±4095 counts) • Maximum Error at 25°C and 0 V Common Model ±0.1% full scale • Common Mode Error 0.01% per Volt to a maximum of ±6 V • Temperature Error 0.0016% per °C to over full temperature range • Maximum Error Over Temperature and Common Mode Range ±0.25% full scale • Differential Mode Rejection 80 dB at 6 V peak, dc to 50/60 Hz balance input • Differential Mode Voltage Without Damage ±50 VDC or peak AC • Common Mode Reject 60 dB minimum at 50/60 Hz • Maximum Common Mode Voltage ◦ Operating within spec ±6 V ◦ Without damage ±50 dc or peak AC • Reference Voltages Zero volts and full scale positive (+1 V)
Digital Inputs	• Input Circuit 24 per input module

	• Input Types Any input can be used for Status, Momentary Change Detect, Sequence of Events, and Accumulator • Circuit Types Common return for all 24 inputs, positive or negative • Input Voltage 24 V, 48 V or 129 VDC from field supply • Input Current 5 mA per input (nominal)
Control Outputs	• Output Types Outputs can be configured as: Pulse, Trip/Close pairs, Raise/Lower pairs, single Variable Pulse, Latched, or Set-point • Security One or more relay energized test check before execution of control
Multi I/O Mini-Pilot Relay Termination Assembly	
Multi I/O Mini-Pilot Relay Termination Assembly	24 VDC, 48 VDC, or 129 VDC with 2 kV AC RMS isolation to chassis for Status inputs. Printed circuit assembly 261.8 mm (10.307087 inches) x 35 mm (1.377953 inches) attached to frame by captive screws. Terminals sized for 1.5 sq. mm(16 AWG) wire.
Analog Inputs	• 2 Terminals per point • Loop drop resistor mounted on rear side of terminal assembly • Suppression device to ground from each input terminal
Digital Inputs	• 24 Status inputs • 1 terminal per point • 2 shared common terminals • Suppression device across each input to the common
Monitors/Indicators	Green/Red Diagnostic LED
Number of Relays	Eight
Relay Coil Current	18 mA
Contact Arrangement	8 single pole contacts and 1 common contact
Contact Rating	• 0.5 A 125 VAC cos Φ = 0.4 (30,000 operations) • D.C. make capacity 0.5 A 129 VDC (30,000 operations) • D.C. break capacity ◦ 0.25 A 50 VDC L/R 40 ms (30,000 operations) ◦ 50 mA 129 VDC L/R 40 ms (30,000 operations)
Isolation	• 2 kV RMS for 1 minute output to frame • 1 kV RMS for 1 minute across open contact
Multi I/O Paired-Pilot Relay Termination Assembly	
Multi I/O Paired-Pilot Relay Termination Assembly	24 VDC, 48 VDC, or 129 VDC with 2 kV AC RMS isolation to chassis for Status inputs. Printed circuit assembly 261.8 mm (10.307087 inches) x 35 mm (1.377953 inches) attached to frame by screws. Terminals sized for 1.5 sq. mm (16 AWG) wire.
Analog Inputs	• 2 Terminals per point

	• Loop drop resistor and voltage divider terminals mounted on the rear side of terminal assembly • Suppression device across each input to the common terminal
Digital Inputs	• 24 Status inputs • 1 terminal per point • 2 common terminals • Suppression device across each input to its common terminal
Monitors/Indicators	Green/Red Diagnostic LED
Number of Relays	6 relays in 3 pairs
Relay Coil Current	18 mA
Contact Arrangement	Contacts arranged in pairs of single pole contacts sharing a common contact

Contact Rating	• 5 A 250 VAC cos Φ = 0.4 (30,000 operations)
	• D.C. make capacity
	  5 A 129 VDC (30,000 operations)
	• D.C. break capacity
	  ◦ 0.5 A 50 VDC L/R 40 ms (30,000 operations)
	  ◦ 200 mA 129 VDC L/R 40 ms (30,000 operations)

Isolation	• 2 kV RMS for 1 minute output to frame • 1 kV RMS for 1 minute across open contact

Physical Specifications - I/O Modules

- Each plug-in module requires frame space of 35 mm (1.377953 inches) for SCD6000 and 70 mm (2.755906 inches) for SCD6000-SVX.

- Modules are assemblies of one or more printed circuit boards. These modules plug into a backplane (Electrobus) through a DIN 41612 connector and are of double Eurocard size (233.4 mm (9.188976 inches) x 149 mm (5.866142 inches)).

- DIN 41612 connectors are also fitted to the front edge of the PCB to provide connection to the terminal board assembly.

  NOTE: All SCD6000 Input/Output modules share the same physical and environmental specifications and all SCD6000-SVX Input/Output modules share the same physical and environmental specifications.

Dual Communication Modules

This module provides options for Foxboro SCADA remote devices and RTU50 to communicate with SCADA Client Stations, Human Machine Interfaces (HMI), Intelligent Electronic Devices (IEDs) and plant equipment. For more information, see *EcoStruxure™ Foxboro™ SCADA SCD6000 RTU Architectural Overview* (PSS 41H-8S6KAOV).

Figure 5 - SCD6000 Dual Communication Modules

Figure 6 - SCD6000-IOX Dual Communication Modules

Serial port on the SCD6000 CPU module (*EcoStruxure™ Foxboro™ SCADA SCD6000 CPU Modules* (PSS 41H-8S6KCPU), 8 Channel Serial module (See 8 Channel Digital Output Module, page 20), and this range of Dual Communication modules support various media options.

The Dual Communication modules allow communication over a wide variety of media such as leased lines, radio, microwave, fiber optic, power-line carrier, and other such infrastructure with these media standards:

- ITU-T V.28 (RS-232)

- ITU-T V.11 (RS-485/RS-422)
- Glass fiber optics

Each Dual Communication module provides two independent channels. In modules that support server protocols, the channels can be used to connect to two separate client stations. The second channel can also be used as a backup to the primary channel.

To verify consistent communication, while sending and receiving data, each Dual Communication module is independently responsible for error handling.

The Dual Communication modules support a wide variety of current and legacy protocols. The supported protocols are:

- DNP3
- IEC 60870-5-101
- IEC 60870-5-103
- Conitel (C2025, C300, C3000)

Through this flexibility in protocol and communication media support, SCD6000 and SCD6000-SVX are ideally suited for Greenfield and Retrofit SCADA sites. In addition, through the dual communication technology in each module, consistent communication can be achieved over a wide range of system configurations.

V.28 Dual Communication Module

The V.28 Dual Communication module provides two digital RS-232-C compatible communication channels with data rates of 300 to 9600 bits per second (bps) standard, and up to 64 Kbps with a single channel only.

The V.28 Dual Communication module supports a range of current and legacy protocols. The wide use of V.28 interface makes the V.28 Dual Communication module suitable for interfacing to many different communication media. Together with the broad range of supported protocols, this makes the V.28 Dual Communication module an ideal choice for both Greenfield and Retrofit sites, and for small to large input/output counts. The V.28 Dual Communication Module is enhanced to support the V.23/Bell 202 interface via an IG202T-R38 Modem from Data Connect Enterprise.

Functional Specifications - V.28 Dual Communication Module

V.28 Dual Communication Module	
Interface	TU-T V.24/RS-232-C (ITU-T V.28) DTE
Terminations	DB15-pin socket-type connector
Number of Channels	Two
Data Rates[a]	• 300 to 9600 bps dual channel mode • Up to 64000 bps single channel mode
Operating Modes	Asynchronous/Synchronous
Radio Interface	Through a suitable modem
V.23/bell 202 Interface	Through Data Connect Enterprise IG202T-R38 Industrial Grade Modem
Power Available	±12 V 50 mA maximum per channel
Power Requirements	450 mA at 5 V

V.28 Dual Communication Module	

Supported Protocols	For SCD6000:
	
	• DNP3 Controlling Station and DNP3 Outstation, Conitel C2025 Master and Slave, Conitel C300 and C3000 Slave, and IEC 60870-5-101 Slave and Master.
	
	    NOTE: DNP3 Controlling Station and DNP3 Outstation, Conitel C2025 Master and Slave, Conitel C300 & C3000 Slave protocols are supported when using V.28 DCB with IG202T-R38 Modem.
	
	For SCD6000-SVX:
	
	• DNP3 Controlling Station and DNP3 Outstation, IEC 60870-5-101 Slave and Master, and WISP Master and Slave
	
	    NOTE: DNP3 Controlling Station and DNP3 Outstation protocols are supported when using V.28 DCB with IG202T-R38 Modem.
	
	NOTE: IG202T-R38 from Data Connect Enterprise is proven to operate with V.23/Bell 202 signals with V.28 DCB as a substitute for the V.23 DCB for both SCD6000 and SCD6000-SVX. WISP Master and Slave Module is available to support existing RTU50 SVX customers.

(a) Only 1200 bps is supported while interfacing V.28 DCB with IG202T-R38 Modem.	

V.11 Dual Communication Module

The V.11 Dual Communication module provides two high speed digital RS-422/RS-485 compatible communication channels.

The V.11 Dual Communication module is ideally suited to demanding Greenfield SCADA projects, particularly in the electricity transmission and large distribution substation environment.

Functional Specifications - V.11 Dual Communication Module

V.11 Dual Communication Module	
Interface	ITU-T V.11 DTE
Number of Channels	Two
Data Rates	• 300 to 9600 bps dual channel mode • Up to 64000 bps single channel mode
Operating Modes	Asynchronous/Synchronous
Line Termination	V.11 drivers/receivers (RS-422, can be wired as RS-485)
Terminations	DB15 plug-type connector ISO 4903 X .27/V.11
Isolation	Direct connection
Power Requirements	450 mA at 5 V
Supported Protocols	DNP3 Controlling Station and DNP3 Outstation

Optical Dual Communicating Module

The Optical Dual Communication module provides two optical (glass) communication channels.

The Optical Dual Communication module is particularly suited to Greenfield SCADA applications where large input/output counts require frequent scanning back to a central or local client station.

Functional Specifications - Optical Dual Communicating Module

Optical Dual Communication Module	
Interface	Optical (full duplex)
Number of Channels	Two
Data Rates	• 300 to 9600 bps dual channel mode • Up to 64000 bps single channel mode
Operating Modes	Asynchronous/Synchronous
Maximum Fiber Length	2000 meters
Optical Connector	Dual ST connector 820 nm wavelength, multimode 62.5/125 µm glass fiber 1 core transmit 1 core receive
Power Requirements	450 mA at 5 V
Continuous Transmit Protection	Time out on long RTS (10 seconds)
Supported Protocols	• DNP3 Controlling Station and DNP3 Outstation • IEC 60870-5-103 Master

Functional Description - Dual Communication Modules

The Dual Communication modules are based on intelligent communication cards, with each card featuring a microprocessor, associated Random Access Memory (RAM), and Read-only Memory (ROM). The on-board processor sends and receives messages, and controls the implemented communication protocol. This information is passed to the CPU module via shared memory on the Dual Communication module. Error detection algorithms appropriate for each supported protocol monitor communication integrity and helps guarantee a high level of data integrity.

Where the communication subsystem is used as part of time synchronization from the SCADA client station, the Dual Communication module implements the protocol-specific requirements to verify the required accuracy in time-sensitive SCADA applications.

Separate data sets can be configured when operating in dual communication mode to two independent client stations. These data sets can be equivalent, disjoint, or intersecting sets of either the complete SCADA database or its subset. Therefore, greater flexibility is provided in the data available to each client station.

Additionally, the CPU module maintains its own independent Sequence of Events (SOE) buffers, digital input momentary detect information, and accumulators. This helps ensures complete and independent operation of each client station.

With the second port as backup to the first, identical data sets and buffer sets are provided to the client station. The backup port is always active and can be scanned at any time, thus the client station controls the fail-over.

For Dual Communication modules that support client and server protocol implementations, each channel can be individually configured for either the server or the client operation. This allows communication to a Client Station and to a downstream server device via the same communication module.

Figure 7 - Typical Configurations
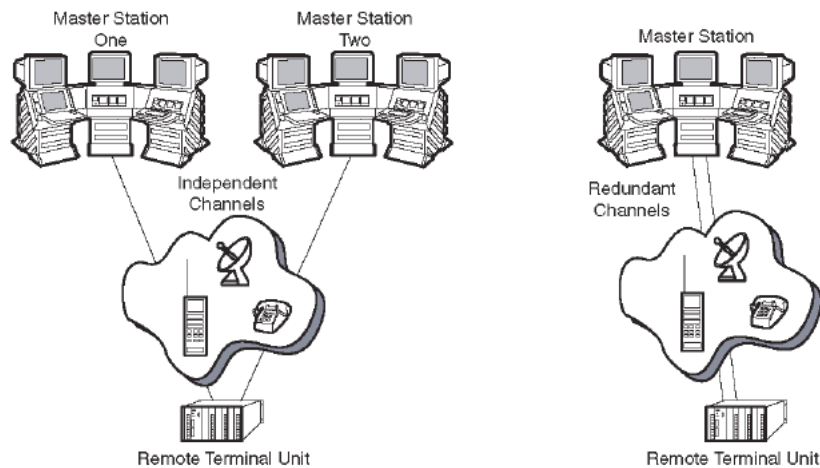
Physical Specifications - Dual Communication Modules

SCD6000	160 mm (6.299213 inches) x 127.3 mm (5.011811 inches) bare board – 185 mm (7.28346 inches) x 145 mm (5.708661 inches) x 35 mm (1.377953 inches) including handle
SCD6000-SVX	160 mm (6.29921 inches () x 127.3 mm (5.011811 inches () bare board – 185 mm (7.28346 inches) x 127.3 mm (5.011811 inches) x 25 mm (0.984252 inches) including handle

Wide Range Input Power Supply Modules

Located in the first slot of the file, the Power Supply module accommodates a fully utilized ten I/O file for SCD6000 and six/seven slot file for SCD6000-SVX. The input supply is connected to this module only. The COPE module power supply is not used in ten I/O file configurations.

Figure 8 - SCD6000 Wide Range Input Power Supply Module

Figure 9 - SCD6000-IOX Wide Range Input Power Supply Module

Features - Wide Range Input Power Supply Module

- Input supply: 19.2 V to 148 VDC positive or negative grounding
- Meets the power requirement of a ten I/O file for SCD6000
- Meets the power requirement of a six/seven slot file for SCD6000-SVX
- Withstands 4 ms dead short supply input
- Over current and over/under voltage protection
- SCD system failure alarm LED and contact
- Control supply isolation terminals
- Loop power distribution terminals
- Power supply OK and ERROR LEDs

Functional Description - Wide Range Input Power Supply Module

As shown in the figure **Power Supply Module Functional Block Diagram**, this module provides a regulated +5 VDC, +15 VDC, and -15 VDC supplies to the larger 19 inch files (ten I/O slot file for SCD6000 and to six/seven slot file for SCD6000-SVX). A 1.000 VDC supply is provided as a reference for internal checking of analog input modules.

A switched mode design provides operation over a wide DC input range, from 19.2 V to 148 V. It also provides high input to output isolation and minimizes size to weight ratio, while offering high power conversion efficiency and high reliability.

Internal monitoring resets the RTU modules if the +5 V supply is abnormal. A front panel INPUT OK LED indicates that the supply is normal.

Figure 10 - Power Supply Module Functional Block Diagram
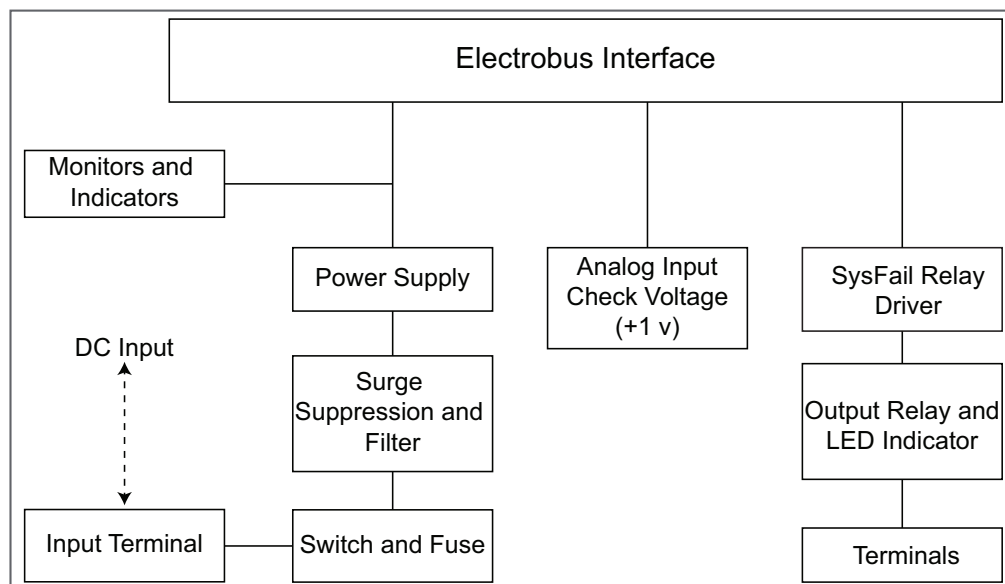
The ±15 V rails are monitored and the status is indicated by the ±15 V OK LED on the front panel. A relay contact (normal open and normal closed), controlled by the system fail and ±15 V rail fault, is available on the front panel terminals. This can be connected to a warning lamp or an audible alarm to indicate an SCD fault or a ±15 V rail fault.

I/O Slot File Power Supply System

Figure 11 - Ten I/O File Power Supply System for SCD6000, Example Implementation
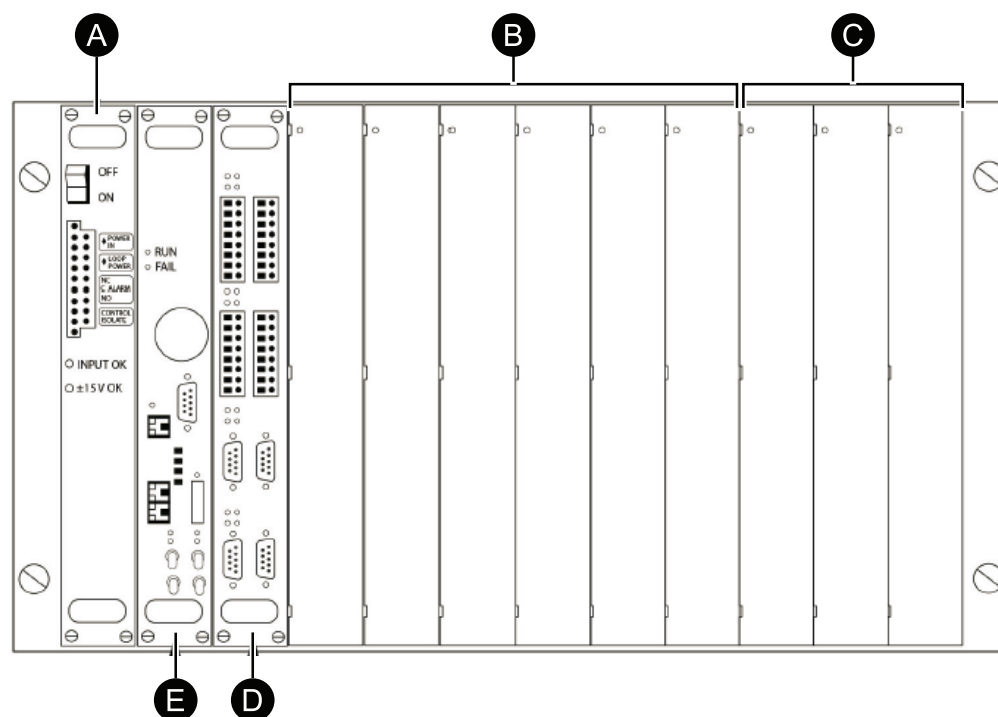
A	POWER SUPPLY MODULE
B	INPUT MODULES
C	OUTPUT MODULES
D	COMMUNICATIONS MODULE
E	PROCESSOR MODULE

This figure shows the structure of a ten I/O file power supply system for SCD6000. Each ten I/O card file has a removable power supply module. The power supply module can accommodate fully utilized ten I/O files. The Wide Range Input Power Supply module is always located in the first slot of the ten I/O File.

Figure 12 - Seven Slot File Power Supply System for SCD6000-SVX/RTU50 SVX, Example Implementation
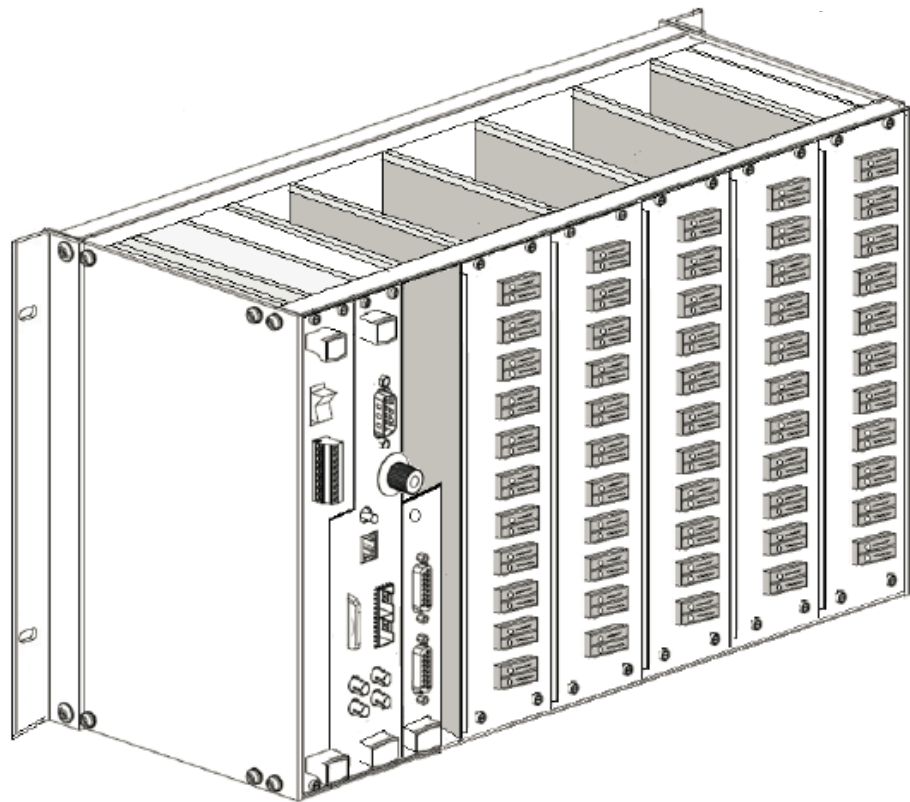
This figure shows the structure of a seven-slot file power supply system for SCD6000-SVX/RTU50 SVX. Each seven slot card file has a removable power supply module. The power supply module can accommodate fully utilized seven-slot files. The Wide Range Input Power Supply module is always located in the first slot of the seven-slot file.

To isolate the control supply, you can follow either of the instructions:

• Wire an external switch to the controls isolate terminals of the module

• Relay the controls isolate terminals of the module

Front Panel

• The module plugs into a backplane (Electrobus) using a 96 pin DIN 41612 connector that is of double Eurocard size

• The modules can be supplied using a 24, 48, or 129 VDC nominal power source

• The module provides contacts for an external warning lamp or audible alarm to indicate an SCD fault or a ±15 V fault

- Control supply isolation can be done with the help of an external switch or a relay
- A pair of terminals are connected to a remote facility for isolating supply to control outputs
- A power switch is available

Functional Specifications - Wide Range Input Power Supply Module

Power Requirements	• 90 W maximum input for SCD6000 • 100 W maximum input for SCD6000-SVX
Input Voltage	Wide range 19.2 V to 148 VDC
Output Capability	For SCD6000: • +5 V at 9 A • +15 V at 1 A • −15 V at 0.35 A • Maximum output of 65 watts total permitted For SCD6000-SVX: • +5 V at 9 A • +15 V at 1.75 A • −15 V at 0.35 A • Maximum output of 75 watts total permitted
Input Current	• 4.7 A maximum at 19.2 V • 0.60 A maximum at 148 V
Efficiency	> 70% at full load with nominal input voltage
Current Limit	Shut down at maximum power with auto-recovery
Over-Voltage Protection	Crowbar protection set at 6.25 V
Under-Voltage Protection	Shut down at low input voltage
Hold-up Time	Withstands 4 ms dead shorted power supply input
Ripple and Electromagnetic Noise	• 50 mV peak-to-peak (+5 V) • 100 mV peak-to-peak (±15 V)
Isolation	• 2000 VAC RMS for 1 minute • Primary to Chassis and Primary to Secondary isolation
ERROR Alarm Output	Relay output contact to terminals controlled by Electrobus SYSFAIL signal and ±15 V rail fault.
LED Indications	Input voltage OK, ±15 V within limits
On Board Fuse	10 A/250 V Type T, 20 mm (0.787402 inches) x 5 mm (0.19685 inches)

# Physical Specifications - Wide Range Input Power Supply Modules

SCD6000	This module is of double Eurocard size with dimensions 233.4 mm (9.1889764 inches) x 160 mm (6.29921 inches) board, 261.8 mm (10.3070866 inches) x 182 mm (7.16535 inches) x 35.3 mm (1.389764 inches). It requires a frame space of 35.6 mm (1.401575 inches).
SCD6000-SVX	This module is of double Eurocard size with dimensions 233.4 mm (9.1889764 inches) x 160 mm (6.29921 inches) board, 261.8 mm (10.307087 inches) x 182 mm (7.16535 inches) x 35.3 mm (1.389764 inches). It requires a L shaped frame with 40.3 mm (1.586614 inches) and 14.9 mm (0.5866142 inches) width.

Remote Terminal Unit (RTU) 3 Phase Digital Transducer Module

The onboard digital signal controller uses voltage and current inputs to calculate the electrical quantities of frequency, voltage, current, phase angle, sine of current phase angle, power, power factor, Volt-Ampere Reactive (VARs), Volt Ampere (VA), and positive, negative and zero phase sequence voltage.

NOTE: This module is plug compatible with SCD6000 and SCD6000-SVX.

Figure 13 - Remote Terminal Unit (RTU) 3 Phase Digital Transducer Module
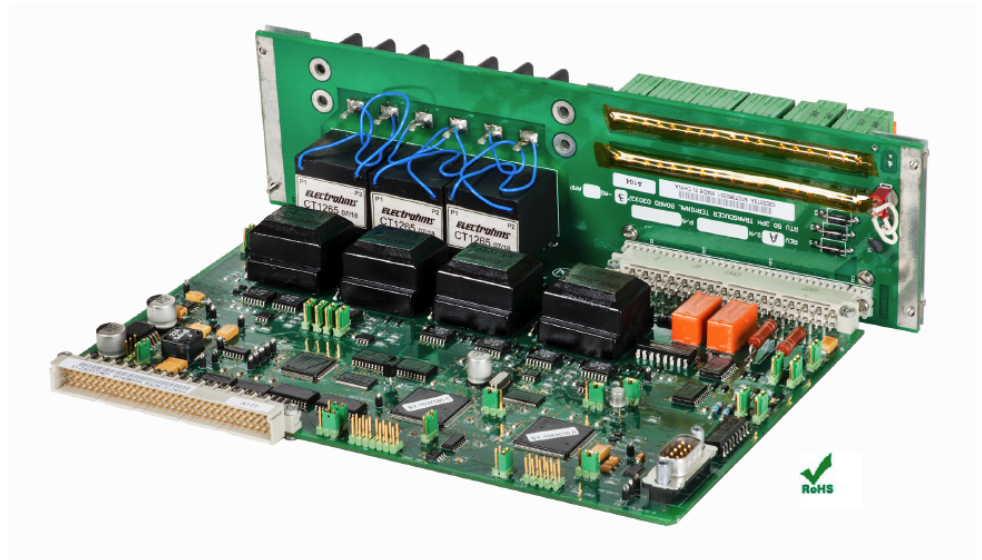
Features - RTU 3 Phase Digital Transducer Module

- Simultaneous sampling eliminates skew error
- Replaces Mega Watt (MW), Mega Volt Ampere Reactive (MVAR), Megavolt Amperes (MVA), voltage, current, frequency, and power factor transducers for single and three phase circuits
- Availability of voltage, frequency, and phase angle for a fourth voltage input
- Provides two digital inputs and outputs for use as additional I/O
- Provides 0.5% accuracy on voltage, current, and frequency readings.
- Operates at 60 MHz
- Current Transformers (CT) mounted on the terminal board can be disconnected without breaking the CT circuit
- Current Transformers (CT) and Voltage Transformers (VT) can be connected in either a Star or a Delta configuration
- Current Transformers have dual windings to help protect against open circuits
- Four sync-check functions permit the RTU to automate circuit breaker closure synchronization interlocking and control

# Functional Description - RTU 3 Phase Digital Transducer Module

Figure 14 - Phase Digital Transducer Module Functional Block Diagram
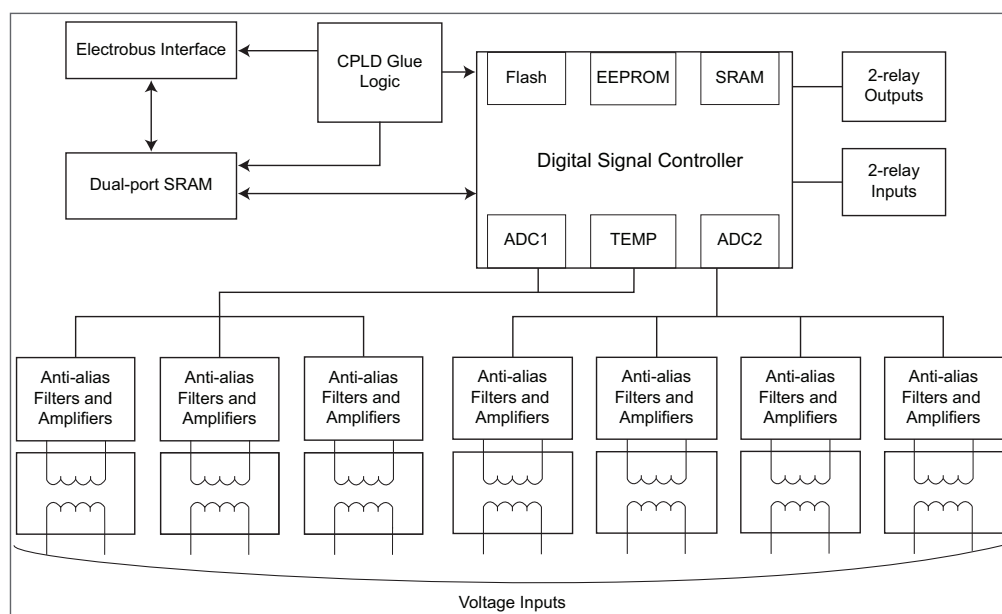
The main board contains the Digital Signal Controller (DSC), which has on-chip RAM, Flash, EEPROM, and four 4-channel 12-bit Analog/Digital Converters (ADC). This board also has amplifiers and anti aliasing filters.

VTs are mounted on this board. The interface to Electrobus is by a Dual Port Memory (DPRAM) on the main board. CTs are mounted on the terminal board to help prevent the CT current loop from disconnecting.

Two 4-channel ADCs are used to simultaneously sample eight channels. This simultaneous sampling helps eliminate any skew error. Seven channels are used to provide the isolated transformer signals. The eighth channel is used to monitor temperature and allow dynamic temperature conversion. The temperature sensor is available on the Digital Signal Controller (DSC) chip.

Figure 15 - Front Panel
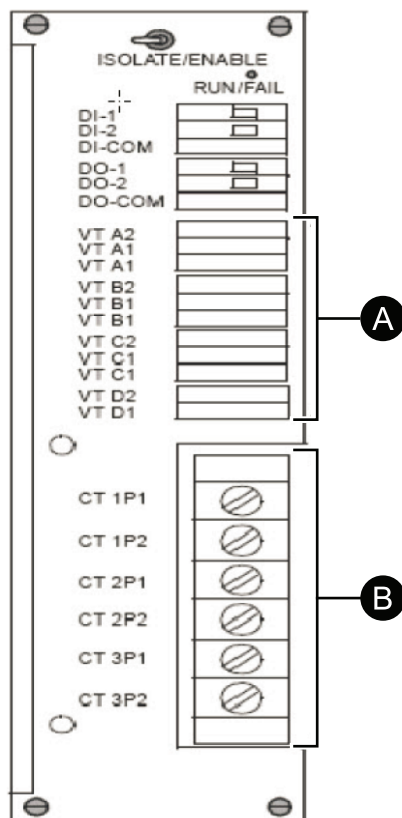
Front Panel Inputs

Four voltage inputs are provided on the front panel. These are connected to voltage field transformers. Three of the inputs are normally used to measure the voltage upstream of a circuit breaker. The fourth input is used to measure the voltage downstream of the breaker and to synchronize the check application.

Three 2-terminal current inputs are provided, which are connected to current field transformers. These inputs are available in either 1 A or 5 A nominal signal configurations.

In addition, a utility digital input is provided, which follows the specifications of the SCD6000 Analog/Digital Input Module.

Front Panel Outputs

The front panel also has two digital outputs that meet the specifications of the SCD6000 pilot relay outputs. These outputs, along with the front panel digital inputs, are used to provide additional general purpose I/O.

Functional Specifications - RTU 3 Phase Digital Transducer Module

|	
Processor Type	MC56F8346 - 60 MHz

Memory System	• Internal:
	   ◦ 128 KB Program Flash
	   ◦ 4 KB Program RAM
	   ◦ 8 KB Data Flash
	   ◦ 8 KB Data RAM
	   ◦ 8 KB Boot Flash
	• External:
	   ◦ 16K X 16 DUAL-PORT SRAM (25 nS)
	• Internal ADC
	   ◦ Four 4-channel, 12-bit ADCs
	   ◦ +4 V input range, unipolar

Limits of Nominal Range	• Volts: Nominal 63.5 V or 110 V user configurable • AMPS: Current ranges of 1 A or 5 A based on the part number ordered • Frequency: 30%-110% (50 Hz and 60 Hz)
Overload Capacity	Two Hour Continuous Overload • Current Inputs: 125% of nominal • Voltage Inputs: 125% of nominal Short Duration • Current Inputs: 20 times rated current for 2 seconds • Voltage Inputs: 2 times rated voltage for 2 seconds • Isolation: 2 kV rms
Anti-Aliasing Filter	7 x switched capacitor type
Temperature Reference	Onboard, Class 2 accuracy
Bandwidth	250 Hz
CPU Update Time	All quantities are updated every cycle; the CPU performs calculations every power station cycle; CPU updates are performed every 100 ms
Accuracy	0.5% of full scale output for voltage, current and frequency at reference conditions, as per AS1384-1973, over these ranges: • Volts: 80% to 110% • AMPS: 20% to 125% • Frequency: 95% to 105%
Burden of Measuring Circuit	Not to exceed: • 0.1 VA per element for voltage circuit • 0.1 VA per element for current circuit

Physical Specifications - RTU 3 Phase Digital Transducer Module

Power Supply	Electrobus Interface
Dimensions	Height: 262 mm (10.31496 inches), Width: 71 mm (2.795276 inches), Depth: 196 mm (7.716535 inches)
Mass	760 g (26.80 oz) approximate

8 Channel Serial Module

The 8 Channel Serial Module provides a flexible and cost-effective method for communicating with a multitude of intelligent field devices or client devices. The module facilitates point-to-point and multi-drop communication with a wide range of electronic flow meters, analytical devices, relays, circuit breakers, and other intelligent devices. When combined with the programming capabilities of the main processor, the 8 Channel Serial Module provides a powerful interface for gathering data from Original Equipment Manufacturer (OEM) devices.

Figure 16 - SCD6000 8 Channel Serial Module
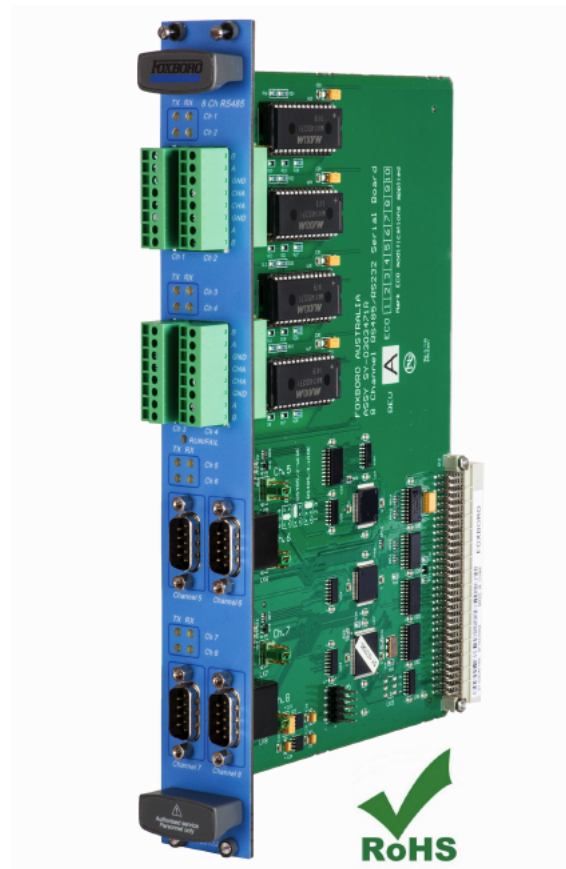
Features - 8 Channel Serial Module

- Eight channels per module
  - Four isolated RS-485 2-wire ports
  - Four RS-232 or RS-485 (2-wire or 4-wire) ports
- LED indication of communication activity on each channel
- Data rate: 50 bps to 38400 bps
- Hardware handshake on RS-232
- RS-232 modem control available on RS-232/RS-485 selectable ports

- Supports these protocols
  - ◦ DNP3 Controlling Station
  - ◦ DNP3 Outstation
  - ◦ Modbus Client
  - ◦ Modbus Server
  - ◦ IEC 101 Master
  - ◦ User configured via SALL HLSI functions
- Supports these functionalities
  - ◦ Terminal Server
  - ◦ Diag Router
  - ◦ Diag Server
  - ◦ Analog Logger
  - ◦ Event Logger
- Slew-rate limiting

Functional Description - 8 Channel Serial Module

The first four channels (1-4) provide isolated RS-485 half-duplex (2-wire) interfaces, ideal for long cable runs, large networks, and noisy environments. Duplicated signal connections on the 2-wire RS-485 interface allow simple wiring of multi-drop configurations.

The other four channels (5-8) are independently configurable for a RS-232, RS-485 full duplex (4-wire), or RS-485 half-duplex (2-wire) connection. A RS-485 4-wire operation is compatible with RS-422 devices. The differential signaling of the RS-485 and RS-422 standards provide high tolerance to electromagnetic noise and differences in ground potential.

RS-232 hardware flow control is provided on Channels 5-8. RS-232 level modem control is available on Channels 5-8 for RS-232 configurations. SALL HLSI allows hardware flow and modem control in user-developed protocols.

Functional Specifications - 8 Channel Serial Module

General	16550 type two quad UART devices with a 64-character FIFO on each transmitter and receiver.
Indications	Transmit LED and Receive LED (yellow) for each channel, Run/Fail diagnostic LED (green/red) for the module.
Data Rate	• 50 to 38400 baud (dependent on protocol configuration options) • RS-232 and RS-485 ports are slew-rate limited
Communications Protocols	• DNP3 Controlling Station and DNP3 Outstation • Modbus Client and Modbus Server • SALL HLSI, IEC 101 Master

Channels 1 Through 4	Interface: • RS-485 2-wire (Compatible with CCITTV.11 and TIA/EIA-485-A) • 8 way plug-in screw type terminals (Phoenix MC 1.5-3,81 series) Isolation: • 1 kV rms (1 minute) • Galvanic isolation (data lines from the logic circuits) • Surge ground and screen connection Driver capability: • 1000 pF or 1200 m, 32 unit drive, 1 unit loading
Channels 5 Through 8	Interface: • Link configurable as RS-232, RS-485 2-wire or RS-485 4-wire, DB9 Plug, modified TIA/EIA-574 (RS-232 compatible computer) • RS-232 hardware flow control • RS-232 level modem control for RS-232 and RS-485 configurations Isolation: • Direct connection (±7 V common mode on RS-422/RS-485) Driver capability: • RS-232: 1000 pF or 15 m, ±5 V drive • RS-485: 1000 pF or 120 m, 32 unit drive, ¼ unit loading **NOTE:** RS-485 4-wire is RS-422 level compatible.

Physical Specifications - 8 Channel Serial Module

SCD6000	187 mm (7.3622 inches) x 262 mm (10.315 inches) x 35 mm (1.37795 inches)

Environmental Specifications

	Temperature	Relative Humidity	Altitude
Operating	-20°C to +70°C (-4°F to +158°F)	5% to 95% (non condensing)	-300 m to +2,000 m (-1,000 ft to +6,500 ft)
Storage	-40°C to +85°C (-40°F to +185°F)	5% to 95% (non condensing)	-300 m to +2,000 m (-1,000 ft to +6,500 ft)
Vibration	1 g (10 Hz to 150 Hz)		
Shock	5 g (18 pulses for 11 ms each)		
Bump	10 g (6000 pulses for 16 ms each)		

Regulatory Compliance

Electromagnetic Compatibility (EMC)	
European EMC Directive 2014/30/EU	• Meets EN 61326-1 Immunity requirements for industrial locations • EN 61000-6-5: Generic Standards - Immunity for power station and substation environments
CISPR 11, Industrial Scientific and Medical (ISM) Radio-Frequency Equipment - Electromagnetic Disturbance Characteristics - Limits and Methods of Measurement	Radiated emissions meet Class "A" limits Conducted emissions meet Class "A" limits
IEC 61000-4-2 ESD Immunity	Contact ±6 kV, air ±8 kV
IEC 61000-4-3 Radiated Field Immunity	• 10 V/m at 80 MHz to 1000 MHz • 3 V/m at 1 GHz to 6 GHz
IEC 61000-4-4 Electrical Fast Transient/Burst Immunity	±2 kV at 100 kHz for Signal Lines ±4 kV at 100 kHz for Power Lines
IEC 61000-4-5 Surge Immunity	±2 kV
IEC 61000-4-6 Immunity to Conducted Disturbances Induced by Radio Frequency Fields	10 Vrms at 150 KHz to 80 MHz
IEC 61000-4-16 Conducted, Common Mode Disturbances Immunity	For Power Lines: • 10 Vrms to 1 Vrms 15 Hz to 150 Hz • 1 Vrms 150 Hz to 1.5 kHz • 1 Vrms to 10 Vrms 1.5 kHz to 15 KHz • 10 Vrms 15 kHz to 150 kHz For Signal Lines: • 30 Vrms to 3 Vrms 15 Hz to 150 Hz • 3 Vrms 150 Hz to 1.5 kHz • 3 Vrms to 30 Vrms 1.5 kHz to 15 KHz • 30 Vrms 15 kHz to 150 kHz • 300 Vrms for 1 second short duration
IEC 61000-4-17 Ripple on DC Input Power Port Immunity	10% of the Nominal Voltage
IEC 61000-4-18 Damped Oscillatory Wave	• Common mode ±1 kV @1 MHz • Differential mode ±0.5 kV @1 MHz
IEC 61000-4-29 Voltage Dips and Short Interruptions Immunity	Voltage Dips: 30% for 100 ms, 60% for 100 ms, 0% for 50 ms

Product Safety

This product complies with these safety standards:

- UL 61010-1 - Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements - 3rd Edition

- CSA C22.2 NO. 61010-1 - Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory use

- EN 61010-1:2010 - Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements

Ordering Information

SCD6000 Supported Modules

Part Number	Description
Multiple I/O Module	
SY-0399095R	Multi Input Output Module 129 V 8 Mini Pilot Relay
SY-0399094R	Multi Input Output Module 48 V 8 Mini Pilot Relay
SY-0399088R	Multi Input Output Module 24 V 8 Mini Pilot Relay
SY-0399097R	Multi Input Output Module 129 V 6 Paired Pilot Relay
SY-0399096R	Multi Input Output Module 48 V 6 Paired Pilot Relay
SY-0399089R	Multi Input Output Module 24 V 6 Paired Pilot Relay
Analog Input Module	
SY-0399085R	20 Channel Analog Input Module (Isolated)
Analog/Digital Input Module	
SY-0399160R	4 Analog/32 Digital Input Module (24 V to 129 V)
SY-0399222R	4 Isolated Analog Inputs and 32 Digital Inputs (Deep Wiring Channel) Module
SY-60399035R	4 Isolated AI and 32 DI Input Board 24 V to 129 V with configurable debounce time
SY-60399011R	4 Isolated AI and 32 DI Input Board (Deep Wiring Channel) 24 V to 129 V configurable debounce time
Digital Output Module	
SY-0399086R	12 Pilot Relay Digital Output Module
SY-0399087R	12 Magnetically Latched Relay Digital Output Module
SY-0399136R	8 Digital Output 10 Amp Module
Analog Output Module	
SY-0399084R	4 Channel Analog Output Module
V.28 Dual Communication Modules	
SY-0399192R	Communication Module V.28 Conitel C2020/C2025 Master/Slave, C300/C3000 Slave
SY-0399194R[a]	Communication Module V.28 DNP3 Master/Slave
SY-0399196R	Communication Module V.28 IEC 60870-5-101 Slave
SY-0399226R[b]	SCD6000 Communication Module V.28 DNP3 Master/Slave Type 2
SY-60399036R[c]	SCD6000 Communications Module V.28 IEC60870-5-101 Master
V.11 Dual Communication Modules	
SY-0399163R[a]	Communication Module V.11 DNP3 Master/Slave
SY-0399224R[a]	Communication Module V.11 DNP3 Master/Slave (Ignore DCD)
SY-0399225R[b]	SCD6000 Communication Module V.11 DNP3 Master/Slave Type 2
Glass Fiber Optic Dual Communication Modules	
SY-0399122R[a]	Communication Module Glass Optical DNP3 Master/Slave

Part Number	Description
SY-0399127R	Communication Module Glass Optical IEC 60870-5-103 Master
SY-0399227R[b]	SCD6000 Communication Module Glass Optical DNP3 Master/Slave Type 2
Wide Range Input Power Supply Module	
SY-0399131R	Wide Input Range Power Supply Module
8 Channel Serial Module	
SY-0399132R	8 Channel Serial Module
RTU 3 Phase Digital Transducer Module	
SY-0399140R	3 Phase Digital Transducer Module (1 Amp, 0.5% Accuracy)
SY-0399142R	3 Phase Digital Transducer Module (5 Amp, 0.5% Accuracy)
(a) These modules support SCD6000 firmware version SY-1101207_A up to SY-1101207_C	
(b) These modules support SCD6000 firmware version SY-1101207_D	
(c) These modules support SCD6000 firmware version SY-1101207_K and later.	

SCD6000-SVX Supported Modules

Part Number	Description
Analog Input Module	
SY-0399071R	SCD6000-IOX 20 Channel 1 KV Analog Input Module (Isolated)
Analog/Digital Input Module	
SY-0399161R	SCD6000-IOX 32 DI/4 AI Module (24 V to 129 V)
SY-60399037R	SCD6000-IOX 32 DI/4 AI Debounce Assembly
Digital Output Module	
SY-0399008R	SCD6000-IOX 12 DO Pilot Relay Module
Analog Output Module	
SY-0399012R	SCD6000-IOX 4 Channel Analog Output Module
V.28 Dual Communication Modules	
SY-0399195R	SCD6000-IOX RTU Dual Communications Board V.28 IEC 60870-5-101 Slave Module Assembly
SY-0399197R [a]	SCD6000-IOX RTU Dual Communications Board V.28 WISP+ Master/Slave Module Assembly
SY-0399228R[b]	SCD6000-IOX Dual Communications Module V.28 DNP3 (Without Link Layer) Firmware Assembly
SY-60399038R[c]	SCD6000-IOX V.28 DCB IEC 101 Master Module Assembly
V.11 Dual Communication Modules	
SY-0399230R[b]	SCD6000-IOX Dual Communications Module V.11 DNP3 (Without Link Layer) Firmware Assembly
Glass Fiber Optic Dual Communication Modules	

Part Number	Description
SY-0399073R	SCD6000-IOX RTU Dual Communications Board Glass Optical IEC 103 Module Assembly
SY-0399229R[b]	SCD6000-IOX Dual Communications Module Glass Optical DNP3 (Without Link Layer) Firmware Assembly
Wide Range Input Power Supply Module	
SY-0702076R	SCD6000-IOX PSU Module
RTU 3 Phase Digital Transducer Module	
SY-0399140R	3 Phase Digital Transducer Module (1 Amp, 0.5% Accuracy)
SY-0399142R	3 Phase Digital Transducer Module (5 Amp, 0.5% Accuracy)
(a) These modules support RTU50. **NOTE:** For more information on other binary options and non-RoHS variants, see the latest revision of Product Specification Sheet No. PSS 31H-8G5. (b) These modules support SCD6000 firmware version SY-1101207_D (c) These modules support SCD6000 firmware version SY-1101207_K and later.	

Electrodynamic Controller Supported Modules

Part Number	Description
Power Supply	
SY-0399131R	Wide Input Range Power Supply Module (needed for 2003098R) (RoHS)
Multi I/O Modules	
SY-0399095R	Multi Input Output Module 129 V 8 Mini Pilot Relay
SY-0399034R	Multi Input Output Module 48 V 8 Mini Pilot Relay
Analog Output Modules	
SY-0399084R	4 Channel Analog Output Module (for simplex configurations only)
SY-60399016R[a]	4 Channel Analog Output Module for Electrodynamic Controllers
(a) This module is available in early 2024. For more information, contact Global Customer Support at https://pasupport.se.com (registration required). For more information on the module's use in Electrodynamic Controller applications, see *EcoStruxure™ Electrodynamic Controller* (PSS 41S-2EDC).	

Related Documents

Document Number	Document Name
B0780DV	*EcoStruxure™ Foxboro™ SCADA RTU AC Transducer Module - Type 2 User's Guide*
B0780DW	*EcoStruxure™ Foxboro™ SCADA SCD6000 Hardware User's Guide*
B0780EV	*EcoStruxure™ Foxboro™ SCADA SCD6000 and SCD6000-SVX Installation Guide*
B0780EQ	*EcoStruxure™ Foxboro™ SCADA SCD6000-SVX and RTU50 SVX Hardware User's Guide*
B0780FA	*EcoStruxure™ Foxboro™ SCADA Remote Terminal Unit Migration Guide*
B0700JB	*EcoStruxure™ Foxboro™ DCS Electrodynamic Controller User's Guide*
PSS 41H-8S6KAOV	*EcoStruxure™ Foxboro™ SCADA SCD6000 RTU Architectural Overview*
PSS 41H-8S6KCPU	*EcoStruxure™ Foxboro™ SCADA SCD6000 CPU Modules*
PSS 41S-2EDC	*EcoStruxure™ Electrodynamic Controller*

⚠️ **WARNING**: This product can expose you to chemicals including lead and lead compounds, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information, go to www.p65warnings.ca.gov/.

PSS 41H-8S6KMOD, Rev D