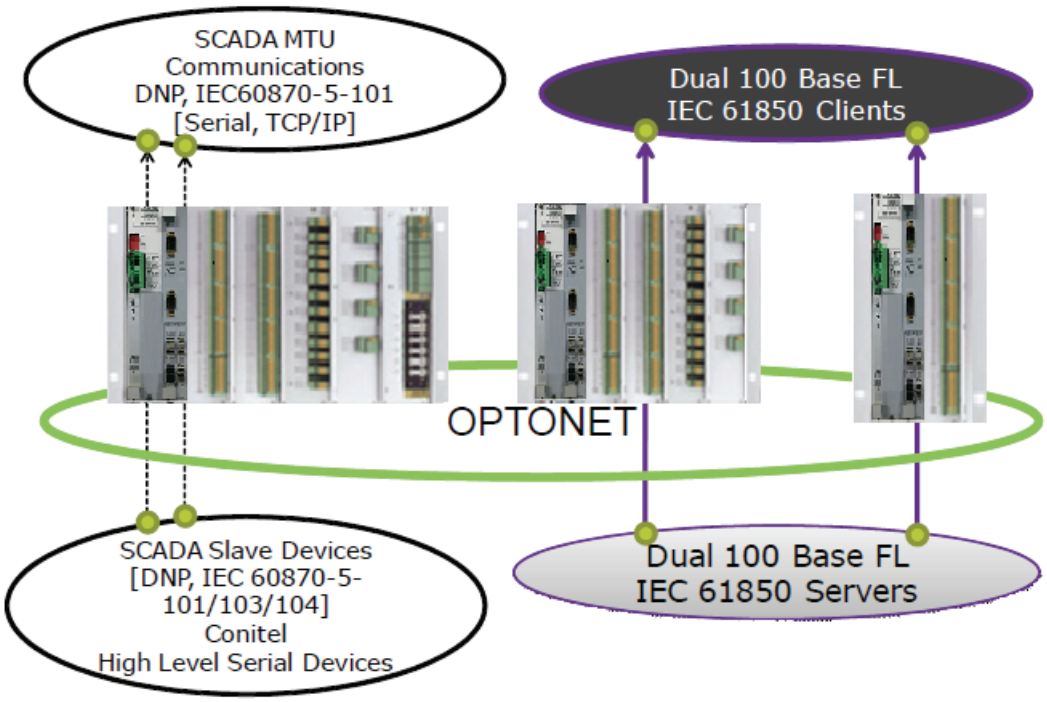
I/A Series® Remote Terminal Unit (RTU)
RTU50 SCADA RTU Architecture



RTU50 OVERVIEW

The RTU50 architecture is designed with a flexibility that allows users to configure Remote Terminal Units (RTUs) into many different configurations, solving many control system requirements. The same equipment, software and networks are used as building blocks to produce a fully integrated system based on the following concepts:

- Flexible I/O expansion from a single RTU50 to multiple chassis' using user configuration utilities
- Analog, digital, or fiber-optic communications via multiple communications ports, each using different communications protocols (refer to PSS 21H-8C5 B4)
- Intelligent I/O modules for high performance processing
- High speed peer-to-peer distributed automation over a dual-ring optical network
- Global database for the RTU network
- "Check-before-operate" security on all controls
- Applications Software Library for a wide range of control system applications

The RTU50's architectural design allows users to mix-and-match any of these features, to produce a control solution reflecting the specific needs of plant operation, resource availability and security requirements. The same RTU equipment is configurable to accommodate a wide range of situations, including:

- Small I/O RTUs
- Larger sites using a "monolithic" RTU, requiring centralized field cabling and control logic
- Distributed I/O performing logic for the total I/O capability
- Distributed automation across several RTUs, via a high speed optical network
- Control strategies from a central RTU, coordinating several other RTUs, over a variety of communications protocols
- Data concentration by a central RTU, via local communications channels for transfer to other networks
- Communications interface of local IEDs, PLC or DCS networks into a total RTU data network
- Communications interface to multiple master stations using multiple protocols

All these features are user-configurable using the utilities and tools supplied with the RTU. For security and convenience, the Master Processor Module (see PSS 21H-8C1 B4) firmware is stored in a file system in flash memory. It is loaded into dynamic RAM allowing the hardware to be "personalized" to the user's requirements. User Control Logic and programs are also stored in the files in the flash memory. These files automatically reload the RTU and its logic functions after a power outage or during commissioning of a new control strategy.

RTU50 DISTRIBUTED BUILDING BLOCK OPTIONS

The RTU50 architecture can be considered as a series of building blocks that can be tailored to suit your control needs. This section gives a brief overview of the various ways these building blocks can be inter-connected to obtain the optimum solution for your needs. These options are:

- ElectroBus Expansion
- OptoNet Expansion
- DCIU Integration
- IED Integration.

In addition to these, the RTU50 included two other architecture options that are no longer available due to their obsolescence and replacement with more advanced techniques: These options were a Condensed Package (called C50 CP) single-module form factor, and the OptoBus distributed I/O capability. The CP has now been replaced by the SCD5200 with one I/O module. OptoBus expansion to add multiple I/O modules to a single RTU has been superseded by the use of OptoNet, which distributes the I/O across multiple RTUs instead of clustering a large I/O count in a single RTU. This provides greater I/O data diversity.

While no longer available for use in system extension, these earlier options continue to be supported in the RTU software and in the RTU configuration and diagnostic tools.

RTU50 MAIN FILE

The RTU50 can be configured as an independent RTU, monitoring and controlling a remote plant via a variety of communication interfaces. The RTU can be as simple as a main file of electronics, or include extended I/O modules using ElectroBus for a maximum of up to four chassis; or can be configured as part of an OptoNet network.

The RTU50 Main File (see Figure 1) is a modular unit, consisting of the following subsystems:

- Power Supply Module
- Master Processor Module
- Communications module

The Main File, which is the first chassis of the RTU, is the module that contains the configuration data for all individual I/O slots, includes the database and logic definition for the extended RTU.

This basic chassis is expandable through the addition of I/O modules located in any available slot.

The RTU's real time clock is synchronized to either a local GPS clock or from the master station as part of the protocols synchronizing the master station's clock. Time synchronization is extended across the ElectroBus as additional signals to the Industry Standard Architecture (ISA) bus. The intelligent input modules use the real-time clock to time stamp the changes of all status inputs.

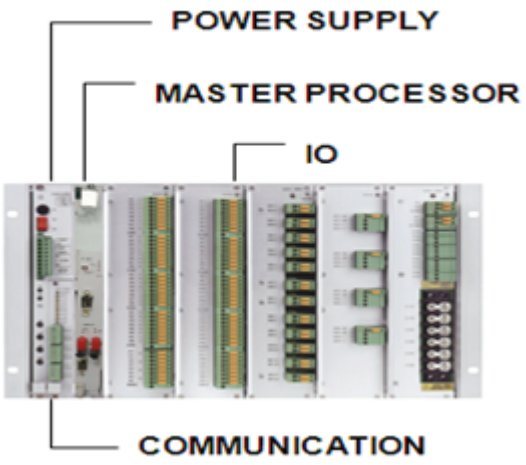


Figure 1. RTU50 Main File

ElectroBus EXPANSION

To expand the RTU50 main file to include additional I/O cards, expansion files are added to the main file using ElectroBus. This extends the back plane of the RTU up to a maximum of four chassis. Each additional unit is electrically connected to the RTU50 Main File through an ElectroBus Extender (see Figure 2).

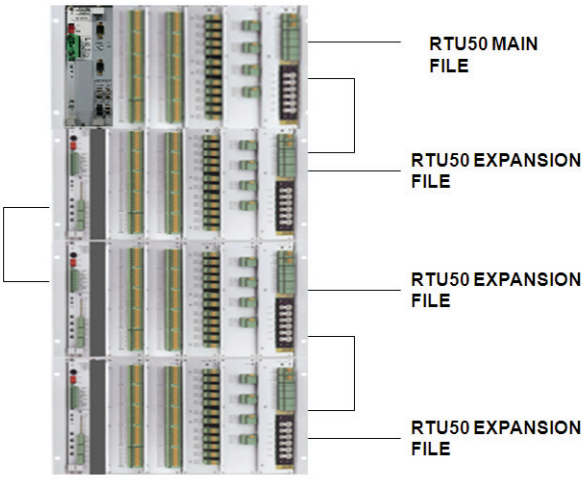


Figure 2. ElectroBus Expansion

OptoNet DISTRIBUTION OF CONTROL LOGIC

Local logic within each processor can seamlessly access data and controls from any node on the OptoNet LAN (see Figure 3), through the use of a “global database”.

OptoNet allows optimization of:

- Logic – distributed to match the plant configuration
- Distributed I/O – to minimize cabling
- Performance – locating processing power where it is needed
- Availability – no single point of failure affects the total plant performance
- Flexibility – full peer-to-peer access to database and logic
- Maintainability – all modules are maintained from one location.

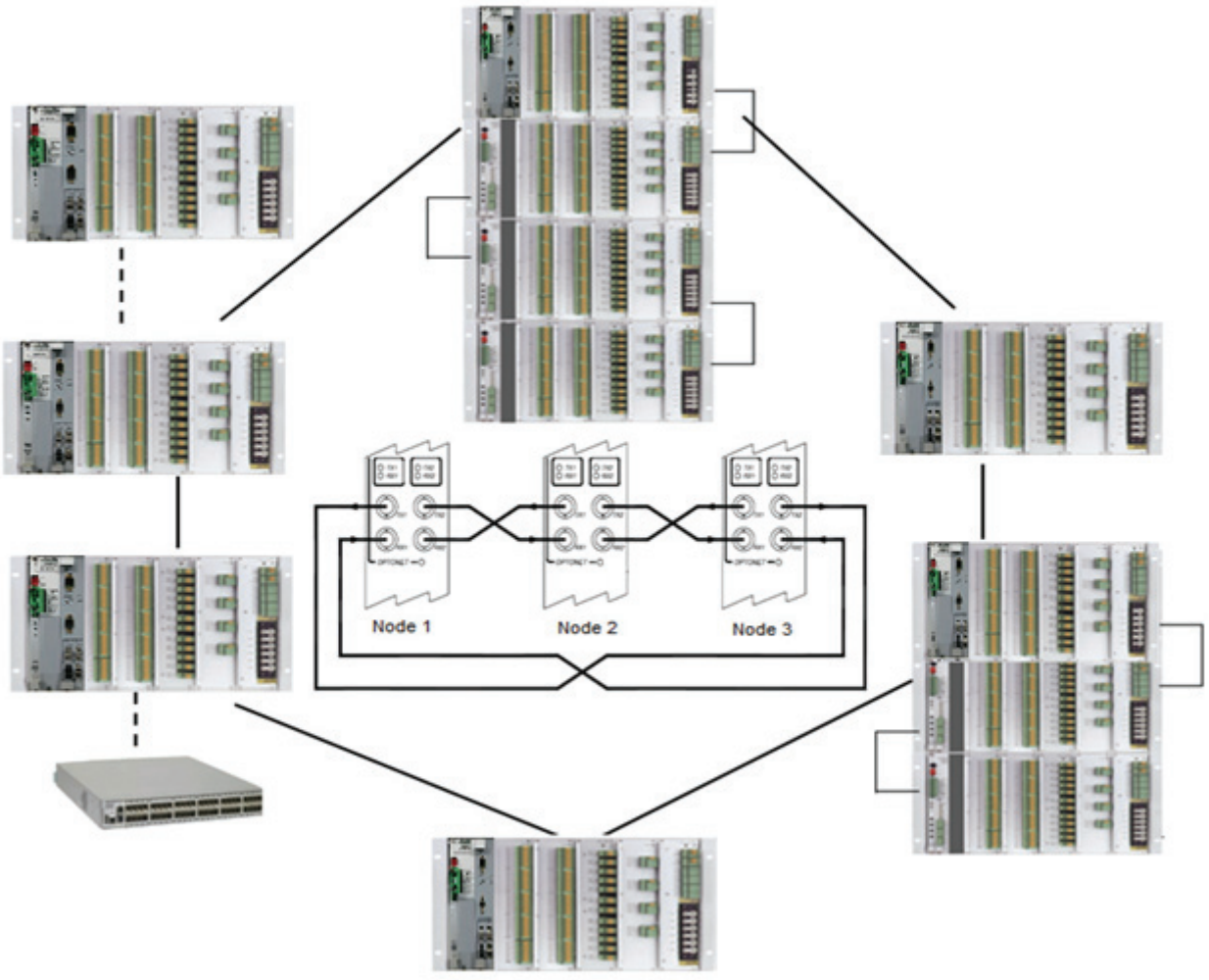


Figure 3. OptoNet Expansion

OptoNet is a ring topology optical network. Each RTU on the network has a processor, power supply and OptoNet Interface which completely supports peer-to-peer communications between all nodes on the network. The protocol ensures the very secure, time deterministic delivery of the data across the OptoNet for up to 63 nodes on the network.

The ring network also supports the distribution of automation functions across the network, allowing control functions to be configured to match the plant topology for high availability solutions. In addition, the protocol communication is maintained independent to the processor in each node and is not affected by a single processor or network interface failure.

COMMUNICATIONS INTEGRATION

Communication interfaces are used to communicate to multiple master stations, using multiple protocols. Each communications interface card is a dual ported card supporting two topologies. It is configurable as either a primary and backup channel, or as two independent channels connected to two master stations. Communications interfaces can be located in any slot of any of the main files of an OptoNet configuration. Given that each node has access to the total database of the network, all data is available for transmission via any node with a communications interface.

DCIU INTEGRATION

An optional implementation of the communications capability for the RTU50 includes the Data and Control Interface Unit (DCIU). This function allows an RTU to scan and control other RTUs. The RTU is then able to use any of the communications interfaces to link to other RTUs, or master stations (for example, store, data concentrate, and forward operation).

The database of the DCIU RTU contains all the points resident in the scanned RTUs. Therefore State and Logic Language (SALL) logic can implement control strategies that include remote RTUs. This is useful for providing local control strategies independent of the master station and communications links.

IED INTEGRATION

Each processor in a RTU50 main file has an RS-232 interface available for local Intelligent Electronic Device (IED). The SALL language supports a configurable protocol link via this port using the IED's native protocol. The data acquired forms part of the RTU's database and is available for all the RTU's functions. Several protocols are already implemented via this port as detailed in the SALL PSS 21S-4A1 B3 (GEC, Schwitzer, and so forth). Optionally, additional ports are available with the Multi-channel Serial Interface Module, which can be located in any I/O slot.

RTU50 PRODUCT SPECIFICATIONS

The product specification sheets listed below give detailed information necessary to design RTU50 architecture to fit the users' needs.

- *Master Processor Module* (PSS 21H-8C1 B4) explains the function of the AMD processor and other associated features
- *RTU50 3-Phase Digital Transducer Module* (PSS 21H-8C8 B4) explains the interface for voltage and current transformers
- *RTU50 Analog/Digital Input Module* (PSS 21H-8C6 B4) explains this unit's Analog/Digital data collection and input monitoring capability
- *Magnetically Latched Relay Output Module* (PSS 21H-8C6 B4) explains this module's use as a relay output
- *Power Supply Module* (PSS 21H-8A8 B4) explains the power supply for the RTU50 units
- *V.11 Dual Communications Module* and *V.28 Dual Communications Module* (PSS 21H-8C5 B4) explains different communications modules and their unique capabilities
- *OptoNet Module* (PSS 21H-8C1 B4) provides logic for the "ring" network possible using RTU50 technology
- *2/4 Channel Analog Output Module*, *20 Channel Analog Input Module*, and *Twelve Relay Digital Output Module* (PSS 21H-8C6 B4) – each specification explains a unique output control solution offered by the RTU50 system
- *State and Logic Languages (SALL)* (PSS 21S-4A1 B3) explains the language used by the RTU50 system
- *RTU50 TOOL – A Diagnostic Utility* (PSS 21S-4A2 B3) explains the RTU50 diagnostic utility
- *SCD5200 Remote Terminal Viewer (RTV) Diagnostic Utility* (PSS 21S-2M4 B3) describes a graphical diagnostic interface that can also be used to monitor the operation of the RTU50
- *SCD5200 System Configurator* (PSS 21S-2M6 B3) describes a graphical configuration tool that can also be used to configure the RTU50

RTU50 MASTER MODULES

Part Number	Description
SY-0399145	RTU50 P3E Master Processor Module
SY-0399165	RTU50 P3OE Master Processor Module
SY-0399153	RTU50 P3E Master Processor Module (64 MB)
SY-0399166	RTU50 P3OE Master Processor Module (64 MB)

OPTICAL PATCH CORDS

Part Number	Description
SY-1051002	Optical Cable Assembly Multimode two ST to two ST L meter

I/O FILES

Part Number	Description
SY-2003084	RTU50 Main Card File 2 slot
SY-2003085	RTU50 Main Card File 3 slot
SY-2003088	RTU50 Main Card File 6 slot 19in Rack Mount
SY-2003089	RTU50 Main Card File 7 slot
SY-2003097	RTU50 DCIU 3 x 2 SLOT CARD FILE
SY-2003099	RTU50 Two x Three Slot Card File

POWER SUPPLY

Part Number	Description
SY-0702076	RTU50 100 W Wide Input Range Power Supply Module

I/O ASSEMBLIES

Part Number	Description
Multiple I/O Module	
SY-0399075	RTU50 24 Digital Input/6 Analog Input/8 Relay Output Module 24 V
SY-0399076	RTU50 24 Digital Input/6 Analog Input/8 Relay Output Module 48 V
SY-0399077	RTU50 24 Digital Input/6 Analog Input/8 Relay Output Module 129 V
20 Channel Analog Input Module	
SY-0399071	RTU50 20 Channel Analog Input Module Isolated
Analog/Digital Input Module	
SY-0399161	RTU50 32 Digital Input/4 Analog Input Module (24V to 129V)

Part Number	Description
12 Channel Digital Output Modules	
SY-0399008	RTU50 12 Relay Output Module
SY-0399009	RTU50 12 Magnetically Latched Relay Output Module
SY-0399010	RTU50 12 10 Amp Relay Output Module
4 Channel Analog Output Module	
SY-0399012	RTU50 4 Channel Analog Output Module

COMMUNICATION BOARDS

Part Number	Description
V.28 Dual Communications Module	
SY-0399191	RTU50 Communications Module V.28 Conitel (C3000, C2025, C300)
SY-0399029	RTU50 Communications Module Harris 5000/5500, 6000
SY-0399034	RTU50 Communications Module V.28 LN57
SY-0399035	RTU50 Communications Module V.28 LN57 Dialup
SY-0399193	RTU50 Communications Module V.28 DNP3
SY-0399195	RTU50 Communications Module V.28 IEC 60870-5-101
SY-0399197	RTU50 Communications Module V.28 WISP
V.11 Dual Communications Module	
SY-0399022	RTU50 Communications Module V.11 LN57 Sync
SY-0399032	RTU50 Communications Module V.11 LN57 Async
SY-0399157	RTU50 Communications Module V.11 IEC 60870-5-103
SY-0399162	RTU50 Communications Module V.11 DNP V3.00 Master/Slave
Glass Fiber Optic Dual Communications Module	
SY-0399025	RTU50 Communications Module Glass Optical LN57
SY-0399063	RTU50 Communications Module Glass Optical DNP3
SY-0399073	RTU50 Communications Module Glass Optical IEC 60870-5-103

SERIAL MODULE

Part Number	Description
SY-0399135	RTU50 Eight Channel Serial Module

3 PHASE DIGITAL TRANSDUCER MODULE

Part Number	Description
SY-0399140	RTU50 3 Phase Digital Transducer Module (1 Amp, 0.5% Accuracy)
SY-0399142	RTU50 3 Phase Digital Transducer Module (5 Amps, 0.5% Accuracy)
SY-1014601	RTU50 ACT Cable for field upgrades of firmware

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