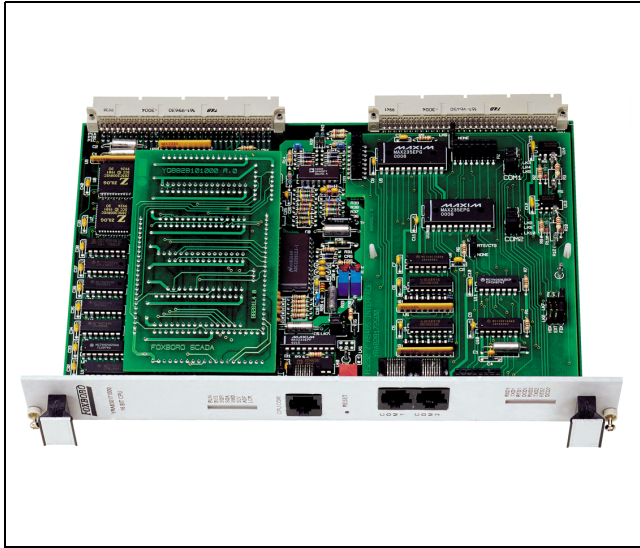


I/A Series® Remote Terminal Unit (RTU)

RTU 20 – 32-Bit Central Processing Unit Module



The 32-bit Central Processing Unit (CPU) is the main control board for the I/A Series RTU 20 family. It has been designed to operate both in single and redundant configurations, enhancing the reliability of the SCADA system.

The module is driven by a MC68332 Motorola™ microcontroller, the most advanced component of the Motorola 32-bit microchip family.

The microcontroller has been designed using HCMOS technology and, due to its high level of immunity to electromagnetic interference, wide operating temperature range and low energy consumption, is particularly suitable for applications in the industrial control field. A 25 MHz clock ensures, to all RTU logic, enhanced local real-time operations and a very high calculation power.

The MC68332 highly integrated 32-bit microcontroller combines high performance data manipulation capabilities with powerful peripheral subsystems. It incorporates a system integration module, an enhanced serial communication interface subsystem, a time processing unit, and a queued serial peripheral interface (SPI) subsystem.

In addition to the microcontroller, the 32-bit CPU module hosts:

- 1 MB flash (expandable up to 2 MB) and 1 MB RAM (expandable up to 2 MB) memories
- A real-time calendar clock (RTCC) with battery backup
- Two DUARTs (4 UARTs) to manage up to four RS-232-C or four opto-isolated RS-485 interfaces. Two of them are built-in on the CPU board, while two additional interfaces can be installed on a dedicated communication I/O module to be housed in the RTU 20 rack. The four serial lines are used to interface the external serial communication lines with a data transfer rate up to 115,000 bps
- A built-in RS-232-C or an opto-isolated RS-485 serial interface for diagnostic or local connection purposes
- A 13-bit analog-to-digital converter (ADC)
- Two built-in analog inputs to monitor battery backup voltage and the internal temperature of the cabinet
- Logic to manage redundant CPU configurations
- A 2 Mbps serial bus (driven by the microcontroller SPI) managing the process I/O modules contained in the RTU 20 rack.

Each 32-bit CPU can manage up to 36 I/O modules (half- or full-size) distributed in up to four RTU 20 chassis (nine I/O slots each).

Connections to external communication lines can be either through standard telephone connectors on the front edge or dedicated terminal blocks.

The 32-bit CPU is equipped with eight LED indicators to monitor the module's proper operation or fault status.

To easily program the CPU/RTU address, a micro-dip switch group is installed on the CPU module.

BASIC AND ADVANCED FUNCTIONALITY

The RTU's basic functions are performed by a microprogram developed in "C" language and resident in the 32-bit CPU non-volatile flash memory. This powerful microprogram provides the RTU with all the functionality required to autonomously interface with the local I/O modules and to manage the remote communications with SCADA control centers, slave RTUs and Intelligent Devices.

The 32-bit CPU basic operating functions include the management of:

- Advanced real-time self-diagnostics with logic to automatically manage redundant CPU configurations
- Automatic I/O module configuration at power-up: the RTU does not need to be reprogrammed after the addition or removal of I/O boards
- Digital inputs local scan and change detection
- Analog inputs local scan and pre-processing
- Analog and digital outputs safe selection and execution
- Report-by-exception data communication technique for the optimized real-time use of low speed telephone lines (if supported by the adopted communication protocol)
- Broadcast control messages: addressing all RTUs on the line with a single message, to perform synchronized plant-wide control actions (if supported by the adopted communication protocol)
- Real-time calendar clock, with backup battery, to locally manage time-related data archiving
- Up to four opto-isolated RS-485 interfaces or RS-232-C full modem control communication lines toward SCADA control centers, slave local/remote RTUs and Intelligent Devices

- Foxboro SCADA P6008, Modbus™ binary and ASCII, DNP 3.0 communication protocols
- One additional independent RS-232-C/RS-485 connection to a local human machine interface (HMI) terminal (for example, a portable PC) for diagnostic, program and process data handling at the RTU location. An optional LCD sealed I/O panel is also available for viewing of field data.

To match particular application requirements, the RTU 20 32-bit CPU basic functionality can be easily expanded to manage special functions such as:

- Typical programmable logic controller-oriented single and multiple automatic sequences: user-programmable through the five standard IEC 61131-3 programming graphic/literal languages (downloadable by local PC or SCADA control center)
- Gas flow calculations: AGA3, AGA5, AGA7, AGA8, NX19
- Management of PID algorithms
- Time-stamped local archiving for digital and analog inputs with one second resolution. Up to 12,000 items can be stored in a first-in/first-out (FIFO) historical list filled in on variation of signals status. This list can be used for a timed data transmission to the SCADA control center (for example, RTU polled once per hour), to support store-and-forward functionality during a communication line fault or for dial-up RTU unsolicited/spontaneous data communication on standard switched telephone lines.
- Store-and-forward data communications: to locally store, at the RTU level, incoming field data variations during a communication fault and transmit them (time-stamped) to the SCADA control center when the data line returns to normal condition.

- Management of a dial-up communication line with an auto-call feature for unsolicited/spontaneous (independent from the standard polling cycle) data transmission to the SCADA control center.
- Sequence of Events (SOE) up to 1 ms resolution for maximum of 64 digital inputs (more than 64 events can be managed with lower time resolution). This function must be supported by the adopted communication protocol.
- Remote data concentrator toward slave RTUs in active and passive mode

When the RTU is in redundant configuration:

- Both CPUs continuously address all I/O modules and update their input data buffers.
- Each CPU performs diagnostic checks on the other one (through a watchdog timer).
- In case of failure, a CPU can be disconnected from the I/O bus without affecting the operations of the other one.
- Each CPU manages its communication lines.

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