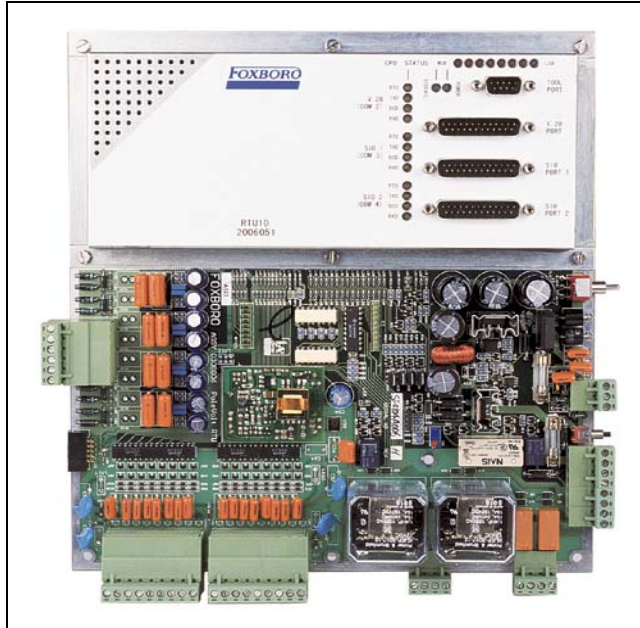# I/A Series® Intelligent SCADA RTU10 Remote Terminal Unit

The RTU10 integrates selected functionality from the RTU50's field-proven software and hardware into a compact, high performance, and cost effective package matched to a range of applications including:

- Automated Air-Break Switches
- Pole Mounted Reclosers
- Remote Line Circuit Breakers and Sectionalizers
- Fault Indicators
- Remote Voltage Regulators
- Load Transfer Switches
- Kiosk Transformers and Switch Gear
- Small Commercial and Industrial Substations

The RTU10 is specifically designed to operate in harsh electrical environments, provide integrated battery backup for mains supply and operate with a range of remote communications bearers, including data radios and public switched telephone network modems.

The RTU10 features the same powerful programming and configuration capabilities as the I/A Series RTU50 and SCD5200.

FEATURES

- Compact low cost Remote Terminal Unit
- Low Power Consumption (< 4 Watts typical)
- Industrial Processor with Real-time battery backed calendar clock and watchdog timer
- Eight CPU status indicators
- 16 Opto-isolated digital inputs
- Digital inputs provide Status, Sequence of Events, and Accumulator
- Sequence of Events resolution of 10 ms
- 4 Relay-isolated digital outputs
- Latch, trip-close (pair), raise-lower (pair), or fixed pulse outputs
- High security "check-before-operate" control outputs
- 4 High resolution analog inputs (12 bit plus sign)
- Plug in analog current loop and voltage divider resistors
- Serial RS-232 port for local diagnostic utility and configuration
- Three RS-232 serial ports for communications
- Removable terminal assemblies allow card replacement without disconnecting field wiring
- Support of industry standard DNP3 Slave protocol
- User defined protocols can be configured
- Supply options including mains (18 V ac nominal via low cost transformer) or 24 V dc nominal
- 12 V dc battery backup for mains supply
- Integral smart battery charger with test facility and remote control and monitoring
- Battery replacement available on-line
- Switchable isolated 28 V dc Field Input Power Supply
- Switchable 12 V dc supply provided for radio or communication modem
- Radio press-to-talk associated with one communications port
- Run/fail status front panel indicator and database health point
- High transient and surge immunity
- EMC emission and immunity to CE standards for industrial equipment
- –20 to 75°C operating range

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FUNCTIONAL DESCRIPTION

The RTU10 is a low power consumption device. It requires less than 4 watts in normal operation (fully charged battery and neglecting any radio power).

At the core of the software operation is a real time operating system delivering real time data acquisition and control characteristics. Inputs, outputs, communications and control tasks are all coordinated by a secure, priority based scheduler.

Configuration information is loaded from FLASH memory at startup.

The I/O subsystem consists of 16 digital inputs, 4 analog inputs, and 4 digital outputs. The I/O subsystem scans the analogue, digital, and serial inputs, and stores data into local memory to be used by the user configurable logic and/or the communications subsystem. This subsystem provides check-before-execute security against false controls, more-than-one relay checking for trip/close and raise/lower pairs, and controls the digital outputs.

The RTU10 continually runs self diagnostic functions including:

- Integrity of power supplies
- Status of configuration (checksum)
- System idle time
- Memory usage
- Health monitoring of internal subsystems

Digital Inputs

To provide flexibility for a wide range of input types, the RTU10 digital inputs can be individually configured by software as status, time stamped events, or accumulator. One digital input can be configured as a fast accumulator type capable of counting up to 2 kHz.

Each input point is isolated against surge transients and has configurable de-bounce filters to reduce false input indications. Digital inputs can be wired as either current sink or current source and an isolated 28 V nominal Field Interrogation Power Supply (FIPS) is provided on board (jumper selectable). The digital inputs are conveniently common returned in two groups of eight.

Digital Outputs

The RTU10 eliminates the need for high current interposing relays by featuring two on-board high capacity output relays. The 4 digital outputs comprise two relays rated at 10 Amp, 150 V dc, and two pilot relays rated at 5 Amp, 30 V dc. To provide further flexibility, outputs may be individually configured via user software as latched or pulse types (to support, for example, raise/lower or trip/close applications).

Analog Inputs

The RTU10 provides four general purpose, high-resolution (12 bit plus sign) analog inputs. Two check voltages are continuously scanned for calibration drift.

Facilities for precision resistors on each input channel accommodate a range of current and voltage transducer specifications.

Communication Interfaces

Four asynchronous V.28 (RS232) interfaces are provided for communications to the Master station, Intelligent Electronic Devices (IEDs) and the diagnostic tool for maintenance. All ports are DTE.

The master communications port is a standard DB25 connector which supports radio interfacing. Signals used are TxD, RxD, RTS, CTS, DCD, DTR, RI and GND.

A radio-keying relay is provided with user software configurable radio ON and OFF keying times.

Two communication ports, provided with standard DB25 connectors, enable user developed or embedded protocol interfacing to IED equipment or time synchronization from a GPS receiver. User defined protocols are developed using the flexible Foxboro RTU State And Logic Language (SALL) High Level Serial Interface (HLSI) protocol development environment.

One serial port, provided with a standard DB9 connector, facilitates the connection of the diagnostic tool for maintenance and configuration.

Power Supply

The RTU10 operates from an external nominal 24 V dc or 18 V ac power supply and may be fitted with an optional battery. An on-board isolated 28 V dc power supply is included for powering the digital inputs.

Power Conservation

Two power conservation mechanisms are employed to increase battery operation time. A transmit disable feature is available to the user to optionally minimize power consumption while not transmitting. Secondly the FIP supply can be turned off.

Battery Management

Batteries are perhaps the most fragile component in remote RTU deployments, and can involve expensive maintenance.

The RTU10 provides excellent battery management including:

- Battery load up monitor
- Temperature compensated charging
- Battery voltage measurement
- Unload of battery at minimum voltage
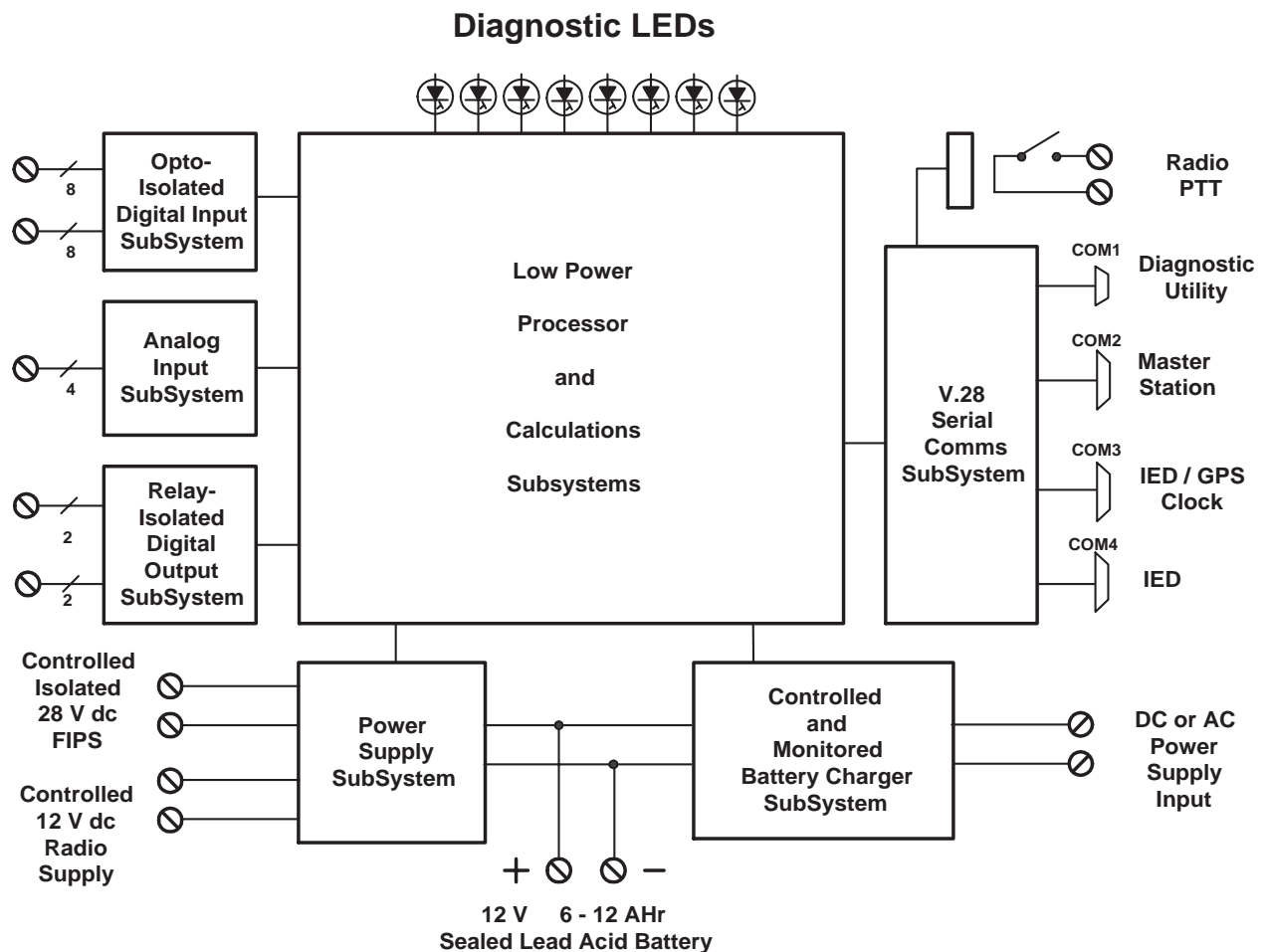- On-line discharge test to check on health of batteries

Diagnostic LEDs

Figure 1 - RTU10 Functional Block Diagram

PHYSICAL SPECIFICATIONS

Physical Size
RTU10 BASIC UNIT (2006051)
275 mm x 254 mm x 60 mm

RTU10 IN CABINET (2006057)
NEMA 4 (IP 65) Enclosure
400 mm x 500 mm x 210 mm

ENVIRONMENTAL SPECIFICATIONS

Ambient Temperature
–20°C to +75°C

Humidity
10% to 95% (non-condensing)

FUNCTIONAL SPECIFICATIONS

Power Requirements
INPUT VOLTAGE
24 V dc nominal (19 to 30 V dc) or
18 V ac nominal (14 to 21 V ac)
CONSUMPTION
Less than 4 Watts (Relays not operated)
30 W maximum during battery charging

Battery Charger Subsystem
TYPE
Integrated smart battery charger and battery test
facility with remote control and health monitor.
Unload protection on low battery threshold
FAST CHARGE
800 mA current limited temperature compensated
voltage and charge rate terminated
TRICKLE CHARGE
Temperature compensated
1.9 mA at –20°C
19 mA at +65°C

Batteries
TYPE
12 V Sealed Lead Acid 5AH minimum
Two Hawker Energy Cylon Monobloc 8 AH 6 V
battery in series recommended
BACKUP TIME
8 hour*
CHARGE TIME
80% capacity in less than 10 hours*
95% capacity in less than 24 hours*
BATTERY CYCLE LIFE
300 full discharge/charge cycles*
FLOAT LIFE
Greater than 8 years at 25°C*

Processor and Memory
Motorola 68332
AMX Operating System
1 MB Flash memory for program and configuration
1 MB Static RAM for data

Real Time Clock
RESOLUTION
10 ms
ACCURACY
25 ppm

Serial Ports
RS-232 INTERFACE
One DB9 male socket and three DB25 male
sockets wired per TIA/EIA-574 (DTE) with
hardware flow and modem control
COM1
DB9. Provides local or dial-up connection for
diagnostics/configuration
COM2, COM3, COM4
DB25. Provide general purpose user configurable
communications port for connection to GPS clock,
IED, or SCADA Master Station
BAUD RATES
50 to 38.4 K baud
COMMUNICATIONS PROTOCOLS
DNP3 Slave and user configurable
RADIO INTERFACE
Radio Press to Talk isolated relay make contract
associated with a serial port
Radio supply controlled 12 V dc 2A max
(16 V dc max)

Diagnostic LEDs
Power LED
System Healthy/Fail LED
CPU Activity LEDs (eight)
Communications Activity LEDs (TxD, RxD, RTS and
DCD on COM 2, 3, and 4)

*For recommended battery

Digital Inputs
 NUMBER OF CHANNELS
  15 Status Inputs
  1 Status with high speed (2 kHz) counter
 INPUT TYPE
  Status
  Time stamped event 10ms on any input
  Accumulator 10 Hz standard on any input
  Accumulator high speed 2 kHz (Form A only)
  assignable to one input only
 CIRCUIT TYPES
  Common return in groups of eight
  Common positive or negative
 STATUS INPUT VOLTAGE
  28 V dc nominal
 INPUT CURRENT
  3.6 mA per input (nominal)
 ISOLATION
  Optocoupler
  2 kV RMS
 TRANSIENT PROTECTION
  Common Mode
   5 kV Impulse
   2.5 kV High Frequency Disturbance

  Transverse Mode:
   5 kV Impulse
   1 kV High Frequency Disturbance

Digital Outputs
 NUMBER OF CHANNELS
  Four
 OUTPUT TYPES
  Outputs can be configured as:
  Spare, Trip/Close (in pairs),
  Raise/Lower (in pairs), Pulse, Latched
 SECURITY
  One or more than one relay energized test
  Only one of trip/close or raise/lower pair can be
  active at any time
 CONTROL OUTPUTS
  Two motor control relays 10 A, 150 V dc
  Two pilot relays 5 A, 30 V dc
 RELAY COIL CURRENT
  Motor control relays 1.3 W
  Pilot relays 1.1 W
 ISOLATION
  2 kV RMS 1 min, output to frame
  1 kV RMS 1 min, across open contacts
  2 kV RMS 1 min, between outputs

Analog Inputs
 INPUT CIRCUITS
  Four input circuits with individual shield terminals
 MULTIPLEXER
  Solid State
 ADC TYPE
  Sigma-delta
 RESOLUTION
  12 bits + sign
 DATA AGE
  1500 ms maximum
 INPUT SIGNAL RANGE
  ±1 V or 0 to 2 V dc
 FULL SCALE RANGE
  ±2000 counts (over-range of ±2047 counts) or
  +4000 counts (over-range of +4095 counts)
 COMMON MODE ERROR
  0.01% per V to a maximum of ±6 V
 MAXIMUM ERROR
  ±0.25% over full common mode and temperature
  range
 DIFFERENTIAL MODE VOLTAGE
  ±50 V dc or peak ac without damage
 DIFFERENTIAL MODE REJECTION
  50 dB at 50 Hz
 COMMON MODE VOLTAGE
  Operating within specification ±6 V
  Operating without damage ±50 V dc or peak ac
 COMMON MODE REJECTION
  80 dB at 6 V peak dc to 60 Hz
 REFERENCE VOLTAGES
  0 and 1 V dc

Field Input Power Supply
 OUTPUT
  28 V dc nominal
 CONSUMPTION
  2 W maximum
 ISOLATION
  2 kV ac RMS (1 min)

STANDARDS COMPLIANCE

Emissions	EN50081-2 CISPR11 Class A
Immunity	**EN50082-2 Industrial & IEC61326** **Measurement, Control & Laboratory** EN61000-4-2 [IEC1000-4-2] Electrostatic discharge (8 kV air, 4 kV contact) EN61000-4-3 [IEC1000-4-3] EM field (10 V/m) EN61000-4-4 [IEC1000-4-4] Electrical Fast Transient (2 kV power supply, 2 kV capacitive clamp to I/O, 1 kV capacitive clamp to comms) EN61000-4-5 [IEC1000-4-5]: Surge (Power supply: 1 kV line to line, 2 kV line to ground; AI: 1 kV through shield; DI: 1 kV through shield, 1 kV common mode; DO: 2 kV common mode, 1 kV transverse; Comms: 1 kV through shield) EN61000-4-6 [IEC1000-4-6] Conducted RF (10 V) EN61000-4-11 [IEC1000-4-11] Voltage interruption (1 cycle/100%)
	High Frequency Disturbance: **IEC255-4 Class 3** Power supply, AI, DI, and DO: 1 kV transverse, 2.5 kV common mode
	Impulse Voltage withstand: **IEC255-4 Class 3** Power supply, AI, DI, and DO: 5 kV transverse, 5 kV common mode
Safety	**EN61010-1 [IEC61010-1]:** Safety requirements for electrical equipment for measurement, control and laboratory use.

ORDERING INFORMATION

Part Number	Description
2006051	RTU10 Basic Unit
2006057	RTU10 in NEMA 4 cabinet – with batteries
1101165	RTU10 Software Upgrade
1101050	RTU Configurator Software
2005654	RTU User Documentation CD-ROM

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