



The intelligent Protection and Automation Controller (iPAC) is specially designed for comprehensive feeder protection and automation applications. That includes fault detection, fault isolation, restoration, re-closing, metering, trend recording, fault recording and monitoring in one integrated platform. It is easy to customize, install, operate, maintain and yet cost effective.

Main Features

- Comprehensive over-current protections and re-closer functions.
- Feeder Protection takes in any combinations of 16 Voltages/Currents
- Protection functions include IEEE Devices 25, 27, 32, 46, 50, 51, 59, 60, 67, 79, 81, 86, 87
- Event Driven Control Operator (EDCO) Control Package for time critical logic and sequential controls.
- Multiple protocol support such as Modbus, IEC T101, DNP 3.0, LG8979, CDC II SCADA communication protocols.
- Full SCADA capabilities such as SOE, Data concentration for IED and much more.
- Redundancy support for critical installations.
- IRIB-B time stamping and sample synchronization.
- Front accessible wiring termination for ease of pole top mounting.
- Modularized Hardware components for ease of customization to configure various combinations of PT and CT.
- Flexible device configuration such that user can define number of protective devices as needed.
- Peer to peer communication is available for intelligent fault isolation.
- CMOS components for low power consumption.



Measurement functions

- Voltage and Current RMS Values
- Neutral Current RMS Values
- Power Factor Measurement (Power factor correction: Capacitor bank switching)
- Total Power Measurement
- Real and Reactive Power Measurement
- Power Quality Measurement (FFT for Harmonic Measurement)
- Frequency measurement
- Total Harmonic Distortion measurement

IEEE Protective Devices

- Sync Check (25)
- Under Voltage (27)
- Directional Power (32)
- Phase Balance (46)
- Instantaneous Over Current (50)
- Inverse Time Over Current (51)
- Over Voltage (59)
- Voltage Balance (60)
- Directional (67)
- Reclosing (79)
- Under and Over Frequency (81)
- Lockout (86)
- Differential for Transformer Protection (87)

Advanced Features for protections

- Coil Monitoring for Relay failure detection.
- Cold Load Pickup Logic to prevent protective devices from operating when cold load is put on the circuit.
- Voltage Constraint with Current pickup lowered to increase sensitivity when voltage is also collapsing during the fault.
- Breaker Control Blocking for coordination with upstream and downstream protective devices via DI or Peer-to-peer communication.
- Directional on Over Current Devices

Trending and Recording

- Transient disturbance time stamped event recording (External DI, Protective Stage Status and Breaker Operation)
- AI Wave Form Capture
- Fault History recording

Communication

- RS232/RS485 ports: 4 user ports, 1 jumper selectable maintenance or user port
- 4 Sync/Async ports, 1 Async port, 300 – 38.4k Baud
- Hand shaking signals: DCD, RTS, CTS
- Specifications: Meet all EIA/TIA-232-E and V.28 Specifications.
- Multiple Open Protocol support: T101, DNP3, Modbus, CDC II, LG8979
- Redundant Communication
- Data Concentrator Protocol: Modbus, IEC T101, DNP 3.0, CDC II

Maintenance



- Window Based DynaView Maintenance Software
- Window Based DynaConfig Configuration Software

Monitoring and Supervision

- Power Quality Measurement: THD and Harmonic Measurement (up to 32 Harmonics)
- Electronics temperature Monitoring
- Circuit Breaker Electric Wear
- Trip Circuit Supervision (Base on Value of trip coil current, auxiliary Contact of the Trip Relay or the present of the Voltage).
- Trip/Close Breaker Operation counters
- Breaker Travel Time Supervision

Control

- Power Factor Control (Capacitor Bank Switching)
- Programmable Multiple Shots Recloser (Maximum 6 shots)
- Programmable Digital Output for LED Indications
- Manual Circuit Breaker control
- Programmable Logic and Sequential Control

Diagnostics

- Power Up Diagnostics: Software and Configuration Integrity Checking
- Digital Output Relay Driver Integrity Checking
- Digital Input Wetting Voltage Monitoring
- AI Reference Monitoring
- Battery Voltage Monitoring (Optional)
- EPROM and RAM integrity Checking

Configuration Template

- Ready made standard configuration or customize the unit to specific application for detail refine setting by customer.

Technology

- CMOS components for low power consumption.
- Extensive use of Surface Mount components.
- Employing In-System-Programming technology for EEPROM and EPLD.

CPU, DSP and Memory

- 32- bit HCMOS Motorola 68332 @ 20 MHz.
- 32- bit Floating Point DSP ADSP21062 @ 40 MHz.
- CPU Memory: 1 MegaBytes EEPROM. 1 MegaBytes Battery backed up RAM with 3 years of shelf life. Battery can be changed with live power on for uninterrupted operations.
- DSP Memory: 2 Megabits of on-chip RAM, 128 Kilo-Bytes of Dual Ported RAM.

Real Time Calendar Clock

- Hardware Calendar Clock with year, month, day of month, day of week, hour, minute and second.
- Optional high accuracy, temperature compensated crystal oscillator, 20.0000 MHz +/- 2 PPM at -20 to 70 degrees Celsius.
- Battery backed up Real Time Calendar Clock with 3 years of shelf life. Battery can be changed with live power on for uninterrupted operations.

Microprocessor Supervisor



- Watchdog Timer. Power Monitor. Reset. Power Switching functions. Watchdog relay: For system malfunction annunciator, indication and control overrides.

Power Requirement and On-board Power Supplies

- Isolated unregulated 24 VDC (1 Amp) for electronics. Separate Power Supply for Digital Input Excitation.
- Switching mode, +5 VDC for digital electronic, +5 VDC, -12 VDC and +12 VDC for analog electronic.

System Status Indicators

- Power On indicator. Performance indicator. System normal indicator. Control malfunction indicator.

Digital Inputs

- 16 Optical Isolated Digital Inputs with Input indicator on each digital input.
- Isolation Rating: 2500 Vrms (Point Input to Logic).
- Hardware Digital Filter: Programmable 2-15 ms debounce timer, transition detection and interrupt capability.
- Accumulator: Any digital input can be configured as an Accumulator.
- Maximum Rate of Accumulator: 150 Hz.
- Types of point: Form A, Form C and BCD.
- SOE: Any Digital Input Point can be Configured as SOE with accuracy of 1 ms.
- Chatter Filter is available for preventing malfunctioning inputs from filling up the SOE buffer.

AC or DC Analog Inputs

- Up to 16 AC Analog Input Points: Can be either Voltage or Current inputs. Rating: I nominal = 5 A or 1 A, V nominal = 120 V, Nominal Frequency: 50/60 Hz
- Accuracy: +/- 1%
- Temperature Coefficient: +/-5PPM per degree Celsius.
- Resolution: 15 bit plus sign.
- Auto Self Calibration Reference Points: -5.000VDC, 0VDC and +5.000VDC.
- CMRR (@0-60Hz): 90 dB.
- NMRR (@60Hz) 60 dB.
- Analog input self calibration, Auto-correction of gain and offset errors.

- Up to 16 DC Analog Input Points: Bipolar, Differential input @ +/- 10.0V, +/- 5.0V, +/- 1.0V, +/- 1 mA, +/- 20 mA, 4-20 mA
- Accuracy: +/- 0.05% (DC voltage input).
- Temperature Coefficient: +/-5PPM per degree Celsius.
- Resolution: 15 bit plus sign.
- Auto Self Calibration Reference Points: -5.000VDC, 0VDC and +5.000VDC.
- CMRR (@0-60Hz): 90 dB.
- NMRR (@60Hz) 60 dB.
- Analog input self calibration, Auto-correction of gain and offset errors.

Digital Outputs

- 16 relay outputs with Output indicator on each digital output.
- Control Output Configurations: Isolated Discrete control output relays, Trip/Close, Raise/Lower, Set/Reset, Pattern Controls, Relay fail to OFF, Relay fail to last commanded position.
- Control Security: Single component failure protection, Master Trip/Close relays, relay driver input status check back for point selection confirmation, Double point select-before-operate.
- Remote/Local Switch for enable/disable controls.
- Either a Malfunction of the system (detected by the watchdog), or the failure of a point selection confirmation shuts down the control module.



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- Control Functions: ON/OFF, Timed ON/OFF (Pulse Duration of 1 ms resolution), Variable duty cycle pulse output with variable repetition rate (Pulse Train of 1 to 254 or continuous, 1 ms resolution), Pattern controls (a group of contiguous outputs).
 - Contact Rating: 10 Amp at 125 VDC.
 - Dry Contact, 1500 VDC Isolation

Operating Environment

- Temperature Range: -40 to +85 degrees Celsius. Humidity: < 95%, non-condensing.

Advanced Features

- Remote Software download.
- Remote Configuration download.
- Dual Configurations: The system maintains 2 sets of Configuration. One resides in the EEPROM and the other resides in the Battery backup RAM. The set in the Battery backup RAM is used for configuration upgrade. After thoroughly testing, the set in the Battery backup RAM can be transferred to EEPROM or the set in the EEPROM can be brought back to active state. That is to say, the user can always fall back to the last well tested configuration.
- Rich set of Digital Inputs: Form A DI, Form C DI, Form A ACC, Form C ACC, BCD.
- Rich set of Digital Outputs: Latch DO, Pulse Train DO, Pulse Duration DO, Trip/Close, Raise/Lower, Double Point Select before Operate, Pattern Controls.
- Analog Inputs are auto calibrated.
- RTU ambient temperature sensor provided.
- 4 user communication ports can be used for sync or async.
- 1 jumper selectable maintenance or user communication port for asyn communication.
- The maintenance/application port can be used for host or maintenance communication with one communication channel. A pseudo control point is available for switching between the host or maintenance communication.
- Built in Serial I/O Communication analyzer.
- Battery backed up hardware Real Time Calendar Clock.
- Baud rate can be up to 38.4K.
- Efficient Process Control Software Package: EDCO (Event Driven Control Operator) for time critical process control applications.
- Extensive error checking in Configuration Compilation: Configuration errors can be easily identified and resolved at the time of configuration not at the time of configuration download to the RTU.
- Time Sync: IRIG-B, RS232
- Front Panel Indicators:
 - System Status LED: Power, Performance, System Normal, Control trouble.
 - 16 DI LED
 - 16 DO LED
 - 10 TX and RX LED for 5 communication ports