

# iESP Master Control Unit

Monitoring and control of operational electric submersible pump (ESP) installations is critical for several reasons. There are some instances where the well site visits of the pumper or operator are not frequent enough for the proper control on these installations. Some of the reasons for this are:

Remote locations that are either difficult or dangerous to get to leading to a need to reduce the frequency of visits to the location.

Prolific producers, of which any down time results in large losses of revenue, require immediate notification of a down system.

Trouble wells due to dirty power, cyclic reservoirs, solids production, and scale formation require advanced control logic to optimize.

eProduction Solutions offers an intelligent ESP solution (iESP). The EXS-1000 Remote Terminal Unit (RTU) is the heart of the iESP optimization solution providing automatic remote control of ESP produced wells. The iESP interfaces with a variety of smart sensors at the well site to monitor, control, and automate the start-up process for ESP systems.

Several features have been incorporated into the RTU including "smart" serial communications interfaces to the local control valve, sand monitor probe, downhole pressure sensor, and ESP controller. The iESP gathers and stores information from each of the smart sensors through a polling process. This information is then processed locally by the iESP or fed back to the control center to allow well analysts to make decisions on system optimization. The result is that real-time decisions are made and implemented which increases overall system efficiency. Optimization of motor speed for variable flux drive applications is also supported.

- Smart interface to downhole sensor (Phoenix) and other well site instrumentation
- Adaptive control templates allow remote start-up, choke control, and monitor speed control
- Data, time, and event-based logging
- Easily retrofitted to existing ESP installation
- Single SCADA interface eliminates need for multiple communication interfaces on site

Additional system benefits are:

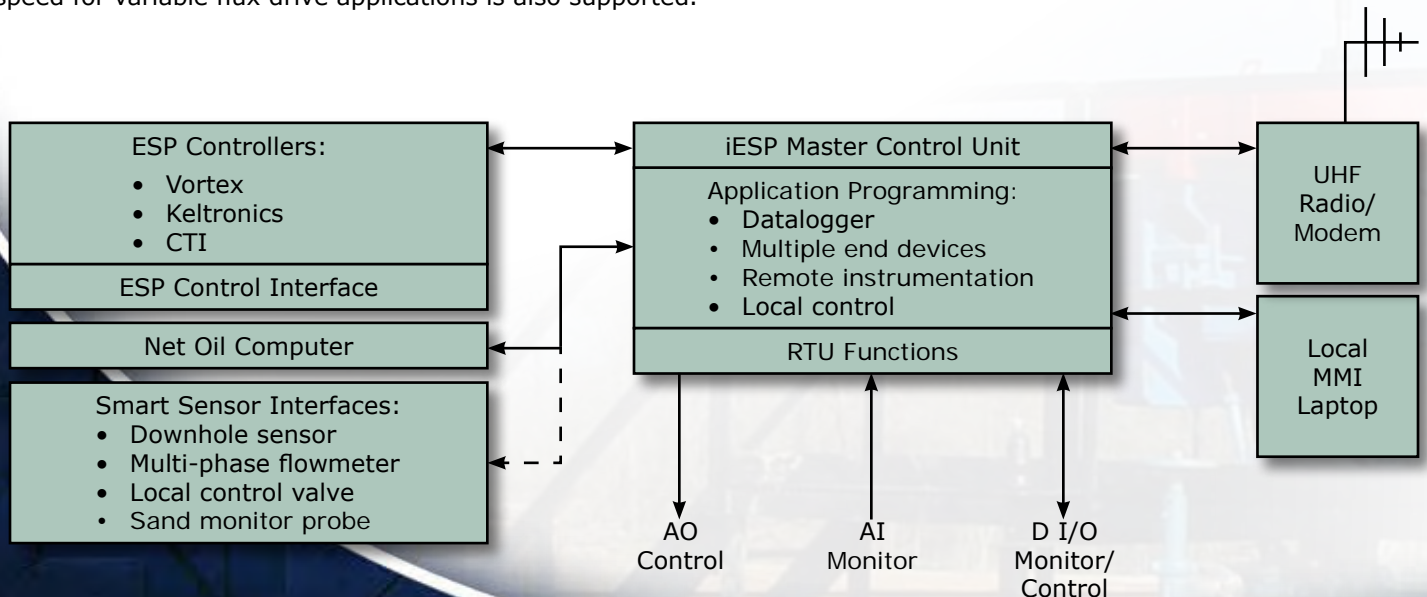
A fully protected remote start-up process of the ESP pumping system, utilized in appropriate situations, minimizes production deferment.

Remote optimization of the well to provide the maximum produced fluid while maintaining the system integrity within operating limits.

The iESP supports a smart interface to all brand name ESP controllers including Vortex, Keltronics, and Wood Group (CTI).

## Features

- Eight digital inputs and eight digital outputs
- Eight analog inputs and two analog outputs
- Two RS-232 serial ports, expandable to four or six
- Controls up to two PID loops
- Eight channel data logger with up to 240 records-per-channel
- User programmable via Automatic Control Logic (ACL)
- Communication packages including Cellular Digital Packet Data (CDPD)



## Applications

The utilization of the iESP can range from simple to complex. The use will depend on the end-devices available and actual application. Some of the uses are:

- Data-logging
- Interface to remote instrumentation
- Implementation of custom well site logic

## Functions

With the standard features of the EXS-1000 and the additional interfaces of the ESP firmware, the iESP can perform a multitude of functions. Some of these include:

- Intelligence distributed at the well site
- Access to continuous real-time data
- Twenty-four hour local optimization
- Single point interface to SCADA and MIS systems
- Stand alone capability
- Informed decisions
- Multi-channel real-time data-logging
- Interrogate and/or configure remote instruments

## Specifications

### Software Specifications

Control	Two PID control loops, output calculated every second
Serial Communication Interface	Two RS-232 asynchronous serial ports expandable up to four or six
Communications Protocols	Modbus ASCII, Modbus RTU or 8500
Communications Options	Bell Model 103, 202 or 212 modem. Digital radio with integral modem (450- or 900-Mhz)

### Hardware Specifications

Analog Inputs	Eight (one analog input can be jumpered for direct 100 Ohm platinum RTD input)
Range	Nominal 0 to 5 Vdc, 1 to 5 Vdc, 0 to 25 mA or 4 to 20 mA (jumper selectable)
Resolution	12-Bit, unipolar
Accuracy	Current inputs $\pm 0.1\%$ of full scale, voltage inputs $\pm 0.1\%$ of full scale (including linearity, hysteresis, repeatability, and resolution)
Temperature coefficient	$\pm 0.01\%$ of full scale/degree F
Analog Outputs	Two
Range	0- to 25-mA or 4- to 20-mA
Resolution	12 Bit, unipolar
Accuracy	$\pm 1.1\%$ , firmware calibratable to $\pm 0.1\%$ (including linearity, hysteresis, repeatability, and resolution)
Digital Inputs	Eight inputs @ 4- to 32-Vdc, 2 Hz maximum, 2 mA current limited (firmware filtered)
Optional	Turbine meter prescaler accepts up to 5-Khz signals from turbine meter
Digital Outputs	Eight outputs @ 0.5-Amp continuous, 6 Amp pulsed, 32 Vdc maximum
Real Time Clock	Accurate to within $\pm 1$ minute/ month over operating temperature range
Data Ports	Two RS-232 asynchronous serial ports (1 for MMI, 1 for 300 to 19.2 KBaud telecommunications) Expansion ports provide RS-232 or RS-485 interface to external instruments and/or controllers
Operating Range	-40° to +85°C, 0-95% relative humidity (non-condensing)
Overvoltage/Transient Protection	All inputs/outputs and power supply devices provided with surge protection to ANSI/IEEE C37-90.1-1989 (IEEE Std. 472-1974)
Local Display	2 x 24 LCD (-20°C to +70°C), optional with 20-key keypad
Power Requirements	8- to 32-Vdc @ 2.5 Watts average
Options	110 Vac, 50/60-Hz input with one day battery (12-Vdc) backup, 0° to 60°C operation (assumes 1 Amp maximum load) 24 Vdc battery charging and backup for AC or solar powered units 12/24 Vdc DC to DC converter, used for 4 to 20 mA transmitters when battery backup is 12 Vdc 220 Vac, 50/60-Hz operation for AC input units



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