WellPilot® F-15 Plunger-Lift Controller

Weatherford's *WellPilot* F-15 plunger-lift controller (PLC) is an entry-level controller that offers many of the features and benefits associated with mid- to upper-range controllers—all in a compact enclosure at an affordable price. One of the advanced features in the F-15 is the AutoAdjust™ feature, which enables automated cycle and production optimization based on plunger arrival times.The F-15 shares with all controllers in the *WellPilot* family a design that meets the rigorous demands of long-term wellsite performance. The functionality of this controller was designed with input from production operators with vast experience in optimizing production for plunger-lifted wells.

Applications

The *WellPilot* F-15 PLC is suitable for wells requiring

- basic plunger-lift functionality;
- plunger-lift systems that incorporate a secondary "B" valve to assist plunger and fluid arrival when necessary;
- pressure input (tubing, casing or flowline) to initiate *on* and *off* overrides of preset cycles;
- non-arrival shutdown capability for managing loading sensitivity;
- fast-arrival shutdown to control risks associated with fast and dry plunger runs;
- automated cycle tuning/optimization to compensate for flowline pressure fluctuations and fluid slugging (*AutoAdjust* feature);
- automated cycle tuning/optimization for remote or inaccessible locations (*AutoAdjust* feature);
- intermittent gas-lift injection to assist plunger lift in fluid unloading and maintaining production;
- intermittent gas injection with the additional *AutoAdjust* feature to control gas injection and optimize production based on plunger arrival times;
- both tubing and casing intermittent flow;
- high-low operations;
- tank level shut-in.

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Features, Advantages and Benefits

The standard features of the *WellPilot* F-15 PLC offer numerous advantages and benefits:

- Metal enclosure with top-mount 2.5W solar array provides a compact design that is easy to install and maintain.
- Pull-down front panel facilitates a safer, faster wiring hookup.
- Automatic high/low-pressure shutdown with reset provides an economical means of controlling the well on pressure.
- Ultra-low power consumption extends battery life in minimal-sunlight areas.
- Data logger records the latest 50 plunger-lift arrivals for cycle comparisons and trending.
- Single-button data retrieval system offers a fast and convenient way to view operational data.
- Lockable front latch deters vandalism.
- Analog and digital inputs enable collection of data from peripheral devices to aid in optimization.
- Electronic components are coated to protect against moisture, dust, chemicals, and other environmental stresses to maximize the life of the controller.

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Features, Advantages and Benefits (continued)

In addition to basic controller functions, the F-15 offers the following control and optimization features and their associated benefits:

- **AutoAdjust**™ feature minimizes the effects of many surface and downhole conditions that ultimately affect plunger arrival and speed. These conditions include fluctuating line pressure, declining reservoir performance, increased water production, and plunger wear. The *AutoAdjust* feature takes into account the well depth and the associated optimal plunger arrival speed and then adjusts the off time and/or sales time after the arrival to accelerate or slow the plunger to the targeted arrival speed.
- **Auto-catch with dual-valve control** is used with dual-outlet lubricators and the auto-catch assembly to catch and hold the plunger between cycles. Adding pneumatic or electric control valves to each lubricator outlet enables the controller to keep the lower outlet closed until the plunger has arrived in the auto-catch assembly. Once the plunger is caught in the auto-catcher (above the lower outlet), the lower outlet opens, allowing the well to flow without restriction. This feature is especially vital in applications of hydrates, solids management, and low-rate producers, where flowing around the plunger will restrict production.
- **Fast-arrival controller shutdown** prevents possible damage to the plunger and lubricator caused by abnormally fast arrivals. This feature stops and holds the cycle, leaving the well shut in until the operator or Weatherford plunger-lift specialist arrives on location to take corrective action.
- **High-line pressure shutdown** protects the plunger optimization settings from temporary high-line pressure-spike interruptions caused by compressor downtimes or other well interference. This feature simply stops and holds the cycle while the line pressure is too high. Once the line pressure returns to the normal range, the controller resumes control with normal operating cycle times and control features.
- **Non-arrival controller shutdown** prevents further liquid loading after one or multiple no-arrivals. This feature stops and holds the cycle, leaving the well shut in until the operator or Weatherford plunger-lift specialist arrives on location to take corrective action.
- **Auto recovery mode** enhances recovery from a no-arrival by shutting in the well for an extended period (defined and set by the user) to obtain sufficient pressure to lift a slug of fluid causing the plunger arrival failure.
- **Intermittent gas-lift plunger-assist optimization optimizes** the gas-lift injection time based on the plunger arrival speed to ensure the lowest possible flowing bottomhole pressure. This capability results in increased production while requiring less injected gas, improving the return on investment from the well.

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Specifications

Analog Input Channels	
Number of channels	One voltage input (1 to 5 V or 0 to 5 V)
Accuracy	0.1% of full scale after factory calibration
Input impedance	2 MΩ, 12-bit resolution

Digital Input Channels	
Number of channels	Three digital inputs
Open-circuit input	3.3 V
Short-circuit current	65 µA
	Dry contact only, 1 K maximum

Digital Output Channels	
Number of channels	Four digital outputs
Rated output	6 V at 1 A or 12 V at 2 A, open collector output, pulsed current switched battery voltage to end device (solenoid typical)

Power Consumption	
Nominal	72 mW (12 mA at 6 V)
Display active	150 mW (25 mA at 6 V)

Onboard Memory	
Flash	64 KB

Environmental Data	
Pollution	Degree 2
Installation	Category 1
Altitude	1.24 mi *2,000 m*
Humidity	90%
Electrical supply	6V battery
Maximum ambient temperature	140°F *60°C*

Options

- External enclosure for latching valve
- 10W solar panel (2.5W standard)
- Operating capability for pneumatic motor valves (standard) or electronically controlled valves
- Multiple electronics certifications available