



# Weatherford®

Production Optimization

## *SP350 Series Programmable Logic Controllers*

Weatherford offers the SP350 series programmable logic controllers (PLCs), a quantum leap in performance and flexibility. The controllers combine high-performance 32-bit processing with high speed LAN and USB communication and advanced power-saving features. Additionally, the product has an integrated power supply, 12 to 24 Vdc converter, analog and digital input/outputs (I/O), serial communication capabilities and turbine flowmeter counter inputs. The PLCs use industry-standard Modbus® and DNP 3 serial protocols as well as Modbus TCP and UDP based Ethernet protocols, and can be programmed locally or remotely through a choice of flexible programming languages.



### *Overview*

**Compact and Powerful**—the SP350 series PLCs provide remote terminal unit (RTU) functionality with flexible programming options. The unit is programmable in either the TelePACE™ ladder logic editor or the IEC 61131-3 family of languages and provides sophisticated control functionality such as flow calculation and proportional-integral-derivative (PID) control. Additionally, up to 32 independent C/C++ applications can be loaded, executed and deleted in parallel with standard controller logic to provide maximum flexibility and performance. The central processing unit includes a 32-bit microprocessor with 16 Mb flash ROM and 4 Mb CMOS RAM for use in firmware and application programming. Custom power-saving features include multiple configurable power modes, sleep mode, 24 V power shutdown as well as serial/LAN/USB port and clock frequency power consumption control. The basic controllers come with six analog inputs, eight digital I/O, three counter inputs (including two turbine meter inputs) and two optional analog outputs. With the addition of the optional 5606 lower I/O module, an extra 32 digital inputs, 16 digital outputs, 8 analog inputs and 2 analog outputs are available. Support for I/O expansion modules further increases the controller's I/O capacity and versatility. With all these features, the SP350 series controllers are the right choice for a wide variety of process control and metering connections.





## *SP350 Series Programmable Logic Controllers*

### *Overview (continued)*

Flexible Communications—as with all controllers, the PLCs offer a variety of communication modes making them one of the most communication rich controllers on the market. The PLCs include two USB 2.0 compliant ports providing low speed (1.5 Mb/s) and full speed (12 Mb/s) communication, a peripheral port to connect the controllers to PC-based applications and a powered host port to attach third-party hardware such as mass storage devices (memory sticks). One RS-485, one RS-232/485 and one RS-232 serial communication port offers Modbus RTU, Modbus ASCII and DNP 3 communication protocols. For applications requiring high speed Ethernet LAN or WAN communication, a fully integrated 10/100BaseT Ethernet port furnishes Modbus/TCP, Modbus RTU/ASCII in UDP, DNP in TCP, DNP in UDP and ICMP (ping). For those challenging remote applications, a fully integrated, license-free spread spectrum wireless module is available at 900 MHz and 2.4 GHz. The controllers also support external radios and dial-up modem communication.

### *Features*

- High performance 32-bit processor
- 10/100BaseT Ethernet port
- Two USB 2.0 compliant ports (host and peripheral)
- Configurable power saving modes (15 mW in sleep mode)
- Three serial ports (RS-232, RS-485, RS-232/485)
- Optional 5606 lower I/O module
- Optional integrated spread spectrum radio
- Two or four run custody flow computer using RealFLO™ gas flow computer (GFC) software
- Support for 32 independent C/C++ applications
- UL Class 1, Division 2, Groups A, B, C and D for use in Hazardous Locations
- Three-year warranty on parts and labor





## *SP350 Series Programmable Logic Controllers*

### *Applications and Benefits*

The SP350 series PLCs are designed with power conservation in mind. They're a natural choice for applications that require low power operation in tandem with a varied mix of analog and digital I/O as well as multiple communication ports. Coupled with real-time communications using industry-standard Modbus and DNP protocols, the controllers integrate easily with Weatherford's operations management software and Vision series of operator interface terminals, as well as a wide range of third party SCADA software, MMIs, DCS systems, intelligent instrumentation and remote I/O control applications. Flexible controllers that can be used in both Modbus master and slave configurations, the PLCs support report-by-exception, store and forward messaging and can also make the most of DNP's advanced protocol functionality, including maintenance polling, unsolicited messaging and data-backfilling. The SP350 series flow computer furnishes two or four run custody transfer options. In solar panel-powered applications the PLCs offer further cost reduction by allowing smaller solar panels and batteries to be used. The integrated DC/DC converter and overall small footprint also enables the use of compact mounting enclosures for those applications where space is at a premium. Similar in manufacture to all Weatherford electronic flow measurement (EFM) products, the PLCs have conformal coating, gold-plated machined sockets and zinc-plated steel system components. Regardless of the specific need, the controllers can provide reliable and compact stand-alone performance in the hazardous environments so often found in SCADA applications.





# SP350 Series Programmable Logic Controllers

## Specifications

### P350 (5209 controller board only)

<b>Controller</b>	
Processors	CPU: 32-bit ARM7 microcontroller, 32 MHz clock, integrated watchdog timer Two microcontroller co-processors, 20 MHz clock
Memory	4 Mb SRAM, 16 Mb flash ROM
Non-Volatile	CMOS SRAM with lithium battery retains contents for two years with no power
Datalog Capacity	465 k words
<b>I/O</b>	
Analog Inputs	Five, user selectable 0 to 10 V (15-bit) or 0 to 20 mA (14-bit) One, 0 to 32.7 Vdc (15-bit)
Analog Outputs	Standard: none Two, 0 to 20 mA/4 to 20 mA (12-bit) with optional 5305
Digital I/O	Eight, user selectable as dry contact inputs or open drain outputs
Counter Inputs	One, 0 to 10 Hz (dry contact) Two, 0 to 10 kHz (turbine or dry contact)
<b>Communications</b>	
Serial Port COM1	RS-485 port, two-pole removable terminal block, two-wire, half duplex
Serial Port COM2	RS-232 port, eight-pin modular RJ45 jack, full or half duplex RS-232, or RS-485 port, two-wire, half duplex
Serial Port COM3	RS-232 port, eight pin modular RJ45 jack, half duplex with RTS/CTS control and Vision OIT power control
Baud Rates	300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200
Serial Protocols	Modbus RTU, Modbus ASCII, DNP 3, DF1
Serial Protocol Modes	Slave, master, master/slave, store and forward
Ethernet Port	RJ45, 10/100BaseT
Ethernet Protocols	Modbus TCP, Modbus RTU in UDP, Modbus ASCII in UDP, DNP in TCP, DNP in UDP
Network Protocols	IP, ARP, TCP, TFTP, UDP and ICMP
USB Host Port	USB 2.0 compliant "A" type receptacle, provides up to 100 mA at 5 V
USB Peripheral Port	USB 2.0 compliant "B" type receptacle
Wireless <sup>1</sup>	Spread spectrum radio at 900 MHz <sup>2</sup> and 2.4 GHz <sup>2</sup>
<b>General</b>	
I/O Terminations	Six and twelve-pole removable terminal blocks, 12 to 22 AWG, 15 A contacts
Dimensions	8.40 in. (213 mm.) wide, 5.00 in. (127 mm.) high, 1.80 in. (45 mm.) deep
Packaging	Corrosion resistant zinc-plated steel with white enamel paint
Environment	5% RH to 95%, non-condensing, -40° to 158°F (-40° to 70°C)
Power Input	11 to 30 Vdc, 12 mW at 12 V during sleep 510 mW at 12 V during normal operation, 32 MHz, LEDs off, no expansion, LAN and USB disabled 275 mW at 12 V during normal operation, 8 MHz, LEDs off, no expansion, LAN and USB disabled (reduced power mode) 1.2 W at 12 V during normal operation, 32 MHz, LEDs off, no expansion, LAN enabled and USB disabled Add 25 to 100 mW when enabling the LEDs 12 W at 24 V maximum, 5 V supply fully loaded and Vloop on and boosted, fully loaded
Voltage Converter	12 to 24 Vdc
Warranty	Three years on parts and labor
<b>Certifications</b>	
	UL Class 1, Division 2, Groups A, B, C and D for use in Hazardous Locations

<sup>1</sup>Available only with optional integrated wireless modules or with stand-alone wireless modules.<sup>2</sup>Not applicable in all countries.



## SP350 Series Programmable Logic Controllers

### P357 (5209 controller board and integrated 5606 I/O board)

Controller	
Processors	CPU: 32-bit ARM7 microcontroller, 32 MHz clock, integrated watchdog timer Two microcontroller co-processors, 20 MHz clock
Memory	4 mB SRAM, 16 Mb flash ROM
Non-Volatile	CMOS SRAM with lithium battery retains contents for two years with no power
Datalog Capacity	465 k words

I/O	
Analog Inputs	Five, user selectable 0 to 10 V (15-bit) or 0 to 20 mA (14-bit) One, 0 to 32.7 Vdc (15-bit) Eight, 0 to 20 mA/4 to 20 mA/0 to 5 V/0 to 10 V (15-bit) software configurable
Analog Outputs	Standard: none Two, 0 to 20 mA/4 to 20 mA (12-bit) with optional 5305 on 5209 controller board Two, 0 to 20 mA/4 to 20 mA (12-bit) with optional 5305 on 5606 I/O board
Digital I/O	Eight, user selectable as dry contact inputs or open drain outputs Thirty two, 12/24 V, 48 V, 115/125 V, 240 V digital inputs Sixteen, dry contact relay outputs
Counter Inputs	One, 0 to 10 Hz (dry contact) Two, 0 to 10 kHz (turbine or dry contact)

Communications	
Serial Port COM1	RS-485 port, two-pole removable terminal block, two-wire, half duplex
Serial Port COM2	RS-232 port, eight-pin modular RJ45 jack, full or half duplex RS-232, or RS-485 port, two-wire, half duplex
Serial Port COM3	RS-232 port, eight-pin modular RJ45 jack, half duplex with RTS/CTS control and Vision OIT power control
Baud Rates	300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200
Serial Protocols	Modbus RTU, Modbus ASCII, DNP 3, DF1
Serial Protocol Modes	Slave, master, master/slave, store and forward
Ethernet Port	RJ45, 10/100BaseT
Ethernet to Serial Gateway <sup>1</sup>	RJ45, 10BaseT
Ethernet Protocols	Modbus TCP, Modbus RTU in UDP, Modbus ASCII in UDP, DNP in TCP, DNP in UDP
Network Protocols	IP, ARP, TCP, TFTP, UDP and ICMP
USB Host Port	USB 2.0 compliant "A" type receptacle, provides up to 100 mA at 5 V
USB Peripheral Port	USB 2.0 compliant "B" type receptacle
Wireless <sup>1</sup>	Spread spectrum radio at 900 MHz <sup>2</sup> and 2.4 GHz <sup>2</sup>

Power Input	
5209 Controller Board	11 to 30 Vdc, 12 mW at 12 V during sleep 510 mW at 12 V during normal operation, 32 MHz, LEDs off, no expansion, LAN and USB disabled 275 mW at 12 V during normal operation, 8 MHz, LEDs off, no expansion, LAN and USB disabled (reduced power mode) 1.2 W at 12 V during normal operation, 32 MHz, LEDs off, no expansion, LAN enabled and USB disabled Add 25 to 100 mW when enabling the LEDs 12 W at 24 V maximum, 5 V supply fully loaded and Vloop on and boosted, fully loaded
5606 I/O Module	11 to 30 Vdc, 600 mA (max) at 5 V required from 5209 controller board 12 mA plus analog outputs

General	
I/O Terminations	Five, six, nine, ten and twelve-pole removable terminal blocks, 12 to 22 AWG, 15 A contacts
Dimensions	8.40 in. (213 mm.) wide, 6.13 in. (155 mm.) high, 2.80 in. (72 mm.) deep
Packaging	Corrosion resistant zinc-plated steel with white enamel paint
Environment	5% RH to 95%, non-condensing, -40° to 158°F (-40° to 70°C)
Voltage Converter	12 to 24 Vdc
Warranty	Three years on parts and labor

Certifications	
	UL Class 1, Division 2, Groups A, B, C and D for use in Hazardous Locations

<sup>1</sup>Available only with optional integrated wireless modules or with stand-alone wireless modules.

<sup>2</sup>Not applicable in all countries.