OBSERVANT™

OBSERVANT SOLO™
USER GUIDE

Contents

Illustrations

Tables

1. General Information

About this guide

This document provides information on the features, installation, and typical usage of the Solo remote monitoring and control platform. The information contained in the appendices can be used as a pocket reference during installation, commissioning, and troubleshooting. More specific information on associated, third-party devices and Observant Global™ data-delivery services can be found in the relevant product guides and via the Observant website.

Regulatory Compliance

The following describes relevant approvals and certifications for the Solo product and it's variants. Please note, any modifications to the equipment as supplied not expressly approved by Observant could void the user's authority to operate the equipment by invalidating all applicable regulatory approvals and certifications.

Australia

The Solo is approved for use through the RCM mark.

Other

This product complies with the European RoHS directive 2002/95/EC.

USA

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This product contains the following FCC IDs:

- SOLO-G: VW3HILO3G.
- SOLO-900: KQLAC4490.
- SOLO-Q: QIPPXS8.
- SOLO ALL models: P14BL600.

This equipment generates/uses radio frequency energy, and there is no guarantee that interference with other equipment in a given installation will not occur. If this equipment does cause harmful interference to other radio frequency equipment, the user may be able to correct the interference via the following measures:

- Reorient or relocate the unit.
- Increase the separation between the unit and the equipment in question.
- Consult an experienced RF technician for assistance.

2. Overview

Description

The Solo is a robust, remote, monitoring-and-control platform designed for sites using just one or two sensors. The Solo is an easily-deployed, fully-integrated, solar/battery-powered, radio-enabled, telemetry unit. It is housed in a robust (IP-65 rated) enclosure that is easily mounted to a pole.

The Solo can be factory configured with a number of different radio communications technologies. It can be deployed either as a single unit (with cell technology) or

as one element of a wider, multi-unit, 900 MHz network. Along with Observant's own suite of sensing and control equipment, the Solo can be connected to a range of standard sensors. Additionally, wide-ranging support for specific third party products exists. Details will be provided upon request.

When combined with Observant Global™, the Solo becomes a very powerful, remote management tool allowing alerts, data history, and equipment control services to be delivered to a variety of web-connected devices.

Warnings

- Use appropriate tools when installing the Solo; excessive force may cause damage to the unit.
- Third party equipment (e.g., sensors) attached to the Solo must comply with the technical specifications of the unit. Damage may occur when connecting equipment presenting voltages to the Solo's input in excess of 30 VDC.
- The Solo contains no user serviceable components; do not attempt to repair the unit yourself. Please contact Observant or your reseller for service.

Solo

Components

1. Radio antenna.
2. Bird deterrent spike.
3. Solar panel.
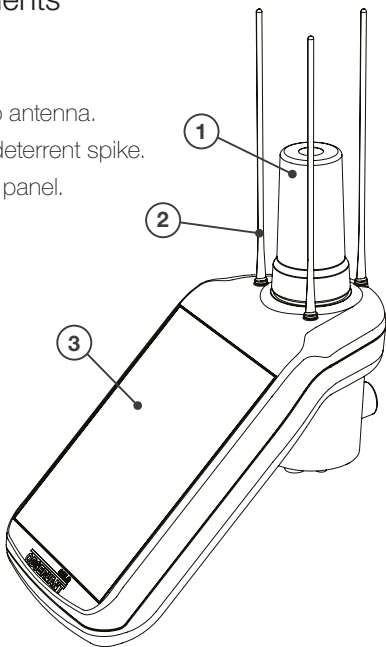
Figure 1. Solo top components

1. Power/User button.
2. LED indicators.
3. Serial number info label.
4. Retaining screw.
5. Pole mount.
6. Connector panel.
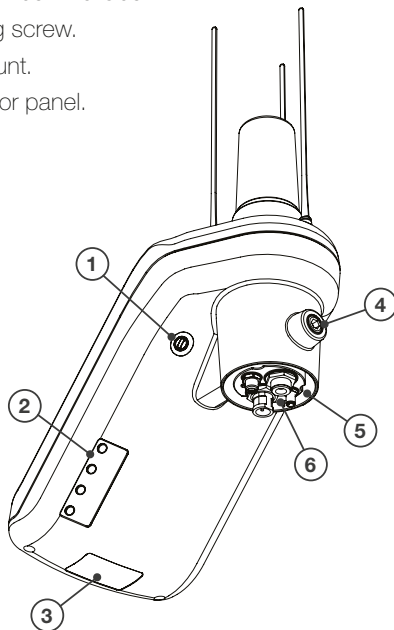
Figure 2. Solo bottom components

Specifications

Power

- Integrated, 2 W, solar panel.
- Auxiliary power connection via 2.5 mm DC power connector (30 VDC max, 20 W max).
- 50–100 mW typical draw depending upon radio technology and mode of operation.

Battery

- 36 WHr total capacity.
- LiFePO$_4$ (Lithium ferrous phosphate) technology.
- Nominal 7 year design life.

Wireless Technology

- GPS.
- Bluetooth class 2.
- Optional 3G/GSM/CDMA/LTE radio or 1 W, 900 MHz, spread-spectrum radio.

IO Connections

- 2 Digital/Analog inputs.
- 1 Dual mode sensor power output.
- 1 Dual mode sensor serial port.
- 2 High power sensor/solenoid drive outputs.

Environmental

- Ingress Protection rating: 65.
- Operating temperature: -22 to 158 °F (-30 to 70 °C).
- Storage temperature: -58 to 176 °F (-50 to 80 °C).
- Operating humidity: 0 to 100% RH.

Dimensions

As installed:

	English	Metric
Length	8"	204 mm
Width	4.7"	120 mm
Height	12"	305 mm

As shipped:

	English	Metric
Length	12.6"	320 mm
Width	6.7"	170 mm
Height	6.7"	170 mm

Weight

- As installed: 2.7 lb (1.2 kg).
- As shipped: 3.3 lb (1.5 kg).

Mounting

- Integrated 1½" (DN40) pole mount.
- Single, hex socket-head fastener (5 mm Allen wrench).

Cable Management

- Weather and vermin-proof locking connectors.
- Connector and cabling concealed within mounting pole.

Product Codes

Code	Description
SOLO-3G	3G cellular comms enabled
SOLO-Q	CDMA cellular comms enabled
SOLO-900	1 W, 900 MHz, spread-spectrum, comms enabled

Table 1. Solo product codes

Code	Description	Size
PWR-S	2-way, power cable (bare ends)	9.8 ft (3 m)
OUT-S	3-way, output cable (bare ends)	9.8 ft (3 m)
INP-S	4-way, input cable (bare ends)	16.4 ft (5 m)
DTZ	RS485/SDI-12 or 4–20 mA, device-connector cable (Port connector to 4-way switchcraft male)	16.4 ft (5 m)
DCE	Device extension cable (4-way switchcraft female to male)	32.8 ft (10 m)
DTB	Device cable (4-way switchcraft female to bare ends)	4 ft (60 cm)

Table 2. Solo cable product codes

3. Installation

Preparation

Location

Maximizing the solar panel's ability to charge the Solo's battery pack is especially critical in the winter. Avoid placing the unit where shadows might interfere with the sunlight and face the panel true (not magnetic) south (in the northern hemisphere). In the southern hemisphere, it should face true north instead.

If the unit has the (nominal) 900 MHz radio, care must be taken to avoid interference with the radio's ability to

transmit and receive information. It is best to have the unit positioned so that its antenna is above surrounding features and not positioned adjacent to anything that might interfere with its operation (Do not, for example, install it against the side of a metal shed.).

Mounting Posts

A typical installation will involve mounting the Solo to the very top of a circular pole that has been driven (or concreted) securely into the earth. While dependent upon the radio configuration, a typical pole installation in flat, open areas would have the unit easily accessible, about 5' (1.5 m) above ground level. Where there are tall crops or poor cell-phone reception (or even to deter vandalism) much higher installations should be considered. **Warning: the specifications of the pipe used for mounting a Solo is critical**. The Solo mount is designed to fit on a metal pole with a Nominal Pipe Size (NPS) of *1½"* or *DN40*. The pipes thickness may not exceed the standard *SCH40* thickness of 0.145" (3.683 mm). If a greater pipe diameter is required for structural reasons, an adapter will be required to reduce the diameter at the top to 1½". This top section must be at least 2.5" (63 mm) long.

Pre-cabling

Carefully consider the routing and protection of equipment cables prior to installation. The Solo is designed such that all cable and connections may be concealed within the mounting pole (Figure 3-2). Therefore, the cabling must be laid/buried within the protection of conduit or direct burial sheaths prior to the installation of the mounting pole.

1. Mounting pole.
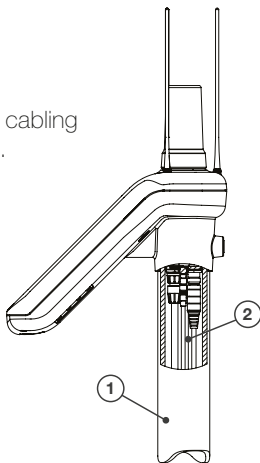2. Internally routed cabling and connectors.

Figure 3. Cable routing

Solo Unit Installation

Mounting

- Connect appropriate sensor and power cables to corresponding ports on the Solo connection panel (Figure 4-A, pg. 20).
- Held with its antenna vertical, carefully lower the Solo onto the mounting pole. It should sit snugly and enclose the top 2.5" (63 mm) of the pole.
- Orient the solar panel appropriately (refer to Appendix A3, pg. 33). Tighten the retaining screw with the hex key (Figure 4-C, pg. 20; Figure 5, pg. 21).
- Note the retaining screw should be tightened sufficiently to prevent rotation of the Solo on the post under moderate force. **Caution: excess force might damage the enclosure.**

Bird Deterrent

- Gently press the three bird deterrent spikes into their sockets (Figure 4-D, pg. 20).

Power Up

- Remove the protective label covering the solar panel (Figure 4-E, pg. 20).
- If exposed to sunlight, the Solo will turn on automatically. If indoors (or in low light), a short press of the Power/User button (Figure 2-1, pg. 11) will turn on the unit.
- After approximately 20 seconds, a series of beeps will be heard, indicating that the unit is powered up and operational.
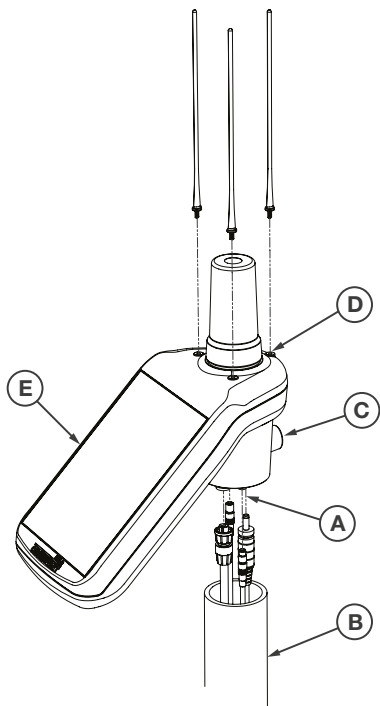- Further confirmation of the unit's status can be determined by the LED indicators (Appendix A2).
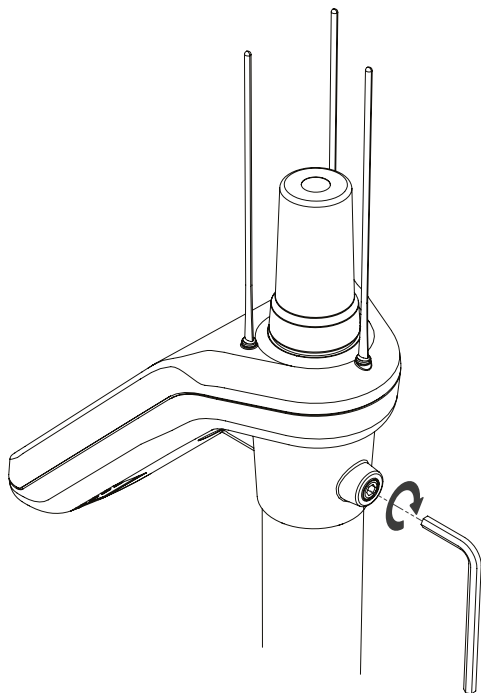
Figure 4. Solo installation

Figure 5. Securing the Solo to its post

4. Appendix

A1. Electrical Connections

Equipment and power connections to the Solo are made via panel mounted connectors on the bottom of the unit (Figure 2-6, pg. 11, and Figure 6, pg. 23). The following describes the specifications and functions of these connections and the relevant connector pin assignments for each function.

Note that there are limits on the number of devices that can be connected to a Solo. It would be uncommon for all of these ports to be in use on a single Solo unit.

1. Input port.
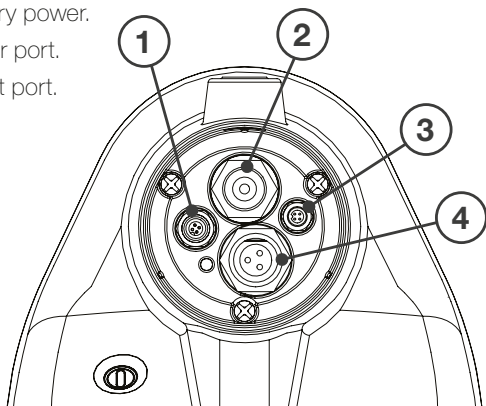2. Auxiliary power.
3. Sensor port.
4. Output port.

Figure 6. Bottom View: Port connector cluster

Input Port

- 2 dual-purpose, analog/digital inputs.
- Configurable, digital, sink or source (pull-up or pull-down) for connection to pulse-output flow meters, rain gauges, or any other outputs of wet or dry contact devices.
- 5 V pull-up voltage.
- Tolerant of up to 30 V input.
- Frequency and pulse counting capability of up to 1 kHz (@ 50% duty cycle).
- 0–10 V analog input mode with 10 kΩ input impedance, with full-scale accuracy of ±1%.
- A 5 m, bare-ended, input interface cable (with wire colors as shown Table 3, below) is available. See Table 2, pg. 14, for cable product codes.

Color	Function
Brown	Input 1 (Digital or 0–10 V)
White	Ground
Blue	Input 2 (Digital or 0–10 V)
Black	Ground

Table 3. Input interface-cable color codes

Sensor Port

- Power output is available either at a nominal 12 V, 600 mA *or* a 20 V 4–20 mA loop powered sensor mode with ±1% accuracy over full scale range.
- Output will latch off at current limit (600mA in Power Mode, 50mA in 4–20 mA mode) and report a fault.
- Dual mode serial interface: true, fault-tolerant, 2-wire RS485 *or* 1-wire, bidirectional SDI-12.
- A 5 m device cable, terminated to suit Observant's standard sensor and cable products, is available. See Table 2, pg. 14, for cable product codes.

Color	Function
Red	Sensor power or 4–20 mA
Blue	RS485A (+)
Yellow	RS485B (–) or SDI-12
Green	Ground

Table 4. Sensor-cable color codes

Output Port

- Two high current outputs capable of sinking or sourcing 12 VDC at up to 7A for short periods.
- Each output can be configured to drive an actuator in either direction, or activate a 2-wire or 3-wire latching solenoids.
- Outputs can be pulsed with a configurable pulse width to accommodate a variety of latching coils.
- Full source-current monitoring and fault diagnostics.
- A 3 m, bare-ended cable (with wire colors as indicated in Table 5, below) is available. See Table 2, pg. 14, for cable product codes.

Colour	Function
Blue	Output 1 (12 VDC sink/source)
Yellow	Output 2 (12 VDC sink/source)
Black	Ground

Table 5. Output port description

Auxiliary Power

- 2.5 mm DC power jack for supplementary power or service charging
- 5-30 V input, 20 W maximum power draw
- A 3 m, 2-core, bare-ended cable with locking DC connector is available. See Table 2, pg. 14, for cable product codes.

Pin	Colour	Function
Center	Red	5–30 V DC power input
Outer	Black	Ground

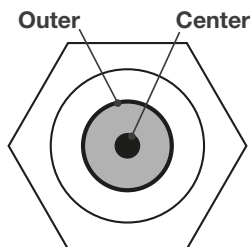**Table 6. Auxiliary-power cable color codes**

Figure 7. Auxiliary-power connector pinout

A2. User Interfaces

The Solo makes use of a number of tricolour indicators to denote various states and modes of operation (Figure 2-2, pg. 11). There is also a primary Power/User button (Figure 2-1, pg. 11) and an audio feedback mechanism to assist in local configuration and control tasks.

LED Indicators

With the exception of the battery status indicator, the Solo must be in User Mode for the indicators to be actively showing its status. This is a power conservation measure. User Mode can be activated by a short press of the power button. With no further activity, User Mode will deactivate after 10 minutes.

Power level and charging state

Observant Global™ connection status

Input port status

Sensor port status

Table 7. LED assignments

LED action [every 4 seconds]	Description
Single green flash	• Battery healthy. • No external power. • Battery discharging.
Double green flash	• Battery healthy. • External power present. • Charger on standby.
Triple green flash	• Battery healthy. • Battery charging.
Single amber flash	• Battery low. • No external power. • Battery discharging.
Triple amber flash	• Battery low. • Battery charging.
Single red flash	• Battery critical. • No external power. • Battery discharging.
Triple red flash	• Battery critical. • Battery charging.
None	Unit power off

Table 8. Power level and charging-status LED

LED action [every 4 seconds]	Description
Double amber flash	Connecting–registration pending
Single amber flash	Connecting–registered
Single green flash	Connected–comms pending
Double green flash	Connected–comms ok
Triple amber flash	Disconnecting
Double red flash	Fault
None	Radio off, or User Mode inactive

Table 9. Observant Global™ connection-status LED

LED action	Description
Solid green	Input active
Flashing green	Input pulsing
None	No input active, or User Mode inactive

Table 10. Input-port status LED

LED action	Description
Solid green	Sensor power active
Flashing red	Sensor power over-current
Green flash	Communications transmit
Amber flash	Awaiting response
Red flash	Response error
Long Red flash	Response time-out
None	No sensor communications active, or User Mode inactive

Table 11. Sensor-port status LED

Power/User button

The Power/User button input (Figure 2-1, pg. 11) serves a variety of purposes, which depend upon the state of the Solo at the moment. They are as follows:

- If the Solo is off, a momentary touch of the button will power up the Solo.
- If the Solo is on, but not in User Mode, a momentary press will activate User Mode, as indicated by an ascending series of beeps.
- If the Solo is on, a momentary press will send a 'User Visit' event via the connected radio. The radio will connect if not already connected.
- To power down the Solo, the touch button should be held momentarily, released, then held again until four short beeps and one long beep are heard. Note: when the solar panel transitions from an unlighted condition to a lighted one, the Solo will immediately restart.
- Some devices connected to the Solo may make use of the User Button for purposes other than those described above. See specific device documentation for more information.

A3. Mounting Orientation

The Solo unit must be oriented such that, when in the northern hemisphere, the solar panel is facing true south. If using a compass, be sure to compensate for magnetic declination. When in the southern hemisphere, the solar panel must face true north. This allows the Solo to produce as much power as possible during the winter months, when the Sun is at its lowest.
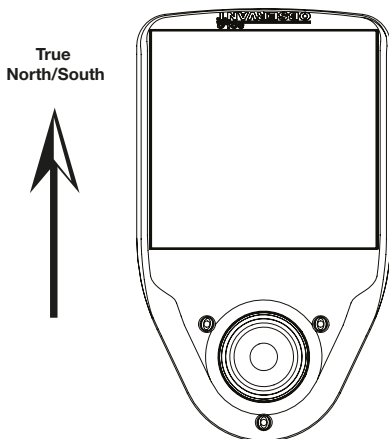

Figure 8. Solar panel orientation (top down view)
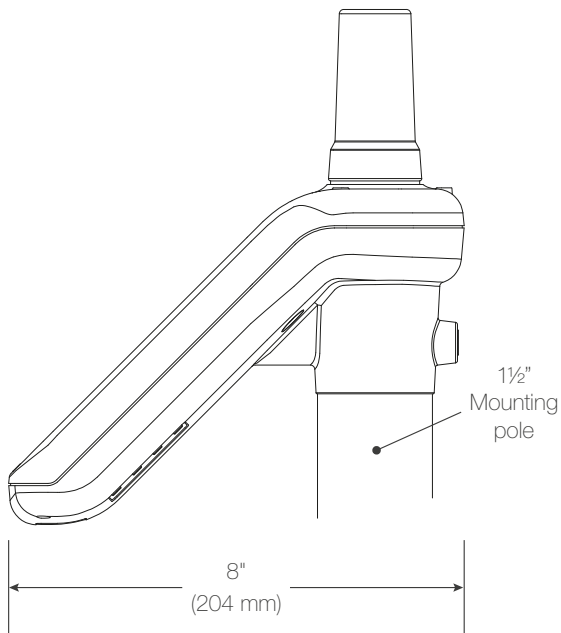
A4. Physical Dimensions

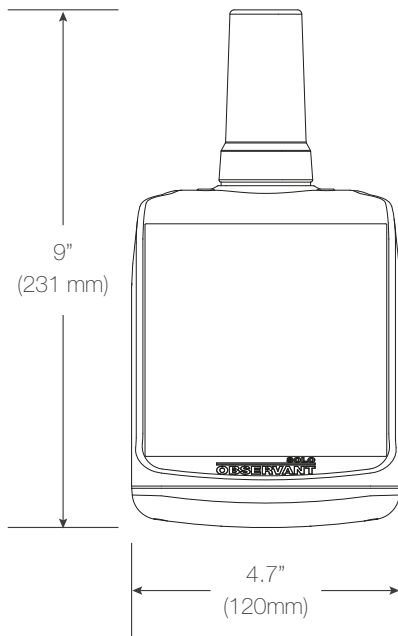**Figure 9. Solo profile dimensions**

Figure 10. Solo front dimensions

A5. Cabling Guidelines

Protection

- No cable (or part thereof) should be left exposed to the elements.
- Cable suitable for direct burial is recommended, as it can be routed directly out of the bottom of the mounting post and into the soil. Above ground, cable is vulnerable to both mechanical damage and degradation from UV radiation.
- The use of rigid electrical conduit is recommended as the most economical way of effectively protecting cable and wiring above ground.
- If flexible conduit is to be used, only high-quality, UV-resistant material is suitable. Inexpensive conduit (readily available in hardware stores) will degrade quickly outdoors.
- Appropriate glands and fittings should be used with all conduit to ensure any cabling is protected for its full length.
- Gel-filled, quick-crimp-style connectors are recommended where joins are to be made and housed within conduit junction boxes or the mounting post.

Distance

- In general, any cabling length over a few hundred meters is not cost effective in terms of installation and maintenance. In these cases, additional telemetry units are recommended.
- RS485 devices and those with switching inputs can work up to 3000' ($\approx$ 1 km) with appropriate cabling. However, it is best to refer to the manufacturer's documentation, in case shorter distances are specified.
- High-frequency, pulsed input (e.g., certain flow meters) may not work at distances over 30' ($\approx$10 m).
- SDI-12 cabling should not exceed 300' ($\approx$100 m).
- High power outputs, when connected to DC latching solenoids (or relays), will have a practical limit of about 600' ($\approx$180 m). In these cases, 16 AWG cable (or larger) is required to avoid significant voltage drop.

Revisions

OBS-USR-M005-Solo User Guide

R1: Initial release October 2014 (A.Kahl).

R2: Localization and content edits (LP & JY).

Designed in Australia

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