



Pump Station Controller

Models SF1 and SF3



Installation Guide

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Introduction

The Abbey Systems *swampfox*™ is a self-contained pump station controller and telemetry RTU. It contains an integrated power supply with battery backup, and optionally an internal VHF, UHF or cellular radio transceiver, or a connector for an external radio. *swampfox* is available in two basic models, with these field I/O quantities:

Model	Field I/O columns	Digital inputs	Digital outputs	Analog inputs
SF1	1	12	5	4
SF3	3	36	15	12

Discrete field I/O connects to removable plugs that accept wires up to 2.5 mm in diameter.



Mounting

Mount *swampfox* against a flat surface using four M5 screws.

Model	Screw spacing		Outside dimensions	
	Horizontal (A)	Vertical	Width (B)	Height
SF1	153 mm	141 mm	175 mm	168 mm
SF3	217 mm	141 mm	240 mm	168 mm

swampfox's depth is 125 mm, plus front clearance for wiring (at least 70 mm for an antenna cable, 30 mm for models without internal radios).

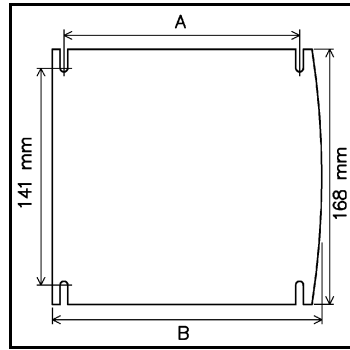


Fig. 1 Mounting template

Powering

Use one of these three powering arrangements. We recommend the first one.

Arrangement	Voltage (nominal, min~max)	Rating	Apply power to...	Backup battery
24VAC (Fig. 2)	24V AC from mains adapter	48VA	POWER	Internal or external
24VDC (Fig. 3)	27.6V DC (24.0~36.0VDC)	48W	POWER	Internal or external
12VDC (Fig. 4)	13.8V DC (12.5~15.0VDC)	3A	EXT. BATT/DC	External

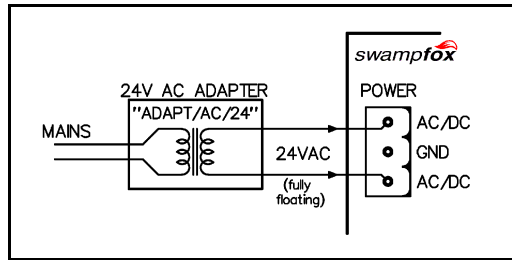


Fig. 2 24VAC supply (recommended arrangement)

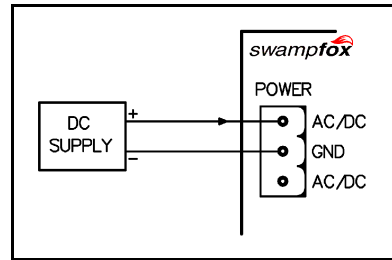


Fig. 3 24VDC supply

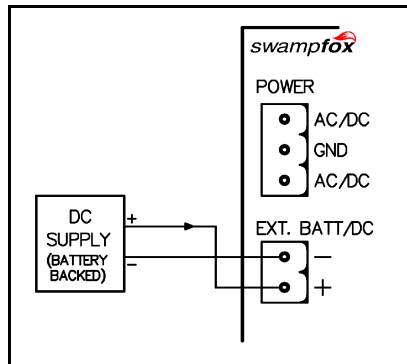


Fig. 4 12VDC supply

With the 12VDC powering arrangement, a 12V DC battery-backed-up supply, which must remain in the range 12.5~15.0V at all times, is fed into the **EXT. BATT/DC** connector. The **POWER** connector is not used. *swampfox*'s internal battery is not present.



All **GND** pins, the **EXT BATT/DC** connector negative pin, and the antenna shield, are all connected together inside *swampfox*.



Connect an antenna before powering up *swampfox*.

In powering arrangements 1 and 2, *swampfox*'s internal battery charger charges the internal battery, or an external 12V sealed lead-acid battery (6 Ah or more) connected to the EXT BATT/DC connector, while **POWER** is present. The **Mains** and **Battery** indicators show *swampfox*'s state:

Mains LED	Battery LED	<i>swampfox</i> power, charger and battery status	
Green	Green	Normal	POWER energised, battery OK, not charging
Red	Green	Backup	POWER not energised, running from battery
Either	Red	Battery Low	Battery voltage is low (or battery is disconnected)
Unlit	Green	12V Powered	Powered through EXT. BATT/DC (arrangement 3)
Green	Green flashing	Charging	(See below for flash rates)
Green	Red flashing	Charge failure	Mains failed while charging, or faulty battery

Charger indications (green): Slow (1 flash per 1.8 seconds) = trickle-charge; Medium (1.7 flashes per second) = medium charge; Fast (5 flashes per second) = full rate charge.

Digital and Analog Inputs

Inputs	General description	Inactive, LED off	Active, LED on	Maximum	Resistance
Digital	Positive voltage-activated	0~+1.8V	+4.5~36V	±60V DC	12kΩ to GND
Analog	Positive 4~20 mA current	0~+4 mA	+4~20 mA ⁽¹⁾	±5V; ±40 mA	120Ω to GND

⁽¹⁾ If the analog input current exceeds 20 mA, the LED flashes rapidly.

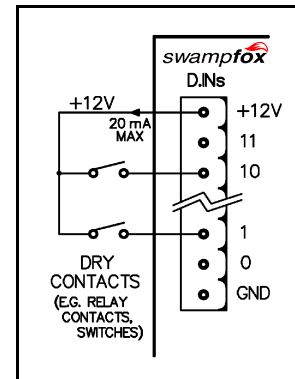


Fig. 6 Digital inputs

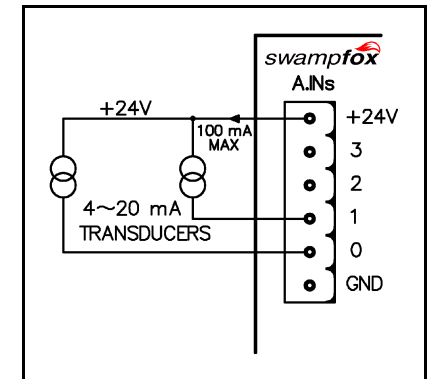


Fig. 7 Analog inputs

The diagrams above show typical field wiring, in which the field devices are powered from *swampfox*'s supplies. These supplies have the following characteristics:

Supply	Voltage (typ, min~max)	Battery-backed?	Maximum loading
Digital In	+13.8V (10.0~15.0V)	Yes	20 mA per I/O column
Analog In ⁽¹⁾	+24V (24.0~26.0V)	Yes	100 mA per I/O column ⁽¹⁾
Digital Out	+13.8V (10.0~15.0V)	Yes	500 mA per I/O column

⁽¹⁾ Do not power any other equipment or devices from the Analog In supply (+24V)

The top or bottom* four digital inputs in each field I/O column can accept pulse signals, and count pulses and calculate pulse rates.
 * Software-configurable

Digital outputs

Open-collector-type outputs which close to GND when activated. Each can switch and carry up to 100 mA from a supply of up to +40V DC.

Each load connects between an output and a positive supply rail, which may be taken from the digital output connector's "+12V" output pin as long as the total load on this pin does not exceed 500 mA per I/O column. If the loads need more voltage and/or current, use an external power supply.

The pin with the diode symbol must be connected to the positive rail from which the loads are powered, to protect *swampfox* against back-EMF from inductive loads.

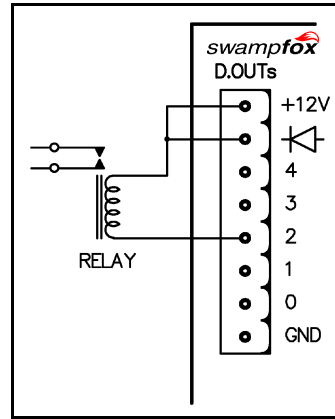


Fig. 8 Digital output

Security I/O

Connects to on-site security and warning devices, if used.

Connect a microswitch from the **TAMPER** input to GND to detect tampering, such as opening of a building door or the RTU cabinet door. The switch must be closed while the site is secure, and open to indicate tampering.

Connect a key-operated switch (or similar) from the **INHIBIT** input to GND. While the switch is closed, the Master will suppress all alarms from the site (as these could have been generated by on-site activity).

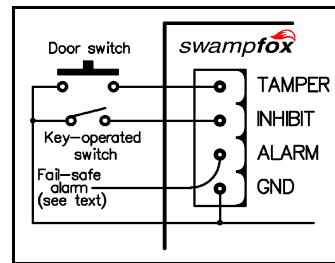


Fig. 9 Security I/O

The open-collector, fail-safe **ALARM** output can drive an on-site alarm annunciator to indicate a "defect" (RTU hardware or software failure) or loss of communication with the Master. It will switch and carry 50 mA at up to 30V, and can drive a relay coil directly. It is fail-safe, i.e. closed to ground in the normal state, and open-circuit in the alarm state, so that unplugging the connector or breaking the wire will activate the alarm.

Radio connectors and comms indicators

swampfox models without internal radios have an RJ-45 **External Comms** connector, which connects to an external radio or a compatible comms bearer using a radio-model-specific cable.

Plug a suitable microphone into the **Mic/speaker** connector to hear comms audio and talk on the channel during installation and comms troubleshooting.

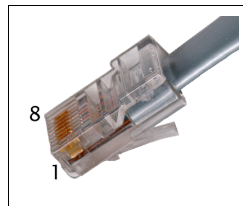


Fig. 10 RJ-45 numbering

Pin	Dir	Name
1		GND
2	sf→	PTT
3	sf←	Channel Busy
4	sf→	Tx Audio
5	sf←	Rx Audio
6	sf→	Serial TxD
7	sf←	Serial RxD
8		GND

Fig. 11 External Comms

On *swampfox* models with internal radios, connect the antenna to *swampfox*'s BNC **Antenna** connector using RG58 or similar high-quality 50Ω coaxial cable.

Always use best radio-frequency engineering practices for all radio and antenna installation.



Connect an antenna before powering up *swampfox*.

The **Comms** indicators show communication between *swampfox* and the telemetry Master:

Indicator	Indication	Meaning
VAD/COMMS	Green short blink ⁽¹⁾	A valid message for a <i>different</i> RTU was received
	Green long blink ⁽¹⁾	A valid message for <i>this</i> RTU was received
	Red	Comms Fail (no comms with the Master)
CHAN BUSY	Yellow	The radio transceiver is receiving RF on its channel
RX DATA	Yellow	Shows the data being received by <i>swampfox</i>
PTT	Yellow	<i>swampfox</i> is transmitting on the radio channel
TX DATA	Yellow	Shows the data being transmitted by <i>swampfox</i>

⁽¹⁾ A short blink is about 0.1 seconds. A long blink is about 0.5 seconds.

Serial ports

Name	Type	Socket	Typically used for...
PORT 1	RS-232	RJ-45 ⁽¹⁾	Local connection to PLC, data logger, meter
PORT 2	RS-232	RJ-45	Local connection to PLC, data logger, meter
CONFIG	RS-232	RJ-45	Laptop, Analog Output module

⁽¹⁾ Connector pins 2 and 3 are not connected on PORT 1.

⁽²⁾ The +12V outputs can power small loads such as serial converters (see "Related products" on page 5).

Pin	Dir	Name
1	sf→	+12V ⁽²⁾
2 ⁽¹⁾	sf→	COut2
3 ⁽¹⁾	sf←	CIn2
4	sf→	COut1
5	sf←	CIn1
6	sf→	TxD
7	sf←	RxD
8		GND

Fig. 13 Serial ports

Each port has a red/green LED indicator, which blinks green when *swampfox* receives a valid message. Red indicates an error condition.



Serial ports can be permanently damaged if an Ethernet cable is plugged into them.

Ethernet port

This is a standard 100-base-T Ethernet port. It is only functional on an SF*n*-O-*x* model.

Ready LED and Reset

Ready LED indication	<i>swampfox</i> operating state
Green	Normal <i>swampfox</i> is operating normally
Red	Defect Hardware or firmware fault

The **Reset** button is behind a small unmarked hole in the front panel near the **Display** button. To reset and restart *swampfox*, press **Reset** briefly, using a straightened-out paper clip.

Shutdown mode for shipping

To put *swampfox* into shutdown mode for shipping, remove power from the **POWER** connector, press the **Reset** button (see above) and hold it for about two seconds, until the **Ready** indicator starts flashing red quickly, then release **Reset**. *swampfox* will shut down ready for shipping. If you hold **Reset** in too long, *swampfox* will enter firmware update mode (**Ready** LED orange). Release **Reset** and try again.

Other front panel items

All field I/O indicators light when the input is within the “active” range or when the output is ON. Also, analog input indicators will flash rapidly if the input current exceeds the top of scale (20 mA).

The **Display** button turns the front panel LED indicators on and off. They are normally enabled but by default will turn off if input power fails. The **Ready** LED is always enabled.

The **Address** switches set *swampfox*'s three-digit RTU address.



swampfox only examines the address switches when it starts up or is reset.

Part number (example “SF1-U-N” shown)

Encoding	Meaning	Options available
SF	<i>swampfox</i>	SF
1 -	Number of field I/O columns	1 or 3
U -	Comms type	V = VHF radio transceiver (internal) U = UHF radio transceiver (internal) X = External radio transceiver O = Ethernet C = CDMA modem (internal) G = GPRS modem (internal).
N	Power supply	N = NiMH battery (internal) E = External battery or DC supply (no internal battery) 0 = No battery, no charger.

Related products

Name and description	Part number	Details
RS-485 serial adapter	B06-071	Converts RS-232 serial to RS-485
“Foxcub” fibre-optic adapter	B06-074	Converts RS-232 serial to fibre-optic (plastic or glass)
Analog Output module	B05-037-01	Four 4~20 mA current-sourcing outputs (12-bit)
Cable for PC or laptop	CAB-LM-PL	Cable from the CONFIG port to a D9 serial port
Local Master software	F05-041	Configuration and interrogation software for laptop

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www.abbey.co.nz

support@abbey.co.nz

Level 3, 220 Willis Street
PO Box 27-497
Wellington, New Zealand
Phone +64-4-385-6611
Fax +64-4-385-6848

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