

PS640 Irrigation Control Panel

Installation and Operation Instructions



Please read the following information before installing. A visual inspection of this product for damage during shipping is recommended before installation. It is your responsibility to ensure that qualified mechanical and electrical technicians install this product. If in doubt, please contact your local Murphy representative.

WARNING

BEFORE BEGINNING INSTALLATION OF THIS MURPHY PRODUCT

- ✓ Disconnect all electrical power to the machine
- ✓ Make sure the machine cannot operate during installation
- ✓ Follow all safety warnings of the machine manufacturer
- ✓ Read and follow all installation instructions

General

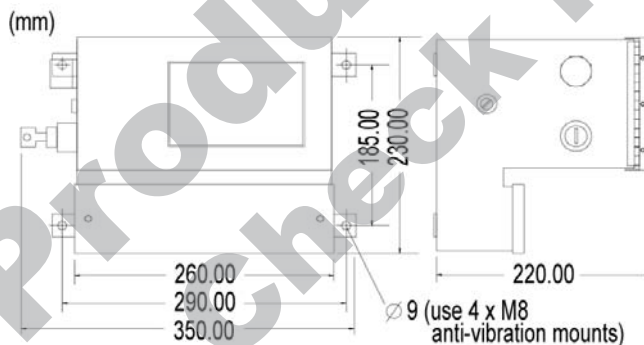
The PS640 control panel provides control, instrumentation and fault protection for an engine-driven irrigation pump.

The system is housed in a rugged, weatherproof enclosure. A front facia window allows viewing of the main control module, which includes operator control keys, back-lit LCD display and LED fault indicators. The panel also features an on/off security keyswitch, an emergency stop push-button and user-replaceable fusing.

Panel fixing

The PS640 weighs approximately 6.8 Kg. Mount the panel securely in a position that minimises vibration and ingress of dust, dirt or moisture. The positioning must also allow for cable access (see 'electrical connection' below).

Overall and fixing dimensions are:-



Product specification

Power supply:

operating voltage: steady state range	5 – 40 V DC continuous
crank brown-out	to 0 V for $\geq 100\text{ms}$
current consumption: standby (typ)	95mA @ 12V, 55mA @ 24V
cranking (typ)	280mA @ 12V, 170mA @ 24V

Inputs:

engine oil pressure & engine coolant temperature	Murphy resistive senders (see 'accessories' below), wired to negative DC
pump water pressure	4 – 20 mA (0 – 600 psi) transmitter (not supplied)
no flow and common shutdown	switch contacts, closing to negative on fault
magnetic pickup:-	
voltage range	2.5 – 25 V AC rms
frequency measurement range	0 – 10 kHz.
engine RPM display accuracy	$\leq 2\%$ of full scale
engine RPM display resolution	10 RPM

Outputs: (all ratings for resistive load)

start, fuel and preheat relays	positive DC (switched relay) combined rating 8 A max @ 24VDC
warning and shutdown	negative DC (semiconductor) 500 mA max. @ 33 V DC

Physical:

overall dimensions (W x H x D)	350 x 235 x 220 mm
weight (approx.)	6.8 Kg
operating ambient temperature	-10 to +55 °C

Accessories (supplied):

magnetic pickup, 68.MP.0058	5/8" x 18 UNF, 48mm long
oil pressure sender, 00.00.3042	0 – 100psi, 1/8" NPT, 2 wire
engine temp sender, 10.09.0051	0 – 150°C, 5/8" UNF, 2 wire



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USA - ISO9001:2000 FM 28221
UK - ISO9001:2000 FM 29422

Electrical connection

Electrical connection is via a 20-way screw terminal strip, located in the base of the panel under a removable cover. Access holes for the engine wiring harness must be cut in the panel base to customer requirements: use wiring glands to maintain the appropriate environmental sealing.

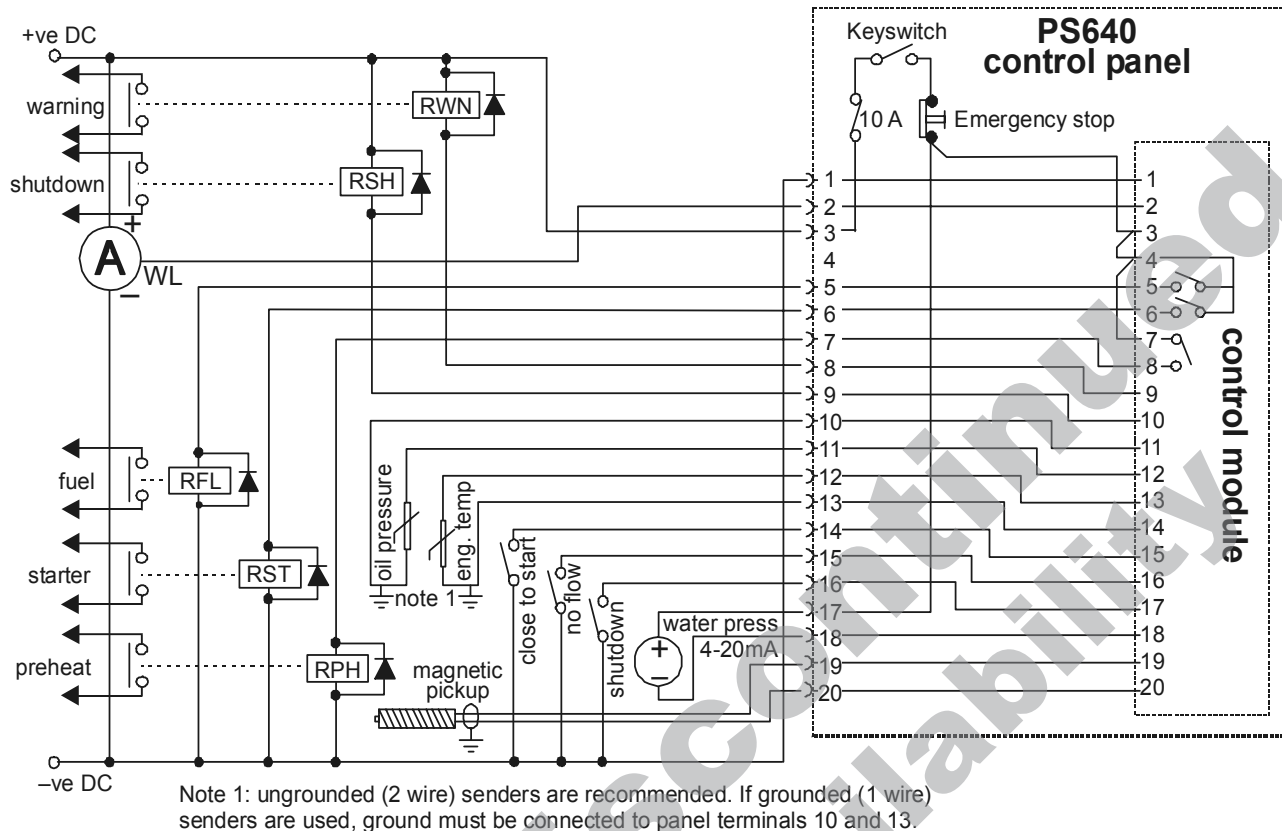
Each terminal is labelled with a number and short description. A list of terminal functions is given below, followed by a typical connection diagram.

term. no.	function
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1	Negative DC power supply/ground
3	Positive DC power supply The power supply for the control panel, normally the engine's 12V or 24V battery pack. The design is optimised for use with negative ground (earth return) systems, but may also be used with insulated (two wire) systems. The PS640 MUST NOT be connected to positive earth systems. Pin 3 is the positive supply feed for the panel's keyswitch, emergency stop button and 10 Amp fuse.
2	Charge fail input Terminal 2 may be connected to the warning lamp (WL) terminal of an engine-driven charge alternator. Terminal 2 provides excitation current for the charge alternator during engine start. After engine start-up (and after the fault override time), a negative DC connection to terminal 2 causes a 'charge fail' warning fault condition: the display indicates 'charge fail' and the amber warning LED lights (see also terminal 8 below). If a charge alternator is not used, leave terminal 2 open circuit.
4	Not used – no connection
5	Fuel output
6	Starter output
7	Preheat output These are positive DC outputs for the control of engine preheat, (energised to run) fuel and starter motor circuits. The maximum combined load rating for these outputs is 8 Amps: to prolong PS640 relay life, Murphy recommend the connection of slave relays, with suppressed coils, between these outputs and preheat, fuel and starter solenoids (see 'typical connection' overleaf).
8	Warning fault output
9	Shutdown fault output These outputs may be used to drive remote indication or audible alarms during warning or shutdown faults. The outputs are semiconductor-based, giving a negative DC signal during fault conditions. Each output has maximum rating of 500mA and is typically used to drive a remote slave relay: connect the slave relay coil between the output and positive DC, and suppress each coil with a flywheel diode or suitable suppressor network (see 'typical connection' overleaf).

10	Oil Pressure sender return/ground
11	Oil Pressure sender input
12	Engine Temperature sender input
13	Engine Temperature sender return/ground These terminals are used with engine-mounted resistive senders to measure engine oil pressure and coolant temperature. Two-wire, insulated return Murphy senders (supplied with each panel) are recommended for greatest measurement accuracy. One-wire (earth return) Murphy senders may also be used, but give reduced accuracy. Note also the connection of ground terminals to pins 10 and 13. The measured oil pressure and engine temperature are displayed on the PS640 control module during engine running. After engine start-up and expiry of the Override time, oil pressures below 20 psi and coolant temperatures above 98°C result in immediate engine shutdown and display of the appropriate fault message.
14	Remote start input Use this input with a remote switch/relay contact to initiate an automatic engine start and stop. Connect terminal 14 to negative DC to start and run the engine; make terminal 14 open circuit to stop the engine immediately (see also 'operation' below).
15	No flow shutdown input
16	Common shutdown input Connect either of these inputs to battery negative to trigger an immediate automatic engine shutdown: the appropriate shutdown message is displayed on the main control module.
17	Pump pressure 4-20mA transducer positive
18	Pump pressure 4-20mA transducer negative This input measures pump pressure in conjunction with a remote 4 - 20mA / 0 – 600 psi pressure transducer (not supplied). Connect pin 17 (a positive DC supply) to transducer positive terminal; connect pin 18 to transducer negative. High and low pump pressures, with limits set in program mode (see 'configuration' below), cause an immediate engine shutdown. The Pump Override timer (also set in program mode) is used to prevent a fault shutdown immediately after engine start.
19	Magnetic pickup engine speed transducer negative
20	Magnetic pickup engine speed transducer positive This input measures engine speed in conjunction with a magnetic pickup transducer (supplied). Once the PS640 is correctly set in calibration mode (see 'configuration' below), engine RPM is displayed on the main control module and is used to automatically release the engine starter motor (above 500 RPM).

Typical connection



Control module

Control, monitoring and configuration of the PS640 is through the main control module, located under the front fascia window. The module has five push button keys, a back-lit 32 character LCD display, and 2 LEDs for indication of warning and shutdown faults (amber and red respectively).

To access the control keys, loosen the securing screw to the right of the panel display window, then open the hinged door. The control keys' main functions are:-

key	function
calib mode	Used to enter speed calibration mode.
prog mode	Used to enter program mode.
start	Press to start the engine, or to start and stop/reset the run timer when the engine is running
stop	Press to stop the engine
info	Press to scroll the display through various engine and pump parameters (see 'operation' below).

The keys are also labelled with ∇ , Δ , \triangleright , \triangleleft and \triangleleft symbols for menu navigation in program and speed calibration modes.

To operate or configure the PS640, the keyswitch must first be turned to I (on). If the control module display does not light immediately:-

- reset the emergency stop switch by twisting clockwise
- check the battery power supply connection

Configuration

Configuration is a 2 stage process:-

- Program mode parameter set-up
- Engine speed calibration

Program mode

The PS640 has several operating parameters that **MUST** be set before pump commissioning. For some applications, one or more of these settings (e.g. the Run time) may also need adjustment by the pump operator before each engine start.

Program mode can be accessed with the panel fully wired, or with just the DC supply terminals connected. To prevent automatic start attempts before accessing program mode, temporary disconnection of pin 14 is recommended.

Turn the keyswitch to I (on). To enter program mode, press the **prog mode** key and hold for approx. 1 second. For each program mode parameter displayed, use the ∇ and Δ keys to change the displayed value or option, then press \triangleleft to store that parameter and move on to the next. In order of appearance, the program mode parameters are:-

Parameter	Description, values / options
Preheat: XX Sec	Sets the engine preheat time: 0, 5, 10 or 15 secs
Override XX Sec	Sets a time (after an engine start) for override of an engine low oil pressure fault: 3 to 60 secs
Pressure In: XXX	Sets the pressure units displayed: PSI or BAR
Pump HighXXXXXPSI or Pump HighXXXXXBAR	Sets the pump low pressure shutdown level:- 50 – 550 psi (10 psi steps) or 3 – 39 bar (0.5 bar steps)
Pump LowXXXXX PSI or Pump LowXXXXX PSI	Sets the pump low pressure shutdown level:- 50 – 550 psi (10 psi steps) or 3 – 39 bar (0.5 bar steps)
Pump o/rideXX:XX	Sets a time (after an engine start) for override of a pump low pressure fault: 00:10 (10 secs) to 15:00 (15 mins)
Run time XX:XX	Sets the (optional) pump run time: 00:01 (1 min) to 24:00 (24 hours)

Calibration mode (for engine speed)

In normal operation, the PS640 needs to measure engine speed in order to a) display the speed (in RPM) and b) automatically release the starter motor (above 500 RPM) during engine start-up.

Speed measurement is by use of a magnetic pickup transducer, which is usually mounted in close proximity to engine flywheel or gearwheel teeth. Different engine types (with different numbers of flywheel/gearwheel teeth) mean that this circuit **MUST** be calibrated before pump commissioning.

To enter calibration mode, press the **calib mode** key and hold for 2 seconds. The LCD displays:

```
RPM Setup
Press START..
```

Press and hold the **start** key (the starter motor will engage) then release the **start** key when the engine fires. (Note: there is no automatic crank-disconnect in this mode). After the **start** key is released, the PS640 waits 5 seconds for the engine speed to stabilise. If at the end of this period the PS640 has not detected a speed signal, the LCD displays:-

```
RPM Setup
No Speed Signal!
```

...followed after 3 seconds by an automatic return to the start of calibration mode.

If a speed signal *is* detected, the LCD displays:-

```
Speed Signal OK
Enter RPM xxxx
```

Use the ▽ and △ keys to enter the actual running speed (which must be independently measured), then press ◀ (enter) to confirm this setting. The PS640 displays:-

```
Speed Signal OK
Aprox XXX teeth
```

...where XXX is the calculated number of flywheel teeth. After 3 seconds, the calibration data is stored and PS640 automatically returns to normal operation mode.

Operation

User operation by front facia push-keys

For an immediate, automatic engine start, press and release the **start** button. Engine preheat and cranking status is displayed on the LCD display and crank release is automatic if the engine fires and speed rises above 500 RPM.

If the engine does not fire after 10 seconds cranking, the PS640 releases the starter motor, waits for a 5 second crank rest period, then repeats the start sequence: the PS640 will make 3 attempts to start the engine before signalling a 'start fail' shutdown fault.

After a successful engine start, the PS640 runs the engine indefinitely until the operator presses either:-

- the **stop** key. The engine will stop immediately.
- the **start** key. This starts the Run timer (as set in program mode): the PS640 displays the remaining time (in hours:mins format) and automatically stops the engine when the time expires. Subsequent presses of the **start** key can be used to stop (reset) the Run timer (causing the engine to run indefinitely), and to start the timer again.

At any time, the operator can power down the control module and stop the engine by turning the keyswitch to **O** (off), pressing the emergency stop button, or removing the power supply.

When the engine is stopped, the default display is battery voltage. When the engine is running, the default display is pump pressure. To display additional engine/pump running data, press the **info** key. Data appears in the following order:-

- Engine speed
- Engine oil pressure
- Engine coolant temperature
- Pump pressure
- Engine hours run

Automatic operation by remote contact

For an automatic, remote start of the engine, use a switch or relay contact to connect terminal 14 to battery negative. Automatic start then occurs exactly as for an operator-controlled start above.

With pin 14 connected to battery negative, the PS640 runs the engine indefinitely: the operator cannot initiate the Run timer or stop the engine using the control module **stop** key. When pin 14 is made open circuit, the PS640 stops the engine immediately and returns the system to standby mode.

The operator can stop the engine at any time by switching the keyswitch to **O**, pressing the emergency stop button or removing the power supply.

Fault conditions

The PS640 is fitted with engine and pump fault warning and shutdown protection. After engine crank release, and once the fault Override time has expired, the PS640 automatically shuts down the engine for the following faults:-

- engine low oil pressure (below 20 psi)
- engine high coolant temperature (above 98°C)
- pump low pressure (limit set in program mode)
- pump high pressure (limit set in program mode)
- start fail (no speed signal after 3 start attempts)

In all the cases above, the appropriate fault message is displayed, the red shutdown LED lights and the shutdown output (terminal 9) activates. This fault shutdown state can only be cleared by turning the key to **O** (off) or removing the power supply.

A charge alternator fail condition (see 'electrical connection', terminal 2) causes a fault warning state: the amber warning LED lights and terminal 8 activates, but these will automatically clear if the fault clears.

Warranty and maintenance

The PS640 is supplied with a 2 year limited warranty on parts and workmanship. Full details of our warranty terms are available at www.fwmurphy.co.uk/warranty.

The PS640 is designed to be largely maintenance free. Maintenance is limited to checking for:-

- secure fixings / vibration mounts
- excessive dust, dirt or moisture ingress or build-up (e.g. around door/cover seals and cable glands). The PS640 external facias may be cleaned using a damp, lint-free cloth.
- secure electrical connection of engine wiring harness

Once the warranty period has expired, the panel design allows competent personnel to access and replace certain components: please contact your nearest Murphy representative for further advice. No attempt should be made to dismantle the main control module.