CANstart™ 9631/9632
Engine and Generator Controls

00-02-0664
revision A, 29th January 2010
section 40 & 75

Installation 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.

General Information

WARNING

BEFORE BEGINNING INSTALLATION OF THIS 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

CANstart™ 9631 and 9632 modules provide operator start/stop control, panel gauge driving, fault indication and auxiliary shutdown protection for ECU-controlled, CANbus SAE J1939 compatible engines. These compact controllers can be used with manual-start generators, pumps and other engine-driven applications.

CANstart features a 4 way keyswitch for operator control of the engine, with 6 LEDs for indication of status and faults - see 'front view' diagram for details. Electrical connection and configuration options are at the rear - see 'Rear view, connection and settings' diagram.

For each CANstart ordered, the following is supplied:
- 1 x CANstart module (see below right for model options), fitted with 4 x panel mounting clips
- 2 x keys
- these instructions

Panel installation

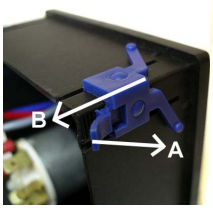
CANstart is designed for front-of-panel mounting in a DIN standard 92 x 92 mm (3.6 x 3.6 in.) cut-out. Allow 90mm / 3.6 in. behind the panel for the case depth, keyswitch and wiring.

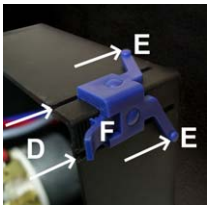
Secure the case to the panel with the two ratcheted mounting clips:

1. Remove the plastic mounting clips from the CANstart case: release each clip's ratchet mechanism by pulling outwards (A), then slide the clip back and off the case (B).

2. At the front of the panel, insert the CANstart (without clips) into the panel cut-out (C).

3. At the rear of the panel, refit the two mounting clips into the slots on the CANstart case (D). Slide each clip forward until the arms (E) are secured behind the panel face. Ratchet mechanism (F) prevents the clip from moving backwards.





Product specifications

Power supply
Operating voltage, steady state: 8 to 32 VDC
Operating voltage, brown out / cranking: 5 VDC minimum
Current consumption: < 100mA

Inputs
CANbus:
SAE J1939 protocol, switchable 120 Ohm terminating resistor
Auxiliary shutdown (x2): close to negative DC during fault

Outputs (all ratings non-reactive)
Run (ECU), start (crank):
positive DC (protected FET), 6A max @ 32 VDC
Alarm:
negative DC (open collector transistor), 250mA max @ 32 VDC
Oil pressure gauge:
suitable for Murphy, VDO 5 or 10 Bar, Datcon 7 or 10 Bar
Engine temperature gauge: suitable for Murphy, VDO or Datcon
Tachometer: for use with charge alternator driven tachometers

Adjustable settings
Model 9631 (variable speed engines)
Overspeed level: 1250 – 2800 RPM (50 RPM increments), or 'off'
Model 9632 (fixed speed engines/gensets)
Nominal speed: 1500 or 1800 RPM
Overspeed level: 1 – 15% of nominal speed (1% increments), or 'off'

Physical
Electromagnetic compatibility: 2004/108/EC
Case material: polycarbonate / polyester
Overall dimensions (w x h x d): 96 x 96x 131mm / 3.8 x 3.8 x 5.2 in.
Panel cut-out size: DIN 92 x 92mm / 3.6 x 3.6 in.
Weight: approx 240g / 0.6 lb
Operating temperature: –20 to +75 °C / –4 to +167 °F

Model options

CST9631 K2

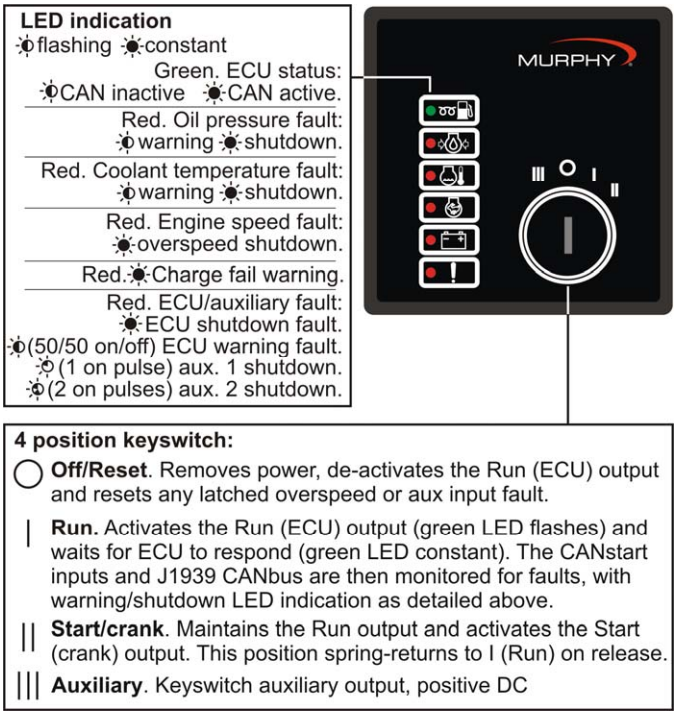
Model:
CST9631 For variable speed engines, overspeed setting range 1250-2800 RPM*
CST9632 For fixed speed engines/gensets, overspeed setting range 100-115% of 1500/1800 RPM*

Keyswitch type:
K2 Type 2, rubberised

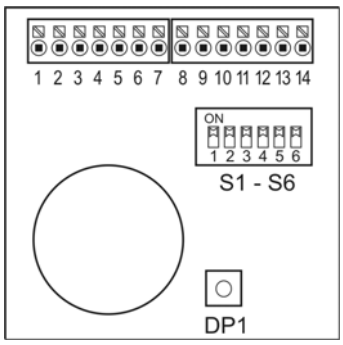
* *Default overspeed settings are:-*
CST9631: 1250 RPM
CST9632: 110% of 1500 or 1800 RPM (please specify).
Non-standard (NS) settings/options are available to order.

General Information (cont.)

Front view and operation



Rear view, connection and settings



S1 – S6 DIP switch settings
DP1 overspeed setting
See 'Configuration Settings' section below for full details

Connection
(see 'Electrical Connection' section for full details)

1 – DC power supply
2 + DC power supply
3 run (ECU) output
4 start (crank) output
5 alarm output
6 charge fail (alternator WL)
7 aux 1 input
8 aux 2 input
9 oil pressure gauge output
10 coolant temp gauge output
11 tachometer output
12 CAN screen
13 CAN high
14 CAN low

Configuration

Before electrical connection or use, DIP switches S1 to S5 and Digital potentiometer DP1 must be configured for correct operation.

S1 – S5: DIP switch settings

The table right shows the configuration options for S1 to S5.

Switches S1 to S3 configure the tachometer, oil pressure and coolant temperature gauge outputs for different gauge types.

Switch S4 allows the 120 Ohm CANbus terminating resistor to be in-circuit (if CANstart is at the end of a CANbus network), or removed (if CANstart is between other devices on the network).

Switch S5 is used with DP1 below to set an engine overspeed shutdown level.

S1 – S5 DIP switch settings
Note: switch S6 reserved for future use.

switch position ▲ *on (up)* ▼ *off (down)*					*options (default settings marked *)*
S1	S2	S3	S4	S5	
▲	▲	▲			Murphy temp. and pressure gauges *
▼	▲	▲			Datcon temp. and 0 – 7 bar pressure gauges
▼	▲	▼			Datcon temp. and 0 – 10 bar pressure gauges
▲	▼	▲			VDO temp. and 0 – 5 bar pressure gauges
▲	▼	▼			VDO temp. and 0 – 10 bar pressure gauges
			▲		CAN 120 Ohm terminating resistor in circuit *
			▼		CAN 120 Ohm terminating resistor removed
				▲ ▼	sets range for DP1 overspeed level (see below).

DP1: Engine overspeed shutdown level

DP1 is a 16-way digital potentiometer that, with DIP switch S5, allows the setting of an engine overspeed shutdown level. If the actual engine speed (determined by ECU-transmitted J1939 data) exceeds the set level, CANstart initiates an engine shutdown. Note: the CANstart overspeed feature operates in addition to any ECU overspeed protection.

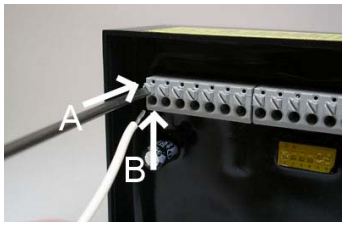
CANstart model 9631 provides overspeed settings between 1250 and 2750 RPM (in 50 RPM increments) for general purpose, variable speed engines. Model 9632 allows settings of 1 to 15% above either 1500 or 1800 RPM fixed speed engines, e.g. as used in 50 or 60 Hz gensets. On both models, the overspeed protection can be set to 'off' (i.e. disabled).

DP1 and S5 settings are: -

DP1 position:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Model 9631, variable speed engines:																
S5 on (up), RPM	Off	1250	1300	1350	1400	1450	1500	1550	1600	1650	1700	1750	1800	1850	1900	1950
S5 off (down), RPM	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750
Model 9632, fixed speed engines/gensets:																
S5 on, % above 1500 RPM	Off	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%
S5 off, % above 1800 RPM	Off	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%

Electrical Connection

Electrical connection to 0.5 to 1.5 mm² / 16 – 20 AWG panel wiring is by spring-clamp terminals at the rear.



- Pre-strip 8 to 10 mm / 0.3 to 0.4 in. of insulation from each wire.
- Above each terminal is a square push-button with a diagonal slot. Insert a flat-head screwdriver into the slot (A), then push down to (towards the front of the CANstart) to open the terminal clamp.
- Insert the wire into the terminal (B), checking that the insulation is clear of the clamp. Release the screwdriver / spring clamp pressure and check that the wire is secure.

General connection recommendations

Murphy make the following recommendations for the electrical connection of engine and generator controllers.

- Minimise controller output load current (i.e. wear/tear and potential damage) by using slave relays between the controller outputs and high power end-devices, e.g. starter solenoids.
- Suppress (at source) electrical interference from panel relay and engine solenoid coils, using flywheel diode or proprietary snubber networks as appropriate.
- Use separate routing for AC and DC wiring harnesses.
- Use separate wiring for a) connection of battery charger to battery, and b) connection of battery to panel DC supply. Separate wiring will reduce high frequency battery charger output noise on the panel DC power supply.

Terminal functions

Pin Function

1 Negative DC power supply
2 Positive DC power supply

CANstart operates with any smooth DC / battery voltage in the range 8 – 32V. Supply brown-out protection is fitted as standard. Connect a 5 Amp anti-surge fuse in the positive DC line (pin 2).

3 Run (ECU) output
4 Start (crank) output

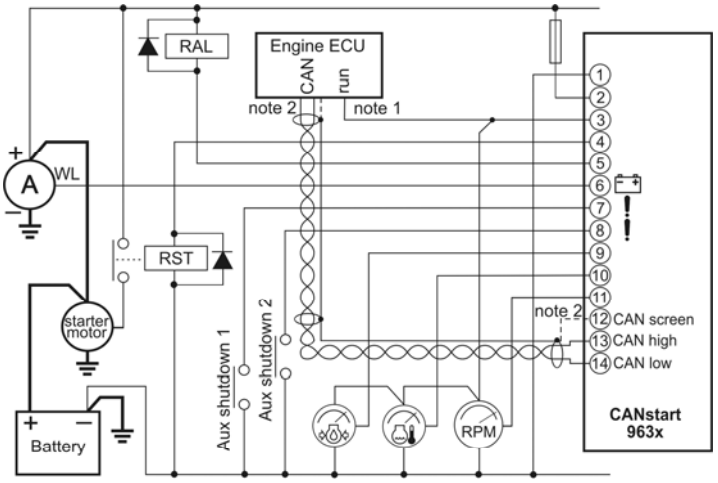
These outputs provide control signals for the engine's ECU Run input and starter motor. Both outputs use solid-state FET devices, which give a positive DC signal (rated 6 Amp max) when active.

The Run output (pin 3) is used to control the ECU Run input. Before connection, check the engine documentation for ECU Run input polarity requirements. If the ECU requires a switched negative/ground or 'open to start' connection, use an interposing relay with suppressed coil between pin 3 and the ECU Run input.

Pin 3 activates as soon as the key is switched to the **I** (RUN) position, and remains at positive DC as long as the engine is required to Run. Pin 3 de-activates if the key is switched to **O** (off/reset), if the ECU transmits an engine shutdown fault code, if a CANstart auxiliary fault input is activated, or if the overspeed fault levels are exceeded.

The Start output (pin 4) operates when the operator switches the key to the (spring-loaded) **II** (start) position. A slave relay with suppressed coil is recommended between pin 4 and the starter motor solenoid coil.

Typical connection



Notes:-
1. Wiring shown for ECU with close to positive to run input. An additional interposing fuse or relay may be required between pin 3 and ECU: check engine documentation for ECU 'run' input requirements.
2. ECU CANbus screen is typically earthed/grounded at one end only. Check engine & ECU documentation for details

5 Alarm output

The alarm output activates during fault conditions, triggered either from the ECU-transmitted J1939 message, or from CANstart's auxiliary inputs or overspeed shutdown feature.

Pin 5 is an open collector transistor output: activation gives a negative DC signal rated 250mA @ 32VDC max. The output typically drives a relay coil, which in turn drives an audible or visible alarm. The relay coil should use a flywheel diode or other suppression device - see 'typical connection' above.

6 Charge fail

The charge fail ( ) LED lights, but there is no shutdown or alarm output, when pin 6 is connected to battery negative. When using a charge alternator, connect pin 6 to the alternator warning lamp (WL) terminal. Note: pin 6 supplies the alternator excitation current.

7 Auxiliary 1 fault input
8 Auxiliary 2 fault input

These inputs allow engine shutdowns to be triggered by remote switch or relay contacts. Connection of these inputs to battery negative causes deactivation of the Run output (pin 3), activation of the alarm output (pin 5) and the flashing of the Aux fault ( ) LED – see operation section for details.

To reset an auxiliary fault condition, turn the key to **O** (Off) or remove the DC power supply.

9 Oil pressure gauge output
10 Coolant temperature gauge output
11 Tachometer output

These outputs can be used to drive a tachometer and electric gauges, based on ECU-transmitted J1939 engine data.

Pins 9 and 10 give a variable current output for driving oil pressure and coolant temperature electric gauges. The outputs can operate with several different manufacturers' gauge types, as set using DIP switches S1, S2 and S3 - see Configuration Settings section above.

Pin 11 gives a square wave output (0V to battery positive DC) with a frequency proportional to engine speed. At 1500 RPM engine speed, the output frequency is approximately 121 Hz, suitable for driving charge alternator based tachometers such as the Murphy AT(H)A series. Pin 11 gives no output below 100 RPM engine speed.

Electrical Connection (cont.)

Gauge/tacho outputs (cont).
Connect each output to the appropriate gauge and tachometer signal input terminals. Connect gauge and tachometer negative terminals to battery negative, ideally via dedicated wiring to CANstart pin 1. (The use of dedicated return wiring to pin 1, rather than via a chassis/ground return, minimises gauge inaccuracies caused by ground noise.)

12 CAN shield/screen
13 CAN High
14 CAN Low

These connections receive ECU-transmitted J1939 CANbus data, including engine parameters and fault codes. Wiring and connection should be made in accordance with the SAE J1939 standard and ECU/engine manufacturer's guidelines. Attention should be paid to the wiring type (normally twisted pair, often with a shield/screen), and to the shield/screen ground connection (normally only at one end of CANbus network, often at the ECU).

CANdrive™ is supplied with a 120 Ohm CANbus terminating resistor in circuit. If CANdrive™ is not located at the end of the CANbus network, switch out the terminating resistor using DIP switch S4 - see Configuration Settings above.

Operation and Maintenance

Operation

Operator control of the engine is through the 3 position keyswitch:

O **Off / reset.** Removes DC power from the CANstart, de-activating the Run (ECU) output (stopping the engine) and resetting any CANstart fault conditions, e.g. overspeed or auxiliary input.

I **Run.** When the key is switched to **I**:

- The Run (ECU) output activates, signalling the ECU that the engine is required to run.
- The **CAN** LED lights, initially flashing, then continuous – see 'LED operation' below.
- The charge fail LED lights – see 'LED operation' below.

The Run (ECU) output deactivates:

- If the ECU transmits (and CANstart receives) a J1939 fault shutdown message – see 'LED operation' below.
- If engine speed (from ECU J1939 data) exceeds CANstart's overspeed limit, as set by S5 and DP1.
- If a CANstart auxiliary shutdown input is activated.

II **Start.** Activates the Start (crank) output. Keyswitch position **II** is sprung-loaded to return to the **I** (Run) position.

LED operation

	Power / CAN status: • Lights continuously when CANstart is powered and valid J1939 CAN messages are present. • Flashes if CANstart is powered, but no valid CAN messages are detected.
	Oil pressure fault. Lights in response to ECU-transmitted J1939 messages: • Lights continuously following a shutdown fault • Flashes during a warning only fault.
	Coolant temperature fault. Lights in response to ECU-transmitted J1939 messages: • Lights continuously following a shutdown fault • Flashes during a warning only fault.
	Overspeed fault. Lights continuously following an overspeed shutdown fault (whether triggered by ECU or CANstart).
	Charge fail fault. Lights continuously during a charge fail condition, whenever CANstart terminal 6 is connected to battery negative. If CANstart is used with a charge alternator, the LED also lights when the engine is stationary (indicating that CANstart is providing charge alternator excitation current).
!	General fault. Lights in response to both ECU-transmitted J1939 fault messages and CANstart auxiliary inputs: • Continuously lit indicates an ECU-initiated fault shutdown • A regular 50/50 on/off flashing indicates one or more ECU-transmitted fault warning messages. The LED goes out if the ECU stops sending fault messages. • One short flash followed by a long pause indicates an engine shutdown triggered through CANstart's 'aux 1 fault' input. • Two short flashes followed by a long pause indicate an engine shutdown triggered through CANstart's 'aux 2 fault' input.

Maintenance and Warranty

CANstart contains no user-serviceable parts. Maintenance is therefore limited to the following preventative checks:

- Check that CANstart electrical connections are secure.
- Check that the case is mounted securely, with vibration and environmental exposure minimised where possible. The case may be wiped with a clean, damp cloth. Do not use cleaning solvents.

CANstart is supplied with a two year warranty on parts and workmanship. In the event of a fault or technical query, and before returning equipment, please contact your Murphy representative for technical support.

FW MURPHY
P.O. Box 470248, Tulsa, Oklahoma 74147 USA
+1 918 317 4100 Fax: +1 918 317 4266
E-mail: sales@fwmurphy.com

INDUSTRIAL PANEL DIVISION
Fax: +1 918 317 4124
E-mail: ipdsales@fwmurphy.com

MURPHY POWER IGNITION
Website: www.murphy-pi.com

CONTROL SYSTEMS AND SERVICES DIVISION
P.O. Box 1819, Rosenberg, Texas 77471 USA
Phone: +1 281 633 4500 Fax: +1 281 633 4588
E-mail: css-solutions@fwmurphy.com

FRANK W. MURPHY LTD.
Church Road, Laverstock,
Salisbury, SP1 1QZ, United Kingdom
Tel: +44 1722 410055
Fax: +44 1722 410088
E-mail: sales@fwmurphy.co.uk
Web: www.fwmurphy.co.uk

COMPUTRONIC CONTROLS
41 – 46 Railway Terrace, Nechells,
Birmingham, B7 5NG, United Kingdom
Tel: +44 121 327 8500
Fax: +44 121 327 8501
E-mail: sales@computroniccontrols.com
Web: www.computroniccontrols.com

FW MURPHY INSTRUMENTS (HANGZHOU) CO., LTD.
77 23rd Street, Hangzhou Economic & Technological Development Area
Hangzhou, Zhejiang, 310018, China
Phone: +86 571 8788 6060 Fax: +86 571 8684 8878
E-mail: apsales@fwmurphy.com