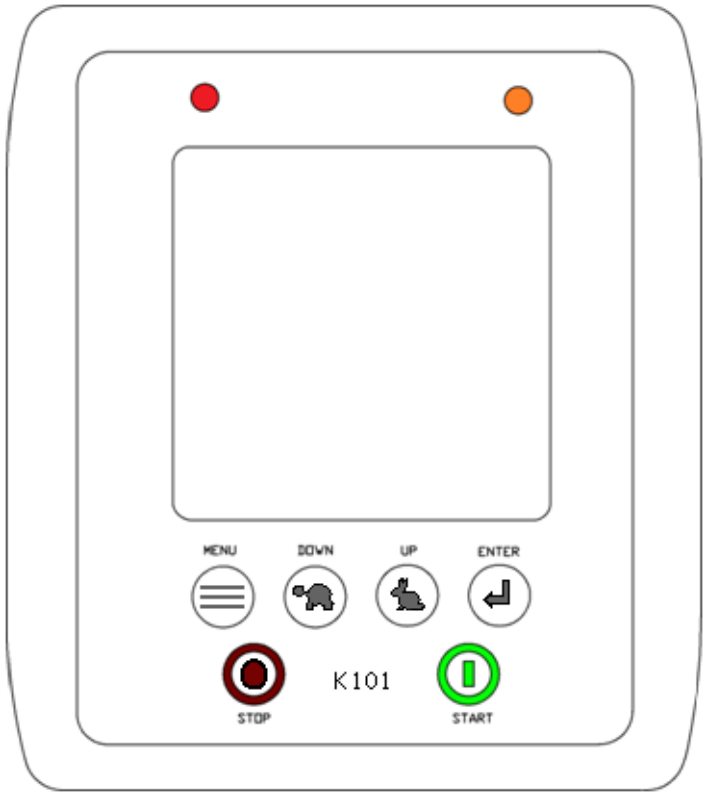
Remko K101 Engine Control Panel

Operations Manual



Version 1.00+

Rev 1.0 - 06.06.2025

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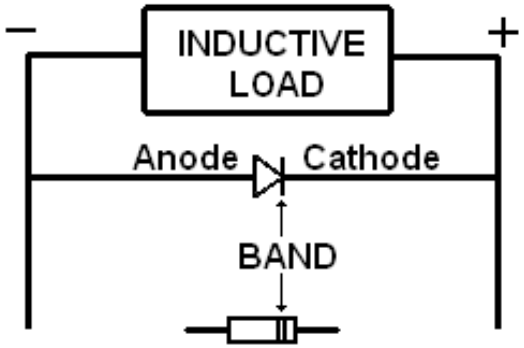
WARNING

Prior to Installation
- Remove all electrical power from controller and engine
- Ensure machine is safely secured during installation
- Check and follow all safety warnings and read all instruction manuals carefully
- Only use the controller for its intended purpose.

Prior to Engine Ignition
- Ensure that persons, engine and moving parts are free from obstruction.
- The user is responsible for ensuring the engine and controller are operated safely. Any parameter or settings changes must be carried out by persons with expert knowledge. Failure to do so may result in serious damage to equipment, persons and may also void warranty.

Fly-back Diode Installation

All Inductive Loads e.g. Starter Solenoids, Fuel Stop Solenoids, Clutch Solenoids, General Relays, etc, must be fitted with a flyback diode such as the widely available 1N4005. The diode used must be of sufficient size to prevent damage from reverse voltage spikes. A fly-back diode is sometimes also referred to as a snubber diode, freewheeling diode, suppressor diode, catch diode, or clamping diode. The diode is fitted onto the source of the inductive load, normally in the engine wiring loom.



Considerations Prior to Operation

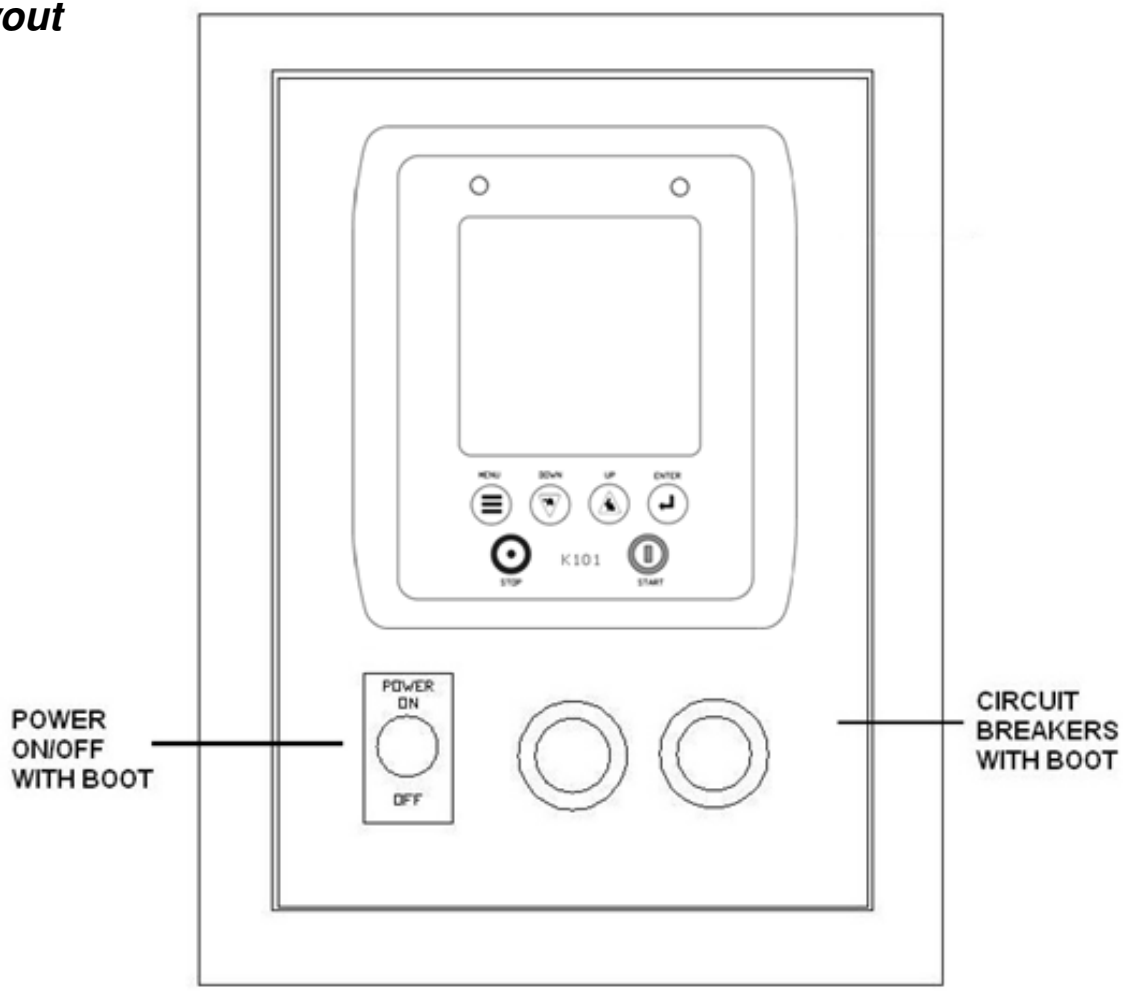
- When mounting and during the life of the controller, please avoid subjecting the controller to external elements including excessive heat, oil, dust, vibration, and rain. **It is mandatory that vibration mounts are used when mounting the K101 control panel to an engine or engine base.**
- High-pressure cleaning devices must not be used and will likely cause damage to the controller. Use a damp soft cloth to clean the face of the decal and controller.
- Grounding of the controller must be carried out to prevent damage from a lightning strike, a suitable ground strap to earth or pump skip may be sufficient.
- Persons under the influence of drugs and/or alcohol must not use the controller or operate any machinery.
- Maintenance of the engine must be carried out within the manufacturer's guidelines.
- Sensor or Panel wiring must not be bundled with High Voltage AC Wiring.

Features of the K101 Control Panel

- Operates with both J1939 Electronic ECU and Mechanical Engines using applicable wiring harnesses.
- Throttle Torque/Speed Control (TSC) for J1939 electronic with the ability to automatically ramp the engine to a fixed speed.
- Engine Warm-Up and Cool down timers with variable idle and RPM ramp rates.
- J1939 data providing Active Codes, Stored Codes, and Engine Configuration.
- Engine Fault History logging and display.
- Clear, large, and easily visible Liquid Crystal Display shows Battery Voltage, Engine RPMs with Over Speed / Under Speed protection, and Engine Hour Meter.
- Backlit LCD Display for low light level operation.
- 6 x Interface buttons for clear, easy control.
- Adjustable 100-Hour Run Timer.
- 4-20mA sensing for Flow or Pump Pressure with adjustable engine shutdowns for Low Flow/Loss of Prime and Maximum Flow/Pump Pressure, with a built-in Bypass Timer and Slush Timer.
- 1 x Relay output used to control ECU power or fuel stop solenoid including Energize to Run or Energize to stop functionality.
- 1 x RS232/RS485 port for advanced data and configuration purposes.
- 1 x Speed detection input (Magneto, Magnetic Pickup, or Alternator pulse detection) used on mechanical engines.
- 1 x grounded digital input with re-naming capability.

1 Interface Panel

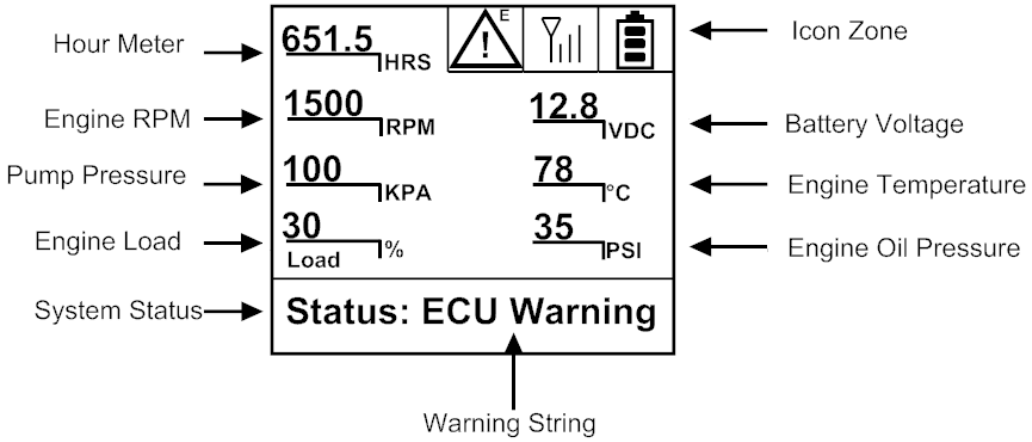
1.1 Control Panel Layout



1.2 Graphical LCD Layout

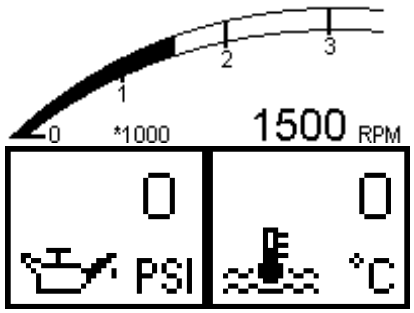
1.2.1 Main Screen

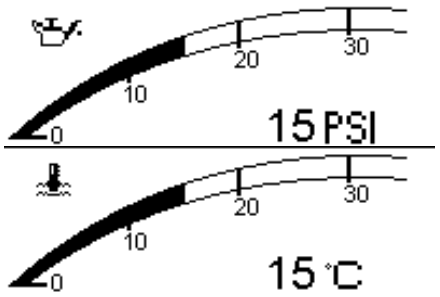
The main screen is divided into **Information** and **ICON** zones.
The **Information Zone** shows the engine and Sensor Data (when active) and shows the current state of the controller.
The **ICON Zone** shows if the GSM or MODBUS is active, battery warning, pump, throttle, and Engine Status.



1.2.2 Gauge Screens

Pressing ENTER on the main screen will cycle through active items on the third line and then the gauge screens as the examples shown below,





1.3 Keypad Description

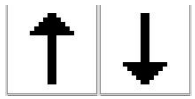
Interface Button	Purpose
MENU 	The MENU button allows access to the menu structure. Pressing once while on the main screen enters the menu. Further presses cycle back through the various menus.
DOWN 	The DOWN button allows for scrolling through menu items and decreasing the various values. This is signified on the screen by the down arrow(↓) when the throttle is active the down button will decrease engine speed.
UP 	The UP button allows for scrolling through menu items and increasing the various values. This is signified on the screen by the up arrow(↑) when the throttle is active the up button will increase engine speed.
ENTER 	The ENTER button is used to alter values and confirm changes. Pressing this button in the main menu will enter a sub-menu.
STOP 	The STOP button will stop the engine. The Engine Cool down Timer will commence. Pressing STOP a 2nd time will bypass the Cooldown timer and stop instantly.
MANUAL START 	The MANUAL START button will manually run the engine by starting it immediately. Throttle control is conducted by pressing the up and down arrow, on electronic engines with TSC only.

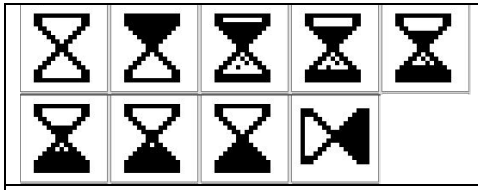
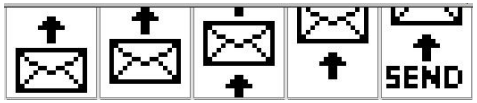
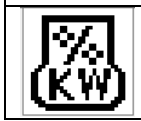
1.4 Interface LEDs and LCD Display

1.4.1 Warning and Fault LEDs

Colour/State	**K101 Status**
Steady Amber	ECU Engine Warning.
Steady Red /Flashing RED	ECU Engine Fault./ Shutdown Fault

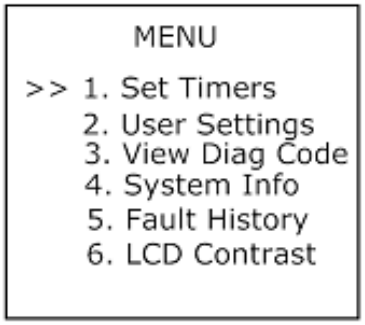
1.4.2 Icon Indication

	Battery Status indication Low to High.
	After 10mins of engine operation if the battery does not appear to be charging. The Charge Fail ICON will be blinking.
	GSM modem or MODBUS GSM is enabled. ? - Denotes no connectivity to the modem. Blinking means the controller is attempting to connect to the modem—this may happen for a 2min period. X - Denotes no connectivity to network carrier. Animated ICON—General Bars show the current signal strength. Less than two bars is a relatively weak signal strength.
	Animated ICON when MODBUS combination MODEM is enabled. Icon denotes that the MODBUS modem is communicating via Satellite. NO GSM is available at the time of transmission.
	CAN J1939 ECU Warning symbol when an Active Warning code is present. Press the MENU button and go to View Diag. Codes to see the ECU Warning.
	Arrows appear when the engine is running and the throttle is engaged via the toggle switch or automatic operation. The RPM follows the arrow direction.
	Flashing Padlock ICON when engine and pump are running within the Lockout Delay Period set in Engine Parameters.
	Engine DATA is Derived from CAN J1939 BUS. Please note, that if MODBUS and CAN are enabled together these symbols will appear in one box.
	Engine DATA is Derived from CAN J1939 BUS. Please note, that if MODBUS and CAN are enabled together these symbols will appear in one box.

	Animated Hour Glass ICON when the engine is running in Auto or Manual and the 100Hour run Timer has been enabled. The Stop time can be viewed by Pressing ENTER and the 3rd line will show the time left. e.g. Stop In: 01:02:45
	Animated ICON when the GSM Text messaging system is enabled and messages are being sent to the users set in User Settings —>GSM.
	This appears when a GSM Text messaging system is enabled and a message is being received. Only messages from registered users will be processed and acted on by the controller.
	Appears when the engine load is greater than 90% and will blink if greater than 95% as a warning.

2 Menu Options

The K101 can be configured by accessing the menu items shown on the following LCD screen.



2.1 Set Timers

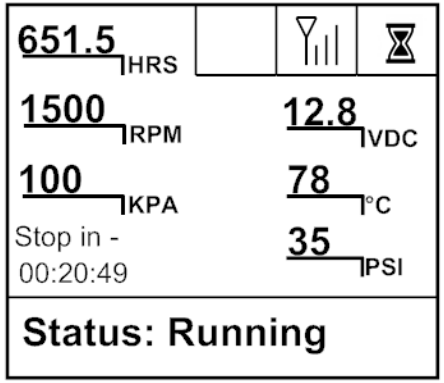
In the Set Timers menu, the Set Stop Timer is configurable for up to 100 hours when running. Using the up and down arrow Enable the timer and the time can be set in hours and/or minutes.

If this timer is set to e.g. 5hours 30mins after the engine is running the timer begins to count down. Once the time has elapsed the engine will go into a normal shutdown with the resulting message being “Stop Timer”. This is a useful feature such that the user can start the engine and it will only run for a preset time unless no other stop condition exists.

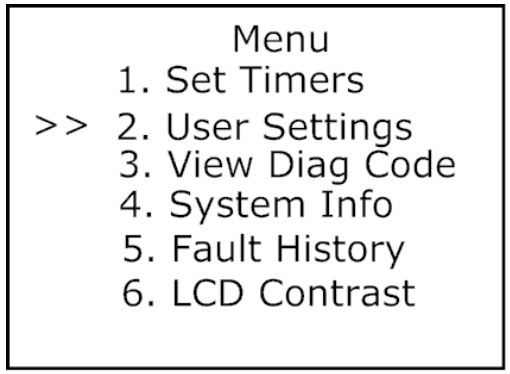
It can also be adjusted while the engine is running and will begin the countdown from the new time entered.

The stop timer can be viewed on the fourth line by pressing the ENTER button only while the engine is running. The format is HH:MM:SS.

During this time the animated hourglass icon will be present in the ICON ZONE.
Aborting or cancelling the timer can be done at any time by disabling the Timer function.



2.2 Settings Menu



The User Settings Menu is password protected and should only be accessed by qualified and authorized users.

The password is a string of 4 numbers. Upon entering this menu, the first number shown in red below will blink. Use the Up and Down arrows to change the individual numbers and press ENTER to progress to the next number.

Once the password entry is complete you will be able to enter individual user settings items described in detail in the following sections.

These settings will define how the system will operate and care must be taken when changing settings as incorrect values will cause undesirable results. In the following sections, each parameter is listed and a functional description is given.
Please read these descriptions before making any changes to the settings.

A correct password will allow access to the Setup Menu. For an incorrect password, *"**Wrong password**"* will momentarily appear and the screen will return to the Settings Menu.

Press the Up(

) and down(

) buttons to cycle through all available menu items as per below.

User Settings
1. Profile
>> 2. Engine
3. Throttle
4. 4-20mA Sensor
5. Digital Inputs
6. Rest History
7. Modbus

User Settings
8. GSM
9. Change Password
>> 10. Change Unit
11. I/O Test

Each of these items is associated with different parameters described in detail below.

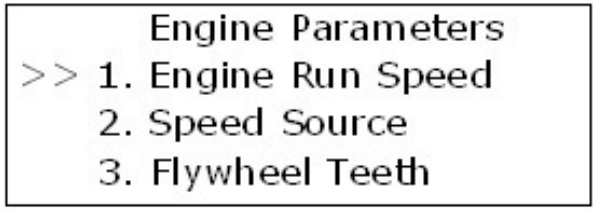
Please note, that at any time the MENU button can be pressed to exit any screen and return to the upper-level menu screen.

Editing User Settings from the Keypad

To make changes to the settings please do the following:

The example below is changing the RUN SPEED in engine parameters.

When in User Settings use the UP and DOWN buttons to move '>>' to '2. Engine' then press ENTER.



Use the UP and DOWN buttons to move '>>' and choose 1. Engine RUN Speed then press ENTER.

The engine speed variable shown will now be blinking.

Use the UP and DOWN to change the number to the desired value then press ENTER.

It will momentarily show the setting confirmed.

Please note:
When working within any part of the menu system, if any button has not been pressed for 60 seconds the screen will automatically return to the main RPM screen.

Once you have entered the password you can repeatedly enter the User Settings. However, If the controller has entered sleep mode or is powered down you will be required to enter the password again to enter User Settings.

2.2.1 Profile Setting

The profile forms the basis of an engine and the pump parameter setup. The panel has default settings or profiles for an electronic or mechanical engine with or without throttling capability.

Default profiles are standard configurations, these cover the most basic engine parameters but may still require some key settings to be changed such as speed source and flywheel teeth or pulses/rev. Generally, additional sensors such as pump pressure are turned off to allow an engine to run.

Active profile. When users make changes to the settings these directly affect the current operation and are usually engine/pump and site-specific. Once you are happy with the active setup you can save this to an Onboard Backup as a baseline for the commissioned engine and pump or generator.

Onboard Backup. The onboard backup does not affect the active operation but is useful to save a working profile in case a user makes temporary changes. The onboard backup can be retrieved at any time to restore the Active profile.

RS232: This option allows users to upload and download settings via the RS232 communications port to and from a personal computer. A PC program is available to create, save, upload, and download settings.

Menu	Option	Description
1. Load Profile	1. Default ECU	Basic setup for CAN J1939 ECU Engines with Throttling Enabled for Go To Fixed Speed operation when in Auto.
	2. Default MECH	Basic setup for Mechanical engines with no throttling. Speed Source is set to Alternator and tachometer calibration is a default setting.
	3. Onboard Backup	Load from a previously backed-up active profile stored on the controller.
	4. RS232	Loads the settings or profile from a personal computer that has a program. The Connection is with a cable connected to the RS232 ports of the controller and personal computer.
2. Save Profile	1. On Backup	Known working settings can be saved to the onboard backup as a safety net in case temporary changes are made.
	2. TO RS232	Saves the settings or profile to a personal computer that has a settings program. The Connection is with a cable connected to the RS232 ports of the controller and personal computer.

2.2.2 Engine Parameters

Item	Parameter	Default Value	Range	Change Amount	Function Description
1	Engine Run Speed	1800RPM	1000 to 4000 RPM	25RPM	Desired Speed of the Engine at Load when in Auto and throttle type is GOTO FIXED RPM. If the throttle type is MODBUS Control this is only applicable if an incorrect speed is sent to the controller and this acts as a safe speed set point.
2	Speed Source	Alternator	J1939, ALT, MPU.	-	RPM Speed source from J1939 ECU, Alternator, Magnetic Pickup (NO FILTER)
3	Flywheel Teeth	120 Teeth	60 to 190 Teeth	1 tooth	Number of Teeth on the Flywheel when MPU is selected as the speed source for a Mechanical Engine.
4	Pulses Per REV	10.50	2.00 to 25.00	0.02	Number of Pulses from an Alternator for 1 revolution when the Alternator is the speed source on a Mechanical Engine.
5	Underspeed	650RPM	550 to 2000RPM	25RPM	Engine Overload, slow speed protection with a Slush Delay of 5secs.
6	Overspeed	1950RPM	1000 to 4000 RPM	25RPM	Engine/Pump high-speed protection with a slush delay of 5 seconds.
7	Start Speed (Crank Disconnect)	600RPM	400 to 2000RPM	25RPM	On engine startup when the engine speed rises above this value a crank disconnect will occur.
8	Lockout Delay	30secs	20 to 60secs	1sec	Digital and Analogue sensor shutdown bypass timer upon engine start-up.
9	Crank Time	10secs	5 to 20secs	1sec	The maximum time the engine will crank on a start attempt.
10	Crank Rest Time (Stabilization time)	10secs	5 to 60secs	1sec	Allows the engine to rest for a specific time after an unsuccessful start attempt before a crank retry. This value also acts as the Shutdown stabilization time at an engine stop. Increasing this value keeps the ignition off for longer. This timer also acts as the

					'energize to stop' timer when Fuel Relay Ctrl is set to Energize to Stop.
11	Crank Attempts	3	3 to 10	1sec	Maximum crank attempts. Allowed before the 'failed to start' is registered.
12	Glow Time	3secs	0 to 20secs	1sec	Time to energize the glow plug(s) before cranking the engine as an aid in cold temperatures.
13	Warm Up Time	mins00:00secs	00:00 to 20:00	10secs	Allows the engine to warm up at idle before throttling to the specified RUN Speed.
14	Cool down Time	mins00:00secs	00:00 to 20:00	10secs	Allows the engine to return to idle for a set period before shutting down. The cool-down timer may not begin until the RPM is within 50rpm of the set IDLE.
15	Engine Temp. Alarm	105'C	0 to 215'C, Disabled	1'c	If the coolant temperature rises above this value the panel will shut down the engine. This can be Disabled and becomes READ only. (Does not affect ECU protections.)
16	Read Engine Temp.	Mechanical Sender	Mech or J1939	-	The source can be Mechanical Sender or J1939 even if the Speed Source is J1939.
17	Eng Oil Prs. Alarm	20PSI	0 to 144PSI, Disabled	1PSI	If the engine pressure drops below this value the panel will shut down the engine. This can be Disabled and becomes READ only. (Does not affect ECU protections.)
18	Read Oil Prs.	Mechanical Sender	Mech or J1939	-	The source can be Mechanical Sender or J1939 even if the Speed Source is J1939.
19	Coolant Level	Disabled	Enabled/Disabled	-	This is the panel Coolant Level probe input usually used for Mechanical engines or Electronic ECU engines with an additional probe connected to the panel. (This does not affect a J1939 ECU Coolant level probe.)
20	Crank Assist.	0counts	0 to 150Counts	1count	Ignores erroneous values from the ECU, ALT, or MPU for a set period.
21	Fuel Relay Control	Energize to Run	Energize to Run Energize to Stop	-	Energize to Run: The fuel stop solenoid has a constant power signal while the engine is running. Energize to Stop: The fuel stop solenoid is activated for 10 seconds to stop the engine and then released. See the Crank Rest Timer in the Engine parameters.

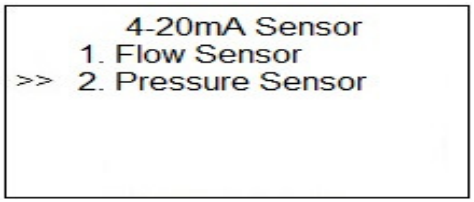
2.2.3 Throttle Parameters

Item	Parameter	Default Value	Range	Change Amount	Function Description
1	Throttle Type	Disabled	GOTO Fixed RPM, Toggle Switch MODBUS Control	-	Enabled Throttle Control for J1939 Engines or Mechanical Engines with a Throttle Actuator. There are different throttle modes that the engine can be set to are described in detail in the following section.
2	Engine Idle	800RPM	Auto-detect to 1200RPM	25RPM	Throttle Controlled Engine can have a panel set IDLE point. Please note: the IDLE point set in the panel cannot be lower than the IDLE set in the ECU or mechanical governor.
3	J1939 INC	40RPM	10 to 250RPM	10RPM	When throttling to idle, line fill speed, fixed speed, or max/min RPM defines the incremental rate at which the throttle will increase.
4	J1939 DEC	40RPM	10 to 250RPM	10RPM	When throttling to idle, line fill speed, fixed speed, or max/min RPM defines the incremental rate at which the throttle will decrease.
5	FEEDBACK DELAY	0.2sec	0.2 to 4Sec	0.1sec	When throttling to idle, line fill speed, fixed speed, or max/min RPM defines the delay between throttling steps to allow the pump or generator system to respond. It is recommended that the feedback delay for mechanical engines is greater than 1sec.
6	Ramp Rate RPM/SEC	100RPM/SEC	10 to 600RPM/SEC	10RPM	Electronic engine - The J1939 TSC will respond to the ramp/rate specified. Mechanical Engine - This value entered is an estimation of how quickly we believe the Throttle is running. Increasing this number will dynamically calculate and increase the RPM dead Zone (item 7) when in Auto. We do this to stop hunting. If the arm on the pivot of the throttle body is long we can decrease this number but if it is short then increasing this number better reflects the ramp/rate.

2.2.3.1 Throttle Type - Method of Operation

Throttle Type	Description of Operation
Go to FIXED RPM	**Manual Start Button:** If the engine is started from the start button on the module the RPM will not throttle unless the ↑↓ keypad buttons are used. The maximum RPM allowed is governed by the over-speed set point in Engine Parameters. **GSM or MODBUS:** On an engine started from MODBUS or a GSM Modem source the throttle is governed by the Ramp/Rate set in throttle parameters. It will remain at IDLE for the Warm UP period then proceed to run to the Engine RUN Speed set in Engine Parameters. On an engine stop signal, the RPM will return to idle for the cool-down period and then shut down.
Toggle Switch (Keypad)	The RPM will not throttle unless the ↑↓ keypad buttons are used. The maximum RPM allowed is governed by the over-speed set point in Engine Parameters.
MODBUS Control	**Manual Start Button:** The RPM will not throttle unless the ↑↓ keypad buttons are used. The maximum RPM allowed is governed by the over-speed set point in Engine Parameters. **MODBUS Start:** On an engine start from the MODBUS source the throttle is governed by the Ramp/Rate set in throttle parameters. It will remain at IDLE for the Warm UP period then proceed to run to the Engine RUN Speed. If a remote command is received via MODBUS register 40048 and is within the IDLE to OVERSPEED range the engine will throttle to the speed indicated by this register. On an engine stop signal, the RPM will return to idle for the cool-down period and then shut down.

2.2.4 4-20mA Sensor



The 4-20mA Sensor is the primary pressure or flow sensor input and will be displayed on the main RPM Screen.
The K101 supports a 2-wire (loop-powered device) or 3-wire 4-20mA Sensor.

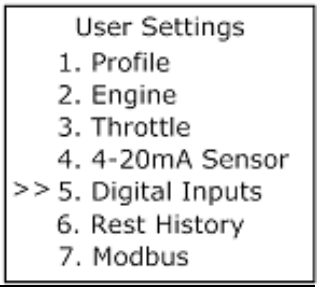
2.2.4.1 Flow Parameters

Item	Parameter	Default Value	Range	Change Amount	Function Description
1	Sender Function	Disabled	Enabled/Disabled Read Only	-	Enables or disables the 4-20mA Flow as the primary sensor. Read Only function: The sensor is active but has no protection for Min or Max Flow Alarm. However, the sensor must not be in error or faulty.
2	Sender Range 4-20mA	300L/S	0 to 1000L/S	5L/S	The range or scale of the Flow sensor i.e. 4mA = 0 L/S, 20mA = 300 L/S
3	Set Min. Flow	75L/S	0 to Sensor Range	5L/S	Low flow value alarm point to which the controller will then shut down the engine when monitoring and the slush period has elapsed.
4	Set Max. Flow	245L/S	0 to Sensor Range	5L/S	High flow value alarm point to which the controller will then shut down the engine.
5	Flow Bypass Time	3mins	0 to 60mins	1min	Duration of time, only at engine start-up to which the low alarm point is not monitored. (High Flow is not bound by this timer and is monitored immediately at startup.)
6	Flow Slush Time	10secs	10 to 60secs	1secs	When the live value falls below or rises above the nominated alarm points, a timer activates and the condition must remain for the full slush time set before a shutdown is triggered.
7	Calibration	50 Counts	0 to 100Counts	1count	A calibration option to zero the value read by the controller when at 4mA
8	Latched Shutdown	Disabled	Enabled/Disabled	-	The controller can be set to a Normal Fault shutdown. A normal shutdown will allow another start when in Auto. A fault or Latched shutdown requires the controller to be reset before it can be used again.

2.2.4.2 Pump Pressure Parameters

Item	Parameter	Default Value	Range	Change Amount	Function Description
1	Sender Function	Disabled	Disabled, Enabled, Read Only	-	Disable or Enabled pressure sensor input as Primary Sensor. Read Only Function - The sensor is active but has no protection for Min or Max Pressure Alarm. However, the sensor must not be in error or faulty.
2	Sender Range 4-20mA	1000KPA	0 to 3200KPA	10KPA	The range or scale of the Flow sensor i.e. 4mA = 0KPA, 20mA = 1000KPA
3	Set Min. Pressure	200KPA	0 to Max Pressure	10KPA	Low pressure or loss of prime value alarm point to which the controller will then shut down the engine when monitoring and the slush time has elapsed.
4	Set Max Pressure	800KPA	Min Press. to Sender Range	10KPA	High or Over pressure value alarm point to which the controller will then shut down the engine.
5	Pump Prs. Bypass	3mins	0 to 60mins	1min	Duration of time, only at engine start-up to which the low alarm point is not monitored. (High pressure is not bound by this timer and is monitored immediately at startup.)
6	Pump Prs. Slush	10secs	10 to 60secs	1secs	When the live value falls below or rises above the nominated alarm points, a timer activates and the condition must remain for the full slush time set before a shutdown is triggered.
7	Calibration	50Counts	0 to 100counts	1count	A calibration option to zero the value read by the controller when at 4mA. Modifying this value will increase or decrease the live value to zero for the sensor at 4mA.

2.2.5 Digital Inputs



There is one digital input that can be utilized by the user. Digital input is triggered by a connection to the Battery negative or GND. Input is configurable for Normally Open or Normally Closed conditions, bypass upon start-up, and slush timers. User-definable name or label can be given to the input such that the eventual shutdown is as described by the user. E.g. Aux Digital 1 can be changed to "PIVOT STOP". The description is up to 12 characters and/or numbers.

Digital Input 1 can also be used to send a GSM Warning Only or Alternate Speed Input. See Section 1.5.8

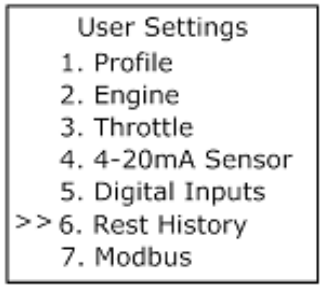
Item	Parameter	Default Value	Range	Change Amount	Function Description
1	Input Enable	Disabled	Enabled, Disabled	-	Enables or Disables the digital input.
2	Input type	Normally Closed	Normally Open Normally Closed	-	Normally Open: The switch closes to GND on the fault condition Normally Closed: The switch is disconnected from GND on the fault condition. (usually wired and set in this mode for failsafe operation)
3	Bypass Time	3min:00sec	00:00 to 20:00 Minutes	10secs	Digital input is ignored on engine start-up for the nominated period.
4	Slush Time	5secs	0 to 60secs	1secs	When the input is in the fault condition, a timer activates and the condition must remain for the full slush time set before a shutdown is triggered.
5	Shutdown Type	Shutdown Latched	Shutdown Latched Shutdown NON-Latched GSM Warning Only Alternate Speed	-	Shutdown Latched is recorded as a fault and the controller requires a RESET. Shutdown NON-Latched is a normal shutdown and will allow a restart when in Auto mode. GSM Warning: Will send a GSM TXT message if the 3G Modem is active, at any time the condition is met. Alternate Speed: When the Throttle type is set to GOTO FIXED RPM, on activation of this input the engine will throttle to the Speed defined in item 7. When the input returns to its normal state the engine will return to the defined "Engine RUN Speed".
6	Input Label	AUX. INPUT X	12 Characters and/or Number Combination	-	The message that appears for the defined input can be changed to suit the application to better describe the fault or shutdown condition. The text can be up to 12 characters made up of letters, numbers, spaces, and some symbols.
7	Alternate Speed	1200RPM	800 to 4000RPM	25RPM	When Digital Input has been defined as Alternate Speed and the throttle type is set to GOTO FIXED RPM. On activation of this input after the bypass period, the engine will throttle to the defined speed. When the input returns to its normal state the engine will return to the defined "Engine RUN Speed.

2.2.6 Reset Fault History

The Reset History function deletes the recorded engine and attached sensor faults the “panel” has detected.
This has no bearing on codes or faults that are recorded in an electronic engine (ECU).

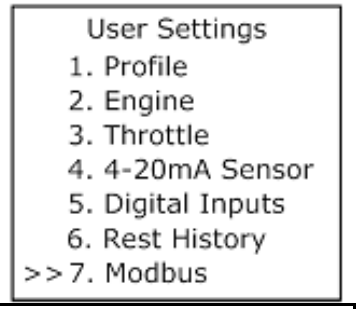
When the panel shuts down the engine on a “fault” condition it is recorded in non-volatile memory on the controller.
The fault description, engine hours, and position in history count.

These faults can be viewed on-screen or sent via RS232 to a PC with the program GUI interface.



To review the faults before deleting, at the main RPM screen press MENU then use the down arrow to option 6. Fault History and uses the ↑↓ button to scroll through the faults until the End of History prompt appears.

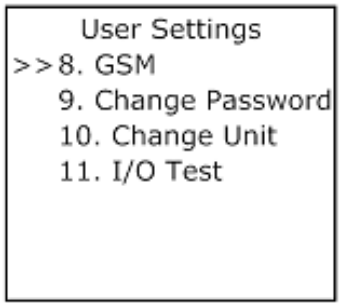
2.2.7 MODBUS Communication



This menu is used to set up the K101 Panel's MODBUS communication functionality. MODBUS data can be acquired from the controller for SCADA, PLC, or any other MODBUS-compliant telemetry system. The controller is always the SLAVE in the MODBUS relationship. A register list of all controller data is available on request. It is recommended that all registers are polled at once with a baud rate of 19200 or 9600, 8 data bits, 1 stop bit, and No Parity. The Master can poll the K101 as fast as every 2 seconds with a response timeout generally set to 1000ms. In multi-drop systems, it is best to have a polling time of 3 to 5 seconds.

Item	Parameter	Default Value	Range	Change Amount	Function Description
1	MODBUS Channel	RS485	RS485 RS232 (GSM Disable)	-	The K101 has one configurable communication port. When using the Kensho text modem RS232 must be selected. MODBUS can be either RS232 or Rs485
2	Slave Address	10	0 to 250	1	By default, the slave address is 10, but in RS485 systems where more than one slave device is present this value can be changed
3	Baudrate	9600bps	2400, 4800,9600, 19200 and 38400bs	-	Different baud rates are supported which may depend on the requirements of the master device, the distance between Master and Slave, or whether a wireless link is used. E.g. Packet Radio.
4	Diagnostics	-	-	-	This is a simple tool to indicate if the panel is receiving, decoding, and sending data. The counters for the Receive, Sent and Valid data will increase on a successful poll from the Master. Please note: If you are in a multi-drop system and the message received is intended for a different slave address, the receive counter will increase but a sent response will not be given.

2.2.8 GSM Parameters



The K101 GSM Modem facility allows registered users to start, stop and receive engine status information via GSM text messaging. Up to 5 users can receive messaging when the engine starts, stops or shuts down on a fault.

Up to 5 registered users can be entered in the controller always starting from User 1 and entering sequentially. The network Connectivity and Signal Strength of the modem are represented in the ICON Zone as shown in the Graphical LCD ICON Zone. It is recommended that a SIM card suitable for the region on a low-cost plan is used instead of a pre-paid and this is usually set up and managed by the end user. Messages to the unit from unknown users are ignored and deleted.

Please Note: Messaging is a carrier or network dependant. In low coverage areas or peak times, it may take up to several minutes for a message to be sent or responded to. The controller will make 3 attempts to send a message to each user.

Item	Parameter	Default Value	Range	Function Description
1	Active	Disabled	Enabled, Disabled	Disables or Enables the GSM Modem Function.
2	Message Enable	Enabled	Enabled, Disabled	If the panel is set to run on floats it may not be necessary to receive messages every time it starts and stop. Disabling Messages will only text on faults or INFO requests.
3	Site Name	Blank	Up to 8 Characters and Numbers	Can be set up to 8 character e.g. Engine 1, Station 3, DAM PUMP
4	Baudrate	38400bps	2400,4800,9600,19200 and 38400bps	The default is 38400bps—if there is a reason to slow down communications it must be done within the modem and saved before changing the panel to suit.
5	Bootup delay	15secs	0 to 20secs	Some modems take longer to boot than others and allow a boot time before we begin communicating. If the modem does not connect try extending this time to the maximum.
6	Security Lock	Disabled	Enabled, Disabled	Can be locally or remotely locked such that no one can operate the engine. The password may be changed until unlocked.

7	User Phone No. 1	+61 ##########	Mobile number in international notation.	Enter a mobile for the registered users e.g. +61457123123 for each user. Leaving a user +61############ disables the user but there should be no gaps in user positions i.e. if there are 3 users they must be in positions 1,2 and 3.
8	User Phone No. 2			
9	User Phone No. 3			
10	User Phone No. 4			
11	User Phone No. 5			
12	Ini GSM Modem	-	Yes, No	Forces an initialization on the modem. It may take up to 2 minutes to run this procedure.

2.2.8.1 Instruction for GSM

Authorized Users can use the following commands to control the engine. The Text messages must appear as below with no spaces and it is case sensitive.

Commands

Item	Command	Command Description
1	START	Text command to Start the engine.
2	STOP	Text command to Stop the engine.
3	ESTOP	Text Command to Stop the engine in latched shutdown. Please note that there will be no cooling down period for EStop.
4	INFO	Real-time status giving engine and pump information including RPM, Volts, Load, Fuel Rate, Oil Pressure, Engine Temperature, Hours, Pump pressure, etc.
6	LOCK	Text command to remotely enable the Security Lock.
7	UNLOCK	Text command to remotely disable the Security Lock

Basic Operation

To START the Engine/Pump via a text message.

1. If your phone number is entered in the panel send “START” via text message to the controller
2. If a message is sent and received successfully by the controller the engine will start as per normal operation. Once the engine is running, the programmed users will be each sent a message in the order they are entered.

e.g. PUMP 1 ENGINE RUNNING

To STOP the Engine/Pump via a text message.

1. If your phone number is entered in the panel send “STOP” via text message to the controller.
2. If a message is sent and received successfully by the controller the engine will stop as per normal operation. Once the Engine has stopped the message Sending SMS ICON will appear and the programmed users will be each sent a message in the order they are entered.

e.g. PUMP 1 ENGINE STOPPED – STOP via SMS

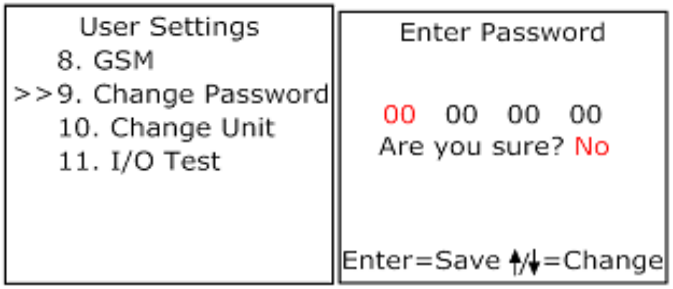
FAULT Text Messages

- If the Engine Stops on a fault, for example, Low Oil Pressure a message will be sent
  - e.g. PUMP 1 ENGINE STOPPED – Low Oil Pressure
  - e.g. PUMP 1 ENGINE STOPPED – High Temp
  - e.g. PUMP 1 ENGINE STOPPED – Low Pump Pressure.
- If there is an active ECU Fault message with SPN and FMI code will be sent to the users.
- If the battery voltage drops below a certain level a message will be sent to the users indicating low battery status.

Note: The modem operation is subject to the network provider and signal strength in the area. Please ensure that you have a SIM Card that best works in the area and that The Modem Antenna is mounted in the best position to receive network coverage. On power up of the controller – please wait until the Signal strength is not “X” as commands from the controller will timeout and may not be sent if there is no coverage. The controller will attempt to send a message 3 times in 20second intervals if a message sent response is not received by the network. This may occur in times of high network traffic or poor coverage.

2.2.9 Change Password

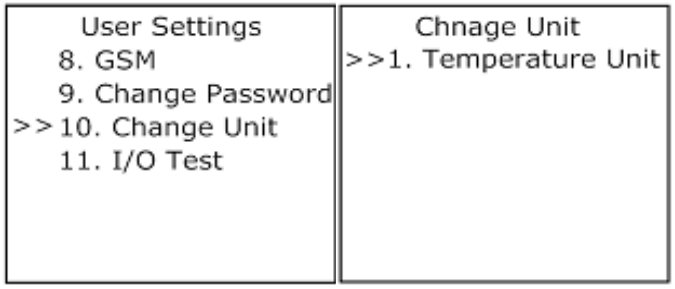
The user can change the password from the default and provide added security such that only authorized users can change settings in the panel.
Please note: that once the password has been changed, the user is responsible for remembering the new password and limiting its distribution to authorized users only.



Press ENTER then up and down to input a new password and select Yes, then press ENTER to set this new password.

2.2.10 Change Unit

This item allows the user to change the temperature units from Celsius to Fahrenheit or vice Versa.
To access the Change Unit menu press the Enter button and select item 10.

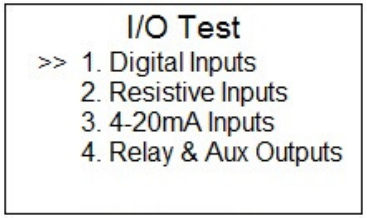


Item	Parameter	Default Value	Range	Change Amount	Function Description
1	Temperature Unit	Celsius	Celsius, Fahrenheit	-	Changes the reading to the desired unit.

Once users change this setting, all the other settings which relate to temperature will update their value to the current unit automatically. It is still better for users to check those settings such as engine temperature, pump temperature, and so on.

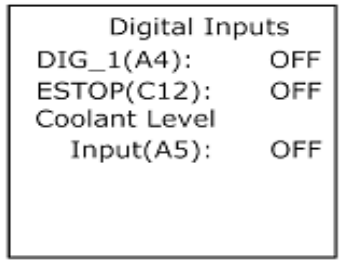
2.2.11 I/O Test

Please note that the user must disconnect all connections between the control panel and engine especially outputs before entering the unit test screen.



Select the “I/O Test” menu option and press ↑↓ then ENTER on the item you wish to test.

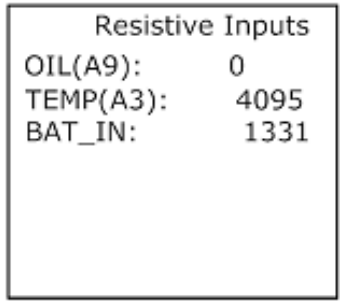
Please refer to your specific panel schematic for circuit name e.g. Schematic circuit and settings configuration as to what Inputs, Outputs, Communications, and CAN functions are available and in use.



Select 1.“Digital Inputs” and press the “Enter” button, the screen will display the state the digital inputs are currently in.

OFF = Open Circuit, ON = Closed Circuit.
e.g.

- DIG_1(A4) Connect this input to GND and see the change of State from OFF to ON.
- Only the Coolant Level Input is ON open circuit as the normal condition is Closed.
- EStop expects a connection to Battery positive.

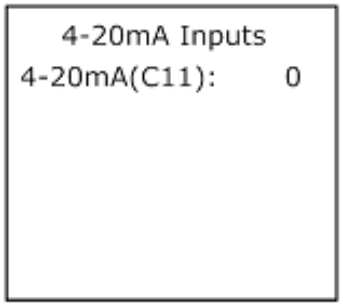


Select 2.“Resistive Inputs” and press the “Enter” button, the screen will display the raw 12bit analog value.

The range of the analog value is from 0 to 4095 (12bit) for Resistive sensors - coolant temperature, oil pressure, and Battery input Raw, except for OIL(A9) which is from 0 to 1371, when selected as Resistive.

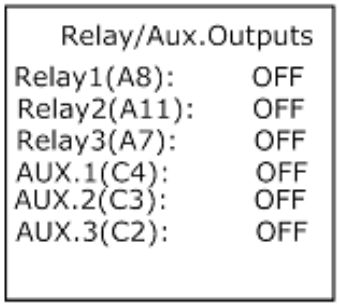
When Oil Pressure is selected as 0-5V, OIL(A9) is 0 when open-circuit or shorted to ground as this is an active 0 to 5VDC sensor. Its range is 0.5 to 4.5V

If a value is shown other than open or closed e.g. 2831 then the sensor is connected and the resistance of the sensor is correctly calculated. At this stage, you can go to the relevant sensor screen and see temperature, fuel, or pressure values.



Select 3.“4-20mA Inputs” and press the “Enter” button, the screen will display the raw 12bit analog value.

- The range of the analog value is 0 to 4095 (12bit).
- The 4-20mA Sensor input already has the load resistor and when not connected will be pulled down to 0V and will show 0 counts.
- At 4mA the sensor will show approximately 820 on this test screen. Shorted to a positive source will show close to 4095.



Select 3.“Relay & Aux Outputs” and press the "Enter" button, the screen will display the output state of the Relay or Aux Output.

- The Relay Output will be Battery Positive when ON and the Aux output is closed or sunk to the ground (Battery negative).
- Please check your specific circuit as the Auxiliary outputs may be connected to relays or other internal devices.
- When Entering this screen all outputs are switched OFF. By Pressing the ENTER button on this screen you will sequentially turn on each output one by one.

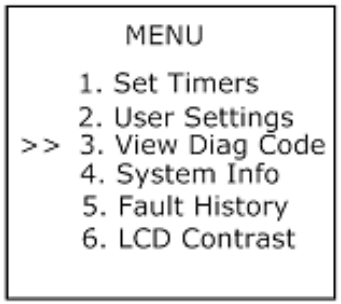
Please note: A8 and A11 are Fuel/IGN and Crank respectively and will cause the fuel solenoid/ECU ignition and crank to become active.

C3 is maybe connected to an external relay for an engine running output.

Warning: Please disconnect the output harness when doing the 'Relay and Aux Outputs' test to avoid unexpected operation on the engine!

Please note that all the submenus and setting screens except the I/O Test screen will jump out to the main RPM screen automatically if the buttons are not activated for one minute. And when the I/O Test screen is displayed, the engine cannot start by any start triggers even if the condition meets.

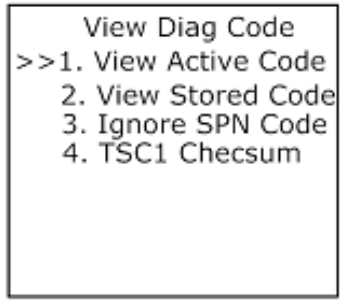
2.3 ECU Warnings and Faults



The K101 talks directly to the ECU of an electronic engine over a CAN network using the J1939 protocol. The controller derives all of its engine information from the ECU and also requests some vital information when required.

The ECU also has a method of reporting faults under this protocol when there is a problem with the engine.

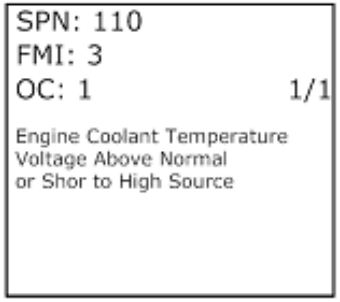
When the ECU is currently sending a live message to the controller this is referred to as an Active Diagnostic Trouble Code which we can view in '1. View Active code'.



Any codes that were once active and are now rectified are committed to the memory in the ECU and are called “previously active “ or “stored” codes. The K101 can request this information from the ECU and display the information on the LCD screen. Go to 2. 'View Stored' and press ENTER where the message “Requesting Stored Code” will appear and the ECU will respond with the required data. If the request does not get serviced a “Request Timeout” message will appear.

The Active or Stored codes are made up of an

SPN: Suspect Parameter Number.	Defines the area of the problem e.g. Oil Pressure
FMI: Failure Mode Identifier	Describes the type of problem e.g. Data Valid but below the normal operating range
O/C: Occurrence Count	Describes how many times this fault has occurred.



Most all engine manufacturers comply with the J1939 standard and use the same SPN and FMI numbers to identify the type of fault on the engine.

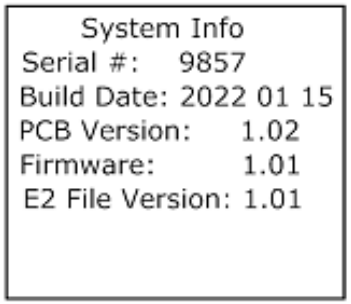
E.g. SPN 100 Engine Oil Pressure, SPN 110 Engine Coolant Temperature

In the 'Ignore SPN' menu, the user can enter five different SPNs, the controller will ignore the first four SPN from the engine and the fifth option is any SPN greater than the number entered will be ignored.

The TSC1 Checksum menu is to enable or disable the checksum on the TSC message, as some ECU does not like the checksum on the TSC message, the user can disable or enable depending on the ECU connected.

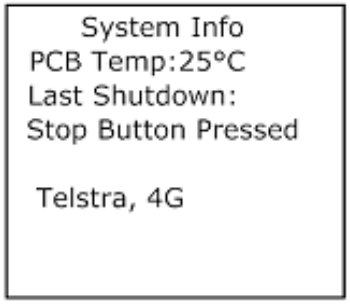
2.4 System Information

System Info provides the controller details, status information, and ECU J1939 information.



To Navigate through System Info use the Up and Down arrows.

Serial #	The electronics or module serial number
Build Date:	The manufacturing date of the module.
PCB Version:	The hardware version of the controller
Firmware:	The current software level of the controller. (PC GUI Updatable)
The E2 File version	The Graphical, LCD ICON version. (PC GUI Updatable)

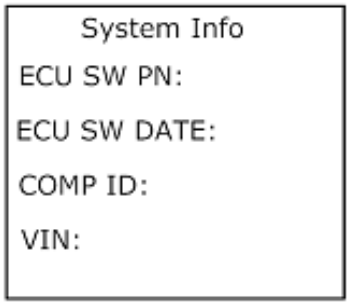


PCB Temp	The internal temperature of the module. (It may be a few degrees higher than the outside temperature).

The last Shutdown describes the reason for the last engine stop which could be a normal shutdown (buttons or remote input) or fault shutdown(engine or added sensors). Refer to Section 11 for full descriptions.

If the GSM modem is connected to the panel and a signal is present it will say something like "Telstra, 4G", representing it is connected to Telstra and it is 4G at the moment.

When connected to an Electronic CAN J1939 engine some data can be obtained from the ECU about the engine details including ECU part number, Firmware or Software date, composition ID, and engine vehicle identification number.

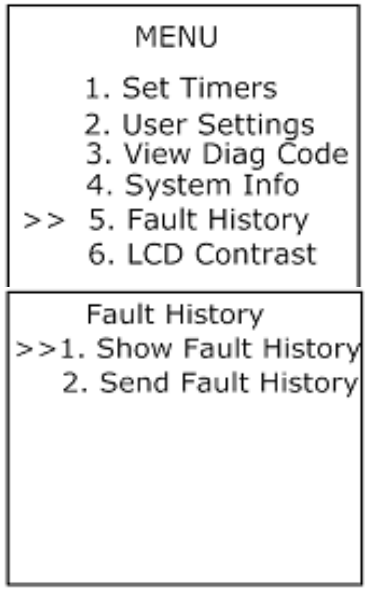


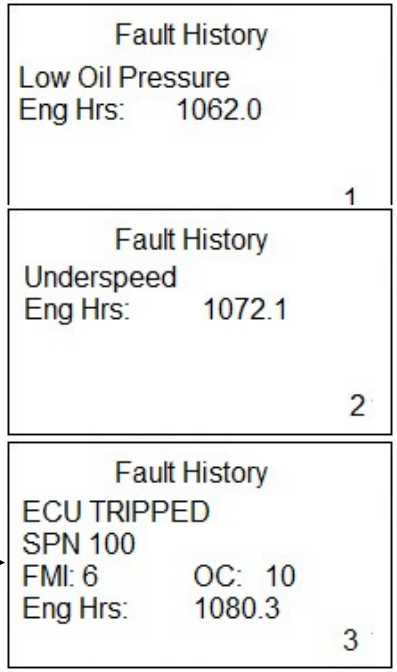
2.5 Fault History

The controller fault history records shutdowns instigated by the controller. The shutdowns can be engine or any user-activated sensors such as 4-20mA Sensors, Fuel Level, pump temperature, flow switch, gearbox temperature, etc. Up to 20 events are recorded and the fault is logged along with the engine hours it occurred. 2. Send Fault History requires the PC GUI and computer.

A shutdown of the engine can be instigated by the protection in the ECU, and in this case, it may appear as an ECU Tripped, Under speed or CAN Data Lost.

E.g. If the ECU self-protection shuts the engine down on Low Fuel Pressure Metering Rail 1.





Once in Show Fault History menu use the up and down arrows to scroll through the faults.

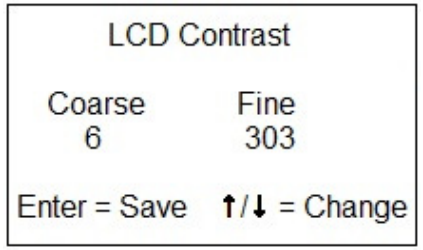
Event Numbers shows the sequence of the Faults.

The Engine Hours can show the pattern of how often a particular fault has occurred indicating to the user that needs to be paid and a service may be needed.

The controller may also record a shutdown event where an active J1939 code was present at the time of shutdown. Any SPN and FMI code is ECU generated and you may need to contact the engine manufacturer to rectify the fault.

2.6 LCD Contrast

The contract of the text can be lightened or darkened by entering this menu and adjusting the number Coarse Value between 2 to 6 and the fine value between 20 and 63 by using the up and down arrows. Please note, that the lightest setting or darkest settings may be unreadable depending on temperature.



3 Early Setup Parameters

The Early Setup parameters can be accessed by turning off the controller, as you turn the controller ON by pressing the MENU and ENTER buttons at the same time just as the "ENGINE CONTROLLER" text appears on the screen.

As same as User Settings, these parameters are to be changed by qualified and authorized users only. Please refer to your deal and /or engine manufacturer before making changes to any of these settings. Incorrect settings may produce undesirable results.

Item	Parameter	Default Value	Range	Change Amount	Function Description
1	TSC1 Address	234	0 to 254	1	Torque/Speed Control address in the ECU to which throttle messages are directed. Refer to the engine manufacturer for the address information. If the address does not match the ECU then no speed control will occur.
2	TSC Control Mode	205	0 to 254	1	The governing method, speed, or torque. Refer to the engine manufacturer for the address information. If the governed type is not set correctly the engine may not run to the speed defined.
3	TSC1 Trans, Rate	20ms	10 to 50ms	10ms	The TSC1 Message rate must be sent at a particular speed, if the message speed is too slow the ECU will revert to its alternate throttling method. An ECU Warning may be presented in this case e.g. SPN 639 FMI 9
4	SPN Conversion	4	1 to 4	1	Under the J1939 protocol, there are 4 methods of conversion. Most engine manufacturers are at method 4. Some Mercedes engines may use 2.
5	ECU Warnings	Treat as Shutdowns	Treat as Shutdowns Treat as Warnings	-	The panel can treat ECU Earnings as a fault condition and shut down the engine. If the ECU presents an SPN for Oil Pressure, Coolant Temp, Oil Temp, or Coolant Level these will be treated as a shutdown. This is an added level of protection for the engine is desired.

6	ECU Shutdown Time	10secs	10 to 60secs	1sec	If the ECU Warning is treated as a shutdown the panel will wait for the set period before shutting down to allow the ECU to process the fault.
7	Read Volts From	Read ECU Voltage	Read ECU Voltage Read from Panel	-	Some J1939 ECU does not transmit a battery voltage. In this case, the panel monitors and displays the battery voltage of the system.
8	R3 Function	Engine Running	Engine Running, Common Alarm, Not in Auto, Low Fuel, Disabled	-	Gives a grounded output on output two when an early Setup parameter option chosen has become true.
9	Set Engine Hours	NO	No, to Hours Set	5hours	For a mechanical Engine, the engine run hours can be set or reset on the controller.
10	Set Aux Hours	NO	No, to Hours Set	5hours	For any driven equipment, the hour runs can be set or reset on the controller.
11	Asset Tag Num	0	0 to 10000	1	Used in MODBUS this register can be used to give a unique number for the asset being monitored via MODEM or SCADA system.
12	Toggle SW Max Point	Disabled	800RPM to Overspeed RPM	25RPM	When an RPM value has been set the user will be unable manually ramp past this point. This may be used to stop users from running over the pump curve RPM.
13	Engine Type	Generic	Generic, Scania, Volvo, Cummins, Wechai	-	Allow selecting which engine type to be used in the early parameters setup. E.g. Cummins, Caterpillar, Mercedes, Perkins, Yamaha, Deutz etc

4 MODBUS Registers

MODBUS Setup	Default Settings
Standard MODBUS RTU format.	
Baud 2400, 4800, 9600, 19200, 38400	9600bps
Data Bits 8	8
Stop Bits 1	1
Parity None	None
Slave MODBUS Address Engine 1 (Adjustable)	10

Data accessible via MODBUS

MODBUS	K101 Terminal	Description	Range	Resolution
40001	J1939	Percent Load	0-125%	1%//bit
40002	J1939	Engine RPM	0-8131.875RPM	0.125/bit
40003	J1939	Total Engine Hours LSB	0-210554060.75Hrs	0.05Hrs/bit
40004	J1939	Total Engine Hours MSB		
40005	J1939	Engine Coolant Temp	-40c -210c (410F)	1'c/bit (-40c offset)
40006	J1939	Engine Oil Temp	-273c-1735c	0.03125c/bit (-273c Offset)
40007	J1939	Engine Oil Pressure	0-145PSI	4kPa/bit 0.58015psi/bit
40008	J1939	Coolant Level	0-100%	0.4%/bit
40009	J1939	Fuel Rate	0 - 3212.75L/H	0.05L/H /bit
40010	J1939	Boost Pressure	0 - 72.5PSI	2kPa/bit 0.29007psi/bit
40011	J1939	Intake Manifold Temp	-40c – 210c	1'c/bit (-40c offset)

40012	J1939	Electrical Potential	0.00 – 3212.75VDC	0.05V/bit
40013	J1939	Battery Potential	0.00 – 3212.75VDC	0.05V/bit
40014		Pressure or	0 to 3200 KPA	1KPA/bit (-256offset)
		Flow	0 to 1000 L/S	1L/S /bit (-256offset)
40015		RESERVED		
40016		RESERVED		
40017		Pump Temp	0 -150'C	1'c/bit (-40'c offset)
40018	J1939	Machine Hours LSB	0-210554060.75Hrs	0.05H/bit
40019	J1939	Machine Hours MSB		
40020	------	Remote Start/Stop	0xAA = Start 0x55 = Stop	** Write to Controller
40021	------	Force Reset/Auto mode	0x66 = Reset 0xBB = Auto mode	** Write to Controller
40022	------	Auto/Manual mode	Bit 1 1 = Auto 0 = Manual Bit 2 1 = Engine Running Bit 3 1 = Warm Up Bit 4 1 = Engine Line Fill Bit 5 1 = Cool down Bit 6 1 = Common Alarm	
40023	------	Configuration #	0-65535	** Write to Controller
40024	------	Asset Tag)	0-65535	Asset/Pump Number
		Mechanical Engine Data		
40025		Engine Pressure (MECH)	0 – 145 psi	2.91psi/bit
40026		Engine Temp (MECH)	-40c -210c (410F)	1'c/bit (-40c offset)
40027	------	Battery Volts (MECH)	0.00 – 3212.75VDC	0.05V/bit
40028		Engine Speed (MECH)	0-4000RPM	0.125/bit

40029	------	Eng Hrs LSB (MECH)	0-210554060.75Hrs	0.05H/bit
40030	------	Eng Hrs MSB (MECH)		
40032		RESERVED		
40033		RESERVED		
40034		RESERVED		
40035		RESERVED		
40036		RESERVED		
40037		RESERVED		
40038	J1939	CAN SPN		
40039	J1939	CAN FMI		
40040		RESERVED		
40041		RESERVED		
40042		RESERVED		
40043		RESERVED		
40044		RESERVED		
40045		RESERVED		
40046		RESERVED		
40047		Heart_Beat	Continuously changing counter	
40048		RESERVED		
40049		RESERVED		
40050		RESERVED		
40051		RESERVED		
40052		RESERVED		
40053		RESERVED		

40054		RESERVED		
40055		RESERVED		
40056		Auxiliary Digital Input 1 Active Low	Bit 1 1 = Active 0 = Not Active Bit 2 1 = N0 0 = NC	
40057		RESERVED		
40058		RESERVED		
40059		Firmware Version		
40060		Coolant Level Probe	Bit 1 1 = Active 0 = Not Active	
40061	-----	Status/Fault Code Output	0 = Normal Operation 1 = Low Oil Pressure 2 = High Engine Temp. 3 = N/A 4 = N/A 5 = Alt Failure 6 = Coolant Level Low 7 = Overspeed 8 = Underspeed 9 = Bad or NO RPM 10 = Failed Crank Attempts 11 = Aux. Input 1 12 = N/A 13 = N/A 14 = N/A 17 = Low Pump Pressure 18 = Max Pump Pressure 19 = CAN BUS Failure 20 = N/A 21 = Internal Protection 23 = Check ECU Codes 24 = Timer Complete 25 = Normal Shutdown 25 29 = Low Flow 30 = High Flow 31 = N/A 32 = Normal Shutdown 32	8bit code number

*(NC = Normally Closed, NO = Normally Open)

Register 61 is the status and fault code register. When the register has the value:

0 The panel is in normal operating mode with no faults.

24 The panel has shut down due to a Set Stop Timer completion. In Auto, the Register will show 24 for the stabilization period and return to 0. In the manual, it will remain until reset.

25 The panel has shut down due to the stop button being pressed. It will return to 0 after the stabilization time has elapsed.

32 The panel has shut down due to the remote or normal stop when in Auto Mode.
It will return to 0 after the stabilization time has elapsed. All the remaining in Register 61 table, shown above, are fault-related shutdowns. The fault value will remain in this register until the panel has been reset.

Standard polling:
It is recommended as a default - 9600bps, 8 data bits, 1 Stop bit, and No parity. Where possible, poll all 61 registers starting from 0 at the address set in the controller.

The fastest polling peer-to-peer can be every 2 seconds with a minimum response timeout of 1000ms. Longer polling periods are recommended for Multi-drop systems. i.e. multiple slaves when using RS485. (Communication ports for RS232 or RS485 can be selected in the panel.)

Writing to the Command Registers:
To perform a write to the controller that will be recognized you must change or increment the value in the configuration register. Register 40023. This configuration number change stops multiple or accidental writes and actions to the controller.

The number in the configuration **Register 40023** must be changed or incremented.
Then a write to the Start Register can be initiated.
i.e. **Register 40020** 0xAA (Start)

The number in the configuration **Register 40023** must be changed or incremented.
Then a write to the stop Register can be initiated
i.e. **Register 40020** 0x55 (Stop)

The number in the configuration **Register 40023** must be changed or incremented.
Then a write to the Force Reset Register can be initiated.
i.e. **Register 40021** 0x66 (Force Reset)

Depending on your SCADA/PLC or MODEM system you may need at least 500ms between sequential writes to the K101 taking into account the time it takes for the K101 to respond.

Remote RPM Register 40048
When running to MODBUS CONTROL a write to this register will change the nominated run speed that the engine will run to. This does not require a write to the configuration register BUT there are safeguards in place to ignore erroneous writes. The write will only be recognized or acted on when the engine is running and validated by the controller. If for example, a message is read that is outside the engine Idle or engine Overspeed panel set points then the message is ignored and not saved. The engine will either retain the current run speed or move to back to the internal Engine Run Speed set in engine parameters.

EXAMPLE: STARTING in via MODBUS.
You must perform the following sequence.
1. The number in the configuration register 40023 must be changed or incremented.
   Write a number to 40023. Allow the allocated response time.
2. Write to the start Register i.e. 40020 command 0xAA (Start)

Check Register 40022 if you have the engine running Bit or the RPM register.

5 Fault and Last Shutdown Messages

Last Shutdown Message	Description
Stop Timer	Normal Stop – Shutdown on Set Stop Timer
Stop Button Pressed	User Stopped by Keypad button
Pump Pressure (Normal)	Normal Shutdown on pressure set point
SMS Command	Normal stop via SMS Text Message
SMS Emergency Command	Alarmed Shutdown via SMS Text Message
MODBUS Command	Shutdown via MODBUS (PLC, SCADA, or Website)
AUX. INPUT 1 (user configurable)	Normal or Fault shutdown on Digital Input 1
Over Speed	Fault Shutdown on Engine RPM Overspeed
Under Speed	Fault Shutdown on Engine RPM Underspeed
Coolant Temp Abnormal	Fault Shutdown on High Engine Coolant Temperature
Low Oil Pressure	Fault Shutdown on Low Engine Oil Pressure
Coolant Level Low	Fault Shutdown on Low Coolant Radiator Level
Pump pres max alarm point	Fault Shutdown on High Discharge 4-20mA Pump Pressure
Pump pres min alarm point	Fault Shutdown on Low or Loss of 4-20mA Pump Pressure
Flow max alarm point	Fault Shutdown on High Flow L/S (4-20mA Sensor)
Flow min alarm point	Fault Shutdown on Low Flow L/S (4-20mA Sensor)
Flow Switch Shutdown	Fault Shutdown on Low Flow Switch
Max Crank Attempts	Engine start Attempts exceed
E-Stop Button Pressed	Stopped by Emergency Stop or Isolated power
ECU TRIPPED	Shutdown by J1939 CAN SPN, FMI Active Fault

CAN Data Lost	Fault Shutdown because J1939 CAN is lost
Switch Power In Turn Off	Stopped by Power **ON**/**OFF** Toggle Switch

Fault and Last Shutdown messages shown in the System Information can be either on a “Normal Shutdown” operation or a protected Latched Fault Shutdown.

Fault Shutdowns and the toggle “Switch Power In Turn OFF” are shown in the Last Shutdown in the System Info screen and also recorded in the Fault History against engine hours.

6 Glossary of Terms

Auto Mode
When the controller receives a start input signal from either MODBUS or GSM Modem. If the throttle feature is active it will throttle to what has been set. All engine and pump protection are active.

Manual Mode
The mode in which the panel will only start and stop from the Manual Start button and Stop button on the keypad. If enabled, throttling is done manually by the user with the toggle switch. All engine and pump protection are active.

Engine Run Speed
The Engine speed or RPM of the controller will automatically throttle to Auto Mode only.

Speed Source
Defines the Engine Type and where the tachometer (Engine RPM) receives its data.
E.g. J1939 CAN BUS, Alternator W+, or Magnetic Pickup.

J1939 CAN BUS
Electronic Engine communication protocol. Engines are fitted with an ECU (Electronic Control Unit) that supports the J1939 Engine protocol.

ECU Warning
A warning message, generated by an Engine ECU over J1939 CAN BUS to the control panel.

ECU Stop
A critical error message, generated by an Engine ECU over J1939 CAN BUS to the control panel.

SPN
Suspect Parameter Number: Describes the specific area of the source of a fault.

FMI
Failure Mode Identifier: Defines the type of fault for the SPN generated.

O/C
Occurrence Count: Defines how many times the SPN and FMI combination has occurred on the engine.

Magnetic Pickup
is an inductive sensor that is placed over the teeth of a flywheel which generates a tachometer output.

Pulses per REV. (Pulses/Revolution)
Calibration unit for an Alternator or Dynamo/Regulator for the Tachometer output.

Underspeed
Low tachometer (RPM) alarm point to which the controller will shut down the engine.

Overspeed
High tachometer (RPM) alarm point to which the controller will shut down the engine.

Start Speed
The nominated Engine RPM at which the controller will disconnect the crank signal to the starter motor upon engine startup.

Lockout Delay
On engine start-up, the engine and some pump sensors are NOT monitored or “locked out” for the set period. Once the delay has elapsed engine and pump protection monitoring is active.

Warm Up Time
The time the engine will remain at IDLE, when in Auto Mode, before running to a higher engine RPM. This allows the engine to get to operating temperature before running at a higher RPM with a load.

Cooldown Time
The time the engine will run at IDLE before shutting down. Also known as a turbo timer.

Bypass Time
The initial time that a given sensor will NOT be monitored after an engine start.
Once the bypass time has elapsed the given sensor protection will become active.

Slush Time
The continuous time at which a given sensor is beyond the alarm point to trigger an action or engine shutdown.

4-20mA Sensor
A universal standard for a device that has a variable current output between 4mA and 20mA. E.g. Pump Pressure Sensor 0 to 2500KPA , 4mA = 0KPA, 20mA = 2500KPA

Controlled Shutdown
When throttle control is enabled and there is a call to stop the engine, the system will return to engine idle after a cool-down before shutting down.

Immediate Shutdown
The controller when called to stop the engine will shut down immediately with no cool-down.

Digital Input
A “switch” type is input to the controller, which is either on or off.

Analogue Input
A variable signal is an input to the controller from a Resistive or 4-20mA Sensor, allowing a readable value on the LCD screen.

MODBUS (Modicon Communication BUS)
A standard communication protocol. Commonly available means of connecting industrial electronic devices.

IMT
Intake Manifold Temperature: Temperature of pre-combustion air found in the intake manifold of the engine air supply system

CL
Coolant Level: Ratio of the volume of liquid found in the engine cooling system to the total cooling system volume.

Limited Warranty

Contact your dealer with any warranty queries or claims.

- This warranty runs for 12 months or 1000 engine operating hours (whichever occurs first) from the date of purchase.
- Warranty or repair is specifically “Return to Base”.
- Any on-site work must be authorized before work commences.
- For a full description of the Warranty Please contact your local dealer.

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