

Remko K27 (EC270) Engine Control Panel Operations Manual

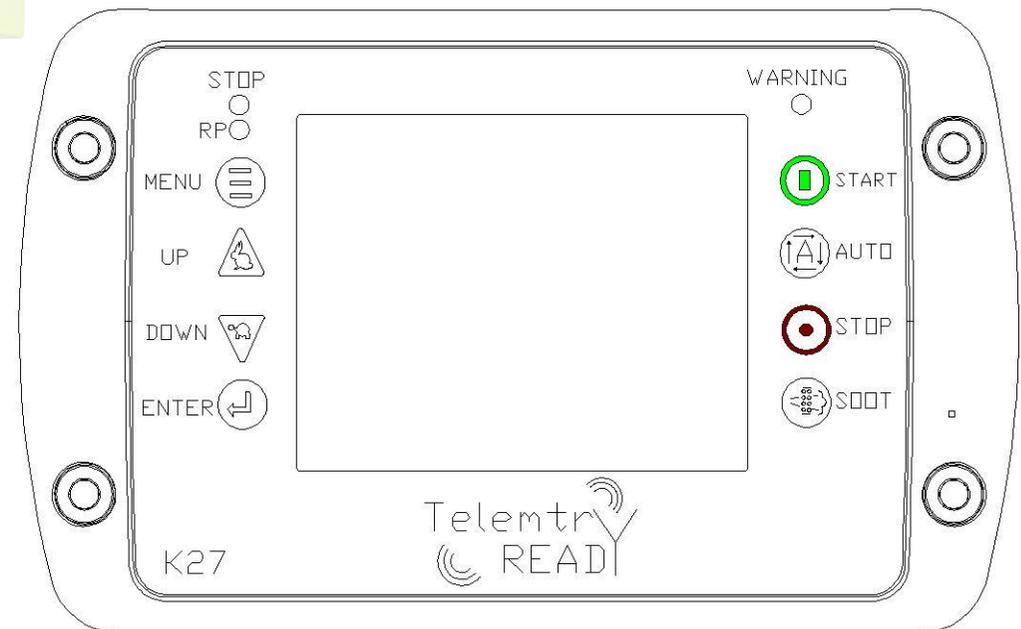


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WARNING

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.

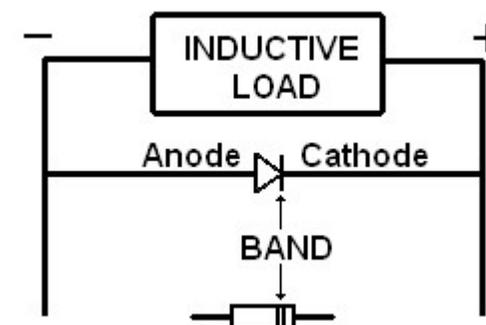
Prior to Engine Ignition

- 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 fly-back 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, free-wheeling 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

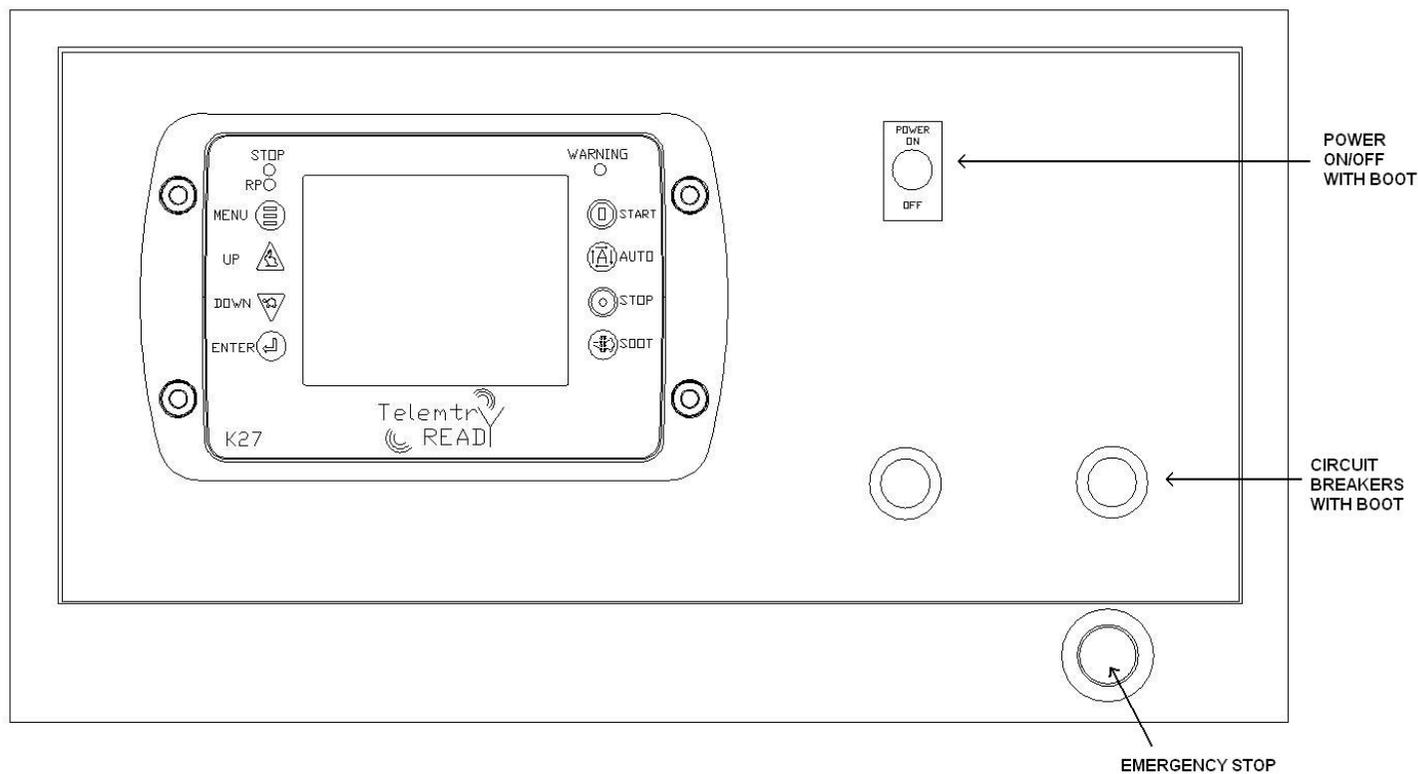
- When mounting and during the life of the controller, please avoid subjecting the controller to external elements including excessive heat, oil, dust, vibration, and rain. **It is mandatory that vibration mounts are used when mounting the K27 control panel to an engine or engine base.**
- High-pressure 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 K27 Control Panel

- Operates with both J1939 Electronic ECU and Mechanical Engines using applicable wiring harness.
- 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 rate.
- 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.
- 8 x Interface buttons for clear, easy control.
- Adjustable 100-Hour Run Timer.
- 1 x Fuel level analogue input designed for resistive fuel level Senders.
- 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.
- Remote Start/Stop ability using external switching device e.g. Water Float
- 1 x Relay output used to control ECU power or fuel stop solenoid including Energize to Run or Energize to stop functionality.
- Analogue sensing for Pump Temperature with the adjustable set point.
- Flow Switch input with adjustable bypass and slush timers. Configurable input type.
- 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.
- 4 x grounded digital inputs with individual re-naming capability.
- Mechanical Engine throttle control available with PWM additional module.

1 Interface Panel

1.1 Control Panel Layout (K27 only)



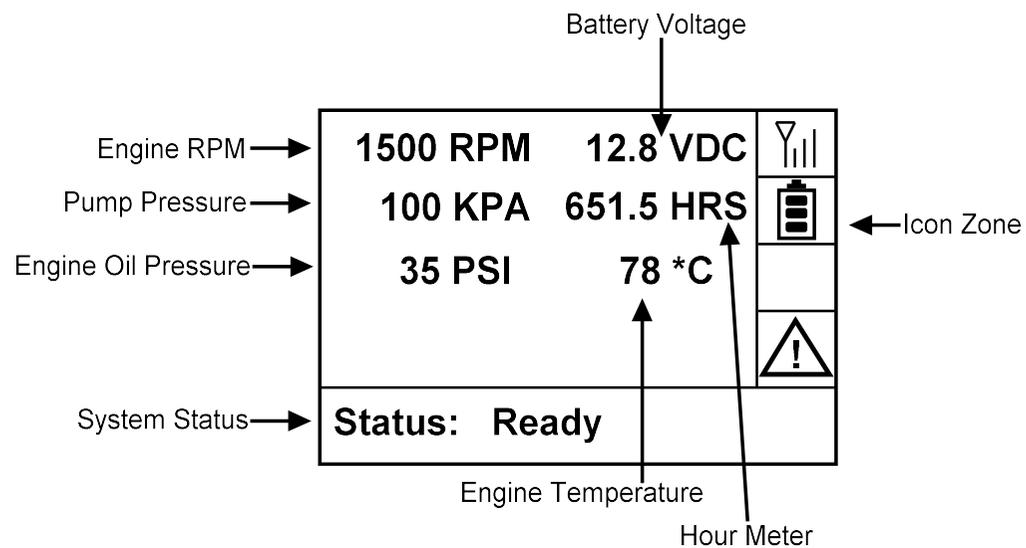
1.1.1 Graphical LCD Layout

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.



1.1.2 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 the decreasing of various values. This is signified on the screen by ↓. When the throttle is active the down button will decrease engine speed in Manual Mode.
UP 	The UP button allows for scrolling through menu items and the increasing of various values. This is signified on the screen by ↑. When the throttle is active the up button will increase engine speed in Manual Mode.
ENTER 	The ENTER button is used to alter values and confirm changes. Pressing this button in the main menu will enter a sub menu.
AUTO 	The AUTO button will place the K27 into Automatic mode. Holding the AUTO button will start the engine in AUTO mode thus enabling the automatic throttle operation on an electronic engine or a mechanical engine with PWM and Actuator Control.
STOP 	The STOP button will stop the engine. The Engine Cool down Timer will commence. Pressing STOP a 2 nd time will bypass the Cool down timer and stop instantly. This will place the controller back into Manual Mode.
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 or mechanical engines with a throttle actuator.
SOOT 	Button used ONLY for Tier 4 emission engines. (Future Implementation) Pressing this button can cancel or force a diesel particulate regeneration sequence.

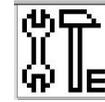
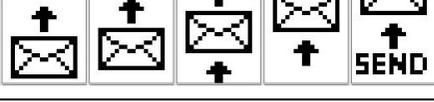
1.2 Interface LEDs and LCD Display

1.2.1 Warning and Fault LEDs

Color/State	K27 Status
Steady Amber	ECU Engine Warning.
Steady Red /Flashing RED	ECU Engine Fault./ Shutdown Fault

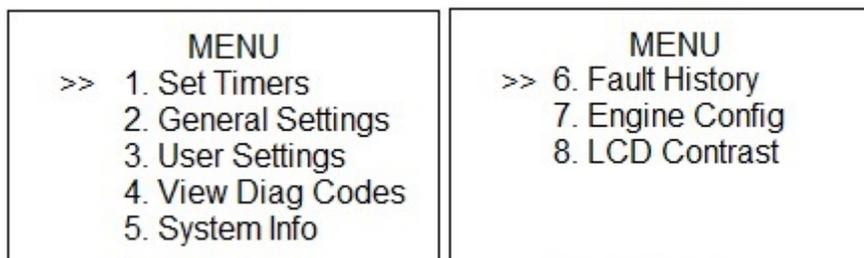
1.2.2 Icon Indication

	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 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 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 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.

	<p>Engine DATA is Derived from CAN J1939 BUS. Please note, if MODBUS and CAN are enabled together these symbols will appear in the one box.</p>
	<p>Engine DATA is Derived from CAN J1939 BUS. Please note, if MODBUS and CAN are enabled together these symbols will appear in the one box.</p>
	<p>Animated Hour Glass ICON when 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</p>
	<p>The Maintenance Timer for the Engine has elapsed indicating a service is due. It will disappear when the timer is RESET or disabled.</p>
	<p>The Maintenance Timer for the Pump has elapsed indicating a service is due. It will disappear when the timer is RESET or disabled.</p>
	<p>The Maintenance Timer for the Engine and Pump have elapsed indicating a service is due on both elements.</p>
	<p>Animated ICON when the GSM Text messaging system is enabled and messages are being sent to the users set in User Settings —>GSM.</p>
	<p>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.</p>
	<p>Appears when engine load is greater than 90%, and will blinking if greater than 95% as warning.</p>

1.3 Menu Screens

The K27 can be configured by accessing the menu items shown on the following LCD screen.



1.4 Set Timers

In the Set Timers menu the Set Stop Timer is configurable up to 100 hours when running in Auto or Manual. 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 in manual and it will only run for a preset time unless no other stop condition exists.

When in Auto, e.g. starting on a float, it can also limit the run time unless the stop float is initiated. Whichever occurs first.

The Timer can be adjusted before the engine starts and will count down on every start when enabled. It can also be adjusted while the engine is running and will begin the count down from the new time entered.

The stop timer can be viewed on the third line by pressing the ENTER button only while the engine is running.

During this time the animated hour glass icon will be present in the ICON ZONE.

Aborting or cancelling the timer can be done at any time by disabling the Timer function.

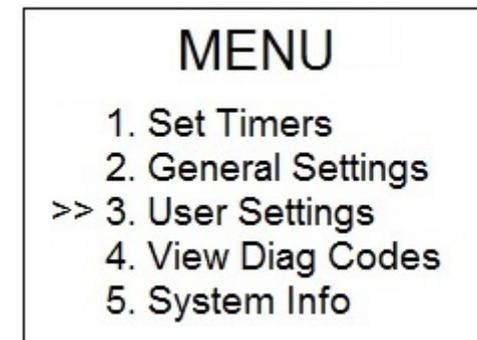
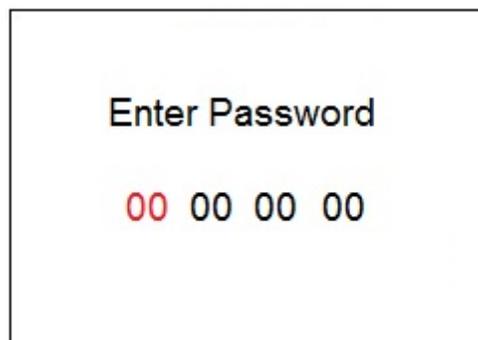
1500 RPM	12.8 VDC	
100 KPA	651.5 HRS	
35 PSI	78 °C	
Status: Running		

1.5 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 be blinking. 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  and  to cycle through all available menu headings as per below.

<p>User Settings</p> <ul style="list-style-type: none"> 1. Profile >> 2. Engine 3. Throttle 4. 4-20mA Sensor 5. Fuel Level 	<p>User Settings</p> <ul style="list-style-type: none"> 6. Pump Temperature >> 7. Flow Switch 8. Digital Inputs 9. Reset History 10. Start Type
<p>User Settings</p> <ul style="list-style-type: none"> 11. Modbus >> 12. GSM 13. Aux Hour 14. Maintenance 15. Language Setting 	<p>User Settings</p> <ul style="list-style-type: none"> 16. Change Password >> 17. Change Unit 18. 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 to return to upper level menu screen

Editing User Setting from the Keypad

To make changes to the settings please do the following:

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

User Settings

1. Profile

>> 2. Engine

3. Throttle

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

Engine Parameters

>> 1. Engine Run Speed

2. Speed Source

3. Flywheel Teeth

Use the  and  buttons to move >> and choose 1. Engine RUN Speed then press .

Engine Parameters

1. Engine Run Speed

1800 RPM

Enter=Save Up/Dn=Change

The engine speed variable shown will now be blinking.

Use the  and  button to change the number to the desired value then press .

It will momentarily show 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.

1.5.1 Profile Setting

A profile forms the basis of an engine and 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 fuel level and pump pressure are turned off to allow an engine to run.

Active profile. When users make changes to the settings these directly affect 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 on board backup has no effect on the active operation but is useful to save a working profile in case a user makes temporary changes. The on board back up 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. Default MECH + GOV	Basic setup for Mechanical Engines with Throttling Enabled for Go To Fixed Speed operation when in Auto. Basic Actuator setup has been provided.
	4. Onboard Backup	Load from a previously backed up active profile stored on the controller.
	5. RS232	Loads the settings or profile from a personal computer which 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 on board backup as a safety net in case temporary changes are made.
	2. TO RS232	Saves the settings or profile to a personal computer which has a settings program. The Connection is with a cable connected to the RS232 ports of the controller and personal computer.

1.5.2 Engine Parameters

Item	Parameter	Default Value	Range	Change Amount	Function Description
1	Engine Run Speed	1800RPM	600 to 4000 RPM	25RPM	Desired Speed of 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 setpoint.
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 a start of the engine 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 Shut down stabilize 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	1 to 10	1sec	Maximum crank attempts allowed before a 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 prior to 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 shutdown the engine. This can be Disabled and becomes READ only. (Does not affect ECU protections.)
16	Read Engine Temp.	Mechanical Sender	Standard Resistive J1939, Digital, Deutz, Murphy, JD	-	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 shutdown the engine. This can be Disabled and becomes READ only. (Does not affect ECU protections.)
18	Read Oil Prs.	Mechanical Sender	0-5VDC 7bar, 10bar, Standard Resistive, J1939, Digital, Deutz, Muprhy	-	The source can be Mechanical Sender or J1939 even if the Speed Source is J1939. (Please note: some options only available in hardware version 1.06 and above)
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	Read Eng Hrs From	J1939 ECU	J1939 ECU Read From Panel	-	Display the Engine Hours read from ECU or display the controller recorded Engine Hours.

1.5.3 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 a number of different throttle modes the engine can be set and will be described in detail in the following section.
2	Actuator Type	Linear	Linear, Proportional, Digital Output, J1939ECU	-	**Linear Actuator moves with respect to a PWM Signal (frequency and Direction). ***Proportional Actuator moves with respect to an electrical input signal. Digital output will trigger FET outputs. J1939 ECU is to use TSC.
3	Engine Idle	800RPM	Auto detect to 1200RPM	5RPM	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.
4	Line Fill Speed	1200RPM	800 to 200RPM	25RPM	After the warm up timer has elapsed, the engine (when in auto) will throttle to this speed for the adjustable Line Fill Time set to fill irrigation lines.
5	Line Fill Time	mins2:00secs	0 to mins20:00secs	10sec	After the warm up timer has elapsed the engine (when in auto) will throttle to Line Fill Speed for the adjustable time set to fill irrigation lines.
6	RPM Dead Zone	20RPM	10 to 200RPM	5RPM	When the engine speed is changing the throttle will cease to alter once the real time speed is within +/- the RPM dead zone of the target RPM
7	J1939 INC, LINEAR INC SPEED	40RPM 40%	10 to 250RPM 10 to 100%	10RPM 1%	When throttling to idle, line fill speed, fixed speed or max/min RPM this defines the incremental rate at which the throttle will increase.
8	J1939 DEC, LINEAR DEC SPEED	40RPM 40%	10 to 250RPM 10 to 100%	10RPM 1%	When throttling to idle, line fill speed, fixed speed or max/min RPM this defines the incremental rate at which the throttle will decrease.
9	FEEDBACK DELAY	0.2sec	0.2 to 4Sec	0.1sec	When throttling to idle, line fill speed, fixed speed or max/min RPM this 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.

10	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.
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** Linear Actuator control requires a PWM Module fitted to the Controller

*** Proportional Actuator Control requires a GAC Module fitted to the Controller.

Both modules are fitted internally.

1.5.4 Throttle Type---Method of Operation

Throttle Type	Description of Operation
Go to FIXED RPM	Manual Mode: The RPM will not throttle unless the ↑↓ keypad buttons used. The maximum RPM allowed is governed by the over speed set point in Engine Parameters. Auto Mode: On an engine start in Auto mode the throttle is governed by the Ramp/Rate set in throttle parameters. It will remain at IDLE for the Warm UP period, throttle to the Line Fill RPM if a time is set 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 then shutdown.
Toggle Switch (Keypad)	Auto or Manual Mode: The RPM will not throttle unless the ↑↓ keypad buttons used. The maximum RPM allowed is governed by the over speed set point in Engine Parameters.
MODBUS Control	Manual Mode: The RPM will not throttle unless the ↑↓ keypad buttons used. The maximum RPM allowed is governed by the over speed set point in Engine Parameters. Auto Mode: : On an engine start in Auto mode the throttle is governed by the Ramp/Rate set in throttle parameters. It will remain at IDLE for the Warm UP period, throttle to the Line Fill RPM if a time is set 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 then shutdown.

1.5.5 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 K27 supports a 2 wire (loop powered device) or 3 wire 4-20mA Sensor. This is selectable in the Sensor Type menu option. Refer to the user manual of your device before setting the Sensor Type option.

4-20mA Sensor

1. Flow Sensor
- >> 2. Pressure Sensor
3. Sensor Type

1.5.5.1 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 - Sensor is active but has no protection for Min or Max Flow Alarm. However, 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 shutdown 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 shutdown 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 start up.)
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 or 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.

1.5.5.2 Pump Pressure Parameters

Item	Parameter	Default Value	Range	Change Amount	Function Description
1	Sender Function	Disabled	Disabled, Enabled Enabled With Start_Stop, Read Only	-	Disable or Enabled pressure sensor input as Primary Sensor. Enabled with Start/Stop allows the controller to start and stop the engine based in a static line pressure input when in Auto. Read Only Function - Sensor is active but has no protection for Min or Max Pressure Alarm. However, 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 shutdown 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 shutdown 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 start up.)
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 the sensor at 4mA.
8	Start Option	Start Low Stop High	Start Low Stop High/ Start High Stop Low	-	When the sender function is “Enabled with Start_Stop” when in Auto the engine can be made to start on a low or drop in pressure and stop on a rise or high pressure and vice versa. Usually the start and stop parameters is set within the Min and Max Pressure alarm points.
9	Start Pressure	300KPA	Min Press. to Max Press.	10KPA	4-20mA Pressure value to which the engine will start.
10	Stop Pressure	700KPA	Min Press. to Max Press.	10KPA	4-20mA Pressure value to which the engine will stop.

Sender Function: Enabled with Start and Stop

When starting and stopping the engine based on line pressure a clear understanding of the application is required and some simple questions need to be answered before you begin.

1. What is my line pressure when the engine is not running? i.e. is the line statically charged or at atmosphere?
2. What is my nominal line pressure when the engine is running?
3. What pressure is required to start the engine?
4. What pressure is required to stop the engine?

The following example is only representative of an actual system. Please refer to the specifications of your engine, pump and lines for your specific requirements.

A statically charged line with the engine not running has a constant charged pressure of approx. 350KPA. A valve or outlet is opened 1km away from the pump and the pressure in the line pressure begins to fall as the water flows. Once the pressure drops below 200KPA the engine /pump is expected start and run at a fixed speed of 1500RPM to which the line pressure is nominally about 500KPA. After running for a period of time the outlet valve is closed. The line pressure while running rises above 600KPA to which the user wants the engine to stop. The pipe work is rated to 800KPA of max pressure. A loss of prime condition is when the engine is running and the pressure is below 100KPA. The sensor used is a 4-20mA 10bar (1000KPA) device.

Below is an example settings list for the 4-20mA Pump Pressure sensor.

Item	Parameter	Set Value	Functional Outcome
1	Sender Function	Enabled with Start/Stop	The Engine will start on low and stop based on pressure. Please note: Set Start Type must be set to MOMENTARY in Start Types.
2	Sender Range 4-20mA	1000KPA	The Sender used is 10bar (1000KPA)
3	Set Min. Pressure	100KPA	Low pressure or loss of prime value alarm point to which the controller will then shutdown the engine as a fault.
4	Set Max Pressure	750KPA	High or Over pressure value alarm point to which the controller will then shutdown the engine as a fault.
5	Pump Prs. Bypass	3mins	The loss of prime or low pressure will be ignored for the first 3mins of operation.
6	Pump Prs. Slush	10secs	Low / High/ start and stop pressure slush times
7	Calibration	50Counts	No calibration required for this example.
8	Start Option	Start Low Stop High	When the live pressure drops below the start pressure and the slush has elapsed the engine will start, when live pressure rises above the stop pressure the engine will stop.
9	Start Pressure	200KPA	4-20mA Pressure value to which the engine will start.
10	Stop Pressure	600KPA	4-20mA Pressure value to which the engine will stop.

1.5.5.3 4-20mA Sensor Type

To access 4-20mA Sensor Type press the ↑↓ button and select the item 3. 4-20mA Sensor

Press up and down to alter the 4-20mA Sensor type, then ENTER to save the value.
The value can be “3 Wires 4-20mA” or “2 Wires 4-20mA” loop powered.
Please refer to your Sensor manufacturer for the specific wiring to your sensor.

4-20mA Sensor
Sensor Type

2 Wires 4-20mA

Enter = Save ↑/↓= Change

1.5.6 Fuel Level Parameters

Note: WEMA or VDO Fuel Level Senders required. Refer to dealer for part numbers.

The K27 supports a number of different fuel level senders that are resistive in nature. in tubular or “float or arm type” formats. Generally senders from VDO or WEMA are supported but sender with same resistance ranges can be used.

Please note that when choosing a fuel level sensor depends of the DEPTH of the tank and the type of mounting system.

Generally the two types of mounting is a flanged or thread type.

Item	Parameter	Default Value	Range	Change Amount	Function Description
1	Fuel Alarm Point	Disabled	Disabled to 100%	1%	Setting a value here will enable the sensor. Pressing enter at the main screen will reveal a small bar graph with a percentage or a full gauge in the gauge screens
2	Alarm Action	Warning	Warning, Shutdown	-	The alarm action can be set to warning, to which a screen prompt only indicating a low fuel level which be shown, Setting this shutdown which will cause the controller to shutdown the engine with a fault condition.
3	Fuel sender Type	Tubular	Tubular, FloatI, 10-180ohm FloatII 315-7ohm, Generic 240-30ohm	-	<p>Tubular sensors: Resistance 82-78ohm (full) to 2-3ohm empty</p> <p>Float-I sensor: Resistance 10 to 180ohm or 0 to 190ohm (EMPTY to FULL)</p> <p>Generic sensor: Resistance 240 to 30ohm (EMPTY to FULL)</p> <p>Float-II sensor: Resistance 315 to 7ohm (EMPTY to FULL)</p>

4	Fuel Calibration	82Count	10 to 254Counts	1count	Only appears when the sender type is Tubular. The tank can be empty and the calibration can zero the reading on the screen.
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1.5.7 Pump Temperature Parameters

A temperature sensor can be added to a pump volute or bearings to monitor temperature. If the pump temperature rises above nominated, the controller will shut the engine down.

To access Pump Temperature Parameters press the $\uparrow\downarrow$ button and select the item 6. Pump Temperature.

User Settings

- >> 6. Pump Temperature
- 7. Flow Switch
- 8. Digital Inputs
- 9. Reset History
- 10. Start Type

Item	Parameter	Default Value	Range	Change Amount	Function Description
1	Pump Temp. Alarm	Disabled	Enabled, Disabled, HYD OIL	-	Enables and Disable the sensor input. Bypass Timer is governed by the Lockout Delay in Engine Parameter. HYD OIL allows the user to use the alternate oil temp calibration sensor.
2	Pump Temp Set point	40°C	0 to 145°C	1°C	The temperature point that the engine will be shutdown.

1.5.8 Flow Switch Parameters

The flow switch input is a simple digital input where the bypass timers, slush timer are user adjustable from the panel. A basic paddle or trailing wire flow switch can be used and **does not** need to be a powered device which requires any external timers. When allocating a bypass time in the settings, take in account, warm up at idle, line fill time etc such that you give enough time to achieve flow. The input can support normally open or normally closed wired inputs from the flow switch. Some ultrasonic devices used as flow/no flow may have a switched positive (Active) or switch negative (Passive) output. The K27 can accept either input and is selectable in the Input Type menu option. Please note that these are physically different inputs and a wiring modification may be required.

User Settings
 6. Pump Temperature
 >> 7. Flow Switch
 8. Digital Inputs
 9. Reset History
 10. Start Type

Item	Parameter	Default Value	Range	Change Amount	Function Description
1	Flow Switch Bypass	Disabled	Disabled, 1 to 20mins	1min	Entering a Bypass time upon start up will enable the function.
2	Flow Slush Time	10secs	10 to 300secs	1sec	When the switch is in the no flow position, a timer activates and the condition must remain for the full slush time set before a shutdown is triggered.
3	Flow Switch Type	Normally Open	Normally Open Normally Closed	-	Normally Open : The flow switch closes when NO FLOW Normally Closed : The flow switch opens when NO FLOW (usually wired and set in this mode for failsafe operation)
4	Shutdown Type	Immediate	Immediate, Controlled	-	Immediate i.e. no cool down on engines with no throttle control. Controlled i.e. return to idle for the cool down period before shutdown.
5	Input Type	Passive	Passive, Active	-	Active : The common/output of the flow switch is Batt+ and should be wired to Terminal B1 of the K27. (Active type may not available on some hardware) Passive : The common/output of the flow switch is Batt- and should be wired to Terminal B11 of the K27
6	Latched Shutdown	Shutdown Latched	Shutdown Latched Shutdown NON Latched	-	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.

1.5.9 Digital Inputs

There are up to 4 digital inputs that can be utilized by the user. Each digital input is triggered by a connection to Battery negative or GND. All are configurable inputs for Normally Open or Normally Closed conditions, individual bypass upon start up and slush timers. User definable names or labels 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.

User Settings 6. Pump Temperature 7. Flow Switch >> 8. Digital Inputs 9. Reset History 10. Start Type
--

Digital Input 1,2 & 3 can also be used for send a GSM Warning Only or Alternate Speed Input. See Section 1.5.13
 Digital Input 3 and 4 can be used to with a momentary toggle Switch for RPM Increment and Decrement if required.
 Digital Input 4 can be used for Auxiliary Hour

Each Digital Input 1 to 4 is individually configured in the same way set as described in the table below.

Item	Parameter	Default Value	Range	Change Amount	Function Description
1	Input Enable	Disabled	Enabled, Disabled, Immediate Start Inhibit [Dig 4 only]	-	Enables or Disables the digital input. Immediate - used for shutting down immediately regardless of cooldown time. e.g. Low oil level. Start Inhibit will Inhibit the engine to start.
2	Input type	Normally Closed	Normally Open Normally Closed Auxiliary Hour [Dig 4 Only] Toggle Sw (UP) [Dig 3 only] Toggle Sw (DOWN) [Dig 4 only]	-	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) Auxiliary Hour: When Aux Hours is set to PUMP and Dig 4 set to Auxiliary Hour engine does not shutdown only increment the hour counter. Toggle SW option on Digital 3 and 5 for throttling with a momentary toggle switch. Bypass and slush timers to not apply when set to Toggle SW.
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	3secs	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 Warning Only	-	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". Warning Only: Will only display warning Icon with input label on Status line.
6	Input Label	AUX. INPUT X	12 Character 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	600	800 to 4000RPM	25RPM	When Digital Input 1,2 or 3 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".

1.5.10 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 send via RS232 to a PC with the program GUI interface.

<p>User Settings</p> <p>6. Pump Temperature</p> <p>7. Flow Switch</p> <p>8. Digital Inputs</p> <p>>> 9. Reset History</p> <p>10. Start Type</p>

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.

1.5.11 Start Types

The Start Type parameter defines the mode of operation for the remote start and stop inputs which are both voltage free contacts. It also defines if the engine fuel stop solenoid, on a mechanical engine is an “energize to run” or “energize to stop” system.

The Force Auto option on a hardwired input , either on panel powered up or at any time can automatically place the panel into Auto Mode.

User Settings
 6. Pump Temperature
 7. Flow Switch
 8. Digital Inputs
 9. Reset History
 >> 10. Start Type

Item	Parameter	Default Value	Range	Change Amount	Function Description
1	Set Start Type	Maintained	Maintained or Momentary	-	Maintained: Simple two wire operation. Momentary: 2 Switch or 2 float operation, and must be used when GSM, MODBUS, Pressure, Suction and DAM Level start/stops are used.
2	Input Type	Start NO Stop NO	Start NO Stop NO Start NO Stop NC Start NC Stop NO Start NC Stop NC	-	NO = Normally Open, NC = Normally Closed. The both the remote start and remote stop inputs can be set for NO or NC combinations depending of the wiring configuration of floats used or failsafe requirements. i.e. on a broken wire a the engine can stop safely.
3	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 10seconds to stop the engine and then released. See the Crank Rest Timer in Engine parameters.
4	Force Auto	Disabled	Disabled, Enabled	-	The Force Auto option on a hardwired input , either on panel powered up or at any time can automatically place the panel into Auto Mode.
6	Slush Time	Start 04 Stop 04	0 to 10 Secs	1	Start Input full slush time must pass before Start Input is registered. Stop Input full slush time must pass before Stop Input is registered.

1.5.12 MODBUS Communication

This menu is used to setup the K27 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 at a baud rate 19200 or 9600, 8 data bits, 1 stop bit, No Parity. The Master can poll the K27 as fast as every 2 seconds with a response timeout generally set to 1000ms. In multi drop systems, it is best to have polling at 3 to 5 seconds.

User Settings
>> 11. Modbus
12. GSM
13. Aux Hour
14. Maintenance
15. Language Setting

Item	Parameter	Default Value	Range	Change Amount	Function Description
1	MODBUS Channel	RS485	RS485 RS232	-	The K27 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 with more than one slave device is present this value can be changed
3	Baudrate	9600bps	2400, 4800,9600, 19200 and 38400bs	-	A number of different baud rates are support which may depend on the requirements of the master device, 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.

1.5.13 GSM Parameters

The K27 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. As status request message Up to 5 registered users can be entered always starting from User 1 and entered sequentially in the following positions. Network Connectivity and Signal Strength of modem is represented in the ICON Zone as shown in the Graphical LCD ICON Zone. It is recommend that a SIM card suitable for the region on a low cost plan is used instead of a pre-paid and this is usually setup and managed by the end user. Messages to the unit from unknown users are ignored and deleted.

User Settings	
	11. Modbus
>>	12. GSM
	13. Aux Hour
	14. Maintenance
	15. Language Setting

Please Note: Messaging is 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 too. The controller will make 3 attempts to send a message for 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	Baudrate	38400bps	2400,4800,9600,19200 and 38400bps	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.
4	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.
5	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.
6	Site Name	Blank	Up to 8 Characters and Numbers	Can be set up to 8 character e.g. Engine 1, Station 3, DAM PUMP
7	User Phone No. 1	+61	Mobile number in	Enter in a mobile for the registered users e.g +61457123123 for each user.

8	User Phone No. 2	##### ##	international notation.	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.
9	User Phone No. 3			
10	User Phone No. 4			
11	User Phone No. 5			
12	Ini GSM Modem	-	Yes, No	

1.5.14 Instructions 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	AUTO	Text Command to force the controller into Auto Mode. If you try and start the engine when in Manual Remotely you will receive a message "TEST ENGINE CANNOT START:- MANUAL MODE"
4	INFO	Real time status giving engine and pump information including RPM, Volts, Load, Fuel Rate, Oil Prs, Eng.Temp, Hours, Pump pressure etc.
6	LOCK	Text command to remotely enable the Security Lock.
7	UNLOCK	Text command to remotely disable the Security Lock
8	ESTOP	Stops the engine and will not allow a restart

Basic Operation

To START the Engine/Pump via a text Message.

1. Ensure the control panel is on and in AUTO,
2. If your phone number is entered in the panel send "START" via text message to the controller
3. 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 AUTO MODE

To STOP the Engine/Pump via a text Message.

1. While the engine is running in AUTO,
2. If your phone number is entered in the panel send “STOP” via text message to the controller.
3. 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 will 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, 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 SPN and FMI message will be sent to user.
- If the battery voltage drops a message will be sent to user indicating a 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.

1.5.15 Aux Hour

The Auxiliary Hours function is gives the ability to add an hour counter for any driven equipment. A separate hour meter can be used for the new pump or generator connected to an existing engine or vice versa. The new hour meter appears on the main RPM screen by pressing ENTER and viewing the forth line.

E.g. Pump Hr: 1234.0 HRS or Genset Hr: 100.0 HRS

The Auxiliary Hours can be preset in the Early Setup Parameters if an existing pump or generator is being up fit to a new engine.

User Settings	
	11. Modbus
	12. GSM
>>	13. Aux Hour
	14. Maintenance
	15. Language Setting

Item	Parameter	Default Value	Range	Change Amount	Function Description
1	Aux. Hour Function	Disabled	Disabled, Enabled	-	Enables or Disables the Function
2	Label	Pump	Pump, Genset	-	Label for the main RPM screen.

1.5.16 Maintenance (Timers)

The Maintenance Timer function is gives the ability to add an service hour counter for engine and driven equipment.

The maintenance or service timers will bring an Service ICON in the ICON Zone indicating when the nominated hours have been reached for the engine or driven equipment or both.

The maintenance timer can be set in 50hour blocks up to 1000 hours.

The timers can be reset in the menu when the service is completed.

Refer the engine and pump manufacturers specifications for the recommended service interval.

User Settings	Maintenance
11. Modbus	>>1. Engine
12. GSM	2. Pump
13. Aux Hour	3. Reset Timers
>> 14. Maintenance	
15. Language Setting	

Item	Parameter	Default Value	Range	Change Amount	Function Description
1	Engine	Disabled	Disabled (0) to 1000hours	50Hours	A time here enables the timer and an ICON will be shown when the hours have elapsed.
2	Pump	Disabled	Disabled (0) to 1000hours	50hours	A time here enables the timer and an ICON will be shown when the hours have elapsed.
3	Reset Timers	No	No, Yes	-	Resets the timers and begins the count again.

1.5.17 Language Setting

The system language of the K27 (by default) is English. We can however, set the Language to Chinese if the user requires it.

- To access the Language Setting menu press the ENTER button and select item 15.

User Settings 11. Modbus 12. GSM 13. Aux Hour 14. Maintenance >> 15. Language Setting	Language Setting English Are you sure? No Enter=Save ↑↓=Change
--	---

- Press ENTER then ↑↓ to select Yes and press ENTER to change the system language as user request. Currently, English and Chinese language can be as system language.

1.5.18 Change Password

The user has the ability to 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.

User Settings >> 16. Change Password 17. Change Unit 18. I/O Test	Enter New Password 00 00 00 00 Are you sure? No Enter=Save ↑↓=Change
--	---

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

1.5.19 Change Unit

This item allows the user to change the Temperature units for Celsius to Fahrenheit or vice Versa.

To access the Change Unit menu press the button and select item 17.

User Settings 16. Change Password >> 17. Change Unit 18. I/O Test	Change Reading Unit >> 1. Temperature Unit
--	---

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 current unit automatically. It is still better for users to check those settings such as engine temperature, pump temperature and so on.

1.5.20 I/O Test

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

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

Please refer to your specific panel schematic for circuit name e.g. Schematic circuit B2 and settings configuration as to what Inputs, Outputs, Communications and CAN functions are available and in use.

Select 1. "Digital Inputs" and press "Enter" button, the screen will display the state the digital input is currently in.

OFF = Open Circuit, ON = Closed Circuit.

e.g. FSW-AL(B11) (Defined as Flow switch) Connect this input to GND and see the change of State from OFF to ON. FSW-AH(B1) may not be available on a some hardware versions.

Only Coolant Level is ON open circuit as the normal condition is Closed. EStop and AH or active high inputs expect a connection to Battery positive.

I/O Test	
>>	1. Digital Inputs
	2. Resistive Inputs
	3. 4-20mA Inputs
	4. Relay & Aux Outputs

Digital Inputs	
RSTART(B2):	OFF
RSTOP(B3):	OFF
DIG_1(B4):	OFF
DIG_2(B5):	OFF
DIG_3(B6):	OFF

Digital Inputs	
FSW-AL(B11):	OFF
DIG_4(A4):	OFF
ESTOP(C12)	OFF
F-AUTO(B12):	OFF
FSW-AH(B1):	OFF

Digital Inputs	
Coolant Level Input (A5):	ON

Select 2. "Resistive Inputs" and press "Enter" button, the screen will display the raw 12bit analogue value.

The range of the analogue value is 0 to 4095 (12bit) For Resistive sensors - coolant temperature, fuel level, pump temperature and oil pressure.

Resistive Inputs	
OIL(A9):	0
TEMP(A3):	4095
FUEL(B10):	4095
PUMP-T(B9):	4095
BAT_IN:	1331

With the exception of OIL(A9) the open circuit condition is value = 4095, the closed or shorted to ground is approximately 290 when diagnosing faults.

Only 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 resistance of the sensor is being 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 "Enter" button, the screen will display the raw 12bit analogue value.
 The range of the analogue 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 in this test screen. Shorted to high source will show close to 4095.

4-20mA Inputs	
4-20mA(B7):	0

Select 4. "Relay & Aux Outputs" and press "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 sink to 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 in 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. C2 and C4 are connected to an internal PWM or GAC Module (if fitted).

Relay@Aux Outputs	
RELAY1(A8):	OFF
RELAY2(A11):	OFF
AUX. 1(C4):	OFF
AUX. 2(C3):	OFF
AUX. 3(C2):	OFF

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

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

Select 5. "Throttle Actuator" and press Enter the screen will show . Throttle Command.
 Pressing the UP and Down arrow should drive the Actuator is both directions regardless of engine running state.
 When pressed - Throttle UP or Throttle Down should de disabled on screen during motion. When nothing is pressed it will show "----".

1.6 ECU Warnings and Faults

The K27 talks directly to the ECU of an electronic engine over a CAN network using the J1939 protocol. The controller derives all of it 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 refer to as an Active Diagnostic Trouble Code which we have the ability to view in [1. View Active code](#) or by pressing the Warning Button.

```

MENU
1. Set Timers
2. General Settings
3. User Settings
>> 4. View Diag Codes
5. System Info
    
```

Any codes that were once active and now rectified are committed to the memory in the ECU are called “previously active “ or “stored” code. The K27 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.

```

View Diag Code
>> 1. View Active Code
2. View Stored Code
    
```

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 normal operating range
O/C: Occurrence Count	How many times this fault has occurred.

```

SPN:      100
FMI:      6
OC:       10
Engine Oil pressure
Current Above Normal or Grounded
Circuit
    
```

Most all engine manufacturers comply to 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

Refer to the Engine Manufacturer for SPN and FMI codes not described by the controller.

Ignore SPN Code:

For non-critical warnings users can enter the SPN in the ignore list, this will inhibit the warning to be shown on the LCD screen. There are four single codes the user can enter, the fifth one is the range of SPN greater than the number entered in the controller.

Please note: critical warning including SPN:100(Low Oil Pressure), SPN:110(High Engine Temp), SPN:111(Low Coolant Level) and SPN:175(Oil Temperature) will not be ignored.

It is recommended to not ignore critical warnings and resolve the issue related to warnings, as it can damage the engine.

View Diag Code
1. View Active Code
2. View Stored Code
>> 3. Ignore SPN Code
4. TSC1 Checksum

Ignore SPN Code
Ignore SPN 1

SPN: 0 0 0 0 0

To add an SPN number use the Up and Down arrows to change the current digit then press Enter to set each digit.

Please Note: Ignoring SPN Code is done at your own risk and may cause damage to the Engine.

Ignoring SPN codes does not stop the Engine ECU from logging them into its database.

TSC1 Checksum:

Torque speed control (TSC) checksum can be enabled or disabled depending on the ECU being used. By default this checksum is enabled, for some ECUs we might need to disable the checksum as it will not throttle if enabled. Please check with the engine manufacturer manual.

View Diag Code
1. View Active Code
2. View Stored Code
3. Ignore SPN Code
>> 4. TSC1 Checksum

1.7 System Information

System Info provides the controller details, status information and ECU J1939 information.
To Navigate through System Info use the UP and Down arrow.

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)

System Info

Serial #: 977
Build Date: 2016 5 1
PCB Version: 1.05
Firmware V1.28
E2 File Version: V1.07

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

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.

System Info

PCB Temp: 25'C
Last Shutdown:
Stop Button Pressed

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.

System Info

ECU SW PN:

ECU SW DATE:

COMP ID:

VIN:

1.8 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 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.

```

MENU
>> 6. Fault History
    7. Engine Config
    8. LCD Contrast
    
```

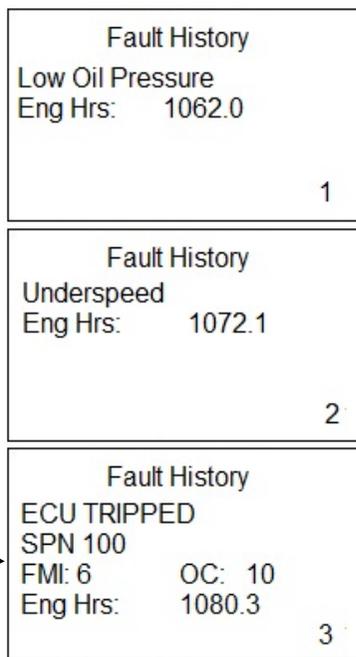
```

Fault History
>> 1.Show Fault History
    2.Send Fault History
    
```

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.



1.9 Engine Configuration

The Engine Configuration is read only data stream from an ECU that describes the stationary behavior of the engine and the torque indicated as a given speed. The map reflects the effect of changes due to barometric pressure, engine temperature, and any other stationary changes (sensor failures, etc.) which influence the engine torque curve more than 10%. This map is only valid for maximum boost pressure. At low boost pressures the torque limit may be much lower.

The engine configuration message is sent at any time that the engine configuration map has changed by more than 10% of speed or torque (due to events other than boost pressure) since that last time the message was transmitted.

As an alternative, it may be sent periodically, once every 5s. For more information refer to the engine manufacturer.

This information may be useful to follow the performance of speed and torque with respect to any driven equipment such as pumps or generators. Pressing ENTER here will show any data captured. If no data is currently present it will momentarily show NO CAN DATA Press UP and DOWN to scroll through all the parameters given.

MENU 6. Fault History >> 7. Engine Config 8. LCD Contrast
Engine Configuration Engine Speed @ Idle PT1 1000RPM Torque @ Idle Pt1 131%

Engine Configuration Parameter	Scale / Unit	Example Value
Engine speed at idle, point 1	Range 0 to 8031RPM	1000RPM
Percent torque at idle, point 1	-125 to 125%	76%
Engine speed at point 2	Range 0 to 8031RPM	2200RPM
Percent torque at point 2	-125 to 125%	81%
Engine speed at point 3	Range 0 to 8031RPM	1700RPM
Percent torque at point 3	-125 to 125%	97%
Engine speed at point 4	Range 0 to 8031RPM	2000RPM
Percent torque at point 4	-125 to 125%	89%

Engine speed at point 5	Range 0 to 8031RPM	1400RPM
Percent torque at point 5	-125 to 125%	100%
Engine speed at high idle, point 6	Range 0 to 8031RPM	2740RPM
Gain (KP) of end speed governor	Calculated Value	-1%
Reference engine torque	0 to 64255NM	695NM
Maximum momentary engine override speed, point 7	Range 0 to 8191RPM	8191RPM
Maximum momentary engine override time limit	0 to 25secs	25sec
Requested speed control range lower limit	0-2500RPM	255RPM
Requested torque control range lower limit	0-2500RPM	255RPM
Requested torque control range upper limit	-125 to 125%	125%

1.10 LCD Contrast

The contract of the text can lightened or darkened by entering this menu and adjusting the number Coarse Value between 0 and 255 an the fine (value 250 and 510) by using the up and down arrows. Please note, the lightest setting or darkest settings may be unreadable depending on temperature.

LCD Contrast	
Coarse	Fine
6	303
Enter = Save ↑/↓ = Change	

2 Early Setup Parameters

The Early Setup parameters can be access by turning off the controller , as you turn the controller on press MENU and ENTER just as the "ENGINE CONTROLLER" text appear on the screen. As per the 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 with respect to 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	12ms	10 to 50ms	1ms	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 for e.g. engines may use 2.
5	ECU Warnings	Treat as Shutdowns	Treat as Shutdowns Treat as Warnings	-	The panel has the ability to treat ECU Earnings as a fault condition and shutdown 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 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 do not transmit a battery voltage. In this case, the panel monitors and display this Battery voltage of the system.
8	R3 Function	Engine Running	Engine Running, Common Alarm, Not in Auto, Low Fuel and 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 hours run can be set or reset on the controller. Pressing Menu here will increment by 100hours
10	Set Aux Hours	NO	No, to Hours Set	5hours	For any driven equipment, the hour runs can set or reset on the controller. Pressing Menu here will increment by 100hours
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	-	Allow to select which engine type to be used in the early parameters setup. Eg Cummins, Caterpillar, Mercedes, Perkins, Yamaha, Deutz etc

3 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	K27 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	-----	Aux. Hours LSB	0-210554060.75Hrs	
40033	-----	Aux. Hours MSB		
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		Fuel level	0 -100%	1%/bit
40046		RESERVED		
40047		Heart_Beat	Continuously changing counter	
40048		Remote RPM	IDLE to 4000RPM	1 RPM/bit
40049				
40050		Remote Start Input Active Low	Bit 1 1 = Active 0 = Not Active Bit 2 1 = NO* 0 = NC*	
40051		Remote Stop Input Active Low	Bit 1 1= Active 0 = Not Active Bit 2 1 = NO* 0 = NC*	

40052		Auxiliary Digital Input 2 Active Low	Bit 1 1 = Active 0 = Not Active	
40053		Auxiliary Digital Input 3 Active Low	Bit 1 1 = Active 0 = Not Active	
40054		Toggle INC, Aux Input 5 Active Low	Bit 1 1 = Active 0 = Not Active	
40055		Toggle DEC, Aux Input 4 Active Low	Bit 1 1 = Active 0 = Not Active	
40056		Auxiliary Digital Input 1 Active Low	Bit 1 1 = Active 0 = Not Active Bit 2 1 = NO 0 = NC	
40057		Flow Switch Active Low – (Passive)	Bit 1 1 = Active 0 = Not Active	
40058		Flow Switch Active Hi (B+) (Active)	Bit 1 1 = Active 0 = Not Active	Not available on some hardware versions
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 = Auxiliary 3 4 = Loss of Flow Sw. 5 = Alt Failure 6 = Coolant Level Low 7 = Overspeed 8 = Underspeed 9 = Bad or NO RPM 10 = Failed Crank Attempts 11 = Aux. Input 1	8bit code number

			12 = Aux. Input 2 13 = Aux. Input 3 14 = Low Fuel Level 17 = Low Pump Pressure 18 = Max Pump Pressure 19 = CAN BUS Failure 20 = Pump Temperature 21 = Internal Protection 23 = Check ECU Codes 24 = Timer Complete 25 = Normal Shutdown 25 29 = Low Flow 30 = High Flow 31 = Stagnant Timer 32 = Normal Shutdown 32	
--	--	--	---	--

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

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

- 0** The panel is in a normal operating mode with no faults.
- 24** The panel has shutdown due to a Set Stop Timer completion. In Auto, the Register will show 24 for the stabilize period and return to 0. In manual it will remain until reset.
- 25** The panel has shutdown due to the stop button being pressed. It will return to 0 after the stabilize time has elapsed.
- 32** The panel has shutdown due to the remote or normal stop when in Auto Mode. It will return to 0 after the stabilize 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 recommend as a default - 9800bps, 8 data bit, 1 Stop bits, 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.

E.g. When using the MODBUS start or a stop in the controller the Start Type must be set to Momentary in the menu:

3.User Settings –10. Start Types > 1 Set Start Types.

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)

The number in the configuration **Register 40023** must be changed or incremented.

Then a write to the Auto Register can be initiated.

i.e. **Register 40021** 0xBB (Auto Mode)

Depending on your SCADA/PLC or MODEM system you may need at least 500ms between sequential writes to the K27 taking into account the time it takes for the K27 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 in auto mode. 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 in the internal Engine Run Speed set in engine parameters.

EXAMPLE: STARTING in AUTO via MODBUS.

You must perform the following sequence.

If the Panel is already in Auto you can Write a Start.

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.

Setting the panel to Auto Mode

If the panel is not in Auto - you must write a FORCED RESET command first and once MODBUS communications has returned then write an AUTO command. This sequence has been implemented as safety precaution for any local users who is working at the engine.

When a remote reset has occurred, MODBUS responses are paused until the boot up cycle completes. This may take up to 25 to 30secs to complete as there is a 10secs warning and buzzer before reset, the boot cycles takes up to 15 to 20secs to reboot, which includes a reported forced reset message (including the beeper) and also show the Last Fault message (if reset after a fault). MODBUS communications will return to normal at this point.

4 Fault and Last Shutdown Messages

Last Shutdown Message	Description
Stop Timer	Normal Stop – Shutdown on Set Stop Timer
Remote Start Removed	Maintained Operation – Start Signal Removed
Remote Stop	Momentary Operation – Stop Input triggered
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
AUX. INPUT 2 (user configurable)	Normal or Fault shutdown on Digital Input 2
AUX. INPUT 3 (user configurable)	Normal or Fault shutdown on Digital Input 3
AUX. INPUT 4 (user configurable)	Normal or Fault shutdown on Digital Input 4

Pump Temperature	Fault Shutdown on High Pump Temperature
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
Low Fuel Level	Fault Shutdown on Low Fuel Level Set point
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 System Info screen and also recorded in the Fault History against engine hours.

5 Glossary of Terms

Auto Mode

The mode in which the control panel will start and stop from a remote source. E.g. Floats, Pressure Start/Stop, GSM Modem. If enabled, the Automatic Throttle feature is active. All engine and pump protection is active.

Manual Mode

The mode in which the panel will only start and stop from 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 is active.

Engine Run Speed

The Engine speed or RPM the controller will automatically throttle to in 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 fitted with an ECU (Electronic Control Unit) that supports 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: How many times the SPN and FMI combination has occurred on the engine.

Magnetic Pickup

Inductive sensor placed over the teeth of a flywheel generating 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 shutdown the engine.

Overspeed

High tachometer (RPM) alarm point to which the controller will shutdown 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 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 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 a 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 which 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, when called to stop the engine will return to engine idle for 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 input to the controller which is either on or off.

Analogue Input

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

Passive (Input Type)

A digital input which responds to a Battery Negative (B-) signal.

Active (Input Type)

A digital input which responds to a Battery Positive (B+) signal.

MODBUS (Modicon Communication BUS)

A standard communication protocol, which is now a commonly available means of connecting industrial electronic devices.

IMT

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

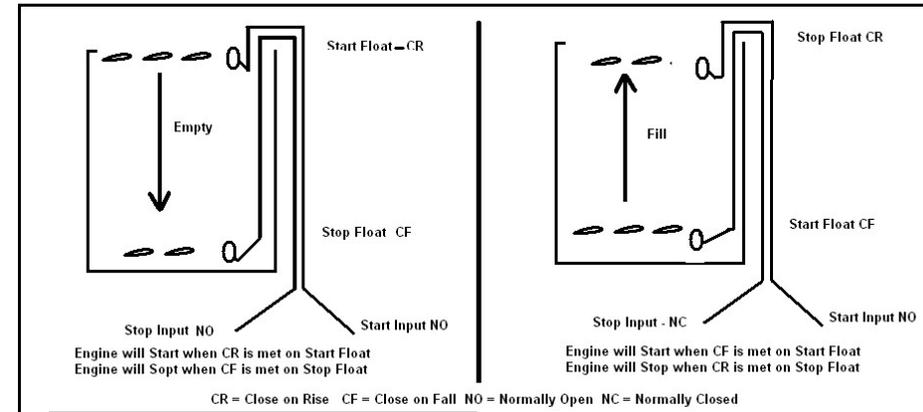
CL

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

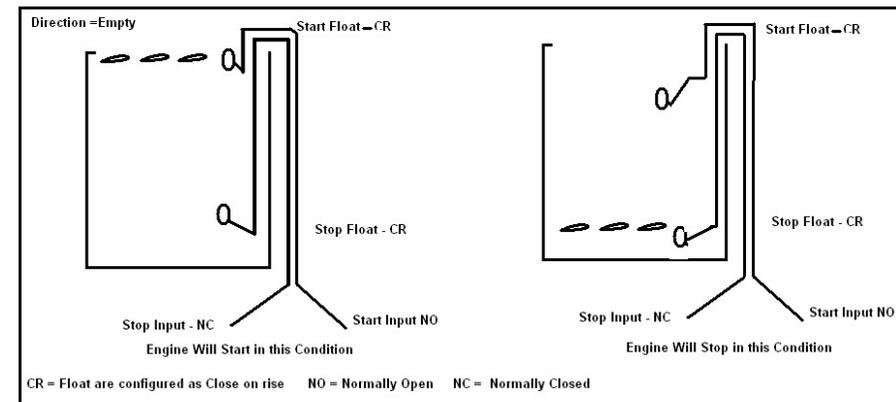
Appendix A: Float Setup Examples

Set in Start Parameters Input Type.

Input Type – “Start NO Stop NO” using 1 CR Float and 1 CF Float
 Example shows both an Empty and Fill Application.
 Note the orientation of the Start and Stop Floats in examples.



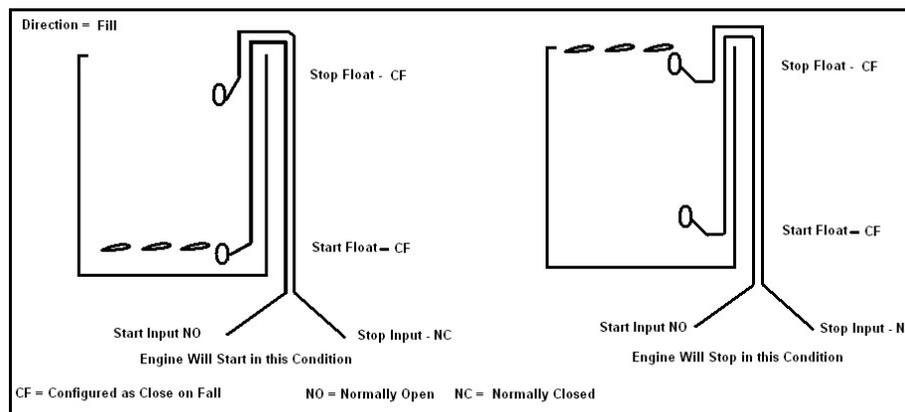
Input Type – “Start NO Stop NC” using 2 x CR Floats.
 Example shows an Empty Application
 Note the orientation of the Start and Stop Float.



Input Type – “Start NO Stop NC” using 2 x CF Floats.

Example shows a Fill Application

Note the orientation of the Start and Stop Float.



Limited Warranty

Contact your dealer with any warranty queries or claims.

- This warranty runs for 12months 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.

Contact Information:

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