EP4301
ENGINE CONTROLLER
USER MANUAL

SmartGen

SmartGenRegistered trademark

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Table 1 - Software Version

Date	Version	Note
2024-12-20	1.0	Original release.

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Table 2 - Symbol Instruction

Symbol	Instruction
⚠NOTE	Highlights an essential element of a procedure to ensure correctness.
⚠CAUTION	Indicates a procedure or practice, which, if not strictly observed, could result in damage or destruction of equipment.
☠WARNING	Indicates a procedure or practice, which could result in injury to personnel or loss of life if not followed correctly.

CONTENTS

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1 OVERVIEW

EP4301 Engine Controller is used for the control or data display of engines to realize start/stop, speed control, data measurement and alarm display of the engine. It fits with colour LCD display, optional Chinese, English and French, which is reliable and easy to use.

EP4301 Engine Controller applies 32-bit microprocessor technology, realizing precise measuring of many parameters, value adjusting and threshold setting etc. functions. A majority of parameters can be adjusted from the front panel. All parameters can be adjusted via USB or RS485 port by PC. With compact structure, simple wiring and high reliability, it can be used in various engine automation systems.

2 PERFORMANCE AND CHARACTERISTICS

— Applies ARM-based 32-bit SCM, high integration of hardware;

— 4.3-inch color LCD display, resolution 480x272 with adjustable backlight (the backlight can be adjusted), optional Chinese, English and French, which can be chosen at the site, making commissioning convenient for factory personnel;

— Silicon panel and pushbuttons, hard screen acrylic for screen protection;

— Fitted with CANBUS port to communicate with J1939 engines, not only can monitor the ECU data (such as water temperature, oil pressure, engine speed, fuel consumption and so on, but also control the start/stop, speed adjustment of the engine through CANBUS port;

— 6 programmable analog sensor inputs, the programmable sensor 3-6 input ports can be directly connected to resistance, voltage or current sensors, while other sensor inputs can only be connected to resistance sensor;

— More kinds of curves of temperature, oil pressure, fuel level can be used directly and users can define the sensor curves by themselves;

— Precision measure and display parameters of engines: speed, battery voltage, charger voltage, total start time and start attempts, etc.;

— Three crank disconnect conditions (speed, oil pressure, speed+oil pressure) are optional;

— Wide power supply range, suitable to different starting battery voltage environment;

— Sealed enclosure design, the whole unit protection can reach IP65;

— Modular structure design, flame-retardant plastic shell, pluggable water-proof connector, built-in mounting, compact structure with easy installation.

3   SPECIFICATION

Table 3 - Performance Parameter

Item	Content
Working Voltage	DC8V ~ DC35V, DC reverse connection protection Resolution: 0.1V Accuracy: 1%
Overall Consumption	<4W (Standby mode: <2W)
Speed Sensor	Voltage Range: 1.0V~ 24V (RMS) Frequency Range: 5Hz~10000Hz
Charger(D+) Voltage	Range: DC0V ~ DC60V Resolution: 0.1V Accuracy: 1%
Analog Sensor	Resistance Input Range: 0Ω ~ 6000Ω Resolution: 0.1Ω Accuracy: 1Ω (below 300Ω)
	Voltage Input Range: 0V ~ 5V Resolution: 0.001V Accuracy: 1%
	Current Input Range: 0mA ~ 20mA Resolution: 0.01mA Accuracy: 1%
Digital Output 1-3	5A DC28V DC power supply output (relay output)
Aux. Input 1-3	Active when connect to negative of power supply Low threshold voltage: 1.2V High limit input voltage: 60V
RS485 port	Isolated, half-duplex, baud rate 9600bps, the maximum communication length 1000m
CAN Port	Isolated, maximum communication length 250m, using Belden 9841 cable or equivalent
CE-EMC Certification	EN 55032, EN 55024
Vibration Test	5 Hz~ 8 Hz ±17 mm 8 Hz ~100 Hz: a= 4g 100 ~ 500Hz: a=2g IEC 60068-2-6
Shock Test	50g, 11ms, half-sine, three consecutive shocks are applied from each of the three perpendicular directions, a total of 18 times IEC 60068-2-27
Bump Test	25g, 16ms, half-sine IEC 60255-21-2
Case Dimensions	127mm x 115mm x55.9mm
Panel Cutout	115mm x 103mm
Working Temperature	(-40~+70)°C

Item	Content
Working Humidity	(20~93)%RH
Storage Temperature	(-40~+80)°C
Protection Rating	IP65
Weight	0.45kg

4   OPERATION

4.1   CONTROLLER PANEL

Fig.1 – EP4301 Front Panel

⚠**NOTE: Partial indicators description.**

Table 4 – Key Icon Introduction

Icon	Function	Description
⚠	Warning Alarm	Slow flashing (1 time per second)
⚠	Shutdown Alarm	Fast flashing (5 times per second)
	After-treatment Icon	Engine fault
	After-treatment Icon	High exhaust temperature indicator light
	After-treatment Icon	NCD status indicator light
	After-treatment Icon	DWS/driver warning indicator light
	After-treatment Icon	DPF regeneration request
	After-treatment Icon	DPF Regeneration inhibit

4.2 KEYS DESCRIPTION

Icon	Keys	Function
⚠	Alarm Check /Reset	When there is no alarm, the key is disabled. When there is an alarm, but not on alarm page, press this key to skip to the alarm page. Press this key to reset the alarm on alarm page.
🔲	Menu	Press this key to enter the menu.
OK	Confirm	Press this key to confirm the current configuration during menu setting.
🕐	Speed Control	Press this key, the controller will enter the speed control mode when the key function enables. When speed control begins, the icon will turn red. Press this key again to exit the speed control.
⬅	Left/Decrease	Press this key to turn the page left when switching the page. Press this key to move the cursor up on menu page. Press this key, the number will decrease one in setting configuration.
➡	Right/Increase	Press this key to turn the page right when switching the page. Press this key to move the cursor down on menu page. Press this key , the number will increase one in setting configuration.
⬆	Speed Up	After pressing this key, the engine will increase the setting speed.
⬇	Speed Down	After pressing this key, the engine will decrease the setting speed.
↩	Return	Press this key to return to previous page on menu page.
⌂	Homepage	Press this key to return to homepage on menu page.
···	Keyboard Wakeup	When the homepage key is hidden and then the status bar is showed, press this key to wake up the keyboard.

⚠NOTE: Please press any key on main screen to mute the sound.

4.2.1 MAIN DISPLAY

Fig.2 – Hidden Status Bar

Fig.3 – Keys Unhidden

Fig.4– Sensor Display

Fig.5– IO Port Status

| Sensor 1 Open Warn |
| Sensor 2 Open Warn |
| Sensor 3 Open Warn |
| |
| |
| |
| |
| ⚠ ⬅ ▦ ➡ ⤪ |

Current Maintenance	
Maintenance 1	0: 10:9
Maintenance 2	0: 0:0
Maintenance 3	0: 0:0
⚠ ⬅ OK ➡ ⤪	
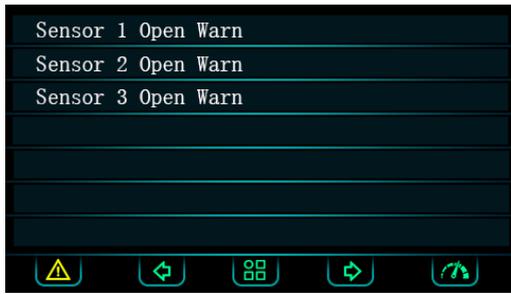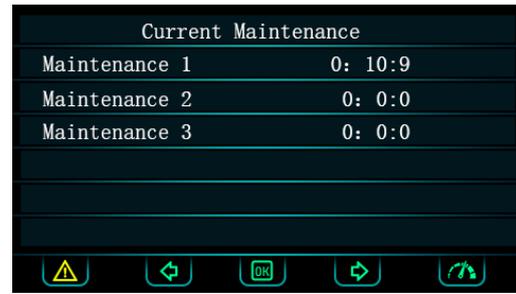
Fig.6– Alarm Page   **Fig.7– Maintenance Page**

4.2.2   USER MENU AND PARAMETER SETTING

Press ▦ key to enter the user menu.

——Parameter Setting: input the correct password (factory default is 00318) to enter the parameter setting screen.

——Event Log: to enter the details page of event log.

——Maintenance Setting: input the correct password (factory default is 01234) to enter the maintenance setting screen.

——ECU DM2: to display DM2 alarms of engine.

——Backlight Adjustment: to adjust the screen backlight.

——Language Select: to select simplified Chinese, English and French.

——Controller Information: to view the development information of controller, such as software version, hardware version and release date.

Parameter setting includes the following contents:

——Module Setting

——Timer Setting

——Engine Setting

——Flexible Sensor Setting

——Aux. Input Ports

——Aux. Output Ports

——GOV Setting

For example:

Table 6 – Menu Screens

Configuration Screens	Description
★Menu Setting	
▶ Parameter Set Event Log Maintenance Set ECU DM2 Backlight Adjust Language Select Controller Information	⟲ Return to the previous menu.
	◁ Move the cursor to the previous line.
	OK Confirm it to enter the menu corresponding to cursor.
	▷ Move the cursor to the next line.
	⌂ One-touch back to home page.
★Timer Setting	
Timer Set ▶Preheat Set 0000 s Cranking Time 0000 s Crank Rest 0003 s Safety On Time 0003 s Start Idle Time 0002 s High-speed Warming Up Time 0002 s	⟲ Return to the previous menu.
	◁ Move the cursor to the previous line; press the confirm key to decrease the number.
	OK Press it to adjust the parameter; press it again to save after adjustment.
	▷ Move the cursor to the next line; press it to increase the number.
	⌂ One-touch back to home page.
★Engine Type Setting	
Engine Type: 40 ▶00 Non ECU 01 ECU 02 CAT 03 Reserved 04 CUMMINS-QSK-Modbus 05 CUMMINS-QST-Modbus	⟲ Return to the previous menu.
	◁ Move the cursor to the previous line.
	OK First press it, the curson appears on screen. Then press it again to confirm the configuration.
	▷ Move the cursor to the next line.
	⌂ One-touch back to home page.
★Speed Control Setting	
▶GOV Port Select: 00Not Used Local Sensor Channel Select: Sensor3 Remote Sensor Channel Select:Sensor4 Idle Volt.: 00.75 V Rated Speed Volt.: 03.84 V Idle Volt.: 04.00 mA Rated Speed Current: 20.00 mA	⟲ Return to the previous menu.
	◁ Move the cursor to the previous line.
	OK Confirm it and enter the corresoponding configuration of cursor.
	▷ Move the cursor to the next line.
	⌂ One-touch back to home page.
★Custom Sensor Curve Setting	
Custom Sensor 1 CurveX∗0.1 X1-X4: 8 210 280 390 X5-X8: 560 1160 2580 3000 Y1-Y4: 140 110 100 90 Y1-Y4: 140 110 40 20	⟲ Return to the previous menu.
	◁ Decrease the number.
	OK Confirm it and keep current setting value.
	▷ Increase the number.
	⌂ One-touch back to home page.
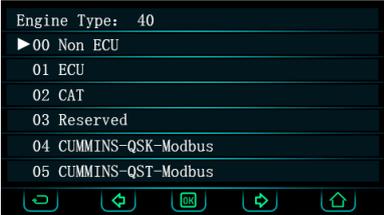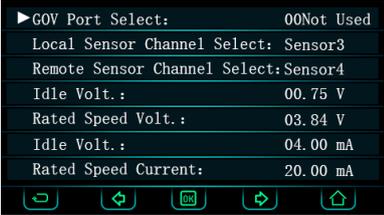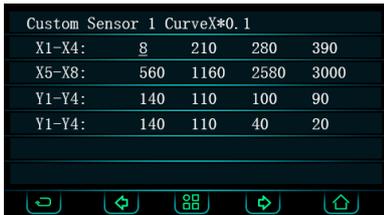
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5 PROTECTION

5.1 WARNING ALARMS

When controller detects the warning signal, it only issues warning but the engine will not stop.

Table 7 – Warning Alarms

No.	Type	Description
1	Over Speed	When controller detects that the engine speed is above the pre-set over speed value, the controller sends a warning signal.
2	Under Speed	When controller detects that the engine speed is under the pre-set under speed value, the controller issues a warning signal.
3	Maintenance 1~3 Time Due	When maintenance time due reaches the settng time and action type selects "Warning", controller sends a warning signal.
4	Low Oil Pressure	When controller detects that the oil pressure of engine is below the pre-set oil pressure value, the controller sends a warning signal.
5	High Engine Temp.	When controller detects that the engine temperature is above the pre-set high temperature value, the controller sends a warning signal.
6	Stop Failure	After the engine stop delay is over, if the engine is not stop, the controller will send a warning signal.
7	Low Fuel Level	When the Aux. input port is configured as "Low Fuel Level" warning and it is active, the controller sends a warning signal.
8	Charg Alt Fail	When the voltage difference between B+ and D+(WL) is greater than the charging failure voltage, the controller sends a warning signal.
9	Battery Undervoltage	When controller detects that the battery voltage of engine is under the pre-set value, the controller sends a warning signal.
10	Battery Overvoltage	When controller detects that the battery voltage of engine is over the pre-set value, the controller sends a warning signal.
11	Flex. Sensor 1~6 Open	When controller detects the Flex. sensor is open, and the open action selects warning, the controller sends a warning signal.
12	Flex. Sensor 1~6 High	When controller detects that the Flex. sensor is higher than the upper limit value, the controller sends a warning signal.
13	Flex. Sensor 1~6 Low	When controller detects that the Flex. sensor is lower than the lower limit value, the controller sends a warning signal.
14	DPF Regeneration	When controller receives a DPF regeneration signal via J1939, it sends a warning signal.
15	ECU Warning	When controller receives a warning signal from engine via J1939, it sends a warning signal.
16	Input Port 1 Warning	When the Aux. input port 1 is configured as warning and it is active, the controller sends a warning signal.
17	Input Port 2 Warning	When the Aux. input port 2 is configured as warning and it is active, the controller sends a warning signal.
18	Input Port 3 Warning	When the Aux. input port 3 is configured as warning and it is active, the controller sends a warning signal.

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5.2 SHUTDOWN ALARMS

When controller detects the shutdown alarm signal, it will shut down the engine directly, and display the alarm type.

Table 18 − Shutdown Alarms

No.	Type	Description
1	Emergency Stop	When controller detects emergency stop alarm signal, it sends an alarm signal.
2	Over Speed	When controller detects that the engine speed is above the pre-set value, it sends an alarm signal.
3	Under Speed	When controller detects that the engine speed is below the pre-set value, it issues an alarm signal.
4	High Engine Temp.	When the input port is set as "High Temp. Shutdown Input" and it is active, the controller sends an alarm signal.
5	Low Oil Pressure	When the input port is set as "Low Oil Pressure Shutdown Input" and it is active, the controller sends an alarm signal.
6	Start Failure	Whinin the set start attempts, if the engine fails to start, it will send an alarm signal.
7	Maintenance 1~3 Time Due	When maintenance time due reaches the setting time and action type selects "Shutdown", the controller sends an alarm signal.
8	Flex. Sensor 1~6 Open	When controller detects that the Flex. sensor is open and the action type selects shutdown alarm, the controller sends an alarm signal.
9	Flex. Sensor 1~6 High	When controller detects that the Flex. sensor is higher than the upper limit value, it sends an alarm signal.
10	Flex. Sensor 1~6 Low	When controller detects that the Flex. sensor is lower than the lower limit value, it sends an alarm signal.
11	ECU	When controller received the shutdown alarm signal of engine via J1939, the controller sends an alarm signal.
12	ECU Comm Failure	When controller doesn't receive the data via J1939 after start the engine, the controller sends an alarm signal.
13	Input 1~3 Shutdown	When Aux. input port is configured as "Shutdown Alarm", the controller sends an alarm signal.

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6 WIRING CONNECTION

The back panel of EP430 controller is as follows:

Fig.2 – Controller Back Panel

Table 9 – Terminal Connection Description

No.	Function	Cable Size	Remark
1	Flex. Sensor 1	0.5mm²	Connect with temperature, pressure or level sensor. Setting items see Table 13. Only resistance sensor is available.
2	Flex. Sensor 2		
3	Speed Sensor Input MP1	0.5mm²	Speed Sensor Input
4	Speed Sensor Input MP2		Speed sensor input, controller inside has been connected to negative post of battery.
5	Charger D+ Input	1.0mm²	Connect with charger D+ (WL) terminal. If this terminal doesn't exist, hang it in the air.
6	Flex. Sensor 3	0.5mm²	Connect with temperature, pressure or level sensor. Setting items see Table 13. Voltage sensor, current sensor and resistance sensor are available.
7	ECU CAN H	0.5mm²	Impedance-120Ω shielding wire is recommended, and the single-end shall be earth connected. The "Matched Resistance Enable" is configured to determine if a 120Ω matched resistance should be connected to CANBUS automatically.
8	ECU CAN L	0.5mm²	
9	Flex. Sensor 4	0.5mm²	Connect with temperature, pressure or level sensor. Setting items see Table 13. Voltage sensor, current sensor and resistance sensor are available.
10	VOUT (+5V)	0.5mm²	Output DC+5V, Max. current is 30mA.

No.	Function	Cable Size	Remark	
11	Flex. Sensor 5	0.5mm²	Connect with temperature, pressure or level sensor. Setting items see Table 13. Voltage sensor, current sensor and resistance sensor are available.	
12	Flex. Sensor 6		Connect with temperature, pressure or level sensor. Setting items see Table 13. Voltage sensor, current sensor and resistance sensor are available.	
13	GND	1.0mm²	Sensor Common.	
14	RS485 B(-)	0.5mm²	Impedance-120Ω shielding wire is recommended, and the single-end shall be earth connected. No extenal 120Ω resistance is required, the "Matched Resistance Enable" is configured to determine if an internal resistance should be used automatically.	
15	RS485 A(+)	0.5mm²		
16	AUX. Input 1	0.5mm²	Ground connected is active (B-).	See Table 12
17	AUX. Input 2	0.5mm²	Ground connected is active (B-).	
18	AUX. Input 3	0.5mm²	Ground connected is active (B-).	
19	AUX. Output 1	1.0mm²	B+ is suppied by 22 points, rated 5A.	See Table 11
20	AUX. Output 2	1.0mm²	B+ is suppied by 22 points, rated 5A.	
21	AUX. Output 3	1.0mm²	B+ is suppied by 22 points, rated 5A.	
22	DC Power B+	1.5mm²	Connect with positive post of starting battery.	
23	GND	1.5mm²	Connect with negative post of starting battery.	

NOTE1: The USB interface on back panel is a parameter programming interface, and you can use a PC to program the controller.

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7 SCOPES AND DEFINITION OF PROGRAMMABLE PARAMETERS

7.1 CONTENTS AND SCOPES OF PARAMETERS

Table 10 –Contents and Scopes of Parameter Setting

No.	Item		Range	Default	Description
Language Selection					
1	Language		(0-2)	0	0: Simplified Chinese; 1: English; 2: French
Backlight Adjustment					
1	Brightness		(0-4)	0	0: Recommended; 1: Brightness 1(25%); 2: Brightness 2(50%); 3: Brightness 3(75%); 4: Brightness 4(100%); The larger of brightness number, the brighter of the backlight.
Maintenance Setting					
1	Maintenance 1		(0-1)	0	0: Disable; 1: Enable.
2	Maintenance 2		(0-1)	0	The maintenance time, maintenance time due action and maintenance time reset can be set at the same time. After maintenance, the maintenance time due alarm can be reset by setting maintenance time. See Table 15 for details.
3	Maintenance 3		(0-1)	0	
Module Setting					
1	Module Address		(1-254)	1	The controller address of remote monitoring.
2	Password		(0-9999)	318	This password is used to enter the advanced parameter setting.
3	Maintenance Password		(0-9999)	1234	This password is used to enter the maintenance parameter setting.
4	CAN Comm	Baud Rate	(0-2)	1	0: 125kbps: 1: 250kbps: 2: 500kbps.
		Matched Resistance	(0-1)	0	0: Disable; 1: Enable (A 120Ω matched resistance is connected to CANBUS automatically when it is enabed.)
5	Homepage Theme	Top Left	(1-7)	1	01 Engine Temperature; 02 Oil Pressure; 03 Fuel Level; 04 Battery Voltage; 05 Charging Voltage; 06 AdBlue Level; 07 Load Rate
		Bottom Left		3	
		Top Right		2	
		Bottom Right		4	

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No.	Item		Range	Default	Description
6	RS485	Baud Rate	(0-3)	2	0：2400bps； 1：4800bps； 2：9600bps； 3：19200bps。
		Stop Bit	(1-2)	1	1: 1 bit;　　2: 2 bits
		Parity Bit	(0-2)	0	0: No parity bit;　　1: Odd;　　2: Even
		Matched Resistance	(0-1)	1	0: Disable;　　1: Enable
7	Boot Screen		(0-1)	1	0: Disable;　　1: Enable
Timer Setting					
1	Preheat Time		(0-300)s	0	The precharging time for heater plug before the starter is powered on.
2	Cranking Time		(0-60)s	0	Time for starter power on each time.
3	Crank Rest Time		(0-60)s	0	When waiting time before second power up if engine start fails.
4	Safety On Time		(1-60)s	10	Alarms for under speed and charging failure are inactive.
5	Start Idle Time		(0-3600)s	0	Running time for engine idling speed when the engine is starting.
6	Warming Up Time		(0-3600)s	0	After engine enters high-speed running, the warming up time before engine is normal running.
7	Cooling Time		(0-3600)s	0	After engine unloads, the cooling time before engine stops.
8	Stop Idle Time		(0-3600)s	0	Running time for engine idling speed when the engine is stopping.
9	ETS Hold Time		(0-120)s	20	Time for the stop electromagnet energization as the engine is stopping.
10	Fail to Stop		(0-120)s	0	Time after "idle delay" is over before the complete stop when "ETS Hold Time" is set "0"; time after "ETS Hold Time" delay is over before the complete stop when it is set other than "0".
Engine Setting					
1	Engine Type		(0-69)	1	Default: General engine. When connect to J1939 engine, please select the corresponding engine type.
2	Flywheel Teeth		(10.0-300.0)	118.0	Tooth number of the engine, for judging of starter separation conditions and inspecting of engine speed.
3	Under Speed Shutdown Threshold		(0-6000) r/min	1200	When engine speed is lower than this value and lasts for 5s, it is considered as underspeed and sends an alarm of shutdown signal.

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No.	Item	Range	Default	Description
4	Overspeed Shutdown Threshold	(0-6000) r/min	1710	When engine speed is higher than this value and lasts for 2s, it is considered as overspeed and sends an alarm of shutdown signal.
5	Loss of Speed Signal Delay	(0-20.0)s	5.0	When loss of speed signal and shutdown delay, if set as 0s, it will only warn but not stop.
6	Voltage Difference of Charging Failure	(0-30.0)V	6.0	During engine normal running, when the voltage difference between B+ and charger D+(WL) is greater than this value and lasts for 5s, it will send charging failure shutdown.
7	Battery Over Volt. Threshold	(12.0-40.0) V	33.0	When battery voltage is higher than this value and last for 10s, it will send abnormal battery voltage signal, this value only warn but not stop.
8	Battery Under Volt. Threshold	(4.0-30.0)V	8.0	When battery voltage is lower than this value and last for 10s, it will send abnormal battery voltage signal, this value only warn but not stop.
9	Start Attempts	(1-10)次	3	Maximum start times for start failures; when it reaches up to the set value, controller will issue fail to start signal.
10	Crank Disconnect Conditions	(0-2)	0	Conditions for starter and engine are magnetic sensor and oil pressure, aiming to separate the starter motor and engine as soon as possible. 0: Speed; 1: Oil Pressure; 2: Speed+Oil Pressure.
11	Disconnect Speed	(0-3000)r/min	360	When engine speed is above this value, it is considered as crank disconnect, the starter will separate.
12	Disconnect OP	(0-400)kPa	200	When engine oil pressure is above this value during starting, it is considered as crank disconnect, the starter will separate.
13	Disconnect OP Delay	(0-20.0)s	0.0	When crank disconnect conditons include oil pressure, the engine oil pressure is above pre-set value and the delay is above the pre-set value, it is considered as crank disconnect, the starter will separate.
14	Idle Speed	(0-6000) r/min	750	The idle speed threshold of engine.
15	Rated Speed	(0-6000) r/min	1500	The rated speed threshold of engine.
16	ECU Speed Control Period	(1-200)r/min	5	During the speed control, the engine speed increases or decreases for a single press of speed up/down key.
17	ECU Speed Control Address	(0-255)	3	The communication source address of ECU speed control.
18	ECU Speed Control Ramp Rate	(0-1000)r/s	100	The max. variable speed per second of ECU speed control.
19	DPF Screen Display	(0-1)	1	0: Disable;　1: Enable

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No.	Item		Range	Default	Description
ECU Configuration					
1	ECU Alarm Shutdown		(0-1)	0	0: Disable; 1: Enable
2	High Engine Temp. Shutdown	Enable	(0-1)	1	0: Disable; 1: Enable
		Set	(0-1000) °C	98	When the sensor temperature is above this value, it issues high temperature shutdown alarm. This value judges only after safety on delay.
		Delay	(0-3600) s	3	
3	High Engine Temp. Warn	Enable	(0-1)	1	0: Disable; 1: Enable
		Set	(0-1000) °C	95	When the sensor temperature is above this value, it issues high temperature warning. This value judges only after safety on delay.
		Return	(0-1000) °C	93	
		Delay	(0-3600) s	5	
4	Low Engine Oil Pressure Shutdown	Enable	(0-1)	1	0: Disable; 1: Enable
		Set	(0-1000) kPa	103	When the oil pressure of sensor is below this value, it issues low oil pressure shutdown alarm. This value judges only after safety on delay.
		Delay	(0-3600) s	3	
5	Low Engine Oil Pressure	Enable	(0-1)	1	0: Disable; 1: Enable
		Set	(0-1000) kPa	124	When the oil pressure of sensor is below this value, it issues low oil pressure shutdown warning. This value judges only after safety on delay.
		Return	(0-1000) kPa	138	
		Delay	(0-3600) s	5	
Flex. Sensor Setting					
Flex. Sensor 1					
1	Sensor Type		(0-6)	0	Not Used. See Table 13.
2	Curve Type		(0-12)	0	Not Used. See Table 13.
3	Open Action		(0-2)	1	0: Inactive; 1: Warning; 2: Shutdown Alarm
4	High Shutdown		(0-1)	0	0: Disable; 1: Enable
5	Setting Value		(0-1000)	100	The unit is the same as selected sensor.
6	Delay Value		(0-3600)s	5	
7	High Warning		(0-1)	1	0: Disable; 1: Enable
8	Setting Value		(0-1000)	90	The unit is the same as selected sensor.
9	Return Value		(0-1000)	80	The unit is the same as selected sensor.。
10	Delay Value		(0-3600)s	5	
11	Low Shutdown		(0-1)	0	0: Disable; 1: Enable
12	Setting Value		(0-1000)	10	The unit is the same as selected sensor.
13	Delay Value		(0-3600)s	5	
14	Low Warning		(0-1)	1	0: Disable; 1: Enable
15	Setting Value		(0-1000)	20	The unit is the same as selected sensor.
16	Return Value		(0-1000)	30	The unit is the same as selected sensor.
17	Delay Value		(0-3600)s	5	

No.	Item	Range	Default	Description
Flex. Sensor 2				
1	Sensor Type	(0-6)	0	Not Used. See Table 13.
2	Curve Type	(0-12)	0	Not Used. See Table 13.
3	Open Action	(0-2)	1	0: Inactive; 1: Warning; 2: Shutdown Alarm
4	High Shutdown	(0-1)	0	0: Disable; 1: Enable
5	Setting Value	(0-1000)	100	The unit is the same as selected sensor.
6	Delay Value	(0-3600)s	5	
7	High Warning	(0-1)	1	0: Disable; 1: Enable
8	Setting Value	(0-1000)	90	The unit is the same as selected sensor.
9	Return Value	(0-1000)	80	The unit is the same as selected sensor.
10	Delay Value	(0-3600)s	5	
11	Low Shutdown	(0-1)	0	0: Disable; 1: Enable
12	Setting Value	(0-1000)	10	The unit is the same as selected sensor.
13	Delay Value	(0-3600)s	5	
14	Low Warning	(0-1)	1	0: Disable; 1: Enable
15	Setting Value	(0-1000)	20	The unit is the same as selected sensor.
16	Return Value	(0-1000)	30	The unit is the same as selected sensor.
17	Delay Value	(0-3600)s	5	
Flex. Sensor 3				
1	Sensor Type	(0-6)	0	Not Used. See Table 13.
2	Curve Type	(0-12)(Level Sensor 0-11)	0	Not Used. See Table 13.
3	Open Action	(0-2)	1	0: Inactive; 1: Warning; 2: Shutdown Alarm
4	High Shutdown	(0-1)	0	0: Disable; 1: Enable
5	Setting Value	(0-1000)	100	The unit is the same as selected sensor.
6	Delay Value	(0-3600)s	5	
7	High Warning	(0-1)	1	0: Disable; 1: Enable
8	Setting Value	(0-1000)	90	The unit is the same as selected sensor.
9	Return Value	(0-1000)	80	The unit is the same as selected sensor.
10	Delay Value	(0-3600)s	5	
11	Low Shutdown	(0-1)	0	0: Disable; 1: Enable
12	Setting Value	(0-1000)	10	The unit is the same as selected sensor.
13	Delay Value	(0-3600)s	5	
14	Low Warning	(0-1)	1	0: Disable; 1: Enable
15	Setting Value	(0-1000)	20	The unit is the same as selected sensor.
16	Return Value	(0-1000)	30	The unit is the same as selected sensor.
17	Delay Value	(0-3600)s	5	
Flex. Sensor 4				
1	Sensor Type	(0-6)	0	Not Used. See Table 13.
2	Curve Type	(0-12) (Level Sensor 0-11)	0	Not Used. See Table 13.

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No.	Item	Range	Default	Description
3	Open Action	(0-2)	1	0: Inactive; 1: Warning; 2: Shutdown Alarm
4	High Shutdown	(0-1)	0	0: Disable; 1: Enable
5	Setting Value	(0-1000)	100	The unit is the same as selected sensor.
6	Delay Value	(0-3600)s	5	
7	High Warning	(0-1)	1	0: Disable; 1: Enable
8	Setting Value	(0-1000)	90	The unit is the same as selected sensor.
9	Return Value	(0-1000)	80	The unit is the same as selected sensor.
10	Delay Value	(0-3600)s	5	
11	Low Shutdown	(0-1)	0	0: Disable; 1: Enable
12	Setting Value	(0-1000)	10	The unit is the same as selected sensor.
13	Delay Value	(0-3600)s	5	
14	Low Warning	(0-1)	1	0: Disable; 1: Enable
15	Setting Value	(0-1000)	20	The unit is the same as selected sensor.
16	Return Value	(0-1000)	30	The unit is the same as selected sensor.
17	Delay Value	(0-3600)s	5	
Flex. Sensor 5				
1	Sensor Type	(0-6)	0	Not Used. See Table 13.
2	Curve Type	(0-12) (Level Sensor 0-11)	0	Not Used. See Table 13.
3	Open Action	(0-2)	1	0: Inactive; 1: Warning; 2: Shutdown Alarm
4	High Shutdown	(0-1)	0	0: Disable; 1: Enable
5	Setting Value	(0-1000)	100	The unit is the same as selected sensor.
6	Delay Value	(0-3600)s	5	
7	High Warning	(0-1)	1	0: Disable; 1: Enable
8	Setting Value	(0-1000)	90	The unit is the same as selected sensor.
9	Return Value	(0-1000)	80	The unit is the same as selected sensor.
10	Delay Value	(0-3600)s	5	
11	Low Shutdown	(0-1)	0	0: Disable; 1: Enable
12	Setting Value	(0-1000)	10	The unit is the same as selected sensor.
13	Delay Value	(0-3600)s	5	
14	Low Warning	(0-1)	1	0: Disable; 1: Enable
15	Setting Value	(0-1000)	20	The unit is the same as selected sensor.
16	Return Value	(0-1000)	30	The unit is the same as selected sensor.
17	Delay Value	(0-3600)s	5	
Flex. Sensor 6				
1	Sensor Type	(0-6)	0	Not Used. See Table 13.
2	Curve Type	(0-12) (Level Sensor 0-11)	0	Not Used. See Table 13.
3	Open Action	(0-2)	1	0: Inactive; 1: Warning; 2: Shutdown Alarm
4	High Shutdown	(0-1)	0	0: Disable; 1: Enable

No.	Item	Range	Default	Description
5	Setting Value	(0-1000)	100	The unit is the same as selected sensor.
6	Delay Value	(0-3600)s	5	
7	High Warning	(0-1)	1	0: Disable; 1: Enable
8	Setting Value	(0-1000)	90	The unit is the same as selected sensor.
9	Return Value	(0-1000)	80	The unit is the same as selected sensor.
10	Delay Value	(0-3600)s	5	
11	Low Shutdown	(0-1)	0	0: Disable; 1: Enable
12	Setting Value	(0-1000)	10	The unit is the same as selected sensor.
13	Delay Value	(0-3600)s	5	
14	Low Warning	(0-1)	1	0: Disable; 1: Enable
15	Setting Value	(0-1000)	20	The unit is the same as selected sensor.
16	Return Value	(0-1000)	30	The unit is the same as selected sensor.
17	Delay Value	(0-3600)s	5	
Custom Sensor Curve Setting				
1	Custom Sensor Curve			Select the sensor, and then input the resistance value (or current or voltage) and its corresponding value at each point of the curve. A total of 8 points are required.
Aux. Input Port Setting				
1	Input 1	(0-19)	2	Emergency stop input. See Table 12.
2	Delay	(0.0-20.0)s	2.0	
3	Active Type	(0-1)	0	0: Close for active; 1: Open for active.
4	Input 2	(0-19)	6	Speed up pulse input. See Table 12.
5	Delay	(0.0-20.0)s	2.0	
6	Active Type	(0-1)	0	0: Close for active; 1: Open for active.
7	Input 3	(0-19)	7	Speed down pulse input. See Table 12.
8	Delay	(0.0-20.0)s	2.0	
9	Active Type	(0-1)	0	0: Close for active; 1: Open for active.
Aux. Output Port Setting				
1	Output 1	(0-57)	44	Crank output. See Table 11.
2	Output 2	(0-57)	45	Running key output. See Table 11.
3	Output 3	(0-57)	41	Overload output. See Table 11.
Speed Control Setting				
1	Interface Selection	(0-2)	0	Selection list: "00 Not Used" "01 Throttle" "02 Panel Key"
2	Local Sensor Channel Selection	(0-3)	0	Selection list: "00 Sensor 3" "01 Sensor 4" "02 Sensor 5" "03 Sensor 6"
3	Remote Sensor Channel Selection	(0-3)	1	Selection list: "00 Sensor 3" "01 Sensor 4" "02 Sensor 5" "03 Sensor 6"

No.	Item	Range	Default	Description
4	Idle Speed Voltage	(0-5.00)V	0.75	When the throttle adjusts the speed, the idle speed value corresponds to voltage.
5	Rated Speed Voltage	(0-5.00)V	3.84	When the throttle adjusts the speed, the rated speed value corresponds to voltage.
6	Idle Speed Current	(4-20.0)mA	4.0	When the throttle adjusts the speed, the idle speed value corresponds to current.
7	Rated Speed Current	(4-20.0)mA	20.0	When the throttle adjusts the speed, the rated speed value corresponds to current.

NOTE 1: The ranges of temperature sensor, oil pressure sensor and level sensor are: 0~1000℃，0~1000 kPa and 0~300% respectively.

7.2 DEFINITION CONTENTS OF PROGRAMMABLE OUTPUT PORTS 1-3

Table 11 − Definition Contents of Programmable Output Ports 1-3

No.	Items	Description
00	Not Used	
01	Custom Time Output 1	Function description see the following contents.
02	Custom Time Output 2	
03	Custom Time Output 3	
04	Custom Combined Output 1	
05	Custom Combined Output 2	
06	Custom Combined Output 3	
07	Engine Running	Output when engine is in normal running, disconnect when the speed is below the crank disconnect speed.
08	Over Speed Warning	Act when the over speed warning occurs.
09	Over Speed Shutdown	Act when the over speed shutdown alarm occurs.
10	Under Speed Warning	Act when under speed warning occurs.
11	Under Speed Shutdown	Act when under speed shutdown alarm occurs.
12	Sensor 1 High Warning	Act when Flex. Sensor 1 high warning occurs.
13	Sensor 1 Low Warning	Act when Flex. Sensor 1 low warning occurs.
14	Sensor 1 High Shutdown	Act when Flex. Sensor 1 high shutdown occurs.
15	Sensor 1 Low Shutdown	Act when Flex. Sensor 1 low shutdown occurs.
16	Sensor 2 High Warning	Act when Flex. Sensor 2 high warning occurs.
17	Sensor 2 Low Warning	Act when Flex. Sensor 2 low warning occurs.
18	Sensor 2 High Shutdown	Act when Flex. Sensor 2 high shutdown occurs.
19	Sensor 2 Low Shutdown	Act when Flex. Sensor 2 low shutdown occurs.
20	Sensor 3 High Warning	Act when Flex. Sensor 3 high warning occurs.
21	Sensor 3 Low Warning	Act when Flex. Sensor 3 low warning occurs.
22	Sensor 3 High Shutdown	Act when Flex. Sensor 3 high shutdown occurs.
23	Sensor 3 Low Shutdown	Act when Flex. Sensor 3 low shutdown occurs.
24	Emergency Stop	Act when emergency stop alarm occurs.
25	Idle Control	Used for the engine with idle speed. Pick-up when crank while disconnect when entering into warming up. Pick-up when stop idle while disconnect when engine stops

No.	Items	Description
		completely.
26	Maintenance Time Due	Act when maintenance time due occurs.
27	Common Shutdown Alarm	Alarm when common shutdown alarms
28	Common Warning Alarm	Act when common warning alarms.
29	High Battery Voltage Warning	Act when high battery voltage warning alarms.
30	Low Battery Voltage Warning	Act when low battery voltage warning alarms.
31	Speed Control Enable	Act when speed control enables.
32	Charge Alt Fail	Act when charging failure warning alarms.
33	Reserved	
34	Low Fuel Level Warning	Act when low fuel level warning is active.
35	High Water Temp. Warning	Act when high water temperature warning occurs.
36	Low Oil Pressure Warning	Act when low oil pressure warning occurs.
37	ECU Warning Alarm	ECU issues a warning alarm signal.
38	ECU Shutdown Alarm	ECU issues a shutdown alarm signal.
39	ECU Comm Failure	Controller can not communicate with ECU.
40	Reserved	
41	Overload Output	During normal running, when the controller detects that the engine speed is less than the pre-set threshold value, the output enables. When the speed rises to the return value, the output will be disconnected.
42	Reserved	
43	Reserved	
44	Start Output	Act when engine starts and disconnects after successful start.
45	Running Key	For the engine that needs to view ECU data, which outputs as soon as power on and stops output during the "ETS Solenoid Hold" and "Stop Failure", and controls the signal of the running key switch.
46	Sensor 4 High Warning	Act when Flex. Sensor 4 high warning occurs.
47	Sensor 4 Low Warning	Act when Flex. Sensor 4 low warning occurs.
48	Sensor 4 High Shutdown	Act when Flex. Sensor 3 high shutdown occurs.
49	Sensor 4 Low Shutdown	Act when Flex. Sensor 4 low shutdown occurs.
50	Sensor 5 High Warning	Act when Flex. Sensor 5 high warning occurs.
51	Sensor 5 Low Warning	Act when Flex. Sensor 5 low warning occurs.
52	Sensor 5 High Shutdown	Act when Flex. Sensor 5 high shutdown occurs.
53	Sensor 2 Low Shutdown	Act when Flex. Sensor 5 low shutdown occurs.
54	Sensor 6 High Warning	Act when Flex. Sensor 6 high warning occurs.
55	Sensor 6 Low Warning	Act when Flex. Sensor 6 low warning occurs.
56	Sensor 6 High Shutdown	Act when Flex. Sensor 6 high shutdown occurs.
57	Sensor 6 Low Shutdown	Act when Flex. Sensor 6 low shutdown occurs.

7.2.1 CUSTOM PERIOD OUTPUT

Defined period output is composed by 2 parts: period output S1 and condition output S2.

S1 and S2 both are true, then it outputs.

S1 or S2 is false, it doesn't output.

Period output S1 can be configured randomly to one, or several period outputs; Delay time and output time after entering period can be set;

Condition output S2 can be any contents of output settings.

NOTE 1: When period output S1 delay time and output time are both 0, configurations of period output S1 are both true.

NOTE 2: When selected period is standby, it is circular output, the other periods are single output.

Output period: Start

Delay output time: 2s

Output time: 3s

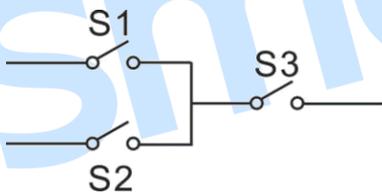Condition output contents: Input 1 is active;

Condition output active/inactive close; close when active (disconnect when inactive)

When input port 1 is active, and it enters start time and delays for 2s, custom period output starts to output, after outputting for 3s, it stops outputting;

When input port 1 is inactive, custom output doesn't output.

7.2.2 DEFINED COMBINATION OUTPUT

Defined combination output is composed by 3 parts: OR condition output S1, OR condition output S2, AND condition output S3.

S1 or S2 is true, and S3 is true, then combination output works.

S1 and S2 both are false, or S3 is false, then combination output doesn't work.

NOTE: S1, S2 and S3 can be any contents except itself defined combination output of the output settings.

NOTE: S1, S2 and S3 cannot include or recursively include itself.

Examples:

Contents of OR condition output S1: input port 1 is active;

Close when OR condition output S1 is active/inactive: close when active (disconnect when inactive);

Contents of OR condition output S2, input port 2 is active;

Close when OR condition output S2 is active/inactive: close when active (disconnect when inactive);

Contents of AND condition output S3: input port 3 is active;

Close when AND condition output S3 is active/inactive: close when active (disconnect when inactive);

When input port 1 is active or input port 2 is active, if input port 3 is active, defined combination output is working; if input port 3 is inactive, defined combination output is not working;

When input port 1 is inactive and port 2 is inactive, no matter port 3 is active or not, defined

combination output is not working.

7.3 DEFINITION CONTENTS OF DIGITAL INPUT PORTS 1-3

Table 12 – Digital Input Ports 1-3

No.	Items	Description
0	Not Used	
1	User-defined	Users can customize the following functions: Indication: display only, no warning, no shutdown. Warning: warning only, no shutdown. Shutdown: alarm and stop immediately. Inactive: input is deactivated. Always active: input always detects. Active from crank: detect begins from crank disconnect. Active from safety on delay: detect begins from safety on delay.
2	Emergency Stop	When input is active, controller will stop immediately.
3	Idle Speed	When input is active, it enters the idle running.
4	Idle/Rated Speed	When input is active, it enters idle running; while input is inactive, it returns to high-speed running.
5	Common Alarm	When input is active, it issues common alarm.
6	Speed Up Pulse	The engine type is 34 GTSC1, when input is active, the target speed increases to the setting speed
7	Speed Down Pulse	The engine type is 34 GTSC1, when input is active, the target speed decreases to the setting speed
8	DPF Regeneration	When input is active, controller sends the DPF regeneration request command to ECU.
9	Eliminate Alarms	When input is active, can reset shutdown alarm.
10	Reset Maintenance Time	When input is active, can reset the maintenance time.
11	Low Fuel Level Warning	When input is active, it issues low fuel level warning.
12	High Temp. Warning	Connect to digital input of sensor.
13	Low Oil Pressure Alarm	Connect to digital input of sensor.
14	Over Speed Shutdown	When input is active, it issues over speed shutdown alarm, and controller etners the stop process.
15	Speed Control Inhibit	When input is active, the speed control is disabled.
16	Start Input	When input is active, simulate the start key function.
17	Stop Input	When input is active, simulate the stop key function.
18	Inhibit DPF Regeneration	When input is active, controller sends the regeneration inhibit command to ECU.
19	Local/Remote Throttle Channel	When the hand throttle controls, if the input is active, the speed control is local throttle; if the input is inactive, the speed control is remote throttle.
20	Reserved	
21	Reserved	
22	Reserved	
23	Reserved	

No.	Items	Description
24	Reserved	
25	Reserved	

7.4 SELECTION OF SENSORS

Table 13 – Sensor Selection

No.	Sensor	Curve Types	Remark
1	Temperature Sensor	0 Not used 1 Custom Res Curve 2 VDO 3 SGH 4 SGD 5 CURTIS 6 DATCON 7 VOLVO-EC 8 SGX 9 Custom (4-20)mA curve 10 Custom (0-5)V curve 11 Digital LSB Active 12 Digital MSB Active	Defined input resistance range is 0~6kΩ. Factory default is "Not Used".
2	Oil Pressure (Pressure) Sensor	0 Not used 1 Custom Res Curve 2 VDO-10Bar 3 SGH 4 SGD 5 CURTIS 6 DATCON 7 VOLVO-EC 8 SGX 9 Custom (4-20)mA curve 10 Custom (0-5)V curve 11 Digital LSB Active 12 Digital MSB Active	Defined input resistance range is 0~6kΩ. Factory default is "Not Used".
3	Level (Fuel Level) Sensor	00 Not used 01 Custom Res Curve 02 SGH 03 SGD 04 Custom (4-20)mA curve 05 Custom (0-5)V curve 06 Digital LSB Active 07 Digital MSB Active 08 10~130Ω 09 70~10Ω 10 4~180Ω 11 12~170Ω	Defined input resistance range is 0~6kΩ. Factory default is "Not Used".

NOTE1：**Flex.Sensor 1 and Flex.Sensor 2 support custom resistance curve, but custom voltage and custom current need to be customized**.

NOTE2: The input signal connected to Flex. Sensor 3~6 can be resistance, current and voltage. When set "custom current/voltage curve" via controller panel, the X-coordinate data is expanded by 10 times, such as 4mA input data is "40".

7.5 CONDITIONS OF CRANK DISCONNECT

Table 14 – Crank Disconnect Conditions

No.	Content
0	Speed
1	Oil Pressure
2	Oil pressure + Speed

a) There are 2 kinds of crank disconnect conditions. Speed sensor and oil pressure sensor can be used seperately. Oil pressure sensor and speed sensor used together is recommended, in order to make the starter and the engine disconnect as soon as possible;

b) Speed sensor is installed in the engine for testing flywheel teeth;

c) When choosing speed, ensure the number of flywheel teeth is the same as the pre-set, otherwise over or under speed shutdown may occur;

d) If the engine has no speed sensor, please don't choose the corresponding item; otherwise Fail to Start or Loss of Speed Signal shutdown will occur;

e) If the engine has no oil pressure sensor, please don't choose the corresponding item.

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8 PARAMETERS SETTING

8.1 MENU

Press ⊞ to enter into the parameters setting menu on main screen, the menu items include:

Parameter Setting
Event Log
Maintenance Setting
ECU DM2
Backlight Adjustment
Language Selection
Controller Information

8.2 CONTROLLER PARAMETERS SETTING

Input password "00318" can set all the parameter items. When the default password (00318) is changed, it needs to input the same password with controller for parameter setting via PC software. If more parameter items need to be set (such as sensor calibration) or password is forgotten, please contact with the manufacturer.

Notes:

a) Please modify the parameter in standby mode (crank conditions, Aux. input/output configuration, multi delays, etc.), otherwise, shutdown alarm or other abnormal conditions may occur;

b) The high threshold value must be over than the low threshold value, such as the over voltage threshold value must over than the under voltage threshold value, otherwise, over voltage and under voltage will occur at the same time;

c) The over speed threshold value must greater than the under speed threshold value, otherwise, over speed and under speed will occur at the same time;

d) When setting the warning alarm, please correctly set the return value, otherwise, the abnormal alarm will occur. When setting high warning, the return value should be less than the set value, while setting low warning, the return value should be greater than the set value;

8.3 EVENT LOG

Users may query up to 200 pieces of records via this item.

8.4 MAINTENANCE SETTING

The maintenance time and action can be set via this item.

Table 15 – Maintenance Setting

Item	Contents	Description
Enable Selection	0: Disable; 1: Enable	Used to set whether the current maintenance is active or not.
Maintenance Time	(0-30000)h	The number of hours from maintenance is enabled to the time when maintenance is required.
Maintenance Time Due	0: Warn 1. Alarm Shutdown 2: No Action	The alarm action when the maintenance timer reaches the maintenance setting time.

Item	Contents	Description
Maintenance Alarm Time	(0-30000)h	The number of hours from maintenance is enabled to the time when maintenance alarm is active.
Maintenance Alarm Time Due	0: Warn 1: Alarm Shutdown 2: No Action	The alarm action the when maintenance timer reaches the maintenance alarm setting time.
Maintenance Time Resetting		After the maintenance is finished, reset the maintenance time by seting this parameter.

8.5 ECU DM2

This selection screen displays the engine DM2 alarm records.

8.6 BACKLIGHT ADJUSTMENT

This item can adjust the brightness of LCD backlight.

8.7 LANGUAGE SELECTION

The selection screen displays simplified Chinese, English and French.

8.8 CONTROLLER INFORMATION

This screen displays the development information of controller, such as software version, hardware version and release date.

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9 SENSOR SETTING

When choosing sensor, standard of sensor curve will be needed. If temperature sensor is set as SGD, sensor curve should be SGD curve; If it is set as SGX, sensor curve should be SGX curve.

If there is difference between standard sensor curve and chosen sensor curve, select "defined sensor", and then input defined sensor curve.

When sensor curve is inputted, X value must be in accordance with the order of small to large, otherwise errors will occur.

When sensor is selected as "Not used", the sensor curve will not take effect.

If there is only alarm switch of the corresponding sensor, then you must set the sensor as "Not used", otherwise shutdown alarm or warning may occur.

Can set several points of headmost or backmost as the same ordinate, as the following picture:

Fig.9 – Sensor Curve Diagram

Table 16 – Conventional Pressure Unit Conversion Table

	$1N/m^2$ (pa)	$1kgf/cm^2$	1bar	$(1b/in^2)$ psi
1Pa	1	1.02×10^{-5}	1×10^{-5}	1.45×10^{-4}
$1kgf/cm^2$	9.8×10^4	1	0.98	14.2
1bar	1×10^5	1.02	1	14.5
1psi	6.89×10^3	7.03×10^{-2}	6.89×10^{-2}	1

10 COMMISSIONING

Please make sure the following checks are made before commissioning,

— Ensure all the wiring connections are correct and wire diameter is suitable;

— Ensure that the controller DC power has fuse, and controller's positive and negative and starter battery are correctly connected;

— Take proper actions to prevent engine from cranking successfully (e. g. Remove the connection wire of fuel valve). If checking is OK, make the start battery power on;

— The engine will start when the start input configuration is active. After the cranking times set before, controller will send signal of Start Failure; reset the controller when stop input configuration is active.

— Recover the action to prevent engine from cranking successfully (e. g. Connect wire of fuel valve), press start button again, and engine will start. If everything goes well, engine will be normally running after idle running (if idle run is set). During this time, please watch engine's running situation. If there is something abnormal, stop engine and check all wiring connections according to this manual.

— If there is any other question, please contact SmartGen's service.
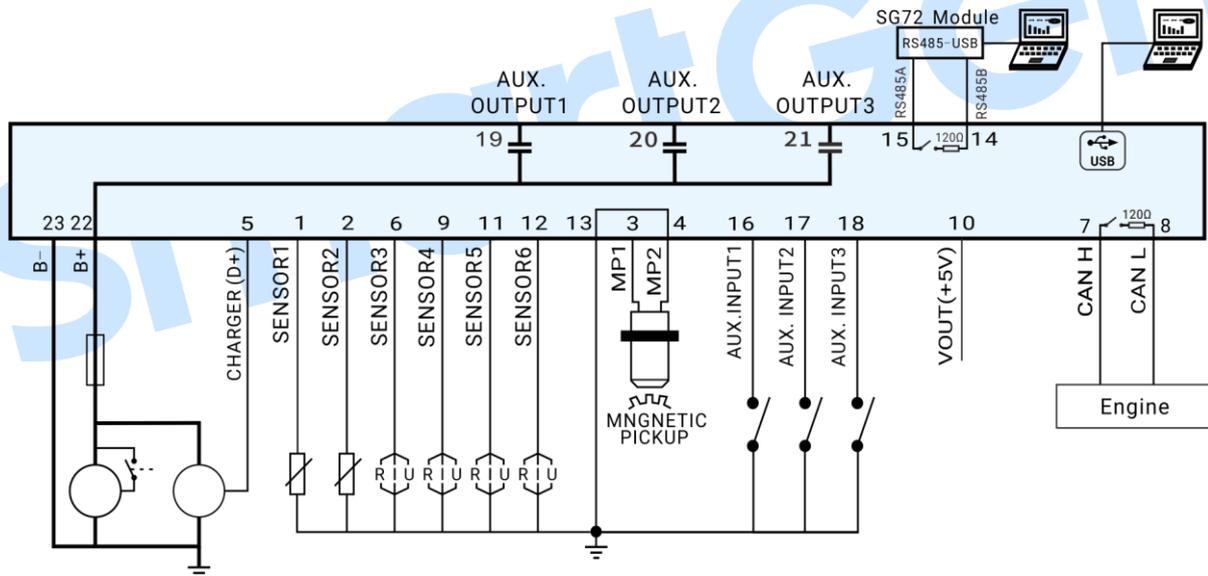
11 TYPICAL APPLICATION

Fig.10 – EP4301 Typical Application Diagram
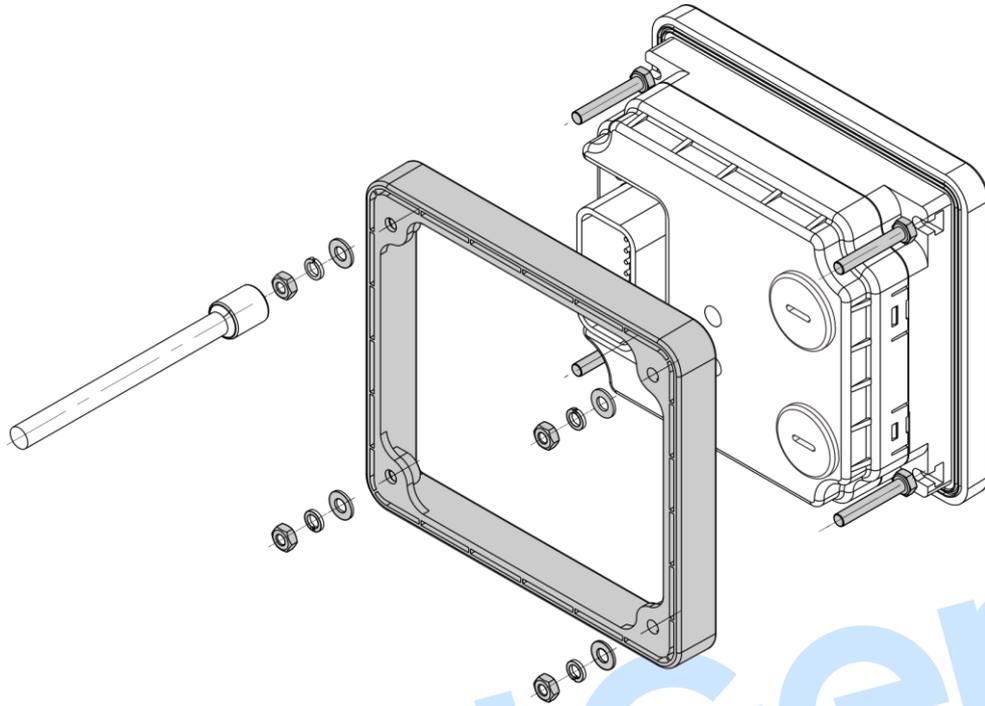
12 INSTALLATION

12.1 FIXING CLIPS

Fig.11 – EP4301 Fixing Clips Installation

– This controller is panel built-in design and is fixed by pressure frame when installation;
– Remove the pressure from the controller;
– Remove the four M4 bolts and place them in the corresponding slots of the front shell;
– Place the controller in the opening position of the control cabinet, place the pressure frame behind the controller by aligning the four bolts;
– Install and tighten the flat washers, spring washers and hexagonal nuts respectively.

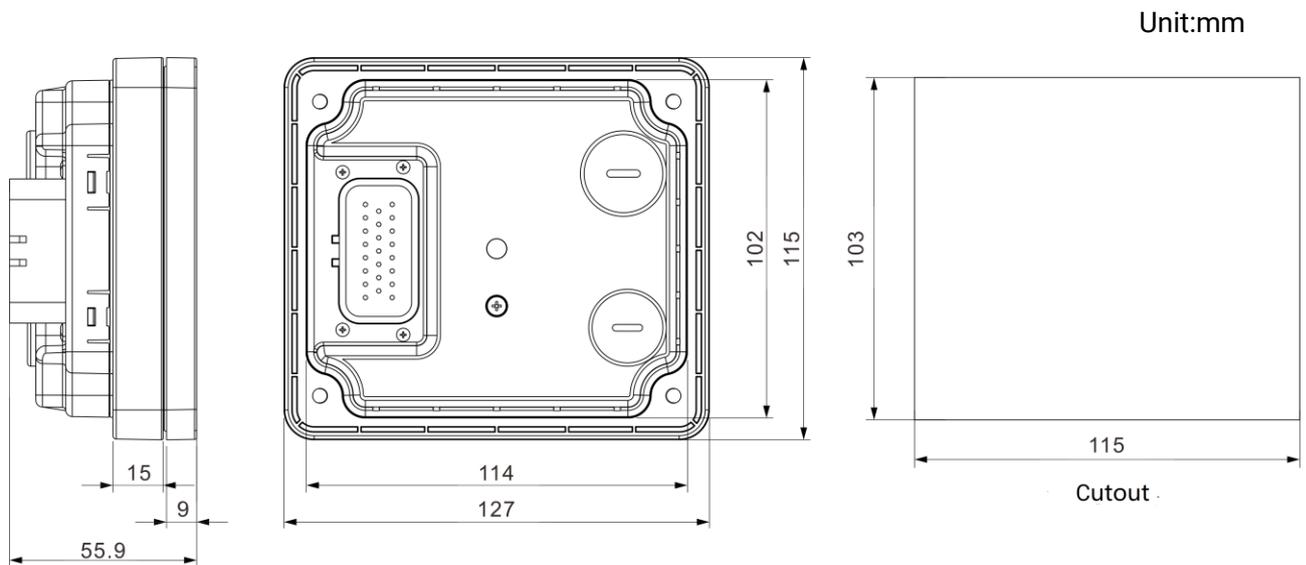### 12.2 OVERALL DIMENSIONS AND PANEL CUTOUT

Unit:mm

Fig.12 – Overall Dimensions and Panel Cutout

13 CONNECTIONS OF CONTROLLER WITH J1939 ENGINE

13.1 CUMMINS QSX15-CM570

Suitable for CM570 engine control module. The engine type is QSX15, etc.

Table 17 50-pin Connector

Terminals of controller	50 pins connector	Remark
Aux. output 1	38	Oil injection switch; Configure it as "Running Output".
Aux. output 2	-	Configure it as "Crank Output". Connect to starter coil directly via expand relay.

Table 18 9-pin Connector

Terminals of controller	9 pins connector	Remark
CAN(H)	SAE J1939 signal-C	Using a connection wire with impedance of 120Ω.
CAN(L)	SAE J1939 return-D	

13.2 CUMMINS QSZ13

Table 19 Engine OEM Connector

Terminals of controller	OEM connector of engine	Remark
Aux. output 1	45	Oil injection switch. Configure it as "Running Output".
Aux. output 2	-	Configure it as "Crank Output". Connect to starter coil directly via expand relay.
CAN(H)	1	Using a connection wire with impedance of 120Ω.
CAN(L)	21	

Engine type: Common J1939.

13.3 MTU ADEC (SMART MODULE)

Suitable for MTU engine with ADEC (ECU8) and SMART module

Table 20 ADEC (X1 Port)

Terminals of controller	ADEC (X1 port)	Remark
Aux. output 1	X1 10	Configure it as "Running Output". X1 Terminal 9 connected to negative of battery.
Aux. output 2	X1 34	X1 Terminal 33 connected to negative of battery.

Table 21 SMART (X4 Port)

Terminals of controller	SMART (X4 port)	Remark
CAN(H)	X4 1	Using a connection wire with impedance of 120Ω.
CAN(L)	X4 2	

Engine type: MTU-ADEC.

13.4 MTU ADEC (SAM MODULE)

Suitable for MTU engine with ADEC (ECU7) and SAM module.

Table 22 ADEC (X1 Port)

Terminals of controller	ADEC (X1 port)	Remark
Aux. output 1	X1 43	Configure it as "Running Output". X1 Terminal 28 connected to negative of battery.
Aux. output 2	X1 37	X1 Terminal 22 connected to negative of battery.

Table 23 SAM (X23 Port)

Terminals of controller	SMART (X4 port)	Remark
CAN(H)	X23 2	Using a connection wire with impedance of 120Ω.
CAN(L)	X23 1	

Engine type: Common J1939.

13.5 VOLVO EDC4

Suitable engine mode is TD520, TAD520 (optional), TD720, TAD720 (optional), TAD721, TAD722, TAD732.

Table 24 Connector

Terminals of controller	B1 connector	Remark
Aux. output 1	Expand 30A relay, the relay supplies battery voltage for Terminal 14. The fuse is 16A.	Configure it as "Running Output".
Aux. output 2	-	Configure it as "Crank Output". Connect to starter coil directly via expand relay.
-	1	Connected to negative of battery.
CAN(H)	12	Using a connection wire with impedance of 120Ω.
CAN(L)	13	

Engine type: VOLVO-EDC4

13.6 YUCHAI

Suitable for Yuchai BOSCH common rail electronic-controlled engine.

Table 25 Engine 42-pin Port

Terminals of controller	Engine 42 pins port	Remark
Aux. output 1	1.40	Configure it as "Running Output". Connects to engine ignition switch.
Aux. output 2	-	Configure it as "Crank Output". Connect to starter coil directly via expand relay.
CAN(H)	1.35	Using a connection wire with impedance of 120Ω.
CAN(L)	1.34	

Table 26 Engine 2-pin Port

Battery	Engine 2-pin Port	Remark
Negative	1	Cable size 2.5 mm^2
Positive	2	

Engine type: BOSCH

13.7 WEICHAI

Suitable for Weichai BOSCH common rail electronic-controlled engine.

Table 27 Engine Port

Terminals of controller	Engine port	Remark
Aux. output 1	1.40	Configure it as "Running Output". Connects to engine ignition switch.
Aux. output 2	1.61	Configure it as "Crank Output". Connect to starter coil directly via expand relay.
CAN(H)	1.35	Using a connection wire with impedance of 120Ω.
CAN(L)	1.34	

Engine type: GTSC1

⚠**NOTE:** If there is any question of connection between controller and ECU communication, please feel free to contact SmartGen's service.

14 TROUBLESHOOTING

Table 28 – Troubleshooting

Symptoms	Possible Solutions
Controller no response with power	Check starting battery; Check controller wirings; Check DC fuse.
Engine stop	Check water/cylinder temperature is too high; Check DC fuse.
Controller emergency stop	Check emergency stop input is configured or not; Check wire connection is open circuit or not.
Oil pressure low alarm after crank disconnection	Check oil pressure sensor and its wire connections.
Water temp. high alarm after crank disconnection	Check water temperature sensor and its wire connections.
Shutdown alarm in running	Check related switch and wirings according to LCD information; Check Aux. input ports.
Crank failure	Check fuel circuit and related wirings; Check starting battery; Check speed sensor and its wire connections; Refer to engine manual.
No response for starter	Check starter wire connections; Check starting battery.
RS485 communication abnormal	Check RS485 wire connections; Check COM port settings are correct or not; Check RS485 A and B are connected reversely or not; Check PC communication port is damaged or not; Check 120Ω resistor between A and B of RS485 is enabled or not.
ECU communication abnormal	Check the wrings polarity of CAN high and CAN low; Check if engine type selection is correct or not; Check if the wrings between controller and engine is correct or not, the output port setting is correct or nor; A 120Ω resistance connected between CANH and CANHL is recommended; If ECU is normally powered on.

15 OPTIONAL ACCESSORIES

Table 29 – Optional Accessories

Category	Model	Brand
Terminal core of plug	T72XXS-C193P1SN01W	WCON Electronic (Guangdong)
Plug	74040-3FC023AN00WA1W	

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