VP Pump Engine Electric System

Installation Guide

RAYWIN POWERTRAIN TECHNOLOGY CO., LTD.
Add: NO.99 JIUJIANG RODE, SHUANGFU DISTRICT, Chongqing, China
Tel: +86 23 85553153

Appendix 1：

12V ECU Electrical System Schematic Diagram

24V ECU Electrical System Schematic Diagram

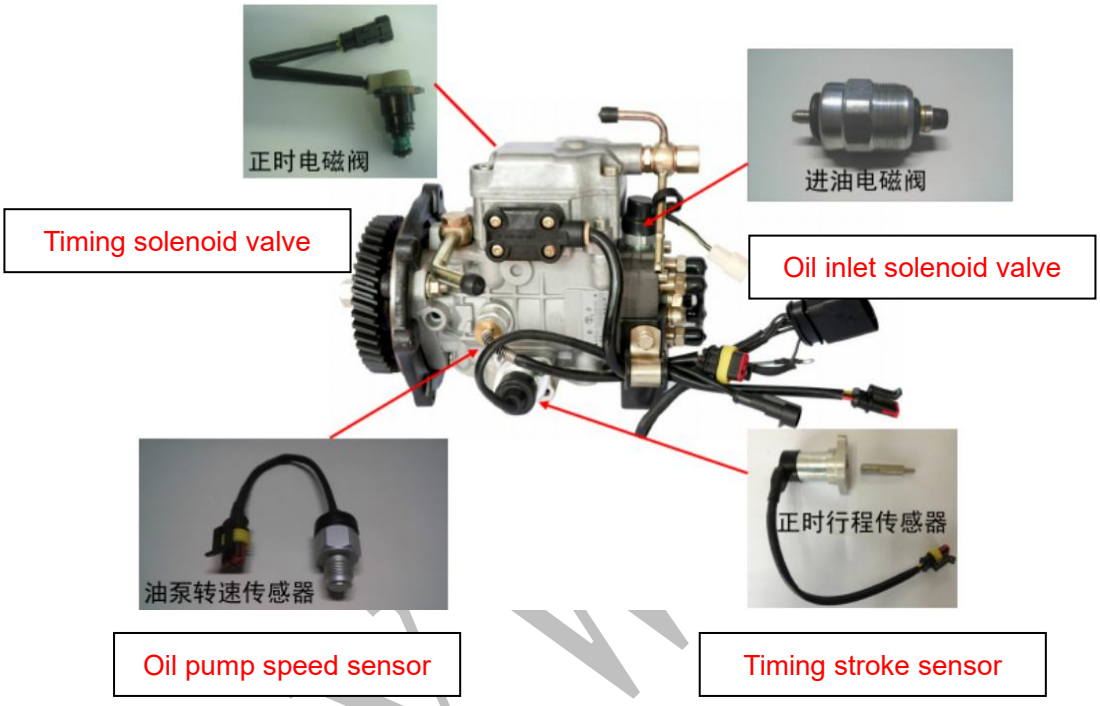
Wiring harness installation guide

Update History

Version	Date	Author	Updates	
1.0	2019/07/17	HWL	Created	N/A
1.1	2019/12/25	HWL	Increase differences in ship machinery	N/A
1.2	2020/08/01	YUE GANG	Add 32-bit system and wiring guidance	N/A
1.3	2021/01/19	YUE GANG	Add fault information	N/A
1.4	2021/01/21	-	Installation and wiring precautions	N/A
1.5	2023/07/24	CYX	Modify the wiring instructions and successful startup conditions of the ship's engine	N/A

1.System introduction

1.1 Fuel system：



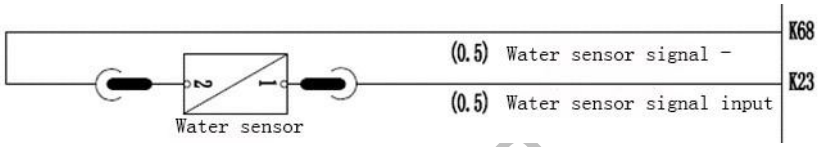
ECU:

ECU Shape

Note: The 12V and 24V ECUs have the same appearance as 64pin.

2.Sensors

2.1 Water sensor



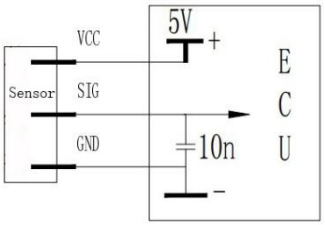
The temperature sensor is composed of NTC thermistors, and the resistance value of the thermistor changes with the temperature of the coolant, causing the voltage output of the sensor to also change. The ECU calculates the current coolant temperature value based on the collected signal, mainly used for cold start control.

2.2 Oil pressure sensor

Oil pressure sensor: VDO 10Bar

Installation thread: NPT 1/4

Output the oil pressure signal to the ECU, and finally feedback it to the instrument through CAN communication, which is displayed in digital form

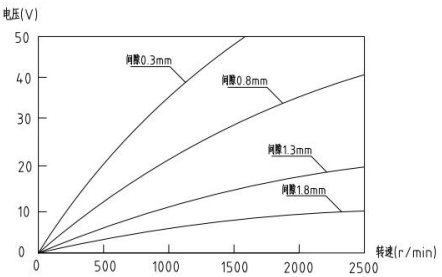


2.3 Speed sensor

Speed sensor (optional):

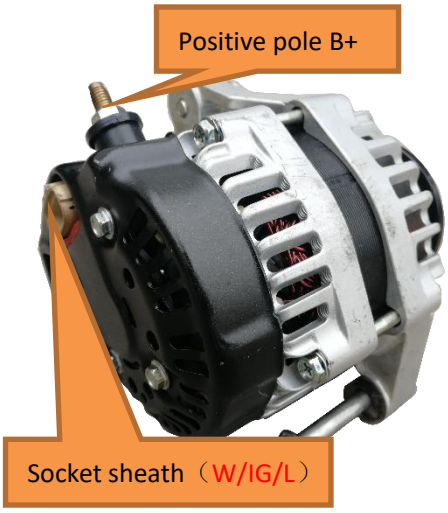
Installation thread: M18X1.5

Installation distance: generally 0.7-1mm from the flying gear teeth



3.Alternator, starter introduction

3.1 Alternator

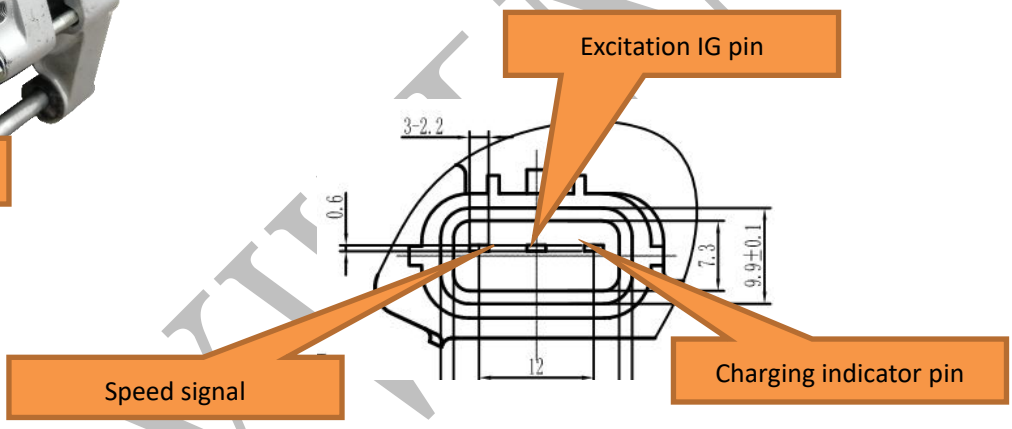


Alternator adopts conventional Japanese structure

Electrical part:

1、 Positive pole B+（ ϕ6）

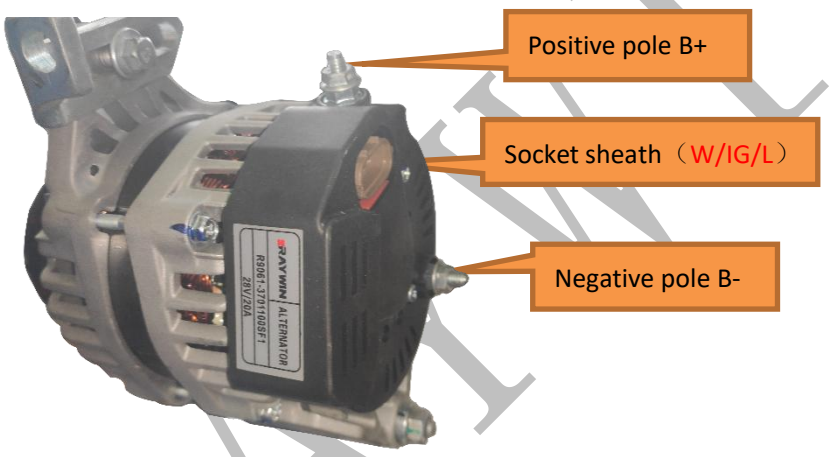
2、 **3-pin connector**（We provide connectors and pins）



Note: The land generator set has provided excitation wires on the engine harness; The generator is not self-excited, and the IG signal is normally energized in the ON position.

3.1.1 Marine Alternator

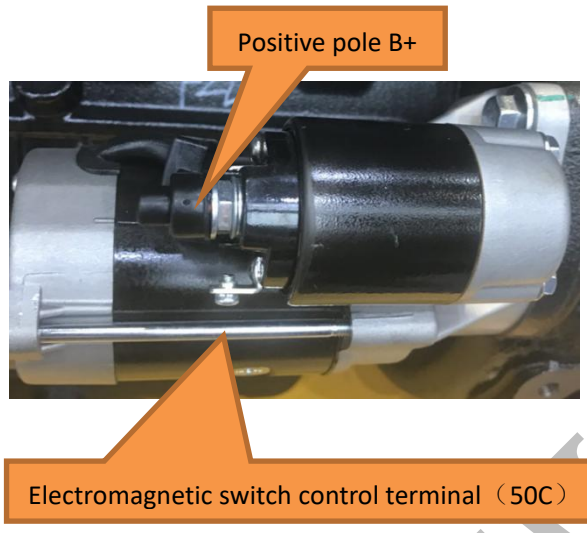
Special note: Due to market demand, the marine alternator is a dual wire system, and the negative electrode needs to be grounded. The negative electrode B- of the marine alternator is led out with a bolt and not connected to the engine casing. The details are as follows



Requirement: In addition to the grounding of the land alternator, the negative pole of the marine alternator also needs to be directly connected to the main switch of the battery negative pole, otherwise the generator cannot generate electricity normally. The recommended wire diameter from generator B+to battery charging line is 10mm ^{2} (Adjustable according to generator current and

distance)

3.2 Starter



The starter is a DC geared motor

Electrical part:

1、 Positive terminal B+（φ8）

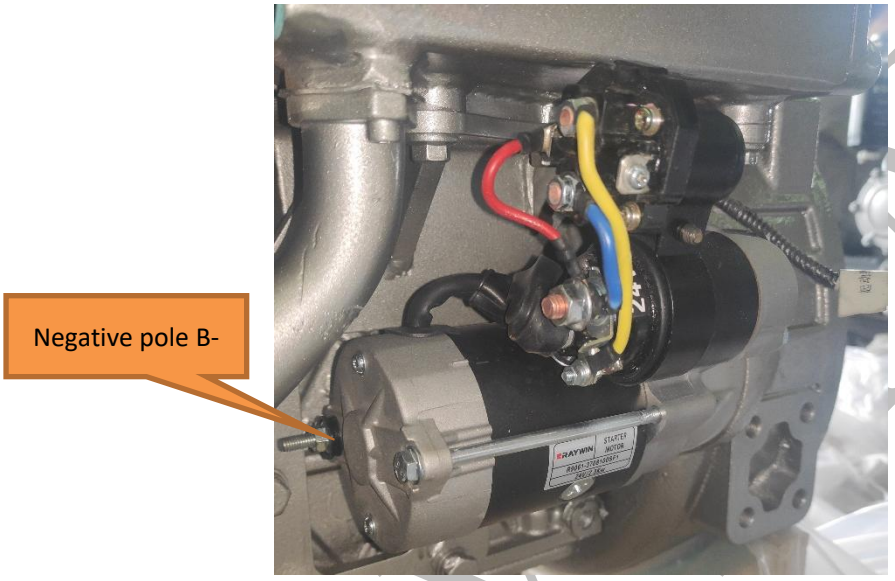
2、Electromagnetic switch control terminal (also called 50C terminal or S terminal)（φ4））

12V Starter electromagnetic switch current: 45-60A

24V Starter electromagnetic switch current: 25-30A

3.2.1 Marine starter

Special note: Due to market demand, the marine starter is a dual wire system, and the negative pole needs to be grounded. The negative pole B- of the marine starter is led out with a bolt and not connected to the engine casing. The details are as follows

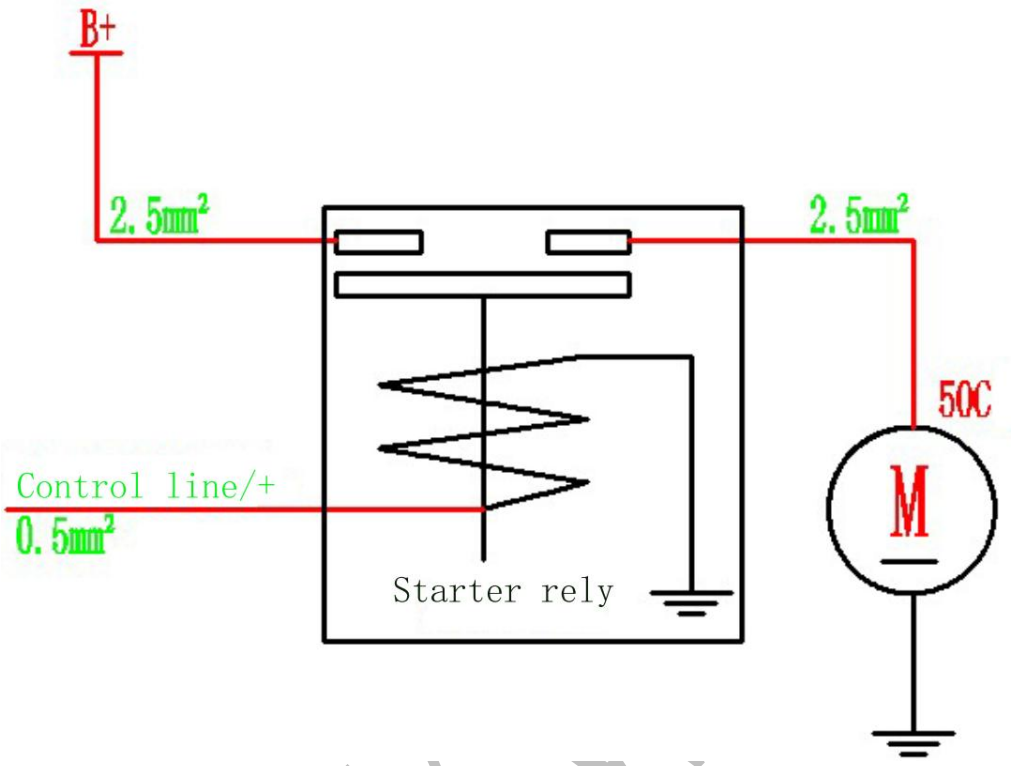


Requirements:

1. On the basis of land based starters, the negative pole B- of marine starters needs to be directly connected to the battery negative pole main switch.

2. The general configuration of the marine engine is as shown in the figure with a starting relay, which can also be directly controlled by the customer by installing a new relay (refer to the following three requirements for details)

3.3 Usage requirements（must read）



3.3.1 Starter rely:

The starting method is relay controlled starting, and the principle is shown in the right figure.

Starter rely ≥12V/60A;24V/40A

3.3.2 Panel requirements：（important）

To prevent damage to the starter due to reverse drag, a panel is used for startup control。

1.1 Condition for determining successful engine start: Speed=350rpm,

Oil pressure=125kPa

1.2 If the engine fails to start for three consecutive times, it should be shut down for a short time to wait for the starter to cool down, and the oil, electricity, and gas circuits should be checked for faults before starting the operation

3.3.2 Basic Introduction

1. The engine ECU adopts CAN communication and follows the J1939 protocol. It can display water temperature, oil pressure, power voltage, and speed, and has a fault code, without connecting to a fault light or charging indicator

2. The ECU power cord in the reserved interface must be connected to the battery terminal as much as possible, and no other electrical appliances except switches are allowed to be connected in the middle

3. If the engine is used as the main engine, please use the Yuchai system standard throttle interface for the throttle

4. Used as a generator set, with the control strategy starting at idle speed and automatically rising to the working speed within 10 seconds without connecting the speed switch

3.4 Battery and Mainline Requirements (Recommended)

Battery requirements：

12V System ≥85Ah 630CCA

24V System ≥85Ah 630CCA*2

It is recommended to increase the battery capacity in high-altitude and cold regions.

Main line requirements for power supply: wire diameter 50-75mm ^{2} Above length<2m

Suggestion: Connect the positive wire of the battery to the positive wire B+ of the starter, and connect the negative wire controlled by the main switch directly to the bolt of the flywheel housing. The connection should be firm and reliable. For the selection of the main line diameter, please refer to the following table. The line diameter in the table is only for calculation purposes. Please choose the appropriate line diameter according to the actual situation.

Nominal voltage	Drop Vd/100A	Conditions of Use
12V	0.2	Good/General
24V	0.4	
12V	0.1	Bad
24V	0.17	

The usage conditions in the table are "good", "general", and "bad", which need to be determined by experience based on the degree of impact of the actual usage environment on the engine, including temperature, humidity, vibration, corrosion, and other factors. They are also related to the engine's usage time, area, and purpose

Average starting current	Drop Vd/100A	Conditions of Use	Line length L	1m	2m
300A	0.2	Normal	Wire diameter S（mm²）	40	50
	0.1	Bad		50	75
S=I*2L/(54.4*Vd)					

3.5 Requirements for marine engine batteries

The environmental requirements for the use of marine engines require high electrical performance. It is recommended that customers use large capacity batteries to meet the engine's battery requirements to the greatest extent possible:

12V system ≥ 150Ah 1000CCA

24V system ≥ 150Ah 1000CCA * 2

Main line requirements for power supply: wire diameter 50-75mm ² The above length is less than 2m.

3.6 Requirements for marine engine batteries

The environmental requirements for the use of marine engines require high electrical performance. It is recommended that customers use large capacity batteries to meet the engine's battery requirements to the greatest extent possible:

12V System ≥150Ah 1000CCA

24V System ≥150Ah 1000CCA*2

Main line requirements for power supply: wire diameter 50-75mm ^{2} The above length is less than 2m.

4.Common electrical system faults

4.1 Battery loss

Generally, starting an engine requires a battery level of 60% -70% or more. Under normal conditions, the static discharge current is very low, and the battery can be stored for more than one month. If the battery loses power in a short period of time, there may be a situation where the electrical appliance continues to discharge. All electrical appliances need to go through the negative main switch. When not in use, the negative main switch can be disconnected to minimize electrical consumption; Check if the engine belt is loose, which may lead to poor engine charging or power loss. Tensioning or replacing the belt is sufficient.

4.2 Engine cannot stop

The engine shutdown is achieved by powering off the A2 signal line; A2 is normally energized during normal operation; If there is a power outage, the machine will shut down. If the machine cannot be stopped, check if the A2 wiring is in the ON position.

4.3 The generator panel cannot control the shutdown

The panel can start and stop the engine normally. But after disconnecting the negative main switch, the instrument cannot be powered off and extinguished. In this situation, the positive and negative poles of the panel are usually directly connected to the positive and negative poles of the battery, without passing through the negative main switch; It is recommended to connect the negative main switch. The reason for this is often due to other electrical appliances applying reverse voltage through the circuit of the monitor when the circuit is complete, which may cause the instrument to fail to turn off. It can be checked by disconnecting the wiring to the instrument one by one.

4.4 Alternator doesn't generate electricity

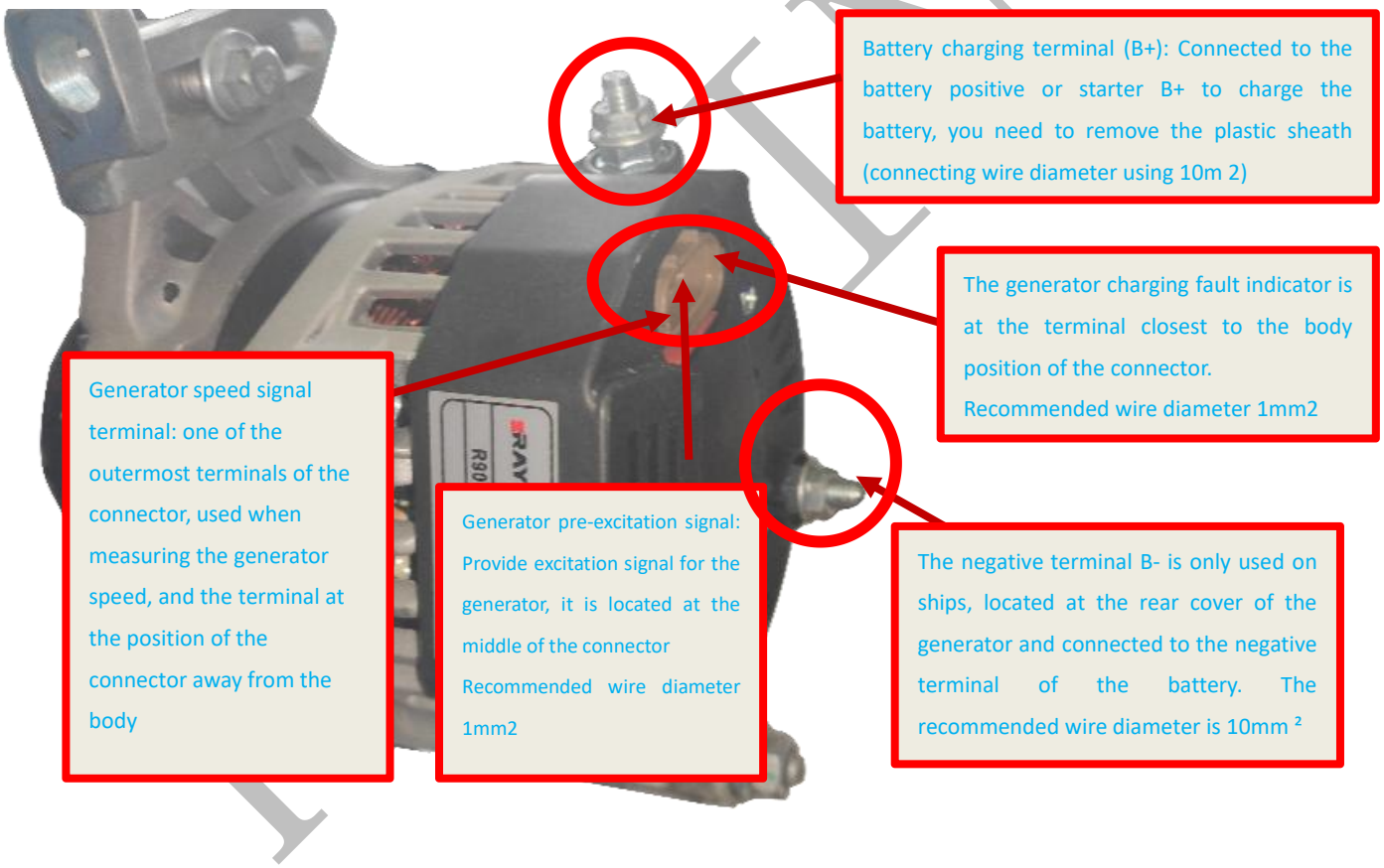
The normal generator output voltage is around 14 ± 0.25V and 27V, which is slightly higher than the battery voltage.

The conditions for normal operation of the generator: the speed of the generator gear train is greater than 1000rpm; There is an excitation signal, and the excitation requires ON power, and there is always power during operation; The generator B+should form a complete circuit with the battery; If you believe that the generator is

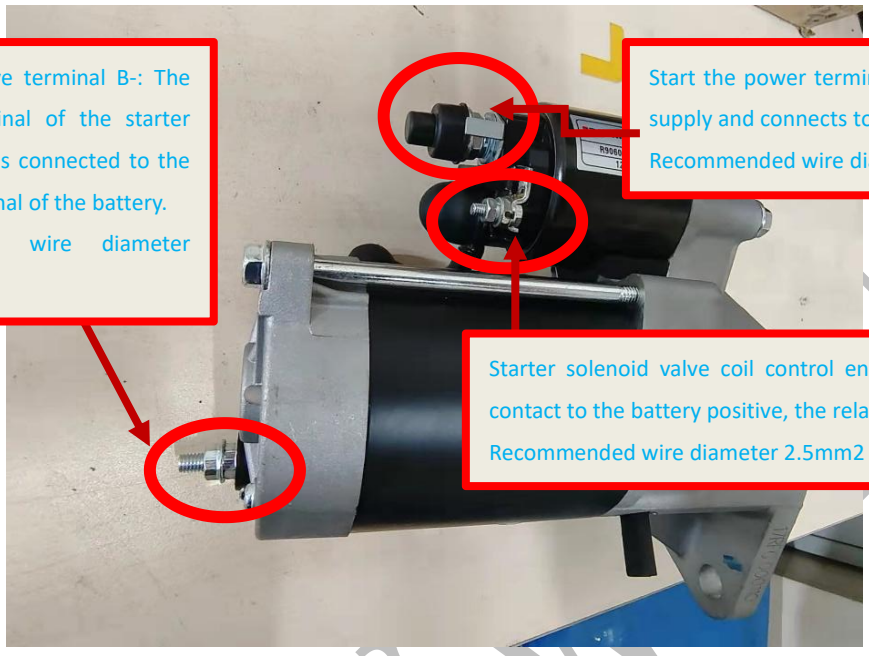
faulty, please check if the above three conditions are met.

5.Important parts installation instructions

5.1 Alternator wiring



5.2 Starter Wiring



6.Installation and wiring precautions

6.1 The wiring locations of battery+ and battery - on the engine harness

（Wrong） （Right）

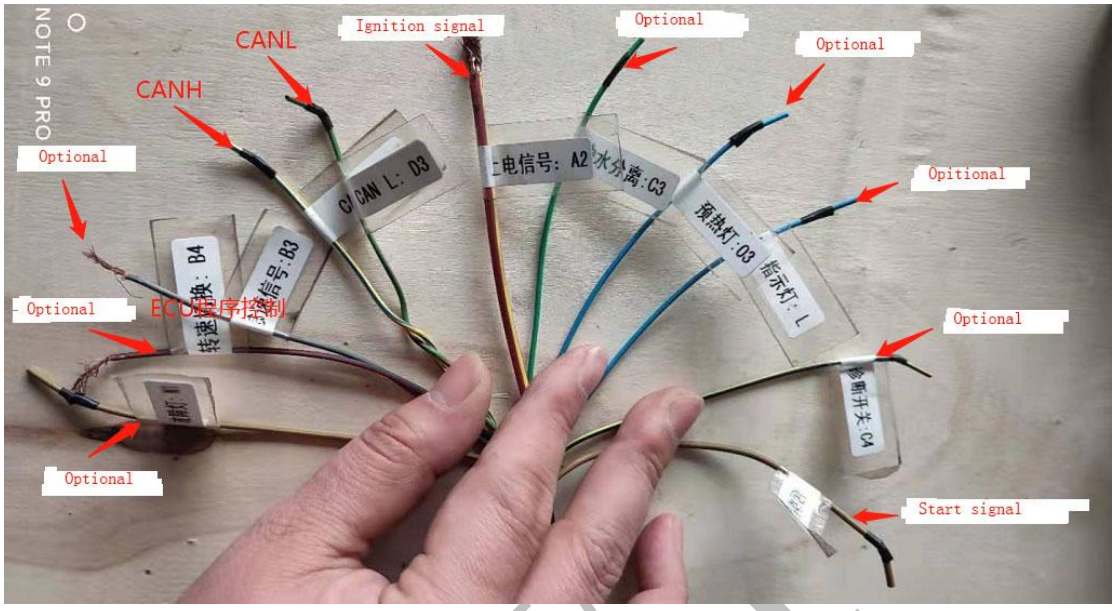
Attention: The purpose of the above wiring is to avoid excessive voltage drop at the remote end during startup, which may ultimately lead to startup failure. When shutdown for a long time without use, the negative main switch must be turned off to avoid battery feeding (all negative circuits must be controlled by the negative main switch).

6.2 Check the fuse

If the instrument displays communication failure and the starter operates normally but cannot be started, please check whether the ECU fuse is normal;

6.3 Alternator wiring

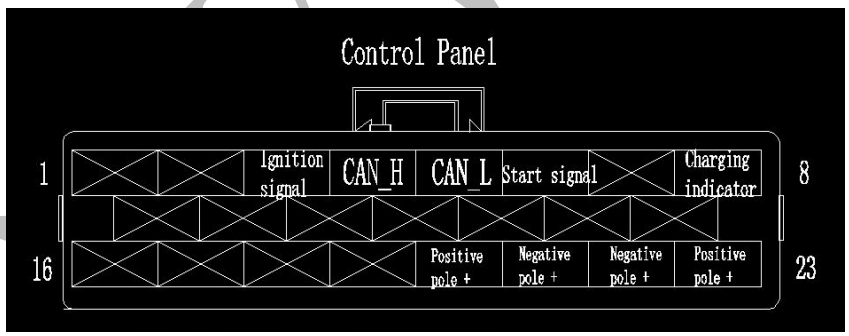
6.4 Engine harness and instrument wiring



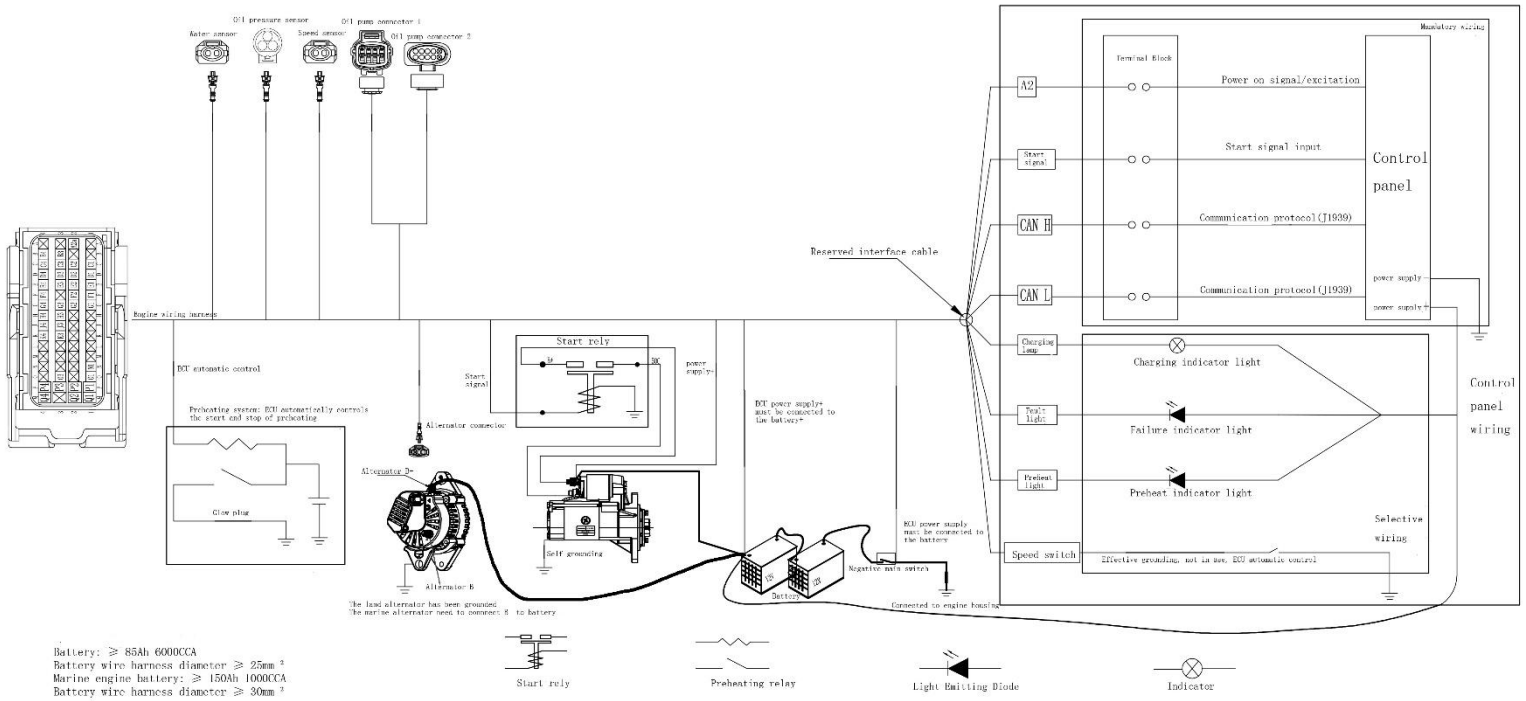
6.5 Check the preheating plug

Note: The working time of the preheating plug is controlled by the engine ECU. Firstly, confirm whether the preheating plug is correctly connected during the wiring process; Secondly, whether the preheating relay is working properly.

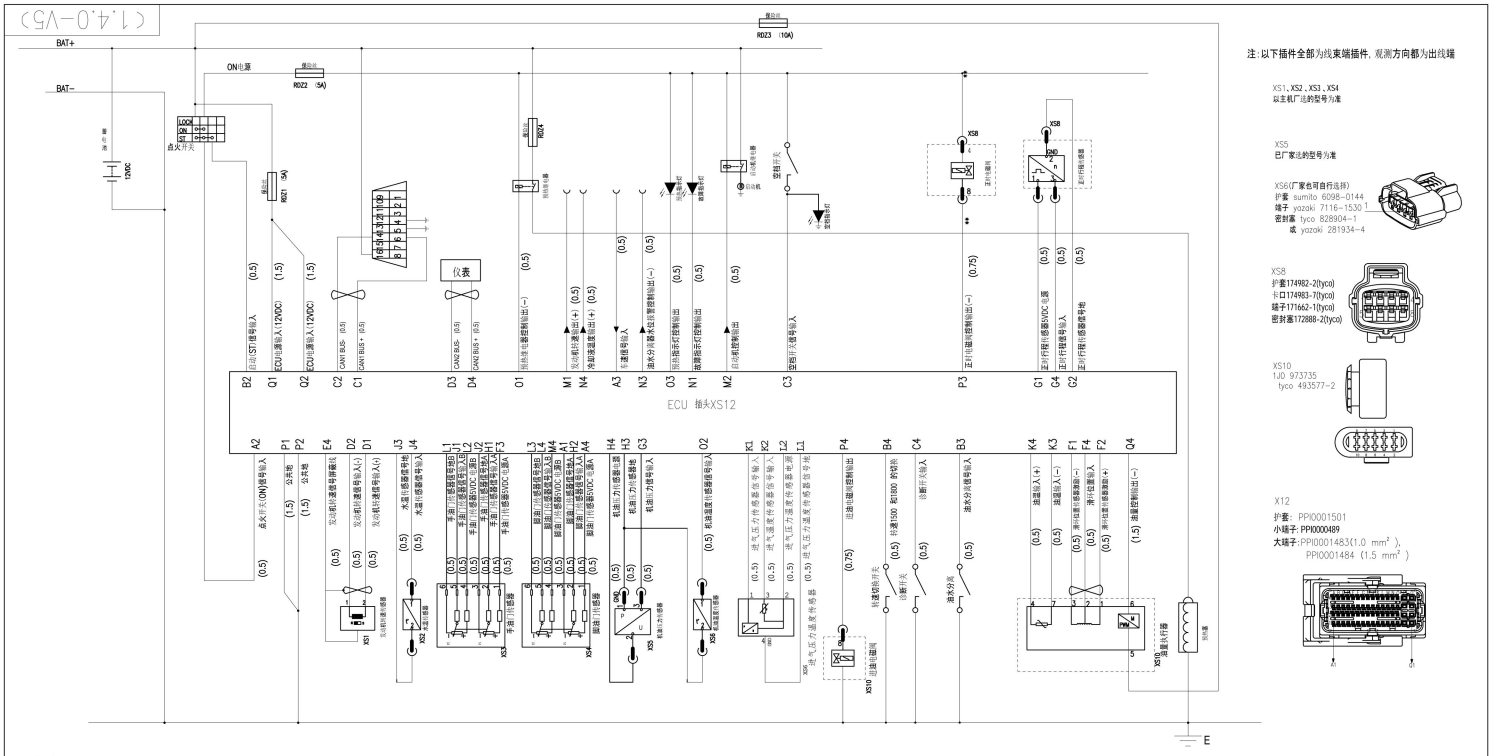
6.6 Location of ship machinery sheath and instrument signal line holes



As shown in the figure, the sheath is connected to the marine monitor used by our company. If you do not use the monitor provided by our company, you can separately select 4 signal wires (power on, CANH, CANL, start) and connect them to the instrument. The power cord is for our company's instrument power supply and may not be used.



RAYWIN POWERTRAIN TECHNOLOGY CO., LTD.
Add: NO.99 JIUJIANG RODE, SHUANGFU DISTRICT, Chongqing, China
Tel: +86 23 85553153



备注：
绿色线框为油泵上的传感器；
必须双绞线；
** 必须双绞线；
须双绞加屏蔽线。

技术要求

1.油量执行器与其他传感器需分开走线，需保证XS10-5接线端与蓄电池正之间的线阻小于200mΩ；
2.大电流的感性负载需与其他传感器最大程度的分开走线；
3.预热继电器、启动机继电器的吸合电流不大于300mA,推荐预热塞继电器线圈阻值为50欧；
4.电瓶额定电压为12V；
5.ECU A2针脚与点火开关之间接线应不经过任何电器；
6.M1、N4、N3输出为OC门，需在仪表盘输入口接上拉电阻（建议1～10K）；
7.油水分离报警，为低端驱动：水位正常时，输出为高阻态；水位高报警时，输出为低电平；
8.手油门和脚油门的B信号为A信号的一半电压值；
9.需保证启动电机正接线端与蓄电池正之间的线阻小于50mΩ；
10.ECU电源（Q1、Q2）需从BAT+直接输入，公共地（P1、P2）需从BAT-接入；
11.曲轴转速传感器推荐使用径向安装，若信号轮是槽型设计，传感器连接到ECU上的两个信号接头需反接。

标记	处数	更改文件号	签字	日期	T4		南京威孚金宁有限公司
设计		顾淑淑	标准化				电控VP泵电气原理图（润威）
校对		孙鹏	批准	江浩	图样标记	重量	比例
审核		仲磊			A		1:1
工艺			日期	2022.10.21	共 页	第 页	（1.4.0-V5）

RAYWIN POWERTRAIN TECHNOLOGY CO., LTD.
Add: NO.99 JIUJIANG RODE, SHUANGFU DISTRICT, Chongqing, China
Tel: +86 23 85553153