AUTOMOTIVE SIGNAL GENERATOR ASG102

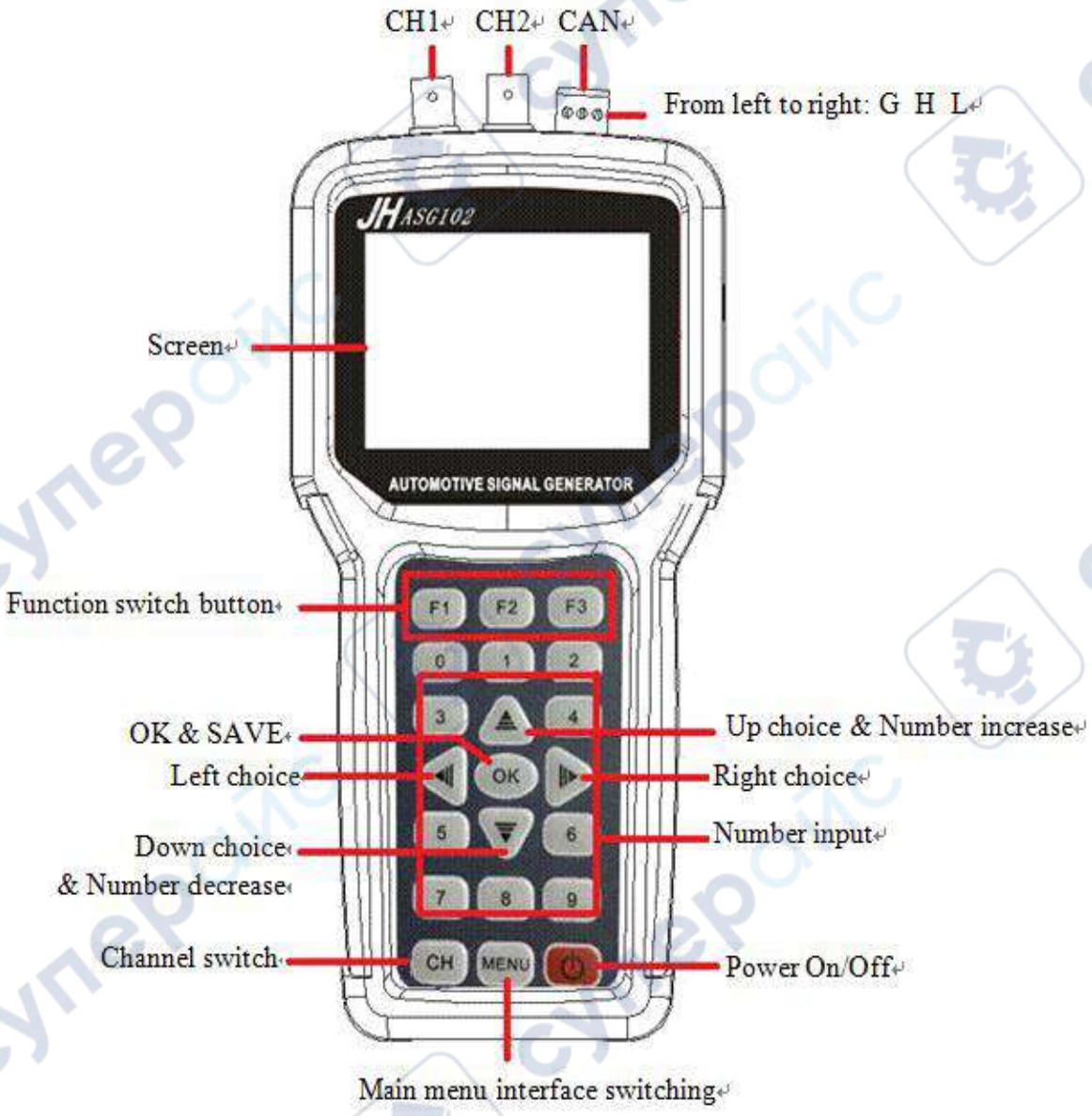
Manual

Content

Part I Basic Operation

First Interface introduction

1. The introduction of signal generator interface



(1) Button and main function

F1: Mainly used to switch and select the first and fourth items, or switch value of the selected item.

F2: Mainly used to switch and select the second and fifth items, or switch value of the selected item.

F3: Mainly used to switch and select the third and sixth items, or switch value of the selected item.

OK: Used for confirming and saving.

: Up, used for upward selection or numerical increase.

: Down, used for downward selection or numerical decrease.

: Left, used for moving one item (bit) to left with selection.

: Right, used for moving one item (bit) to right with selection.

CH: Mainly used for switching configuration interface of CH1 and CH2

MENU: Mainly used to return to menu selection interface.

0-9: Number button, used for setting value.

: Power on/off

(2) Connector description: (as shown in right Figure)

CH1: Output connector of CH1.

CH2: Output connector of CH2.

CAN: Data receiving connector of CAN bus.

(3)Machine features:

According to the rules and actual needs of vehicle diagnosis, we analyze and summarize the characteristics of the car signal generator. As follows :

① Signal characteristics are adjustable in real time: signal can be adjusted at any time including waveform, amplitude, frequency and the number of missing teeth when signal output, which facilitates the determination of faults in the process of vehicle repair greatly.

② Double-CH waveform signal output: it can output different frequencies, amplitudes and waveforms signals in two bandwidths simultaneously.

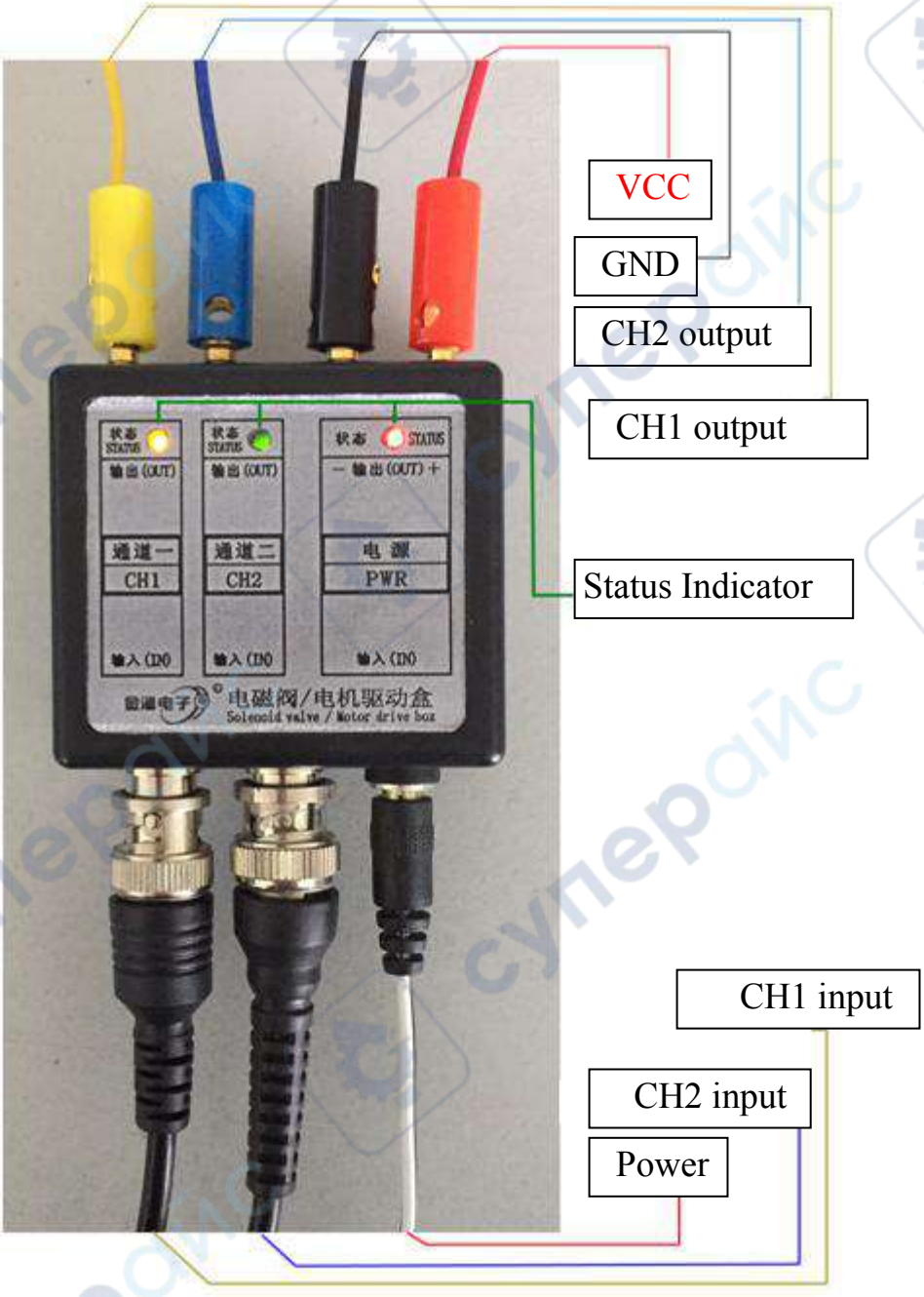
③ CAN bus: to test whether CAN bus of various cars models is normal communication or not, test rate is 10K, 20K, 33.3K, 50K, 62.5K, 83.3K, 125K, 250K, 500K, 1M.

④ Friendly man-machine interface: instrument adopts the most simple design idea and 320*240 large LCD. The display interface is clear and logic; the panel operation is clearly illustrated, which is convenient for operator to perform various operations quickly.

⑤ The appearance is small and convenient, and it is made by double injection molding which makes you comfortable. The internal components are all imported, users can use it with confidence!

2. Solenoid valve drive box interface introduction

The solenoid valve drive box is used to drive coil type or modular high power actuators; the definition is shown below. The power supply is connected by a DC plug. The maximum input voltage is 24V and the maximum current is 2A. More than 2A box will be powered off to protect device. Drive signal is input by BNC connector; output is connected to drive box through banana head.



Second The main interface operation of singal generator

(1) When instrument is turned on, you will enter main operation interface (as shown in Figure1- 1) Press any button (except Power button), CH1 will be selected by default.

(2) After that, you can switch items with selection by ‘ ’.

(3) Then press OK button, you will enteronfiguration interface.

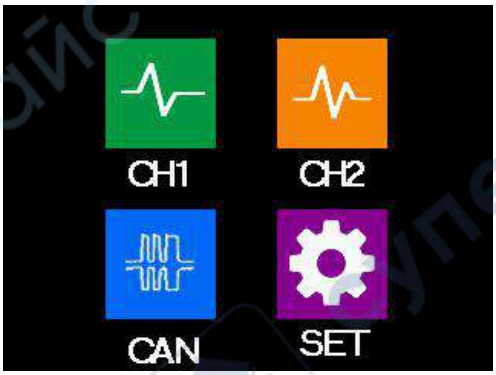


Figure1- 1

1. The signal generator operation

The local signals are divided into DC signal (DC), AC signal (AC), frequency modulation signal (PFM), pulse width modulation signal (PWM), and serial data (multiple) signals.

DC signals: engine coolant temperature sensor, fuel temperature sensor, intake air temperature sensor, throttle position sensor, waste recirculation pressure and position, wing or hot wire air flow meter, vacuum and throttle switch, and GM, Chrysler And the intake pressure sensor of Asian cars.

AC signal: vehicle speed sensor (VSS), wheel speed sensor, magnetoelectric crank angle (CKP) and camshaft transmission (CMP) sensor, engine vacuum balance waveform obtained from analog pressure sensor (MAP) signal, detonation sensor.

Frequency Modulation Signals: Digital Air Flow Meter, Ford Digital Intake Pressure Sensor, Photoelectric Vehicle Speed Sensor (VSS), Hall Type Vehicle Speed Sensor (VSS), Photoelectric Camshaft Angle (CAM) and Crankshaft Angle (CKP) Sensors Hall-type camshaft angle (CAM) and crank angle (CKP) sensors.

Pulse width modulated signals: primary ignition coil, electronic ignition timing circuit, exhaust gas recirculation control (EGR), purification, turbocharging and other control solenoid valves, injectors, idle speed control motors and solenoid valves

After entering main operation interface, you can select CH1 or CH2, and then press OK so you can enter parameter setting interface.(As shown

in Figure1- 2 (CH1) and Figure1- 3(CH2).The main parameters you will configure include frequency, amplitude, duty cycle, waveform, X and Y.

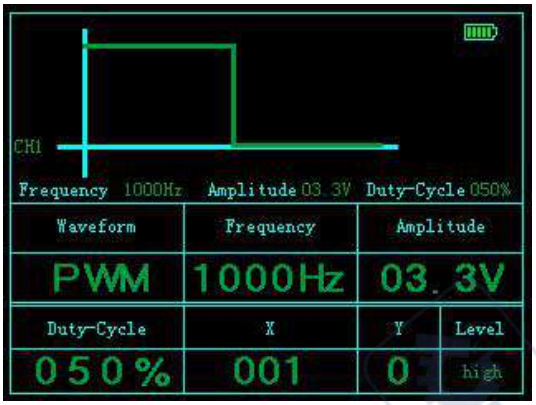


Figure1- 2 (CH1)

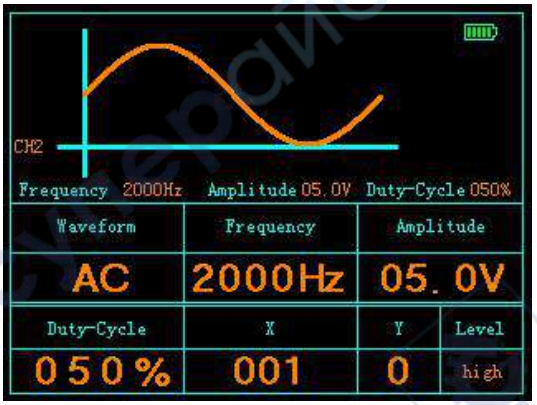
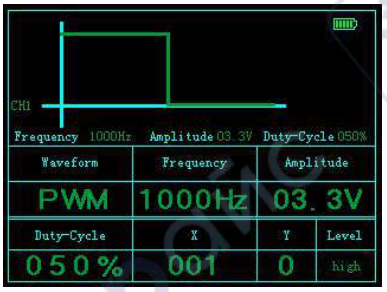


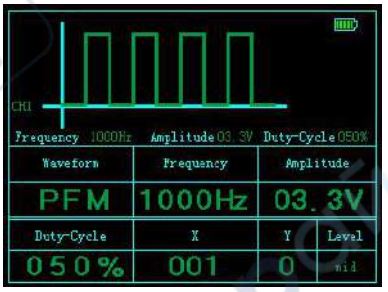
Figure1- 3(CH2)

(1) Waveform selection

(2) Press F1 to select the first item ("Waveform"), then use the "▲ or ▼" key to select the waveform (a total of 6 waveforms) to select the waveform to be output. The waveform corresponding to the serial number can be seen on the display. The waveform and corresponding serial number are as shown below:



1



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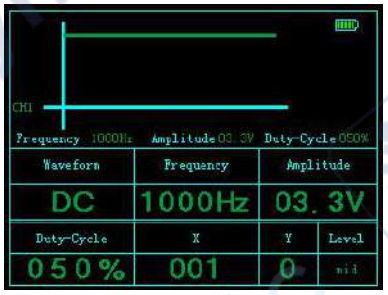

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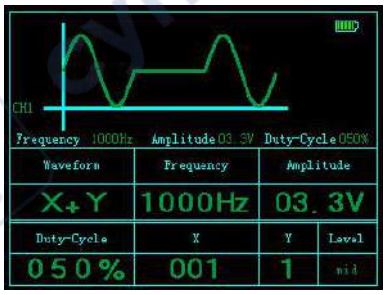

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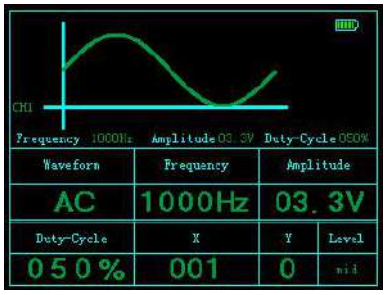
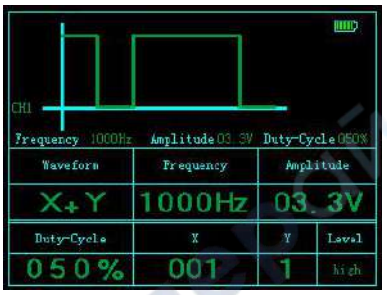




5 6

In the above figure, there is no connection with the level except the waveform X+Y.

(2) Set frequency

Press F2 to select 'Frequency' item, use' ◀ ' or ' ▶ ' button to select a certain bit (such as thousand, hundred, ten) of frequency, then add or subtract (step by step) value by ' ▲ ' or ' ▼ ' or use number button directly.

***Note**: Frequency range is from 1Hz to 5000Hz.*

(3) Set amplitude

Press F3 to select 'amplitude' item, use ' ◀ ' or ' ▶ ' button to select a certain bit (such as thousand, hundred, ten) of amplitude, then add or subtract (step by step) value by ' ▲ ' or ' ▼ ' or use number button directly.

***Note**: Amplitude range is from -10V to 20V.*

(4) Set duty cycle

Press F1 to switch and select 'duty cycle' item, use ' ◀ ' or ' ▶ ' button to select a certain bit (such as hundred, ten) of duty cycle, then add or subtract (step by step) value by ' ▲ ' or ' ▼ ' or use number button directly.

***Note**: duty cycle range is from 0% to 100% and it's only effective for square wave.*

(5) Set X

X represents the number of sine or square waves.

Press F2 to switch and select ‘X’ item, use ‘ ◀| ’ or ‘ |▶ ’ button to select a certain value (such as hundred, ten) of ‘X’, then add or subtract (step by step) value by ‘ ▲ ’ or ‘ ▼ ’ or use number button directly.

***Note**: X range is from 1 to 199.*

(6) Set Y

Y represents the number of lines.

Press F3 to switch and select ‘Y’ item, use ‘ ▲ ’ or ‘ ▼ ’ button to add or subtract (step by step) value or use number button directly.

***Note**: Y range is from 0 to 9.*

2. Example description

For example, now we set CH1 to output a square wave with amplitude 3.3V, frequency 500Hz, duty cycle 10%; and we set CH2 to output a sine wave with amplitude 5.0V, frequency 1KHz, X=58, Y=2. The specific operation as follows:

After signal generator is turned on, select ‘CH1’ then press ‘OK’ to confirm entering CH1 setting interface. Set the waveform PWM (square wave), amplitude 3.3V, frequency 500Hz, duty cycle 10%. As shown in Figure1- 4.

Connect signal generator CH1 with oscilloscope probe. The output can be observed through oscilloscope. As shown in Figure1- 5.

Figure1- 4

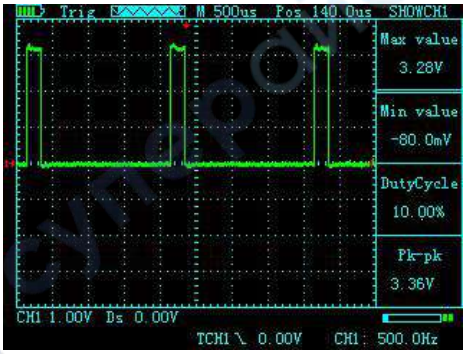


Figure1- 5

Press ‘CH’ to switch to CH2 setting interface (or select ‘CH2’ after power on), then set the waveform X+Y sine wave, amplitude 5.0V, frequency 1000Hz, X=58, Y=2. As shown in Figure1- 6 .

Connect signal generator CH2 with oscilloscope probe. The output can be observed through oscilloscope. As shown in Figure1- 7.

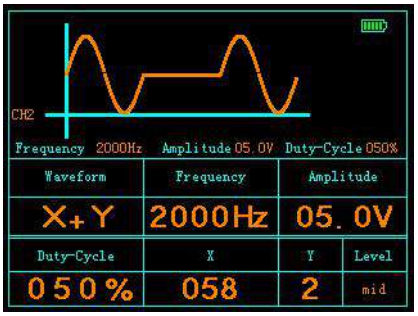


Figure1- 6

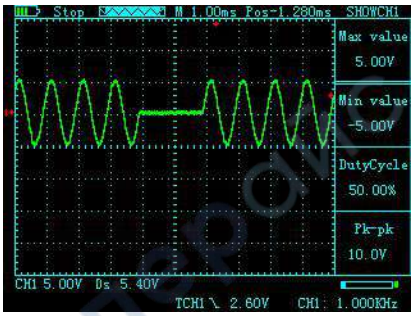


Figure1- 7

Third Drive box settings

Before starting device, check supply voltage of the debug device. For example, fuel supply voltage of gasoline vehicles is generally 12V. Connect box power cable to 12V DC then plug it into power input port of box. At this time, box power supply red indicator light is on. After configuring signal generator, connect output pin to CH1 and CH2 of the drive box. Indicator light will flash (CH1 is for yellow indicator and CH2 is for red indicator). As shown in Figure1- 8

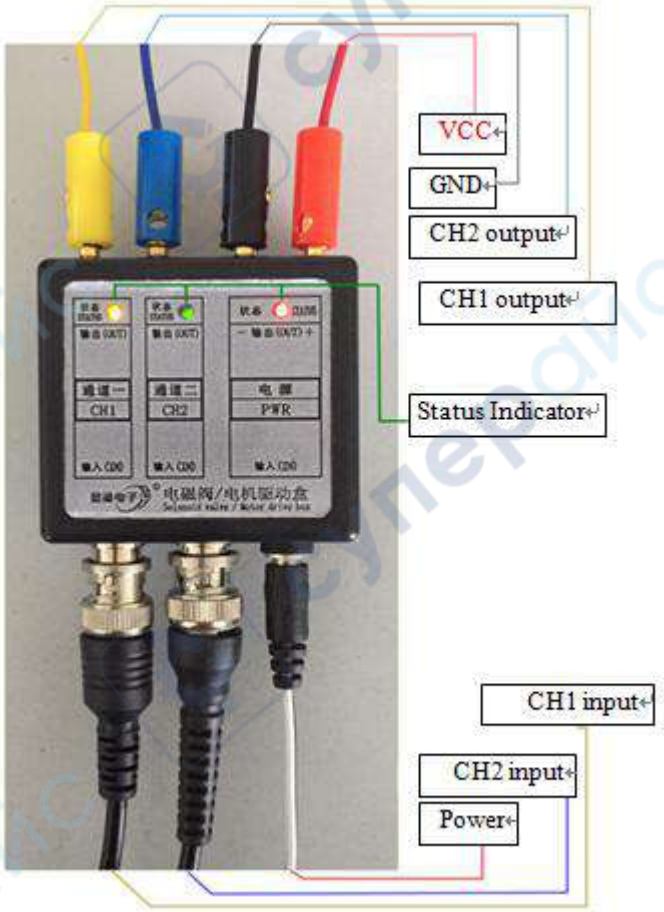


Figure1- 8

Note: When output frequency is large, the indicator light is always on; when output frequency is small, the indicator light flashes. The maximum current of the box is 2A. When drive current exceeds 2A, power will be cut off automatically to protect device. If it is used again, it needs to be powered on again.

Fourth Other settings

After entering main interface (or if you press ‘MENU’ button directly on other interfaces, you will return to main interface), press ‘Settings’ and then press ‘OK’ to enter the setting interface. You can set language, sound, brightness and
restore factory default settings in this interface. As shown in Figure1- 9.

Figure1- 9

(1) Language setting

Press ‘F1’ directly to switch Chinese or English interface.

(2) Sound setting

Press ‘F2’ directly to switch sound on or off.

(3) Brightness setting

Press ‘F3’ directly to adjust screen brightness (level 1-5).The larger value, the brighter screen.

(4) Restore factory default settings

Press ‘ ‘or ‘ ‘ to select ‘Restore factory default settings’ and then press ‘OK’ to confirm. After that, system parameters are changed to default parameters and go to main interface.

Fifth CAN bus

After entering main interface (or if you press ‘MENU’ button directly on other interfaces, you will return to main interface), then press ‘Can bus’ and press ‘OK’ to enter CAN data receiving interface. As shown in Figure1- 10

Figure1- 10

(1) Data receiving

The data receiving area is for displaying each frame of data received, and green portion is the most recently received data. The system can store 50 frames of data temporarily (it will be loss when power off). To view previous data of each frame, you should stop data reception (press ‘F3’ to stop) first and then use ‘▲’ or ‘▼’ key to view. The selected data for each frame is marked in green.

(2) Data analysis instructions

StdId : Standard frame identifier.

ExtId : Extended frame identifier.

IDE: The main difference between StdId and ExtId is: ID is different. The standard frame ID is 11bit (range 0-0x7ff) but extended frame ID is 29bit (range 0-0x1fffffff).

RTR: Data frame or remote frame.

FMI: A 16-bit value indicating which filter the information is filtered by.

In the upper right corner of data parsing area, 'no data' will always flash when no data is received. If data is received, 'have data' will turn to be green. As shown in Figure1- 10.

(3) Receiving operation

① Data line connection: First, insert data receiving line into CAN receiving connector, and put 'broken wire' on the other port. When measuring, connect H and L lines to CAN communication interface of the car.

② Instrument operation: When preparing to receive data, first make sure that receiving status is 'on', so you can press 'F3' to turn it on. Then select communication baud rate, there are two ways： One is manual adjustment, press 'F1' to select baud rate. When switching to a baud rate manually, if there is data coming, receiving area will immediately display received data. This baud rate is we want if you stop switching baud rate at this time. Another way is match automatically. That is, when 'F2' is pressed, system will scan baud rate and display 'Scanning…' in the data receiving area automatically. If data is received, received data will be displayed on screen immediately and the baud rate is set to the baud rate of current communication. If all baud rates have not been received after scanning, screen will prompt: 'Scan failed', which means scan failed.

***Note 1**: The communication rate can be selected as 10K, 20K, 33.3K, 50K, 62.5K, 83.3K, 125K, 250K, 500K, 1M.*

***Note 2**: If you set baud rate manually and do not receive data in every baud rate, please check if the connection is loose or not connected.*

(4) Send data

In CAN receiving setting interface, press and hold 'OK' button, then press '◀‖'button. At this time, 'Sending data...' will be displayed on the screen, which indicates that data is being sent cyclically.

***Note 1**: The data we sent is freely defined by ourselves and it is only used for testing. If data we send is {0x11,0x22,0x33 , 0x44,0xaa,0xa5,0x5a,0xbb}, it will send the first data then send*

the second data in order. Other buttons mustn't be active during data transmission. To exit transmission, press 'MENU' button.

Sixth Upgrade operation

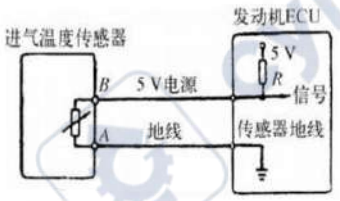
Press and hold 'OK' button in power off state, and then press Power button, it will enter U disk mode. After connecting computer with usb cable, U disk will appear. Copy the upgrade file 'update.bin' into U disk (It is best to perform a formatted operation first), then press ' ' and 'OK' button at the same time to upgrade, restart after upgrade is completed.

Part II Practical application

First The signal generator application introduction

1. Simulate temperature sensor

Temperature sensors include water temperature (coolant temperature), intake air temperature, natural gas temperature, boost temperature, air conditioning evaporator temperature, interior and exterior ambient temperature, fuel temperature hydraulic oil temperature, urea liquid temperature, exhaust temperature (EGR exhaust temperature) , post-treatment of nitrogen oxide temperature, etc.



Two lines of temperature sensor are connected to ECU. One of them is ground wire and the other is signal wire (plug is usually 5Vreference voltage). Inside of the temperature sensor is a thermistor whose resistance value will change according to temperature and the reference voltage of ECU will change (usually 0.5-4.5V), too. ECU determines temperature signal according to voltage change.

When you doubt sensor is damaged, you needn't to replace sensor. Connect the signal generator CH1 to sensor plug as shown in figure. You can change DC voltage amplitude by pressing button to replace sensor to send signals to ECU. Check signal changes perceived by ECU through data flow or screen to judge fault. As shown in Figure2- 1.

Figure2- 1

2. Simulate position sensor

Position sensors include accelerator pedal, throttle knob, remote throttle, throttle position, throttle motor position, exhaust EGR position, coolant level, oil level, fuel level, post-treatment urea level and other lengths, angles and so on.

Common position sensors are three wires which are all connected to ECU. One of them is an external power line (5V is the most, there are also some 12V or 24V), one is ground line, the other is signal line, and voltage will change according to position. ECU measure position signal according to the change of voltage.

When you doubt sensor is damaged, you needn't to replace sensor. Connect the signal generator CH1 to sensor plug and signal ground wire and ground wire of external power also need to be connected. As shown in Figure2- 2. You can change DC voltage amplitude by pressing button to replace sensor to send signals to ECU. Check signal changes perceived by ECU through data flow or screen to judge fault.

Figure2- 2

Position sensors such as electronic throttle and exhaust EGR are all 6-wire plugs, two of them are motor-driven and the other four are position sensors. There are some 4-wire position sensors, and all four wires are connected to ECU. One of them is an external power line (5V is the most, there are also some 12V or 24V), one is the ground line, the other two are

signal lines. And two voltages change according to position. ECU measures position according to the change of voltage.

When you doubt sensor is damaged, you needn't to replace sensor. Connect the signal generator CH1 and CH2 to sensor plug. As shown in Figure2- 3. You can change DC voltage amplitude by pressing button to replace sensor to send signals to ECU. Check signal changes perceived by ECU through data flow or screen to judge fault.

Figure2- 3

The plug of accelerator pedal position sensor is 6 lines. In fact, it is a two-pair three-wire position sensor. They are all connected to ECU. Two of them are external power lines (5V is the most, there are also some 12V or 24V), two are ground lines, the other two are signal lines. And two voltage signals are 1: 2 with position change. ECU measures position according to the change of voltage.

Figure2- 4

When you doubt sensor is damaged, you needn't to replace sensor. Connect the signal generator CH1 and CH2 to sensor plug and signal ground wire and ground wire of external power also need to be connected. As shown in Figure2- 4. You can change DC voltage amplitude by pressing button to replace sensor to send signals to ECU. Check signal changes perceived by ECU through data flow or screen to judge fault.

3. Simulate pressure sensor

Pressure sensors include intake manifold pressure, boost pressure, rail pressure, fuel pressure, oil pressure, natural gas pressure, exhaust pressure, post-treatment urea pressure, hydraulic pump pressure, boom pressure, arm pressure, travel pressure, swing pressure and overflow pressure, etc. Inside the pressure sensor is a varistor whose resistance value will change according to pressure.

Common pressure sensors are three wires which are connected to ECU. One of them is an external power line (5V is the most, there are also some 12V or 24V), one is the ground line, the other is signal line, and voltage changes according to pressure. ECU measures pressure signal according to the change of voltage.

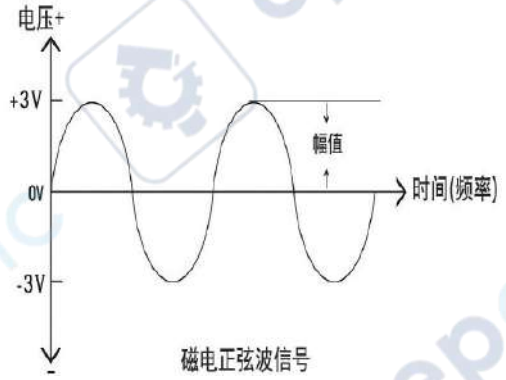
When you doubt sensor is damaged, you needn't to replace sensor. Connect the signal generator CH2 to sensor plug and signal ground wire and ground wire of external power also need to be connected. As shown in Figure2- 5. You can change DC voltage amplitude by pressing button to replace sensor to send signals to ECU. Check signal changes perceived by ECU through data flow or screen to judge fault.

Figure2- 5

4. Simulate magnetoelectric sensor

Magnetoelectric sensors are used for detection of crankshaft speed, camshaft cylinder, diesel pump speed, hydraulic pump torque speed, flywheel speed, generator speed, distributor signal, vehicle speed, wheel speed, etc.

Inside magnetoelectric sensor is an electromagnetic coil that senses rotational speed of the rotating gear and converts it into sine AC signal.



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The magnetoelectric sensor is usually two wires, which are connected to ECU. Pulling out plug and measuring the voltage between two lines is generally about 2V (the detection voltage in ECU, not power supply). One of them is a negative signal (also some signal ground), the other is a positive signal, and sine wave frequency changes with speed. ECU measures speed signal based on the change of frequency.

The magnetoelectric sensor also has three lines. It has a shielded line to prevent signal interference. When you doubt sensor is damaged, you needn't to replace sensor. Connect the signal generator CH1 or CH2 to sensor plug. As shown in Figure2- 6. Change sine wave frequency by pressing button to replace sensor to send signals to ECU. Check signal changes perceived by ECU through data flow or screen to judge fault.

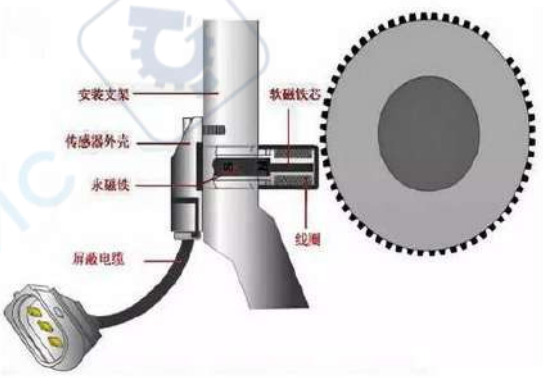
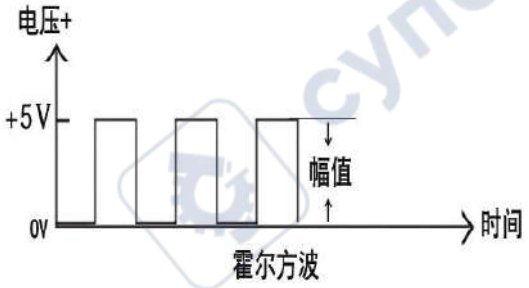


Figure2- 6

If the output of magnetoelectric signal is not received by ECU, it is possible that the sensor signal and signal ground are connected reversed. It is also possible that the signal generator amplitude voltage does not match current sensor. For example, when sensor signal voltage is 200 rpm, it is 2-3V AC voltage. When idle speed is 700 rpm, not only frequency is fast, but also AC voltage is increased. The AC voltage of different engine sensors is different.

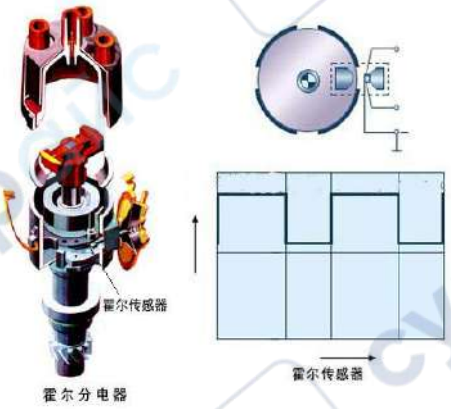
5. Simulate Hall sensor

Hall sensor is used for detection of crankshaft speed, camshaft cylinder, diesel pump speed, hydraulic pump torque speed, flywheel speed, vehicle speed, generator speed, distributor signal, wheel speed, etc. Inside the Hall sensor is a Hall element that senses rotational speed of the rotating gear and translates it into a square wave signal.



Common Hall sensors are three wires which are connected to ECU. One of them is an external power line (5V is the most, there are also some 12V or 24V), one is ground line, the other is signal lin. Square wave frequency changes according to speed. ECU measure speed signal according to the change of frequency.

Of course, some Hall sensors are two lines. For example, Hall-type crankshaft signal (as shown in right Figure), 2-wire Hall sensor. One for power line and the other for signal line.



When you doubt sensor is damaged, you needn't to replace sensor. Connect the signal generator CH1 to sensor plug. As shown in Figure2- 7. Change square wave frequency by pressing button to replace sensor to send signals to ECU (change duty cycle of square wave). Check signal changes perceived by ECU through data flow or screen to judge fault.

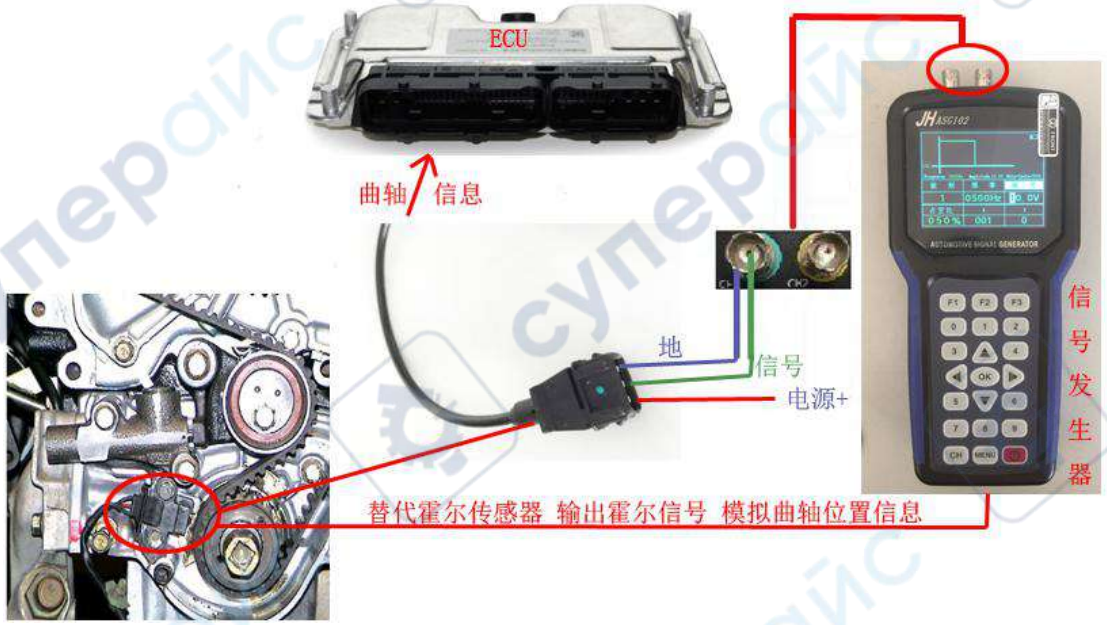


Figure2- 7

If ECU does not receive output signal, it is possible that the signal generator amplitude voltage does not match current sensor. For example, if the sensor signal voltage is 5V (0-5V square wave), it is necessary to adjust amplitude voltage of the signal generator to 5V. And if the sensor signal voltage is 12V (0-12V square wave), it is necessary to adjust the amplitude of the signal generator to 12V. You can adjust square wave voltage amplitude value by pressing button.

Second High power device drive (solenoid valve type)

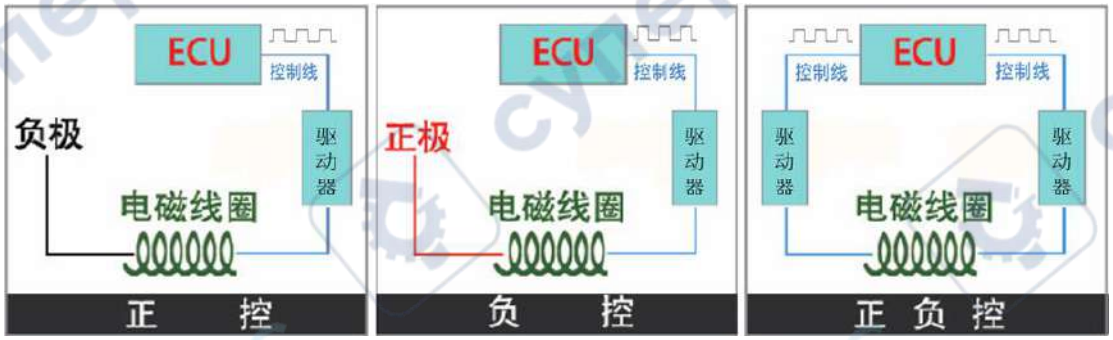
1. Device usage

The signal generator can drive 2-wire electromagnetic coil, solenoid valve or low-power motor including injector solenoid valve, hydraulic control valve, metering valve, SCV valve, PCV valve, VVT valve, canister solenoid valve, transmission hydraulic valve , ignition coil, idle motor, throttle motor, etc. 2-wire solenoid valve control methods are generally divided into three categories.

Positive control: one line is ground line, and the other one controls the positive pole of solenoid valve.

Negative control: one line is for power supply, and the other one is for controlling the negative pole of the solenoid valve.

Positive and negative control: Both lines are control pin, and the positive and negative poles alternately change control.



First set frequency and duty cycle (Frequency is the speed of solenoid valve vibration, the lower frequency, the larger drive current; the higher frequency, the smaller drive current. If you do not know actual operating frequency of solenoid valve, set it between 100Hz and 200Hz first. The duty cycle is the working time of solenoid valve. Under positive PWM control, if duty cycle is small, the working time will be short and operating current will be small. If duty cycle is lager, operating time will be long and operating current will be lager. When under negative PWM control, it is opposite).

We usually use signal generators and solenoid valve drive boxes to drive solenoid valve high power devices.

2. Coil type idle motor drive

Now set the signal generator CH1/2 to output a ‘square wave with amplitude 5v (default, needn’t modify), frequency 8Hz, duty cycle 10% (default, needn’t modify) ’. The specific operations are as follows:

After entering main interface, select ‘CH1’, Press “OK” to confirm entering the channel 1 setting interface and set the waveform PWM, amplitude 5V, frequency 8Hz, duty cycle 10%. As shown in right Figure.

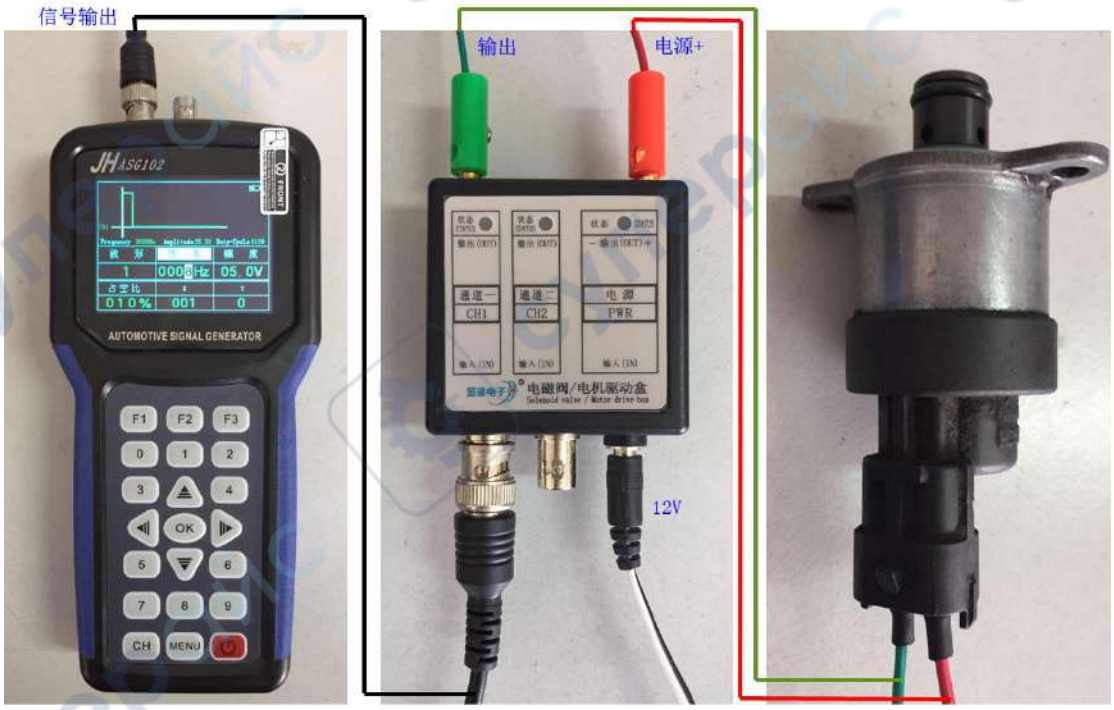
(1) We can measure that the original equipment needs 12V power supply. Connect drive box to 12V or DC power supply. After that, connect to power supply port of drive box directly, and power indicator light is on;

(2) Connect the signal generator output to box input, such as CH1, then you can see that output indicator is flashing;

(3) Connect one port of the idle motor to drive box ‘positive +’ and the other port to ‘CH1’. At this time, you can observe that motor is working.

(4) Adjust duty cycle to observe changes in motor motion.

As shown in Figure .

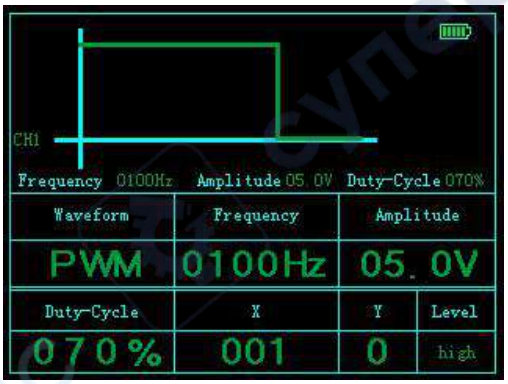


Note: This type of motor does not distinguish between positive and negative poles. Each motor model may be different and it needs to be based on the original supply voltage so you can determine supply voltage to box.

3. Driving urea pump motor

Now set the signal generator CH1/2 to output a ‘square wave with amplitude 5v (default, needn’t modify), frequency 100Hz, duty cycle 70% (default, needn’t modify) ’. The specific operations are as follows:

After entering main interface, select ‘CH2’, press ‘OK’ to enter setting interface and choose waveform 1, amplitude 5V, frequency 100Hz, duty cycle 70%. As shown below.

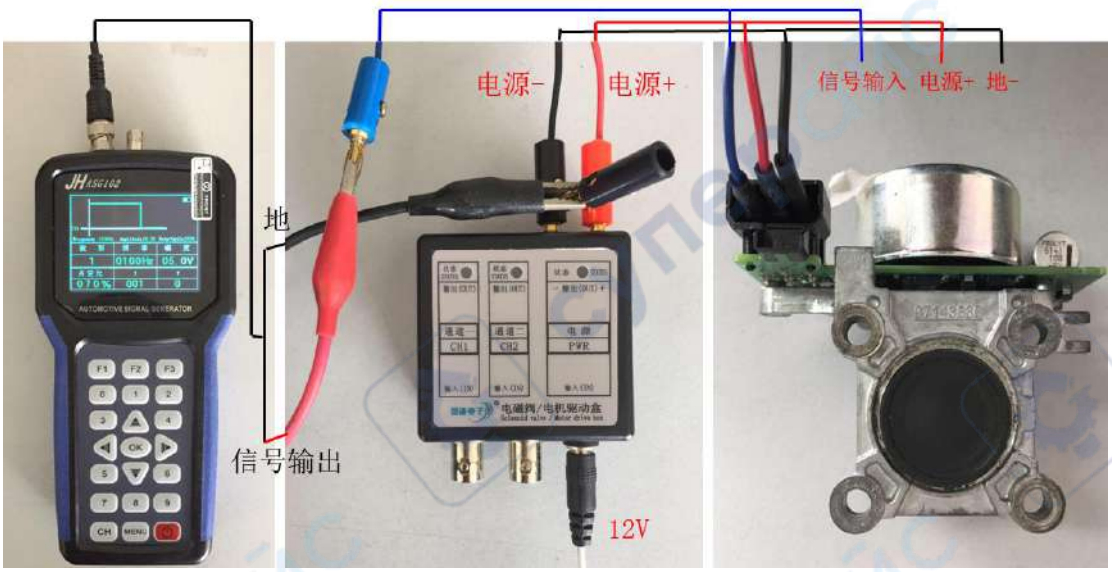


(1) We can measure that the original equipment needs 12V power supply and drive pin voltage is about 5V. Connect drive box to 12V or DC power supply. After that, connect to power supply port of drive box directly, and power indicator light is on;

(2) Connect the positive and negative poles of the urea pump motor to drive box

(3) Connect the ‘ground line’ of CH2 to the ‘negative-’ of box output, and the output pin of CH2 is connected to the drive port of urea pump motor. At this time you can see urea pump turning. Making duty cycle small you can observe that motor speed is getting faster.

Urea pump motor wiring as shown below



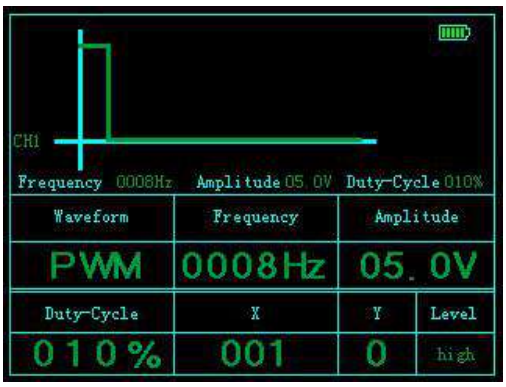
Note: 1. Positive PWM control: The larger duty cycle, the larger current and faster speed.

2. Negative PWM control: The larger duty cycle, the smaller current and slower speed.

The urea pump motor is controlled by negative duty cycle. When duty cycle is adjusted downward, the speed is getting faster and faster.

4. Fuel injector drive

Now set the signal generator CH1/2 to output a ‘square wave with amplitude 5v (default, needn’t modify), frequency 8Hz, duty cycle 10% (default, needn’t modify) ’. The specific operations are as follows:



After entering main interface, select ‘CH1’, Press “OK” to confirm entering the channel 1 setting interface and set the waveform PWM., amplitude 5V, frequency 8Hz, duty cycle 10%. As shown in right figure.

(1) We can measure that the original equipment needs 24V power supply. Connect drive box to 24V or DC power supply. After that, connect to power supply port of drive box directly, and power indicator light is on;

(2) Connect the signal generator output to box input, such as CH1, then you can see that output indicator is flashing;

(3) Connect one port of the idle motor to drive box ‘positive +’ and the other port to ‘CH1’. At this time, you can observe that motor is working.

(4) Increasing duty cycle can observe that motor motion becomes stronger. When duty cycle is adjusted upwards, current may exceed 2A. And box will be powered off to protect device and it needs to be powered on again. However, it is still possible to initially determine whether the injector is damaged or not under a small duty cycle.

Fuel injector drive wiring as shown below

Note: This type of Fuel injector does not distinguish between positive and negative poles. Each motor model may be different and it needs to be based on the original supply voltage so you can determine the supply voltage to the box.

Special note:

The solenoid valve box cannot work for a long time.

Do not wear a protective plate for the 18650 lithium battery when use instrument!