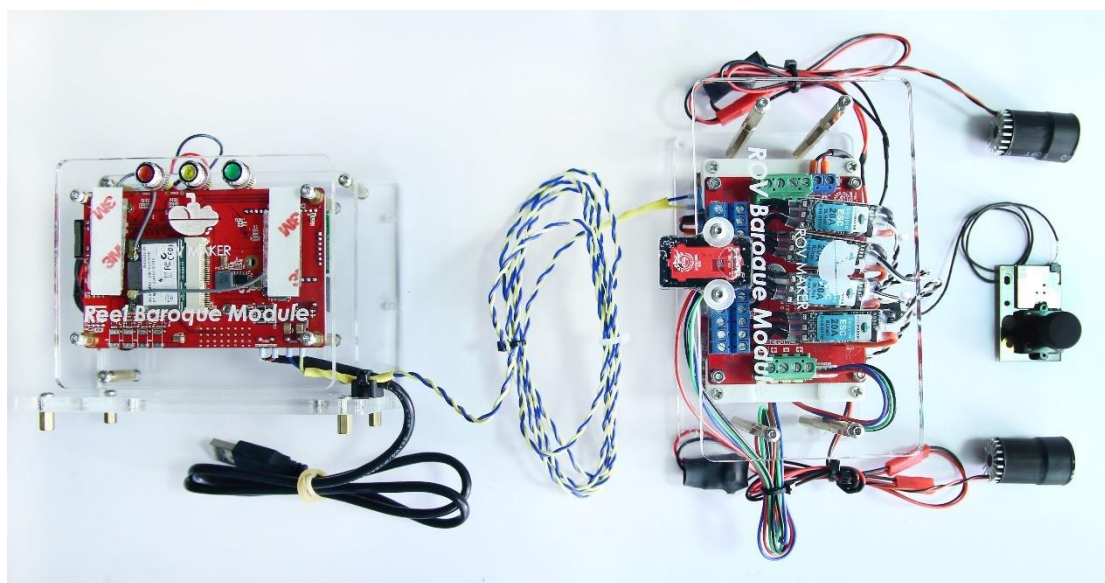

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# **FORMOSA Control Solution User Guide**

## **ROVMAKER. LTD.**

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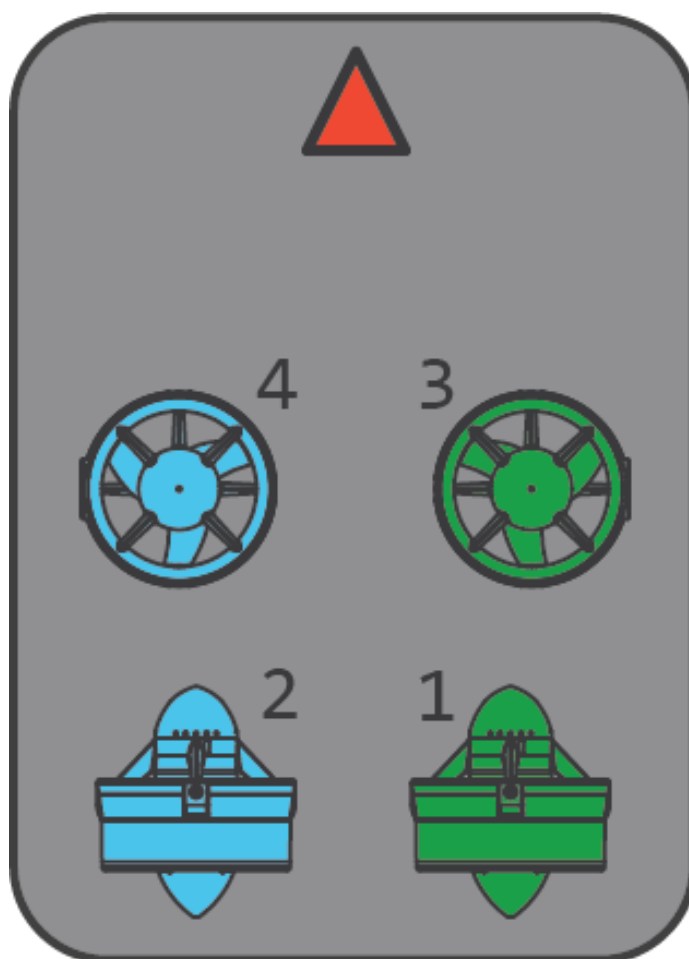
<i><b>REVISION HISTORY</b></i>			
<b>Release</b>	<b>Date</b>	<b>Author</b>	<b>Comments</b>
1.0	2020/03/01	Jenching Lee	1 <sup>st</sup> Release


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## Introduction

Formosa is the control system for the underwater drone developed by ROV MAKER. What makes the solution special is that it is ready to play. The system includes both software and hardware and it saves lots of effort for the developers who want to DIY their own ROV/underwater drone and thus enable them to focus on other domains like mechanic design and waterproof issues. Formosa is already integrated into Voyager II, a product of ROV MAKER.

Formosa provides a relatively simple way to integrate the ROV control system into developers' own ROV tube. Formosa solution now supports a simple ROV style that consists of 2 vertical thrusters and 2 horizontal thrusters, shown as follows.




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The Formosa solution includes the following modules.

- ROV module ( ROV Baroque Board + PLC + ESC board + 4 ESC)
- Reel module (Reel Baroque Board + PLC + WIFI module)
- Mazu Sensor Board (MPU9250 + MS5837-30BA + IST8310)
- HD IP camera
- 30 m neutral buoyancy line

The Formosa solution set is calibrated before shipping, including the electronic speed controller. You can enter Factory Test Mode to make adjustment.

This is the user guide of the FORMOSA control solution. If you have any questions or concerns, please contact us at [rovmaker@rovmaker.com](mailto:rovmaker@rovmaker.com).

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## Environment Installation

FORMOSA uses Chrome browser on windows/Linux as the operational interface and the video transmission is based on webRTC. We recommend Chrome 70.0.3538.77 or even earlier versions due to the limit of webRTC versions. If this requirement is not met, the user will run the risk of the video not displaying. Please refer to the [link](#) for the older versions of Chrome.


To make sure Google Chrome stays with a certain version, the user must disable Chrome auto updates. Refer to [this](#) for more information.

FORMOSA is installed with OpenCV JavaScript version. For image processing, the user must enable the WebAssembly thread function since Chrome 70. Please refer to [this](#) to enable this feature.

It is highly recommended that the user uses a laptop as the control device, which helps access full Chrome functions. Formosa connection is possible with WIFI or RJ45. Users should ensure they have at least one of the above-mentioned devices.

The recommended equipment is as follows:

- NB or PC equipped with i5 CPU or better versions
- Operational system: Windows 8 /10 or Ubuntu 16.04 LTS
- Operating method: X360 joystick / NB touchscreen

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# Power-On Sequence

## 1. Connection of ROV Module and Reel Module


Before shipping, Reel Module and ROV Module have been connected through one-meter twisted pair. Users can test soon after they receive the delivery. The diagram shows how to install his/her own transmission cables.



## 2. Power-On Reel Module

Reel Module must be powered before ROV Module. The recommended working voltage is 5V- 18V. Formosa is accompanied with USB cables and electricity can be supplied with a portable chargers. Users are free to



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modify their ROVs and change power cables.



Please pay attention to the light change after Reel Module is powered.

#### **Reel light (red):**

If this light does not come on, please check the battery power level or the power connection.

#### **WIFI light (yellow):**

This light comes on after WIFI is functional, and flashes during data transmission.


#### **ROV light (green):**

This light flashes a number of times and then stays on when the reel is connected with ROV.

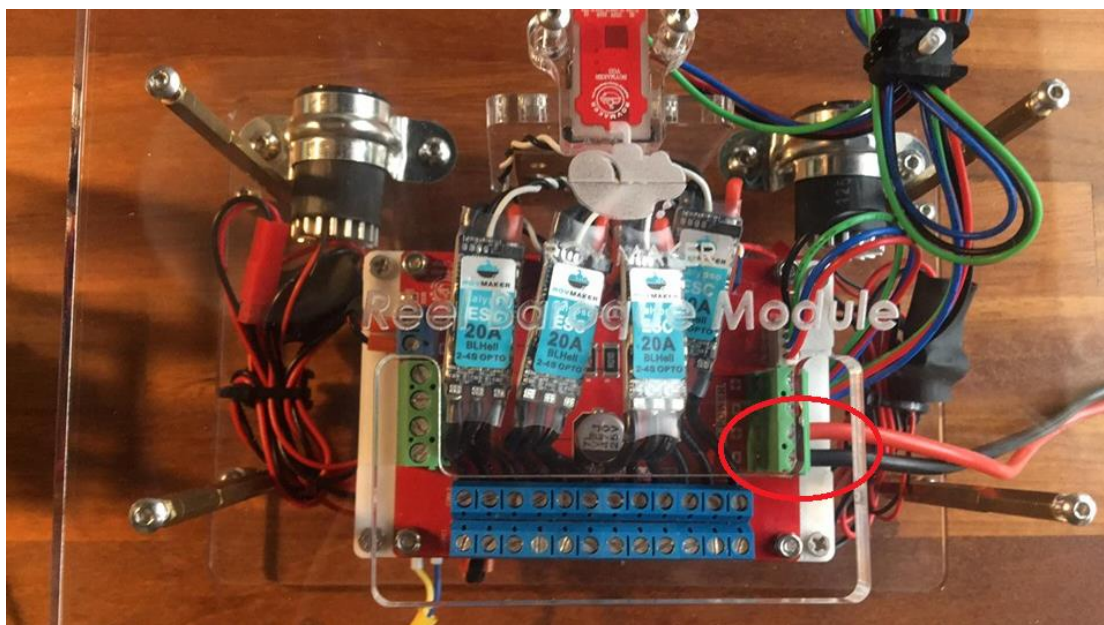
### **3. ROV Module Power On**

Please switch on ROV Module after the Reel Module is turned on in 2 minutes.

The working voltage for the ROV Module is 11V – 18V. After opening the box, the user switches on the power, the procedures are demonstrated in the following diagram. It is crucial that the user should figure out the


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positive and negative ends of the batteries as mismatching the two ends may cause the circuit board to be burned. Please refer [ESC Board User Guide](#) for more information



After the ROV powers on, it takes ROV Module roughly 3-5 minutes to switch on. If you see ROV's front light flash a number of times, this means ROV Module is on.



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# How to Connect to Formosa

## 1. Connection by laptop / tablet

Please make sure **ONLY ONE** laptop is being used to operate the Formosa, as more than one laptop will delay video transmission and signal control. This might cause the ROV to lose control and even get damaged.

There are two connection method provided by Formosa Reel Module, as described below:

### Cable Connection:

Reel Module comes with a cable RJ45 interface and users have to get themselves CAT tether cable with RJ-45 connector on both sides.


### WIFI Connection

- Please let the front side of Reel Module, the side with the light, face the laptop / tablet. This facilitates better WIFI connection.
- The setting of Reel Module before shipping is as follows.  
SSID : FORMOSA  
Password : 12345678
- Turn on the WIFI of the laptop / tablet and use the above settings for WIFI connection.

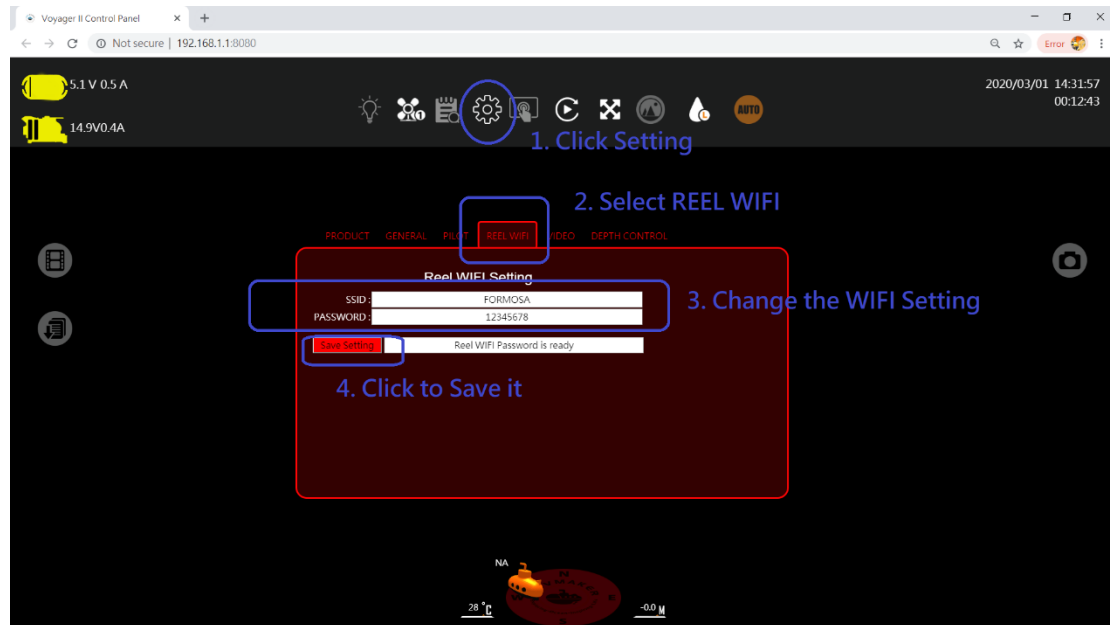
## 2. Switching on the Control Panel on NB/tablet


The control panel of ROV module is running on Chrome browser. Please turn on the Chrome browser and enter **192.168.1.1:8080**

## 3. Changing WIFI SSID and the Password at first login

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It is highly recommended that the user change WIFI SSID and the password at first login. The procedures are shown in the following diagram.



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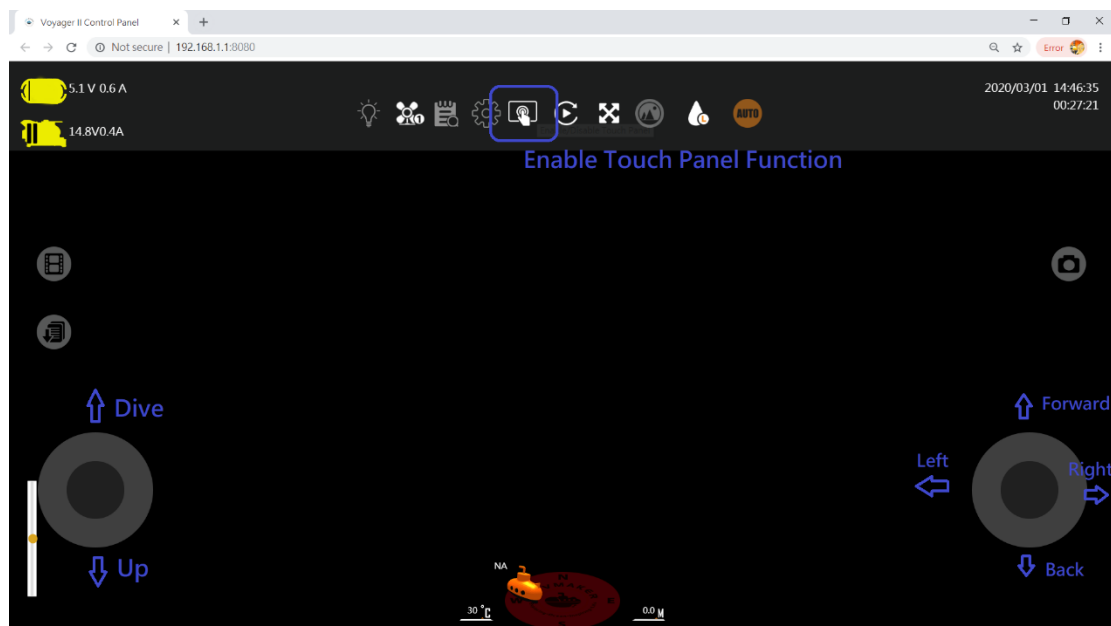
# How to Operate Formosa

Formosa Control Solution provides two method to operate the ROV Module, joysticks and touchscreen.

## 1. Touchscreen:


Users make sure their laptop and tablet support Windows or Linux and must be equipped with touchscreen function.

Switch on the touchscreen function on the control panel and the screen will indicate relevant touch button, as shown in the following diagram.




## 2. X360 Joystick

No matter the laptop comes with a touchscreen or not, the joystick is another great option. Formosa works with X360 joystick, whose operation is shown as follows.

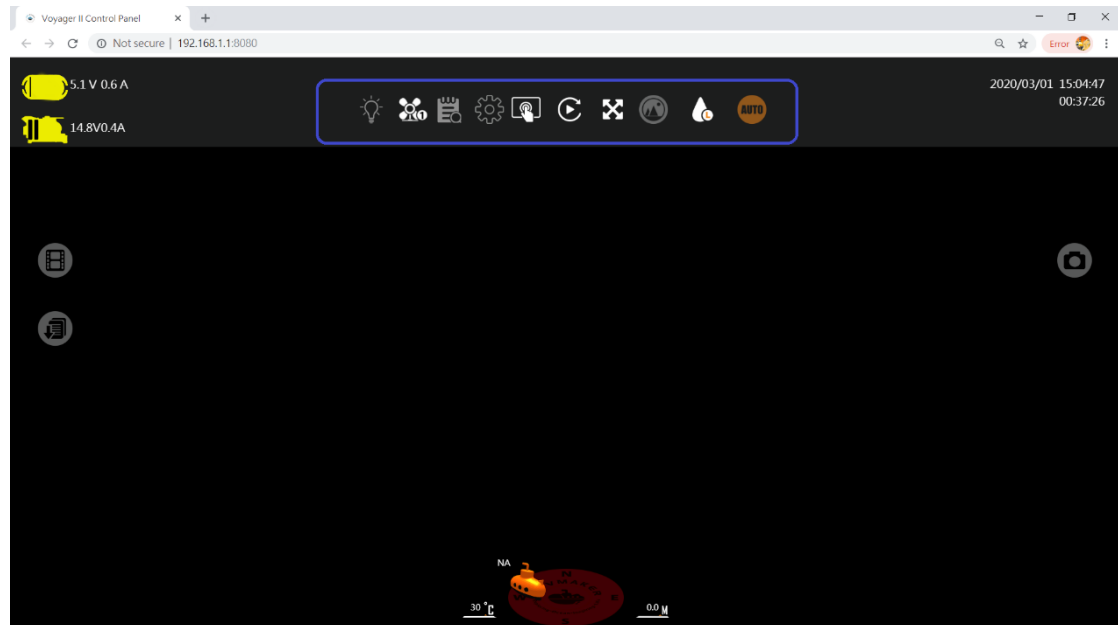
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To avoid touching the wrong button by accident, the joystick doesn't have the five-level power change. The user can change the power level on the screen or simply choose the numbers 1-5 on the keyboard.

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# Control Panel



The Control Panel is implemented by HTML/CSS/JS and running on the Chrome browser. After ROV Module is power-up and ready, User can turn on the Chrome browser and enter **192.168.1.1:8080** to login Control Panel.

## 1. Main Menu


The main menu is composited of several functions shown as dedicated icon list on top of the middle on the screen. The description of each function will display when moving the mouse over dedicated icon.



ROV LED light switch: clicking to switch on / off



Switching Power Change: clicking this icon for 5-level power change or alternatively choosing the numbers 1-5 on the keyboard for the same function

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ROV Trace Log: Log from ROV BSP, Debug Only



System setting: providing information regarding WIFI, power setting and products



Switching on /off the touch panel control



Restarting video preview: using this function in case of failed video preview. Refrain from using this function unless necessary.



Switching on / off full screen: using this function for better screen control or when the video region is not displayed normally when control panel is ready.



OpenCV test cases.



Switching water type between freshwater and seawater: this function is only used for depth control.



Enable/Disable depth control

## 2. Battery Information

Battery information provides the status of voltage and current of Reel Module and ROV Module.




Reel Module Voltage/Current



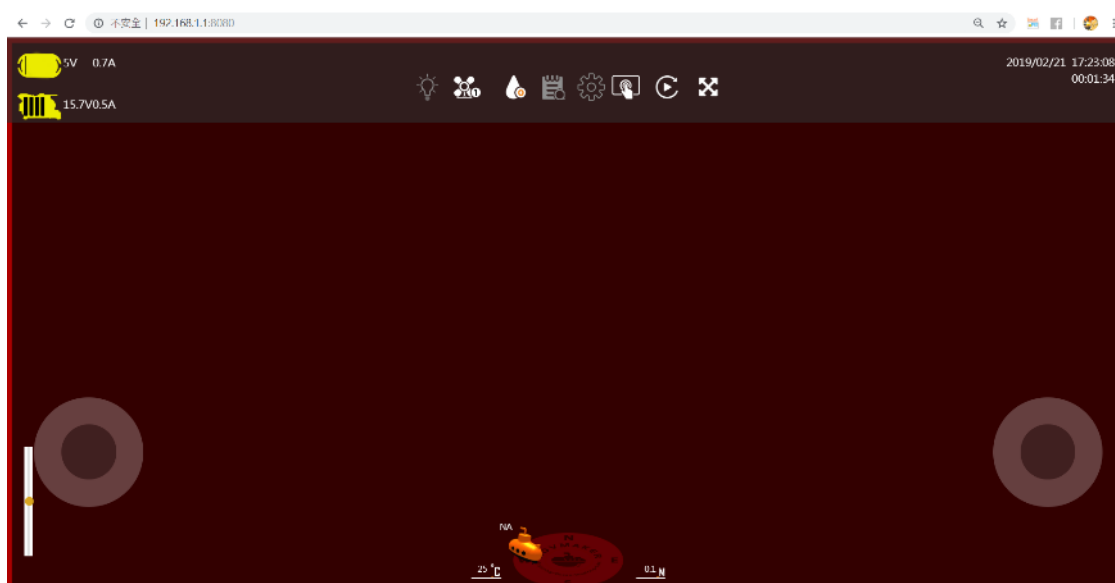
ROV Module Voltage/Current



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### 3. Battery-Low Warning

FORMOSA shows low battery warning of ROV Module, with the screen getting red. The threshold setting of Low battery warning can be set on the Factory Test Mode.




### 4. Mazu Sensor Board

As part of Formosa solution, Mazu sensor board integrates MS5837-30BA pressure and temperature sensor, MPU-9250A inertial measurement unit and IST8310 eCompass.

Temperature is indicated on the Celsius scale, which doesn't require setting. ROV detects the temperature of the surroundings right after being switched on.

Depth is obtained through the dedicated conversion of pressure value. In the air, the value varies daily, so the depth is open to change.

ROV's motion can be detected through the built-in IMU (Inertial measurement unit). This device uses a 3D-submarine icon on the control

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interface instead of unfeeling numbers, allowing the user to intuitively find out about the ROV's Yaw / Roll / Pitch motion.

The electronic compass is indicated on the control panel in a straightforward manner. The top of the compass shows the ROV's front and changes direction as ROV moves. The value of current position is meanwhile provided for the user's reference.

The eCompass ROVMAKER adopts provides easy calibration prior to use. All the user needs to do is to hold the board and move it in either clockwise-and-counterclockwise or back-and-forth directions. The following are two pictures of before-and-after calibrations.

E-Compass is not ready

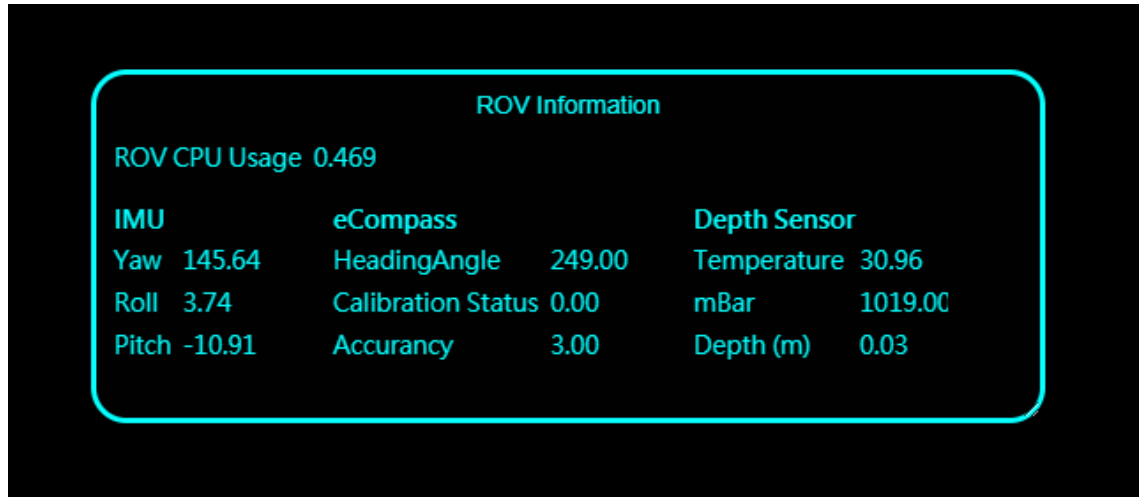


E-Compass is ready



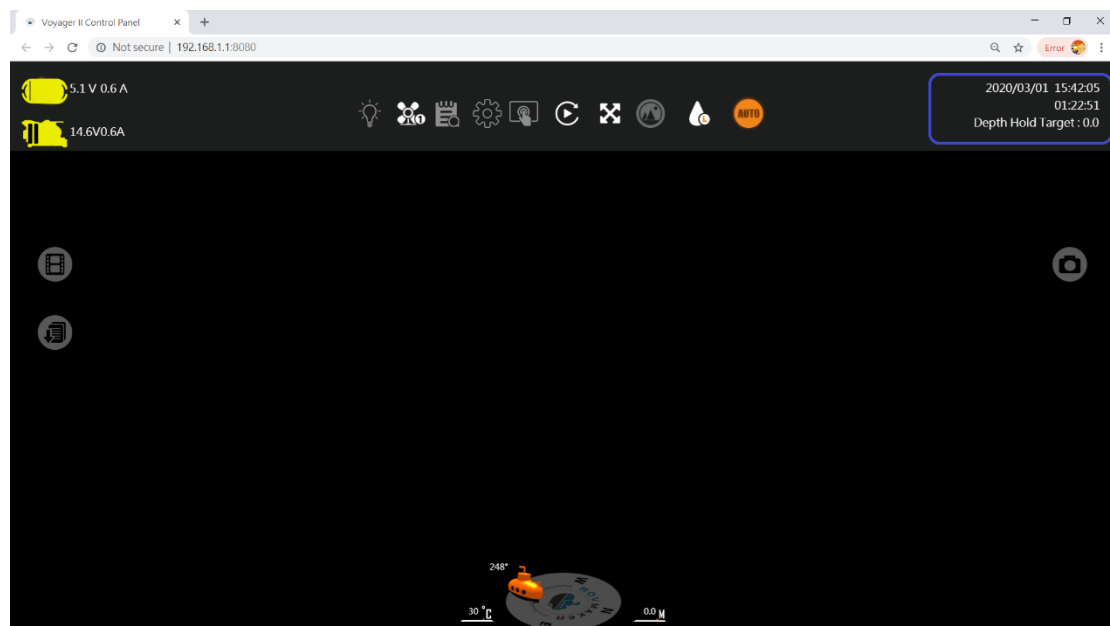
The ROV information Window display the real-time sensor raw data. The user can either toggle the **R** key on keyboard to show / close It. The ROV Information Window is draggable and user can drag it to any place with

the mouse.



## 5. Timing Information

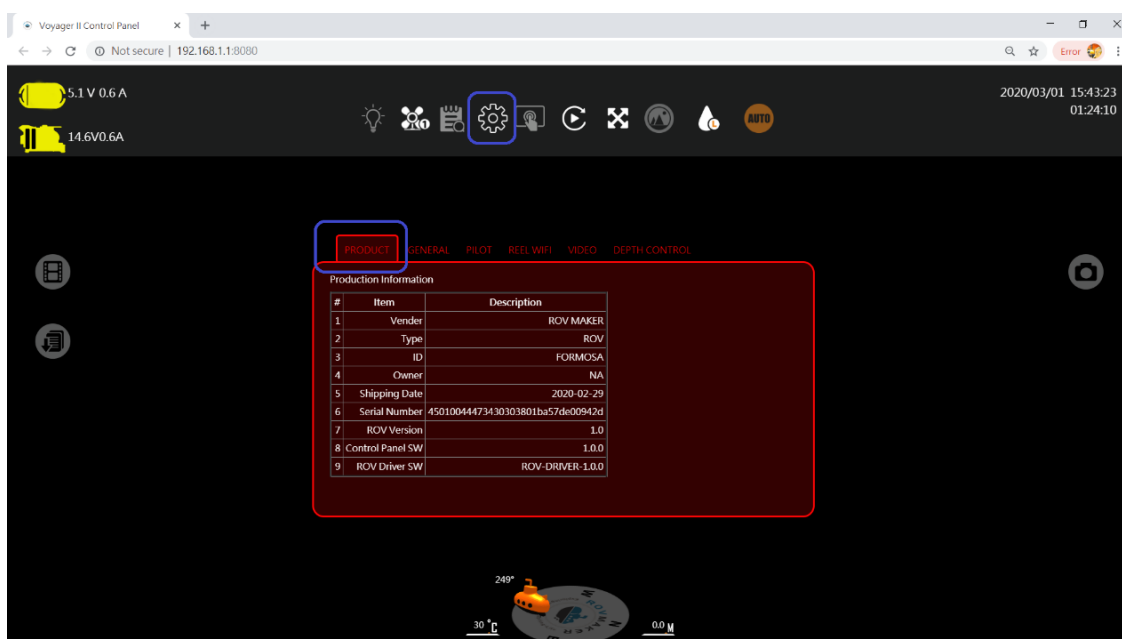
On the upper right-hand corner of the screen shows information regarding time, the length of time ROV has been operating and ROV's depth (if the depth-control function is on).



# System Setting in Main Menu

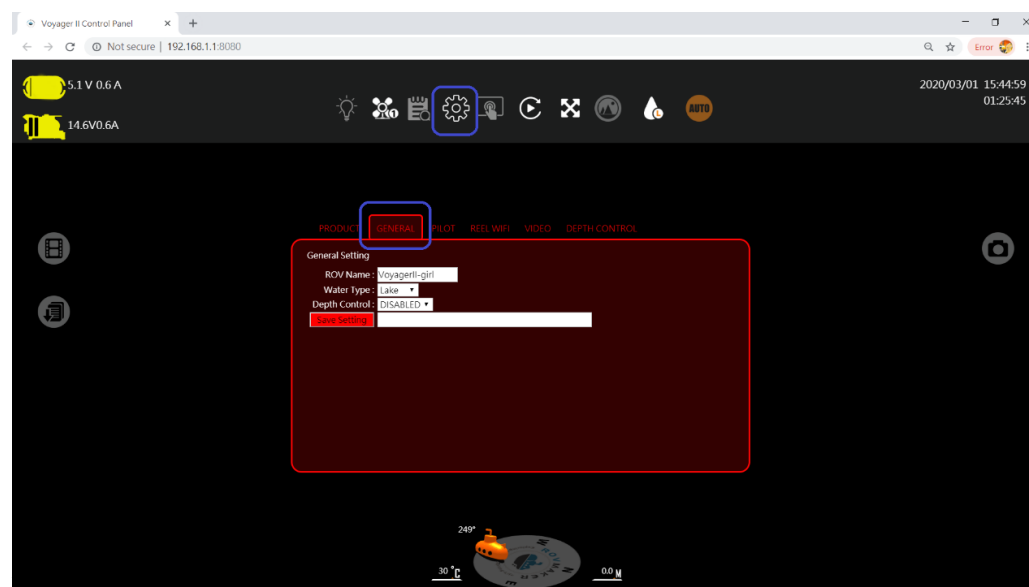
## 1. Product Information

Information regarding the product.



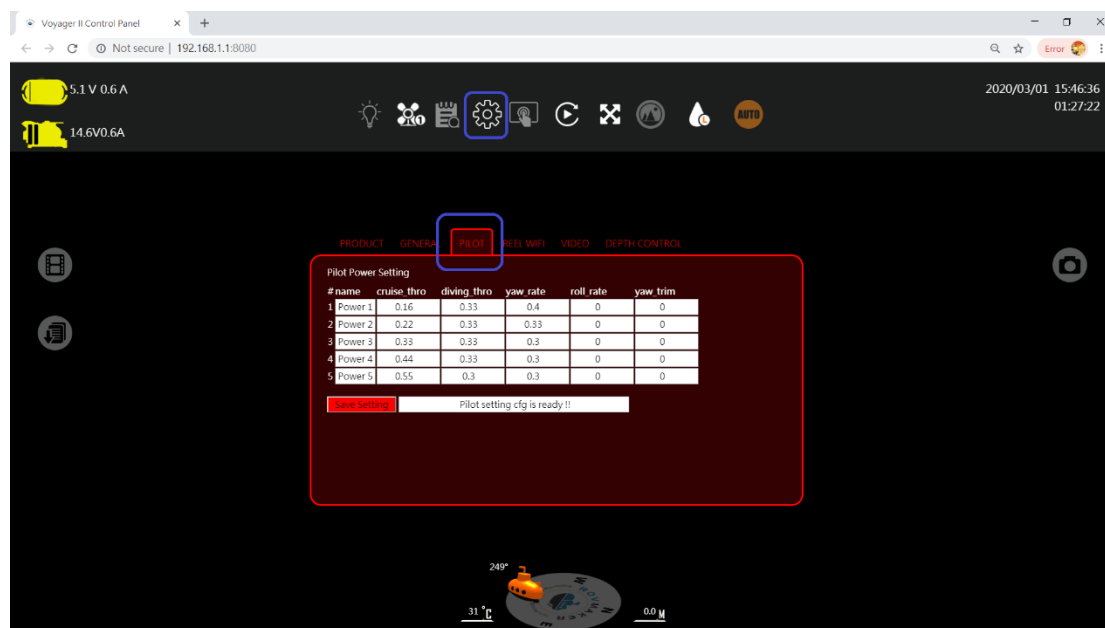
## 2. General

It is basic setting of ROV




### 3. Pilot

It shows the setting from power 1 to 5, which is recommended to be modified on the Factory Test Mode.

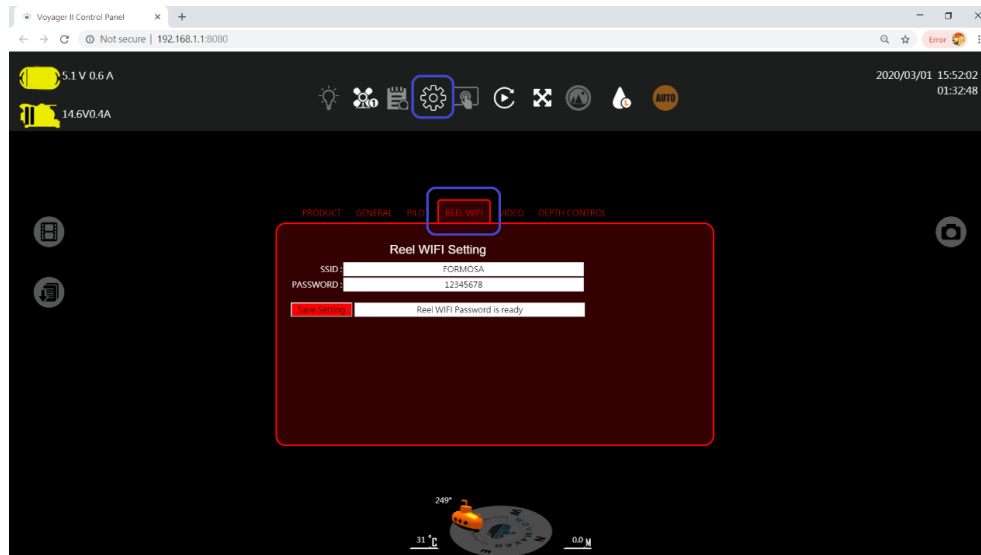


- **Cruise\_thro** : ratio of cruise throttle, which is not open to change here and recommended to modified on the Factory Test Mode
- **Diving\_thro** : diving / surfacing throttle, which is not open to change here and recommended to modified on the Factory Test Mode °
- **yaw\_rate** : ratio of rudder throttle (as opposed to cruise throttle), which is open to change on the range of 0-1.
- **roll\_rate** : ratio of aileron throttle (as opposed to diving throttle), which is open to change on the range of 0-1. **(This function will be implemented in the future)**
- **yaw\_trim** : rudder offset calibration , which is open to change on the range of 0-1.

### 4. Reel WIFI

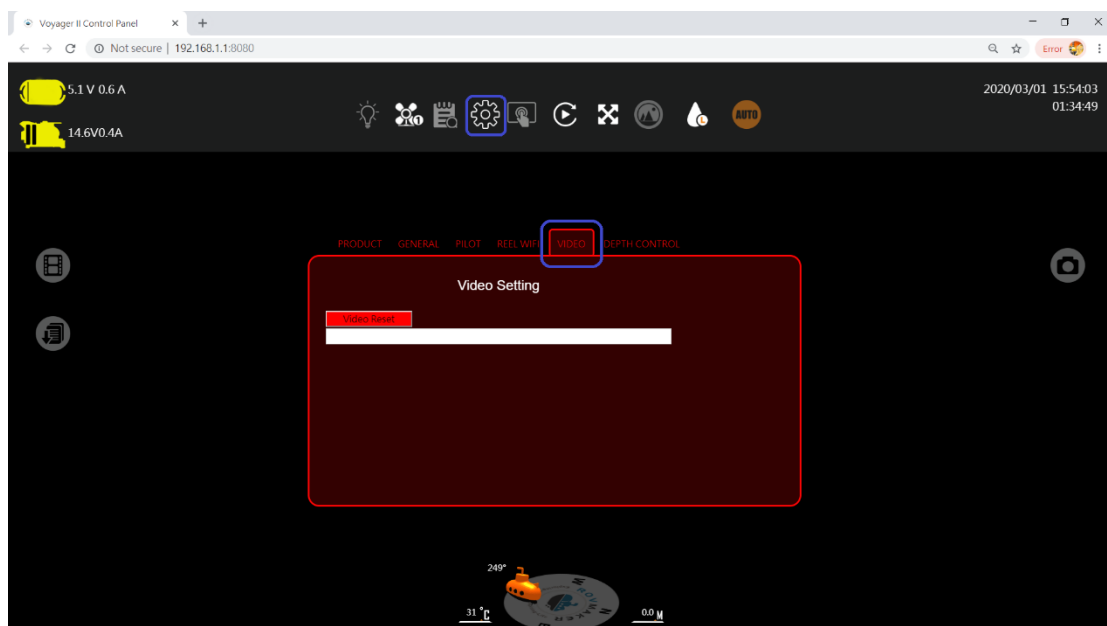
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It is the function to set WIFI SSID and the password of Reel Module. After the setting is completed, please switch off the Reel and ROV Module and wait about 5- 10 seconds before re-executing the power-on sequence to make the new WIFI setting work.



## 5. Video

It is function about restarting video transmission, which is for software debug only. The user is advised not to use this function.



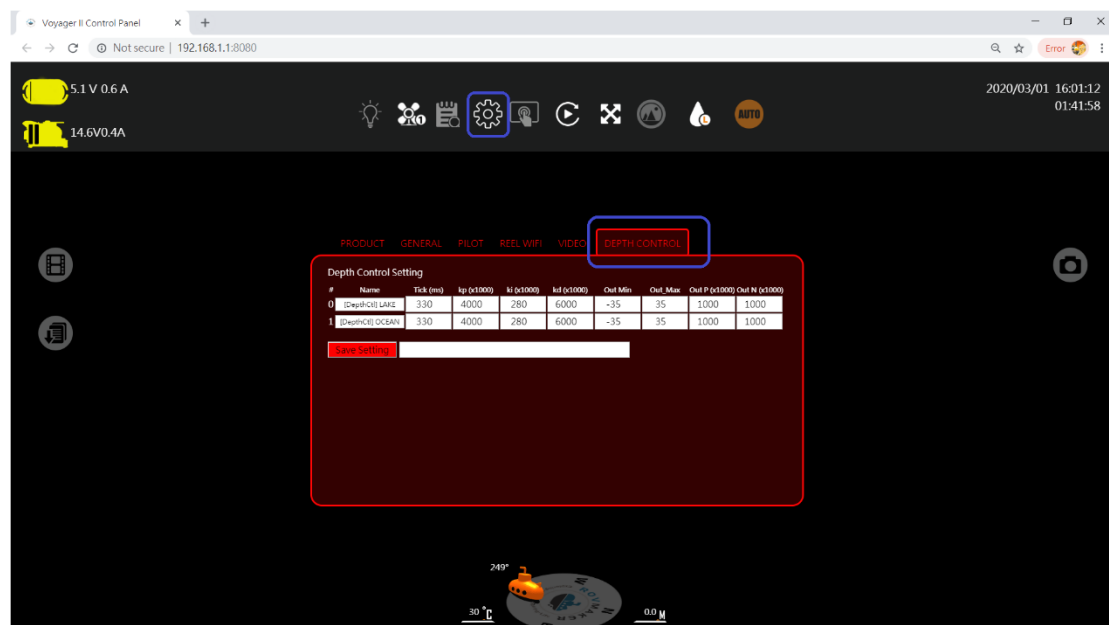


## 6. Depth Control

FORMOSA adopts PID algorithm to implement depth auto control and provides both freshwater / seawater parameters. The user can toggle




to change freshwater / seawater parameters. It is necessary for the user to understand how PID works to adjust parameters.



Formosa provide PID information Windows, providing real-time PID

Depth Ctl PID ( Lake Mode )					
PID Tick	171				
Target Depth (m)	0.02	Now Depth (m)	0.03	dt (sec)	0.33
Pout	-4.00	Kp	4.00	Error	-1.00
Iout	-1.39	Ki	0.28	Integration	-4.97
Dout	0.00	Kd	6.00	Derivative	0.00
PWM Out	-5				

calculation results. It is helpful to assist user to get proper PID parameters for depth control. Toggle the D Key to show / close PID

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Information Window, the box of which is draggable. The user can drag the box to another place. This allows the user to know the process of PID algorithm and work on better setting.

## Photographs / videos / records of sensor data

On both sides of the screen are function buttons that allow the user to explore underwater.



**Photo Capturing:** recording photographs in a webpage manner with the image resolutions being 1280 x 720. The photographs mark relevant sensor data.



**Video Recording:** using the Baroque control board to videotape, which can go on for 1.5 hours. The image resolutions are 1280 x 720 and the video content has no sensor data.



**Sensor Data Recording:** recording the sensor data into txt formatted file per second. The data contents are as follows.


Voyage Data Recording of Voyager II, started from VoyagerII-girl-2020-3-1--16-17-54

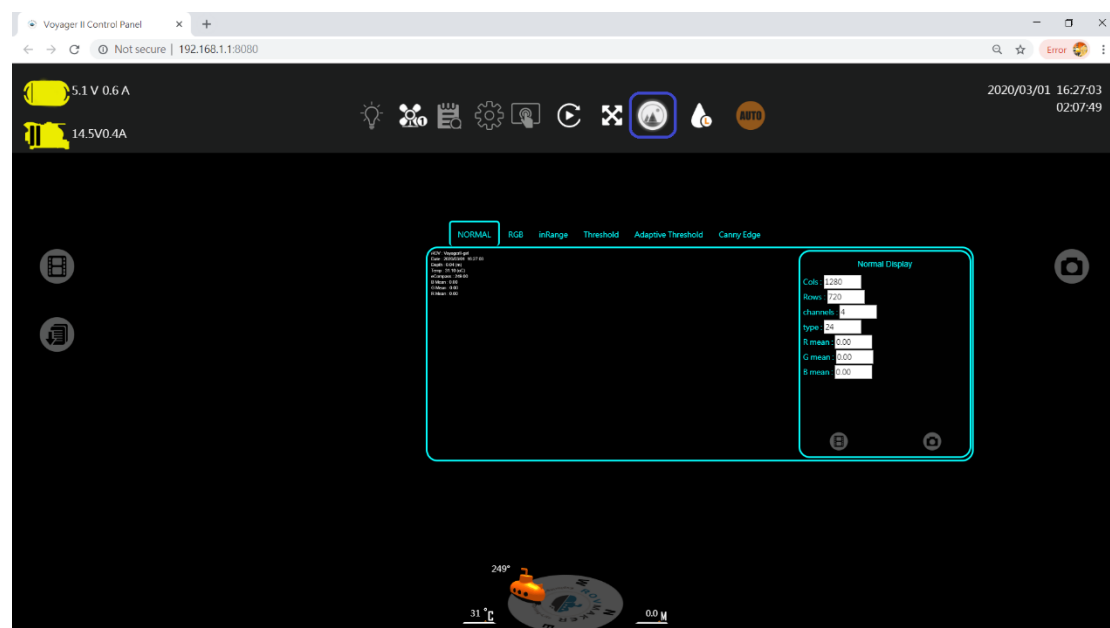
TimeStamp	yaw	roll	Pitch	Angle	CaliSts	MagAcc	Depth(m)	mBar	Temp
20200301-161754 :	000	000	000	+249.00	000.00	+003.00	+000.03	+1019.00	+030.81
20200301-161756 :	000	000	000	+249.00	000.00	+003.00	+000.03	+1019.00	+030.82
20200301-161757 :	000	000	000	+249.00	000.00	+003.00	+000.03	+1019.00	+030.81
20200301-161758 :	000	000	000	+249.00	000.00	+003.00	+000.03	+1019.00	+030.81
20200301-161759 :	000	000	000	+249.00	000.00	+003.00	+000.03	+1019.00	+030.81

## OpenCV JavaScript Version

OpenCV is an open source software widely used for image processing. Formosa integrates OpenCV JavaScript versions and provides relevant test cases.

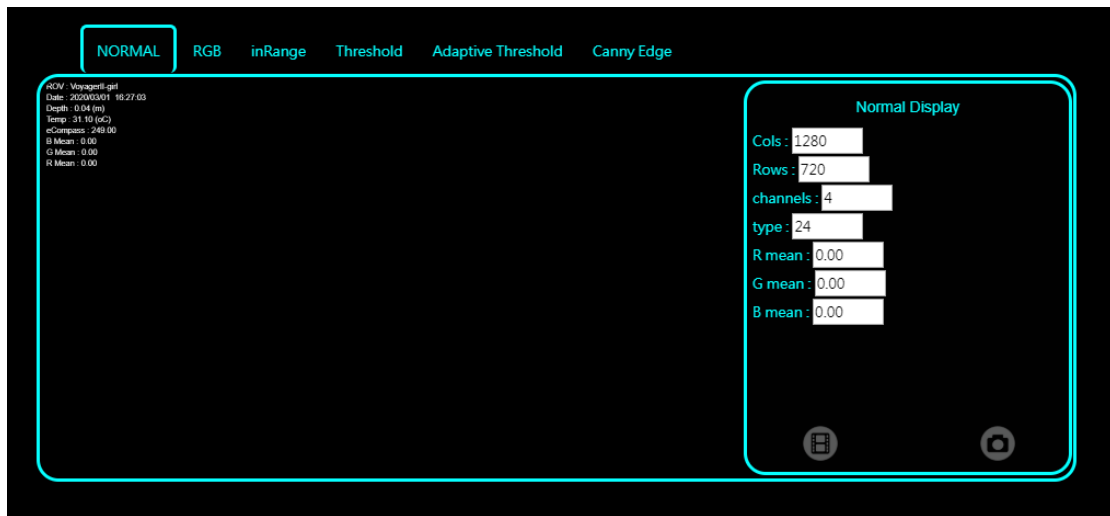
Before use, the user needs to turn on the WebAssembly thread function on the Chrome browser.

Push the  function icon on main menu which on the top of the screen and the OpenCV window will appear.



**The tests available currently includes:**

## ● Normal Display




## ● RGB Channel Information



## ● inRange

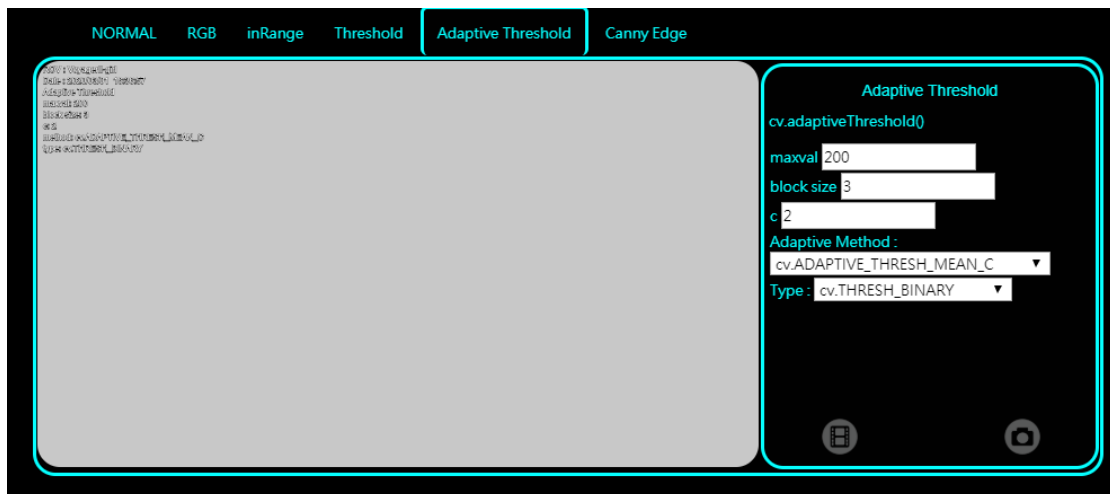


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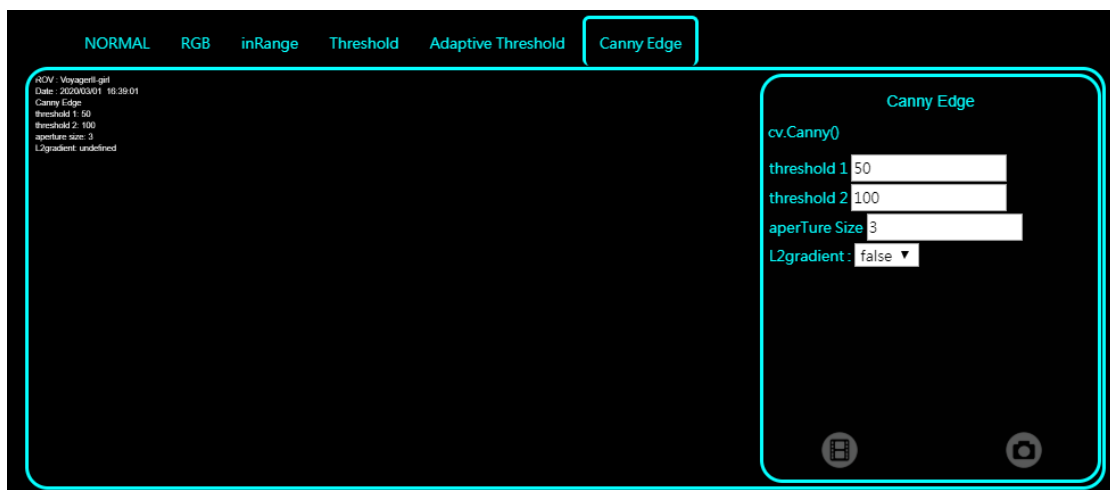
## ● Threshold




## ● Adaptive Threshold



## ● Canny Edge





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OpenCV window also provides real-time photographing and videotaping, with the two icons located on the lower right-hand corner of it.



OpenCV Photo Capturing: the resolution is 1280 x 720 and the image is processed by OpenCV and comes with parameter setting values and sensor data.



OpenCV Video Recording: the resolution is 1280 x 720. The OpenCV recording record all the operations on OpenCV windows. It uses the MediaRecorder element on the browser. The recording buffer uses the browser memory. It is recommended that the recording time does not last more than 20 minutes due to the limited memory of the browser.

## Factory Test Mode

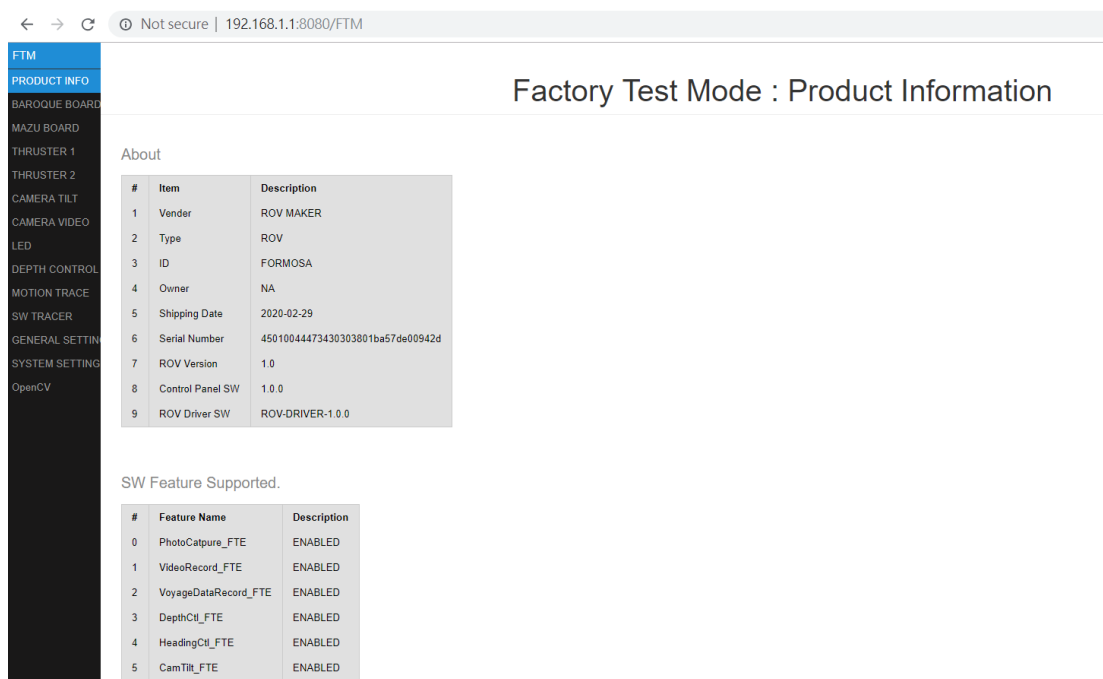
Factory Test Mode is the testing program with which Formosa Solution supplies ROV Voyager II. It is meant for testing assembly and calibrating relevant parameter.

Factory Test Mode is greatly helpful for DIY assembly and testing. The following are several important testing items involved in Factory Test Mode.

The user logs into <http://192.168.1.1:8080/FTM> and enters Factory Test Mode.

### 1. Production Information

This item shows product information and enabled software features.



The screenshot shows a web browser at the address <http://192.168.1.1:8080/FTM>. The page title is "Factory Test Mode : Product Information". On the left is a dark sidebar menu with options: FTM, PRODUCT INFO (selected), BAROQUE BOARD, MAZU BOARD, THRUSTER 1, THRUSTER 2, CAMERA TILT, CAMERA VIDEO, LED, DEPTH CONTROL, MOTION TRACE, SW TRACER, GENERAL SETTING, SYSTEM SETTING, and OpenCV. The main content area is titled "About" and contains two tables.

#	Item	Description
1	Vender	ROV MAKER
2	Type	ROV
3	ID	FORMOSA
4	Owner	NA
5	Shipping Date	2020-02-29
6	Serial Number	45010044473430303801ba57de00942d
7	ROV Version	1.0
8	Control Panel SW	1.0.0
9	ROV Driver SW	ROV-DRIVER-1.0.0

Below the first table, it says "SW Feature Supported." followed by another table:

#	Feature Name	Description
0	PhotoCapture_FTE	ENABLED
1	VideoRecord_FTE	ENABLED
2	VoyageDataRecord_FTE	ENABLED
3	DepthCtl_FTE	ENABLED
4	HeadingCtl_FTE	ENABLED
5	CamTilt_FTE	ENABLED

### 2. Baroque Boards

This item shows data regarding the voltage and current of ROV Baroque board and Reel Baroque board.

FTM

PRODUCT INFO

BAROQUE BOARD

MAZU BOARD

THRUSTER 1

THRUSTER 2

CAMERA TILT

CAMERA VIDEO

LED

DEPTH CONTROL

MOTION TRACE

SW TRACER

GENERAL SETTING

SYSTEM SETTING

OpenCV

Factory Test Mode : Baroque Boards

System Power

#	Name	Voltage	Current	Battery Level
1	ROV	14.470	0.420	2.00
2	ROV Baroque Board	14.460	0.370	2.00
3	Reel	4.920	0.560	0.00

ROV Runtime

Total Time (ms) : 154203.00

Total Time (formatted) : 00:02:34

CPU Usage of ROV Baroque Board

ROV CPU : 0.485

### 3. Mazu Sensor Board

FTM

PRODUCT INFO

BAROQUE BOARD

MAZU BOARD

THRUSTER 1

THRUSTER 2

CAMERA TILT

CAMERA VIDEO

LED

DEPTH CONTROL

MOTION TRACE

SW TRACER

GENERAL SETTING

SYSTEM SETTING

OpenCV

Factory Test Mode : Mazu Sensor Board

IMU

#	Item	Value
1	Yaw	169.98
2	Roll	3.62
3	Pitch	-10.75
4	Accel X	0.00
5	Accel Y	0.00
6	Accel Z	0.00

eCompass

#	Item	Value
1	HeadingAngle	237.00
2	Calibration Status	1.00
3	Accuracy	0.00

Depth Sensor

#	Item	Value
1	Temperature	30.01
2	mBar	1020.00
3	Depth (m)	-0.01

Real-time raw data of Mazu Sensor Board makes sure the sensor boards are connected properly and the values are accurate.

## 4. Thruster 1

This item is meant to set the electronic speed controller and the brushless motor.

← → ↻ Not secure | 192.168.1.1:8080/FTM?page=thruster1

### Factory Test Mode : Thruster 1

PWM IC (PCA9685)  
PWM frequency is 50 Hz  
PWM frequency prescale offset (range : -30 ~ 30)

Thruster Configuration

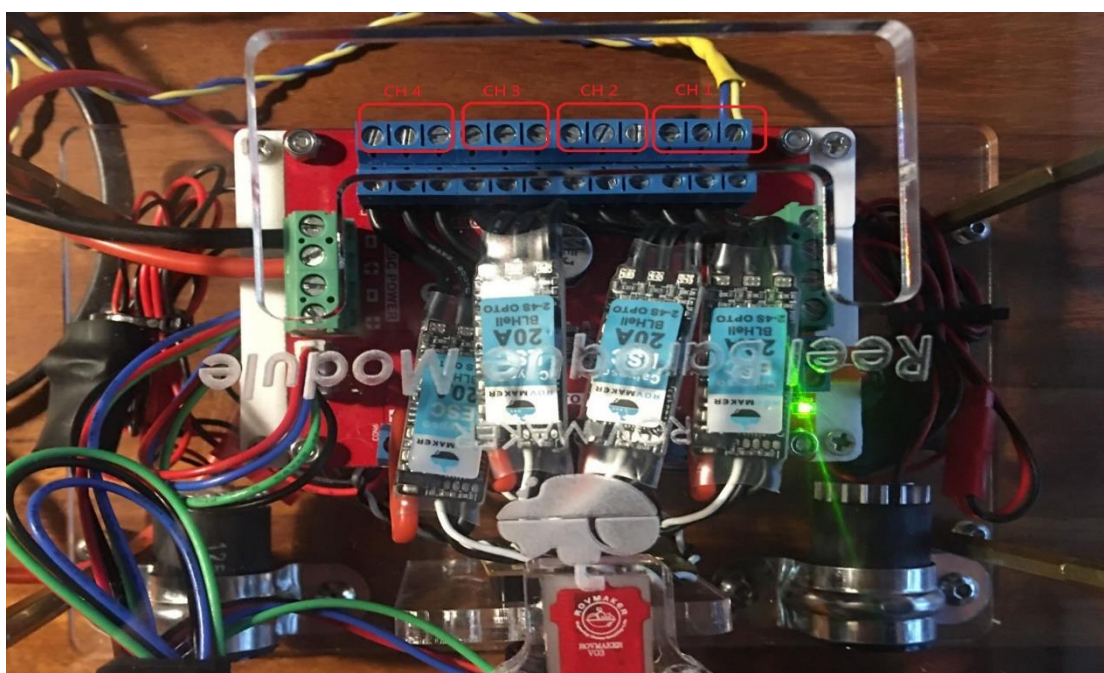
#	Name	PWM CH	Zero Point	Roate_Direction	P Dead Zone	P Margin	N Dead Zone	N Margin	Position
1	THRUSTER1	3 ▼	1507	1 ▼	27	200	27	200	DIVE_L
2	THRUSTER2	1 ▼	1507	0 ▼	27	200	27	200	DIVE_R
3	THRUSTER3	4 ▼	1507	1 ▼	27	200	27	200	CRUISE_L
4	THRUSTER3	2 ▼	1509	0 ▼	27	200	27	200	CRUISE_R

PWM Channel Test

PWM CH 1:   
PWM CH 2:   
PWM CH 3:   
PWM CH 4:   
PWM CH 5:   
PWM CH 6:   
PWM CH 7:   
PWM CH 8:

PWM frequency prescale has been set before shipping and the user is advised not to change it. Please refer to PCA9685 IC data sheet for more information. This value is intended to make the signal neutral point get close to 1500 ms with perion 50Hz.

The diagram below shows the dedicated channels on ESC control board that for the brushless motors before shipping.



After connect the brushless motor on the dedicated channel, user could execute PWM Channel Test to execute following test.

### PWM Channel Test

PWM CH 1:	<input type="text" value="1500"/>
PWM CH 2:	<input type="text" value="1500"/>
PWM CH 3:	<input type="text" value="1500"/>
PWM CH 4:	<input type="text" value="1500"/>
PWM CH 5:	<input type="text" value="1500"/>
PWM CH 6:	<input type="text" value="1500"/>
PWM CH 7:	<input type="text" value="1500"/>
PWM CH 8:	<input type="text" value="1500"/>

- Making sure of the proper connection between the motors and their dedicated channels, and their proper operation
- Calculating the dead zone range of connected the ESC (Electronic Speed Controller)
- Using the average of the dead zone range to work out the neutral point

After confirming the proper function of motors and dedicated channels and the values of the Dead Zone, the user sets the ROV configuration with the thruster configuration.

### Thruster Configuration

#	Name	PWM CH	Zero Point	Roate_Direction	P Dead Zone	P Margin	N Dead Zone	N Margin	Position
1	<input type="text" value="THRUSTER1"/>	<input type="text" value="3"/>	<input type="text" value="1507"/>	<input type="text" value="1"/>	<input type="text" value="27"/>	<input type="text" value="200"/>	<input type="text" value="27"/>	<input type="text" value="200"/>	<input type="text" value="DIVE_L"/>
2	<input type="text" value="THRUSTER2"/>	<input type="text" value="1"/>	<input type="text" value="1507"/>	<input type="text" value="0"/>	<input type="text" value="27"/>	<input type="text" value="200"/>	<input type="text" value="27"/>	<input type="text" value="200"/>	<input type="text" value="DIVE_R"/>
3	<input type="text" value="THURSTER3"/>	<input type="text" value="4"/>	<input type="text" value="1507"/>	<input type="text" value="1"/>	<input type="text" value="27"/>	<input type="text" value="200"/>	<input type="text" value="27"/>	<input type="text" value="200"/>	<input type="text" value="CRUISE_L"/>
4	<input type="text" value="THURSTER3"/>	<input type="text" value="2"/>	<input type="text" value="1509"/>	<input type="text" value="0"/>	<input type="text" value="27"/>	<input type="text" value="200"/>	<input type="text" value="27"/>	<input type="text" value="200"/>	<input type="text" value="CRUISE_R"/>

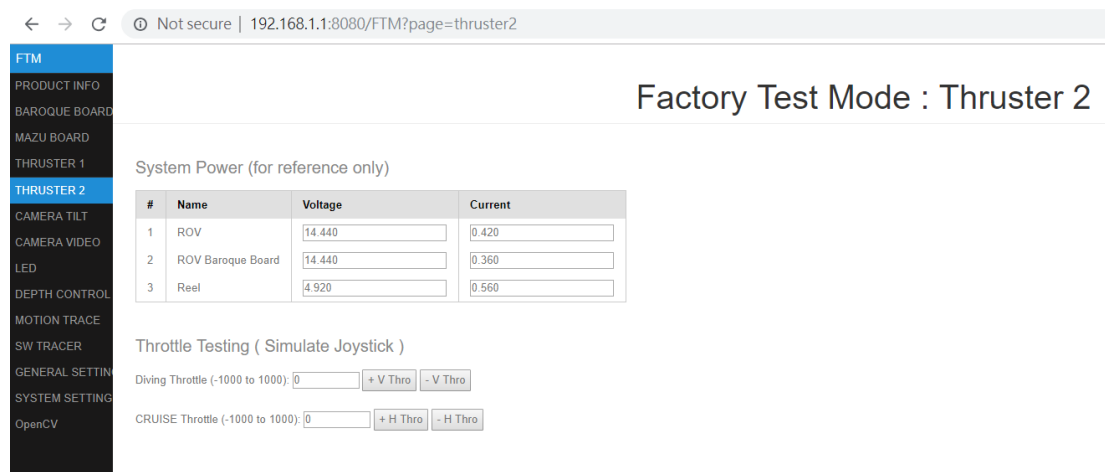
**DIVE\_L** and **DIVE\_R** are configuration about vertical thrusters. The user can specify the channel / motor and enter the Zero Point value. The direction of the motor is determined by whether the value of Roate Direction is 0 or 1.

**CRUISE\_L** and **CRUISE\_R** are configuration about horizontal thrusters, the setting of which is the same as that of **DIVE\_L** and **DIVE\_R**.

**P\_Margin** and **N\_Margin** are the travel distance of PWM that use to control the electronic speed controller. The value is preset to be 200 and is open to modification. Please make sure these travel distance is suitable based on the power consumption and thrust.

**P Dead Zone** and **N Dead Zone** are used by the ROV driver to cut the thruster power. The two zones should be larger than one of the used electronic speed controllers in vertical or horizontal pair. This makes sure that the thruster in pair has the same behavior when the PWM signals get close to Dead Zone. **P Dead Zone** and **N Dead Zone** are also used for PID depth control.

## 5. Thruster 2



← → ↻ Not secure | 192.168.1.1:8080/FTM?page=thruster2

**FTM**

PRODUCT INFO  
BAROQUE BOARD  
MAZU BOARD  
THRUSTER 1  
**THRUSTER 2**  
CAMERA TILT  
CAMERA VIDEO  
LED  
DEPTH CONTROL  
MOTION TRACE  
SW TRACER  
GENERAL SETTING  
SYSTEM SETTING  
OpenCV

### Factory Test Mode : Thruster 2

System Power (for reference only)

#	Name	Voltage	Current
1	ROV	14.440	0.420
2	ROV Baroque Board	14.440	0.360
3	Reel	4.920	0.560

Throttle Testing ( Simulate Joystick )

Diving Throttle (-1000 to 1000):

CRUISE Throttle (-1000 to 1000):

This is meant to simulate joystick's travel distance and is mainly used to test the power of ROV after it is assembled.



## 6. System Setting

← → ↻ Not secure | 192.168.1.1:8080/FTM?page=systemsetting

FTM  
PRODUCT INFO  
BAROQUE BOARD  
MAZU BOARD  
THRUSTER 1  
THRUSTER 2  
CAMERA TILT  
CAMERA VIDEO  
LED  
DEPTH CONTROL  
MOTION TRACE  
SW TRACER  
GENERAL SETTING  
SYSTEM SETTING  
OpenCV

ROV MAKER FTM

Factory Test Mode

System Setting

Pilot Power CFG Table

#	name	cruise_thro_f	diving_thro_f	yaw_f	roll_f	yaw_trim	roll_trim
1	Power 1	0.16	0.33	0.4	0	0	0
2	Power 2	0.22	0.33	0.33	0	0	0
3	Power 3	0.33	0.33	0.3	0	0	0
4	Power 4	0.44	0.33	0.3	0	0	0
5	Power 5	0.55	0.3	0.3	0	0	0

Save Pilot Configuration

Battery Management Table

#	name	lv0 threshold (volt)	lv1 threshold (volt)	lv2 threshold (volt)	lv3 threshold (volt)	lv4 threshold (volt)	low threshold (volt)	cut threshold (volt)	bat low info period (ms)
1	rov_bat_mgr	14.4	14.8	15.4	15.8	16.2	11.6	14.4	10000
2	winch_bat_mgr	11.2	11.4	11.7	12	12.3	11.3	11.5	10000

Save Battery Management Configuration

The system setting contains two tests.

### ● Pilot Power CFG Table

Pilot Power CFG Table


#	name	cruise_thro_f	diving_thro_f	yaw_f	roll_f	yaw_trim	roll_trim
1	Power 1	0.16	0.33	0.4	0	0	0
2	Power 2	0.22	0.33	0.33	0	0	0
3	Power 3	0.33	0.33	0.3	0	0	0
4	Power 4	0.44	0.33	0.3	0	0	0
5	Power 5	0.55	0.3	0.3	0	0	0

Save Pilot Configuration

This table defines the power level of ROV.

**Cruise\_thro\_f**: power level of cruise, the percentage of P and N Margin of **CRUISE\_L** and **CRUISE\_R** (200 as default value)

**Diving\_thro\_f**: power level of diving/surfacing, the percentage of P and N Margin of **DIVE\_L** and **DIVE\_R** (200 as default value)

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<b>FORMOSA Control Solution – User Guide</b>		<a href="http://www.rovmaker.com">www.rovmaker.com</a>

**Yaw\_f** : curve speed, the percentage of **Cruise\_thro\_f**

Other parameters are under construction and currently have no function.

## ● Pilot Power CFG Table

This table defines the battery level and warning levels according to voltage (only functional for ROV Module but not for Reel Module).

Battery Management Table

#	name	lv0 threshold (volt)	lv1 threshold (volt)	lv2 threshold (volt)	lv3 threshold (volt)	lv4 threshold (volt)	low threshold (volt)	cut threshold (volt)	bat low info period (ms)
1	rov_bat_mgr	14.4	14.8	15.4	15.8	16.2	11.6	14.4	10000
2	winch_bat_mgr	11.2	11.4	11.7	12	12.3	11.3	11.5	10000

Save Battery Management Configuration