

# BRUSHLESS Speed Controller

## BL-PRO4 / BL-RS4

### Instruction Manual



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## 1. Introduction

Thank you for trusting YOKOMO products. Purchasing BL-PRO4 / BL-RS4 Brushless ESC means that you selected the best ESC out of currently existing ones. This ESC is integrated with Hi-Tech features, and it is the most outstanding ESC you can get in the market. It is very dangerous when used improperly or remodeled without an approval, and this can cause critical damages to peripheral products & devices. Please carefully read this manual before use of this product.

## 2. Caution

- To avoid short circuit, please check if the wires and connections of the ESC are protected and are not in contact with peripheral devices.
- Be well-acquainted with the user manual for power devices / chassis before use, and check with the operating ranges.
- Use a soldering iron with at least 60W for soldering all input / output wires and connections.
- Keep the operation atmosphere dry in order to protect the ESC from humidity, water, oil, and other substances.
- Allow the product to have good ventilation, and be cautious for overheat.
- The ESC must be separated from the battery after use.

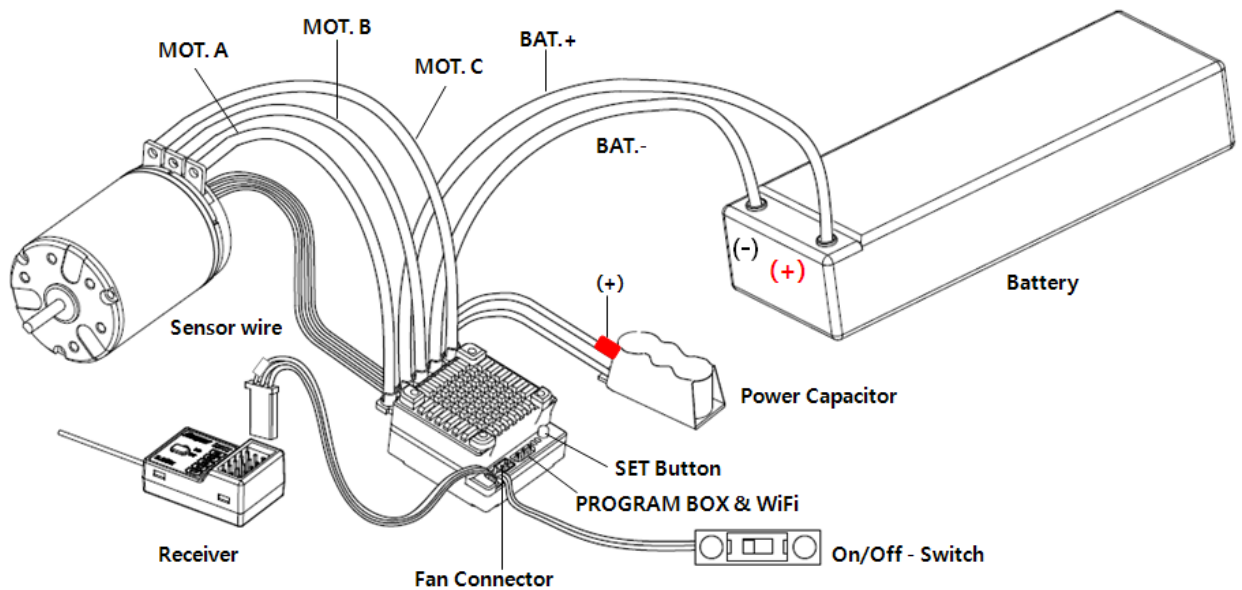
## 3. Features

- Full aluminum case and heat sink design
- Full compatibility with modified and stock race
- The excellence of the software reduced the motor temperature by modifying commutation algorithm and upgrading hardware, and it also increased the speed.
- With its max voltage 6V and 7.4V, a built-in boost BEC can operate various kinds of servos without using power of other receivers.
- New turbo / boost timing setting and delay time setting.
- It became possible to have various types of race and controls by setting new brake response mode and PWM / brake frequency individually.
- It is settable by connecting ESC to a program box or WiFi module with separated program port
- Using new WiFi module, the user can set the program parameter and upgrade the firmware. Also, all the ESC & motor data such as temperature, current, voltage, RPM and battery consumption can be stored in real time with the data log.
- Using superlative FET and low resistance power PCB design
- Maximizing the cooling with a 30mm fan

#### 4. Specification

	BL-PRO4	BL-RS4
Motor Type	Censored / 4Pole Censored	
Motor Limit "Specification when using the fan"	>3.5T	>5.5T
Operating voltage	3.7-7.4V	
Forward / Brake / Reverse	yes	
Full aluminum case / heatsink	yes	
Typ. Voltage Drop @20A per phase	0.0095V	0.016V
Rated Current per phase	828A	424A
Plugged 30x30x10mm Fan	yes	optional
BEC Output	6V/7.4V Built-in DC Booster, Continuous Current of 3A	
Multi-Protection-System	yes	
"Boost 0" Mode	yes	
Multi-frequency system	yes	
Power Wires	12Awg	
USB Software Updateability	yes	
Case Size(with out fan)	32.9 x 34.6 x 21mm	
Weight(with out cable)	50g	

#### 5. Connection



- . Caution

For maximum performance, black silicon wire without any connector was used for provided 12AWG wire. For soldering the battery and motor wires onto the solder bar, we recommend the soldering iron with at least 60W, and try to avoid soldering more than 5 seconds. Overheat can damage the ESC. With provided tube, it is possible to prevent the short circuit and to check the polarity after connection.

- . Motor wire connection

When connecting ESC and motor, the wire A/B/C should go to where they belong. However, some cars have their wirings in opposite way. For this case, you can switch from A-B-C to C-B-A on Motor-Wiring setting. If changed it to C-B-A, then the C & A should be switched on the figure above, and incorrect setting and connection can cause a critical problem. For your information, If the ESC is reset, then the C-B-A wiring setting will be back to A-B-C, so switch it to C-B-A again and then use.

Then connect the sensor wire to 6-pin sensor port.

- . Power capacitor

Do not ever drive without power capacitor. This is absolutely needed to protect the ESC and improve the punch. Proper polarity is very significant. Connect indicated red wire in the figure above to (+) of the ESC. Connect another wire to (-) of the ESC, and the connected wire should be short. Incorrect connection and poor soldering will damage the ESC. The warranty does not cover this part.

- . Battery wire connection

Proper polarity is very significant. Make sure if (+) wire is connected to (+) of the battery, and vice versa for (-) wire. If connection is not adequate, then it will surely damage the ESC. The warranty does not cover this part.

- . Receiver wire connection

Throttle wire of the ESC should be connected to 2CH of the receiver, and the white indication of the wire is the signal. This wire supplies 6/7.4V voltage to receiver and servo and others, therefore, there is no need of additional battery connected to receiver. If external power is connected to the receiver, the ESC might get damaged.

- . Fan connector

A cooling fan, screws and fan protector are provided according to the ESC specification. The fan mount is located on top of the heat sink, and it is recommended to use fan under the extreme situation such as modified or 4WD off-road. If the ESC temperature is 35°C or below, or the RPM of the motor is low, then the fan would not operate. The fan can be connected with using 2-pin connector at the front.

## 6. Connection Install Guide

- . Locate the ESC in a safe place where is easily accessible to connector and buttons.

- . Tightly fix the ESC with provided double-sided tape.

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. Make sure that there is some distance among the ESC, power wire and antenna / receiver. Try to avoid the direct touch among such parts. If the receiver and antenna are too close to each other, then signal confusion might be occurred. If this happens, re-install the parts with more distance.

## 7. Transmitter Settings

Before connecting the ESC to the receiver, check the transmitter settings are set as below. (Default settings)

Throttle Travel	High ATV,EPA	100%
Brake Travel	Low ATV,EPA,ATL	100%
Throttle Exponential	EXP,EXPO	Start with 0
Neutral Trim	SUB Trim	Center
Trigger	RATE Forward-Brake	F50 : B50

- . Make sure that the ESC is not connected to the battery and its power is OFF.
- . Remove the motor pinion, or check if the wheels rotate freely while the car is over (not touching) the surface.
- . Turn the transmitter on and place the throttle on the neutral.

## 8. ESC Setup

- . Connect the ESC to the battery, and then turn the switch ON.
- . Hold the SET button at least for 3 seconds. Release the button when GREEN LED blinks. GREEN LED turns on with the motor sound. "Neutral Position Save"
- . RED LED turns on when throttle is moved forward to the maximum. "Acceleration Full Position Save"
- . Both GREEN and RED LED turn on when throttle is moved backward to the maximum. "Brake or Reverse Full Position Save"
- . Green and RED LED blink by turns when throttle is moved to "Neutral Position" and motor sound occurs.
- . After the procedure above, then the ESC becomes possible to use.
- . If motor moves at neutral position, it means there is difference with saved neutral value. Re-calibrate the throttle range.
- . It is possible to check the ESC settings are correctly done with the LEDs' condition in accordance with the throttle movement.

	GREEN LED	RED LED
Neutral	ON	OFF
Neutral("BOOST OFF MODE")	Blinking	OFF
Max Acceleration	OFF	ON
Max Reverse or Brake	ON	ON

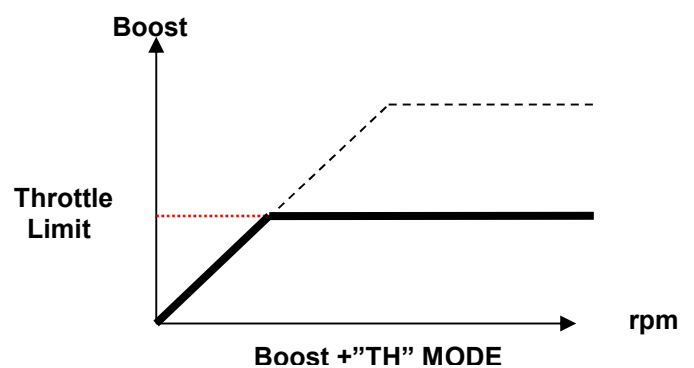
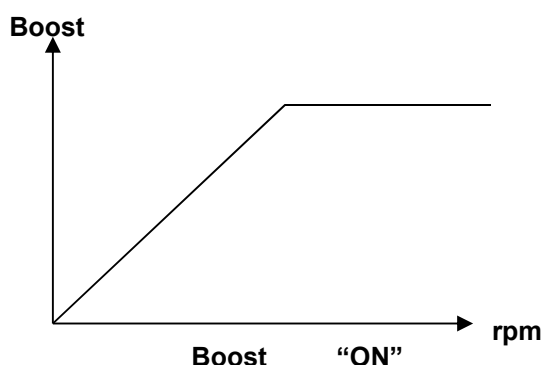
## 9. Programmable items

You can set detailed setting parameters and check racing information & present data using the program card or WiFi module decide. If motor is not connected, the program card is not connected. It can be connected using the front 3pin connector, and please refer to the manuals on the program card and WiFi module decide for further details.

Programmable Items	Parameter Values		Default
	Sensor	Hybrid	
Motor Type			Sensor
Select Battery	LiPo / LiFe / NiMh(NiCd)		LiPo
Cut Off Voltage	Disable / Auto / 3.0V ~ 7.5V(Step:0.1V)		Auto
Power Curve	0 ~ 10		5
Boost Max+TB	Boost    Max                    +            TB Off        X ON        0 ~ 58(Hybrid:25) +TH       0 ~ 58(Hybrid:25)	0 ~ 58(Hybrid:25) 0 ~ 58(Hybrid:25)	Off
Boost Min-rpm	0~64500(Step: 500rpm)		5000rpm
Boost Max-rpm	0~65000(Step: 500rpm)		25000rpm

Boost-TH. Limit	TH 20% 40% 60% 80% 100%	Limit 0~58(Hybrid:25) 0~58(Hybrid:25) 0~58(Hybrid:25) 0~58(Hybrid:25) 0~58(Hybrid:25)	0
Turbo Delay	0.00 ~ 1.00s (step: 0.05s)		0.20s
Turbo + Slope	0.00 ~ 1.00s (step: 0.05s)		0.20s
Turbo - Slope	0.00 ~ 1.00s (step: 0.05s)		0.20s
Acceleration	0~10		5
Start Power	0~100(step: 1%)		0%
Start Curr Limit	Off, 1% ~ 100%(step: 1%)		Off
Current Limit	Off, 1% ~ 100%(step: 1%)		Off
Reverse Function	One Way / Two Way / Two Way2 / Two Way3		One Way
Reverse Delay	Off / 0.2s / 0.5s / 0.8s / 1.3s / 1.8s / 2.5s		2.5s
M- Reverse Amount	20% ~ 100%(step: 1%)		100%
Neutral Width	Narrow / Normal / Wide		Wide
Motor Direction	Normal / Reverse		Normal
Brake Response	0% ~ 100%(step: 1%)		0%
A.B.S Brake	Off / Weakest/Weak/Normal/Strong/ Strongest		Off
Drag Brake	0% ~ 100%(step: 1%)		0%
Min Brake Amount	0% ~ 100%(step: 1%)		30%
Mid Brake Amount	0% ~ 100%(step: 1%)		50%
Mid Brake Location	0% ~ 100%(step: 1%)		50%
Max Brake Amount	0% ~ 100%(step: 1%)		100%
Soft Brake	Hard / Soft	Soft	Soft
Brake Freq	1Khz / 2Khz / 5Khz / 8Khz / 16Khz / 32Khz		1Khz
Motor Freq	1Khz / 2Khz / 5Khz / 8Khz / 16Khz / 32Khz	8Khz / 16Khz	5Khz
Drag Freq	1Khz / 2Khz / 5Khz / 8Khz / 16Khz / 32Khz		1Khz
Cut Off Temp	100° ~ 135°(step: 5) / Disable		135°
Cut Off M-Temp	100° ~ 135°(step: 5) / Disable		135°
B.E.C Voltage	6.0V / 7.4V		6.0V
Current Voltage	XX.X		
Current Temp	0°~ 135°		
Max Temperature	0°~ 135°		
Motor Temp	0°~ 135°		
Motor Max Temp	0°~ 135°		
Max Current	0 A ~ 999 A		
Motor Pole Num	2 ~ 20 Pole		2 Pole
Gear Ratio	2.0 : 1 ~ 15.0 : 1		2.0 : 1
Tire Diameter	40mm ~ 200mm		63mm
Motor-Wiring	A-B-C / C-B-A		A-B-C
Maximum Speed	XXX.X km/h		
Maximum RPM	XXX rpm		
Error History	M,T1,T2, S, V, R		
Download	All parameters inside the setup card are downloaded to the ESC.		
Restore Memory	All setting information inside EEPROM are read via the RAM.		
Backup Memory	All setting information inside the RAM are stored at EEPROM		
Factory Setting	Change the setting of ESC to default factory status.		

- Motor Type
- Sensor : Power system should be activated only with the censored mode as it has highest efficiency and racing performance. The ESC immediately stops if the sensor error occurs during driving. Please check the connection related to the motor and sensor cables.
- Hybrid: the ESC starts and works with the censored at low RPM then it works automatically with the sensorless. This mode could be used for 4WD SCT of 4 pole motor.
  - Select Battery
  - It is extremely important to select correct battery type. Otherwise, it could damage the battery.
    - Cut Off Voltage
    - This function is to set the cut off voltage to protect the battery.
      - Power Curve
      - The parameters of the throttle curve are relating to the position of the throttle and it impacts the output of the ESC. Its default is "5" and the power curve should be changed into other shapes using the PC program or WiFi module. For example, if +EXP value is added at initial part, the value of the initial output value is increased, and if -EXP value is added, smaller throttle value is outputted.
        - Boost Max+TB
        - OFF: All timing is disabled, and this can be set at the condition of "True stock racing" etc.. green LED should blink at neutral in this mode.
        - ON: The speed and efficiency of the motor is depending on boost timing setting. When boost timing is bigger, speed should be fast, and it also impacts the output depending on the motor RPM. Higher values would increase the power and RPM but also cause high heating. So, excessive setting could cause fatal problems to the ESC and motor.
        - TB(TURBO) should be activated when the throttle is located at 100%. (Boost setting + TB setting) are applied into timing. The max value of both is limited to 58. This item is an ideal for long straight course. The sum at Hybrid mode is limited to 25.
          - Boost Min-rpm
          - This is to set the required RPM that causes the Boost timing to be activated. For example, if the boost start timing is set as 1000, when RPM reaches the 1000, timing should be activated. It can be set 0~64500. This value can not be set higher than Boost Max RPM.
            - Boost Max-rpm
            - After boost value is set, then rpm is set. For example, if boost timing is set as 20 degree and boost finish RPM is set as 20000, When the ESC reaches over 20000, then timing boost is activated as 20 degree that you set. It can be set 0~65000. This value can not be set lower than the value of Boost Min-rpm.
              - Boost-TH. Limmit
              - At Boost Max+TB, +TH mode allows the setting of timing limit with 5 steps of the throttle location. Boost "OFF" and "ON" are not supported. Please refer to the graphs below.



- Turbo Delay
- Turbo start should be immediately activated when the throttle is moved to "full" when it is set as "0.00", it is immediately applied. When it is set as other values, the turbo is activated after a delay time that is set at full throttle location.
  - Turbo + Slope
- This is to set the slope time when turbo is activated. When the value of this item becomes lower, acceleration and heating are increased. This item is about time that reaches up to "50"
  - Turbo – Slope
- After turbo timing is activated, when the throttle is back to the original location from turbo condition, this item is to set its applied time. When its value is lower, brake effect occurs and movement of the vehicle becomes worse. This item is about time that reaches up to "50"
  - Acceleration
- This is to adjust the TIME that reaches the max output from the motor at pause.
  - Start Power
- This is to be used when setting the minimum start power and set the minimum power when the motor is rotated.
  - Start Current Limit
- This is to set start current limit. It is used at start and make the start being more stable. The optimized setting value for this function is to prevent the vehicle from slipping. This optimized value can vary depending on the vehicle type. "off" setting allows max output. Start current limit is activated when the throttle stick stays at neutral or brake position for over 10 seconds. This function is disabled when the throttle stick is back to neutral and the motor is rotated.
  - Current Limit
- This is to set current limit. This is to help to reduce the torque that is occurred at the motor and to easily control the vehicle.
  - Reverse Function
- One Way: forward / brake
- Two Way: Forward / brake / reverse. Reverse is activated after reverse delay. Brake is activated during this delay period.
- Two Way2: Forward / brake / reverse. Reverse is activated after 1second at motor pause, regardless of the reverse delay. Direction can be changed after max 6~7 seconds.
- Two Way3: Forward / brake / reverse. When the motor is rotated forward, if the throttle stick is moved to the reverse, brake is activated. Even if the stick stays there, reverse function is not activated. To function the reverse, move the throttle stick to the neutral then back again to the reverse direction then reverse is activated.
  - Reverse Delay
- This is to set the delay before reverse. After this delay, reverse is activated.
  - M- Reverse Amount
- This is to set the max reverse speed to 20~100% during driving.
  - Neutral Width
- This is to set the neutral width. This neutral width is the barometer to determine the neutral position of a transmitter.
  - Motor Direction
- This is to set the forward / reverse rotation of the motor.
  - Brake Response
- This is to adjust the strength of the brake. You can obtain the strongest brake at 100%.
  - A.B.S Brake
- This is to set ABS brake. Please leave the ABS brake at OFF position when the full brake is needed.
  - Drag Brake
- This is to set auto brake which delivers small brake effect at neutral position.
  - Min Brake Amount
- This is to set the first brake amount.



- Mid Brake Amount
- This is to set the middle brake amount.
  - Mid Brake Location
- This is to set the position on the middle brake amount.
- This function is deactivated when mid brake amount and mid brake location are set as 0%.
  - Max Brake Amount
- This is to set max brake range. Please leave the brake at "FULL BRAKE" position.
  - Soft Brake
- This is to set the brake power like "Hard" or "Soft".
- "SOFT" is only supported at Hybrid mode.
  - Brake Freq
- This is to set the brake frequency. When the frequency is lower, control becomes also bigger, and if the frequency is higher, soft control is achieved.
  - Motor Freq
- This is to set the motor frequency. When the frequency is lower, initial acceleration becomes rapidly fast. When the frequency is higher, it becomes softer, but the ESC generates more heating.
- 8khz / 16khz can be set at Hybrid mode.
  - Drag Freq
- This is to set drag frequency. When the frequency is lower, the effect of the brake control is very good. When the frequency is higher, soft control is achieved.
  - Cut Off Temp
- This is to set the cutoff temperature of the ESC. When this function is disabled, the ESC can not be protected from the temperature, thus we do not recommend that you set this function as disable.
  - Cut Off M-Temp
- This is to set the cutoff temperature of the motor. When this function is disabled, the motor can not be protected from the temperature, thus we do not recommend that you set this function as disable.
  - B.E.C Voltage
- This is to set the voltage that is supplied to a receiver. The ESC could get damage due to wrong voltage setting, this please make sure to use according to the servo spec.
- 7.4V does not work when 1S battery is used.
  - Current Voltage
- You can check the present battery voltage when the program is connected.
  - Current Temp
- You can check the present ESC's temperature when the program is connected.
  - Max Temperature
- You can check the max temperature that is obtained during racing when the program is connected.
  - Motor Temp
- You can check the present motor's temperature when the program is connected.
  - Motor Max Temp
- You can check the max temperature of the motor that is obtained during racing when the program is connected.
  - Max Current
- You can check the max current that is obtained during racing when the program is connected.
  - Motor Pole Num
- This is to set the motor poles. If this setting is not done correctly, max speed could be indicated differently.
  - Gear Ratio
- This is to set the gear rate of the vehicle. If this setting is not done correctly, max speed could be indicated differently.

- Tire Diameter
- This is to set the diameter of the tire. If this setting is not done correctly, max speed could be indicated differently.
  - Motor-Wiring
- This is to set the order of motor cable connection like A-B-C or C-B-A. when you need to change this, make sure to also change the motor configuration and setting identically. Otherwise, wrong configuration and setting could cause the damage to the ESC.
  - Maximum Speed
- This is to confirm the max speed that is obtained at racing of the car.
  - Maximum RPM
- This is to confirm the max RPM of the motor that is obtained at racing of the car.
  - Error History
- (R) signal problem of the receiver.
- (V) this is to indicate the ESC stops due to low voltage.
- (S) Sensor problem.
- (T1) this is to indicate the ESC stops due to the temperature issue on the ESC.
- (M) Motor connection problem / motor problem / product damage
- (T2) this is to indicate the ESC stops due to the temperature issue on the motor.
  - Download
- changed setting value is stored at the ESC.
  - Restore Memory
- Recall the setting parameters that are stored at Backup Memory room.
  - Backup Memory
- Setting parameters can be backup.
  - Factory Setting
- changes the ESC setting parameters to the factory default settings.

## 10. LED status for the error

- When it's turned on and if GREEN and RED LED blink at the same time, it means that it's not connected to the motor or lines of ESC are short-circuited. Once you check this point and if same problem occurs again, it means FET of ESC is damaged. Please send the product to our service center.
- RED LED blinks one time repeatedly mean that there is no receiver signal. Please check the connection part of transmitter/receiver.
- RED LED blinks two times repeatedly mean that low voltage cut is activated.
- RED LED blinks three times repeatedly mean that motor sensor has a problem. Please check the sensor cable connection and motor status.
- RED LED blinks four times repeatedly mean that temperature protection of ESC is activated.
- RED LED blinks five times repeatedly mean that there is PWM output but the motor isn't running for more than 2 seconds. Please check the motor status or check the car.
- RED LED blinks six times repeatedly mean that temperature protection of motor is activated.
- RED LED blinks seven times repeatedly mean that BEC output has a problem. Please check the servo.

## 11. Data check

- You can check the maximum temperature/current/speed/rpm of ESC and MOTOR through a program box or WiFi module. User should wait at least 5 seconds at the neutral position after driving then turn off ESC. You can check the related list when turning on ESC after connecting a program box and port. To delete the driving information, it should stay in neutral position for more than 5 seconds after turning on ESC.

## 12. Liability Exclusion

This ESC is designed and approved exclusively for use with the types of battery and motors stated in this instruction manual.

Yokomo is not liable for any loss or damage, whether direct or indirect, incidental or consequential, or from any special situation, arising from the use, misuse or abuse of this product.

Our obligation to pay compensation, regardless of the legal argument employed, is limited to the invoice value of those Yokomo products which were immediately and directly involved in the event in which the damage occurred.

By using this product, the user is deemed to have accepted these terms and conditions.

## 13. Customer Service

- To receive customer service, a valid proof of purchase will be required.
- For customer service outside of Japan, please first contact your local dealer. Please understand Yokomo can not provide service to end user outside of Japan directly.
- Only Yokomo can conclude whether a product is defective. Resellers, dealers and distributors do not have the authority to conclude whether a product is defective.
- If you have any questions which are not mentioned in the manual, please feel free to send e-mail to [support@teamyokomo.com](mailto:support@teamyokomo.com)