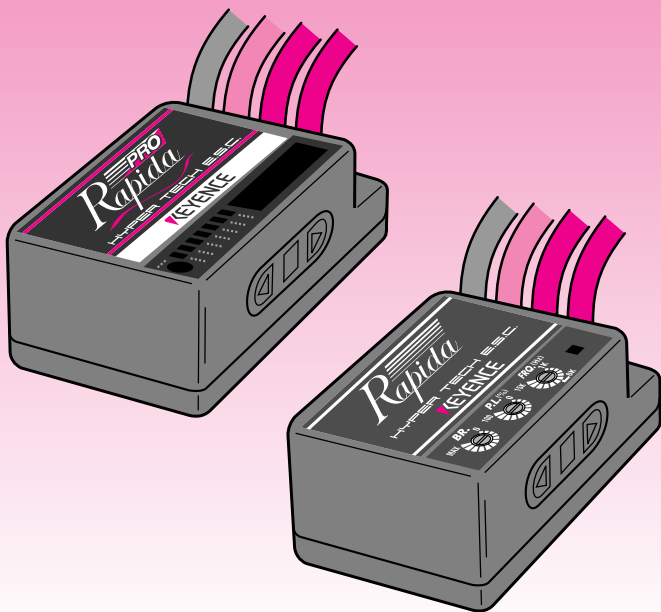


Rapida Series

Digital Speed Controller Instruction Manual



KEYENCE

Rapida *series*

Digital Speed Controller Instruction Manual

Precautions

Batteries

⚠ WARNING To avoid the risk of fumes, fire or burns

Improper use of the battery is very dangerous. The battery must be handled carefully. Incorrect wiring or short-circuiting of wiring may cause fire or fumes. Before connecting or disconnecting the battery to or from the ESC, be sure to turn off the power switch of the ESC. When the battery is not in use, disconnect it from the ESC or charger, and store it in a suitable location with wires and screws removed.

Connecting silicone wiring

⚠ WARNING To avoid the risk of fumes, fire or burns

Incorrect wiring may cause fire or fumes that can damage both the ESC and battery beyond repair. To avoid the risk of accidents, do not modify wiring by yourself, even though the ESC is fitted with terminals. Take the product to KEYENCE instead.


Connecting to a motor


⚠ WARNING To avoid the risk of fumes, fire or explosion

Make sure to fit the included capacitor to the motor to be used. Otherwise, the ESC may become damaged due to malfunction resulting from electrical noise.

Caution


Make sure to carefully read and understand the important warning messages in this Instruction Manual before commencing to use the product.

 **WARNING** Information for preventing serious injury

 **CAUTION** Information for preventing accidents or product damage


NOTE Useful information on handling the product

Radiating fins

 **WARNING** To avoid the risk of fumes, fire or burns

Electricity flows through the metal upper part of the ESC. Therefore, take care to avoid contacting this with cables and other metal parts or the carbon chassis of the ESC. Take the same care even after a radiating fin is installed, since radiating fins conduct electricity.

Proper operation

 **CAUTION** To avoid accidents or product damage

Do not modify the ESC in any way. Use it only for its intended purpose. Keep the ESC away from flames or heat. Avoid splashing any liquid, such as water, on the ESC.

INDEX

- P.2 to P.8 How to Connect RAPIDA Series
- P.9 to P.15 Various Settings of RAPIDA
- P.16 to P.26 Various Settings of RAPIDA PRO
- P.27 Heat Sink
- P.28 to P.29 Troubleshooting of RAPIDA Series
- P.30 RAPIDA PRO Hierarchical Chart of Functions
- P.31 Setting Examples of RAPIDA PRO by Category

Features

- Features the latest MOS-FET (SOP) components, which allow powerful braking as well as a forward function.
- Advanced control circuitry using a 4-layer board that allows high-density mounting of electronic components.
- Utilizes an MPRS^{*1} system, which has proved very successful in large-current circuits, for compactness and high performance.
- With AGCS^{*2}, Schottky diodes are no longer necessary, and motor voltage loss during pulse drive is reduced to 1 percent. This results in a longer run-time and prevents the heat generated by FETs.
- Smooth frequency control allows settings to be adjusted flexibly.
- AWG14 silicone cables, for flexibility and large currents, are used. (JRM connector specifications)
- Gold-plating is used for all electrical connectors for extremely low contact resistance.
- Outstanding energy-saving performance can be achieved by setting the power limiter function to an appropriate value
- Includes a high-capacity state-of-the-art low impedance capacitor to minimize electrical noise.
- Improved receiver and servo power allow the RAPIDA series to handle a high torque servo.
- Improved throttle output resolution for more stable operation.

RAPIDA

- The RAPIDA offers 20 high-performance surface-mounted FETs with an ON-resistance value of 0.28 m Ω (FET standard value), amongst the lowest in the world.
- You can choose four settings for brake frequency to adjust the "braking feel" to just how you like it.
- You can switch neutral brake ON/OFF.
- By setting the power limit to an appropriate value, you can drive very smoothly.
- Uses trimmer specifications for simple operation.

RAPIDA PRO

- The RAPIDA PRO offers 24 high-performance surface-mounted FETs with an ON-resistance of 0.28 m Ω (standard value), amongst the lowest in the world.
- Outstanding energy-saving performance can be achieved by setting the power limiter function to an appropriate value.
- With the addition of an indicator function, a variety of settings and measurement can be made using only the body of the ESC.

- Equipped with a variety of measuring functions for visual confirmation of optimum settings.

***1 MPRS: Mental Plate Radiation of heat Structure**

MPRS is a hybrid structure in which current is conducted not only through a copper foil on the printed board but also through a metal plate, for optimum configuration of FETs.

*** 2 AGCS: Advanced Gate Control System**

AGCS is a groundbreaking system that dramatically reduces losses during pulse drive by dynamically controlling FET gates (ON-OFF) according to motor speed (RPM). (PATENT PENDING)

Specifications

• RAPIDA

Power supply	6-cell battery (NiCd, NiMH, etc.)
Maximum current	Max. current of battery
ON resistance	0.28 mΩ (FET standard value)
Compatible motors	Any
Dimensions	W37.4 x D27.5 x H18.0 (excl. projection)
Weight (ESC unit)	28.8 g
Regulator for receiver/servo	6V 3A output

• RAPIDA PRO

Power supply	6-cell battery (NiCd, NiMH, etc.)
Maximum current	Max. current of battery
ON resistance	0.23 mΩ (FET standard value)
Compatible motors	Any
Dimensions	W37.4 x D27.5 x H18.0 (excl. projection)
Weight (ESC unit)	29.6 g
Regulator for receiver/servo	6V 3A output

Part Names And Wiring

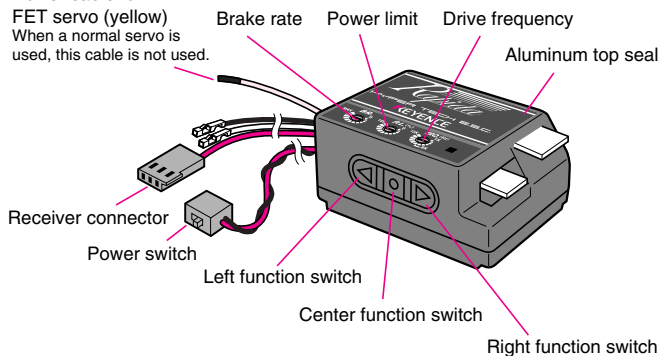
Part names

• RAPIDA

Power cable for

FET servo (yellow)

When a normal servo is used, this cable is not used.

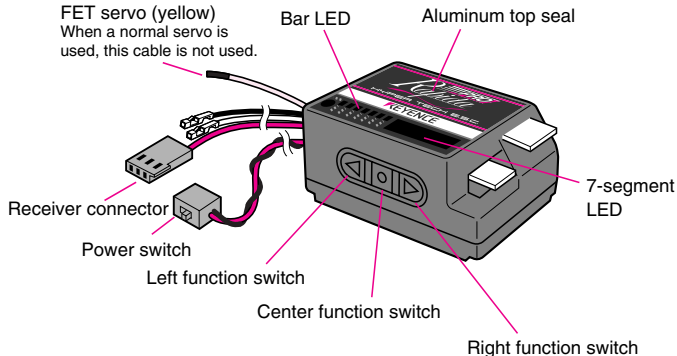


• RAPIDA PRO

Power cable for

FET servo (yellow)

When a normal servo is used, this cable is not used.

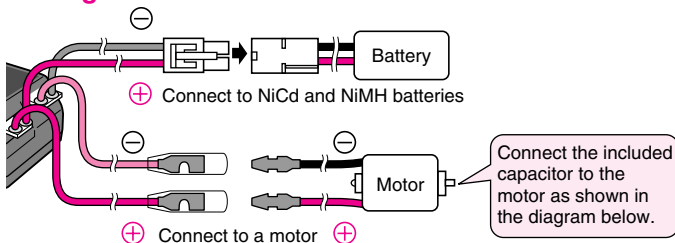


Wiring

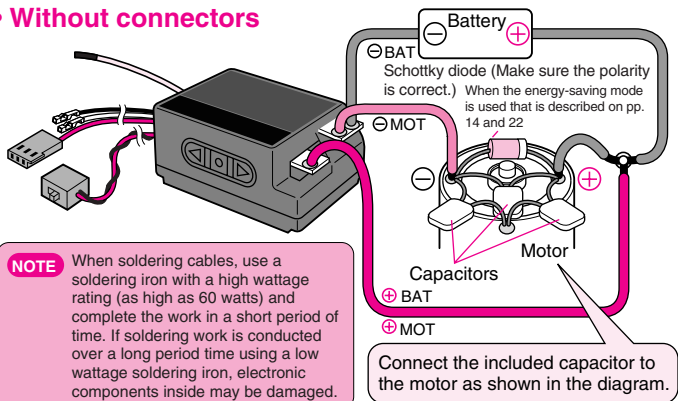
⚠ WARNING To avoid the risk of fumes, fire or burns

Take care not to make mistakes with battery polarity. Also, make sure to connect the included noise-suppression capacitor to the motor. If not, you may damage the ESC.

• Using connectors



• Without connectors



NOTE When soldering cables, use a soldering iron with a high wattage rating (as high as 60 watts) and complete the work in a short period of time. If soldering work is conducted over a long period time using a low wattage soldering iron, electronic components inside may be damaged.

* Even when a capacitor is already attached to a motor, attach the included capacitors. (three spots: between the + terminal and - terminal, between the + terminal and the motor case, and between the - terminal and the motor case)

Part Names And Wiring

Receiver connector




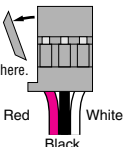
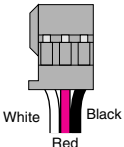
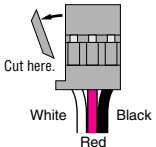
⚠ WARNING To avoid the risk of fumes, fire or burns

Do not change wiring before disconnecting the battery. Also, take care not to make mistakes with the polarity of wiring, otherwise you may damage the ESC, receiver or servo. Take particular care of the servo and receiver since these cannot be repaired by KEYENCE.

Insert the receiver connector pin according to the directions of the maker of the receiver you are going to use. According to the diagram, orient the connectors properly and connect them to connector pins in such a way that the connector pin latch stays in the opening of the connectors. Be careful not to make mistakes.

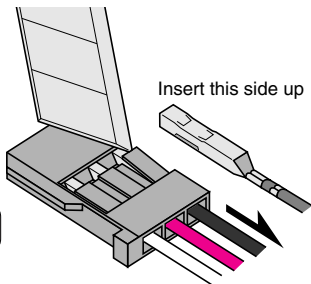
Connecting cables incorrectly or inserting connectors in reverse may cause damage to the servo and receiver.

If you use a receiver by a manufacturer other than those listed below, contact your distributor or KEYENCE.

Receiver manufacturer	Old SANWA Old KO	FUTABA New KO	New SANWA (Z connector) JR
Shape of connector insert port (receiver side)	Take care not to insert in reverse. 	No need to change it. 	Take care not to insert in reverse. 
Wiring	 Cut here. Red White Black	 White Red Black	 Cut here. White Red Black

* To lock the connection, the connector (the resin part) of this type has barbs inside but not on the connector pins (the metal contacts). When you pull cables out of the connector, you should lift the connector's lip by using sharp point like cutter or needle and pull out. When you insert, you should turn the snagging side (the concave side) of the connector pins (the metal contacts) up and push them until you hear a "click".

⚠ CAUTION Take care when you handle the needle or cutter.



Rapida 

(For information on RAPIDA PRO, see p. 16.)

Setting Up Functions



WARNING

Before performing settings for each function, make sure to disconnect the motor or to keep the vehicle suspended in the air.

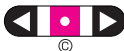
Switches on the side of the main body



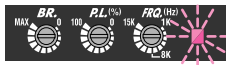
1. Setting the transmitter throttle position

If the throttle position of the transmitter is not set properly, various settings following the position setting may be inaccurate. Make sure the setting is right.

- 1 Press the center function switch for four seconds.



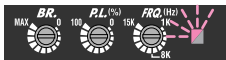
- 2 Red and green LEDs blink.



- 3 Set the transmitter trigger to the neutral position and press the right function switch.



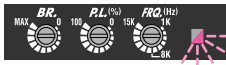
- 4 Green LED blinks.



- 5 Set the transmitter trigger to the high point position and press the right function switch.



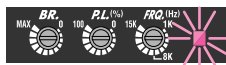
- 6 Red LED blinks.



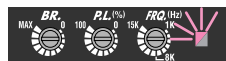
- 7 Set the transmitter trigger to the brake high point position and press the right function switch.



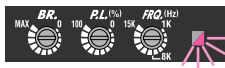
- 8 Settings are complete and the red and green LEDs blink at the neutral position.



- 9 As you pull the trigger of the transmitter, the LED goes off once, and then the green LED turns on at the high point position.



- 10 When you push the trigger of the transmitter to the brake side, the LED goes off once, then the red LED turns on at the brake high point position.



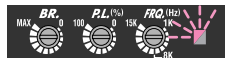
2. Brake frequency settings

Adjust the feel of the brake during operation. The lower the numeric value, the more strongly the brake operates. The higher the value, the more smoothly the brake works.

- 1 Press the left function switch for four seconds.



- 2 The display passes through four stages from the turning off of the green LED to the turning on of the green LED, according to the current brake frequency.



Set the frequency you want by using the right function switch.



3

Frequency	Green LED	Brake feel
2 kHz	Off	Strong brake operation
4 kHz	Blinking	
6 kHz	Blinking	
8 kHz	On	Smooth brake operation



- 4 If you press the left function switch, the frequency is set and recovered.



3. Neutral brake settings

Set the degree to which brakes are applied in the case where the trigger is in neutral. (0 to 70 %)

- 1 Turn off the ESC power switch once.



- 2 Turn on the power switch while pressing the right function.



Setting Up Functions

- 3 The neutral brake is ON when the ESC returns to normal operation while the red LED is blinking.
The neutral brake is OFF when the ESC returns to normal operation while the green LED is blinking.



- 4 By repeating this same action, the neutral brake switches ON and OFF in turn.
- 5 Since the mode is registered, there is no need to reset it.

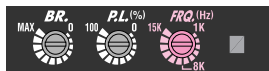
* It is turned off in the case of a general ESC.

4. Frequency adjustment function

Adjust the frequency response at the forward side. Setting a numeric value low results in low to medium speed and high torque. Setting a numeric value high results in high speed and low torque.

NOTE

Trimmer can only rotate 240 degrees.
Do not try to force it more than this.



Frequency adjustment trimmer

- You can adjust the frequency from 1 kHz to 15kHz, according to the "feel" you desire.

Low numeric value	Low to medium speed, high torque
High numeric value	High speed, low torque

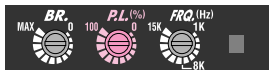
- By changing the position of the trimmer, the frequency changes to linear adjustment, allowing more detailed settings.

5. Power limit adjustment function

With this function, the largest current can be controlled for the sake of enhancing fuel efficiency. Lowering a value can reduce initial torque, preventing wheel-spin. Using this function with the dash power mode (see no. 6) enables sharp starting up.

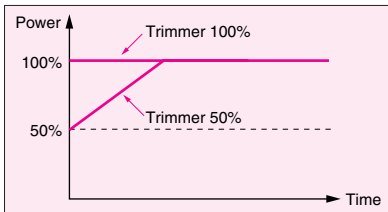
NOTE

Trimmer can only rotate 240 degrees.
Do not try to force it more than this.



Power limit adjustment trimmer

- By adjustment the power limit, it is possible to drive on slippery surfaces and to extend the run-time of the vehicle.



- The higher the power limit value (closer to 100%), the higher the electric current that flows in the motor.
- Lowering the trimmer value effectively controls the starting up power and the level of traction. Lowering the trimmer value also extends the run-time.

* The dash power mode is not available in the case of 100 %.

* The setting value is common for the entire operating range of the trigger (the forward side).

6. Dash power mode

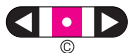
This function can be used to override the power limit for the first throttle action at the time of starting up. This allows faster starting up.

This mode is not available when the power limit (see no. 5) is 100 %.

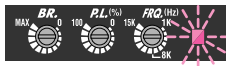
NOTE

If the ESC is subject to electrical noise, there is a danger that the noise is interpreted as the first throttle action, thereby deactivating dash power mode by mistake.

- 1 Turn the transmitter switch on and press the center function switch for four seconds. The LED then starts blinking. (Same as setting mode.)



- 2 Lift your hand from the function switch and wait until the LED stops blinking. (It takes approximately 10 seconds).
→ LED blinks red and green in turn.



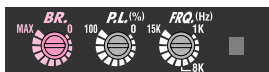
This procedure above causes the dash power mode to be in a standby state.

7. Brake rate adjustment function

This function allows the brake to work more strongly with less trigger operation. Driving can be made smoother by setting the brake adjustment value according to the specific road conditions.

NOTE

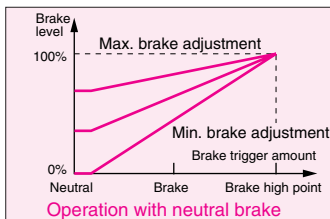
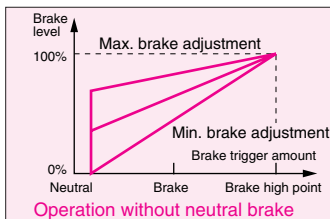
Trimmer can only rotate 240 degrees.
Do not try to force it more than this.



↑ Brake rate adjustment trimmer

- Adjusting the brake rate can result in higher torque braking.

Setting Up Functions



When the neutral brake is off (see no. 3), the minimum brake level can be adjusted by changing the set value of the brake adjustment trimmer. At the minimum setting, the brake value changes linearly according to the trigger value. As the setting reaches a maximum, the minimum brake value changes up to about 70% of the maximum brake value. If you need stronger braking than this, set to the appropriate value by gradually increasing the setting from the minimum value.

8. Energy saving mode (abbreviation: EnSA)

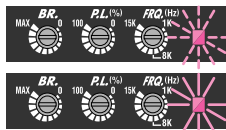
- 1 Turn off the amplifier power switch once.



- 2 Press and hold the left function switch while turning on the power switch.



- 3 If the unit returns to normal operation with the red or green LED flashing, the Energy Saving Mode is on. If the unit returns to normal operation with the red or green LED illuminated, the Energy Saving Mode is off.



- 4 Repeating the same action turns the neutral brake on and off alternately.

- 5 The mode, once set, is stored in memory, so you don't have to set the same mode again.

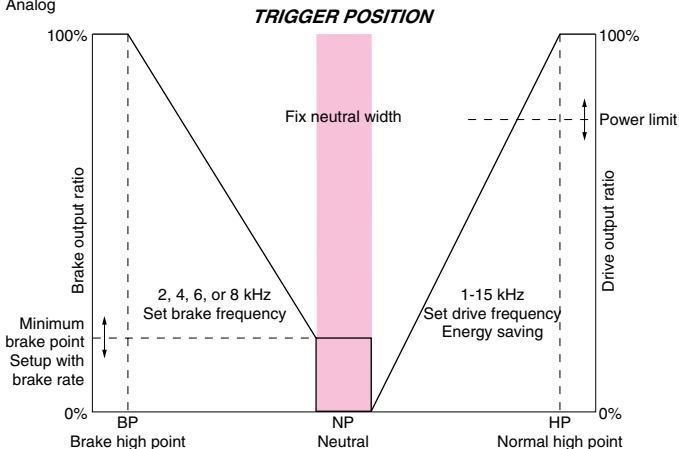
Energy Saving Mode		ON	OFF
Neutral Brake (see no. 3)	ON	Green flashes	Green ON
	OFF	Red flashes	Red ON
Energy Saving Effect	Great Small		
Motor Noise Influence	High Low		
Schottky Diode	Required	Not required	

The Energy Saving Mode should generally be turned on, but turning off the Energy Saving Mode may help achieve more stable performance, depending on the type of motor and its degree of deterioration. If the motor has deteriorated, turning off the Energy Saving Mode enables more stable operation. Malfunctions caused by noise may be avoided with the Energy Saving Mode turned off.

Various Settings

Output on throttle operation is shown in the graph below.
(with neutral braking)

Transmitter rate
Analog



1. For full-torque driving, set frequency rather low, to around 1.0-2.0 kHz.
2. For smooth driving, set frequency rather high, to around 8.0-14 kHz.
3. As you increase frequency, driving is smoother but the amount of heat generated in the electric circuitry increases. When using a high-powered motor, we recommend that you limit the frequency of the drive brake to 10 kHz.
4. The energy saving circuit is particularly effective for driving at low and medium speed. However, effectiveness depends on the type of motor, gear ratios and drive frequency. If the drive frequency is too low, the energy saving circuit does not work well. On the other hand, if the drive frequency is too high, the loss due to internal heat generation becomes too high. So, generally, the frequency range for energy saving is around 3.0-12.0 kHz, according to the settings for the vehicle.
5. For frequency settings, if the starting speed torque is not high enough, increase the value of minimum drive power.
6. If the brake doesn't work well, increase the value of minimum brake power.

The logo consists of a large, black, stylized letter 'R' on the left. To its right, the word 'Rapida' is written in a black, elegant cursive script. Above the 'Rapida' text, the word 'PRO' is written in a bold, black, sans-serif font. The 'PRO' text is set against a white background with three horizontal black lines to its left, suggesting speed. A pink swoosh underline is positioned below the 'Rapida' text, and a pink triangle points to the right at the end of the 'PRO' text.

(For information on RAPIDA, see p. 9.)

Function Indicators (settings are explained from p. 20)

Pressing the left or right function switch changes the display on the indicator. (Hereinafter, "switches" shall mean the function switch on the main body.)

Switches on the side of the main body

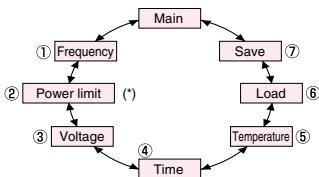
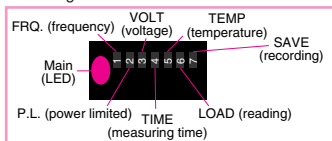
Left function switch (L)



Center function switch (C)

Right function switch (R)

The items displayed by the 7-segment LED are as follows.



* The numerals are numbers in the LED chart to the left.

When the switches are turned on, "HELLO" is indicated, followed by the MAIN LED (the left end) illuminating in red (ready for driving). Also, pressing the center function switch on the side of the main body here allows the device to become ready for various settings.

1. Main Display

This indicates the current output as a percentage. (The display changes automatically according to the change in the number of LED bars displayed.)

LED main, red lamp is on.



n...neutral

Normally displays 0P (percent); current value is displayed when adjusting the neutral brake setting.



d...drive (forward)

Displays values up to 100P (percent) according to the change in the LED bars.



b...brake

Displays values up to 100P (percent) according to the change in the LED bars.

2. Frequency (F.R.Q.) display

This indicates the currently set frequency in kHz.

LED (1) is on.



Fd...drive frequency

Adjust the frequency response at the forward side. Setting a numeric value low results in low to medium speed and high torque. Setting a numeric value high results in high speed and low torque.

Displays values between 0.1 and 20.0 (100 to 20000 Hz).

Function Indicators (settings are explained from p. 20)



br ...brake frequency

Adjust the feel of the brake during operation. The lower the numeric value, the more strongly the brake operates. The higher the value, the more smoothly the brake works. Displays values between 0.1 and 20.0.

3. Power limit (P.L.) display

Displayed values are in units of %.

This indicates the current power limit value. Lowering the value can reduce initial torque, preventing wheel-spin. Using this function with the dash power mode (see 3-2, p. 24) enables sharp starting up.

LED (2) is on.



- * The largest current can be controlled for the sake of enhancing fuel efficiency with this function.
- * The higher the value, the larger the amount of flowing current becomes. Lowering the value can reduce initial torque, preventing wheel-spin.
- * Using this function with the dash power mode (see 3-2, p. 24) allows the power limit to be removed only at the time of starting up, enabling sharp starting up.

4. Battery voltage (VOLT) display

This indicates the current value of battery voltage (unit: VOLT). (The value is higher before driving; lower after driving.) This value can be used as a yardstick to assess battery condition. If this value remains low even after recharging, the battery is effectively dead.

LED (3) is on.



Yardstick voltage values when using
7.2 V NiCd and NiMH

(8 V or higher) High	Battery can be effectively used.
(6.8 V or lower) Low	Battery is depleted or dead.

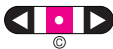
5. Measuring time (TIME) display

This indicates the amount of time from the moment when power is turned ON or from the moment the trigger is pulled after reset, until the time the voltage falls to the set value. Displaying the time measured enables you to check the battery condition.

To perform a reset, press the center function switch for four seconds.

1. If different kinds of batteries are used in the same vehicle, these values can be used to decide which batteries have the longest running time.
2. If the same kinds of batteries are used in multiple vehicles, these values can be used to find out the influence of different settings on vehicle run-time.

LED (4) is on.

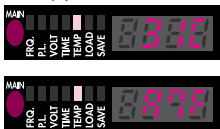


Reset by pressing
the center function switch
for four seconds.

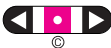


6. Internal temperature (TEMP) display

LED (5) is on.



This indicates the current internal temperature.



By pressing the center function switch, the display switches between units of Centigrade (C) and Fahrenheit (F).

- * The value may be affected by the road surface temperature.
- * We recommend that, as a general rule, you dissipate heat when temperature gets over 100C (210 F).

7. Program load

LED (6) is on.



This is the setting used to call up a program.

8. Program save

LED (7) is on.



This setting is used for saving the original program. (Up to four patterns can be saved.)

Setting up Functions



WARNING

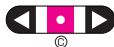
Before performing settings for each function, make sure to disconnect the motor or to keep the vehicle suspended in the air.

1. Setting the transmitter position

NOTE

If the throttle position of the transmitter is not set properly, various settings following the position setting may be inaccurate. Make sure the setting is right.

When the display is in the main mode, press the center function switch on the side of the main body. You can then perform a variety of settings by switching the displays using the left and right function switches.



Main LED blinks.

1-1 Setting transmitter throttle position

nutr neutral
dHP drive (forward) high point
brHP brake high point



When in SET display mode, press the center function switch for four seconds.

The display will then switch to nutr (neutral). Match the transmitter trigger to the position of neutral, and press the right function switch on the side of the main body.

The display will change to dHP (drive, high point). Match the transmitter trigger to the high point position and press the right function switch on the side of the main body.

The display will change to brHP (brake, high point). Match the transmitter trigger to the high point position and press the right function switch.

Settings are complete and the display returns to SET display mode.

1-2 Setting neutral width

Press the right function switch in SET display mode. Set the width of allowance in the neutral position for the trigger operation.

Start moving the trigger at its stationary position in the case of both the forward and brake directions, and then set the position where signals are transmitted to the motor.



The transmitter trigger performs a count-up on the drive side and a count-down on the brake side.

Set the values you want using the transmitter.

When you determine the setting value, press the right function switch.



1-3 Setting minimum drive power

Set the initial starting up power at the time of pulling the trigger. (0 to 70 %)



The transmitter trigger performs a count-up on the drive side and a count-down on the brake side.

Set the values you want using the transmitter.

When you determine the set value, press the right function switch.



1-4 Setting minimum brake power

Set the initial brake power at the time of applying the brakes. (0 to 70 %)



The transmitter trigger performs a count-up on the drive side and a count-down on the brake side.

Set the values you want using the transmitter.



* If the initial values set for both drive and brake power are extremely high, motor output width for trigger operation on the transmitter side will decrease.

* Units used for 1-2 to 4 are P (percent).

1-5 Setting neutral brake power

Set the degree to which brakes are applied automatically when the trigger is set back to neutral.



The transmitter trigger performs a count-up on the drive side and a count-down on the brake side.

Set the values you want using the transmitter.



* The neutral brake is turned off in the case of a general ESC.

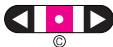
Setting Up Functions

1-6 Engine brake ON/OFF

This setting performs dummy engine braking, which effectively applies brakes according to the amount of trigger recovery of the transmitter.



Set to ON/OFF using the transmitter. The transmitter trigger turns ON on the drive side and OFF on the brake side. When values are set, press the center function switch and complete the procedure.



- * Brakes are applied according to the amount of trigger recovery of the transmitter in this system.
- * The engine brake is turned off in the case of a general ESC.

1-7 Energy saving mode (abbreviation: EnSA)

EnSA	100%	70%	30%	0%
Energy Saving	Maximum			Minimum
Motor Noise	Larger			Smaller
Schottky Diode	—		Required	

* The energy saving mode is always at 100% while engine braking is on.

- The transmitter trigger performs a count-up on the drive side and a count-down on the brake side. The setting can be selected from the four patterns above. When you determine the set value, press the right function switch.
 - Use the EnSA mode at 100% for normal operations. However, adjusting the EnSA level will ensure more stable operations depending on the type of motor and its deterioration level.
 - When the motor has deteriorated, set the EnSA level to "0" to stabilize the operation.
 - When malfunctions are caused by noise, lowering the EnSA level may alleviate the problem.
- * When using the EnSA mode with a setting other than 100%, attach the Schottky diode to the motor. (Not required at the 100% setting.) (See p. 7.)

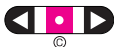


WARNING

Before performing settings for each function, make sure to disconnect the motor or to keep the vehicle suspended in the air.

2. Setting frequency

When in frequency display mode (see no. 2, p. 17), press the center function switch. You can then perform various settings by switching display using the left and right function switches.



Ex. Displayed values are in units of 1000 Hz.
4.1 = 4100 Hz

LED (1) blinks.



2-1 Drive frequency

Adjust the frequency response at the forward side. Setting a numeric value low results in low to medium speed and high torque. Setting a numeric value high results in high speed and low torque.



The transmitter trigger performs a count-up (frequency increases) on the drive side and a count-down (frequency decreases) on the brake side. Set the values you want using the transmitter. When you determine the set value, press the right function switch.



2-2 Brake frequency

Adjust the feel of the brake during operation. The lower the numeric value, the more strongly the brake operates. The higher the value, the more smoothly the brake works.



The transmitter trigger performs a count-up on the drive side and a count-down on the brake side. Set the values you want using the transmitter. When you determine the set value, press the right function switch.

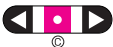


2-3 Neutral brake frequency

You can set the brake level when using a neutral brake.



The transmitter trigger performs a count-up on the drive side and a count-down on the brake side. Set the values you want using the transmitter. When you determine the set value, press the center function switch.



3. Setting the power limit and dash power mode

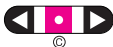
When in power limit display mode (p18, 3), press the center function switch. You will then be able to perform various settings related to power limit and dash power mode by switching the display using the left and right function switches.



LED (2) blinks.

3-1 Setting power limit

Lowering the value can reduce initial torque, preventing wheel-spin.



When in power limit display mode, press the center function switch. LED (2) starts blinking and the display automatically alternates between Po-L (power limit) and the value (%) in turn. (Power limit setting display) At this point, you can switch between setting power limit and setting dash power mode by pressing either the left or right function switch. When power limit setting is displayed, the transmitter trigger performs a count-up on the drive side and a count-down on the brake side. Set the value you want using the transmitter. When you determine the set value, press the right function switch.

3-2 Dash power mode

This function raises the power limit from the first trigger action at starting time, which helps to start up quickly.



While in dash display mode, press the center function switch for four seconds. You will then be in dash power mode. Check if the dash and limit value (LXXP = limit XX%) appear in turn, as shown in the diagram, when power limit display mode returns. If so, setting is completed. * If the display shows L100P, no effect will be observed.

4. Setting voltage level for time measurement

When in voltage level for time measurement, press the center function switch. To measure time, start from the state where the trigger is pulled, then stop when the battery voltage reaches the set level. You can set the battery voltage when time measurement stops.



LED (3) blinks.

To measure time, start from the state where the trigger is pulled, then stop when the battery voltage reaches the set level. You can set the battery voltage when time measurement stops. When you have determined the setting value, press the center function switch. Measurement stops as soon as the voltage drops below the set voltage value, even for just a moment. When the battery is running down, the ordinary voltage value of 7.2 V may drop momentarily due to motor speed fluctuation. For this reason, set to about 3-5 V.

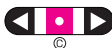
5. Program load

This function can be used to call up both initial (default) settings and custom settings.



The RAPIDA PRO offers a total of seven types of programs. You can change programs in P1 to P4 by program save. In P5 to P7, the original (default) programs are stored in advance.

- * It is possible to load and call up an original (default) program, make a change to it, save it, and then reuse it as a custom program.
- * Set by default at the factory as P5.



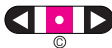
- When in load display mode, press the center function switch. LED (6) starts blinking. Then, set the number of the program you wish to load by using either the left or right function switch. Then press the center function switch for four seconds.
- When the program loading is complete, "End" will be displayed.

6. Program save

You can save custom programs according to road and vehicle conditions.



Changed (custom) programs can be saved from P1 to P4.

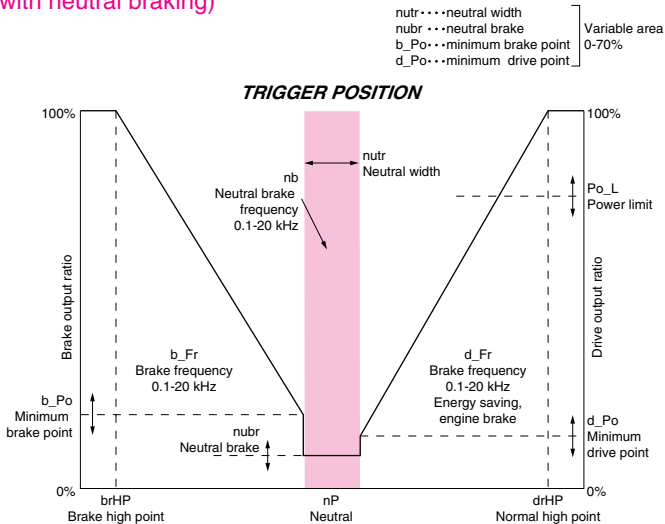


- When in save display mode, press the center function switch. LED (7) starts blinking. Then, set the number of the program you wish to save by using either the left or right function switch. Then press the center function switch for four seconds.
- When the program loading is complete, "End" will be displayed.

*Except for program mode, when you turn the power ON, all previous settings (transmitter position, frequency, etc.) are restored.

Various Settings

Output on throttle operation is shown in the graph below.
(with neutral braking)



1. For full-torque driving, set frequency rather low, to around 0.5-2.0 kHz.
2. For smooth driving, set frequency rather high, to around 8.0-14 kHz.
3. As you increase frequency, driving is smoother but the amount of heat generated in the electric circuitry increases. When using a high-powered motor, we recommend that you limit the frequency of the drive brake to 15 kHz.
4. The energy saving circuit is particularly effective for driving at low and medium speed. However, effectiveness depends on the type of motor, gear ratios and drive frequency. If the drive frequency is too low, the energy saving circuit does not work well. On the other hand, if the drive frequency is too high, the loss due to internal heat generation becomes too high. So, generally, the frequency range for energy saving is around 3.0-12.0 kHz, according to the settings for the vehicle.
5. For frequency settings, if the starting speed torque is not high enough, increase the value of minimum drive power.
6. If the brake doesn't work well, increase the value of minimum brake power.
7. When you turn the engine brake ON, the speed suddenly changes to match the transmitter trigger. You can use this as you like.

Default Values (manufacturer's setting values) (RAPIDA PRO)

	P5'	P6'	P7'
Neutral width	9%	7%	5%
Minimum drive power	10%	7%	3%
Minimum brake power	10%	7%	3%
Neutral brake	0%	0%	0%
Engine brake	—	—	—
Drive frequency	1.5 kHz	5.0 kHz	9.5 kHz
Brake frequency	2.0 kHz	4.0 kHz	5.0 kHz
Neutral brake frequency	2.0 kHz	4.0 kHz	5.0 kHz
Power limit	100%	100%	100%
Battery voltage for time measuring	4.0 V	4.0 V	4.0 V

P5': High-torque setting (factory default setting)

By setting the drive frequency to a low value, this setting enhances the trigger pick-up in the low speed range.

This is a good setting to use when vehicle tires have a good grip.

P6': Standard setting

Frequency of ESC is set to a standard value that provides even performance from low to high speeds.

P7': Smooth setting

Frequency is set to handle subtle throttle work from medium to high speeds.

Installing A Heat Sink (radiating fin)



WARNING To prevent fumes, fire or burns

Electricity flows through the copper plates in the upper part of the ESC.

If you install a heat sink, electricity may flow through it, so do not allow other cables or metal parts to make contact with the heat sink.

When running a car outdoors directly under the sun, or if you are using a high-torque motor, installing a heat sink enables more stable operation. Mount the heat sink as described below:

1. Remove the aluminum sticker at the top of the ESC housing.
2. A metallic plate is exposed.
3. Remove dust from the plate surface.
4. Attach the double-sided tape (included) to a heat sink (the thin tape)
5. Attach the heat sink securely to the metal plate of the ESC.

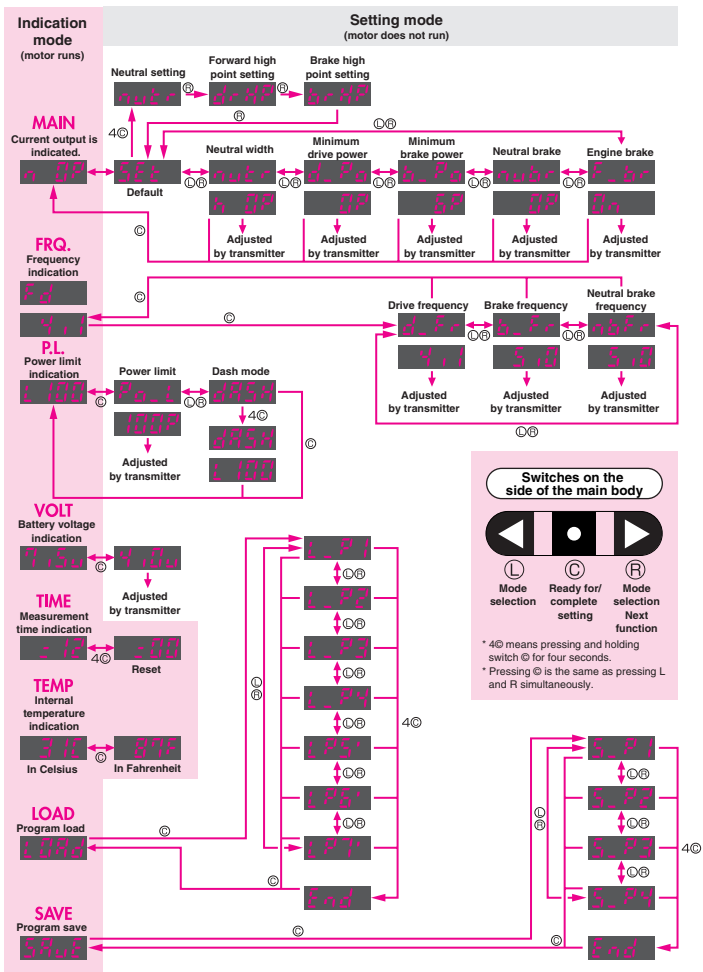
(To improve radiation, apply a 2-gel type epoxy resin adhesive instead of the double-sided tape. Knead the gels well and apply a light coat of it to the heat sink. Attach the heat sink to the metallic plate and fix them until the adhesive dries. Note that you cannot remove the heat sink once you attach it.)

Troubleshooting

Symptom	Cause
Cannot set "High point".	Improper setting of ESC <small>Reset transmitter throttle setting to normal before setting "High point". Set "High point" position to 90% of full throttle. (See pp. 10 and 20.)</small>
	Improper transmitter setting
	Power limit value too low
Brake fails.	Improper setting of ESC
	Improper transmitter setting
Both motor and servo do not work.	Bad contact with battery
	Improper wiring of receiver
	Receiver failure
	Transmitter failure
	Bad contact with receiver connector
Motor does not work but servo works.	ESC failure by noise, shock, short or reverse connection
	Incorrect setting of ESC
	Motor failure
	Bad contact with battery
	Bad contact with receiver connector
	ESC failure by noise, shock, short or reverse connection
ESC gets too hot.	Damage to electrolytic capacitor caused by noise
	Input voltage too high
	Insufficient cooling
	Driving load too high
	Drive frequency too high
Reduced acceleration.	Improper setting of ESC
	Power limit value too low
	Bad contact of battery cable or motor cable
Car operates improperly.	Failure of motor capacitor
	Bad receiver position
	Transmitter/receiver affected by motor noise
	Affected by noise caused by incorrect wiring
Power cannot be turned on.	Bad contact with receiver connector
	Damage to switch
The motor runs regardless of whether the power is ON or OFF.	ESC failure by noise, shock, short or reverse connection

	Remedy
	Reset transmitter throttle setting to normal before setting "High point". Set "High point" position to 90% of full throttle. (See pp. 10 and 20.)
	Correct transmitter throttle setting. (See pp. 10 and 20.)
	Increase power limit value. (See pp. 12 and 24.)
	Reset transmitter brake (reverse) setting to normal before setting "Brake high point". Set "Brake point" position to 90% of full throttle. (See pp. 10 and 20.)
	Correct transmitter brake setting. (See pp. 10 and 20.)
	Check that contact with battery is good. (See p. 7.)
	Check wiring of receiver and servo. (See p. 8.)
	Replace crystal or request repair.
	Replace crystal or request repair.
	Check whether the pins of the receiver connector are broken, bent or improperly inserted.
	Request repair.
	Setup ESC again from the beginning. (Make sure to set transmitter position accurately before doing this.) (See pp. 10 and 20.)
	Replace motor.
	Check that battery and cables are properly connected. (See p. 7.)
	Check that Rx connector pins are not broken.
	Request repair.
	Request repair.
	Use 6-cell power supply.
	Attach radiating fin to improve air flow and heat radiation.
	Adjust drive system to work smoothly.
	Lower drive frequency. (See p. 23.)
	Setup ESC again from the beginning. (Make sure to set transmitter position accurately before doing this.) (See pp. 10 and 20.)
	Increase power limit value. (See pp. 12 and 24.)
	Check that they are connected properly. (See p. 7.)
	Replace motor capacitor. (See p. 7.)
	Keep receiver as far from battery or ESC as possible.
	Request repair from the maker.
	Wire silicone cables in such a manner that they are not located on the receiver side.
	Check whether the pins of the receiver connector are broken, bent or improperly inserted.
	Request repair.
	Request repair.

RAPIDA PRO Hierarchical Chart of Functions



Typical Settings of RAPIDA PRO by Category

Touring car 540 motor specifications



Typical Settings

Neutral width	7%
Minimum drive power	40%
Minimum brake power	50%
Neutral brake	0%
Engine brake	OFF
Drive frequency	1.0 kHz
Brake frequency	0.5 kHz
Neutral brake frequency	2.0 kHz
Power limit	100%
Battery voltage for time measurement	5.0 V

Touring car Stock motor specifications



Typical Settings

Neutral width	5%
Minimum drive power	20%
Minimum brake power	15%
Neutral brake	0%
Engine brake	OFF
Drive frequency	2.2 kHz
Brake frequency	2.0 kHz
Neutral brake frequency	2.0 kHz
Power limit	100%
Battery voltage for time measurement	5.0 V

Touring car Modified motor specifications



Typical Settings

Neutral width	5%
Minimum drive power	18%
Minimum brake power	15%
Neutral brake	0%
Engine brake	OFF
Drive frequency	4.1 kHz
Brake frequency	2.0 kHz
Neutral brake frequency	2.0 kHz
Power limit	100%
Battery voltage for time measurement	5.0 V

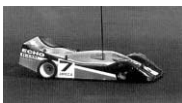
Formula (F201)



Typical Settings

Neutral width	3%
Minimum drive power	40%
Minimum brake power	10%
Neutral brake	5%
Engine brake	OFF
Drive frequency	12.0 kHz
Brake frequency	1.5 kHz
Neutral brake frequency	2.0 kHz
Power limit	100%
Battery voltage for time measurement	5.0 V

1/12 racing



Typical Settings

Neutral width	12%
Minimum drive power	0%
Minimum brake power	0%
Neutral brake	0%
Engine brake	OFF
Drive frequency	15 kHz
Brake frequency	15 kHz
Neutral brake frequency	2.0 kHz
Power limit	100%
Battery voltage for time measurement	3.6 V

Off-road car



Typical Settings

Neutral width	7%
Minimum drive power	15%
Minimum brake power	45%
Neutral brake	0%
Engine brake	OFF
Drive frequency	2.2 kHz
Brake frequency	1.0 kHz
Neutral brake frequency	2.0 kHz
Power limit	100%
Battery voltage for time measurement	5.0 V

Repair Conditions

- Parts that can be repaired:
 - Internal electronic circuitry
(Damage caused by incorrect connection or operation is not covered by the warranty.)
- Note that the ESC will not be repaired in the following cases:
 - If the ESC housing has been opened
 - If a power supply other than the designated 6-cell battery (7.2 V) is used
 - If wiring has been modified in order to use a different power supply
- KEYENCE assumes no responsibility for damage to the receiver or servo caused by incorrect connection of the ESC.
- Note that if the repair card is not properly filled out, repair and return of the ESC may be delayed.

Warranty

Item	Ultra-small digital speed controller RAPIDA Series	Purchase date	(Y/M/D) / /
Manufacture no.		Warranty term	3 months from purchase date
Address	Tel. no.		
Name			

Note that if the date and location of ESC purchase are not entered on the warranty card, you will be charged for repairs even within the warranty term.

If a failure occurs within three months of purchasing the ESC, write the symptoms of the problem and operating conditions on a separate sheet. Request repair of the ESC from either the distributor where you purchased the product or directly from KEYENCE (Service Section of the Hobby Department).

Repair card

1. Symptoms

Write the symptoms of the problem, giving as much detail as possible.

2. Payment method

- Consent is not required if repair costs are 3,500 yen or less.
- Consent required if repair costs money.

KEYENCE CORPORATION

Service Section, Hobby Department

1-3-14 Higashi Nakajima, Higashi Yodogawa-ku,
Osaka 533-8555

Tel: +81 06-6379-1191

Fax: +81 06-6379-1190

<http://www.keyence.co.jp/hobby/>

Distributor's name
(shop name, address, and tel. no.)