



For sensored motor
MC970CR

For sensored motor
MC970CR

BRUSHLESS
SPEED
CONTROLLER

INSTRUCTION MANUAL

Futaba[®]
Produced by **ACUVANCE**



The MC970CR is an ESC dedicated to a brushless motor with sensor for electric radio controlled cars that enabled setting from a transmitter and displaying data to a transmitter by S.BUS connection development in cooperation with Acuvance Corporation.

Before using your MC970CR, please read this manual thoroughly and use the MC970CR properly and safely. After reading this manual, store it in a safe place.

※ S.BUS :

Standard name of serial communication for radio control system of Futaba Corporation.

For sensored motor
MC970CR

**BRUSHLESS
SPEED
CONTROLLER**

INSTRUCTION MANUAL

- ©Copyright 2019. No part of this manual may be reproduced in any form without prior permission.
- The contents of this manual are subject to change without prior notice.
- This manual has been carefully written. Please write to Futaba if you feel that any corrections or clarifications should be made.
- Futaba is not responsible for the use of this product.

INDEX

| | |
|--|----|
| PRECAUTION FOR USE | 4 |
| FEATURES | |
| Specifications | 5 |
| Accessories | 5 |
| PART NAMES AND WIRING | 6 |
| PREPARATIONS BEFORE DRIVING | |
| Initial setting of radio throttle position | 8 |
| How to Calibrate | 10 |
| Verifying the transmitter positions have been correctly set to their initial settings..... | 10 |
| Checking standby mode | 10 |
| [Important] Safety feature for driving in reverse | 11 |
| TUNING THE DRIVING EXPERIENCE | |
| Selecting setting modes | 12 |
| Flow for changing setting and ESC mode | 12 |
| Select mode (when Setting mode = ESC mode | 13 |
| Setting mode (in ESC setting mode) | 14 |
| 1 - Load program..... | 14 |
| 2 - Device frequency | 14 |
| 3 - Neutral brake frequency..... | 15 |
| 4 - Brake frequency..... | 15 |
| 5 - Initial speed..... | 16 |
| 6 - Neutral brake power..... | 16 |
| 7 - Initial brake power..... | 16 |
| 8 - Full brake power..... | 17 |
| 9 - Operation mode | 18 |
| 10 - Cutoff voltage..... | 18 |
| About Boost / Turbo Function | 19 |
| 11 - Full boost timing..... | 19 |
| 12 - Boost start rpm | 20 |
| 13 - Boost end rpm | 20 |
| 14 - Full turbo timing | 21 |
| 15 - Rev-Limiter rpm (current value)..... | 21 |
| Saving user program (current value)..... | 22 |
| OTHER | 22 |
| WARRANTY & REPAIR SERVICE (IN U.S.A.) | 23 |

PRECAUTION FOR USE

Use this product in a safe manner. Please observe the following safety precautions at all times.

Pay special attention to safety where indicated by the following marks.



Indicates a procedure which could lead to a dangerous situation and may cause death or serious injury if ignored and not performed properly.



Indicates procedures which may lead to dangerous situations and could cause death or serious injury as well as superficial injury and physical damage.



Indicates procedures that may not cause serious injury, but could lead to physical damage.

About batteries



To prevent 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 speed controller (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 free of any loose wires or screws.

System and mounting position



To prevent malfunction

Do not use with other than 2.4GHz systems. Install the receiver and receiver antenna away from the amp, motor cord, power cord, battery, and other parts that carry a high current.

About aluminum case



To prevent burns

The surface of the body can be extremely hot after heavy load driving. Please handle the unit carefully after operation to avoid risk of burn.

Handling precautions



To avoid accidents or product failure

Do not modify the ESC in any way. Use it only for its intended purpose. Keep the ESC away from flames or seat. Avoid splashing any liquid, such as water, on the ESC. The model cannot be controlled, runaway and it is very dangerous. Also, it may cause malfunction. Always perform a check of operation before running. If a pebbles or other foreign object gets caught in the gears or the vehicle hits an obstruction, do not try to forcefully run vehicle. Forcefully running the vehicle will cause trouble.

FEATURES

- The MC970CR supports wireless / wired communication with a transmitter compatible with the MC link function (**T7PX / T7XC / T4PM as of January 2019**). By connecting the attached S.BUS conversion cable (SBM-1), data can be displayed to the transmitter by setting from the transmitter and telemetry function. Using the MC link function greatly increases the setting items / ranges and dramatically improves drivability. Moreover, it corresponds to our SR mode, making it possible to drive by high speed response.

*Telemetry function can be used in T-FHSS system. Since the telemetry function cannot be used in SR mode, data display is not available.

- Stylish aluminum body based on calculated heat dissipation design. The aluminum has been adopted for the case. This gives us a stylish design all while ensuring the aluminum quickly absorb the heat from the board and quickly dissipate stored heat.
- Optimized circuit design and linear output characteristics. By optimizing the balance between output and efficiency, we have improved drive feeling and reduced heat generation of ESC and motor. Flat and direct output characteristics are easy to handle for beginner users as well as advanced users, and can be applied to a wide range of RC categories.
- Integrated power switch and set button. Minimize wiring and make mounting on the chassis easy.

Specifications (Specifications are subject to change without prior notice.)

| | |
|------------------------------------|--|
| Power Supply | :6.0V - 7.4V |
| Continuous/spontaneous max current | :Max. current of battery |
| ON resistance | :0.27mΩ (FET standard value) |
| Compatible motors | :Sensored motor |
| | : Boost turbo (Disabled): Without FAN 7.5T or more turns / With FAN 4T or more turns |
| | : Boost turbo (Enabled): Without FAN 8.5T or more turns /With FAN 5Tor more turns |
| Dimensions | :W31.0 × D36.0 × H20.5mm |
| Weight | :46.0g (excluding connector, cords and switch) |
| Regulator for receiver/servo | :6V 3A output |

Accessories

- 200mm RX cable (Connect to the MC970CR and receiver throttle channel)
- S.BUS conversion cable (SBM-1) (Connect to the MC970CR and receiver's S.BUS 2 port to use for telemetry function and wireless setting)
- 160mm Sensor wire / Double sided tape (x2) / Heat shrink tube (x2)

PART NAMES AND WIRING

WARNING To prevent fumes, fire, or burns

Be careful not to reverse the battery poles. Doing so can cause the ESC to fail. Also incorrect wiring or short-circuiting of wiring may cause fire or fumes.

Please connect as shown below

LINK terminal

Connect to the MC970CR and receiver's S.BUS 2 port to use for telemetry function and wireless setting or the com port of the transmitter to use for wired setting.

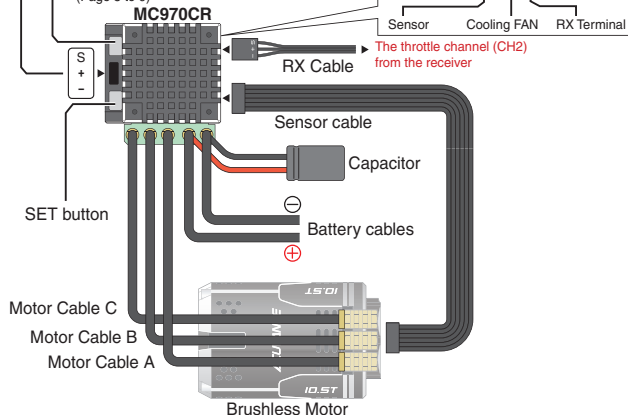
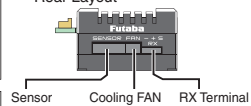
Even when telemetry function and wireless setting by S.BUS connection is not performed, by connecting to the S. BUS of the receiver or an empty channel, the power of the servo stabilizes.



POWER button

- Press- LED (green + red) blink 3 times to LED (green + orange) flashes 4 times and can run in standby state (Page 10)
- Press and hold for 2 seconds to turn off the power.
- If you press and hold the 2 to 3 seconds while the power is OFF, the LED (green + orange) blinks 3 times at the same time, the LED green starts blinking and the initial setting mode is entered. (Page 8 to 9)

Rear Layout



• POWER BUTTON

It is the button to turn the unit ON or OFF.

• LINK TERMINAL

This is a terminal that connects the included S.BUS conversion cable (SBM - 1) and communicates data with the transmitter. Connect to the com port of the transmitter or the S.BUS 2 port of the receiver.

• SET BUTTON

It is used for setting change in the MC970CR main unit. It is also used to switch between "ESC mode" setting of the main unit, and "MC LINK mode" setting with transmitter.

• COOLING FAN CONNECTION TERMINAL

Cooling FAN connection terminal (sold separately). The plug design is an Acuvance proprietary design, therefore other company's cooling FAN cannot be used. (FAN may be damaged if you use other company's FAN.)

WARNING When inserting the connector, pay attention to the way in which it being inserted. It is very dangerous if the connector breaks out due to vibration and the car runs away. Also, if inserted backwards, the device will not operate.

WARNING When setting or checking the operation, please remove the motor or put the car on the adjustment base, etc. so that the car does not run out. If it is not set correctly, the car runs unexpectedly, it is very dangerous.

CAUTION If the sensor cable is not connected, has not been properly inserted, has been disconnected, or is loosely connected, all the LEDs will blink (high-speed blinking). While in this state, all operations will not be received. If this occurs, check the connection for the sensor cable or replace the cable.

CAUTION Be sure to match the cables to the symbols A, B, and C on the ESC. Failure to follow this precaution can result in loss of control over the motor speed, or subject the ESC and motor to large currents. Unlike brushless motors without a sensor, swapping these cables does not change the rotating direction of the motor. If necessary, change the direction of rotation at the ESC*.

* To change the direction of rotation, it is essential to have the rotation direction change function in the ESC. This machine has this function. (page 18)

CAUTION When replacing the motor cable, use a soldering iron with a broad tip and high output rating (as high as 60 W) and work swiftly. A soldering on with the low output rating will not melt enough of the solder resulting in a poor soldering connection which can cause cables to loosen under vibration or loose connections. Also, subjecting the internal parts to excessive heat over prolonged periods (10 seconds or more) can damage them. (Be careful not to short-circuit the terminals with solder)

CAUTION Be sure to use screws with the length specified for the motor to fix the motor to the motor mount. If the screw is too long, it may interfere with parts inside the motor, resulting in malfunctions such as short circuit.

PREPARATIONS BEFORE DRIVING

When using for the first time, the neutral position of ESC with the transmitter you have will not match. If you try driving before the initial setting is completed, the motor may start rotating at the same time as the switch is turned on. Since it is very dangerous, be sure to perform the following "initial setting of the radio throttle position" when turning on the power for the first time. (The motor will not rotate during initial setting.)

Initial setting of radio throttle position

Immediately after purchasing or immediately after replacing the transmitter, it is necessary to store the neutral point, forward MAX point and reverse (brake) MAX point of the transmitter in the ESC. Follow the procedure below.

Preparations Before setting, please set all settings (EPA = endpoint adjustment, maximum braking amount, etc.) for the throttle of the transmitter to a neutral position (zero value). If the settings are different, the ESC may not detect the throttle input and calibration will not be performed successfully.

Preparations When performing the initial setting, be sure that the sensor cable is connected to the motor and ESC. If the sensor cable is not connected, has not been properly inserted, has been disconnected, or is loosely connected, all the LEDs will blink (high-speed blinking). Check the connection for the sensor cable or replace the cable as all operations will not be received while it is in this state. Also, in assertion to when performing the initial settings, the sensor cable should always be connected when the vehicle is being driven. The three motor cables (A, B, C) may be left disconnected but be careful to not have the cable connectors touch each other as they will short.

Preparations If performing the initial settings with the motor cables connected, secure the motor in a motor mount or other device, and remove the pinion gear to keep the car from moving unexpectedly.

**Drive Mode
Power ON**

Press- LED (green + red) blink 3 times to LED (green + orange) flashes 4 times and can run in standby state (Page 10) The LED blue lights up, and it becomes possible to drive (blinking blue / blinking red / Orange light on the setting mode). Please set the following initial settings before driving.

Power OFF

Press and hold for 2 seconds to turn off the power.

WARNING

Always turn the power switches on and off in the following order: ON: Transmitter → ESC / OFF: ESC → transmitter

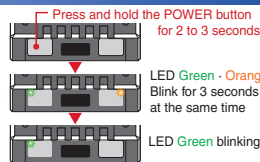
How to Calibrate

1 <<Before making calibration>>

Be sure the ESC power is turned off, and make sure the ESC is properly connected to the battery, motor (or just the sensor cable only), and receiver. Then turn the transmitter power on.

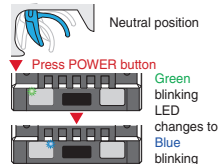
2 <<Calibration mode>>

If you press and hold the POWER button for 2 to 3 seconds while the power is OFF, the LED (green + orange) blinks 3 times at the same time, next the LED green starts blinking and the initial setting mode is entered. Then release the POWER button.



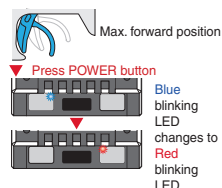
3 <<Setting of the neutral point>>

While the LED blinks green, set the transmitter throttle to the neutral position and press the POWER button briefly. After that, the blue LED will blink.



4 <<Setting of the high point>>

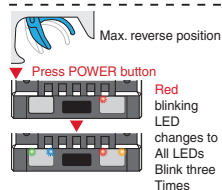
While the blue LED is blinking, set the throttle on the transmitter to the maximum forward position and press the POWER button once. The red LED will start blinking.



* If the red LED does not blink after pressing the set with the throttle at the maximum forward position, set the throttle to the maximum reverse (brake) position and then press the set POWER button once.

5 <<Before making calibration>>

While the red LED is blinking, set the transmitter throttle to the maximum position on the opposite side of step 4 and press the POWER button once. All LEDs blink 3 times.



This completes the initial settings for the transmitter positions. The ESC automatically changes to the standby mode (Page 10).

Important If you performed the procedure described by the * under Step 4 above, <<Setting the high point>>, change the throttle channel normal and reverse with the transmitter's REVERSE function after completing the initial setting for all transmitter positions.

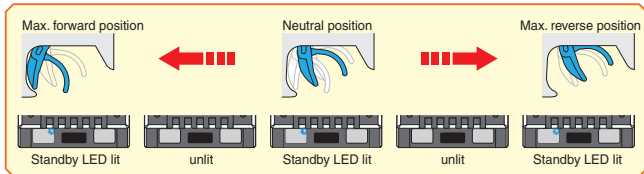
CAUTION The throttle position for the transmitter may become misaligned due to changes or deterioration over time. If the LED lights are flashing while the ESC is in standby mode, readjust the initial settings for the transmitter.

PREPARATIONS BEFORE DRIVING

Verifying the transmitter positions have been correctly set to their initial settings

The standby LED (see below) should be the only one illuminated when the throttle is in the neutral, maximum forward, and maximum reverse (brake) positions. If the Standby LED is unlit in all other positions, the initial setup has been completed properly.

(The standby LED is the only LED that alternately illuminates and goes out when adjusting the throttle)

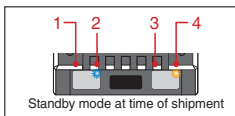


If the standby LED does not follow this lighting pattern, the initial setting was not completed properly. Make sure the throttle related adjustment on the transmitter are initialized and the RX cable is properly connected to the receiver. Then, retry the initial setting procedure.

* Depending on the configuration of the vehicle, the car may move in reverse when the throttle is operated in the forward direction. If your car displays this behavior, change the rotation direction of the motor (Page18).

Checking standby mode

At the time of shipment, the standby mode is as shown in the figure on the right. Each LED has the following meaning.



1 LED<green> : Factory shipped condition = unlit

* If the battery voltage becomes lower than the cutoff voltage (Page18) while driving, the green LED will blink and the car will drive at extremely low speeds. If this occurs, replace the battery.

2 LED<blue> : Factory shipped condition = lit

Standby LED when setting mode (Page 12) is in ESC mode. Unlit during MC LINK mode.

Under "ESC Mode", <blue> LED will be blinking if the program selected (Page 14) is "Boost/Turbo Disabled", or both "Full Boost Timing"(Page 19) and "Full Turbo Timing" (P.21) are disabled.

3 LED<red> : Factory shipped condition = unlit

Standby LED when setting mode is in Card Programming mode. Unlit during ESC mode.

Under "MC LINK Mode", <red> LED will be blinking if the program selected is "Boost/Turbo Disabled", or both "Full Boost Timing" and "Full Turbo Timing" are disabled.

4 LED<orange> : Factory shipped condition = lit

Illuminated when the reverse drive feature (Page 18) is set to ON. Unlit when set to OFF.

If the ESC heats up to temperature limits while driving, the motor will remain at low speed and the orange LED will blink. If this situation occurs, discontinue operation until the ESC temperature drops back to ambient temperature. If the orange LED starts blinking after driving for only a brief period of time, check to see if the gear ratio settings are overloading the motor.

Important! Safety feature for driving in reverse

On radio controlled cars, the same throttle controls are used for braking and driving in reverse. This can cause car to move backward when the intention is to apply the brakes. Suddenly trying to reverse the motor while it is rotating forward can place severe stress to the gears, motor, and ESC, sometimes resulting in internal damage. The MC970CR is equipped with the following feature to prevent this.

After applying the brakes, before reversing, the ESC will wait for 1 second or more for the throttle to return to neutral and for the motor to go from rotating in a forward direction to come to a complete stop (it will not go into reverse within the span of 1 second). This feature prevents unintentional reversing even if the reverse drive feature is set ON on the ESC. It prevents damage to the drivetrain of the car and potential collision with other vehicles, as well as many other possible problems, and is essential to allow short braking action when turning corners.

-Note: This safety feature cannot be disabled. However, as detailed in [Reverse drive ON/OFF and motor rotating selection] (Page 18), when configuring to crawler oriented settings, vehicle movement that occurs once the throttle is placed in the brake position will be specialized for reverse driving (the brake will not work), thus disabling this function.

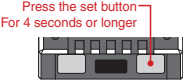
This completes the preparation before driving. Connect the motor and enjoy driving. When using lithium polymer batteries, set the cutoff voltage before driving to 3.2V/cell (recommended). (Page 18)

TUNING THE DRIVING EXPERIENCE

Selecting setting modes

First, select either [ESC mode] or [MC LINK mode]. Select ESC mode to adjust various features on the ESC, or MC LINK mode to change function settings for the effector. At time of shipment, ESC is set to ESC mode.

Selecting Setting Modes

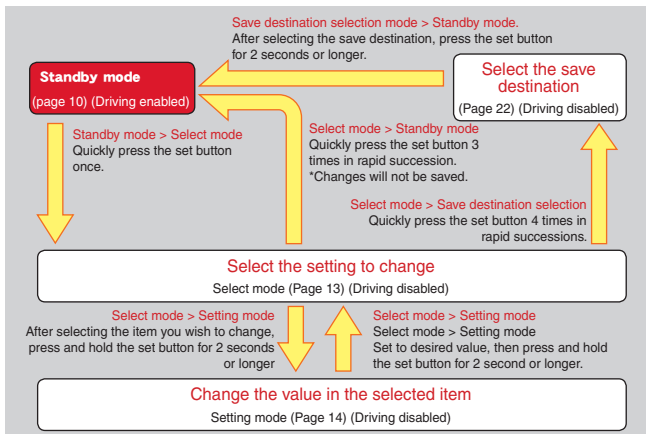
- In standby mode, press and hold the set button for 4 seconds or longer. 
- The LEDs (blue & red) alternately blink indicating the setting mode is now active.

*When the reverse drive function (Page 18) is enabled, the LED orange remains lit.). Repeating the same procedure alternates between [ESC mode] (blue) and [MC LINK mode] (red).

Important The numerical setting ranges and unit of adjustment differ depending on the mode selected (Page 14 to 22). Refer to the following section for setting procedure in ESC mode, or the instruction manual supplied with the transmitter for setting procedures in MC LINK mode.

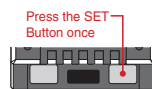
Flow for changing setting and ESC mode

*If the initial settings have not been completed, the following procedure cannot be performed.



Select mode (when Setting mode = ESC mode)

In Standby mode (Page 10), quickly press the set button once. The green LED will start blinking indicating the ESC is in Select mode. (While in Select mode, the motor will not rotate even if the transmitter throttle is operated.)



Select mode (blinking green LED)



Neutral brake power adjustment is selected (Blinking orange LED)

Each time the SET button is pressed briefly, the blinking LED is switched to indicate the currently selected setting item (see the setting items below for details). Also, pressing the SET button twice shortly will return to the previous item.

Description of each blinking LED pattern
(For details of each item, see the following pages)

| | |
|---|---|
| [Green blinking twice] Load Program | [Grn + Blu + Red blinking twice] Operation mode |
| [Blue blinking twice] Drive Frequency | [Blu + Red + Org blinking twice] Cutoff Voltage |
| [Red blinking twice] Neutral Brake Frequency | [Green blinking 4 times] Full Boost Timing |
| [Orange blinking twice] Brake Frequency | [Blue blinking 4 times] Boost Start RPM |
| [Green + Blue blinking twice] Initial Speed | [Red blinking 4 times] Boost Stop RPM |
| [Green + Red blinking twice] Neutral Brake Power | [Grn + Red blinking 4 times] Full Turbo Timing |
| [Green + Orange blinking twice] Initial Brake Power | [Blu + Red + Org blinking 4 times] Turbo Start Time |
| [Blue + Red blinking twice] Full Brake Power | |

[Verifying your current settings]

In Select mode, set the LED to the item you want to check the value of, after 2 seconds the LED representing the item & the LED representing the value of the item will blink alternatively. (The LED indicate the item selected> <The LED indicates the value of the selected item)

- *Pressing the SET button once returns to the Select mode.
- *Refer to page 14 to 22 for the meaning of each displayed values.

TUNING THE DRIVING EXPERIENCE

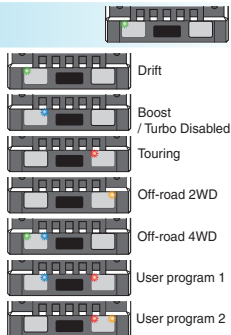
Setting mode (in ESC setting mode)

Changing to Setting mode

While in Select mode (Page 13), move the LED to the setting to be changed using the SET button. Press and hold the SET button 2 seconds or longer. This activates the Settings mode. (While in Settings mode, the motor will not rotate even if the transmitter throttle is operated.)

1 - Load program (green blinking twice)

In the select mode (the green LED blinking twice), press the SET button for 2 seconds or more to enter the setting mode. Each time the SET button is pressed briefly, the LED pattern changes and the program changes accordingly as shown on the right. Align the LED with your favorite program, and press the SET button for 2 seconds or more. The program is now set and the LED returns to the select mode (green blinking). It is also possible to call the preset program and change each function to the setting of your choice.



About user program

- This is the area to store each set item on this unit. There are two storage areas (user programs 1 and 2) on this unit.
- Additionally, once all your settings have been adjusted, you can save into a user program.



If the power is turned off without saving to a user program, the settings will be lost.



When "Boost / Turbo Disabled" is selected, boost and turbo function (item (11) and later described below) cannot be used. In this case, 11 to 15 are skipped in select mode. Also, the timing angle is fixed at 0 deg.

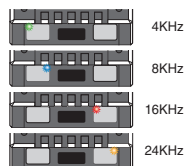
2 - Device frequency (blue blinking twice)

In the select mode (the blue LED blinking twice), press the SET button for 2 seconds or more to enter the setting mode. Each time the SET button is pressed once, the lighting LED changes and the drive frequency changes as shown on the upper right.

Align the LED with your favorite setting, and press the SET button for 2 seconds or more. The set value is validated and it returns to select mode. The changed value will be reset if the power is turned off without saving. Please save your settings before turning your unit off (Page 22).

Commentary

The lower the value = strong initial punch/lowered smoothness. The higher the value = small initial punch/ increased smoothness

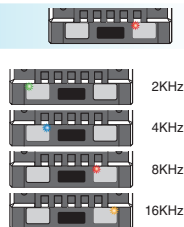


3 - Neutral brake frequency (red blinking twice)

In the select mode (the red LED blinking twice), press the SET button for 2 seconds or more to enter the setting mode. Each time the SET button is pressed once, the LED pattern changes and the neutral brake frequency changes as shown on the right. Align the LED with your favorite setting, and press the SET button for 2 seconds or more. The set value is validated and it returns to select mode. The changed value will be reset if the power is turned off without saving. Please save your settings before turning your unit off (Page 22).

Commentary

The lower the value = quicker braking
The higher the value = smoother braking

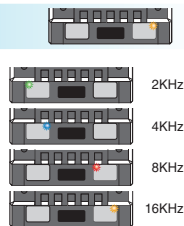


4 - Brake frequency (orange blinking twice)

In the select mode (the orange LED blinking twice), press the SET button for 2 seconds or more to enter the setting mode. Each time the SET button is pressed once, the LED pattern changes and the brake frequency changes as shown on the right. Align the LED with your favorite setting, and press the SET button for 2 seconds or more. The set value is validated and it returns to select mode. The changed value will be reset if the power is turned off without saving. Please save your settings before turning your unit off (Page 22).

Commentary

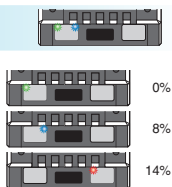
The lower the value = quicker braking
The higher the value = smoother braking



TUNING THE DRIVING EXPERIENCE

5 - Initial speed (green + blue blinking twice)

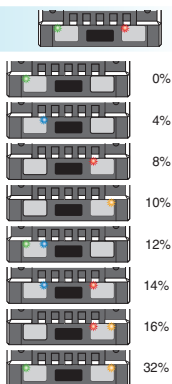
In the select mode (the green + blue LEDs blinking twice), press the SET button for 2 seconds or more to enter the setting mode. Each time the SET button is pressed once, the LED pattern changes and the initial speed value changes as shown on the right. Align the LED with your favorite setting, and press the SET button for 2 seconds or more. The set value is validated and it returns to select mode. The changed value will be reset if the power is turned off without saving. Please save your settings before turning your unit off (Page 22).



Commentary It is the amount of speed as soon as you begin to pull your throttle lever. The higher the value = higher speed at the beginning of your throttle. Excessive initial speed can cause tire spin or chip gears. Choose your setting carefully.

6 - Neutral brake power (green + red blinking twice)

In the select mode (the green + red LEDs blinking twice), press the SET button for 2 seconds or more to enter the setting mode. Each time the SET button is pressed once, the LED pattern changes and the neutral brake power value changes as shown on the right. Align the LED with your favorite setting, and press the SET button for 2 seconds or more. The set value is validated and it returns to select mode. The changed value will be reset if the power is turned off without saving. Please save your settings before turning your unit off (Page 22).



Commentary It is the amount of braking force applied when the throttle is returned to neutral. The higher the value = increased braking force

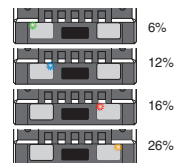
7 - Initial brake power (green + orange blinking twice)

In the select mode (the green + orange LEDs blinking twice), press the SET button for 2 seconds or more to enter the setting mode. Each time the SET button is pressed once, the LED pattern changes and the initial brake power value changes as shown on the right. Align the LED with your favorite setting,



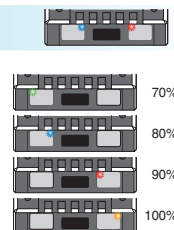
and press the SET button for 2 seconds or more. The set value is validated and it returns to select mode. The changed value will be reset if the power is turned off without saving. Please save your settings before turning your unit off (Page 22).

Commentary It is the brake power that is applied once the throttle is placed in the brake position. The higher the value = stronger initial braking force

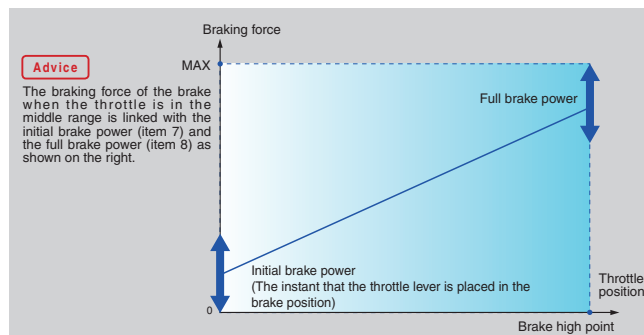


8 - Full brake power (blue + red blinking twice)

In the select mode (the blue + red LEDs blinking twice), press the SET button for 2 seconds or more to enter the setting mode. Each time the SET button is pressed once, the LED pattern changes and the full brake power value changes as shown on the right. Align the LED with your favorite setting, and press the SET button for 2 seconds or more. The set value is validated and it returns to select mode. The changed value will be reset if the power is turned off without saving. Please save your settings before turning your unit off (Page 22).



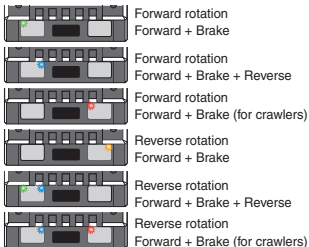
Commentary It is the brake power that is applied when the throttle is in fully braked position. The higher the value = stronger braking force at full braking



TUNING THE DRIVING EXPERIENCE

9 - Operation mode (green + blue + red blinking twice)

In the select mode (the green + blue + red LEDs blinking twice), press the SET button for 2 seconds or more to enter the setting mode. Each time the SET button is pressed once, the LED pattern changes and the operating mode changes as shown on the right. Align the LED with your favorite setting, and press the SET button for 2 seconds or more. The set value is validated and it returns to select mode. The changed value will be reset if the power is turned off without saving. Please save your settings before turning your unit off (Page 22).



Commentary

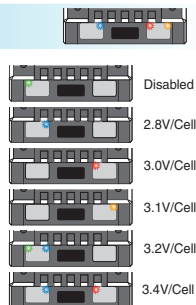
Switched between normal and reverse motor rotation. Regardless of whether the initial settings have been completed properly, the car may go into reverse once the throttle is applied. If this condition occurs, please use Reverse rotation operation mode. The orange LED will be lit in standby mode when Reverse rotation is selected.

CAUTION

With crawler-oriented settings, the brake will not work and the ESC will switch between forward and reverse instantly. This function must not be used on non-crawler vehicles otherwise damage to the ESC, motor, or gears may occur.

10 - Cutoff voltage (blue + red + orange blinking twice)

In the select mode (the blue + red + orange LEDs blinking twice), press the SET button for 2 seconds or more to enter the setting mode. Each time the SET button is pressed once, the LED pattern changes and the cutoff voltage value changes as shown on the right. Align the LED with your favorite setting, and press the SET button for 2 seconds or more. The set value is validated and it returns to select mode. The changed value will be reset if the power is turned off without saving. Please save your settings before turning your unit off (Page 22).



Reference

Because the number of cell is automatically recognized, select the voltage per cell. If set to disabled, pay close attention to your runtime.

Commentary

It is a function to notify the driver of low voltage condition before the unit reaches critical voltage and performance decrease. When the voltage reaches the cutoff voltage while driving, the green LED will flash and the vehicle will travel very slowly. When disabled is selected, this function will not work. Please be careful about your runtime and other conditions.

About Boost / Turbo Function

What is the boost function?

It is a function that increases the electronic timing in conjunction with the motor rpm to further increase motor rpm.

What is the turbo function?

It is a function that increases the electronic timing when in full throttle to increase motor rpm.

Advice

If "boost / turbo disabled" has been selected in Load program, the "boost function" and "turbo function" cannot be used.

When using the "boost/turbo disabled" program, zero timing will be activated, and while in standby, the blue LED will blink in "ESC mode" and the red LED will blink in "program card mode". This is also known as a "Blink mode". It allows the user understands at a quick glance that the ESC is in zero timing modes and that "boost/turbo" is disabled.

The "MC970CR" ESC allows to operating either "boost function" or "turbo function" independently. (When doing so, make sure to use a program other than "boost/turbo disabled".)

WARNING

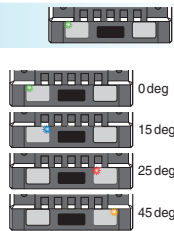
When using "boost + turbo" or "boost" only, please use a motor of 8.5T turn (with FAN) or higher. Damage caused by using a motor with a lower turn count will not be covered by warranty.

CAUTION

In general, "boost + turbo" function will overload the ESC/motor. Pay close attention to the heating of the ESC / motor as well as the gear ratio when using these functions.

11 - Full boost timing (green blinking 4 times)

In the select mode with (the green LED blinking 4 times), press the SET button for 2 seconds or more to enter the setting mode. Each time the SET button is pressed once, the LED pattern changes and the boost timing value changes as shown on the right. Align the LED with your favorite setting, and press the SET button for 2 seconds or more. The set value is validated and it returns to select mode. The changed value will be reset if the power is turned off without saving. Please save your settings before turning your unit off (Page 22).



Commentary

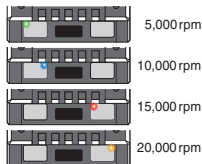
This determines the maximum value (terminal value) for timing increased through boost.

TUNING THE DRIVING EXPERIENCE

12 - Boost start rpm (blue blinking 4 times)



In the select mode (the blue LED blinking 4 times), press the SET button for 2 seconds or more to enter the setting mode. Each time the SET button is pressed once, the LED pattern changes and the boost start rpm value changes as shown on the right. Align the LED with your favorite setting, and press the SET button for 2 seconds or more. The set value is validated and it returns to select mode. The changed value will be reset if the power is turned off without saving. Please save your settings before turning your unit off (Page 22).



Commentary

This determines the motor rpm at which the boost will begin to operate. As this rpm value is set lower, boost will operate from a lower speed/rpm point.

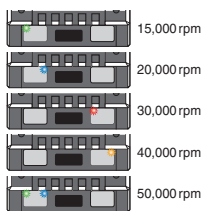


When set low, it is necessary to lighten the drive load and adjust your gear ratio.

13 - Boost end rpm (red blinking 4 times)



In the select mode (the red LED blinking 4 times), press the SET button for 2 seconds or more to enter the setting mode. Each time the SET button is pressed once, the LED pattern changes and the boost end rpm value changes as shown on the right. Align the LED with your favorite setting, and press the SET button for 2 seconds or more. The set value is validated and it returns to select mode. The changed value will be reset if the power is turned off without saving. Please save your settings before turning your unit off (Page 22).



Commentary

This determines the motor rpm at which the boost will end. As this rpm value is set higher, boost will operate to a higher speed/rpm point.

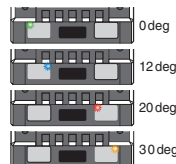


Please make sure to set the boost end rpm higher than the value of your boost start rpm. The sudden jump in timing may overload the ESC, therefore it is advised to start with a much higher boost end rpm and progressively lower timing as you get comfortable with your gearing.

14 - Full turbo timing (green + red blinking 4 times)



In the select mode (the green + red LEDs blinking 4 times), press the SET button for 2 seconds or more to enter the setting mode. Each time the SET button is pressed once, the LED pattern changes and the full turbo timing value changes as shown on the right. Align the LED with your favorite setting, and press the SET button for 2 seconds or more. The set value is validated and it returns to select mode. The changed value will be reset if the power is turned off without saving. Please save your settings before turning your unit off (Page 22).



Commentary

This determines the amount of turbo timing added at full throttle.

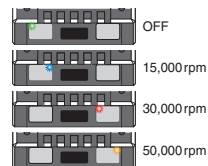
Important

When using both boost and turbo function at the same time, make sure the total value of full boost timing and full turbo timing are less than 60°

15 - Rev-Limiter rpm (blue + red + orange blinking 4 times)



In the select mode (the blue + red + orange LEDs blinking 4 times), press the SET button for 2 seconds or more to enter the setting mode. Each time the SET button is pressed once, the LED pattern changes and the rev-limiter rpm value changes as shown on the right. Align the LED with your favorite setting, and press the SET button for 2 seconds or more. The set value is validated and it returns to select mode. The changed value will be reset if the power is turned off without saving. Please save your settings before turning your unit off (Page 22).



Commentary

This function limits the output of the motor so that the rpm does not exceed the set value.

TUNING THE DRIVING EXPERIENCE

Saving user program (current value)

In SELECT mode, pressing the SET button 4 times quickly causes all LEDs to blinking, and then automatically change to the display that selects the save destination of the user program. The green LED is the user program 1, the orange LED is the user program 2. Each time you press the SET button, the save destination is switched. After selecting the save destination, press the SET button for 2 seconds or more to save it and return to the standby mode.



User program 1



User program 2

Commentary

The saved user programs can be called up by the program load function mentioned earlier.

About the factory preset program

When shipped from the factory, the unit is preset with the [Drift] program (see the table above for the setting values of each item). Please change each set of value according to your preference (For changing method, see page 12 to 21).

OTHER

- If the capacitor attached to this unit is damaged, the internal circuit may also be damaged at the same time. In such cases, we will be available for repair, so please contact us.
- If you replace the capacitor attached to this unit with our optional "Chevalier Series" capacitor, higher performance can be achieved such as better acceleration, battery consumption, etc.
- The battery connection is reversed, the schottky diode between the battery terminals of the ESC will be damaged. Please be careful not to reverse it.

About the brake operation of MC970CR

In categories such as touring cars, when the brake operation is performed from the high speed range, it has a soft feeling in terms of specifications.

WARRANTY & REPAIR SERVICE (IN U.S.A.)

If any difficulties are encountered while setting up or operating your MC970CR, please consult the instruction manual first. For further assistance you may also refer to your hobby dealer or contact the Futaba Service Center at the e-mail address, fax or telephone number listed below:

Phone:1-256-461-9399, FAX:1-256-461-1059

E-Mail: service@futabaUSA.com

If you are unable to resolve the issue, pack the system in its original container with a note enclosed and a thorough, accurate description of the difficulty. Include the following in your note:

- Symptoms (including when the problem occurred)
- System (Transmitter, Receiver, Servos and model numbers)
- Model (Model name)
- Your Name, Address and Telephone number

Send the respective items to the authorized Futaba Service Center Address below:

Futaba Corporation of America
2681 Wall Triana Hwy
Huntsville, AL 35824, U.S.A.

FUTABA CORPORATION

oak kandakajicho 8F 3-4 Kandakajicho, Chiyoda-ku, Tokyo 101-0045, Japan

TEL: +81-3-4316-4820, FAX: +81-3-4316-4823

©FUTABA CORPORATION 2019, 03

Press the set button once

Quickly press Set button twice

Quickly press Set button 3 times

Quickly press Set button 4 times

Press and hold the set button (4 second or more)

After initial setting is performed

Press and hold the **POWER** button for 2 to 3 seconds while the power is off

LED (green + orange) blinks for 3 seconds, LED (green) flashes

Initial setting of radio throttle position

Press and hold the **POWER** button

LED (green + red) flashes 3 times

LED (green + orange) flashes 4 times

In Normal State

Standby state (runnable)

ESC mode (Blue LED) blinking; boost and turbo invalid)

MC LINK mode (Red LED) blinking; boost and turbo invalid)

Press and hold the set button for more than 4 seconds to change mode

Storage Location Selection

User program 1 (Green LED)

Every time the set button is pressed once, the storage location is switched to 1 or 2.

User program 2 (Orange LED)

It automatically shifts to selection of save destination.

Program saving (All LED blinks)

(Note) Since the changed value is reset when the power is turned off, be sure to save the setting value at the end of your programming.

"If you select "Boost/Turbo Invalid" in "Program Load", the functions below full boost advance can not be used and will be skipped. In this case, the timing angle is fixed at 0°."

Select mode (cannot run)

1- Program Load flash twice

2- Drive frequency flash twice

3- Neutral brake frequency flash twice

4- Brake frequency flash twice

5- Initial speed flash twice

6- Neutral brake power flash twice

7- Initial brake power flash twice

8- Full brake power flash twice

9- Operation mode flash twice

10- Cutoff voltage flash twice

11- Full boost limiting flash 4 times

12- Boost start RPM flash 4 times

13- Boost end RPM flash 4 times

14- Full turbo limiting flash 4 times

15- Rev-limiter flash 4 times

Back to 1

Setting mode (cannot run)

Drift
Off-Road 2WD
User Program 1
4kHz
2kHz
2kHz
0%
0%
6%
70%

Non Boost
Off-Road 4WD
User Program 2
8kHz
4kHz
4kHz
8%
4%
12%
8%

Touring
16kHz
16kHz
14%
8%
14%
16%
16%

2kHz
8kHz
8kHz
10%
10%
32%
26%

100%
15,000rpm
20,000rpm
15,000rpm
40,000rpm
0deg
5,000rpm
20,000rpm

10,000rpm
30,000rpm
50,000rpm
0deg
12deg
20deg
45deg

15,000rpm
30,000rpm
50,000rpm
OFF
50,000rpm

(Fwd. Rotation)Fwd/Brk
(Fwd. Rotation)Fwd/Rev
(Rev. Rotation)Fwd/Brk
(Rev. Rotation)Fwd/Rev

NONE
3.1V/Cell
0deg
5,000rpm
20,000rpm
15,000rpm
40,000rpm
0deg

2.8V/Cell
3.2V/Cell
15deg
10,000rpm
20,000rpm
30,000rpm
50,000rpm

3.0V/Cell
3.4V/Cell
25deg
15,000rpm
30,000rpm
50,000rpm

(Fwd. Rotation)Fwd/Brk/Rev
(Fwd. Rotation)Fwd/Brk/Rev
(Rev. Rotation)Fwd/Brk/Rev
(Rev. Rotation)Fwd/Rev

0deg
15deg
25deg
45deg

5,000rpm
20,000rpm
15,000rpm
40,000rpm
0deg

10,000rpm
30,000rpm
50,000rpm
15,000rpm
30,000rpm
50,000rpm

0deg
12deg
20deg
30deg

15,000rpm
30,000rpm
50,000rpm
OFF
50,000rpm

(Fwd. Rotation)Fwd/Brk/Rev
(Fwd. Rotation)Fwd/Rev
(Rev. Rotation)Fwd/Brk/Rev
(Rev. Rotation)Fwd/Rev

0deg
15deg
25deg
45deg

5,000rpm
20,000rpm
15,000rpm
40,000rpm
0deg

10,000rpm
30,000rpm
50,000rpm
15,000rpm
30,000rpm
50,000rpm

0deg
12deg
20deg
30deg

| Setting items | Preset initial value | | | | | Setting range | | Functional overview |
|----------------------------------|---|---------------------|------------------|--------------|--------------|--------------------------|-----------------------------------|---|
| | Drift | Boost/Turbo Invalid | Touring | Off-road 2WD | Off-road 4WD | MC970CR Unit | Tx (MC LINK) | |
| Drive frequency (kHz) | 16 | 16 | 4 | 4 | 16 | 4-24 (4 Kinds) | 1-32 (24 Kinds) | Determine the throttle feeling (quick or mild) |
| Neutral brake frequency (kHz) | 16 | 16 | 8 | 2 | 8 | 2-16 (4 Kinds) | 0.5-32 (24 Kinds) | Determine the brake feeling (quick or mild) that will be applied when the throttle returns to the neutral position while driving. |
| Brake frequency (kHz) | 8 | 2 | 2 | 2 | 8 | 2-16 (4 Kinds) | 0.5-32 (24 Kinds) | Determine the brake feeling (quick or mild) that will be applied when the throttle is on the brake side during running. |
| Initial speed (%) | 8 | 0 | 8 | 14 | 8 | 0-8-14 (26 Kinds) | 0-50 (26 Kinds) | Determines the initial speed when starting acceleration from a stopped state. The bigger the number, the sharper the start. |
| Neutral brake power (%) | 16 | 4 | 16 | 16 | 24 | 0-32 (8 Kinds) | 0-100 (51 Kinds) | Determines the brake power applied when returning the throttle to the neutral position while driving. |
| Initial brake power (%) | 26 | 6 | 26 | 26 | 12 | 6-26 (4 Kinds) | 0-50 (26 Kinds) | Determines the brake power to be applied at the moment when the throttle is put on the brake side while driving. |
| Full brake power (%) | 100 | | | | | 70-100 (4 Kinds) | 0-100 (51 Kinds) | Determines the brake power applied when the throttle is put in full brake while driving. |
| Max forward speed(%) | 100 | | | | | 100 | 50-100 (26 Kinds) | It is a function to limit the maximum speed on the forward side of the throttle. |
| Max reverse speed(%) | 25 | | | | | 25 | 25-100 (4 Kinds) | It is a function to limit the maximum speed on the forward side of the throttle. |
| Operation mode | N / F / B / R (forward rotation, reverse enabled) | | | | | 6 Types | | Determine the direction of motor rotation, presence of brake, and presence of reverse function. |
| Cutoff voltage (V / Cell) | 3.2 | | | | | OFF & 2.8-3.4 | OFF & 2.6-3.6 | When the battery voltage drops to the set value, the ESC will inform the driver that the battery voltage is decreasing by running at ultra low speed. |
| Full boost timing (deg.) | 0 | - | 25 | 0 | 0 | 0-45 (4 Kinds) | 0-60 (61 Kinds) | It is the maximum timing angle value achieved by the boost function. |
| Boost start rotation speed (rpm) | 5000 | - | 10000 | 5000 | 5000 | 5000-20000 (4 Kinds) | 1000-40000 (79 Kinds) | This is the motor speed at which boost starts. Below the set value, the throttle curve will remain linear. |
| Boost end rotation speed (rpm) | 20000 | - | 30000 | 20000 | 20000 | 15000-50000 (5 Kinds) | 10000-100000 (181 Kinds) | This is the motor speed at which boost ends. Passed the set value, the boost function stop and the throttle curve become linear again. |
| Throttle Boost Control | OFF | | | | | - | ON / OFF | It is a safety feature that automatically regulate the rotation speed to prevent sudden change in motor rotation speed under sudden throttle action. |
| Turbo activation | At Full Throttle | - | At Full Throttle | | | - | 3 Types | Determines the factor that trigger the turbo activation. (When full throttle or when set rpm value is reached or both) |
| Full turbo timing (deg.) | 12 | - | 20 | 12 | 0 | 0-30 (4 Kinds) | 0-30 (31 Kinds)) | It is the maximum timing angle value achieved by the turbo function. |
| Turbo start rotation speed (rpm) | 20000 | - | 20000 | | | - | 10000-50000 (81 Kinds) | This is the motor speed at which the turbo starts operating. |
| Turbo on slope (deg./0.1 sec.) | 3 | - | 9 | 3 | 3 | - | 1-25 | It is the ramping speed at which turbo reaches full timing from the moment it activates. Larger value equal to a faster timing increase. |
| Turbo off slope (deg./0.1 sec.) | 6 | - | 6 | | | - | 1-25 | It is the ramping speed at which the turbo decrease from full timing to inactive. Larger value equal to faster timing decrease. |
| Turbo start delay time (sec.) | 0.15 | - | 0.15 | | | - | 0-1.00 (21 Kinds) | It is the time it takes for the turbo to turn ON once full throttle is reached. |
| Turbo off delay time (sec.) | 0 | - | 0 | | | - | 0-1.00 (21 Kinds) | It is the time it takes for the turbo to turn OFF once full throttle is released. |
| Rev-limiter (rpm) | OFF | | | | | OFF-15000 30000-50000 | OFF & 10000 ~100000 (92 Kinds) | The output to the motor is capped at an arbitrary rpm value. Unexpected speed increase can be prevented, such as when using a high-speed motor. |
| Free zone adjustment (%) | 6 | | | | | - | 1-10 (10 Kinds) | Adjust the output characteristics at the moment the throttle shifts from neutral to drive. Lower value. Lower value create a quicker output, higher value create a mild/smooth output |