



MC950CR

(Drivable brushless sensor motor)

INSTRUCTION MANUAL

Before using your MC950CR, please read this manual thoroughly and use the MC950CR properly and safely. After reading this manual, store it in a safe place.

- 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.

Accessories

- Sensor wire
- Power Capacitor
- Double sided tape
- Silicone flex wire (Red,Black,Blue,Yellow,Orange)
- Heatshrink tube, red (x1), black (x1)
- Miniature screwdriver (Use to press the pushbutton switch.)
- 1.4mmx2.5mm(4)&1.4mmx12.5mm(4) screws
Use to mount heatsink (optional part).

Thank you for purchasing the MC950CR. The MC950CR is a high-frequency drive FET speed control developed for model electric cars. It is compact and light weight competition speed control, and uses a simple digital setting system.

FEATURES

- **SMD MOSFETs with smallest internal resistance for minimal losses and maximum power**
- **PWM frequency is Performed by load adaptive**
- **Forward, reverse, and brake operations are all linear**
- **Reverse operation cancellation function**
- **The upper and the middle case made from aluminum**
- **Heat protector**
- **Low-voltage protection function**
- **Power left on alarm function**
- **External solder points with 14AWG silicone flex wire**
- **Terminal is Oxygen-Free-Copper**
- **Serial communication function**

[MC950CR Technical Data] (Specifications are subject to change without prior notice.)

- Operating system: Forward and brake (resolution:255)
- Power requirement: Nicd, NiMH battery 4~7 cells (4.8~8.4V)
- PWM frequency:
 - Forward and Reverse :500Hz~30kHz/Initial value:3.0kHz~5.0kHz
 - Brake :500Hz~30kHz/Initial value:1.0kHz
- BEC voltage: 6.0V (excluding at less than 6V)
- Setting: One-touch input by pushbutton switch.

Applicable motors (Number of turns is criteria.)

Use the MC950CR with a motor with 2.5 turns or sensor brushless more. (With optional heatsink & fan)

*If a motor with a number of turns smaller than the above is used, the heat protector and overcurrent protection circuit may operate. The number of turns of the motor is a criteria only. Depending on the running conditions, the protection circuit may operate even if the condition above is satisfied.

Power supply

Nicd, NiMH battery 4~7 cells
(4.8~8.4V)

- Current capacity (FET rating) :
 - Forward :900A (Momentary load: 1300A)
 - Brake :900A
- Case size: 37.2x36.6x14.0mm (excluding protruding parts)
- Silicon cord gauge size: AWG14 equivalent
- Weight: 33.3g (excluding connector, cords and switch)

Serial communication function (Options)

The following settings and operations are possible with a Windows PC by using the optional interface unit (CIU-2) and MC950CR Link soft.

- Data logging function data read and erase (Data logging memorizes the running current and power supply voltage for approximately 8 minutes at 1 second intervals.)
- Variable frequency range setting: 500Hz ~ 30kHz (Sets the load response system variable frequency range.)
- Dead band: $\pm 2\mu s \sim \pm 55\mu s$ (The neutral point range can be set.)
- Low battery protection voltage setting: 2.5V ~ 6.0V (Sets the voltage which cuts output to motor when the power supply voltage is drops.)
- Current limiter: 50A ~ 480A (The current limit for suppressing wasted power can also be set.)
- Brake MAX duty: 0% ~ 100% (Sets the brake strength of the MAX brake point from neutral.)
- Brake PWM frequency: 500Hz ~ 30kHz
- Neutral brake: 0% ~ 100% (Brake setting at the throttle neutral point)
- Reverse: cancel / Robot (Forward \leftrightarrow neutral \leftrightarrow reverse)

*Windows is registered trademark of Microsoft Corporation.

MOUNTING PRECAUTIONS

⚠ WARNING

- 1 Install the receiver and receiver antenna away from the amp, motor cord, power cord, Nicd battery, and other parts that carry a high current.
- 1 Metal and carbon chassis and other conductive parts transfer switching noise. When mounting the receiver to such a chassis, use thick double-sided tape to mount the receiver as far away from the chassis as possible.
- 1 Insert the connectors firmly.
If vibrations while running cause the connectors to work loose, control may be lost and an extremely dangerous situation may occur.

⚠ CAUTION

- ⊘ Do not wrap your MC950CR in foil.
It is important to provide a free flow of cooling air over it.
- 1 Do not remove the case of MC950CR.
The MC950CR may not be repairable.
- 1 Never reverse the battery polarity.
Reverse connection will immediately destroy the amp.
- ⊘ Mount the MC950CR so that conductive parts do not directly touch the solder parts of the input/output cord.
A short circuit may occur.

MOUNTING PRECAUTIONS

⚠ WARNING

- ⊘ Do not run the vehicle in the rain or through puddles or on muddy or snowy roads.
If moisture enters the amp, erroneous operation may cause loss of control and an extremely dangerous situation may occur. It may also cause amp trouble. Should moisture enter and cause erroneous operation, send the MC950CR out for repair and inspection.
- 1 Always turn the power switches on and off in the following order:
ON: Transmitter -> receiver (amp switch)
OFF: Receiver (amp switch) -> transmitter
If the power switches are operated in the opposite order, the vehicle may run unexpectedly and an extremely dangerous situation may occur.
- 1 When going to and returning from the circuit, and when storing the model, always remove the Nicd battery.
If the switch is turned on erroneously, control may be lost or a fire may start.
- 1 Always perform a check of operation before running.
- 1 When making adjustments, remove the motor, or place the vehicle on a stand, so that it cannot run.
When not set up correctly, the vehicle may run unexpectedly and an extremely dangerous situation may occur.

⚠ CAUTION

- ⊘ If a peddle 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.
- ⊘ Do not touch the motor or MC950CR immediately after running.
Touching the motor or amp immediately after running may result in serious burns.
- ⊘ If the motor is connected to the speed control, you must not run the motor by connecting a separate battery.
This will wreck the unit.
- 1 Turn the power switches on in the state where the vehicle is floated.
When turning on, depending on the receiver used, a motor may rotate for a moment. Be careful not to injure a finger etc. by rotation of the wheels.

Important:

Because the MC950CR has pure race competition specifications, it is designed so that it is difficult to operate the protection circuits. Use at an overload may cause trouble. Incorrect power supply polarity or a power supply or motor short circuit may cause the MC950CR to burn out.

Special Markings

Pay special attention to the safety at the parts of this manual that are indicated by the following marks.

- Symbol: ⊘ :Prohibited
1 :Mandatory

Mark

⚠ DANGER

⚠ WARNING

⚠ CAUTION

Meaning

Procedures which may lead to a dangerous condition and cause death or serious injury to the user if not carried out properly.

Procedures which may lead to a dangerous condition or cause death or serious injury to the user if not carried out properly, or procedures where the probability of superficial injury or physical damage is high.

Procedures where the possibility of serious injury to the user is small, but there is a danger of injury, or physical damage, if not carried out properly.

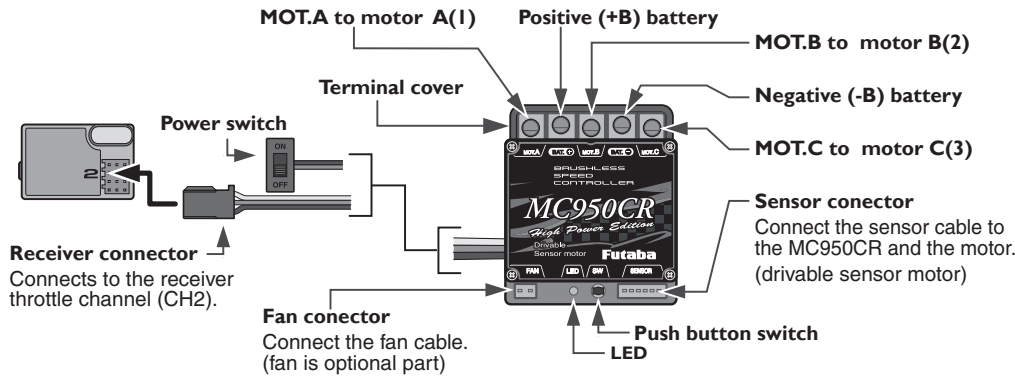
INSTALLATION TIPS

- Mount the speed control in the model using the double-sided foam tape supplied.
- Provide plenty of cooling openings in the bodywork; this increases the performance and extends the life of all electronic components.
- Install the speed control in a location where it is protected from crash damage.
- The speed control should be installed in such a way that you have easy access to all connectors and the set-up button.

Important:

- Ensure that there is an adequate distance (approx. 3 cm) between the speed control and power cables and the receiver or receiver antenna. Avoid direct contact between all power system components and the receiver or antenna, as this can cause interference. If you encounter interference problems, re-position the components in the model.
- The antenna should be run vertically up and away from the receiver. Avoid contact with any parts made of carbon fibre or metal. See also the instructions supplied with your radio control system.

CONNECTION



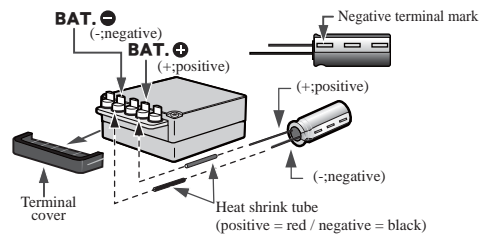
POWER CAPACITOR

Always install Power Capacitor to suppress battery noise. Also, Power Capacitor stores battery energy and supplies this to the motor additionally when extra power is required.

[INSTALLATION]

See the pictures for the example of installation.

- 1 Remove the terminal cover from the MC950CR.
- 2 Use the included heat shrink tube to isolate the pins of the Power Capacitor. This will also make it easier to indicate the polarity of the Power Capacitor. Place the red heat shrink tube on the positive terminal and the black heat shrink tube on the negative terminal.
- 3 The Power Capacitor needs to be soldered to the speed control between + (positive = M.B.+) and - (negative = BAT.-).
- 4 Attach the terminal cover to the MC950CR.



SET UP

In set-up mode MC950CR stores every step when you press the Set-up button. All the settings are stored in the unit even when the speed control is subsequently disconnected from the battery. Set up the following basic functions on your transmitter (if present):

- High ATV, EPA (throttle travel) - maximum Low ATV, EPA, ATL (brake travel) - maximum
- EXP, EXPO (exponential) - start with 0
- SUB trim (neutral trim) - center TH trim - center
- Throttle reverse (servo reverse) - any setting; must not be changed after completion of set-up procedure.
- Non-proportional stick travel is possible (2/3 throttle - 1/3 brake)

If your transmitter does not feature these set-up functions, it is already in "basic set-up" mode.

Remove the motor pinion, or ensure in some other way that the wheels of the model are free to rotate.

1 Turn on the power in following order.

- Switch the transmitter on.
 - Set the transmitter throttle to neutral, and then switch the speed control on.
- * Depending on the neutral position of the throttle, the red and green LED will blink simultaneously (orange) and a beeping sound will be repeated. (Alarm: Waiting for neutral data)

[Wiring Precautions]

- Always set the MC950CR power switch to the OFF position before performing any wiring.
- When stripping the covering of the silicon cord to the length needed for soldering, be sure not to cut the center conductor with the cutter or nippers.
- Refer to the diagram above and check the polarity before performing wiring.
- When soldering to the terminals of the MC950CR, remove the terminal cover. (After soldering, re-install the terminal cover.)

CAUTION

⚠ Never reverse the capacitor and wires polarity.

The capacitor may break or the capacitor electrolyte may leak. Reverse connection will immediately destroy the amp.

⚠ Never use solder containing acid flux.

Use solder containing rosin flux only. Do not inhale the solder vapours. This might damage health.

1 Vibrationproof the capacitor by mounting it with thick double sided tape.

If the pin of the capacitor is broken, it may short-circuit with the pin between + and - terminal of the speed control.

1 Be careful when soldering to the tags on the speed control; don't overheat the tags with your soldering iron and take great care to avoid short-circuits between two of the three tags on the speed control.

Such a short-circuit would destroy the speed control.

2 Hold the SET button pressed in for at least 3 seconds using the small screwdriver supplied.

- The SET LED flashes green, to indicate that the unit is in set-up mode.

| | Transmitter throttle operation | SET button operation | MC950CR LED |
|----------------------------------|--------------------------------|--------------------------|---|
| 3 Neutral point setting | • Neutral state | • Press SET button once. | LED LED goes out and the motor beeps. |
| 4 High point setting | • Full high state | • Press SET button once. | flashes blue two times LED and the motor beeps. LED goes out |
| 5 Brake MAX point setting | • Full brake state | • Press SET button once. | flashes blue three times LED and the motor beeps. LED goes out |

- This completes the set-up procedure.

Reverse Cancelling function (Brake operation only)

While pressing the push button switch, set the power switch to ON. flashes purple and the motor beeps. (5 times)

*When desired, you can enable the cancelled reverse function by repeating the operation shown above. (The reverse function is switched alternately.)

LED DISPLAY

- The MC950CR operating state can be checked with the LED as shown below.
- After operating the throttle trigger (stick) of a transmitter to the brake (reverse) side, if it is again operated to the brake side once it returns to a neutral position, MC950CR will carry out reverse operation.

| Operation | Brake MAX point | Neutral point | High point |
|-----------|--|---|--|
| | | | |
| | On (green) | On (blue) Mode: Brake operation only | On (white) |
| LED | On (red) *Becomes brighter nearer the MAX point. | On (purple) Mode: Reverse operation | On (green) *Becomes brighter nearer the high point. |
| | On (yellow) *Becomes brighter nearer the MAX point. | On (red) Mode: Robot (Forward ↔ neutral ↔ reverse) | |

| Cause | LED |
|---|--|
| (Amp power left on alarm) When the transmitter power was turned off first. | flashes red and the motor beeps. *Not used with PCM receivers. *When the transmitter if OFF, this function is not performed in environments such that the servo operates erroneously |
| (Alarm when waiting for the data of a neutral point) *When the switch of speed control is turned ON ahead of a transmitter. *When the neutral position of a transmitter differs from the last setup. | flashes blue and the motor beeps. |
| (Data error alarm) Displayed when an abnormal signal was input. | flashes red and the motor beeps. |
| (Protection circuit operation) When a protection circuit operates. | flashes yellow |

* The confirmation beep sounds only when the motor connected.

Protection Circuits

Heat protection: After the FET overheating is detected, a protection circuit operation alarm is activated, and the output to the motor is gradually lowered, and then, output to the motor is cut. The protection circuit is automatically reset by a drop in the FET temperature.

Low battery protection: When the power supply voltage drops, the output current to the motor is limited and supply voltage to the receiver is ensured. When the power supply voltage drops to the set voltage (initial setting 2.7V), a protection circuit operation alarm is activated and output to the motor is cut. The protection circuit is automatically reset by recovery of the power supply voltage.