Futaba
1M23N25409

NOTE: Always read this manual before using the MC9100A/MC9700A Airplane ESC.

ESC for brushless motor dedicated airplanes

MC9100A MC970A

INSTRUCTION MANUAL

Refer to the separate table for the motors recommended by fuselage class.

Thank you for purchasing an MC9100A/MC970A Airplane ESC.

The MC9100/MC970A mount the latest FET and are ESC for brushless motor dedicated motor airplanes. Their performance can be displayed to the full by combining them with the Futaba airplane brushless motor sold separately.

Before using the MC9100A/MC970A

* **Improper handling of the LiPo battery is extremely dangerous. Use the battery in accordance with the instruction manual supplied with it.**
* **Some commercial motors may not match advance timing adjustment, etc. of the MC9100A/MC970A. We recommend that you use the MC9100A/MC970A with the Futaba motors recommended in the separate table.**
* **Always solder the MC9100A/MC970A battery connection cord to a connector matched to the battery used. Do not use the ESC in a temporarily connected state.**

Mounting precautions

⚠WARNING

Always use the MC9100A/MC970A within the operating conditions range given in the specifications.

Be sure that the battery polarity is correct.

Reverse connection will cause sparking and immediate destruction or burning inside the ESC.

Never short circuit even places where there is no battery, motor, receiver, or connector.

Short circuits will cause sparking and immediate destruction or burning inside the ESC.

Mount the ESC so that the soldered part of the I/O cord does not touch conductive parts.

Mount the receiver and receiver antenna away from the MC9100A/MC970A, motor cord, power cord, drive battery and other parts through which a large current flows.

If the receiver is erroneously operated by noise, control will be lost and is extremely dangerous.

Insert the connection connectors fully.

If a connector works loose due to vibration, control will be lost and is extremely dangerous.

Mount the MC9100A/MC970A where it will not be exposed to oil, grease, and water.

Mount the MC9100A/MC970A to the fuselage where there is an ample flow of cooling air.

Do not wrap the MC9100A/MC970A body in aluminum foil.

Such wrapping will cause a loss of cooling effect and the specified performances will not be obtained.

Install the motor securely. Also clamp all the cables.

⚠CAUTION

Do not disassemble the ESC. Do not open the case of the product.

Opening the case will damage the interior. In addition, repair will become impossible.

Operating precautions

⚠WARNING

Be careful that no part of your body touches parts that rotate during operation.

Unexpected rotation may cause serious injury.

Depending on the receiver, the motor may rotate the instant the power is turned on.

Do not fly in rainy weather.

If water drops enter the ESC, control will be lost due to erroneous operation and is extremely dangerous. It may also cause an accident. If the ESC operates erroneously due to the entry of water, repair and inspect it.

Always turn the power switches ON and OFF in the following order:

ON: Set the throttle stick to the stop position and turn on the power switches in transmitter → receiver order.

OFF: Set the throttle stick to the stop position and turn off the power switches in receiver → transmitter order.

If performed in reverse, the propeller may rotate unexpectedly and is extremely dangerous.

Always remove the battery when not using the ESC.

If the switch is turned on erroneously, the propeller will rotate unexpectedly or a fire may start.

Before flying, check operation of the ESC and all the control surfaces.

When not set properly and when a different model is selected, control will be lost and is extremely dangerous.

⚠CAUTION

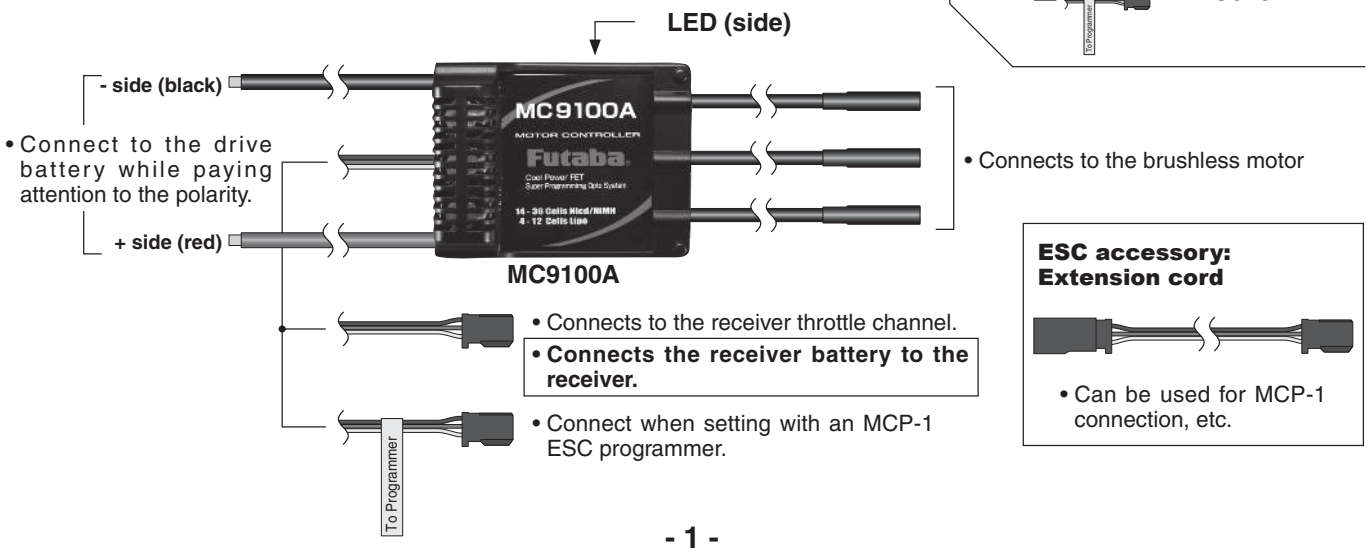
Do not touch the motor and ESC immediately after flight.

It will cause a burn.

MC9100A/MC970A Connection Method

[Preparation] Solder the ESC battery connector cords (red, black) to connectors corresponding to the battery used. In addition, insulate the connector section with heat shrink tubing.

The figure below shows the MC9100A connections. Connect the MC970A in the same manner.



Throttle Position Setting

First set the high point and maximum slow point by the following method. (When model type is AIR)

[Preparation 1] Connect the ESC, receiver (separate power supply for receiver is necessary) and motor in accordance with the previously described connection method. At this time, do not connect the drive battery.

[Preparation 2] Set the receiver side throttle channel travels (EPA, AFR, D/R, etc.) to 100%. For a Futaba transmitter, set the throttle channel reversing function to the reverse side.

	Operation	Stick	LED
❶	**Turn on the transmitter and receiver power and hold the throttle stick in the full high position.**		---
↓			
❷	**Connect the drive battery.** • Two-tone rising pitch beep sound → About 10 seconds later a two-tone double beep sound is generated.		Lit
↓			
❸	**Move the throttle stick to the maximum slow position within 3 seconds after ❷ above.** • Two-tone rising pitch beep sound → Double beep continues to sound.		
↓			
❹	**Remove the drive battery.**		

* If the ESC LED blinks after connecting the drive battery at step ❷ above, reverse the throttle channel by transmitter side servo reversing function and temporarily remove the drive battery and then repeat the setting.

* When the reverse function is ON when the model type is CAR or BOAT, set the high point, neutral point, and reverse point by performing the following operations at step ❸ of throttle position setting above: Throttle stick to neutral (two-tone rising pitch beep sound) → reverse (two-tone rising pitch beep sound) → (double beep sound) → drive battery removal

Parameters Setting

When not using the ESC programmer, set the parameters by the following method. The 5 parameters shown in the table below can be set.

#	Setting item	At parameter selection	At parameter check & change	
		LED/beep	LED on/beep (every 2 sec.)	LED blink/beep (every 0.5 sec.)
❶	**Battery type**	1 blink (consecutive)	LiPo	NiCD/NiMH
❷	**Motor direction**	2 blinks (consecutive)	Normal	Reverse
❸	**Air brake on/off (Air)** **Governor on/off (Heli)** **Reverse on/off (Boat/Car)**	3 blinks (consecutive)	OFF	ON
❹	**Model type**	4 blinks (consecutive)	AIR	HELI
❺	**Model type**	5 blinks (consecutive)	BOAT	CAR

[Important] Do not perform the contents check operation after setting the model type at No. 4 or No. 5. If the check operation is performed, the set model type may be overwritten by a different model type.

Setting item (parameter No.) selection method

Select the parameter No. as follows:

[Preparation] Connect the ESC, receiver (including receiver power supply), and motor in accordance with the connection method previously described. At this time do not connect the drive battery.

	Operation	Stick	LED
❶	**Turn on the transmitter and receiver power and hold the throttle stick in the full high position.**		-----
↓			
❷	**Connect the drive battery.** • Two-tone rising pitch beep sound → About 10 seconds later, a two-tone double beep sound is generated → About 3 seconds later, a double beep sound is generated.		Lit
	• Subsequently, short beep sounds continuously. (Indicates that parameter No. 1 was selected.)		Blink
↓			
❸	**Quickly operate the throttle stick high → slow → high.** • A beeping sound (2 soft beeps) is generated continuously. (Indicates the state in which parameter No.2 was selected.)		
↓			
• Parameter No. 3 (3 soft beeps) ~ parameter No. 5 (5 soft beeps) can be selected by repeating step ❸.			

Parameter change method

After selecting the parameter No. you want to change as described above, change the parameter as follows:

	Operation	Stick	LED
(State in which the parameter you want to set or check was selected by the selection method described above.)			Blink
↓			
❶	**Hold the throttle stick at the maximum slow side.** • About 3 seconds later a two-tone falling pitch beep sound is generated. • Subsequently the LED display and beep sound that show the current setting state are generated.		On or blink
↓			
❷	**(Changing the current setting)** **Quickly operate the throttle stick to slow → high → slow.** • The setting is changed and the LED display and beep sound are also switched.		
	(Returning to parameter No. selection) **Return the throttle stick to the full high side.** • Double beep sound is generated and the ESC returns to the parameter selection state.		Blink
↓			
❸	**Remove the drive battery in the parameter No. selection state.** • Settings are saved.		

Initial Setting

The following initial setting is an example of initial setting when using the air brake.

Throttle position setting

The throttle stick full high and maximum slow positions are memorized in the ESC.

* Set the positions in accordance with the previously described "Throttle position setting" procedure.

↓

Parameter setting

Set the ESC parameters to match the usage conditions.

[IMPORTANT] With the MC9100A/MC970A, the initial setting of the model type is "AIR" (airplane use). Set up the following parameters in the state of this model type.

•Battery type selection (Parameter No. 1)

Select the battery type matched to the drive battery used.

LiPo: LiPo battery

NiCD/NiMH: Nickel-cadmium or nickel-metal hydride battery

•Air brake ON/OFF (Parameter No. 3)

To use the air brake function, set to the ON side.

* Set each parameter in accordance with the previously described "Parameters setting" procedure.

* For parameter detail setting, use the MCP-1 ESC programmer sold separately.

After the initial settings above are complete, remove the drive battery.

Normal Operation

⚠WARNING

! Before using the MC9100A/MC970A always set the parameters to match the throttle position and usage conditions.

⃠ When normal operation has become possible, check the direction of rotation of the motor. If the direction of rotation is incorrect, change it by parameter setting or motor connection.

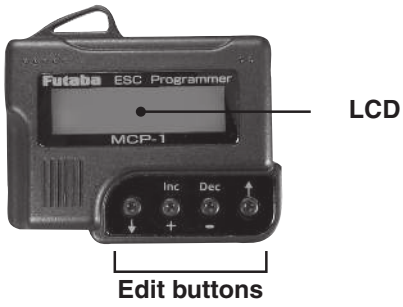
If used with the wrong setting, the motor will rotate unexpectedly and control will be lost and is extremely dangerous.

At normal operation, connect the drive battery in the state in which the transmitter throttle stick is in the maximum slow position. A 2 quick beeps sound is generated and operation is possible. At this time, the LED will light.

* If the drive battery is connected when the throttle stick is not in the maximum slow position, the LED will blink. In this case, if the throttle stick is set to the maximum slow position, the 2 quick beeps sound will be generated and operation will become possible.
* When the drive battery was connected and the setting mode was entered with the throttle stick at the high side, temporarily remove the battery and begin again.

Parameters Setting by MCP-1

Set the ESC parameters by an ESC programmer MCP-1 sold separately as follows:



Programmer connection

Connect the MCP-1 and drive battery to the ESC as the MC9100A/ MC970A connection method above.

Edit buttons operation

Setting item selection	Select the setting items with the left and right outside arrow buttons (↓ or ↑).
Setting contents change	The inside INC(+) and DEC(-) buttons are used to select and change the setting contents.
Model type change	The model type can be changed by pressing both arrow buttons simultaneously.

MCP-1 setting items

The setting items are shown in the table below.

Setting item (Model type: AIR)	
(1) Battery type selection	(9) Air brake function ON/OFF
(2) Cut off voltage setting	(10) Motor poles number setting
(3) Cut off type selection	(11) Gear ratio setting
(4) Motor direction selection	(12) Maximum speed display
(5) Advance timing setting	(13) Average speed display
(6) Acceleration setting	(14) Writing setting data to ESC
(7) Start power setting	(15) Reaing setting data saved at MCP-1
(8) Air brake function type selection	(16) Saving setting data to MCP-1

Setting method

When the MCP-1 and drive battery are connected to the ESC, the current setting contents of the ESC are automatically read to the MCP-1.

Select the item you want to change with the arrow buttons (↓or↑) and change the setting contents with the INC(+) and DEC(-) buttons.

[IMPORTANT] At the end of ESC parameters setting with the MCP-1, write the setting data to the ESC with the (14) "Writing setting data to ESC" function. The setting data is not written to the ESC by only setting the parameters.

(1) Battery type selection

Setting range: LiPo, NiCd
Initial setting: LiPo

Select the type of drive battery used by means of the DEC(-) or INC(+) button.

* When the battery type changes, the "CUT OFF VOLTAGE" and "CUT OFF TYPE" parameters change.

(2) Cut off voltage setting

Setting range: Auto (automatic setting), 4.5~50V
Initial setting: Auto

Set the cut off voltage to match the type of battery used. Adjust the voltage with the DEC(-) or INC(+) button.

* At auto mode (Auto) setting, when the battery type is LiPo, power to the motor is cut off at 3V per cell. For NiCd, power to the motor is cut off when the total voltage is 12V.

(3) Cut off type selection

Setting range: Soft off (soft), Hard off (hard)
Initial setting: Soft off

The cut off method when the battery voltage drops to the set cut off voltage can be selected.

(4) Motor direction selection

Setting range: Normal (forward rotation), Reverse (reverse rotation)
Initial setting: Normal

The direction of motor rotation is selected here.

* When the direction of rotation is reversed, change the mode.
* The direction of rotation can also be changed by changing the motor wiring.

(5) Advance timing setting

Setting range: 0~25°
Initial setting: 14° (for FMA-50xx Series)

As a setting standard, for an ordinary 2-pole inner rotor motor, a setting of 0~5° is recommended.

When setting to match the motor used, set within the following range:

Setting example: 0~10° (inner rotor), 14~25° (outer rotor)

* For the FMA-50xx Series, 14° is recommended.

(6) Acceleration setting

Setting range: Lowest/Low/Normal/High/Highest (Slow)←→(Fast)
Initial setting: Normal

The speed of rise until the ESC reaches maximum speed can be set here. (Delay function) Select the acceleration with the DEC(-) or INC(+) button.

This function is mainly set when turning the ESC on and off by switch.

(7) Start power setting

Setting range: Lowest/Low/Normal/High/Highest (Low power)←→(High power)
Initial setting: Normal

The power (torque) level at motor starting can be set here.

* To avoid rapid and drastic gear wear when using a helicopter, setting the start power to a low level is recommended.

(8) Air brake function type selection

Setting range: Slow/Normal/Fast/value 5~100% (Slow)←→(Fast)
Initial setting: Normal

When the model type is AIR, the air brake effect can be adjusted. Whether the motor stops gradually or stops immediately can be selected. Select with the DEC(-) or INC(+) button.

* 100% is immediate stop.

(9) Air brake function ON/OFF

Setting range: On/Off
Initial setting: Off

Air brake ON/OFF can be selected here.

(10) Motor poles number setting

Setting range: 2~36 poles
Initial value: 14 (For FMA-50xx Series)

Change the number of poles to match the motor used.

* This setting is necessary to display the actual speed.

(11) Gear ratio setting

Setting range: 1.0:1 ~ 25.0:1
Initial value: 1.0:1

Inputs the gear ratio of the gearbox used.

* The speed display value is calculated from the number of motor poles and the gear ratio of the gearbox.

(12) Maximum speed display

Displays the maximum speed directly before flight.

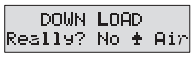
* The speed display value is calculated from the number of motor poles and the gear ratio of the gearbox. The initial value records the factory test value. The maximum speed display value changes when the motor speed changes.

(13) Average speed display

Displays the average speed directly before flight.

* The speed display value is calculated from the number of motor poles and the gear ratio of the gearbox. The initial value records the factory test value. The average speed display changes when the motor speed changes.

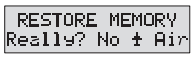
(14) Writing setting data to ESC



Execute when writing (transferring) the set values to the ESC. Start writing by pressing the INC(+) button.

* A beep sounds every second until writing is complete. If you want to abort the procedure, press the DEC(-) button.

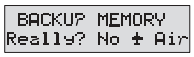
(15) Reading setting data saved at programmer



Execute to read the setting data saved at the programmer memory. Start reading by pressing the INC(+) button.

* A beep sounds every second until reading is complete. If you want to abort the procedure, press the DEC(-) button.

(16) Saving setting data to programmer memory



Execute to save the setting data to the programmer memory. Start backup by pressing the INC(+) button.

* A beep sounds every second until backup is complete. If you want to abort the procedure, press the DEC(-) button.

[Recommended Motor/ESC by Fuselage Class]

Class	Motor	Recommended propeller	Fuselage specifications	ESC
50-60	**FMA5055-525KV**	LiPo 5 cells: APC15x8E/APC15x10E/APC15x12E/ APC16x8E/APC16x10E	LiPo 4-5 cells: Acrobatic: -2.8kg/Stunt: -3.0kg/Scale: -3.7kg	**MC970A**
60-70	**FMA5055-410KV**	LiPo 6 cells: APC15x12E/APC16x8E/APC16x10E/ APC17x8E/APC17x10E	LiPo 5-6 cells: Acrobatic: -3.4kg/Stunt: -3.6kg/Scale: -4.2kg	**MC970A**
90-110	**FMA5065-300KV**	LiPo 8 cells: APC17x8E/APC17x10E/APC17x12E/ APC18x8E/APC18x10E	LiPo 7-8 cells: Acrobatic: -4.3kg/Stunt: -4.5kg/Scale: -5.2kg	**MC9100A**

[MC9100A/MC970A Specifications]

	MC970A	MC9100A
Functions	Forward, stop, brake/reverse	
Load current (peak)	70A (85A 5 secs)	100A (150A 5 secs)
Dimensions	78x29x14mm	73.4x56x31mm
Weight	89g	124g
Number of cells	14-36 NC/NiMH, 4-12 LiPo	
Parameters setting	Body/MCP-1 ESC programmer (sold separately)	
Protection functions	Start protection/low voltage cut off/no signal cut off/overheating protection	
PWM frequency	32kHz	

* Cool Power FET: Latest high performance power FET
* Opto: System that reduces the effect of motor noise by electrically separating the motor and receiver sides.
* MCP-1 ESC Programmer: Connects to the MC9100A/MC970A and simplifies detailed setting.
* Start protection: Stops unexpected motor rotation when starting.
* Low voltage cut off: Stops the motor before a voltage that may cause loss of control or cause damage by over discharge of cells is reached.
* No signal cut off: Turns off the ESC when a signal is not received from the transmitter.
* Overheating protection: Protects the FET by limiting the output when the temperature rises abnormally due to an overload.
* Anti-spark: Function that reduces sparking generated when a battery is connected.
* Automatic confirmation of number of battery cells: Function that automatically confirms the number of battery cells connected.

Meaning of Special Markings

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

⚠DANGER	Procedures which may lead to dangerous conditions and cause death/serious injury if not carried out properly.
⚠WARNING	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.
⚠CAUTION	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.

⃠: Prohibited ❗: Mandatory

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