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Handbook only for product code:

cod.E0018A MAC1	NiCd NiMh 5 cells batteries version with output voltage not stabilized
cod.E0018B MAC2	Io-Li Li-Poli batteries version with output stabilized voltage
cod.E0018E MAC828	Io-Li Li-Poli batteries version with output stabilized voltage and servo programmer

Electronic power supplies SERIES:

MAC

Microcontroller systems for RC handling

Usage handbook



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Dear client,

We express our thanks for your purchase of radio power supply **MAC** series.

MAC is the servo management unit with microcontroller to manage the radio control circuit on board with dual battery, dual electronic switches with a control button, double charge indicator system with battery storage, two voltage regulators (only for MAC2 and MAC828 versions) with power supply voltage setting and active filters servos over 8 independent channels for operating a total of 28 servos distributed over 8 channels.

The main feature of MAC828 version is the servos programming system for each of the 8 channels.

This function will allow you to program the direction of rotation, the excursion and position of the centers and the end of run, independent of a total of 28 servos. In addition it is possible to activate the special function "Digital Servos" that will control and exploit the digital servo technology at the maximum performance.

The configuration of channels and the distribution of programmable servos is the following:

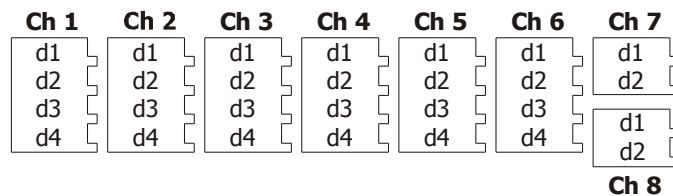


Figure 1

The MAC servo management units are able to handle two independent battery packs thanks to the two-way power management and the concept of redundancy with which it was conceived. The two batteries will be required of the same rated voltage (equal number of cells) and must be of the same technology (NiCd - NiMh - Io.Li - Li.Poli), but may have different value of capacity, although it is advisable to equip the system with cells of the same voltage and same capacity.

Note: The system can work properly even with only one battery but the greatest security is achieved only with double accumulator.

The MAC series servo management units features are:

- Double electronic switch with a control button on the external panel
- Double-charging indicator that monitors the voltage of the batteries through the two flashing red LED diodes on the external panel
- Dual voltage stabilizer (only for MAC2 and MAC828 versions) that adjusts the input voltage input Battery Type Li-Io, Li-Poly from 7.4V to constant voltage of 5.2 - 5.9 V with maximum power up to 36A
- Double 5V 1.5A voltage stabilizer for the separate power of the receiver

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- Double diode which provides insulation in case of short circuits
- Filtering servo signal system and independent protection for each output servo from short circuits for each output servo

With the servo management units of MAC SERIES you have at your disposal a complete RC system composed of a double electronic switch, double charging indicator with alarm system, a dual voltage stabilizer for feeding separately servos from the receiver, active filters on 8 independent channels and a programming system of relays and switches and the servo-board telemetry.

Only in this way you can fly, every time, in complete safety.

AVAILABLE VERSIONS:

MAC 1: radio system equipment for 5 cells NiCd – NiMh accumulators (6V voltage)
Cod. E0018A

MAC 2: radio system equipment for 2 cells Io-Li – Li-Poli accumulators (7.4V voltage) with programmable voltage stabilizers
Cod. E0018B

MAC 828: radio system equipment for 2 cells Io-Li – Li-Poli accumulators (7.4V voltage) with programmable voltage stabilizers and micro-controller for programming 28 servos on 8 channels
Cod. E0018E

INSTALLATION:

You must keep special attention to install every electronic devices. The way you fix MAC unit will be decisive to ensure its proper functioning.
Please note: Incorrect installation can with the passing of the time, undermine the proper functioning.

The Unit is supplied with a lower plate which has on the tops, appropriate fixing points; these holes are isolated from the body via 4 rubber supports which will be inserted into the four mounting screws.

The plate on which the unit will be fixed must have 4 fixing points all on the same level, to ensure its smooth surface.

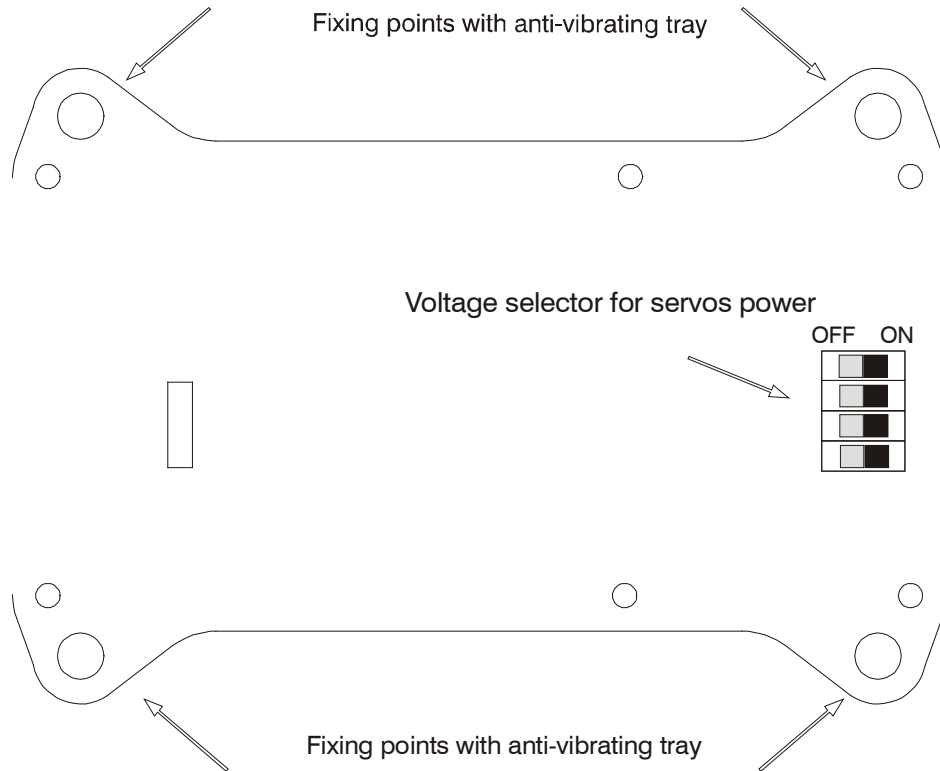


Figure 2

The unit will stay in perfect plane referring to its fixing points.

By tightening the four screws the unit should not absolutely undergo twisting or flexing.

Be also careful don't tighten strong the four mounting screws, avoiding to damage completely rubber supports.

The MAC unit can be installed in the inverted position or 90° always being in agreement with what it has mentioned above.

It is recommended to create an anti-vibrating tray with vertical rubber columns to insulate the electronic circuit from any vibration from the propulsion system.

An example for an easy and safe installation is listed below:

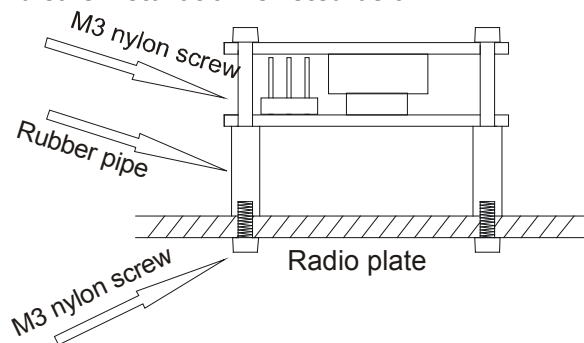


Figure 3

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You have to choose the place where install the external panel, avoiding any places close the internal combustion or electrical engine also avoiding to place it in the same direction of exhaust gases and choose a position easy to reach to make easier the switching on and off by pushing the button.

In addition you have to choose a good clearly place which allows you to verify at a glance the power batteries charge status in every moment.

At first, you have to make 2 holes for the passage of fixing screws okf 2 light indicators and the button as shown in the Figure 4.

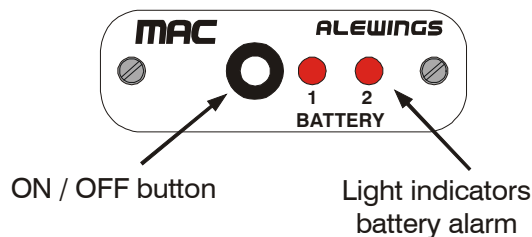


Figure 4

Put only the panel on the exact point of installation, draw 5 internal outlines of the button and 2 light indicators. When you have created all the holes, put the external panel and fix inside the device with the furnished screws. The button will pop out of about 2 mm from the external panel, if necessary place inside some thicknesses between the electronic plate and th fixing tray.

CONNECTIONS:

➤ CONNECTION UNIT - BATTERY:

Connect to the inputs identified as BATT 1 and BATT 2 the two accumulator type NiCd - NiMh or Li-I - Li-Poly, depending on MAC version. The red wire is the positive and the black is the negative one.

Be careful: Do not reverse the polarity, this action could cause serious breakage of the device.

➤ CONNECTION UNIT- RECEIVER:

Using the 8 extensions supplied and always with attention to the polarity of the connectors, connect the MAC unit to the receiver.



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Connect to the input channels of the unit identified by "CHANNEL INPUTS 1 ... 8" the channels of the receiver that you want to use.

Please note: it is recommended to connect all the 8 extensions even if you don't use all the channels. It is not mandatory following the numbering on the unit channel receiver, the channel 1 of the unit can connect any channel of the receiver.

➤ CONNECTION UNIT- SERVOS:

Depending on the channels used, connect servos to the unit outputs as shown in "Figure 5".

Please note: be careful to the polarity of the plug if you use servos like Graupner, JR Hitech; in case of Futaba servos, the direction of insertion is forced by the milling on the top panel.

➤ CONNECTION UNIT – EXTERNAL PANEL :

Insert the supplied flat cable in the connector on MAC top panel. Subsequently connect the other end of the flat cable to the connector on the external panel of ignition and battery status monitoring.

➤ CONNECTION UNIT – SERVOS PROGRAMMING CONTROL (only for version MAC828):

To program MAC828 unit it's necessary to connect the programming remote control to the unit through a flat cable of 1.5m of length.
Connect the supplied cable to the connector on the unit identified by the words "Programming Keyboard"



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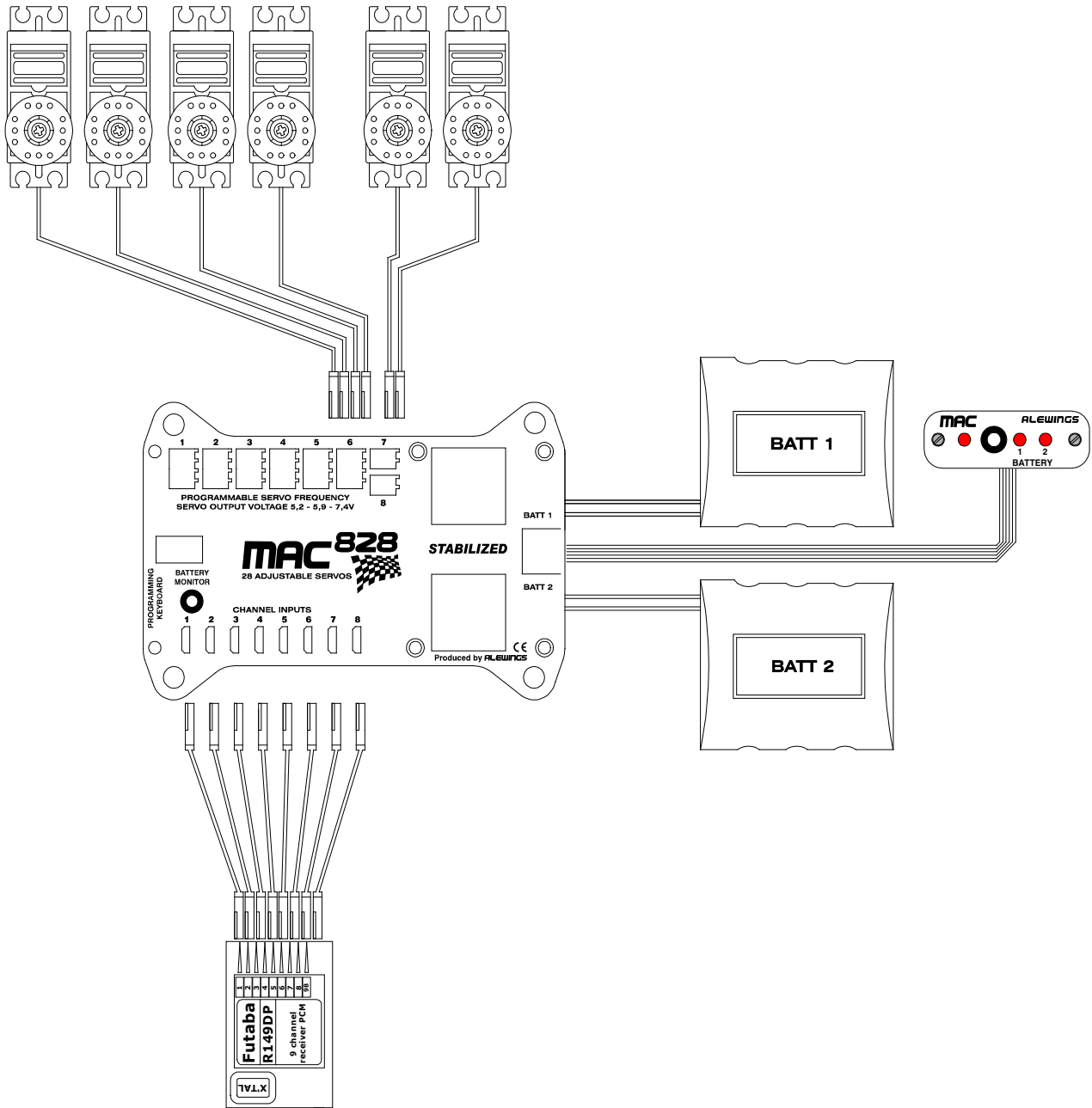


Figure 5

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USAGE INSTRUCTIONS:

Selecting servos output voltage:

MAC828 and MAC2 versions are equipped with voltage stabilizers for feeding servos. The output voltage is programmable through the placement of 4 micro switches at the bottom of the unit. Selectable voltages are 5.2V and 5.9V, see the following Figure for the proper setting.

Please note that, since the declaration of the manufacturer of servos to feed them with 4.8V, it is highly inadvisable to set the unit on 5.9V voltage. Use the output voltage of 5.2V.

Output voltage	Switch 1	Switch 2	Switch 3	Switch 4
5.2V	ON	ON	ON	ON
5.9V	OFF	ON	OFF	ON

5.2V output voltage setting



5.9V output voltage setting



Switching on the device:

Push ON/OFF button on the external panel (Figure 4) for at least 2 seconds. The 2 LEDs indicators will switch on and will flash quickly depending on the version (MAC1 – MAC2 – MAC828).

E0018A = MAC1, a sequence of 3 quick flashes. Charge indicator calibrated for 5 cells NiCd – NiMh (6V).

E0018B = MAC2, double sequence of 3 quick flashes. Charge indicator calibrated for 2 cells Io-Li Li-Poli (7,4V).

E0018E = MAC828, double sequence of 3 quick flashes. Charge indicator calibrated for 2 cells Io-Li Li-Poli (7,4V).

After 2 seconds, the system will be ready to use and the 2 LEDs indicators will indicate on the external panel the battery charge status according the following values and chart:

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VOLTAGE	FULL <i>1 flash every 4 sec</i>	NORMAL <i>1 flash every 2 sec</i>	PRE ALARM <i>1 flash every 500msec</i>	ALARM <i>Always switched on</i>
NiCd NiMh 5s 6V	> 6,3V	6,3V - 6,0V	6,0V - 5,8V	< 5,8V
Io-Li Li-Poli 2s 7,4V	> 7,5V	7,5V - 7,2	7,2V - 7,0V	< 7,0V

IMPORTANT: The indication of battery charge, does not correspond to the instantaneous voltage but the minimum voltage recorded during the flight.

The system records the 2 minimum noted voltage values, which are typically measured during the flight or under stress and keeps them until the system switches off.

This feature guarantees a double safety because it records the battery status during the flight where the battery are stressed and the operator cannot visually check over the battery charge status.

It could happen that at the end of the flight the led diode indicates a PRE ALARM status and the next time it indicates the NORMAL status. Be careful because in any case the battery is exhausting.

Switching off the device:

You have to push the ON/OFF button for at least 2 seconds to switch off the device. When you have pushed the button, the 2 light indicators will switch on continuously, then after 2 seconds they will switched off. Then when you release the button, the device will be placed on OFF status.



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PROGRAMMING MAC828 UNIT:

Formatting the memory:

Formatting the memory means to delete all servos settings. To format the memory:

- Connect the programming remote control to unit
- Push the buttons "PROGRAM", "DOWN" and "UP" and switch on the unit as shown in the previous paragraph
- Make sure that on the display appears the inscription "Er."
- Release the buttons "PROGRAM" "DOWN" and "UP"

Monitor status batteries:

MAC828 unit will allow you to know the minimum voltage reached by the two batteries. Thanks to a control circuit it will be possible, at the end of flight, checking the real status of the batteries.

Note: at the unit shutdown these data will be cleared.

- When MAC828 is switched on, push the button, on the unit, identified with the writing "BATTERY MONITOR"
- On the display it will appear ciclically the status of the two batteries, for example if the battery 1 has reached a minimum voltage of 7.6 V and the battery 2 of 7.4 V, on the display it will appear cyclically the following written:

b1 7.6 b2 7.4 b1 7.6 b2 7.4 ...

The display will switch off automatically after 30 seconds.

It is possible to switch it off manually by pushing again the button "BATTERY MONITOR. It is possible to enable the display by the programming the remote control acting on the button "MONITOR".

Programming servos

Connect the programming remote control to MAC828 unit as shown in the "Links" paragraph. Switch on MAC828 and verify the proper functioning of servos through the use of radio control

Buttons description:

- Button "*PROGRAM*": It is used to step up and down in the setup menu and to confirm the settings.
 - To confirm a setting or to step up the menu, push and hold for more than 1 second
 - To step down the menu, quickly push it

Long press stores the data and continues in the programming.
Short press, does not store the data back to the previous menu

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- Button "UP": Within each level of menu, it is used to select the next variable or to make adjustments on individual servo (anticlockwise direction).
- Button "DOWN": Within each level of menu, it is used to select the previous or variable to make adjustments on individual servo (clockwise direction).

Channel selection: the first step is to select the channel to program.

- Push and hold "PROGRAM" for more than 1 second.
 - The display shows "C1"
- Push the "UP" or "DOWN" to select the desired channel.
- If you want to confirm the selected channel and if you want to proceed with servos setting, push "PROGRAM" for more than 1 second. Otherwise if you want to exit the menu and return to normal functioning, push "PROGRAM" quickly.
 - The display shows the flashing writing "CE", the programming phase of the maximum servo excursions

Excursions setting: Before proceeding with the programming of the real movement of servos, you should store in advance in MAC828 the maximum excursions of the regular channel in the transmitter.

- When "CE" is flashing on display (flash = not yet stored) put the stick of the transmitter at the center and push "PROGRAM" for more than a second, it will appear the writing "Pr" (data stored) and then it will appear the stable writing CE that it means that the center position is stored (not flash = stored).

Move the stick of the transmitter related to the channel you are programming to the end of run. It will appear the flashing writing "Hi" and "Lo" (data not stored).

- Hold the stick fixed at the end at the end of "Lo" side and push "PROGRAM" for more than a second. It will appear the writing "Pr" (data stored) and then it will appear the fixed writing "Lo" (low side stored)

Return the stick in the center and check that appears the fixed writing "CE"
Repeat the same procedure to store end of "Hi" side.

Note: Only after having successfully saved the channel center and the "Hi" and "Lo" ends the display will not flash more and the movement of the stick will display the fixed writings "Hi" "Lo" "CE".

Reset end trips: If you want to reset the programming "Hi" "CE" "Lo", push simultaneously the keys "UP" and "DOWN"
Later it will appear the flashing writing "CE".



Servo selecting: Now we execute the selection of servo, to set the direction of rotation and excursions of movement

- Moving the stick of the transmitter and put it to the position (Hi CE or Lo) in which you want to regulate servos. It is advisable to start with "CE". With the display switched on fixed on "CE" push "PROGRAM" for more than 1 second. When the writing "d1" will appear, release the stick of the transmitter.
- Push "UP" or "DOWN" to select the servo where you want to make the adjustment. You must refer to Figure 1 to see the position of servo..

Programming rotation sense: If you want to reverse the direction of rotation of the servo press "MONITOR"

On the display it will appear the writing "Fo" (direction of rotation forward) or "rE" (direction of rotation reverse)

To change the direction of rotation, push "Monitor", and simultaneously push "DOWN" and "UP" to select "Fo" or "rE"

To store the data release simply "MONITOR".

Servo adjustment: Now you can regulate the movement of servo selected.

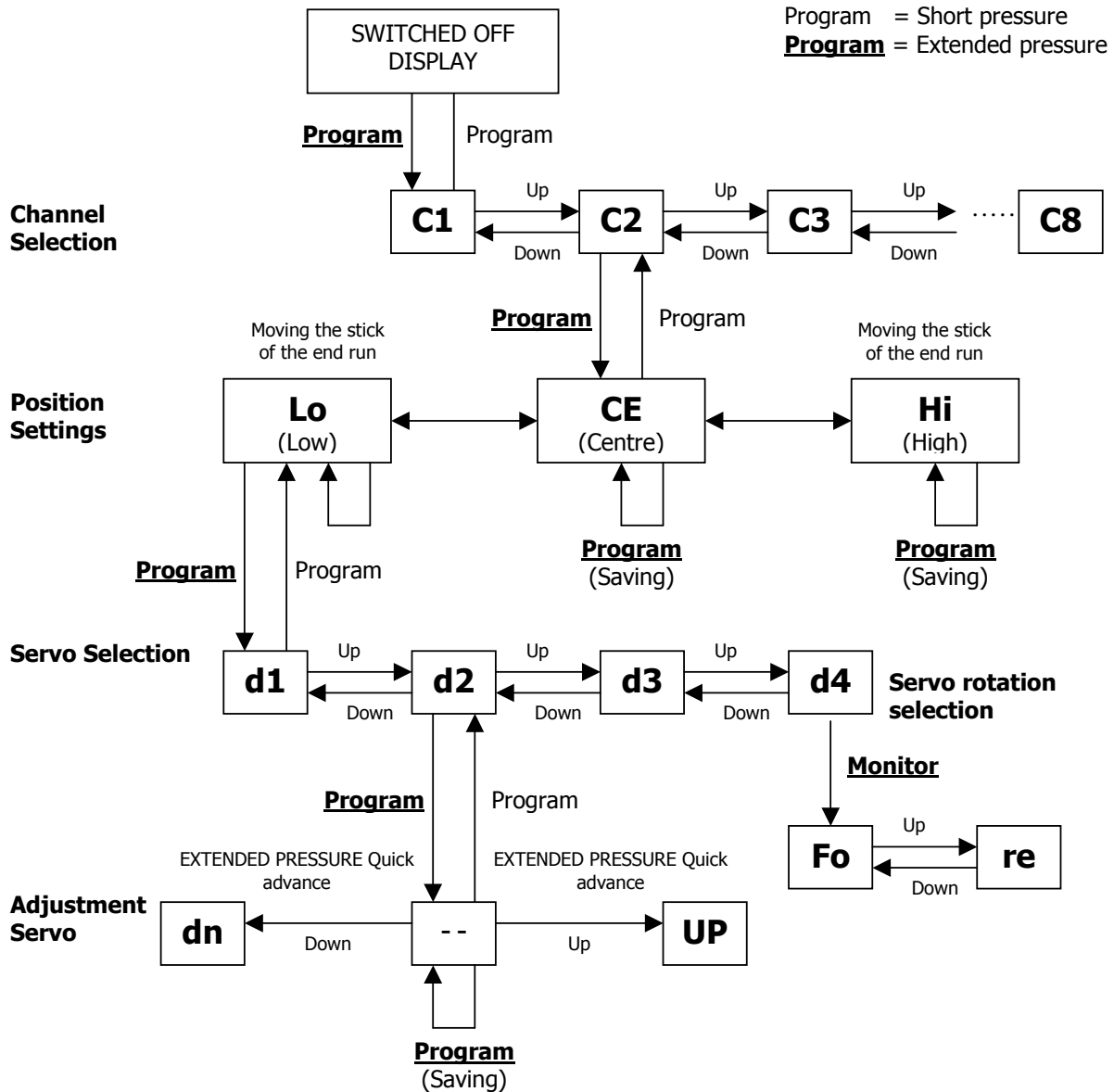
- Once positioned on servo you want to program (for example with the display indicating "d1"), push "PROGRAM" for more than 1 second
 - The display shows "- -"
- Press "DOWN" or "UP" to do the adjustment: pushing shortly one of two buttons, servo will progress of a single step (corresponding to 0.1 °) while holding it down continuously, it will advance quickly.
 - The display shows "UP" if you push the button "UP"
 - The display shows "DOWN" if you push the button "DOWN"
- Once the adjustment is optimal, push "PROGRAM" for more than 1 second to save the setting.
 - The display shows "Pr" (programmed) and then displays again "d1"
- Select a new servo and proceed in the same way, before programming the movement of servo always select the direction of rotation.
- By pushing shortly "PROGRAM" you will go back one step into the menu to select a new location "Hi CE Lo". Repeat the programming procedure here described also for the end of run switches "Hi" and "Lo" ends.

Return to Normal working:

Once you have executed the procedure for all servos, for all positions (Hi CE and Lo) and for all channels, you can exit the programming menu.

To do this, you have to push quickly the button "PROGRAM" to come back, until you get the shutdown of the display.

A block diagram representing the flow of programming is shown below:





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Technical peculiarities:

Inputs receiver:	8 channels with separate power and active filters	
Servo outputs:	28 total outputs (6 channels at 4 outputs, 2 channels at 2 outputs).	
Switches:	double electronic and controlled by a button	
Batteries status indicator:	double with single led diode and state of memory Minimum voltage reading display (only for version MAC828)	
Power:	double 5 cells NiCd NiMh	MAC1
	double 2S LiIon – LiPoli	MAC2
	double 2S LiIon – LiPoli	MAC828
Functioning voltage	+7,4V	MAC2 e MAC828
Functioning voltage	+6,0V	MAC1
Output voltage	programmable from 5.2V 5.9V 36A stabilized MAC2 and MAC828	
Output voltage	not stabilized	MAC1
Voltage loss	300mV @ 20A	MAC1
Total power supplied:	36A at maximum	
Precision servo programming	0,1°	
Range movement programming	+/- 12.5° for each position (centre, end of run high and low)	
Maximum power for every output:	3A continuous, every output protected for short circuits	
Absortion of switched off leds:	200 mA @ 7.4V	MAC828
	150 mA @ 7.4V	MAC2
	150 mA @ 6.0V	MAC1
Size of device:	130x69x27 mm	
External panel size:	45x15mm	
Weight with connection cables:	180gr	MAC828
Control and external connections	175gr	MAC2

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150gr

MAC1

Functioning temperature: -10 up to +60°C

WARNINGS

Not to draw up the device to:

- Heat above +60 ° C
- Gas mixtures, alcohol or solvents
- Do not place in the device in humid places
- Not cause short-circuits, absolutely not introduce metallic objects within the electronic circuit
- Do not cause short circuits on servos output connectors
- If not in use for more than 36 hours we recommend you to disconnect the batteries.
- Disconnect the power source when not in use
- Do not damage or remove lower or higher protections

For cleaning units MAC SERIES units:

- Use a soft cloth
- Do not use corrosive solvents
- If necessary scouring with detergent-based soap avoiding wetting sensitive parts such as electronic connectors and plate.

USERS NOTICES:

Warnings:

Not put near a source of heat above +60°C, mixture of gasoline, alcohol or solvents, don't place the device in humid areas, not cause short circuits, not damage or remove the thermo constricting protection.

AEE Waste disposal:

According to art.13 of the Legislative Decree of July 25th 2005, n.151, "Implementation of Directives 2002/95/EC, 2002/96/EC and 2003/108/EC, concerning the reduction of hazardous substances for electrical and electronic equipment and disposal of waste".

The symbol of the crossed rubbish bin shown on the equipment or on its packaging, indicates that the product at the end of its useful life must be collected separately from other waste.

At the end of its use, the user will have to bring the equipment to its suitable separate collection of electronic and electro-technical rubbish or bring it back to the dealer at the moment of the purchase of a new similar device.

The proper collection of the desued recycling equipment, the treatment and the environmentally compatible disposal contributes in preventing possible adverse effects on the environment and human health and it furthers the reuse and/or the recycling of materials.

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Improper disposal of products involves the application of administrative sanctions provided by law.