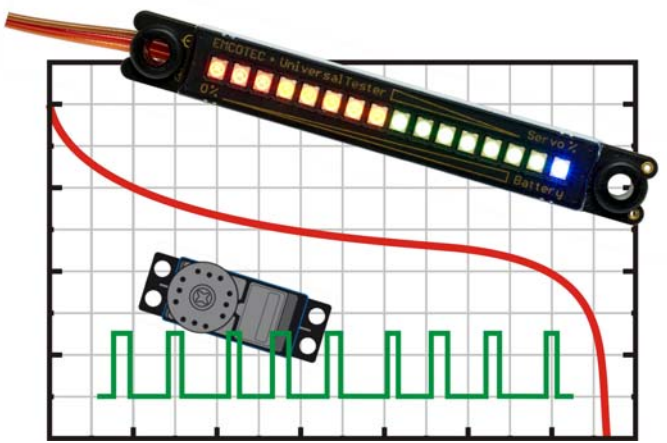
EMCOTEC®

embedded controller technologies

English

UNIVERSAL-TESTER



Operating Manual

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1. Preface

Dear customer,

we are glad that you decided for the **UniversalTester** from EMCOTEC. Despite simple handling of this product, operation and usage demand some knowledge from the user. This manual will introduce you quickly to this device.

In order to reach this goal safely carefully read this manual and safety instructions before operating your **UniversalTester**.

We wish you success and fun with this high grade product!

Exclusion of liability:
This product is exclusively designed and approved to be mounted into radio controlled RC models. EMCOTEC assumes no liability if used otherwise.

Both, adherence to the operating instructions as well as conditions and methods of operating the **UniversalTester** can not be monitored by EMCOTEC.

Therefore, we assume no liability whatsoever for loss, damage or cost which result from erroneous usage and operation or which can be linked to such events.

As far as allowable by law, commitment for indemnification, independent of any legal foundation, is limited by the invoice value of the directly engaged products causing the damaging event.

This does not hold true if for mandatory statutory provisions unlimited accountability is demanded due to deliberate intention or grossly negligence.

Wehringen, September 2010

The Staff of EMCOTEC GmbH

2. EMCOTEC UniversalTester

- Intelligent multi-meter device – simple to configure
- 16 ultra bright light emitting diodes for indication of different functions (bar graph)
- Battery State Check: displays approximate charge state of a battery
- Voltage Monitor: displays voltage of voltage source
- Servo Pulse Monitor: indicates servo position of a receiver output
- Alarm-Output for an external control LED
- Huge operating voltage range from 6V up to 16.8V (up to 4S LiPo)

The EMCOTEC **UniversalTester** is a high precision measuring device with optical display (bargraph). On one hand, this universal tester informs the user about the voltage state of the battery using 16 ultra bright light emitting diodes, on the other it functions as an indicator for the servo position of a receiver output. The appropriate function is easily selected by simple programming.

The following battery types can be monitored by **UnivesalTester**: 2S, 3S, 4S LiPo, 5 / 6 cell NiMH, 2S, 3S, 4S LiFePO4. Furthermore, the **UniversalTester** can be used as bar graph. In this case, each LED corresponds to a linear voltage increase of 100mV, 200mV, 300mV, 400mV or 500mV. The display ranges from approx. 6V to 14V. Different display modes allow for exact evaluation of the power supply.

A separate output serves as connector for an external alarm-LED. The LED indicates the on-/off state of the equipment as well as an impending low voltage of the battery by blink code. An external alarm-LED (Part Nr. A71056) is available as accessory.

When connected to a receiver channel, the **UniversalTester** is usable as a servo pulse monitor. One illuminated LED means 10% servo travel. Each additional increase in position by 10% turns on one more LED. Using 15 LED's allows for indication of 150% servo travel. The 16th LED indicates the "direction of spin" of the servo channel: LED on = positive servo values, LED flashes = negative servo values. This **UniversalTester** allows for quick evaluation of the servo position on a receiver channel.

Mounting is done vibration protected by two cable support sleeves using two screws.

3. Turning On

With each power-on, all LEDs temporarily are controlled in "Knight Rider Style", i.e. the LEDs move on from one side to the other and back again. This walking light serves as test for all LEDs.

After this self-test, the corresponding program starts: either as battery state tester, as voltage monitor or as servo pulse monitor.

Hint:
At delivery, the **UniversalTester** is always programmed in operating mode "Battery State Tester, 2S LiPo".

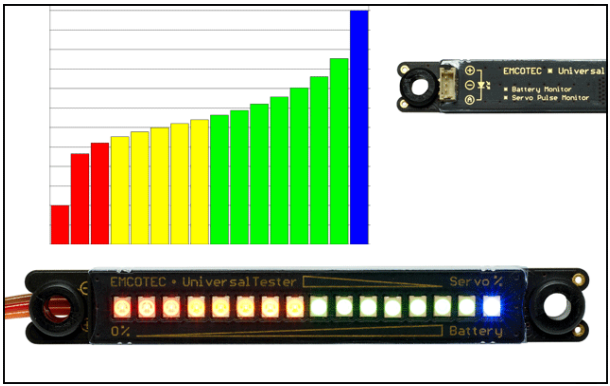


4. Battery State Check

In operating mode battery state test the level of capacity of the connected battery is displayed by the LEDs. The colors of the LEDs indicate different meanings:

Blue means:	Voltage is little over charging end limit. The battery therefore is complete full or nearly “over charged".
Green means:	The battery is almost fully charged and all is in "green" range.
Yellow means:	The battery reaches discharge state soon and should be recharged.
Red means:	The battery is almost empty and should be recharged immediately.

The display of the LEDs correspond approximately to the characteristic (discharge curve) of commercially available batteries for model building.



After power-on and self-test, all LEDs are turned on corresponding to the maximum value of the actual voltage (e.g. first 13 LEDs). The LEDs are turned on simultaneously for five seconds in order to provide a quick overview. After these five seconds, only the LED remains on, which corresponds to the actual voltage of the battery (this is e.g. LED 13). Because only one LED is on, this does not load the battery (lower current consumption).

If a battery's internal resistance is relatively high, its voltage drops more or less significantly when loaded. When the load is removed, the voltage increases again. The same holds true, if the battery is almost empty. Here too, the voltage drops significantly. The **UniversalTester** recognizes the smallest measured voltage and indicates this by a second blinking LED (2 Hz). The further the second blinking LED for minimum voltage and the steadily lit LED for the actual voltage are apart, the more critical is the current supply (battery) to rate.

Hint:
Blinking of a LED for indicating a minimum battery voltage only occurs if there is at least one LED distance between the actual and the minimum voltage.

4.1. Alarm-LED

The connector of the alarm-output is covered by a shrink hose at delivery to avoid short circuits caused by metallic small parts. In order to connect the LED, the shrink hose is to cut around the connector using a sharp knife (cutter).



The alarm-output of the **UniversalTester** controls an external bright LED (optional accessory, part number A71056), which e.g. is mounted in the sidewall of the fuselage. The alarm-LED with its 10 mm / 0.4" diameter is turned on steadily in normal operation and therefore indicates a powered system. If the **UniversalTester** recognizes an impending low voltage, the LED outputs blink codes. It then flashes several times. Alarm information corresponds to low voltage codes of the DPSI®-Family. The blink code is repeated regularly.



Hint:
For the battery state test, the remaining capacity of the battery is monitored by its voltage. If the battery voltage (depending on battery type) drops below a defined threshold, this is qualified and output at the alarm-output. The threshold is at approx. 60% to 70% of discharge.

The 4S LiPo battery (B) (program 10) has a special status. Here, the low voltage is rated differently. This is not indicated by an error code but rather by turning the electronics off (sleep mode). If the power off threshold falls below 12.8V, this is indicated by active setting at the alarm-output. If the sleep mode threshold of 12.0V is reached, all LEDs and the complete electronics of the **UniversalTester** are turned off (sleep mode). Due to powering off, no current is consumed. Therefore, the battery can not be deeply discharged.

Hint:
In program 10 (4S LiPo battery type B) the **UniversalTester** turns itself off completely and automatically, if the supply voltage drops below 12V.

6. Voltage Monitor (linear)

In this mode (program 11 to 15) the battery voltage is not monitored and the display of the LEDs does not follow discharge curves of the batteries. Here, the display behaves totally linear, i.e. a voltage change results in a directly proportional display of the LEDs. Depending on the program, voltage steps of 100mV, 200mV, 300mV, 400mV or 500mV per LED are displayed. The alarm-output of the **UniversalTester** is not driven by these programs.

Hint:
With the linear voltage display, only one LED is on at any given time, indicating the corresponding voltage. There is no minimum indication by an additional blinking LED as is the case for battery state test.

7. Servo Pulse Monitor

For testing or monitoring the receiver signal (servo pulse), all 16 LEDS are in use. Here, the last LED (blue) indicates the signal range the signal is in (positive or negative). For negative values (-0% … -150%), the blue LED flashes very fast (10Hz), for positive values (+0% … +150%), the blue LED is on steadily. The other LEDs are divided into 10% steps. The wider the servo position the more LEDs are turned on. The percental display corresponds to the JR range.

-100% mean 1.1ms pulse length, 0% mean 1.5ms and +100% mean 1.9ms pulse length. The last red LED indicates a servo position of >= +/-150%.

Graupner/JR (20msec) as well as robbe/Futaba (14msec) frame rate is supported. The high speed mode of Futaba (7ms pulse distance) is supported also.

In case of error, i.e. there is no servo signal or the signal is out of the permissible range (smaller than 0.7ms or wider than 2.3ms), all LEDs flashes very fast with 10Hz. There is no change at the alarm-output of the **UniversalTester**.

8. Programming

The **UniversalTester** supports different operating modes and therefore must be programmed. This programming can be changed arbitrarily often and is stored after each programming action.

Hint:
In order to correctly execute programming, the supply voltage must be at least 6.0V. If program 10 (4S LiPo battery B) is activated, the supply voltage must be at least 12V!

Hint:
In program 10 (4S LiPo battery B) the **UniversalTester** turns itself off automatically if voltage is below 12V (sleep mode). This is intended and is NO malfunction!



Programming overview:

1.) Bypass programming contacts (using tweezers or similar)
2.) Provide supply voltage
3.) Wait, until all LEDs flash simultaneously
4.) Open programming contacts
5.) Wait, until corresponding program LED blinks (1, 2, 3, … 15)
6.) Bypass programming contacts again
7.) Wait, until program LED does not blink any more
8.) Open programming contacts
9.) Done!

Before providing supply voltage short the programming contacts (e.g. using tweezers or small pliers). As soon as the supply voltage is provided and programming is recognized, this is signaled by blinking of all LEDs twice. Now, remove the short of the programming contacts. The **UniversalTester** is in programming mode now.

Hint:
The **UniversalTester** waits until the short of the programming contacts is removed or the supply voltage is disconnected. During this wait time, all LEDS are turned off.

Now, the first red LED blinks for three seconds. Then the second red LED blinks for three seconds, then the third LED and so on. Each blinking LED represents a certain program. You can select between 15 programs all together. The 16th program is unused. If only the first LED blinks this means program 1, if LED 2 blinks, this means program 2 and so on.

In order to confirm a setting (i.e. selecting a program) the programming contacts must be bypassed again within three seconds while the corresponding LED blinks. This confirms the setting and saves it permanently.

The programs are defined as follows:

1. Receiver Signal Test (Servo Signal Test)
2. Voltage Indication 2S LiPo Battery
3. Voltage Indication 3S LiPo Battery
4. Voltage Indication 4S LiPo- Battery
5. Voltage Indication 5-cell NiMH Battery
6. Voltage Indication 6-cell NiMH Battery
7. Voltage Indication 2S LiFePO4 Battery
8. Voltage Indication 3S LiFePO4 Battery
9. Voltage Indication 4S LiFePO4 Battery
10. Voltage Indication 4S LiPo Battery (B) (Special case)
11. Voltage Indication 6,1 to 7,6V linear
12. Voltage Indication 6,2 to 9,2V linear
13. Voltage Indication 6,3 to 10,8V linear
14. Voltage Indication 6,4 to 12,4V linear
15. Voltage Indication 6,5 to 14,0V linear
16. Unused Programming Slot

Hint:
Voltage characteristics of the batteries correspond to usually used types in model building. It is assumed a load of the batteries of 0.5C to 1C.

Voltage levels / display are based on the following battery types:

LiPo battery:	KOKAM 3.3Ah @ 0,5C discharge
NiMH battery:	Sanyo HR-4/5 AU @ 1C discharge
LiFePO4 battery:	A123 @ 0,5C discharge
LiPo battery (B):	KOKAM 25Ah @ 0,5C discharge

The following page shows all programs and their assigned thresholds of the LED indicators. Program 16 is unused.

Hint:
Resolution of the voltage (accuracy) is approx. 50mV (0.05V).

Programm		Anzeige der LED-Kette (links rot, rechts blau)															
1	RX-Signal	150%	140%	130%	120%	110%	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%	+/-
2	2S LiPo	6,40	6,98	7,10	7,15	7,20	7,23	7,26	7,29	7,33	7,38	7,44	7,51	7,61	7,72	7,91	8,40
3	3S LiPo	9,60	10,47	10,65	10,73	10,79	10,84	10,89	10,93	10,99	11,06	11,16	11,27	11,41	11,58	11,86	12,60
4	4S LiPo	12,80	13,96	14,20	14,31	14,39	14,45	14,51	14,57	14,65	14,75	14,88	15,03	15,22	15,44	15,82	16,80
5	5 NiMH	4,99	5,56	5,74	5,85	5,93	5,99	6,03	6,06	6,08	6,10	6,12	6,13	6,15	6,20	6,44	6,91
6	6 NiMH	5,99	6,67	6,88	7,01	7,12	7,18	7,23	7,27	7,30	7,32	7,34	7,36	7,38	7,43	7,73	8,29
7	2S LiFePo	4,00	4,21	4,43	4,64	4,85	5,07	5,28	5,49	5,71	5,92	6,13	6,35	6,56	6,77	6,99	7,20
8	3S LiFePo	6,00	6,32	6,64	6,96	7,28	7,60	7,92	8,24	8,56	8,88	9,20	9,52	9,84	10,16	10,48	10,80
9	4S LiFePo	8,00	8,43	8,85	9,28	9,71	10,13	10,56	10,99	11,41	11,84	12,27	12,69	13,12	13,55	13,97	14,40
10	4S LiPo (B)	12,80	13,31	13,61	13,79	13,92	14,03	14,15	14,28	14,42	14,60	14,79	15,05	15,35	15,69	16,12	16,80
11	100mV linear	6,10	6,20	6,30	6,40	6,50	6,60	6,70	6,80	6,90	7,00	7,10	7,20	7,30	7,40	7,50	7,60
12	200mV linear	6,20	6,40	6,60	6,80	7,00	7,20	7,40	7,60	7,80	8,00	8,20	8,40	8,60	8,80	9,00	9,20
13	300mV linear	6,30	6,60	6,90	7,20	7,50	7,80	8,10	8,40	8,70	9,00	9,30	9,60	9,90	10,2	10,5	10,8
14	400mV linear	6,40	6,80	7,20	7,60	8,00	8,40	8,80	9,20	9,60	10,0	10,4	10,8	11,2	11,6	12,0	12,4
15	500mV linear	6,50	7,00	7,50	8,00	8,50	9,00	9,50	10,0	10,5	11,0	11,5	12,0	12,5	13,0	13,5	14,0
16	frei																

9. Safety Instructions

- In general, all connecting lines should be run so that they do not come into contact with moving or hot parts of the model (such as servos, gears or sound absorbers).
- The **UniversalTester** must be protected from humidity and moisture.
- Improper handling of the **UniversalTester** can result in serious damage/injury to property or persons!
- Carry out a general inspection of all connections in your model before each use! All plugs must be correctly polarized and have clean contacts (i.e. fit tightly). Loose cables present a potential hazard!
- Under no circumstances may power sources that do not meet the specified voltages be used.
- The current-conducting contacts of the connector plugs may not be short-circuited. If you fail to observe this warning, the short-circuited cables may overheat and even melt.
- The **UniversalTester** may not be taken apart or technically altered under any circumstances.
- Never use the **UniversalTester** for purposes other than for RC model making as a hobby. Above all, their use in passenger-carrying equipment is strictly prohibited.
- Operate the **UniversalTester** only with the remote control components provided for model making.
- Always ensure that you have fully charged batteries when operating your model. Empty batteries inevitably lead to failure of the RC components, which cause the model to crash.
- Do not expose the **UniversalTester** to any extremely hot or extremely cold temperatures, moisture or humidity. This would lead to danger of malfunction, damage or decreased efficiency.
- Only use (by us) released accessories in connection with the **UniversalTester**.

10. Technical Data

Operating Voltage range	6.0V 16.8V
Current Consumption (Sleep Mode)	Ca. 2µA
Current Consumption (Average)	Ca. 17.5mA @ 7.4V
Current Consumption (Maximum)	Ca. 130mA (all LEDs on)
Measuring Accuracy	Ca. 50mV
Connection Cable	JR/Uni with gold plated contacts, 30cm / 1' long
CE-Test	according to 2004/108/EC
Environmental Conditions	-10°C .... +50°C / 14°F ... 122°F
Permissible Temperature Range	-25°C .... +70°C / -13°F ... 158°F
Dimensions	92,0mm x 12,4mm x 6,2mm (L x B x D) / 3.62" x 0.48" x 0.24" (length x width x thickness)
Hole Distance for Mounting	81mm / 3.19"
Weight	Ca. 10g / 0.022046 pounds
Warranty	24 month

Technical modifications and errors excepted!



11. Warranty

EMCOTEC GmbH shall issue a 24-month warranty on the **UniversalTester**. The guarantee period shall begin with delivery of the equipment by the retailer and shall be not extended by any guarantee repair or guarantee replacement.

During the period of guarantee, the warranty shall cover the repair or replacement of any proven manufacturing or material defects at no charge. There shall be no specific entitlement to repair work. In case of a guarantee claim, the manufacturer shall reserve the right to exchange the equipment for a product of equal value if repair of the item is not feasible for economic reasons. There shall be no assumption of liability for consequential damages that are brought about by a proven defect during operation of the **UniversalTester**. There shall be no extended claims for damages.

- All transportation, packaging and travel expenses shall be borne by the purchaser.
- No liability shall be assumed for any damages during transport.
- If repair is needed, the equipment must be sent to the appropriate service center of the respective country or directly to EMCOTEC GmbH.
- The guarantee shall only be valid when the following conditions are met:

  The guarantee document (original invoice) must include the delivery date, the company stamp, the serial number and signature of the retailer.

  No intervention in the equipment may have been undertaken.

  It must have been operated in accordance with our operating instructions.

  Only the power sources and other accessory devices and components that were recommended by us may have been used.
- The guarantee document, the original invoice and other pertinent information regarding the malfunction (a short description of the defect) must be included with the transmittal.
- The equipment must still be the property of the initial purchaser.
- If equipment is sent in that later proves to be functional following an initial inspection, we shall impose a flat processing fee of € 15.
- In all other respects, the general business terms and conditions of EMCOTEC embedded controller technologies GmbH shall apply for any items not listed.

Legal information:



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- EMCOTEC
- DPSI
- DPSI RV

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EMCOTEC®
embedded controller technologies

EMCOTEC GmbH ☎ +49 (8234) 95 98 95 0
Waldstr. 21 +49 (8234) 95 98 95 9
D - 86517 Wehringen info@emcotec.de

www.rc-electronic.com