Modell-UBOOT-Spezialitäten

user manual

Ballast Tank Switch

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NORBERT BRÜGGEN

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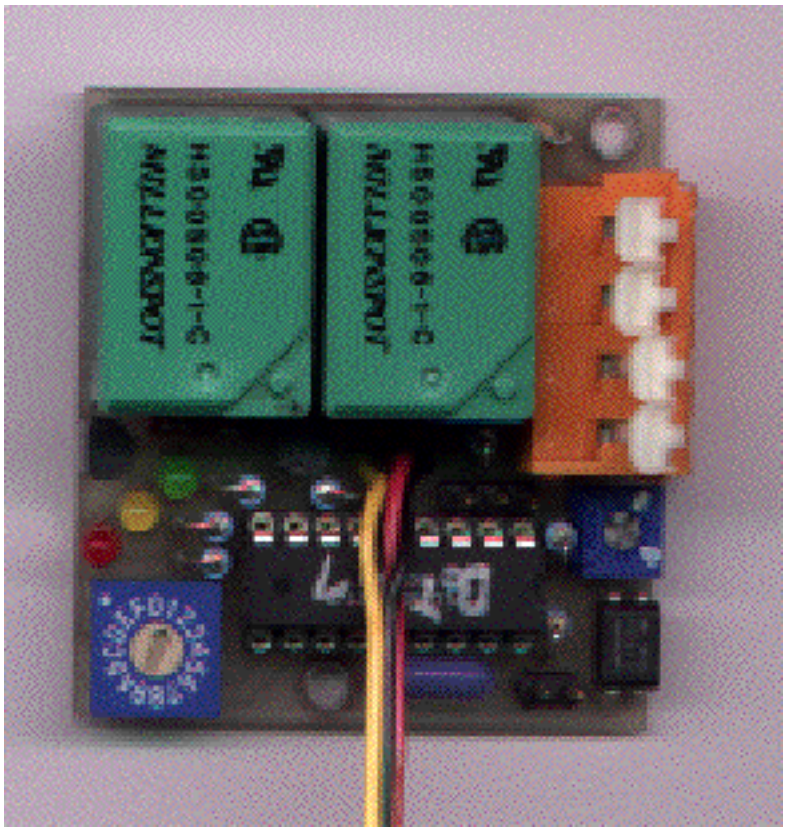
Why ?



Two switch functions on one proportional canal? „That's stoneage RC." You are right with that, but...

The classic solution is a servo with two microswitches. This worked for decades and is quite reliable. But it is big and clumsy and does not fit into small boats.

More elegant is a electronic switch circuit with one or two relais. But these are not fail proof when the transmitter signal becomes weak. The relais start flickering and the attached motor jumps back and forth.

Both variants do not have a defined behavior when the signal is lost completly. But a submarine should at least blow it's ballast tanks under this condition.

Function

The Ballast Tank Switch decodes a proportional (=servo) canal from the receiver to a forward – stop – backward switch function for a motor. In neutral position of the stick both relais are off and the motor is stopped. On half way to either end of the stick travel one relais is activated and the connected motor starts turning. The relais action is monitored by a yellow and a green LED

The switching takes place after a short delay of some 1/10th seconds to filter short fail pulses. The on and off points of a relais differ a little (hysteresis). This prevents the relais from flickering.

If the signal is lost – due to great depth or other circumstances – the Ballast Tank Switch will switch to „blow". This failsafe function can be delayed (0, 5, 10 or 30 sec) so that not every twitch can ruin the subs trim.

When the two terminals of the water sensor are connected by water or wire the „flood" relais is blocked. A new diving is though prevented. The red LED flashes to indicate the reason.

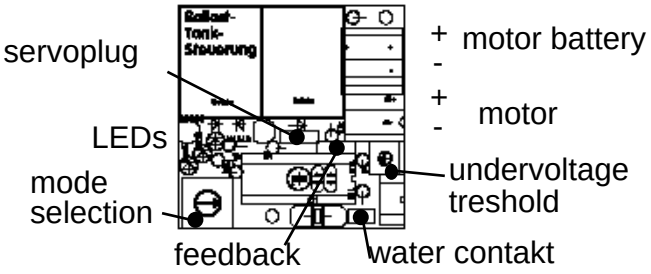
The voltage of the motor battery is permanently monitored. When it falls below the „empty" mark (preset to 9V for a 12V battery) for more than 6 seconds the unit will activate the „blow" relais. The red LED flashes in groups of two.

When you have undervoltage condition at startup, the unit works in test mode. This means the red LED flashes in long intervals and the undervoltage monitor is deactivated. This is usefull during workbench tests without motor battery or when you use a different voltage and have not yet readjusted the treshold voltage.

The feedback input can be used with the „automatic trim" switch of ENGEL piston tanks.

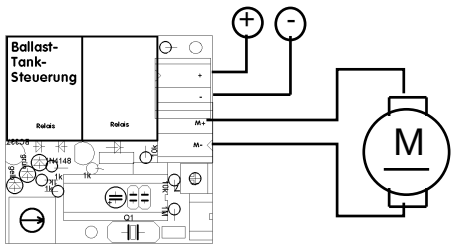
Connection

Obviosly the servo connector has to be pluged into a receiver output.



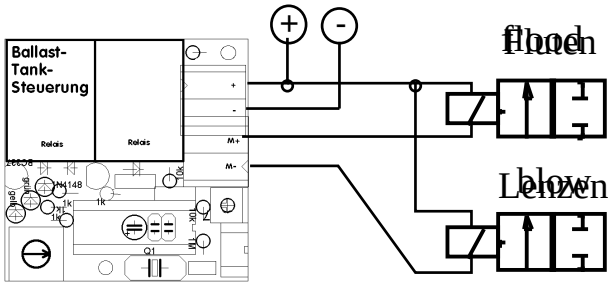
placement of connectors

The relais are internally connected to form a forward – stop – backward circuit. This makes connection of a motor simple.



basic connection (peristaltic pump etc.)

One precaution should be taken when setting up the circuit: Use a fuse in the battery connection! If there is a mistake you may otherways damage the unit or even burn your fingers. There is an emergency fuse (thiner cooper track) on the solder side of the pcb. It will burn at aprox. 30 Amp. If you blow this, replace it with a fuse, not a wire!



connecting two solenoid valves

Presurised air ballast system

The Ballast Tank Switch can also be used with a pneumatic or gas system that has two solenoid valves. The delay of the failsafe function is especially usefull here to safe gas during short interruptions of the RF link.

Piston Tank with stop switches

Connecting a piston tank with stop switches is a little more complicated. Two alternative schematics are possible (diagrams on next page):
Using diodes reduces the wiring but the motor stopps smooth (maybe too smooth) and it restarts in opposite direction with reduced power. This may be evident in a 6V system. The diodes must withstand the startup current of the motor.

The variant without diodes lets the motor stop abruptly and restart at full power.

Water contact

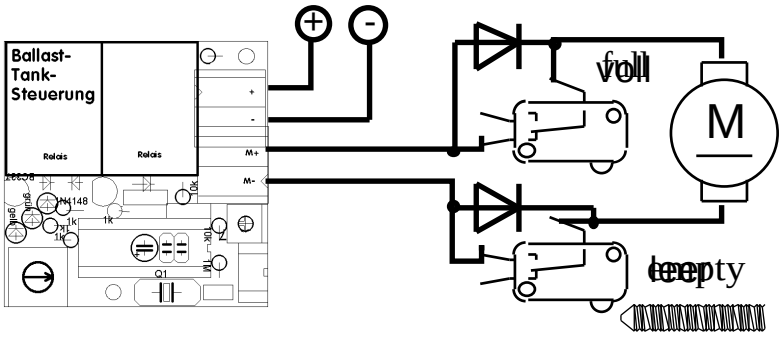
The water sensor is connected to the two terminal plug. As sensor two unisolated wires of 10mm length (=± 1/2'') and 1-3mm distance(=± 1/16 - 1/8'') are well suited. A test with a wet finger verifies the function.

Feed back input

The feedback input of the standart version is set up to work with the „automatic trim" switch of ENGEL piston tanks. When the outer pins are connected the „blow" relais is activated but can be overriden by a „flood" from the transmitter.

This results in a „trim automatic" without extra channel: When you hold the stick to „flood" the tank will fill completly resulting in negative boyancy. When you release the stick the piston

will travel back to the „trimed“ switch and the model is equally boyant (If you trimmed the lead ballast appropriate)

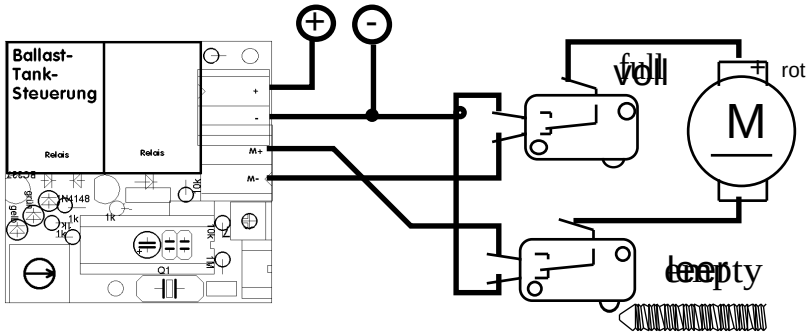


piston tank with stop switches and diodes

red LED

off:	all systems ok
on:	RF contact lost
flash:	water contact
flash double:	undervoltage

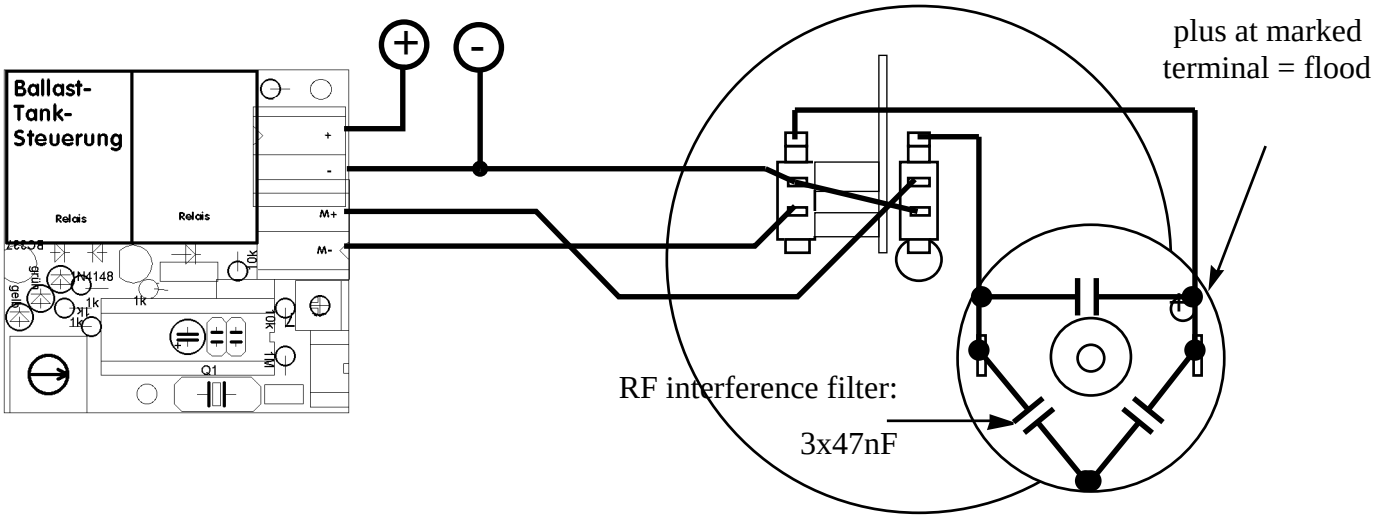
flash in long intervals: undervoltage monitor deactivated



piston tank with stop switches

preset switch

0,4,8,C:	Futaba, Becker
1,5,9,D:	Graupner
2,6,A,E:	old Robbe
3,7,B,F:	Futaba FC PCM
0…3:	no delay
4…7:	5s
8…B:	10s
C…F:	30s



a more mechanical view of the same schema

technical Data

receiver voltage:		Input pulses	positiv, 1,0 - 2,5ms, fits to all RC brands
safe	4.0 - 6.0V	dimensions	48x45x20 mm open PCB
possible	3.0 - 7.0V		
consumption	0,5mA idle 100mA active relais	weight	49 g

Version DRServo

This special version is designed as a servo amplifier for a proportional ballast tank.

An additional feedback poti measures the actual piston postion and the controller moves the motor appropriate so that the piston moves parallel to the lever at the transmitter.

This servo piston tank gives a maximum of controll to the pilot. He can always determin how much water is in the tank.

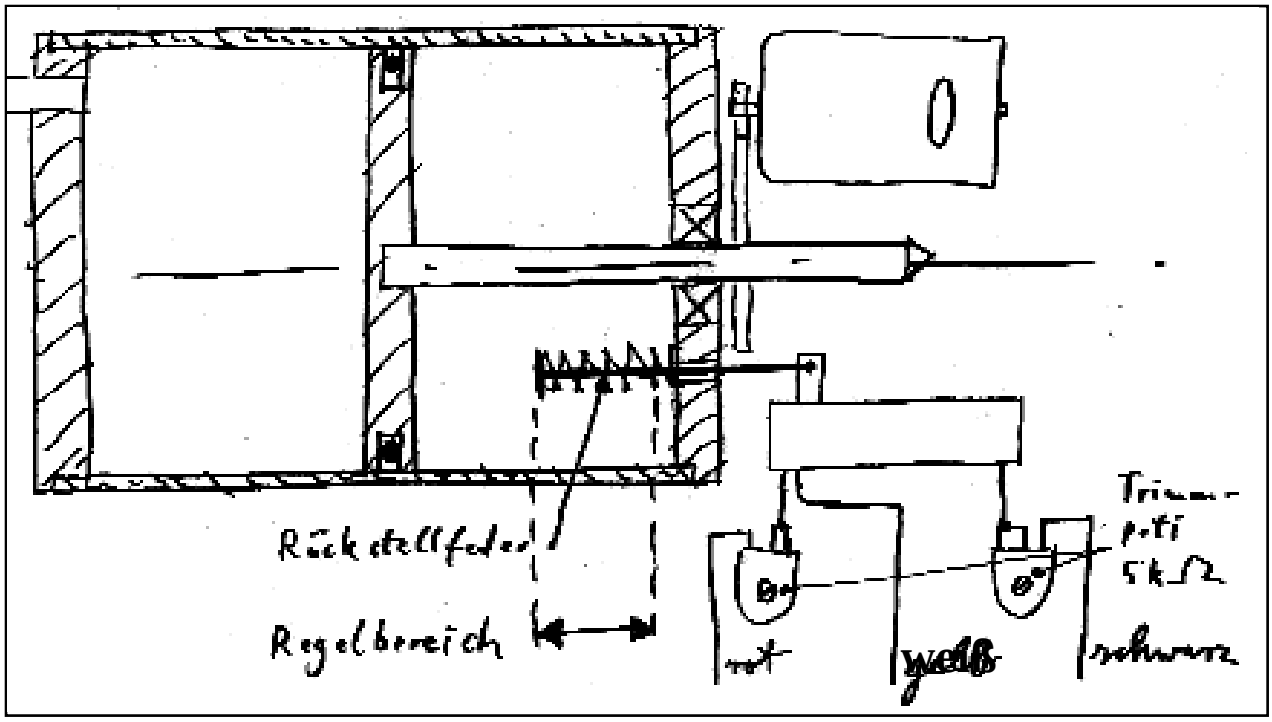
Even after a failsafe blow the position that is commanded from the transmitter is readjustet automatically.

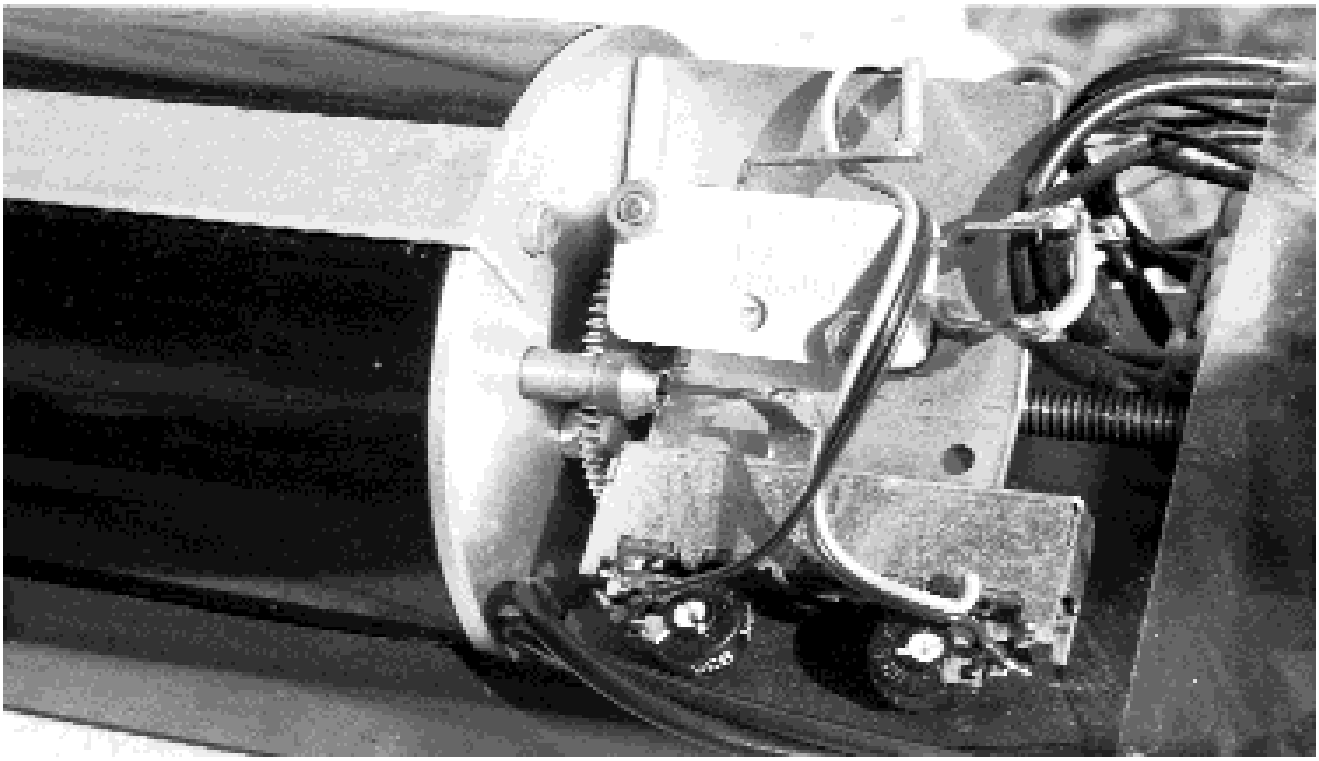
The feedback poti can be any type of 10kΩ poti. Resistor values of 5 to 100kΩ will work. The mecanical type may be a linear poti as well as a 270° or multiturn poti.

The controller will use the center two quaters of the full travel as working region. By adding two trim potis this can be streched to the complet travel. The trim potis have to be adjusted to your transmitter individually.

The poti(with the trimm potis) is connected to the feedback connector on the PCB. A standart servocable fits perfectly. The white cable has to point to the LED on the PCB and is connected to the moving contact of the poti.

The motor and RC connections are identical to the standart version. Especially the failsafe, undervoltage and water contact have the same function.





Mounting the potentiometer

The mecanical mounting of the feedback poti can be done in several ways.

For short tanks a linear poti is well suited. Strokes of 30 to 100mm can be handeled by low cost potis.

For longer strokes a rottory potentiometer with an apropriate lever can be used. A good solution is a multiturn poti (10 turns) with a small gearwheel on its shaft. This uses the thread as a rack. As exsample: a 20 turn poti with a 10 tooth wheel modulus 0.3 fits on a ENGEL 750ml piston tank.

A good solution for big and long tanks is a *short* linear potentiometer. This will not measure the whole stroke, but only a few centimeters on the „flooded“ end. Especially on big tanks most of the stroke need not be exactly controlled. A sub with a half filled tank will still swim. The big volume is needed to give the sub a scale waterline. For exact control of the neutral boyancy only some gramm more or less are important.

The linear poti is converted to a feeler by attaching a long pin and a draw back spring. (see drawing) The trimpotis are set up in a way that the piston runs over the „empty“ end of the feeler. The controller will then let the motor work until the stop switch is reached.

You can conpare this setup to serarate dive and trim tanks. The long stroke represents the dive tanks and can only be set to two positions: full or empty. The short stroke that is exactly controlled by the potetiometer and servo amplifier represents the trim tank.