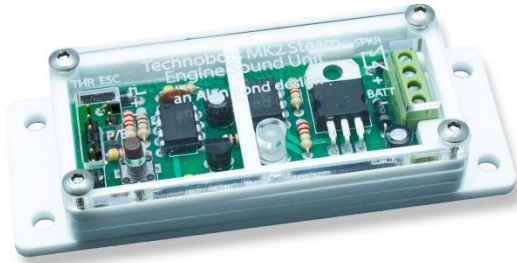




MK2 ENGINE SOUND SIMULATOR

Instructions for: #3803-230 Diesel, #3803-231 Petrol, #3803-232 Steam



This engine sound simulator is principally intended for radio controlled model boats but may also find application in trucks, tanks, cars, rock-crawlers and even aircraft.

FEATURES

The MK2 Engine Sound Simulator is packaged in a small footprint, low profile, laser cut acrylic case which allows all wiring connections and adjustments to be made without the need to first remove the case.

Functional features of the unit are as follows:-

- automatic start/stop
- start-up and run-down sounds ('petrol' & 'diesel' only)
- push-button adjustment of cylinder count
- bi-colour LED indicates neutral and run conditions
- option for set-up by remote push-button

OVERVIEW

The sound unit picks up its speed demand from the r/c throttle signal of the model and produces an engine sound that varies smoothly and proportionally with the throttle setting demand in both forward and reverse. With the throttle closed, the engine has an idling time-out period followed by a 'run-down' (stopping) sound. Opening the throttle again causes the engine to re-start following a short 'cranking' sound. *The start-up and run-down sounds plus the idling period are inappropriate for the steam version and are therefore omitted.*

The unit is designed to be used with any digital proportional PPM radio control systems, including PCM that utilises the industry standard 1-2mS servo signal. The unit is easily installed by removing the Electronic

Speed Controller (ESC) lead from your receiver and plugging in the 'THR' lead from the sound unit in its place. The ESC lead then plugs into the sound unit's 'ESC' port. The unit's electronics takes its power from the receiver, but the loudspeaker derives its power from either the model's main propulsion battery or a separate battery pack. Connections for the speaker power and the loudspeaker itself are made using screw terminal blocks.

Whilst a synthesized engine sound can never compete with recordings of the real thing, this unit captures the 'spirit' of the various engine sounds.

SPECIFICATIONS

<ul style="list-style-type: none"> • speed demand sensing method 	receiver throttle channel (unit has pass-through to ESC)
<ul style="list-style-type: none"> • neutral (idling) signal condition 	fixed at the industry standard of 1.5mS
<ul style="list-style-type: none"> • neutral / run indication 	bi-colour LED - red for neutral, otherwise green, pulses at engine rate if latter is running.
<ul style="list-style-type: none"> • receiver voltage (which powers the unit's electronics) 	4.8V min to 6V max (this is usually supplied by a BEC which is often incorporated in the ESC) DO NOT USE A "6V" LEAD ACID BATTERY – a fresh fully charged one of these can output as much as 6.6V
<ul style="list-style-type: none"> • speaker impedance 	8 ohm minimum (Technobots part no. 2400-015 recommended)
<ul style="list-style-type: none"> • speaker supply voltage 	from zero to 12V (governs the volume of the unit)
<ul style="list-style-type: none"> • engine types 	'petrol', 'diesel' or 'steam'
<ul style="list-style-type: none"> • number of cylinders 	'petrol' & 'diesel' - 2, 3, 4, 5 or 6 'steam' – 1, 2, 3, 4, 5, or 6
<ul style="list-style-type: none"> • engine start / stop 	automatic, determined by throttle demand and idling period
<ul style="list-style-type: none"> • idling period 	approximately 20 seconds (<i>steam version stops immediately when neutral selected</i>)

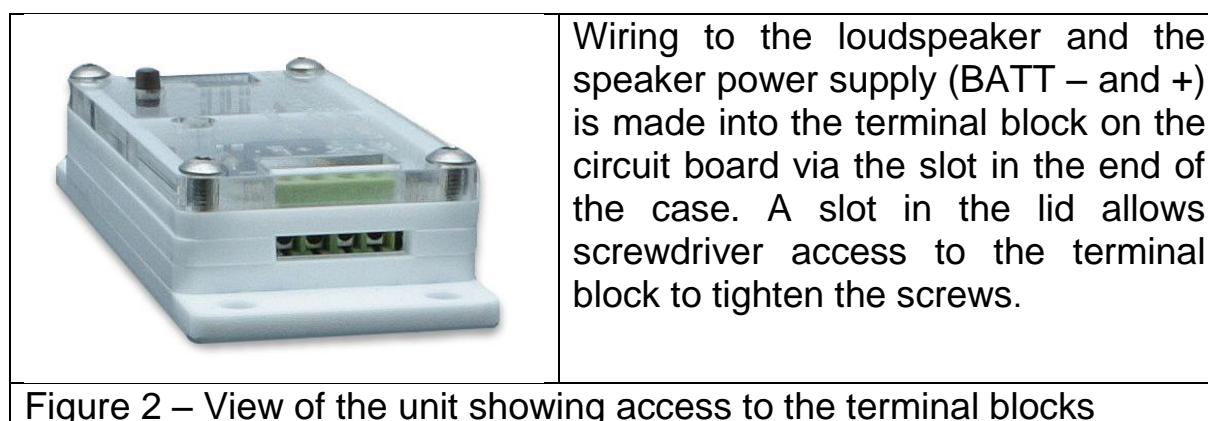
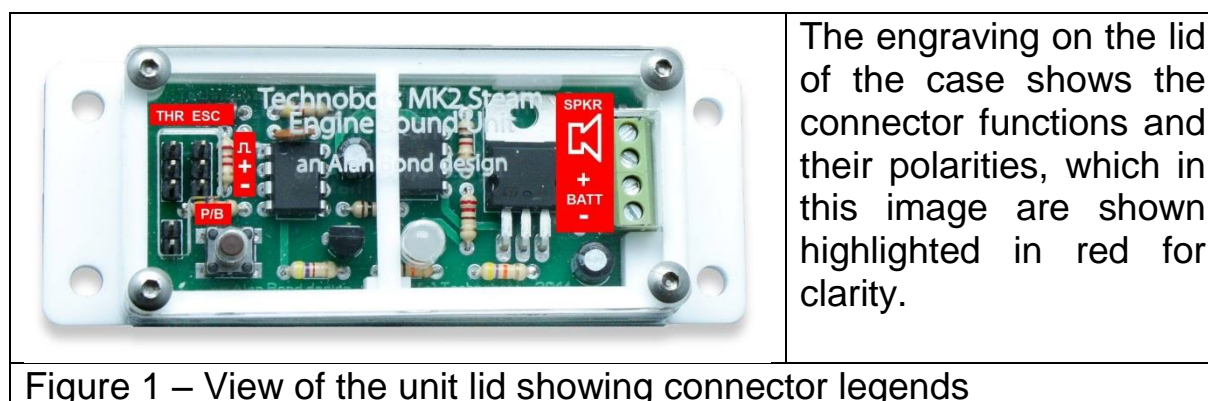
INSTALLATION

The unit has a clear acrylic top and is supplied with a protective film attached. The film is easily peeled off, but the letters in the panel engraving may need a light rub with the fingernail to remove any film adhering in closed loops of the text.

The unit may be mounted by the flanges on its case to a convenient location in the boat or vehicle. The case affords mechanical protection to the electronic circuitry and renders it “splash resistant” but certainly not “waterproof”, so in marine installations it should be mounted accordingly.

Acrylic is brittle, so do not over-tighten the fixing screws.

Figures 1 and 2 below show the connector designations.



Ideally the unit should be mounted close enough to the ESC for the latter's signal input lead to reach the ESC port on the unit, but failing that a servo extension lead can be used (Technobots part #3601-003). A male/male connector lead (JR type - brown, red, orange) is supplied to connect the receiver's throttle channel to the sound unit's THR port.

Both these leads are inserted side by side through a slot in the top of the case onto the three pin headers on the circuit board. Be sure to mate the connectors correctly, guided by the +/- legends on the case lid and the table in the wiring diagram (Fig 4) below which shows equivalence of the JR, Futaba and Hitec industry standard colour schemes.

You must connect up the unit in this manner rather than using a 'Y' lead from the receiver to the sound unit and ESC, as the unit outputs a neutral (stop) signal to the ESC whilst the cylinder set-up routine is being executed. *For this reason the throttle and ESC ports are NOT interchangeable.*

If the user elects to fit a remote pushbutton, then this should be plugged into the two pin header (marked 'P/B') through the same slot in the case. For those users, a matching lead is available for purchase from Technobots (#3601-030). *Size and fitting constraints dictated by the model mean that the pushbutton is best chosen by the user and must be a momentary action 'press to make' type.* Technobots carry a range of suitable pushbuttons, #1613-061 being a good example.

Users could also consider replacing the remote push button by a relay type RC switch in order to allow total set-up capability from their transmitter. Again Technobots have a range of suitable types – see the "Radio Controlled (RC) Relays" section under the "Interfaces" tab. *Note that the digital output types are NOT compatible.*

WIRING

The wiring diagram (figure 3 below) illustrates the typical interconnection of the major components of a basic RC model, prior to installing the sound unit. The main battery usually ranges between 6 to 12V and in the example shown the Electronic Speed Controller (ESC) has a built-in Battery Eliminator Circuit (BEC) which drops the receiver and servo voltage down to 5V. In the event that the ESC does not have an integral BEC then sometimes a separate receiver battery pack is used and is plugged into either a spare channel, or a dedicated battery slot on the receiver. Receiver battery packs are typically 4 AA cells, either 1.2V NiMh rechargeables or 1.5V primary cells.

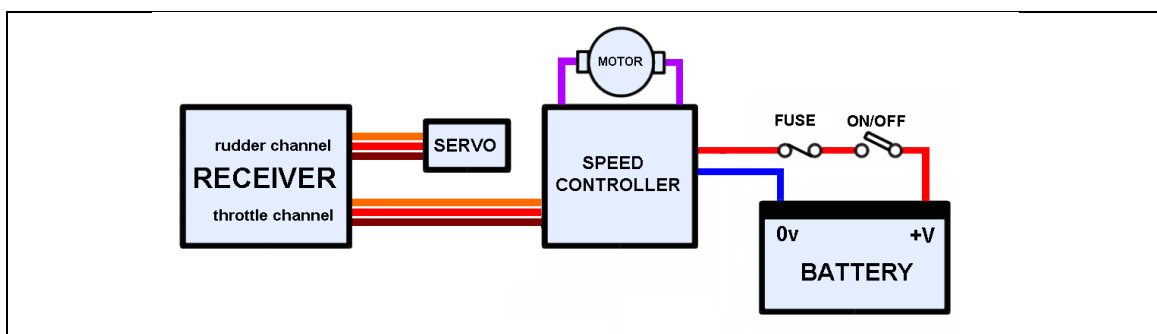
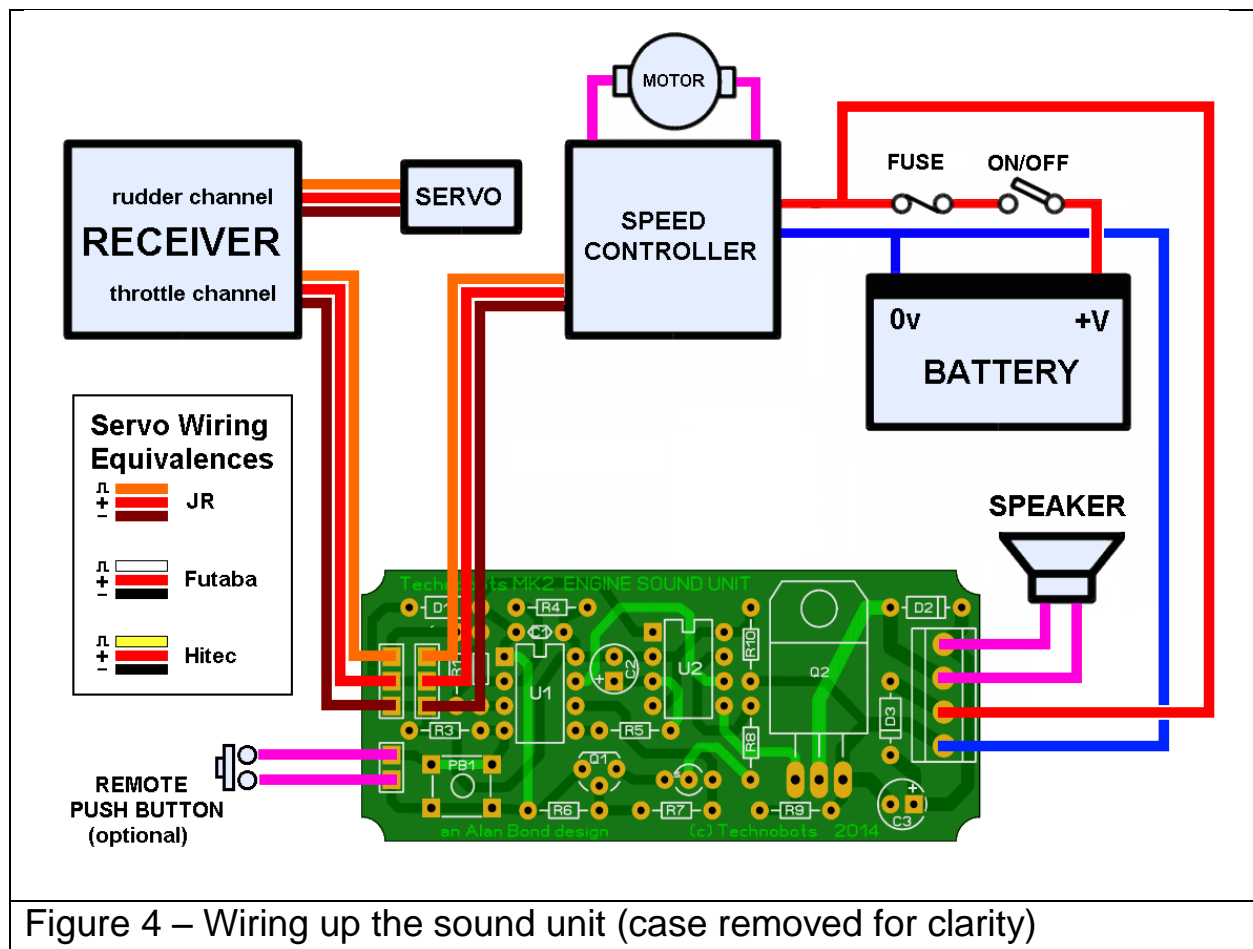


Figure 3 – Typical wiring of an R/C model

As will be seen from figure 4 below, the sound unit is simply interposed between the receiver and the ESC, and takes its speaker power from the main battery.



Note the colours and orientation of the (JR standard) cables connecting receiver and ESC to the sound unit.

The battery supply to the sound unit and the speaker currents are very modest and thin multi-strand flexible cable of 1amp rating (or higher) can be used (Technobots 7/0.2mm Equipment Wire)

Users could also consider replacing the remote push button by a (relay type) RC switch in order to allow total set-up capability from the user's transmitter.

SPEAKER POWER SUPPLY

As the installation diagram shows this is usually taken from the main propulsion battery of the model. Correct polarity **MUST** be observed -

battery positive to the “+”, and battery negative to the “-“. Connection of these leads alone will NOT power the unit, and equally without these leads being connected there will be no sound output from the unit.

As the speaker signal is digital in nature, for simplicity, cost and efficiency the speaker is switched directly to its battery supply. This results in the output volume not being adjustable. But to a very large degree the quality and volume of sound produced will depend on the speaker itself and the way it is mounted in the model. If for example using a 6V propulsion battery the resultant sound is too quiet, or if on 12V it is too loud then an auxiliary battery or batteries of higher or lower overall voltage may be used to achieve the volume level required (*12V maximum limit applies*). A pack of AA cells is quite adequate for this purpose, with the benefit that the number of cells may be easily adjusted.

MOUNTING OF THE LOUDSPEAKER

Inevitably the size and construction of the model may preclude the recommended speaker being used and if in addition its installation is less than ideal, then both the volume and the quality of the sound will be compromised. If in any doubt as to the unit's capabilities, try connecting it to a music-centre loudspeaker and hear the result. Your model sounding anything less rewarding than this represents the magnitude of your personal battle to defy the laws of acoustics!

Speakers are ideally mounted on a baffle – this is usually a piece of wood whose width is about twice the diameter of the cone with a hole in it about the size of the cone (determined by the speaker mounting arrangement). The purpose of the baffle is to prevent the anti-phase sound waves from the rear of the cone 'leaking' round to cancel out the in-phase sound waves from the front. Hi-fi speaker cabinets are generally sealed to achieve this. The hull of a boat makes an excellent substitute if the speaker can be mounted beneath the cabin using the entire deck as a baffle and the sound can escape through open portholes, windows, doors or ventilation grilles in the superstructure.

If you can't achieve that sort of set-up you can try the recommended Technobots 10W speaker facing upwards with a 50mm long, thick cardboard tube whose 75mm internal diameter is a snug fit over the

inboard rigid rim surround of the speaker. The wall thickness of the tube is about 4/5mm - being the inner former of a roll of heavy duty 50mm black pvc tape like you find in pound shops. That is stage one and modifies the sound interestingly - then try the palm of your hand over the end of the tube – and if you like the result then use some of the black tape to seal it! Other users report good results from this sort of set-up with various lengths of sealed stout tube with a short stub opening at the tube top of maybe 10 to 20mm dia and about 20mm long.

If you make the sound sealing box too small the speaker will struggle to compress the air in it (the cone displacement must make a large percentage volumetric change) and the volume and sound quality will suffer.

The steam unit is the least demanding with respect to both the speaker and its mounting considerations.

UNIT FAMILIARISATION

It is assumed that the unit has been correctly connected up following the installation procedure above and the model is restrained on a stand to allow the propeller(s), wheels or tracks to run free. First set the throttle joystick to neutral and then switch on the transmitter. Now power the model and the red LED on the unit should be showing a 'solid' red, signifying the engine is stopped and the throttle channel is in the 'neutral' condition. Advance the throttle and the speaker should issue a short cranking sound (steam excepted) and the 'engine' should start and smoothly run up to full speed as the throttle is opened fully, the LED now flickering green in sympathy with the engine rate. With the joystick returned to the central position the engine should return to idling speed and the LED should revert to flickering red. After approximately 20 seconds of idling in neutral the engine will run down to a stop and the LED will then show a 'solid' red.

The LED indication for neutral (and the corresponding tickover speed) may not line up with the existing 'neutral' of the system and it may be necessary to adjust the neutral of the ESC to match that of the unit to ensure the engine is idling when the model's motor is at a standstill. *The **MK2 Combo** version of this unit, amongst many other additional features has the facility to set its neutral to match that of the user's*

system (including forward only type installations or 70/30 forward/reverse 'pistol' type controllers).

If the signal span of the transmitter's throttle joystick fails to meet the industry standard that this sound unit supports, then the full speed sound may occur prior to full movement of the throttle or, more likely, full speed sound will not be reached at full throttle. This issue is most prevalent with earlier 'analogue' type transmitters, but not completely unknown with modern 'computer' type transmitters. *Again, the **MK2 Combo** version of this unit has the facility to match its dynamic range to the span of the user's transmitter.*

CYLINDER COUNT SETTING

This is achieved by means of the unit's pushbutton. If the unit is correctly installed in accordance with the instructions, the ESC will NOT respond during this procedure even though the engine will sound to be running at a moderate speed, so an unrestrained model will be quite safe.

When the button is pressed, the unit emits a 'beep' and regardless of its previous state, the engine begins to run at a medium speed and cycles in turn through the number of cylinders available. When the desired cylinder count is heard, press the button to save the cylinder count value into memory. The engine sound ceases, a confirmatory 'trill' is issued and user control is resumed.

NO SIGNAL CONDITION

If the unit is powered but no throttle signal can be detected then the LED will alternately flash red and green at about one second intervals. After each ten flash cycles, the speaker will issue a brief 'tick' sound to warn of this condition in case the LED is not visible.

ASSISTANCE

We provide full technical support through our website, simply click on the Q and A tab, post your question and check back later for a reply.