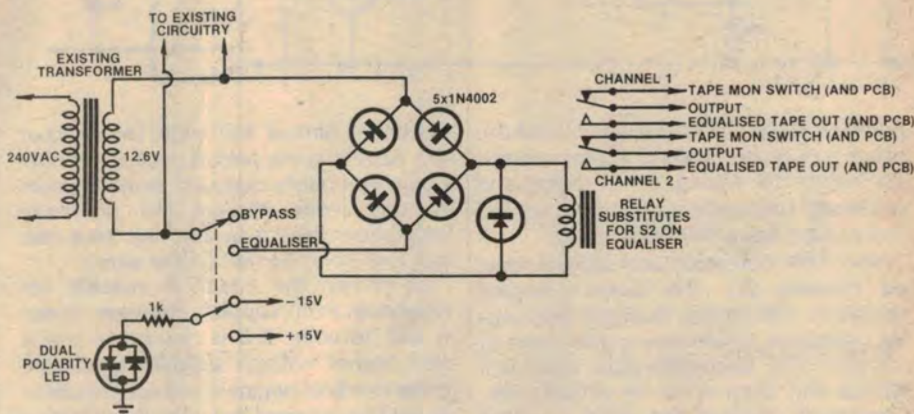
Circuit & Design Ideas

Interesting circuit ideas from readers and technical literature. While this material has been checked as far as possible for feasibility, the circuits have not been built and tested by us. As a consequence, we cannot accept responsibility, enter into correspondence or provide constructional details.

Suppressing Audio Switching Transients



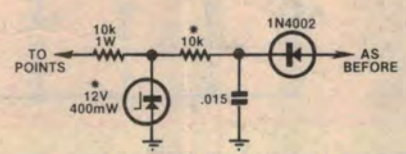
Many ancillary items of hifi audio equipment produce unwanted audible transients at switch on and/or off. As most of these devices are intended for insertion into the "tape monitor" circuitry of their associated audio amplifier systems, a switched OPERATE/BYPASS function is usually featured in these units for in/out comparison of sound quality. Substitution of a DPDT relay (and interfacing components) for the hard-wired switching circuitry enables suppression of the aforementioned audible transients.

For example, the Playmaster Graphic Equaliser (EA May, 1979) produces a slight "chirp" at its output when it is switched off. This chirp can be muted by installing a supplementary bridge rectifier and 12 volt DC relay to perform the audio switching (as shown in the accompanying diagram). One pole of the BYPASS/EQUALISE switch is utilised to interrupt the supply to the rectifier and thus control the relay operation. If desired, the spare pole of this 2-pole switch could be utilised to change polarity to a bi-colour dual polarity LED, and so give visual indication of the equaliser's operational mode.

The changeover contacts are so wired that the equaliser is only in circuit when the relay is energised. Thus, at "switch off", power is removed from the relay and the contacts change the circuit to the BYPASS mode so that the chirp is not heard.

R. Raymond,
Como, WA.

Cure for Fluctuating Dwell and Tacho Readings



* ADDED TO ORIGINAL CIRCUIT

When used on some motor vehicles, the EA Digital Engine Analyser (October, 1980) may produce slightly varying readouts (of the order of 1 to 3%). This can be due to an above average voltage "spike" being generated across the points of that vehicle's ignition system. This problem can be simply cured by adding a "voltage clipping section" ahead of the low pass filter at the input of the instrument.

Only two additional components are required: a 10kΩ resistor, and a 12 volt zener diode. Lift the end of the original 10kΩ 1 watt series input resistor from its connection with the 0.015μF capacitor and 1N4002 diode. Insert the new 10kΩ resistor between the unattached end of the original resistor and the capacitor/diode junction. The neatest modification is to stand both resistors vertically to the printed circuit board, and "arch" their junction.

Now connect the cathode of the zener diode to the junction of the two resistors. Drill a small hole in the PCB near the "earthy" end of the 0.015μF capacitor, pass the anode lead of the zener through this hole and solder to the "earth" track.

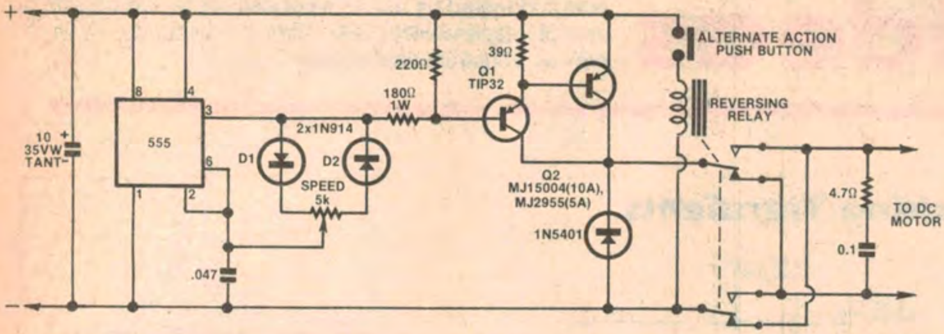
G. W. Ford,
Horsham, Vic.

Switch-Mode Control of Low Voltage DC Motors

Whilst this power control circuit was developed for use with radio-controlled model boats, it may also be used in other low-voltage DC load applications. As shown, the design is suitable for 7 amp continuous loads; and up to 10 amps intermittent. If 5 amps (or less) maximum output is required, an economical MJ2955 may be substituted for the MJ15004(Q2). In contrast with the characteristics of the usual power rheostats (used in model boats), speed control of a motor is very smooth with reliable running at very low rpm. Such performance is due to the unit's low source impedance at the "simulated" low voltage outputs.

Basis of the design is to vary the duty cycle of a 555 timer which is connected in the astable mode. The pulsed output of the 555 drives a Darlington pair of PNP transistors, which feed the load. For model boat applications, a relay with heavy duty changeover contacts is interposed between the output and the motor to permit simple remote reversing control. The reverse connected 1N5401 diode protects the output transistors from possible voltage "spikes" produced by an inductive load.

A novel method has been chosen for varying the duty cycle of the free running 555 timer circuit, with the complementary-symmetry output of the 555 being used as the source for both charging and discharging the timing capacitor. The charging circuit is via D1 and half the resistance of the potentiometer (assuming the potentiometer is set to its mid-



point); and the discharge via D2 and the other half of the potentiometer. At this potentiometer setting, series charge and discharge resistances are equal, so the 555 output has a 50% duty cycle.

Now if the potentiometer slider is moved towards D1, the series charging resistance will be less than the discharging resistance, resulting in a duty cycle of less than 50%. Taking the slider to D1 will reduce the duty cycle to virtually 0%. Conversely moving the slider towards D2 increases the duty cycle, with it becoming almost 100% with the slider at D2. Note that the period of oscillation remains essentially constant, since the sum of the series charge and discharge resistances (hence output high plus output low periods) remain the same.

As shown the circuit is suitable for operation from supplies between about 6 and 16 volts. If it is desired to use it with higher voltage supplies a suitable three terminal negative voltage regulator should be inserted between the negative "return" of the 555 timer and the negative rail, such that the supply to the 555 is kept around 12 volts.

Note that for model boat applications it is possible to use a standard radio control servo unit (without the need for gearing) by modifying a wire-wound 10kΩ potentiometer. Obtain a small length of nichrome wire (eg from a jug element) and prise off the back cover of the pot. At the point where it is desired to limit the angular rotation of the pot (say 100°), twist one end of the nichrome wire around the pot winding and solder the other end of the wire to the far end connection of the pot winding. The result is a 4kΩ pot (100° = approx 40% full rotation) that rotates only 100° to match the servo's rotation. If an alternate action (push on/push off) pushbutton switch is used to control the reversing relay, it could be mounted to operate from the same servo in such a way that is triggered each time the servo returns to the "stop" position.

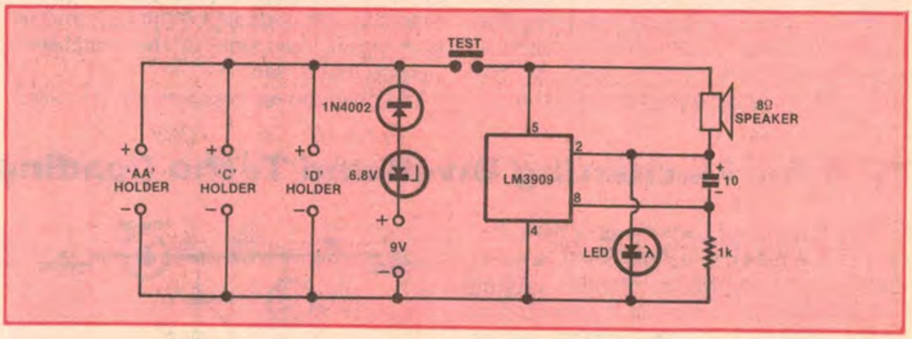
P. Allison,
Summer Hill, NSW.

Battery Tester for Blind Persons

Using an LM3909 "LED Flasher" IC, essentially connected in the manufacturer's suggested "Buzz Box Continuity Tester" configuration, this circuit provides audible indication of battery condition. It was designed for use by blind persons, most of whom have a keen sense of hearing in terms of pitch and amplitude of sound.

Any standard 1½ volt cell, or a rectangular 9V "transistor" battery may be tested. Note that the voltage from a 9V battery is reduced to a nominal 1½V by two series diodes (one a 6.8 volt zener) which also provide reverse-polarity protection. Battery terminal voltage and internal resistance determine the pitch and volume of the sound, such that an experienced operator can soon determine cell condition.

C. Groenhout,
Watson, ACT.



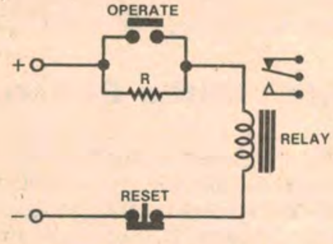
Simple Relay Latching Circuit

Unlike the standard relay latching circuit which uses a normally-open contact set to latch the relay when it is operated, this circuit makes that contact set available for other purposes since latching is obtained without the need for a contact set.

This idea is based on the fact that it usually takes at least twice the current to pull-in a relay armature from its "rest" position, than it does to hold the armature in its "operated" position.

Operation of the circuit is such that the relay armature is pulled-in by the momentary action OPERATE pushbutton in the normal way. When this button is released, a resistor (connected across the switch contacts) passes sufficient current through the relay coil to securely hold its armature in. Pressing the momentary action RESET pushbutton opens the circuit to the relay, and the armature is thus released. After the button itself is released, current once again flows through the relay coil (via the aforementioned series resistor) but is insufficient to pull-in and operate the relay.

The value of the series resistor has to be determined by trial and error (since exact value is dependent upon the electro-mechanical characteristics of the particular relay). However a good starting point is to try a resistor whose value is about twice the DC resistance of the relay coil.



G. Sheridan,
Hunters Hill, NSW.

PSST! Got any neat circuit ideas? Why not send 'em to us? We pay between $5 and $20 per item, depending on how much work we have to do to publish it.