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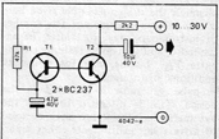
marine diesel

Apart from ship sirens and fog horns, builders of ship models are also interested in imitating marine engine noises. With only a few components the 'marine diesel' circuit lends realism to a model.
The noise produced by a diesel-driven ship is made by the thump of the engine and the regular puffing of gases escaping through the exhaust. The noise of these escaping gases is imitated by a small noise generator in the circuit. The thump effect is achieved by using an IC in a trapezium generator circuit, with the noise added on the leading and trailing edges. The figure shows the circuit. The base-emitter junction of T_1 is reverse biased to breakdown and the resulting noise signal is fed to the non-inverting input of the operational amplifier. The feedback network, formed by R_4, R_5, R_6 and C_3 then determines the form of the trapezium voltage. As long as the IC has not reached saturation, the output produces a voltage ramp with superimposed noise. The noise is suppressed as soon as the IC reaches saturation. An oscilloscope connected to the output of the circuit should show one of the waveforms drawn in the diagram, depending on whether the DC-connected or the AC-connected oscilloscope input is used.
If after completion of the circuit it is found that the sound produced by the model is too slow, certain modifications may be made. C_1 affects the noise; C_2, R_5 and R_7 determine the repetition rate. The output of the circuit can be connected to the input of an amplifier. A resistor (value to be found by experiment, depending on amplifier sensitivity and input impedance) connected between the circuit and the amplifier prevents overdrive of the amplifier.

noise generator

Despite its simple design, this circuit is a universal noise generator which produces a very high noise amplitude. Transistor T_1 is connected as a zener diode and is connected to the base of the second transistor (T_2). The current through the zener transistor, and hence the amplitude of the noise, is adjusted by resistor R_1. This noise voltage is then amplified by T_2.
The supply voltage can be varied over a wide range and, depending on the required output voltage, can be chosen between 10 V and 30 V. At a number of



different supply voltages the following noise output voltages were measured:

$+V_b = 12\ V -\ 5\ V_{p\text{-}p}$
$+V_b = 15\ V -\ 8\ V_{p\text{-}p}$
$+V_b = 20\ V - 10\ V_{p\text{-}p}$
$+V_b = 25\ V - 15\ V_{p\text{-}p}$

If required, transistor T_1 serving as the zener diode can, of course, be replaced by a real zener of 6-8 V.