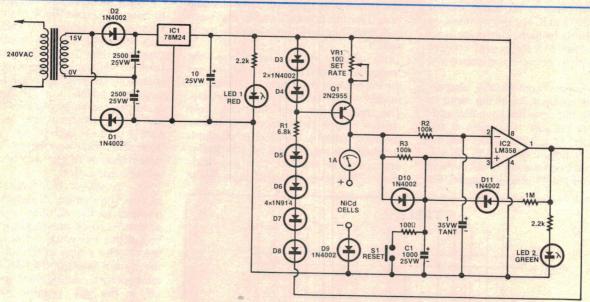
Circuit & Design Ideas

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.



Constant current NiCd charger with automatic shut-off

During the charging cycle of NiCd cells, the voltage increase across them follows an upward monotonic curve. When the cells are fully charged, the voltage across them remains constant. This NiCd charger circuit detects when no further change occurs in cell voltage and automatically turns off the charger at the end of the charging cycle.

A bonus of this scheme is that the charger can automatically accommodate from one to 12 cells, since specific voltages are not detected. Only the charging rate requires manual setting.

The circuit shows a conventional constant-current charger (Q1 et al) configured so that the cell voltage to be detected is ground-referenced. Any constant-current charger could be adapted to this design.

The full-charge detector circuit employs an LM358 op amp (IC2) as a comparator in which the cell voltage is applied to the inverting input (pin 2) as a reference voltage whilst the same source applied to the non-inverting input (pin 3) is delayed by the time-constant R3.C1. As long as the reference (cell) voltage continues to increase, the non-inverting input will lag sufficiently behind the inverting

input to hold the LM358 output low. The bias resistor for Q1 is thus grounded and Q1 is turned on.

When the cells are fully charged, no further cell voltage increase occurs and the reference voltage becomes static. The non-inverting input voltage will continue to rise slowly as the charge on C1 increases until the input offset voltage of the LM358 is reached (typically 2mV). The output of IC2 will then begin to rise. Positive feedback accelerates the rise and latches the output in the high state.

Current now ceases to flow through Q1's bias resistor R1, and thus Q1 turns off. Diodes D5, 6, 7, 8 provide sufficient forward voltage drop to ensure that no current can flow through R1 when pin 1 of IC2 goes high (IC2 output = Vcc - 1.5V). LED 2 (green) indicates that full-charge has been reached.

The 24V regulator (IC1) is required to eliminate any effects of mains voltage variations and to limit the rail voltage to less than the 30V maximum for the LM358. No values are critical except R1. This may require adjustment to accommodate the charging rate range which is continuously adjustable from 50mA to 500mA by VR1. The range is limited only by the capacity of the power transformer used. If the charger shuts off prematurely, increase the values of R2 and R3.

Finally, take care to ensure adequate heatsinking of Q1 and IC1. I. Board, McDowall, Qld.

Stereo sound for TV

Stereo sound for TV has been the subject of much experiment and discussion over the past 12 months. Two opposing systems have been proposed: the dual carrier system used in Western Europe, and the multiplex system used in FM stereo. The technically superior two channel system has been recommended for Australia and TCN Channel 9 in Sydney has been transmitting both real and simulated stereo using this system since September 1982. The system is designed to handle mono, stereo or dual language transmissions.

The original sound channel is left untouched at 5.5MHz above the vision carrier, but, for stereo, carries the sum of the two channels (L + R). A second FM carrier at 5.742MHz above the vision carrier carries the modulation for the right channel only. The three modes (mono, stereo, dual channel) are identified by the modulation of a 54kHz subcarrier on the second sound channel. This subcarrier is amplitude modulated to a depth of 50%, with one of the following:

- (a) Mono transmission: no modulation
- (b) Stereo transmission: 117.5Hz

(c) Dual language: 274.1Hz

Tone decoders are normally provided to detect these tones and switch the outputs appropriately. However, readers may like to experiment with stereo reception using manual switching.

This circuit shows a simple method of obtaining stereo sound from a Philips K9 or K11 receiver. The method consists of duplicating the FM demodulator section and dematrixing the resulting (Right) output to yield Left and Right channels.

A simple demodulator is the Philips U240 module which can easily be retuned to 5.742MHz. When added to a Philips K9 or K11 receiver, the module outputs are then suitable for direct connection into a summing amplifier. The outputs of the two op-amps are Left and Right directly, and can drive line level inputs on your stereo or VCR. The prototype used an 8-pin dual MC1458 op amp IC but two 741s would be just as good.

Note that pins 2 and 3 of the U240 module provide a balanced audio output at constant level. Pin 5, however, provides an audio output that varies with the remote control setting.

A standard TV IF response is designed to handle an FM sound signal at

31.375MHz, and the response includes a minimum at this frequency. Some frame buzz may be evident in the output of the second channel, and the setting of the sound IF trap may need to be changed to a frequency between the old (31.375MHz) and new (31.133MHz) sound carriers.

The alignment procedure for the additional U240 module is as follows:

- Connect an FM signal generator to pin 17. Set generator to $100\mu V$ out at 5.5MHz, modulated with 1kHz;
- Observe demodulated audio on pin 3 of module (preferably using a CRO);

- Adjust L11 and L12 for maximum audio output (see Fig.1). Adjust L10 for lowest noise/distortion:
- Retune signal generator to 5.6MHz, 5.7MHz and, finally, 5.742MHz. Adjust L11, L12 and L10 as above for each new frequency;
- Check that limiting occurs at IF input at 100-130μV;
- Set generator to 5.742MHz and 50% AM and adjust L10 for minimum demoduated audio. (Note: he shield should be fitted for this adjustment.)

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