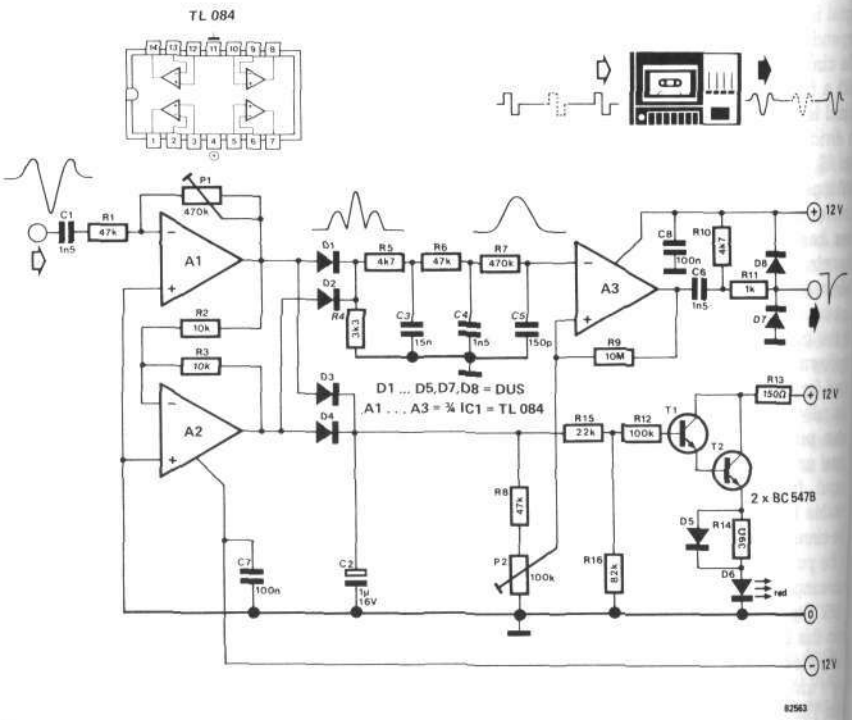
130 TRS 80 cassette interface rediscovered

The TRS 80 computer is a fairly good machine, but the cassette interface has already driven many an owner to the depths of despair. Why the tapes are read back so unreliably has never been worked out, and because of this there are a number of suggestions on how to improve matters. The circuit given here also produces good results, but as with so many good suggestions we do not really know why.

The TRS 80 records clock pulses and data pulses on the tape at a constant amplitude. The time interval between pulses is 2.4 ms. The logic is written by inserting a pulse between two clock pulses after 1.2 ms. If this pulse is not there this signifies a logic 0. The ironic thing now is that although the amplitude of the pulses is constant during recording, when the tape is played back the volume setting is extremely critical. One possible explanation is that one small interference pulse can easily convert a logic 0 into a logic 1. On the other hand, a drop out in the tape can convert a logic 1 into a logic 0. Matters get even worse if a clock pulse gets lost. In this case, a following data pulse may be recognised as a clock pulse, and from this point onwards



the whole thing gets totally out of hand. The situation deteriorates still further when playing back commercial tapes. These are very often recorded at high speed, and this has the effect that there is not so much a pulse on the tape as a damped sine wave. In all fairness, most home recorded tapes may not appear very elegant when viewed with an oscilloscope during playback.

The following circuit attemps to solve all these problems by integrating the signal coming back from the tape recorder. This has a few advantages. Short interference pulses are filtered out by the low-pass filter R5—R6—R7—C4—C5, so they do not lead to incorrect data. Drop outs also have less effect on the circuit because, even if the pulse itself does not come out so well, the transients which follow the main pulse will still be there, and after integration will provide sufficient amplitude. To ensure that these pulses are not missed, A1 and A2 are used as a two phase rectifier. This has the added advantage that the phase of the signal coming from the cassette deck is completely unimportant. The rectified signal is passed on to the filter and also to peak detector D3/D4 and C2. When the amplitude of the cassette deck output varies a little (when an older or a different type of tape is used), no critical adjustment of the output level is required.

The filtered signal is compared in A3 with part of the peak rectified signal. In this way the comparator becomes independent of the input amplitude (within reasonable limits). This means that P2 must be used to set a suitable level so that the data arrives clean at the output. The combination C6 and R10 converts the data into short pulses with a 5 V output amplitude ideally suitable for passing to the bistable included in the TRS 80, especially for this purpose.

LED D6 is included as a simple indicator. Provided there is sufficient signal level present (in the order of a few volts), the LED will light. The gain is set by P1. The current consumption is only a few mA which can easily be obtained from the supply of the TRS 80. It should be noted that D6 can draw up to 50 mA if it is included.