4. Low level Discriminator Using Tunnel Diode Monostable Circuit.

4.1 Circuit description and theory of operation

A block diagram of tunnel diode monostable circuit is shown in Fig. 4.1. It shows the principal parts of the circuit under discussion. The output of the tunnel diode is coupled to a Schmitt trigger which serves as the buffer between input and output and at the same time as a pulse former and amplifier.

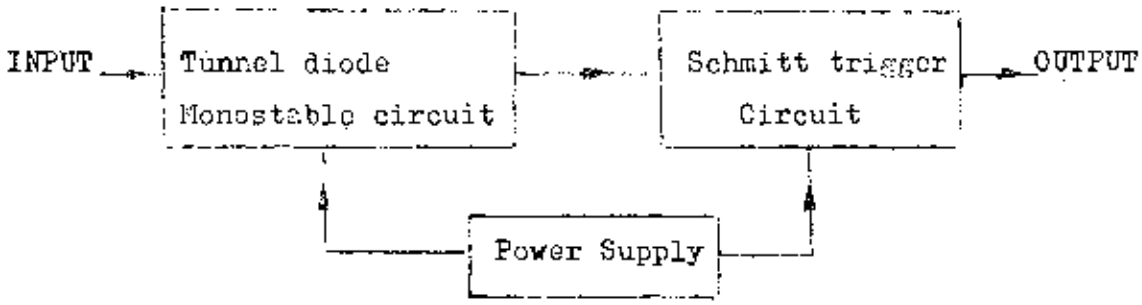

Fig. 4.1 Blockdiagram of a low level discriminator using tunnel diode monostable circuit.

When a negative pulse enters the input (See Fig.4.2) with amplitude large enough to produce a current through the adjustable resistor R to raise the load line up to the peak current of the tunnel diode characteristic.

The tunnel diode will switch to the high voltage level causing the transistor Q 1 to conduct. The output is taken from the collector of transistor Q 2. The sensitivity of Schmitt trigger can be adjusted by varying the resistance R_L.

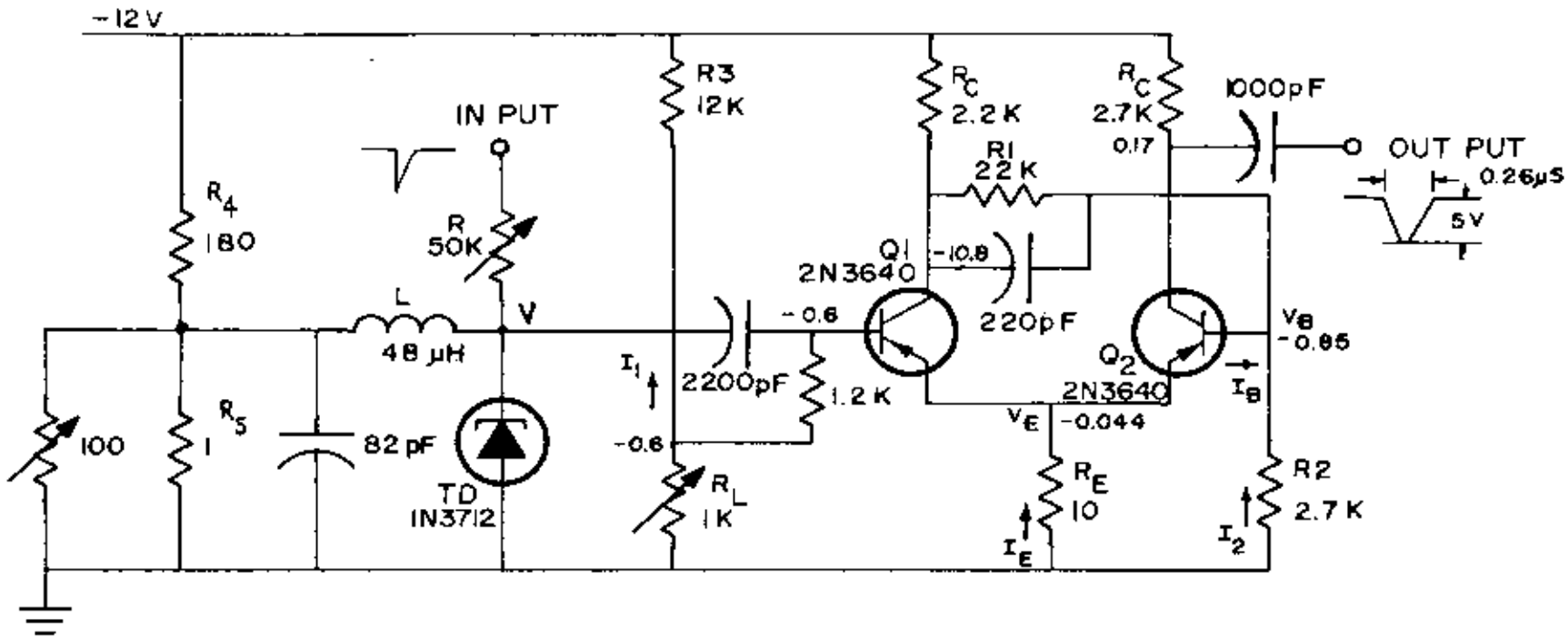

Fig.4.2 Circuit diagram of the tunnel diode monostable discriminator

R in ohm unless specified

4.2 Experimental result and linearity of the discriminator

The linearity is the prime importance of the tunnel diode low level discriminator. To find the linearity, the tunnel diode is biased at 55 mv. near its peak current, the experiment is done by varying the amplitude of the input pulse with respect to the resistance R and the result is obtained as shown in Fig.4.3

From Fig. 4.3 we get

1. Current sensitivity at the linear portion

$$CS1 = \frac{30}{2} = 15 \quad \mu a$$

2. The curve in Fig. 4.3 shows that no drastic change in linearity occurs between the range of 0 to 200 mv.

3. The percentage deviation at the upper limit (200 mv.) is determined by calculating the current sensitivity at point 1 and point 2 and take the difference.

$$CS2 = \frac{30}{2.1} = 14.3 \quad \mu a$$

$$\text{Percentage deviation} = \frac{CS1 - CS2}{CS1}$$

$$= \frac{15 - 14.3}{15} = \frac{0.7}{15}$$

$$= 4.67\ \%$$

4. From Fig. 4.2 by observation from the oscilloscope the output wave-form has a rise time to be about 0.1 μsec. as well as the fall time.

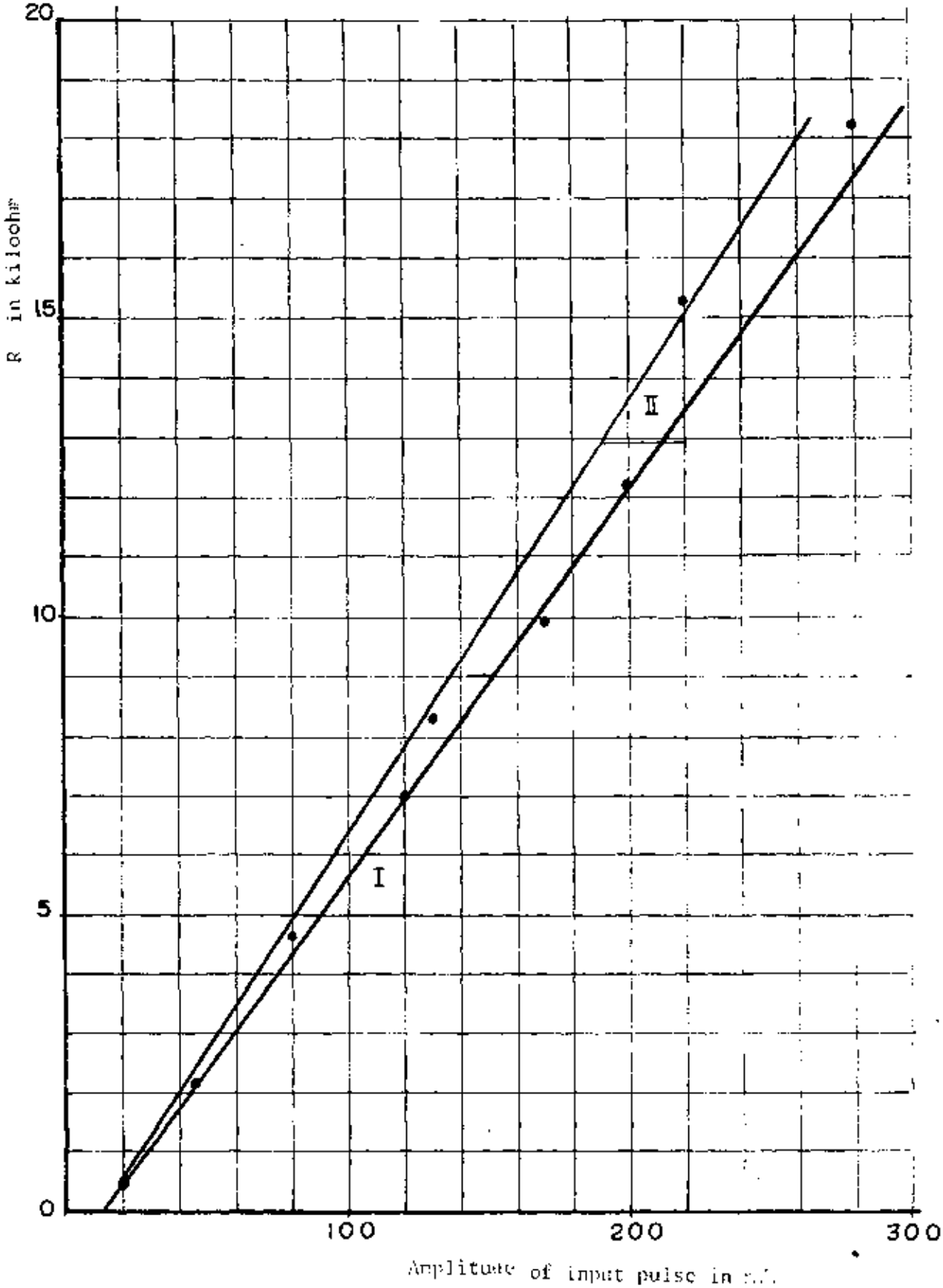

Fig.4.5 The linearity of the tunnel diode monostable discriminator