In addition to electronic instruments other major auxiliary equipment includes a lapping machine, a toolmaker's microscope (which serves for measuring traces on films and other purposes) and a diamond cut-off saw.

A. Velocity and Tilt Circuits

The projectile velocity is measured electronically immediately before the target is impacted when the grounded projectile shorts four pins of accurately known separation. The projectile tilt at impact is measured by four pins in the plane of the target which are shorted by the impacting face of the projectile.

Both the velocity and tilt circuits are identical in design and operation. The circuit for each consists of four triggerable constant current sources connected to a load resistor as shown in Figure 15. The trigger inputs for these constant current sources are the velocity pins for the velocity circuit and the tilt pins for the tilt circuit.

Once triggered these constant current sources remain on until reset manually by the operator. This feature prevents any one of the current sources from turning on and then off due to a loss in the ground connection at the pin input. Thus, the voltage across the load resistor is given by:

$$V(t) = R(I_1 H(t-t_1) + I_2 H(t-t_2) + I_3 H(t-t_3) + I_4 H(t-t_4)), \qquad (1)$$

where

$$H(\xi) = 0, \qquad \xi < 0,$$

$$H(\xi) = 1, \qquad \xi \geq 0,$$

and t_1, t_2, t_3, and t_4 correspond to the times at which pins 1, 2, 3 and 4 for either the tilt or the velocity circuit are grounded by the projectile. Further, the current ratios $I_1::I_2::I_3::I_4$ determine the relative voltages across the load resistor R for the respective pin shortings 1, 2, 3, and 4. In the case of the velocity circuit the ratios are all 1:1 so