BEAM SWITCHING TUBE CIRCUITS
for
MBS TUBES
TYPES 6700 -- 6701

Electronic Tube Division

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THE BASIC CIRCUIT IS RECOMMENDED AS THE STARTING POINT FROM WHICH FURTHER CIRCUIT DESIGNS MAY BE DEVELOPED

Some of the features of the Basic Circuit are the use of a cathode resistor for improved output uniformity, greater operating voltage range, a voltage divider grid bias source, and a zero set circuit that will reset from any random position. Numerous modifications of this Basic Circuit are possible as the circuits which follow will indicate.

The constant current output may be used to obtain any output voltage by changing the target load resistors and target supply voltage. Values are selected to insure proper voltage at the target. Spade by-pass capacitors prevent the large target pulse from causing spade switching instability.

The same output characteristics may be used to drive relays. By-pass capacitors are used to prevent the inductive overshoot of the relay from causing target switching instability. Diodes can also be used.
WITH THE BEAM SWITCHING TUBE, THE PROBLEM OF OBTAINING A VISUAL READOUT IS EASILY SOLVED

Diagram A indicates how the Pixie (HB-105) or an NE-2 may be operated directly from the spade. If a large value of RL is used, diagram B with an NE-2 or "Nixie" (HB-106) is applicable.

METHODS OF ELECTRONIC CLEAR AND RESET ARE OFTEN REQUIRED

This circuit replaces the switch in the Basic Circuit with a triode that can be gated on and off with the reset pulse. An essentially square waveform is desirable. A and B are waveshapes that would be suitable.

Where voltage levels or pulse widths are a problem, this AC coupled reset circuit may be more desirable. In this case the reset pulse triggers a blocking oscillator which provides a standardized pulse for resetting the MBS tube.

METHODS OF VISUAL READOUT

HIGH SPEED CLEAR AND RESET CIRCUIT (DC COUPLED)

HIGH SPEED CLEAR AND RESET CIRCUIT (AC COUPLED)
CIRCUITS WHICH AUTOMATICALLY SET THE BEAM IN THE ZERO POSITION WHEN A TUBE IS INITIALLY TURNED ON ARE REQUIRED FOR MANY APPLICATIONS

This circuit has provision for both automatically forming the beam and for clearing the tube. A negative pulse applied to the grid of the series 5687 will clear the tube. The change in voltage levels causes the second half of the 5687 to conduct through the "O" spade resistor and reset the 6700 to zero.

A relay may be used in much the same way. Here, the relay is held open by beam current. If there is no beam current, the relay grounds the "O" spade and forms a beam in the zero position. One should note the values are such that the tube resets with closing of the relay contacts rather than the opening.

This circuit is similar to the automatic Tube Type above with the transistor replacing the triode.

ONE OF THE MANY REASONS WHY THE MBS TUBE IS SO VERSATILE IS THE VARIETY OF INPUTS WHICH CAN BE USED.

Perhaps one of the simplest types of input is the multivibrator or flip-flop. This flip-flop has provision for resetting in the event the MBS tube is connected to produce an odd numbered count. Input pulse amplitude to the beam switching tube grids should exceed minimum switching voltage requirements while maintaining proper bias.
Discrete pulse operation is also of great use. A typical high speed blocking oscillator is shown here which develops a pulse suitable for driving the MBS tube at one megacycle.

If a sine wave is available, it may be used to drive directly in a push-pull fashion. The high switching speeds of the Magnetron Beam Switching Tube may be easily realized with this drive.

Sometimes operation from a switch or relay is desired. Because of contact bounce, pulses developed from these sources cannot be used directly. This circuit eliminates the bounce problem and develops a discrete pulse for driving the MBS tube. This one shot MV can also be used to cascade stages directly.

For single input type of operation an almost endless variety of pulse heights and widths can be used to operate the MBS tube. This graph shows some possible combinations and indicates that wider pulses can be used by adding capacity across the spade resistors.
THE VARIETY OF CIRCUITS THAT CAN BE DESIGNED WITH THE MBS TUBE IS LIMITED MAINLY BY IMAGINATION. A FEW ARE SHOWN

Often it is desirable to drive one tube directly from the preceding one as in a decade counter. One method of doing this is illustrated here.

If some means of having the tube count without producing an output until a predetermined time is required, this circuit may be the answer. When the gating pulse turns tube T-1 on, current from the MBS tube flows through the appropriate load. If voltage gating is required, the following circuit should be used.

When a count must be stored or remembered, this circuit is useful. MBS Tube No. 1 does the normal counting. On the arrival of a transfer pulse, whatever count is in the tube No. 1 is transferred into Tube No. 2 through a voltage gate.
Frequently a count greater than ten is required. The multi-position distributor shown provides 18 positions. Additional tubes may be connected in a similar manner to provide more positions in units of 1 to 9 for each such tube.

The reason for the reliability and large permissible voltage variations that are possible with the MBS tube are shown here. The shaded area represents the ±20% tolerance area of both spade resistance and spade voltage variation.
FOR LOW VOLTAGE AND TRANSISTOR APPLICATIONS, MBS TUBE 6701 PROVIDES NEW RANGES OF FLEXIBILITY IN DESIGN

LOW VOLTAGE BST BASIC CIRCUIT
As in the case of the 6700, the 6701 also has a preferred Basic Circuit.

TRANSISTOR DRIVEN MEGACYCLE COUNTER FOR 6701 MBS TUBES
The low voltage tube does not suffer in frequency since megacycle speeds are possible as shown. The 903 provides automatic zero set.

TYPICAL SINGLE INPUT PULSE REQUIREMENTS

TOLERANCE OF PARAMETERS SHOWN ON Rs - Vs PLANE
The graph illustrates the ±20% tolerance region.

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