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tech tips

Testing HV Circuits With The VA62A

Early model television receivers often used a solid state HV multiplier (doubler, tripler, or quadrupler) to rectify the flyback output pulses and form the high voltage DC that was supplied to the picture tube.

Late model receivers usually use a flyback transformer with the rectifiers built into the step-up high voltage secondary winding. No external rectifier or multiplier is used. This type of flyback is called an Integrated High Voltage Transformer (IHVT). You can easily recognize an IHVT by the high voltage lead feeding directly from the transformer to the CRT high voltage connection.

Both conventional flybacks and IHVTs often develop shorted or open windings. Use the VA62A RINGING TEST to isolate these failures.

An additional failure mode of IHVTs involves the combination of the high voltage step-up winding and the integral high voltage rectifier diodes. (See Figure 1 for a schematic of a typical IHVT.) A shorted winding in the high voltage secondary causes the RINGING TEST to show bad; but an open high voltage secondary winding, a shorted diode, or an open diode will not affect the RINGING TEST. (You can't test for these defects with an ohmmeter because of the multiple diodes with high forward turn-on voltage.)

It is difficult to isolate problems in the high voltage rectifier section of both IHVTs and HV multipliers unless you test the component under conditions that are similar to actual circuit conditions (dynamic testing). With the VA62A, you can drive the suspected IHVT/HV multiplier and measure the resulting output voltage to dynamically test the IHVT/HV multiplier rectifier circuit for opens or shorts. This test simulates the actual circuit conditions to completely check the windings and diodes. (If an IHVT fails the ringing test, you know it is defective and there is no reason to perform the IHVT drive test.)

How To Perform The IHVT Drive Test

Perform this test by driving the IHVT primary (pins 3 & 5 in Figure 1) with the VA62A HORIZ KEY PULSE and measuring the DC voltage output from the high voltage secondary (pin 2 & HV lead in Figure 1) with the VA62A meter

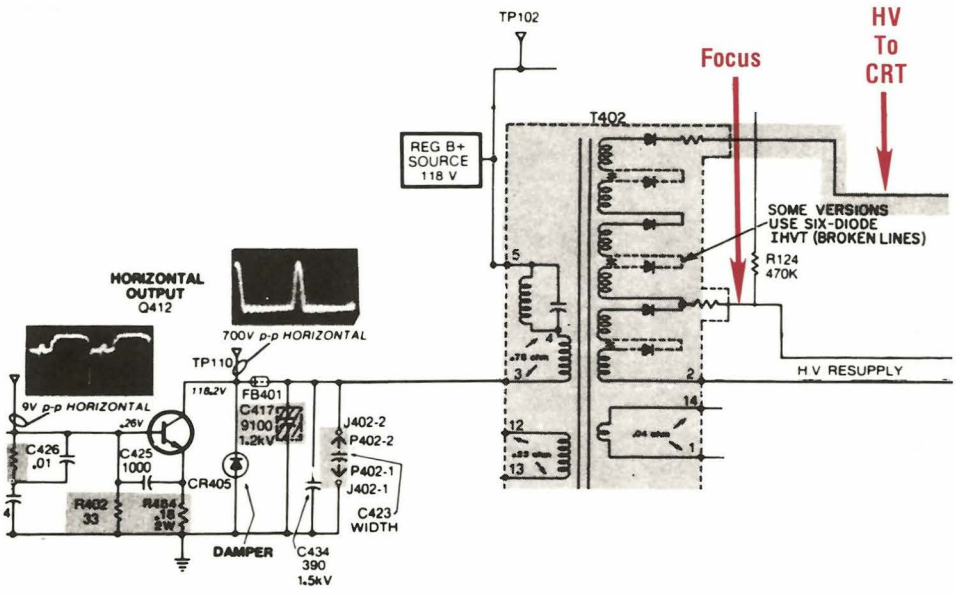

Fig. 1: Typical IHVT circuit (RCA CTC108).

NOTE: You must use the (optional) TP212 10 KV Transient Protector Probe to make this measurement to prevent loading of the high impedance secondary circuit.

Using a 25 volt P-P positive polarity input signal, compare the output voltage you obtain to the minimum correct voltage found in the table in Figure 2. The voltages in the table represent the correct relationship between applied test voltages and actual voltage levels normally found in the circuit.

The numbers on the left of the table represent the P-P collector voltage shown on the schematic. (If the schematic doesn't show the signal level, use the VA62A EXT PPV input to measure the voltage on a like chassis.) The numbers on the top of the table represent the normal CRT high voltage for the receiver. The intersection of the two shows you the minimum DC voltage the test should produce at the high voltage lead. A good secondary will give you a reading of this value or higher. A bad IHVT will produce a lower voltage.

WARNING

Before working in the high voltage circuit, discharge the high voltage to chassis ground. Newer receivers do not contain bleeder resistance in the high voltage circuit and dangerous voltage levels may remain for a substantial period of time after the receiver is turned off.

To test the secondary:

NOTE: Do not perform this test unless the flyback has already passed the RINGING TEST. As with the RINGING TEST, be sure the cores and spacers are installed in the flyback if you are testing it out of the circuit.

1. If you are testing the flyback in the circuit, be sure to disconnect the collector of the horizontal output transistor by removing the transistor mounting screws,

disconnect the high voltage lead and filament leads from the CRT, and disconnect one end of the rectifier diode in each of the scan derived supplies.

2. With the VA62A off, select the HORIZ KEY PULSE position of the DRIVE SIGNAL switch. Set the DRIVE RANGE switch to the 30 VPP position. (This provides the proper drive impedance.)

3. Connect the DCV meter probe (with the TP212 connected) to the high voltage lead (disconnected from the CRT) and the DCV meter common lead to the bottom of the high voltage secondary winding that contains the high voltage diodes (for example, pin 2 of Figure 1).

4. Connect the leads from the DRIVE OUTPUT jack to the primary of the flyback. (Red output lead to horizontal output collector connection and black output lead to supply voltage connection.) Proper polarity of the drive signal input is needed to turn on the HV diodes. Remember that both the common lead from the DRIVE OUTPUT and from the EXT PPV & DCV IN connectors must be connected (although to two different test points) because they are isolated from each other inside the VA62A.

5. Turn the VA62A on and use the DRIVE SIGNAL function of the DIGITAL METER switch to adjust the DRIVE LEVEL control for an amplitude of 25 volts P-P, positive polarity.

Collector PPV	CRT HIGH VOLTAGE			
	20	25	30	35
500	1000	1250	1500	1750
700	700	890	1000	1250
900	550	690	830	970
1100	450	560	680	790

Fig. 2: Use the normal horizontal output voltage and high voltage to determine the minimum DC voltage for the integrated flyback test. A good IHVT will produce that voltage or higher when you supply 25 VPP to the input.

6. Select the EXT DCV position of the DIGITAL METER switch. Read the DC output. Remember to move the decimal place one position to the right (multiply the reading by 10) to compensate for the TP212.

7. Compare your DC reading to the table in Figure 2. The secondary and the high voltage diodes are good if the voltage you measure is the value shown in the table or higher.

How To Test HV Multipliers

You can test HV multipliers (doublers, triplers, and quadruplers) with a procedure similar to that you used for IHVTs. The dynamic test procedure is outlined in the VA62A Operation and Application Manual. The procedure follows:

To test a high voltage multiplier:

1. Disconnect the lead running from the flyback to the multiplier input and the lead from the multiplier to the CRT high voltage anode.

2. With the VA62A turned off, select the HORIZ KEY PULSE position of the DRIVE SIGNAL switch.

3. Connect the DCV meter probe (with the TP212 connected) to the high voltage lead and the DCV common lead to the common (ground) connection on the multiplier.

4. Connect the red DRIVE OUTPUT lead to the multiplier input and the black DRIVE OUTPUT lead to the multiplier common point. (Remember you must connect both the common lead from the DRIVE OUTPUT and the common lead from the EXT PPV & DCV IN connectors because they are isolated from each other inside the VA62A.)

5. Turn the VA62A on and use the DRIVE SIGNAL function of the DIGITAL METER switch to adjust the DRIVE LEVEL control for an amplitude of 250 volts P-P, positive polarity.

6. Select the EXT DCV position of the DIGITAL METER switch. Read the DCV output on the DIGITAL METER. Remember to move the decimal one place to the right (multiply the reading by 10) to compensate for the TP212.

7. Compare your DC reading to the table. If the DC voltage you measure is the value shown or higher, the multiplier is good.

HV Multiplier Type	Output Voltage
Doubler	250
Tripler	500
Quadrupler	750

Fig. 3: A good high voltage multiplier will produce these voltages or higher when you supply 250 VPP to the input.

How To Test IHVT and HV Multiplier Focus Taps

You can test the focus tap on either an IHVT or HV multiplier at the same time you test the HV circuit.

After you test the DC output on the HV output lead, check the DC voltage on the focus output lead. If the internal focus supply circuit is good, the voltage at the focus tap should be 25-50% of the voltage you measure at the HV lead.

In the case of a HV multiplier with a CTL pin (normally connected to the focus control), connect the CTL pin to the multiplier ground or common pin before testing. In this case, expect the focus tap voltage to be 10-20% of the voltage you measure at the HV lead.

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