SERVICE CLINIC

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Helpful flyback tests

YOU'VE OFTEN HEARD ME SAY, "I GET BY with a little help from my friends." Never was that statement more true than now! I've received a letter from a (very smart) reader, John P. Chalupski (MD), who has worked out a handy procedure for testing flyback transformers—the heart of the horizontal deflection circuit. (See Fig. 1.)

His letter said he wished he had a *flybacker*—a 16-kHz oscillator with a meter to read grid current—like the one described in October 1974's "Service Clinic." Not having a flybacker, he devised his own test procedure to use with the test equipment he had on hand (scope and function generator).

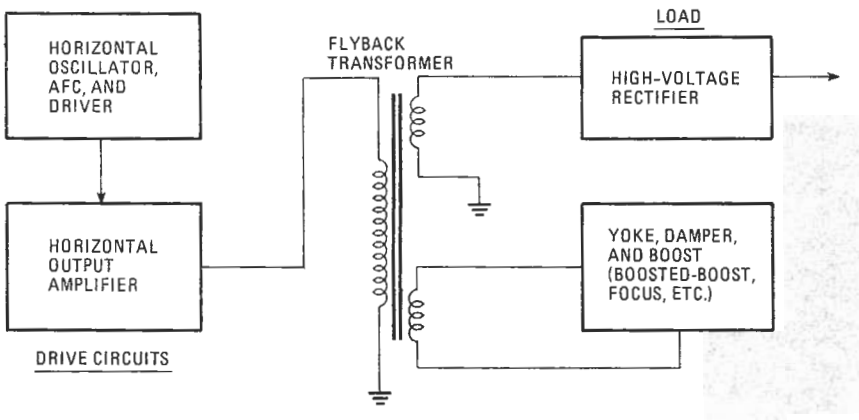

FIG. 1

Flyback test procedure

What John did was to substitute an audio function-generator and scope for the flybacker. He hooked the function generator across the output tube plate and high-voltage rectifier—evidently he had a generator with either a built-in sweep, or one that could be swept by applying a low AC-voltage across the VCO. The scope was hooked across the generator output.

While sweeping through 10 kHz to about 100 kHz, he noted that the resonant points (as seen on the scope) showed that the bad flyback, or the one he suspected of being bad, had fairly sharp resonant peaks at around 71 kHz. The good flyback that he had tested prior to that showed a much broader peak at the same frequency. When he took out the damper tubes, both flybacks showed the same thing: You guessed it—a shorted damper tube!

It should also be possible to make a similar test without using a swept signal by simply sweeping manually with an AC voltage. To do so, turn the function generator's dial through the same range (10 to 100 kHz) with the scope connected at the same place (across the terminal). You'll see a bar pattern on the screen, but you will not need to synchronize the sweep of the scope with it. Simply note the amplitude of the signal and find the resonant points (where the pattern increases in height; sometimes it will become more square).

He mentioned that this test can be made with only a scope and an audio-signal source that's variable over the necessary range. Also, if you don't have a scope, any good AC voltmeter will show the peaks, and that's all you need. He also said that this couldn't be used to check for a shorted winding.

This is a good example of one of those faithful readers who are smarter than I am (I'd say that includes roughly, 93% of them)! So keep those cards and letters coming folks! They are really appreciated.

Checking shorted windings

While John's procedure cannot be used to test for shorted windings in a flyback transformer, there is, however, a simple way to do so. (I found this one in the book that discussed the operation of the flybacker.) Simply hook your function generator up to the flyback and observe the scope trace, or reading (on the flybacker). Now, pick up that little coil of solder that you have on the bench and unwind about 3–4 inches. Now slip it around the core of the suspected bad flyback, then pull the ends together and pinch.

That makes a closed loop (one shorted turn) around the core. The reading on the flybacker should drop to zero, and the curve on the scope should vanish. If it does, that's a normal reaction with this test. It shows that you have no shorted windings. But if there is little or no change in your reading, then you've got a problem.

What's happening here is that the solder coil is placing an AC short across the transformer, which lowers the Q of the circuit and causes a bad reading. But if the transformer is already shorted, the solder-coil will have little or no effect on the circuit. That's a difficult problem to detect with ordinary test instruments such as ohmmeters and voltmeters because the DC continuity of the circuit will check out OK, but it won't work with the normal AC drive.

You can, however, measure the small resistance of the little windings, provided you have an extremely accurate digital VOM. I would recommend that you use needle-point test prods to ensure that you're able to get through any flux or whatever else might be on the terminal. Sharp tips allow you to get right down to the bare solder so you can get an accurate reading.

By using the test procedure worked out by John, and then doing the shorted-turns test (with a loop of solder) while observing changes in the scope pattern to see if it goes to a straight line, you can tell if the flyback or some other component is causing the problem. If when doing the shorted-turns test, the scope shows a very narrow range of movement of the tuning dial, the transformer is OK. The broad peak can be identified in the same way.

Since we're talking about flybacks anyway, this seems to be as good a time as any to tell you about a letter I received long ago from a man who had this complaint about a TV set he was working on.

The letter said that with the set's horizontal oscillator plugged in, the fuse would blow right away, but if oscillator was pulled out, the fuse wouldn't blow. From the symptom, I speculated that the cause of the problem was an AC short (and told him so).

Not long after that, I received another letter from that person saying that I was absolutely right. He had found that one winding of the flyback was shorted to the other. Again I wrote saying that, to me, it sounded as though the short were in the leads out of the winding! He wrote back again and said, "Darned if you weren't right again!"

The key to locating the trouble was the almost normal current without any drive, and the overload of current with drive. The DC path was alright, but when an AC drive signal was put on it, the AC saw a dead short. So, remember that it's possible to have an AC short in circuits of that type without showing any indication using regular ohmmeter tests.

Finally, I'd like to thank all the good people who sent get-well cards. You can be sure that they were much appreciated. **R-E**

SERVICE QUESTIONS

THE EASY SOLUTION

On a Systems 3 Zenith, I found several components shorted, including the output transistor. I replaced them, plugged the set in, and bang! The output transistor blew, taking out a fast recovery diode. Any help will be appreciated.—O.R., Virginia Beach, VA

I hate to rain on your parade, but replacing the 9-160 module in its entirety will save you time, money, and also your sanity.

MOMENTARY SYNC-PROBLEM

This MGW Magnavox chassis B5-O4, will drop out of sync momentarily, causing a flash in the picture, and then go back in sync. That happens every 10 minutes. Any suggestions?—W. K., Columbus, OH

Of all the information you sent with your letter, the bit that deserves the most attention is the slowly rising voltage you get at R504 and C505. That's the point of AFC correction, and any changes in its potential will affect the horizontal frequency. As you describe it, I suspect something is causing a slow buildup and then a sudden discharge. Check all the components between the oscillator base back to, and including, the dual-diodes. Measure those resistors out of circuit! Don't ignore the R-C network returning the pulse from the flyback! **R-E**