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BENCH BRIEFS

SERVICE INFORMATION FROM HEWLETT-PACKARD
1st Quarter 1995

The Metrological and Financial Implications of a Clogged Fan-Filter!

Martin Aust / Hewlett-Packard
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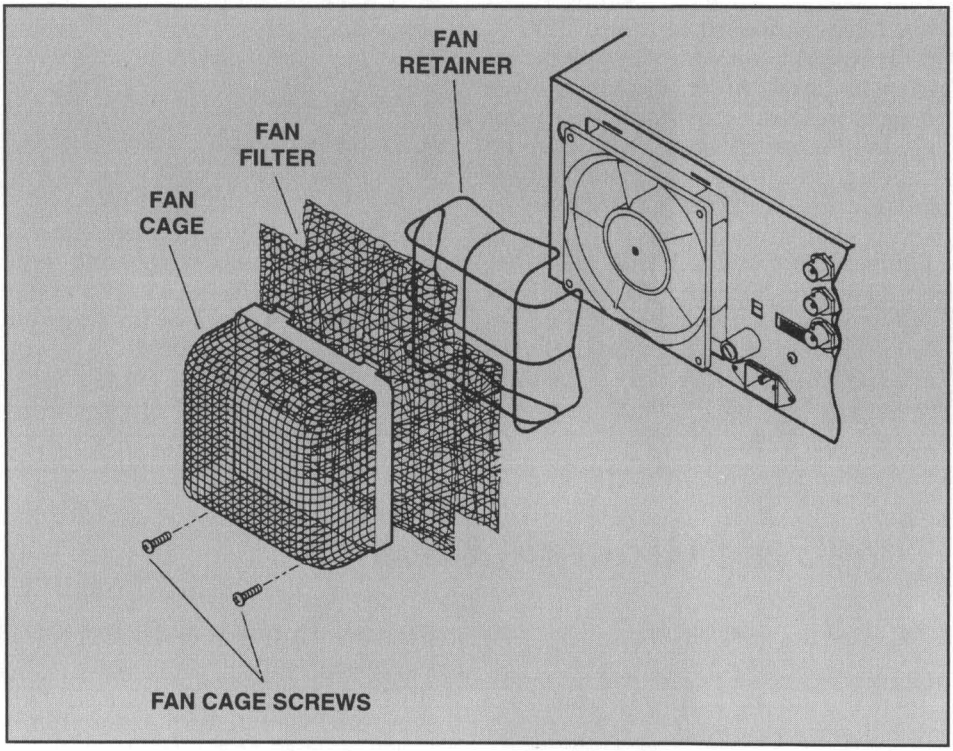
Mike Hutchins / Hewlett-Packard



When you've peeked around the back of an ATE system, have you ever discovered one or more dirty or clogged fan filters?

If not, then congratulations!

Maybe your work environment approaches 'clean room' quality – or maybe your preventive maintenance program is effective enough to keep the filters clean.

However, it's reasonable to consider that the majority of systems are operating in environments and processes that:

- Degrade metrological integrity; and,
- Increase equipment maintenance cost and downtime.

How serious are these effects? It may help to consider the following scenario, drawn from a number of real situations.

The Scenario

Over a period of months, the air filter for an instrument in your ATE system gradually becomes clogged. The internal operating temperature gradually rises and some metrological parameters gradually drift. At some point, due to circuit temperature coefficients, the instrument goes out of specification. Unaware of this problem, you continue to use the instrument!

Of course, the air filter continues to collect debris. Eventually – maybe weeks later – you smell something burning. Almost simultaneously, the instrument goes into hard failure. Now for the first time, you become suspicious, to say the least. You search, inspect and ponder . . . . .
. . . . . and it doesn't take long for you to spot the clogged air filter.

Although the cause of this dilemma is now obvious, perhaps you don't even want to think about the metrological and financial effects. The truth is that, for some unknown period of time, you have been using an out-of-tolerance instrument in your production process. *This is the metrological impact!*

Furthermore, your system is now inoperative due to the failure. This downtime translates to lost income, and almost certainly, to customer dissatisfaction. And, due to the nature of heat damage and the associated repair process, the instrument is likely to be out of service for weeks. When you have the instrument repaired and recalibrated, it will more than likely be at great expense because there are multiple failures.

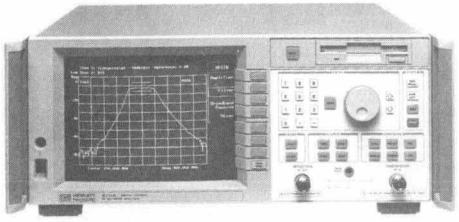
Eventually, you get the instrument back and begin using it again. Unfortunately, due to the original heat-damage inci-

(See "Fan Filter," page 4)

Pub. No. 5952-3467

HP 8711A Network Analyzer Spare Parts Kit Is Now Available

John Vallelunga / Hewlett-Packard



Hewlett-Packard has just introduced two new spare parts kits for the 8711A RF Network Analyzer. These kits will allow any user to quickly repair more than 80 percent of any failures. The intended customers are those users who have a medium-to-large installed base and require a minimal downtime.

The standard kit is HP P/N 08711-60133 for the 50 ohm 8711A. HP P/N 08711-60134 is available for 75 ohm units (Option 1EC). Both are provided at a substantial discount over the individual assembly prices. Each kit contains the following assemblies:

- A2 CPU
- A3 Frac-N
- A4 Source
- A5 Receiver
- A6 Power Supply
- A8 Disk Drive

These assemblies will allow most all failures to be quickly repaired. Once repaired, the defective unit can be returned and a restored exchange assembly can then be purchased to restock the kit. This kit does not contain the A1 front panel, the A7 CRT, or the A8 Attenuator. These all have very low fail rates and are available separately.

In order to make the required adjustments once an assembly has been replaced, some or all of the test equipment shown in Table 1 may be required depending upon which assembly failed. This list assumes the latest 8711A firmware is used (A.02.10) as well as the latest performance test software (P/N 08711-10011). This list does not include common equipment such as cables, adapters, voltmeters, and power supplies. For complete instructions, refer to the HP 8711A Service Manual. □

Table 1. HP 8711A Test Equipment

Equipment	Equipment Notes
438A or 437B Power Meter	436A will not work
8482A Sensor	Required for both 50 and 75 ohm units
8481D Sensor	Required for all attenuator units (Opt 1E1)
08711-60017 Service Cable	Part of 08711-60010 service kit
11852B Minimum Loss Pad	Required only for 75 ohm units (Opt 1EC)
Cal Kit (85032B/E 50 ohm)	(85036B/E for 75 ohm units)
8116A Function Generator	
8496A/G 10dB Step Atten	With Cal data
Computer: HP Series 200/300	
30dB SMA pad and short SMA cable - need not be calibrated.	

Timebase Ground-Loops

Greg Burnett / Hewlett-Packard

Break the ground loop with a timebase isolation transformer!

The practice of locking the timebase of an instrument to a "house frequency standard" is a good way to improve the frequency accuracy and traceability of your measurements. However, an undesired side-effect may be a ground-loop induced measurement error for certain measurands — especially for low-level audio measurements. (In such instances, the external timebase connection may complete an unwanted ground-loop path.)

The Problem

For example, consider the following scenario: I was using an HP 3325B Synthesized Generator and an HP 3585B Spectrum Analyzer to measure the audio gain of a device-under-test (DUT). I locked the 3325B and 3585B timebases to the "house frequency standard" via a distribution amplifier. I then connected a very low-level audio signal from the 3325B to the DUT's input port. The DUT amplifies the small signal (80 dB gain), which I attempted to measure by connecting the DUT's output port to the 3585B 1M ohm input port. However, I discovered the DUT was self-oscillating (which it isn't supposed to do). When I disconnected the 3325B external timebase connection, I broke the gound-loop and the problem "went away."

Many times external timebase ground-loop effects are more subtle than the above scenario. This can be even worse because moderate measurement errors may go undetected for some time. Therefore, to be safe, you may wish to isolate most (or all) of your external timebase connections. (The problem tends to be worse when an instrument's external timebase input and main signal output are both "floating" relative to the chassis, but not relative to each other; however, many ground-loop scenarios are possible.)

The Solution

Break the timebase ground-loop by inserting isolation transformers between the frequency distribution amplifier and the external timebase input of each instrument. (Place each isolation transformer as near the external timebase input as possible.)

The isolation transformer should preferably:

1. Have 1:1 ohms ratio, with bandwidth to at least 20 MHz.

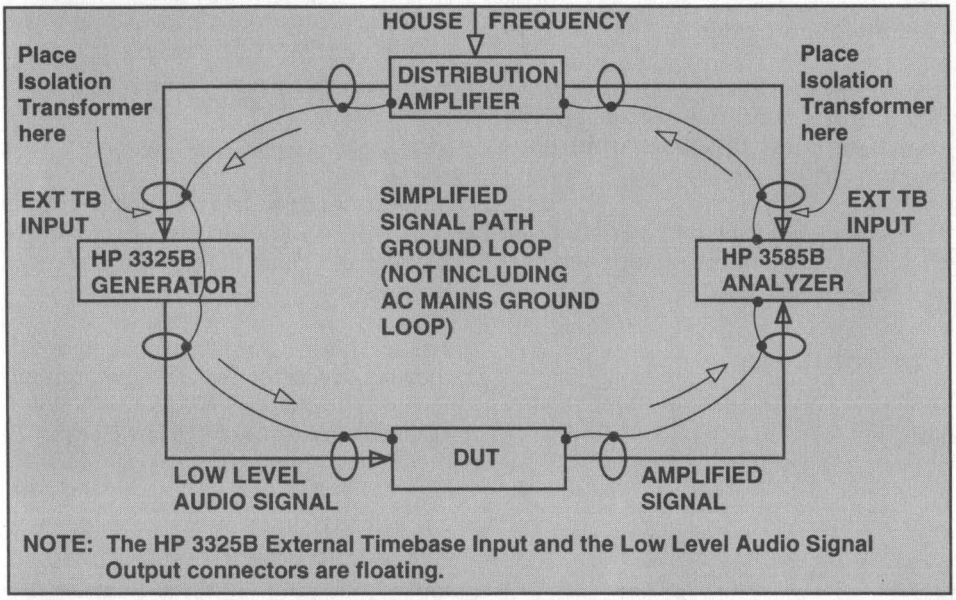


Figure 1. Block diagram showing simplified ground-loop problem

2. Be mounted in a small, shielded case with BNC connectors.

3. Break the ground-loop, but not alter the timebase signal.

The transformer may be "home-built" from suitable parts. However, as of this writing, I have used a low-cost, commercially available isolation transformer to successfully break timebase ground-loops. It is:

Mini-Circuits, P/N FTB-1-1-75 *C15
$36.95 (U.S. Dollars)

Contact:
Mini-Circuits
P.O. Box 350166
Brooklyn, NY 11235-0003
Phone: 718-934-4500
FAX: 718-332-4661 □

READERS' CORNER

Dear Editor

Nice article on "Calibration of Time Base Oscillators," however, I believe there is a mistake in the Example 2 paragraph where it references Figure 3b, the Recalibration Chart for Rubidium Standards. If the chart is correct, then the recalibration time should be approximately 80 days and not 101 as the text states.

Also a note on frequency standards. The HP 5065A Rubidium Frequency Standard has been our "house frequency standard" at our manufacturing division for the last 20 years. A three month calibration cycle was established many years ago and I only have to "steer" it back to nominal approximately once a year. We still use WWVB as a calibration source due to its geographical closeness to our site. I do a 48 hour drift test for maximum accuracy.

A follow-up article on calibration sources for high-end frequency standards would be nice to see in the next *Bench Briefs*.

John Chapman/Measurement
Standards & Services
Hewlett-Packard Colorado Springs

John – Thanks for catching a typographical error in our Application Note 52-2 Appendix C that has been there unknown for at least 20 years. Starting on page 2-4, a sample problem is worked out that happens to be the same example used in the appendix. At the end of the formulae on page 2-6 the correct answer of 75 days is given. However, somehow this was transposed to 101 days in the example in Appendix C, which was passed on in the Bench Briefs *article.*

As for a new frequency standard, John, look at Hewlett-Packard's new HP 58503 GPS Receiver, which will be describe in a later issue of Bench Briefs. *For more information contact your local HP sales office.*

Another reader wrote in that he preferred to see the Allowable Offset column in Table 1 to be shown in unitless fractional form to avoid confusion. Therefore, Table 1 would read as follows:

Editor □

Table 1. Typical specifications of the five types of oscillators.

Time Base Type	Typical Aging	Typical Shift for 5 C°	Allowable Offset @ 10 MHz	Typical Warmup	Allan Variance (T=1 sec.)
XO	3×10^{-7} per month	5×10^{-6}	60 Hz (6×10^{-6})	30 minutes	1×10^{-9}
TCXO	1×10^{-7} per month	1×10^{-6}	13 Hz (1.3×10^{-6})	3 hours	1×10^{-10}
OvenXO	5×10^{-10} per day	5×10^{-10}	150 mHz (1.5×10^{-7})	3 days	5×10^{-12}
Rubidium	1×10^{-11} per month	5×10^{-12}	400 μHz (4×10^{-11})	4 hours	7×10^{-12}
Cesium	None (Primary Std.)	3×10^{-12}	50 μHz (5×10^{-12})	45 minutes (21.5 nsec/hour)	1×10^{-11}

("Fan Filter," continued from page 1)

dent, many parts (that were not replaced) are functional – *but wounded*. During the following months and years, you notice the instrument has poorer reliability than before and it is not as stable between calibrations.

You might need to reduce the instrument's calibration interval according to your company's periodicity management process – a pity since the instrument previously had an extended interval based on its excellent historical performance. So, to meet metrological reliability targets, the instrument is calibrated more often.

The *cost* of ownership – and the *inconvenience* of downtime – are disappointing, compared to what could have been.

It is without doubt that variations of this scenario do occur in normal working environments.

The Solution

The solution to this problem is very simple . . . .

- To help preserve metrological traceability of your processes,
- To improve *your* customer's satisfaction, and
- To reduce operating costs,

all you need to do is follow a simple preventive maintenance program to inspect and clean the air filters at regular intervals.

For further information on this or advice on any other Test & Measurement Support matter, call your local Hewlett-Packard Customer Support Center. □

Safety-Related Service Notes

Service Notes from Hewlett-Packard relating to personal safety and possible equipment damage are of vital importance to our customers. To make you more aware of these important notes, they are printed on paper with a red border, and the service note number has an "-S" suffix. In order to make you immediately aware of any potential safety problems, we are highlighting safety-related service notes here with a brief description of each problem. Also, in order to draw your attention to safety-related service notes in the service note index, each safety-related service note is highlighted with a contrasting color.

HP E1550A C-Size DS1 32-Channel Daisy Chain/Multiplexer Switch

Serial Numbers Affected

3315A00100/3315A00141

The maximum input voltage for the E1550A is 42 Vpk. Some units were shipped with sheet metal (top covers) marked with an input voltage of 200 Vdc/170 Vrms. The manual does indicate the correct specification. Electric shock and/or equipment damage is possible if input voltage greater than 42 Vpk is applied.

Order Safety Service Note E1550A-01-S (document ID number 5758 on the HP FIRST system) for more information.

E3951A IPATS Primary Access Test System; Front end adapter

Serial Numbers Affected

0000U00000/9999U99999

Note: This Safety Service Note is for *information only*. All systems have been repaired and no further action is necessary.

For more information, order Priority Safety Service Note E3951A-01-S (document ID number 6166 on the HP FIRST system).

E1421A C-Size Portable Mainframe

Serial Numbers Affected

US34000101/US34000216

A potential electrical shock hazard and/or fire hazard could result if certain fault conditions were to occur in the instrument.

A possible assembly error connects the AC neutral wire in series with the fuse instead of the line wire. This error occurs on the power entry module.

Note: This wiring error only creates a problem in North America (US and Canada) and other countries that use polarized mains. For countries that do not have polarized mains and that rely on the branch circuit over-current devices for protection, the reverse wiring is not a particular issue.

For more information, order Safety Service Note E1421A-01-S (document ID number 6251 on the HP FIRST system).

J2522A & J2523A Internet LAN Advisor

Serial Numbers Affected

J2522A - 3440A00116/3440A00158

J2523A - 3439A00165/3440A00238

Due to a redesign of the chassis to meet RFI standards, there exist components that do not have the appropriate clearance to a ground point. If the power cord ground is defeated and the component arcs to ground, a shock hazard may occur.

Return your instrument to the nearest HP Service Center and it will be repaired at no charge. For more information, order Priority Safety Service Notes J2522A-01-S or J2523A-01-S as document ID numbers 6262 or 6264 from the HP FIRST system. □

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T & M Service Notes - Press 2
Enter the Password - 76683

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MR	E1474A-01	Mod prevents erratic operation at elevated temperatures	6111
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MR	J2301A-03	Modification prevents damage to power supply during power on	6257
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Service Note Types

IO	Information Only	SA	Safety
MA	Modification Available	PS	Priority Safety
MR	Modification Recommended		

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