

An Era Told Through Electronic Masterpieces

HP: The Golden Age

Volume 3

Counters, Spectrum Analyzers

5335A, 5316B, 8552/53B, 8557A, 8567A, 8568B

Giovanni Becattini



References

The following references are used in this book:

- [TEO] Tektronix Epic Oscilloscopes – Elektor Books
- [7KS] Tektronix 7000 Series – Elektor Books
- [TREG] Tektronix Oscilloscopes Restoration Guide – Elektor Books
- [HP1] Hewlett-Packard and its Voltmeters and Oscilloscopes – Quacktech
- [HP2] Hewlett-Packard Signal Sources – Quacktech
- [HP3] Hewlett-Packard Counters and Spectrum Analyzers – Quacktech
- [HP4] Hewlett-Packard Calculators, Computers and HP-IB – Quacktech
- [VRE] Vintage Radio Equipment – Elektor Book
- [MAC] Apple Macintosh – History, Engineering, and Restoration – Elektor Books
- [QT602] The Good Giant – Tektronix DSA 602A Oscilloscope – Quacktech
- [QT11KP] The Last Plug-ins – Tektronix 11000-Series Plug-ins – Quacktech
- [SCLI] Strumentazione Vintage – Edizioni C&C
- [QTCOL] Collins Classics – KWM-2, 30L-1 and 51S-1: History, Engineering, and Restoration – Quacktech Editions
- [QT324] Two Giants and a Shorty – Tektronix 323/324 - Quacktech
- [QTYOP] Become Your Own Publisher – Quacktech
- [QTHPSS] Hewlett-Packard Signal Sources – Quacktech
- [DAB] Digital but Analog – Quacktech
- [TG7] When Machines Learned to Write - Quacktech

- All rights reserved. No part of this publication may be reproduced or stored in any form or by any means, electronic or mechanical, without the prior written permission of the Author.
- The Author has made every reasonable effort to ensure the accuracy of the information contained herein but assumes no responsibility for errors or omissions, or for any loss or damage resulting from the use of this material.
- Most photographs were taken by the Author; others derive from commercially licensed or Creative Commons sources, clearly indicated where applicable.
- AI-assisted content disclosure – This book contains AI-assisted content used for language revision and for the creation of original illustrative material. All ideas, technical content, structure, and final editorial decisions remain entirely the Author's own.
- Some illustrations in this book were generated with the assistance of artificial intelligence tools, using original prompts and concepts developed by the Author. These images serve a purely illustrative and metaphorical purpose and are not intended to depict or reference any existing copyrighted characters, brands, or proprietary visual styles.
- Apple, Hewlett-Packard, Tektronix, Teletype, and other trademarks or logos mentioned in this book are acknowledged and remain the property of their respective owners.
- © 2025, 2026 Giovanni Becattini, Florence, Italy.

Table of Content

Preface	7	Standard Deviation	53
		Mean and Smooth	53
Counters	11	Automatic Functions	55
Measuring Frequency	13	Beyond an Universal Counter	55
Not Always So Simple	14	B-Side	56
The BC-221	14	Block Diagram	58
HP 500 Frequency Meter	16	Two Main Blocks	58
The Phantastron	18	Unprecedented Flexibility	58
The Nixies Arrive!	22	LSI Counter	61
The MRC Chip	22	Split-Band Amplifiers	64
Don't Waste These Masterpieces!	24	New Trigger, New Chips	66
In the Following Subsections	24	Automatic Triggering	69
5316B Universal Counter	27	HP-IB Programmability	70
Description	28	Yet Another HP-IB Instrument	70
"Good Performance, Affordable (?) Prices"	30	Putting it to Work	70
The MRC	30	Remotely Control with the HP-85	72
Functions	30	High Quality Design & Components	74
Time Interval Measurements	30	Service Tips	76
Like a Properly Plugged Oscilloscope?	32	Voltages	76
Construction	33	Signature Analysis	76
Circuitry	33	Super Check	78
5335A Universal Counter	39	A True Keyboard	80
Introduction	40	I Like it!	80
Family Feeling	42	A Routine Job	80
Power for the Money	45	Keyboard Details	82
An Innovating Counter	45	Special Features	84
Prices and Options	45	Phantom Functions	84
Would I Have Bought It?	47	Spectrum Analyzers	87
Math	48	Introduction to SA	89
Special Keys	48	Spectrum Analyzers	91
Fact Checking	51	Ghosts?	91
Does it Really Work?	51	Less Popular	91
Telefunken E863	51	What Is a Spectrum Analyzer?	92
Statistics	53	Key Features of a Spectrum Analyzer	92
		Tracking Generators	94

Table of Content (cont'd)

141T+8553B+8552B	97	More Shields	145
"Frequency Domain Oscilloscopes"	99	Look and Feel	145
Immense Areas of Application	100	Modular	146
Nameless?	100	A Repair	146
A New Modular Family	100	Serviceability	146
140 Goes 180	103	Other Fixings	148
Modularity	105	Recovering From a Shock	148
The First Time	105	Tracking Adjustment	148
Easy to Use and Interpret	105	More Faults	151
The 8553B/8552B Pair	106	They Are Old, it May Happen...	151
The Most Appealing Features	106	Starting the Investigation	151
Block Diagram	110	Electronics for Pigs?	151
Multiple Conversion Superheterodyne	110	The Crowbar Circuits and Pigs	152
Residual Responses.	112	The Mysterious Noise	153
70-dB Log Amplifier	113	Prejudices	153
Frequency Stability Issues	117	Stand-by Mode	154
The Optional Tracking Generator	119	The A14 Board	154
The Cathode Ray Tube	120	Italian Proverbs	156
Beautiful	120	Me Too!	158
The Problem	120	SMA Connectors	160
CRT Removal	120	SMB Connectors	162
Cleaning	122	SMC Connectors	164
Result	122	Connectors' Gender	165
8443A Tracking Generator	127	8557A+853A	167
The 8443B (Without the Counter)	128	Plug-in Mania	169
The 8443A (With The Counter)	130	8557A SA Plug-in	171
The Nixies	130	Simple, 3-Knob Operation	171
Output Leveling	134	Absolute Amplitude Calibration	172
Thin-film Microcircuit	135	Continuously Variable Video Filter	172
Counter Section	135	8557A Specifications	172
Specifications	136	853A Display	174
Tracking Generator	136	Two Configurations	174
Counter	136	Hardcopy etc.	174
External Inputs	136	A Bit of Digital	177
Auxiliary Outputs	136	A Better Display	178
General	136	Better Than an Oscilloscope	178
Ex Uno Discere Omnes	138	Like an Apple II	178
A Widely Used Scheme	138	Weights	178
Design Goals	138	How Many Trimmers!	181
Modularity	138	Ingenious Mechanics	182
The Main Board	140	8640B	185
External Interconnections	140	Can't Always Win	186
Internal "Tiny Bus"	140	8568B (8567A)	191
Shielding	140	Introduction	193
Boards in the Pockets	142	A Little History	193
Shield at All Costs!	144	Not Cheap	194

One of the First	194	Real Time Execution	234
Composition	194	Stored Execution (DLP)	236
8567A The Little Brother	198	Learn Mode	236
Performance	200	Softkeys	236
Selectivity Matters	206	Computer Control	239
How Did We Do Earlier?	208	Which Computer?	239
Phase Noise	210	Computer Advantages	239
User Experience	212	Fiddling With Computers	239
Exceptional Quality CRT	214	Third-party Software	242
The Digital Section	216	Phase Noise Measurement	242
Two Modules and Three Processors	217	Spectrum Surveillance	242
Block Diagram	218	7470A Plotter Emulator	242
The Right Thing For You	220	An Yttrium Hearth	244
We Do Have the Solution	220	YIG, What's That?	244
Video Section	223	The RF Section	246
It Left Its Mark	225	Separate Rails	250
The HP-IB Interface	225	Interesting Details	252
A Modular Approach	225	Restoration	258
My Prayers Always	225	My Dear Diary...	258
Firmware Development	226	Fixing the Calibrator	270
Assembly Language	226	Keyboards	273
High-level Languages	226	Keys Maintenance	274
Development Tools	226	Dealing With the Attenuator	278
Measurements Aids	228	How Does It Work?	283
AM Modulation	230	Why Did I Come Here?	283
Programmability	233	Conclusions	284
Never by Chance	233	Bibliography	286
Structurally Ready	233		
A Measurement System	233		
Tektronix 7854	233		
HP 8568B Logic	234		



Preface

For generations of engineers, Hewlett-Packard—simply “HP”—set the standard for electronic instrumentation. Its instruments were not merely tools, but symbols of precision, reliability, and intellectual rigor. (When it came to oscilloscopes, many of us—myself included—often preferred Tektronix, but that is another story.)

Founded in 1939 by Bill Hewlett and David Packard, HP grew from a small Palo Alto garage into one of the most respected electronics companies in the world. Over the decades, it shaped the way measurements were made and understood, establishing reference points for generations of engineers and scientists.

This volume is part of the Technical Art Books collection and belongs to the series HP: The Golden Age – An Era Told Through Electronic Masterpieces, devoted to exploring the most significant period of Hewlett-Packard’s production through a selection of representative instruments, calculators, and computers. Rather than aiming at completeness, this series presents a portrait of an era through emblematic examples of electronic design.

This specific volume is dedicated to what Hewlett-Packard called signal sources: an exceptionally broad family of instruments—including signal, pulse, and function generators—produced in a vast number of different models, of which this book presents only a selected group of representative examples.

More than a catalog, this book is intended as a historical and technical journey, combining images, technical investigation, personal experience, and practical restoration, in order to preserve the memory of an exceptional generation of instruments and of the era that produced them.

Giovanni “Gianni” Becattini
[*giovanni.becattini.books@gmail.com*](mailto:giovanni.becattini.books@gmail.com)

*To my wife
and my family*

Voltmeters and
Oscilloscopes

Signal Sources

Counters and
Spectrum
Analyzers

Calculators,
Computers,
and GPIB

Hewlett-Packard

Voltmeters

Oscilloscopes

Signal Sources

Counters

Spectrum Analyzers

Calculators

Computers

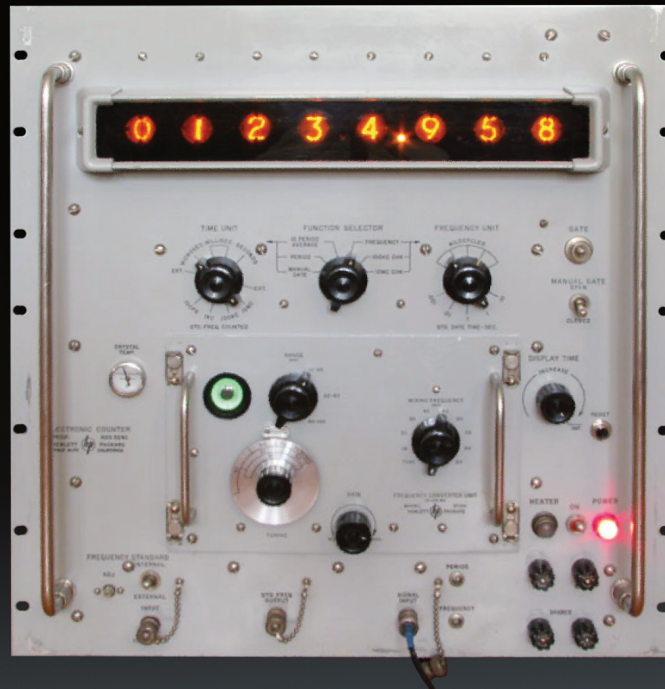
HP-IB



Section

Counters

A primer on the different types of equipment you will see in the chapters that follow



Section:

Counters

Subsection:

Measuring Frequency

Some small talks about frequency measurement in general.

Not Always So Simple

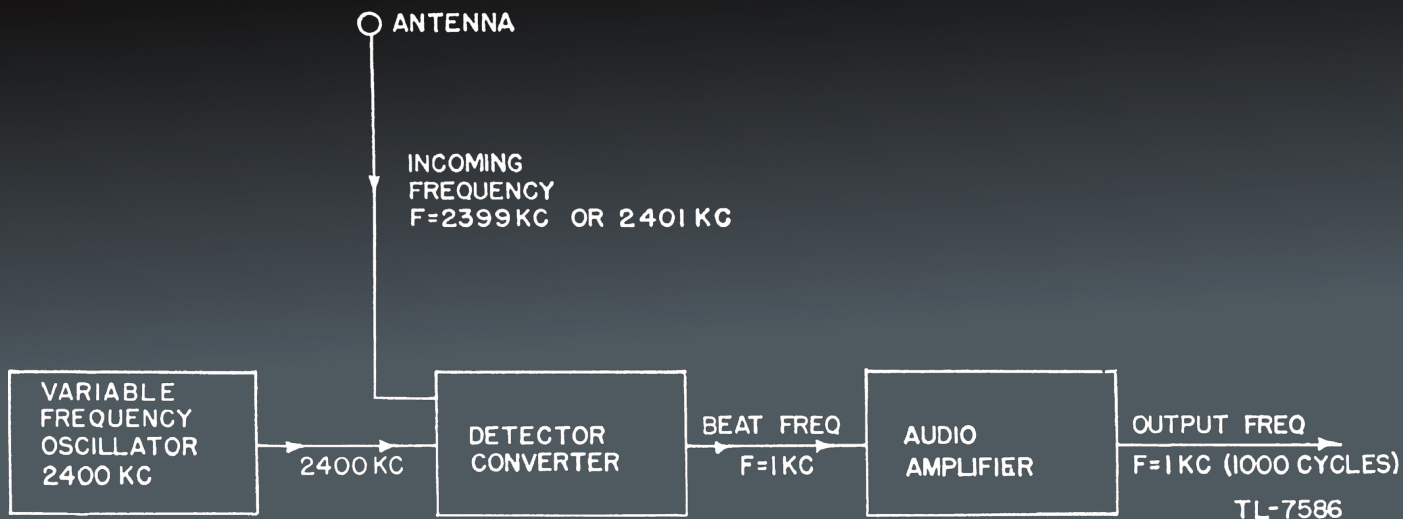
Precisely measuring the frequency of an alternate, repetitive signal is one of the simplest operations today; you can do it with a digital counter or an oscilloscope. For low frequencies, even many VOMs can solve your problem.

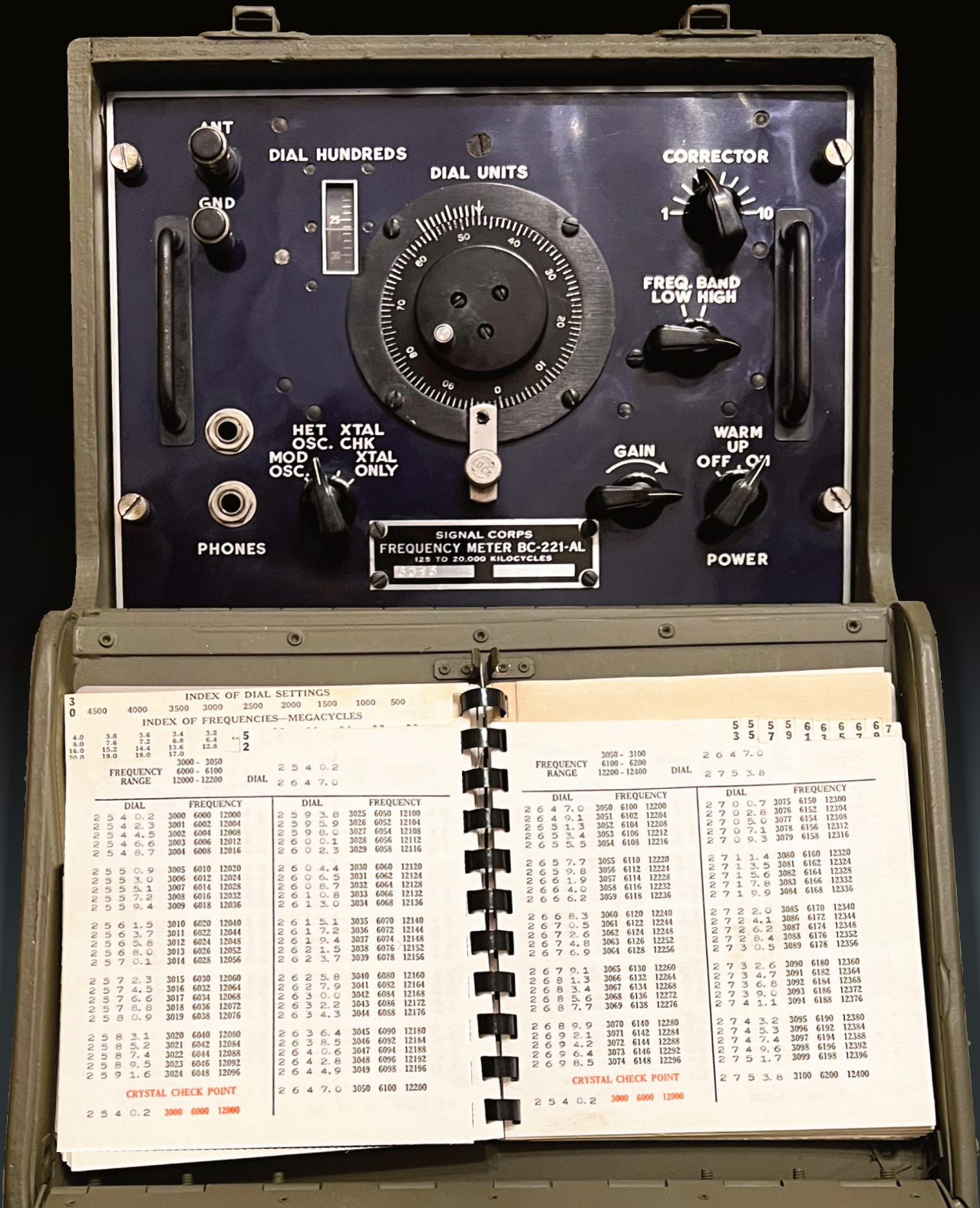
In the past, it was not so simple. The simplest way to measure a frequency is to use a capacitor in series with a voltmeter. The higher the frequency, the lower the capacitive reactance of the capacitor, and so the voltmeter moves more, but certainly the scale will be non-linear and the accuracy low.

The BC-221

The first time I read the words "frequency meter" was probably in a magazine ad for a 1941 military surplus **BC-221** (photo on the left), very common in the sixties, at least in Italy, but at that time I had no clear idea how it could work.

Later I discovered that the principle of operation is simple: as shown below, the BC-221 is essentially a broadband receiver and a variable frequency oscillator (VFO). It allows you to hear the beat of this oscillator and the unknown signal. The VFO is not only highly stable, but also individually calibrated.





INDEX OF DIAL SETTINGS

3	4500	4000	3500	3000	2500	2000	1500	1000	500
---	------	------	------	------	------	------	------	------	-----

INDEX OF FREQUENCIES—MEGACYCLES

4.0	3.8	3.6	3.4	3.2	5
8.0	7.6	7.2	6.8	6.4	2
16.0	15.2	14.4	13.6	12.8	
16.0	13.0		17.0		

FREQUENCY RANGE 6000 - 6100 DIAL 2 5 4 0 2

FREQUENCY RANGE 12000 - 12200 DIAL 2 6 4 7 0

DIAL	FREQUENCY	DIAL	FREQUENCY
NNNNN	3000 6000 12000	NNNNN	3025 6050 12100
4 4 0 0 0	3001 6002 12004	NNNNN	3026 6052 12104
4 4 2 0 0	3002 6004 12008	NNNNN	3027 6054 12108
4 4 4 0 0	3003 6006 12012	NNNNN	3028 6056 12112
4 4 6 0 0	3004 6008 12016	NNNNN	3029 6058 12116
NNNNN	3005 6010 12020	NNNNN	3030 6060 12120
NNNNN	3006 6012 12024	NNNNN	3031 6062 12124
NNNNN	3007 6014 12028	NNNNN	3032 6064 12128
NNNNN	3008 6016 12032	NNNNN	3033 6066 12132
NNNNN	3009 6018 12036	NNNNN	3034 6068 12136
NNNNN	3010 6020 12040	NNNNN	3035 6070 12140
NNNNN	3011 6022 12044	NNNNN	3036 6072 12144
NNNNN	3012 6024 12048	NNNNN	3037 6074 12148
NNNNN	3013 6026 12052	NNNNN	3038 6076 12152
NNNNN	3014 6028 12056	NNNNN	3039 6078 12156
NNNNN	3015 6030 12060	NNNNN	3040 6080 12160
NNNNN	3016 6032 12064	NNNNN	3041 6082 12164
NNNNN	3017 6034 12068	NNNNN	3042 6084 12168
NNNNN	3018 6036 12072	NNNNN	3043 6086 12172
NNNNN	3019 6038 12076	NNNNN	3044 6088 12176
NNNNN	3020 6040 12080	NNNNN	3045 6090 12180
NNNNN	3021 6042 12084	NNNNN	3046 6092 12184
NNNNN	3022 6044 12088	NNNNN	3047 6094 12188
NNNNN	3023 6046 12092	NNNNN	3048 6096 12192
NNNNN	3024 6048 12096	NNNNN	3049 6098 12196

CRYSTAL CHECK POINT

2 5 4 0 2 3000 6000 12000

FREQUENCY RANGE 3050 - 3100 DIAL 2 6 4 7 0

FREQUENCY RANGE 6100 - 6200 DIAL 2 7 5 3 8

FREQUENCY RANGE 12200 - 12400 DIAL 2 7 5 3 8

DIAL	FREQUENCY	DIAL	FREQUENCY
NNNNN	3050 6100 12200	NNNNN	3075 6150 12300
4 7 0	3051 6102 12204	NNNNN	3076 6152 12304
4 9 1	3052 6104 12208	NNNNN	3077 6154 12308
5 1 2	3053 6106 12212	NNNNN	3078 6156 12312
5 3 3	3054 6108 12216	NNNNN	3079 6158 12316
NNNNN	3055 6110 12220	NNNNN	3080 6160 12320
NNNNN	3056 6112 12224	NNNNN	3081 6162 12324
NNNNN	3057 6114 12228	NNNNN	3082 6164 12328
NNNNN	3058 6116 12232	NNNNN	3083 6166 12332
NNNNN	3059 6118 12236	NNNNN	3084 6168 12336
NNNNN	3060 6120 12240	NNNNN	3085 6170 12340
NNNNN	3061 6122 12244	NNNNN	3086 6172 12344
NNNNN	3062 6124 12248	NNNNN	3087 6174 12348
NNNNN	3063 6126 12252	NNNNN	3088 6176 12352
NNNNN	3064 6128 12256	NNNNN	3089 6178 12356
NNNNN	3065 6130 12260	NNNNN	3090 6180 12360
NNNNN	3066 6132 12264	NNNNN	3091 6182 12364
NNNNN	3067 6134 12268	NNNNN	3092 6184 12368
NNNNN	3068 6136 12272	NNNNN	3093 6186 12372
NNNNN	3069 6138 12276	NNNNN	3094 6188 12376
NNNNN	3070 6140 12280	NNNNN	3095 6190 12380
NNNNN	3071 6142 12284	NNNNN	3096 6192 12384
NNNNN	3072 6144 12288	NNNNN	3097 6194 12388
NNNNN	3073 6146 12292	NNNNN	3098 6196 12392
NNNNN	3074 6148 12296	NNNNN	3099 6198 12396

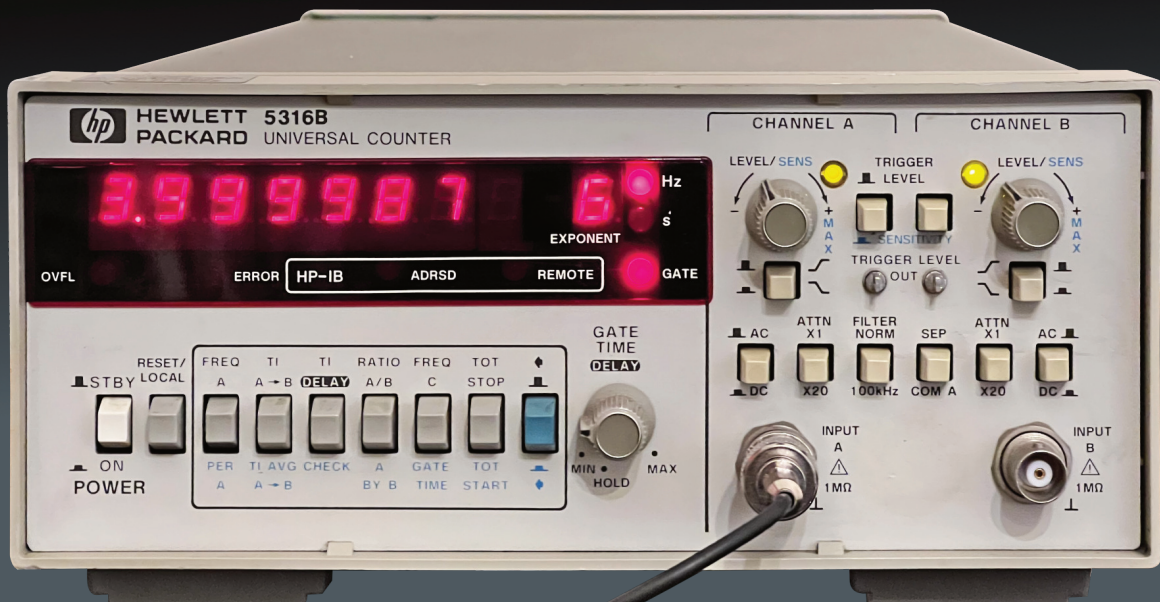
CRYSTAL CHECK POINT

2 5 4 0 2 3000 6000 12000

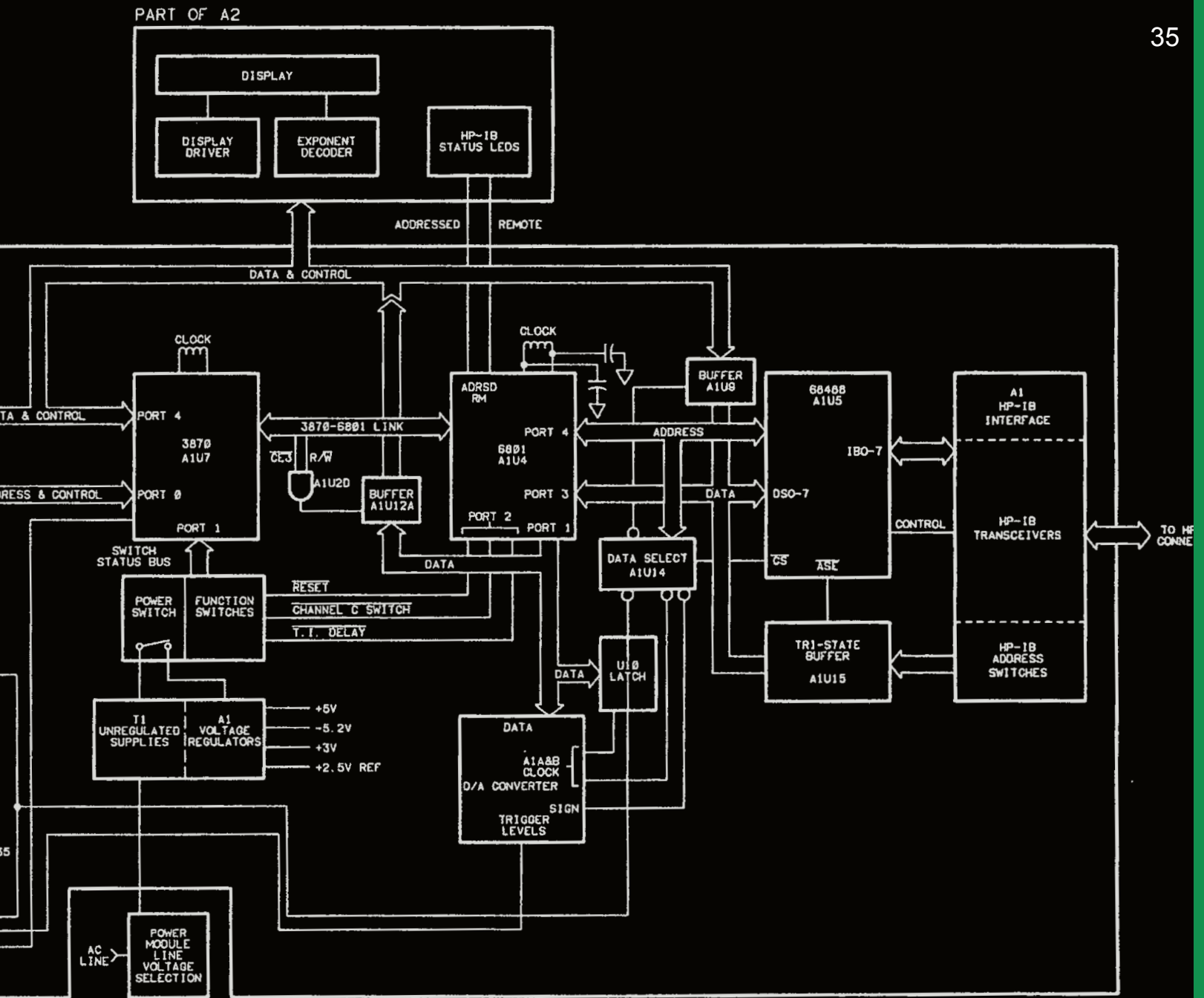
5 5 5 5 6 6 6 6 6 7
3 5 5 7 9 1 2 2 7 0



5335A Universal Counter



5316B Universal Counter



With today eyes I liked immediately the 5316B, as soon as I took it out of the box. It was like new and perfectly operating, still with the calibration seals from the last check, performed on November 11, 2003. Even today, within its limits, is perfectly usable and very practical.

Power for the Money

An Innovating Counter

In the early eighties, most electronics was by now going digital, and many digital circuits parameters like **pulse width, duty cycle, and phase** had become significant. A conventional counter could not be used to measure these parameters, or at least multiple setups were needed, accompanied by manual calculation. The 5335A offered **new functions**, or at least functions which I was not used to see in a digital counter, in addition to the **HP-IB** extended programmability. As we explore further below, we could summarize the novelties in two groups, which we have seen and are going to see also in oscilloscopes:

- math and statistics;
- automatic measurements.

In addition to these special functions, the 5335A had also good general performances, with 200 MHz range and **12-digit display**; some interesting options also added other possibilities.

Prices and Options

The price of the 3325A in 1980 was of \$2,950, equivalent to \$11,243.98 in 2024. But you had available very interesting options (in parentheses the 2024 equivalent):

- **Opt 010: Oven Oscillator**: \$650 (2,477);
- **Opt 020: Digital Voltmeter** (DVM) with auto-ranging, auto-polarity, ± 10 , ± 100 , $\pm 1000V$ ranges, 100 μV to 100 mV sensitivity (depending on range), up to 4 digits: \$275 (1,048);
- **Opt 030: C Channel**, with 150 MHz to 1.3 GHz with C/A capability: \$450 (1,715).

Interesting the voltmeter; it was completely independent from the counter, just like the Tektronix 7D13 oscilloscope plug-in. Digital voltmeters were a novelty and the possibility to share the display was evidently considered important by itself. Surprising that the most expensive was the oven; I would have thought it was the C Channel.

Automatic Functions

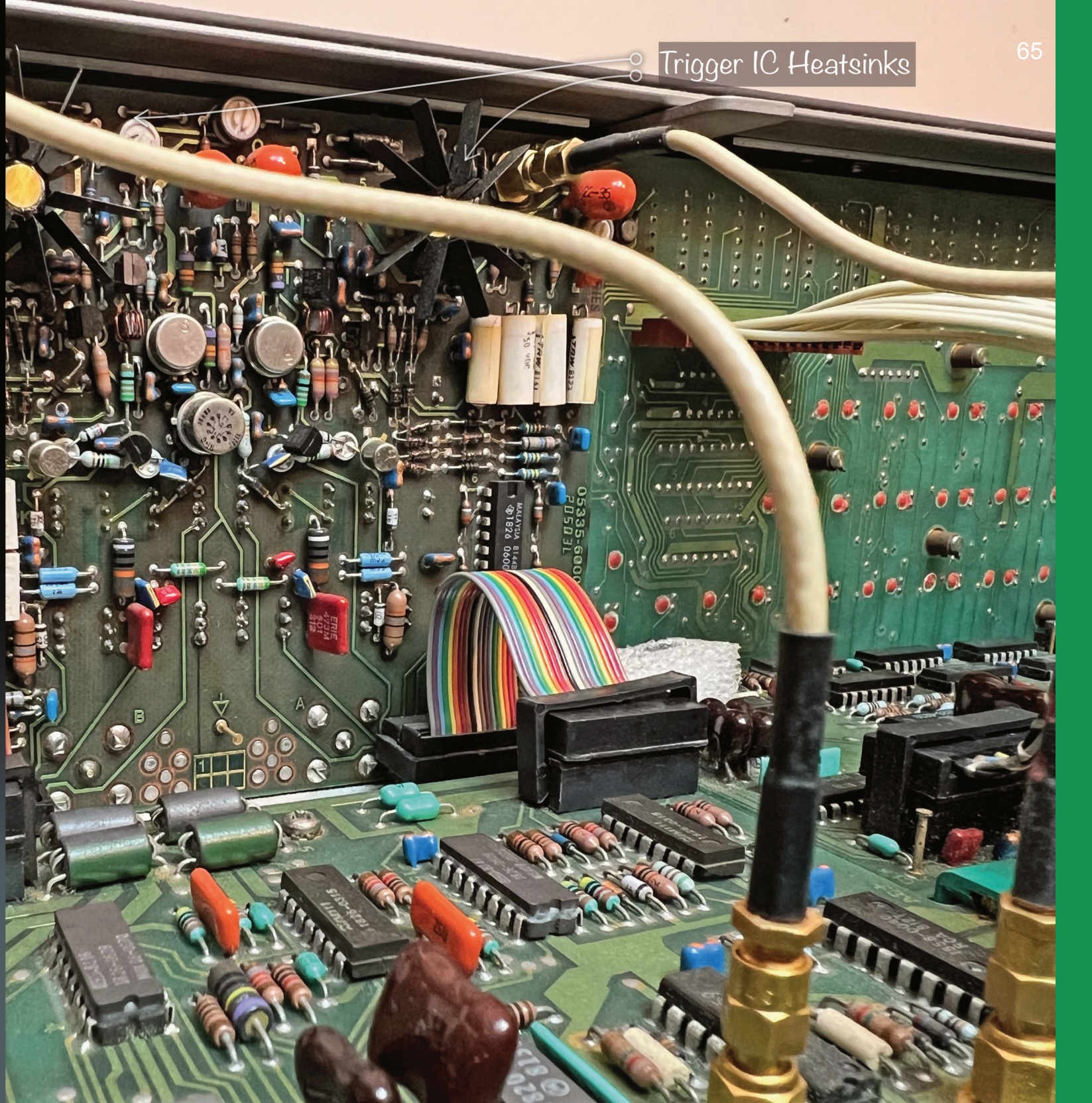
Beyond an Universal Counter

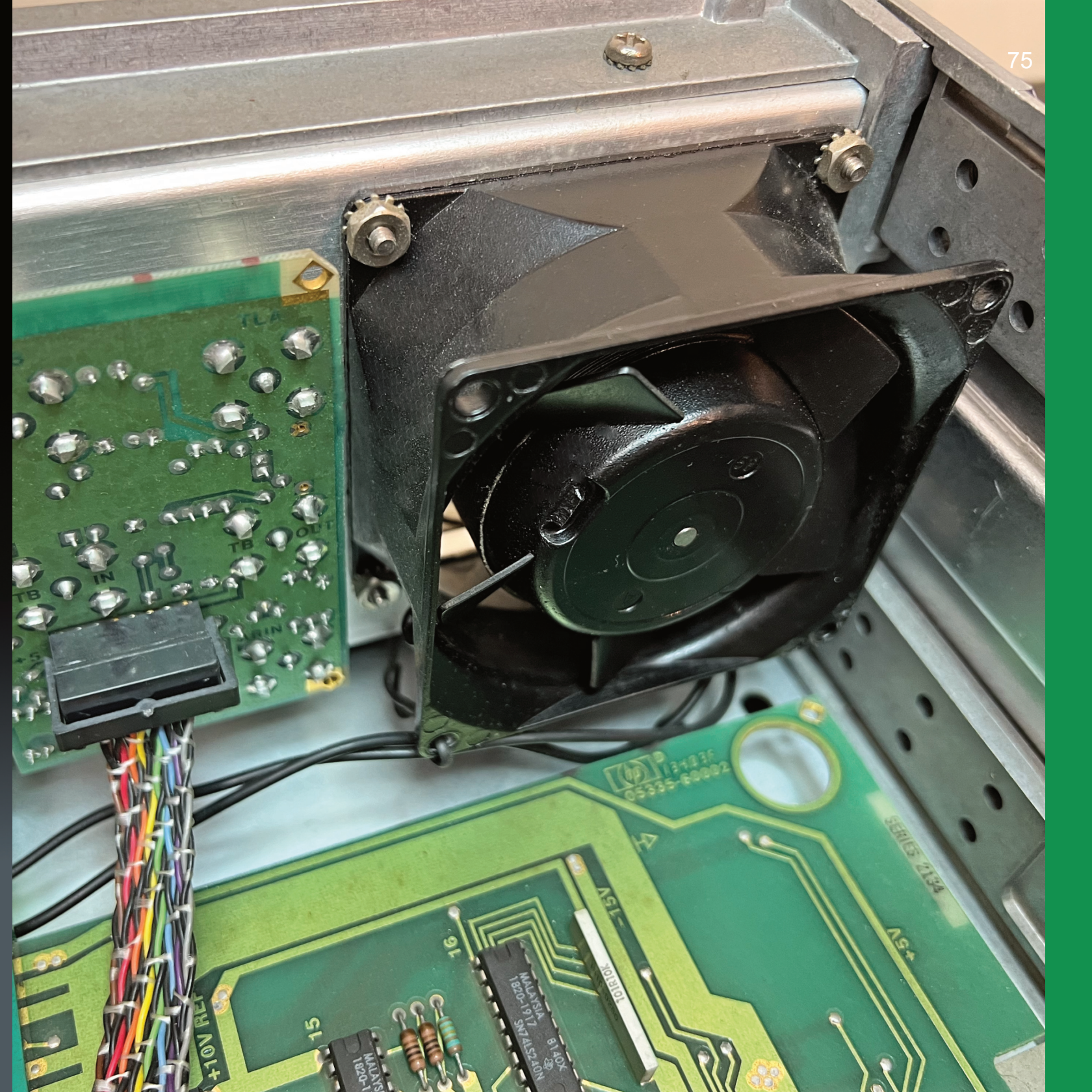
Manual/Automatic Triggering circuits allowed to either set the trigger levels yourself, or have the 5335A set them. Using this capability to the fullest carried the 5335A beyond the usual universal counter measurements of Frequency, Period, Time Interval, Ratio and Totalize to include measurements such as:

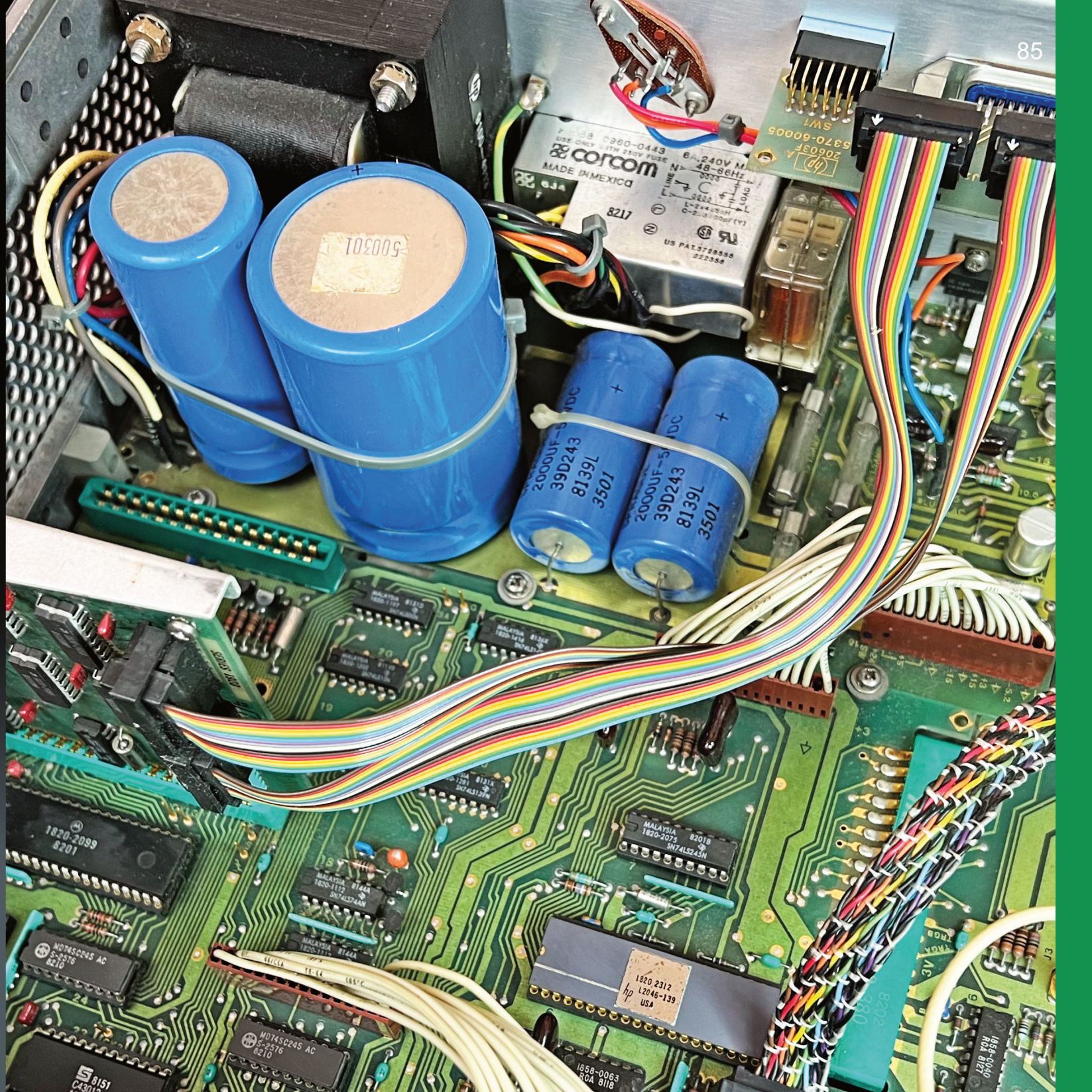
- Pulse Width;
- Rise and Fall Time (10% to 90%);
- Slew Rate;
- Duty Cycle;
- Phase A Relative to B;
- Inverse Time Interval (velocity).

All done automatically at the push of a button. Also both A and B channel trigger levels and gate time could be measured and displayed on the standard 5335A.

Trigger IC Heatsinks







8380-0443
USE ONLY WITH 250V FUSE
corcom
MADE IN MEXICO
6A 240V M
48-36CHZ
2000
8217
US PAT. 3728585
222358

503031

2000UF-5VDC
39D243
8139L
3501

2000UF-5VDC
39D243
8139L
3501

1820-2099
8201

MD76SC245 AC
S-2576
8210

8151
C43013
1818-137

MD76SC245 AC
S-2576
8210

1820 2312
L2046-139
USA

1858-0063
RCA 0118

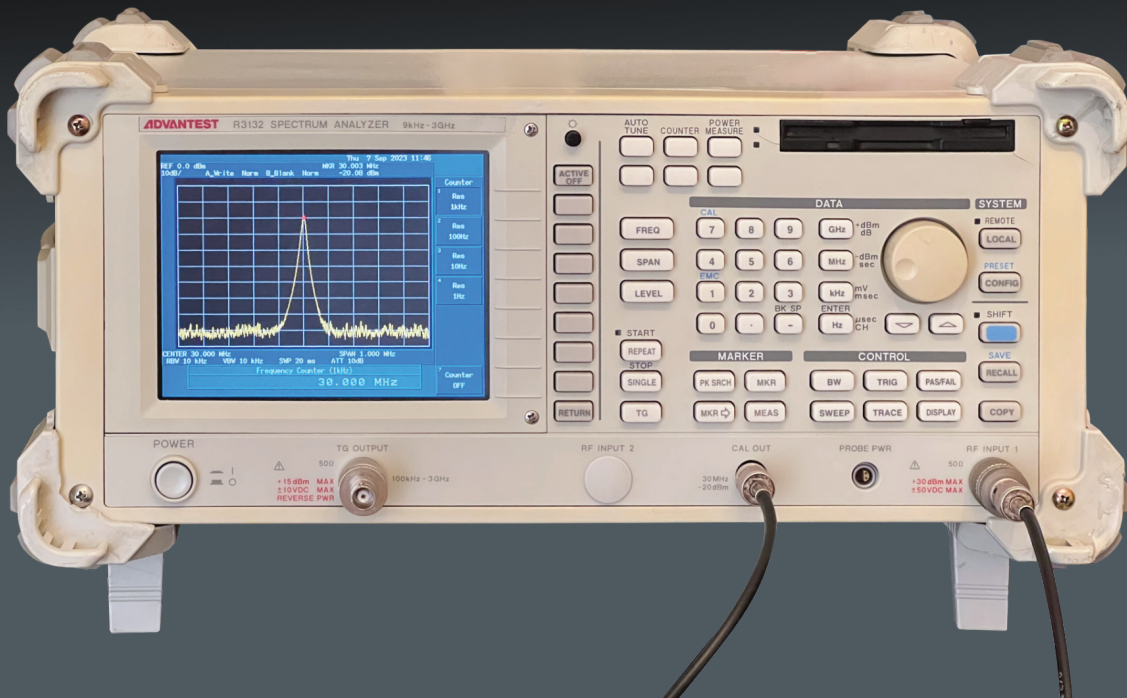
MALAYSIA 8201B
1820-2073
3N741S245M

MALAYSIA 8146A
1820-1124
SN74ALS24AN

MALAYSIA 8146A
1820-1124
SN74ALS24AN

8202

1858-0040
KOA 8127



Modularity

The different modules are well integrated. It is easy to extract the plug-in composed by the RF and IF sections (green triangle in the photo). Separating them is also easy, knowing that you have to press the button indicated by the red triangle and then rotate the unit, as shown in the photo.

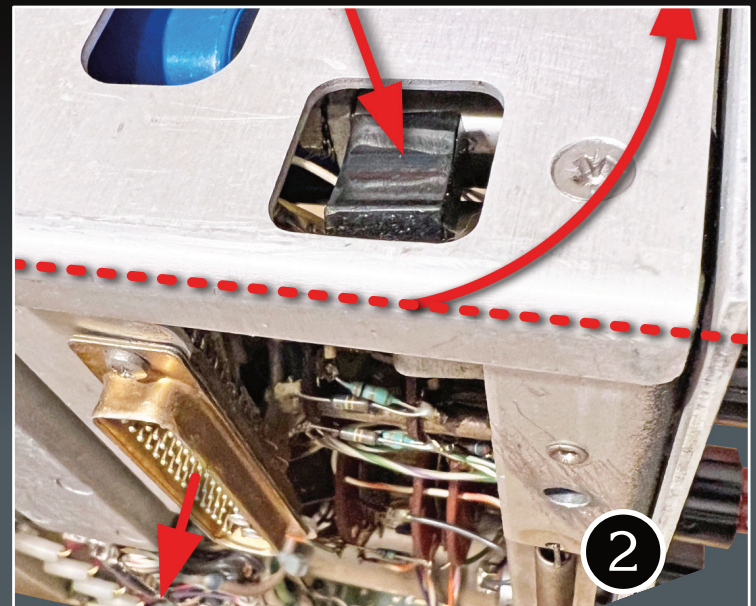
Certainly, the modules are easy to manage and interchangeable among the various models, but they did not claim the modularity. Probably changing the RF or IF section would have required recalibration of the instrument; it was not a simple plug-in exchange like in the Tektronix 7000-Series, I suppose.

The First Time

According to HP Journal 8/1968, this was the first spectrum analyzer to combine absolute amplitude calibration with wide sweep capability, high sensitivity, low distortion, wide dynamic range, and flat frequency response. The new spectrum analyzer was designed to be a general-purpose measurement tool, to make the frequency domain as scope-accessible as the time domain.

Easy to Use and Interpret

A key design goal was to make the controls and display easy to use and interpret. Automatic frequency stabilization occurs during normal use of the unit without prior adjustment. The display is clutter-free because a low-pass input filter prevents out-of-band signals from overloading the analyzer or causing confusing spurious responses. A red panel light alerts the operator if the display becomes uncalibrated because the scan rate is too fast for the selected bandwidth.



- ① Plug-ins removal (green arrow). The two modules can be then separated by pressing the button pointed by the red arrow.
- ② The button and how to rotate the module to separate it from the other.



8552B IF section

IF SECTION

LOG REF LEVEL • LINEAR SENSITIVITY

dBm
20 10 0
-20 -10 0 10 20 100
2 mV/DIV
0.5 0.5

2 1 0
-2 -1 0
-4 -3 -2 -1 0
-12 -11 -10 -9
8

CAL OUTPUT
- 30 dBm
(7.1 mv)
30 MHz

PEN LIFT OUTPUT
TRIG BLANK
INPUT

VERTICAL OUTPUT

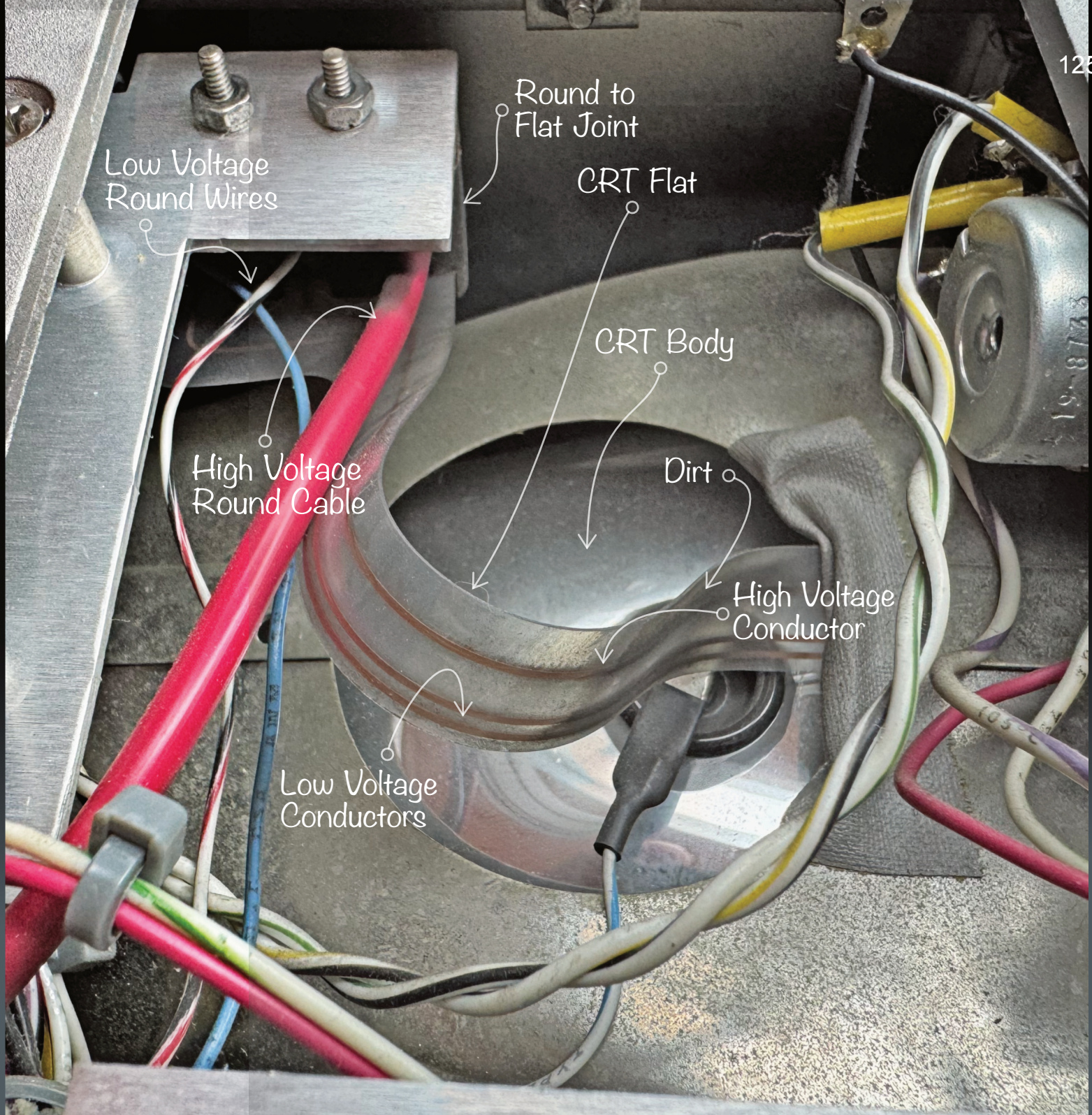
SCAN IN / OUT

DISPLAY ADJUST

POSITION
HORIZONTAL
VERTICAL
GAIN

2 dB LOG
10 dB LOG
LINEAR

SCAN TRIGGER
VIDEO EXT
LINE AUTO



Low Voltage Round Wires

Round to Flat Joint

CRT Flat

CRT Body

Dirt

High Voltage Round Cable

High Voltage Conductor

Low Voltage Conductors

feedback voltage is increased, the center frequency of the notch moves closer to 200 MHz, increasing the attenuation of the signal. This type of gain-adjusting element gives a range of more than 30 dB with a minimum of components.

Thin-film Microcircuit

A Thin-film microcircuit technology met the need for flat, high-gain output amplifiers. A high-gain amplifier is required to give a high, level output, since the output of the third mixer is made low in level to minimize spurious signals. Flat frequency response is easier to achieve with a thin-film circuit because of its relative freedom from parasitic inductive and capacitive effects. Placing the detector on the thin-film circuit very close to the 500 thin-film output resistor promotes the achievement of good VSWR characteristics in the leveled output. Microcircuit techniques are also advantageous because of the excellent heat sinking that is obtained by putting the active device directly on the sapphire substrate.

Counter Section

The 8443A marker control circuit stops the scan ramp generator in the 8552 IF Section during a part of each sweep cycle and counts the 8443A output frequency during the period when the scan is stopped and the frequency is fixed.

Because the scan is stopped at the same point on each sweep, the CRT beam is directed at the same point on the CRT for a large percentage of the scan time, causing an intensified spot at that point. This spot is an easily recognizable marker, and its position corresponds precisely to the frequency measured by the counter. By use of a continuously variable MARKER POSITION control, the operator can locate the marker on any point of the swept frequency display.



More Shields

DC connections are made through the motherboard with small circular holes in the ground plane. In addition, the exposed leads and connector pins on the bottom side of the motherboard are shielded with a sheet aluminum cover.

The counter box provides RF shielding of the low-frequency counter circuitry using overlapping riveted sheet metal and a unique metal etched screen in front to attenuate the RF radiating from the numeric indicator tubes. All this results in a unit well shielded against RI susceptibility and radiation.

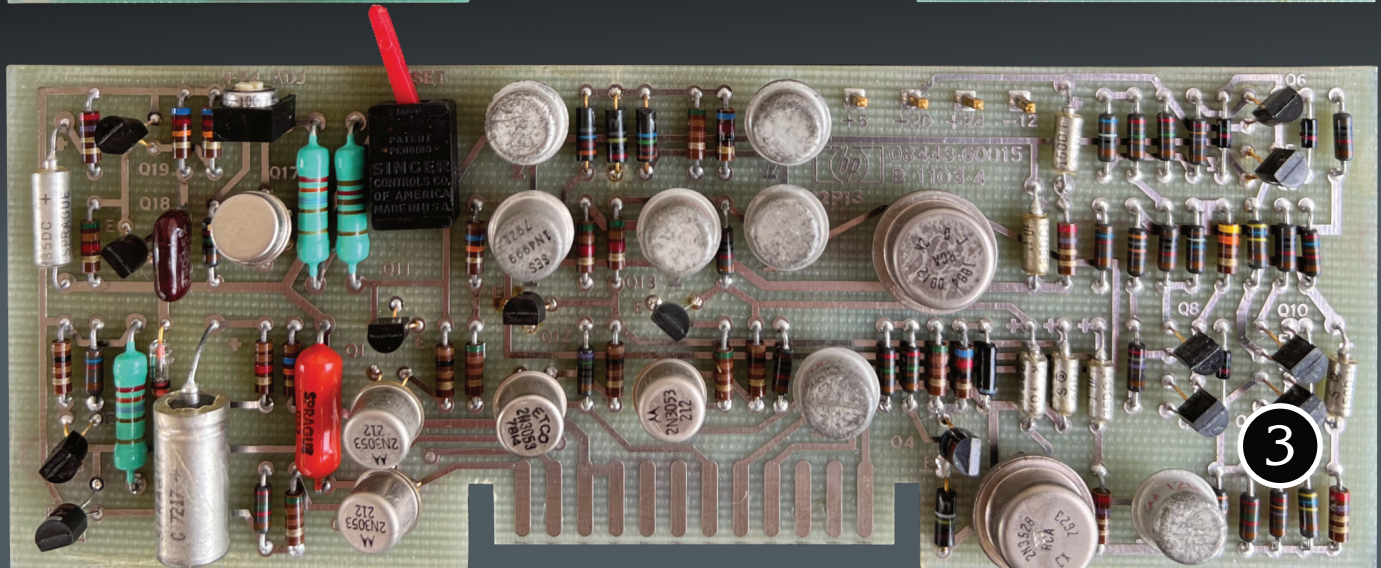
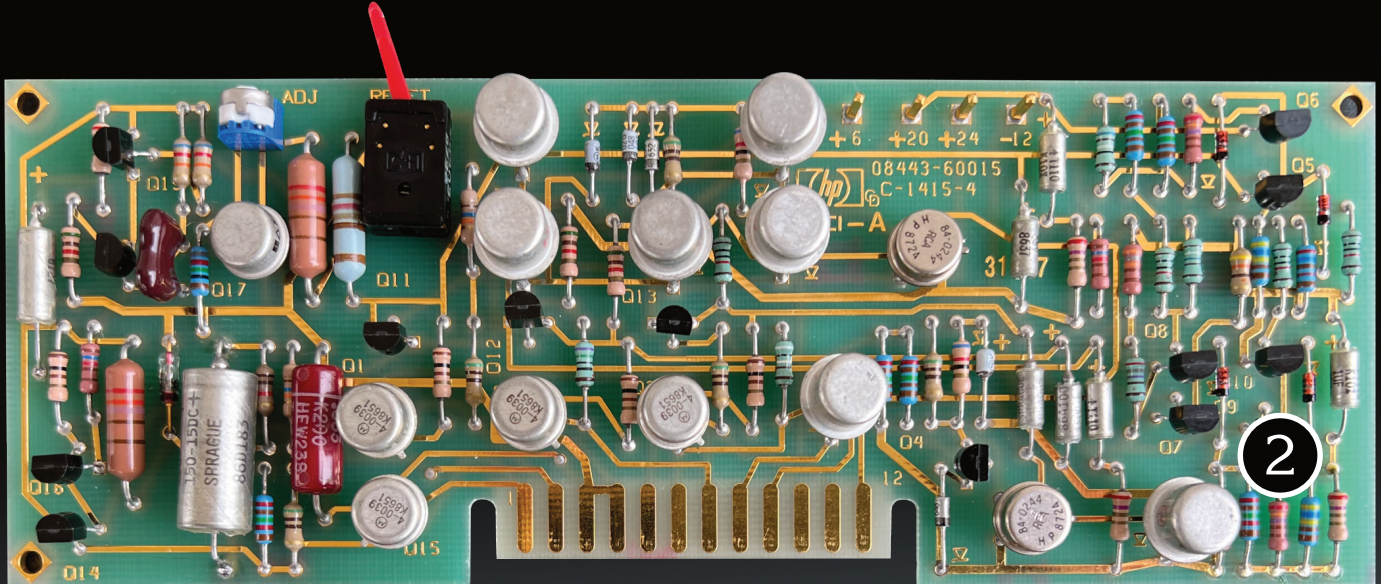
Look and Feel

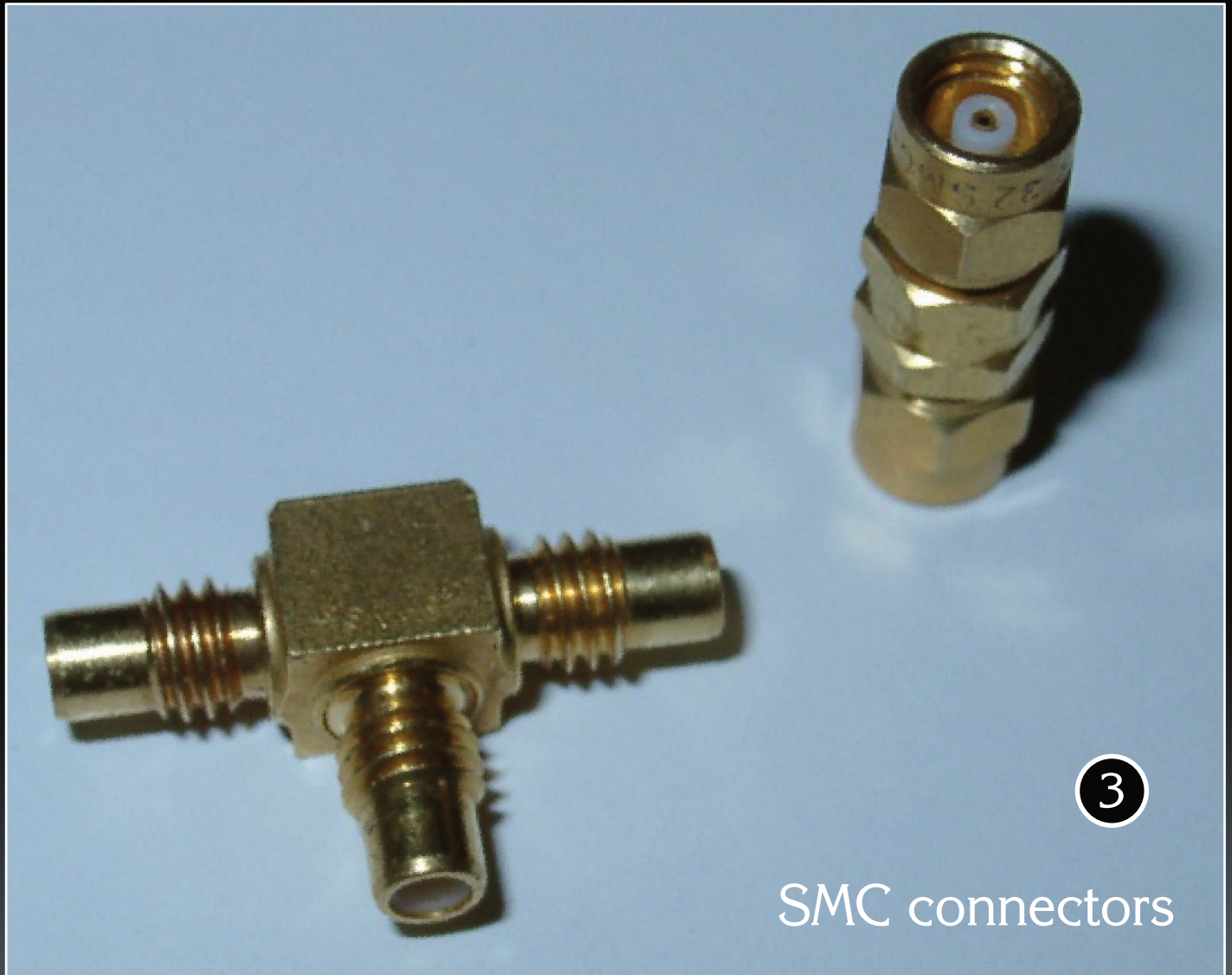
Compatibility with the 8552/8553 Spectrum Analyzer has been accomplished by using the same panel color arrangement, similar panel trim and matching recessed dials for attenuation readout.

from this 8443A, the one with the seven-segment display, and the other from the older 8443A, 155 the one with the Nixies. Unexpectedly: the second board worked perfectly, with no noise. This made my job much easier: the problem was definitely in the A14 board.

Here began a long session with few results. Exasperated I replaced all interested capacitors, the 1854-0071 transistors (with 2N3904), the zener diode CR5 and swapped with the other board Q15

❶ A14 Sense Amplifier Board component layout. ❷ The A14 board we are talking about. ❸ Another A14 board from the older 8443A, the one with Nixie display. Note the evolution to a gold-plated PCB.





Connectors' Gender

The MIL-STD-348 subminiature connectors follow a rule somewhat different from the others. Normally, a “plug” is called male and a “jack” female. In this case, we consider instead the center pin to define the male, as shown by the photos in these pages.

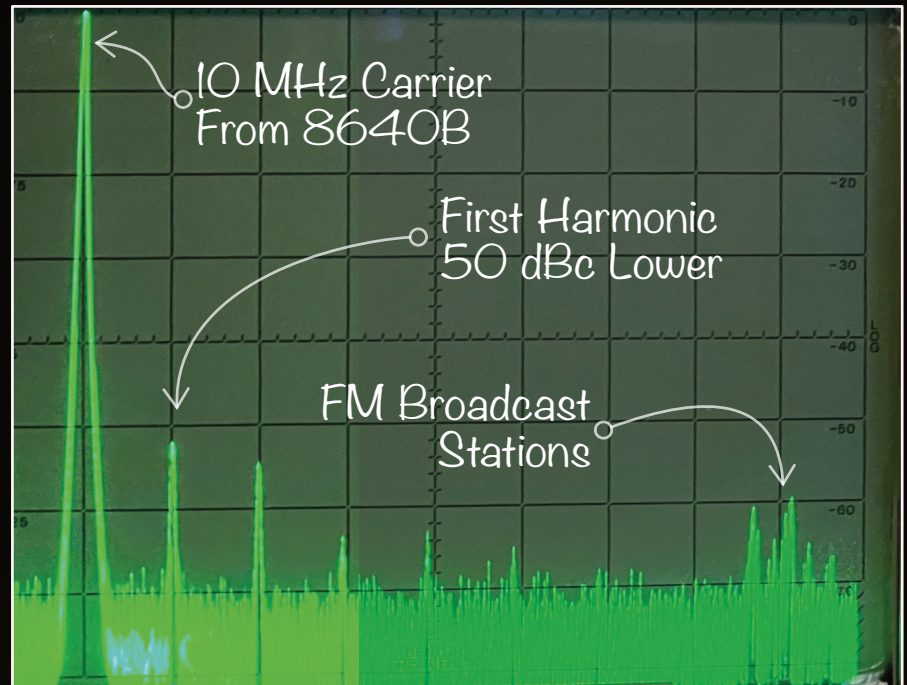


1983

8640B

I wanted to check the spectral purity of the famous **8460B** Signal Generator.

At first I thought of a failure: how many harmonics! But the scale is logarithmic, and the old 8640B is still well within spec (+10dBm: < -30 dBc). In this case, we are at -50 dBc (dBc refers to the carrier).



FREQUENCY MHz

TIME BASE
VERN

UNCAL
CAL

FREQUENCY TUNE

FINE TUNE

OUTPUT LEVEL

RF

OFF ON

REVERSE
POWER
PROTECTION
50 WATTS
MAX

RF
OUTPUT

LO IN

COMB IN

PILOT

DE NO

J2

704

A2

J3

A23A4 85680-60057

REMOV

LITTE

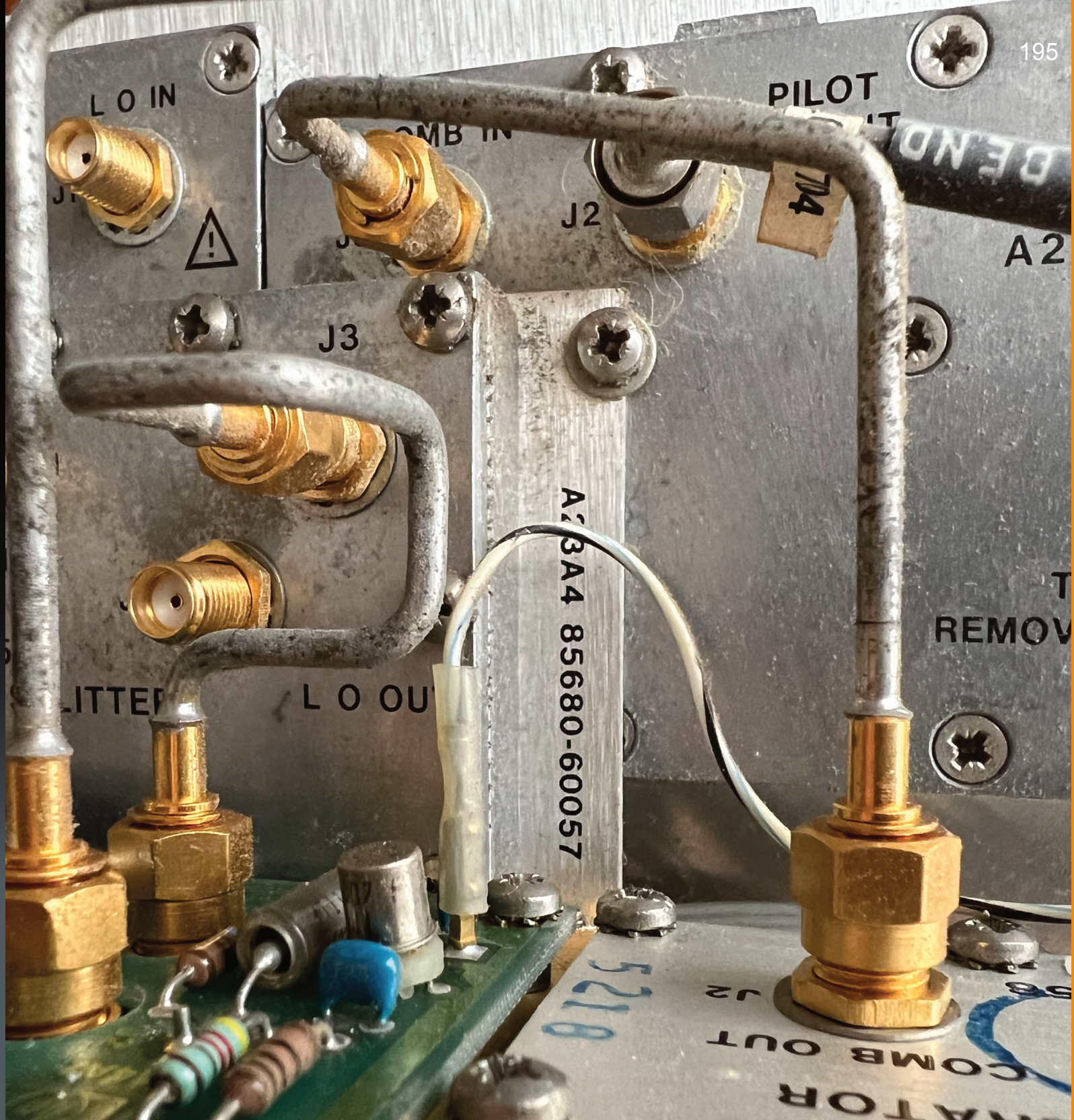
LO OU

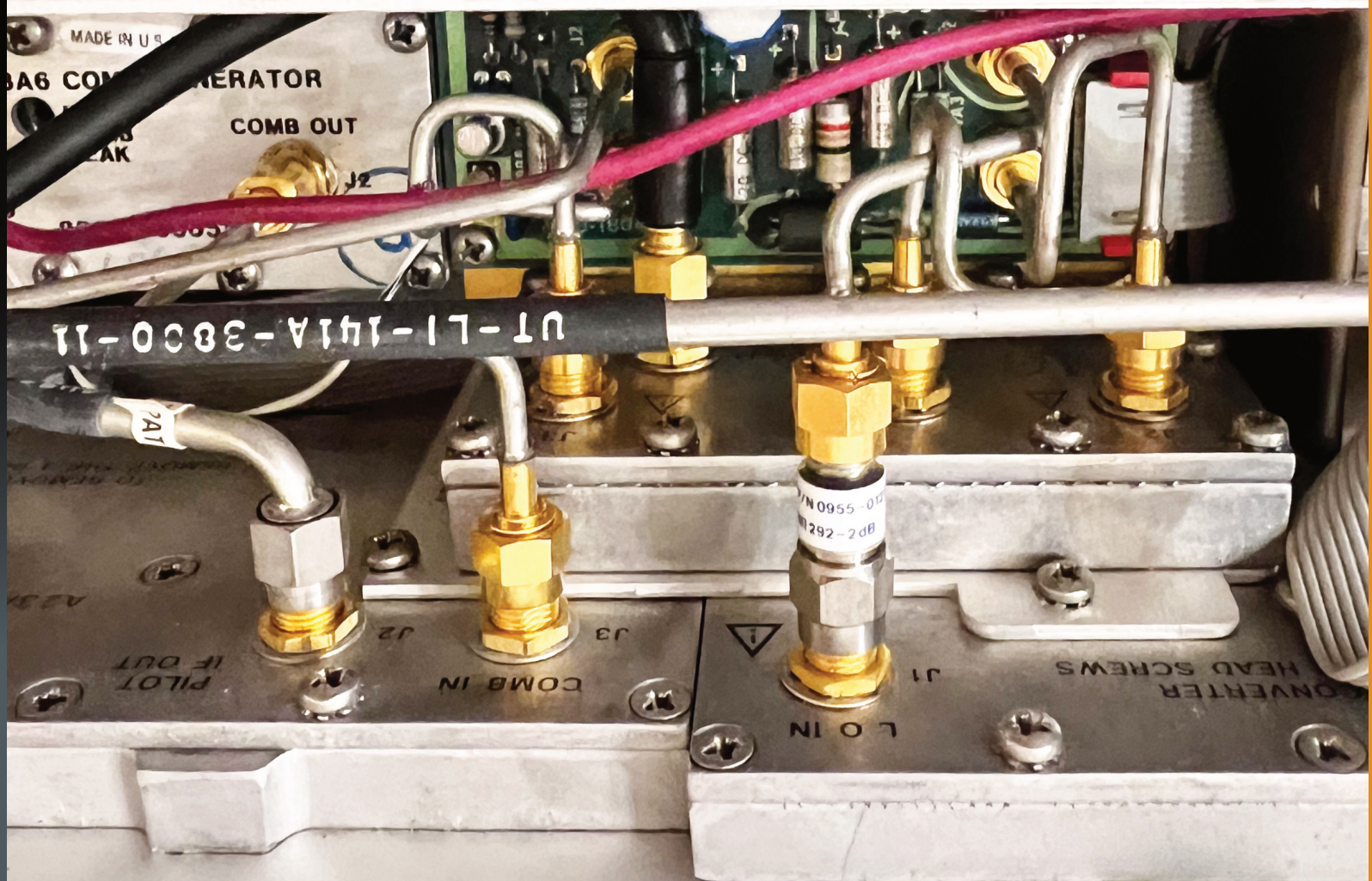
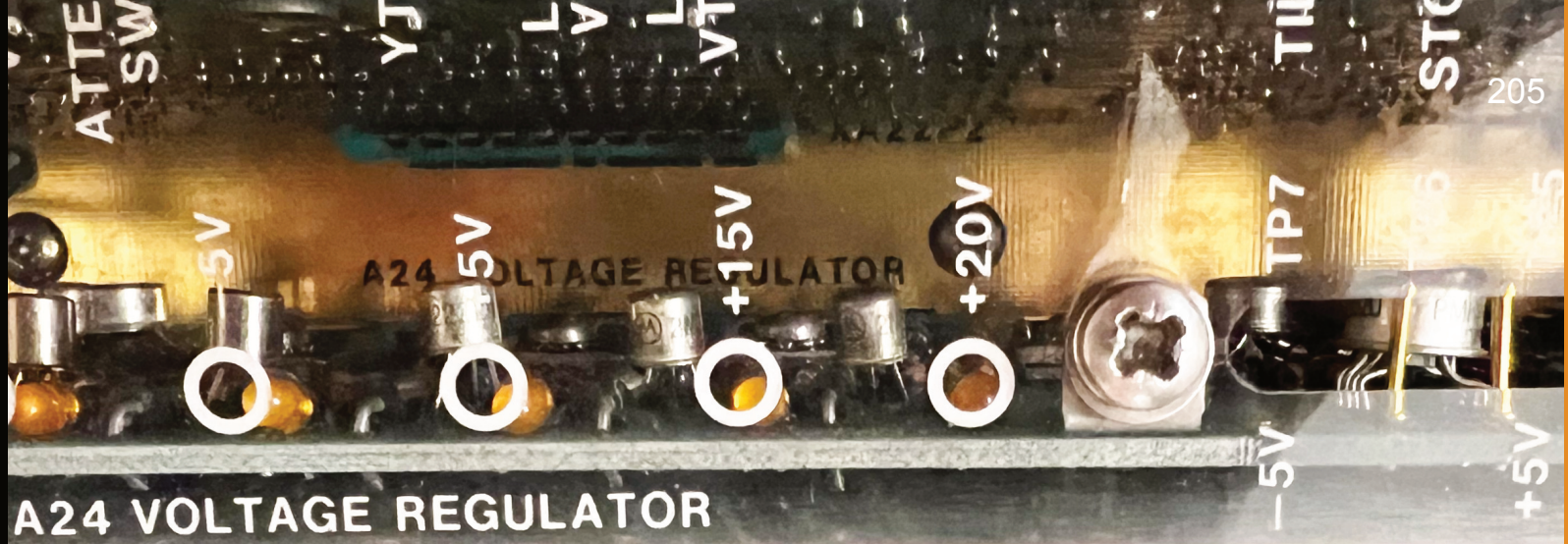
5218

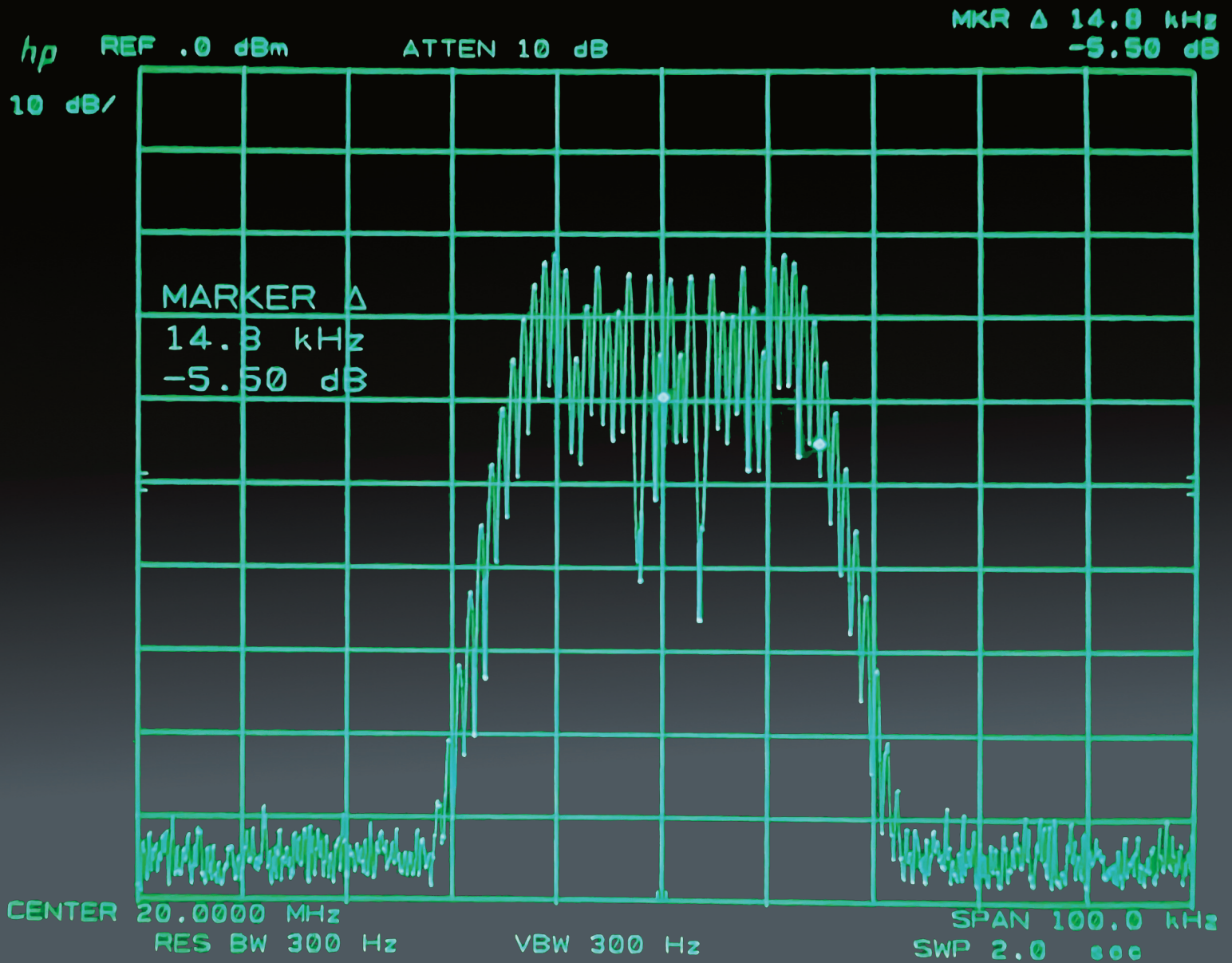
J2

COMB OUT

ATOR







It Left Its Mark

The HP-IB Interface

An 8-bit microprocessor architecture was chosen for the HP-IB interface. This frees the main instrument controller from handling the HP-IB protocol. In addition, the power of the microprocessor allows pre-processing of the incoming data. This mainly involves interpreting the 171 mnemonics for the main instrument controller, which define the front panel keys in terms of the single ASCII code character printed next to each key. For example, when the HP-IB microprocessor receives CF, it converts it to v, the character adjacent to the CENTER FREQUENCY key, and passes it to the main controller.

This microprocessor was onboard of the same A15 where the main processor is.

A Modular Approach

It was decided to design the hardware on a modular basis with a minimum of interfaces between modules. The primary interface is to the 50-line main microprocessor bus, which also connects to the display unit via the cables described earlier.

The result is that more than **50 circuit boards** make up the 8564B, with a component count that I fear to guess.

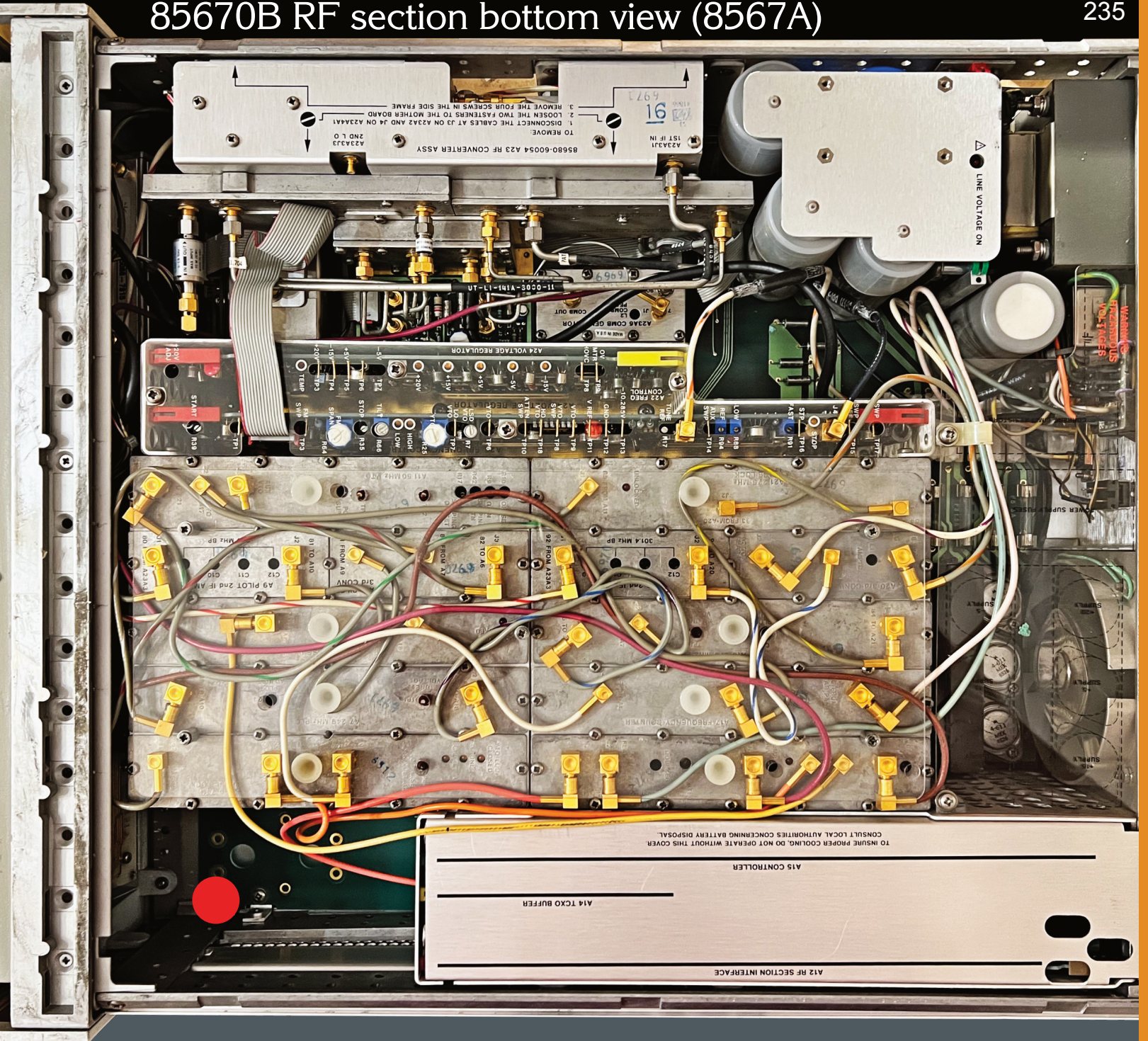
My Prayers Always

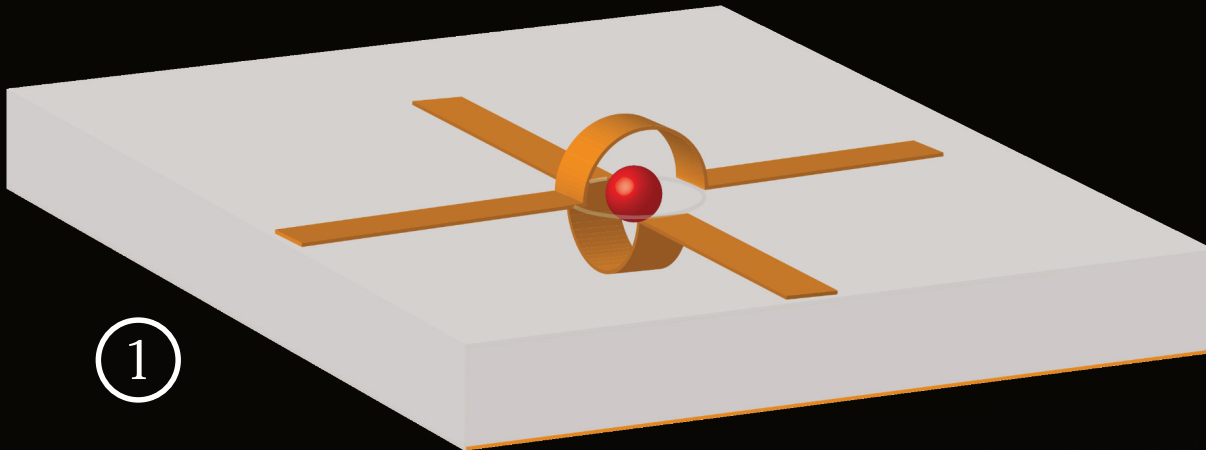
I use the 8568B quite often, and if I have no particular reason to do so, I turn it on anyway and invent some weird measurement just for fun. But when I turn it on, while the CRT is warming up, **I pray** that none of these little devices decide that it is time to retire after more than 40 years of honorable service...

Nevertheless, the glorious HP 8568B is still doing very well for now, and with its **100 Hz** lowest frequency and **10 Hz** selectivity, it can still look down on many of its very young descendants.

It has left its **mark** on the history of instruments.

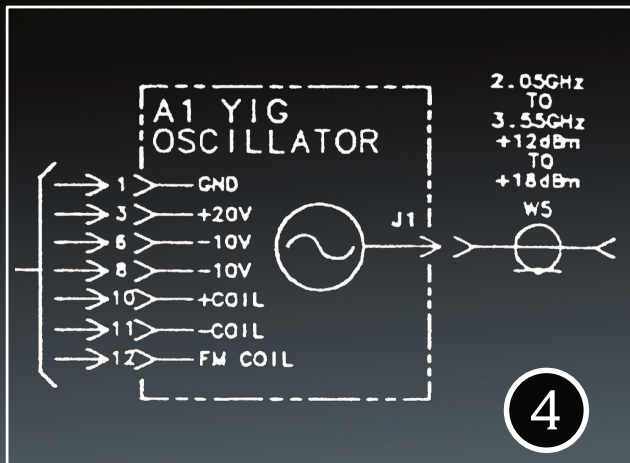
85670B RF section bottom view (8567A)



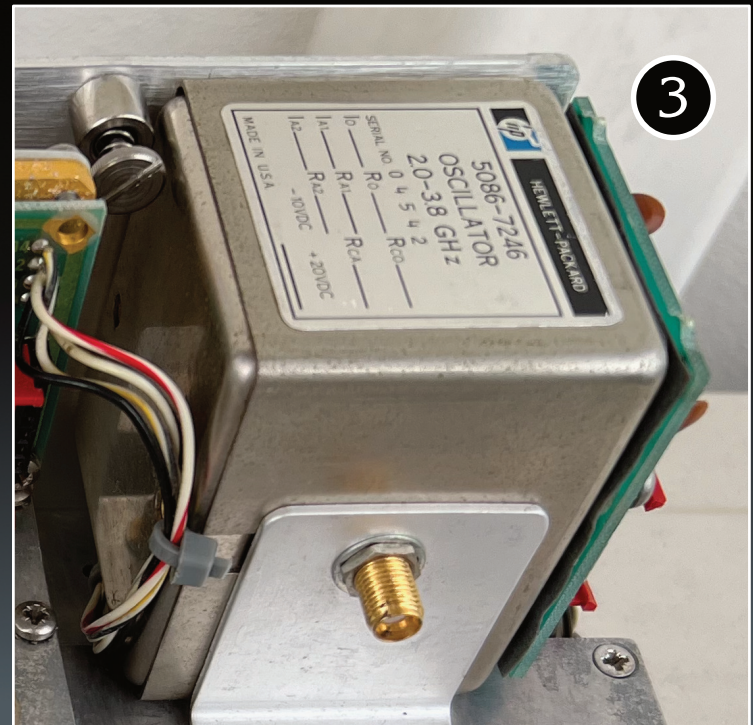


1

Hyper-technological inside, from a practical point of view it is a very simple object, as you can see in the electrical diagram reported here. Note the separate coil for frequency modulation.



4



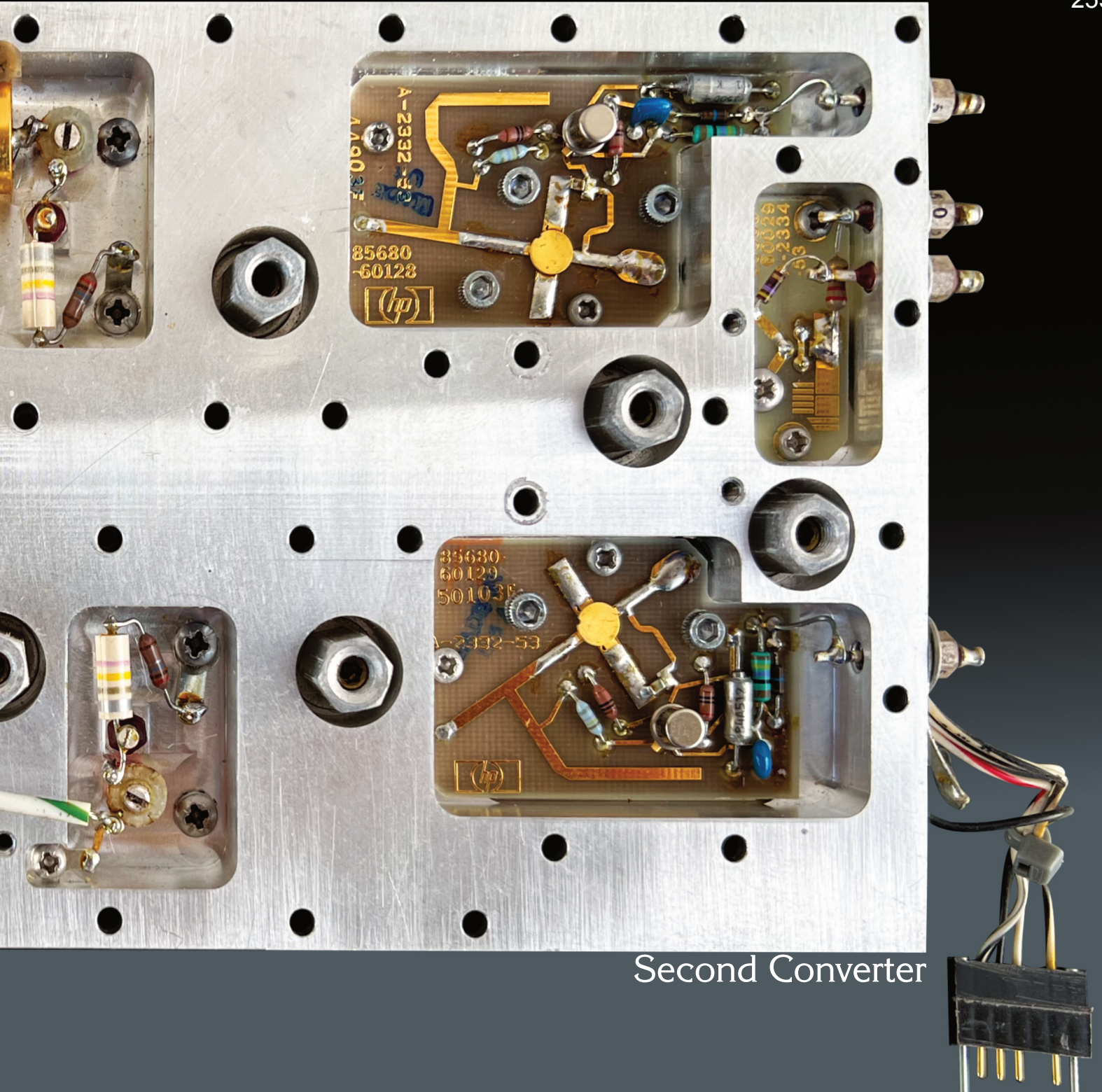
3

❶ Simplified schematics of YIG-resonator coupling to micro-strip network (By c.w. - Own work, CC BY-SA 4.0, <https://commons.wikimedia.org/w/index.php?curid=36884929>)

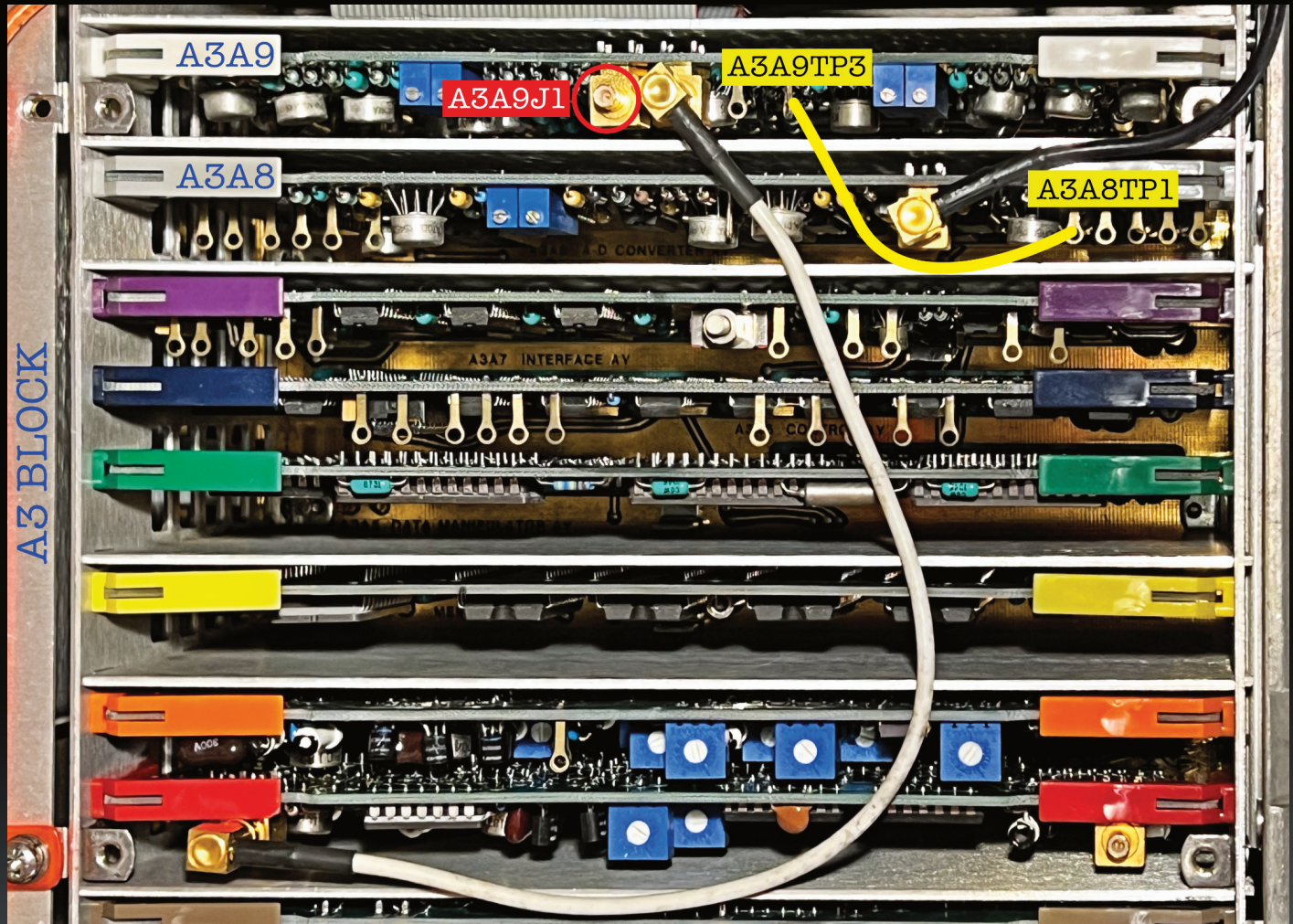
❷ YIG filter partially disassembled. The electromagnet is on the left. The module with YIG sphere and input and output coils is on the right. (By Avpu - Own work, Public Domain, <https://commons.wikimedia.org/w/index.php?curid=6969531>)

❸ The 8568 YTO is identified as A23A1 in the manuals and is contained in the RF section A23.

❹ The YTO in the electrical schematic diagram. Besides the power supply, it requires only the current for the main coil and for the frequency modulation coil.

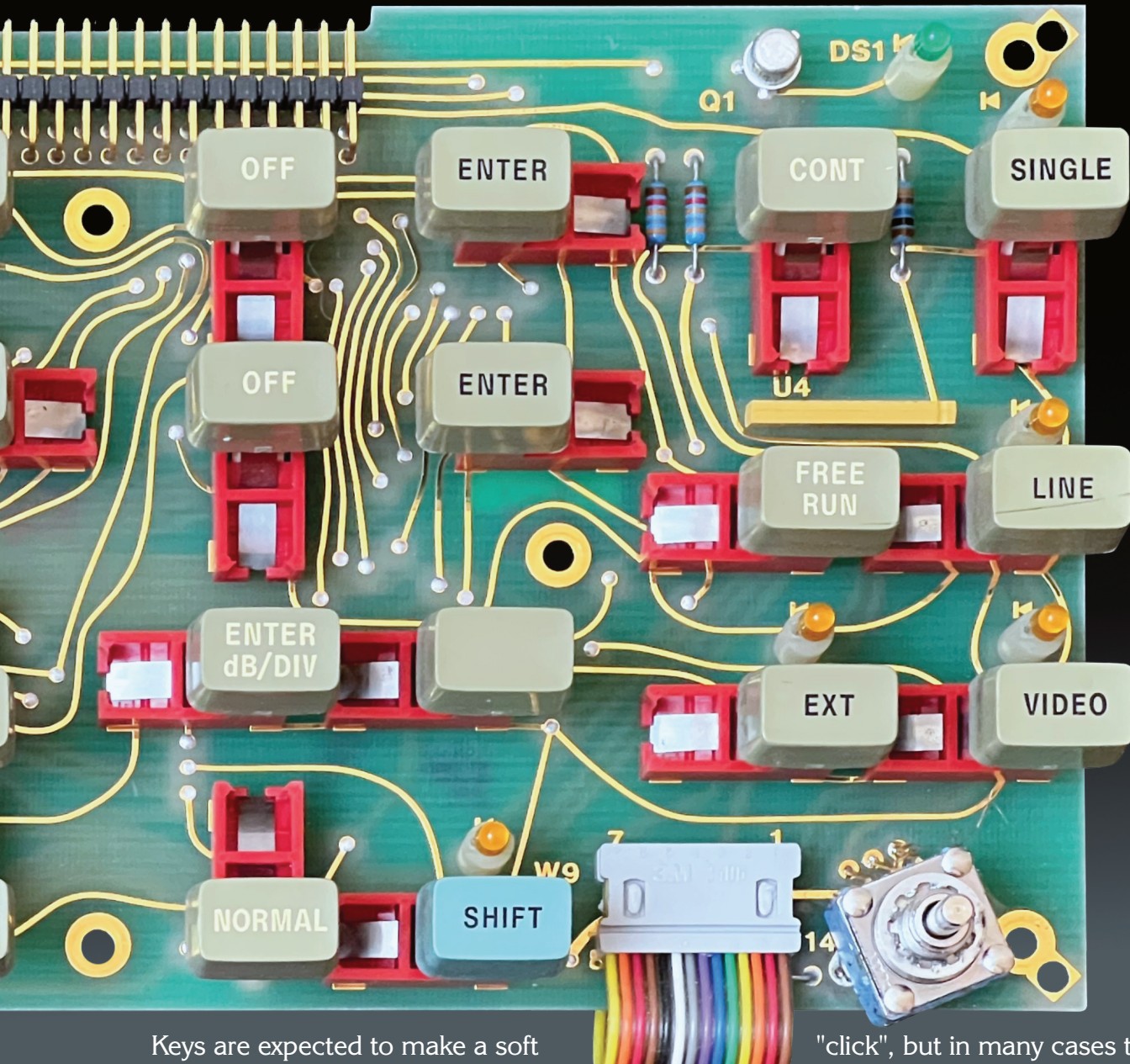


Second Converter



3

- ❶ The KSR command output. From this unretouched screenshot, you can also see the high quality of the CRT display, which allows you to read even the smaller fonts.
- ❷ The diagonal line produced as described in the text confirms that the ADC and subsequent stages are working properly. The image in my manual (and probably yours) is not well digitized and I was not sure that a complete diagonal line was expected (even if you can understand it from the text).
- ❸ These boards of the upper module (CRT) go under the name A3, and are ordered from A3A9 downward. If you remove the A3A9J1 connector and connect the A3A9TP3 and A3A8TP1 test points, you get the diagonal line shown in the photo ❷. All these boards are protected by a cover that must be removed for the access.



Keys are expected to make a soft ugly KLACK, very unpleasant. The cure is quite simple. Remove the front panel by removing the screw on the four sides, remove the keyboard board, spray the key mechanism with WD40 Contact (definitely not normal WD40!), and try again. The keys will magically click again, and the effect will last even after the WD40 dries. It is also an opportunity for a better panel and key cleaning. It's worth it; your instrument will look newer and be more comfortable to use.

"click", but in many cases they make an ugly KLACK, very unpleasant. The cure is quite simple. Remove the front panel by removing the screw on the four sides, remove the keyboard board, spray the key mechanism with WD40 Contact (definitely not normal WD40!), and try again. The keys will magically click again, and the effect will last even after the WD40 dries. It is also an opportunity for a better panel and key cleaning. It's worth it; your instrument will look newer and be more comfortable to use.

RATOR
COMB OUT

UT-LI-141A-3

