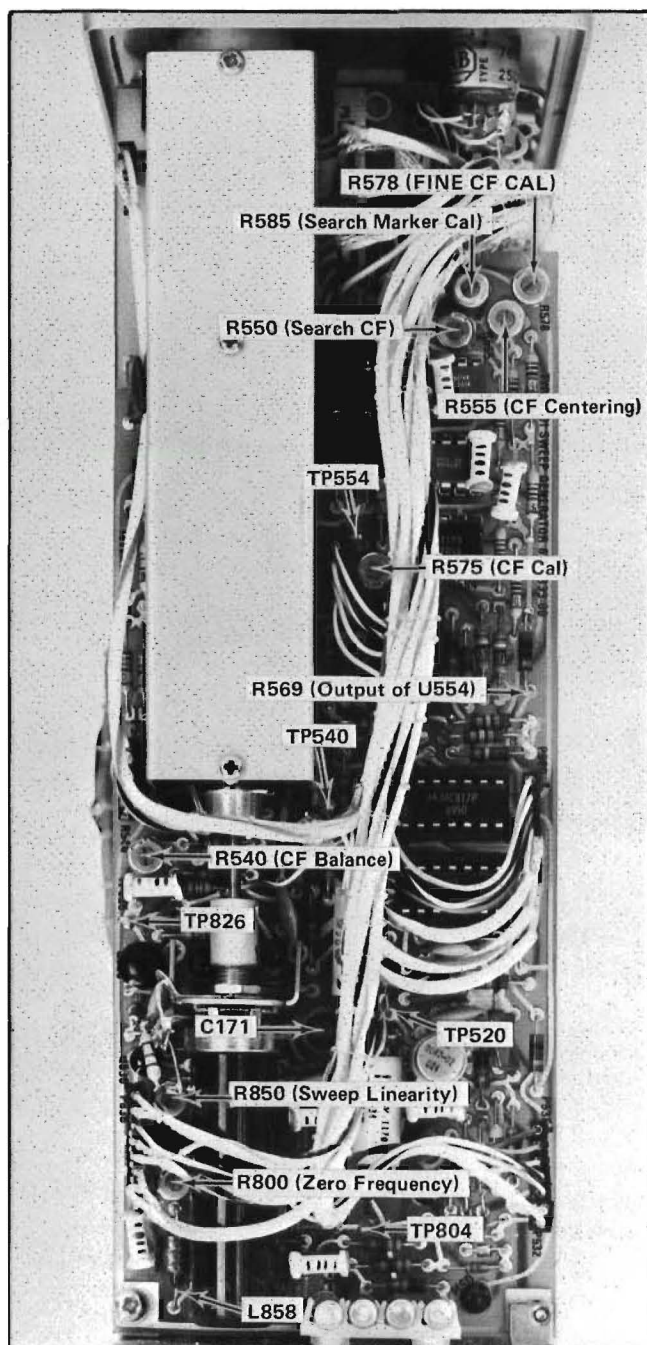


# SERVICE SCOPE

## Calibration and Troubleshooting Aids for the 1401A

by Bob Williams and John Ross, Production Test



Location of test points and adjustments on the 1401A Sweep Board.

Calibrating and troubleshooting the compact portable 1401A Spectrum Analyzer Module is a relatively easy job despite its small size. However, there are some aids that will help speed the job. Here are some items we've found helpful:

### THE POWER REGULATOR

It is often difficult to determine which section of the power supply is faulty because of the feedback to the pre-regulator. The feedback can be disabled by removing Q708 and inserting a 100-K $\Omega$ , 1/8 watt carbon resistor in the socket between the emitter and collector terminals. This should permit the multivibrator in the pre-regulator to run and you can proceed from there.

Another area that sometimes causes concern is checking ripple on the supplies. A lead connected from the ground post on the side of the 1401A, to the test scope ground will reduce the apparent ripple.

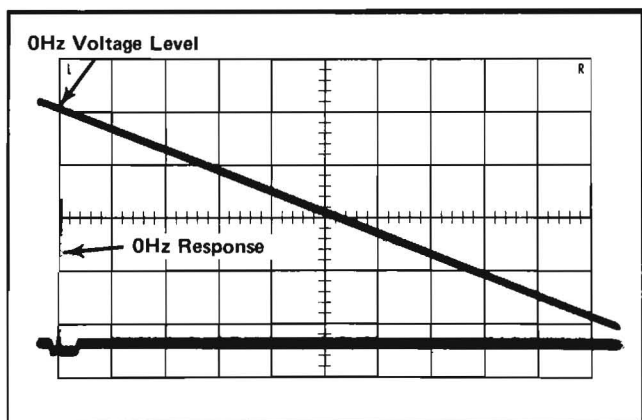
### THE RF SECTION

If you are experiencing low sensitivity, the first step is to make sure the RF attenuator is switched out of the circuit. You can bypass the attenuator by feeding the signal directly into J141. If the sensitivity is quite low, check mixer diode CR167 in the second converter. It is physically located between two sections of the RF module and is easily broken if installed with leads that are too short. Failure of Q184 in the second converter will cause total loss of signal. If it is replaced you should check the 720-MHz oscillator adjustments as outlined in the manual.

Note that care should be taken when soldering parts or leads on the RF module printed circuit board. The board is made of material having low dielectric loss and is subject to damage from prolonged or excessive heat.

It is a characteristic of microwave RF components that they require special techniques and tools to properly service them. If you have problems in the RF attenuator, low-pass filter, voltage tuned oscillator or the wideband mixer, we suggest you return the unit to Tektronix for service.

If you have occasion to align the RF section of the analyzer, you will encounter a spurious that occurs at about 12.5 MHz. This can be tuned down by inserting an RF signal close to it in frequency. With both the signal and spurious displayed on screen, set the RF module adjustments for optimum signal response and minimum spurious amplitude. The spurious may be twice the noise in amplitude if the input of the 1401A is not properly terminated (50  $\Omega$  for the 1401A and 75  $\Omega$  for the 1401A-1).



Test scope display when setting R550, center frequency adjustment.

### THE IF SECTION

While we're discussing alignment, you will find that T208 and T210 have considerable effect on sensitivity. These should be set for peak signal. Low amplitude when in the 3-kHz resolution position indicates that the 100-kHz filter is not aligned over the 3-kHz filter. If you have removed the power regulator board for servicing and inadvertently reversed the connector on P711 or P712 you will have a similar symptom.

IF gain is contributed by Q208, U240 and U260. Q208 is the most likely suspect if gain through the IF section is low.

The IF section also contains the circuitry for gated operation of the 1401A. If trouble is suspected in this area, you can bypass the gate by placing a jumper between Pin 1 and 4 of P208.

### THE SWEEP CIRCUIT

Because the sweep adjustments interact, more difficulty with calibration has been experienced in this area than in any other. The following procedure will help set the sweep adjustments properly:

1. Set up the 1401A and test scope as detailed in step 5 of the manual calibration/adjustment procedure.
2. Set R575 (CF Cal) on the sweep circuit board about 1/3 turn from full CCW.
3. Connect the test scope probe to TP554 and adjust the test oscilloscope EXT HORIZONTAL GAIN for about 10.5 divisions centered horizontally.
4. Adjust R555 (CF Centering) for 0 V at TP554.
5. Switch FREQ SPAN MHz/div to 20 and adjust R540 (CF Balance) for 0 V at the center of the sweep.
6. Switch FREQ SPAN MHz/div to SEARCH and adjust R550 (Search CF) for 0 V at the left graticule line.
7. Continue as shown in the manual for the remaining sweep adjustment, commencing with step 8.

When adjusting the sweep shaper the following points may be noted:

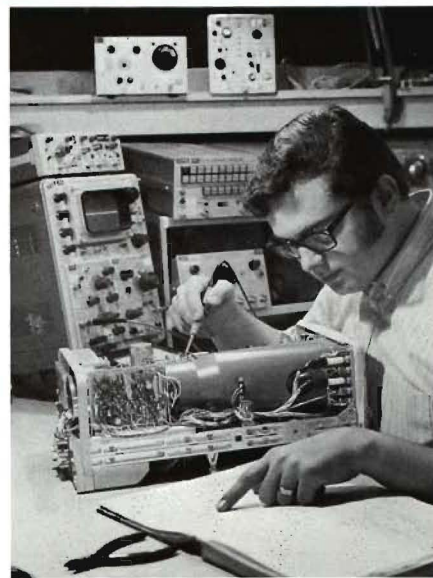
- a. Step 12 of the procedure calls for measuring the voltage across R108. This cannot be done without removing the gate-calibrator board. An alternate method is to measure the voltage at L858 on the sweep board. It should be approximately 1 V more negative than at TP826.
- b. If the 0-Hz response moves appreciably ( $\approx 0.5$  cm) when adjusting R415 it usually indicates R800 will have to be set to a different voltage level and R850 readjusted.
- c. It is not always necessary to adjust R410 to R415 from their preset positions to achieve proper sweep shaper adjustment.

Using these service hints and the calibration and maintenance procedures outlined in the manual you should be able to keep your 1401A in good working order. If you have difficulty, don't hesitate to call your TEKTRONIX Field Engineer.



**Bob Williams**, pictured at left, is a staff engineer in Production Test. Bob has been with Tek six years, working primarily with spectrum analyzer products. He started his electronics career in the Navy as an Electronic Technician. Bob's leisure time is largely filled with his wife and three children; he does admit to an occasional stint at the bowling lanes.

Co-author **John Ross**, at right, also works in Production Test. He joined Tektronix nearly six years ago upon graduation from Spokane Community College. He, too, likes to bowl; however, electronics is John's main hobby as well as vocation. He has a charming wife and year-and-a-half old daughter.







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## The 1401A/324 Portable Spectrum Analyzer System

Spectrum analysis from 1 MHz to 500 MHz with 60 dB dynamic range and absolute calibration.

Oscilloscope measurements from DC to 10 MHz at 10 mV/div and to 8 MHz at 2 mV/div.

System weight including batteries is less than 15 pounds.

The 1401A is tailored for use with the SONY/TEKTRONIX 323, 324 and 326 Oscilloscopes. It is compatible with any oscilloscope having 0.5 V/div horizontal deflection factor and 1.2 volt full-screen vertical deflection.