

Errata

Title & Document Type: 420A/B Crystal Detector Operating Note

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HP References in this Manual

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Search for the model number of this product, and the resulting product page will guide you to any available information. Our service centers may be able to perform calibration if no repair parts are needed, but no other support from Agilent is available.

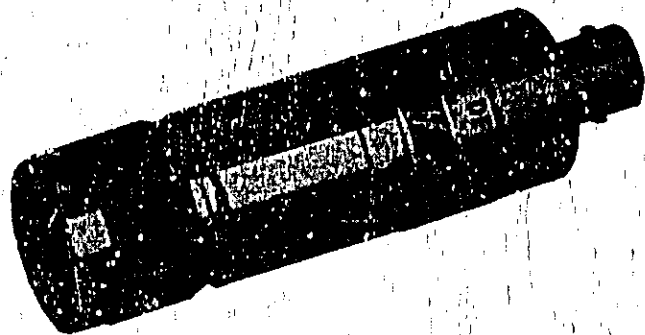


Agilent Technologies

420A/B

OPERATING NOTE

**CRYSTAL
DETECTOR**
420A/B



DECEMBER 1971

HEWLETT  PACKARD

420A/B



Figure 1. Model 420A Crystal Detector

SECTION I GENERAL INFORMATION

1. The Model 420A Crystal Detector (figure 1) and Model 420B Reflectometer Crystal Detector are broadband devices designed for flat frequency response and low SWR across the band. The Model 420A and 420B have a frequency range of 10 mc to 12.4 gc. The output signal is negative for both models.

SECTION II OPERATING INSTRUCTIONS

2. The Model 420B is similar to the Model 420A but was designed for use in the 1 to 4 gc range for applications where good square-law characteristics are needed. The Model 420B includes a selected load resistor to provide this square-law response. For reflectometer systems the Model 420B is available in matched pairs. In a matched pair, each Model 420B meets its required specifications and the frequency response of each tracks within ± 1 db of the other over the frequency range of 1 to 4 gc. Matched pairs can be obtained from $\text{\textcircled{C}}$ upon order.

3. The detected output is taken from a BNC connector. The input signal is coupled through a type N connector to a modified 1N26 crystal.

4. GENERAL.

5. The Model 420A, Crystal Detector is generally used as a demodulator, obtaining from it rf pulse envelopes that can be observed on an oscilloscope; it can also be used as a general purpose detector.

Table 1. Specifications

$\text{\textcircled{C}}$ Model 420A Crystal Detector	$\text{\textcircled{C}}$ Model 420B Reflectometer Crystal Detector
FREQUENCY RANGE: 10 mc to 12.4 gc	Similar to Model 420A, except, that at frequencies from 1 to 4 gc, the specifications are as follows:
SENSITIVITY: Approximately 0.1 v/mw	SENSITIVITY: Approximately 0.05 v/mw
FREQUENCY RESPONSE: ± 3.5 db*	FREQUENCY RESPONSE: ± 3 db*
MAXIMUM SWR: 3	MAXIMUM SWR: 3
MAXIMUM INPUT POWER: 100 mw	SQUARE-LAW CHARACTERISTICS: ± 1 db* from low level up to 0.1 volt output
OUTPUT POLARITY: Negative	MATCHED PAIRS: Frequency response characteristics track within ± 1 db* for power levels less than approximately 0.1 mw (response measured using $\text{\textcircled{C}}$ Model 416A Ratio Meter).
CONNECTORS: Input, UG-21B/U Type N Output Type BNC	DETECTOR UNIT: 1N26 Crystal, modified, with selected load resistor, factory installed.
SIZE: 0.75 in. (19, 0 mm) dia., 3 in. (76, 2 mm) long	
NET WEIGHT: 4 oz (112 g)	
DETECTOR ELEMENT: 1N26 Crystal, modified ($\text{\textcircled{C}}$ Stock No. 420A-95B)	

*As read on a meter which is calibrated for use with square-law detectors.

6. As a demodulator, a few precautions may have to be exercised when observing a waveshape on an oscilloscope. The cable from the detector to the oscilloscope should be as short as possible and be shunted with a resistor, as shown in figure 2. Ideally this resistor should be 50 Ω to terminate the coaxial cable properly. However with this resistance the output video pulse will be too small for most oscilloscopes. Therefore use as small a value of resistance as possible to obtain suitable deflection on the oscilloscope. The larger the resistance the more the degradation of rise time. Typical values are between 50 Ω and 10 k Ω .

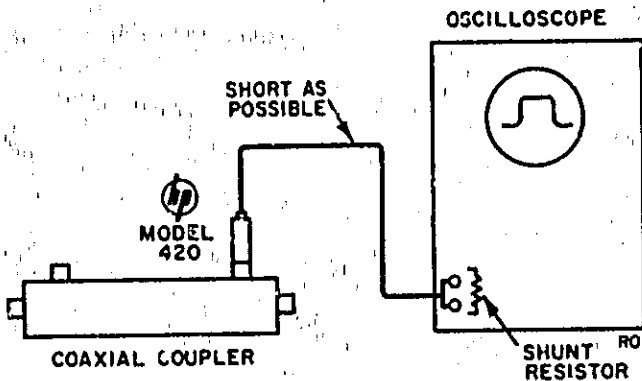


Figure 2. Use of Model 420 When Waveshapes Viewed Have Rise Times of Less than 15 μ sec.

7. The power applied to the detector can be either modulated or cw. If modulated at 1000 cps rate the sensitive Model 415C can be used as the indicator. For cw detection, a dc microammeter or microvoltmeter can be used as the indicator.

8. The Model 420B can be used for the same purposes as the Model 420A. In addition the Model 420B has good square-law response in the 1 to 4 gc range. For reflectometer systems, use matched pairs.

9. APPLICATIONS.

10. For use with a reflectometer system, refer to Hewlett-Packard Journal, Vol. 7, No. 2, a copy of which may be obtained from the Hewlett-Packard Co. upon request.

11. For other measurements refer to Hewlett-Packard Application Note 38, 'Microwave Measurements for Calibration Laboratories'. A copy of this application note may be obtained from the Hewlett-Packard Co. upon request.

SECTION III
CIRCUIT

12. An equivalent circuit for the Model 420A is shown in figure 3. The equivalent circuit for the Model 420B is the same as for the Model 420A, except for the load resistor, which provides the good square-law response. The Model 420B disc resistors are matched to within 5 ohms of each other. The dielectric for the rf bypass capacitor is the insulating film around the crystal body.

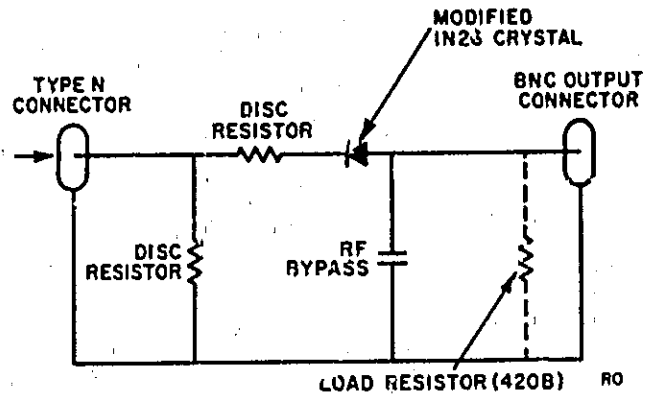


Figure 3. Model 420A Equivalent Circuit

SECTION IV
MAINTENANCE

13. INTRODUCTION.

14. This section contains information necessary for maintenance of the Model 420A. Such items as replacing Crystal (see paragraph 20), replacing Resistor Assembly (see paragraph 21) and replacing BNC connector (see paragraph 22), are included in this section.

15. Stock numbers for replaceable parts are given in section V.

16. For Maintenance of the Model 420B, refer to section V, paragraph 27.

17. REPLACEMENT OF PARTS.

18. The following information is for removal and installation of parts for the Model 420A.

19. Precautions when Handling Crystals.

a. When installing a crystal in a mount, first touch exposed metal on the mount with your hand to discharge static electricity, then insert the crystal into the mount.

b. When connecting a cable to a crystal mount, connect the other end of the cable first in order to discharge any stored electricity.

c. When handing a crystal to another person, either touch hands first, or handle the crystal by the case only.

d. Do not use an ac operated ohmmeter to measure forward and back resistance.

20. Replacing Crystal. Refer to figure 4 and proceed as follows:

- a. Remove connector cap.
- b. Remove old crystal.

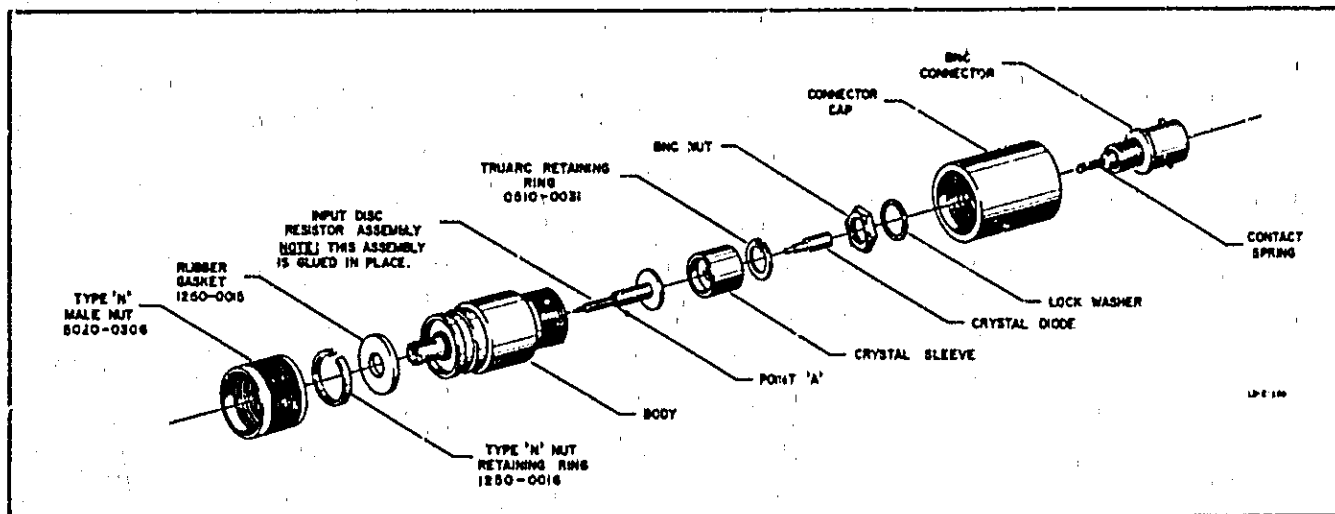


Figure 4. Assembly Drawing

- c. Install the pretested replacement crystal.

Note

Make sure the insulating film on the replacement crystal has not been damaged or removed. When inserting the crystal, do not force it down into the crystal sleeve or the disc resistors will be damaged.

- d. Restore connector cap.

21. Replacing Resistor Assembly.

a. Required Tools

- (1) Waldes Truarc pliers No. 1.
- (2) Tweezers.
- (3) Female pin out of a type N connector or similar sleeve approximately 1 inch or longer with an outside dimension of less than 0.12 inch.
- (4) Plastic hammer.

b. Procedure. Refer to figure 4 and proceed as follows:

- (1) Remove connector cap.
- (2) Remove crystal
- (3) Remove Truarc retaining ring.
- (4) Remove crystal sleeve.
- (5) Place the body so it rests on the threaded end. With a plastic hammer and the sleeve (item 3 of the Required Tools), tap the Disc Resistor Assembly lightly until the seal with the body is broken.

- (6) Remove the Disc Resistor Assembly with care, as the inside of the detector body can be scratched.

Note

Handle the Disc Resistor Assembly replacement with care. Foreign matter on the resistive material will change its characteristics.

- (7) Place a small quantity of Duco cement on the Disc Resistor Assembly replacement at Point A (see figure 4), and insert the assembly into the body.
- (8) Restore crystal sleeve and Truarc retaining ring.
- (9) Restore crystal.
- (10) Restore Connector cap.

22. Replacing BNC Connector. For removal and installation of a BNC connector, a BNC wrench or similar tool is needed. Refer to figure 4 and proceed as follows:

- a. Remove connector cap from the body.
- b. With a pair of long nose pliers hold the nut on the inside of the connector cap. Unscrew the BNC connector with the BNC wrench.
- c. Install the replacement BNC connector with the nut tightened on the inside of the connector cap.
- d. Restore connector cap to the body.

SECTION V REPLACEABLE PARTS

23. GENERAL.

24. This section contains information pertaining to replaceable parts (see table 2) and ordering of these parts for the Model 420A.

25. To order a replacement part, address order or inquiry to your nearest Hewlett-Packard field office (see maps at the rear of this Note).

- b. Hewlett-Packard stock number
- c. Description of part.

26 Specify the following information for each part:
 a. Model number

27. For replacement of parts on Model 420B it is advisable to return the instrument intact, indicating possible troubles, to CUSTOMER SERVICE DLPT., at the factory.

Table 2. Replaceable Parts

Description	Stock Number	Manufacturer	TQ
Resistor assembly	420A-95A	Hewlett-Packard	1
Crystal, 1N26, modified	420A-95B	Hewlett-Packard	1
Connector, BNC, includes contact spring	934A-95C	Hewlett-Packard	1
Body assembly, includes rubber gasket, retaining ring, and N type nut	420A-95C	Hewlett-Packard	1
Note: This parts list is for Model 420A only. For parts on Model 420B refer to paragraph 27.			
TQ = Total quantity used in the instrument.			

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Part No. 430A-00003

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