

Errata

Title & Document Type: 940A Frequency Doubler Set Operating Note

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HP 940A

OPERATING NOTE

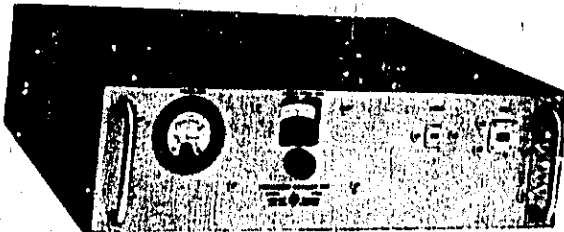
FREQUENCY DOUBLER SET

940A

MARCH 1965

HEWLETT  PACKARD

HP 940A



SECTION I

GENERAL INFORMATION

1. INTRODUCTION.

2. The Model 940A Frequency Doubler Set generates signals in the 26.5- to 40-gc range when driven by a 13.25- to 20-gc power source. The set is a broadband device, and will convert pulsed and swept signals, as well as cw signals, to R-band frequencies. Conversion loss is no greater than 18 db; output power is typically 0.5 mw when the driving source is a signal generator such as the Models 626A, 628A, or 695A. The Model 940A output circuit includes a power-monitoring meter and a precision 0- to 100-db attenuator. Input and output connectors are N- and R-band cover-type flanges. The instrument is available in a cabinet or for rack mounting. The housing of the cabinet model is unusually strong so that the driving source can set on top of the Model 940A.

3. DESCRIPTION.

4. The Model 940A Frequency Doubler Set includes a harmonic generator, a monitoring meter, an R-band filter, and an output attenuator. Arrangement of the set is shown in block-diagram form in figure 1, schematically in figure 2.

5. Incoming 13.25- to 20-gc signals are applied to a harmonic generator (the 940A-59A), the main component of which is a crystal diode. The amplitude of the current flowing in the crystal circuit is measured, and is indicated on a front panel meter calibrated in dbm. The output of the crystal is passed through a waveguide filter (the Model R362A Low-Pass Filter) which passes the second harmonic and rejects higher harmonics. A 0- to 100-db double rotary-vane attenuator makes it possible to reduce the output signal to the desired level.

Table 1. Specifications

FREQUENCY RANGE:

Input: 13.25 to 20 gc
Output: 26.5 to 40 gc

CONVERSION LOSS:

Less than 18 db at 10 mw input

OUTPUT POWER:

Depends on input power supplied: approximately 0.5 mw when used with typical Model 626A or 628A SHF Signal Generator

INPUT POWER REQUIRED:

Design center is 10 mw

MAXIMUM INPUT POWER:

100 mw

OUTPUT MONITOR ACCURACY:

±2 db

OUTPUT ATTENUATOR ACCURACY:

±2% of reading or ±0.2 db, whichever is greater

ATTENUATOR RANGE:

100 db

OUTPUT SWR:

Full output: 2.5
Attenuator set for 10 db or more: <1.5

FLANGES:

INPUT: N-band cover-type for WR-51 waveguide
Output: R-band cover-type for WR-28 waveguide; equivalent JAN type: UG-599/U

DIMENSIONS: 5-3/8 in. (137 mm) high x 19-1/4 in. (489 mm) wide x 18 in. (457 mm) deep

WEIGHT:

20 lb (9 kg)

ACCESSORIES AVAILABLE:

Adapters: NP292A, N-to-P band
NK292A, N-to-K band
MP292B, M-to-P band

Signal Generators:

Models 626A, 628A, 695A

Flexible Waveguide:
11503A Flexaguide

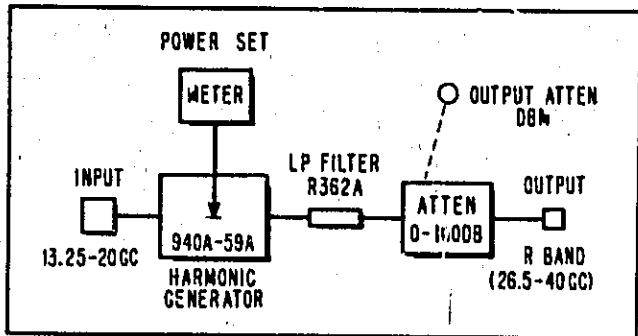


Figure 1. Model 940A Frequency Doubler Set Block Diagram

SECTION II
OPERATION

6. CONNECTIONS.

7. Connect a source of 13.25- to 20-gc signals to the Model 940A. If P-band or K-band flexible waveguide or elbow is used, make the connections through waveguide adapters such as the MP292A, M-to-P adapter, NP292A N-to-P adapter, or the NK292A N-to-K adapter.

CAUTION

Protect the INPUT and OUTPUT flanges from damage. Any scoring or burring of the mating surface causes discontinuity; the resulting increase in swr degrades performance.

8. OPERATING INFORMATION.

9. MAXIMUM INPUT POWER. Maximum allowable input is 100 mw; at higher powers crystal characteristics may be permanently changed.

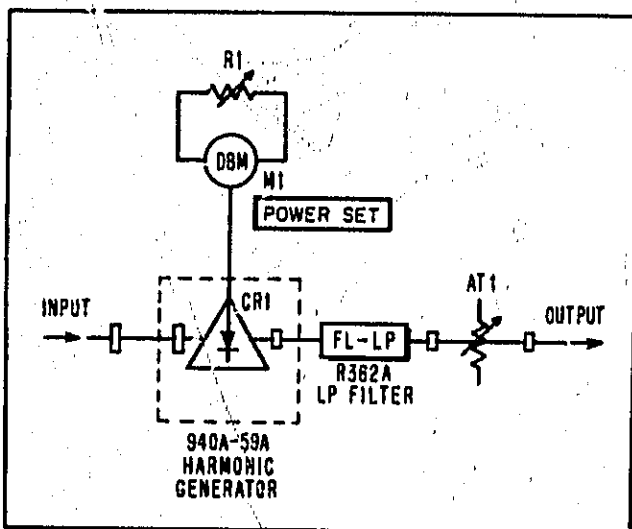


Figure 2. Model 940A Frequency Doubler Set Schematic Diagram

10. OUTPUT POWER LEVEL.

a. The level of the output signal is the algebraic sum of the reading of the POWER SET meter and the setting of the output attenuator, with the attenuator setting considered as a negative number.

b. Maximum output is approximately 3 mw.

11. OUTPUT FREQUENCY. The frequency of the output signal is two times the frequency of the input signal.

Note

When operating at the low end of the band (inputs between 13.25 and 15.3 gc), small amounts of third harmonic may be present in the output. The stop band, where all signals are attenuated at least 40 db, is from 46 gc to 120 gc.

SECTION III

MAINTENANCE

12. GENERAL.

13. The only part in the Model 940A which may require replacement is the crystal diode in the 940A-59A harmonic generator. Installation of the diode in its holder flange is a factory operation, and therefore replacement diodes are furnished installed in their holders; the part number is 940A-59A-2. The replacement procedure is described in paragraph 14.

14. REPLACING THE DIODE.

15. To reach the diode it is necessary to remove the cover plates, take the harmonic generator out, and disassemble the generator.

16. REMOVING COVER PLATES. Stand the set, front panel down, so the set rests on its handles and the bottom plate is toward you.

a. Cabinet Model.

- (1) Remove the screws which hold the feet in place, and pull off the four feet. Remove the bottom plate.
- (2) The top-and-rear plate is secured to the chassis by four machine screws accessible from inside the instrument. These screws are designated A2 in figure 3. To loosen the screw near the harmonic generator, use a right-angle screwdriver.

b. Rack Model.

- (1) Remove the four screws which secure the bottom plate, and lift it off.
- (2) Remove the eight nuts, screws, and associated lockwashers (four sets on the top, four on the rear) which secure the top-and-rear plate, and remove the plate.

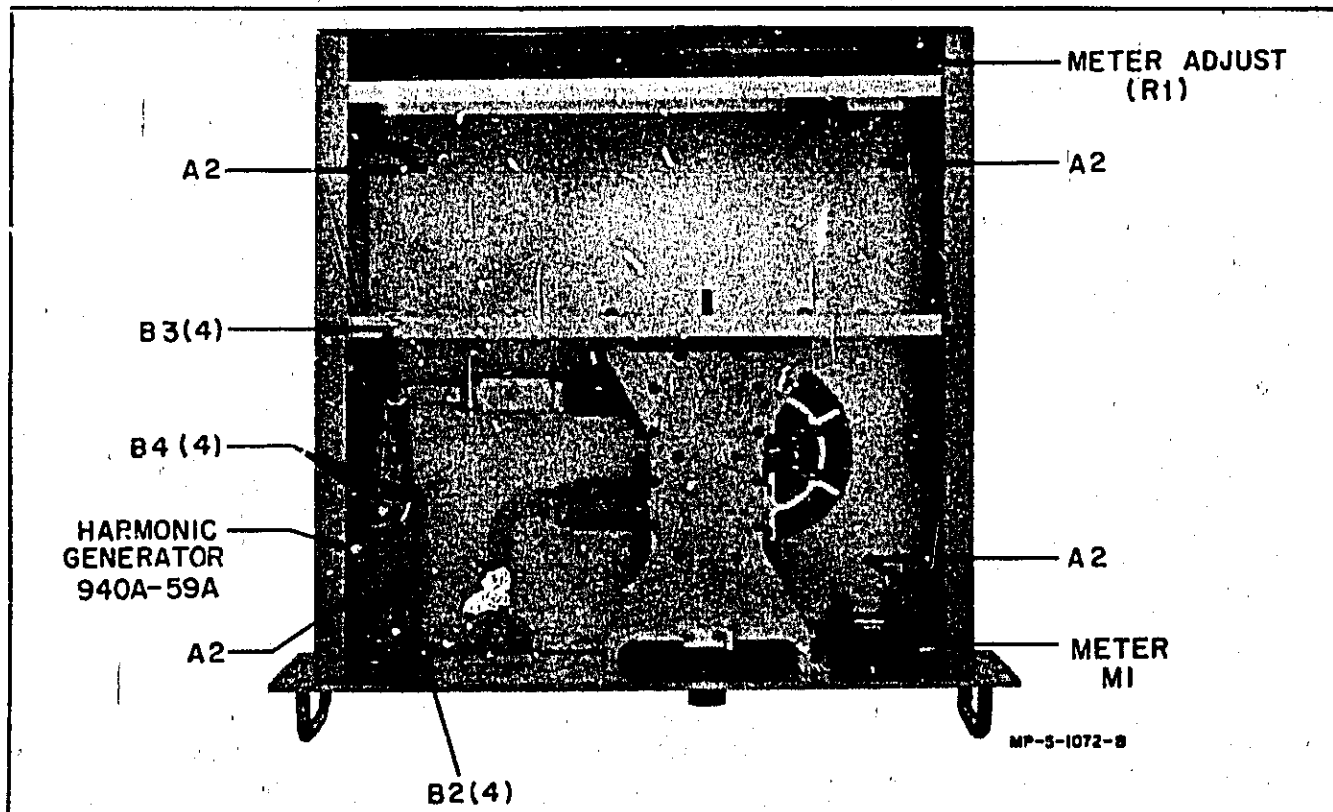


Figure 3. Model 940A Frequency Doubler Set, View from Bottom, Plate Removed

17. REMOVING HARMONIC GENERATOR. Parts of the generator are identified in figure 4.

- a. Disconnect the cable from the BNC connector.
- b. Remove the screws (8) designated B2 and B3 in figure 3.
- c. Lift the harmonic generator out.
- d. Remove the four screws designated B4 in figure 3. Lift the R-band section off the assembly.
- e. Remove crystal holder 940A-59A-2. Note orientation of holder with respect to the N-band section.

18. INSTALLING CRYSTAL HOLDER.

a. Place the new 940A-59A-2 crystal holder on the N-band section. The two sides of the holder are not symmetrical and the harmonic generator will not function properly unless the holder is seated correctly. If the holder faces as shown in figure 4, it will be positioned correctly. In the correct position:

- (1) The ridge and slot in the holder line up with the ridge and slot in the N-band section.
- (2) The filter (recessed portion) on one side of the holder faces down, resting against the N-band section.
- (3) The crystal lead makes contact with the leaf spring on the BNC connector.

b. Position the R-band section on the stack so the slot lines up with the holder and N-band section slots. The only way to ensure this alignment is to check it by eye; light can be seen down the slot when the assembly is aligned.

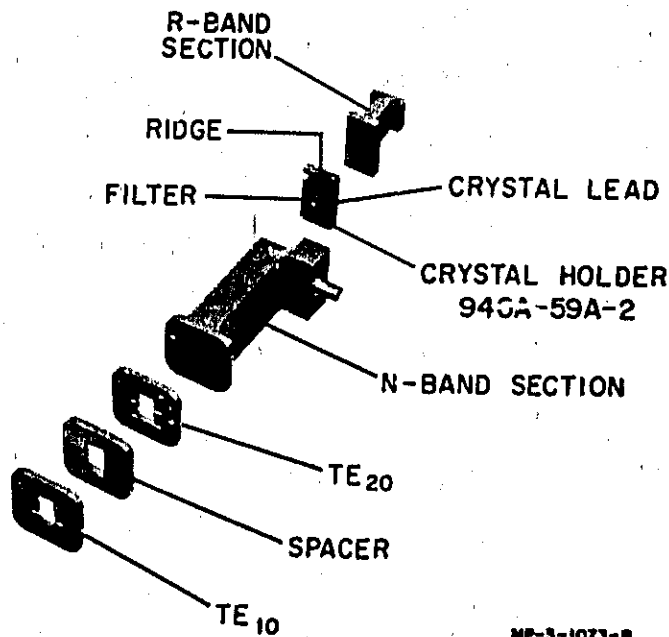


Figure 4. Disassembled 940A-59A Harmonic Generator and Input Filters

c. Fasten the sections and crystal holder with the screws removed in step 17-d. It is recommended that all four be screwed in finger tight, and then tightened.

19. CHECKING THE 940A-59A. Before reinstalling the generator in the Model 940A housing, measure the resistance across the BNC connector. Always use a low-current ohmmeter such as a Model 410B.

a. Set the ohmmeter for the R \times 100 or higher range. Connect one ohmmeter lead to the center conductor and the other to the shell of the BNC; take a reading. Reverse the leads and take another reading.

(1) Normal. There will be a reading on the order of a few hundred ohms in one direction and tens of thousands of ohms in the other.

(2) Open. If there is no reading, the leaf spring is not making contact with the crystal lead. Remove the BNC connector (a mating male connector may be used to loosen the female), stretch the leaf spring, re-install the BNC, and again measure the resistance.

(3) Short. If the reading is very low, the leaf spring probably is touching the side of the guide. Remove the BNC, adjust the spring so it will center in the opening, re-install the BNC, and again measure the resistance.

b. When normal readings are obtained, re-install the 940A-59A in the Model 940A chassis.

20. INSTALLING THE 940A-59A.

a. If the input filters were disturbed when the 940A-59A was removed, arrange them so the filter spacer is between the TE₁₀ (see figure 4) and TE₂₀ filter. It does not matter which filter is nearest the input. Be sure the filters are positioned so the inner dimensions align with those of the 940A-59A.

b. Fasten the 940A-59A in position (see figure 3) with the eight screws removed in step 17-b. Fasten all screws finger tight, and then tighten them.

21. ADJUSTING THE METER SHUNT. After a diode is replaced, check meter calibration.

a. Equipment Required.

(1) A rf power detector and power meter such as the Model R487B Broadband Waveguide Thermistor Mount and Model 430C Microwave Power Meter or Model R486A Waveguide Thermistor Mount and Model 431A/B Power Meter

(2) A source of signals in the band of interest, such as the Models 626A and 628A SHF Signal Generators or Model 687C Electronic Sweep Oscillator

b. Procedure.

(1) Set up the equipment as indicated in figure 5.

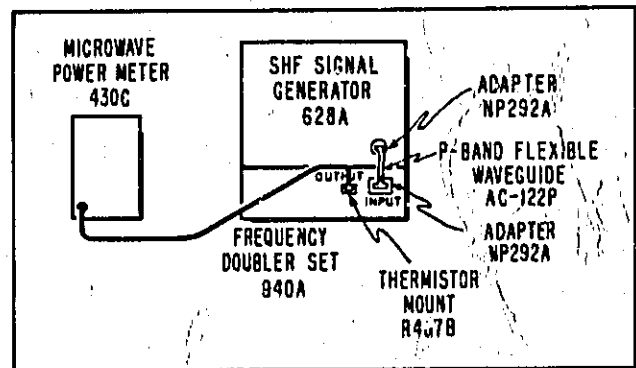


Figure 5. Typical Meter Adjustment Setup

(2) Set the Model 940A attenuator for 0 db.

(3) Set the frequency control on the signal generator (Model 628A) for 15 gc and the output level to obtain a reading of -3 dbm on the Model 430C Microwave Power Meter.

(4) If the Model 940A POWER SET meter does not read -3 dbm, adjust meter shunt R1 (identified in figure 3) to obtain a reading of -3 dbm.

(5) Repeat this procedure with the Model 628A set for 20 gc, and then for one intermediate frequency. Adjust the meter shunt for the best across-the-band compromise.

22. REPLACE THE COVERS. Follow the steps in paragraph 16, in reverse order.

SECTION IV

REPLACEABLE PARTS

23. INTRODUCTION.

24. This section contains information on ordering replacement parts for the Model 940A Frequency Doubler Set.

25. Parts information is given in table 2. Parts listed in table 2 are shown schematically in figure 2 or photographically in figures 3 and 4. Except for the hardware, table 2 lists the manufacturer's name and the stock number for each part. The table also gives the total quantity (TQ) used in the instrument, and recommended spare quantity (RS) for one year of isolated service.

26. ORDERING INFORMATION.

27. To order a replacement part, address order or inquiry either to your authorized Hewlett-Packard sales representative or to

CUSTOMER SERVICE
Hewlett-Packard Company
333 Logue Ave.
Mountain View, California

or in Western Europe, to

Hewlett-Packard S.A.
Rue du Boise-du-Lan 7
Ch 1217 Meyrin 2,
Geneva, Switzerland

b. Φ stock number.

c. Description of part.

28. Specify the following for each part:

a. Model number and serial number of the instrument.

29. To order a part not listed, give a complete description of the part including its location in the instrument.

Table 2. Replaceable Parts

Circuit Ref., Figure 2		Description, Manufacturer	Φ Stock No.	TQ	RS	
CR 1		Diode, in holder	HP*	940A-59A-2	1	1
		Screw, foot-holding: 8-32 x 1 F11H			4	1
Fig	Ref					
3	M1	Meter	BF*	1120-0092	1	1
3	R1	Resistor: variable, wirewound, 4 ohms \pm 10%, 4 watts, linear	BO*	21J0-0139	1	1
3	A2	Screw, for top-and-rear plate: 8-32 x 5/16 FHMS			4	1
3	B2	Screw, N-band input: 6-32 x 7/8 RHMS Lockwasher, No. 6, split-ring			4	1
3	B3	Screw, R-band output: 4-40 x 5/8 F11H Hex nut, 4-40			4	1
3	B4	Screw, crystal holder: 4-40 x 5/8 F11H			4	1
3		Harmonic Generator	HP*	940A-59A	1	1
4		TE ₁₀ filter	HP*	940A-27B	1	1
4		Spacer	HP*	940A-27A	1	1
4		TE ₂₀ filter	HP*	940A-27C	1	1
<p>* BF Weston Electrical Inst. Corp. BO Chicago Telephone Supply HP Hewlett-Packard Company</p>						