

OPERATING INFORMATION

**DIGITAL  
MARKER  
8600A**

DUPLICATE OF SECTIONS 1 THRU 3  
OF YOUR OPERATING AND SERVICE MANUAL  
KEEP WITH INSTRUMENT

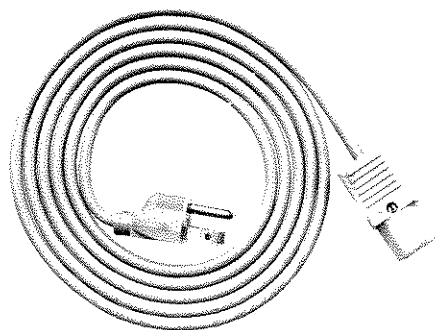
SEPTEMBER 1970

HEWLETT  PACKARD



**8600A DIGITAL MARKER**

**POWER CABLE**



*Figure 1-1. Model 8600A Digital Marker and Accessories*

## SECTION I GENERAL INFORMATION

### 1-1. INTRODUCTION

1-2. This manual contains all information required to install, operate, test, adjust and service the Hewlett-Packard Model 8600A Digital Marker. This section covers instrument identification, description, specifications and other basic information.

1-3. Figure 1-1 shows a front view of the instrument and accessories supplied.

1-4. The various sections in this manual provide information as follows:

a. SECTION II, INSTALLATION, provides information relative to incoming inspection, power requirements, mounting, packing and shipping, etc.

b. SECTION III, OPERATION, provides information relative to operating the instrument.

c. SECTION IV, PERFORMANCE TESTS, provides information required to ascertain that the instrument is performing in accordance with published specifications.

d. SECTION V, ADJUSTMENTS, provides information required to properly adjust and align the instrument after repairs are made.

e. SECTION VI, REPLACEABLE PARTS, provides ordering information for all parts and assemblies.

f. SECTION VII, MANUAL CHANGES, normally will contain no relevant information in the original issue of a manual. This section is reserved to provide back-dated and up-dated information in manual revisions or reprints.

g. SECTION VIII, SERVICE, includes all information required to service the instrument.

### 1-5. INSTRUMENTS COVERED BY MANUAL

1-6. Hewlett-Packard instruments carry a ten digit serial number (see Figure 1-2) on the back panel. The first four digits are the serial number prefix. When the serial number prefix of your instrument matches one of the prefix numbers on the inside title page of this manual, the manual applies directly to the instrument. When the

instrument serial number prefix is not listed on the inside title page of the initial manual issue, manual change sheets and manual up-dating information is provided. Later editions or revisions to the manual will contain the required change information in Section VII.

### 1-7. DESCRIPTION

1-8. The Model 8600A Digital Marker was designed as a complement to the Model 8601A Generator/Sweeper.

#### Note

Model 8601A Generator/Sweepers with serial numbers lower than 945-1130 will require a minor modification before being used with the Model 8600A. The modification kit part number is 08601-60093.

1-9. The required modification does not affect sweeper functions; sweep modes, sweep rates, and sweep linearity are all preserved. The 8600/8601 combination may be used with any display having an external horizontal input, such as an oscilloscope, the HP Model 8407A/8412A Network Analyzer, or a graphical recorder.

1-10. The Model 8600A provides five independent markers which may be placed at any point on a display while making swept measurements. The markers appear either as bright spots on the trace or as vertical markers. In addition, the frequency of any selected marker is continually displayed on a numerical read-out while sweeping.

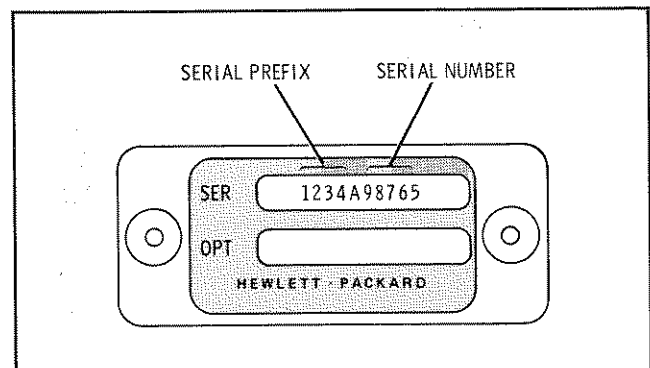


Figure 1-2. Instrument Identification

Table 1-1. Specifications

## SPECIFICATIONS

**MARKER**

When providing markers, the 8600A must be used with the 8601A Generator/Sweeper. Hence, all marker specifications apply only for the 8600A/8601A combination. Markers may be generated on an oscilloscope (SCOPE mode) or recorder (Recorder mode):

**Marker Accuracy:** Any marker may be placed at a desired frequency  $\pm$  (0.05% of sweep width + sweeper stability\*).

**Drift:**

- $\pm 0.1\%/^{\circ}$  temperature change.
- $\pm 0.001\%/V$  line voltage change.
- $\pm$  sweeper drift.
- $\pm$  counter stability (refer to COUNTER section).

**Typical Marker Drift:** When the 8601A is in SYMMETRICAL mode and SWEEP speed  $< 1$  sweep/second is:

- $< 5$  kHz/10 min high range.
- $< 0.5$  kHz/10 min low range.

**Minimum Marker Separation:** Approximately 1% of display width.

**COUNTER**

**Display:** 6-digit readout, least significant digit may be suppressed.

**Frequency Measurement:**

Range: 0.1 kHz to 15 MHz.

\*Typically  $< 2$  kHz high band,  $< 0.2$  kHz low band.

**Gate Time:** 10 msec (100 Hz resolution).

**Input Sensitivity:** 100 mV rms to 10 Vrms.

**Overload:** Input should be less than 10 Vrms.

**Damage Level:** 15 Vrms.  $\pm 50$  Vdc.

**Impedance:**  $0.5 M\Omega$  shunted by 30 pF.

**Accuracy:**  $\pm 1$  count  $\pm$  time base accuracy.

**Time Base:**

**Frequency:** 1 MHz

**Stability:**

**Temperature:**  $\pm 30$  ppm ( $0^{\circ} - 50^{\circ}C$ );  $\pm 5$  ppm ( $10^{\circ} - 40^{\circ}C$ ).

**Line Voltage:**  $< 1$  ppm for  $\pm 10\%$  line voltage variation.

**Sample Rate:** 5/sec.

**Reset:** Automatic.

**GENERAL**

**Front Panel Connector:**

**Input:** Accepts AUX OUT from sweeper to count marker frequency; also is the signal input for normal COUNTER operation. (Refer to COUNTER section above.)

**Line Voltage:** 115 - 230 Vac  $\pm 10\%$ ; 50 - 400 Hz; 35 watts.

**Weight:** Model 8600A; Net, 12 lbs 12 oz (5,78 kg). Shipping, 18 lb (8,16 kg).

**Dimensions:** 3-7/8 in. high x 16-3/4 in. wide x 13-1/4 in. long (99 x 413 x 337 mm).

The scan ramp of the Generator/Sweeper is stopped for 15 milliseconds at the frequency of the marker to be counted. Other markers stop the scan ramp for 1.5 milliseconds.

1-11. At slow sweep rates the ratio of stop time to scan time becomes quite small and marker intensity may be inadequate. Under these conditions, vertical markers may be added which are clearly visible on the slowest sweeps. A positive pulse on the CRT identifies the marker at which the frequency is being counted. Negative pulses identify remaining markers to avoid ambiguity. Marker height is controlled by a front panel MARKER HEIGHT control.

1-12. In the RECORDER mode the Model 8600A operates as it does in the SCOPE mode except that the sweep is stopped for 100 milliseconds at all markers to allow time for the Y-axis of the recorder to respond to the fast marker spikes.

1-13. In the COUNTER mode the Model 8600A operates as a standard 10 millisecond gate time counter with a sample rate of 5/second. The input signal may be from any source within the amplitude and frequency range of the counter.

1-14. Complete specifications for the Model 8600A are provided in Table 1-1.

**1-15. ACCESSORIES SUPPLIED**

1-16. The following accessories are supplied with the Model 8600A:

- a. A power cord.
- b. A rack mounting kit.
- c. Modification Kit. A simple modification is required on model 8601A's with Serial Number 945-01130 and below. One kit is supplied with each Model 8600A. Additional kits may be ordered through your local HP Sales Office by specifying HP Part Number 08601-60093.

**1-17. ACCESSORIES NOT SUPPLIED**

1-18. A Service Kit, HP Part Number 08600-60018 is recommended for maintenance purposes.

**1-19. WARRANTY**

1-20. Certification and Warranty information for the Model 8600A appears on the inside front cover of this manual.

**1-21. TEST EQUIPMENT AND ACCESSORIES REQUIRED**

1-22. Table 1-2 lists test equipment and accessories recommended to service the Model 8600A.



## SECTION II

### INSTALLATION

#### 2-1. INITIAL INSPECTION

#### 2-2. Mechanical Check

2-3. Check the shipping carton for evidence of damage immediately after receipt. If there is any visible damage to the carton, request the carrier's agent to be present when the instrument is unpacked. Inspect the model 8600A for physical damage such as bent or broken parts and dents or scratches. If damage is found refer to paragraph 2-6 for recommended claim procedures. If the model 8600A appears undamaged, perform the electrical check (see paragraph 2-4). The packaging material should be retained for possible future use.

#### 2-4. Electrical Check

2-5. The electrical performance check consists of following the procedures listed in paragraphs 4-10 to 4-15. These procedures allow the operator to determine that the instrument is, or is not, operating within the specifications listed in Table 1-1. The initial performance and accuracy of the instrument are certified as stated on the inside front cover of this manual. If the model 8600A does not operate as specified, refer to paragraph 2-6 for the recommended claim procedure.

#### 2-6. CLAIMS FOR DAMAGE

2-7. If physical damage is found when the instrument is unpacked notify the carrier and the nearest Hewlett-Packard Sales/Service Office immediately. The Sales/Service Office will arrange for repair or replacement without waiting for a claim to be settled with the carrier.

2-8. The warranty statement for the model 8600A is on the inside front cover of this manual. Contact the nearest Sales/Service Office for information about warranty claims.

#### 2-9. PREPARATION FOR USE

##### CAUTION

Before applying power check the rear panel slide switch for proper position (115 or 230 volts).

#### 2-10. Power Requirements

2-11. The model 8600A Digital Marker may be operated on 115 or 230 volts ac  $\pm 10\%$  at 50 to 400 cycles, single phase. Power required is about 35 watts. The 115/230 volt slide switch on the rear of the instrument must be in the correct position to avoid damage to the instrument. When shipped, the instrument is set for 115 volt ac operation.

#### 2-12. Power Cable

2-13. To protect operating personnel, the National Electrical Manufacturers Association (NEMA) recommends that the instrument panel and cabinet be grounded. This instrument is equipped with a detachable three-conductor power cable which, when plugged into an appropriate receptacle, grounds the instrument. The offset pin on the power cable three-prong connector is the ground connection. When using a three-prong to two-prong adapter the ground lead on the adapter should be grounded to retain the safety feature.

#### 2-14. Operating Environment

2-15. The model 8600A does not require forced air cooling when operating at temperatures from 0 to 55°C (32 to 131°F). Normal air circulation will maintain a reasonable temperature within the instrument.

#### 2-16. Bench Operation

2-17. The model 8600A has plastic feet and a foldaway tilt stand for convenience in bench operation. The tilt stand permits inclining the instrument for ease in viewing the front panel indicators. The plastic feet are shaped to provide clearance for air circulation and to make modular cabinet width instruments self-aligning when stacked. The instrument may also be rack mounted.

#### 2-18. STORAGE AND SHIPMENT

#### 2-19. Original Packaging

2-20. The same containers and materials used in factory packaging can be obtained through the

Hewlett-Packard Sales/Service Offices listed at the end of this manual.

2-21. If the model 8600A is being returned to Hewlett-Packard for servicing, attach a tag indicating the type of service required, return address, model number and full serial number. Also mark the container FRAGILE to assure careful handling.

2-22. In any correspondence refer to the instrument by model number and full serial number.

### 2-23. Other Packaging Materials

2-24. The following general instructions should be used for repackaging with commercially available materials.

a. Wrap the instrument in heavy paper or plastic. (If shipping to a Hewlett-Packard Service Office or center, attach a tag indicating the type of service required, return address, model number and full serial number.)

b. Use a strong shipping container. A double-wall carton made of 350 pound test material is adequate.

c. Use enough shock-absorbing material (three to four inch layer) around all sides of the instrument to provide firm cushion and prevent movement inside the container. Protect the control panel with cardboard.

d. Seal the shipping container securely.

e. Mark the shipping container FRAGILE to assure careful handling.



## SECTION III OPERATION

### 3-1. INTRODUCTION

3-2. This section provides operating instructions for the HP Model 8600A Digital Marker.

3-3. Operating instructions for the Generator/Sweeper, which must be interconnected with the model 8600A, are not included in this manual except as required in initial setup and operation. The operator should be thoroughly familiar with the Generator/Sweeper or have the appropriate manual on hand.

### 3-4. PANEL FEATURES

3-5. Front and rear panel controls, indicators and connectors of the model 8600A are identified in Figure 3-1.

### 3-6. OPERATING INSTRUCTIONS

3-7. In view of the simplicity of operation of the model 8600A, the Operator's Checks provide adequate information to assure proper operation of the instrument. However, the operator should experiment with the instrument in order to become more familiar with its operation.

3-8. The model 8600A/8601A may be used with any display which can be swept by an external device. The operator's checks include instructions for using the model 8600A/8601A with the HP Model 180A Oscilloscope, the HP Model 8407A Network Analyzer, and the HP Model 7005 X-Y Recorder.

### 3-9. OPERATOR'S CHECKS

3-10. During checkout at the factory, the model 8600A is adjusted for proper operation. No adjustment should be required prior to use. The following procedures verify proper operation of the instrument.

a. Interconnect the equipment as shown in Figures 3-2, 3-3 or 3-4.

b. Set the slide switch on the rear panel to be compatible with the available line voltage and apply power.

### 3-11. OSCILLOSCOPE INSTRUCTIONS

3-12. Connect the equipment as shown in Figure 3-2. The output response of any device within the frequency range of the Generator/Sweeper may be displayed on the oscilloscope CRT. The response curve shown in Figure 3-2 is that of a 50 MHz bandpass filter; the model 8601A Generator/Sweeper is in symmetrical mode and is being swept from 45 to 55 MHz.

3-13. With the model 8600A operating in the scope mode, position the markers on the response curve at the points to be counted. If vertical markers are desired the Y-Axis output of the model 8600A must be connected to the oscilloscope vertical input (use BNC Tee).

3-14. Depress the PUSH TO COUNT switches one at a time and note that the counter counts the frequency at the brightest marker dot on the response curve.

### 3-15. NETWORK ANALYZER INSTRUCTIONS

3-16. Connect equipment as shown in Figure 3-3.

3-17. The output response of any device within the frequency range of the Generator/Sweeper may be displayed on the model 8412A CRT. The display may be amplitude or phase, or both. The response shown in Figure 3-3 is the amplitude display of a 50 MHz bandpass filter being swept from 45 MHz to 55 MHz. The model 8600A is being operated in the SCOPE mode.

3-18. With the model 8600A operating in the SCOPE mode, position the markers on the response curve at the points to be counted.

3-19. At slow sweep rates the markers may not appear because the scan ramp is stopped only a short time compared to the length of the sweep. When this occurs vertical markers may be made to appear on the response curve by adjusting the MARKER HEIGHT control. The positive-going marker is for the frequency being counted. The negative markers identify the markers not selected for counting to avoid ambiguity.

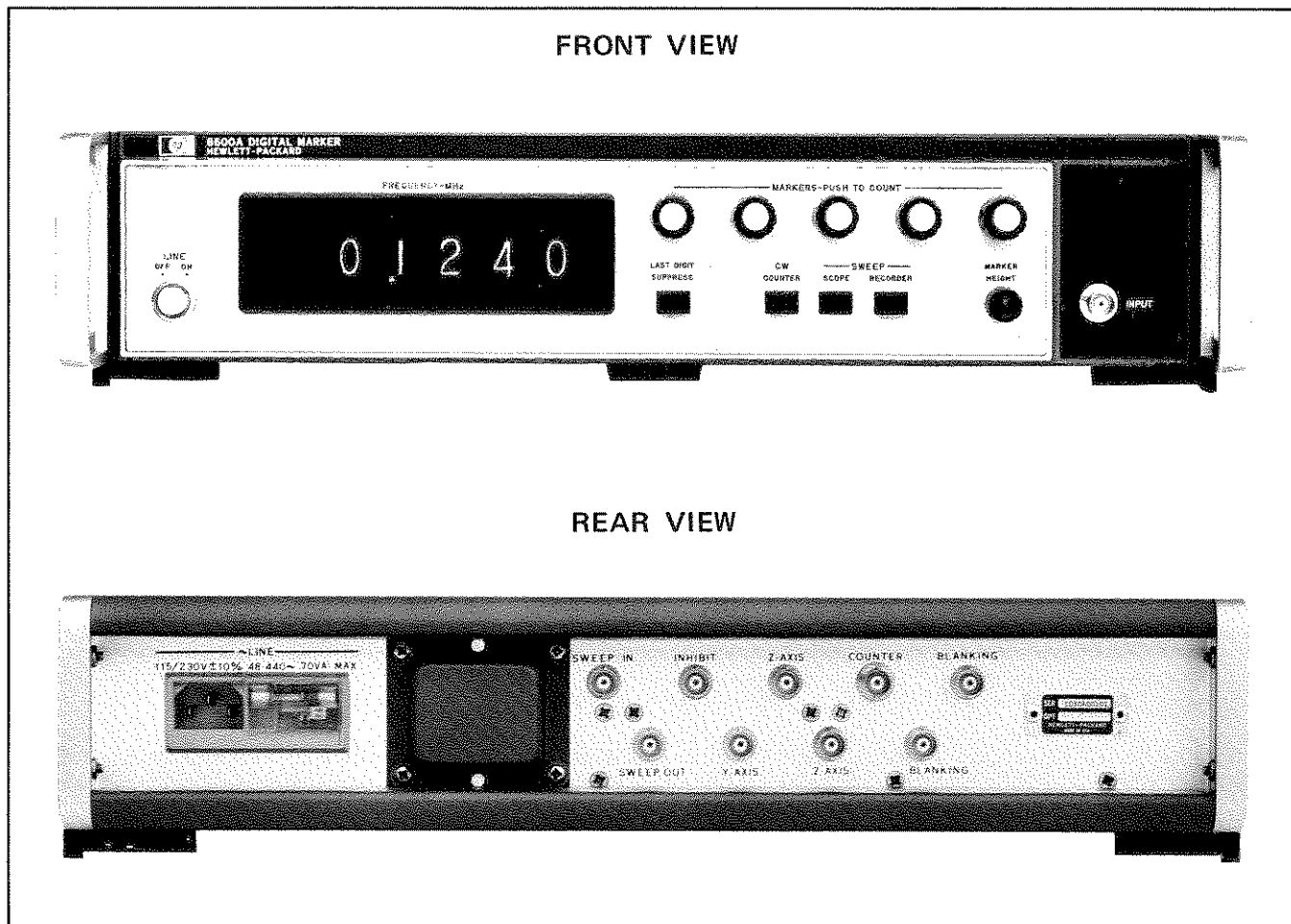


Figure 3-1. Digital Marker Controls, Connectors and Indicators

3-20. Depress the PUSH TO COUNT switches one at a time and note that the counter counts the frequency at the brightest marker dot (or the positive marker) on the response curve.

### 3-21. X-Y RECORDER INSTRUCTIONS

3-22. Connect equipment as shown in Figure 3-4.

#### Note

Before placing the model 8600A in the RECORDER mode set the marker position controls to the frequency points of interest in the SCOPE mode.

3-23. The output response of any device within the frequency range of the Generator/Sweeper may be displayed on an X-Y recorder. The display will be that of the response curve with positive and negative markers to identify the markers.

As with the Network Analyzer mode, the positive marker identifies the marker being counted and the negative markers identify the markers not counted. The response shown in Figure 3-4 is that of a 50 MHz bandpass filter being swept from 45 MHz to 55 MHz.

3-24. Because the response of X-Y recorders is slow, the SLOW sweep mode (and slow sweep rate) of the Generator/Sweeper must be used.

3-25. Depress the PUSH TO COUNT switches one at a time and note that the counter counts the frequency at the positive marker.

### 3-26. Last Digit Suppress

3-27. The last digit suppress pushbutton switch on the front panel allows the operator to blank the least significant digit in the numerical read-out.

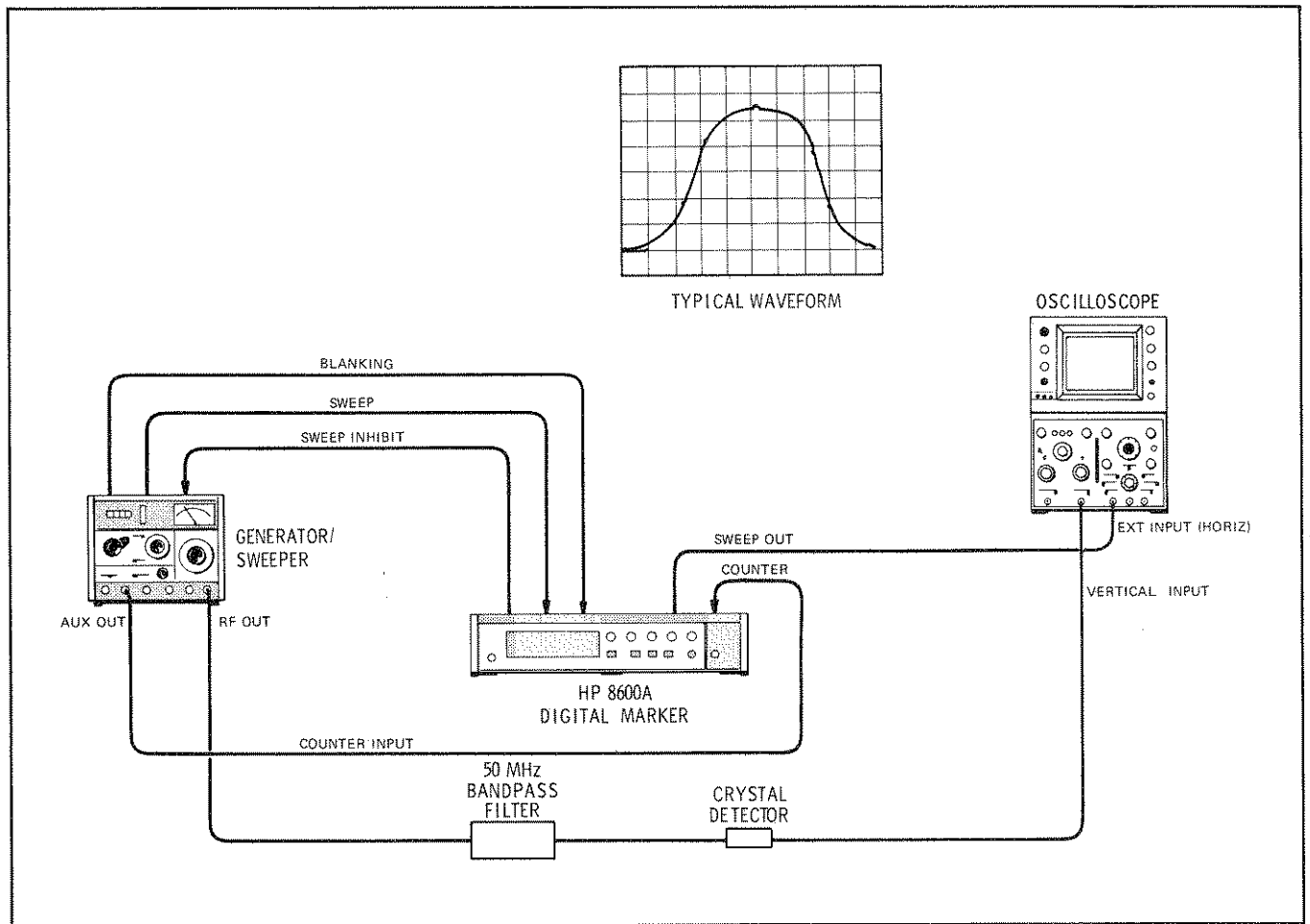


Figure 3-2. Oscilloscope Interconnections and Typical Waveform

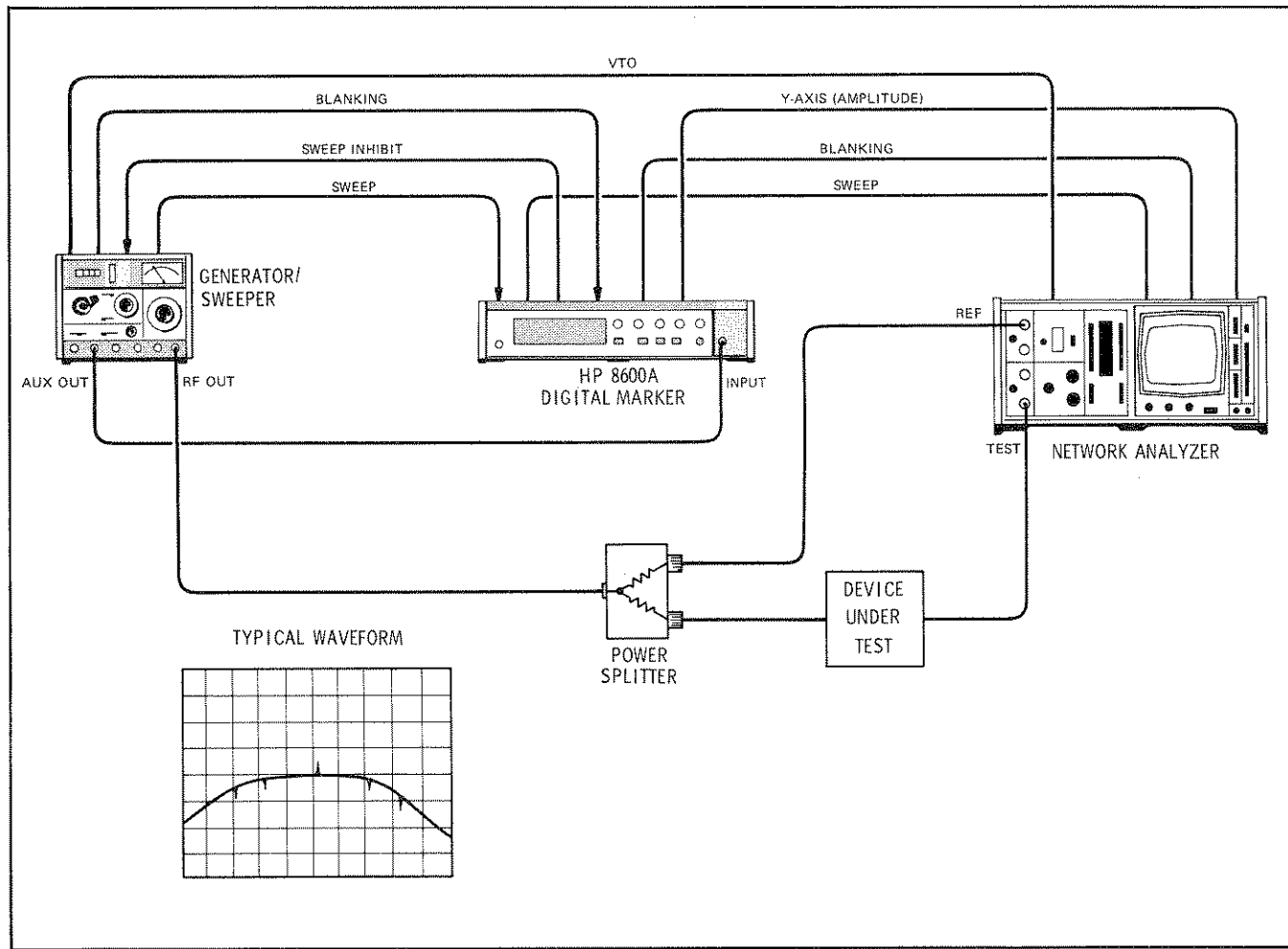


Figure 3-3. Network Analyzer Interconnections and Typical Waveform

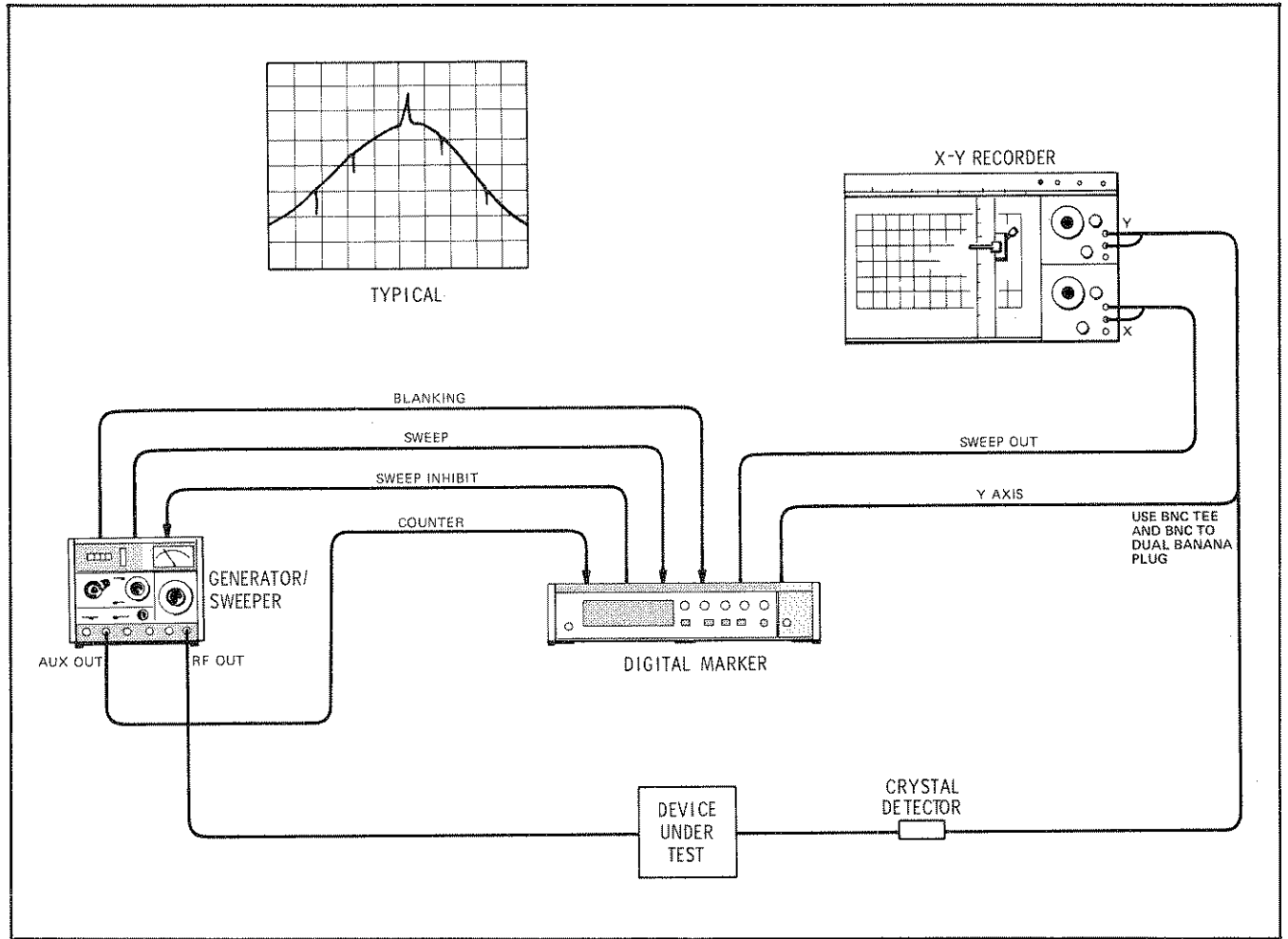


Figure 3-4. X-Y Recorder Interconnections and Typical Display







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