OPERATING AND SERVICE MANUAL

MODEL 8004A

PULSE GENERATOR

This manual contains service information for instruments with the serial number prefix

G 944

For supplementary information pertaining to instruments with lower prefix numbers, refer to the backdating section of this manual.

For supplementary information pertaining to instruments with higher prefix numbers, refer to the manual supplement for those instruments.

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08004–90001

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Table 1–1. Specifications

PULSE CHARACTERISTICS
(50 Ω source and load impedance)

Rise and Fall Time: < 1.5 ns.

Overshoot and Ringing: < 5% of pulse amplitude.

Preshoot: < 5% of pulse amplitude.

Corner Rounding: Occurs no sooner than 95% of pulse amplitude.

Amplitude: 5 V maximum across 50 Ω; seven-step attenuator reduces output to 0.05 V in 5, 2.5, 1 sequence; vernier provides continuous adjustment between steps and reduces minimum output to < 0.02 V. Rotating vernier fully c.c.w., may increase overshoot to 10%. Output short-circuit proof.

Polarity: Positive or negative, selectable.

Source Impedance: 50 Ω, shunted by typically 10 pF.

DC Offset: ± 2 V across 50 Ω load; independent of attenuator and vernier settings; can be switched off.

Pulse Width: 0 to 1 ms in six ranges; vernier provides continuous adjustment between ranges.

Maximum Duty Cycle: > 50% from 100 Hz to 1 MHz; > 25% from 1 to 10 MHz.

Width Jitter: < 0.1% on any width setting, + 50 p sec.

Pulse Position: (with respect to trigger output): 0 to 1 ms delay in 5 ranges; vernier provides continuous adjustment between ranges.

Delay Jitter: < 0.1% on any delay setting.

REPETITION RATE AND TRIGGER

Free Running

Repetition Rate: 100 Hz to 10 MHz in five ranges; vernier provides continuous adjustment between ranges.

Period Jitter: < 0.1% on any delay setting.

Double Pulse: Minimum pulse spacing of 50 ns allows maximum repetition rate of 20 MHz.

External Triggering

Repetition Rate: 0 to 10 MHz can be triggered with sine waves or pulses of either polarity.

Sensitivity: Sine waves, 2 V pp; pulses, 1 V peak at least 15 ns wide; maximum input, ± 10 V.

Delay: Approx. 125 ns between trigger input and trigger output.

Input Impedance: Approx. 1 kΩ, dc coupled.

Manual: Push button for single pulse.

Trigger Output

Amplitude: > + 2 V across 50 Ω.

Width: 15 ns ± 10 ns.

Gating

Synchronous Gating: Gating signal turns pulse generator "on". Pulse repetition rate, amplitude, polarity, and width determined by panel control settings; first pulse is coincident with the leading edge of the gate, last pulse is normal even if gate ends during pulse.

Asynchronous Gating: Gating signal turns output pulse "on" Trigger output always available; last pulse ends with gate.

Gate Input: - 2 V to - 20 V enabling.

Input Impedance: Approx. 1 kΩ, dc coupled.

GENERAL

Power: 115 or 230 V, + 10% - 15%, 50 to 400 Hz, 35 W.

Weight: Net 7 lbs (3.5 kg); shipping 9 lbs (4.5 kg).

Dimensions: 7-3/4 in. wide, 6-1/2 in. high, 11 in. deep from panel (197 x 165 x 279 mm).

SECTION I

GENERAL INFORMATION

1–1. DESCRIPTION

1–2. The HP Model 8004A Pulse Generator is a general-purpose pulse source which generates fast rise and fall time pulses over a wide range of repetition rates. The complete specifications are listed in Table 1–1. The internal repetition rate is continuously variable from 100 Hz to 10 MHz. Pulses of lower repetition rate may be obtained by external triggering. A double pulse mode effectively increases the maximum repetition rate to 20 MHz.

1–3. Either positive or negative pulses can be selected, the amplitude being continuously variable from less than 0.02V to 5V across a 50Ω load by means of a step attenuator and vernier. A dc offset, continuously variable from - 2 V to + 2 V is also available. Minimum pulse width at full amplitude is about 2.5 ns. Narrower pulses are obtained at the expense of reduced amplitude. Maximum pulse width is 1 ms. Delay of the output pulse w.r.t. the trigger output is continuously variable from 0 to 1 ms.

1–4. The Model 8004A features both synchronous and asynchronous gating. In the former mode, gating signals affect both output pulses and trigger output, while in the latter mode only the output pulses are affected - the trigger signals are always available.

1–5. ACCESSORIES AVAILABLE

1–6. Test equipment, cables, connectors, adapters, and other items are available from Hewlett-Packard. For more information on specific items consult the Hewlett-Packard Catalog or Sales and Service Office.

1–7. INSTRUMENT IDENTIFICATION

1–8. Each Model 8004A is identified by a two-section, eight-digit serial number, preceded by the letter G (000–00000). The first three digits of the serial number, to be found on the rear panel of the instrument, should agree with those on the title page of this manual, otherwise there are differences between your instrument and the one described here. To obtain correct manual information for any instrument, contact your nearest Hewlett-Packard Sales and Service Office; always specify the model number and complete serial number.

Figure 1–1. HP Model 8004A Pulse Generator

SECTION III

OPERATING INSTRUCTIONS

INTRODUCTION

3–2. This section contains the operating instructions for the Model 8004A Pulse Generator. Figures 3–1 and 3–2 identify and briefly describe the purpose of each panel control and connector on the instrument. Operating limits are as specified in Table 1–1.

TRIGGER MODES

Internal

3–5. The Model 8004A will generate internally any repetition rate from 100 Hz to 10 MHz. The repetition rate is established by setting the REP. RATE selector to any of the five internal ranges and then adjusting the VERNIER to the specific rate desired.

3–6. External

3–7. With the REP. RATE selector set to EXT.–, sinusoidal signals or negative pulses with a width of at least 12 ns will trigger the Model 8004A. In the EXT.+ position, sinusoidal signals or positive pulses will trigger the instrument. One output pulse is produced for each period of the trigger signal. The repetition rate of the external signal may be anywhere from 0 to 10 MHz. Maximum input is ± 10 V. Output pulse characteristics are determined by front-panel settings.

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3–9. With the REP. RATE selector set to EXT.+, a single output pulse is produced every time the MAN. button is pressed. Pulse characteristics determined by front-panel settings.

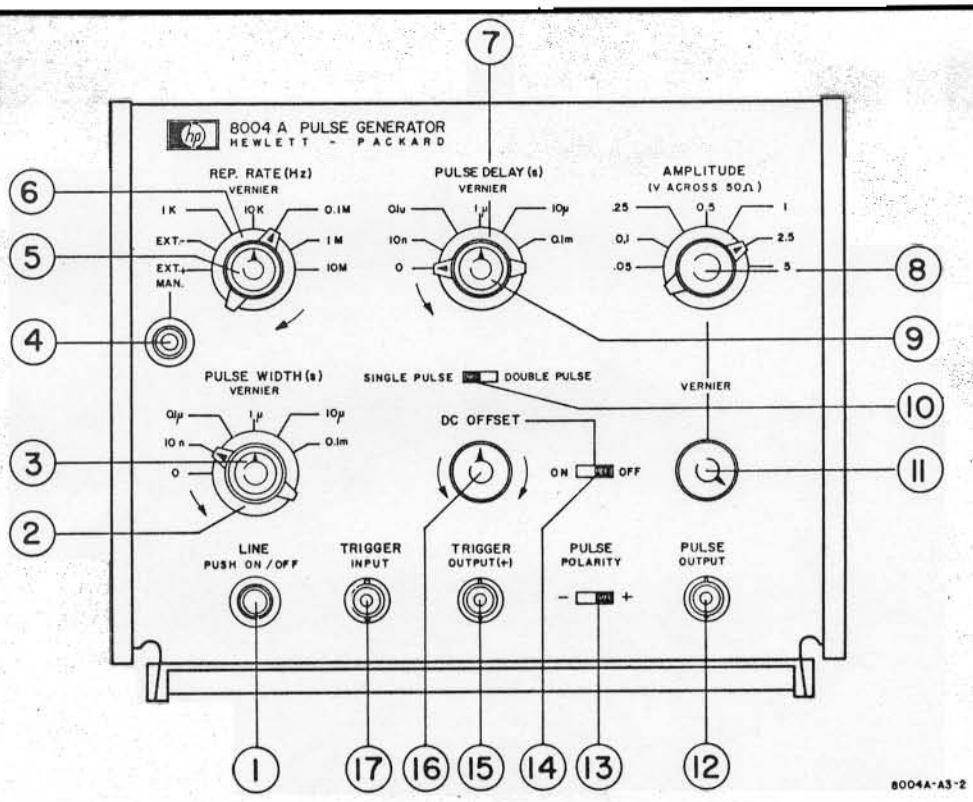
3–10. GATING

3–11. There are two gating modes in the Model 8004A. With OPER.MODE switch in SYN-position, output pulses are only produced when a signal at least - 2 V is present at the GATE INPUT. When this condition is not satisfied, the instrument is in effect turned off, producing neither output pulses nor trigger output. The ASYN-mode of operation is similar, except that the trigger output is always available, even when no gate signal is applied. Figure 3–3 shows the operation of the two gating modes.

NOTE 1: When the instrument is operating normally, i.e. in the ungated mode, the OPER.MODE switch must be in the NORM.-position, otherwise no output pulses are obtained.

NOTE: 2: In all modes of operation, it is important that the width, delay and REP.RATE be compatible, i.e. the width plus delay must be smaller than the period determined by the REP.RATE setting, taking into account the maximum available duty cycle. Illegal settings will not harm the instrument, but the output may be wrongly interpreted.

3–12. The Model 8004A is delivered with a fixed delay of approximately 100 ns between the trigger output and the signal from the internal repetition rate generator. This delay may be removed by switching a slide switch on PC board A1. See Section VII for location.



1. LINE PUSH ON/OFF: On-Off switch, glows red when instrument is on.

2. PULSE WIDTH (s): Switch selects output pulse width range. Indicated width is lower limit of range.

3. VERNIER: Adjusts output pulse width within limits set by 2.

4. MAN.: Pressing of push button causes a single output pulse, width, amplitude, and delay as selected by front-panel controls. REP.RATE switch must be in EXT.+/MAN. position.

5. REP.RATE VERNIER: Adjusts internal repetition rate within limits set by REP.RATE switch 6.

6. REP.RATE (Hz): Switch selects internal repetition rate, external or manual triggering. On internal triggering, setting indicates upper limit of range.

7. PULSE DELAY (s): Switch selects output pulse delay w.r.t. trigger output. Setting indicates lower limit of selected range.

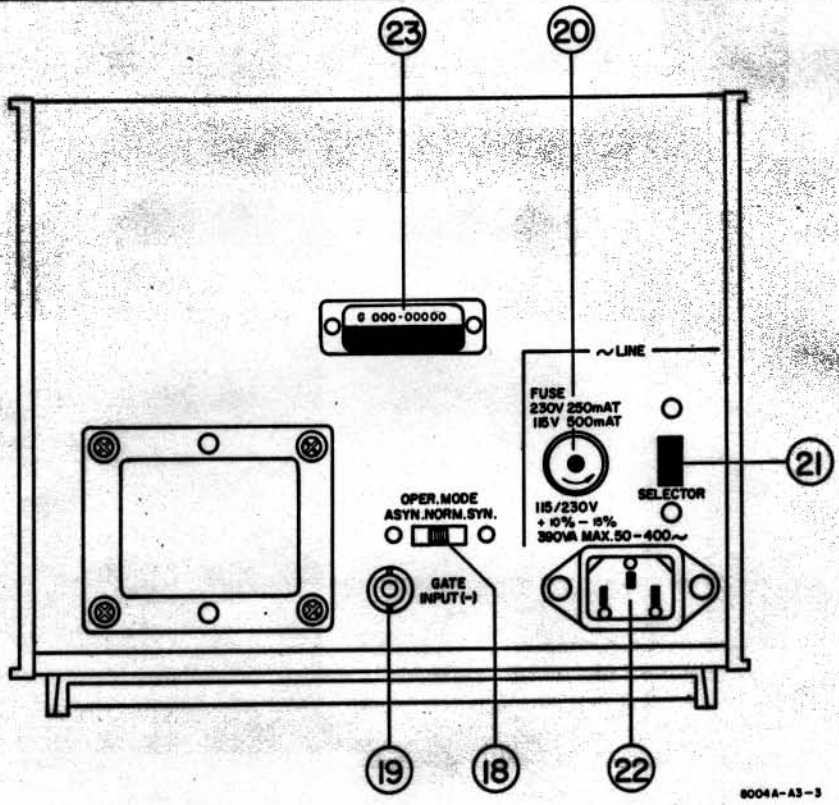
8. AMPLITUDE (V ACROSS 50Ω): Selects amplitude range of output pulse. Setting indicates upper limit of selected range.

9. PULSE DELAY (s) VERNIER: Adjusts delay within limits set by 7.

10. SINGLE PULSE/DOUBLE PULSE: Selects pulse mode. In double pulse mode, PULSE DELAY controls 7. and 9. determine spacing between the double pulses.

11. VERNIER: Adjusts output pulse amplitude within limits set by 8.

Figure 3-1. Front Panel Controls and Connectors



12. PULSE OUTPUT: Female BNC connector supplies output pulse.

13. PULSE POLARITY: Switch selects polarity of output pulse.

14. DC OFFSET ON/OFF: Switch controls presence or absence of baseline shift in output signal.

15. TRIGGER OUTPUT (+): Female BNC connector provides at least a +2V trigger signal into a 50Ω load.

16. DC OFFSET: Vernier controls offset level from –2V to +2V; must be in ON position.

17. TRIGGER INPUT: Female BNC connector accepts external trigger signals, 6. must be in either of the two EXT. positions.

18. OPER.MODE: Selects gating mode. For normal operation, i.e. ungated, this switch must be in NORM. position.

19. GATE INPUT (–): Female BNC connector accepts gating signal. –2V applied with 18. in either the SYN. or ASYN. position opens the gate, permitting output pulses to pass.

20. FUSE: Line fuse (1/2A slow-blow for 230V ac). Use properly rated fuse.

21. 115V/230V: Switch adapts instrument to available line voltage.

22. AC LINE: Receptacle for power cable.

23. SERIAL NUMBER: Identifies instrument.

Figure 3–2. Front and Rear Panel Controls and Connectors

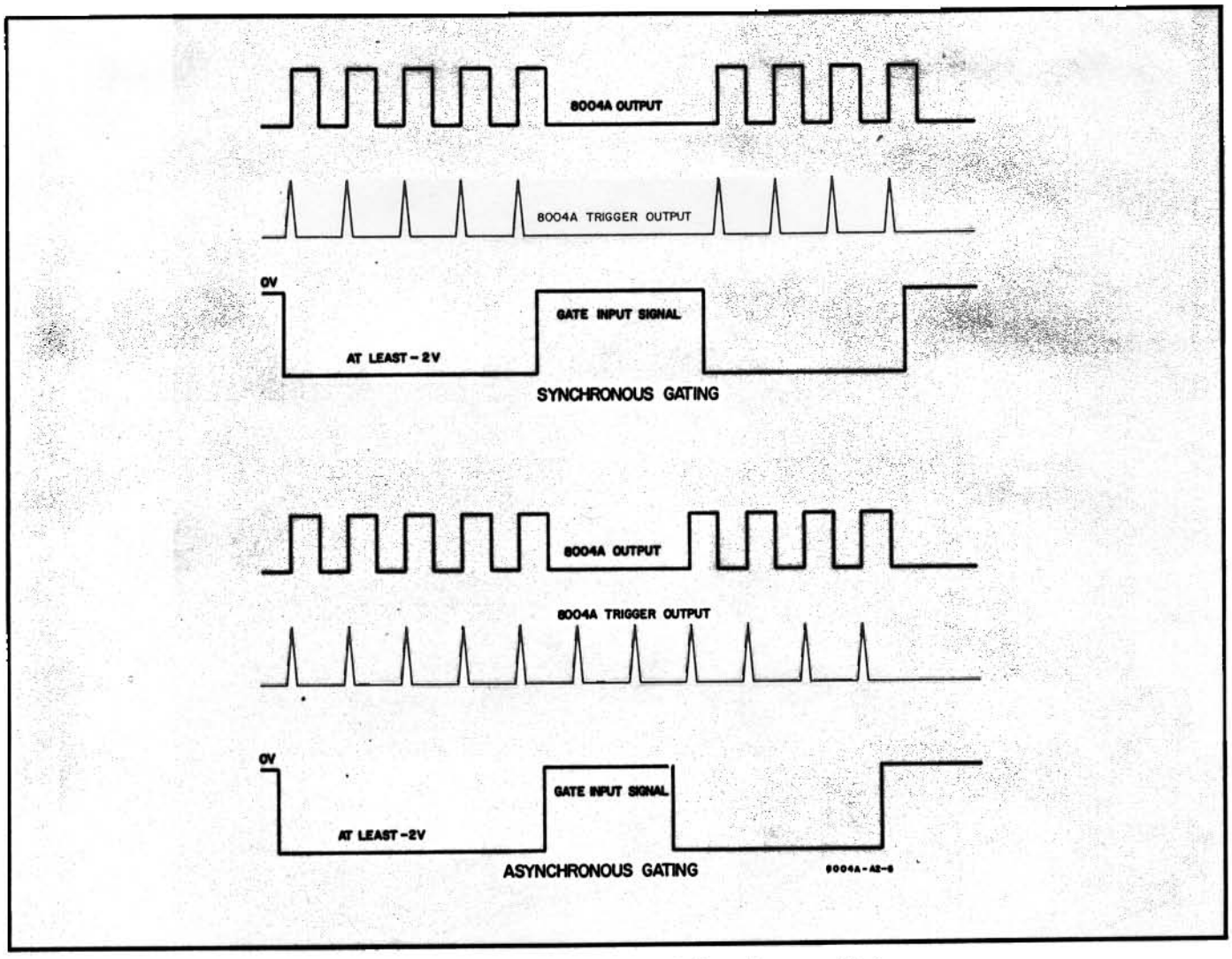


Figure 3–3. Synchronous and Asynchronous Gating