SECTION 1

GENERAL INFORMATION

1–1 INTRODUCTION

1–2 The Hewlett-Packard Model 8013A Pulse Generator is a dual channel, multi-purpose pulse source with variable repetition rate (PULSE PERIOD controls), pulse delay and pulse width. The dual outputs, OUTPUT (+) and OUTPUT (-), are usually developed across a 50 ohm external impedance and have independent amplitude controls. In addition, symmetrical pulse outputs, either as single pulses or pulse trains (in which the positive and negative limits of the respective pulse amplitude are an equal amount above and below ground potential), or a compliment of each pulse, can be obtained by introducing a suitable dc bias (OFFSET controls).

1–3 Three modes of operation are possible as follows:

a. Normal Mode: In this mode an internal repetition rate generator determines the pulse period. The generator may be triggered internally, externall, or manually; it may also be gated. Trigger pulses are available for synchronising external circuits; the delay time between the trigger and the output pulses may be varied as required. Square wave output may be selected.

b. RZ Mode: In this mode the external pulses determine only the repetition rate of the output pulses. All other output pulse parameters are determined by the settings of the pulse generator's front panel controls. Pulses produced by the repetition rate generator bear no time relationship to the output pulse train but can be used as an independent trigger for other equipment, if desired. It is not possible to gate the output pulse or to obtain square waves.

c. External Width Mode: Pulses applied to an input socket on the rear panel determine the width and repetition rate of the output pulses. Pulses produced by the repetition rate generator bear no time relationship to them, but can be used as an independent trigger for other equipment, if desired. Note that it is not possible to gate the output pulses and that square wave pulses forms are not available in this mode.

1–4 ACCESSORIES AVAILABLE

1–5 Electronic test equipment, cables, connectors, adaptors, and other accessory items are available from Hewlett-Packard. For more information on specific items consult the Hewlett-Packard Catalog or Sales/Service Office.

1–6 MANUAL IDENTIFICATION

1–7 This instrument carries a 10-character serial number on the rear panel, the first 5 characters of which are termed the serial number prefix. If the prefix does not agree with that quoted on the title page, reference should be made to the change sheets supplied with the manual. To obtain further information for any instrument, contact the nearest Hewlett-Packard Sales/Service Office, always specify the model number and complete serial number.

1–8 ORDERING ADDITIONAL MANUALS

1–9 One manual is shipped with each pulse generator. Additional manuals may be purchased from the local Hewlett-Packard field office (see list at rear of this manual for addresses). Specify the model number, complete serial number prefix, and HP stock number provided on the title page.

Table 1–1. Specifications

PULSE CHARACTERISTICS

(50 Ω source and load impedance)

Transition Times: < 3.5 ns fixed

Overshoot and Ringing: < ± 5% of pulse amplitude.

Preshoot: < ± 5% of pulse amplitude.

Pulse Width: < 10ns to 1s in four ranges. Vernier provides continuous adjustment within ranges.

Width Jitter: < 0.1% + 50s on any width setting.

Maximum Duty Cycle: > 75% from 1 Hz to 10 MHz, decreasing to ⩾ 40% at 50 MHz.

Maximum Output: 5V across 50Ω (10V across open circuit). Output circuit protected, cannot be damaged by shorting (10V across 50Ω, when internal 50Ω load is disconnected).

Attenuator: Four-step attenuator reduces output voltage to 0.5V. Vernier provides continuous adjustment between steps and reduces output to 0.2V.

Polarity: dual channel, positive and negative output simultaneously.

Source Impedance: 50Ω ± 3% shunted by (typically) 20pF.

DC Offset: positive channel: variable from −5V to +1V across 50Ω load. Negative channel: variable from +5V to −1V across 50Ω load.
Offset voltage independent of attenuator and amplitude vernier setting, can be switched off. If internal 50Ω load is disconnected, DC-Offset switches off.

Pulse Delay: < 35ns to 1s (with respect to trigger output) in four ranges; vernier provides continuous adjustment within ranges.

Delay Jitter: < 0.1% + 50ps on any delay setting.

REPETITION RATE AND TRIGGER

Repetition: 1 Hz to 50 MHz in four ranges. Vernier provides continuous adjustment within ranges.

Period Jitter: < 0.1% + 50ps on any repetition rate setting.

Square Wave: 0.5 Hz to 25 MHz in four ranges. Duty cycle 50% ±5% up to 1 MHz, tolerance increases to ± 15% at 25 MHz.

Trigger Output: Amplitude: > +1V across 50Ω. Width: 16 ns ± 10ns. Suitable for triggering another 8013A.

EXTERNAL OPERATION

External Triggering

Repetition Rate: 0 to 50 MHz. For square wave output, frequency divided by factor 2.

Trigger Input: sinewaves > 1.5Vpp (about zero) or pulses > 0.8V, (positive or negative) at least 7ns wide.

Delay: 25ns ± 8ns between leading edge of trigger input and trigger output signals.

Maximum Input Amplitude: ± 7V

Input Impedance: 50Ω ± 10%

Coupling: DC-Coupled

Manual: Front panel pushbutton for single pulse.

Gating

Synchronous Gating: Gating signal turns generator "on". First trigger output pulse is coincident with leading edge of gate pulse. Last output pulse is always generated with normal width even if gate pulse ends during generation of output pulse.

Gate Input: DC-coupled; voltage at open circuit gate connector approximately + 1.8V. Shorting current ⩽ 12mA. Input impedance approximately 160Ω

Gate Input Signal: Voltage > + 1.5V or resistor > 300Ω from gate input to ground enables the repetition rate generator.
Voltage < + 0.8V or resistor < 160Ω disables the repetition rate generator. Gate input is TTL compatible.

Maximum Input Signal: ± 5V

Table 1–1. Specifications (cont'd)

External Width and RZ Modes

External Width: Output pulse width determined by the width of drive input signal. Amplitude selectable. Repetition rate generator running provides trigger output but these trigger pulses are not related to the pulses at the output connector.

RZ Mode: External drive input switched to delay generator. Pulse period determined by pulse period of drive input signal. Delay, width and amplitude are selectable.

Input Signal: Input Impedance 50Ω,DC-coupled. Signal $>$ +1V, at least 7ns wide, provides output signal.

Maximum Input Signal: ± 5V
Repetition rate generator running provides trigger output but these trigger pulses are not related to the pulses at the output connector.

GENERAL

Operating Temperature Range: 0°C to +55°C

Power Requirements: 115 or 230V + 10%, −15%, 48 to 440 Hz, 70Va maximum.

Weight: net 9lbs. (4 kg), shipping 14.6 lbs (6.5 kg).

Dimensions: 7.9 in. wide, 5.6 in. high, 13 in. deep. (200 x 142 x 330 mm).