PM 5781

GPIB IEEE-488

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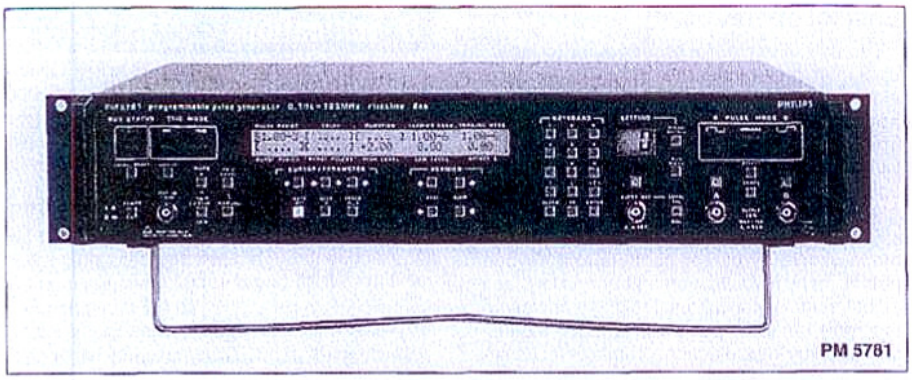

PM 5781 125 MHz Programmable Pulse Generators

- Wide frequency range 0.25 mHz...125 MHz
- Amplitude 0.2V...10V into 50Ω
- Dual pulse outputs
- Excellent 50Ω backmatching absorbs reflections
- Rise- and falltimes 2 ns...100 ms
- Preset burst with external or internal burst generator
- External triggering, gating and shaping
- Single/double pulse, squarewave and constant duty factor
- High performance interface IEEE-488.2
- Alphanumeric LCD display for easy operation and programming

The PM 5781 is a fully programmable pulse generator, designed primarily for automatic test systems applications.This instrument's easy operation with built-in microcomputer convenience also makes it very attractive for manually operated, semi-automatic benchtop applications.

The high speed, wide amplitude range and functional versatility of the PM 5781 enable it to handle virtually any analog and digital circuit testing. Fast digital circuitry such as TTL, BiCMOS or ECL is easily handled, and the wide choice of internal/external trigger and gate functions make setting-up of special test signals unbeatably easy. For example, the preset burst function lets you set the number of pulses in a burst, the pulse repetition frequency and the burst repetition frequency, all without the need for auxiliary equipment.

Programming via the IEEE-488 bus is very simple and powerful, thanks to full implementation of the new IEEE-488.2-1987 Standard. Both generator and bus interface have been designed for high-speed bus performance.

High performance pulses

The PM 5781 offers high-speed, high-performance pulses at repetition rates up to 125 MHz, and as low as 0.25 mHz. A wide variety of application requirements can therefore often be covered by this single generator.

The PM 5781's fast output pulses have rise- and falltimes which are independently and continuously variable from 2 ns to 100 ms (10% to 90% of amplitude). The 20% to 80% transition times, as specified for ECL circuits,range from as low as 1.4 ns.

The output amplitude (into 50Ω) is variable between 0.2V and 10V, within the -10V to+10V window. In fact, pulse levels are directly defined by setting the high- and low-level values.

The internal 50Ω backmatching absorbs more than 90% of reflections from mismatched loads, thus ensuring very clean pulses, even when driving a non-50Ω load.

The PM 5781 has dual outputs for simultaneous positive- and negative-going pulses. Both outputs offer the same high-performance pulses. An additional offset facility on the B channel further enhances the versatility of the dual outputs. This offset voltage makes it possible to program bipolar pulses, for example, as well as complementary positive and negative pulses for digital applications.

To protect sensitive loads against overvoltages caused by operating or programming mistakes, limits on output values may be programmed. An additional protection facility is provided by the output disable function. This allows the programmer to prevent connection of the output signal to the device under test until all pulse parameters have been set.

To avoid damage to the generator outputs, the PM 5781 has full protection against short and open circuits, as well as against external transients applied to the outputs.

Versatile functionality

The PM 5781 offers a complete range of possible trigger and pulse mode facilities including:

- Continuous pulses: generated by the internal clock generator or triggered by an external clock signal.
- Gated pulses: produce bursts of pulses generated by the internal clock, gated by an external gate signal. The burst frequency and duration are defined by the external gate signal.
- Preset burst: in this mode, pulse bursts are generated with a pulse frequency and duration defined by the PM 5781. The number of pulses in each burst is selectable from 1 to 9999. The burst repetition period can be triggered from an external generator, but can also be generated internally in the PM 5781 by a special burst-period generator. This unique feature eliminates the need for a second, external generator. This feature is particularly valuable in automated test systems, since it saves the cost, rack-space and programming effort of an additional generator.
- Single pulses: can be generated, triggered by an external trigger signal, manually or via the IEEE-488 bus.
- External duration: in this mode, the generator functions as a pulse-shaper and/or pulse booster for externally connected signals. The external signal defines the frequency and pulse duration, while the high and low levels, rise- and fall times and normal/complementary mode selection are defined by the pulse generator settings.

Pulse mode selection further includes the choice of single and double pulse, squarewave and programmable duty cycle. The latter is just one example of the PM 5781's unique TRACK function, which allows selection of pulse parameters that maintain a fixed, programmable relationship when any one of these parameter is modified.

Depending on the application, all the above pulse modes can be externally triggered in a variety of trigger modes. The selectable trigger sources are:

- Internal clock
- External clock/pulses
- Manual operation
- A variety of trigger modes via the bus

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Pulse Generators

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To facilitate correct triggering from any external input signal, the PM 5781 offers all trigger facilities, such as:
- DC...125 MHz trigger range
- + and - slope selection
- 50Ω and 1 MΩ impedance selection
- 5 V to +5 V trigger level selection

Advanced IEEE-488 bus facilities

The PM 5781 has been designed primarily for automatic test system applications, and offers advanced facilities for operation via the IEEE-488 bus. All functions and parameter values are 100% programmable.

To reduce system development time, the generator complies fully with the requirements of the new IEEE standard 488.2-1987 (Standard Codes, Formats, Protocols and Common Commands). Test programs can therefore be written quickly and efficiently, even when using the PM 5781 for the first time.

The PM 5781 offers a wide variety of features to facilitate programming and to speed up operation via the bus, for example:

- 49 complete instrument settings: can be saved in non-volatile memory. A short and simple command recalls a complete instrument setting as stored in memory, e.g. *RCL 17. The bus transaction time for this command is only a few milliseconds, after which all operating parameters are set.
- LEARN: helps the inexperienced programmer to write instrument programming codes. When the LEARN command is used, the pulse generator transmits the full string of programming commands corresponding to the current setting.
- CODES? and SYNTAX?: programming help functions. After transmitting one of these queries, the pulse generator returns headers for all codes or the syntax for a command. These functions make programming extremely easy, even without the manual or programming card.
- Debug mode: instead of showing the numerical pulse parameter values, in the debug mode the generator displays the programming string as actually received via the bus. Operating problems and failures to command the instrument via the bus, caused by hardware failure or software incompatibility, are easily detected by using this mode.
- Speed: after debugging of all programming commands, the instrument's operating speed can be improved further by disabling a number of functions such as error checking, local displays etc. In addition, the set of available bus commands and the bus interface have been optimised for very fast bus operation.

Ease of operation

The use of microprocessor power to facilitate operation has made the PM 5781 generator extremely easy to use in non-programmable applications. The clearly laid-out, uncluttered front panel, with all 10 pulse parameter values visible on the alphanumeric LCD display, further enhances ease of operation.

Function selection and parameter settings are made simple by cursor controls and keyboard entries, or by up/down vernier buttons for smaller adjustments of set values. Making a choice from the wide range of pulse and trigger modes is facilitated by key selections from a selection tree shown on the display.

But best of all - the PM 5781's microprocessor constantly keeps track of all your settings, and warns of illegal entries. The risk of conflicting combinations of pulse period, delay, duration and rise-/falltime settings usually requires all the operator's attention, and can still lead to errors. The PM 5781's microprocessor control concept completely eliminates this problem. It doesn't just warn you, it even corrects errors with the help of the green AUTOSET button.

Other powerful features are the memory save and recall facility for 49 complete instrument settings and sequence facilities. The recall of settings from memory can be sequenced; for example you can step through 4 series, each including different sequences of saved settings, using a simple NEXT command, issued either manually or via the bus.

Systems compatibility

In addition to its powerful IEEE-488 bus features, the PM 5781 has other characteristics that make it exceptionally easy to install and use in test systems, such as:

- 19"rack-mounting: hardware is included standard. The low-profile cabinet steals a minimum of your rack space - no more than 2E (89 mm/3.5 inch) high.
- Rear-panel input/outputs: are optionally available instead of front-panel mounted connectors.
- Wide 0...50°C ambient temperature range: allows the PM 5781 to be used even in rack configurations with many other instruments, all dissipating power without central ventilation.
- EMI: good protection against electromagnetic interference provides high tolerance to other instruments in the same rack or stack

Specifications

Technical Specifications

Specifications apply with all outputs terminated with 50Ω load resistance. Unless otherwise specified, inaccuracy specifications apply at 20°C...30°C. Use temperature coefficient derating above 30°C and below 20 °C. An "in situation recalibration" is possible for other temperature ranges through a programming procedure, available via the front panel.

Time Parameters

Specified at 50 % of pulse amplitude at minimum transition times

Pulse Repetition Period

Internal trigger mode
Range: 8.000 ns...10.00 s
Programming Resolution: 4 digits
Inaccuracy: ± 0.1% ± 0.1 ns (0°C...50°C)
Jitter$_{RMS}$: 0.1% + 50 ps for period times < 1 µs. 0.03% for period times ≥ 1 µs
Gate and burst modes
Range: 8.00 ns...10.0s *
Programming Resolution: 3 digits
Inaccuracy: ±0.3 % ±0.5 ns after the first 5 pulses in each burst
Temperature coefficient: < 0.1%/°C
Repeatability Error: 3 times better than inaccuracy
Jitter$_{RMS}$: 0.1% + 50 ps for period times < 1µs. 0.03 % for period times ≥ 1 µs.

** Using internal burst, with only 1 pulse per burst, the period range is extended up to 4000s*

Pulse Delay

Range: 8.00 ns...100 ms
Programming Resolution: 3 digits
Inaccuracy: ±0.3% ± 1 ns
Temperature coefficient: < 0.1%/°C
Repeatability Error: 3 times better than inaccuracy
Jitter$_{RMS}$: 0.1% + 50 ps

Pulse Duration

Range: 4.00 ns...100 ms.
Programming Resolution: 3 digits
Inaccuracy: ± 3% ± 1 ns
Temperature coefficient: < 0.1%/°C
Repeatability Error: 3 times better than inaccuracy
Jitter$_{RMS}$: 0.1% + 50 ps
Duty Factor: Up to 50% in normal mode. Approaching 100 % in complementary mode

Constant Duty Factor

Repetition period and pulse duration tracked
Range: 0 %...50 % in normal mode.
50 %...100 % in complementary mode

Preset Burst

Range: 1...9999 pulses in each burst
Internal Burst Repetition Period: 1 µs... 4000s
Programming Resolution: 4 digits, min. 1 µs
Inaccuracy: < 1 x 10^{-5} (0°C...50°C)
External Burst Repetition Period: > 250 ns

Transition Times

(Between 10% and 90% of amplitude)
Range: 2.00 ns...100 ms
Minimum transition time, between 20% and 80% of amplitude, is 1.4 ns.
Leading and trailing edge are independently programmable within each of the following ranges:

2.00 ns...20.0 ns	10.0 µs...200 µs
10.0 ns...200 ns	100 µs...2.00 ms
100 ns...2.00 µs	1.00 ms...20.0 ms
1.00 µs...20.0 µs	10.0 ms...100 ms

Programming Resolution: 3 digits
Inaccuracy: ±0.5% ±1 ns
Temperature coefficient: < 0.2%/°C
Repeatability Error: 3 times better than inaccuracy
Linearity Error: ±5 % for transition times longer than 20 ns

Outputs

Main Pulse Outputs

Outputs: 2 channels, A (normal) and B (complementary)
Pulse Modes: Single pulse, double pulse and squarewave
Output Mode: Normal/complementary; to make A complementary and B normal
High Level Range: - 9.80V...+ 10.0V
Low Level Range: - 10.0V...+ 9.80V
Programming Resolution: 10 mV
Inaccuracy: ±1% of progr. value ±3% of amplitude ± 40 mV
Temperature coefficient: < 0.1%/°C
Repeatability Error: 2 times better than inaccuracy
Pulse Amplitude: 0.2V...10V, being the difference between the progr. high and low levels
Offset Channel B: within ±10V
Preshoot, Overshoot, Ringing: ±5% of pulse amplitude ±10 mV
Source Impedance: 50Ω (Reflection coefficient < 0.1)
Output Disable: Output galvanically separated
Level Limit: Programmable high and low levels can be limited to preprogrammed values
Output Protection: Against short and open circuit

Clock Output

Pulse Levels:
TTL; 0V and + 2.5V into 50Ω, 0V and + 5V into high impedance
ECL; - 0.8V and - 1.7V into 50Ω
Transition Time: 1 ns (10% and 90% of amplitude)
Source Impedance: 50Ω
Output Protection: Against short and open circuit
Output Disable: Clock output galvanically separated

Burst Sync Output

Approximately - 0.4V to - 0.8V pulse from 50Ω source during the pulse burst duration

Input

External Input

Frequency Range: DC...125 MHz
Minimum Pulse Duration: 4 ns
Sensitivity: 500 mVpp
Dynamic Input Voltage Range: 10Vpp within ±10V
Trigger Level Range: - 5.00V...+ 5.00V
Programming Resolution: 10 mV
Trigger Slope: + or -
Input Impedance: 1 MΩ/45 pF or 50Ω
Max. input voltage without damage:
50Ω; 10VRMS
1 MΩ; 50VRMS at < 10 MHz,
10VRMS at > 10 MHz

Trigger Modes

Int Trig: Continuously repetitive waveform is generated
Int Gate: Internal burst generator enables the period generator synchronously. Burst duty factor 50%
Int Burst: Internal burst generator enables the period generator to provide a preprogrammed number of pulses (1...9999)
Ext Trig: Each input pulse generates a single output pulse
Ext Gate: External signal enables internal period generator synchronously
Ext Burst: Each input pulse generates a preprogrammed number of pulses (1...9999)
Ext Dur: External signal generates an output signal with same duration and repetition rate and selectable transition times and output levels
Manual: Simulates an external input signal

Features

Front Panel Displays

Alphanumeric display: A 2 lines x 40 characters alphanumeric LCD display with backlighting. The display shows 10 pulse parameters simultaneously. The display is also used for various function selection and error massages
Bus Status Display: An LED display shows Bus status; REMOTE, LLO, ADDR (listen/talk) and SRQ
Trigger Mode Display: An LED display shows trigger mode
Setting Number Display: An LCD display shows setting number
Pulse Mode Display: An LED display shows main pulse output mode

Non-Volatile Memory

Internal battery-backed RAM is used to save settings. Current setting is saved on power down
Power On: Last setting is activated when the power is switched on (Output disabled)
Settings: 49 complete instrument settings can be saved and recalled

Error Handling

Error Detection: Erroneous settings are detected and error messages are displayed
Autoset: Erroneous settings are easily corrected with the AUTOSET key

Track

A change of one pulse parameter value can automatically cause other parameters to follow proportionally. E.g. tracking of pulse period and duration results in a pulse with constant duty factor

Lock

Unintentional changes of numerical parameter-values can be prevented by the locking facility

Rear Panel Connectors

A version with all input and output connectors on the rear panel, instead of on the front panel, is also available

IEEE 488 Capabilities

All functions and parameters are programmable. The interface complies with the requirements of the IEEE 488.1 - 1987 and IEEE 488.2 - 1987 Standards. Interface Functions: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0, E2 Address: Set via the front panel

General Specifications

Environmental Conditions

Meets environmental requirements of MIL-T-28800D Type III, Class 5 as follows

Calibration Interval: 1 year
Warm-Up Time: 30 min to reach specified performance
Ambient temperature:
Operating; 0°C...+50°C.
Non-operating; -20°C...+70°C
Altitude: < 4600 m (15000 ft)
Humidity: < 95% RH, 0°C...40°C
Vibration: Operating; 15 min along each of the 3 major axis, 10 Hz...150 Hz, 0.33 mmpp amplitude and 2 g max. acceleration
Shock: Operating; 3 shocks along each of the 3 major axis, half-sinewave, 6 ms duration and 40g acceleration pulses
Bench handling: MIL-STD-810D method 516.3, procedure VI

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Safety: CSA Bulletin 556B certified and Philips certification to comply with IEC 348, Class 1 requirements
EMC: Meets VDE 0871 Level B, FCC Part 15J

Power Requirements

LINE: 100, 120, 220 and 240V ±10%, 48 Hz... 420 Hz, 200 VA

Dimensions and Weight

Width: 440 mm, (17.3 in), excl. 19" rack mount brackets
Height: 89 mm, (3.5 in)
Depth: 500 mm, (19.7 in)
Weight: Net 12 kg (26.5 lbs), Shipping 15.5 kg (34 lbs)

Included Accessories

1 Power Cord
1 Bench-Top Conversion Kit
1 Operator's Manual
3 IEEE 488 Pocket Guides

Ordering Information

Models

PM 5781/011 Pulse Generator with Front Panel Connectors
PM 5781/012 Pulse Generator with Rear Panel Connectors

Optional Accessories

PM 9581: 50Ω Feed-through Termination; 3W
PM 9584: 50Ω T-Piece (matched power splitter)
PM 9585: 50Ω Feed-through Termination; 1W
PM 9588: 50Ω Coaxial Cable Set (5x1 ns, 4x2 ns, 3x3 ns, 3x10 ns)
PM 2295/05: IEEE Cable, 0.5m
PM 2295/10: IEEE Cable, 1m
PM 2295/20: IEEE Cable, 2m