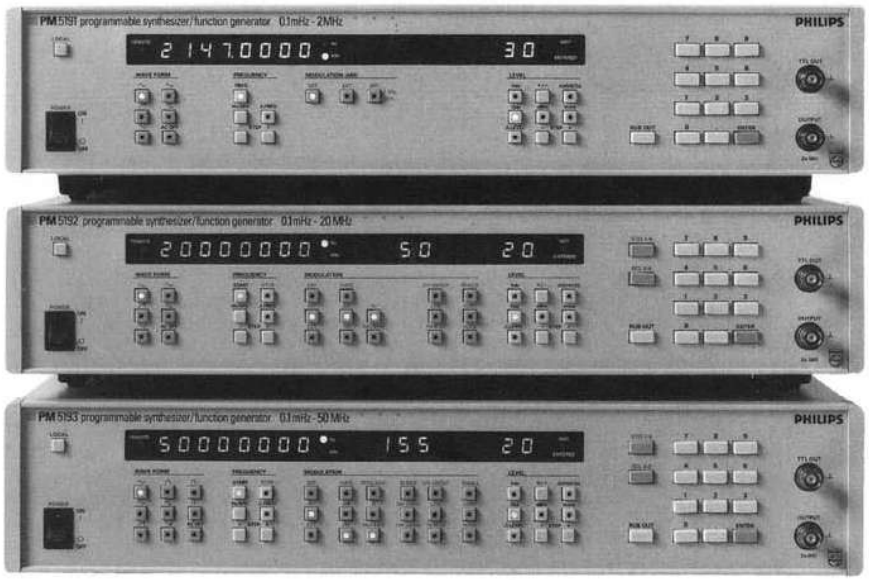
Function Generators

PM 5191, PM 5192 & PM 5193

GPIB
IEEE-488



PM 5191/92/93

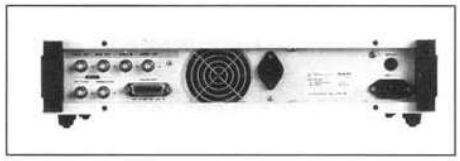
PM 5191, PM 5192 & PM 5193 Synthesized Function Generators
Wide frequency ranges: 0.1 mHz to 2.147, 20 or 50 MHz
8 standard waveforms (PM 5193) or 5 waveforms (PM 5192/91)
8 Digit Frequency Resolution
Maximum 20V p-p output (PM 5191: 30V p-p) plus TTL ouput
Independent amplitude and offset
GPIB/IEEE-488 interface standard
Modulation facilities including AM (all models) FM, Gate and Sweep (PM 5192 and PM 5193), plus Burst (PM 5193)
Video modulation facilities with model PM 5193V
10 MHz external synchronization with models PM 5191S, PM 5192S, PM 5193S

If you need precision, versatility and value in a waveform generator, Fluke offers a complete line of instruments that cover your requirements – exactly. Choose from the top-of-the-line PM 5193, with its 50 MHz frequency range. The versatile 20 MHz PM 5192. And the economical PM 5191, with excellent performance up to 2.147 MHz.

Each model offers you a comprehensive choice of waveform functions - up to eight on the PM 5193. AM, FM, gating and burst modes extend flexibility, and all can be modulated either internally by the generator, or by an external source. Linear and logarithmic sweep with fully independent start and stop frequencies and sweep times can also be made – with three different sweep modes (sweep and flyback, sweep and hold, sweep up and down). Add to this flexibility the precision of 8-digit resolution and high long-term stability, ensuring total reproducibility of your test routines.

PM 5193: The Most Versatile 50 MHz Performance

The PM 5193 offers complete versatility of performance, and a wide array of features to meet both today's and tomorrow's requirement. Complete in frequency range, with an exceptional 11½-decade coverage and setting accuracy of better than 0.1 mHz. Complete in function selection, with a choice of eight waveforms that includes sine, square, ramps and haversine, plus a built-in pulse generator for positive and negative pulses with 3 ns transition times. Complete in modulation, with AM, FM, gating and counted burst with programmable single-shot or continuous operation, and programmable internal (to 200 kHz), or external modulation. Complete in sweep facilities, with linear and logarithmic sweep and three sweep modes, which can be controlled internally (single or continuous) or by an external trigger. Finally, complete for both bench top or systems applications, with ten stored set-up and full GPIB/IEEE-488* programmability.



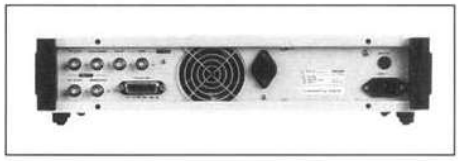
If you're budgeting for a 'standard' synthesizer/function generator, the PM 5193 offers you complete performance for about the same price. Compare and see how the PM 5193 can address your needs today for applications such as digital communications, calibration and use with state-of-the-art electronic equipment – plus the versatility to meet tomorrow's applications as well.

PM 5192: The New Standard in 20 MHz Synthesizer/Function Generators

If your applications require performance up to 20 MHz, the PM 5192 offers the features at a price you may not expect. With a frequency range from 0.1 mHz to 20 MHz, 8-digit precision and 1 ppm long-term stability, the PM 5192 provides the signals you need to guarantee the repeatability of your tests. Versatile enhanced by three modulation modes: AM, FM and gating. Both internal modulation (1 kHz) and external modulation (dc to 200 kHz) are possible in AM, FM and gating modes. Linear and logarithmic sweep with three different sweep modes-sweep and flyback, sweep and hold, sweep up and down – allow all standard waveforms to be used as carriers over the frequency range 1 mHz to 20 MHz. Sweep time is programmable from 10 ms to 999s.

The PM 5192 is equally at home on the bench, with ten stored set-ups, or in systems with its full IEEE-488 programmability.

The wide frequency range makes this model ideal for a wide range of applications in fields like mechanical and electrical engineering and electronics.



**The terms GPIB and IEEE-488 may be used interchangeably throughout this catalog.*

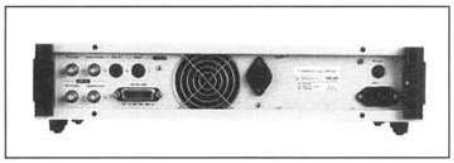
PM 5191, PM 5192 & PM 5193

PM 5191: The Value Leader

The PM 5191 brings 8-digit precision and repeatability and full IEEE-488 programmability to the budget-conscious engineers. A full 10-decade frequency range (From 0.1 mHz to 2.147 MHz), five standard waveforms and internal or external AM make this a versatile general-purpose instrument. Internal modulation (1 kHz) uses any of the waveforms as carrier, while external AM modulation covers a 200 kHz range. The carrier frequency is variable over the instrument's entire frequency range from 0.1 mHz up to 2.147 MHz.

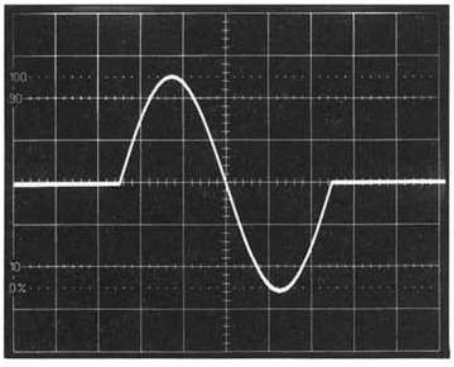
The PM 5191 also offers phase noise of –80 dBc/Hz and a high 30V pp output level.

With this outstanding combination of performance and value, the PM 5191 is well suited for lab or production line use, as well as for education and training.

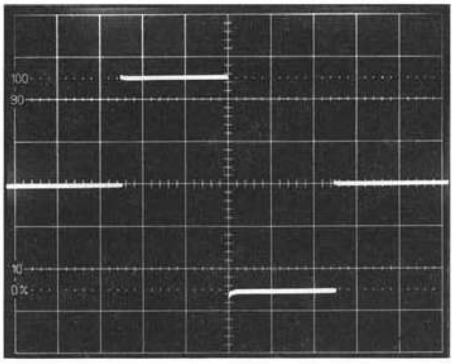


Wide Choice of Standard Waveforms

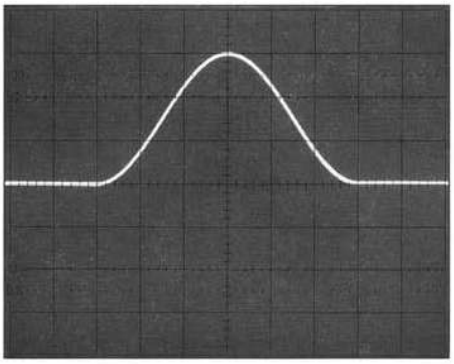
Each instrument offers a wide choice of standard waveform functions: no less than eight for the PM 5193, and five for the PM 5191 and PM 5192. All these functions are selectable either through the front panel or the IEEE-488 interface, with LED indicators to show at a glance which function is selected. Out-of-range or other invalid settings are indicated by blinking LED indicators, simplifying use of the front panel and the bus interface.



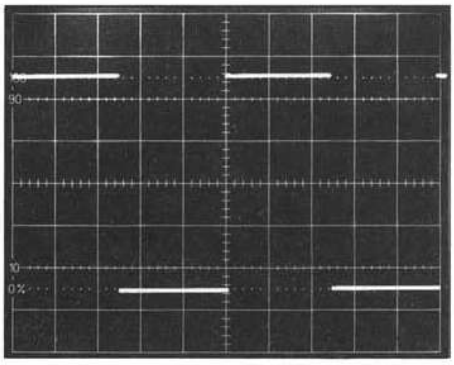
Sine wave



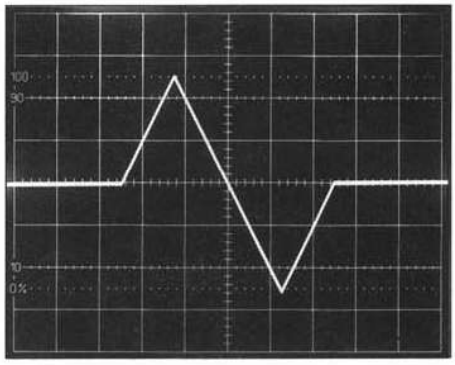
Square wave



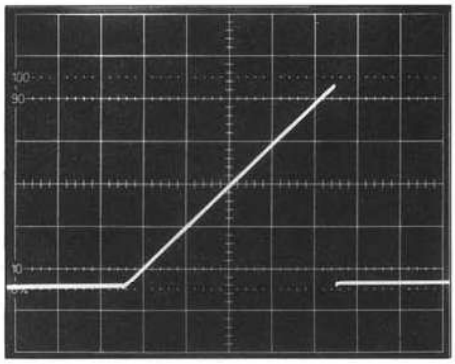
Haversine (sine² signal) (PM 5193 only)



Positive and negative pulses with 3 ns transition time (PM 5193 only)



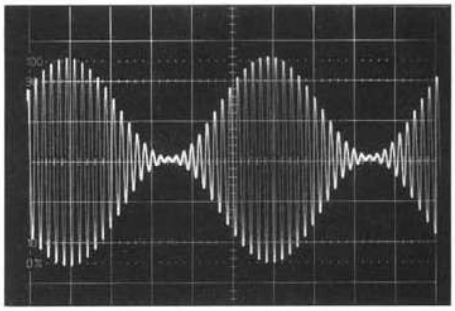
Triangle



Positive and negative ramps

Instantly Selectable Modulation Modes

All required modulation modes are also instantly available at the touch of a button covering AM, FM, burst and gating. For sweep you have a choice of linear or logarithmic sweep and a selection of sweep modes: sweep and re-trace, sweep up - sweep down, or sweep-and-hold.



Carrier wave with amplitude modulation; 100% modulation depth

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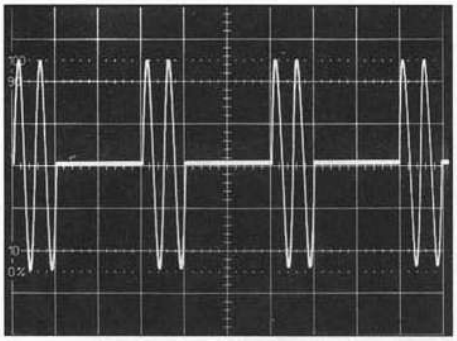
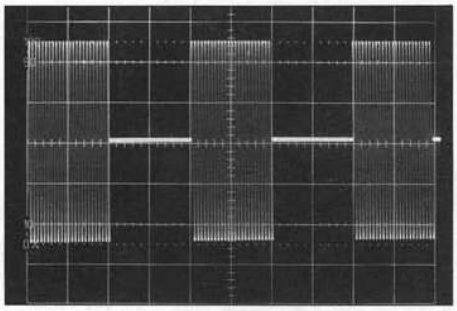
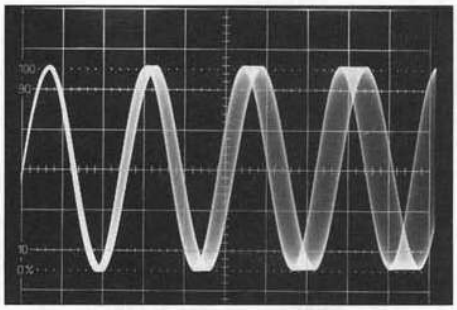
PM 5191, PM 5192 & PM 5193



Burst signal, programmable on/off cycles; 2 on, 4 off cycles (PM 5193 only)



Gated signal; non-phase-coherent on/off keying (PM 5192/PM 5193 only)



Oscillogram showing frequency sweep or frequency modulation (PM 5192/PM 5193 only)

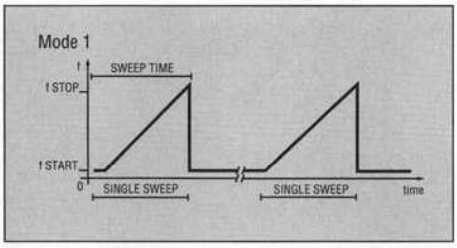


Figure 1.

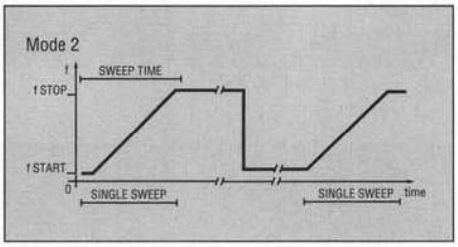


Figure 2.

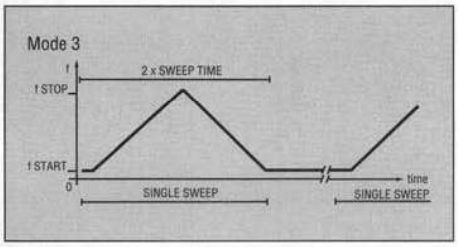


Figure 3.

Precise Frequency Programming

The frequency keypad area allows precise programming of all frequency-related settings, choice of scale (Hz/kHz) and frequency steps. These preset frequency steps can then be repeated manually using the step + or - buttons.

Versatile Output Level Setting

The desired output levels in V pp, V rms or dBm can be selected by a special keypad, while the selected output voltage is indicated on the LED display. A step function allows quick changes in output level in presettable steps.

Specially developed circuitry prevents any interaction between ac and dc settings. The signal outputs, including a TTL output, are short-circuit proof.

Full GPIB/IEEE-488 Program-mability Adds Extra Versatility

The full IEEE-488 programmability of all these Philips synthesizer/function generators adds an important extra dimension to their versatility.

Built-in Learn and Identification modes speed and simplify IEEE-programming. In Learn mode, complete strings of instruction representing front-panel settings can be transmitted to the controller. The same instrument set-up can be reproduced whenever required, simply by re-transmitting the same string of instructions. In the Identification mode, the instrument automatically responds to an identification request from the controller by transmitting its type number and software version.

10 MHz External Synchronization

In many applications where frequency synthesizers are used, the possibility of synchronizing the outputs of two or more synthesizers is valuable when it is desired to have signals of exactly the same frequency, precisely determined frequency rations or in locked phase conditions.

The Philips PM 5191, PM 5192 and PM 5193 synthesizers all use the same synchronization frequency of 8.6 MHz, allowing convenient synchronization of any combination of these instruments.

For applications demanding traceability to an external standard, the PM 5191S, PM 5192S and PM 5193S generators can be synchronized with external standards at 10 MHz, or sub-harmonics such as 1, 2 or 5 MHz.

Note: Phase locking to other 10 MHz instruments using the external reference is not possible.

Quick Selection Table

	PM 5191	PM 5192	PM 5193
Maximum Frequency	2 MHz	20 MHz	50 MHZ
Waveforms	5	5	8
Output Voltage Vp-p	30	20	20
Internal Modulation	1 kHz	1 kHz	10 Hz - 200 kHz
INT/EXT AM	y	y	y
INT/EXT FM	–	y	y
INT/EXT SATE	–	y	y
Sweep	–	y	y
Burst	–	–	y
Front Panel Setups	1	10	10

Video Modulation Facilities

The PM 5193V adds video modulation facilities to the wide range of waveforms and modulation facilities of the standard instrument. In this version, video modulation is provided by an external modulation signal, and replaces the AM external modulation mode of the PM 5193.

PM 5193 Specifications

Technical Specifications

Frequency and Characteristics

Nominal Range: 0.1 mHz to 50 MHz
Operational Range: Sine wave 50 MHz
Positive pulse 50 MHz
Negative pulse 50 MHz
Square wave 20 MHz;
Triangle 200 kHz;
Haversine 50 kHz
Positive sawtooth 20 kHz;
Negative sawtooth 20 kHz
Setting: Local via front-panel keyboard. Remote via IEEE-488 bus interface ± stepping function with programmable step width.
Resolution: 8 digits; >0.1 mHz
Display: 8-digit LED display, Hz/kHz indication
Setting Error: <1 x 10^{-6}
Frequency Jitter: 0.02%, <1200 Hz; f ≥2 MHz, LF bandwidth 10 Hz to 20 kHz
Temperature Coefficient: <0.2 ppm/K
Aging: <1 ppm per year
Drift: <0.3 ppm in 7 hours

Output Characteristics

Connector: BNC socket on front or rear panel
Impedance: $Z_0 = 50\Omega$
Load Capability: Short-circuit proof
Maximum External Voltage: ±12V p-p (<3 min.)

AC Voltage

Independent of dc settings within ±10V window
Ranges: Range I 2.1 to 20V p-p open-circuit voltage; Range II 0.21 to 2.00V p-p open-circuit voltage; Range III 0 to .200V p-p open-circuit voltage
Resolution: Range 1 0.1V; Range II 0.01V; Range III 0.001V
Setting: Remote or local +/- stepping Programmable step width
Alternative Settings: V rms, dBm
Basic Setting Error: ±2% (1 Hz to 200 kHz) V p-p >2.1V

DC Voltage

Independent of ac setting within ±10V window
Range: ±10V open-circuit voltage
Resolution: 0.1V
Error: ±2% of setting
Offset: <0.03V (Vac ≤2V); <0.08V (Vac >2V)
Setting: Remote or local; +/- stepping function. Programmable step width.

TTL Output

Connector: BNC socket on front panel
Fan-Out: 5 TTL inputs
Level: 0/>3.5V

Waveforms

Standard Functions: Sine wave, square wave, triangle, haversine, sawtooth (positive- and negative-going ramps), positive and negative pulse
Selection: Local via front panel keyboard. Remote via GPIB/IEEE-488 bus interface.
Indication: Key LEDs

Sine Wave

Frequency Range: 0.1 mHz to 50 MHz
Output Range: 0 to 20V p-p

Distortion

THD: typ. 92%, <0.5% (f = 1 Hz to 200 kHz)
typ. 0.4%, <0.7%, (f = 200 kHz to 2 MHz)
Harmonics:<-37 dBc (f<10 MHz, Vp-p >10 mV)
Spurious: <-40 dBc (2 MHz< f <50 MHz, open circuit voltage ≥100 mV p-p, distance from carrier >15 kHz); <-50 dBc (0.1 mHz< f <2 MHz, open circuit voltage ≥100 mV p-p)

Haversine

Frequency Range: 0.1 mHz to 50 kHz
Output Range: 0 to 10V p-p
Distortion: <0.8% (output >10 mV p-p)

Square Wave

Frequency Range: 0.1 mHz to 20 MHz
Transition Times: 10 ns typically, <11.5 ns
Duty Cycle: 50%
Aberration: <2% ±20 mV range I; <2% ±3 mV range II

Triangle

Frequency Range: 0.1 mHz to 200 kHz
Output Range: 0 to 20V p-p
Temperature Coefficient: <0.1%/K
Linearity: >99%

Sawtooth (pos/neg ramps)

Frequency Range: 0.1 mHz to 20 kHz
Output Range: 0 to 10V p-p
Temperature Coefficient: <0.1%/K
Flyback Time: <1 µs
Linearity: <99%

Pulse

Frequency Range: 0.1 mHz to 50 MHz
Output Range: 1.0 to 10V p-p
Rise/Fall Time: 3 ns typical, <4.5 ns
Aberration: <2% ±40 mV

Modulation

Modes: AM int /ext, FM int/ext, lin/log sweep, gate int/ext, burst. Internal modulation frequency programmable via keypad.
Resolution: Range I (0.01 to 0.99 kHz): 10 Hz
Range II (1.0 to 9.9 kHz): 0.1 kHz
Range III (10 to 200 kHz): 1.0 kHz

Internal AM

Carrier Frequency: 0.1 mHz to 50 MHz
Carrier Wave: All, except pulses
Modulation Frequency: 10 Hz to 200 kHz
Modulation Depth: 0 to 100%
Resolution: 1%
AM Envelope Distortion: <2% (m ≤98%); <1.5% (m <50%, fm 100 Hz to 20 kHz)

External AM

Modulation Frequency: 0 to 200 kHz
AM Envelope Distortion: 2% (m <98%); 1.5% (m<50%; fm 100 Hz to 20 kHz)

Internal FM

Carrier Frequency: >2 MHz
Modulation Frequency: 10 Hz to 200 kHz
Deviation: 10 kHz to 200 kHz
Resolution: 1 kHz
Modulation Distortion: <1% (f ≤30 MHz; Df ≤100 kHz; fm ≥200 Hz to ≤50 kHz)

External FM

Carrier Frequency: >2 MHz
Modulation Frequency: 10 Hz to 200 kHz
Deviation: 10 kHz to 200 kHz
Distortion: <1%

Sweep

Carrier Wave: All waveforms
Sweep Functions: lin/log, up/down, single/continuous, hold/release
Range: 1 mHz to 50 MHz phase-continuous, depending on waveform; independent setting of start and stop frequencies
Sweep Time: 10 ms to 999s
Resolution: Maximum 0.01s (3 digits)
Error: 0.1 ms, sweeptime ≤4s

Internal Gate

Non phase-coherent signal keying
Carrier Frequency: 0.1 mHz to 50 MHz (depending on waveform): carrier wave: all except pulses
Modulation Frequency: 10 Hz to 200 kHz
Duty Cycle: 50%

External Gate

Modulation Frequency: 0 to 500 kHz; min on/off time 2 µs

Burst

Carrier Frequency: <2 MHz all carrier waveforms
On and Off Cycles: 1 to 200 programmable
Burst Functions: Single/continuous
External Triggering: TTL positive edge; via modulation input
Maximum Repetition Rate: 1 kHz

Video Modulation (PM 5193V only)

Carrier Waveform: Sine
Carrier Frequency: ≤50 MHz
Modulation Bandwidth (-1 dB): ≥8 MHz; carrier frequency <45 MHz
External Modulation Signal: CVBS; amplitude: 1V p-p
Maximum DC Offset: ±5V
Modulation Mode: Double sideband amplitude modulation (A3F), negative poarity
RF Synchronizing Level: 100%
Residual Level (white level): 11 ±3%; related to RF synchronising level

PM 5191, PM 5192 & PM 5193

Independent Linearity Error: ≤2% between black and white level
Connector: BNC; "VIDEO IN" at rear of the instrument
Impedance: 75Ω

GPIB/IEEE-488 Bus Remote Control

Control Capability: All signal functions and characteristics
Interface Functions: AH1, L4, RL1, SR1, SH1, T6
Listener Address: Programmable via keyboard, indicated by LED display
Address Range: 0 to 30
Service Request: Error and single end message
Remote Lock-Out: Go-to local front panel key. Device identification and learn modes provided as standard.

10 MHz Output (PM 5193S only)

Protection: Short-circuit proof, maximum external voltage 10V
Frequency: 10 MHz (squarewave)
Level: Typical 2 dBm >0 dBm
Impedance: 50Ω

External Reference Input (PM 5193S only)

Maximum Voltage: ±5V
Waveform: Sine or square
Frequency: $\frac{10\ MHz}{N}$ N = 1,2,3 to 10 for Synchronization purposes <2s
Lock-In Range: ±0.1% – a relative frequency offset of the reference frequency, results in the same relative offset of the output frequency
Level: 0 to 20 dBm
Impedance: 50Ω

Note: It is not possible to phase lock with other 10 MHz instruments

General Specifications

Miscellaneous

Non-Volatile Memory: 1 memory location for last setting. 9 memory locations for programmable settings.
Rear Connectors: Modulation output BNC; Sweep output BNC; Pen-lift output BNC; Clock output BNC; Modulation Input BNC; Clock input BNC; GPIB/IEEE-488 bus connector; Mains connector

Operating Conditions

Reference Temperature: +23°C ±1°C
Operating Temperature: +5°C to +40°C
Storage Temperature: -20°C to +70°C

Power Requirements

Line Voltage: 100V, 120V, 220V, 240V, tolerance ±10%
Line Frequency: 50 Hz to 60 Hz, tolerance ±5%
Power Consumption: 105W

Mechanical Specifications

Size: 105 mm H x 440 mm W x 430 mm L (4.1 in H x 17.3 in W x 15.6 in L), rack mounting facility standard (2 units high)
Weight: 10.5 kg (23 lb)

Ordering Information

Models

U.S. Versions
PM 5193M Programmable Synthesizer/Function Generator
PM 5193SM Programmable Synthesizer/ Function Generator with 10 MHz Reference Input
PM 5193VM Programmable Synthesizer/ Function Generator with Video Modulation

European Versions
PM 5193 Programmable Synthesizer/Function Generator
PM 5193S Programmable Synthesizer/Function Generator with 10 MHz Reference Input
PM 5193V Programmable Synthesizer/ Function Generator with Video Modulation

Included with Instrument
One-year product warranty, line cord, rack mounting brackets, programming card, Operator's manual and Certificate of Calibration Practices.

Option
Rear Panel Output

Accessories (Also see Section 19)
PM 9051 BNC to 4 mm Banana Adapter
PM 9551 50Ω to 600Ω Adapter
PM 9581/01 50Ω Feedthrough Termination 3W
PM 9585/01 50Ω Feedthrough Termination 1W
PM 9613/01 Rack Slide Kit
PM 2255 Instrument Drivers Software
PM 2250/001* TestTeam Plus Software

**Available in European countries only*

Manuals
PM 5193 Operator*
PM 5193 Programming Card*
PM 5193 Service

**No charge with purchase of unit*

Customer Support Services

Also see Section 20.

Factory Warranty
One-year product warranty.

PM 5192 Specifications

Technical Specifications

Frequency Characteristics

Nominal Range: 0.1 mHz to 20 MHz
Operational Range:
Sine wave 20 MHz;
Square wave 20 MHz;
Triangle 200 kHz;
Positive sawtooth 20 kHz;
Negative sawtooth 20 kHz
Setting: Local via front-panel keyboard. Remote via GPIB/IEEE-488 bus interface +/- stepping function with programmable step width.
Resolution: 8 digits; >0.1 mHz
Display: 8-digit LED display, Hz/kHz indication
Setting Error: $<1 \times 10^{-6}$
Frequency Jitter: <0.01%, <500 Hz, f≥2 MHz, LF bandwidth 10 Hz to 20 kHz
Temperature Coefficient: <0.2 ppm/K
Aging: <1 ppm per year
Drift: <0.3 ppm in 7 hours
Synchronization: 2 (or more) PM 5192 generators can be synchronized by rear socket connection

Output Characteristics

Main Output
Connector: BNC socket on front or rear panel
Impedance: $Z_0 = 50\Omega$
Load Capability: Short circuit proof
Maximum External Voltage: ±12V p-p (<3 min)

AC Voltage

Independent of DC settings within ±10V window
Ranges: I 2.1 to 20V p-p open-circuit voltage;
II 0.21 to 2.00V open-circuit voltage;
III 0 to 0.200V open-circuit voltage
Resolutions: Range I 0.1V;
Range II 0.01V;
Range III 0.001V
DC Voltage
Independent of AC setting within ±10V window
Range: +/- 10V open-circuit voltage
Resolution: 0.1V
Error: ±2% of setting
Offset: <0.03V (Vac ≤2V); <0.08V (Vac >2V)
Setting: Remote or local; +/- stepping function. Programmable step width.

TTL Output

Connector: BNC socket on front panel
Fan-Out: 5 TTL inputs
Level: 0/>3.5V

Waveforms

Standard functions: Sine wave, square wave, triangle, sawtooth (positive- and negative-going ramps)
Selection: Local via front panel keyboard. Remote via GPIB/IEEE-488 bus interface.
Indication: Key LEDs

Sine Wave

Frequency Range: 0.1 mHz to 20 MHz
Output Range: 0 to 20V p-p

PM 5191, PM 5192 & PM 5193

Distortion

THD: typical 92%, <0.5% (f = 1 Hz to 200 kHz)
typical 0.4%, <0.7% (f = 200 kHz to 2 MHz)
Harmonics: <-37 dBc (f<10 MHz, Vp-<10 mV)
Spurious: <-40 dBc (2 MHz<f <20 MHz, open circuit voltage ≥ 100 mVp-p, distance from carrier >15 kHz); <-50 dBc (0.1 mHz < f <2 MHz, open circuit voltage ≥100 mVp-p, distance from carrier >15 kHz)

Square Wave

Frequency Range: 0.1 mHz to 20 MHz
Transition Times: 10 ns typical, <11.5 ns
Duty Cycle: 50%
Aberration: <2% ±20 mV range I; <2% ± 3 mV range II

Triangle

Frequency Range: 0.1 mHz to 200 kHz
Output Range: 0 to 20V p-p
Temperature Coefficient: <0.1%/K
Linearity: >99%

Sawtooth (pos/neg. ramps)
Frequency Range: 0.1 mHz to 20 kHz
Output Range: 0 to 10V p-p
Temperature Coefficient: <0.1%/K
Flyback Time: <1 µs
Linearity: >99%

Modulation

Modes: AM int/ext, FM int/ext, lin/log sweep, gate int/ext internal modulation frequency 1 kHz

Internal AM

Carrier Frequency: 0.1 mHz to 20 MHz
Modulation Frequency: 1 kHz
Modulation Depth: 0 to 100%
Resolution: 1%
AM Envelope Distortion: 1.5% (m <98%); 0.7% (m <50%)
Impedance of Modulation Source: ≤50Ω

Internal FM

Carrier Frequency: >2 MHz
Modulation Frequency: 1 kHz
Deviation: 10 kHz to 200 kHz
Resolution: 1 kHz
Modulation Distortion: <1% Df ≤100 kHz

External FM

Carrier Frequency: >2 MHz
Modulation Frequency: 10 Hz to 200 kHz
Deviation: 10 kHz to 200 kHz
Distortion: 1% impedance of modulation source: ≤50Ω

Sweep

Carrier Wave: All waveforms
Sweep Functions: lin/log, up/down, single/continuous, hold/release, triggered
Range: 1 mHz to 20 MHz phase-continuous, depending on waveform; independent setting of start and stop frequencies
Sweep Time: 10 ms to 999s
Resolution: Maximum 0.01s
Error: 0.1 ms, sweep time <4s

Internal Gate

Non-phase-coherent signal keying
Carrier Frequency: 0.1 mHz to 20 MHz (depending on waveform)
Modulation Frequency: 1 kHz
Duty Cycle: 50%

External Gate

Modulation Frequency: 0 to 500 kHz; minimum on/off time 2 µs

10 MHz Output (PM 5192S only)

Protection: Short-circuit proof, max. external voltage 10V
Frequency: 10 MHz (square wave)
Level: Typical 2 dBm >0 dBM
Impedance: 500Ω

External Reference Input (PM 5192S only)

Maximum Voltage: ±5V
Waveform: Sine or square
Frequency: $\frac{10\ \text{MHz}}{N}$ N = 1,2,3 to 10 for synchronization purposes

GPIB/IEEE-488 Bus Remote Control

Control Capability: All signal functions and characteristics
Interface Functions: AH1, L4, RL1, SR1, SH1, T6
Listener Address: Decimal programmable via keyboard, indicated by LED display
Address Range: 0 to 30
Service Request: Error and single sweep end message
Remote Lock-Out: Go-to local front panel key. Device Identification and learn modes provided as standard.

General Specifications

Miscellaneous

Non-Volatile Memory: 1 memory location for current setting, 9 memory locations for programmable setting
Rear Connectors: Modulation output BNC; **Sweep output BNC:** Pen-lift output BNC; Clock output BNC; Clock input BNC; IEEE-488 bus connector; Line connector

Operating Conditions

Reference Temperature: +23°C ± 1°C
Operating Temperature: +5°C to +40°C
Storage Temperature: -20°C to +70°C

Power Requirements

Line Voltage: 100V, 120V, 220V, 240V, tolerance ±10%
Line Frequency: 50 Hz to 60 Hz, tolerance ±5%
Power Consumption: 100W

Mechanical Specifications

Size: 105 mm H x 440 mm W x 430 mm L (4.1 in H x 17.3 in W x 16.9 in L), rack mounting facility standard (2 units high)
Weight: 10.5 kg (23 lb)

Ordering Information

Models

U.S. Versions
PM 5192M Programmable Synthesizer/Function Generator
PM 5192SM Programmable Synthesizer/Function Generator with 10 MHz Reference Input
European Versions
PM 5192 Programmable Synthesizer/Function Generator
PM 5192S Programmable Synthesizer/Function Generator with 10 MHz Reference Input

Included with Instrument
One-year product warranty, line cord, rack mounting brackets, programming card, Operator's manual and Certificate of Calibration Practices.

Option
Rear Panel Output

Accessories (Also see Section 19)
PM 9051 BNC to Banana Adapter
PM 9551 50Ω to 600Ω Adapter
PM 9581/01 50Ω Termination 3W
PM 9585/01 50Ω Termination 1W
PM 9613/01 Rack Slide Kit
PM 2250/001* TestTeam Plus Software
**Available in European countries only*

Manuals
PM 5192 Operating*
PM 5192 Programming Card*
PM 5192 Service
**No charge with purchase of unit*

Customer Support Services

Also see Section 20.
Factory Warranty
One-year product warranty.

PM 5191 Specifications

Technical Specifications

Frequency Characteristics

Nominal Range: 0.1 mHz to 2.147 MHz
Operational Range: Sine wave 2.147 MHz;
Square wave 2.147 MHz;
Triangle 200 kHz;
Positive sawtooth 20 kHz;
Negative sawtooth 20 kHz
Setting: Local via front-panel keyboard. Remote via IEEE bus interface +/- stepping function with programmable step width

PM 5191, PM 5192 & PM 5193

Resolution: 8 digits; <0.1 mHz
Display: 8-digit LED display, Hz/kHz indication
Setting Error: <1 x 10^{-6}
Temperature Coefficient: <0.2 ppm/K
Aging: <1 ppm per year
Drift: <0.3 ppm in 7 hours
Phase Jitter RMS: <3 mrad
Phase Noise: <-80 dBc/Hz (1 kHz from carrier)

Output Characteristics

Main Output
Connector: BNC socket on front or rear panel
Impedance: Z_0 = 50Ω
Load Capability: Short-circuit proof
Maximum External Voltage: ±15V p-p (<3 min)

AC Voltage
Independent of dc settings within ±15V window
Ranges: I 3.1 to 30V p-p;
II 0.31 to 3.00V;
III 0 to 0.300V
Resolutions Ranges: Range I 0.1V;
Range II 0.01V;
Range III 0.001V
Setting: Remote or local +/- stepping. Programmable step width.
Basic Setting Error: ±2.5% (1 Hz to 200 kHz) (0.31V to 3.00V)

DC Voltage
Independent of ac setting within ±15V window
Range: +/- 10V open circuit voltage
Resolution: 0.1V
Error: ±2% of setting ±40 mV
Setting: Remote or local; +/- stepping function. Programmable step width.

TTL Output
Connector: BNC socket on front panel
Fan-Out: 5 TTL inputs
Level: 0/5V

Waveforms

Standard Functions: Sine wave, square wave, triangle, sawtooth (positive- and negative-going ramps)
Selection: Local via front panel keyboard. Remote via IEEE bus interface.
Indication: Key LEDs

Sine Wave
Frequency Range: 0.1 mHz to 2.147 MHz
Output Range: 0 to 30V p-p

Distortion
THD: <0.35% (1 Hz< f <200 kHz, open circuit voltage >10 mV p-p)
Harmonics: <-35 dBc (200 kHz< f, open circuit voltage ≥10 mV p-p)
Spurious: <-40 dBc (0.1 mHz< f, open circuit voltage >31 mV p-p, distance from carrier >15 kHz)

Square Wave
Frequency Range: 0.1 mHz to 2.147 MHz
Transition Times: <35 ns
Duty Cycle: 50%
Output Range: 0 to 30 p-p
Abberration: <2% ±20 mV range I; <2% ±3 mV range II

Triangle
Frequency Range: 0.1 mHz to 200 kHz
Output Range: 0 to 30V p-p
Temperature Coefficient: <0.1%/K
Linearity: >99%

Sawtooth (pos/neg ramps)
Frequency Range: 0.1 mHz to 20 kHz
Output Range: 0 to 15V p-p
Temperature Coefficient: <0.1%/K
Flyback Time: <1 µs
Linearity: >99%

Modulation

Internal AM
Carrier Frequency: 0.1 mHz to 2 MHz
Modulation Frequency: 1 kHz
Modulation Depth: (30 ±2)%
Modulation Distortion: <0.6% (sine wave modulation)
Modulation Output: 0.3V eff ±3%

External AM
Modulation Frequency: 0 to 200 kHz
Modulation Distortion: <1.5% (depth <98%) <0.7% (depth <50%)

10 MHz Output (PM 5191S only)
Protection: Short-circuit proof, maximum external voltage 10V
Frequency: 10 MHz (square wave)
Level: Typical 2 dBm >0 dBm
Impedance: 50Ω

External Reference Input (PM 5191S only)
Maximum Voltage: ±5V
Waveform: Sine or square
Frequency: $\frac{10\ \text{MHz}}{N}$
Lock-In Time: <2s
Lock-In Range: ±0.1% – a relative frequency offset of the reference frequency, results in the same relative offset of the output frequency
Level: 0 to 20 dBm
Impedance: 50Ω

IEEE-488 Bus Remote Control

Control Capability: All signal functions and characteristics
Interface Functions: AH1, L4, RL1, SR1, SH1, T6
Listener Address: Decimal programmable via keyboard, indicated by LED display
Address Range: 0 to 30
Service Request: Error message
Remote Lock-Out: Go-to local front panel key. Device Identification and learn modes provided as standard.

General Specifications

Miscellaneous

Non-Volatile Memory: 1 memory location for current setting
Rear Connectors: Modulation output BNC; Clock output BNC; Modulation input BNC; Clock input BNC; IEEE bus connector; Mains connector

Operating Conditions

Reference Temperature: 23°C ±1°C
Operating Temperature: 5°C to 40°C
Storage Temperature: -20°C to +70°C

Power Requirements

Line Voltage: 100V, 120V, 220V, 240V, tolerance ±10%
Line Frequency: 50 Hz to 60 Hz, tolerance ±5%
Power Consumption: 100W

Mechanical Specifications

Size: 105 mm H x 440 mm W x 430 mm L (4.1 in H x 17.3 in W x 16.9 in L), rack mounting facility standard (2 units high)
Weight: 10 kg (22 lb)

Ordering Information

Models

U.S. Versions
PM 5191M Programmable Synthesizer/Function Generator
PM 5191SM Programmable Synthesizer/Function Generator with 10 MHz Reference Input

European Versions
PM 5191 Programmable Synthesizer/Function Generator
PM 5191S Programmable Synthesizer/Function Generator with 10 MHz Reference Input

Included with Instrument
One-year product warranty, line cord, rack mounting brackets, programming card, Operator's manual and Certificate of Calibration Practices.

Option
Rear Panel Output

Accessories (Also see Section 19)
PM 9051 BNC to 4 mm Banana Adapter
PM 9551 50Ω to 600Ω Adapter
PM 9581/01 50Ω Feedthrough Termination 3W
PM 9585/01 50Ω Feedthrough Termination 1W
PM 9613/01 Rack Slide Kit
PM 2255 Instrument Drivers Software
PM 2250/001* TestTeam Plus Software
**Available in European countries only*

Manuals
PM 5191 Operator*
PM 5191 Programming Card
PM 5191 Service
**No charge with purchase of unit*

Customer Support Services

Also see Section 20.

Factory Warranty
One-year product warranty.