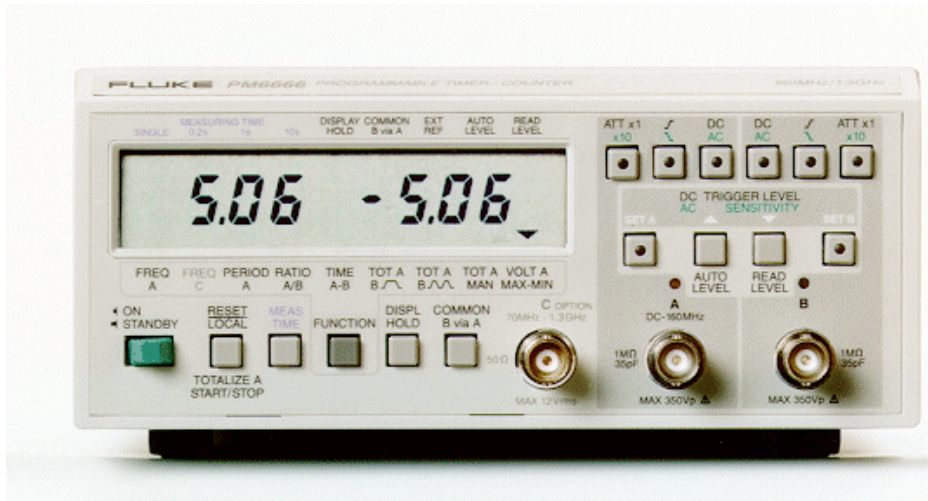
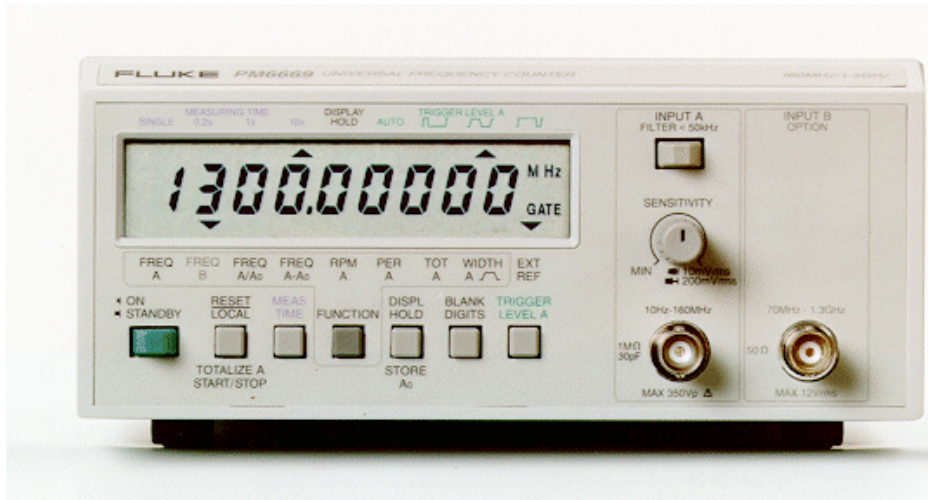


PM 6666 Programmable Timer / Counter

Technical Data



PM 6669 Frequency Counter



- Unrivalled price/performance
- 160 MHz / 1.3 GHz option
- Reciprocal counting, 7 digits per second
- High stability MTCXO: 2×10^{-7} over 0°C to 50°C with push-button calibration
- Error-free triggering-, high noise immunity input circuitry
- PM 6666: Full GPIB/IEEE 488 programmability, Auto trigger, Voltage measurements
- PM 6669 Ease of operation, auto triggering, auto range and auto display
- Rugged, no compromise quality, MTBF 50.000h & 70.000h
- Excellent suppression of RF interference through all-metal cabinet
- Optional battery for field use

The PM6666 and PM6669 are economical, easy-to-use counters that meet the demands for high-precision measurements, reliability and durability. The units use reciprocal frequency counting, which yields high resolution measuring results under all conditions, even on low frequency measurements. The high performance counter front-ends, providing variable sensitivity and noise immunity increase measuring accuracy. Accuracy can be further improved with the optional high stability MTCXO TimeBase, that offers a stability of 2×10^{-7} (0°C to 50°C), comparable to that of an oven stabilized oscillator. The counters have high input protection, allowing it to withstand inputs of 12V rms on the optional 50 Ω RF input and 350V (dc+ac peak) on the 1 M Ω LF input.

PM 6669 Frequency Counter

The multi-function PM 6669 offers next to frequency measurements also period, count totalization, ratios, pulsewidth and frequency difference measurements, functions normally found only in more expensive timer / counters. This counter can be used on the test bench or for field service. It has a full 9-digit display, to allow complete presentation of measuring results. When less accurate measurements are made, blanking of irrelevant display digits makes it easy to read results.

PM 6666 Programmable Timer/Counter

The PM 6666 is a low cost timer/counter with high accuracy frequency, time and voltage measurements that also offers 100% programmability including trigger level and sensitivity settings. A bus learn mode is provided to speed and simplify programming. The PM 6666 is also a bench-top use; with 9 front panel selectable measuring functions including voltage max. /min. measurements.

Error-Free Triggering

Triggering is error-free on the PM 6666 for all waveforms.

Trigger level setting can be automatic on all input signals over 100 Hz. Resolution is 20/200 mV, over a very wide range (-50V to +50V) that allows measurements to be accurate even on high voltage events. The trigger level can be displayed immediately with one keystroke; and inputs can be instantly checked for triggering with the Tri-state LED trigger indicators. To give the various noise immunity settings, input sensitivity has six steps, from 20 mV to 1V rms.

V pp measurements up to 50 MHz

The PM 6666 has Volt peak measurements up to 50 MHz. When displaying Vmax. / min. measurements, positive and negative signal peaks of the input signal are shown simultaneously with a resolution of 20 or 200 mV.

High Resolution

The PM 6666 can measure low frequency signals to high resolution with synchronized multiple period measurements and computing the reciprocal values. Resolution is at least 7 digits on a 1s measuring time, because the traditional ± 1 input cycle error is eliminated. Time interval measurements are high resolution

Selection Table	PM 6666 timer/counter	PM 6669 frequency counter
Freq. A	0.1 Hz to 160 MHz	10 Hz to 160 MHz
Freq. B via GPIB	0.1 Hz to 16 MHz	
RF Freq. option	70 MHz to 1.3 GHz (Chan. C)	70 MHz to 1.3 GHz (Chan B)
Measuring Modes	Freq. A, B, C (RF)	Freq. A, B (RF)
	Time Interval A-B, Period A Ratio A/B, Ratio B/A, C/A, C/B (GPIB) Totalize A Volt max. /min. A	Pulse width A, Period A, RPM A Freq. A/AO, Freq. A-AO Totalize A
Resolution	7 digits/s (frequency) 100 ns (time interval single, period), ≥ 30 ps time interval averaged	7 digits/s (frequency)
Measuring times	0.2, 1, 10s and SINGLE	0.2, 1, 10s and SINGLE
Sensitivity LF, RF	20, 10 mV	10, 10 mV
Sensitivity setting, range	6 steps, x1 ... x50	x1 to x400, cont. variable
Trigger level	AUTO, Manual, GPIB	AUTO, Manually set (+, 0, -)
Input attenuation	x1 x10 AUTO	
GPIB interface	Full programmable	All front panel settings
External Reference input	10 MHz	10 MHz
Noise suppression filter	-	50 kHz low pass
Other facilities	-	Display hold, Reset, Digit blanking
Options	MTCXO time base, 1.3 GHz RF input, GPIB interface, Rack mount, Battery pack, Carrying case	

as well as high accuracy, due to the time interval averaging technique. The 100 ns resolution is improved by a factor $\sqrt{N}$ (N = number of time intervals averaged) when compared with single time interval measurements.

MTCXO Time Base

(Mathematically Temperature Compensated Crystal Oscillator) Counter stability and precision is ultimately determined by the time-base oscillator. This can be further improved with the optional high stability MTCXO time-base that offers a stability, comparable to that of an oven stabilized oscillator, but at much lower cost. The temperature dependency curve for each individual crystal oscillator is factory-measured, and the frequency deviations (Δf) across the temperature range are stored in a non-volatile memory. During operation, the Δf value for the operating temperature is referenced in memory and used to compensate the measuring result before it is displayed. This automatic temperature compensation also results in highly accurate measurements instantly, without long warm-up times. The unique MTCXO principle gives a residual temperature stability of 2×10^{-7} over the temperature range 0°C to 50°C .

Specifications PM6666

Measuring Modes

Freq. A, Freq. B, Freq. C, Period A, Ratio A/B, (Ratio B/A & C/A & C/B via GPIB), Totalize A, Time Interval A-B, Volt Max./Min. A.

Frequency A or C

(Frequency B via GPIB only)
Freq. A: 0.1 Hz to 160 MHz (120 MHz to 160 MHz with limited temperature range; typ. $+23^\circ\text{C} \pm 5^\circ\text{C}$)
Freq. B: 0.1 Hz to 16 MHz (only via GPIB)
Freq. C: 70 MHz to 1.3 GHz (option)

Mode: Reciprocal freq. counting.

LSD displayed:

$2.5 \times 10^{-7} \times \text{FREQ} / \text{Measuring time}$

Period A

Range: 8 ns to 2×10^6 s

Mode: Single period measurement (SINGLE) or period average measurement (at 0.2, 1 or 10 s measuring-times).

LSD displayed:

SINGLE period measurement:

- (TIME < 100 s): 100 ns
- (TIME > 100 s): $5 \times \text{PERIOD} / 10^9$ s

Period average measurement:

- $2.5 \times 10^{-7} \times \text{PERIOD} / \text{meas. time}$

Ratio A/B

(Ratio B/A, C/A or C/B via GPIB only)

Range:

0 and 1×10^{-7} to 2×10^9 (A/B)
 0 and 1×10^{-8} to 2×10^8 (B/A)
 0 to 1×10^{15} (A/B SINGLE and B/A SINGLE), 8 to 6×10^{10} (C/B) (C/A)

Frequency range:

Input A: 0.1 Hz to 160 MHz (A/B) (120 MHz to 160 MHz with limited temperature range; typ. $+23^\circ\text{C} \pm 5^\circ\text{C}$)
 0 Hz to 16 MHz (B/A, C/A, A/B SINGLE)

Input B: 0 Hz to 16 MHz

Input C: 70 MHz to 1.3 GHz (option PM 9608B)

LSD displayed (Ratio A/B):

$25 / \text{meas. time} \times \text{FREQ B}$ (0.2, 1 or 10 s Measuring times)

LSD displayed (Ratio B/A):

$2.5 / \text{meas. time} \times \text{FREQ A}$ (0.2, 1 or 10 s Measuring times)

LSD displayed

(A/B SINGLE, B/A SINGLE):

(RATIO < 10^9): 1
 (RATIO > 10^9): $5 \times \text{RATIO} / 10^9$

LSD displayed (Ratio C/A or C/B):

$640 / \text{meas. time} \times \text{FREQ A or B}$

Time interval A-B

(Time interval B-A via GPIB only)

Range:

100 ns to 2×10^8 s (SINGLE)

0 ns to 20 s (average)

Mode: Single time interval (SINGLE) for time interval average measurements (at 0.2, 1 or 10 s measuring-times).

LSD displayed:

SINGLE Time interval measurement:

(TIME < 100 s): 100 ns

(TIME > 100 s): $5 \times \text{TIME} / 10^9$ s

Time interval average measurement:

$2.5 \times 10^{-7} \times N$

Number of Intervals averaged N:

Measuring time / pulse repetition rate.

Min dead time from stop to start:

250 ns

Timing difference A-B channels:

4 ns max.

Note: Input signals must be repetitive and asynchronous with respect to the time base.

Totalize A

(Totalize B via GPIB only)

Range:

0 to 1×10^{15} with indication of k or M (kilo-pulses or Mega-pulses) the result is truncated if out of display range.

Frequency range: 0 Hz to 16 MHz

Pulse pair resolution: 80 ns

LSD displayed:

1 unit count (counts < 10^9)

$5 \times \text{counts} / 10^9$

(counts > 10^9)

Gated by B (A) mode: Event counting on input A (B) during the duration of a pulse on input B (A).

Start/stop by B (A) mode: Event counting on input A (B) between two consecutive pulses on input B (A).

Manual mode: Event counting is controlled by the START/STOP button. Sequential start-stop counts are accumulated. RESET closes the gate and resets the Timer/Counter to zero.

Volt Max/Min A

(Volt Max/Min B via GPIB only)

Range: -51 V to +51 V

Frequency range:

DC and 100 Hz to 50 MHz

(Input A)

DC and 100 Hz to 5 MHz (Input B)

Resolution:

Input signals within ± 5 V:

20 mV

Input signals outside ± 5 V:

200 mV

Inaccuracy DC and 100 Hz to 16 MHz(A) or to 1 MHz(B):

Input signals within ± 5 V: 30 mV ± 1 % of reading ± 3 %

of Vpp

Input signals outside ± 5 V:

300 mV ± 3 % of reading

± 3 % of Vpp

Inaccuracy 16 MHz to 50

MHz(A) or 1 MHz to 5 MHz(B):

Input signals within ± 5 V: 30 mV

± 10 % of reading ± 10 % of Vpp

Input signals outside ± 5 V:

300 mV ± 10 % of reading

± 10 % of Vpp

Definitions PM6666

LSD displayed

LSD = Unit value of the least significant digit displayed. All calculated LSD's (see section Measuring functions) should be rounded to the nearest decade (e.g. 0.3 Hz is rounded to 0.1 Hz and 5 Hz to 10 Hz) and cannot exceed the 9th digit.

Resolution

Resolution = smallest increment between two measuring results on the display, due to the 1 count error.

Freq. A, C, Period A and Ratio A/B:

Resolution can be 1 LSD unit or 2 LSD units if:

- LSD x Measuring time / FREQ or PERIOD $< 10^{-7}$ the resolution is 2 LSD units

(30 % probability).

- Otherwise resolution is 1 LSD unit (70 % probability).

Ratio A/B:

Resolution can be 1 LSD unit or 2 LSD units if:

- LSD x Measuring time / RATIO < 10 / FREQ A the resolution is 2 LSD units (30 % probability).

- Otherwise resolution is 1 LSD unit (70 % probability).

SINGLE Period A and SINGLE

Ratio A/B:

Resolution equals 1 LSD unit.

Time A-B: Resolution

(95 % confidence level) equals 1 LSD unit or 100 ns/N, whichever is greatest.

Inaccuracy

Inaccuracy, i.e. the relative error, depends on the following factors: $\pm$ Resolution / FREQ, PERIOD, RATIO, or TIME

$\pm$ relative trigger error

$\pm$ relative time base error

$\pm$ relative systematic error

Relative trigger error:

Freq. A, Period A:

$\pm$ noise voltage A [Vpp] / signal

slope A [V/s] x meas. time

Ratio A/B:

$\pm$ noise voltage B [Vpp] / signal

slope B [V/s] x meas. time

Totalize A, gated or start stop by B:

$\pm$ noise voltage B [Vpp] / signal

slope B [V/s] x gate

time B

Time A-B:

$\pm$ noise voltage A [Vpp] / signal

slope A [V/s] x TIME x Sqrt N

$\pm$ noise voltage A [Vpp] / signal

slope A [V/s] x meas. time

Relative time base error:

$\pm$ deviation from 10 MHz /

10 MHz

Relative Time A-B systematic error:

Inaccuracy caused by timing difference between A and B channels $< \pm 4$ ns / TIME.

Input specification PM6666

Input A and Input B

Frequency range:

DC Coupled: DC to 160 MHz*

AC Coupled: 20 Hz to 160 MHz*

*(120 MHz to 160 MHz with limited temperature range; typ. $+23^\circ\text{C} \pm 5^\circ\text{C}$)

Sensitivity, DC coupled

Sine:

20 mV rms, 0 Hz to 30 MHz

40 mV rms, 30 MHz to

120 MHz

60 mV rms typ. 120 MHz to 160 MHz

Pulse:

60 mV pp, 0 Hz to 30 MHz

110 pp, 30 MHz to 120 MHz

Sensitivity AC coupled

20 mV rms, 0 Hz to 30 MHz

40 mV rms, 30 MHz to

120 MHz

Sensitivity is selectable in 6 steps;

20 mV, 50 mV, 100 mV, 200 mV,

500 mV and 1 V rms (sine);

nominal. Sensitivity decreases to 60 mV rms typical at 160 MHz (at room temp.)

Coupling: AC or DC coupled, switch selectable.

Impedance: 1 M Ω //35 pF, independent of "COM B via A" switch setting.

Attenuation: x1 or x10, switch selectable or AUTO.

Channel input: Separate A and B. or A and B common via input-A.

Maximum voltage: 350 V (DC+AC Peak) between 0 and 440 Hz, falling to 8 V rms at 1 MHz.

Triggering

Trigger level range

DC coupled: $+51$ V to -51 V, adjustable via up/down control.

AC Coupled: 0 V fixed or AUTO level.

Trigger level resolution:

signals within ± 5 V: 20 mV

signals outside ± 5 V: 200 mV

Trigger level setting accuracy:

± 10 mV 1 % of setting

AUTO trigger level: Trigger level on input A (and B when required) is automatically set to 50 % of input signal amplitude. Frequency range: 100 Hz to 160 MHz

(120 MHz to 160 MHz with limited temperature range; typ. $+23^\circ\text{C} \pm 5^\circ\text{C}$)

Trigger indicators: Tri state

LED-indicators;

On: Signal above set trigger level.

Off: Signal below set trigger level.

Blinking: Triggering occurs.

Trigger slopes: Positive or negative.

Auxiliary functions PM6666

Power on/off:

Switches counter power on/off. At power up a self test is performed

and the counter is set to default settings.

Default settings

Function: FREQ A
Measuring time: 0.2 s
Coupling Input A: AC
Coupling input B: DC
AUTO trigger level: On
Trigger Slope A & B: Positive

Reset:

The RESET-button has three functions:

RESET: Starts a new measurement. The settings are not changed.

LOCAL: Makes the counter go to LOCAL operation, when in remote operation (unless Local Lock-Out is programmed).

START/STOP: Opens/closes the gate in TOTALIZE A or B manual mode.

Measuring-time

A Measuring-time of 0.2 s, 1 s, 10 s or SINGLE can be selected. (When SINGLE is selected together with PERIOD, RATIO or TIME, the result is a single cycle measurement, but SINGLE together with FREQUENCY results in a fixed 3 ms measuring-time.

Measuring rate:

Approx. 5 measurements/s.
Approx. 2 measurements/s when AUTO trigger level is switched on.

Display time:

Normally the display time equals the set Measuring-time. When SINGLE is selected, a display time of 0.1 seconds is used.

Display hold:

The result of the current measurement will be frozen on the display. A new measurement starts when RESET button is pressed.

SPECIFICATIONS PM6669

Measuring Modes

Freq. A, Freq. B, Period A, RPM A, Totalize A. Freq. A/Ao, Freq. A-Ao, Pulse Width A.

Frequency A or B (optional)

Frequency Range:

Freq. A: 0.1 Hz...160 MHz
Freq. B: 70 MHz...1.3 GHz (option PM 9608B)

Mode: Reciprocal frequency counting.

LSD displayed: $2.5 \times 10^{-7} \times \text{FREQ} / \text{Measuring-time}$

Frequency A/Ao

A Frequency-A measurement is performed. The measured frequency is divided by the constant Ao before display. The resolution of the displayed ratio is determined by the FREQ A measurement. At power-on Ao is set to 1 (default).

Frequency A-Ao

A Frequency-A measurement is performed. The value of constant Ao is subtracted from the measured frequency before display. The resolution of the displayed difference is determined by the FREQ A measurement. At power-on Ao is set to 0 (default).

RPM A

A Frequency - A measurement is done. The measured frequency is multiplied with 60, and shown on the display as revolutions per minute (RPM).

Range: 6 RPM...720 $\times 10^6$ RPM

Period A

Range: 8 ns...2 $\times 10^6$ s

Mode: Single period measurement (SINGLE) or period average measurement (at 0.2, 1 or 10 s measuring-times).

LSD displayed:

- SINGLE period measurement:
(TIME < 100 s): 100 ns
(TIME > 100 s): $5 \times \text{PERIOD} / 10^6$ s
- Period Average measurement:
 $2.5 \times 10^{-7} \times \text{PERIOD} / \text{Measuring time}$

Totalize A

Event counting is controlled by the START/STOP button. Sequential start-stop counts are accumulated. RESET closes the gate and resets the Frequency Counter to zero.

Range: 0... 1 $\times 10^{15}$ with

indication of k or M (kilo-pulses or Mega-pulses). The result is truncated if out of display range.

Frequency range:

Sine-wave: 10 Hz...16 MHz
Pulse: 0 Hz...16 MHz
Pulse pair resolution: 80 ns

LSD displayed:

1 unit count (counts < 10^6)
5 $\times$ counts/109 (counts $\geq 10^6$)

Width A

A positive Pulse Width measurement is performed. Measuring time selection is not valid (always SINGLE measurements).

Range: 100ns...2 $\times 10^6$ s

LSD displayed:

(TIME < 100s): 100ns
(TIME $\geq$ 100s): $5 \times \text{WIDTH} / 10^6$ s
(Triggering on 50% of amplitude will occur only if the duty factor of the signal is 0.5)

Definitions PM6669

LSD displayed

LSD = Unit value of the least significant digit displayed. All calculated LSD's (see section Measuring functions) should be rounded to the nearest decade (e.g. 0.3 Hz is rounded to 0.1 Hz and 5 Hz to 10 Hz) and cannot exceed the 9th digit.

Resolution

Resolution = smallest increment between two measuring results on the display, due to the 1 count error.

Freq. A, B, Period:

Resolution can be 1 LSD unit or 2 LSD units if:

- $\text{LSD} \times \text{Measuring time} / \text{FREQ or PERIOD} < 10^{-7}$
the resolution is 2 LSD units (30% probability).
- Otherwise resolution is 1 LSD unit (70% probability).

SINGLE Period A and

Width A:

Resolution equals 1 LSD unit.

Inaccuracy

Inaccuracy, i.e. the relative error, depends on the following factors:
 $\pm \text{Resolution} / \text{FREQ, PERIOD or}$

WIDTH

± relative trigger error
± relative time base error
Relative trigger error
Freq. A, Period A:
± noise voltage A (Vpp) / signal
slope A (V/s) x meas. time
Relative time base error:
± deviation from 10 MHz / 10 MHz

Input specification PM6669

Input-A

Frequency range:

10 Hz...160 MHz (120 MHz to
160 MHz with limited temperature
range; typ.
+23 °C ± 5 °C)

Sensitivity,

Sine: 10 mVrms, 10 Hz to
120 MHz
30 mV rms typically, 120 to
160 MHz at room temperature
Pulse: 30 mV rms,
0.1 Hz...120 MHz

Coupling: AC

Impedance: 1 MΩ // 30 pF

Attenuation: Continuously
variable in two ranges between
x1 and x400

Filter: Switchable 50 kHz low
pass noise filter with a
suppression of 20 dB at
200 kHz.

Maximum voltage: 350 V (DC +
AC peak) between 0 and 440 Hz,
falling to 11 Vrms at 1 MHz.

Triggering

Trigger levels:

- 3 different levels for triggering on
signals with various duty factors,
and AUTO.
- Symmetrical input signals,
should be selected for input
signals with a duty factor of
0.25...0.75.
 - Positive pulses, for input signals
with duty factor <0.25.
 - Negative pulses, for input signals
with duty factor >0.75.

AUTO trigger level:

The counter will make test
settings and automatically select
the best trig level setting. AUTO
requires repetitive signals with a
repetition rate > 100 Hz. AUTO is
not active in TOTALIZE-A
measurements.

Trigger slopes (via GPIB only):

Positive or negative.

Auxiliary functions PM6669

Power on/off:

Switches counter power on/off. At
power up a self-test is made and
the counter is set to default
settings.

Default settings

Function: FREQ A
Measuring time: 0.2 s
Trigger level Offset: AUTO

Reset:

The RESET-button has three
functions:

RESET Starts a new
measurement. The settings are not
changed.

LOCAL Makes the counter go to
LOCAL operation, when in remote
operation (unless Local Lock-Out is
programmed).

START/STOP, Opens/closes the
gate in TOTALIZE A.

Measuring-time

A Measuring-time of 0.2 s, 1 s,
10 s or SINGLE can be selected.
(When SINGLE is selected
together with PERIOD or WIDTH,
the result is a single cycle
measurement, but SINGLE
together with FREQUENCY or RPM
results in a fixed 3 ms Measuring-
time.)

Measuring rate:

Approx. 5 measurements/s.

Display time:

Normally the display time equals
the set Measuring-time. When
SINGLE is selected, a display time
of 0.1 seconds is used.

Displ. Hold/Store Ao:

The DISPL HOLD/STORE AO
button has two functions

DISPL HOLD: The current
measurement result is frozen on
the display. A new measurement
starts when RESET button is
pressed.

STORE AO: This function is active
in FREQ A measurements only.
When the button is pressed for >

1 s, the result on the display is
stored as the constant AO, which
is used for the calculation of
Frequency difference (A-AO) and
ratio (A/AO).

Blank digits

This function blanks any number
of least significant digits on the
display, in order to hide unstable
digits on the display.

General Specification PM6666 & PM6669

RF Input 1.3 GHz

(Option PM 9608B)

PM6666 Input C

PM6669 Input B

Freq. range: 70 MHz to
1.3 GHz

Coupling: AC

Operating input voltage range:

10 mV rms to 12 V rms,
70 MHz to 900 MHz

15 mV rms to 12 V rms, 0.9 to 1.1
GHz

40 mV rms to 12 V rms,
1.1 to 1.3 GHz

AM tolerance: 98 %, minimum
signal must exceed minimum
operating input voltage
requirement

Impedance: 50Ω nominal, VSWR
<2:1

**Maximum voltage without
damage:**

12 V rms, overload protection with
PIN diodes.

External reference input D

The input automatically detects
when a suitable external
reference signal is connected. The
use of an external reference signal
is indicated on the display.

Input frequency: 10 MHz ±
0.1 MHz

Coupling: AC

Sensitivity: 500 mV rms

Input impedance:
approx. 300 Ω at 10 MHz

Max input voltage: 15 V rms

Power requirements

Line voltage:

115 or 230 V rms ±15 %; 46 to
440 Hz, (<24 VA incl. all options).

Safety:

According to CE publication
73/23 EN10101, CAT II, Pollution
Degree 2;
CSA 22.2 No.231.

Line interference: According to
CE regulation 89/336: Emission
according to EN 50081-1,
EN 55011. Immunity according to
EN 50082-1, inclusive
IEC 801-2,-3,-4

Battery unit: See PM 9605
option.

Dimensions and weight

Dimensions: Width: 186 mm
Height: 88 mm Depth:
270 mm

Weight:

PM 6666 Net: 2.4 kg, Shipping:
3.2 kg

PM 6669 Net: 2.1 kg, Shipping:
3.0 kg

Cabinet:

The counter is housed in a metal
cabinet, to minimize
electromagnetic interference and
achieve good mechanical stability

Environmental conditions**Temperature:**

Operating: 0 °C to +50 °C

Storing: -40 °C to +70 °C

Altitude:

Operating: 5000 m

(53.3 kN/m²)

Storing: 15000 m (15.2 kN/m²)

Humidity:

Operating: 10 % to 90 % RH, no
condensation

Storing: 5 % to 95 % RH

Display

Read out: 9 digit LCD display with
unit indication.

Unit indication: MHz, kHz, Hz, mHz,
ks, s, ms, s, ns, M, k, m, m and n.

GATE indicator: Indicates that the
counter is busy measuring.

REMOTE indicator: indicates
when control over the counter is
taken over by an installed GPIB
interface PM 9604.

Cursor: Indicates selected
measuring function, selected
Measuring-time, input triggering,
display hold and whether an
external reference frequency is in
use.

TimeBase Crystal Oscillators**Standard Crystal Oscillator**

(order no PM 666-/-1-)

Uncertainty due to:

**Calibration adjustment
tolerance,** at +23°C ± 3°C
< 1 x 10⁻⁶

Aging

- per 24 hr. N/A.
- per month: < 5 x 10⁻⁷ (5 Hz)
- per year: < 5 x 10⁻⁶ (50 Hz)

Temperature variation :

- 0 to 50°C: < 1 x 10⁻⁵
(100 Hz)
- 20 °C – 26 °C < 3 x 10⁻⁶
(typical value)

Power voltage variation

10 %: < 1 x 10⁻⁸ (0.1 Hz),

Power-on stability:

- Deviation versus final value after
24hr on time, N/A.
- after a warm-up time of:
30 min

Total uncertainty, for operating
temperature 0°C to 50 °C, at 2σ
(95 %) confidence interval:

- 1 year after calibration
< 1.2 x 10⁻⁵
- 2 year after calibration
< 1.5x10⁻⁵

Typical total uncertainty, for
operating temperature 20°C to
26°C, at 2σ (95 %) confidence
interval:

- 1 year after calibration
< 7x10⁻⁶
- 2 years after calibration
< 1.2 x 10⁻⁵

MTCXO :

**Mathematically Temperature
Compensated Crystal Oscillator**
(order no PM 666x/_3_)

Uncertainty due to:

**Calibration adjustment
tolerance,** at +23°C ± 3°C
< 1 x 10⁻⁷

Aging

- per 24 hr. N/A.
- per month: < 1 x 10⁻⁷ (5 Hz)
- per year: < 5 x 10⁻⁷ (50 Hz)

Temperature variation :

- 0 to 50°C: < 2 x 10⁻⁷
(100 Hz)
- 20 °C – 26 °C < 5 x 10⁻⁸ (typical
value)

Power voltage variation 10 %:
< 1 x 10⁻⁹ (0.1 Hz),

Power-on stability:

- Deviation versus final value after
24hr on time, N/A.

- after a warm-up time of: 30 min
Total uncertainty, for operating
temperature 0°C to 50 °C, at 2s
(95 %) confidence interval:

- 1 year after calibration
< 6 x 10⁻⁷
- 2 year after calibration
< 1 x 10⁻⁶

Typical total uncertainty, for
operating temperature 20°C to
26°C, at 2s (95 %) confidence
interval:

- 1 year after calibration
< 6 x 10⁻⁷
- 2 years after calibration
< 1 x 10⁻⁶

The MTCXO can be ordered
separately for later upgrading of
the counter (option PM 9607).

MTCXO working principle:

(Mathematically Temperature
Compensated Crystal Oscillator)
The temperature of the crystal is
measured. The built in
microprocessor calculates the
frequency deviation for that
particular temperature from a
stored table. The measuring result
is mathematically corrected for the
time-base frequency temperature
error, before being displayed. The
correction is switched off when
SINGLE is selected to increase the
number of measurements/second.
This may introduce an additional
time base error of < 1 x 10⁻⁵.

Explanation:**Calibration Adjustment****Tolerance:**

Is the maximal tolerated deviation
from the true 10MHz frequency
after a calibration. When the
reference frequency does not
exceed the tolerance limits at the
moment of calibration, an
adjustment is not needed.

Total uncertainty:

Is the total possible deviation from
the true 10MHz value under
influence from frequency drift due
to aging and ambient temperature
variations versus the reference
temperature. The operating

temperature range and the calibration interval are part of this specification.

GPIO Interface

Option PM 9604

Mounting: Inside counter cabinet.

Interface functions: SH1, AH1, T5, L4, SRI, RL1, DC1, DT1, E2

Address setting:

Switch selectable at rear panel between 0 and 30. Factory Preset at 10.

Programmable device Functions for:

PM 6666 Full GPIB programmability, Auto trigger, Voltage Measurements.

PM 6669 All front panel settings except Power On/Standby, Sensitivity and Filter On/Off; plus trigger Slope (Pos/Neg)

Max Data Output Rate

Normal Mode: Approx. 5 readings/s

High-Speed Dump: Approx. 100 readings/s.

The highest output rate is obtained for **PM6666** at SINGLE measuring time. The content of the counting registers are transferred to the controller, without being processed by the counter. The processing must be done in the controller instead.

Output Time for measuring Data

Normal Mode:

Approx. 10 ms (21 bytes)

High-Speed Mode:

Approx. 4 ms (15 bytes)

Response time for Addressing:

Approx. 5 μ s

Response Time for Trigger

Command (GET):

Approx. 10 ms

Typical Read Time for

Programming Data:

Approx. 1 ms/byte

Battery unit PM 9605

The PM 9605 is a rechargeable battery unit for mounting inside the counter. The unit contains a standard 6 V sealed lead-acid battery and an automatic battery charger.

Battery capacity (20 °C):

Approx. 15 Wh

Operating time when battery powered for:

PM 6666 2 hours of cont. operation.

PM 6669 3 hours of cont. operation.

Recharging time: 7 hours to approx. 75 % of full capacity.

Battery protection: Overcharge protection and auto-shut-off total discharge protection.

Temperature:

Operating: 0 ... + 40 °C

Storage: -40 ... + 50 °C

Weight: 0.8 kg

Carrying Case PM9609

The PM9609 is a leather like carrying case, for protection of the counter during transportation

Ordering Information

Basic Models

PM 6666/011 Timer/Counter

PM 6669/011 Frequency Counter

Included with Instrument

One-year product warranty, line cord, operator manual, and Certificate of Calibration Practices.

Optional Configurations

When ordering, select basic "PM" Model desired from above, plus construct a 3-digit/suffix by selecting 1-digit in each suffix column to identify Input Frequency, Reference Oscillator, and Interface.

RF Input Frequency Option

/0- - Standard 160 MHz

/4- - 1.3 GHz (PM 9608/201)

Reference Oscillator Option

/-1 - Standard

/-3 - MTCXO (PM 9607/00)

Interface Option

/- -1 Standard line voltage, non GPIB/IEEE-488

/- -3 Battery (PM 9605/00)

/- -6 GPIB/IEEE-488 (PM 9604/00)

Options & Accessories

PM 9581/011 50 Ω Termination, 3W

PM 9585/011 50 Ω Termination, 1W

PM 9604/001 * GPIB Interface

PM 9605/001 * Battery Unit

PM 9606/021 Rack kit for PM 666x and 8840A/42A

PM 9606/011 Rack Kit for PM 666x

PM 9607/001 MTCXO Time Base

PM 9608/201 1.3 GHz RF-Input

PM 9609/001 Carrying Case

All options can be field installed by the user.

* Note: Options PM 9604 and PM 9605 cannot be installed together in a PM 666x Counter.

Manuals

PM 6666 Operator**

PM 6669 Operator**

PM 6669 Service

PM 6666 Service

**No charge with purchase of unit

Factory Warranty

One-year product warranty.

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