

125MHz Universal Counter/Timer

MODEL 6010

- 2 x 125 MHz independent input channels
- Optional Frequency Measurement to 1.3 GHz
- Standard TCXO stability Oscillator
- Optional high-stability Oscillator
- Bright 9 digits display; visible at any lighting condition
- Resolves frequency resolution to 8 digits in one second of gate time (with option 1)
- 10ps averaged time interval resolution (with option 1)
- 10 storable front panel set-ups



- Complete input conditioning on both channels, with internal 50Ω, attenuators, low-pass filters, and slope selection
- 13 automatic measurements, including peak signal amplitude
- 50 built-in gate time intervals plus an external input, extend gate time range from 100µS to 1000s
- Standard GPIB interface

Tabor's Model 6010 is a high performance, 2-channel, 125MHz Universal Counter/Timer for applications from R&D benchtop to Automatic Test Equipment. The module offers nine automatic measurement functions and has an optional 1.3GHz third input available for RF requirements. Model 6010 offers outstanding frequency range and high resolution along with numerous special features and capabilities built-in to this optimal Counter/Timer. In short, there is simply no comparable instrument on the market for such a cost-effective price.

Extremely user-friendly operation

Design approach emphasizes simplicity of operation. Numerous functions, parameters and operating modes resolved to simple, logical blocks and one keystroke operation. In fact, operation is so easy that first time users rarely require an Instruction Manual. A.T.E. Environment Unusually flexible software package. With simple commands one can adapt handshake, commands and termination to designated controller.

High reliability

Each Tabor instrument is aged for at least two weeks and subsequently 100% computerized tested before shipping.

Versatility

Model 6010 is virtually a self-contained automatic test system. A non-volatile memory is capable of storing up to 10 various front panel set-ups; each dedicated to a different test procedure. Recalling a specific set-up or accessing a few set-ups is performed with pushbutton ease.

High performance trigger

In manual mode, the trigger level is programmable from -5.1V to + 5.1V (-51V to + 51V in X10 mode) with an exceptional resolution of 10 mV (100mV in X10 mode). An automatic trigger mode is also available covering the frequencies from 100Hz to 150MHz.

Automatic attenuation selection

Auto trigger mode automatically switches attenuator settings if the input signal exceeds 5.1Vpk-pk.

DVM Measurements

Automatic triggering is used to establish the peak voltages for setting trigger points. This feature is used to measure peak voltage levels.

Individual channel filtering

The 6010 has an independent 100kHz low pass filter on each channel to reduce input stage sensitivity when making low-frequency measurements.

High stability time base

Counter measurement stability can be improved by using an external clock or one of the two optional internal high stability time bases. The internal time base options are:

- **TCXO:** Standard
- **OCXO:** Option 1a
- **Rubidium:** Option 4

Optional analog output

Option 3 (Analog Output) provides a high accuracy source to drive devices like chart recorders. This option is especially useful in measuring and recording the aging and temperature stability of devices like oscillators and Voltage to Frequency (V-F) converters.

Flexible Gate Time and Delay Time Control

The Model 6010 allows fine control of gate time and delay time settings with 46 pre-defined times ranging from 100ms to 10s. In addition, gate or delay may be set to any value between 100ms and 1000 seconds using an external input.



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Service and Support

Beyond providing precision Test & Measurement instruments, Tabor Electronics provides unparalleled service and support, and is continuously finding new ways to bring added value to its customers.

Our after-sales services are comprehensive. They include all types of repair and calibration, and a single point of contact that you can turn to whenever you need assistance. As part of our extensive support, we offer individualized, personal attention Help Desk, both online and offline, via e-mail, phone or fax.

Tabor Electronics maintains a complete repair and calibration lab as well as a standards laboratory in Israel and USA. Service is also available at regional authorized repair/calibration facilities.

Contact Tabor Electronics for the address of service facilities nearest you.

Applications

For expert technical assistance with your specific needs and objectives, contact your local sales representative or our in-house applications engineers.

Manuals, Drivers, and Software Support

Every instrument comes equipped with a dedicated manual, developer libraries, IVI drivers, and software. However, if your specific manual is lost or outdated, Tabor Electronics makes it possible to log-on to its Download Center and get the latest data "in a click".

Product Demonstrations

If your application requires that you evaluate an instrument before you purchase it, a hands-on demonstration can be arranged by contacting your local Tabor Electronics representative or the Sales Department at our Corporate Headquarters.

Three-year Warranty

Every Tabor Electronics instrument comes with a three-year warranty. Each one has full test results, calibration certificate, and CD containing product's manual and complete software package. Our obligation under this warranty is to repair or replace any instrument or part thereof which, within three years after shipment, proves defective upon examination. To exercise this warranty, write or call your local Tabor representative, or contact Tabor Headquarters and you will be given prompt assistance and shipping instructions.

CORPORATE HEADQUARTERS
9 Hattatia St. P.O.Box404,
Tel Hanan, Israel 20302
T +972 (4) 8213393
F +972 (4) 8213388
www.taborelec.com

EUROPE

Austria
UET-Viena
T +43 15451 588
F +43 15451 464

Benelux (Belgium, The Netherlands and Luxembourg)
BFI Optilas B.V.
T +31 172 44 60 60
F +31 172 44 34 14

Bulgaria
New-Tek Ltd.
T +359 296 25286
F +359 268 7110

Cyprus
Sprel Ltd.
T +357 2237 7159
F +357 2237 7284

Czech Republic & Slovakia
Testovaci Technika s.r.o.
T +420 2 7478 237
F +420 2 7478 1285

Denmark
Altimo AS
T +45 8625 8899
F +45 8625 5889

France
Racial Instruments SAS
T +33 1 3923 2205
F +33 1 3923 2225

Germany
CompuMess Elektronik GmbH
T +49 89 321501-0
F +49 89 321501-11

Greece
American Technical
Enterprises S.A.
T +30 210 5240 740
F +30 210 5249 995

Hungary
ProMet Merestechnika
T +36 24 521 240
F +36 24 521 253

Italy
LP Instruments srl
T +39 2 4840 1713
F +39 2 4840 1852

Norway
Nortelco AS
T +47 2257 6100
F +47 2257 6130

Poland
Helmat
T +48 22 436 3106
F +48 22 436 3110

Romania
InterNET SRL
T +40 21 312 1662
F +40 21 312 1663

Russia
CDIP
T +7 0959 56 2022
F +7 0959 56 2022

Spain & Portugal
Instrumentos De Media SL
T +34 91 300 0191
F +34 91 388 5433

Sweden & Finland
Ferner Elektronik AB
T +46 8 760 8360
F +46 8 760 8341

Switzerland
Eistar Elektronik AG
T +41 56 427 1888
F +41 56 427 1976

United Kingdom & Ireland
SEMATRON UK Ltd.
T +44 1256 812222
F +44 1256 812666

**Yugoslavia (Bosnia, Croatia,
Macedonia, Montenegro, Serbia, Slovenia)**
Mechanic & Electronic
Measurement
T +38 1943 4254
F +38 1943 4251

ASIA PACIFIC & JAPAN

Australia
Trio Test & Measurement
Solutions
T +61 8 8234 0504
F +61 8 8234 0130

India
AIMIL Ltd.
T +91 11 2695 0001
F +91 11 2695 0011

Japan
TOYO Corporation
T +81 3 3279 0771
F +81 3 3246 0645

Korea
ITB Corporation
T +82 2 549 8501
F +82 2 549 8502

New Zealand
Electrotest Ltd.
T +64 9 448 2600
F +64 9 448 2611

Philippines
Sunley Inc.
T +63 2751 1216
F +63 2815 0730

Singapore, Thailand & Vietnam
Gold Lite Engineering Pte Ltd.
T +65 6273 0487
F +65 6273 5006

Taiwan, China & Hong Kong
Precision International Corp.

Taiwan
T +886 2 85124888
F +886 2 85124900

China & Hong Kong
T +86 21 64401300
F +86 21 64400524

AFRICA

South Africa
Channels Measurement
T +27 11 254 8362
F +27 11 254 8451

MIDDLE EAST

Israel
Dan-El Technologies Ltd.
T +972 3 9271888
F +972 3 9271666

Turkey
Alfatek Test &
Automation Ltd.
T +90 216 474 7355
F +90 216 474 7357

UNITED STATES
US SALES & SUPPORT OFFICE
T +1 909 7970484
F +1 909 7974955

IL, IN, IA, KS, KY, MN, MO, NE, ND, SD, WI
Base Eight, Inc.
T +1 847 670 1680
F +1 847 670 1737

AZ, CO, ID, MT, NM, TX, EI, Paso, UT, WY
Berry Technical Sales Inc.
T +1 303 665 9116
F +1 303 833 1294

AR, LA, OK, TX
Data Marketing Associates Inc.
T +1 972 661 0300
F +1 972 490 0836

OH, WV, PA, MI
Dytec EAST
T +1 330 405 8311
F +1 330 405 8313

DC, MD, VA
Eastern Instrumentation Corp.
T +1 410 884 7303
F +1 410 884 7306

PA, NJ
El Philly
T +1 856 231 0668
F +1 856 231 9022

HAW, NV, CA
Sierra Technical Sales
T +1 510 713 9957
F +1 510 713 9958

NJ, NY
Tera Technologies Inc.
T +1 888 921-TERA
F +1 888 449 2799

CT, ME, MA, NH, RI, VT
Test-Rep Associates, Inc.
T +1 978 692 8000
F +1 407 839 0337

AL, FL, GA, MS, NC, SC, TN
W.A. Brown Instruments
T +1 407 648 9660
F +1 407 839 0337

CA, NV
W5 Inc.
T +1 949 212 1199
F +1 714 281 0767

CANADA
Testforce Systems Inc.
T +1 514 856 0970
F +1 514 856 6983

LATIN AMERICAS
SALES & SUPPORT OFFICE
T +1 440 543 7710
F +1 440 543 9681



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Specification 125MHz Universal Counter/Timer



INPUT CHARACTERISTICS (CHANNELS A & B)

RANGE

DC coupled: 0 to 125MHz
AC coupled: 30Hz to 125MHz

SENSITIVITY (X1)

35mV rms sine wave: 0 to 100MHz
50mV rms sine wave: 100MHz to 125MHz
100mV p-p: 5ns min pulse width

SIGNAL OPERATING RANGE

X1: -5.00Vdc to +5.00Vdc
X10: -50.0Vdc to +50.0Vdc

DYNAMIC RANGE (X1)

100mv - 5vp-p: 0 to 100mhz
150mv - 2.5vp-p: 100mhz to 125mhz

Coupling: AC or DC, switchable
Impedance: 1MΩ
Slope: Independent selection of + or - slope, switchable
Low Pass Filter: -3db nominal at 100KHz, switchable

DAMAGE LEVEL (AC or DC)

X1: DC to 2kHz - 200V
(DC + peak AC)
2kHz to 100kHz
- 4 x 10E5Vrms Hz/Freq.
Above 100kHz - 5Vrms
DC to 20kHz - 200V
(DC + peak AC)
20kHz to 100kHz
- 4x10E6 Vrms Hz/Freq.
Above 100kHz - 50Vrms

Manual Attenuator: X1 or X10 nominal, switchable

AUTO TRIGGER LEVEL CHARACTERISTICS (CHANNELS A & B)

TRIGGER LEVEL RANGE (automatic mode): -50.0 Vdc to +50.0 Vdc

FREQUENCY RANGE

DC coupled: 100Hz to 125MHz
AC coupled: 100Hz to 125MHz

NOTES:

1. Auto trigger is disabled in the following functions:
Totalize B and Frequency C.
2. Auto trigger function requires that a repetitive signal be present at the input connector.

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AUTO ATTENUATION

Mode: Automatically enabled with the Auto Trigger.

X10 attenuator: Automatically enabled when either peak is greater than 5.1V or when the difference between maximum and minimum peaks exceeds 5.1V.

Minimum amplitude: 100mV rms sine wave, 280 mV p-p

MANUAL TRIGGER LEVEL CHARACTERISTICS (CHANNEL A AND B)

RANGE

X1: -5.00Vdc to +5.00Vdc
X10: -50.0Vdc to +50.0Vdc

PRESET

X1: 0.00Vdc
X10: 00.0Vdc

RESOLUTION

X1: 10mV
X10: 100mV

SETTING ACCURACY

X1: (35mV +3% of the reading)
X10: (350mV +3% of the reading)

FREQUENCY A, B MODE

Reciprocal below 10MHz and when EXT GATE mode or HOLD mode are selected. Conventional above 10MHz. The instrument automatically selects mode of operation. (10MHz above changes to 100MHz with opt 1)

RECIPROCAL FREQUENCY MEASUREMENT CHARACTERISTICS

Range: 0.1Hz to 125MHz

LSD⁽¹⁾ displayed: 4 x 100 ns x frequency
gate time.

e.g. min 7 digits in one second of gate time

with option 1: 4 x 10 ns x frequency
gate time

e.g. min 8 digits in one second of gate time

Resolution: ±LSD (1.4 x Trig error⁽²⁾ + 2 ns) x Freq
gate time

Accuracy: ±resolution ±Time Base Error⁽³⁾ x Freq

CONVENTIONAL FREQUENCY MEASUREMENT CHARACTERISTICS

Range: 10MHz to 125MHz

with option 1: 100MHz to 125MHz

LSD⁽¹⁾ Displayed: 4
gate time

Resolution: ±1LSD

Accuracy: ±1LSD ±Time Base error⁽³⁾ x Freq

FREQUENCY C (AVAILABLE WITH OPTION 2 ONLY)

Mode: Reciprocal mode only

Range: 50MHz to 1300MHz

LSD⁽¹⁾ Displayed: Same as for Frequency A and B

Resolution: Same as for Frequency A and B

Accuracy: Same as for Frequency A and B

PERIOD A, TIME INTERVAL A TO B

Range: 100ns to 10e5s

with option 1: 10ns to 10e4s

LSD⁽¹⁾ Displayed: 100ns for time less than
100s5e-9 x time for time
more than 100s

with option 1:
10ns for time less than
10s5e-9 x time for time
more than 10s

Resolution: ±1LSD ±start trig error⁽²⁾
±stop trig error⁽²⁾

Accuracy: ±resolution ±(Time Base
error⁽³⁾ x Time) ±Trig level
timing error⁽⁴⁾ ±2ns

PERIOD A - AVERAGED (*)

Range: 8ns to 10s

LSD⁽¹⁾ Displayed: 4 x 100ns x Period
gate time

e.g. min 7 digits in 1 second of gate time.

with option 1: 4 x 10ns x Period
gate time

e.g. min 8 digits in 1second of gate time.

Resolution: ±LSD ±(1.4 x Trig error⁽²⁾ + 2ns) x Period
gate time

Accuracy: ±resolution ±Time Base error⁽³⁾ x Period

**Number of
Periods Averaged:** N = Gate time
Period

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TIME INTERVAL A TO B - AVERAGED (*)

T.I A to B Range:	0ns to 10s. A and B signals must have the same repetition rate.
LSD⁽¹⁾ Displayed:	$\frac{5 \times 100\text{ns}}{\sqrt{N}}$
with option 1:	$\frac{5 \times 10\text{ns}}{\sqrt{N}}$
Resolution:	$\pm 1\text{LSD}$
Accuracy:	$\pm \text{resolution} \times \text{Trig error}^{(2)}$ \sqrt{N}
	$\pm \text{Time Base error}^{(3)}$ x Time 2ns
Dead Time	
Stop to Start:	20ns minimum
Number of Samples Averaged:	$N = \text{gate time} \times \text{Frequency A}$

RISE/FALL TIME - AVERAGED (*)

RANGE

Fast Rate:	10ns to 10ms
Slow Rate:	10ns to 25ms

LSD⁽¹⁾ Displayed:	Same as for T.I. A to B
Resolution:	$\pm 1\text{LSD}$
Accuracy:	$\pm (\text{T.I. A to B averaged accuracy})$ $\pm \text{Trigger Setting Error}^{(2)}$ at 10% $\pm \text{Trigger Setting error}^{(2)}$ at 90%

NUMBER OF SAMPLES AVERAGED

Fast Rate:	$N = 0.1\text{s} \times \text{Frequency A}$
Slow Rate:	$N = 1\text{s} \times \text{Frequency A}$

Minimum Amplitude:	500mVp-p
Minimum Width at Peak of Signal:	20ns
MINIMUM FREQUENCY	

Fast Rate:	100Hz
Slow Rate:	40Hz

Input Mode:	Automatically set to common
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TRIGGER LEVEL MODE

Rise Time:	Automatically set to 10% to 90%
Slow Rate:	Automatically set to 90% and 10%

PHASE A TO B - AVERAGED (*)

Range:	0 to $360^\circ \times (1 - 20\text{ns} \times \text{Freq A})$.
Example:	0 to 359.99° at 1KHz
	0 to 180.0° at 25MHz

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Frequency Range:	0.1Hz to 25MHz. A and B signals must have the same frequency.	Resolution:	$\pm \text{LSD} \times \text{Trig error B}^{(2)} \times \text{Ratio gate time}$
LSD⁽¹⁾ Displayed:	$2.5 \times 100\text{ns} \times 360^\circ \times (1 + \sqrt{N})$ gate time or 0.01° , whichever is greater	Accuracy:	Same as resolution
with option 1:	$2.5 \times 10\text{ns} \times 360^\circ \times (1 + \sqrt{N})$ gate time or 0.01° , whichever is greater	V PEAK A	
Resolution:	$\pm 1\text{LSD}$	Operation:	Maximum and minimum peaks of Channel A input signal are simultaneously displayed, each with 3 digits. Decimal points and polarity are automatically displayed.
Accuracy:	$\pm \text{resolution} \times 2\text{ns} \times \text{Freq A} \times 360^\circ$ $\pm \text{Trigger error}^{(2)} \times \text{Freq A} \times 360^\circ$ \sqrt{N}	FREQUENCY RANGE	
		Fast rate:	100Hz to 10MHz
		Slow rate:	40Hz to 10MHz
		Dynamic range:	280mV p-p to 51V p-p
		RESOLUTION	
		x1:	10 mV
		x10:	100mV. Attenuator is automatically activated if either the positive or the negative peaks of the input signal exceeds $\pm 5.1\text{V}$ or when the peak to peak voltage exceeds 5.1V .
		Accuracy:	$\pm \text{resolution} \pm 0.1(V_{\text{pos pk}} - V_{\text{neg pk}}) \pm 35\text{mV}$
		DELAY	
		Operation:	Active only with Time Measurements first input transition opens the gate. Delay inhibits the consequent transitions.
		Modes:	Internal through front panel programming or externally applied through rear panel BNC.
		Internal range:	100 μ s to 10 μ s
		Preset position:	1s
		External range:	100 μ s to 10e5s with option 1: 100 μ s to 10e4s
		GATE TIME	
		Modes:	Internal through front panel programming or externally applied through rear panel BNC.
		Internal range:	100 μ s to 10s or one period of the input.
		External range:	100 μ s to 1000s. Ext gate not available with Time measurements, Totalize B and Time Interval A to B
		Preset position:	1s
		External gate delay⁽⁶⁾:	<10 μ s

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EXTERNAL ARMING (TRIGGER)

Operation:	Arms the instrument when set to HOLD mode.
Trigger Delay⁽⁵⁾:	< 50µs
Minimum Pulse width:	10µs

EXTERNAL INPUT - GATE, DELAY, AND ARMING

Input:	TTL levels, via rear panel BNC
Input Impedance:	1KΩ nominal
Logic:	Positive true

STANDARD TCXO TIME BASE

Frequency:	10MHz
Aging Rate:	< 0.1 ppm/month
Stability:	< 1 ppm, 0 to 50°C
Line Voltage:	0.1ppm for 10% change (short term)
Clock IN/OUT:	Selected with an internal switch
External Time Base Input:	Rear Panel BNC accepts 1, 5 or 10MHz TTL. Selected via an internal switch
Time Base Out:	10MHz, >2 V from a 50Ω source

GPIB INTERFACE

Programmable Controls:	All front panel controls except POWER switch
Multiline Commands:	DCL, LLO, SDC, GET, GTL, UNT, UNL, SPE, SPD
Uniline Commands:	IFC, REN, EOI, SRQ, ATN
Interface Functions:	SH1, AH1, T6, TEO, L4, LEO, C0, SR1, RL1, PP0, DC1, DT1, E1
Data Output Format Reading:	With prefix 18 ASCII characters plus terminator. Without prefix - 14 ASCII characters plus terminator
Gate/Delay time and trigger level:	With prefix - 9 ASCII characters plus terminator or: Without prefix - 5 ASCII characters plus terminator
Address selection:	Front panel controls. Address is stored in a non-volatile memory.

GENERAL

Display Rate:	Normal- Approximately four measurements per s. Hold: Single shot measurement, one measurement taken with each press of the RESET button.
Fast:	Approximately 27 measurements per s.
Arming:	Each channel is armed by it's own signal
Reset:	Clears front panel display and begins a new measurement cycle.
Trigger Level Outputs:	DC Outputs via rear panel terminals, not adjusted for attenuator.
Accuracy:	DC (X1)±50mV±5% of trigger level reading.
Output impedance:	1KΩ, 1%
Display:	9 digits seven segments LED 0.56" high. 2 digits for engineering notations. Operator may select through front panel programming the number of digits to be displayed. Selection may range from 9 to 3 most significant digits.
Decimal Point:	Automatically selected.
Gate:	LED indicator lights when gate is open.
Set-ups:	Ten measurement set-ups, including trigger levels gate/delay time, input conditioning and measurement rate may be stored in memory and subsequently recalled. When AC mains power is removed, a non-volatile memory will preserve the stored setups for a typical period of 5 years.
Operating Temperature:	0 to 40°C ambient, 0 to 80% relative humidity
Storage temperature:	-25 to 65°C
Power Requirements:	115/230Vrms±10% 48-63Hz, 40W max
Voltage Range Selection:	Rear panel switch

Warm-up:

1 hour to rated accuracy and stability

87 x 210 x 390 (H x W x D)

approximately 4kg

CE marked

MTBF per MIL-HDBK-217E, 25°C, Ground Benign

Designed to meet IEC 1010-1, UL 3111-1, CSA 22.2 #1010

Safety:

Conform to IPC-A-610D

Workmanship Standards: Supplied Accessories:

Power Cord, CD containing Operating Manual and developer libraries.

3 years standard

OPTIONS

OPTION 1- X10 CLOCK MULTIPLIER

FREQUENCY

Reference: 100MHz (Internally multiplied by 10)
Resolution: 8 digits per second

OPTION 1A - OCXO + X10 CLOCK MULTIPLIER

Aging Rate: Stability: External Time Base Input:

< 0.1ppm/year
< 0.1ppm, 0 to 50°C

Rear Panel BNC accepts 1,5 or 10MHz TTL. Selected via an internal switch. 10MHz >2V

Time Base Out:

FREQUENCY

Reference: 100MHz (Internally multiplied by 10)
Resolution: 8 digits per second

OPTION 2 - 1.3GHz CHANNEL C

Range: Sensitivity:

50MHz to 1.3GHz
25mV rms to 1.0GHz;
50mV rms to 1.3GHz

Input Impedance: Dynamic Range: Coupling: Damage Level:

50Ω nominal
25mV to 1 Vrms up to 1.0GHz;
50mV to 1 Vrms up to 1.3GHz
AC
DC to 100KHz - 15V
(DC + peak AC)
100KHz to 1.3GHz - 5Vrms

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OPTION 3 - ANALOG OUTPUT

Operation:	Digital to analog converter, provides a high resolution analog output of any three consecutive digits
Decade conversion:	Any 3 consecutive digits can be selected via front panel programming.
Normal mode:	Output is directly proportional to display reading. 000 produces 0.00Vdc, 999 produces 9.99Vdc.
Offset Mode:	Front panel programmed. Adds an offset to obtain analog recorder scale offset.
Offset range:	0 to 9.00Vdc in 1V increments.
Output:	Rear panel BNC connector
Full scale deflection:	9.99Vdc

OPTION 4 - RUBIDIUM TIME BASE

Short term stability	
(10-100s):	1×10^{-11}
Long term stability	
(1 month):	5×10^{-11}
Retrace (off 24 hours)	
1 hour warm-up:	5×10^{-11}
Retrace	
(24 hours warm-up):	2×10^{-11}
Outputs:	2 Rear panel BNC connectors

DEFINITION OF TERMS

- (1) **LSD:** Unit value of least significant digit. Calculation should be rounded as follows 1 to <5Hz becomes 1Hz, 5ns to <10ns becomes 10ns etc.
- (2) **Trigger Error:** $\sqrt{(e_i^2 + e_n^2)}$ seconds rms
Input slew rate at trigger point
Where: e_i is the rms noise voltage of the counter's input channel ($250\mu V$ typically)
 e_n is the rms noise of the input signal for 125MHz bandwidth
- (3) **Time base error:** Maximum fractional frequency change in time base frequency due to all errors: e.g. aging, temperature, line voltage etc.
- (4) **Trigger Level Timing Error (x1):**
18 mV \pm 18 mV
Input slew rate at start Input slew rate at stop
trigger point trigger point
- (5) **External arming (trigger) delay:** Delay from the positive going slope of the arming signal to the internal gate open signal.
- (6) **External gate delay:** Delay from the positive going slope of the gating signal to the internal gate open signal.
- (7) **Dead Time:** Minimum time between measurement which the counter is busy in performing the measurement. The counter will not at this time respond to any input transition.

ORDERING INFORMATION

MODEL	6010
125MHz Universal Counter / Timer.	
OPTIONS	
Option 1:	x10 Time Base Multiplier
Option 1A:	OCXO + x10 Time Base Multiplier
Option 2:	1.3GHz Channel C
Option 3:	Analog Output
Option 4:	Rubidium Time Base
ACCESSORIES	
S-Rack mount:	19" Single Rack Mounting Kit
D-Rack mount:	19" Dual Rack Mounting Kit
Case Kit:	Professional Carrying Bag

Note: Options and Accessories must be specified at the time of your purchase.