

# 50MHz Pulse Generator

## MODEL 8500



- Two independently programmed output channels with standard ECL/TTL auxiliary outputs (Channel B optional) Repetition rate to more than 70MHz
- Extremely high output amplitude level of 32Vp-p, within a  $\pm 24$ Vdc window (open circuit), in less than 5ns
- High-Accuracy, high-resolution digital settings, over exceptionally wide ranges. Pulse width/delay are set with 1ns increments to 79,999ns
- Auto-calibration of output period with the built-in counter. Basic period accuracy is controlled to within 0.1% by an internal counter

- Pulse output modes include single, double, delayed, and pulse complements
- Extremely low jitter pulse width and delay specifications
- Linear transition times and separate controls for leading and trailing edges
- Complete pulse error detection for error-free operation
- Complete GPIB programmability

Model 8500 is a modern-universal source of test stimulus waveform. Its flexibility ensures continuing usefulness for a variety of tasks, today as well as in the future, when demands change. Its versatility, reliability, programmability and economy make it equally-at home in engineering research laboratories, production test stand, automated system or in the maintenance shop. Although providing wide 70 MHz frequency coverage, and large 32 V amplitude span, this generator is very affordable even for versions incorporating two output channels.

### Versatility

Model 8500 employs a microprocessor circuit for ease of manual operation and for simple IEEE-488 programming. Modification of pulse parameters is digitally set (manually or bus programmed) over exceptionally wide ranges:

- **Period** - set from 14nS to 1.999S
- **Amplitude** - set from 0.1V to 16Vp-p with in a window of 12V
- **Pulse Width** - set from 7nS to 4.000mS
- **Delay** - set from 0nS to 4.000mS

- **Rise/Fall Times** - set from 6nS to 20.0MS
- **Fixed Duty Cycle** - set from 1% to 95%
- **Burst** - set from 2 to 65,500 cycles

Model 8500 may be used as a stand-alone asynchronous generator. Consequently, synchronization to an independent external signal is achieved using one of the built-in triggering modes. Output may then be selected between a single pulse, a gated burst or a burst of pre-selected number of output cycles. An internal trigger stimulant having a controllable period is provided as an alternative to the external signal.

### Expandability

As standard, Model 8500 is furnished with one main output (channel A) and one auxiliary output. The auxiliary output delivers a fixed voltage level of either TTL or ECL with transition times better than 2 nS. A second output (channel B), with its supplementary auxiliary output, is available as an option. Period is common to both channels A and B. All other parameters are independently set. In addition to the basic

generator, with its variety of features and GPIB programming capability, the Model 8500 incorporates a built-in counter. This counter is utilized in an internal self-calibration routine which corrects the basic accuracy of the VCO to better than 1%. The self-calibration routine is front panel selectable and is usable at anytime.

Enhanced accuracy is achieved by incorporating the counter in an internal closed loop, which measures and corrects the programmed period.

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Alternately, the instrument may be used as an Independent 7 digits universal reciprocal counter/timer, which is capable of measuring, to a high degree of accuracy and resolution, three external parameters:

- **Frequency:** from 10 Hz to 100 MHz
- **Period averaged:** from 10 nS to .1
- **Pulse width averaged:** from 50 nS to 1S.

#### **Production environment**

Rapid repeatable testing every time is ensured by special features, which reduce possibility of the operator's set-up error. Easy to understand panel layout and positive action buttons simplify operation even for less skilled user. Error messages in the readout warn of possible operator mistake. Any of 30 pre-programmed complete setup states, stored in a non-volatile memory can be recalled by a simple number, ensuring exact duplication of previous set-up no matter how complex thus, saving the time which is otherwise required to set up the instrument

for different tests. The last active set-up state is exactly restored during start-up, eliminating false test after a momentary power loss. The need to periodically calibrate the frequency is virtually eliminated, since the output is compared and corrected to a precise standard. Reliability is due to conservative design, which include protection against short circuit. Self-test on turn on automatically checks all digital circuits numerals and indicator lamps.

#### **Systems environment**

All controls choice of waveforms, setting of modifiers, and waveform output disconnect -are programmable through the built-in IEEE (talker Listener Interface).

Any of 30 pre-programmed set-ups can be recalled from the internal non-volatile memory simplifying system computer programming and reducing test time. Setups may be updated locally or programmed by the bus. Wide control of waveform parameters

provides flexibility for today's automated testing or for extended testing in the future. During system checkout the unit provide an error status report, which may be recalled using the serial polling sequence. The Model 8500 may also be programmed to request service only when a specific condition occurs.



**TABOR ELECTRONICS Ltd.**

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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.

# Specification 50MHz Pulse Generator

# Model 8500



## WAVEFORMS

Pulse, Pulse complement,  
Linear transitions

## OUTPUT MODES

Single, Delayed, Double,  
Fixed duty cycle, Disabled.

## OUTPUT CHANNELS

Two Channels. B Channel  
optional. Only period and  
trigger modes are common.  
Other parameters are  
independently set.

## PULSE PARAMETERS (CHANNELS A&B)

### PERIOD

**Range:** 20.0ns to 1.999s.  
**Extended Range:** 14.0ns to 20ns.  
(amplitude limited to 10V max)  
3 1/2 digits  
**Resolution:** 1999 counts at full scale).

### ACCURACY

**Continuous:**  $\pm 0.5\%$  worst case; typically  
to 0.05% of full-scale value.  
**Gated, and Burst:**  $\pm 2\%$  of programmed value  
whole range (within 1 hour  
following the self calibration  
sequence).

**Duty Cycle:** 1% to 99%  
(limited by 10ns off time).

**Jitter (Peak-Peak):** 0.1%  $\pm 50$ ps.

## WIDTH, DOUBLE PULSE

Measured at 50% of amplitude and fast transition time.

### RANGE

**Pulse Width,  
Double Pulse:** 7ns to 79.999 $\mu$ s  
(with 1ns increments);  
80.0 $\mu$ s to 4.000s.  
**Delay:** 0ns to 79.999 $\mu$ s  
(with 1ns increments);  
80.0 $\mu$ s to 4.000s.

**Resolution:** 5 digits maximum to 79.999 $\mu$ s.  
4 digits maximum from  
80.0 $\mu$ s to 4.000s.

**Accuracy:**  $\pm 1\%$  of programmed  
value  $\pm 2$ ns.

## MAXIMUM JITTER (Peak-Peak)

**Below 1 $\mu$ s:** < 0.1% +50ps.  
**1 $\mu$ s to 10 $\mu$ s:** 0.05%.  
**Above 10 $\mu$ s:** 0.005%.

## FIXED DUTY CYCLE MODE

**Mode:** Output duty cycle remains  
constant. The programmed  
pulse width parameter is  
ignored.  
**Range:** 1% to 95%.  
**Accuracy:**  $\pm 3\%$  of programmed  
value + 2ns).

## OUTPUT LEVELS (CHANNEL A)

**High Level Range:** -11.90V to +12.0V, into 50 $\Omega$ ;  
-23.8V to +24.0V,  
into open circuit.  
**Low Level Range:** -12.0V to +11.9V, into 50 $\Omega$ ;  
-24.0V to +23.8V,  
into open circuit.  
**Amplitude:** 0.1V to 16V, into 50 $\Omega$ ;  
0.2V to 32V, into open circuit.  
**Resolution:** 3 digits.  
**Accuracy (1KHz):**  $\pm 2\%$  of programmed value  
+3% of amplitude + 40mV).  
**Output Protection:** protected against continuous  
short to case ground.

## OUTPUT LEVELS (CHANNEL B)

**High Level Range:** -7.90V to +8.00V, into 50 $\Omega$ ;  
-15.8V to +16.0V,  
into open circuit.  
**Low Level Range:** -8.00V to +7.90V, into 50 $\Omega$ ;  
-16.0V to +15.8V,  
into open circuit.  
**Amplitude:** 100mV to 16V, into 50 $\Omega$ ;  
200mV to 32V,  
into open circuit.  
**Resolution:** 3 digits.  
**Accuracy (1KHz):**  $\pm 2\%$  of programmed value  
+3% of amplitude +40mV).  
**Output Protection:** protected against continuous  
short to case ground.

## PULSE PERFORMANCE (CHANNEL A&B)

**Transition Times**  
Channel A: Fast, 6ns or Linear, selectable.  
Channel B: Fast only, 6ns  
**Aberration:** < 5%.

**Reflections:** <10%.  
**Source Impedance:** 50 $\Omega$ ,  $\pm 2\%$ .

## LINEAR TRANSITION TIMES (CHANNEL A)

Measured from 10% to 90% of amplitude

**Fast Transition:** Fixed, 6ns.  
**Linear Transition:** 8.0ns to 20.0ms,  
in 6 overlapping ranges.  
**In-range Span:** 20:1.  
**Resolution:** 3 1/2 digits maximum.  
**Linearity:**  $\pm 3\%$  for transitions > 50ns.  
**Accuracy:**  $\pm (5\% + 2$ ns).

## SYNC OUTPUT

**Output Impedance:** 50 $\Omega$ ,  $\pm 2\%$ .  
**Output Level:** 1V minimum, into 50 $\Omega$ .  
**Transition Times:** < 2ns.  
**Duty Cycle:** 14ns to 1999ns, 50%;  
above 2000ns, Pulse width  
varies from 100ns to 1 $\mu$ s.

## AUXILIARY OUTPUTS (AUX A & B)

**Period:** 14ns to 1.999s.  
**Operating Mode:** ECL or TTL output, selectable.  
**Output Impedance:** 50 $\Omega$ ,  $\pm 3\%$ .  
**Pulse Parameters:** Share parameters with the  
main outputs; Amplitude and  
transition times remain fixed.  
**Output Modes:** Share modes with the  
main outputs.  
**Output Level:** TTL, 0/2.5V, into 50 $\Omega$ ;  
ECL, -0.9V to -1.7V, into 50 $\Omega$ .  
**Transition Times:** TTL, < 4ns; ECL, < 3ns.

## TRIGGERING CHARACTERISTICS

### EXTERNAL TRIGGER MODES

**External Trigger:** Each input cycle generates  
a single output pulse.  
**External Burst:** As in external trigger for a  
programmable number  
of pulses.  
External signal enables  
generator. First output pulse  
synchronous with the active  
slope of the gating signal.  
Last pulse always complete.

**Gated:**

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**Input Impedance:** 10k $\Omega$ ,  $\pm 5\%$   
**Trigger Level:** -10.0V to +10.0V, adjustable.  
**Trigger Sensitivity:**  $\pm 500$  mVp-p.  
**Slope:** Positive or Negative going leading edge, Selectable.

### EXTERNAL REPETITION RATE

**Triggered:** 50MHz maximum  
**Gated:** 25MHz maximum  
**Burst:** 25MHz maximum

### EXTERNAL TRIGGER DELAYS

Measured from trigger input to SYNC output

**Triggered:** 60ns,  $\pm 10$ ns.  
**Gated, Burst:** 75ns,  $\pm 10$ ns.

### INTERNAL TRIGGER MODES

**Internal Trigger:** An internal timer repeatedly generates a single output pulse. Trigger period is adjustable.

**Internal Burst:** As in internal trigger for a programmable number of pulses.

**Manual:** Simulates an external trigger or gating signal.

**Manual Burst:** Simulates an external trigger stimulant.

### INTERNAL TRIGGER PERIOD

**Triggered, Burst:** Continuously adjustable from 0.05 ms to 1000s.  
**Burst Count Range:** From 2 to 65,500.

### AMPLIFIER INPUT CHARACTERISTICS

**Input:** Rear panel BNC connector.  
**Impedance:** 50 $\Omega$ ,  $\pm 5\%$ .  
**Gain:** -1,  $\pm 2\%$  (inverting).  
**Input Amplitude:**  $\pm 5$ Vp-p maximum.  
**Applications:** Channel A + Channel B, etc.

### COUNTER/TIMER CHARACTERISTICS

**Measurement Functions:** Frequency, Period Averaged, Pulse Width Averaged.

### RESOLUTION

**Frequency, Period Averaged:** 7 digits independent of frequency.

**Pulse Width:**  $\frac{100\text{ns}}{\sqrt{F}}$   
 where F=frequency in Hz.

### ACCURACY

**Freq, Period Avg:**  $\pm (0.01\% + 1 \text{ LSD})$ .  
**Pulse Width:**  $\pm (0.01\% + 3\text{ns} + 1 \text{ LSD})$ .  
**Sensitivity:** 500mVp-p.  
**Gate Time:** 1s, NOMINAL.  
**Detectable Pulse Width:** 5ns, minimum.  
**Dead Time:** 50ns minimum between measured pulses.

### GPIB INTERFACE

**Programmable controls:** All front panel controls except POWER switch.

### Subsets

**Implemented:** SH1, AH1, T6, TE0, L4, LE0, SR1, RL1, PP2, DC1, DT1, C0.

### Data Output

**Format:** Fixed output format consisting of 10 or 14 ASCII characters plus terminators.

**Data Input Format:** ASCII characters lower or upper case. ASCII characters smaller than 20 HEX(32) are ignored except CR (0D HEX).

**Service Request:** Selectable for illegal commands, errors,

pulse error.

**String Termination:** Selectable CR, LF, EOI or combination of all.

### GENERAL

**Display:** 7 digits, 7 segment LED's 0.5" high.

**Power:** 115/230Vac, 50 or 60Hz, 150W max.

**Stored Set-ups:** 30 complete sets of front panel set-ups. Storage guaranteed for 3 years.

**Operating Temperature:** 0 to 50°C, ambient.

**Specified Accuracy:** + 20°C to 30°C, ambient.

**Storage Temperature:** -40°C to + 70°C.

**Humidity:** 80% R.H.  
**Dimensions:** 5.5" x 11.8" x 13.6" (HxWxL).

**Rack Mount Dimensions:** 7" x 19" (HxW).  
**Weight:** Approximately 16Lbs.

**EMC:** CE marked  
**Reliability:** MTBF per MIL-HDBK-217E, 25°C, Ground Benign  
**Safety:** Designed to meet IEC 1010-1, UL 3111-1, CSA 22.2 #1010

### Workmanship

**Standards:** Conform to IPC-A-610D

### Supplied

**Accessories:** Power Cord, CD containing Operating Manual and developer libraries.

### Warranty:

3 years standard.

### ORDERING INFORMATION

**MODEL 8500**

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### OPTIONS

**Option 1:** Channel B. Independent High/Low Levels, Pulse Width, Pulse Delay, Single/Double Pulse, Normal/Complemt.

### ACCESSORIES

**Rack mount:** 19" Single Rack Mounting Kit

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