Model 1088B
GPS Satellite-Controlled Clock

The Arbiter Systems®, Inc. Model 1088B GPS Satellite-Controlled Clock provides unprecedented flexibility, performance, and value for worldwide timing applications. Combining GPS accuracy and ease of use with exceptionally flexible interface features and options in a space-saving package, the Model 1088B offers unparalleled value in GPS-synchronized clocks.

**Flexibility**

Offering standard operation from worldwide AC power sources, plus 110 Vdc to 370 Vdc sources (also standard), the Model 1088B integrates into most environments with no options required. Optional power configurations include terminal-strip power inlet (1088opt07), surge-withstand capability (1088opt15) and 10 Vdc to 60 Vdc operation (1088opt08).

Standard user-configurable input/output (I/O) capabilities provide over 260,000 possible configurations, with 22 different available signals, in the standard unit alone. With the addition of the available options, trillions of combinations are possible!

The available I/O options add a wide variety of capabilities to the Model 1088B. Additional outputs are available in a variety of formats, including fiber optic. High-performance internal oscillators are also available.

With Option 28, the Model 1088B is a Power System Time, Frequency and Phase Monitor with state-of-the-art accuracy.

**Performance**

The Model 1088B offers full-specified GPS timing accuracy of 100 ns rms from UTC/USNO. Typical performance is less than 40 ns rms. The Model 1088B provides this performance 24 hours a day, anywhere in the world.

**Value**

The Model 1088B GPS Satellite-Controlled Clock was designed from the beginning to offer the greatest possible flexibility and value for a wide range of applications. See what we mean – compare the unmatched flexibility, performance, and value for yourself – put the Model 1088B to work in your system today!

**Related Products**

If your application does not require the outstanding flexibility and configurability of the Model 1088B, consider Models 1084A/B/C, 1092A/B/C, and 1093B/C. All offer significant cost savings and many of the most-needed features of the Model 1088B.

Redundant configurations are available for applications that require even more resistance to loss of GPS synchronization. The redundant configuration consists of two clocks with clock-to-clock communications and an interconnect arbiter.
Model 1088B Specifications

**Receiver Characteristics**

**Timing Accuracy**
Specifications apply at the 1 PPS output, in the presence of Selective Availability (SA), as of date of publication.
UTC/USNO ± 50 ns rms, when receiving 4 or more satellites and Position-Hold Mode on
UTC/USNO ± 100 ns rms, receiving a single satellite and Position-Hold Mode on
UTC/USNO ± 200 ns rms, when receiving 4 or more satellites and Position-Hold Mode off

**Synchronization**
CMOS output signals are synchronized to the 1 PPS output, ± 50 ns, maximum.
IRIG-B modulated, ± 1 µs, maximum
The leading edge of the start bit of a received RS-232 data message may be selected to trigger the Event A input, providing synchronization with 100 ns resolution.

**Position Accuracy**
10 meters, rms, 90 % confidence

**Satellite Tracking**
Twelve (12) channel, GPS-L1, C/A code (1575.42 MHz). Receiver simultaneously tracks up to twelve satellites. Results from all tracked satellites are averaged in Position-Hold Mode or, with Position-Hold Mode off, using least-squares estimation.

**Acquisition**
150 seconds typical, cold start
15 minutes, 90 % confidence, cold start
40 seconds, typical, with almanac < 1 month old
15 seconds, typical, with ephemeris < 4 hours old
The GPS Data Backup Battery is included in the Model 1088B. This feature improves acquisition time by supplying constant power to the real-time clock and RAM in the GPS receiver module.

**I/O Configuration**

**Connectors**
Four, BNC, user-configurable. Each connector is configurable as a specific input function or as any one of 22 output functions, listed below, by means of internal, push-on jumpers. Each output connector is independently buffered. Configuration is easily changed in the field.
Refer to the options section for more outputs.
Analog outputs are op-amp (LF353) followers with 560-ohm protective resistors.
CMOS outputs are buffer type (74HC126) with 47-ohm source resistors.

**Input Functions**
Channel A Event or 1 PPS: 5 V TTL/CMOS level
Channel B Event or 1 PPS: 5 V TTL/CMOS level
Freq. Reference 5 V TTL/CMOS or AC-coupled; 100 kHz, 1 MHz, 5 MHz, or 10 MHz

**Output Functions**
Analog IRIG-B, 1 kHz modulated, 10 Vpp
5 V CMOS IRIG-B, IRIG-E, IRIG-D, or IRIG-H
DC level-shift 1 PPS, 1 PPM, 1 PPH
1 PPS, 10 PPS, 50 PPS, 60 PPS, or 100 PPS
1 kPPS, 10 kPPS, or 100 kPPS
1 MPPS, 5 MPPS, or 10 MPPS
Locked
Programmable Pulse
IRIG-B modified Manchester (IEEE Standard 1344)

**Event A/B Inputs**
Two inputs are available, each having 100 ns timing resolution. Each input may be configured to accept an external 1 PPS signal, and measure the deviation from 1 PPS/GPS or to record up to 300 sequential events (separated by 11 ns). Event data is logged in battery-backed RAM and may be read or cleared from the front panel or RS-232 interface.
Model 1088B Specifications

I/O Configuration (Continued)

Programmable Pulse Output
Four modes:
- Every 1 s to 60,000 s, starts top of the minute
- Hourly at a specified offset
- Daily at a specified time of day
- One shot at a specified time of year
Pulse duration is programmable from 0.01 s to 600 s, except in one-shot mode, where the output is Low prior to the specified time and High thereafter.

Interface

Operator
Display 2 x 20 character supertwist LCD
Functions
- Time: UTC or local
- Position: latitude, longitude, altitude
- Receiver and clock status
- 1 PPS (input) deviation
- Event time

Status LEDs
- Operate (green)
- On Line (green)
- Unlocked (red)
- Fault (red)
- Battery Charge (green)
- Battery in Use (green)
- Battery Low (red)

Keyboard
- Eight keys
- Local time offset
- Output code select: Local/UTC
- Daylight Saving Time: On/Off/Automatic
- Backlight control: On/Off/Automatic
- Event input: Event/1 PPS, for each input A and B
- Programmable Pulse setup
- Antenna delay
- Clock offset
- Out-of-Lock time: 1 min. to 99 minutes, Off, or Zero Delay
- Auto-Survey: On/Off, Survey duration
- Position Hold: On/Off, Position Auto/Manual
- Option Configuration and Setup
- Recorder output A/B
- Frequency Reference: standard (internal) or external
- Serial port: RS-232

Interface (Continued)

System
- RS-232
- 1200 baud to 19,200 baud; 7 or 8 data bits; 1 or 2 stop bits; even/odd/no parity
- Has Interrogate (normal) and six
- Broadcast modes: standard ASCII (IRIG-J), Vorne large-display, status/alarm, extended ASCII, event data, and ASCII with time-quality
- Male 9-pin D-sub

Power Requirements

Standard (IEC-320 Power Inlet)
- Voltage 85 Vac to 264 Vac, 47 Hz to 440 Hz, 20 VA max. or 110 Vdc to 370 Vdc, 15 W max.
- Inlet IEC-320 with fuse and mating cordset. Specify cordset P1 - P10.

General

Physical
- Size 1 RU rack mount or tabletop; 260 mm deep FMS. Rack mounts included. 508 mm x 381 mm x 203 mm (20 in x 15 in x 8 in), shipping
- Weight 2 kg (4.5 lbs), net
- 5.5 kg (12 lbs), shipping
- Antenna 0.75 in pipe (1 in - 14 marine) thread
- Cable Connection: F-type
- 80 mm hex (across flats) x 84 mm (3.2 in x 3.3 in)
- Weight: 170 grams (6.0 oz)
- Antenna Cable RG-6 type, 15 m (50 ft) provided
- Weight: 0.69 kg (1.52 lbs) per 15 m

Environmental

Temperature
- Operating: 0 °C to + 50 °C
- -20 °C to + 70 °C typical
- Nonoperating: - 40 °C to + 75 °C

Humidity
- Noncondensing

EMC
- Radiated susceptibility: passes walkie-talkie test
- Conducted emissions: power supply complies with FCC 20780, Class A and VDE 0871/6.78 Class A
- Surge withstand capability (SWC), power inlet: designed to meet ANSI/IEEE C37.90-1 and IEC 801-4
# Model 1088B Specifications

## Options

There are two internal option slots in the Model 1088B and options fit into two categories: those that require internal option slot space, and those that do not. Only one option may occupy the individual Option Slots.

<table>
<thead>
<tr>
<th>Description</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/O</td>
<td></td>
</tr>
<tr>
<td>Parallel BCD Output 1 ms Resolution</td>
<td>1088opt04²</td>
</tr>
<tr>
<td>BCD with Second RS-232 Port</td>
<td>1088opt17²</td>
</tr>
<tr>
<td>Second RS-232</td>
<td>1088opt17A²</td>
</tr>
<tr>
<td>Self-Monitor IRIG-B Distribution</td>
<td></td>
</tr>
<tr>
<td>System and Second RS-232 Port</td>
<td>1088opt18²</td>
</tr>
<tr>
<td>Out-of-Lock Relay 1 Form C (SPDT)</td>
<td>1088opt19²</td>
</tr>
<tr>
<td>Four Configurable Fiber-Optic Outputs</td>
<td>1088opt20A¹</td>
</tr>
<tr>
<td>COMTRADE Sample Rate Generator</td>
<td>1088opt23¹</td>
</tr>
<tr>
<td>Extended BCD Output</td>
<td>1088opt24²</td>
</tr>
<tr>
<td>8-Channel High-Drive IRIG-B Output</td>
<td>1088opt27²</td>
</tr>
<tr>
<td>Power System Time, Frequency and Phase Monitor</td>
<td>1088opt28¹</td>
</tr>
<tr>
<td>Four Additional Outputs with Dry Contact and + 25/50 Vdc</td>
<td>1088opt29²</td>
</tr>
<tr>
<td>Network Time Protocol (NTP) / Precision Time Protocol (PTP) Server</td>
<td>1088opt34²</td>
</tr>
<tr>
<td>Four Configurable Outputs</td>
<td>1088opt36</td>
</tr>
</tbody>
</table>

## Power (select only one)

<table>
<thead>
<tr>
<th>Description</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEC-320 Power Inlet, 85 Vac to 264 Vac, 110 Vdc to 370 Vdc Included</td>
<td></td>
</tr>
<tr>
<td>Terminal Power Strip, 85 Vac to 264 Vac, 110 Vdc to 370 Vdc</td>
<td>1088opt07</td>
</tr>
<tr>
<td>Terminal Power Strip, 10 Vdc to 60 Vdc</td>
<td>1088opt08</td>
</tr>
<tr>
<td>Terminal Power Strip, Surge Withstand 110 Vdc to 170 Vdc</td>
<td>1088opt15A</td>
</tr>
<tr>
<td>Terminal Power Strip, Surge Withstand 110 Vdc to 300 Vdc</td>
<td>1088opt15B</td>
</tr>
</tbody>
</table>

## General

<table>
<thead>
<tr>
<th>Description</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCD Backlight</td>
<td>1088opt01</td>
</tr>
</tbody>
</table>
### Cordset and Plug Styles

The following are the available IEC-320 mating cordset plug style and specifications:

<table>
<thead>
<tr>
<th>No.</th>
<th>Country</th>
<th>Specification</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>P01</td>
<td>Continental Europe</td>
<td>CEE 7/7</td>
<td>220V</td>
</tr>
<tr>
<td>P02</td>
<td>Australia/NZ/PRC</td>
<td>AS 3112-1981</td>
<td>240V</td>
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<tr>
<td>P03</td>
<td>U.K.</td>
<td>BS 1363</td>
<td>240V</td>
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<tr>
<td>P04</td>
<td>Denmark</td>
<td>Afsnit 107-2-01</td>
<td>240V</td>
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<tr>
<td>P05</td>
<td>India</td>
<td>BS 546</td>
<td>220V</td>
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<tr>
<td>P06</td>
<td>Israel</td>
<td>SI 32</td>
<td>220V</td>
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<tr>
<td>P07</td>
<td>Italy</td>
<td>CEI23-16VII1971</td>
<td>220V</td>
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<tr>
<td>P08</td>
<td>Switzerland</td>
<td>SEV 1011.1959</td>
<td>220V</td>
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<tr>
<td>P09</td>
<td>North America and ROC</td>
<td>NEMA 5-15P</td>
<td>220V</td>
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<tr>
<td></td>
<td></td>
<td>CSA C22.2 #42</td>
<td>120V</td>
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<tr>
<td>P10</td>
<td>Japan</td>
<td>JIS8303</td>
<td>120V</td>
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