

BEI MotionPak[®] II

Multi-Axis Inertial Sensing System

DESCRIPTION

The BEI Systron Donner Inertial Division MotionPak II is a "solid-state" MEMS six degree-of-freedom inertial sensing system used for measuring angular rates and linear accelerations in instrumentation and control applications. It is highly reliable, compact, ruggedly packaged and provides both analog and digital (RS-232) outputs. Built with BEI GyroChip[®] technology, the MotionPak II combines the most recent advancements in micromachined quartz rate sensors together with five decades of inertial sensor leadership.



FEATURES

- Low Cost – High Reliability
- "Solid-State" Sensors
- Dual or Single Power Supply Options
- Dual Level Analog DC Outputs
- Digital (RS-232) Output
- RS-232 Data Acquisition Software*
- Internal Temperature Sensor
- Long Operational Life
- Fast Start-Up
- Fully Self-Contained System
- Compact, Rugged Package
- Optional Carrying Case

OPERATION

The MotionPak II may be powered by + and - 15 Vdc input supplies and will provide 12 analog DC signal outputs (6 high signal and 6 low signal) and a digital (RS-232) output. For applications requiring a +12 Vdc input, the *Single Supply Feature* provides 6 analog low DC signal outputs and a digital (RS-232) output. With three orthogonally mounted quartz angular rate sensors and three silicon based accelerometers, the MotionPak II is a fully self-contained inertial sensing system utilizing internal power regulation and signal conditioning electronics.

***RS-232 Data Acquisition Software Requirements:**

IBM compatible PC - Pentium/32 MB RAM, CDROM, RS-232 port;
Microsoft Windows 9x, Windows NT 4.0 operating system or later
Internet Explorer 4.0 or later, Excel 97; Visual Basic 6.0 (for recompiling the source code)

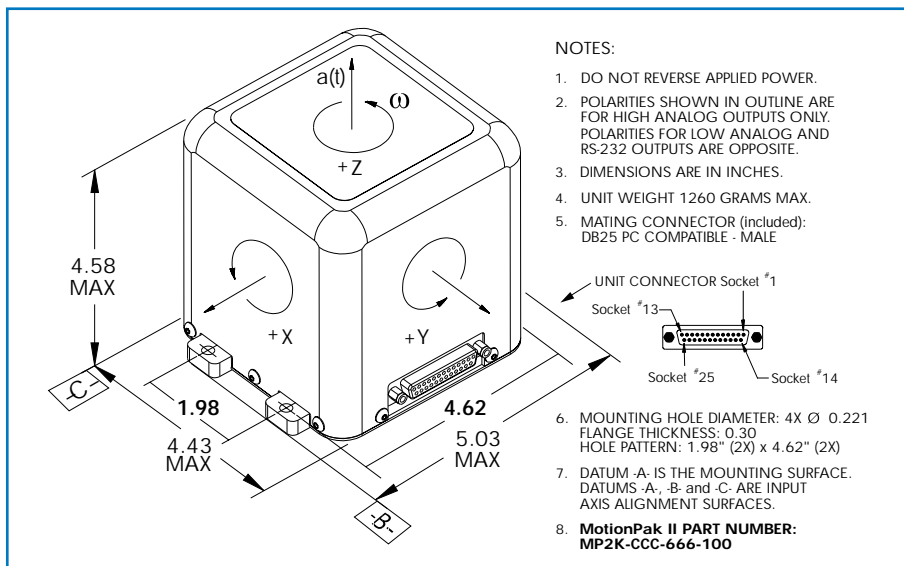


APPLICATIONS

- Vehicle Instrumentation
- Robotics
- Remotely Piloted Vehicles
- Attitude Reference Systems
- Industrial Control Systems
- Navigation Aiding GPS
- Marine Instrumentation
- Flight Testing

BEI MotionPak® II

Multi-Axis Inertial Sensing System



PIN ASSIGNMENT	
PIN NO.	DESCRIPTION
1	+15Vdc INPUT (or) +12Vdc INPUT
2	-15Vdc INPUT
3	PWR GND
4	CASE GROUND
5	X RATE OUT - HIGH ANALOG
6	HIGH ANALOG RETURN
7	Y RATE OUT - HIGH ANALOG
8	RS-232 TD (TRANSMIT DATA)
9	Z RATE OUT - HIGH ANALOG
10	RS-232 RD (RECEIVE DATA)
11	X ACCEL OUT - HIGH ANALOG
12	RS-232 GND
13	SPARE
14	Y ACCEL OUT - HIGH ANALOG
15	SPARE
16	Z ACCEL OUT - HIGH ANALOG
17	SPARE
18	X RATE OUT - LOW ANALOG
19	Y RATE OUT - LOW ANALOG
20	Z RATE OUT - LOW ANALOG
21	LOW ANALOG RETURN
22	Y ACCEL OUT - LOW ANALOG
23	TEMP SENSOR OUT
24	X ACCEL OUT - LOW ANALOG
25	Z ACCEL OUT - LOW ANALOG

GROUPINGS:
 HIGH ANALOG OUTPUT: Pins 5-16
 LOW ANALOG OUTPUT: Pins 18-24
 RS-232: Pins 8, 10, 12
 Temperature Sensor: Pin 23

OUTPUT CAPABILITIES

INPUT POWER

Input Voltage
Input Current

PERFORMANCE

Ranges
Full Range **HIGH** Analog Output
Full Range **LOW** Analog Output

Scale Factor **HIGH**, nominal
Scale Factor **LOW**, nominal
Scale Factor Error, maximum (1)

Bias **HIGH** Analog, nominal
Bias **LOW** Analog, nominal
Bias Error, maximum (2)
Input axis alignment

Output noise **HIGH** Analog (3)
Output noise **LOW** Analog (3)
Start-up time, maximum
Bandwidth, flat ± 3 dB
Non-linearity (% of Full Scale)

ENVIRONMENTS

Operating/storage temperature
Vibration survival
Shock

RS-232 FEATURE

TEMPERATURE SENSOR

STANDARD OPERATION

HIGH & LOW ANALOG and RS-232

DUAL SUPPLY (BIPOLAR)

+ and - 15 Vdc ± 1 Vdc
Plus Supply 125 milliampere, maximum
Minus Supply 35 milliampere, **maximum**

RATE SENSORS

$\pm 75^\circ/\text{sec}$
 ± 10 Vdc
 $+0.5/+4.5$ Vdc

0.133 V/ $^\circ/\text{sec}$
0.027 V/ $^\circ/\text{sec}$
 $\pm 6\%$

0 Vdc
2.5 Vdc
 $\pm 5.0^\circ/\text{sec}$
1 $^\circ$ typical

28 mV RMS
6 mV RMS
1.0 second
DC to >30 Hz
3% maximum

-40 to +85 $^\circ$ C
4 g RMS (20 - 2K Hz)
200 g PK 2 msec $\frac{1}{2}$ sine pulse

Data Transfer Rate: 32 Hz maximum (measuring all seven (7) "12 BIT" WORDS)
LSB = 1.2 millivolt (Least Significant BIT)

LM 335 - internally mounted; 10 millivolt / $^\circ$ K; $\pm 4^\circ$ K
-40 $^\circ$ C (233.15 $^\circ$ K) = +2.33 Vdc; +85 $^\circ$ C (358.15 $^\circ$ K) = +3.58 Vdc

SINGLE SUPPLY FEATURE

LOW ANALOG and RS-232 ONLY

SINGLE SUPPLY

+11.0 to +16.0 Vdc
125 milliampere, maximum

RATE SENSORS

$\pm 75^\circ/\text{sec}$
--
 $+0.5/+4.5$ Vdc

--
0.027 V/ $^\circ/\text{sec}$
 $\pm 6\%$

--
2.5 Vdc
 $\pm 5.0^\circ/\text{sec}$
1 $^\circ$ typical

--
6 mV RMS
1.0 second
DC to >30 Hz
3% maximum

-40 to +85 $^\circ$ C
4 g RMS (20 - 2K Hz)
200 g PK 2 msec $\frac{1}{2}$ sine pulse

ACCELEROMETERS

± 1.5 g
--
 $+0.5/+4.5$ Vdc

--
1.2 V/g
 $\pm 5\%$

--
2.5 Vdc
 ± 125 mg
1 $^\circ$ typical

--
5 mV RMS
1.0 second
DC to >20 Hz
3% maximum

(1) Sum of factory setting and non-linearity, over operating temperature range
(2) Sum of factory setting and temperature effect, over operating temperature range
(3) Output noise, maximum, DC to 50Hz