

**OOI Cabled Array BOTPT instrument OUTGOING DATA FORMATS (v.12)**  
By Bill Chadwick, Oregon State University and NOAA/PMEL

There are 4 continuous data streams from the BOTPT (Bottom Pressure Tilt) instrument that are distinguished by a 4-character ID tag at the beginning of each output record that is transmitted to shore. In addition, there is one system status command that returns one-time output with its own ID tag. The 5 ID tags are as follows:

- 1) NANO, for the Nano-resolution bottom pressure sensor
- 2) LILY, for the LILY high-resolution tilt sensor
- 3) IRIS, for the IRIS low-resolution tilt sensor
- 4) HEAT, for the ADXL327 coarse-resolution tilt sensor
- 5) SYST, to receive one-time BOTPT CPU system status information

All output records are terminated by a line-feed character (\n) by the sensors (and passed on by the CPU).

**NOTE: To distinguish records with data from records with non-data (echoed commands, etc that should be treated as metadata), all non-data records are identified by a "\*" in the record after the ID tag and/or time-stamp.**

If data from any of the four sensors stops for longer than 1 minute, the CPU will send an error message once every minute thereafter until data resumes (with a leading ID tag corresponding to the appropriate sensor and a "\*" after the time stamp), as in:

NANO,2013/03/06 20:01:31,\*Error data rcv stopped

**1) NANO-BPR**

**NOTES:**

Data records are output at a user-selectable rate (20 Hz as of this writing) with a date/time stamp supplied by the sensor in fractional seconds (millisecond resolution).

**EXAMPLE OF DATA FORMAT:**

NANO,P,2012/03/14 20:53:26.000,12.912863,22.602944614

|          |  |  |

|          |  |  |

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|          |  |  |

|          |  |  |

  Temperature (°C)

  Nano-resolution Bottom Pressure (psia)

  Date/Time (YYYY/MM/DD HH:MM:SS.SSS with millisecond precision)

  Flag (P=date/time is synced to PPS signal; V=no PPS lock)

  ID tag (NANO=Nano-resolution bottom pressure recorder; Nano-BPR)

**EXAMPLE OF NON-DATA FORMAT (with an echoed command, in this case):**

NANO,2011/03/20 18:30:34,\*0001E4

The only exception to this is when the \*0100IF command is automatically sent by the CPU to the sensor at power-up or sent manually from shore (to output all current parameter settings), then at the beginning of each IF-parameter output string, the CPU will add "NANO," without a time stamp and will pass on the rest of each IF-parameter output string (all of which start with "\*"), as follows:

**OUTPUT EXAMPLE (output from the \*0100IF command):**

NANO,\*  
-----  
NANO,\*PAROSCIENTIFIC SMT SYSTEM INFORMATION



Or, as a special case, the data output during re-leveling (between issuance of a **start-level** and **stop-level** command) will have a "\*" added after the time stamp by the CPU. Thus, all output non-data records (metadata) will be identified by a "\*" in the record after the time-stamp, including both echoed commands and the output during the re-leveling process.

EXAMPLE OF NON-DATA FORMAT (output during re-leveling, in this case):

```
LILY,2013/03/12 12:34:56,*9900XY-LEVEL,1
LILY,2013/03/12 12:34:56,*-330.000,-330.000,263.33, 21.11,11.87,N7055
LILY,2013/03/12 12:34:56,*-330.000,-330.000,263.33, 21.11,11.87,N7055
...
LILY,2013/03/12 12:34:56,*9900XY-LEVEL,0
LILY,2013/03/12 12:34:56,*9900XYC2
LILY,2013/03/12 12:34:56,-330.000,-330.000,263.33, 21.11,11.87,N7055
...
```

### 3) IRIS-TILT

NOTES:

Very similar to LILY output, except no re-leveling functionality or associated output. Data are output at ~1 Hz (varies slightly).

EXAMPLE OF DATA FORMAT:

```
IRIS,2012/03/22 12:34:56, -00.619,000.023,018.910,N2212
|                   |                   |                   |                   |
|                   |                   |                   |                   | Serial number
|                   |                   |                   |                   | Temperature (degrees C)
|                   |                   |                   |                   | Y-tilt value (degrees)
|                   |                   |                   |                   | X-tilt value (degrees)
|                   |                   |                   |                   |
|                   |                   |                   |                   | Date/Time (YYYY/MM/DD HH:MM:SS)
|                   |                   |                   |                   | ID tag (IRIS=IRIS low-resolution tiltmeter)
```

EXAMPLE OF NON-DATA FORMAT (with an echoed command, in this case):

```
IRIS,2013/03/12 12:34:56,*9900XYC2
```

EXAMPLE OF NON-DATA FORMAT (power-up message, in this case):

```
IRIS,2013/03/12 12:34:56,*APPLIED GEOMECHANICS Model MD900-T Firmware V5.2
SN-N1212 ID01
```

### 4) HEAT-TILT

NOTES:

The coarse-resolution tilt sensor (Analog Devices ADXL327). Data are output every 2-3 seconds.

EXAMPLE OF DATA FORMAT:

```
HEAT,2012/03/22 12:34:56,0002,0001,0018
|                   |                   |                   |
|                   |                   |                   | Temperature (integer degrees C)
|                   |                   |                   | Y-tilt value (integer degrees)
|                   |                   |                   | X-tilt value (integer degrees)
|                   |                   |                   |
|                   |                   |                   | Date/Time (YYYY/MM/DD HH:MM:SS)
|                   |                   |                   | ID tag (HEAT=coarse-resolution tilt sensor for LILY heater)
```

EXAMPLE OF NON-DATA FORMAT (with an echoed command, in this case):

```
HEAT,2013/03/12 12:34:56,*0
```

## 5) SYST

The incoming command "SYST,1" will prompt the instrument CPU to send back system status information with a leading "SYST," ID tag and time stamps, followed by a "\*", as follows:

### OUTPUT (to shore):

```
SYST,2013/03/12 21:27:29,*BOTPT BPR and tilt instrument controller
SYST,2013/03/12 21:27:29,*ts7550n6
SYST,2013/03/12 21:27:29,*System uptime
SYST,2013/03/12 21:27:29,* 21:25:02 up 7 days, 21:25, 1 user, load average: 0.30, 0.15, 0.04
SYST,2013/03/12 21:27:29,*Memory free
SYST,2013/03/12 21:27:29,*          total          used          free          shared          buffers
cached
SYST,2013/03/12 21:27:29,*Mem:          62888          17832          45056              0          2544
5752
SYST,2013/03/12 21:27:29,*-/+ buffers/cache:          9536          53352
SYST,2013/03/12 21:27:29,*Swap:          0              0              0
SYST,2013/03/12 21:27:29,*MemTotal:          62888 kB
SYST,2013/03/12 21:27:29,*MemFree:          45080 kB
SYST,2013/03/12 21:27:29,*Buffers:          2544 kB
SYST,2013/03/12 21:27:29,*Cached:          5752 kB
SYST,2013/03/12 21:27:29,*SwapCached:          0 kB
SYST,2013/03/12 21:27:29,*Active:          10120 kB
SYST,2013/03/12 21:27:29,*Inactive:          3784 kB
SYST,2013/03/12 21:27:29,*SwapTotal:          0 kB
SYST,2013/03/12 21:27:29,*SwapFree:          0 kB
SYST,2013/03/12 21:27:29,*Dirty:          36 kB
SYST,2013/03/12 21:27:29,*Writeback:          0 kB
SYST,2013/03/12 21:27:29,*AnonPages:          5628 kB
SYST,2013/03/12 21:27:29,*Mapped:          4000 kB
SYST,2013/03/12 21:27:29,*Slab:          2084 kB
SYST,2013/03/12 21:27:29,*SReclaimable:          480 kB
SYST,2013/03/12 21:27:29,*SUnreclaim:          1604 kB
SYST,2013/03/12 21:27:29,*PageTables:          456 kB
SYST,2013/03/12 21:27:29,*NFS_Unstable:          0 kB
SYST,2013/03/12 21:27:29,*Bounce:          0 kB
SYST,2013/03/12 21:27:29,*CommitLimit:          31444 kB
SYST,2013/03/12 21:27:29,*Committed_AS:          141412 kB
SYST,2013/03/12 21:27:29,*VmallocTotal:          188416 kB
SYST,2013/03/12 21:27:29,*VmallocUsed:          0 kB
SYST,2013/03/12 21:27:29,*VmallocChunk:          188416 kB
SYST,2013/03/12 21:27:29,*Listening network services
SYST,2013/03/12 21:27:29,*tcp          0          0 *:9337          *: *
LISTEN
SYST,2013/03/12 21:27:29,*tcp          0          0 *:9338          *: *
LISTEN
SYST,2013/03/12 21:27:29,*udp          0          0 *:41660          *: *
SYST,2013/03/12 21:27:29,*udp          0          0 *:323          *: *
SYST,2013/03/12 21:27:29,*udp          0          0 *:mdns          *: *
SYST,2013/03/12 21:27:29,*udp          0          0 *:ntp          *: *
SYST,2013/03/12 21:27:29,*Data Processes
SYST,2013/03/12 21:27:29,*root          639 0.0 2.3 20100 1508 ?          S1 Jan01 0:00
/root/bin/SEND_DATA
SYST,2013/03/12 21:27:29,*root          643 0.0 2.1 19960 1372 ?          S1 Jan01 0:00
/root/bin/DIO_Rell
SYST,2013/03/12 21:27:29,*root          647 0.0 2.1 19960 1360 ?          S1 Jan01 0:00
/root/bin/HEAT
SYST,2013/03/12 21:27:29,*root          659 0.0 2.2 19960 1388 ?          S1 Jan01 0:00
/root/bin/IRIS
SYST,2013/03/12 21:27:29,*root          666 0.0 2.2 19960 1388 ?          S1 Jan01 0:00
/root/bin/LILY
SYST,2013/03/12 21:27:29,*root          671 0.0 2.2 19964 1392 ?          S1 Jan01 0:00
/root/bin/NANO
SYST,2013/03/12 21:27:29,*root          2071 0.0 2.0 20100 1308 ?          S1 Jan04 0:00
/root/bin/COMMANDER
SYST,2013/03/12 21:27:29,*root          3474 0.0 0.9 1704 604 ttyS0          S+ 21:25 0:00 grep
root/bin
```