

Tech Notes

LT-1000 NRU Configuration of Adaptive Calibration

This tech notes describes how to configure a LT-1000 NRU for Adaptive calibration mode. It is expected that the LT-1000 NRU is installed and fasten as described in the LT-1000 User & Installation Manual. In order to configure the LT-1000 NRU to the Adaptive calibration mode, the LT-Service Tool is required. The LT-1000 NRU is from factory configured to Standard calibration mode, which is the Figure 8-pattern calibration. The LT-1000 NRU will output a 5 degrees heading resolution, until deviation calibration has been performed.

Required Documentation

95-100178 LT-1000 User & Installation Manual Rev. 1.00

Please note; rev. 1.00 does not include information about the Adaptive calibration mode.

Required Hardware

Personal Computer or Laptop (Windows), USB to Serial Adapter (RS-422)

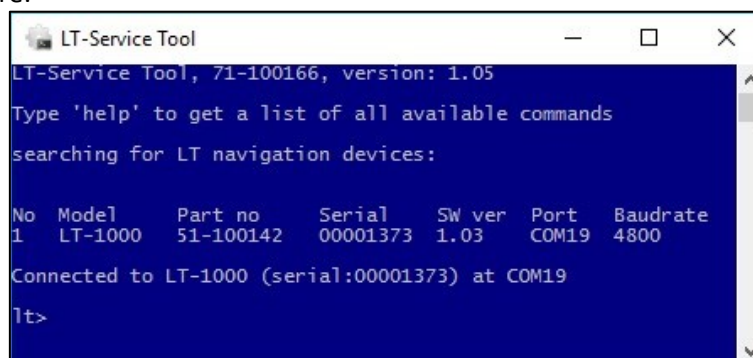
Required Minimum Software Version

LT-1000 NRU: v1.02 or newer

LT-Service Tool: v1.05

Instructions

- 1) Connect the PC to the LT-1000 NRU as described in the LT-1000 User & Installation Manual, see *Connecting LT-Service Tool* on page 25.
- 2) Start the LT-Service Tool by double-click on the file: LT-Service_v1.05.exe. You will now see the following picture:



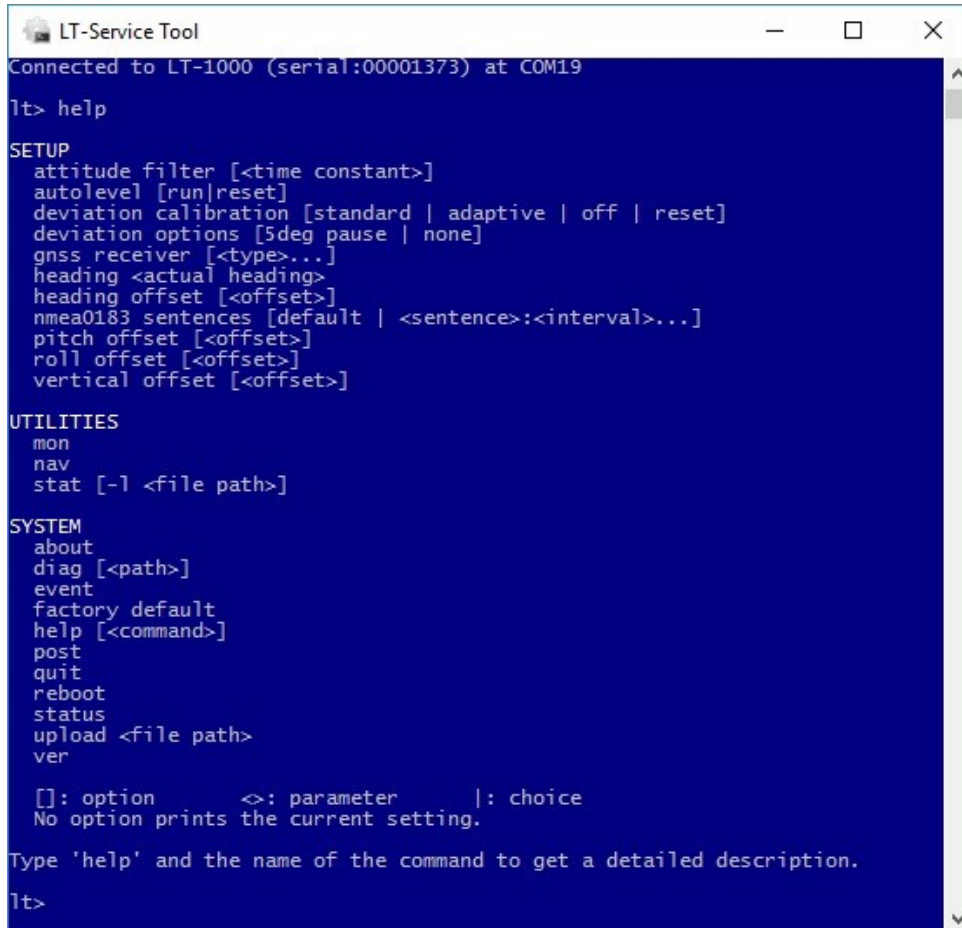
```
LT-Service Tool
LT-Service Tool, 71-100166, version: 1.05
Type 'help' to get a list of all available commands
searching for LT navigation devices:

No  Model  Part no  Serial  SW ver  Port  Baudrate
1   LT-1000  51-100142  00001373  1.03  COM19  4800

Connected to LT-1000 (serial:00001373) at COM19
lt>
```

Figure 1: LT-Service Tool v1.05 connected to a LT-1000 NRU with 4800 baud.

- 3) If you type 'help' in the command shell you will get a complete list of available commands in the LT-Service Tool. To get detailed information for the specific command, type 'help' in front of the command (e.g. lt>help attitude filter).



```
LT-Service Tool
Connected to LT-1000 (serial:00001373) at COM19
lt> help

SETUP
attitude filter [<time constant>]
autolevel [run|reset]
deviation calibration [standard | adaptive | off | reset]
deviation options [5deg pause | none]
gnss receiver [<type>...]
heading <actual heading>
heading offset [<offset>]
nmea0183 sentences [default | <sentence>:<interval>...]
pitch offset [<offset>]
roll offset [<offset>]
vertical offset [<offset>]

UTILITIES
mon
nav
stat [-l <file path>]

SYSTEM
about
diag [<path>]
event
factory default
help [<command>]
post
quit
reboot
status
upload <file path>
ver

[]: option      <>: parameter      |: choice
No option prints the current setting.

Type 'help' and the name of the command to get a detailed description.
lt>
```

Figure 2: Illustration of the 'help' command.

- 4) For the best possible deviation calibration results, the roll and pitch mounting offset must be made known to the LT-1000 NRU. After the LT-1000 NRU has been fasten, execute the following command:

lt>autolevel run

Use the 'nav' command to verify that the LT-1000 NRU has been levelled to zero (roll/pitch) for optimal performance. Below two pictures are illustrating the effect of the 'autolevel' function.

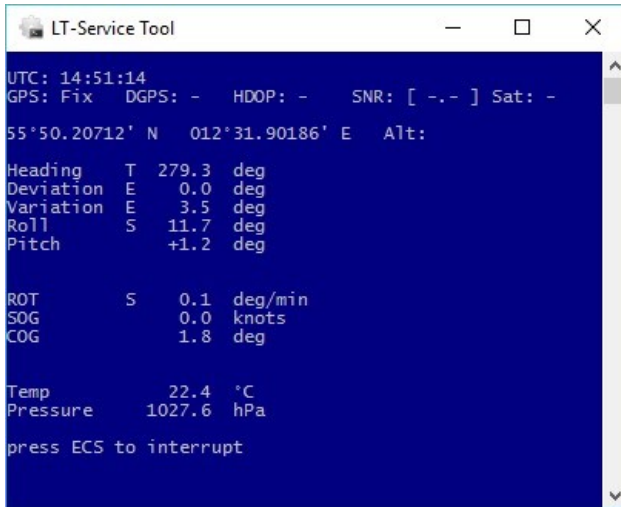


Figure 4: Before applying the 'autolevel' function.

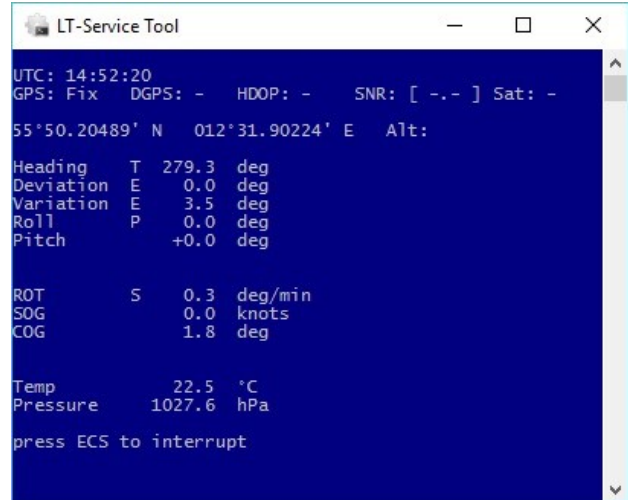


Figure 3: After applying the 'autolevel' function.

- 5) The 'status' command can be used to check the current configuration of the LT-1000 NRU, including the compensated offsets values from the 'autolevel' function.

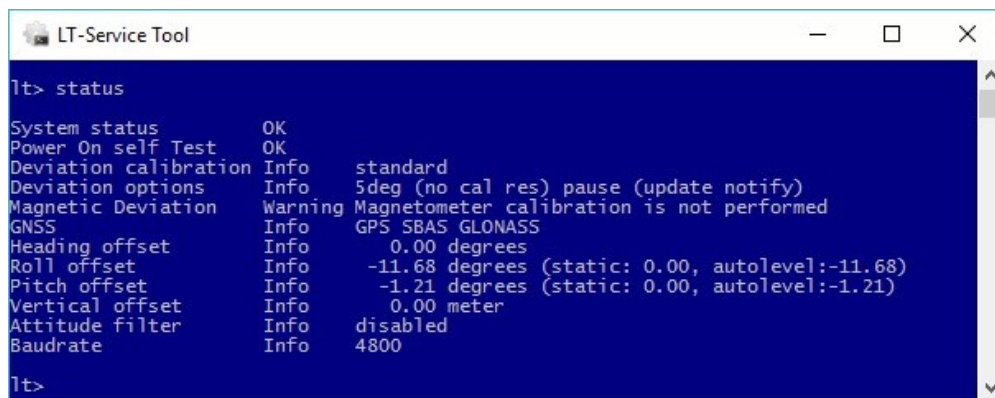


Figure 5: Roll and pitch offset values calculated by the 'autolevel' function.

- 6) The calibration mode is set to Adaptive with the following command (remember reboot):

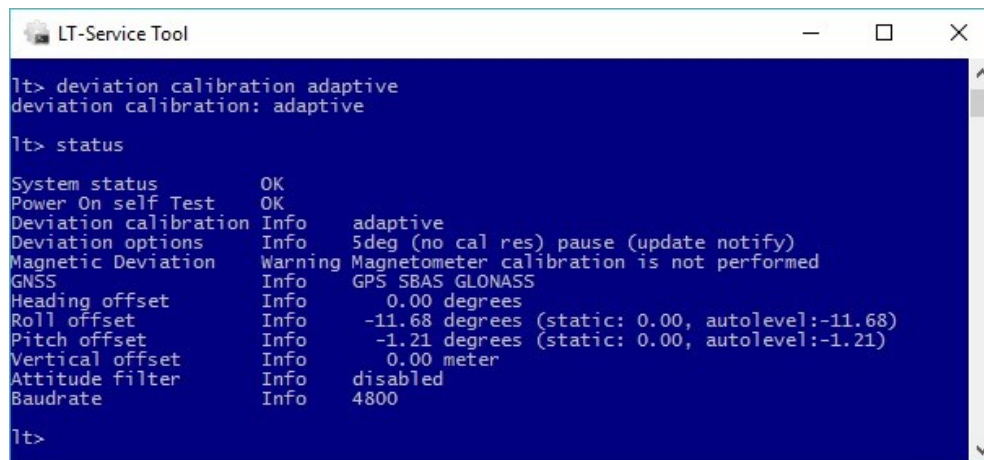
```
lt>deviation calibration adaptive
```

and

```
lt>reboot
```

Type the following command to verify correct read-back of the Adaptive configuration mode:

```
lt>status
```



```

LT-Service Tool
lt> deviation calibration adaptive
deviation calibration: adaptive

lt> status

System status      OK
Power On self Test OK
Deviation calibration Info    adaptive
Deviation options  Info    5deg (no cal res) pause (update notify)
Magnetic Deviation Warning  Magnetometer calibration is not performed
GNSS               Info    GPS SBAS GLONASS
Heading offset     Info    0.00 degrees
Roll offset        Info    -11.68 degrees (static: 0.00, autolevel:-11.68)
Pitch offset       Info    -1.21 degrees (static: 0.00, autolevel:-1.21)
Vertical offset    Info    0.00 meter
Attitude filter    Info    disabled
Baudrate          Info    4800

lt>

```

Figure 6: Configuration of the 'Adaptive' deviation calibration mode

- 7) When in Adaptive calibration mode, data is only collected if the ship has maintained a speed of minimum 3 KTS for the last 0.5 NM.

If the speed drops below 3 KTS, data collection is paused until the vessel has maintained a speed of minimum 3 KTS for the last 0.5 NM.

NOTE: *The LT-1000 NRU will output heading data with a resolution of 5 degrees until the LT-1000 NRU has collected enough data points to calculate the first deviation. Hereafter, the heading data resolution will be 0.1 degrees.*

NOTE: *An initial Adaptive deviation calibration can be forced by completing a 360° circle at low speed (3 to 20 KTS) and low rate-of-turn (< 2°/s).*

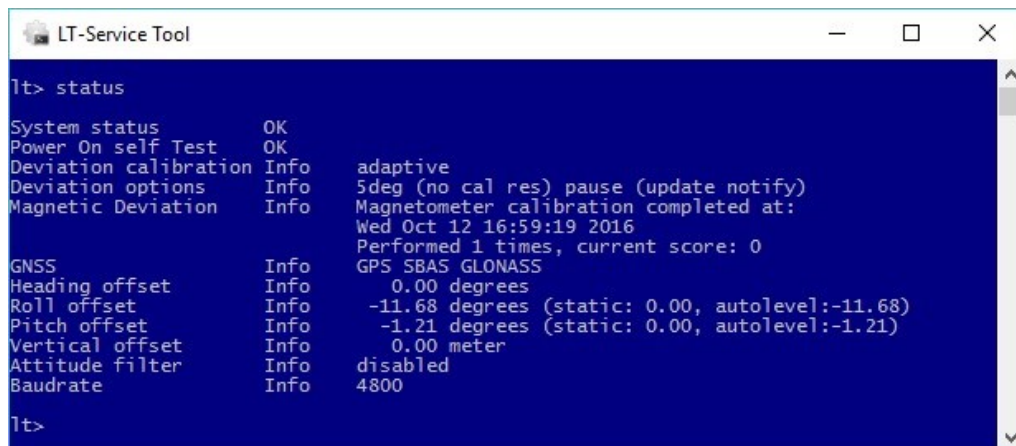
The Adaptive deviation calibration algorithm will continuously collect data and improve the deviation calibration. The user will not be affected/noticed by an update to the deviation calibration in Adaptive calibration mode.

IMPORTANT: If the LT-1000 NRU is physically moved or rotated, it is required to perform a new autolevel and deviation calibration. If configured to Adaptive mode, the deviation calibration should first be reset. Repeat step 4 to step 8.

- 8) The LT-1000 NRU will output full heading resolution, 0.1 degrees, after the first successful deviation calibration has been calculated. Check the chart-plotter, multifunction display, autopilot or other instrument for successful calibration.

Alternatively, connect the LT-Service Tool to check for a successful Adaptive deviation calibration. The 'Status' command can be used for this verification:

lt>status



```

lt> status
System status      OK
Power On self Test OK
Deviation calibration Info    adaptive
Deviation options  Info    5deg (no cal res) pause (update notify)
Magnetic Deviation Info    Magnetometer calibration completed at:
                                   Wed Oct 12 16:59:19 2016
                                   Performed 1 times, current score: 0
GNSS                Info    GPS SBAS GLONASS
Heading offset      Info    0.00 degrees
Roll offset         Info    -11.68 degrees (static: 0.00, autolevel:-11.68)
Pitch offset        Info    -1.21 degrees (static: 0.00, autolevel:-1.21)
Vertical offset     Info    0.00 meter
Attitude filter     Info    disabled
Baudrate           Info    4800
lt>

```

Figure 7: Verify a successful Adaptive deviation calibration.

Info: Magnetometer calibration completed at: Wed Oct 12 16:59:19 2016

Performed 1 times, current score: X

- 9) It is possible to disable the Adaptive deviation calibration mode, if subsequent deviation calibration updates are unwanted. Use the following command to disable the deviation calibration (remember reboot):

```
lt>deviation calibration off
```

and

```
lt>reboot
```

- 10) If the LT-1000 NRU is misaligned with respect to the bow, it is possible to insert a heading offset. The heading offset can be adjusted any time, without affecting the calculated deviation calibration.

```
lt>heading <actual heading>
```

Additional configuration options are available, but will not be described in details in this tech notes. Please contact your local distributor or dealer before making contact to Lars Thrane A/S.