

Command line guide

Low power mobile data logger

ThingsLog LPMDL-110X Data logger

Version 4.9.6

© iTransformers Labs Ltd
11 Magnaurska shkola str., fl. 3, office 315 (Hightech Business Park, BIC IZOT),
1784, Sofia, Bulgaria

Phone (+359) 875 32 80 70• Email: info@thingslog.com

Table of Contents

1 Document History	4
2 Access to CLI console port	4
3 Base service mode	5
3.1 Enter in Base service mode	5
3.2 Store configuration	5
3.3 Load configuration	5
3.4 Get the device number	5
3.5 Get the firmware version	6
3.6 Get date	6
3.7 Set date	6
3.8 Get the current initial config	6
3.8.1 Description of configuration parameters	7
3.9 Set initial config	8
4 Setting up network identifiers	9
4.1 Setting and troubleshooting GPRS service mode options	10
4.1.1 Set collecting server address and port	10
4.1.2 Get collecting server address and port	10
4.2 Set APN (version =< 4.9.5)	11
4.2.1 Set APN, APN USER, APN PASSWORD (version >= 4.9.6)	11
4.3 Set network attachment timeout	12
4.3.1 Get network attachment timeout	12
4.3.2 Set server address and port	13
4.3.3 Get server address and port	13
4.3.4 Set preferred network operator	13
4.9.3 Get the preferred network operator	14
4.9.4 Set preferred network type	14
4.9.5 Get the preferred network type	14
5 Testing analog sensors	15
5.1 Bootstrap analog sensors	15
5.2 Init analog sensors	15
5.3 Read analog sensor value	16
5.4 Finalize analog sensors	16
5.5 Initialize, Read and Finalize Analog Sensors	16
5.6 ADC DUMP	17
5.6 Setup analog sensor settling time	17

5.7 Setup alarm triggering time	18
5.7 Set ADC mode	18

1 Document History

Version	Description
1.0	Initial version of the document
2.0	Added "Testing Analog Sensors" section

2 Access to CLI console port

To access the command line interface you have to connect with an USBtoTTL cable to the logger console (UART) port.

To access the console port you have to connect to the 3 pins to the right of the input ports (in blue).

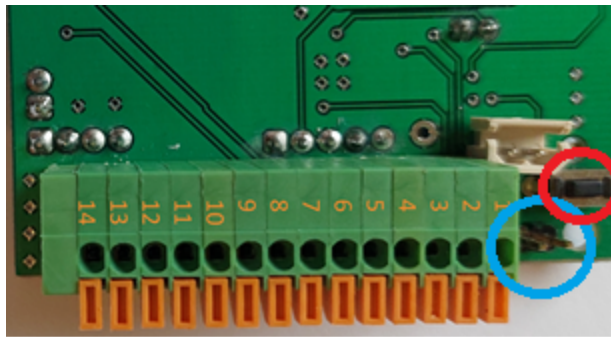


Figure 2 UART & service mode pins in LPMDL-110X

To put the device into service mode you need to press the button (red circle).

Console pins are left to right TXD RXD GND. If you are using ThingsLog console cable

- Black is GND
- Green is RXD
- White is TXD

Note: RX on the cable must be connected to TX on the board and RX on the cable must be connected with TX on the board.

3 Base service mode

There are different commands that can be used to configure the GPRS device when it is in service mode. In order to do this configuration it is necessary to put the device in service mode using the service button.

3.1 Enter in Base service mode

1. Connect to the debug UART port using baud rate 57600
2. Press the service button
3. Verify that the following message appears in UART console: "service # ". This indicates that the device is in the base service mode

Example

```
service #
```

3.2 Store configuration

1. Verify you are in base service mode - the prompt is "service # "
2. Execute "store" command to save the configurations
3. Verify "service # " prompt appears

Example:

```
service # store
service #
```

3.3 Load configuration

1. Verify you are in base service mode - the prompt is "service # "
2. Execute `load` command to load the configurations
3. Verify "service # " prompt appears

Example:

```
service # load
service #
```

3.4 Get the device number

1. Verify you are in base service mode - the prompt is "service # "
2. Execute `number` command to get the device number
3. Verify "number=00000001" hex device number appears

Example:

```
service # number
```

```
number=00000001
service #
```

3.5 Get the firmware version

1. Verify you are in base service mode - the prompt is "service # "
2. Execute `version` command to get the firmware version
3. Verify "version=<some_version>" appear

Example:

```
service # version
version=0x0604bbc1
service #
```

3.6 Get date

1. Verify you are in base service mode - the prompt is "service # "
2. Execute `date` command to get the current date
3. Verify "date=<some_date>" appear

Example:

```
service # date
date=2017-04-01 12:40:00
service #
```

3.7 Set date

1. Verify you are in base service mode - the prompt is "service # "
2. Execute `set_d` command to set the device number
3. Verify "date=" prompt appear
4. Enter the new date in format YYYY-MM-dd HH:mm:ss
5. Verify "done" appears

Example:

```
service # set_d
Date=2017-04-01 12:40:00
Done
service #
```

3.8 Get the current initial config

1. Verify you are in base service mode - the prompt is "service # "
2. Get the current config by executing `configure`.

Example:

```

*** Config ***
2018-09-03 12:03:04
-----
digits1=8
digits2=8
count_init1=1
count_init2=1
record_period=0
every=1
counts_threshold=300
sensors=01: CNT1
-----

```

3.8.1 Description of configuration parameters

Name	Default Value	Possible values	Description
digits1	8	<ul style="list-style-type: none"> Min value: 1 Max value: 9 	Total number of countable digits on the display of the meter for the first pulse input
digits2	8	<ul style="list-style-type: none"> Min value: 1 Max value: 9 	Total number of countable digits on the display of the meter for the second pulse input
count_init1	1	Max value depends on the digits1 value	The value of the meter display of the first pulse input
count_init2	1	Max value depends on the digits1 value	The value of the meter display of the second pulse input
record_period	0	<ul style="list-style-type: none"> 0 – MINUTES 1 – HOURS 	The value of the record period 0 mean minutes
every	1	<ul style="list-style-type: none"> Min value: 1 Max value: 127 	The value in record period (1 - every 1 minute)
counts_threshold	300	<ul style="list-style-type: none"> Min value: 1 Max value: 256 	How many counters to keep in memory
sensors	01	Mask of 12 bits 0000000000000000 <ul style="list-style-type: none"> 0 bit – Pulse sensor 1 1 bit – Pulse sensor 2 2 bit – analog sensor 1 3 bit – analog sensor 2 4 bit – On/Off sensor 1 5 bit – On/Off sensor 2 	Which input is active, 01 means the first pulse input

		<ul style="list-style-type: none"> • 6 bit on/off output 1 • 7 bit on/off output 2 • 8 bit analog 3 • 9 bit analog 4 • 10 bit SEN5 – i2c sensor 1 • 11 bit SEN6 – i2c sensor 2 • 12 bit SEN7 – i2c sensor 3 • 13 bit SEN8 – i2c sensor 4 • 14 bit – future use • 16 bit – future use <p>For example, if you want to enable first pulse input, first analog and i2c sensor 1 and 2 that would resolve in:</p> <p>0000 1100 0000 0101</p> <p>Counting right to left (big endian stype):</p> <p>0101 – first pulse and first analog 0000 – no on/offs are enabled 1100 – first 2 i2c are enabled 0000 - nothing else is enabled</p> <p>So you have to set in set sensors: 0xC05 Hexadecimal number equal to the binary above!!!</p>	
--	--	---	--

3.9 Set initial config

1. Verify you are in base service mode - the prompt is "service # "
2. Execute `set_conf` and enter the configuration menu

```

service # set_conf
config # help
commands:
  help
  set_count_init1
  set_count_init2
  set_digits1
  set_digits2
  set_rec_period
  set_every

```



```
set_counts_threshold
set_sensors
save
exit
```

3. Set record reading frequency. Execute `set_every`

```
config # set_every
set_every= 3
```

4. Enable sensor input port

```
config # set_sensors
sensors= 1
```

5. Set counts threshold (the number of counters to be gathered prior the transmission attempt). Execute `set_counts_threshold` If the transmission is successful all counters will be deleted from memory. If the transmission fails counters will be kept in memory and will be re-transmitted on the next attempt. If memory gets full the oldest counters will be deleted first.

```
config # set_counts_threshold
counts_threshold= 100
```

6. Set counter value. Has to be set all meaningful digits up to the magnet pointer. Execute `set_count_init1` for the first input and `set_count_init2` for the second.

```
config # set_count_init1
count_init1= 123
config # set_count_init2
count_init2= 234
```

7. Save and apply the configuration.

Execute `save`

```
config # save
Save config
Applying config
Config Counters
rec_conf, size=102, rec_size=2, buff_size=206
Alarm enabled
service #
```

4 Setting up network identifiers

The logger could have different modem options: 2G, LoRa or NB-IoT.

4.1 Setting and troubleshooting GPRS service mode options

That section is valid for LPMDL-1101, LPMDL-1102, LPMDL-1104 and LPMDL-1106 data loggers.

4.1.1 Set collecting server address and port

GSM data loggers are using by default TCP communication on port 4444.

1. Verify you are in `gprs_service` mode - the prompt is "`gprs_service #` "
2. Execute command `set_addr_port`
3. Verify "address=" prompt appear
4. Enter the new server address and press enter
5. Verify "port=" prompt appears
6. Enter the new server port and press enter
7. Execute `resolveIp` to set DNS name resolution 8 Verify that `resolveIp=` appears. Set it 1 to resolve the address by DNS or 0 to disable resolving (the address should be an IP address).
8. Verify "done" appears

Example:

```
service # extension
gprs_service # set_addr_port
address=10.10.10.10
port=4444
resolve_ip=1
done
gprs_service #
```

4.1.2 Get collecting server address and port

1. Verify you are in `gprs_service` mode - the prompt is "`gprs_service #` "
2. Execute command `get_addr_port`
3. Verify "address=<some_ip>" appear
4. Verify "port=<some_port>" appear

Example:

```
service # extension
gprs_service # get_addr_port
address=10.10.10.10
port=4444
done
gprs_service #
```

4.2 Set APN (version =< 4.9.5)

1. Execute command `set_apn`
2. Verify "apn=" prompt appears
3. Enter the new APN and press enter
4. Verify "done" appears

Example:

```
service # extension
gprs_service # set_apn
apn=some.operator.apn
done
gprs_service #
```

- Get APN

1. Execute command `get_apn`
2. Verify "apn=some.operator.apn" appear

Example:

```
service # extension
gprs_service # get_apn
apn=some.operator.apn
done
gprs_service #
```

4.2.1 Set APN, APN USER, APN PASSWORD (version >= 4.9.6)

1. Execute command `set_apn`
2. Verify "apn=" prompt appears
3. Enter the new APN and press enter
4. Verify "apn_user=" prompt appears
5. Enter the new APN USER and press enter
6. Verify "apn_pass=" prompt appears
7. Enter the new APN PASSWORD and press enter
8. Verify "done" appears

Example:

```
service # extension
gprs_service # set_apn
apn=some.operator.apn
apn_user=some_username
apn_pass=some_password
done
```

- Get APN
 1. Execute command `get_apn`
 2. Verify "`apn=some.operator.apn`" appear
 3. Verify "`user=apn_user=some_username`" appear
 4. Verify "`password=apn_user=some_password`" appear

Example:

```
gprs_service # get_apn
apn=some.operator.apn
user=some_username
password=some_password
done
gprs_service #
```

4.3 Set network attachment timeout

Network attachment delay is the time for which the logger will wait to be recognized and paged by the mobile network.

3. Navigate to extension mode
4. Execute command `set_net_att_delay`
5. Verify "`net_att_delay=some.delay`" appears.
6. Enter the delay value in milliseconds (default is 35000 ms) e.g 35 seconds.
7. Don't forget to store the configuration

Example:

```
service # extension
gprs_service # set_net_att_delay
net_att_delay=some.delay
done
gprs_service #
```

4.3.1 Get network attachment timeout

1. Navigate to extension mode
2. Execute command `get_net_att_delay`
3. Verify "`net_att_delay=some.delay in ms`" appears

Example:

```
service # extension
nbmodem_service # get_net_att_delay
net_att_delay=35000
done
```

4.3.2 Set server address and port

1. Verify you are in `gprs_service` mode - the prompt is "`gpr_service #` "
2. Execute command `set_addr_port`
3. Verify "address=" prompt appear
4. Enter the new server address and press enter
5. Verify "port=" prompt appears
6. Enter the new server port and press enter
7. Execute `resolveIp` to set DNS name resolution 8 Verify that `resolveIp=` appears. Set it 1 to resolve the address by DNS or 0 to disable resolving (the address should be an IP address).
8. Verify "done" appears

Example:

```
service # extension
gprs_service # set_addr_port
address=10.10.10.10
port=4445
resolve_ip=1
done
gprs_service #
```

4.3.3 Get server address and port

1. Verify you are in `gprs_service` mode - the prompt is "`gpr_service #` "
2. Execute command `get_addr_port`
3. Verify "address=<some_ip>" appear
4. Verify "port=<some_port>" appear

Example:

```
service # extension
gprs_service # get_addr_port
address=10.10.10.10
port=4445
done
gprs_service #
```

4.3.4 Set preferred network operator

Set `mcc_mnc`

You may get the MCC (Mobile Country Code) and the MNC (Mobile Network Code) from

<https://mcc-mnc.com/>

Setting them will make your modem attach preferably in that network.

Example:

```
service # modem
nbmodem_service # set_mcc_mnc
mccmnc=28403
nbmodem_service # exit
```

4.9.3 Get the preferred network operator

1. Navigate to modem
2. Execute command `get_mcc_mnc`
3. Verify "`mccmnc=some.mccmnc`" appears

Example:

```
gprs_service # get_mcc_mnc
mccmnc=28403
done
gprs_service # exit
```

4.9.4 Set preferred network type

Network attachment delay is the time for which the logger will wait to be recognized and paged by the mobile network.

1. Navigate to extension mode
2. Execute command `set_preferred_network`
3. Verify "`type=`" appears.
1. Enter the value 0 - GSM, 7 - 4G, 8 - CAT-M1, 9 NB-IoT.

NOTE: preferred network type could be used only if the preferred network operator is selected and there is a set MCC_MNC in the device!!!!

Example:

```
service # extension
gprs_service # set_preferred_network
type=some.type
done
gprs_service #
```

4.9.5 Get the preferred network type

4. Navigate to extension mode
5. Execute command `get_preferred_network`
6. Verify "`type=some.type`" appears (type = 0 - GSM, 7 - 4G, 8 - CAT-M1, 9 NB-IoT)

Example:

```
service # extension
gprs_service # get_preferred_network
type=9
done
```

Note preferred network type works only if the preferred network operator is set.

5 Testing analog sensors

The ability to test analog sensors while the logger is in service mode has been introduced since firmware version 4.2.0 or any firmware version with the following feature NAU7802.

5.1 Bootstrap analog sensors

This command does the first time initialization of the analog sensor. The same command is executed by the device when it is powered for the first time.

1. Verify you are in base service mode - the prompt is "service # "
2. Execute `adc_bootstrap` command to initialize the sensor

Example:

```
service # adc_bootstrap
service #
```

The action and the output of this command depends on the concrete firmware modification of the logger.

5.2 Init analog sensors

This command does the initialization of the analog sensors. The same command is executed by the device when it wakes up on every record period to collect data from the analog sensors (See [Set initial config](#) the commands: `set_every`, `set_record_period`). In case of non-low power sensor, this command will also set the external power supply pin to a high value..

Note that after the analog sensor is initialized the logger will wait a predefined period of time, specified by the `set_adc_read_time` command (see [Setup analog sensor settling time](#)), before being able to read any data from the sensors. It is important to set the correct `adc_read_time` which is bigger than the settling time of the sensors.

1. Verify you are in base service mode - the prompt is "service # "
2. Execute `adc_init` command to initialize the sensor

Example:

```
service # adc_init
service #
```

The action and the output of this command depend on the concrete firmware modification of the logger.

5.3 Read analog sensor value

This command reads data from the analog sensor. The same command is executed by the device when it wakes up on every record period to collect data from the analog sensors after it is initialized.

3. Verify you are in base service mode - the prompt is "service # "
4. Execute `adc_read_val` command to read a value from the analog sensor

Example:

```
service # adc_read_val
sensor_index=
```

5. Enter the sensor index number. Note that for NAU7802 this step is missing. The sensor index is automatically selected by the firmware.

```
service #
```

The output of this command, showing the value read from the sensor, depends on the concrete firmware modification of the logger.

5.4 Finalize analog sensors

This command does some tear-down actions on the analog sensors before the logger goes to sleep mode. The same command is executed by the device after it wakes up, initializes the sensors, and reads the analog sensor's values. For non-low power sensors, this command will also set the external power supply pin to low value.

1. Verify you are in base service mode - the prompt is "service # "
2. Execute the `adc_finalize` command to initialize the sensor

Example:

```
service # adc_finalize
service #
```

5.5 Initialize, Read and Finalize Analog Sensors

This command internally does in sequence `adc_init`, `adc_read_val`, `adc_finalize`. The same command is executed by the device after it wakes up in order to read and record the readings from the sensors.

1. Verify you are in base service mode - the prompt is "service # "
2. Execute `adc_read` command to read a value from the analog sensor

Example:

```
service # adc_read
sensor_index=
```

3. Enter the sensor index number. Note that for NAU7802 this step is missing. The sensor index is automatically selected by the firmware.

```
service #
```

The output of this command, showing the value read from the sensor, depends on the concrete firmware modification of the logger.

5.6 ADC DUMP

Dump the current values of all ADC and i2c sensors. Used for debug purposes.

Example:

```
service # adc_dump
[2023-11-20 12:52:52.178] service # adc_dump
```

```
Thermocouple t 389 24.31°C 75.76°F
```

```
Ambient t 408 25.50°C 77.90°F
```

```
MCP registers: 01 FF CF 00 82 00
```

5.6 Setup analog sensor settling time

Analog sensor values are obtained by 16 bit Analog to digital converter (ADC). ADC reading time is a parameter that is valid only if you have a logger with analog ports. It should be equal or bigger than the analog sensor settling time. Settling time is the time required by the sensor placed in its particular environment to produce a correct measurement and output it on its analog port. The adc reading time is in ms. Sensors suitable for low-power measurements have short adc read times (10-50ms). Setting ADC reading time to 0 means that the logger will not switch off the power supply to the sensor and will not measure its values in low power mode. This is the ideal mode for sensors on power.

1. Execute command `set_adc_read_time`
2. Verify "adc_read_time=" appears

```
ST=2018-09-03 11:50:56
WKUP 2018-09-03 11:50:56
Service mode triggered
Service
Type help for help
service # adc_read_time
adc_read_time: 400
service # set_adc_read_time
adc_read_time=2000
Done
service # adc_read_time
adc_read_time: 2000
service #
```

Note: The default ADC read time for LPMDL-110X is 50 ms. If you want to disable the logger to switch on/off the power supply of the logger you have to set the ADC read time to 0.

5.7 Setup alarm triggering time

This parameter sets the time the alarm needs to be triggered in order to initialize and send an alarm signal. The range of the parameter is from 500 to 30000, which is a number in milliseconds. The default value is 500ms (0,5 seconds) and the maximum value is 30000ms (30 seconds).

1. Execute command `set_on_off_debounce_time`
2. Verify that you set the desired value by using `on_off_debounce_time`

5.7 Set ADC mode

ADC can work in single-ended or differential modes:

Single-ended mode ADC(default) (pin 14, pin 13, pin 12 and pin 11)

```
service # set_adc_mode=1
```

```
Done
```

Differential mode ADC (pin13-pin14 and pin11-pin12)

```
service # set_adc_mode=0
```

```
Done
```

Get ADC mode:

```
service # get_adc_mode
```

```
adc mode: 0
```

6. Setup MQTT transmission parameters

If you have an MQTT data logger you can use `set_addr_port` to configure the address port to which the logger has to send data.

The username, password, and the main topic to which the data will be sent could be configured/verified as follows:

If your data logger has MQTT parameters

Note: MQTT is available only in loggers with MQTT firmware!!!

To configure the mqtt username

1. Navigate to extension mode
2. Execute command `set_mqtt`
3. Verify that the username/password and root topic prompts appear.
4. All strings parameters be < 10 symbols in length

```
service # extension
nbmodem_service #set_mqtt
username=mqtt_user
password=mqtt_pass
root_topic=mqtt_topic
```

GET MQTT parameters

1. Navigate to extension mode
2. Execute command `get_mqtt`

```
service # extension
nbmodem_service #get_mqtt
username=mqtt_user
password=mqtt_pass
root_topic=mqtt_topic
```