

MLink Evaluation Kit Instruction Guide

Rev 5

Apr 2018



Thank you for selecting the MLink evaluation kit!

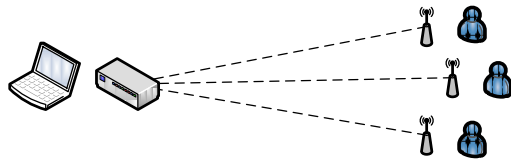
MLink is an energy-efficient, high range, scalable network solution.

The **Getting Started** section below will provide instruction to set up a link between a base and two endpoints. The **Extending The Network** section, beginning on page 7, will provide similar instructions for extending the network using the network extender.

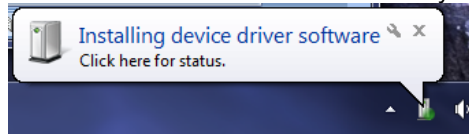
More features and functions can be found in the *MLink Modem Interface Control* document.

Getting Started

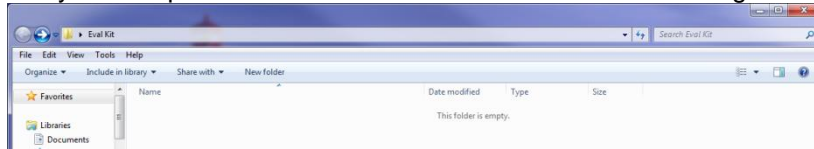
1. Verify you have:
 - a. one base,
 - b. two endpoints,
 - c. spare batteries (AA and D),
 - d. a USB serial cable, and
 - e. a USB memory stick.



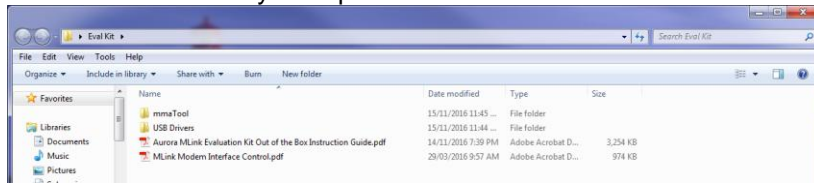
2. Plug in the USB cable between your computer and the base. If needed, follow the prompts to install the driver. Required drivers can also be found on the USB memory stick.



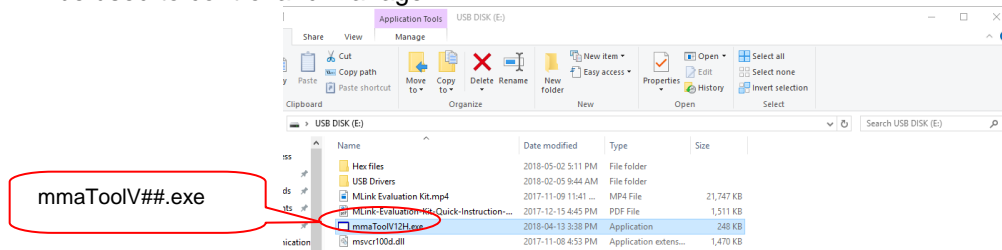
3. Create a folder on your computer to store the Evaluation Kit Software and log files.



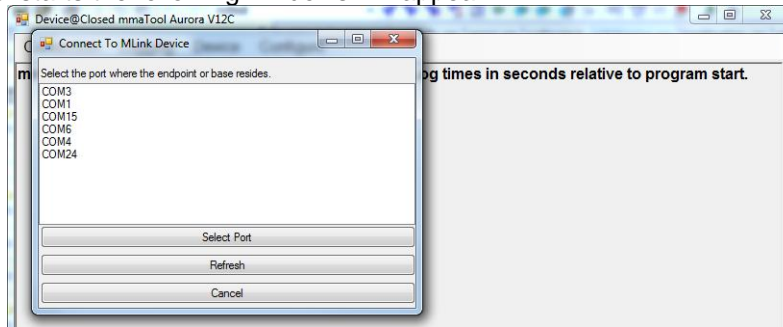
4. Copy the files from the USB memory stick provided with the MLink Evaluation Kit to this directory.



5. Select and open the **mmaTool** directory where you will find the **mmaToolV##.exe** program which will be used to control and manage MLink.

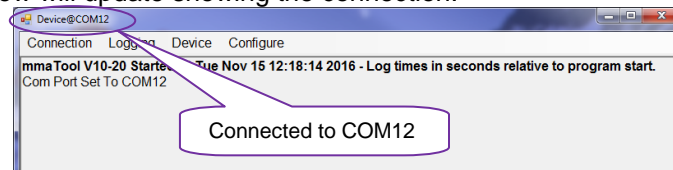


6. Select and run the **mmaToolV##.exe** program.
7. When mmaTool starts the following windows will appear:

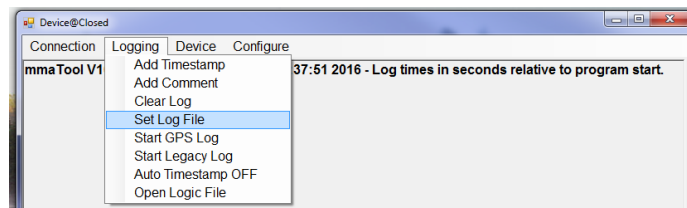


Tip: You can get to this screen again by clicking: *Connection > New.*

8. Select the COM port where MLink is connected. To determine the correct port, unplug the MLink USB cable and click **Refresh**. Then plug the cable back in and hit **Refresh** again. The correct COM port will disappear and reappear on the list. Once you have selected the correct COM port, click **Select Port**.
9. The mmaTool window will update showing the connection.

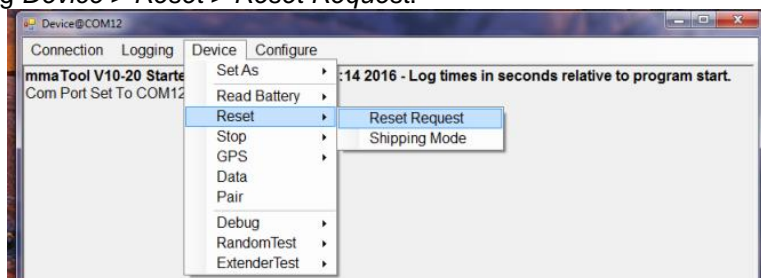


10. **[Optional]** A log file can be created by clicking *Logging > Set Log File*.

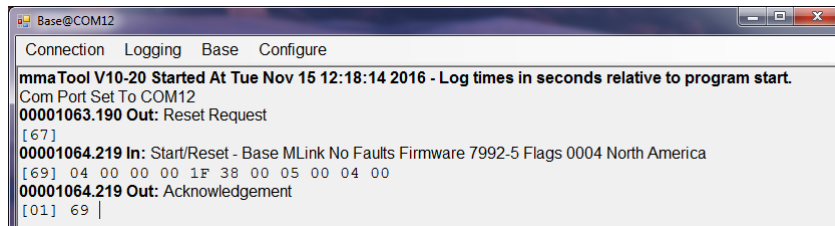


Type a filename for the log file. Once set up, the log file will update automatically as you interact with MLink. You can open it in any text editor to get your full history.

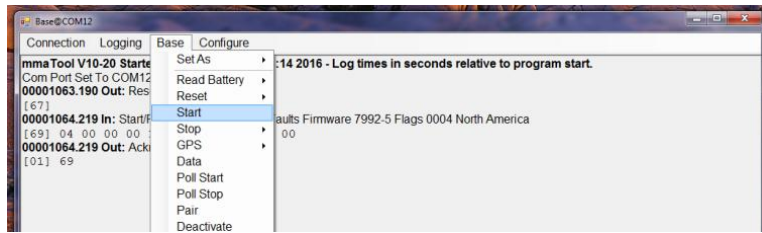
11. Reset the unit by either:
 - a. pressing the *Reset* button on the MLink hardware, or
 - b. selecting *Device > Reset > Reset Request*.



If everything is set up properly, you will see a *Start/Reset* message appear and the *Device* menu will change to *Base*. The *Start/Reset* message comes from MLink any time the unit starts or restarts. The *MLink Modem Interface Control* document has a full list of information included in this message.



12. Use *Base > Start* to start the MLink base.



A pop up window will appear with default settings:

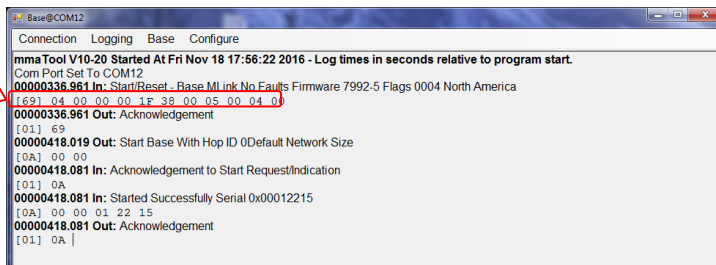
Hop ID 0 and default Network Size are the recommended settings.

Press the *Issue Start Request* button to start the Base.

It is recommended to leave all settings as default.

A message will appear to indicate that the base radio has started up.

Note: Raw message bytes (in hexadecimal) are provided. The number in square brackets is the message ID. A full description of all the messages can be found in the *MLink Modem Interface Control* document.



Note:
The Green LED will blink when the Base is turned on or reset.

The Red LED blinks each time Base transmits.

13. Turn on the endpoint. If the unit has not been recently run, it may take 10 to 20 seconds to charge up. The Red LED should flash rapidly for a few seconds as the endpoint and base synchronize. A few attempts may be required. Once successfully synchronized, a message will appear to indicate that the endpoint has joined.

Note:
The red LED blinks each time the endpoint transmits.

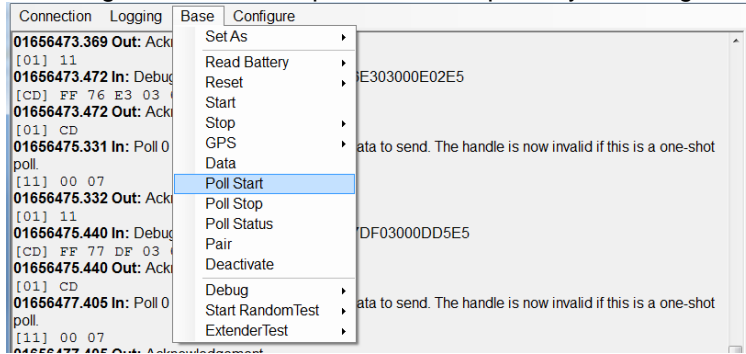
On the Endpoint, the green LED goes on for 1 second when a poll message is received.



Activation started by Endpoint with serial number 11DE0 and RSSI of -16 dBm. The Base has provisional assigned an Endpoint address of 4.

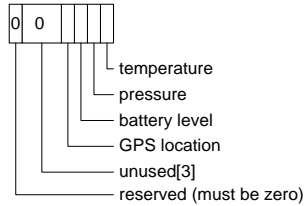
Activation was successful.

14. Once the success message occurs, start a poll on the endpoint by selecting *Base > Poll Start*.

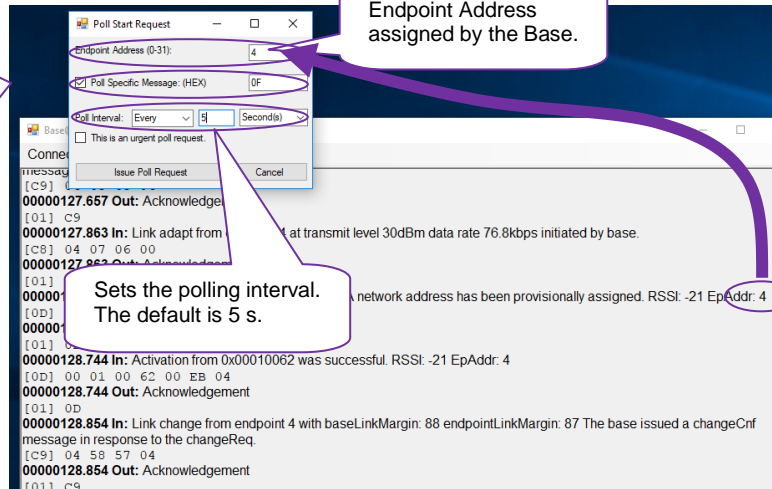


A pop up window will appear.

To poll for all fields, enter "0F". You can also enter another hexadecimal number to poll for some fields and not others.



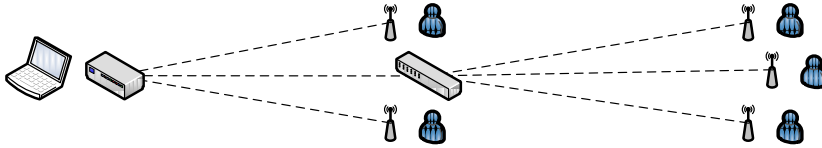
For example, "05" will poll for battery level and temperature.



Sets the polling interval. The default is 5 s.

Adding the Network Extender

The MLink network extender allows you to expand the range as well as the supported number of endpoints in the network.



Network extenders function as both a base and an endpoint, and transmit signals to and from connected endpoints at a greater distance.

1. Set up the base as per steps 1 to 12 in the *Getting Started* section. If the base is already running you can instead set up the base by selecting *Base > Reset > Reset Request* then *Base > Start*. Power off any endpoints.
2. The MLink network extender is shipped in *Shipping Mode*. To activate the network extender, the solar panel has to be connected. You may also need to shine a light on the solar panel.



Connect the solar panel

to the network extender.



Solar panel connected to network extender.



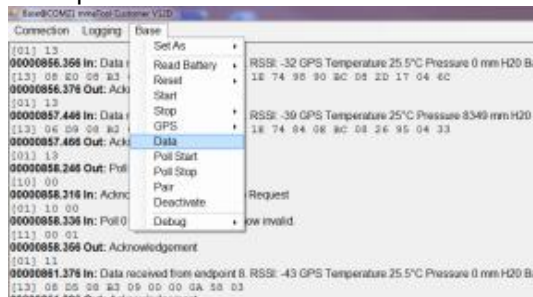
3. The network extender should wake up and activate on the base.

```
00001528.080 Out: Acknowledgement
[01] 00
00001528.170 In: Activation from 0x0011DC0 started. A network address has been provisionally assigned. RSSI: -20 Extender EpAddr: 102
[0D] 00 01 1D C0 0C EC 66
00001528.190 Out: Acknowledgement
[01] 00
00001528.390 In: Activation from 0x0011DC0 was successful. RSSI: -24 Extender EpAddr: 102
[0D] 00 01 1D C0 00 E9 66
00001528.410 Out: Acknowledgement
[01] 00
```

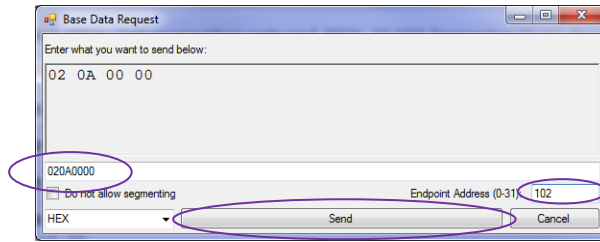
Activation started. Note the provided address.

Activation was successful.

4. Just like the base, the network extender has to be started before endpoints will be able to join it. We will do this by sending a data request over the air. Select *Base > Data*.



A pop up window will open that will allow you to send data to the network extender.

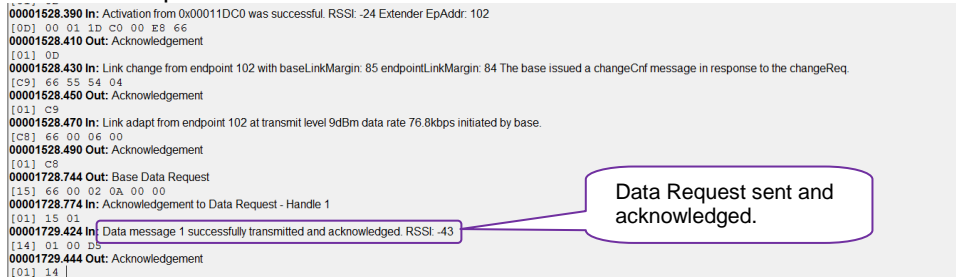


Verify that you have entered the correct network extender address, as provided when the network extender activated on the base (step 3 above). Enter the following start command:

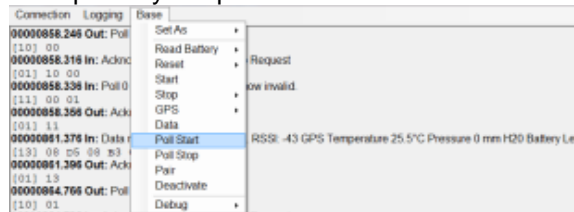
020A0000

More detail about the commands can be found in the *MLink Modem Interface Control* document.

You will see that the request is sent as shown below.

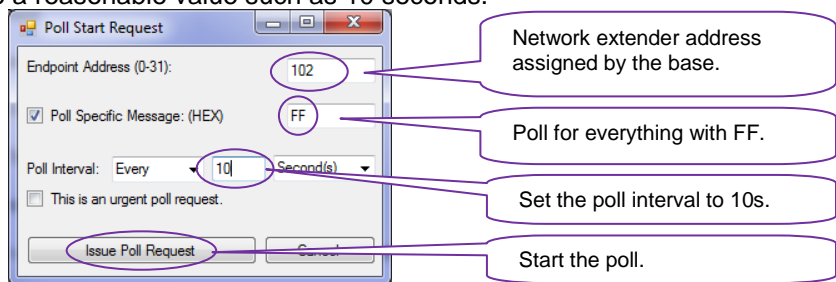


5. We also need to set up a poll so we can get data back from the network extender. This can be done in the same way as we would poll any endpoint via *Base > Poll Start*.



Verify the following in the Poll Start Request dialog:

- The network extender address is correct from the activation.
- The 'Poll Specific Message' checkbox is checked and FF is entered in the textbox. FF is used for a wildcard poll to retrieve any data.
- The poll interval is set to a reasonable value such as 10 seconds.



In the main mmaTool window, you will see the poll being started. 10 seconds later the network extender will respond. Responses will be decoded by the mmaTool.


```

[013] CB
00001728.744 Out: Base Data Request
[15] 66 00 02 0A 00 00
00001728.774 In: Acknowledgement to Data Request - Handle 1
[01] 15 01
00001729.424 In: Data message 1 successfully transmitted and acknowledged. RSSI: -43
[14] 01 00 05
00001729.444 Out: Acknowledgement
[01] 14
00001823.390 Out: Poll Start Request
[0F] 66 FF 00 00 0A
00001823.410 In: Acknowledgement to Poll Start Request - Handle 2
[01] 0F 02
00001823.440 In: Poll 2 started
[11] 02 00
00001823.460 Out: Acknowledgement
[01] 11
00001833.450 In: Data received from extender 102. RSSI: -44. 0x00011DC0: Start/Reset - Extender Endpoint MLink Faults D62B Firmware 8171-1 Flags 0004 North America, 0x00011DC0: Start/Reset - Extender Endpoint MLink Faults D62B Firmware 8171-1 Flags 0004 North America, 0x00011DC0: Start/Reset - Extender Endpoint MLink No Faults Firmware 8171-1 Flags 0004 North America, 0x00011DC0: Start/Reset - Extender Endpoint MLink No Faults Firmware 8171-1 Flags 0004 North America, 0x00011DC0: Started Successfully
Serial 0x00011321
[14] 66 04 0F 69 00 01 1D C0 05 00 D6 2B 1F EB 00 01 00 04 00 0F 69 00 01 1D C0 05 00 D6 2B 1F EB 00 01 00 04 00 0F 69 00 01 1D C0 05 00 00 1F EB 00 01 00 04 00 0F 69 00 01 1D C0 05 00 00
00001833.470 Out: Acknowledgement
[01] 14
00001863.432 In: Poll 2 failed. The endpoint had no data to send. The handle is now invalid if this is a one-shot poll.
[11] 02 07
00001863.452 Out: Acknowledgement
[01] 11
00001863.372 In: Poll 2 failed. The endpoint had no data to send. The handle is now invalid if this is a one-shot poll.
[11] 02 07
00001863.392 Out: Acknowledgement
[01] 11

```

Poll Start Request

Poll Started

Response data from the network extender. Note the Started Successfully message.

The base and network extender are still connected.

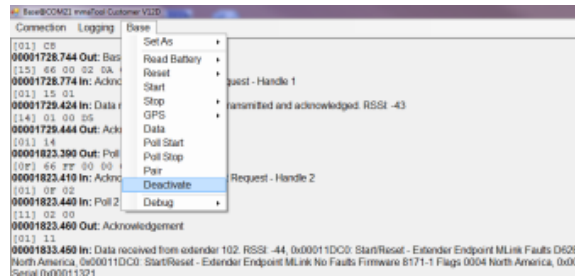
- 6. Turn on one of the endpoints. You should see a flashing light, followed by an activation message. The endpoint may either activate on the base or the network extender. If the endpoint activates on the network extender, you will see a message similar to the following and can skip step 7.

```

[16] 66 D5 07 0D 00 01 00 3E 0C F2 08 07 0D 00 01 00 3E 00 ED 08
00001943.428 In: Data received from extender 102. RSSI: -43. Activation from 0x0001003E started. A network address has been provisionally assigned. RSSI: -14 EpAddr: 8. Activation from 0x0001003E was successful. RSSI: -19 EpAddr: 8
00001943.448 Out: Acknowledgement
[01] 16

```

- 7. If the endpoint activates directly on the base, you can move it to the network extender by deactivating it. Select *Base > Deactivate*.



The following window will appear:

Endpoint Address (0-31): 8

Remove Regardless Of Response

Ignore Requests From This Endpoint

Deactivate
Cancel

Select *Ignore Requests From This Endpoint* to prevent the endpoint from joining the base.

Address assigned by the Base to the Endpoint which you want to deactivate and move to the Network Extender.

Press the **Deactivate** button to deactivate the endpoint.

- 8. The deactivated endpoint will reactivate on the network extender with an activation message similar to the following. Note the endpoint address, you will need this to set up a new poll to it.

```

Base@COM21 mmaTool Customer_V120
Connection Logging Base
[000] 00 00
00001903.456 In: Poll 2 failed. The endpoint had no data to send. The handle is now invalid if this is a one-shot poll.
[11] 02 07
00001903.476 Out: Acknowledgement
[01] 11
00001913.397 In: Poll 2 failed. The endpoint had no data to send. The handle is now invalid if this is a one-shot poll.
[11] 02 07
00001913.417 Out: Acknowledgement
[01] 11
00001923.447 In: Poll 2 failed. The endpoint had no data to send. The handle is now invalid if this is a one-shot poll.
[11] 02 07
00001923.467 Out: Acknowledgement
[01] 11
00001933.378 In: Poll 2 failed. The endpoint had no data to send. The handle is now invalid if this is a one-shot poll.
[11] 02 07
00001933.398 Out: Acknowledgement
[01] 11
00001936.648 Out: Deactivate
[08] 08 00
00001936.668 In: Acknowledgement to Deactivate Indication
[01] 0E
00001937.428 In: Deactivating endpoint 8 was successfully completed.
[08] 08 01
00001937.448 Out: Acknowledgement
[01] 0E
00001941.368 In: Activation from 0x0001003E ignored. Your endpoint is on the ignore list. RSSI: -17
[0D] 00 01 00 3E 09 EF FF
00001941.388 Out: Acknowledgement
[01] 0D
00001941.568 In: Activation from 0x0001003E ignored. Your endpoint is on the ignore list. RSSI: -17
[0D] 00 01 00 3E 09 EF FF
00001941.588 Out: Acknowledgement
[01] 0D
00001943.428 In: Data received from extender 102. RSSI: -43, Activation from 0x0001003E started. A network address has been provisionally assigned. RSSI: -14 EpAddr: 8, Activation from 0x0001003E was successful. RSSI: -19 EpAddr: 8
[16] 66 D5 07 0D 00 01 00 3E 0C F2 08 07 0D 00 01 00 3E 00 ED 08
00001943.448 Out: Acknowledgement
[01] 16
00001953.368 In: Poll 2 failed. The endpoint had no data to send. The handle is now invalid if this is a one-shot poll.
[11] 02 07
00001953.388 Out: Acknowledgement
[01] 11
00001963.409 In: Poll 2 failed. The endpoint had no data to send. The handle is now invalid if this is a one-shot poll.
[11] 02 07
00001963.429 Out: Acknowledgement
[01] 11
00001973.459 In: Poll 2 failed. The endpoint had no data to send. The handle is now invalid if this is a one-shot poll.
[11] 02 07
00001973.479 Out: Acknowledgement
[01] 11
00001983.399 In: Poll 2 failed. The endpoint had no data to send. The handle is now invalid if this is a one-shot poll.
[11] 02 07
00001983.419 Out: Acknowledgement
[01] 11

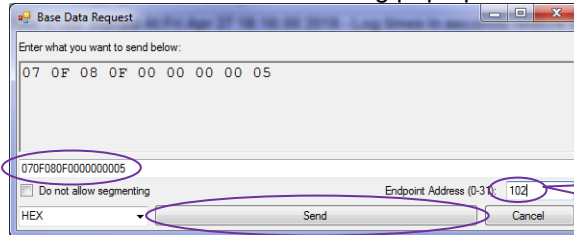
```

Endpoint 8 is deactivated here.

Endpoint 8 attempt to reactivate on the Base is ignored.

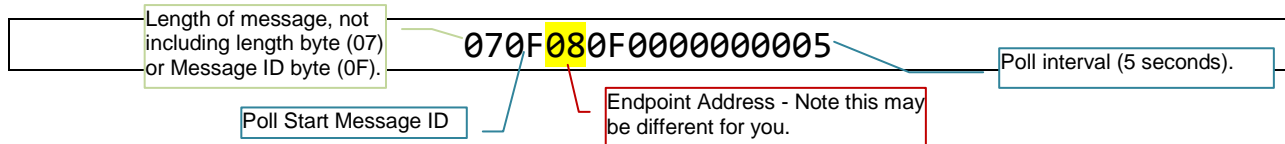
Endpoint 8 successfully activates on the Network Extender.

9. Now we need to start a poll to the endpoint. Since the endpoint is on the network extender, we will send the request there. Go to *Base > Data*. The following pop up window will appear.



Enter the address of the Network Extender here.

The request to start a poll is as follows. The highlighted endpoint address needs to be updated to match the endpoint address provided in step 8. For more information on this message see the *MLink Modem Interface Control* document.



If successful, the mmaTool will update indicating the data request has been sent and polls will start to appear as shown below.

```

[01] 11
00002053.422 In: Poll 2 failed. The endpoint had no data to send. The handle is now invalid if this is a one-shot poll.
[11] 02 07
00002053.442 Out: Acknowledgement
[01] 11
00002063.472 In: Poll 2 failed. The endpoint had no data to send. The handle is now invalid if this is a one-shot poll.
[11] 02 07
00002063.492 Out: Acknowledgement
[01] 11
00002073.412 In: Poll 2 failed. The endpoint had no data to send. The handle is now invalid if this is a one-shot poll.
[11] 02 07
00002073.432 Out: Acknowledgement
[01] 11
00002075.064 Out: Base Data Request
[13] 66 0F 00 0F 00 00 00 05
00002075.164 In: Acknowledgement to Data Request - Handle 2
[01] 13 02
00002075.374 In: Data message 2 successfully transmitted and acknowledged. RSSI: -50
[14] 02 00 0E
00002075.394 Out: Acknowledgement
[01] 14
00002083.454 In: Data received from extender 102. RSSI: -49, 0x00011DC0. Acknowledgement to Poll Start Request - Handle 0, 0x00011DC0. Poll 0 started. 0x0001003E. Data received from endpoint 8. RSSI: -29 GPS Temperature 23.3°C Pressure 0 mm H2O Battery Level 91% No GPS Data Available
[16] 66 D5 07 0D 00 01 00 3E 0C F2 08 07 0D 00 01 00 3E 00 ED 08
00002083.474 Out: Acknowledgement
[01] 16
00002093.504 In: Data received from extender 102. RSSI: -42, 0x0001003E. Data received from endpoint 8. RSSI: -41 GPS Temperature 23.5°C Pressure 0 mm H2O Battery Level 91% No GPS Data Available
[16] 66 D5 07 0D 00 01 00 3E 08 D7 0E AF 09 00 00 0A 5B 03
00002093.524 Out: Acknowledgement
[01] 16

```

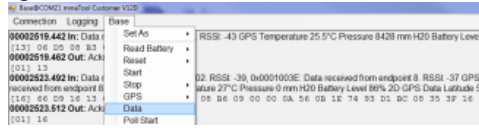
Data request message has successfully sent and acknowledged.

Poll from endpoint 8 connected to network extender 102.

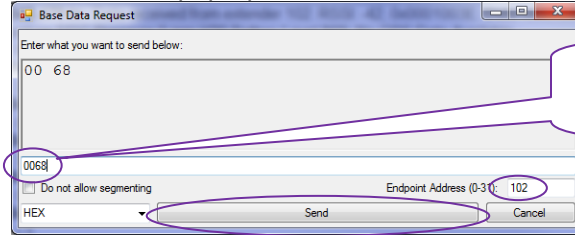
Since the endpoint is being polled every 5 seconds and the network extender is polled every 10 seconds, two responses will appear in the network extender poll.



- 10. At this point, the endpoint is functionally connected to the network extender.
- 11. The network extender does not have any ON/OFF switch, so if left without a base the battery will drain. You can turn the network extender off by putting it in shipping mode again. This is done over the air by pressing *Base > Data* again.

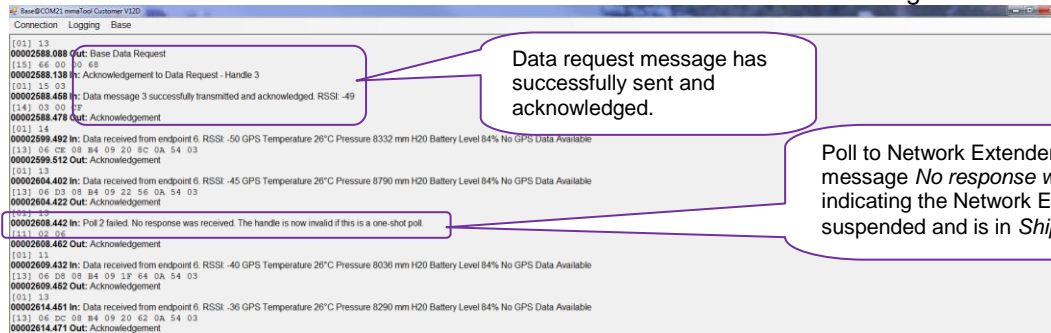


Enter the shipping mode command in the pop-up.



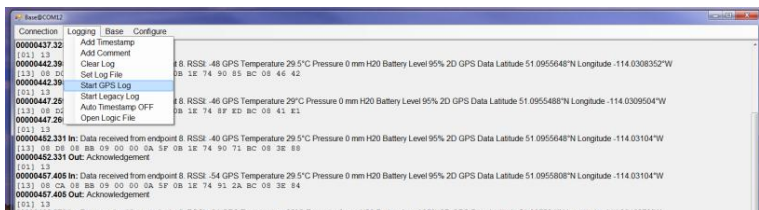
0068

The mmaTool will update indicating that the message was sent and acknowledged. Future polls from the base to the network extender will indicate that the network extender is no longer available.



Additional Notes

- The log file created in step 10 above is a text file which can be readily opened in spreadsheet programs such as Excel, parsed and post processed. For example, to separate out and convert the polled data from the endpoint in to appropriate units.
- [Optional]** A GPS log file can be created by selecting *Logging > Start GPS Log*.



A pop up window will appear for you to save the file.



- The Raw Hex Data can also be processed if desired. An example is illustrated below:

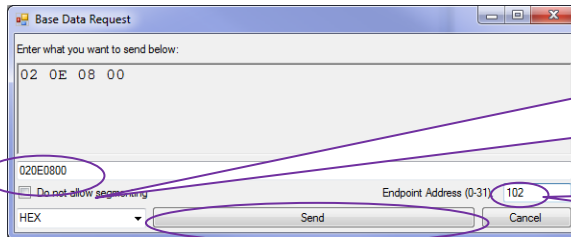
For the polls, the Raw Hex Data can be translated as following. See the MLink Modem Interface Control document for additional information.

[13]	Message ID
08	Endpoint Address 8
CC	RSSI CC (Hex) -> 204 (Dec) -> 204 - 256 = -52 dBm
08	Tag: Temperature data available
B4	Temperature: B4 (Hex) -> 180 (Dec) -> 180/2-64 = 26 C
09	Tag: Pressure data available
0000	Pressure: 0000 (Hex) -> 0 (Dec) mm H20
0A	Tag: Battery Level data available
64	Battery Level: 64 (Hex) -> 100 (Dec) -> 100 %
1B	Tag: GPS data available
1E74933A	1E74933A (Hex) -> 510956346 (Dec) -> 51.0956346 N
BC0822D8	BC0822D8 (Hex) -> -1140317480 (Dec) -> 114.0317480 W
042D	042D (Hex) -> 1069 (dec) -> 1069 m

If you want to deactivate an endpoint from the network extender go to Base > Data.



The Base Data Request window will pop up. Enter the following command to deactivate the endpoint on the network extender.



Type in the first entry bar "020EXX00". Where XX is the Endpoint address assigned by the Network Extender and is 08 in this example.

Enter the address of the Network Extender here.

020E0800

Contact Information

- Phone Number: (403)-777-9988
- Email: support@aurorawirelessnetworks.com



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