Metratec UHF AT Protocol Guide

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1. General Information

This document describes the low-level protocol used by Metratec UHF devices of the current generation (starting from 2023).

These include:

- QRG2
- DeskID UHF v2
- DwarfG2-Mini v2
- DwarfG2 v2
- PulsarLR
- PulsarMX v2

You only need to use this protocol if you need (or want) direct low-level access to the reader. In most cases, using one of our free libraries or SDKs is the easier way to talk to our products. These are available for Java, .NET (C#, etc.), Python and Ansi-C (for Posix and Microcontrollers). There is also an example für MicroPython. All libs can be downloaded from our website and the code is acessible in our public Github account (https://github.com/metratec).

1.1. AT Protocol Definition

All Metratec RFID products from 2023 onwards are controlled by a simple to use and human-readable AT protocol - similar to LTE modems and many other communication devices. The commands are easy to read ASCII code and are just sent via UART, Serial oder a TCP Socket to the device.

The command structure follows the usual AT command conventions. These are:

- Each command is finished with a Carriage Return (CR) or 0x0D in hex notation.
- Each answer contains a result block and a status code block (OK or ERROR) and is framed by Carriage Return + Line Feed (CR+LF) or 0x0D+0x0A in hex notation.

- Optionally you can activate the Echo Mode where each command is repeated with the response to allow easy parsing in asynchronous systems.

- Integrated help using "=?" behind the command, eg. **AT+PWR=?**

Protocol Format Examples:

1. Single-line answer to AT+REG=ETSI, no command echo active

```
Command:
AT+REG=ETSI<CR>

Response:
<CR><LF>
OK<CR><LF>
```

1. Single-line answer to AT+REG=ETSI, with command echo active

```
Command:
AT+REG=ETSI<CR>

Response:
<CR><LF>
AT+REG=ETSI<CR><LF>
OK<CR><LF>
```

1. Multi-line answer to AT+INV, no command echo active

```
Command:
AT+INV<CR>

Response:
<CR><LF>
+INV: E002ABDE4321<CR>
+INV: E002ABFF2111<CR>
+INV: E002ABDC1234<CR><LF>
OK<CR><LF>
```

1. Multi-line answer to AT+INV, with command echo active

```
Command:
AT+INV<CR>

Response:
```

```
<CR><LF>
AT+INV<CR><LF>
+INV: E002ABDE4321<CR>
+INV: E002ABFF2111<CR>
+INV: E002ABDC1234<CR><LF>
OK<CR><LF>
```

For better readability, the CR and CR+LF are not shown in the following command examples.

1.2. Migrating from the prior protocol

Previous versions of the Metratec products used a similar but slightly different low-level protocol. This had a number of issues which have been solved by this new protocol. The most important change is that responses now have a unique identifier (eg. +INV für Inventory), so asynchronous events during continuous scanning our IO events are much easier to parse. Additionally you can activate a command echo for even more clarity. Lastly, the device has a more helpful response if commands are not sent as expected.

1.3. Tools

The easiest way to send ASCII Text to our devices is using a terminal program, eg. metraTerm 2, which can be downloaded from our website at https://www.metratec.com

2. Device Settings

These commands are basic commands to control the device itself. Not all commands are supported by every hardware.

2.1. AT / Basic AT Test

A standard command which can be used to test basic communication (eg. whether you use the right baudrate in a serial device). This command always answers with "OK" and nothing else.

```
Command:
AT

Response:
OK
```

2.2. ATI / Device Information

This command is a general AT command that returns information on the device including hardware name and version, firmware name and version as well as the serial number of the device. This is a general AT command and therefore not separated by a +.

```
Command:
ATI

Response:
+SW: <Software Name + Version>
+HW: <Hardware Name + Version>
+SERIAL: <Serialnumber>
OK
```

2.3. ATE(0/1) / Command Echo

This command activates or deactivates the Command Echo Mode. This is a general AT command and therefore not separated by a +. User ATE0 to deactivate the mode and ATE1 to activate it.

```
Disable echo:
ATE0
```

```
Enable echo:
ATE1

Response:
OK

Get current value:
ATE?
```

2.4. AT+RST / Reset

Resets the RFID service on the device (not the device itself)

```
Command:
AT+RST

Response:
OK
```

2.5. AT+HBT / Heartbeat Messages

This command controls the asynchronous Heartbeat settings (in seconds). Set to 0 to turn off. If activated, the device sends a +HBT every x seconds to show the host that the device is still alive. This is mainly useful for TCP connections.

```
Command:
AT+HBT=0-60

Response:
OK
```

2.6. AT+OUT / Set Outputs

Use this command to control the digital outputs of the device (only for devices with outputs). You can use 1 or 0 to set the starte or HIGH or LOW.

Examples:

```
Command:
AT+OUT=1,1,0,0
```

```
AT+OUT=HIGH,HIGH,LOW,LOW

Response:
OK
```

You can also leave out outputs to leave them unchanged:

```
Command:
AT+OUT=,1,,

Response:
OK
```

You can also query the current state of the outputs:

```
Command:
AT+OUT?

Response:
+OUT=1,HIGH
+OUT=2,LOW
+OUT=3,HIGH
+OUT=4,LOW
```

2.7. AT+IN / Read Inputs

Use this command to check the current state of the inputs (only for devices with inputs).

Examples:

```
Command:
AT+IN?

Response:
+IN=1,LOW
+IN=2,HIGH
```

2.8. AT+IEV / Input Events

This command can be used to activate and deactivate asynchronous input events (only for devices with inputs).

```
AT+IEV=0 (default) or 1
```

Whenever one of the inputs changes, the device will report the state of all inputs:

```
+IEV: 1, HIGH
+IEV: 2, LOW
```

2.9. AT+HOT / High on Tag

This command can be used to activate and deactivate the "high on tag" feature which triggers the selected output to go to the "high" state, when a tag is found. This allows to trigger an external device whenever a tag is in the field. This corresponds to the blue LED.

```
AT+HOT=4,100

Parameters:
1: Output to go high (1-4)
2: Duration (10ms - 1000ms)
```

You can deactivate this feature by setting to output to zero with AT+HOT=0

3. RFID Settings

With the following commands you can configure the behaviour of the RFID engine of the reader.

3.1. AT+PWR / Output Power

This command is used to set the output power of the reader in dBm. Valid values depend on hardware (use AT+PWR=? to query valid values for your device). For high power devices, like the PulsarLR and PulsarFL the range is 0-30. For most low power devices, like DeskID UHF v2, QRG2, DwarfG2-Mini v2, the range is 0-9. The DwarfG2 has a maximum output power of 21. Please keep in mind that additional 3dBm is a doubling of the output power in W.

Example:

```
Command:
AT+PWR=27

Response:
OK
```

Besides setting a single output power for all antenna ports, you can also define separate output powers for each antenna by just adding more power parameters until you reach the number of antennas of your current setup. This includeds any connected multiplexer ports. Devices with only one antenna port and no outputs (DeskID UHF and QRG2) do not support multiple values for power.

Example:

```
Command:
AT+PWR=27,27,25,30

Response:
OK
```

3.2. AT+REG / Region Settings

This command is used to set the region / regulatory scheme the reader is operating in. This has to match the region you are in as well as the antenna(s) you connected to the reader. Valid values depend on hardware. Please check the product datasheet to find out the supported regions or use AT+REG=? to query your device.

Example:

```
Command:
AT+REG=ETSI

Response:
OK
```

Currently, the following values are supported for a device without frequency limitations (eg. PulsarLR):

- ETSI (standard ETSI band with four channels around 868 MHz)

- ETSI_HIGH (higher ETSI band around 915 MHz)

- FCC

- CHINA

Note: Changing the region will also influence the available RF modes (see AT+RFM).

3.3. AT+Q / Q Value

This command is used to set the Q value. This value is used for anti-collision and can be used to tune the speed vs maximum number of tags a reader can find. In many cases, this value can be left unchanged. The allowed value range for Q is [0...15]. The command allows to only set one value or the start value, a minimum and a maximum. In all cases, the reader will dynamically try to change the start value to match the size of the current tag population. But this will take time, so thinking about a reasonable start value is an important tuning factor.

The Q value is the exponent of 2 and should be around or above the expected number of tags. Setting this value too low will result in tags being missed. Setting the value too high will lead to unnessecary slow

inventories.

Typical values are:

- Low number (1-9 transponders): 3
- Medium number (10-25 transponders): 5 (this is the default for long range readers)
- Higher humber (50-100 transponders): 8
- Reasonable max (250+ transponders): 10

Command Format:

```
AT+Q=start, min, max
```

Example:

```
Command:
AT+Q=5,2,10

Response:
OK
```

Only setting initial Q will set min and max values automatically to 0 and 15, respectively:

```
Command:
AT+Q=6

Response:
OK
```

3.4. AT+RFM / RF Mode

This command is used to control the internal RF communication settings between tag and reader. Each mode ID corresponds to a set of RF parameters that fit together. Not all devices support all modes and not all modes can be access in all regions.

Example:

```
Command:
AT+RFM=285

Response:
OK
```

Currently, the following values are supported with the following settings:

Table 1. RF Modes

Mode ID	Optimization	Fwd Link Modulation	Tari	PIE	BLF (KHz)	Rev Link Modulation	Typ. Read Rate	Region
103	Read Rate	DSB-ASK	6.25	1.5	640	FM0	1,000+	FCC
302	Read Rate	PR-ASK	7.5	2	640	FM0	800+	FCC
120	Read Rate	DSB-ASK	6.25	1.5	640	M=2	700+	FCC
323	Read Rate	PR-ASK	7.5	2	640	M=2	550+	FCC
345	Read Rate	PR-ASK	7.5	1.5	640	M=4	400+	FCC
344	ETSI Upper DRM	PR-ASK	7.5	2	640	M=4	400+	ETSI UB
223	ETSI Lower	PR-ASK	15	2	320	M=2	300+	ETSI
222	ETSI Lower	PR-ASK	20	2	320	M=2	250+	ETSI
241	ETSI Lower DRM	PR-ASK	20	2	320	M=4	200+	ETSI

Mode ID	Optimization	Fwd Link Modulation	Tari	PIE	BLF (KHz)	Rev Link Modulation	Typ. Read Rate	Region
244	FCC DRM	PR-ASK	20	2	250	M=4	150+	FCC
285	Sensitivity	RP-ASK	20	2	160	M=8	50+	All

3.5. AT+ICS / Impinj Custom Settings

The RFID tag IC manufacturer Impinj has added two custom features to its tag ICs that are not compatible with tag ICs from other manufacturers. Activate these features with this command - but make sure that you only use tags with Impinj ICs like Monza6 or M7xx or M8xx series. Tags from other manufacturers will most likely not answer at all when those options are active!

```
AT+ICS=Fast ID, TagFocus
```

FastID allows to read the TagID together with the EPC and can speed up getting TID data.

Tag Focus uses a proprietary tag feature where each tag only answers once until it is repowered. This allows to scan a high number of tags because each tag only answers once and makes anti-collision easier for the following tags.

Example:

```
Command:
AT+ICS=1,1

Response:
OK
```

3.6. AT+IAS / Impinj Authentication Service

This command tags to an Impinj M775 tag using the proprietory authencation command. It sends a random challenge to the transponder and gets the authentication payload in return. You can use this to check the authenticity of the transponder with Impinj Authentication Service. For further details, please contact Impinj directly.

Example:

```
Command:
AT+IAS

Response:
+IAS: EPC,OK,SHORT_TID,RESPONSE,CHALLENGE

OK
```

3.7. AT+SES / Select Session

Manually select the session according to the EPC Gen 2 Protocol to use during inventory scan. Default value is "auto" and in most cases this should stay auto. Only change this if you absolutely know what you are doing and if you can control the types of tags you scan. Otherwise, unexpected results during inventory scans with "only new tags" active might happen.

Example:

```
Command:
AT+SES=1 (0-3 or auto)

Response:
OK
```

3.8. AT+ANT / Select Antenna

Manually select one antenna port. Used for AT+INV, AT+CINV and all tag operation commands (see next section). Only supported by readers with multiple antenna ports or with attached multiplexer.

Example:

```
Command:
AT+ANT=1 (1-x, depending on setup)

Response:
OK
```

3.9. AT+MUX / Multiplex Antennas

Configures the automatic multiplexing of antennas 1-x used in AT+MINV, AT+CMINV , AT+INVR and AT+CINVR commands. Always starts with antenna 1. Only supported by readers with multiple antenna ports or with an attached multiplexer.

Example:

```
Command:
AT+MUX=3 (1-x, depending on your setup)

Response:
OK
```

Besides setting a single maximum port to switch to, you can also define sequences of antenna ports with up to 64 entries. The AT+MUX command also takes into account any multiplexers that you might have configured using the AT+EMX command. The following example would be valid for a four port reader with an addition 4x Multiplexer configured on one of the ports.

```
Command:
AT+MUX=4,3,2,1,6,7,5

Response:
OK
```

3.10. AT+EMX / Extend with Multiplexer

Configures the reader to use an external multiplexer on one or several of the antenna ports (depending on the hardware). Only support Metratec Multiplexers, e.g. 4x, 8x or 16x devices. You can tell the reader, which type of multiplexer is connected to which port. All the antenna names are shifted accordingly.

Example:

```
Command:
AT+EMX=0,0,0,4

Response:
OK
```

This will give you antennas 1-7, with 1-3 being the native ports and 4-7 the ports on the 4x multiplexer.

```
Command:
AT+EMX=16,0,0,0

Response:
OK
```

This will give you antennas 1-19, with 1-16 being the multiplexer on native port 1 and 17-19 being the last three native ports on the device.

The new numbering will effect some other commands such as AT+PWR, AT+ANT and AT+MUX.

3.11. AT+INVS / Inventory Settings

This command is used to configure the inventory reporting behavior of the reader. It can be used to also show RSSI and TID (Tag ID) together with the EPC. ONT Mode can be used to report "Only New Tags" - each EPC is reported only once until it leaves the field. The FastStart Mode does an inventory without putting all tags into session state A at the start. This can speed up the start of the inventory (hence the name) - but it requires that all tags are in "reset state". If you activate that mode, you need to make sure that each tag is not powered from a previous scan or the tag will not answer at all.

Command format:

```
AT+INVS=ONT, RSSI, TID, FastStart
```

Disable everything:

```
Command:
AT+INVS=0,0,0,0

Response:
OK
```

Enable everything:

```
Command:
AT+INVS=1,1,1,1

Response:
OK
```

3.12. AT+MSK / Mask (1 byte mask)

This command can be used to configure the RFID engine of the reader to mask all inventories by an EPC mask. This can be used to filter for only particular transponders.

```
AT+MSK=Bank, Start, Data (all in Byte)
```

```
Command:
AT+MSK=EPC,12,EC

Response:
OK
```

Disable mask:

```
Command:
AT+MSK=OFF

Response:
```

```
OK
```

> Masking will match only those bytes of the EPC. If an EPC is shorter the mask will allow the transponder.

Example:

```
AT+MSK=EPC,10,0F19
+INV: 0209AAAABBBBCCCCDDDD
+INV: E20062979705021525700F19
AT+READ=EPC,10,2
+READ: E20062979705021525700F19,OK,0F19
+READ: 0209AAAABBBBCCCCDDDD,OK,0F19
```

3.13. AT+BMSK / Bit Mask (Mask bit-wise)

This command allows to define the mask on a bit-wise level. This is required for some advanced filtering as defined by GS1. The mask is the same as in the MSK command and using one of the two commands will change the same internal value.

Command format:

```
AT+BMSK=Bank, Start, Data  (alles in Bit)
```

Example:

```
Command:
AT+BMSK=EPC,56,10001

Response:
OK
```

If you set a bitmask that is no divisible by 8, eg. AT+BMSK=EPC,12,11010000 will lead to a rounded start value when querying with the AT+MSK command:

```
Command:
AT+MSK?
```

```
Response:
+MSK: EPC,1,D0
```

If you set a bitmask that is no divisible by 8, eg. AT+BMSK=EPC,12,10 this will be interpreted as '1000' and printed by AT+MSK like this:

```
Command:
AT+MSK?

Response:
+MSK: EPC,1,8
```

4. Tag Operation

The command in this chapter all work in connection with one of more transponders. They are the most used commands during RFID operations.

4.1. AT+INV / Inventory

Makes a single (blocking) inventory on the currently selected antenna (as configured by AT+ANT). This is the most basic command to read a transponder (or to be precise, it's EPC).

Example:

```
Command:
AT+INV

Response:
+INV: E00212345678
+INV: E00212345679
+INV: E00212345670
OK
```

Example for a successful inventory, but with no tags in the field:

```
Command:
AT+INV

Response:
+INV: <NO TAGS FOUND>
OK
```

In case of an error (mainly "no antenna connected"):

```
Command:
AT+INV

Response:
+INV: <Antenna Error>
ERROR
```

4.2. AT+CINV / Continuous Inventory

Makes continuous inventory scans on the currently selected antenna (with AT+ANT). Since this is a continuous command, the result "OK" is only returned once and immediately. After that, the reader prints out results until the mode is stopped.

Example:

```
Command:
AT+CINV

Response:
OK

+CINV: E00212345678
+CINV: E00212345679
+CINV: E00212345670
+CINV: <ROUND FINISHED, ANT=X>
```

4.3. AT+MINV / Multiplex Inventory

Does a single inventory over all antennas configured with the AT+MUX command. This command is only available in devices with multiple antenna outputs (PulsarLR) or with an attached multiplexer.

Example:

```
Command:
AT+MINV

Response:
+MINV: E00212345678
+MINV: E00212345679
+MINV: E00212345670
+MINV: <ROUND FINISHED, ANT=1>
+MINV: <Antenna Error>
+MINV: <ROUND FINISHED, ANT=2>
+MINV: E00212345678
+MINV: E00212345679
+MINV: E00212345670
+MINV: <ROUND FINISHED, ANT=3>
OK
```

Only returns ERROR when inventories fail on all antennas, otherwise OK.

4.4. AT+CMINV / Continuous Multiplexed Inventory

Reads tags continuously on every antenna defined with AT+MUX. You can stop this mode by using AT+BINV (for legacy reasons) or AT+BMINV. This command is only available in devices with multiple antenna outputs (PulsarLR, PulsarFL) or with an attached multiplexer via AT+EMX.

Example:

```
Command:
AT+CMINV

Response:
OK

+CMINV: E00212345678
+CMINV: E00212345679
+CMINV: E00212345670
+CMINV: <ROUND FINISHED ANT=1>

+CMINV: E00212345678
+CMINV: E00212345679
+CMINV: E00212345670
+CMINV: <ROUND FINISHED ANT=2>

+CMINV: E00212345678
+CMINV: E00212345679
+CMINV: E00212345670
+CMINV: <ROUND FINISHED ANT=1>
```

4.5. AT+BINV / Break Continuous Inventory

Stops any previous continuous scans like AT+CINV or AT+CMINV.

Example:

```
Command:
AT+BINV

Response:
OK
```

Returns ERROR when no continuous scan is currently running.

4.6. AT+INVR / Inventory Report

This command does multiple inventories over all antennas configured with the AT+MUX command for a given time (default is 100ms) and return a report of tags. This can increase the amount of tags you find (since there are multiple inventories running in the background) and decrease communication between reader and host (eg. your PC), so it is more efficient and often easier to parse than hundreds of tag messages per second. The number of tags is aggregated over all antennas.

Example:

```
Command:
AT+INVR=450

Response:
+INVR: E00212345678,7
+INVR: E00212345679,8
+INVR: E00212345670,5
+INVR: E00212345678,19
+INVR: E00212345679,6
+INVR: E00212345670,22

OK
```

Only returns ERROR when inventories fail on all antennas, otherwise OK.

4.7. AT+CINVR / Contineous Inventory Report

This command starts a contineous inventory report until you stop it with AT+CINVR. This can be handy to just read transponders "in the background" and report all scan events every 250ms or 1.000ms (the maximum), especially in a RFID tunnel or RFID gate where you expect many transponders and just want to have it scanning for some time but also need periodic updates on the number of tags found.

Example:

```
Command:
AT+CINVR=250

Response:
OK
```

```
+CINVR: E00212345678,7
+CINVR: E00212345679,6
+CINVR: E00212345670,9
+CINVR: E00212345678,10
+CINVR: <REPORT FINISHED>
```

Only returns ERROR when inventories fail on all antennas, otherwise OK.

4.8. AT+BINVR / Break Continuous Inventory Report

Stops a previously started continuous report scan (AT+CINVR).

Example:

```
Command:
AT+BINVR

Response:
OK
```

Returns ERROR when no continuous report scan is currently running.

4.9. AT+TID

Command to read out the Tag ID of the transponder. The length and content depends on the IC type of the transponder. Almost all TIDs have a unique serial number. Some have a random number generator as well (so the TID might be different at every read).

Example:

```
Command:
AT+TID

Response:
+TID: E200600311753F23
OK
```

4.10. AT+READ / Read Tag Data

This command is used to read out data from the transponder. The parameters are Membank, Start Byte, Length, (optional) EPC mask - all in Byte and Decimal. Please keep in mind that no all transponders have all membanks and that some membanks might be locked and therefore not readable. Please refer to the datasheet of your transponder's IC to learn more.

List of Membanks:

- PC (protocol control)
- EPC (Electronic Product Code - the main ID of the transponder)
- USR (User Memory)
- TID (Tag ID - often unique number)

The read command will automatically be sent to all transponders in the field. The response will include the EPC of each transponder, the state as well as the data (or an error message). You can limit the transponder by giving a EPC mask at the end of the command.

Examples:

```
Command:
AT+READ=PC,0,1

Response:
+READ: 77771191A50300605E0F0F5F,OK,30

Command:
AT+READ=USR,8,4

Response:
+READ: E20062979705021426900965,OK,00000000

Command:
AT+READ=TID,0,16,E200

Response:
+READ:
E20062979705021525700F19,OK,E2003412013CF2000A980F19031100F6
```

4.11. AT+WRT / Write Tag Data

This command is used to write data from the transponder. The parameters are Membank, Start Byte, Data, (optional) EPC mask - all in Byte and Decimal.

Please keep in mind that no all transponders have all membanks and that some membanks might be locked and therefore not writable. Please refer to the datasheet of your transponder's IC to learn more.

List of writable Membanks:

- PC (protocol control)
- EPC (often 96 - 128bit)
- USR (User Memory - optional)

The write command will automatically be sent to all transponders in the field. The response will include the EPC of each transponder, the state as well as the data (or an error message). You can limit the transponder by giving a EPC mask at the end of the command.

Example:

```
Command:
AT+WRT=EPC,0,ABCDEF123456789012345678

Response:
+WRT: E002123456789,OK
OK
```

Potential errors will reported for each tag.

```
Response:
+WRT: E002123456788,OK
+WRT: E002123456789,ERROR
OK
```

Error Codes:

- MEMORY OVERRUN: Start + length of data exceeds tag memory
- MEMORY LOCKED: Memory bank is locked

- INSUFFICIENT POWER: Not enough power to perform the gen2 transaction

- ACCESS ERROR: Moving a tag from 'Open' to 'Secure' state (by providing the Access password) failed

- ERROR: Catch-all for all other potential errors

Sometimes ERROR occurs instead of INSUFFICIENT POWER when RF power is too low to perform the requested operations. This is because the transponder response (which would contain the error flag) may be missing entirely. Increasing the power usually helps here.

4.12. AT+PWD / Set Lock/Kill Password

This command is used to set the passwords on the transponder. There are usually two types of passwords on a transponder: The general access password (also called Lock password) and the special Kill password, which is only used for that operation. Remember: You need the Lock password to set the Kill password.

Most transponders have a default password of 00000000. If you set this password, the transponder is unlocked.

Command format:

```
AT+PWD=LCK/KILL, Access Password, New Password,EPC_MASK
(opt.)
```

Setting a KILL password also requires the LCK/Access password, NOT the current KILL password.

Examples:

```
Command:
AT+PWD=LCK,00000000,AAAAAAAA

Response:
OK

Command:
AT+PWD=KILL,AAAAAAAA,BBBBBBBB
```

```
Response:
OK
```

Remember: This command only sets the passwords but does not lock them. To make this secure, you should lock the password areas against changes afterwards. Without locking, anybody can read out the current password and set a new one.

4.13. AT+LCK / Lock Tag

This command is used to lock certain memory areas. These include the typical membanks used in the Write Command but also the passwords from the PWD command. As with AT+READ and AT+WRT you can add an optional EPC Mask to limit the transponder that processes this command.

Available areas to lock:

- EPC

- USR

- LCK

- KILL

EPC and USR are only write-locked. LCK and KILL are read-and-write-locked.

Command format:

```
AT+LCK=MEMBANK,PASSWORD,EPC_MASK (opt.)
```

Examples:

Lock the EPC membank of all tags that match the password:

```
Command:
AT+LCK=EPC,ABCD1234

Response:
OK
```

Lock the LCK membank of all tags whose EPC start with DE01:

```
Command:
AT+LCK=LCK,ABCD1234,DE01

Response:
OK
```

4.14. AT+ULCK / Unlock Tag

Just like the lock command but for unlocking (if you have the access password).

Command format:

```
AT+ULCK=MEMBANK,PASSWORD,EPC_MASK (opt.)
```

4.15. AT+PLCK / Permalock Tag

Same as AT+LCK but permanently locks the memory bank.

⚠️ This cannot be changed back, even with a correct password.

Command format:

```
AT+PLCK=MEMBANK,PASSWORD,EPC_MASK (opt.)
```

4.16. AT+KILL / Kill Tag

This command can be used to "kill" a transponder (eg. for privacy reasons at the cash register). The tag must have a non-zero kill password (set with AT+PWD) or this will fail.

Command format:

```
AT+KILL=PASSWORD,EPC_MASK (opt.)
```

Examples:

Kill all tags that match the password:

```
AT+KILL=ABCD1234

Response:
OK
```

Kill all tags whose EPC starts with DE01 that match the password:

```
Command:
AT+KILL=ABCD1234,DE01

Response:
OK
```

5. Feedback

The DeskID NFC has a built-in speaker that can be used to play predefined or custom note sequences. This can be useful to give the end user a quick acoustic feedback.

5.1. AT+FDB / Play Feedback

This command is used to play a predefined feedback sequence.

There are 3 predefined feedback sequences.

Number	Feedback
0	Startup jingle
1	OK Feedback
2	ERROR Feedback

Example:

```
Command:
AT+FDB=1

Response:
OK
```

5.2. AT+PLY / Play custom Feedback

This command is used to play a custom feedback sequence. The parameters are the sequence in string description, the number of times the sequence should be repeated and the length of a single step of the sequence in ms.

The format of the sequence string is described here. A note is always encoded by its name written as a capital letter and octave e.g. C4 or D5. Half-tone steps are encoded by adding a s or b to the note. For example Ds4 or Eb4. Note that Ds4 and Eb4 are basically the same note. A pause is denoted by a lowercase x.

Example:

```
Command:
AT+PLY=E5xE5xxxE5xxxC5xE5xxxG5xxxxxxG4,1,70

Response:
OK
```

5.3. AT+SUS / Start-Up Sound

If you don't want the device to play a sound at start up, you can disable this behaviour with this command

Example:

```
Command:
AT+SUS=0

Response:
OK
```

This setting is persisted over reboots.

6. Version History

The following table shows the different version of this file.

Table 2. Version History

Version	Change	Changed by	Date
1.0	Initial Version / WIP	KD	19.3.2023
1.1	Added AT+EMX, fixed errors	KD	5.7.2023
1.2	New commands added	KD	31.7.2023
1.3	Improvements in text	KD	1.11.2023

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