1 READING PARAMETERS

1.1 Q-VALUE

The Q-value defines the amount of open response slots that tags can use per one inventory round. Number of slots can be calculated by formula 2^Q. It is advised to use twice as much slots compared to amount of tags that you have in your readers reading field simultaneously. Selectable values are 0 – 15 and value 0 means automatic Q-value adjustment. When Q=0 is used reader will automatically increase the Q-value when lots of collisions are noticed and decreased the value when there are only few collisions. By default the Q-value is set to 0.

Table indicating the relation between the Q-value and the number of open slots per round.

Q-value	slots	Q-value	slots
0	automatic	8	256
1	2	9	512
2	4	10	1024
3	8	11	2048
4	16	12	4096
5	32	13	8192
6	64	14	16384
7	128	15	32768

1.2 SESSION

There are four session options which you can use when initializing inventory round. Every session has two target states A and B. By default Gen2 tags are at state A if tag has not been read recently. When tag is read it flips to state B and doesn't reply to readers query. The table below describes the persistence of tag's state machine when using different session values. For example when using session 0 the tag will come back to state A immediately when tag power is lost. Usually tag loses the power when reader stops the inventory round or chances the channel. Persistence when tag power is ON is not defined by the ISO18000-6C when using session settings S0, S2 and S3. With session 1 the tag will keep it state over 500ms but less than 5s. With session values 2 and 3 tags will keep it states over 2s when tag power is lost. Time can vary depending what tag IC is used.

Table indicating persistence characteristics of gen2 tags.

Flag	Persistence: tag power ON	Persistence: tag power OFF
S0	indefinite	none
S1	500ms < t < 5s	500ms < t < 5s
S2	indefinite	t > 2s
S3	indefinite	t > 2s

By changing the target setting from A target to B target reader is able to read also tags that has flipped its state to B state. This would happen if tags would have been read recently using Session 1 2 or 3. eNUR-Ax module also supports dual target mode. In that mode reader will change the target mode between inventory rounds. By default target mode A is used.

1.3 ROUNDS

The rounds setting defines how many query rounds is done inside one inventory round. After every inventory round the reader will send data to the Host. Selectable values are 0 – 10. Zero meaning automatic rounds adjustment. The automatic adjustment decides after every query round whether another round is necessary based on the number of data collisions. By default rounds setting is set to 0. This setting can help the reader to find all the tags that are in the readers reading field when using session 0. Because tags that are found in query round 1 doesn't replay in the following query rounds. When using session 1/2/3 this does not make any significant difference because tags that are read are quiet anyway.

Table describing relation between inventory round and query round.

Inventory round				
Round 1	Round 2	round 3	…	Round 10

1.4 SELECTING THE RIGHT READING PARAMETERS

One approach is to test how many tags are in the readers reading field simultaneously. Keep the reader still at the position that is as close to real reading environment as possible and see how many tags are found.

Based on that amount choose your open slot number to be 1.5 – 2 times larger (refer to the section 6.1). If reader will face many different tag populations auto-Q setting will be a good choice.

Besides Q-value one important parameter is session. In general it could be stated that if the size of tag population is measured in thousands rather than in hundreds it is wise to use sessions 2 or 3. Because then every tag will be read only once and that makes large tag population much faster and easier to read. When using session 2 or 3 it is advised to use Miller 8 encoding scheme to avoid data transfer errors as much as possible. Rounds 1 setting is also advised to be used with session 1 or 2 or 3. With session 0 it might be useful to use higher rounds value than 1 to be able to find all the individual tags. By default automatic (0) rounds setting is used.

Other settings like modulation, link frequency and RX-encoding has a minor impact to the reading speed of the reader. When operating in optimal environment following will apply:

RX encoding: *FM0 is fastest but quite sensitive to interferences / M8 slowest but very robust*
Modulation: *No effect to speed but PR-ASK has better range with some tags*
Link frequency: *320 kHz is the fastest / 160 kHz is the slowest*

Guideline settings to be used with different tag populations.

Settings	Tag population	Simultaneously in the field
Session 0, auto Q, auto Rounds	1 – 100	1 – 100
Session 1, auto Q, Rounds 1	100 – 1 000	under 500
Session 2/3, auto Q, Rounds 1	100 – 1 000	over 500
Session 2/3, auto Q, Rounds 1	over 1 000	over 500