



# ThingMagic Nano Firmware v1.5.0

## Release Notes

These release notes describe features and characteristics of ThingMagic Nano module firmware (FW) version 1.5.0. This firmware is not supported on any other ThingMagic module.

This is the first firmware release for the GA (Generally Available) version of Nano hardware. Any previous versions of Nano firmware that were distributed as part of design verification process are no longer supported.

Nano firmware version 1.5.0 must be used in conjunction with version 1.27.2 of the API. Previous versions of the API will support all the features of this firmware release. Consult the release notes for future versions of the API to determine if they are compatible with this version of Nano firmware.

Topics covered in these release notes are:

- ◆ Features in This Release
- ◆ [Error! Reference source not found.](#)

For full information about the ThingMagic Nano product, please consult the Nano Design Guide, which can

be found at:

<http://www.thingmagic.com/manuals-firmware>

## Features in This Release

### Gen2V2 Support

The ThingMagic Nano now supports the Gen2V2 features of the NXP DNA tags. These features include:

- ♦ “Untraceable”. Ability to limit reading of all or part of EPC, TID and User memory fields by unauthorized readers.
- ♦ Ability to download and activate security keys.
- ♦ Ability to authenticate tag using random challenge strings and AES encryption.
- ♦ Ability to obtain memory data in encrypted form, which can be successfully decoded if the host knows the key that has been activated on the tag.
- ♦ Ability to obtain authentication and encrypted memory data from a tag buffer rather than the tag backscattering that information to the reader immediately.

These capabilities are supported in the 1.27.2 version of the API and may be demonstrated using code samples and the version of Universal Reader Assistant which is distributed with the API.

### Temperature limits extended to -40C

The Micro has been qualified to operate down to -40 C, so the low temperature limit imposed by the firmware have been lowered from -20 C to - 40 C.

### Support for Return Loss Measurement

The firmware will now estimate the return loss of its port, based on multiple readings at multiple channels within the active region. (Note: For the North American region, with 50 channels, this measurement can take as long as 600 msec). The return loss value can be obtained though the API by getting the “/reader/antenna/returnloss” parameter value as well as by using the “CmdGetAntennaReturnLoss” method. The sample code “ReaderStats” has been enhanced to illustrate the recommended method for obtaining this information. The values returned will look like this:

```
Antenna Return Loss
```

```
Antenna 1 | 30
```

Which indicates a return loss of 30 dB for the antenna port.

Note that this measurement loses accuracy as the numbers increase due to the impact of internal signal reflections that increasingly obscure the measurement of the small signal reflected only at the antenna.

The return loss is measured at an RF level of +15 dB in order to limit impact to other services that are running in the same region while the return loss measurement is being made.

## Support for Antenna Detection

Antenna detection is now supported for the ThingMagic Nano, but uses the new return loss measurement as opposed to testing the port with a small amount of DC current as is done in the M6e module. A port that shows a return loss of less than 10 dB (for example the value “4”: above) is considered to be un-terminated. A port with a return loss greater than or equal to 10 dB is considered to be terminated (for example the value “30” above).

Antenna detection is only activated when `/reader/antenna/checkport` is enabled. Unlike the M6e module, this only enables detecting antennas with an explicit request, not checking each time the reader transmits. It is recommended that the host application periodically check for antenna status and adjust the antenna list based on which antennas are present.

## Autonomous Operation

The ThingMagic Nano can now be configured to operate in autonomous reading mode. This provides the ability to set up the module to read and output tag results without a host MercuryAPI application by enabling hardware read triggers and savable configuration settings in the module.

In order to setup the module for autonomous operation the Autonomous Configuration Tool (ACT), distributed as version “autoread-1.27.2” or later, must be used. (When installed, the home screen indicates that the software version is 1.0.0.0, built on Mercury API version 1.27.0.8”).

## Save/Restore Configuration Settings

Autonomous operation relies on the ability of the module to store configuration settings across reboots. This ability can be used even if autonomous operation is not enabled - it will essentially change the default values that the module uses whenever it is rebooted. The settings that can be manipulated in this way include:

- ◆ Serial interface baud rate

- ♦ Region of operation
- ♦ Default protocol (only “Gen2” is supported on Nano)
- ♦ Gen2 settings (“M” value, BLF, Session, Target)
- ♦ RF Power level

## Support for narrow North American Regions (NA2, NA3)

In order to support narrow-band antennas, a new region has been introduced, “NA3”. Here are the characteristics of this new region, relative to the existing “NA2” region:

Paremeter	NA2 region	NA3 region
Enumerated Region Code	0x0D	0x0E
Lowest Permitted Frequency	917400 kHz	917500 kHz
Highest Permitted Frequency	927200 kHz	922500 kHz
Minimum Channel Spacing	200 kHz	100 kHz
Number of Channels in Default Hop Table	50	51

Both these channels are legal for use in regions that adhere to FCC regulatory requirements.

## Support for 25 kHz channel spacing in “Open” region

The minimum channel spacing for the “Open” region has been reduced from 100 kHz to 25 kHz in order to accommodate more flexible channel definitions. Here is a table that gives the information for all supported channels for the ThingMagic Nano module.

Region Name	NA2	NA3	IN	JP	PRC	EU3	KR2	AU	NZ	Open
<b>Lowest Freq permitted</b>	917400	917500	865000	916800	920125	865600	917000	920000	922000	859000 / 915000
<b>Highest Freq Permitted</b>	927200	922500	867000	923400	924875	867600	923500	926000	927500	873000 / 930000
<b>Smallest Step Size (1)</b>	200	100	100	100	125	100	100	250	250	25
<b>Maximum Dwell Time</b>	0.4 sec	0.4 sec	4 sec	4 sec	2 sec	4 sec	0.4 sec	0.4 sec	0.4 sec	0.4 sec
<b>LBT Level (4)</b>	None	None	None	-74 dBm	None	Optional at -72 dBm	None	None	None	Optional at -96 dBm
<b>Lowest Chan in Hop Table</b>	917400	917500	865200	916800	920625	865700	917300	920750	922250	859000
<b>Highest Chan in Hop Table</b>	927200	922500	866800	920800	924375	867500	920300	925250	927250	930000
<b>Hop Table (2)</b>	926000	918800	866000	920800	921375	865700	917300	923750	923750	859000
	919600	919600	865600	919200	922625	866300	919100	921250	926250	860000
	924800	918400	866800	920600	920875	866900	917900	924250	924250	861000
	922600	920800	865200	916800	923625	867500	918500	922750	926750	862000
	921600	919500	866400	918000	921125		920300	925250	923250	863000
	925200	922500		920400	920625		919700	921750	925250	864000
	918400	921700			923125			924750	922750	865000
	919200	918000			921625			922250	927250	866000
	923600	917500			922125			923250	925750	867000
	921800	919700			923875			920750	922250	868000
	923200	919100			921875				924750	869000
	920200	917900			922875					870000
	919400	918200			924125					871000
	921200	918700			923375					872000
	926600	920500			924375					873000
	926800	922100			922375					915000
	920800	920100								916000
	924400	918100								917000
	923800	922000								918000

	921000	919300								919000
	924600	921200								920000
	922000	921500								921000
	917800	917600								922000
	922800	919200								923000
	919000	921300								924000
	917400	918500								925000
	926400	921400								926000
	924000	922200								927000
	919800	918900								928000
	926200	921100								929000
	925000	920300								930000
	918600	919000								
	918800	917800								
	923000	920900								
	918200	922300								
	927000	921800								
	925400	917700								
	922200	920200								
	922400	922400								
	917600	920000								
	920400	921600								
	925800	919800								
	920600	919400								
	924200	919900								
	918000	918300								
	927200	921000								
	920000	918600								
	921400	921900								
	923400	920700								
	925600	920600								
		920400								

#### Footnotes:

(1) Permissible channels are the lowest channel and the lowest channel plus multiples of the "smallest increment", up to the value of the highest channel. No errors will result if frequencies are selected between these values, but the module will automatically round up or down to the nearest permitted value.

(2) This is the exact order of channels in the default hop table

(4) LBT is "Listen Before Talk". If a carrier is detected above the threshold, the channel will not be used.

## Default Output Power Level Changed to +23 dBm

The factory default RF Output Power level has been changed to +23 dBm, from +27 dBm. A different default level may be configured and stored in module memory if desired.

## Antenna Multiplexer Support

The ThingMagic Nano now has the ability to control an antenna multiplexer through one or two of its GPO lines. This allows the antenna port to be split into 2 or 4 antenna ports. Instructions for how to configure this mode of operation are provided in the ThingMagic Nano Design Guide. Once configured, the Nano behaves as if it had additional physical antenna ports for configuration and reporting purposes.

## Tag Buffer Length Increased

The tag buffer length had been 38 tags. It is now 50 tags. This will allow information for up to 50 unique tags to be stored during a single synchronous read cycle, or allow up to 50 tag read records to be stored during continuous read operations when they cannot be off-loaded immediately to the host.

## Reader Stats Reporting Now Supported

The API parameter `"/reader/stats/enable"` is now supported. This was not a bug in the firmware, but rather the Mercury API erroneously reporting the error: "reader received an invalid or unsupported protocol". This has been fixed in MercuryAPI version 1.27.2 and is now supported in all API languages.

## Bug Fixes

- ♦ The receiver tolerance for Backscatter Link Frequency deviation has been improved to accommodate tags that have wider variation than normal. For example, tags that respond with a BLF of 225 kHz when a BLF of 250 kHz is requested by the reader will be accommodated. (Ref#4402)
- ♦ The “NA” region has been removed from the supported list because it contains too many channels that do not fall within the range of the ThingMagic Nano. (ref#4579)
- ♦ All 4 GPIO lines can now be configured and used. (Previous versions of firmware only supported 2 of the 4 lines). (Ref#4583)
- ♦ Reading and writing to large memory tags now works correctly (in previous firmware releases, addresses above a value of 128 bytes would not be requested from the tag correctly). (Ref#4702)