



A2X Firmware 1.5.0 Release Notes

Highlights

The 1.5.0 firmware release adds support for the [IND API 2.0](#) interface to the A2X, while leaving support for the API 1.0 interface intact. This allows users to start taking advantage of the new features in the 2.0 version of the API while preserving compatibility with APDs and data management software that uses the 1.0 version of the API.

The update changes how users, software, and other devices interact with the A2X but it does not change the over-the-air protocol or how different ALERT2 devices interact with each other. Importantly, this means that **there are no compatibility issues with some devices on an ALERT2 network running API 2.0 firmware and some running API 1.0 firmware.**

Please take a moment to review the [IND API 2.0](#) specification when working with this update. The examples section of the specification document should provide a good overview of the updated interface.

Some of the major benefits of this update include:

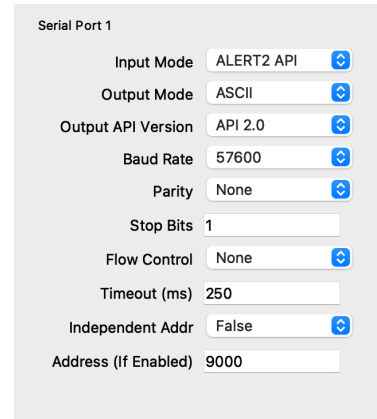
- Resolution of ambiguities between implementation and specification. The API 1.0 implementation that was broadly adopted was not conformant to the specification, and updating the firmware to make it conform would be highly disruptive to existing implementations.
- CSV output format that is easier to read, process, and understand vs the P, N, C, and A strings.
- Binary output format that fully describes received messages and which encapsulates each report in a clearly defined unit.
- Over-the-air queries and updates via the MANT Configuration and Control protocol.
- Definition and standardization of TLV types for network interfaces, GPS management, and more.

Getting Started

Firmware 1.5.0 adds support for the IND API 2.0 specification while retaining compatibility with the IND API 1.0 specification.

The IND API 2.0 interface introduces a new message prefix that is used with all API2.0 messages, while version 1.0 of the API uses a different prefix. The A2X uses this prefix to determine the API version of the request, and will process the message and respond accordingly. That is, a request to the A2X using API 1.0 will get a response using API 1.0, while a request using API 2.0 will get a response using API 2.0. This means that for API interaction, it is not necessary to specify a version explicitly.

Reporting of decoded messages, however, does require explicit selection of an API version. This is done via A2Control, in the serial and network settings sections. There is a new dropdown in the Serial Port interface tab, shown on the right, allowing you to select the Output API Version. In API 2.0, CSV vs binary output is controlled by the Output Mode selector.



Serial Port 1

- Input Mode: ALERT2 API
- Output Mode: ASCII
- Output API Version: API 2.0
- Baud Rate: 57600
- Parity: None
- Stop Bits: 1
- Flow Control: None
- Timeout (ms): 250
- Independent Addr: False
- Address (If Enabled): 9000

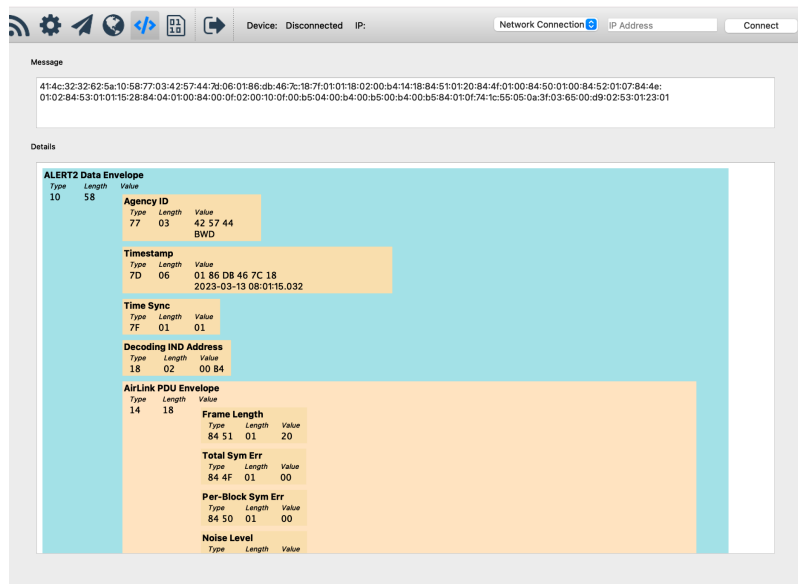
Similarly, the IP settings panel features new configuration options, allowing users to configure a network address for CSV and API 2.0 Binary message forwards.

Logging to the SD card has also been extended, with CSV output strings being recorded in a CSV file alongside the P, N, C, and A strings in a version 1.0 file.

We expect that the CSV output, in particular, will be a popular upgrade. The AirLink, MANT, and Application Layer is parsed and reported in a format that can easily be ingested by any modern spreadsheet or database software. Sensor values are directly visible in the output alongside the MANT and AirLink metadata.

A2Control Updates

This update includes the addition of a message parser to A2Control. In order to help users visualize and understand binary messages, A2Control now contains a message parser tab. This feature should be a useful tool in understanding the API 2.0 binary message format and developing downstream applications. Additionally, the message parser can process P messages from the API 1.0 format, converting them to an API2.0 format internally and then displaying the results.



Device: Disconnected IP: Network Connection IP Address Connect

Message

414c3232625a105877034257447d060186db467e187f0101180200b4141884510120844f01008450010084520107844e01028453010115288404010084000f020010f00b50400b400b500b400b584010f741c55050a3f036500d90253012301

Details

ALERT2 Data Envelope

Type	Length	Value
10	58	
Agency ID		
Type	Length	Value
77	03	42 57 44 BWD
Timestamp		
Type	Length	Value
7D	06	01 86 D8 46 7C 18 2023-03-13 08:01:15.032
Time Sync		
Type	Length	Value
7F	01	01
Decoding IND Address		
Type	Length	Value
18	02	00 B4
AirLink PDU Envelope		
Type	Length	Value
14	18	
Frame Length		
Type	Length	Value
84	21	01 20
Total Sym Err		
Type	Length	Value
84	4F	01 00
Per-Block Sym Err		
Type	Length	Value
84	50	01 00
Noise Level		
Type	Length	Value

The message parser currently expects hex strings – with optional spaces or colons as separators – of messages in the API2.0 binary format. The prefix (AL22b) is optional.

Additionally, the encryption key management interface has been reworked, and should provide a better user experience.

In future releases of A2Control for the 1.5.x series, we plan to extend the “Send Message” interface to support the MANT Configuration and Control protocol and the Application Layer SET and GET types.

New and Updated TLVs

With the release of API2.0, a number of the internal (7000 series) TLVs used by the A2X now have an official type number. In most cases, we updated the TLV to use the new number and did not retain backwards compatibility with the old number. We expect that these changes will not cause any issues because A2Control was typically used to configure the A2X. However, in cases where other software is configuring the A2X, updates may be required.

The following table summarizes the TLV updates in 1.5.0.

Type Description	Old Number (Dec)	New Number (Dec)
Get Address List Data	53 (overloaded)	59
Report Status Frequency	7001	86
Report Status Offset	7018	87
Current IP Address (Read Only)	7016	4119
DHCP	7003	4112
IP Address	7004	4113
Network Mask	7005	4114
Gateway	7006	4115
DNS Servers	7007	4116
Clock Source	7009	4117

NTP Servers	7010	4118
CSV Network Client		7024
API2.0 Binary Network Client		7025

Errata - Specification Ambiguities and Deltas

During development of this firmware, we encountered a few cases where we believe that the specification should be updated. We will pursue those updates with the ALERT2 TWG, but in the meantime the following errata should be noted.

- In the binary message output format, is it not possible to recreate the received ALERT2 message unless the AirLink header is included in the API output. We therefore recommend always including the AirLink header (but not the full payload).
- Status report interval in the API 2.0 specification is stated to be in hours, but a previous request to the TWG changed this value from hours to minutes. The document should be updated to reflect this change.
- Application layer GET and SET types result in two new CSV types: “Sensor Get” and “Sensor Set”. In addition to the common fields, a Sensor Get line will include the Site Address and the Sensor ID. In addition to the common fields, a Sensor Set line will include Site Address, Sensor ID, and a value.
- The specification is ambiguous on what to report for the AirLink frame length TLV (0x8451) when the first block is corrupted (and, therefore, the value may contain errors. Reporting the size of the first block in this case will accurately reflect the time that the decoder was working to decode a message, whereas the value from the decoded message is likely incorrect.
- When setting an encryption key, if no key exists for the address the new key is applied immediately, regardless of the encryption key rotation time setting.
- When reading the “encryption key rotation time” TLV, the rotation time of the currently active key is returned. When writing to the “encryption key rotation time” TLV, the time that will be used with the next “key set” operation is set. The asymmetry here is not clearly documented.

Downgrading Firmware

Beginning with the 1.5.x firmware series, it is possible to downgrade firmware. If, in the root folder of the USB thumb drive, there is a folder named “FORCE” then only firmware update files in the “FORCE” folder will be considered for deployment. The highest version firmware file in this directory will be applied, regardless of whether it is newer than the current version.

Keep in mind, it is only possible to downgrade firmware from a version 1.5.x firmware release; older versions of the firmware will ignore the FORCE directory.