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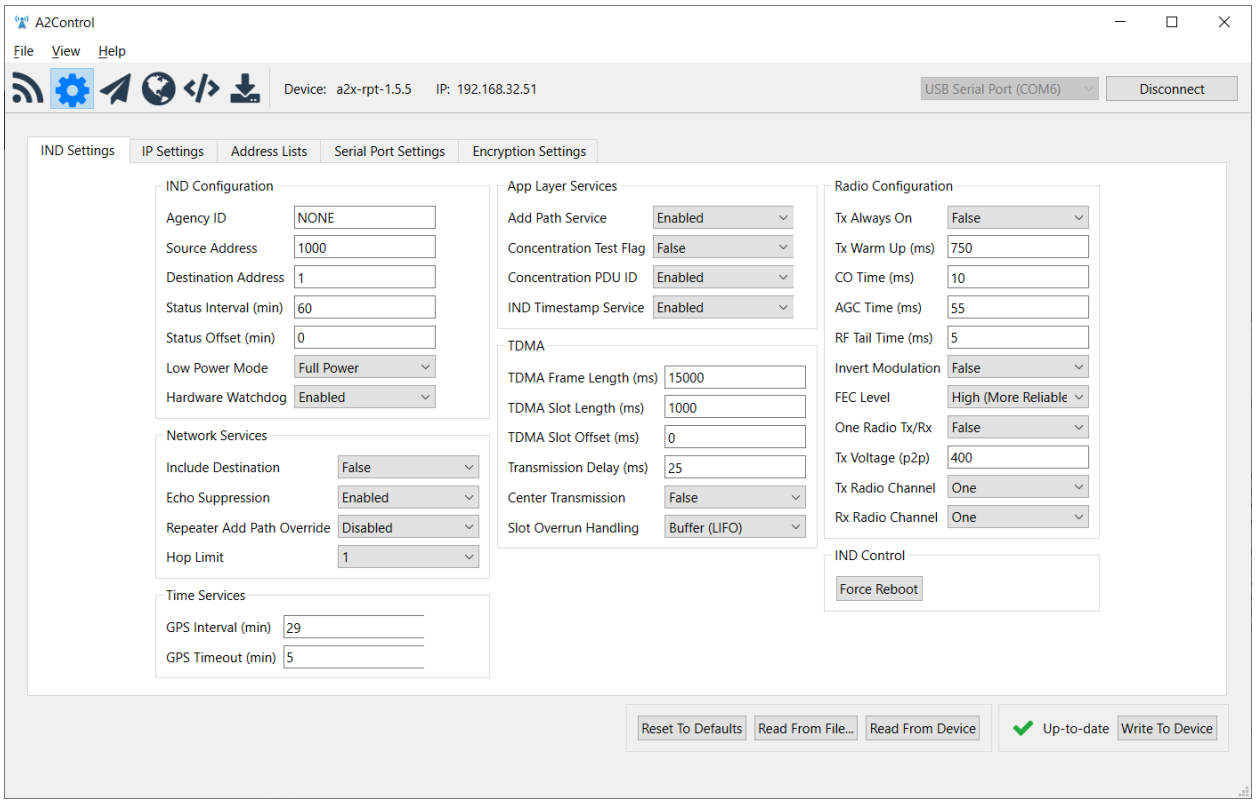
A2Control User Manual



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About A2Control

A2Control is a Windows GUI for interfacing with and configuring Blue Water Design's A2X ALERT2 devices. It supports connections via the A2X's micro USB connection (which functions as a serial port), Bluetooth serial port, or IP.

The software is available for download from the Blue Water Design website at:
http://bluewaterdesign.us/downloads/a2control

ALERT2 Information

ALERT2 is a low-bandwidth, high-reliability protocol designed for the transport of real-time data over radio telemetry networks.

A Description of the ALERT2 Protocol[1], a white paper summarizing the protocol, opens with the following description:

> ALERT2 is a new protocol optimized for the transport of real-time data over radio telemetry networks. It is the intended successor to the ALERT (Automated Local Evaluation in Real Time) protocol introduced in the 1970s. It offers a 7- to 10-fold increase in net data rate (or channel capacity), detects all errors introduced in transmission and corrects the great majority of them. The new protocol comprises multiple sub-protocols, with the flexibility to add new ones as needs emerge. It provides greater "data space" that expands the range of sensor identifiers and data resolution. It can be used in either ALOHA or TDMA environments, the latter providing the opportunity to eliminate data contention altogether.

The protocol specification documents are linked from Blue Water Design's support page, here.

[1] *A Description of the ALERT2 Protocol*, Don Van Wie, October, 2011, http://bluewaterdesign.us/docs/ALERT2_Description_102511.pdf

Connecting to an A2X with A2Control

Wired Connection Method

The simplest and most robust method for connecting to an A2X is to use the USB console interface on the A2X.

- Connect your computer to the console port on the A2X using a MicroUSB cable.
- Launch A2Control.
- If there is only one attached serial port, A2Control selects it by default. Otherwise, select the appropriate serial port from the dropdown in the top right of the window and click the “Connect” button.

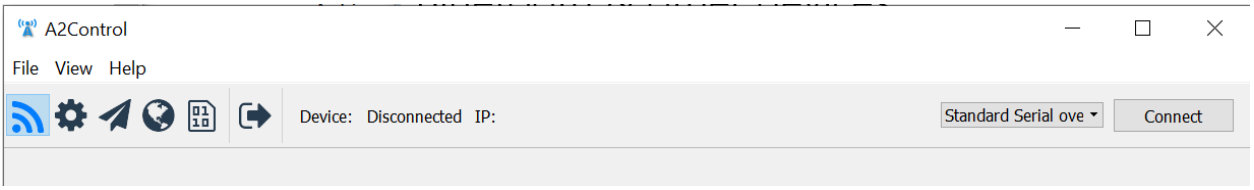

Image: The connect button and serial port selection drop-down

- If A2Control is able to communicate with the A2X, the firmware type and version of the A2X will be shown in the toolbar along the top of the A2Control window as well as the device’s IP address, if it is connected to the network.

NOTE: In order to communicate successfully with an A2X, you must use an appropriate version of A2Control. Specifically, the Major and Minor versions must match, e.g., A2Control 1.3.2 can be used with all A2X versions in the 1.3.X series.

Wireless And Network Connections

In addition to the USB interface, A2Control is able to connect to an A2X using either TCP/IP or Bluetooth. The TCP/IP connection method allows configuration and control of a remote device over the internet, while bluetooth allows connection to a nearby device wirelessly.

TCP/IP Connection

PLEASE NOTE: Before you can connect to the remote device, you must first set a network password in the IP Settings tab of the configuration pane in A2Control. The A2X ships with remote connections disabled as a security precaution, so you must set this password via the wired or bluetooth method before connecting via the network for the first time.

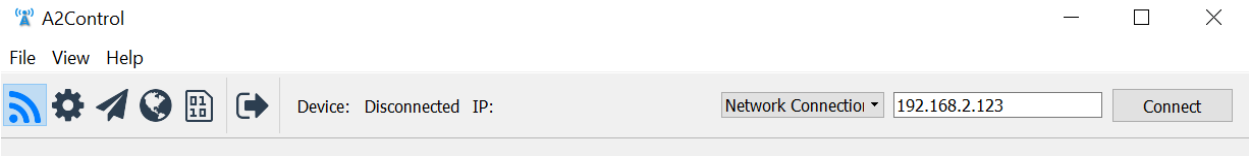

Image: After selecting "Network Connection" from the drop-down, enter the A2X's IP in the provided box and click "Connect"

To connect to a remote A2X, select "Network Connection" in the dropdown to the left of the "Connect" button, then enter the IP address or hostname of the device. When you click "Connect", you will be prompted to enter the network password.

Since version 1.5.4, A2Control allows you to specify a connection port as well. This is done using the format "IP:PORT". For example, you could specify, "192.168.2.123:7240" to connect to port 7240. The A2X listens for connections from A2Control on port 4422.

The IP of the A2X will be displayed in the top bar of A2Control if it's connected to a network. It can be helpful to connect to an A2X using a wired connection initially to determine the device's IP. Depending on your network connection, this address may not be the address you will use to connect to the A2X remotely. Please contact your network administrator for assistance if needed.

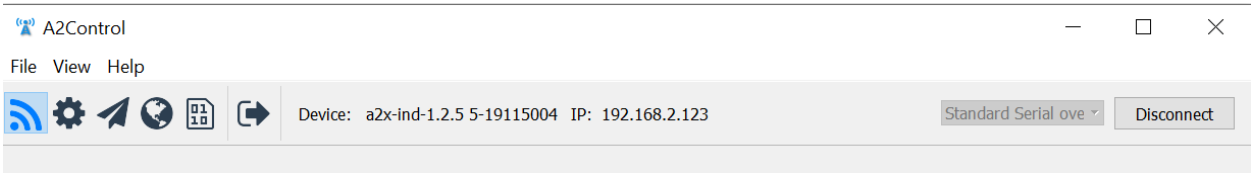

Image: When connected to a Network, the IP will be displayed in A2Control. This IP may be used to configure the A2X via the network once a device password is set.

Bluetooth Connection

A2Control supports connecting to an A2X over a Bluetooth connection. The A2X does not have integrated bluetooth hardware, but it can make Bluetooth connections via a USB Bluetooth adapter. A supported adapter is shipped with the A2FX Field Transceiver.

To use A2Control over a Bluetooth connection, the A2X must first be paired to the PC. Please follow these steps to pair:

- Under Settings click on **Devices - Bluetooth, printers, mouse**
- Under **Bluetooth & other devices** click the plus sign to **Add Bluetooth device** and a black screen should open titled **Add a device.**
- Select **Bluetooth** on the **Add a device** screen

- Power up the A2X. Once booted, the A2X serial number should be listed in the **Add a device** window. Select it to complete the pairing process.
- **NOTE: Make sure the Bluetooth adapter is inserted into the USB port of the A2X before you power on the A2X**. If you insert the adapter after the A2X is powered on, the bluetooth pairing will not work.
- At this point, the PC should recognize the A2X as providing a Bluetooth serial port (also known as SPP, Serial Port Profile), and the port should be available in the connection drop-down in A2Control.

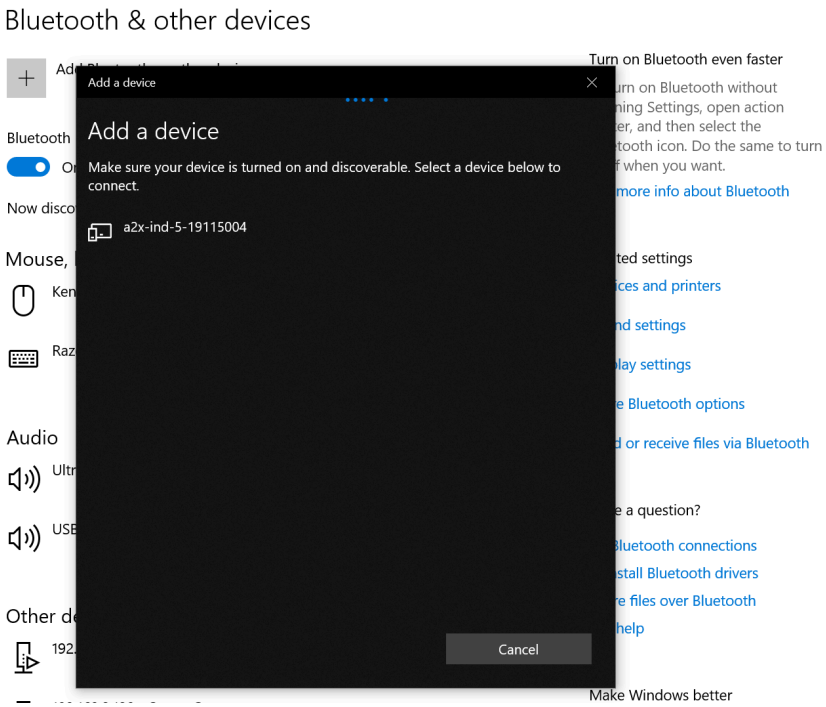

Image: The A2X must first be paired within the PC's Bluetooth configuration. Open the Bluetooth setting screen, power on the A2X, and select it from this screen

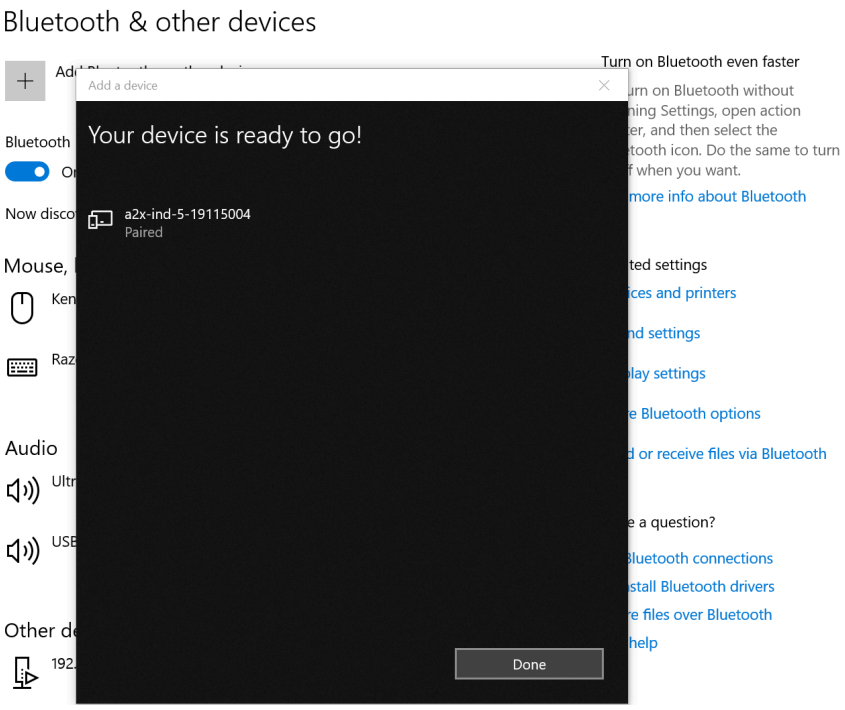

Image: The A2X has been successfully paired with the PC

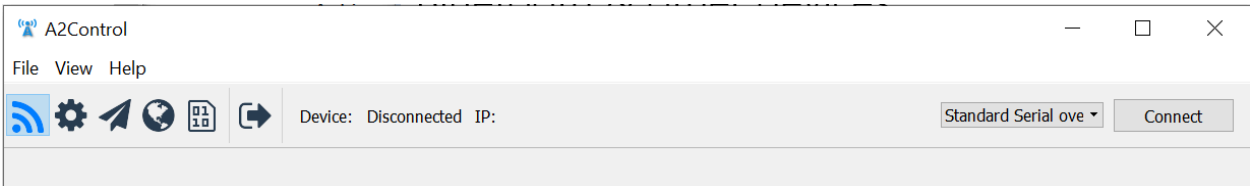

Image: The Bluetooth serial port is now accessible in A2Control

A2Control Operation

Messages Screen

The Messages screen is the first screen shown by A2Control and is also accessible via the left-most toolbar button.

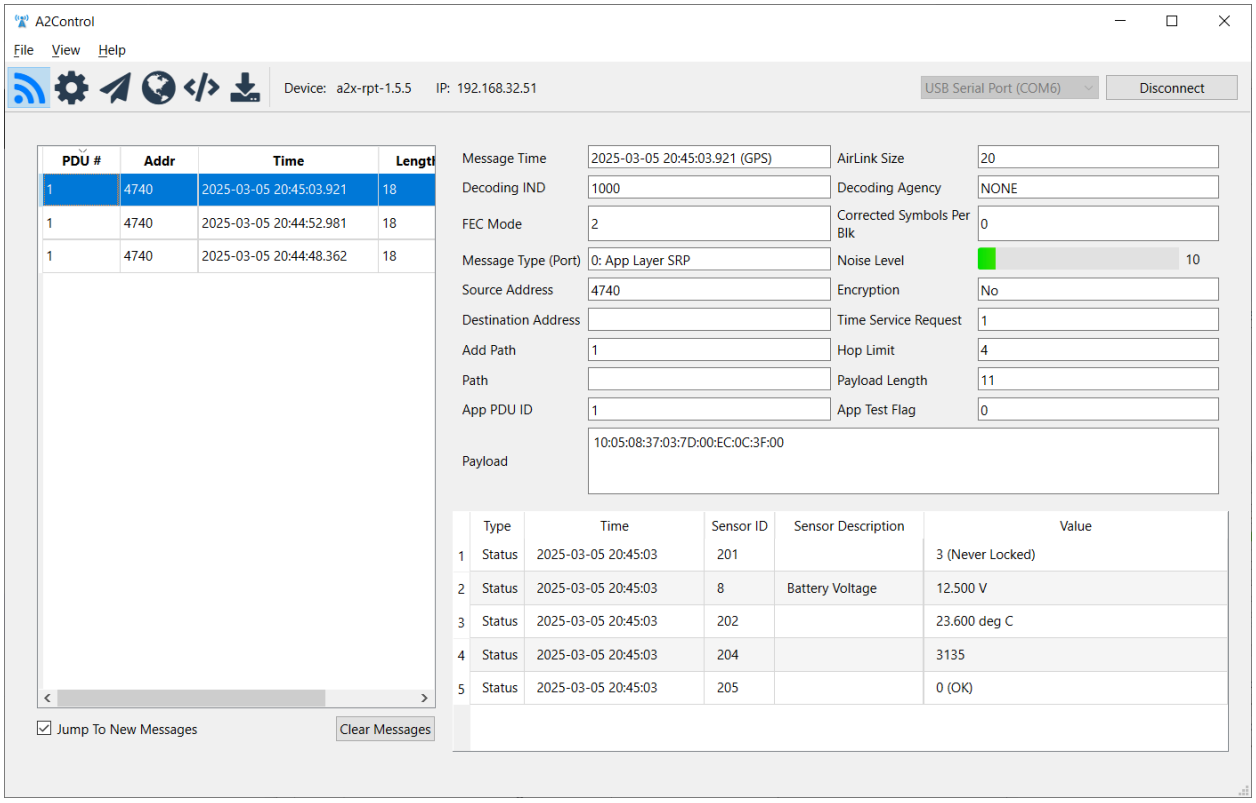

Image: The Messages screen of A2Control

The left-most section shows messages received by the A2X since A2Control has been connected to the device. Clicking on an individual message in the list will populate the right hand side of the screen.

The meaning of the fields shown on the right is as follows:

Message Time	The time that the message was received, based on the clock on the A2X
Decoding IND	The address of the A2X that decoded the message
FEC Mode	**0**: Most error correction, lowest throughput **1**: Moderate error correction, moderate throughput

	2: Least error correction, most throughput
Message Type (Port)	**0**: Application Layer Self-Reporting Protocol (ALERT2 Data) **1**: Application Layer Concentration Protocol (Legacy ALERT) **128**: IND Configuration and Control Protocol
Source Address	The address of the IND that sent this message.
Destination Address	The destination address of this message, if specified. Most ALERT2 messages are sent without a destination address.
Add Path	**0**: Path annotation not requested **1**: Path annotation requested (when this message is processed at a repeater, the address of the repeater will be appended)
Path	The path taken by this message, if “Add Path” is set to 1. Empty indicates that this message was received directly or that path annotation is disabled.
App PDU ID	The PDU ID from the control byte of “Application Layer Self-Reporting Protocol” messages. Typically increments from 0 to 6 then returns to 0. Can be used to identify data completeness.
AirLink Size	The number of bytes in the AirLink message. A single AirLink message may contain multiple MANT messages, resulting in multiple entries in the table.
Corrected Symbols Per Blk	The number of symbols corrected in each block. Higher numbers indicate lower message receive quality.
Noise Level	An indication of the amount of noise in the received message. **0 - 35**: Good **36 - 55**: Fair **55+**: Marginal
Encryption	**Encrypted**: Message contains an encrypted payload and has not been decrypted **Local**: Message originated locally, and is therefore not encrypted regardless of the encryption settings **Authentic**: Message was transmitted and authenticated using the MANT Encryption and Authentication protocol **No**: Message was not sent using the MANT Encryption and Authentication protocol
Time Service Request	**0**: Application Layer Time Service not requested. **1:** Application Layer Time Service requested - the first repeater or decoder to receive this message with a reliable clock will insert a measurement timestamp.

Hop Limit	**0-6**: The remaining number of hops when decoding this message. When a repeater processes a message, it first checks the hop limit. If the value is 0, the message is dropped. Otherwise, the hop limit is decremented before retransmission. **7**: Hop Limit disabled.
Payload Length	The number of bytes in the MANT payload
App Test Flag	The value of the application layer test flag field. This can be set to indicate that this message should not be considered to contain valid data.
Payload	Hexdecimal representation of the MANT payload. If the payload can be understood as an application layer message, the application layer fields are displayed below.

The “Jump To New Messages” checkbox selects new messages for display as they are received.

The “Clear Messages” button clears the list of messages from A2Control.

Device Configuration

The gear button accesses the Device Configuration screen. This screen allows you to view and change the configuration of an A2X.

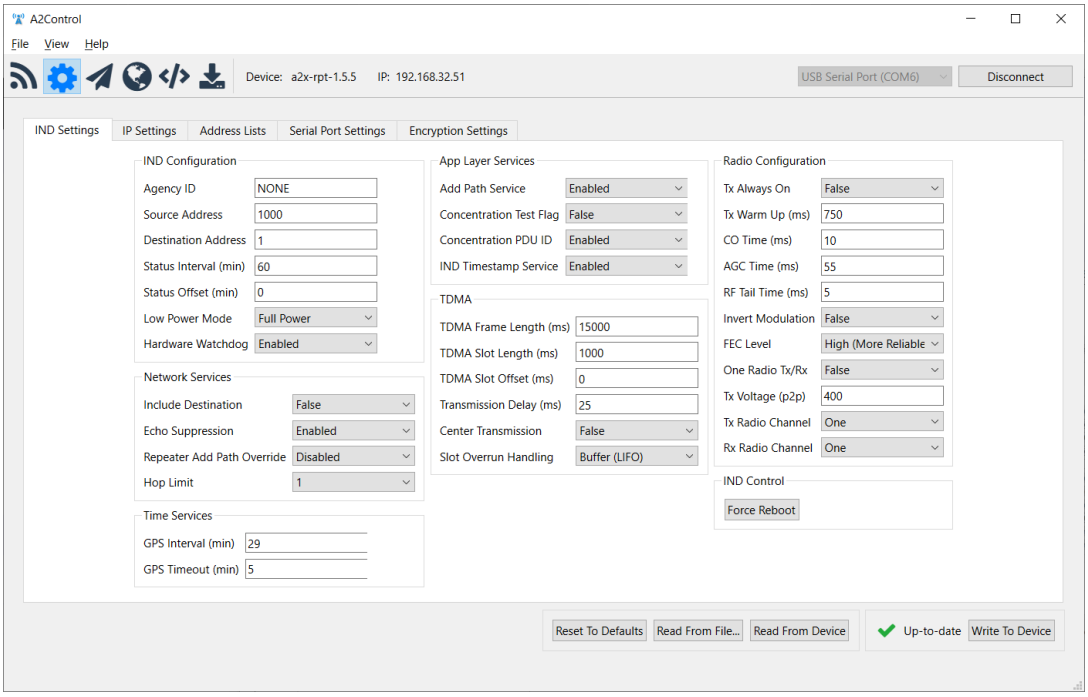

Image: The Device Configuration screen of A2Control

Common Configuration Options

The ALERT2 IND API specification defines a wide range of configurable settings that can apply to an IND. The A2X implements all mandatory and recommended settings in version 2.0 of the specification, and many of the optional configuration items as well. The settings are organized in A2Control by their function.

Because there are so many configuration options, initial setup of an ALERT2 device can be intimidating. In most cases, however, the default values are reasonable and need not be changed.

The following tables highlight values that users should consider changing.

Setting	*Tab*	*Description*
Agency ID	IND Settings	A unique string describing your agency. (e.g., UDFCD or BWD)
Source Address	IND Settings	The unique address of this device. Addresses may be managed through the Source Address Management System (SAMS) at alert2.org
Network Password	IP Settings	A password that can be used to connect to this device remotely
Serial Port Input Output Mode	Serial Port Settings	Configure serial ports for API or Concentration input, ASCII/Binary/No output
Clock Source	IP Settings	Will GPS or NTP be used for time information
ASCII IP Forward	IP Settings	Comma separated list of hosts to which received ALERT2 messages, in ASCII format, will be streamed
Binary IP Forward	IP Settings	Comma separated list of hosts to which received ALERT2 messages, in Binary format, will be streamed
TDMA Frame Length	IND Settings	The overall TDMA frame length of your system
TDMA Slot Length	IND Settings	The TDMA slot length assigned to this device
TDMA Slot Offset	IND Settings	The slot offset into the TDMA frame
Transmission Delay	IND Settings	Delay into TDMA slot (set to 12 ms for 250ms slot)

Tx Voltage (p2p)	IND Settings	Set to 400 (Ritron) or 425 (Maxon) depending on the transmit radio being used

Clock Source Configuration

In TDMA mode, an ALERT2 transmitter requires a 3D GPS fix (a minimum of 5 satellites) in order to acquire accurate time. For a receive-only site, it is optional, and the A2X also supports time synchronization using the NTP protocol via the Ethernet port.

The clock source may be configured on the IP Settings page.

If using the GPS clock source, the GPS will be powered on occasionally to acquire clock sync. The frequency of the GPS cycle is controlled by the *GPS Interval* configuration value. Setting it to 0 will turn the GPS on continuously.

Pass and Reject Lists

The A2X repeater firmware supports up to two different Pass or Reject lists for determining which messages to repeat. Before a message is repeated, it is checked against all active address lists.

Lists can be either a “Pass” list, where only listed entries are repeated, or a “Reject” list where messages are repeated by default, but dropped if they are in the list. Messages can be filtered by Source Address, Destination Address, or the path list added by other repeaters.

Messages can either be reported locally in the ALERT2 logs or dropped silently.

These lists can be configured on the Address Lists tab of the configuration pane in A2Control, or they can be configured via the ALERT2 IND API.

Serial Port Settings

The A2X provides three serial ports, which may be configured on the Serial Port Settings tab.

The **Input Mode** setting allows a port to be configured for the ALERT2 API (default) or placed in ALERT Concentration mode, where it expects binary ALERT data.

The **Output Mode** settings allows the data output on a port to be set to ASCII, Binary, or Disabled. Regardless of the Output Mode setting, the port will respond to ALERT2 API queries in the appropriate format.

If **Independent Addr** is set to True, messages originating on this port will be marked with the source address specified in the **Address** field, rather than the IND’s source address.

The remaining settings control the standard communications parameters of a serial port.

Encryption Settings

The A2X implements the ALERT2 Encryption and Authentication extension to the ALERT2 protocol. See the associated protocol document for more details.

Transmit

Access the Transmit screen by clicking the paper airplane button.

Sensor Message

The first tab on the transmit screen allows sending an application layer “Sensor Message”, either a general sensor report or an application layer SET message. In general, a general sensor report is used to report a sensor reading, while an application layer SET message is meant to implement a command or control action.

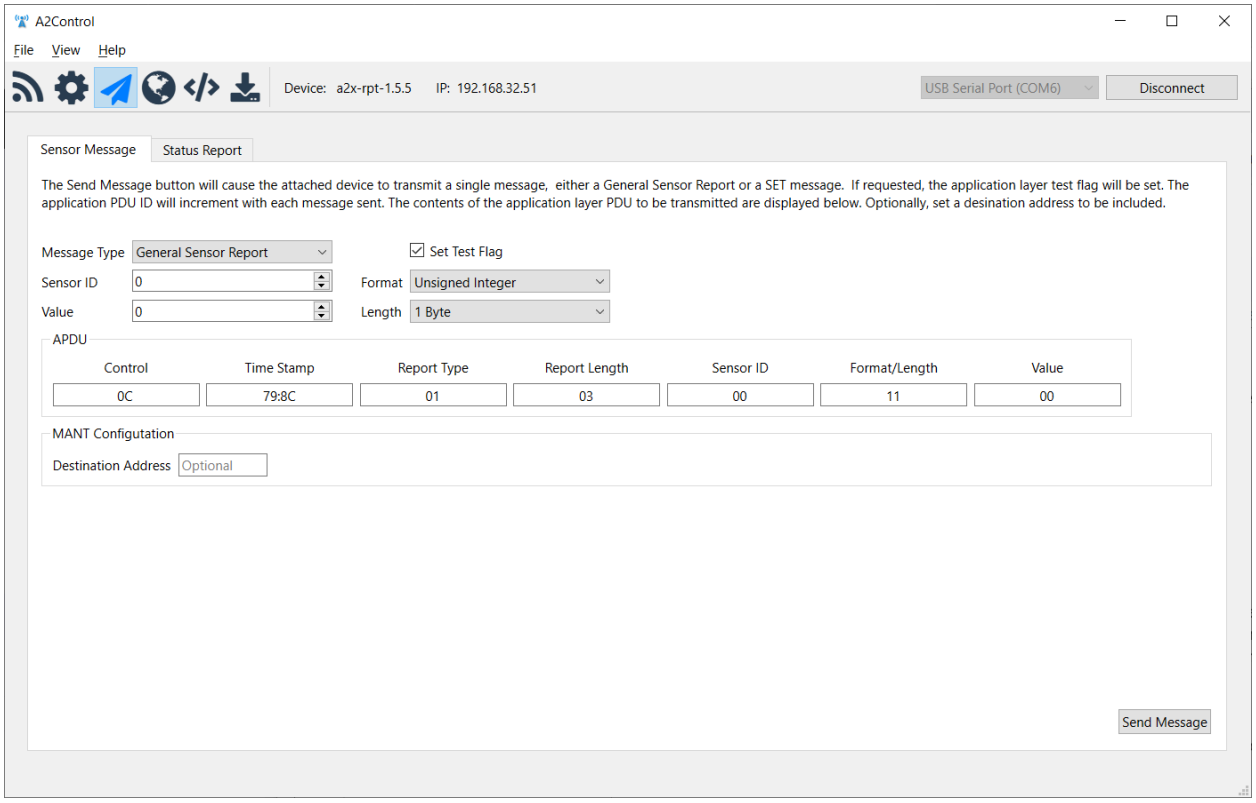

Image: The Transmit Sensor Report screen of A2Control

You can specify the type of message, the sensor ID, the value, and the format and length of the value to be sent using the fields at the top of the page. The binary message that will be sent is displayed in the box label APDU (Application Protocol Data Unit).

Optionally, you may set a destination address.

If encryption and authentication are required, they need to be configured separately on the encryption and authentication page.

Status Report

The status report tab displays the current status of the A2X and allows you to trigger the transmission of a status report by clicking on the “Send Status” button.

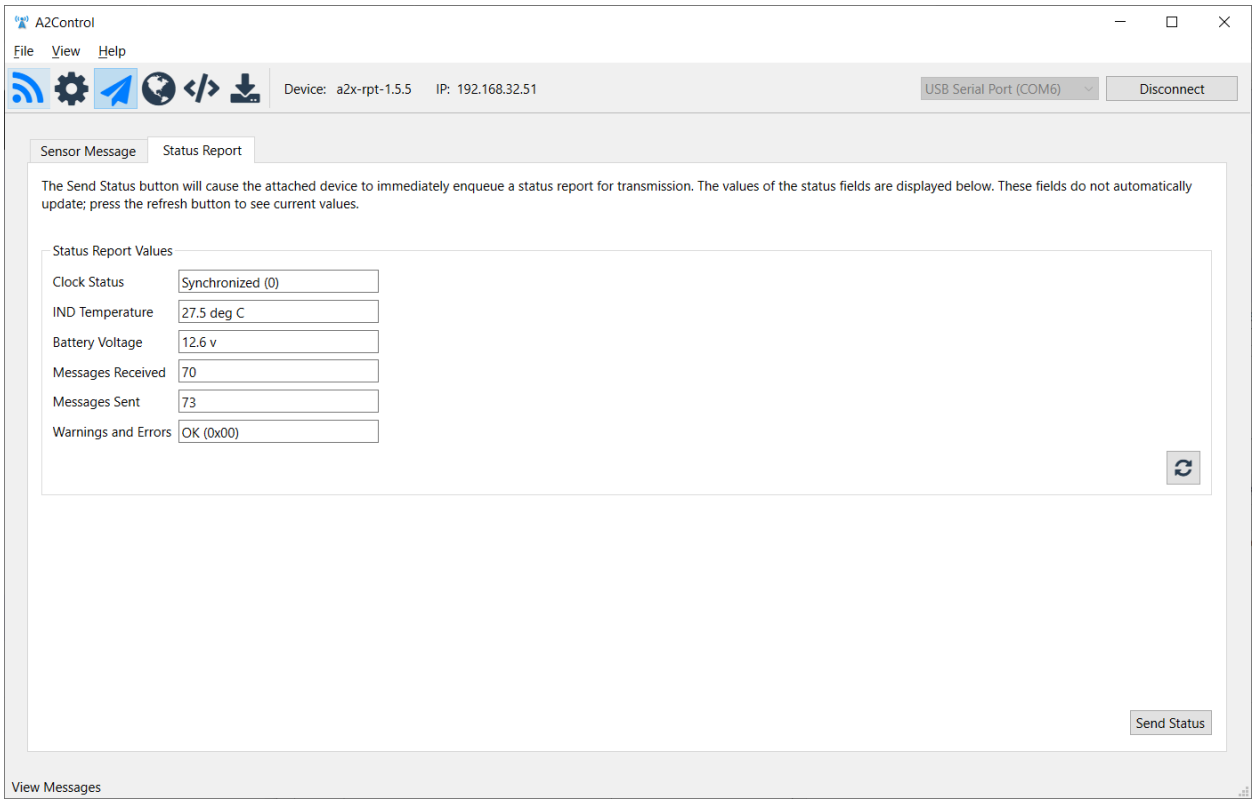

Image: The Transmit Status Report screen of A2Control

GPS Information

GPS Information can be displayed by clicking the globe button.

In the top left corner, various details of GPS status are shown such as the number of Satellites used and if the GPS is on/off. The bars on the right also indicate the GPS Signal Strength. If not enough satellites are in the green zone, it may be difficult for the A2X to get a GPS lock.

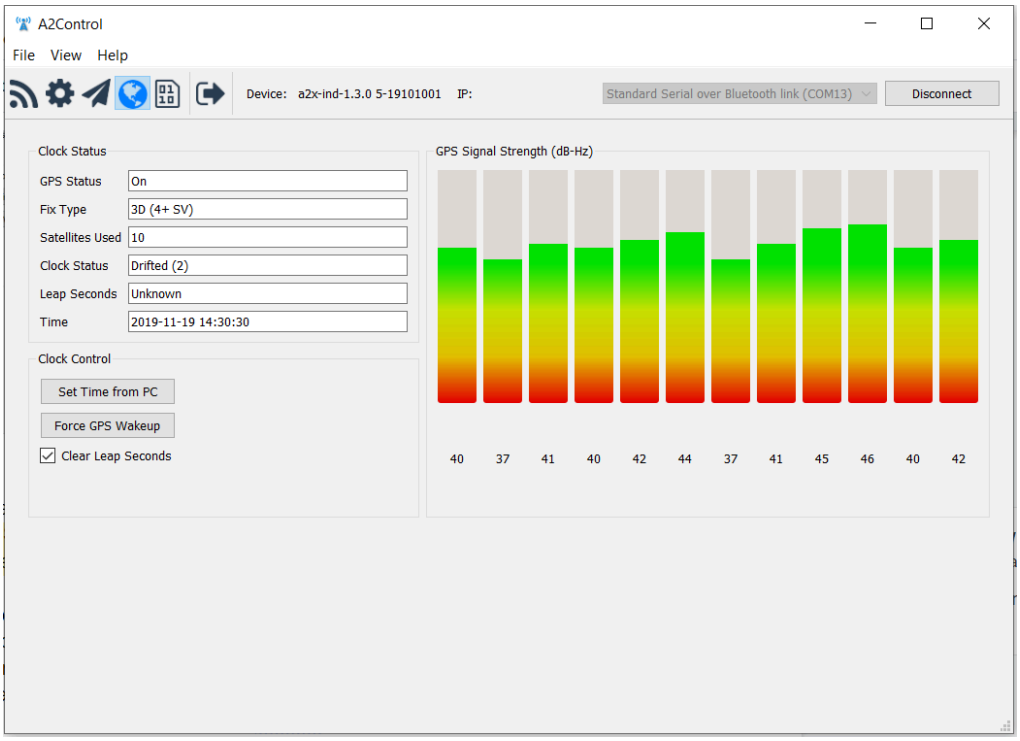

Image: The GPS Information screen of A2Control

Below that, the Clock Control area has the following buttons:

- **Set Time from PC**: Forces setting the A2X's time from the PC clock. This function is intended for use when a GPS is not available. **PLEASE NOTE:** The PC's clock is NOT an accurate enough time source for TDMA use.
- **Force GPS Wakeup**: Forces the GPS to wake up and perform a time sync immediately, regardless of the current time sync schedule
- **Clear Leap Seconds**: this setting can be used for advanced diagnostics of GPS issues. First check the "Clear Leap Seconds" checkbox then click "Force GPS Wakeup. This will cause the A2X to clear the leap seconds count held in memory and reacquire the information from the GPS satellites. It may take up to 13 minutes for the GPS to regain clock sync.

File Browser

The file browser tab can be used to view and download the contents of the MicroSD card on the A2X. The left hand side of the screen provides a file/directory browser interface, where clicking on the caret or double clicking on a directory name will expand or collapse the directory, showing the files and directories it contains. Double clicking on a file will show the file contents in the right-hand side of the display.

Files may be downloaded by clicking the Download File button or deleted using the Delete File button with the trash can icon. All files from the A2X may be downloaded using the Download All Files button.

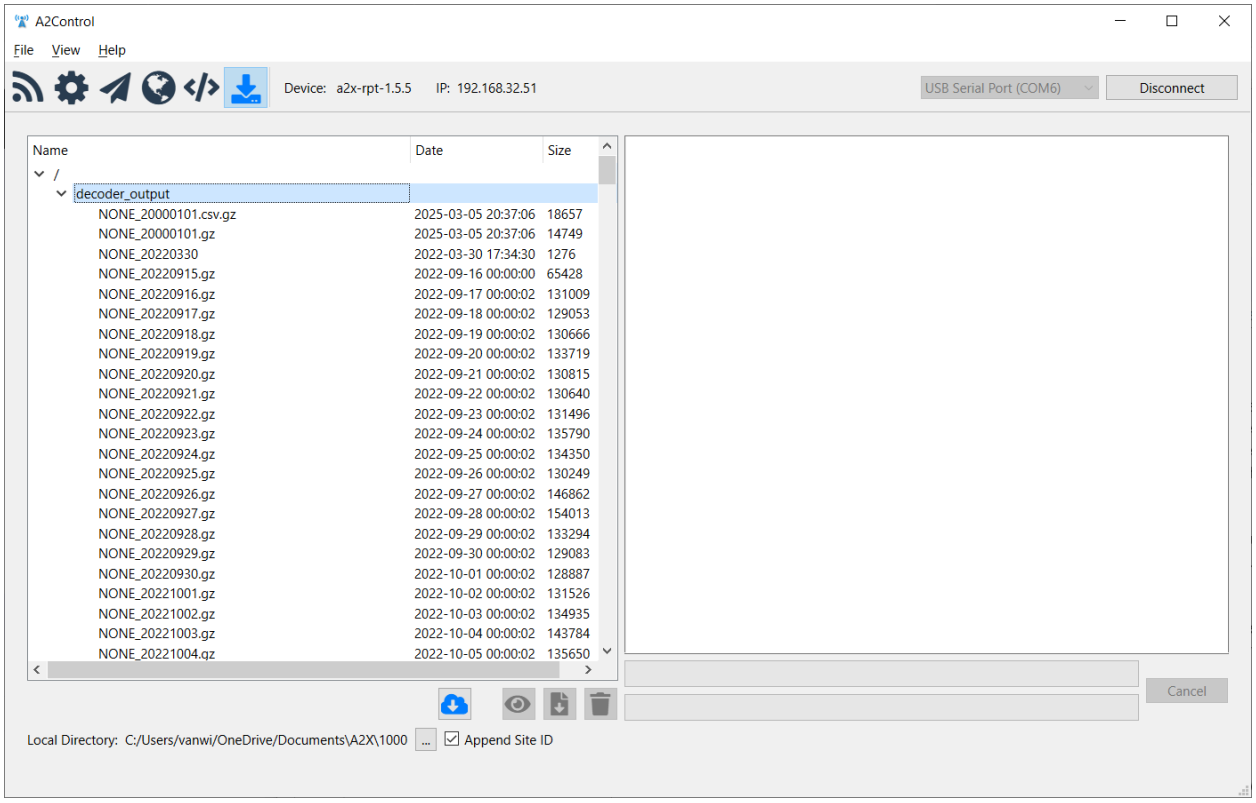

Image: File Browser interface in A2Control

Please note that due to hardware and design limitations, this interface operates at a relatively low speed. When possible, we recommend that you use a USB thumb drive or the SFTP interface to download device logs.

Firmware Updates

Starting with version 1.5.5, A2Control allows users to update the A2X firmware though the A2Control interface. Simply navigate to the File menu, then select “Apply Firmware Update …”. After selecting an appropriate firmware image, the image will be uploaded to the A2X and the firmware update process will begin. In the case of problems, you can review the logs in the logs/sftp-checker/current file for more information.

Please note that due to hardware and design limitations, this interface operates at a relatively low speed. When possible, we recommend that you use a USB thumb drive or the SFTP interface to update firmware.