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AMOS Remote

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Introduction

The AMOS Remote uses a long range 2.4 GHz wireless transceiver to extend the range of wired or Bluetooth data connections. It can be plugged into an available USB port on a computer and used as a wireless serial port or you can connect to it via Bluetooth (Bluetooth Low Energy or BLE) using an Android or iOS Device. It can be purchased with a waterproof box and 3xAA battery pack for outdoor use. The transceiver used is the RF220SU from Synapse Wireless, which includes A to D inputs, digital I/O, and many programmable features. A 2 x 12 header is provided for making easy connections to all the available pins on the RF220SU.

For Bluetooth Use: set jumpers on pins 1 and 2 of J4 and J5

For USB Use: set jumpers on pins 2 and 3 of J4 and J5

Specifications

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Typical Range (line of sight, ground level, with +3 dB antenna)	500 m
Baud Rates Supported	2400 bps, 4800 bps, 9600 bps, 38400 bps, 57600 bps, 115200 bps, 230400 bps, **default = 38400 bps**
Antenna Gain	+3 dB
Antenna Height	170 mm
Antenna Max Width	14 mm
Waterproof box max width	101.5 mm
Waterproof box max length	144 mm
Waterproof box max height	50 mm
Circuit board width	60.5 mm
Circuit board length	104 mm

Parts List

1. AMOS Remote Circuit board including RF220SU (with 24-pin header), HM-10, and USB-serial daughter boards.
2. +3 dB antenna
3. Micro-USB connection cable for connecting unit to PC or other computer (Windows, Mac, and Linux / Raspberry Pi supported).
4. Waterproof case (optional)
5. 3xAA battery pack with Velcro attachment (optional)

Modes of Operation

The device being used to communicate through the AMOS Remote can use either a Bluetooth or a USB connection. The USB connection requires plugging the supplied micro-USB cable from an available USB port on a computer into the micro-USB socket on the USB-serial daughter board, as shown below:

Plug Micro-USB cable in here
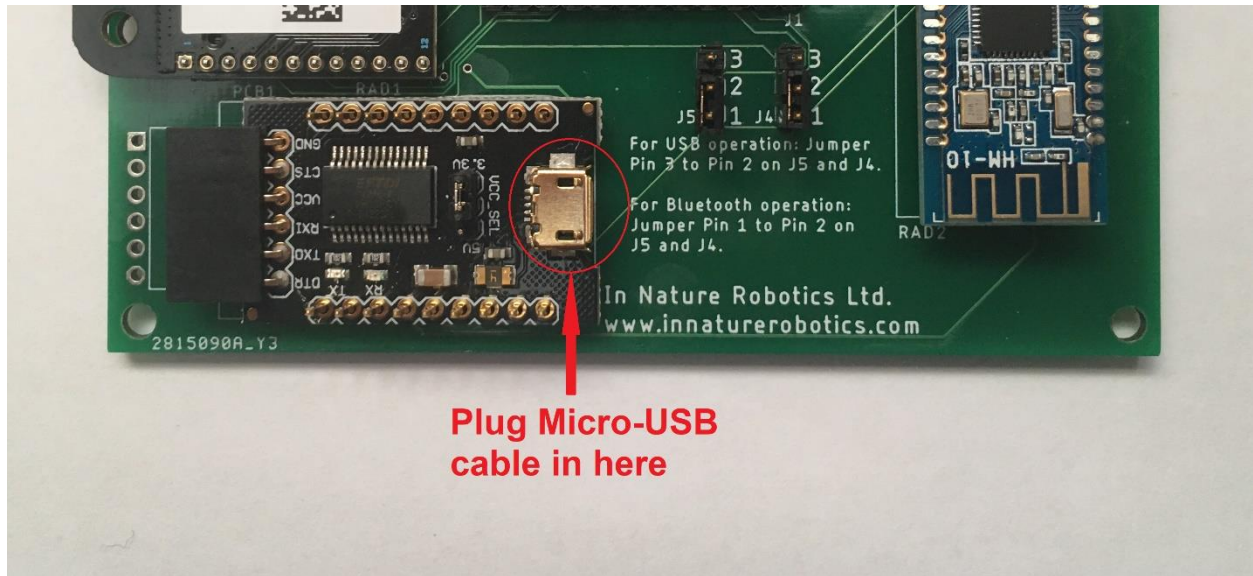
USB operation also requires that the jumper connectors on J4 and J5 both be set on pins 2 and 3. The SWT1 switch should be set to the OFF position, since the board does not need to be powered from the battery pack; it is powered instead from the 5 volts supplied by the computer's USB port. When connecting to the AMOS Remote through the Bluetooth connection, the jumper connectors on J4 and J5 should both be set on pins 1 and 2. Power can be supplied either through the USB connector (SWT1 should be turned off) or through the battery pack (SWT1 should be turned on).

When first powering up the AMOS Remote, using either the USB or Bluetooth connection, the green status LED will turn on and stay on for one minute:
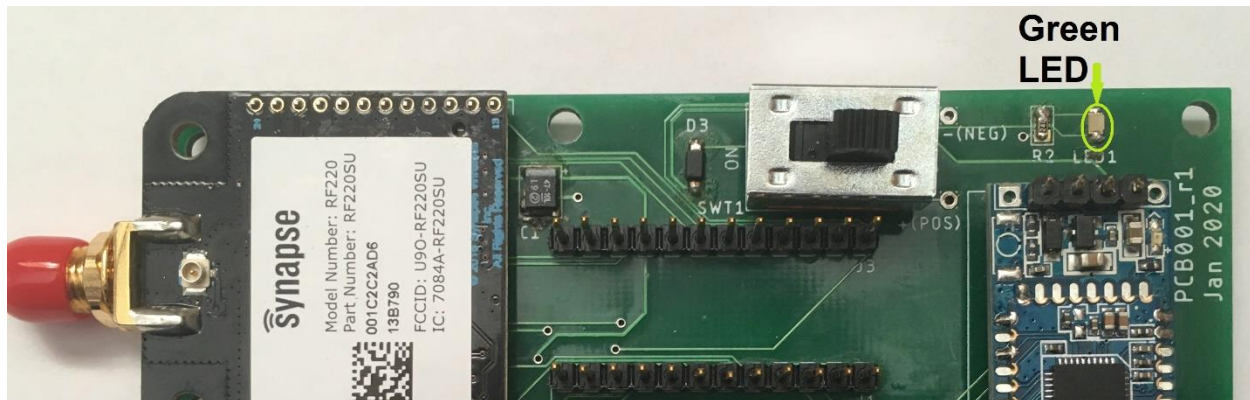
 After one minute, the LED will begin to blink. This indicates that it is ready for communications.

When in USB operation, the AMOS Remote will appear as a serial COM port on the computer being used. Bytes written to the port from the computer will be sent out the RF220SU at the configured baud rate (default = 38400 bps) and sent to one or more pre-configured remote units up to 500 m away. Data received from any remote units will be sent out the serial COM port to the computer.

When using Bluetooth, The AMOS Remote will appear as an available BLE (Bluetooth Low Energy) connection called "AMOS_REMOTE". If your smartphone is equipped with a BLE-capable terminal software, it should be able to connect to the AMOS_REMOTE device and send and receive data. Data sent to the BLE device is forwarded out the RF220SU module to one or more remote units up to 500 m away. Data received from any remote units appears as BLE packets of data over the Bluetooth connection link.

Testing the Connection

A simple way to test a wireless serial linkage is to use terminal software. There are a number of free software terminal programs available. For the PC a good one to use is "Tera Term" (see for example: https://tera-term.en.lo4d.com/windows). There are also a number of terminal apps for mobile devices that work for Bluetooth and BLE connections, a good one to use for the Android operating system is "Serial Bluetooth Terminal ", available here: https://play.google.com/store/apps/details?id=de.kai_morich.serial_bluetooth_terminal&hl=en_US on Google Play.

The following example shows how to setup a wireless serial communications link between a PC using a USB connection to an AMOS Remote with Tera Term and an Android phone using a BLE connection to Serial Bluetooth Terminal.

1. Connect the micro-USB cable between an available USB Port on the PC and the micro-USB socket on an AMOS Remote.
2. Start the Tera Term software.
3. Select the 'Serial' radio button, and then select the COM port from the dropdown control that corresponds to the AMOS Remote radio:
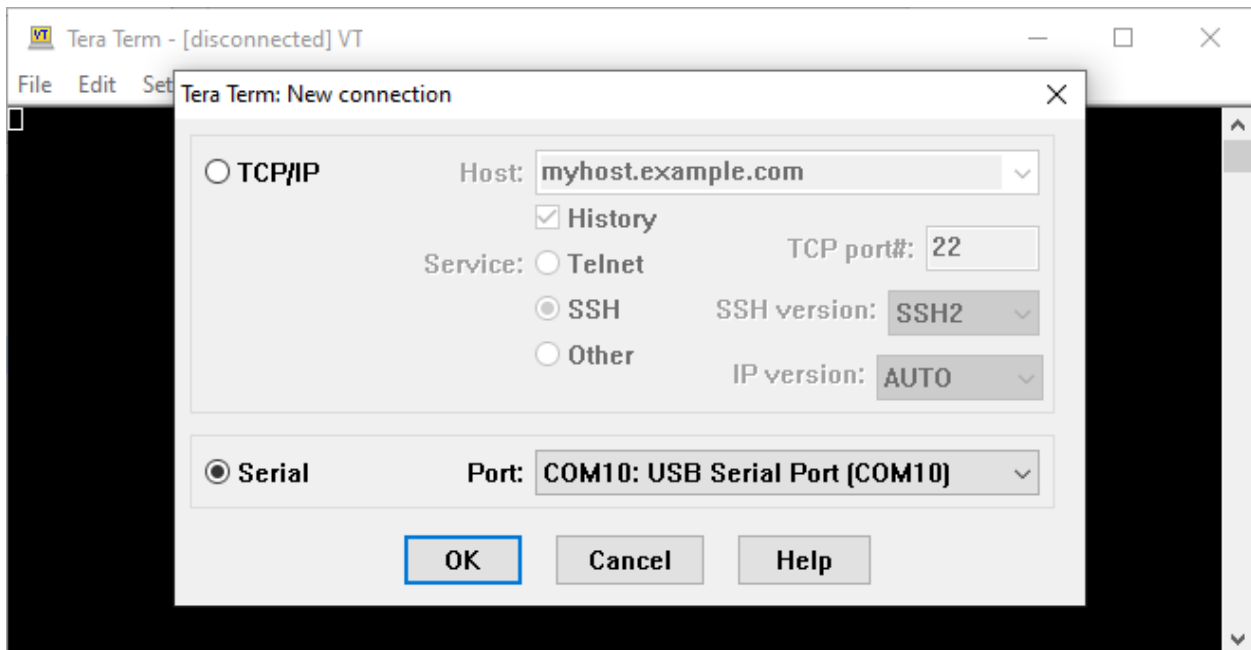
If there are multiple COM ports available on the PC and you are not sure which one corresponds to the AMOS Remote, you can take note of which ports are available, then close the software, disconnect the USB cable, and then re-start Tera Term. The COM port that is no longer there is the one the AMOS Remote was using.

4. Once the AMOS Remote is connected and you have selected the correct COM port, click the 'OK' button.
5. Click the 'Setup' menu item, and then the 'Serial Port' item. If the baud rate of the AMOS Remote has not been modified, it will be set for 38400 bps, so set the 'Speed' value to 38400 (Tera Term uses a default speed of 9600).

Click the 'New setting' button for the new speed to take effect.

6. Click the 'Setup' menu item, and then the 'Terminal' item. Check the 'Local echo' option, and then click 'OK'. This will allow you to see any characters that you type in the terminal window.

7. Now start the Serial Bluetooth Terminal on your Android device. The Android device should be within about 20 m of the AMOS Remote unit that it is using for communications. Also, the AMOS Remote for the Android device must be paired with the AMOS Remote connected to the PC. AMOS Remote units can be purchased from In Nature Robotics already paired to one another, or you can do it yourself using the directions found in Appendix A.

8. Click the menu icon in the top-left corner of the Serial Bluetooth Terminal app, then click the 'Devices' item.

9. Click the 'BLUETOOTH LE' tab and then click the 'SCAN' button.

10. Among the list of Bluetooth Low Energy devices that were found, there should be one called AMOS_REMOTE. Tap it. You should then see a message in the terminal screen like the following, indicating that you have connected to AMOS_REMOTE:
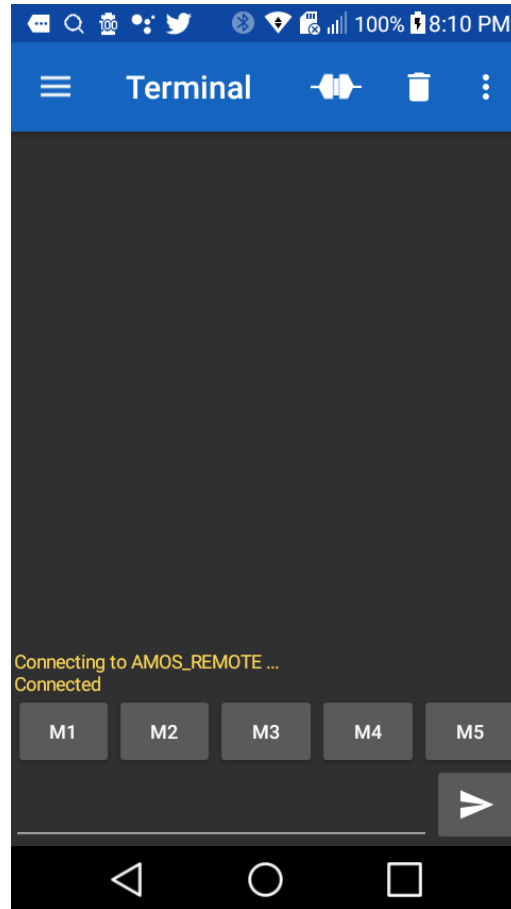
11. Now you should be able to type some text in either terminal and have it appear in the other terminal.

Appendix A – Using the Portal software to modify pairing and customize device software

The RF220SU device used on the AMOS Remote to achieve long range wireless communications can be modified using a PC software program called "Portal" from Synapse Wireless Inc. This software can be found and downloaded from the Synapse website: https://www.synapsewireless.com/.

In order to use Portal to modify the RF220SU, you need to first start with the AMOS Remote unpowered. You should also make sure that any programs that were previously loaded on the RF220SU are backed up somewhere in case you need to load them back later. The default AMOS Remote program is called "Base.py" and it can be found here: https://github.com/mlowerysimpson/AMOSRemote

The programs are written in a language called SNAPpy, which is similar to Python. Any program .py files should be copied to the "\Documents\Portal\snappyImages" folder for editing and uploading using the Portal software.

Make sure that the board jumpers J4 and J5 are both connected to pins 2 and 3 for USB operation. Connect the USB cable from the PC to the AMOS Remote and observe that the green LED lights up and stays solid. Then start the Portal software. It should automatically find the RF220SU on the AMOS Remote, and a screen like the following should appear:
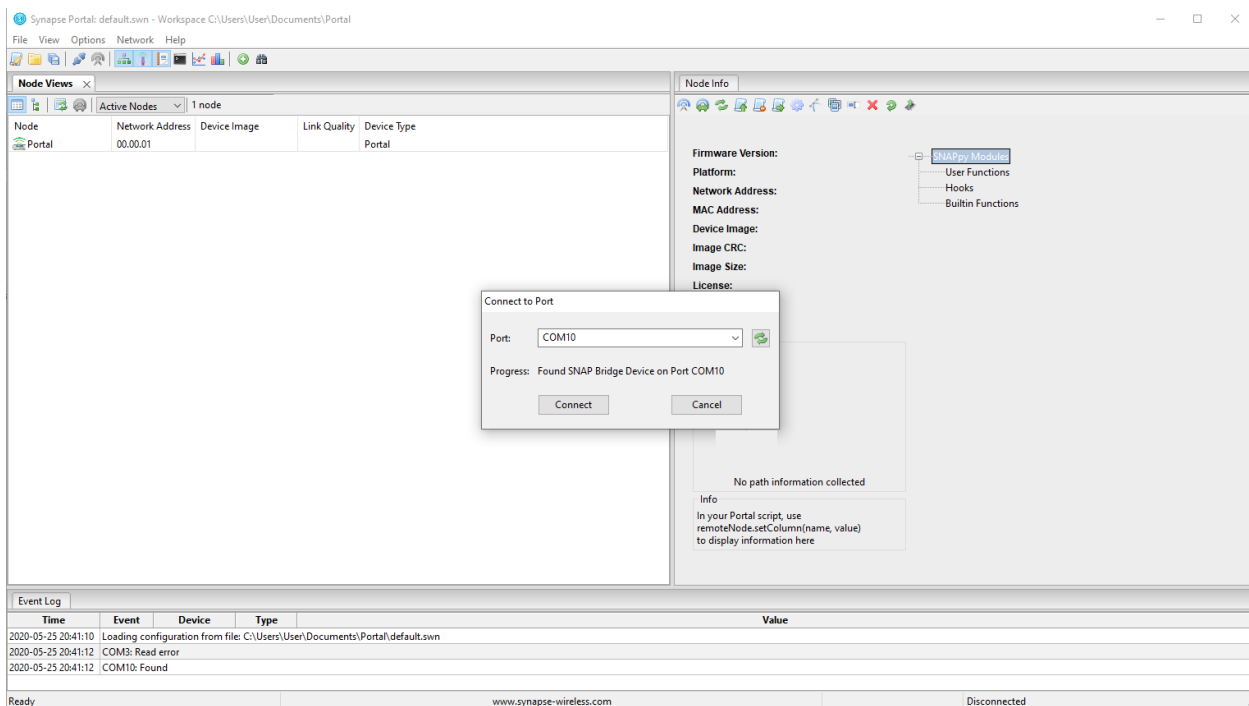
Click the Connect button. Then highlight the item called "Base" in the Node Views tab and then in the Node Info tab on the right part of the screen, click the "Erase SNAPpy Image" icon shown below:

Note: It is necessary to click the "Erase SNAPpy Image" icon within one minute after the AMOS Remote was powered on, since after one minute all USB-serial communications are directly forwarded out the RF220SU's wireless link and direct communications with the Portal software are no longer possible. Once the image running on the RF220SU is erased however, it can no longer run, so you are free at that point to configure the device using Portal and modify the software. If other AMOS Remote units are within wireless range, you can also see them in the Node Views tab and modify their software as well. It is not necessary to erase their images, since communications can occur through the USB-connected node.

The default Base.py program has a variable called "otherNodeAddr". This refers to the 3-byte network address of the wireless device that this unit is paired with. The network address of each node can be seen in the Node Views tab of the Portal software. By default, the Base.py program is set to communicate with just a single node using the "ucastSerial" function. It can be modified however to communicate with multiple nodes at once if desired, using the "mcastSerial" function. For details on doing this, please consult the SNAP Reference manual, available by clicking the 'Help | SNAP Reference Manual' menu item in Portal.

After modifying some SNAPpy code, you can upload it to a node by highlighting that node in the Node Views tab and then clicking the 'Upload SNAPpy Image' button:

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If there are no errors in the program, it will begin running immediately.