

ARDUINO and STD-601 Evaluation Kit **TB-STD601**



Operation Guide

Version 1.0 (Oct. 2015)

CIRCUIT DESIGN, INC.,

7557-1 Hotaka, Azumino-city
Nagano 399-8303 JAPAN
Tel: + +81-(0)263-82-1024
Fax: + +81-(0)263-82-1016

e-mail: info@circuitdesign.jp
<http://www.cdt21.com>

| | |
|---|----|
| CONTENTS | |
| 1. FEATURES | 2 |
| 2. PART NAMES AND FUNCTIONS | 3 |
| 3. BLOCK DIAGRAM | 4 |
| 4. OPERATION RANGE..... | 5 |
| 5. NOTICE ON THE USEAGE OF THE TB-STD601 | 5 |
| 6. HOW TO SETUP..... | 5 |
| 7. INTRODUCTION TO THE SETTING SOFTWARE | |
| 7.1 Connecting to the testboard..... | 7 |
| 7.2 Module selection | 7 |
| 7.3 Acquiring current parameters of STD-601 and Arduino | 7 |
| 7.4 Write to EEPROM | 8 |
| 7.5 Setting STD-601 and Arduino | 8 |
| 7.6 Disconnecting the board | 8 |
| 7.7 Connecting two boards | 8 |
| 8. STD-601 MODULE SETTING | |
| 8.1 Frequency Band selection..... | 9 |
| 8.2 Frequency Channel selection..... | 9 |
| 8.3 RF bit rate..... | 11 |
| 8.4 RF transmit power | 11 |
| 9. ARDUINO SETTING | |
| 9.1 Module..... | 12 |
| 9.2 Communication modes..... | 12 |
| 9.3 Arduino External Port setting..... | 12 |
| 10. LCD SCREEN | |
| 10.1 Displaying current settings | 13 |
| 10.2 Analogue input..... | 13 |
| 10.3 Displaying Packet count..... | 14 |
| 10.4 Displaying RSSI values..... | 14 |
| 11. EXPLANATION OF EACH MODE | |
| 11.1 One-way | 15 |
| 11.2 One-way continuous..... | 15 |
| 11.3 Two-way..... | 16 |
| 11.4 Two-way continuous | 16 |
| 11.5 Telemetry | 17 |
| 11.6 Get RSSI level | 18 |
| 11.7 Get Packet Error..... | 18 |
| 12. EXTERNAL PORTS | 19 |
| 13. MESSAGES | 20 |
| 14. INSTALLING ARDUINO USB DRIVER | 21 |

The TB-STD601 combines the STD-601 module with Arduino MEGA 2560 allowing you to develop your own Arduino code and control the STD-601 module. The kit allows download of a demonstration code and setting software in Windows to allow testing of the STD-601 module.

1. FEATURES

- Switching signal transmission tests using 4 switches and 4 LEDs.
 - One way transmission
 - Two way transmission
- Telemetry transmission
- Packet error test
- Displayed RSSI level on LCD
- Displayed noise floor RSSI level on LCD (when no signal)
- Connection to Arduino external ports for external circuitry
- Board software (set via USB)
 - Sample Arduino code
 - Setting software in Windows
- LCD screen

2. PART NAMES AND FUNCTIONS

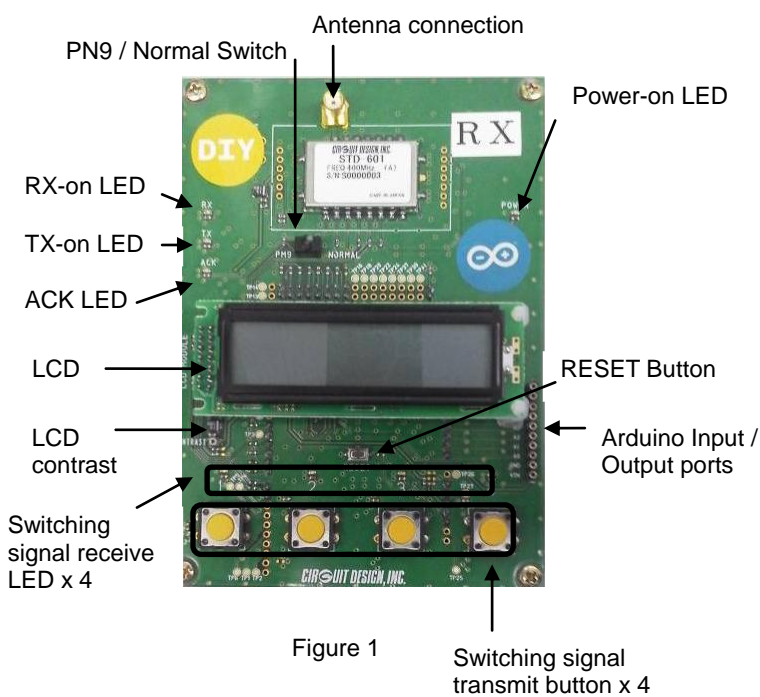


Figure 1

Switching signal transmit button x 4



Figure 2

3. BLOCK DIAGRAM

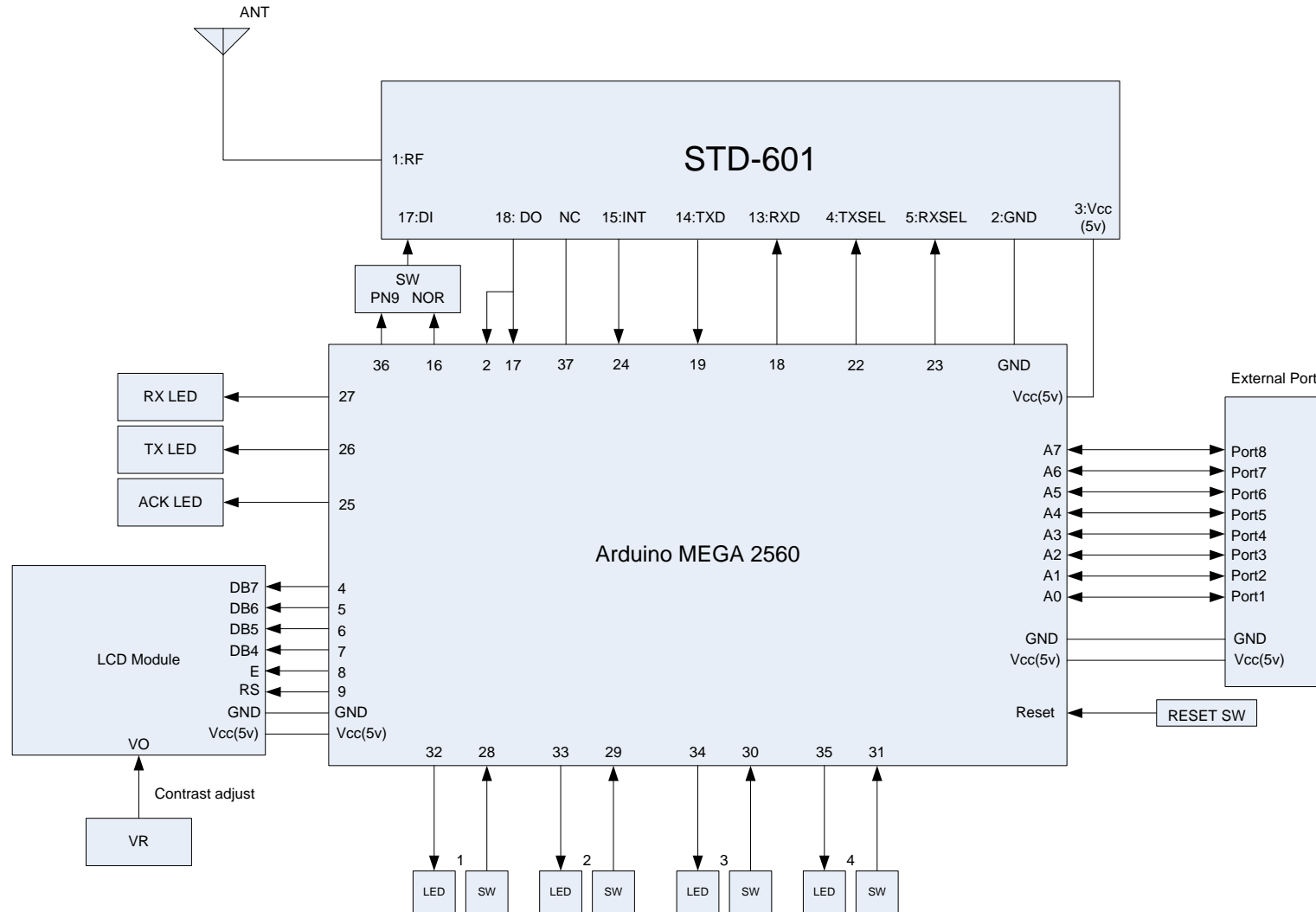


Figure 3

4. OPERATION RANGE

| Item | Min. | Typ. | Max. | Unit |
|---|------|------|------|------|
| Supply Voltage | 6 | 9 | 20 | V |
| Supply Current (2-way cont. Vcc = 9V, RF 10mW, no port load) | - | 130 | - | mA |
| Arduino external input port voltage (A0-A7) High Level | 3.5 | - | 5.5 | V |
| Arduino external input port voltage (A0-A7) Low Level | -0.5 | - | 1.5 | V |
| Arduino external output port voltage (A0-A7) High Level | - | 5 | - | V |
| Arduino external output port voltage (A0-A7) Low Level | - | GND | - | V |
| Arduino external analog input (A0-A7) | 0 | - | 5 | V |

Table 1

5. Notice on the usage of the TB-STD601

The TB-STD601 is intended to be used for communication range tests of the STD-601. Do not use by installing in user's equipment.

6. How to setup

Setup the TB-STD601 as shown in figure 4 and apply 6 V to 20 V (9V norm.) to the power supply jack (see figure 4 for connection).

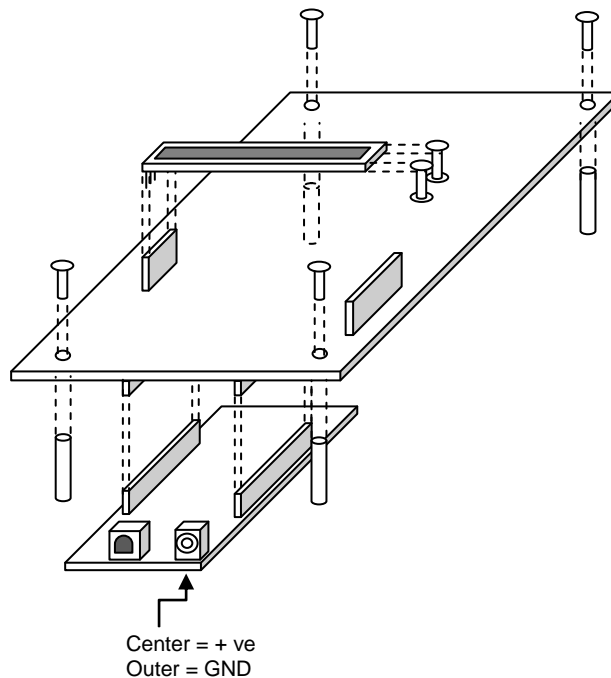
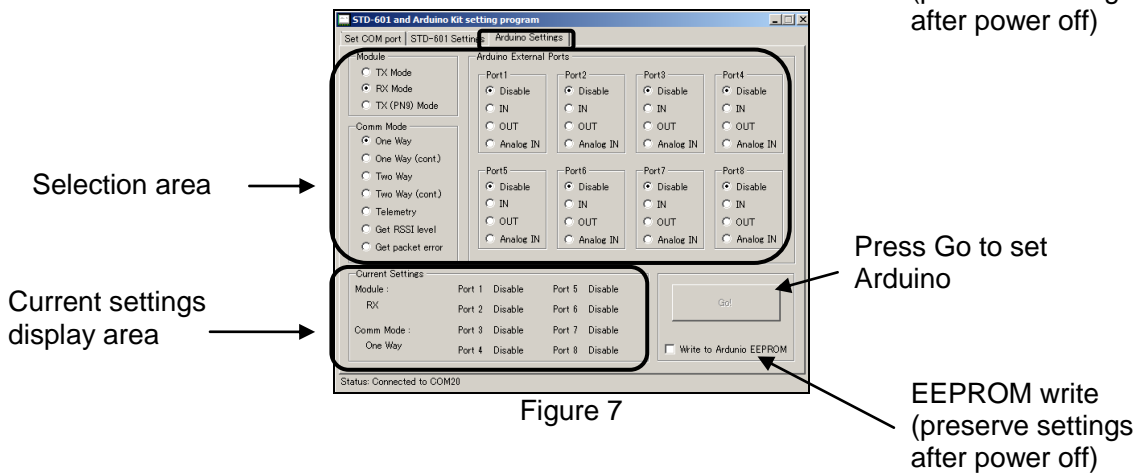
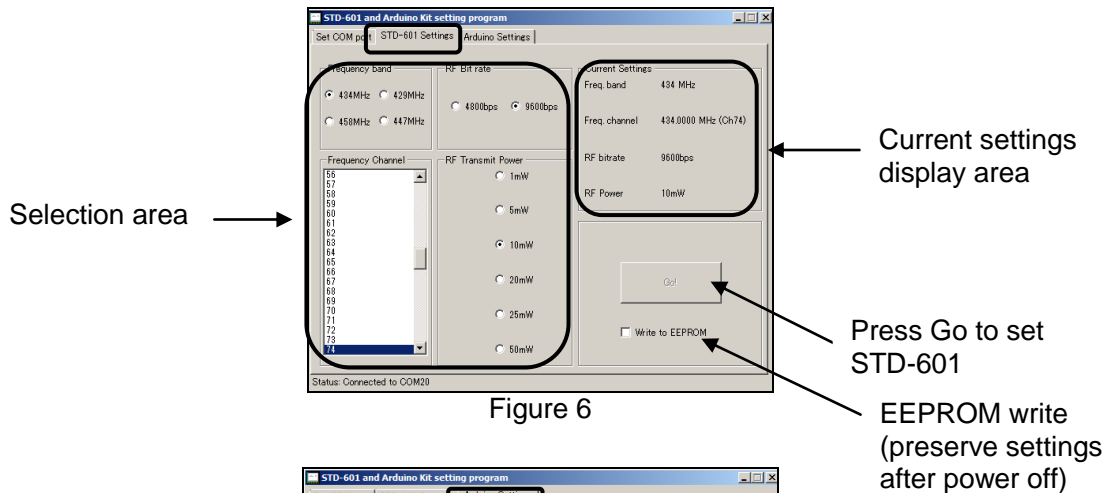
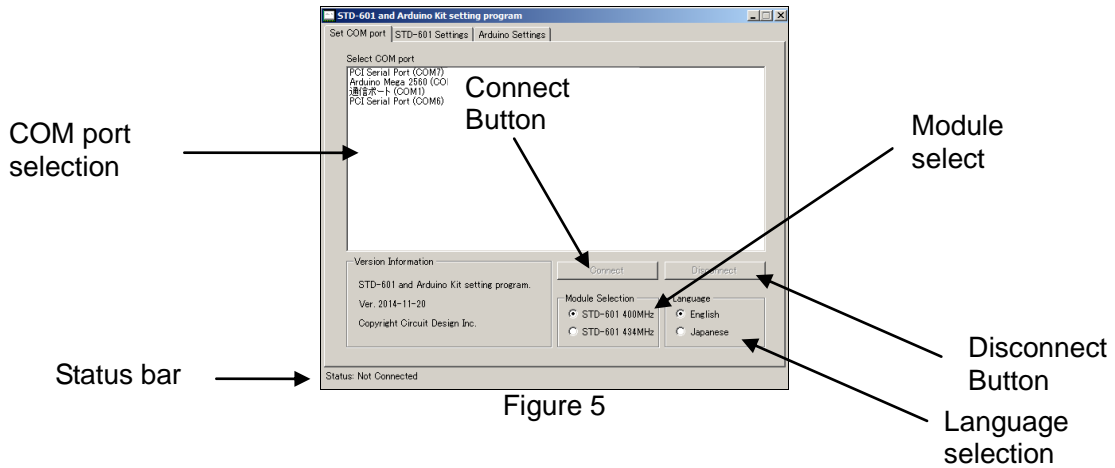


Figure 4

7. INTRODUCTION TO THE SETTING SOFTWARE

The setting software is a simple Windows graphical interface that allows setting of the STD-601 parameters and Arduino MEGA 2560. It is designed to be used with the Arduino MEGA 2560 sample code.

You must connect the evaluation board to your PC's USB port first and then open the evaluation software to get the screen as shown below.



7.1 – Connecting to the testboard

You must connect the TB-STD601 board to the PC first by using a USB cable and then open the setting software. The software will display the connection screen as shown in figure 5 under “Set COM Port”.

The available COM ports will display. Highlight the port that corresponds to the Arduino MEGA 2560 and press [Connect]. The status bar will then indicate a successful connection.

7.2 – Module selection

Before operating the module, the selection of STD-601 400MHz or STD-601 434MHz needs to be made as shown in figure 5. The default selection is STD-601 400MHz.

7.3 – Acquiring the current parameters of STD-601 and Arduino

Upon connection to the board, the software will automatically collect the current setting of both the STD-601 and the Arduino. The selection area in figure 6 and 7 will be enabled and display check marks showing the current parameters. The same information will also be displayed in the “Current settings display area” shown in figure 8.

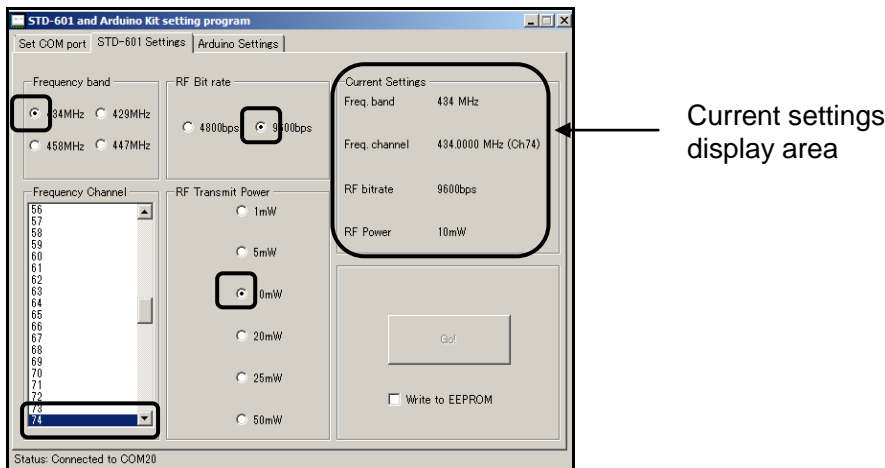


Figure 8

The selection area and parameters is explained in Table 1

| STD-601 Settings tab | |
|-------------------------------|---|
| <i>Frequency Band</i> | The frequency band setting in MHz |
| <i>Frequency Channel</i> | The frequency channel setting for the selected band |
| <i>RF Bit rate</i> | The RF bit rate |
| <i>RF transmit Power</i> | RF transmit power setting |
| Arduino settings tab | |
| <i>Module</i> | Set the board in TX or RX mode. TX(PN9) Mode is for transmission of PN9 signal and should not be used. |
| <i>Arduino External Ports</i> | The Arduino ports (1-8) / A0-A7 and their settings |
| <i>Comm Mode</i> | Sets the communication mode of the board |

Table 1

7.4 Write to EEPROM

Check this box to enable EEPROM for the STD-601 or Arduino as shown in figure 6 and 7. This will save any new settings to the EEPROM so that when power is re-applied, the board will start on these settings.

7.5 Setting STD-601 and Arduino

Press [Go!] button shown in Figure 6 and 7 to set the STD-601 or Arduino after choosing the new settings. There are separate buttons for each of the STD-601 and Arduino tabs. Only when a new selection is made by the user will the [Go!] button be enabled. If no changes are made, the button will be disabled.

When the [Go!] button is pushed the program will go through the setting cycle. A final message at the end of the setting cycle will show. See Figure 9.

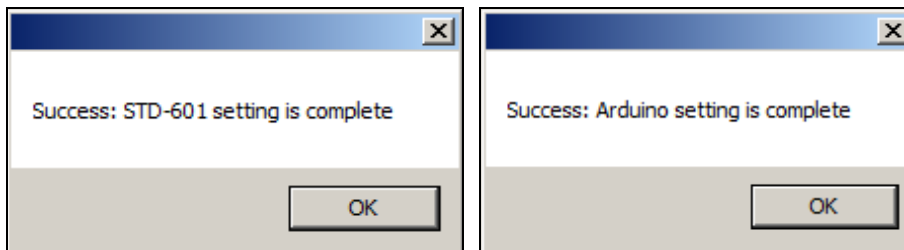


Figure 9

7.6 Disconnecting the board

Press [disconnect] to disconnect the board from the PC. After unplugging from the PC, the board will continue to operate from the settings stored in the STD-601 and Arduino's EEPROM memory.

7.7 Connecting two boards

It is possible to connect more than one board via separate ports and have multiple setting software running simultaneously. The software will display all ports that are currently connected to an Arduino 2560. To avoid selecting a port already in use, the setting software will display a warning if a connection to a used port is attempted.

8. STD-601 MODULE SETTING

8.1 Band selection

Use the Frequency Band selection area in figure 6 to select the frequency band. The available bands will vary according to whether STD-601 400MHz or STD-601 434MHz is selected shown in table 2.

| Frequency Band | STD-601 400MHz | STD-601 434MHz* |
|----------------|----------------|-----------------|
| 434 MHz | • | • |
| 429 MHz | • | |
| 458 MHz | • | |
| 447 MHz | • | |

Table 2

*If STD-601 434MHz is selected, the band selection will be fixed to 434 MHz and not changeable in the band selection area.

After setting the new band and executing the setting cycle, a message shown in figure 9 will display.

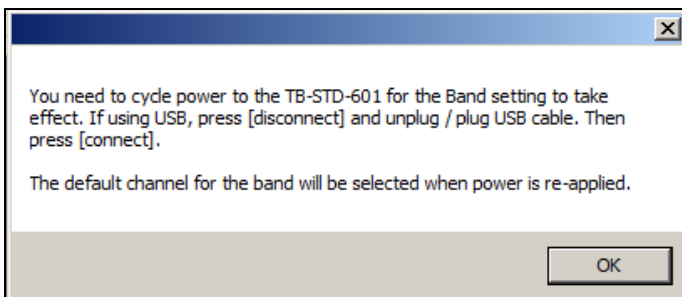


Figure 9

Note 1 : The module will not adjust to the new frequency band immediately after setting. For new band setting to take effect, please cycle power to the board shown in the confirmation message in Figure 9. If using USB power, push [disconnect] to close the port first. Then disconnect / reconnect USB cable.

Note 2: New frequency band setting will automatically write to EEPROM during the setting cycle of the STD-601. After cycling the power, this recently set band will be loaded from the EEPROM when power is re-applied.

Note 3: New frequency band setting will automatically be written to EEPROM during the setting cycle of the STD-601 and the default channel for that band will load when power is re-applied.

8.2 Frequency Channel selection

When choosing a band, the frequency channel selection list will adjust automatically to include the correct number of channels for that band. To select, highlight with the mouse. The corresponding bands, channels and their frequencies are shown in table 3 (Default values are highlighted).

● Channel Table 434MHz

Table 3

| CH | HEX | Freq | CH | HEX | Freq | CH | HEX | Freq |
|----|-----|----------|----|-----|----------|-----|-----|----------|
| 0 | 00 | 433.0750 | 46 | 2E | 433.6500 | 92 | 5C | 434.2250 |
| 1 | 01 | 433.0875 | 47 | 2F | 433.6625 | 93 | 5D | 434.2375 |
| 2 | 02 | 433.1000 | 48 | 30 | 433.6750 | 94 | 5E | 434.2500 |
| 3 | 03 | 433.1125 | 49 | 31 | 433.6875 | 95 | 5F | 434.2625 |
| 4 | 04 | 433.1250 | 50 | 32 | 433.7000 | 96 | 60 | 434.2750 |
| 5 | 05 | 433.1375 | 51 | 33 | 433.7125 | 97 | 61 | 434.2875 |
| 6 | 06 | 433.1500 | 52 | 34 | 433.7250 | 98 | 62 | 434.3000 |
| 7 | 07 | 433.1625 | 53 | 35 | 433.7375 | 99 | 63 | 434.3125 |
| 8 | 08 | 433.1750 | 54 | 36 | 433.7500 | 100 | 64 | 434.3250 |
| 9 | 09 | 433.1875 | 55 | 37 | 433.7625 | 101 | 65 | 434.3375 |
| 10 | 0A | 433.2000 | 56 | 38 | 433.7750 | 102 | 66 | 434.3500 |
| 11 | 0B | 433.2125 | 57 | 39 | 433.7875 | 103 | 67 | 434.3625 |
| 12 | 0C | 433.2250 | 58 | 3A | 433.8000 | 104 | 68 | 434.3750 |
| 13 | 0D | 433.2375 | 59 | 3B | 433.8125 | 105 | 69 | 434.3875 |
| 14 | 0E | 433.2500 | 60 | 3C | 433.8250 | 106 | 6A | 434.4000 |
| 15 | 0F | 433.2625 | 61 | 3D | 433.8375 | 107 | 6B | 434.4125 |
| 16 | 10 | 433.2750 | 62 | 3E | 433.8500 | 108 | 6C | 434.4250 |
| 17 | 11 | 433.2875 | 63 | 3F | 433.8625 | 109 | 6D | 434.4375 |
| 18 | 12 | 433.3000 | 64 | 40 | 433.8750 | 110 | 6E | 434.4500 |
| 19 | 13 | 433.3125 | 65 | 41 | 433.8875 | 111 | 6F | 434.4625 |
| 20 | 14 | 433.3250 | 66 | 42 | 433.9000 | 112 | 70 | 434.4750 |
| 21 | 15 | 433.3375 | 67 | 43 | 433.9125 | 113 | 71 | 434.4875 |
| 22 | 16 | 433.3500 | 68 | 44 | 433.9250 | 114 | 72 | 434.5000 |
| 23 | 17 | 433.3625 | 69 | 45 | 433.9375 | 115 | 73 | 434.5125 |
| 24 | 18 | 433.3750 | 70 | 46 | 433.9500 | 116 | 74 | 434.5250 |
| 25 | 19 | 433.3875 | 71 | 47 | 433.9625 | 117 | 75 | 434.5375 |
| 26 | 1A | 433.4000 | 72 | 48 | 433.9750 | 118 | 76 | 434.5500 |
| 27 | 1B | 433.4125 | 73 | 49 | 433.9875 | 119 | 77 | 434.5625 |
| 28 | 1C | 433.4250 | 74 | 4A | 434.0000 | 120 | 78 | 434.5750 |
| 29 | 1D | 433.4375 | 75 | 4B | 434.0125 | 121 | 79 | 434.5875 |
| 30 | 1E | 433.4500 | 76 | 4C | 434.0250 | 122 | 7A | 434.6000 |
| 31 | 1F | 433.4625 | 77 | 4D | 434.0375 | 123 | 7B | 434.6125 |
| 32 | 20 | 433.4750 | 78 | 4E | 434.0500 | 124 | 7C | 434.6250 |
| 33 | 21 | 433.4875 | 79 | 4F | 434.0625 | 125 | 7D | 434.6375 |
| 34 | 22 | 433.5000 | 80 | 50 | 434.0750 | 126 | 7E | 434.6500 |
| 35 | 23 | 433.5125 | 81 | 51 | 434.0875 | 127 | 7F | 434.6625 |
| 36 | 24 | 433.5250 | 82 | 52 | 434.1000 | 128 | 80 | 434.6750 |
| 37 | 25 | 433.5375 | 83 | 53 | 434.1125 | 129 | 81 | 434.6875 |
| 38 | 26 | 433.5500 | 84 | 54 | 434.1250 | 130 | 82 | 434.7000 |
| 39 | 27 | 433.5625 | 85 | 55 | 434.1375 | 131 | 83 | 434.7125 |
| 40 | 28 | 433.5750 | 86 | 56 | 434.1500 | 132 | 84 | 434.7250 |
| 41 | 29 | 433.5875 | 87 | 57 | 434.1625 | 133 | 85 | 434.7375 |
| 42 | 2A | 433.6000 | 88 | 58 | 434.1750 | 134 | 86 | 434.7500 |
| 43 | 2B | 433.6125 | 89 | 59 | 434.1875 | 135 | 87 | 434.7625 |
| 44 | 2C | 433.6250 | 90 | 5A | 434.2000 | 136 | 88 | 434.7750 |
| 45 | 2D | 433.6375 | 91 | 5B | 434.2125 | | | |

● Channel table 429MHz

| CH | HEX | Freq | CH | HEX | Freq | CH | HEX | Freq |
|----|-----|----------|----|-----|----------|----|-----|----------|
| 0 | 00 | 429.1625 | 16 | 10 | 429.3625 | 32 | 20 | 429.5625 |
| 1 | 01 | 429.1750 | 17 | 11 | 429.3750 | 33 | 21 | 429.5750 |
| 2 | 02 | 429.1875 | 18 | 12 | 429.3875 | 34 | 22 | 429.5875 |
| 3 | 03 | 429.2000 | 19 | 13 | 429.4000 | 35 | 23 | 429.6000 |
| 4 | 04 | 429.2125 | 20 | 14 | 429.4125 | 36 | 24 | 429.6125 |
| 5 | 05 | 429.2250 | 21 | 15 | 429.4250 | 37 | 25 | 429.6250 |
| 6 | 06 | 429.2375 | 22 | 16 | 429.4375 | 38 | 26 | 429.6375 |
| 7 | 07 | 429.2500 | 23 | 17 | 429.4500 | 39 | 27 | 429.6500 |
| 8 | 08 | 429.2625 | 24 | 18 | 429.4625 | 40 | 28 | 429.6625 |
| 9 | 09 | 429.2750 | 25 | 19 | 429.4750 | 41 | 29 | 429.6750 |
| 10 | 0A | 429.2875 | 26 | 1A | 429.4875 | 42 | 2A | 429.6875 |
| 11 | 0B | 429.3000 | 27 | 1B | 429.5000 | 43 | 2B | 429.7000 |
| 12 | 0C | 429.3125 | 28 | 1C | 429.5125 | 44 | 2C | 429.7125 |
| 13 | 0D | 429.3250 | 29 | 1D | 429.5250 | 45 | 2D | 429.7250 |
| 14 | 0E | 429.3375 | 30 | 1E | 429.5375 | 46 | 2E | 429.7375 |
| 15 | 0F | 429.3500 | 31 | 1F | 429.5500 | | | |

● Channel Table 458MHz

| CH | HEX | Freq | CH | HEX | Freq | CH | HEX | Freq |
|----|-----|----------|----|-----|----------|----|-----|----------|
| 0 | 00 | 458.5000 | 20 | 14 | 458.7500 | 40 | 28 | 459.0000 |
| 1 | 01 | 458.5125 | 21 | 15 | 458.7625 | 41 | 29 | 459.0125 |
| 2 | 02 | 458.5250 | 22 | 16 | 458.7750 | 42 | 2A | 459.0250 |
| 3 | 03 | 458.5375 | 23 | 17 | 458.7875 | 43 | 2B | 459.0375 |
| 4 | 04 | 458.5500 | 24 | 18 | 458.8000 | 44 | 2C | 459.0500 |
| 5 | 05 | 458.5625 | 25 | 19 | 458.8125 | 45 | 2D | 459.0625 |
| 6 | 06 | 458.5750 | 26 | 1A | 458.8250 | 46 | 2E | 459.0750 |
| 7 | 07 | 458.5875 | 27 | 1B | 458.8375 | 47 | 2F | 459.0875 |
| 8 | 08 | 458.6000 | 28 | 1C | 458.8500 | 48 | 30 | 459.1000 |
| 9 | 09 | 458.6125 | 29 | 1D | 458.8625 | 49 | 31 | 459.1125 |
| 10 | 0A | 458.6250 | 30 | 1E | 458.8750 | 50 | 32 | 459.1250 |
| 11 | 0B | 458.6375 | 31 | 1F | 458.8875 | 51 | 33 | 459.1375 |
| 12 | 0C | 458.6500 | 32 | 20 | 458.9000 | 52 | 34 | 459.1500 |
| 13 | 0D | 458.6625 | 33 | 21 | 458.9125 | 53 | 35 | 459.1625 |
| 14 | 0E | 458.6750 | 34 | 22 | 458.9250 | 54 | 36 | 459.1750 |
| 15 | 0F | 458.6875 | 35 | 23 | 458.9375 | | | |
| 16 | 10 | 458.7000 | 36 | 24 | 458.9500 | | | |
| 17 | 11 | 458.7125 | 37 | 25 | 458.9625 | | | |
| 18 | 12 | 458.7250 | 38 | 26 | 458.9750 | | | |
| 19 | 13 | 458.7375 | 39 | 27 | 458.9875 | | | |

● Channel Table 447MHz

| CH | HEX | Freq | CH | HEX | Freq | CH | HEX | Freq |
|----|-----|----------|----|-----|----------|----|-----|----------|
| 0 | 00 | 447.2625 | 20 | 14 | 447.5125 | 40 | 28 | 447.7625 |
| 1 | 01 | 447.2750 | 21 | 15 | 447.5250 | 41 | 29 | 447.7750 |
| 2 | 02 | 447.2875 | 22 | 16 | 447.5375 | 42 | 2A | 447.7875 |
| 3 | 03 | 447.3000 | 23 | 17 | 447.5500 | 43 | 2B | 447.8000 |
| 4 | 04 | 447.3125 | 24 | 18 | 447.5625 | 44 | 2C | 447.8125 |
| 5 | 05 | 447.3250 | 25 | 19 | 447.5750 | 45 | 2D | 447.8250 |
| 6 | 06 | 447.3375 | 26 | 1A | 447.5875 | 46 | 2E | 447.8375 |
| 7 | 07 | 447.3500 | 27 | 1B | 447.6000 | 47 | 2F | 447.8500 |
| 8 | 08 | 447.3625 | 28 | 1C | 447.6125 | 48 | 30 | 447.8625 |
| 9 | 09 | 447.3750 | 29 | 1D | 447.6250 | 49 | 31 | 447.8750 |
| 10 | 0A | 447.3875 | 30 | 1E | 447.6375 | 50 | 32 | 447.8875 |
| 11 | 0B | 447.4000 | 31 | 1F | 447.6500 | 51 | 33 | 447.9000 |
| 12 | 0C | 447.4125 | 32 | 20 | 447.6625 | 52 | 34 | 447.9125 |
| 13 | 0D | 447.4250 | 33 | 21 | 447.6750 | 53 | 35 | 447.9250 |
| 14 | 0E | 447.4375 | 34 | 22 | 447.6875 | 54 | 36 | 447.9375 |
| 15 | 0F | 447.4500 | 35 | 23 | 447.7000 | 55 | 37 | 447.9500 |
| 16 | 10 | 447.4625 | 36 | 24 | 447.7125 | 56 | 38 | 447.9625 |
| 17 | 11 | 447.4750 | 37 | 25 | 447.7250 | 57 | 39 | 447.9750 |
| 18 | 12 | 447.4875 | 38 | 26 | 447.7375 | 58 | 3A | 447.9875 |
| 19 | 13 | 447.5000 | 39 | 27 | 447.7500 | | | |

8.3 RF bit rate

Adjust the RF bit rate between 4800bps and 9600bps by clicking the radiobuttons shown in figure 6.

8.4 RF transmit Power

Adjust the RF transmit power of the STD-601 (1, 5, 10 ,20, 25 ,50 mW) by clicking the radiobuttons shown in figure 6.

9. ARDUINO SETTING

9.1 Module

The boards need to be assigned as TX or RX. Use the setting software to set the board as TX or as RX. If selecting TX PN9 mode, activate the switch on the board to PN9. (TX (PN9) mode is only for the purpose of certification process and is not to be used during normal operation).

9.2 Communication Modes

After setting one board as TX and the other as RX, set the communication mode on each board. When selecting “Get RSSI level”, only the receiver needs to be set.

| Communication mode (Board 1) | Page |
|------------------------------|------|
| One way | 15 |
| One way (continuous) | 15 |
| Two way | 15 |
| Two way (continuous) | 16 |
| Telemetry | 17 |
| Get RSSI Level | 18 |
| Get packet error | 18 |

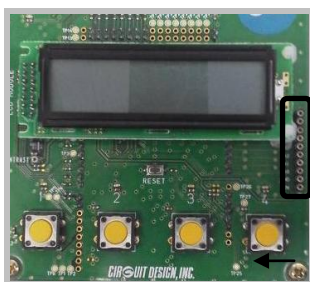
Table 5

9.3 Arduino External Port setting

The user can adjust the Arduino Ports as follows and connect any external circuitry to them e.g. switches LEDs. The ports are labeled A0 – A7 with nearby optional GND and Vout. Note that ports are paired between the boards i.e. Port 1 on TX board used as input(IN) means that the port 1 on RX board needs to be set as output (OUT). See table 6 for the port settings between both boards.

| TX board (A0-A7) | RX board (A0-A7) |
|------------------|------------------|
| Disable | Disable |
| IN | OUT |
| OUT | IN |
| Analog IN | Analog IN |

Table 6



Arduino Ports 1-8

Figure 10

10. LCD SCREEN

10.1 Displaying current settings

The LCD screen is able to display the current settings for the STD-601 and the Arduino as well as the communication (Comm) mode. See table 7 for details.

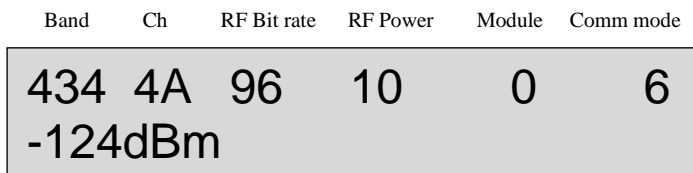


Figure 11

| Parameter | Details |
|-------------|---|
| Band | Frequency band setting |
| Ch | Frequency channel setting. Displayed in HEX |
| RF bit rate | RF Bit rate setting. 48 – 4800bps 96 – 9600bps |
| RF power | RF transmit power setting in mW |
| Module | Module setting. TX mode – 0 RX mode – 1 TX(PN9) - 2 |
| Comm mode | Communication mode setting One Way - 0 One Way (cont) - 1 Two Way - 2 Two Way (cont) - 3 Telemetry - 4 Get RSSI level - 5 Get packet error - 6 |

Table 7

10.2 Analogue input

When analog data is input whilst in telemetry mode, the LCD will display a value from 0 – 99 (100 step) corresponding to the voltage value at the port input. Values of 0 – 5V are represented as 0 - 99.

The RSSI level of the current channel is displayed on the second line on Figure 12.

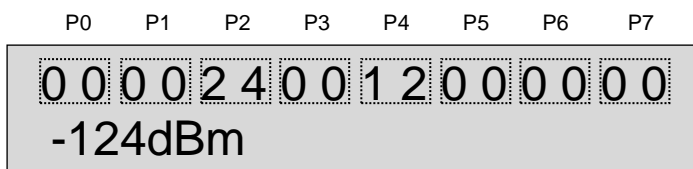


Figure 12

10.3 Displaying Packet count

During the Packet Test, 1000 packets are transmitted. The transmit count will appear on the TX LCD and receive count will appear on the RX LCD. The difference in the two values indicates packets lost.

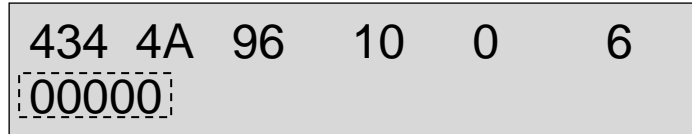


Figure 13

The value on the LCD will show 00000 to 01000.

10.4 Displaying RSSI levels

Displayed RSSI levels at the following settings:

| Module setting | Communication mode | Meaning |
|----------------|--------------------|--|
| TX Mode | Two Way | RSSI level of RF level during reception of ACK from the receiver board. |
| | Two Way (cont) | |
| | Telemetry | |
| RX Mode | One Way | RSSI level of RF level at receiver board during reception of signals from transmitter board. |
| | One Way (cont) | |
| | Two Way | |
| | Two Way | |
| | Telemetry | |
| | Get packet error | |
| | Get RSSI level | RSSI level of surrounding RF level on the current channel not limited to signals from the transmitter. |

11. EXPLANATION OF EACH MODE

11.1 One-way

This mode allows you to push the switches on the TX board and transmit this data to the RX board. Using 2 boards, set the STD-601 module and the Arduino MEGA 2560 as follows:

| Setting | Board TX setting | Board RX setting |
|--------------------|-------------------------|-------------------------|
| Module | TX mode | RX mode |
| Communication mode | One way | One way |

- Press any switch (1-4) on TX board and the corresponding LED will light for 100ms on the RX board.
- Holding down any switch (1-4) will cause the corresponding LED to blink repeatedly.
- The TX LED on the TX board will flash when it transmits data.
- Transmission from the TX board occurs only when a button is pressed.
- The RX LED on the RX board will flash when it receives data.

11.2 One-way continuous

This mode allows you to push the switches on the TX board and transmit this data continuously to the RX board. Using 2 boards, set the STD-601 module and the Arduino MEGA 2560 as follows:

| Setting | Board TX setting | Board RX setting |
|--------------------|-------------------------|-------------------------|
| Module | TX mode | RX mode |
| Communication mode | One way cont | One way cont |

- Press any switch (1-4) on TX board and the corresponding LED will light on the RX board.
- The TX LED on the TX board is ON when it transmits data.
- Transmission from the TX board occurs continuously whether or not a button is pressed.
- The RX LED on the RX board will flash when it receives data.

11.3 Two way

This mode allows you to push the switches on the TX board and transmit this data to the RX board and vice versa. When RX board receives the signal, it sends an ACK signal back to the TX board. Using 2 boards, set the STD-601 module and the Arduino MEGA 2560 as follows:

| Setting | Board TX setting | Board RX setting |
|--------------------|-------------------------|-------------------------|
| Module | TX mode | RX mode |
| Communication mode | Two way | Two way |

- Press any switch (1-4) on TX board and the corresponding LED will light for 100ms on the RX board.
- Holding down any switch (1-4) will cause the corresponding LED to blink repeatedly. During this time, if a switch is pressed on the RX board, the corresponding LED on the TX board will blink.
- The TX LED on the TX board will flash when it transmits data. If the TX board is receiving a signal, its RX LED will flash.
- Transmission from the TX board occurs only when a button is pressed.
- The RX LED on the RX board will flash when it receives data. When it transmits back, its TX LED will flash.
- The ACK LED on the TX board will flash in 100ms intervals, when it receives data from the RX board.

11.4 Two way continuous

This mode allows you to push the switches on the TX board and transmit this data to the RX board and vice versa. When RX board receives the signal, it sends an ACK signal back to the TX board. Using 2 boards, set the STD-601 module and the Arduino MEGA 2560 as follows:

| Setting | Board TX setting | Board RX setting |
|--------------------|-------------------------|-------------------------|
| Module | TX mode | RX mode |
| Communication mode | Two way cont. | Two way cont. |

- Press any switch (1-4) on TX board and the corresponding LED will light on the RX board.
- Holding down any switch (1-4) will cause the corresponding LED to illuminate continuously. If a switch is pressed on the RX board, the corresponding LED on the TX board will also come on.
- The TX LED on the TX board will flash when it transmits data. When the TX board is receiving a signal, its RX LED will flash.
- Transmission/reception from the TX/RX boards occurs continuously whether or not buttons are pressed.
- The RX LED on the RX board will flash when it receives data. When it transmits back, its TX LED will flash.
- The ACK LED on the TX board will flash in 100ms intervals, when it receives data from the RX board.

11.5 Telemetry

This mode is similar to two-way and communication is continuous between the TX and RX boards. It allows transmission of analogue data e.g. from a sensor or potentiometer. The boards do not have onboard potentiometers, so an analogue signal is fed to any of the ports A0-A7. Connect an analogue source to any one of A0-A7. Vin / GND ports are available to use to construct the analogue signal.

Operating the switches in this mode will not turn on the LEDs.

Connection example:

| Setting | TX board | RX board |
|------------------------|---|---------------------------|
| Module | TX Mode | RX Mode |
| Comm Mode | Telemetry | Telemetry |
| Arduino External Ports | With same port used on RX board, set to Analog IN | Set the port to Analog IN |

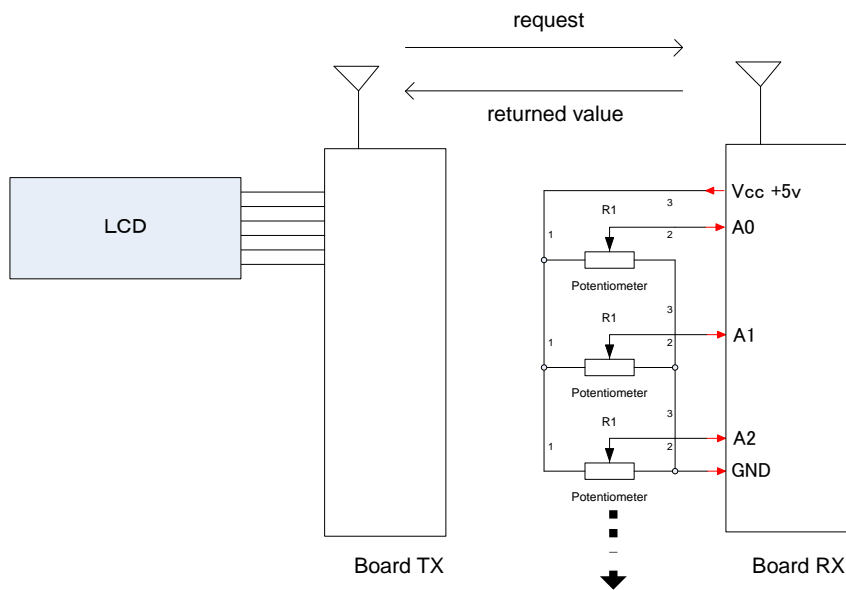


Figure 14

- The TX LED blinks on the TX board during transmission. The RX LED will blink during reception of this signal.
- When the TX board receives the ACK signal from the RX board, the ACK LED will blink at 100ms intervals.

Figure 14 shows connection example with volume controls connected to the Arduino ports. Optional GND and Vcc terminals are placed next to the Arduino ports.

The LCD (Figure 15) displays the ports and their input values. Values 0-99 are used to represent 0-5V.

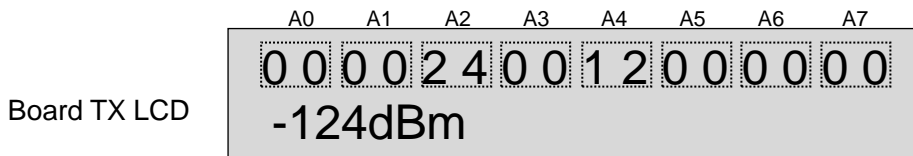


Figure 15

11.6 Get RSSI level

This mode is able to monitor RSSI level (received signal strength indication) of the STD-601's currently set channel. In the Arduino settings tab, set "Module" to RX mode (TX setting will not allow this mode to work) and the communication mode to Get RSSI level.

| Setting | Setting value |
|-----------|----------------|
| Module | RX Mode |
| Comm Mode | Get RSSI level |

The RSSI level is displayed on the LCD in dBm.

11.7 Get Packet Error

This mode, similar to one-way, sends 1000 packets from the TX board to RX board. The number of successfully received packets is displayed on the LCD of the RX board shown in Figure 16.

| Setting | TX board | RX board |
|-----------|------------------|------------------|
| Module | TX Mode | RX Mode |
| Comm Mode | Get packet error | Get packet error |

- On the TX board LCD shows the packets transmitted. On the RX board LCD shows the packets successfully received.
- On the TX board, the TX LED blinks during transmission. The RX board's RX LED blinks during reception.

Control of the packet transmission is shown in Figure 16.

1. TX board

- To start the packet transmission, press switch 1 on the TX board. Switch 2 stops the transmission. If the user does not stop the transmission, it will automatically stop at 1000 packets.
- During transmission of the packets, LED 1 will blink.

2. RX board

- Switch 1 on the RX board will reset the packet count to 0.
- LCD on the RX board will continue to display RSSI in dBm.

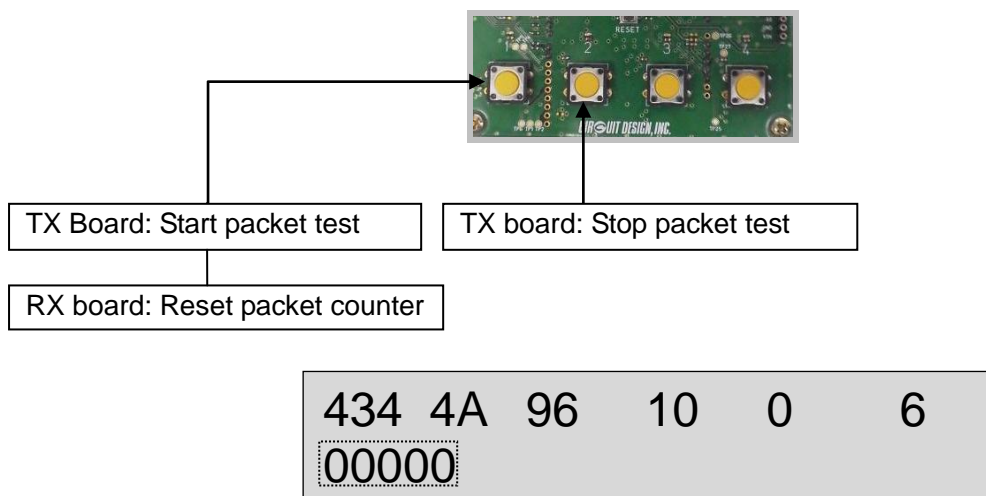


Figure 16

12. EXTERNAL PORTS

The ports 1-8 correspond to A0-A7 on the board. The ports allow connection to external circuitry with examples shown in Figure 17.

In the Arduino settings tab, ports are listed with each port selectable as “Input”, “Output” or “ AnalogIN”. If a port is unused, choose “Disable”. When choosing input, all ports contain inbuilt pull-up resistors, so no external pull-up resistor is required.

For more detail, refer to 9.3 Arduino External Port setting.

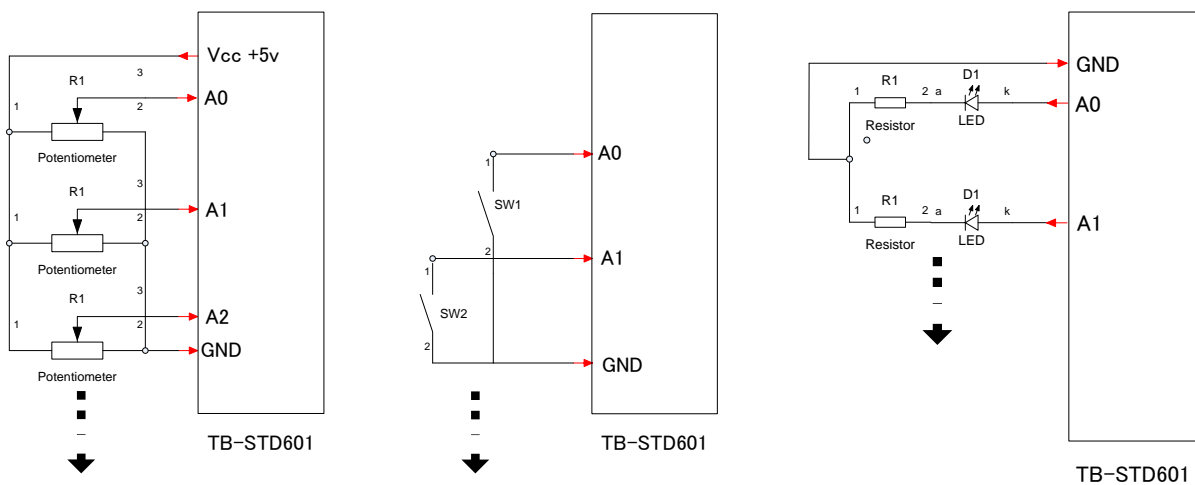


Figure 17

13. MESSAGES

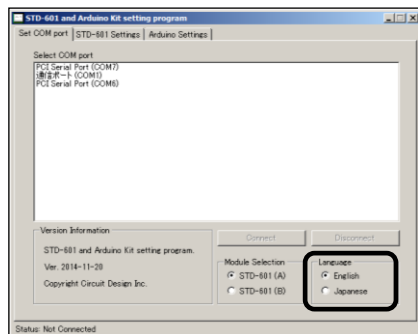


Figure 18

Messages can be displayed in Japanese or English by making the selection shown in Figure 18. Note that language selection cannot be changed once connected.

| STD-601 | |
|--|---|
| You need to cycle power to the TB-STD601 for the Band setting to take effect. If using USB, press [disconnect] and unplug / plug USB cable. Then press [connect]. The default channel for the band will be selected when power is re-applied. | Occurs when changing to a new band. The request is received by both the Arduino and the STD-601, but the STD-601 cannot change over to the new band until power is cycled. Make sure to disconnect the board from the PC first by pushing the disconnect button. |
| STD-601 setting failed | If the STD-601 parameter could not be set, the setting cycle aborts. |
| Success: STD-601 setting is complete | When all STD-601 parameters are successfully set |

| Arduino | |
|---|--|
| Please move the switch to PN9 on the board. | Displayed when selecting TX (PN9) |
| Please move the switch to NORMAL on the board. | Displayed when selecting TX or RX from TX (PN9) |
| Arduino setting failed | If the Arduino parameter could not be set, the setting cycle aborts. |
| Success: Arduino setting is complete | When all Arduino parameters are successfully set |

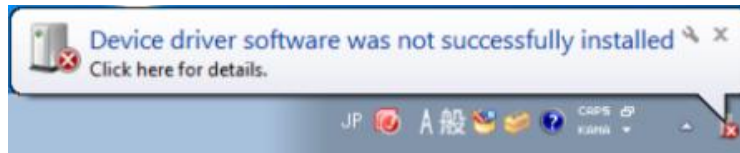
| General | |
|--|--|
| Port cannot be opened (already used by other application) | The port is already used. Select another port |
| Failed to Connect | The port cannot be used |
| Connection to TB-STD601 successful | After opening the port and acquiring all parameters from both Arduino and STD-601. |
| COM Port closed. Unplug USB cable from the board. | After disconnection of PC from the board |
| Could not get or set the parameter for STD-601 | No response when setting the parameter for the STD-601 |
| Could not get or set the parameter for Arduino | No response when setting the parameter for the STD-601 |

| LCD screen | |
|----------------------|------------------------------|
| STD601 ERROR. | Connection to STD-601 error. |

14. INSTALLING ARDUINO USB DRIVER

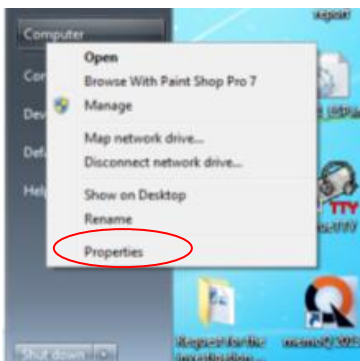
To use the Arduino with your PC, you need to install the USB driver specifically for use with Arduino products. If the Arduino is connected to the PC that does not have the USB driver installed, a message similar to the one below will be displayed.

In this case, please install the Arduino USB driver using the procedure below.
(This procedure below is for Windows 7 users)



1. Download the Arduino USB driver from the following URL:
- <http://www.cdt21.com/products/transceiver/std601b/06.asp>

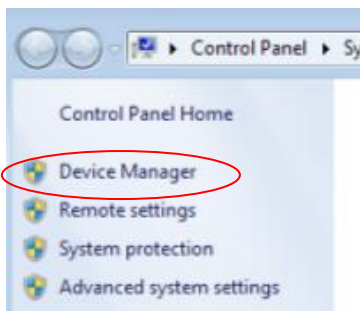
The Arduino USB driver files are zipped so please extract to an appropriate folder. As an example, the following procedure is for extraction to the PC desktop. When extracting to the desktop, the following folder will appear as shown.



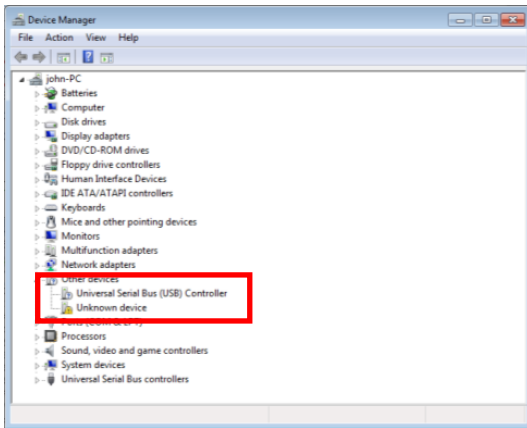
2. Opening Device Manager.

To install Arduino USB driver, open Device Manager. To open Device Manager, follow the procedure here (described procedure is one example, there are other methods)

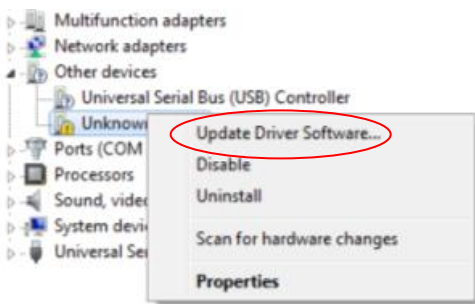
- In the Start menu, right-click on “Computer” and in the drop down menu select “Properties”



- In the dialog window, on the left hand side (Control Panel Home), select “Device Manager”.

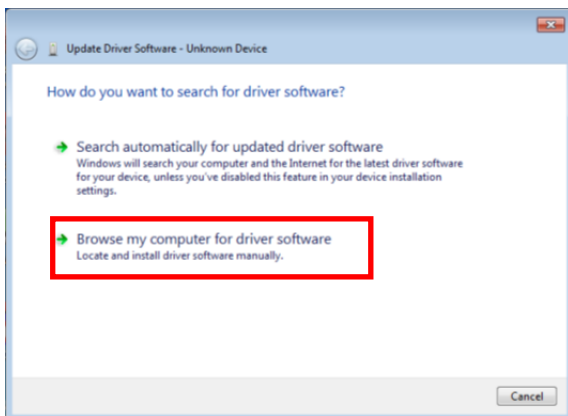


- After opening the Device Manager, scroll down the list to “Other Devices” and “Unknown device” will be displayed here.

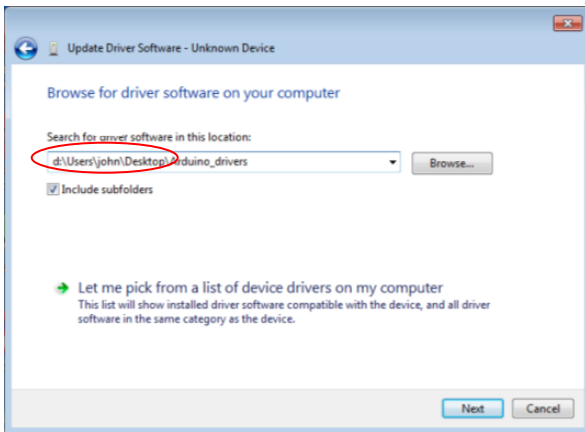


3. Installing the Arduino USB driver
*When you install the USB driver, it will become necessary to have administrator access for that PC. In this case, please install the driver with administrator access.

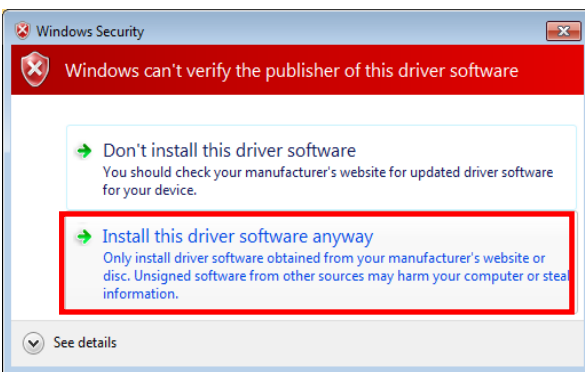
- By right clicking on “Unknown device” in the Device Manager window, a drop down list will appear. Then select “Update Driver Software”.



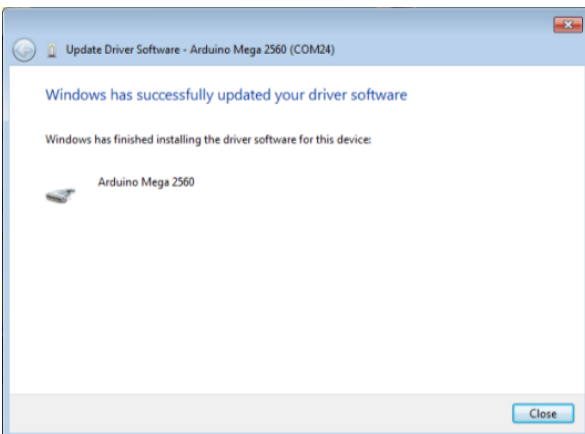
- When the “Update Driver Software” dialog box is open, select “Browse my computer for driver software”. By selecting this, you are going to manually search for the driver software in your PC.



- After making this selection, navigate to the folder where you unzipped the Arduino USB driver. (in this example, the folder on the desktop). Check the option where it says “Include subfolders” and click the “Next button”.



- The Windows security dialog box will display. The second option will show “Install this driver software anyway”. Select this option.



- Installation of the Arduino USB driver will begin. When installation is complete, the following dialog box will display below.

Cautions

- As the product communicates using electronic radio waves, there are cases where transmission will be temporarily cut off due to the surrounding environment and method of usage. The manufacturer is exempt from all responsibility relating to resulting harm to personnel or equipment and other secondary damage.
- Do not use the equipment within the vicinity of devices that may malfunction as a result of electronic radio waves from the product.
- The manufacturer is exempt from all responsibility relating to secondary damage resulting from the operation, performance and reliability of equipment connected to the product.
- Communication performance will be affected by the surrounding environment, so communication tests should be carried out before actual use.
- Ensure that the power supply for the product is within the specified rating. Short circuits and reverse connections may result in overheating and damage and must be avoided at all costs.
- Ensure that the power supply has been switched off before attempting any wiring work.
- The case is connected to the GND terminal of the internal circuit, so do not make contact between the '+' side of the power supply terminal and the case.
- When batteries are used as the power source, avoid short circuits, recharging, dismantling, and pressure. Failure to observe this caution may result in the outbreak of fire, overheating and damage to the equipment. Remove the batteries when the equipment is not to be used for a long period of time. Failure to observe this caution may result in battery leaks and damage to the equipment.
- Do not use this product in vehicles with the windows closed, in locations where it is subject to direct sunlight, or in locations with extremely high humidity.
- The product is neither waterproof nor splash proof. Ensure that it is not splashed with soot or water. Do not use the equipment if water or other foreign matter has entered the case.
- Do not drop the product or otherwise subject it to strong shocks.
- Do not subject the equipment to condensation (including moving it from cold locations to locations with a significant increase in temperature.)
- Do not use the equipment in locations where it is likely to be affected by acid, alkalis, organic agents or corrosive gas.
- The GND for the product will also affect communication performance. If possible, ensure that the case GND and the circuit GND are connected to a large GND pattern.

Warnings

- Do not take apart or modify the equipment.
- Do not remove the product label (the label attached to the upper surface of the product.) Using a product from which the label has been removed is prohibited.

Circuit Design, Inc. All right reserved

No part of this document may be copied or distributed in part or in whole without the prior written consent of Circuit Design, Inc.

Customers are advised to consult with Circuit Design sales representatives before ordering.

Circuit Design, Inc. believes the furnished information is accurate and reliable. However, Circuit Design, Inc. reserves the right to make changes to this product without notice.

REVISION HISTORY

| Version | Date | Description | Remark |
|----------------|-------------|--------------------|---------------|
| 1.0 | Oct 2015 | The first issue | |
| | | | |