

# BTSerial1

## Bluetooth-Serial Port Controller and Wireless UART Cable Replacement Module

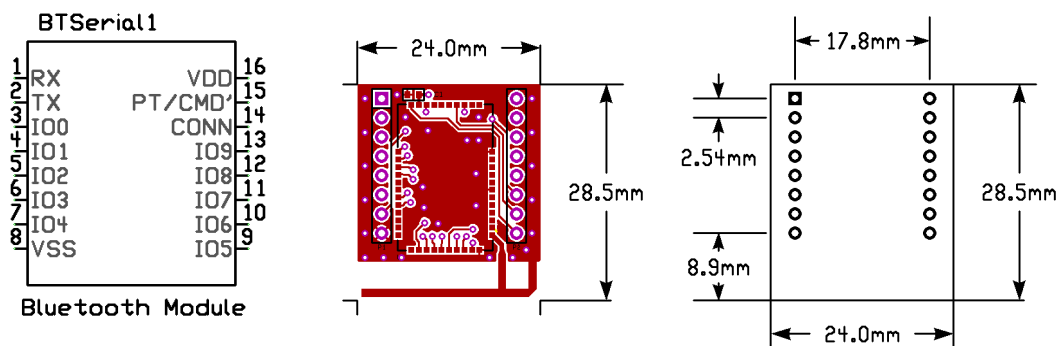
BTSerial1 is a hobbyist friendly Bluetooth module that is easy to incorporate into projects. It is on a wide DIP package that can be easily soldered into a through-hole PCB. It has 10 general purpose I/Os that is controllable by the local serial port or remotely via Bluetooth. Using as pair, the 2 controllers can be made into a wireless UART cable replacement. Like a wireless link between a PC to a remote device or a mobile robot.

The controller may also be used as a wireless communications adapter to a Bluetooth cellular phone. Using the standard Serial Port Profile (SPP), the controller can remote access the phone's AT-commands via Bluetooth. You now have complete wireless control of the phone and able to send/receive SMS, make modem calls and access the address book.

### Technical Specifications:

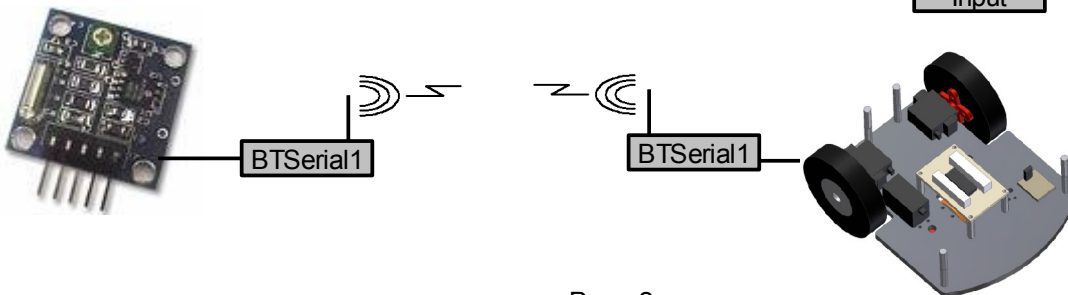
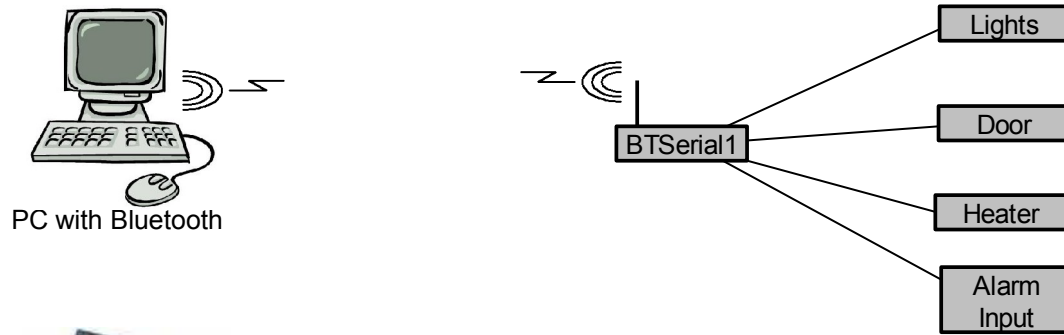
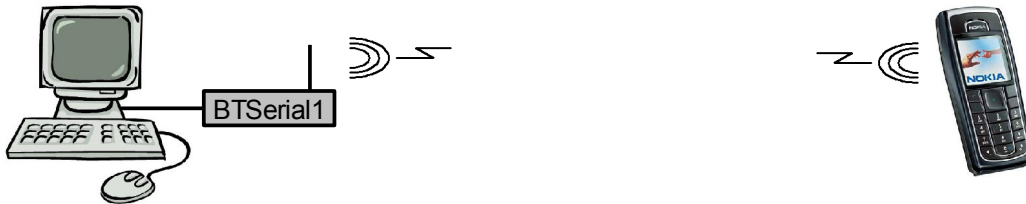
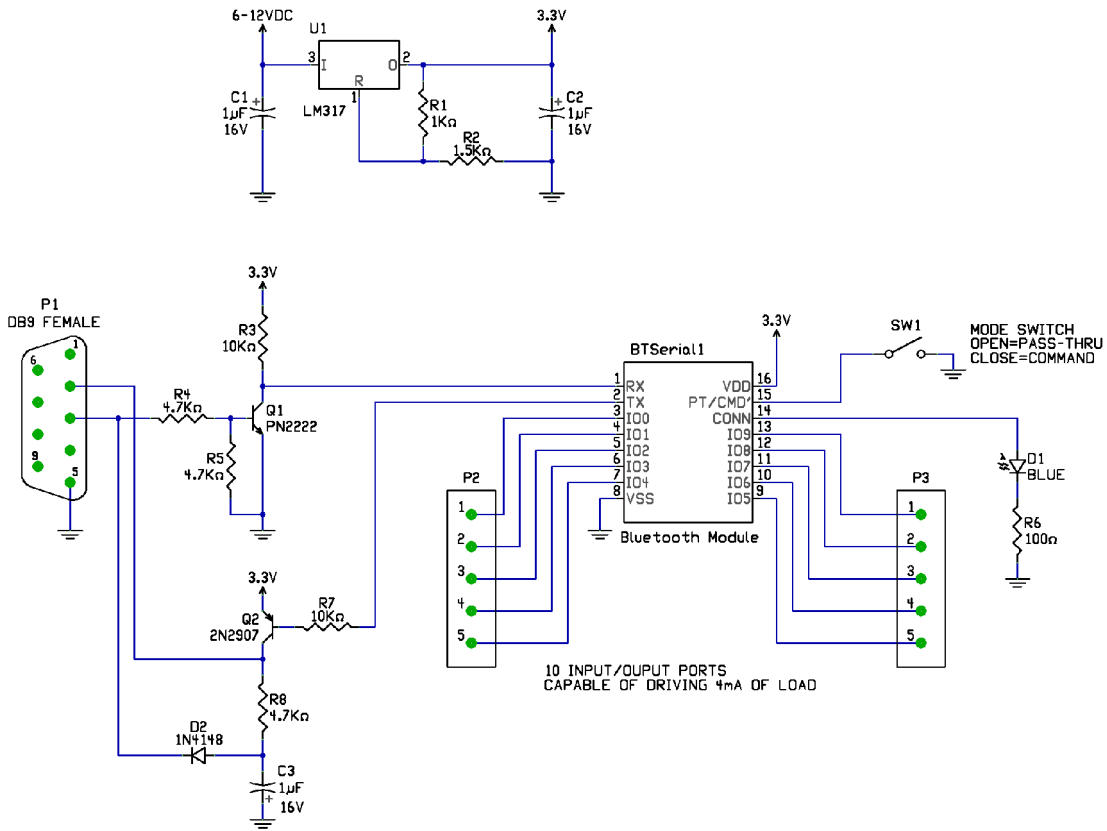
Frequency	2.4000 – 2.4385 GHz
RF Output Power	4dBm / Class2
RF Receiver Sensitivity	-82dBm
Built-in Antenna	Printed Planar Inverted-F Antenna (PIFA)
Supply Voltage	3.0 - 3.3 Volts
Input/Output Ports (I/O)	10
Internal Input Pull-up/down Current	40uA
I/O Input Voltage	+0.8V (low) / 0.7*VDD (high)
I/O Output Voltage	0.2V (low) / VDD-0.2 (high)
I/O Source/Sink Current	4mA
Serial Port Baud Rate	9600 – 115200 bps

### Pin-out:



NAME	PIN	DIR	DESCRIPTION
RX	1	I	Serial Data Input
TX	2	O	Serial Data Output
IO0-IO9	3-7, 9-13	I/O	General Purpose Input/Output Ports
VSS	8	PWR	Power Supply Ground
CONN	14	O	Connect Status: 1 = Connected, 0 = Standby
MODE	15	I	Mode Input: 1 = PASSTHRU – sends all serial traffic to the Bluetooth connection. 0 = CMD – set-up, monitor and control BTSerial1 locally or remotely.
VDD	16	PWR	Power Supply Positive Input (3.0-3.3V)

**Application Schematic:**



**AT Commands:**

BTSerial1 supports modem AT commands for its operations and configuration. AT commands can be issued anytime except when it is connected and on PASSTHRU mode. The AT command can be from the local serial port or from the remote Bluetooth connection. Remote Bluetooth AT commands are accepted if at CMD mode. CMD mode is entered by setting MODE pin LOW.

Example:

```
AT+XXX=<n>[,b][,c]<CR>
```

Parameters enclosed in <> are needed and must not be omitted.

<n> is the value sent, parameters enclosed with square brackets [ ] are optional.

<CR> is ASCII 13 or “carriage return”.

**COMMAND REFERENCE:****A. INFORMATION AND TEST**

Commands for information, baud and connectivity validation. These commands are valid only when disconnected or only if CMD mode when connected.

**AT<CR>**

Parameters: None

Response: *OK<CR>*

Description: Does nothing. Used to test connectivity and correct baud rate.

**ATI<CR>**

Parameters: None

Response: *+MODE:<mode>* - <mode> = PASSTHRU | COMMAND

*+MODEPULLUP:<pull-up>* - <pullup> = 1 | 0

*+PINCODE:<pincode><CR>*

*+BDADDR:<Bluetooth address><CR>*

*+LOCALNAME:<Local BT name seen on during Bluetooth inquiry><CR>*

*OK<CR>*

Description: Queries current settings and information such as current mode, mode pin pull-up, pincode, BT Name and Bluetooth address. Default BT name is “BTSerial1”. This can be changed using AT+LOCALNAME. Default pincode is “1234” and can be changed using AT+PINCODE.

**B. SETUP**

Commands for system setup and configuration. Only works when disconnected either CMD or PASSTHRU mode.

**AT&F<CR>**

Parameters: None

Response: *OK<CR>*

Description: Restores all parameters to default values. Warning, issuing these commands reverts all settings to default and baud rate may change. Default values are:

I/O setting = All inputs and with pull-up

MODE pin pull-up = enabled (1)

PASSTHRU serial setting = 9600,N,1

PINCODE = 1234

LOCALNAME = BTSerial1

**AT+SETUART = <baud>,<par>,<stop><CR>**

Parameters: <baud> = 9600, 19200, 38400, 57600 or 115200  
 <par> = N, O or E for NONE, ODD or EVEN parity respectively  
 <stop> = 1 or 2 stop bits

Response: +SETUART:<baud>,<par>,<stop><CR>  
 OK<CR>

Description: Sets baud rate for PASSTHRU mode. Default setting is 9600,1,N. CMD mode setting cannot be changed and is always 9600,1,N. New setting will be saved on the non-volatile memory. Warning, when in PASSTHRU mode, baud rate is immediately set. Serial port must be set accordingly immediately after the command was issued.

**AT+LOCALNAME = “<name>”<CR>**

Parameters: <name> = New local BT name of the module enclosed in double quotes.  
 Example: AT+LOCALNAME="Mobot Link"<CR>

Response: +LOCALNAME = “<name>”<CR>  
 OK<CR>

Description: Changes the name of the module. This name is seen on when a BT device is searching. Maximum name length is 16 characters. The default name is “BTSerial1”.

**AT+PINCODE = <pin><CR>**

Parameters: <pin> = Maximum of 4 digit numeric pin-code used for pairing

Response: +PINCODE:<pin><CR>  
 OK<CR>

Description: Sets the default pin code of the module. Default is 1234. In order to pair Bluetooth devices, the same pin-codes must be entered on both of them. Bluetooth cellular phones also asks this and must enter the same as the one set.

**AT+MODEPULLUP = <pull-up><CR>**

Parameters: <pull-up> = Either 0 or 1. Value 0 is with pull-down while value 1 is with pull-up.

Response: +MODEPULLUP:<pull-up><CR>  
 OK<CR>

Description: Sets the MODE pin's default configuration either with pull-up or pull-down. This sets the unconnected state to either HIGH or LOW. Default configuration is with pull-up.

**C. I/O SETUP, MONITORING AND CONTROL**

These commands configures the I/Os, retrieves its input states and controls the outputs. When disconnected, these commands set-up the local I/O of the module. These also works when connected and in command mode, if these commands are issued by the remote Bluetooth connection.

**AT+IOSETDIR = <io>,<dir><CR>**

Parameters: <io> = IO number from 0 to 9  
 <dir> = 1=OUTPUT, 0=INPUT

Response: +IOSETDIR:<io>,<dir><CR>  
 OK<CR>

Description: Sets IO direction to either INPUT or OUTPUT. Default IO settings are all INPUTS.

**AT+IOBULKSETDIR = <mask>,<bits><CR>**

Parameters: <mask>= 0-1023, “binary and” mask of IOs to change.  
 <bits> = 0-1023, binary bit direction. 1 = OUTPUT, 0 = INPUT.

Example: AT+IOBULKSETDIR=3,2<CR>  
 Sets IO1 to output while IO0 and IO2 as inputs.

Response: +IOBULKSETDIR = <mask>,<bits><CR>  
 OK<CR>

Description: Sets IO direction in bulk to either INPUT or OUTPUT. Default IO settings are all INPUTS.

**AT+IOGET = <io><CR>**

Parameters: &lt;io&gt; = IO number from 0 to 9

Response: +IOGET:<io>,<state><CR>  
OK<CR>

Description: Reads the IO bit status and returns &lt;state&gt; either 1=HIGH or 0=LOW.

**AT+IOBULKGET<CR>**

Parameters: None

Response: +IOBULKGET = <state decimal>, <state hex><CR>  
OK<CR>

Description: Reads all IO status and returns &lt;state decimal&gt; as a decimal mask values from 0-1023. While &lt;state hex&gt; is its hexadecimal equivalent.

Example: IO0 & IO7 are HIGH while rest are LOW  
Returns +IOBULKGET = 129, 0x81<CR>**AT+IOSET = <io>,<state><CR>**

Parameters: &lt;io&gt; = IO number from 0 to 9

&lt;state&gt; = 1 – HIGH, 0 – LOW

Response: +IOSET:<io>,<state><CR>  
OK<CR>

Description: Sets IO state to either LOW or HIGH if configured as OUTPUT. If the IO is configured as INPUT, a 1 will have a PULL-UP, a 0 a PULLDOWN. Default INPUT configuration is all PULL-UP.

**AT+IOBULKSET = <mask>,<bits><CR>**

Parameters: &lt;mask&gt;= 0-1023, "binary and" mask of IOs to change.

&lt;bits&gt; = 0-1023, binary bits of new IO state. 1 = HIGH, 0 = LOW.

Example: AT+IOBULKSET=7,1&lt;CR&gt;

Sets IO0 to HIGH. And IO1 and IO2 to LOW.

Response: +IOBULKSET = <mask>,<bits><CR>  
OK<CR>

Description: Bulk set the IO to a new state either HIGH or LOW if configured as OUTPUT. If the IO is configured as INPUT, a 1 will have a PULL-UP, a 0 a PULLDOWN. Default INPUT configuration is all PULL-UP.

**AT+IOSETSAVE<CR>**

Parameters: None

Response: +IOSETSAVE<CR>  
OK<CR>

Description: Saves current IO setting in non-volatile memory. This settings will be used by default.

**D. DISCOVERY AND CONNECTION**

Commands for Bluetooth device discovery and connection. These commands are only valid when disconnected. Except for **ATH** and **AT+SEND** that can only be accepted when connected and in CMD mode. **ATH** is also valid if issued via Bluetooth connection and in CMD mode.

**AT+SEARCH<CR>**

Parameters: None

Response: +FOUND:<n>,<bdaddr>,"<BT name>"<CR>  
+FOUND:<n+1>,<bdaddr>,"<BT name>"<CR>  
.  
.  
.  
+FOUND:<max>,<bdaddr>,"<BT name>"<CR>  
OK<CR>

If no BT device found, only OK&lt;CR&gt; is returned.

Description: Searches all known Bluetooth devices around the module. This returns BT device names and addresses. Maximum of 8 devices found within 1 minute search will be sent. Search can be canceled using AT+CANCEL.

**AT+CANCEL<CR>**

Parameters: None

Response: +CANCEL<CR>  
OK<CR>

Description: Cancels previous Bluetooth devices search.

**ATD<n><CR>**

Parameters: <n> = 1-8 position of searched devices returned in AT+SEARCH.

Response: +CONNECT#:<n>,<bdaddr><CR>  
After 10 seconds and connection is not established returns: *ERROR*<CR>  
On success, +CONNECTED<CR> is returned.

Description: Connects to a device using the position in result list from an AT+SEARCH query.

**ATD <bdaddr> <CR>**

Parameters: <bdaddr> = 12 digit hexadecimal Bluetooth device address.

Response: +CONNECT:<bdaddr><CR>  
After 10 seconds and connection is not established returns: *ERROR*<CR>  
On success, +CONNECTED<CR> is returned.

Description: Connects to a device using the Bluetooth address.

**ATDL<CR>**

Parameters: NONE

Response: +CONNECT:<bdaddr><CR>  
After 10 seconds and connection is not established returns: *ERROR*<CR>  
On success, +CONNECTED<CR> is returned.

Description: Connects to the device last used in ATD or ATD> commands.

**ATH<CR>**

Parameters: None

Response: OK<CR>  
+DISCONNECTED<CR> later after disconnected.

Description: Disconnects the Bluetooth connection.

**AT+SEND="<string>"<CR>**

Parameters: <string> - character string to send

Response: OK<CR>

Description: Sends a string of characters to the Bluetooth link.

**Sample Session:**

This is a sample serial session with one BTSerial1 connected to a PC. The remote device also is a BTSerial1. Both modules are in CMD mode. This shows how to search for a device to connect, connect to it. Then remotely set one IO as OUTPUT, set it to HIGH and disconnect after. *Italicized* are the responses from BTSerial1.

PC in Hyperterminal 9600,N,1:

AT+SEARCH	#comments find BT devices around
+FOUND:1,551133445566,"Nokia 6230i"	1st device found
+FOUND:2,112233445566,"BTSerial1"	2nd device found
OK	search finished
ATD>1	connect to the first found device

+CONNECT#:1,112233445566  
+CONNECTED

connect response  
connected within <10sec

At this point, no more local commands are accepted from the PC connected BTSerial1. All typed AT-commands are passed to the Bluetooth connection. The remote BTSerial1 will receive and process them.

AT+IOSETDIR=1,1

set IO1 direction to OUTPUT

+IOSETDIR:1,1  
OK

confirmation of IO direction setting

AT+IOSET=1,1

set IO1 state to HIGH

+IOSET:1,1  
OK

confirmation of IO state setting

ATH

disconnect BT link

OK  
+DISCONNECTED

disconnect command confirmation  
link disconnected

