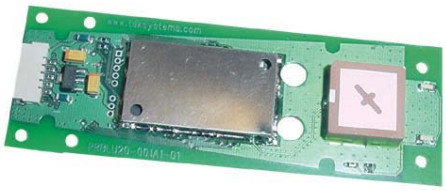
blu^{2i} AT Commands

Quick Start Guide

This document relates to the standard production release firmware Version 1.50, which is included in the BISM1 Bluetooth serial module, the RS232 universal adapter, and PCMCIA card. More recent firmware releases can be downloaded from www.lairdtech.com/bluetooth.



This guide describes how to set up and use Ezurio's BISM Bluetooth serial modules as well as the blu^{2i} devices, such as the PCMCIA card and RS232 adaptors that are based on the blu^{2i} AT command set.

GETTING STARTED

To configure a blu^{2i} module or one of its variants, you need a Windows based PC or laptop with at least two COM ports and a terminal package. Laird advises that you download the latest version of Ezurio Terminal from www.lairdtech.com/bluetooth as this guide refers to configuration using Ezurio Terminal.

Note: Ezurio Terminal is also included in the blu^{2i} CD.

Unless specified otherwise, all products in the blu^{2i} range are supplied with factory default settings. If the blu^{2i} product's configuration is unknown, refer to Appendix II.

During the course of this manual, you will see the following conventions:

- <cr>: carriage return or enter
- <bd_addr>: the Bluetooth address of a particular device

Note: To see a more detailed description of the AT commands or S registers used in this manual, please see Appendix I. For further guidance please refer to the blu^{2i} – AT Command Set Guide.

More details on the syntax for Ezurio Terminal can be found in the "blu^{2i} – Ezurio Terminal Syntax" document.

How to Configure and Connect two blu^{2i} Modules

For quick connection, you need two blu^{2i} modules. Configure one of the modules as a master and the other as a slave.

1. Plug one of the blu^{2i} modules into any COM port on your PC.
2. Run Ezurio Terminal.
3. Select the COM port that's connected to the module.
4. Set the Baud Rate to 9600 and click **OK.**
5. Type 'at'<cr> and you should receive an OK response.

Note: If at any stage you do not receive an OK response, check that the module is powered and connected to the relevant COM port.

This module (Module 1) needs configured to be discoverable, connectable, and answer automatically on one ring. Type the following:

- ats0=1 <cr>
- ats512=4 <cr>
- ats536=1 <cr>
- at&w <cr>
- atz <cr>
- ati4 <cr>

Note the Bluetooth address response. This is the address of this particular blu^{2i} module.

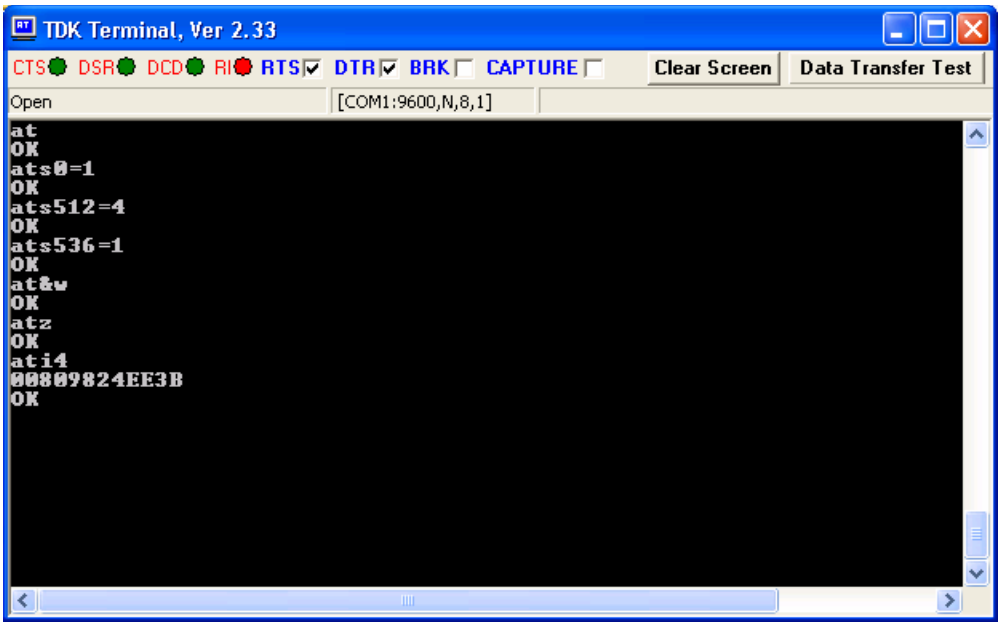


Figure 1: Module address echoed in Terminal

Now, connect the second module (Module 2) to another COM port on your PC.

1. Run 'Ezurio Terminal'.
2. Select the COM port that's connected to the module.
3. Set the Baud Rate to 9600 and click **OK**.
4. Type in **at** <cr>. You should receive an OK response. You now have TDK terminal sessions running for each device.
5. Type in **atd<BT_ADDR>** <cr>, where <BT_ADDR> is the Bluetooth address of the first module.
6. After a few seconds a 'CONNECT' message appears. The modules are now connected via Bluetooth.

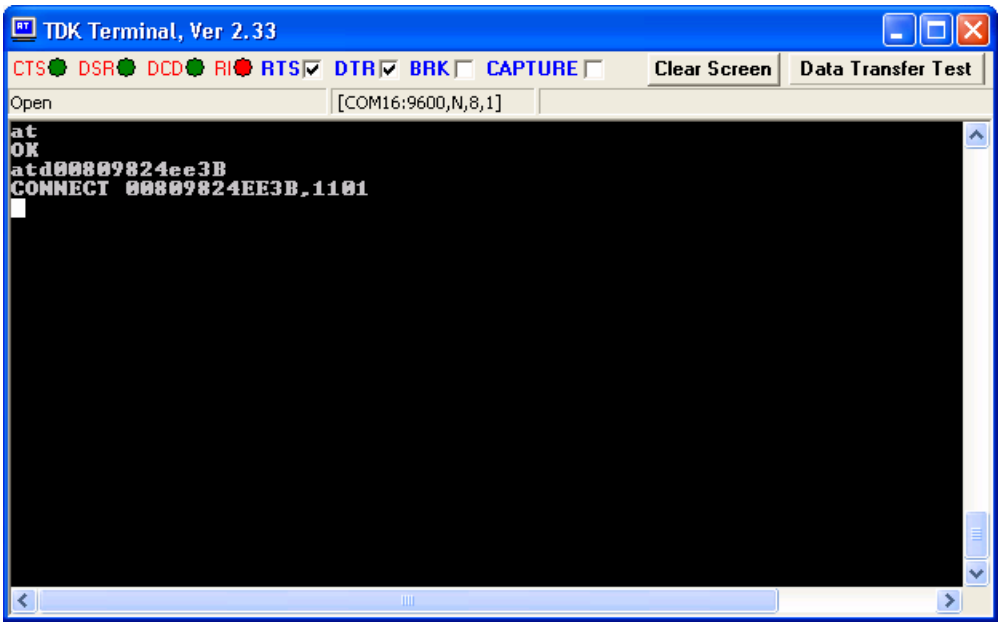


Figure 2: Connect Message

The Ezurio Terminal session for Module 1 displays the following:

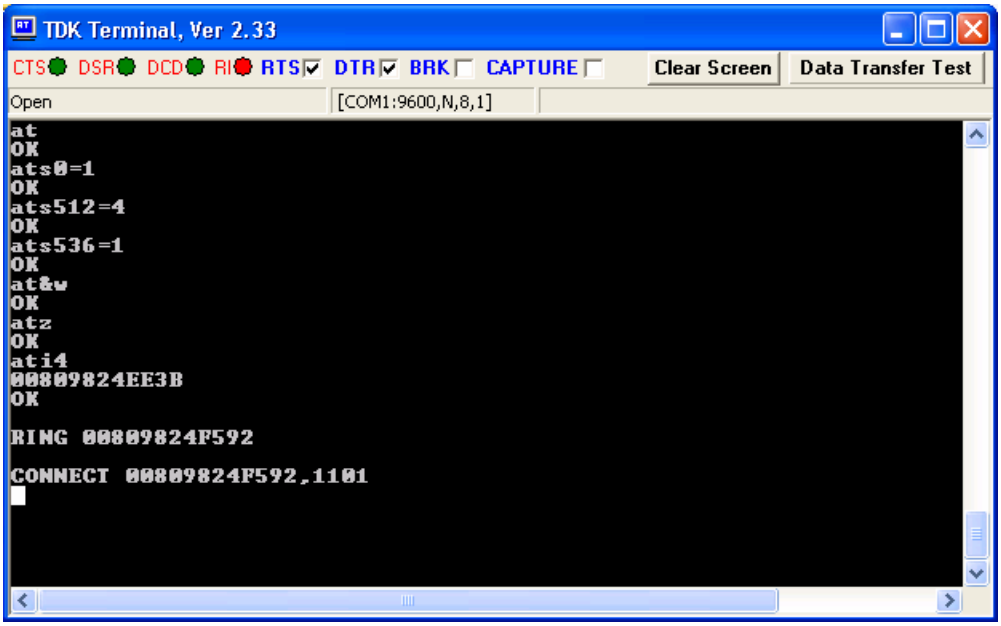


Figure 3: Connect message, accepted after one ring

You can see that the incoming connection was automatically accepted after 1 ring. Characters typed are now seen on the other terminal session.

Entering Remote Command Mode

When the two devices are connected it is possible to communicate remotely with another device. For example, from one terminal session you can talk to both devices (the command that allows this is ats536=1 on the remote device).

Example:

On Module 1, make sure the configuration is the same as set earlier. Do not interface Module 1 with any COM ports.

Run Ezurio Terminal for Module 2 with the appropriate session settings (9600 baud) and then:

- Type **at**, <cr> making sure you receive an **OK** response
- Type **ati4** <cr>
- Type **atd**<bd_addr> where <bd_addr> is the Bluetooth address of the device you wish to connect to <cr>. In this case it's Module 1 which is 00809824ee3b

You will see the following screen:

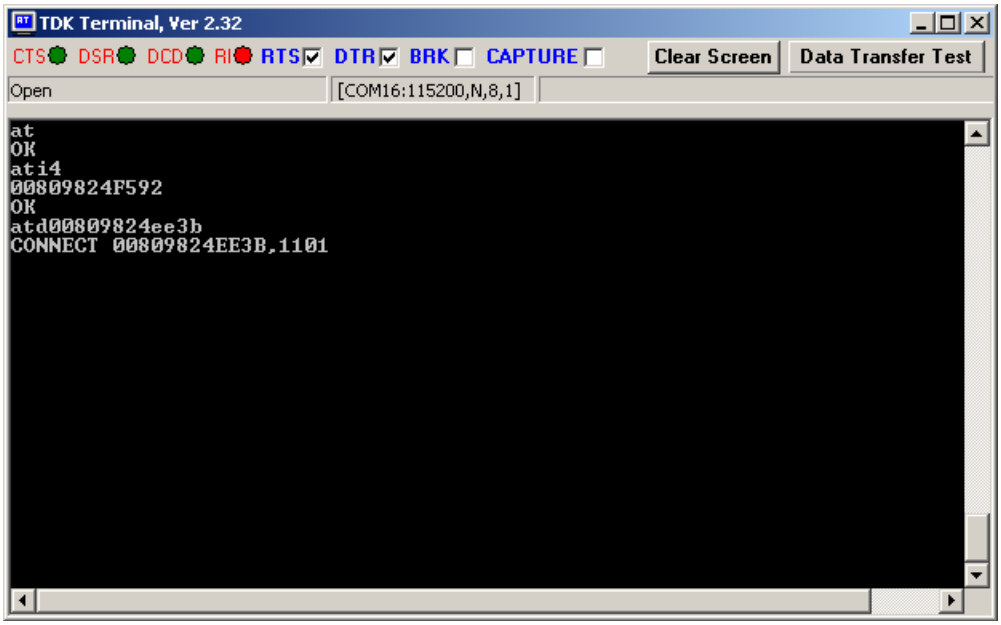


Figure 4: Entering Command Mode

Now that a connection is established, we can send a command that enables us to communicate remotely with Module 1:

- Type !!! (you will not see !!! echoed locally) and an OK response confirms you are remotely communicating with Module 1.

If you type **ati4** <cr> you will now see the address of Module 1 to confirm you are communicating with it remotely.

At any time, if you wish to revert to Module 2, then type **^^^**, and an OK response confirms this action:

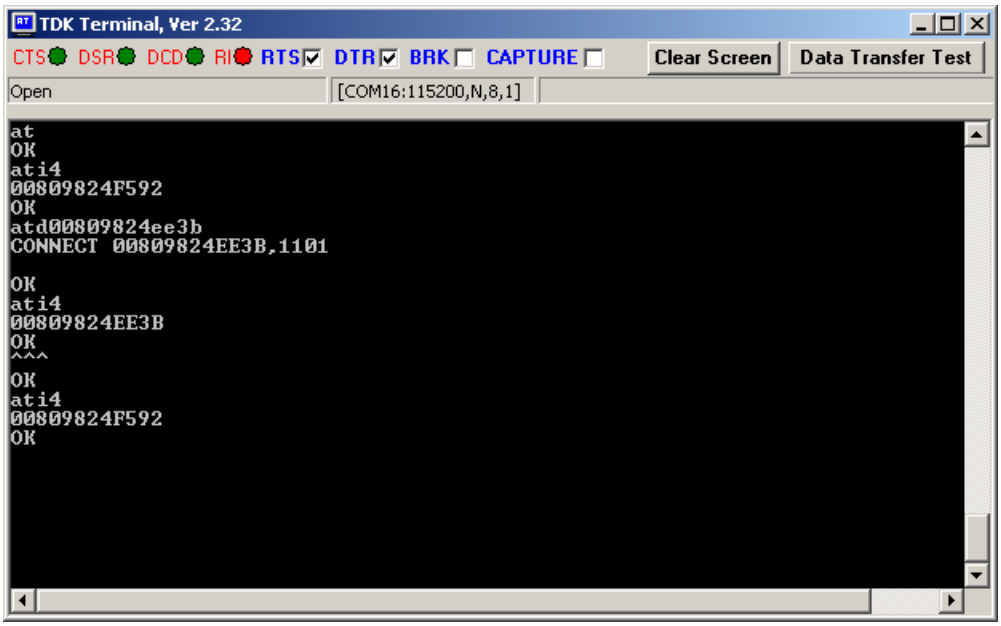


Figure 5: Reverting to module 2

If you wish to connect to Module 1 again, then type **'ato'**<cr>.

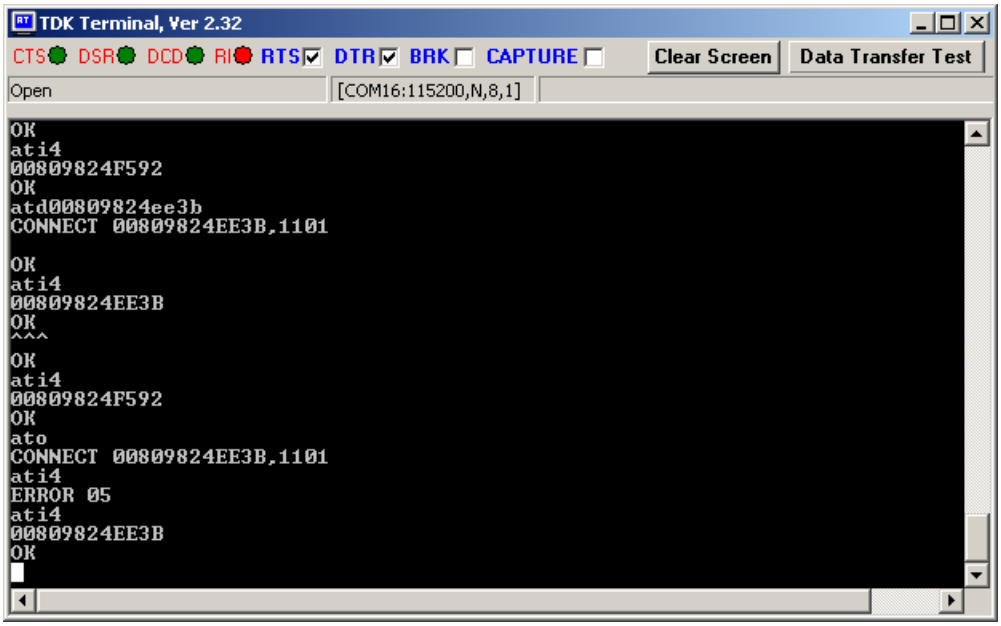


Figure 6: Returning to Module 1

To drop the connection, type **'^^^'**, and when you receive an OK response, type **ath** <cr>:

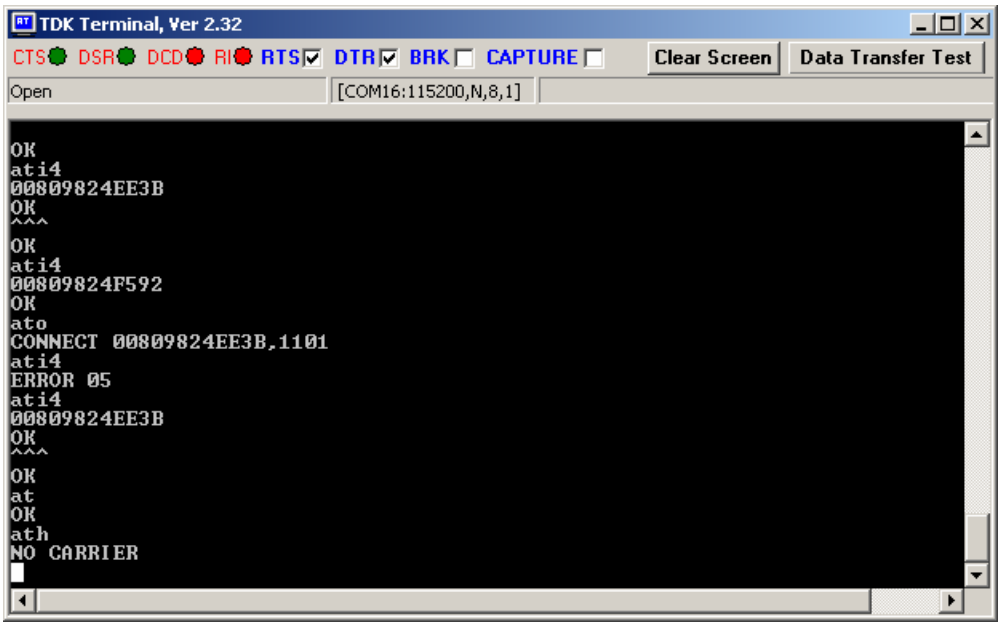


Figure 7: Dropping the connection

You will see a 'NO CARRIER' response that confirms the connection terminated.

Connection of a blu^{2i} Module to a Go Blue USB Adaptor or PC Card

It is also possible to connect a TDK Go Blue USB Adaptor or PC Card to a blu^{2i} module.

Connect to your blu^{2i} module with a free COM port:

1. Run Ezurio Terminal on that particular COM port
2. Type **ats0=1** <cr>
3. Type **ats512=4** <cr>
4. Type **ats502=1** <cr>
5. Type **ats536=1** <cr>
6. Type **at+btk="XXXX"**, where XXXX is a numeric PIN of your choice
7. Type **at&w** <cr>
8. Type **atz** <cr>

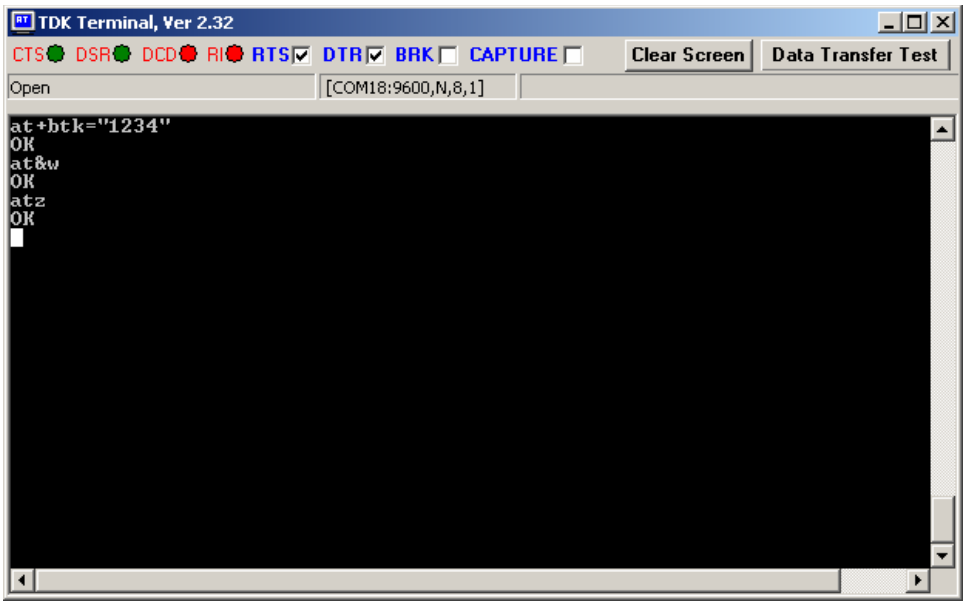


Figure 8: Setting PIN for BT Pair

Once you install the USB Adaptor or PC Card, double click **My Bluetooth Places** and you will see a screen similar to the following:

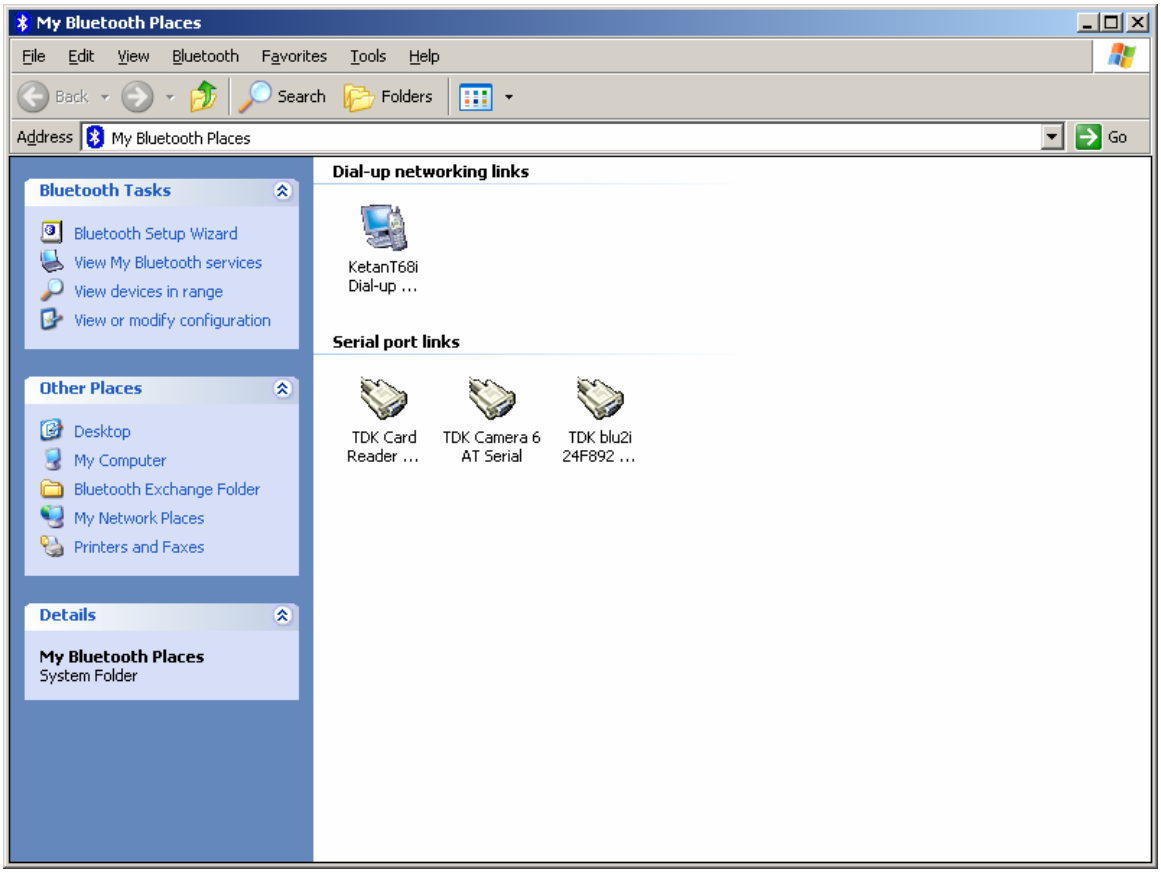


Figure 9: Windows Device Manager

Click on **View devices in range**, and then click **Search for devices in range**.

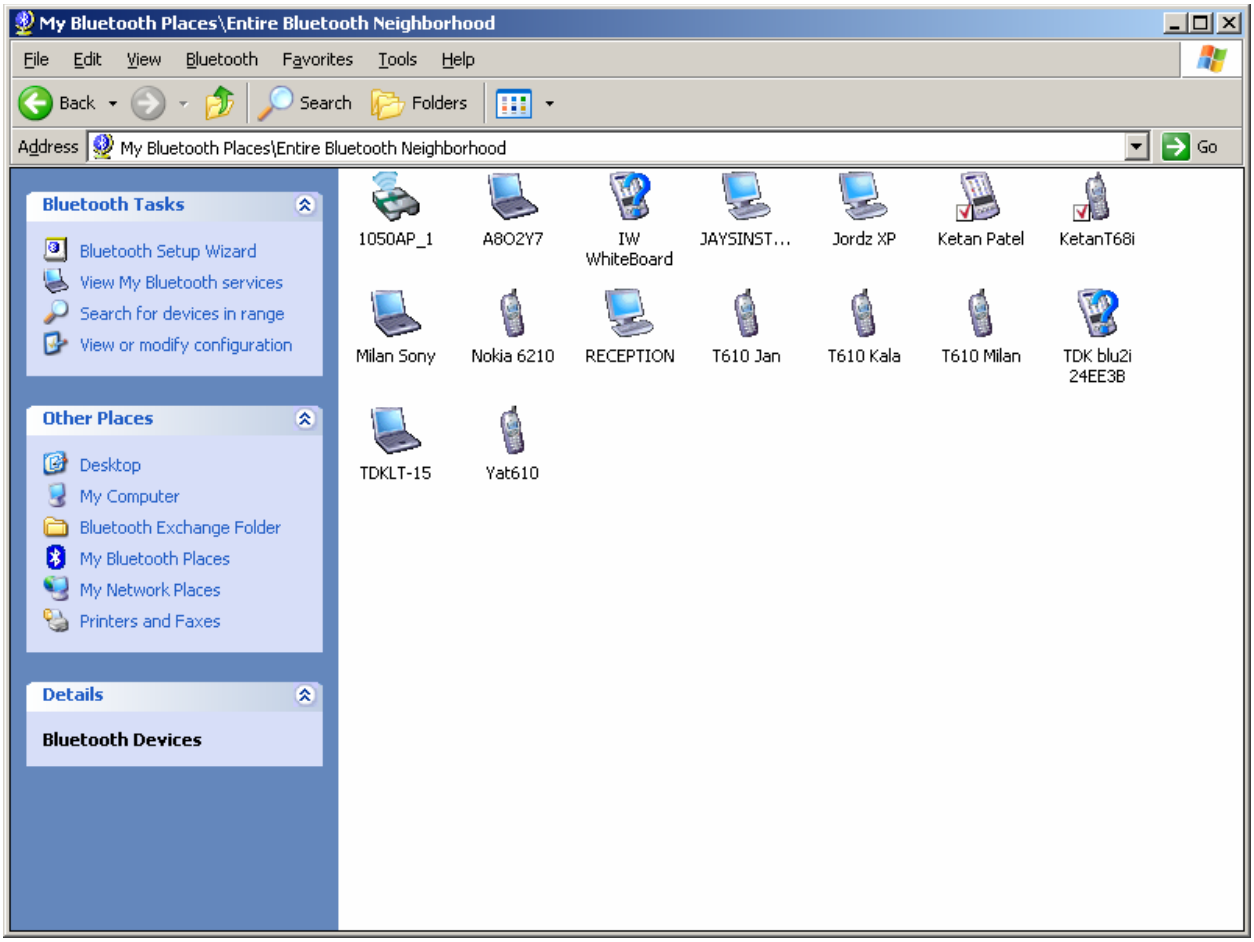


Figure 10: Scanning for nearby devices

Double click on the relevant device you wish to connect to (in this case, the TDK blu^{2i} device).

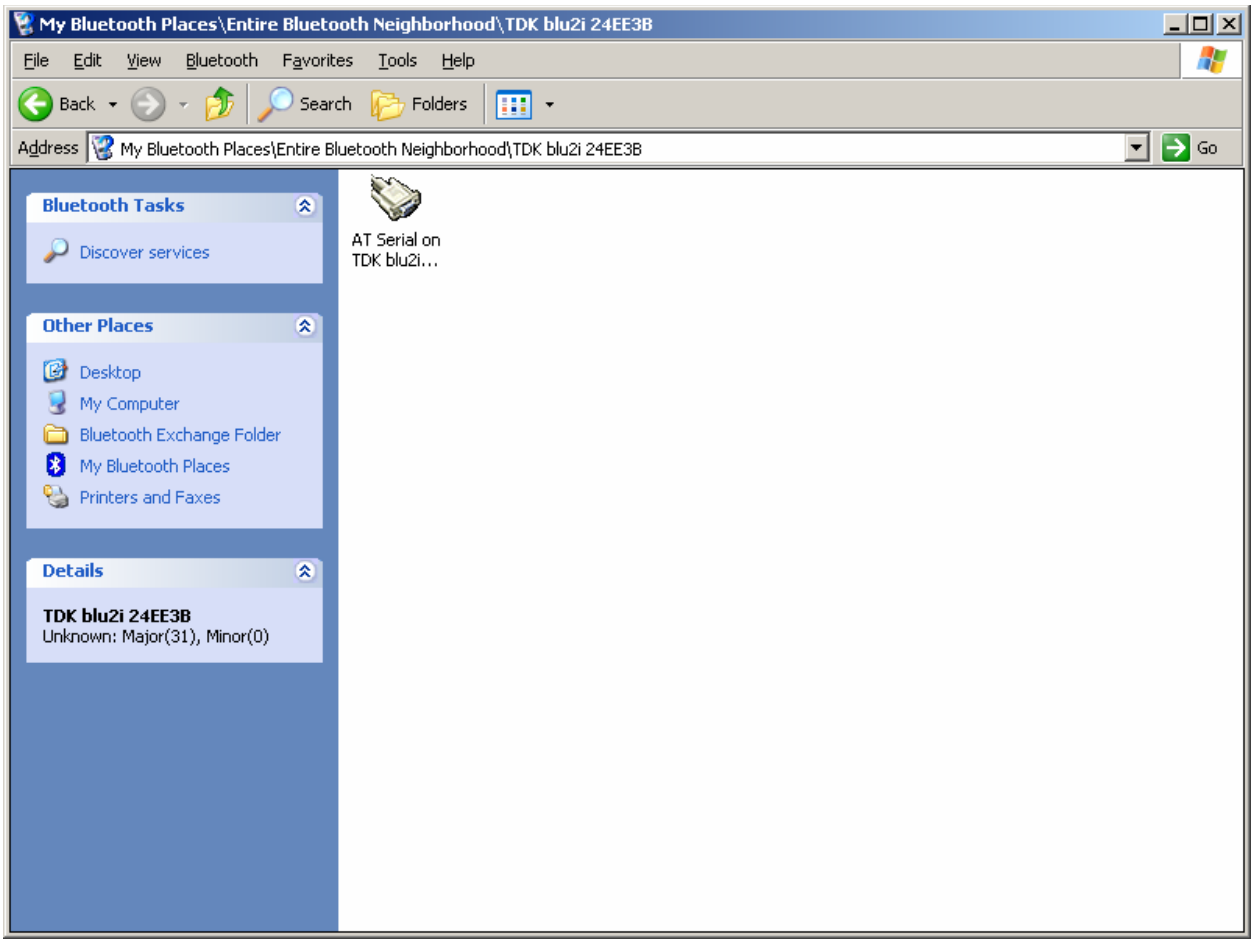


Figure 11: AT Serial connection on Blu2i

Right click on the icon and click **Connect to Bluetooth Serial Port**. You will see the 'connecting' screen, shown below:

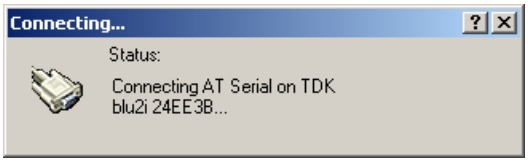


Figure 12: Connection screen

You will now see a prompt in your bottom right side tray of your PC which asks for you to enter a pass code. Enter the PIN number you specified earlier for the blu^{2i} module, and click **OK**.

Once you successfully enter the correct PIN number, you are able to connect to that device any time you wish without re-entering the PIN code.

When you double click on the icon you see the following:

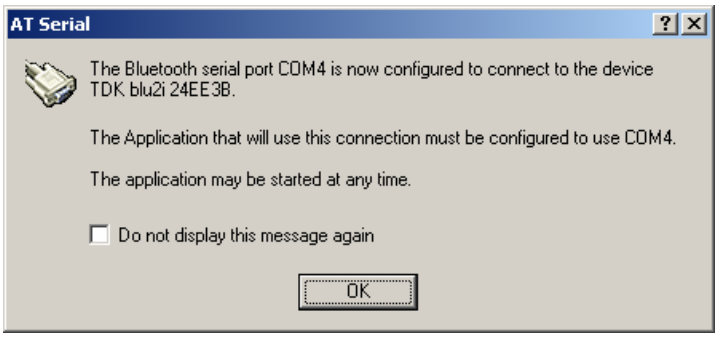


Figure 13: AT Serial connection confirmation

This tells you which COM port is configured to use with your USB Adaptor or PC Card. In this case, it's COM4.

Click **OK** and then double click on the icon and you will see that the icon changes to the following, showing the device is connected.

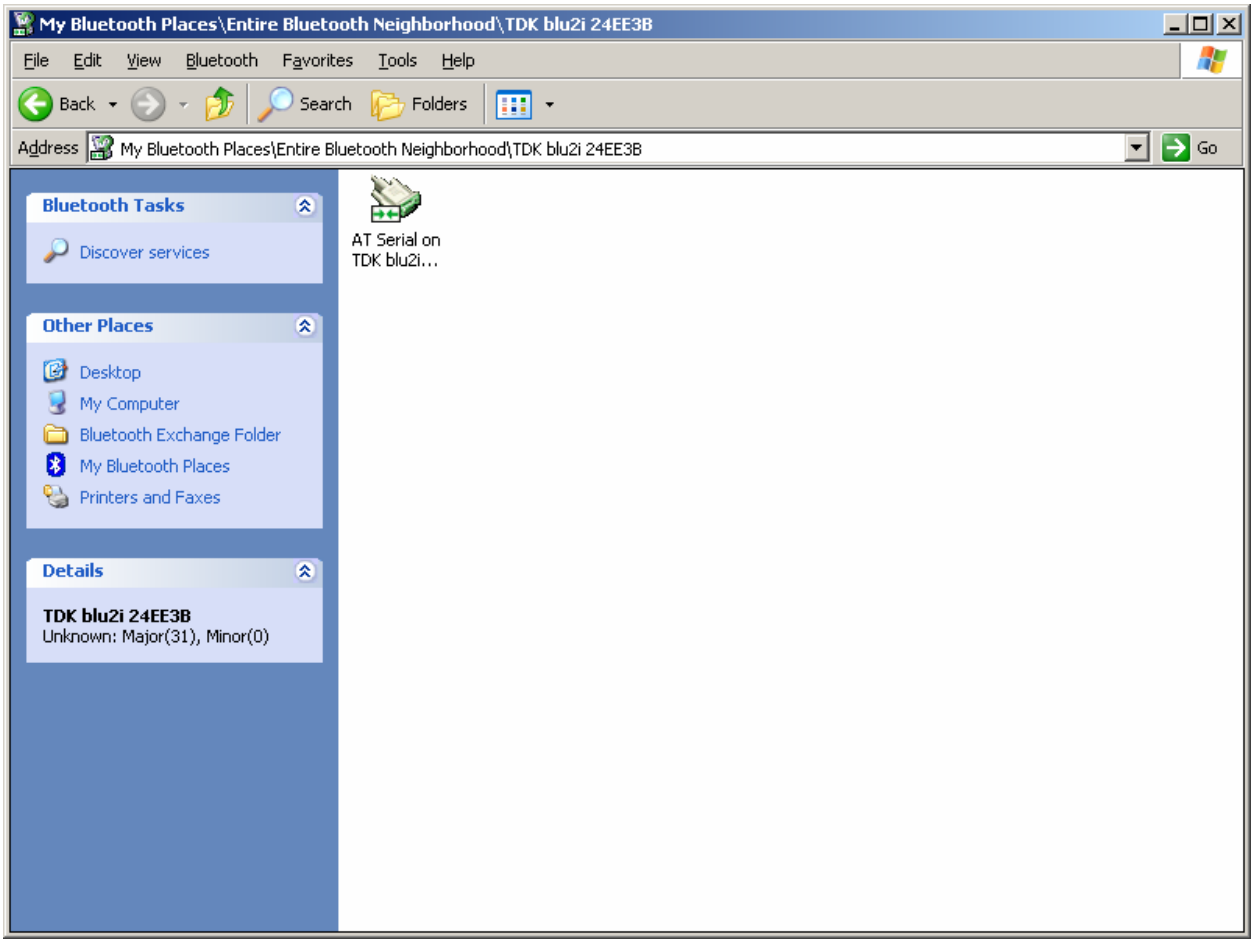


Figure 14: Icon showing the connected device

The following steps show you how to communicate with your blu^{2i} module from your PC:

- Run Ezurio Terminal.
- Choose the relevant COM port, obtained in the previous screen (in this case, COM4).

- Click **OK.**

Notice that you are not able to see any characters typed. To see them, connect to the blu2i module remotely by typing **!!!**

You will see an 'OK' response.

- Type in **ati4** <cr> and you now see the Bluetooth address of the blu2i module:

Figure 15: Address of connected blu2i module

You are now communicating with the remote blu2i module.

blu2i Module Configuration for Connection on Power Up, or Pure Data Cable Replacement Mode

To make an automatic connection when two Bluetooth modules are powered up, plug the motherboard with blu2i Module 1 into a COM port of your PC.

On Module 1:

1. Run Ezurio Terminal on that particular COM port.
2. Type in **ati4** <cr>. You will receive the Bluetooth address as a response. Make a note of this response as you will need this Bluetooth address for use when programming Module 2.
3. Type **at&f*** <cr>
4. Type **ats512=7** <cr>
5. Type **ats0=-1** <cr>
6. Type **at&w** <cr>

Now remove blu2i Module 1 from the motherboard and plug in blu2i Module 2.

On Module 2:

1. Run Ezurio Terminal on that particular COM port.
2. Type **at&f*** <cr>
3. Type **ats512=1** <cr>
4. Type **ats504=1** <cr>
5. Type **ats507=2** <cr>
6. Type **ats530=2000** <cr>
7. Type **at&w** <cr>
8. Type **at+btr**<bd_addr>. Where <bd_addr> is the Bluetooth address of Module 1 obtained above.

The modules now connect to each other when they are both powered up, providing they are in range. Should the modules disconnect when out of range, they will re-connect when they are back in range of each other.

Configuration of Modules for Audio Cable Replacement Mode

To make an automatic connection when two Bluetooth modules are powered up, plug the motherboard with blu^{2i} Module 1 into a COM port of your PC.

On Module 1:

1. Run Ezurio Terminal on that particular COM port.
2. Type in **ati4** <cr>. You will receive the Bluetooth address as a response. Make a note of this response as you will need this Bluetooth address for use when programming Module 2.
3. Type **at&f*** <cr>
4. Type **ats512=7** <cr>
5. Type **ats0=-1** <cr>
6. Type **at&w** <cr>

Now remove blu^{2i} Module 1 from the motherboard and plug in blu^{2i} Module 2.

On Module 2:

- Run Ezurio Terminal on that particular COM port.
- Type **at&f*** <cr>
- Type **ats512=1** <cr>
- Type **ats504=1** <cr>
- Type **ats532=1** <cr>
- Type **ats530=2000** <cr>
- Type **at&w** <cr>
- Type **at+btr**<bd_addr> <cr>. Where <bd_addr> is the Bluetooth address of Module 1 obtained in the second step above.

The modules now replace an audio cable and connect to each other when they are both powered up providing they are in range. Should the modules disconnect when out of range, they re-connect when they are back in range of each other.

PAIRING BLU^{2I} MODULES

To pair two blu^{2i} modules you need two COM ports, one for each device.

For Module 1, Run Ezurio Terminal on the appropriate COM port and with the correct communication settings:

- Type **at** <cr>, and if you receive an 'OK' response you have established communication with Module 1.

For Module 2, run Ezurio Terminal on the appropriate COM port and with the correct communication settings:

- Type **at** <cr>, and if you receive an 'OK' response you have established communication with Module 2.

Make sure you have both terminal sessions running on your PC so that you can see responses from both devices.

On the Module 1, type in the following:

- ats0=1 <cr>
- ats512=4 <cr>
- ats536=1 <cr>
- at+btk="XXXX" <cr> (where XXXX is the numeric PIN of your choice)
- at&w <cr>
- atz <cr>
- ati4 <cr>

Figure 16: Connecting two blu2i modules

On Module 2:

- Type in **at+btw**<bd_addr> <cr> (where <bd_addr> is the Bluetooth address of Module 1) and hit return. See the 'ati4' command response above.

You are prompted for a pin for the module you are trying to pair with every 2 seconds. At this point you need to type in **at+btk="XXXX"**<cr> (where XXXX is the numeric PIN code you specified for Module 1).

Module 1:

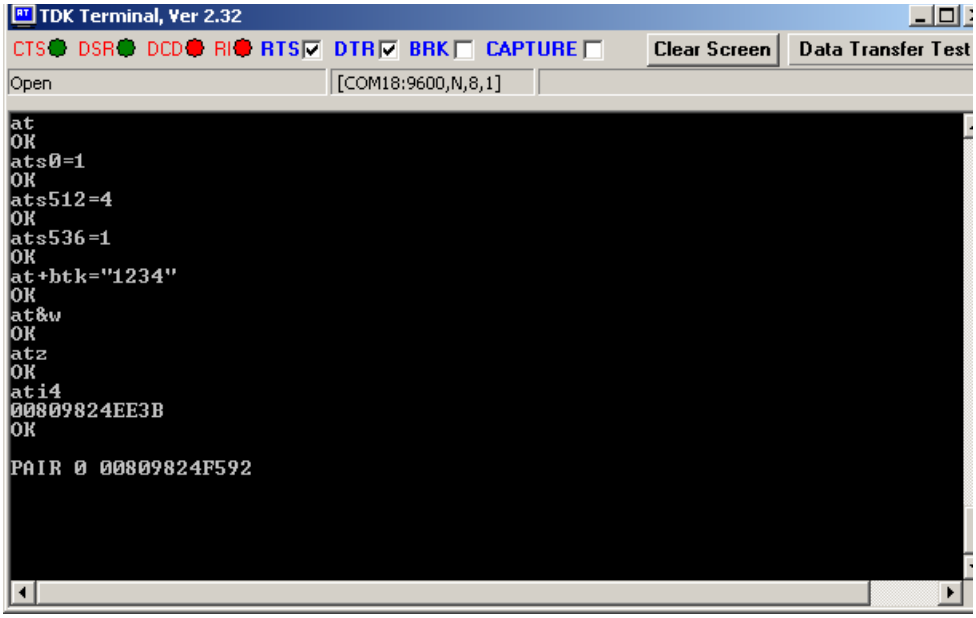


Figure 17: Enter pairing pin

You can see 'PAIR 0 00809824F592' which tells you the Bluetooth address of the device you paired with (in this case, Module 2).

Module 2:

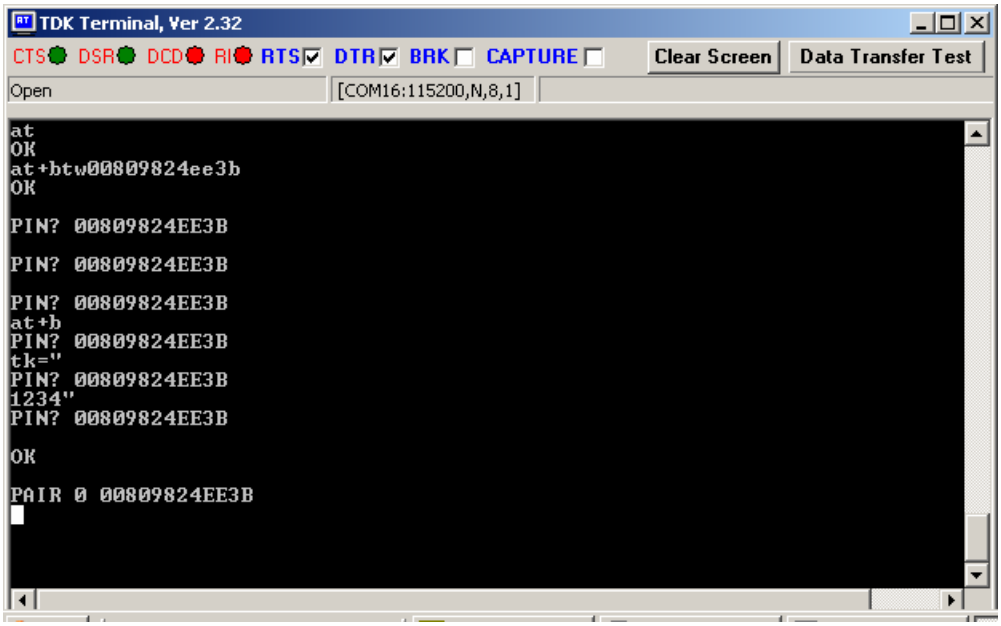


Figure 18: Pair message from Module 2

You can see 'PAIR 0 00809824ee3b' which tells you that Module 2 is paired with Module 1.

Note: The **'at+btk="xxxx"'** is not echoed on the same line.

It is now possible to store Module 1 in Module 2's non-volatile database so that Module 2 recognises Module 1 as a trusted device and allows future paired connections.

To execute this, type in **at+btt** <cr>. An 'OK' response tells you that the device was stored

To check which devices (Bluetooth addresses) have been stored, type in **at+btt?** <cr> and you will see a list of the trusted devices database:

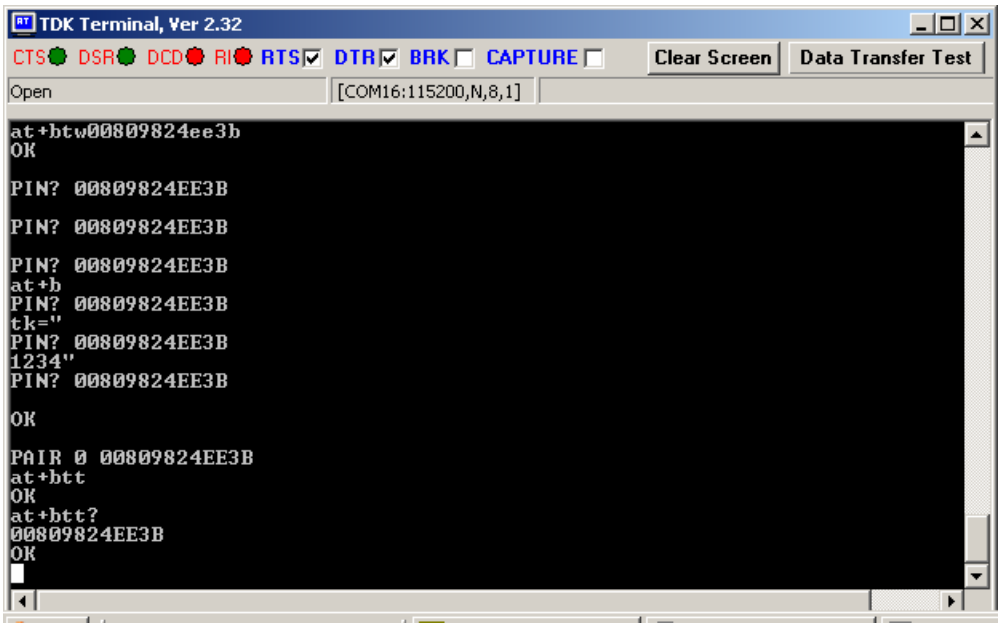


Figure 19: Trusted device database

To delete an address from the database at any time, type **at+btd<bd_addr>** <cr> (where <bd_addr> is the address of the Bluetooth device which you wish to remove from the database).

To delete all addresses from the database, type **at+btd*** <cr>.

MONITORING THE STATE OF ANALOGUE INPUTS AND THE NUMBER OF TRANSITIONS ON GPIO LINES ON A BLU^{2I} MODULE

To monitor the state of the inputs and outputs on a blu^{2i} module, connect to that particular device and issue interrogation commands. Below is an example of this.

Connect to the device which you are interrogating, type in **atd<bd_addr>** <cr> (where <bd_addr> is the Bluetooth address of the device you are connecting to).

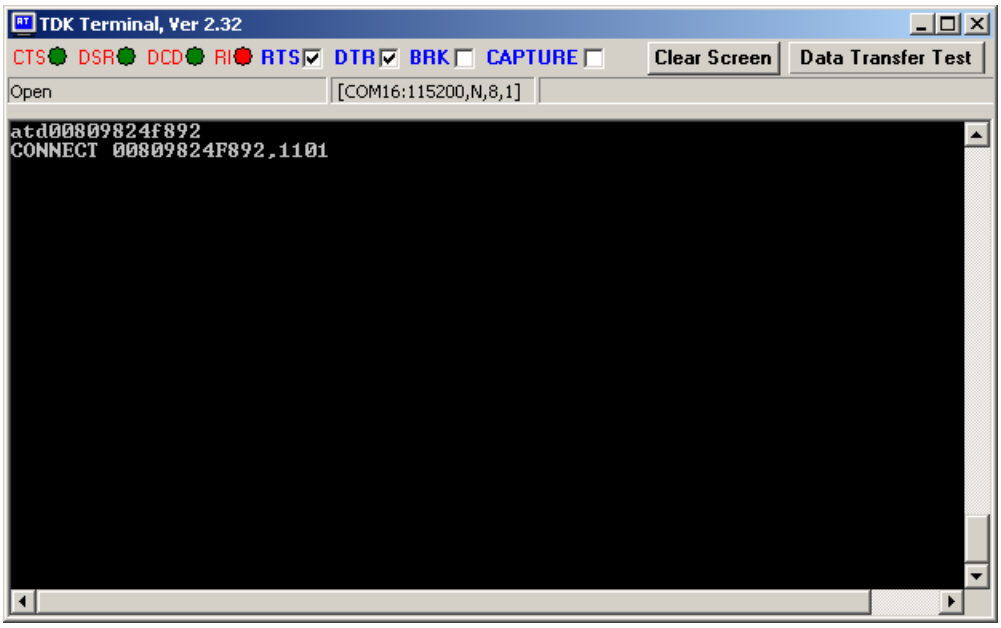


Figure 20: Connecting to device with atd<bd_addr>

Type in **!!!** to enter remote command. This enables you to analyse the state of the remote device. Once you have the OK response, you are communicating with the remote device.

To analyse the state of analogue input 1, type **ats701?** <cr>

You will see the following screen and its response:

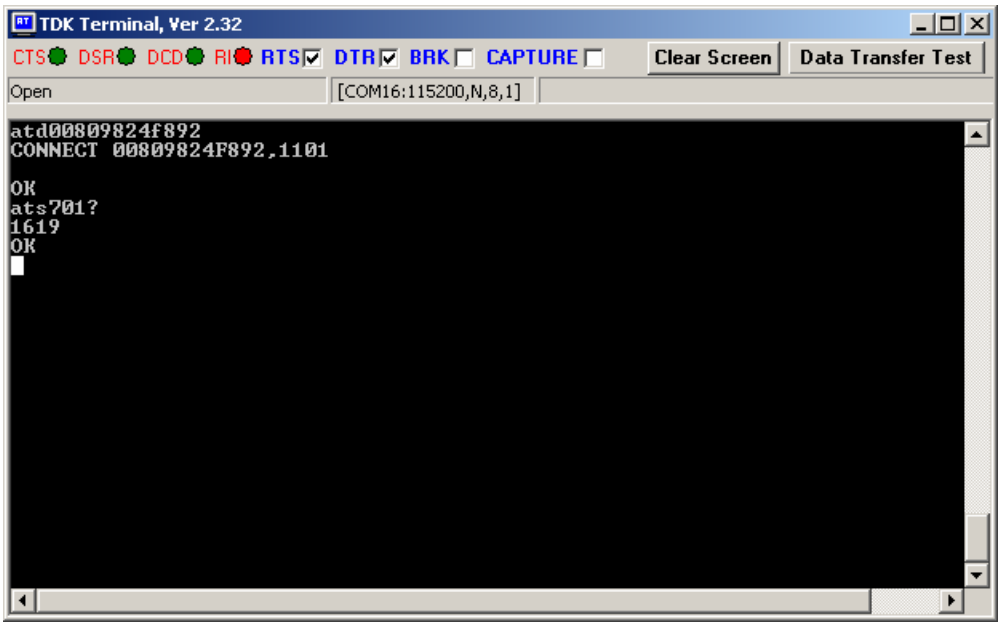


Figure 21: ats701? and response

You can monitor the state of that input at any time by typing in the same command.

To monitor the state of analogue input 2, type **ats702?** <cr>

To monitor the number of transitions of GPIO1, type **ats631?** <cr>

To monitor the number of transitions of GPIO2, type **ats632?** <cr>

Figure 22 shows the values of each query.

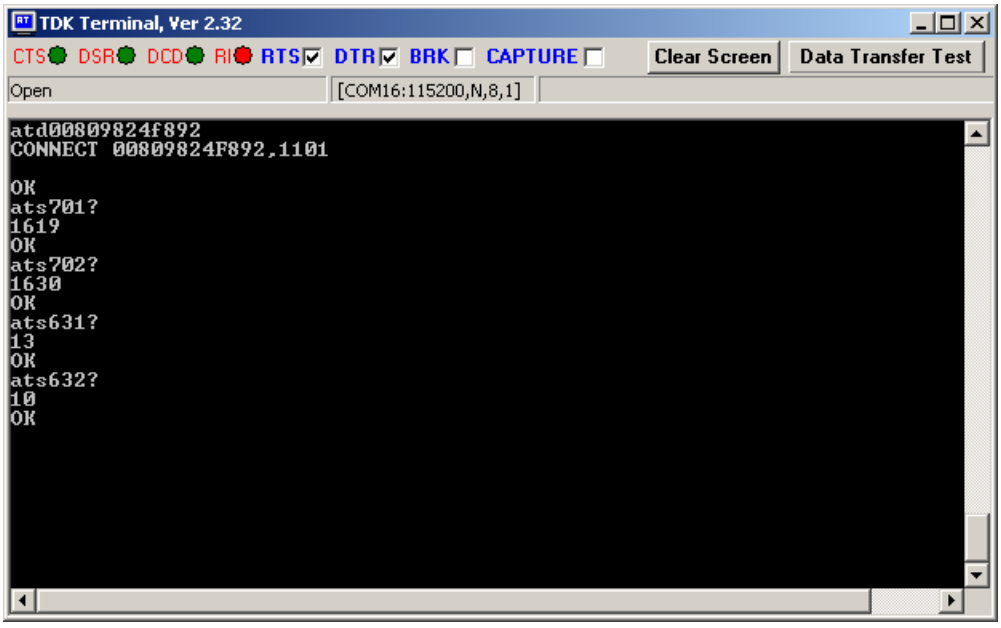


Figure 22: Response to ats702, ats631, and ats632

APPENDIX I

How to configure a blu^{2i} module to be discoverable only

To configure a blu^{2i} module to be discoverable only you need to send the following commands to it:

- **ats512=2** <cr>
- **at&w** <cr>
- **atz** <cr>

How to configure a blu^{2i} module to be connectable only

To configure a module to be connectable only you need to send the following commands to it:

- **ats512=3** <cr>
- **at&w** <cr>
- **atz** <cr>

How to configure a blu^{2i} module to be discoverable and connectable

To configure a module to be discoverable and connectable you need to send the following commands to it:

- **ats512=4** <cr>
- **at&w** <cr>
- **atz** <cr>

How to configure a blu^{2i} module so that it can be communicated with remotely

For a module to be configured so that it can be communicated with remotely you will need to send the following commands to it:

- **ats536=1** <cr>
- **at&w** <cr>
- **atz** <cr>

How to search for devices in range

If you wish to find devices in range you need to issue the following command, and the Bluetooth addresses of the first 8 devices found in range will be listed:

- at+bti <cr>

If you wish to find devices in range with their friendly name as well as the Bluetooth address you need to issue the following command:

- at+btin <cr>

How to set a new friendly name for a device

To set a new friendly name for a device you need to send the following command to the device:

- at+btn=<friendly name> <cr> where <friendly name> is the new name of your choice.
- at&w <cr>

APPENDIX II

How to reset a module back to factory default mode

- Run 'Ezurio Terminal'
- Type at <cr> and make sure you receive an 'OK' response.

If you do not receive an 'OK' response then you must try the various different baud rates on Ezurio Terminal, type in 'at' <cr> for each baud rate until you receive an 'OK' response. Once you have an 'OK' response send the following commands:

- at&f* <cr>
- atz <cr>

Your module is now in factory default mode.