

# **IONOTRONICS WiFi Adaptor User Guide**

**USR WiFi232-T Module Based**

**MK-60689**

April 1, 2016

**IONOTRONICS Corporation**

**<http://www.ionotronics.com>**

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## Table of Contents

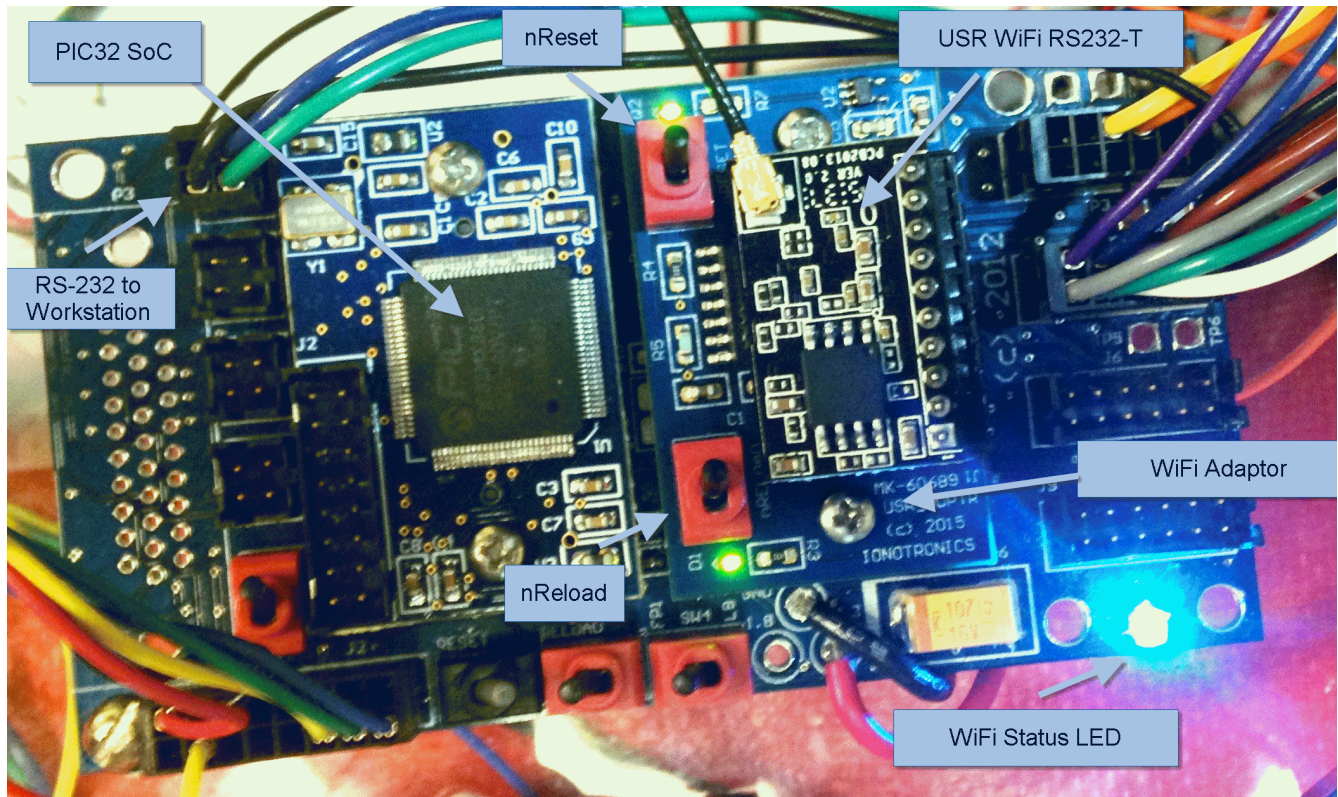
|     |                                                                         |    |
|-----|-------------------------------------------------------------------------|----|
| 1   | Introduction .....                                                      | 5  |
| 2   | The USR WiFi232-T WiFi Module.....                                      | 6  |
| 3   | Setup of the USR WiFi232-T with the MK-60689 Adaptor and Eoraptor ..... | 10 |
| 4   | Configuring the USR-WiFi232-T.....                                      | 11 |
| 4.1 | Introduction.....                                                       | 11 |
| 4.2 | Setting Up the Eoraptor Platform .....                                  | 11 |
| 4.3 | AT Command Mode .....                                                   | 14 |
| 4.4 | Changing Baud Rate to 38400 bps.....                                    | 17 |
| 4.5 | Setting Up the SSID.....                                                | 18 |
| 4.6 | Setting the WiFi Module into Station Mode.....                          | 19 |
| 4.7 | Setting a Fixed IP Address.....                                         | 20 |
| 4.8 | Telnet Session to WiFi Module .....                                     | 24 |
| 4.9 | Communicating to the SoC (PIC 32 Example).....                          | 27 |
| 5   | Appendix A AT Command for Configuring UART .....                        | 29 |
| 6   | GNU Free Documentation License .....                                    | 30 |

## List of Figures

|                                                                                                                                  |    |
|----------------------------------------------------------------------------------------------------------------------------------|----|
| Figure 1 WiFi Adaptor with USR -WiFi232-T and PIC 32 with Blue Status LED showing Association with AP .....                      | 5  |
| Figure 2 USR-WiFi232-T View .....                                                                                                | 6  |
| Figure 3 USR-WiFi232-T Pin Out .....                                                                                             | 7  |
| Figure 4 MK-60689 Top Showing Hirose DF11 Series 1x10 Pin Connector into which the USR WiFi232-T plugs into.....                 | 8  |
| Figure 5 MK-60689 Bottom Showing SAMTEC 40 Pin Connection.....                                                                   | 9  |
| Figure 6 USR WiFi232-T with Antenna .....                                                                                        | 9  |
| Figure 7 USR-WiFi232-T User Manual. See this link. ....                                                                          | 10 |
| Figure 8 Scan for AP. Find USR-WIFI232-T .....                                                                                   | 10 |
| Figure 9 Eoraptor configured for direct serial communication to the WiFi Module (USR-WiFi232-T) ..                               | 12 |
| Figure 10 MK-60689 Showing Switches .....                                                                                        | 13 |
| Figure 11 Tera Term Setup.....                                                                                                   | 14 |
| Figure 12 “a” after escape sequence +++ .....                                                                                    | 14 |
| Figure 13 Response to AT+ command .....                                                                                          | 15 |
| Figure 14 AT Help.....                                                                                                           | 16 |
| Figure 15 AT Command to show baud rate .....                                                                                     | 17 |
| Figure 16 Confirming Baud Rate set to 38400 bps .....                                                                            | 17 |
| Figure 17 Quering the SSID of the WiFi Module .....                                                                              | 18 |
| Figure 18 Setting the SSID to Robotics.....                                                                                      | 19 |
| Figure 19 Quering the AP/STA mode .....                                                                                          | 20 |
| Figure 20 AT Command to set Fixed IP, MASK and Router IP .....                                                                   | 21 |
| Figure 21 MyLanViewer showing the AP and PC on the network. ....                                                                 | 22 |
| Figure 22 Pinging the Wifi module from the PC .....                                                                              | 23 |
| Figure 23 MyLanViewer showing WiFi Module with IP 192.168.100.90 .....                                                           | 24 |
| Figure 24 PUTTY Setup on PC .....                                                                                                | 25 |
| Figure 25 Telnet Test.....                                                                                                       | 26 |
| Figure 26 Eoraptor configured for remote control through WiFi module. Wireless TCP/IP Serial to the Processor (e.g. PIC32). .... | 27 |
| Figure 27 Eoraptor configured for direct serial communication to the Processor (e.g. PIC32) .....                                | 28 |
| Figure 28 Source USR User Guide.....                                                                                             | 29 |

# 1 Introduction

The MK-60689 adaptor support the USR WiFi232-T WiFi device and provides systems built on the Eoraptor Platform the capability to be networked through a wireless TCP/IP network. Java applications on Workstations can communicated with the Syste on a Chip on the Eoraptor platform through the SoC's serial port and the WiFi Module (MK-60689). The MK-60689 provides a direct TCP/IP socket to the serial port. Using Telnet one can send commands directly to the SoC and receive results. Java and C/C++ applications can communicate with the SoC through TCP/IP Sockets. Figure 1 shows the MK-60689 attached to the Eoraptor. Note the Blue LED that shows the WiFi status in this case association with the Access Point (AP). Also attached to the Eoraptor is the PIC32 SoC module. We should notet that the MK-60689 (with the USR WiFi232-T) supports a multi-threaded server. That is multiple simultaneous TCP/IP sockets are supported. For example a Java application can control a Robot through the PIC32 SoC while a Telnet session monitors the traffic and can also send commands.

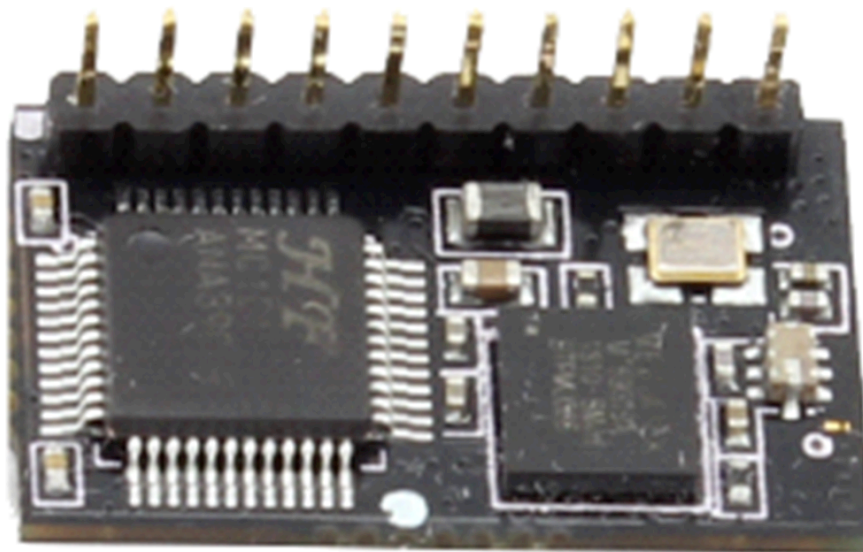


**Figure 1 WiFi Adaptor with USR -WiFi232-T and PIC 32 with Blue Status LED showing Association with AP**

IONOTRONICS provides a remote Robot control firmware as Open Source for both the PIC32MX360F512 and the 1PIC16F1947. So right out of the box you can setup a wireless TCP/IP network to control multiple robots.

## 2 The USR WiFi232-T WiFi Module

Figures 2 and 3 show the USR WiFi232-T module and its pinout. The pin description is shown in Table 1. The USR WiFi232-T plugs into the MK-60689 adaptor shown in Figure 4. Figure 5 shows the bottom of the MK-60689 showing the 40 pin Samtec connection ( for attachment to the Eoraptor). The USR WiFi232-T with antenna is shown in Figure 6.



**Figure 2 USR-WiFi232-T View**

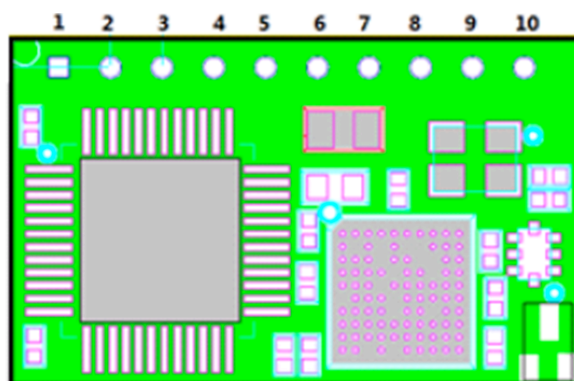
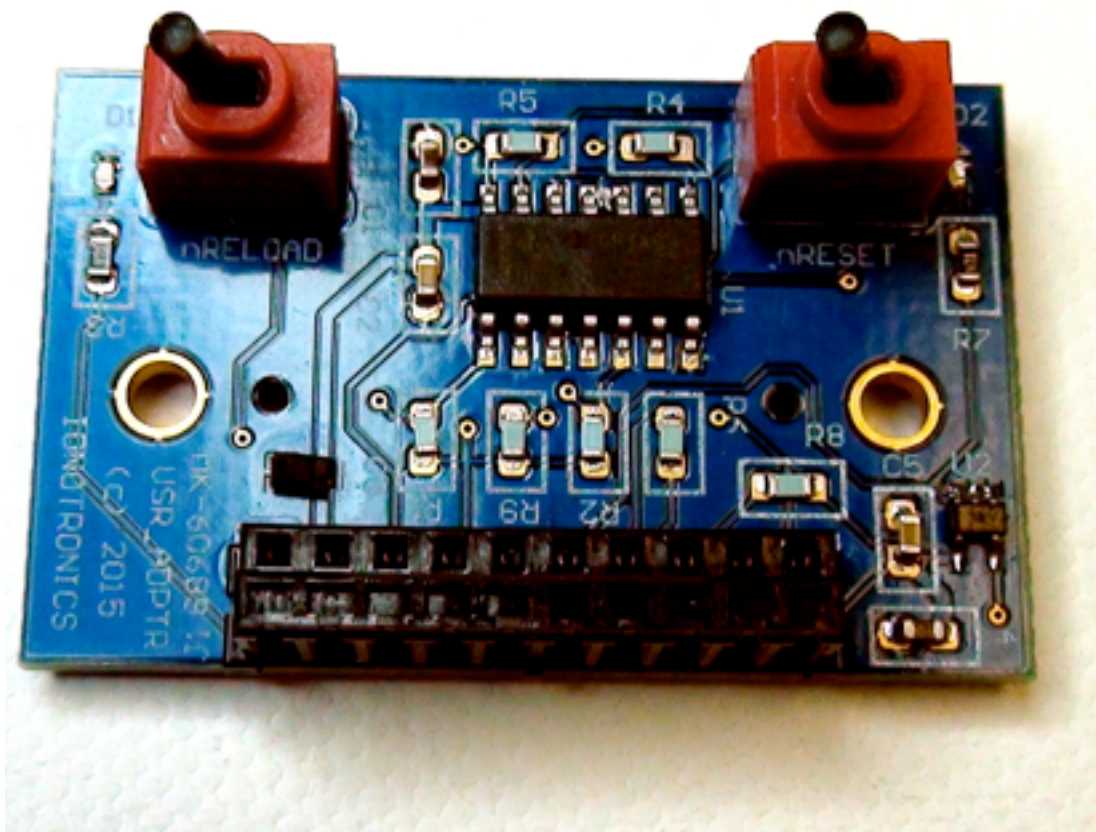


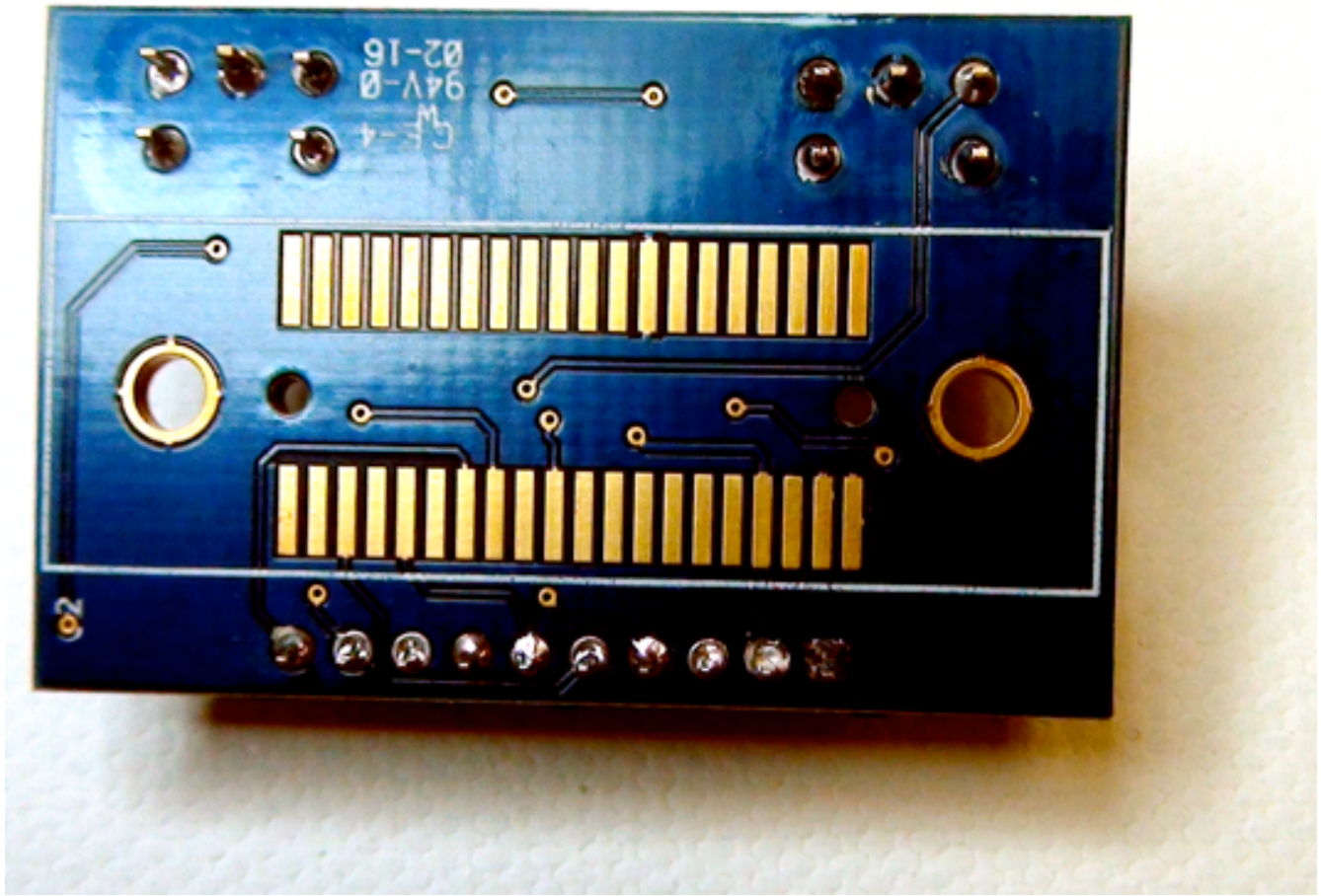
Figure 3 USR-WiFi232-T Pin Out

Table 1 USR-WiFi232-T Pin Description

| Pin | Description       | Net Name | Signal Type | Comments                                                                          |
|-----|-------------------|----------|-------------|-----------------------------------------------------------------------------------|
| 1   | Ground            | GND      | Power       |                                                                                   |
| 2   | +3.3V Power       | DVDD     | Power       | 3.3V@250mA                                                                        |
| 3   | Module Recovery   | nReload  | I           | Low effective reset input.<br>Pull-up if not use.<br>Can be set to Smart Link Pin |
| 4   | Module Reset      | nReset   | I           | Low effective reset input.<br>Pull-up if not use.                                 |
| 5   | UART              | UART_RX  | I           | No connect if not use.                                                            |
| 6   | UART              | UART_TX  | O           | No connect if not use.                                                            |
| 7   | Power soft switch | PWR_SW   | I,PU        | "0" – Power Down Mode<br>"1" – Normal mode<br><b>(Function is reserved)</b>       |
| 8   | PWM/WPS           | PWM_3    | I/O         | Default WPS function,<br>Can be set to PWM/GPIO18.<br>No connect if not use.      |
| 9   | PWM/nReady        | PWM_2    | I/O         | Default nReady function,<br>Can be set to PWM/GPIO12.                             |
|     |                   |          |             | No connect if not use.                                                            |
| 10  | PWM/nLink         | PWM_1    | I/O         | Default nLink function,<br>Can be set to PWM/GPIO11.<br>No connect if not use.    |



**Figure 4 MK-60689 Top Showing Hirose DF11 Series 1x10 Pin Connector into which the USR WiFi232-T plugs into.**

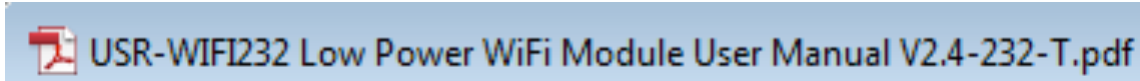


**Figure 5 MK-60689 Bottom Showing SAMTEC 40 Pin Connection**



**Figure 6 USB WiFi232-T with Antenna**

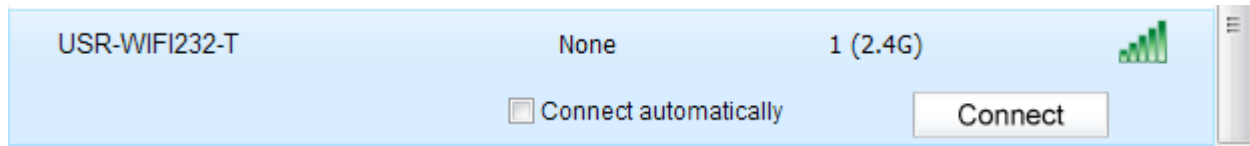
The USR WiFi232-T user manual is provided with this user guide. See Figure 7.



**Figure 7 USR-WiFi232-T User Manual. See this link.**

### 3 Setup of the USR WiFi232-T with the MK-60689 Adaptor and Eoraptor

Attach the USR WiFi232-T to the Eoraptor platform with the orientation shown in Figure1. Set the Reset and nReload switches to the positions shown (both green LEDs on). The Euraptor should be connected to a 3.3V supply. When you scan with a WiFi device, the USR WiFi232-T will appear in the list. This is shown in Figure 8. The USR WiFi232-T can operate as an AP for configuration.



**Figure 8 Scan for AP. Find USR-WIFI232-T**

Once Connected enter the IP Address Below into your WEB Browser (Disconnect any Ethernet Cable to the Workstation first)

**http://10.10.100.254**

Login as *admin* and password *admin*

Do not make any changes. We will configure the device using a direct serial connection and the AT command set. More control. Much better.

## 4 Configuring the USR-WiFi232-T

### 4.1 Introduction

Use direct serial connection to configure the USR-WiFi232-T module. This is technically the best way to do it. Also if you have to do any recovery like setting back to AP Mode you will need to use AT commands.

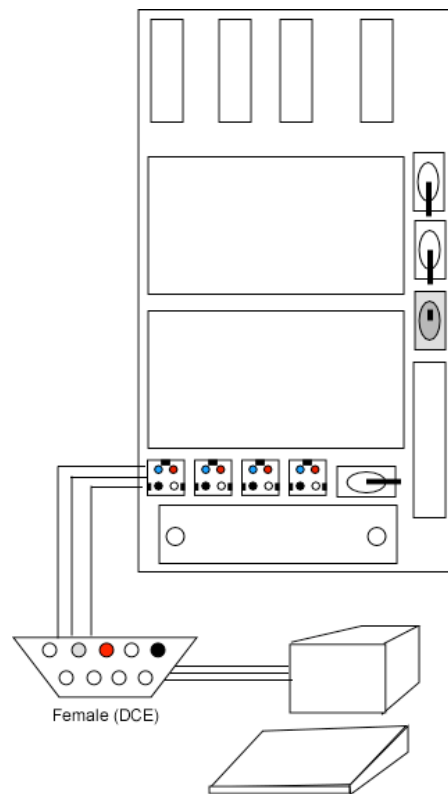
On a PC with Windows we highly recommend the Tera Terminal. See the following link.



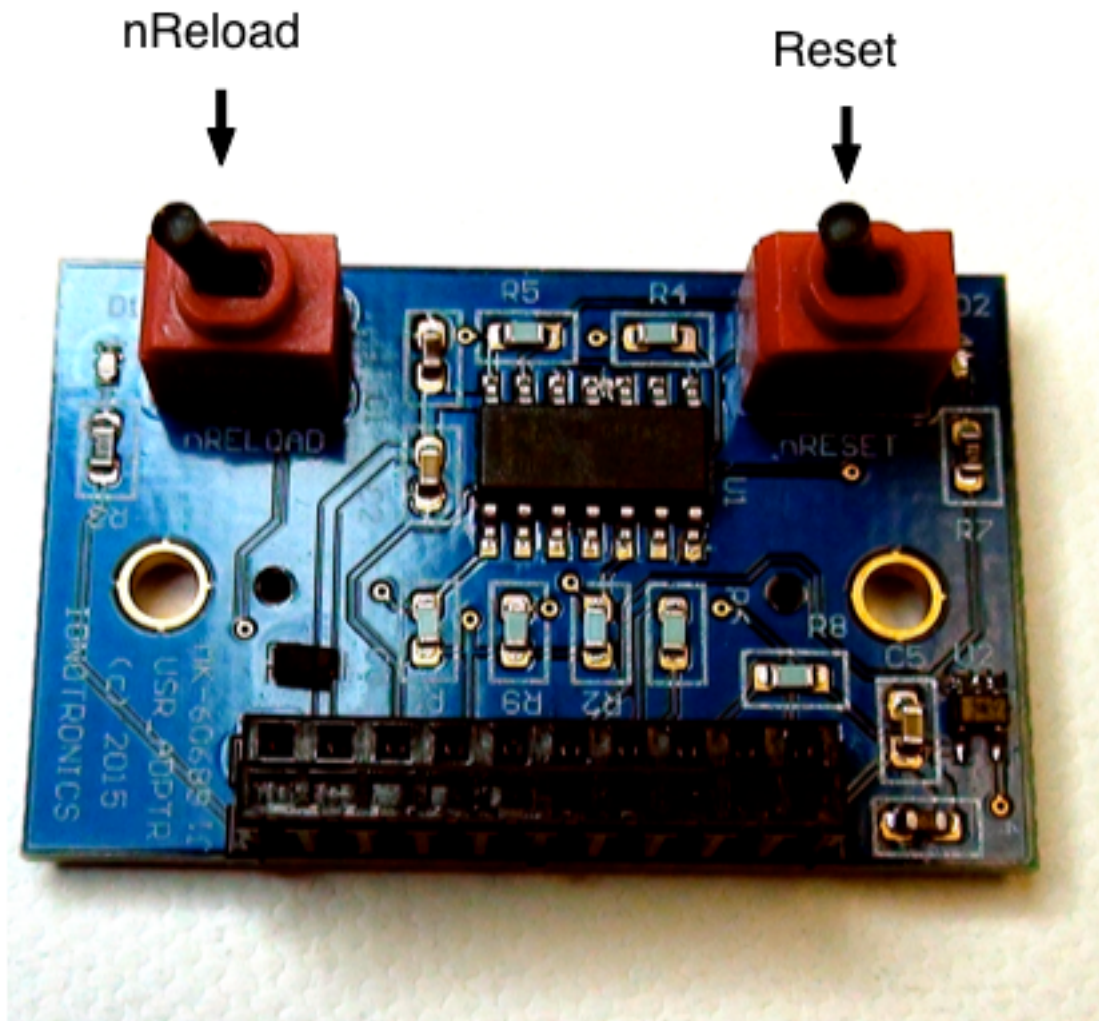
<https://ttssh2.osdn.jp/index.html.en>

### 4.2 Setting Up the Eoraptor Platform

First you need to set the switches on the Eoraptor so that you communicate directly with the USR-WiFi232-T directly. To do this set the switches as shown below:



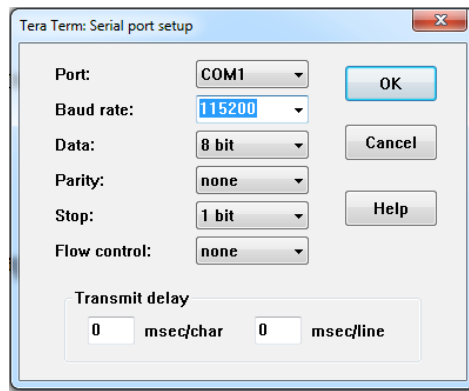
**Figure 9 Eoraptor configured for direct serial communication to the WiFi Module (USR-WiFi232-T)**



**Figure 10 MK-60689 Showing Switches**

Using a 4 pin Hirose to Female DB-9 RS-232 Cable, hook up the Workstation (PC) RS-232 to the Eoraptor. Toggle the *nReload* switch on the WiFi Adaptor Board. Set in a position so that the green LED by the switch is on. The WiFi status LED on the Eoraptor should be green.

Using Tera Term (or PUTTY) set the terminal to serial communication at 115200 bps 8 Bits One Stop Bit.



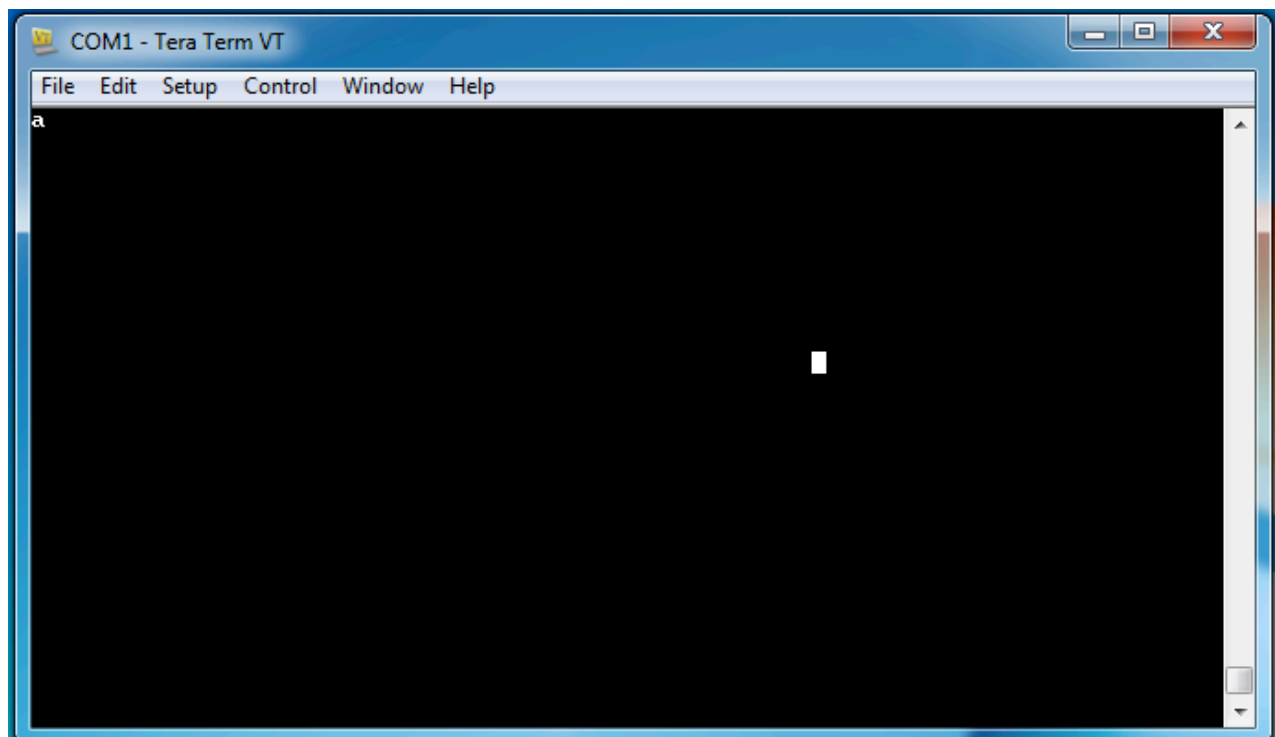
**Figure 11 Tera Term Setup**

## 4.3 AT Command Mode

To Enter AT Command Mode Type:

+++

That is, enter three + characters right after each other. This is the escape sequence to get into the AT command mode in the USR-WiFi-232-T module. The USR WiFi module will respond with an "a" indicating it is ready for AT Commands.

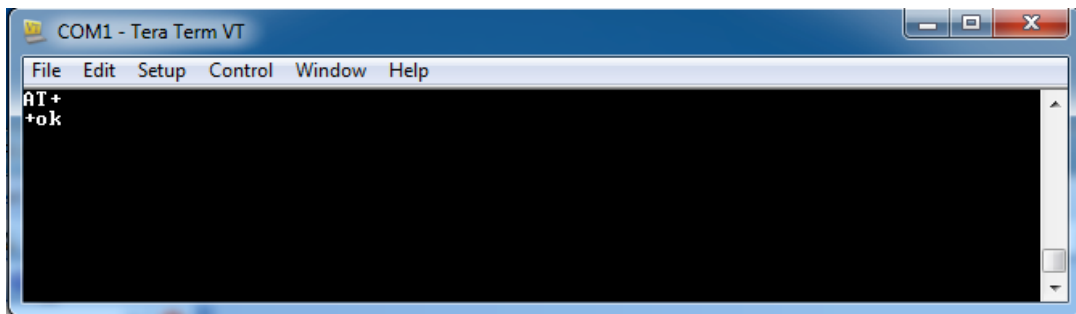


**Figure 12 “a” after escape sequence +++**

Type the following AT Command:

AT+

You will get the "+ok" response back.



**Figure 13 Response to AT+ command**

To get a list of commands, use the Help command:

AT+H

A screenshot of a Tera Term window titled "COM1 - Tera Term VT". The window has a menu bar with "File", "Edit", "Setup", "Control", "Window", and "Help". The main text area displays a list of AT commands and their functions, starting with "AT+H". The commands include: AT+ASWD, AT+E, AT+ENTM, AT+NETP, AT+MSLP, AT+PING, AT+WMODE, AT+WSLK, AT+WSLQ, AT+WSCAN, AT+TCPK, AT+TCPTO, AT+TCPDIS, AT+RECV, AT+SEND, AT+WEBU, AT+WEBUER, AT+WSDNS, AT+WADMN, AT+WEBSWITCH, AT+PLANG, AT+UPURL, AT+UPFILE, AT+UPST, AT+UPWEB, AT+UPCFG, AT+UPAUTO, AT+LOGSW, AT+LOGPORT, AT+SOCKB, AT+TCPKLB, AT+TCPLOB, AT+TCPDISB, AT+RCUB, AT+SNDB, AT+RELD, AT+SLPEN, AT+RLDEN, AT+Z, AT+MID, AT+VER, AT+USERVER, AT+CUSTOMER, AT+RPTMAC, AT+WRPTMAC, AT+RPTMACIP, AT+DTDDIS, AT+DTDDID, AT+HTPEN, AT+HTPTP, AT+HTPSU, AT+HTPHD, AT+HTPURL, AT+HTPTO, AT+HTPFT, AT+WIFICHK, AT+CHKTIME, AT+RSEN, AT+CLOUDEN, AT+CLOUDID, AT+CLOUDPW, AT+REGDIS, AT+REGUSR, AT+DTTY, AT+WANN, AT+LANN, AT+UART, AT+WSSSID, AT+WAP, AT+WSKEY, AT+WKEY, AT+NTPSER, AT+UDPLCP, AT+NDBG, AT+WPSBTNEN, AT+WALKIND, AT+WADHCP, AT+MDCH, AT+WIFI=UP/DOWN, AT+SMILKSI, and AT+H:show help. The list ends with "+ok".

```
AT+H
AT+: NoME command, reply "+ok".
AT+ASWD: Set/Query WiFi configuration code.
AT+E: Echo ON/Off, to turn on/off command line echo function.
AT+ENTM: Goto Through Mode.
AT+NETP: Set/Get the Net Protocol Parameters.
AT+MSLP: Set/Query deep sleep mode parameters.
AT+PING: General PING command.
AT+WMODE: Set/Get the WIFI Operation Mode (AP or STA).
AT+WSLK: Get Link Status of the Module (Only for STA Mode).
AT+WSLQ: Get Link Quality of the Module (Only for STA Mode).
AT+WSCAN: Get The AP site Survey (only for STA Mode).
AT+TCPK: Get The state of TCP link.
AT+TCPTO: Set/Get TCP time out.
AT+TCPDIS: Connect/Dis-connect the TCP Client link
AT+RECV: Recv data from WIFI
AT+SEND: Send data to WIFI
AT+WEBU: Set/Get the Login Parameters of WEB page.
AT+WEBUER: Get WEB version.
AT+WSDNS: Set/Get the DNS Server address.
AT+WADMN: Set/Get the domain name of WEB page.
AT+WEBSWITCH: Set/Get the parameters of WEB page.
AT+PLANG: Set/Get the language of WEB page.
AT+UPURL: Set/Get the path of remote upgrade.
AT+UPFILE: Set/Get the file name of config file for remote upgrade.
AT+UPST: Start the remote upgrade.
AT+UPWEB: Start the remote upgrade webpages.
AT+UPCFG: Start the remote upgrade default setting.
AT+UPAUTO: Start the remote upgrade by config file.
AT+LOGSW: Enable/Disable upload logs.
AT+LOGPORT: Set/Get the UDP port for upload logs.
AT+SOCKB: Set/Get Parameters of socket_b.
AT+TCPKLB: Get The state of TCP_B link.
AT+TCPLOB: Set/Get TCP_B time out.
AT+TCPDISB: Connect/Dis-connect the TCP_B Client link.
AT+RCUB: Recv data from socket_b
AT+SNDB: Send data to socket_b
AT+RELD: Reload the default setting and reboot.
AT+SLPEN: Put on/off the GPIO7.
AT+RLDEN: Put on/off the GPIO45.
AT+Z: Reset the Module.
AT+MID: Get The Module ID.
AT+VER: Get application version.
AT+USERVER: Get user version
AT+CUSTOMER: Get customer version
AT+RPTMAC: Get Report MAC State
AT+WRPTMAC: Set Report MAC State
AT+RPTMACIP: Set Report MAC type
AT+DTDDIS: Query or set D2D function enable or disable
AT+DTDDID: Query or set D2D ID
AT+HTPEN: Query or set httpd function enable or disable
AT+HTPTP: Query or set httpd request type
AT+HTPSU: Query or set httpd server ip and port
AT+HTPHD: Query or set httpd request header
AT+HTPURL: Query or set httpd request url
AT+HTPTO: Query or set httpd time out
AT+HTPFT: Query or set httpd filter enable or disable
AT+WIFICHK: Query or set if wifi error check is enable
AT+CHKTIME: Query or set wifi error check time
AT+RSEN: Query or set RS485 function enable or disable
AT+CLOUDEN: Query or set passthrough cloud function enable or disable
AT+CLOUDID: Query or set device id of passthrough cloud function
AT+CLOUDPW: Query or set password of passthrough cloud function
AT+REGDIS: Query or set register function enable or disable
AT+REGUSR: Query or set data of register
AT+DTTY: Query or set type of data
AT+WANN: Set/Get The WAN setting if in STA mode.
AT+LANN: Set/Get The LAN setting if in ADHOC mode.
AT+UART: Set/Get the UART0/UART1 Parameters.
AT+WSSSID: Set/Get the AP's SSID of WIFI STA Mode.
AT+WAP: Set/Get the AP parameters.
AT+WSKEY: Set/Get the Security Parameters of WIFI STA Mode.
AT+WKEY: Set/Get the Security Parameters of WIFI AP Mode.
AT+NTPSER: Set/Get NTP Server address.
AT+UDPLCP: Set/Get local UDP port.
AT+NDBG: set/get debug level
AT+WPSBTNEN: enable/disable wps button
AT+WALKIND: enable/disable LED indication of AP connection
AT+WADHCP: enable/disable AP dhcp server and set ip address pool
AT+MDCH: Put on/off automatic switching WIFI mode.
AT+WIFI=UP/DOWN: Power down or up the wifi chip.
AT+SMILKSI=mode,protocol: Setup smartlink mode and protocol.
AT+H:show help
+ok
```

Figure 14 AT Help

To get to "Through Mode" use the command: AT+ENTM  
Use the escape sequence to get back to the AT command mode.

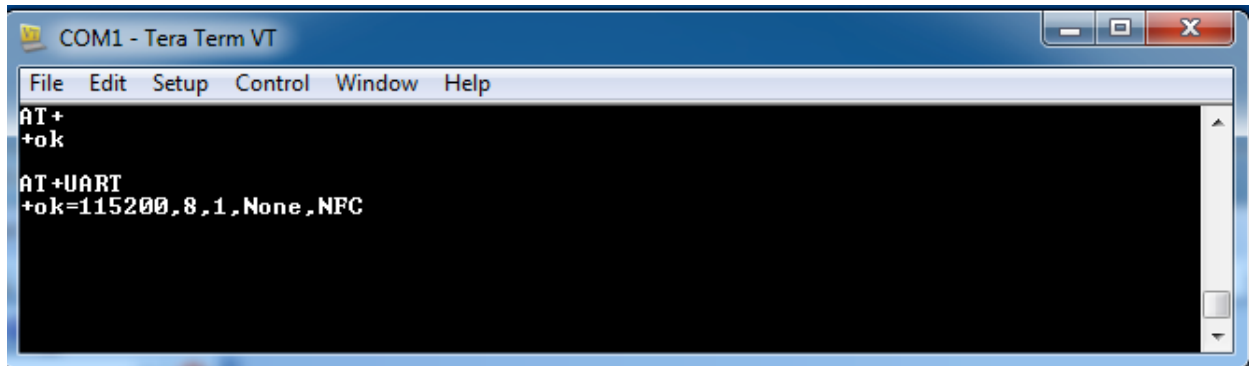
## 4.4 Changing Baud Rate to 38400 bps

We are now ready to configure the WiFi module.

We need to set the Baud rate to 38400 bps. First let's query the existing Baud Rate. Type:

`AT+UART`

The WiFi module response as shown in the Figure below indicating that the Baud rate is 115200 bps.



**Figure 15 AT Command to show baud rate**

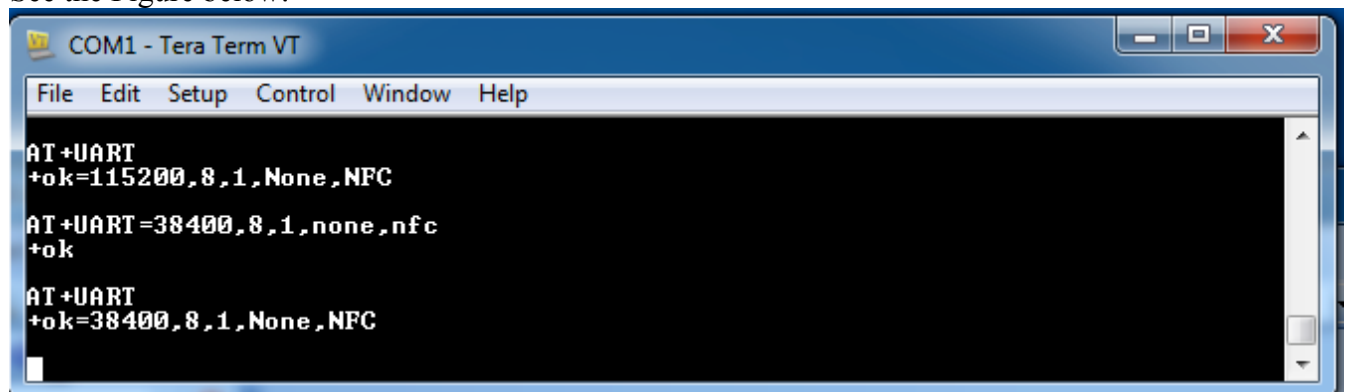
Now type the following to set the Baud Rate to 38400 bps:

`AT+UART=38400,8,1,NONE,NFC`

You will get "ok+". Now query the baud rate:

`AT+UART`

See the Figure below:



**Figure 16 Confirming Baud Rate set to 38400 bps**

Now we need to reset the WiFi module for the new Baud Rate to take effect. So type:

`AT+Z`

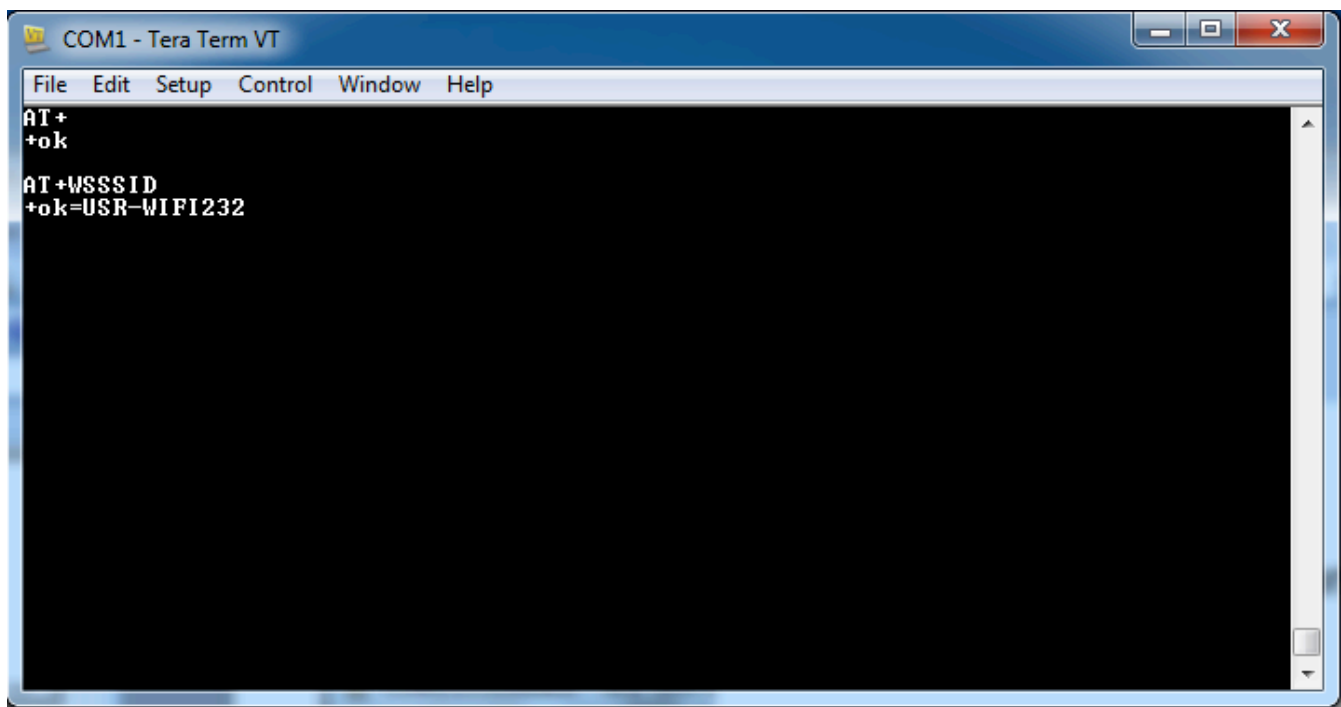
After this command, go to Serial Setup in Tera Term and set the Baud Rate to 38400bps. Toggle the nReset switch on the WiFi Adaptor Module.

Next type the +++ escape sequence. You should get an "a". Type AT+ to get "+ok" verifying that all is well. If you get the "a" but no response from AT+ command. Toggle the nReset switch.

Make sure you changed the Tera Term Baud Rate to 38400bps.

Note: To get back to Factory Default use the command "AT+RELD". This will go back to 115200 bps etc. Of course, you need to be communicating at the Baud Rate you set ( 38400 bps in our case).

A great AT Command is: AT+WSSSID This command queries the SSID of the WiFi Module. See the Figure below:



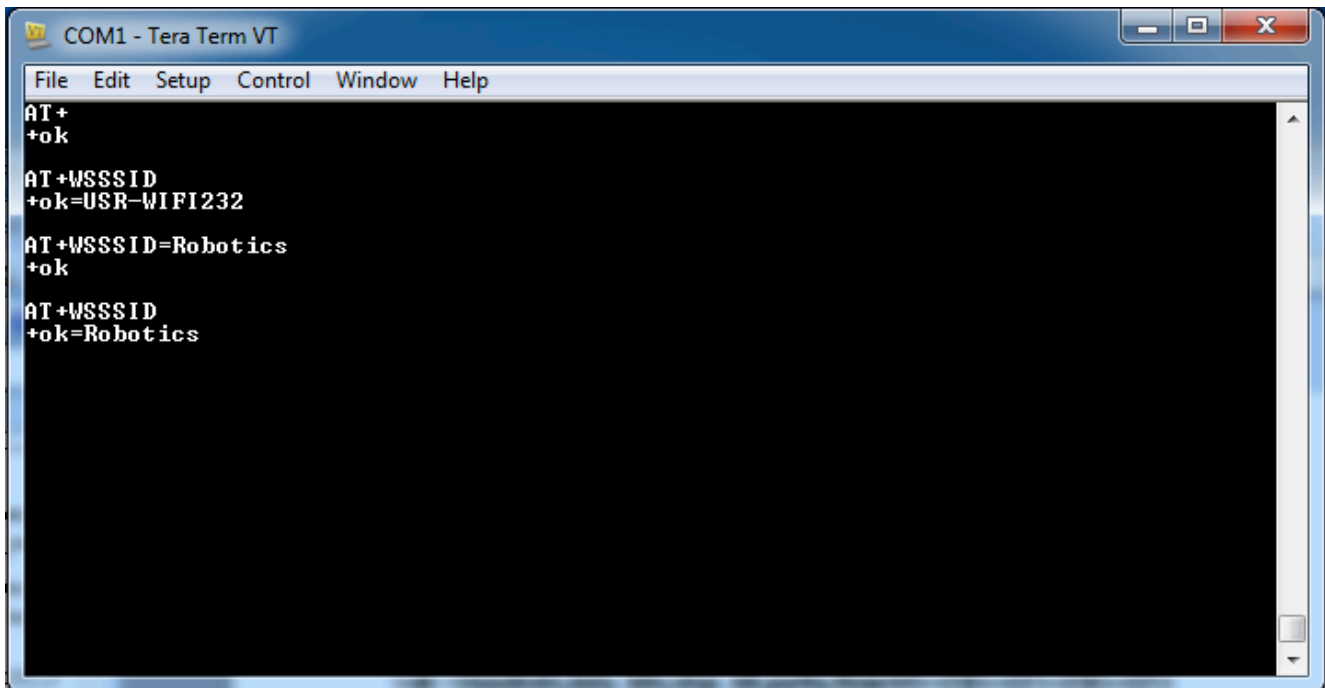
**Figure 17 Quering the SSID of the WiFi Module**

## 4.5 Setting Up the SSID

We will now change the SSID of the WiFi Module to "Robotics".

To do this type:

`AT+WSSSID=Robotics`



**Figure 18 Setting the SSID to Robotics**

Now reset the WiFi module by typing:

`AT+Z`

This resets the WiFi module. To get back to AT Command mode, toggle the *nReset* switch on the WiFi module. Then type "+++". Test with AT+

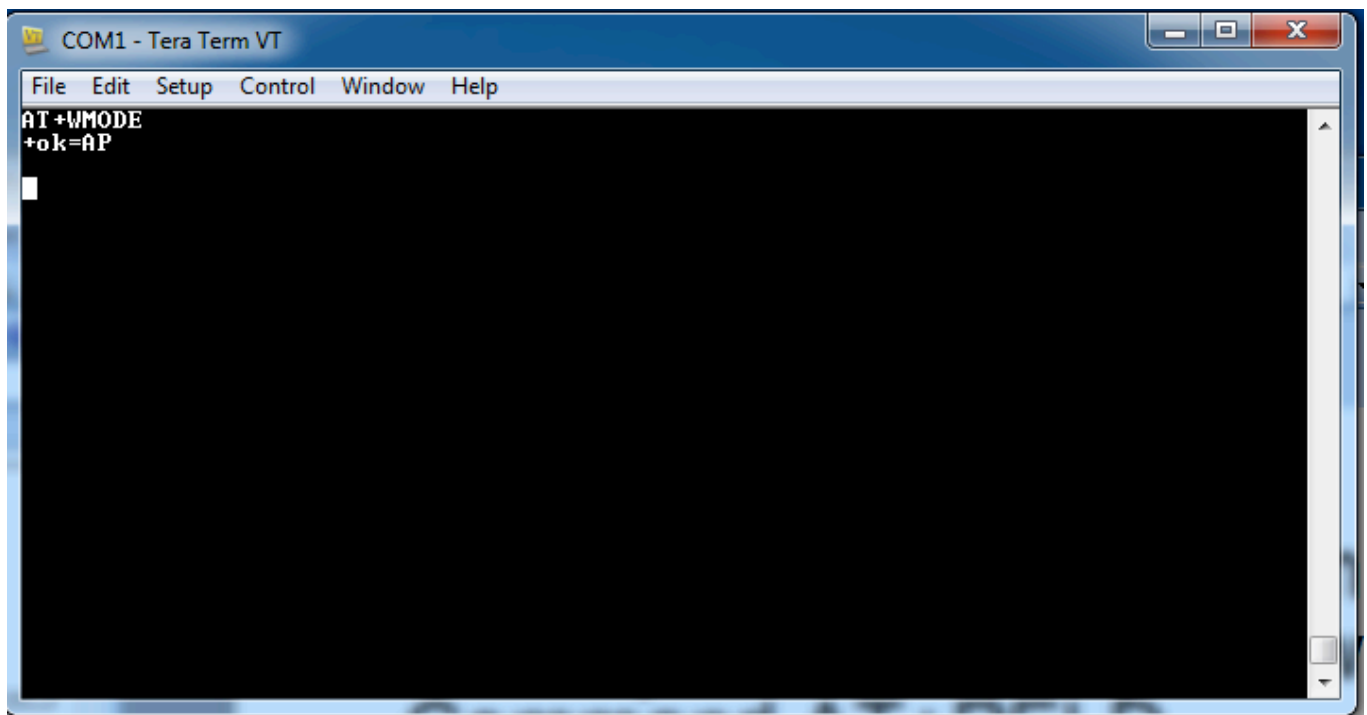
The SSID, is the AP Session ID that the WiFi module will use to associate with when in station mode (STA).

## 4.6 Setting the WiFi Module into Station Mode

In order to communicate with the System on a Chip (SoC), e.g. the PIC32, we need to set the WiFi module into Station mode. It is important to learn how to do this through the AT Commands. If the WiFi module is set to Station mode, you cannot configure it by accessing the AP functionality of the WiFi module (because it is in Station mode). With AT Commands we can revert the WiFi module back to AP mode for WEB based configuration.

First lets query the mode:

`AT+WMODE`



**Figure 19 Quering the AP/STA mode**

Now set the WiFi module to Station Mode:

`AT+WMODE=STA`

Do a query to verify.

## 4.7 Setting a Fixed IP Address

In Robotics as well as other applications, we will use Wireless TCP/IP to control the Robot. In order to communicate with the WiFi module, we will need to do three things:

- 1- Set a fixed IP Address (based on the AP IP Address so that the WiFi module is a subnet).
- 2- Set the SSID so that it can associate with the AP ( "Robotics" in our example).
- 3- Need to know the Port Number of the WiFi module.

To test, we will first ping the WiFi Module at the fixed IP address. Next we will use *telnet* to establish a TCP/IP Socket to the WiFi Module. Once a *telnet* session is established we can send text commands. The *telnet* session will need both the fixed IP address and the port number.

The USR WiFi-232-T port number is fixed at: 8899

The command to set the fixed IP address, set the mask and the IP address of the gateway (AP) is shown below:

### 31) AT+WANN

- Function: Set/Query STA network setting. Setting is valid after reset.
- Format:
  - ◆ Query Operation:  
**AT+WANN<CR>**  
**+ok=<mode,address,mask,gateway><CR><LF><CR><LF>**
  - ◆ Set Operation:  
**AT+ WANN=< mode,address,mask,gateway ><CR>**  
**+ok<CR><LF><CR><LF>**
- Parameters:
  - ◆ Mode:STA's IP network setting
    - Static: Static IP
    - DHCP: Dynamic IP
  - ◆ Address: STA IP address;
  - ◆ mask: STA subnet mask;
  - ◆ gateway: STA gateway address;

**Figure 20 AT Command to set Fixed IP, MASK and Router IP**

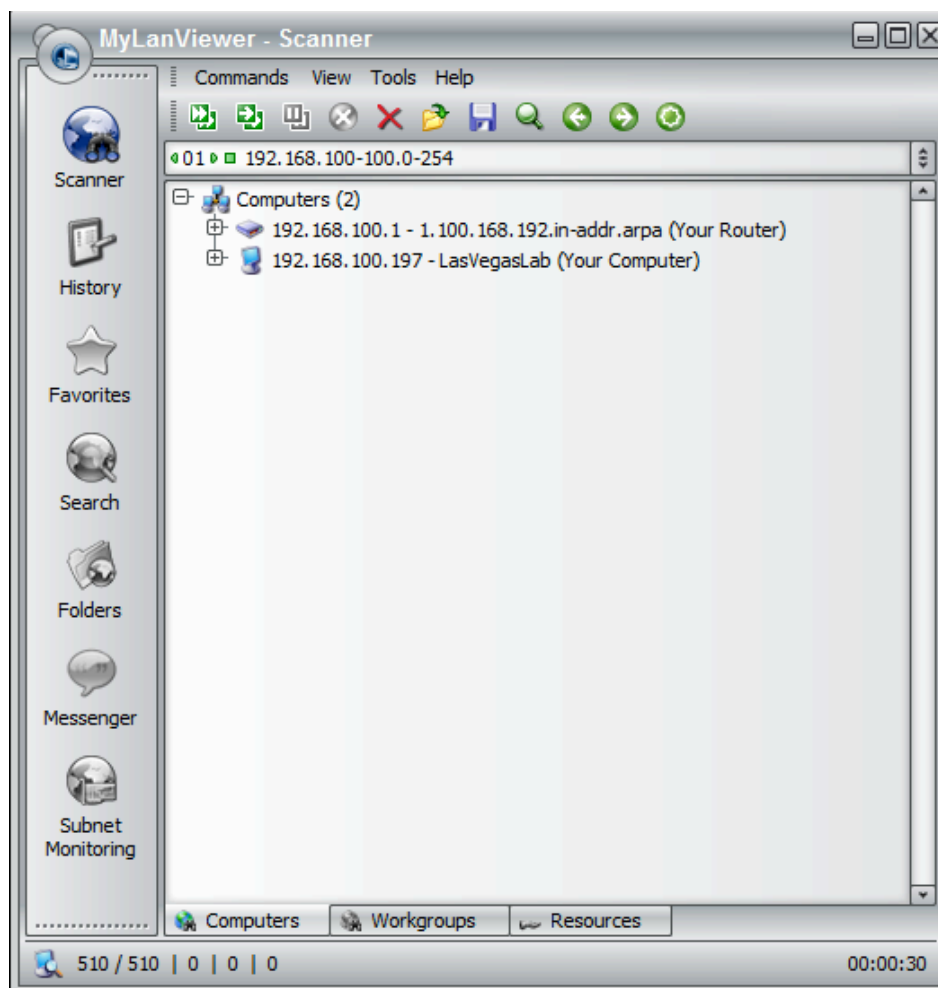
In our example the AP gateway IP address is "192.168.100.1".

We will assign a Fixed IP address to the WiFi Module as: "192.168.100.90".

Here is the command:

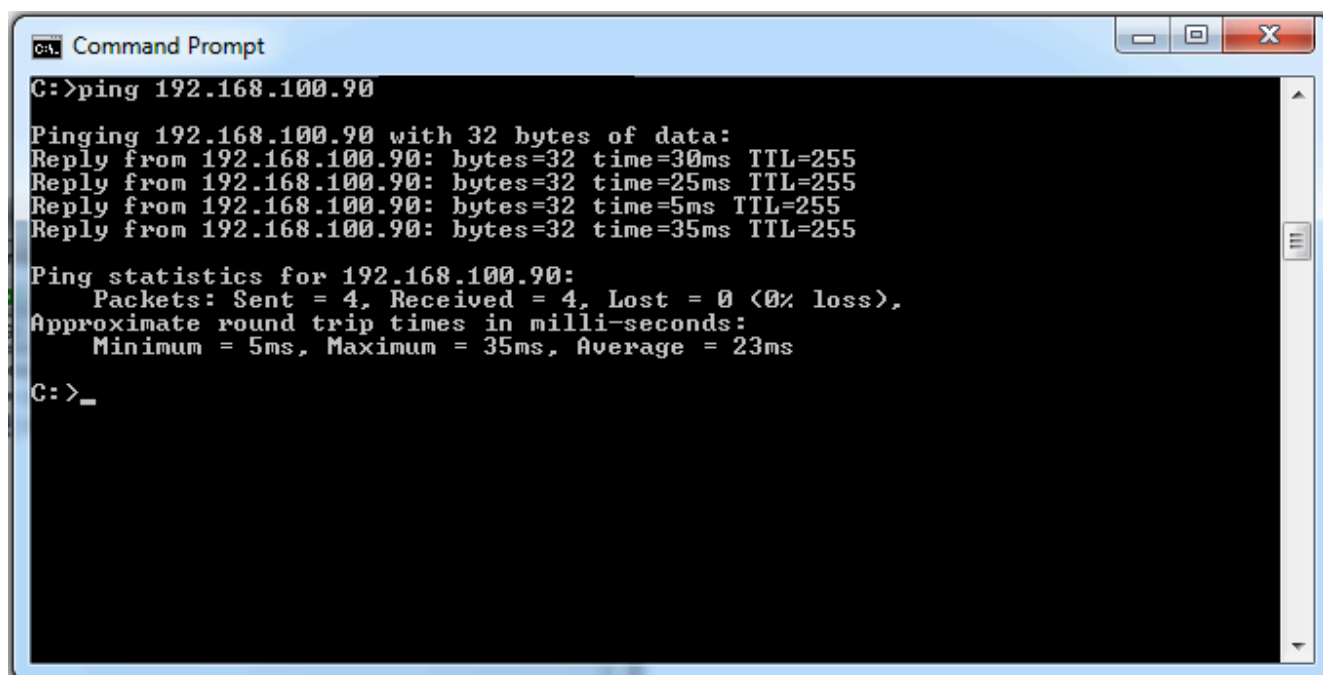
```
AT+WANN=STATIC,192.168.100.90,255.255.255.0,192.168.100.1
```

Once the WiFi module has been configured it needs to be rebooted. Upon reboot, the WiFi module will associate with the AP and the WiFi status LED on the Eoraptor will turn blue. If you use MyLanViewer on the Windows PC you can scan and see the WiFi module on the network.



**Figure 21 MyLanViewer showing the AP and PC on the network.**

Pinging from a PC:



```

C:\>ping 192.168.100.90

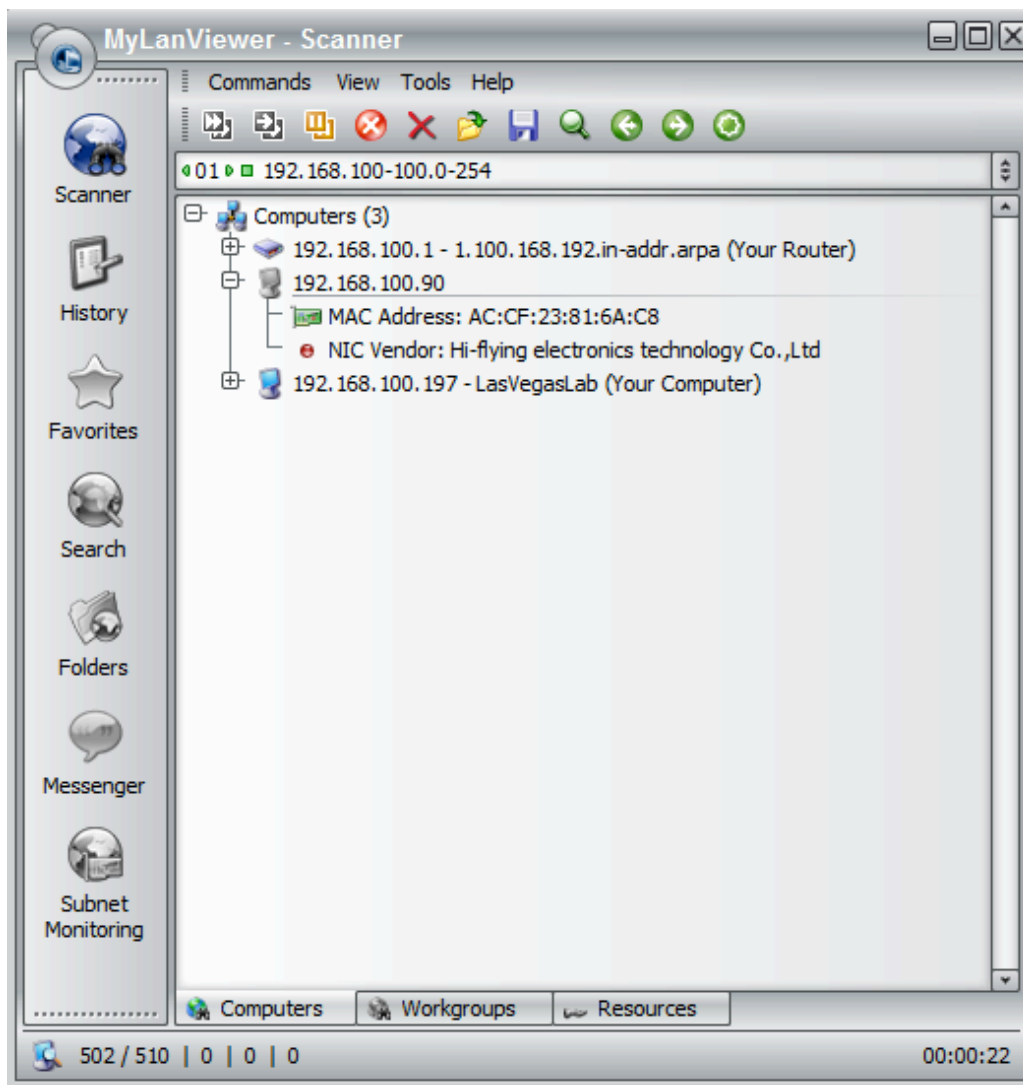
Pinging 192.168.100.90 with 32 bytes of data:
Reply from 192.168.100.90: bytes=32 time=30ms TTL=255
Reply from 192.168.100.90: bytes=32 time=25ms TTL=255
Reply from 192.168.100.90: bytes=32 time=5ms TTL=255
Reply from 192.168.100.90: bytes=32 time=35ms TTL=255

Ping statistics for 192.168.100.90:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 5ms, Maximum = 35ms, Average = 23ms

C:\>_

```

Figure 22 Pinging the Wifi module from the PC



**Figure 23 MyLanViewer showing WiFi Module with IP 192.168.100.90**

## 4.8 Telnet Session to WiFi Module

Now that we have setup the AP Session ID as "Robotics" and have set the Fixed IP as 192.168.100.90 and we have verified that the WiFi module is connected by:

- 1- Checking that the Eoraptor WiFi Status LED is Blue.
- 2- That we can Ping from a Workstation associated with the AP to the WiFi Module fixed IP address.

We are ready for Telnet.

First we need to make sure that the WiFi module is in "through mode". Type:

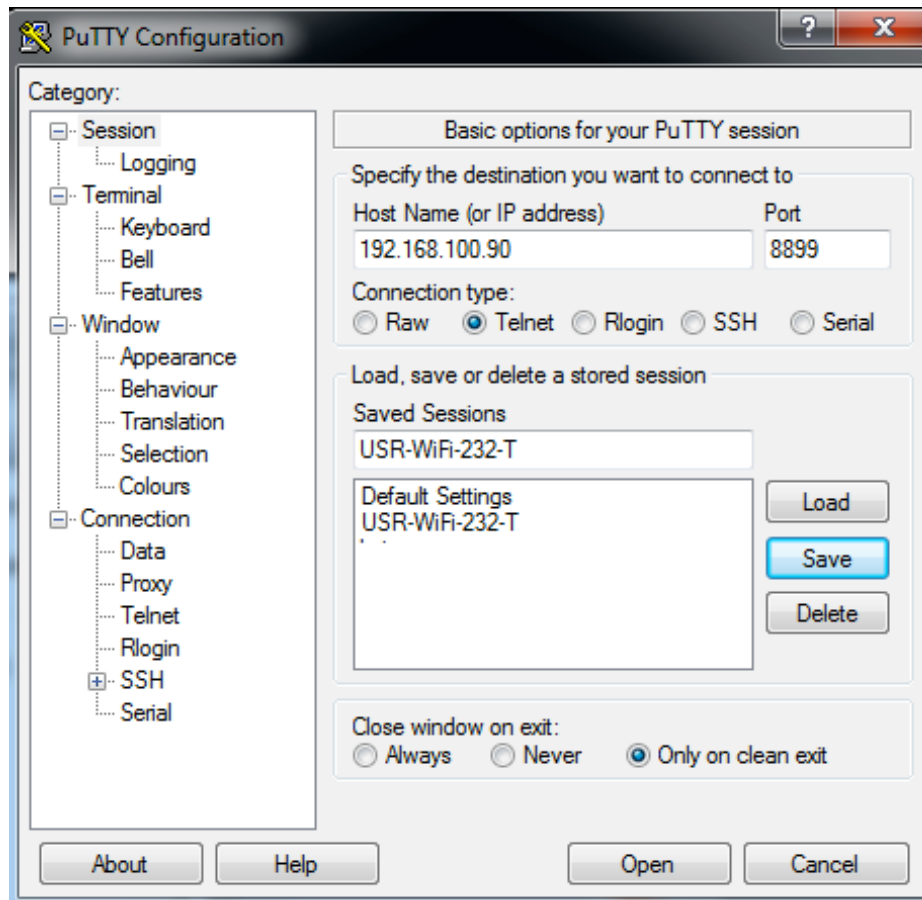
AT+ENTM

Start a telnet session on the Workstation (MAC, Linux associated with the AP) as follows:

```
telnet 192.168.100.90 8899
```

Or if using Windows, use PTTY.

To setup PUTTY see the Dialog below:



**Figure 24 PUTTY Setup on PC**

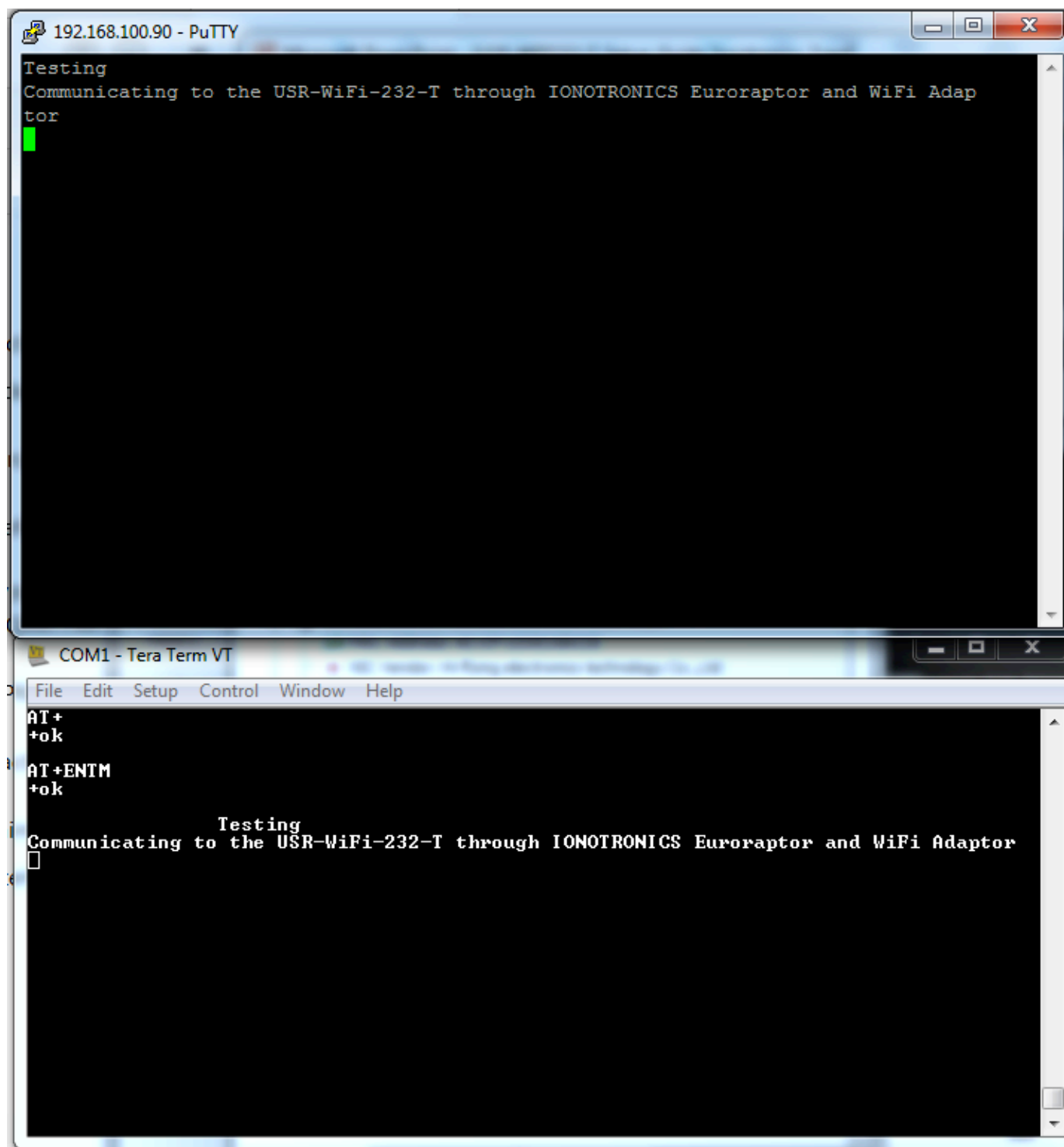
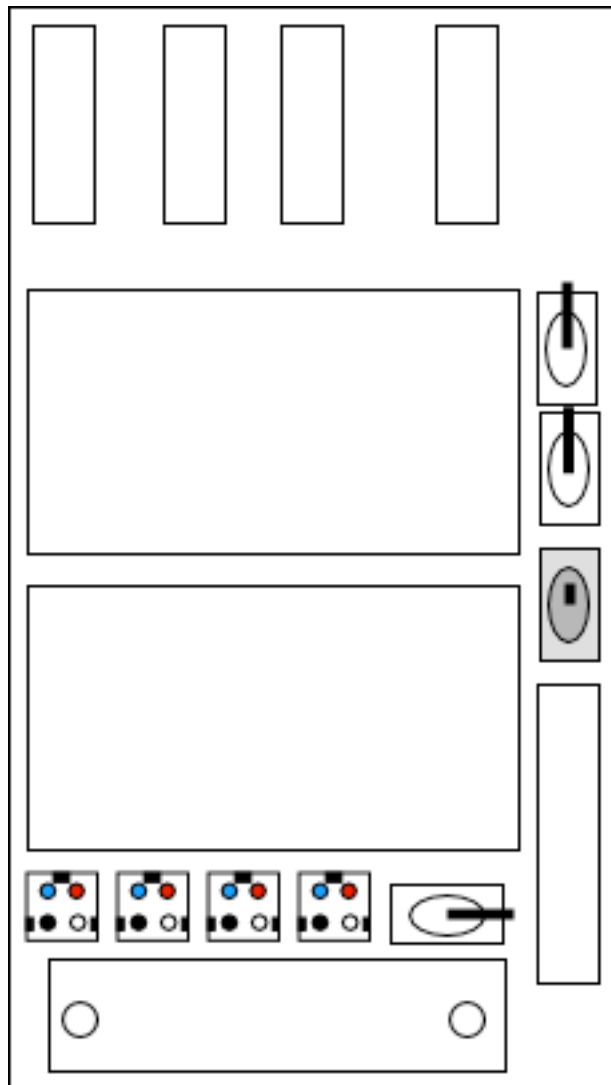


Figure 25 Telnet Test

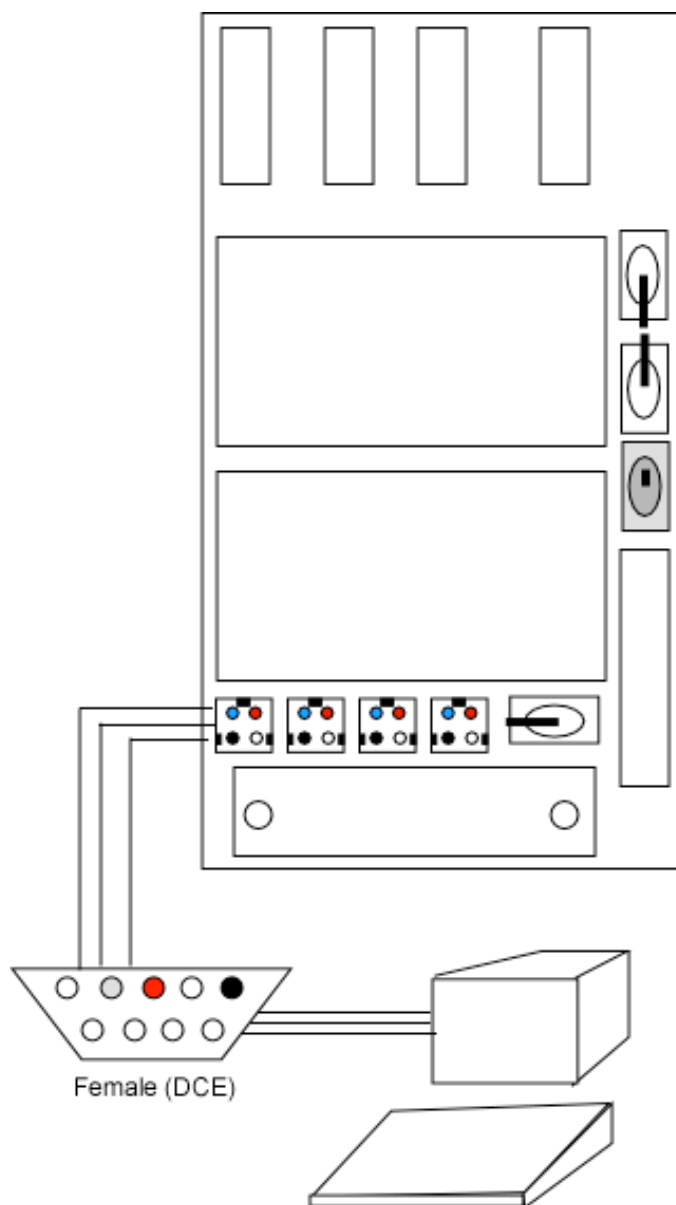
## 4.9 Communicating to the SoC (PIC 32 Example)

Next and this is a key step, we need to set the Eoraptor configuration switches so that the WiFi module has a direct link to the serial port of the SoC (e.g. PIC32). See Figure 26.



**Figure 26 Eoraptor configured for remote control through WiFi module. Wireless TCP/IP Serial to the Processor (e.g. PIC32).**

To interface directly to the SoC (e.g. PIC32) set the Eoraptor switches as shown below.



**Figure 27 Eoraptor configured for direct serial communication to the Processor (e.g. PIC32)**

## 5 Appendix A AT Command for Configuring UART

### 10) AT+UART

- Function: Set/Query serial port parameters. Setting is valid after reset;
- Format:
  - ◆ Query Operation:  
**AT+UART<CR>**
  - +ok=<baudrate,data\_bits,stop\_bit,parity,flowctrl><CR><LF><CR><LF>**
  - ◆ Set Operation:  
**AT+UART=<baudrate,data\_bits,stop\_bit,parity,flowctrl><CR>**  
**+ok<CR><LF><CR><LF>**
- Parameters:
  - ◆ Baudrate:
    - 600,1200,1800,2400,4800,9600,19200,38400,57600,115200,230400,380400,460800
  - ◆ data\_bits:
    - 8
  - ◆ stop\_bits:
    - 1,2
  - ◆ Parity:
    - NONE
    - EVEN
    - ODD
  - ◆ Flowctrl: (CTS/RTS)
    - NFC: No hardware flow control
    - FC: hardware flow control(USR-WIFI232-T don't have hardware flow control).

Figure 28 Source USR User Guide.

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Version 1.3, 3 November 2008

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