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WiModem232TM

Internet modem for computers
with RS-232 serial ports

Installation & Usage Manual

Firmware v2.92

Manual v1.6

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Introduction

Thank you for purchasing the WiModem232! This is device will let you connect any computer that has a RS-232 serial port to the Internet using standard terminal software.

Installation Requirements

The WiModem232 plugs into a male DB25 serial port. If your computer has a female serial port, or has a DB9 serial port, a gender changer or DB25<>DB9 adapter will be required. If do not know where your computer's serial port is located, please consult the manual that came with your computer. A 5vdc power source is also required, through a USB cable.

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SECTION 1 – INSTALLATION

The WiModem232 can be used with any computer that has a standard DB25 male serial interface port.

Plug the WiModem232 into the serial port. The DB25 connector is "keyed" so it can only be plugged in one direction. Typically the components will be facing upwards with the LED visible. See Figure 1 for an example of the WiModem232 plugged into an Amiga 1200.

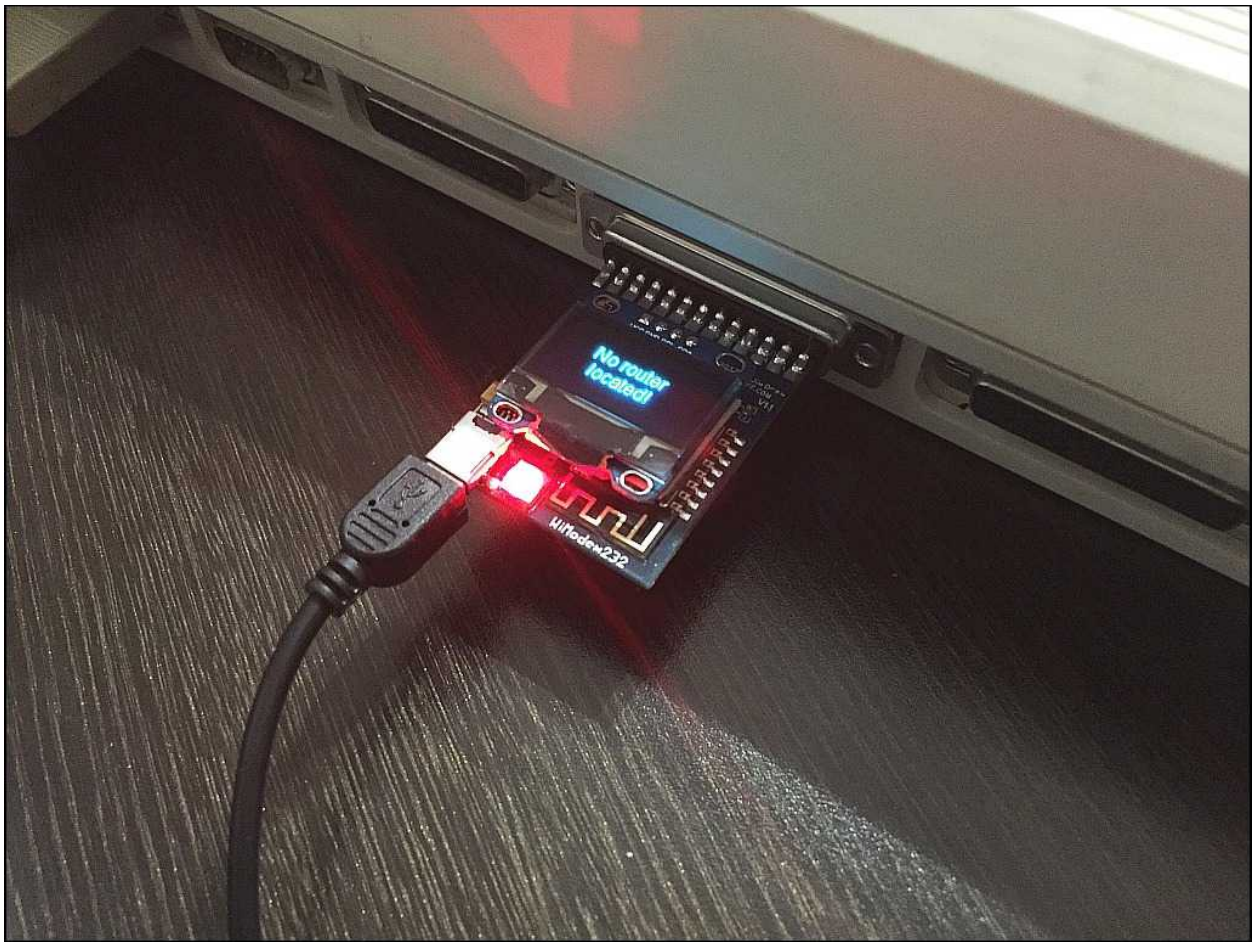


Figure 1 – WiModem232 plugged into an Amiga 1200

Note that “short” gender changers will invert the WiModem232 (so the components face away). This may not be the optimal setup. It is recommended that you use a gender changer or adapter that allows the components facing upwards so you can see the LED (and OLED screen if you have that option). Some computers (like Tandy 100/102) have serial ports that are inverted, so the short gender changer works perfectly because it re-inverts the WiModem232 to be right-side up.

Once the WiModem232 is plugged into your computer you can then plug a USB mini-B cable into the USB port on the WiModem232. The other end of the cable can be plugged into a USB port on a computer, a phone charger, or even a portable power source that has a USB port. A portable power source is very handy for moving the WiModem232 between computers.

When the WiModem232 is powered up, the LED will light up white initially and then pulsate red while it looks for a router connection. If you do not see any LED activity when power is plugged in, double check to make sure that you really have a 5vdc power source attached to the USB cable!

WARNING! DO NOT POWER THE WiModem232 WITH ANYTHING OTHER THAN 5VDC! DOING SO CAN DAMAGE THE WiModem232! THIS TYPE OF DAMAGE WILL NOT BE COVERED UNDER THE LIFETIME WARRANTY (BUT ANY UNIT CAN BE REPAIRED FOR A FEE).

SECTION 2 – USAGE

1. Introduction

The WiModem232 emulates a standard Hayes compatible modem. All of the standard (and most of the extended) AT commands are fully emulated. The default baud rate for the WiModem232 is 300 baud. The default can be changed.

Load a terminal program, and set the terminal program's baud rate to 300 baud. You should set your terminal program to use standard ASCII during the initial setup of the WiModem232. As a test to make sure the WiModem232 and terminal program are communicating, enter the following into your terminal program (note: {RETURN} means press the RETURN key – you do not enter those characters):

```
ATI{RETURN}
```

If the baud rate is 300 baud, and the terminal type is ASCII mode you should now see information about the WiModem232, ie:

WiModem232 – (C)2015-18 By Jim Drew

Firmware:v2.92-07/28/18
Baud:300
Outgoing Port:1541
Incoming Port: 6400
SSID:No Router!
MAC:xx:xx:xx:xx:xx:xx
IP:0.0.0.0
FCC ID: 2AHMR-ESP12F

The MAC address is the unique ID of the WiFi module used on the WiModem232, and that number will be different from what you see above. Notice that because there is no Internet connection at this point the SSID shows as "No Router!", and the IP address is 0.0.0.0.

The WiModem232 has a status LED that can be multiple colors depending on the what the status is alerting you to. The FAQ section of the manual lists the LED colors and their meaning.

2. Setting up the Internet Connection

The biggest difference between a standard modem and the WiModem232 is the fact that we are not using a telephone line to communicate with the outside world. Instead, we are using a high-speed WiFi connection. The WiModem232 uses your local WiFi router as the bridge to communicate with the Internet. The WiModem232 needs to know about the router's SSID and encryption type (if encryption is used). There are three ways to setup the WiModem232 with your router:

1. Using the WPS button on your router.
2. Manually entering the SSID (router name) and passphrase (password).
3. Use a network scan (AT*N), select the network number and add a passphrase (if necessary).

The easiest way to setup your Internet connection is by using the WPS setup. To do this, simply press the WPS button on your router and then enter the following in your terminal program:

```
AT*WPS{RETURN}
```

The WiModem232 will respond with WPS ACTIVATED, and the WiModem232's status LED will turn white. For the next 30 seconds the WiModem232 will attempt a WPS connection with your router. Note: you should always press the WPS button on your router **before** issuing the WPS command via your terminal program. Once the WPS has completed (or has timed out) you will see, "Looking for router...". If the WPS setup was successful you will see, "Connected to xxxxx" (where xxxxx is the name of your router). If the WPS was not successful you will see, "No router located!".

The second way to setup your WiModem232 for use with your router is to manually enter the router's name and passphrase. Note: if your router is not passphrase protected, you can omit the passphrase. **The name and passphrase are case sensitive** (which is why it is always a good idea to use an ASCII terminal mode when doing the setup). When manually entering a SSID, the router name can not contain any space characters (see option 3 if your router name has space characters in it). If you don't know the name of your router you can do a scan for all available networks by entering the following in your terminal program:

```
AT*N{RETURN}
```

After a few seconds, a list of all of the available routers will be displayed, along with the signal strength and encryption type. For example you might see something that looks like this:

Scanning available networks:

Networks available: 2

```
0 - NETGEAR24 (-51 dBm), WPA2  
1 - NETGEAR24-Guest (-52 dBm), Auto
```

To manually setup the SSID you would enter the following into your terminal program:

```
AT*SSID [name][,passphrase]{RETURN}
```

Using the above example, if you wanted to setup the WiModem232 to use the router with the name of NETGEAR24 (which has a passphrase of WiModem1) you would enter the following into your terminal program:

```
AT*SSID NETGEAR24,WiModem1{RETURN}
```

At this point you would see, "Looking for router..." and a few seconds later you would see, "Connected to NETGEAR24".

The third way to setup your WiModem232 for use with your router is by using the number from the network scan (AT*N). Using the above example, if you wanted to connect to the second entry (NETGEAR24-Guest) you would enter the following:

```
AT*NS1[,passphrase]{RETURN}
```

This would select the second entry and attempt to find the router.

If your router can not be located, it may be too far away or too close to your WiModem232, or something is blocking the signal between the router and WiModem232 (like a big block of metal – so keep hard drives and such away from the WiModem232). You can use the AT*N command to scan for available networks and see the signal strength of your router. The lower the dBm value, the stronger the signal is. Signal strengths with a value higher than -85dBm are considered marginal, and indicate something is blocking the signal between the WiModem232 and router.

Once the router and WiModem232 are connected together the status LED will turn yellow and you are now ready to surf the Internet! The SSID information is permanently stored in the WiModem232. So, the next time you connect power to your WiModem232 the router will automatically be connected.

The WiModem232 is shipped with a default of 300 baud. As a quick check to see if the Internet connection is working you can try entering the following into your terminal program (set to 300 baud):

```
ATDT GOOGLE.COM:80{RETURN}
```

Note: {RETURN} throughout this manual means to press the **RETURN** key.

If the Internet is working you should see, "CONNECT" and the status LED will turn green. Congratulations! You have connected to Google's web server! To hang up the connection, press the "+" key 3 times in a row (within 1 second). You should see, "OK". Now enter the following to hang up the connection:

```
ATH{RETURN}
```

You will see another "OK" message and the connection is terminated.

3. Supported AT Commands

The WiModem232 supports all of the standard Hayes commands, following the industry standard syntax. The WiModem232 also has numerous new commands. All commands will start with the first two characters being "AT", followed by the command itself. Below is a list of all supported commands. Note: commands that are labeled in **black** are standard Hayes compatible commands, and commands labeled in **blue** are WiModem232 specific commands. A command with [] indicates a value can be accepted. <> indicates an optional parameter. **Do not enter the actual "[]" or "<>" or {RETURN} characters in any example shown.**

After entering a new command value, there will be a response returned. If the command succeeds, then OK will be returned. Otherwise, ERROR will be return.

Some commands are set by using a value following the command and others require the use of an = character prior to the value. For example to set the carrier mode (ATC) to the value of 1 you would enter:

```
ATC1{RETURN}
```

To set the phone book entry for the first position you would enter:

```
AT&Z0=url_goes_here:1234{RETURN}
```

To view the value of a command, follow the command with a ?, ie:

```
ATC?{RETURN}  
1
```

The response is 1 (because we set it to 1 in the above example). There are some variations to the Hayes command set, so look at each command described below for the exact syntax.

When the WiModem232 is not connected to a server it is in COMMAND mode, where AT commands can be accepted. To enter COMMAND mode while connected to a server (ONLINE), press the '+' key three times in a row (+++) within 1 second. The LED will turn teal in color, and the WiModem232 will then be in COMMAND mode. Use the ATO command to return to ONLINE mode.

AT COMMAND LIST

AT – Attention

Just entering AT{RETURN} by itself will result in an OK response.

ATA – Answer incoming call

This command will answer the incoming connection when RING is being displayed. It is possible to use the S-code (S0) to enable auto-answering so the ATA command is not necessary. The default incoming port is 6400. The incoming port number can be set (see AT*L below). While an incoming connection is being attempted, the RI pin on the RS-232 port will change states.

ATC[x] – Carrier mode [0/1]

This command was used to set the carrier modulation with old telephone systems. It doesn't do anything with the WiModem232, but it is supported so that old terminal and BBS software will work without errors.

ATDS=[x] – Dial stored phone book entry

This command will “dial” (connect) using the phone book entry [x], where 'x' is a value between 0 and 9 from the phone book. See AT&Z for information on using the phone book.

ATDT – Dial URL [name]<:port number>

This ATDT is a hold over from the DT command meaning “Dial Tone”. There was also ATDP for pulse dialing. With the WiModem232, ATDT will make a connection using the name and optionally a port, ie:

```
ATDT COMMODORESERVER.COM:1541
```

The name is the server you want to connect to, and the port number is the port to use for the connection. If no port number is included, the default port number will be used. The default port is set with the AT*P command.

ATDP – Same as ATDT to add compatibility for pulse dial systems.

ATE[x] – Auto echo [0/1]

The auto echo command controls whether characters typed into the terminal are echoed back to the display while in COMMAND mode. Default is 1.

Like most AT commands, entering the command followed by a ? will return the current value, ie:

```
ATE?{RETURN}
1
```

This would indicate that the auto echo is enabled.

To set the auto echo you would enter ATE followed by either a 0 (off) or 1 (on), ie:

```
ATE0{RETURN}
```

This would disable the auto echo.

ATH – Hang up connection

This command is used only while connected and in the COMMAND mode. Entering ATH will terminate the connection. ATH0 is also allowed to be fully compatible with the Hayes command set.

ATI – Information

This command will display information about the WiModem232. ATI0 is also allowed to be fully compatible with the Hayes command set.

ATI1 – Detailed Information

This command will display information containing the status of various registers.

ATI2 – Information about CPU

This command will display information pertaining the CPU and flash memory.

ATI3 – Connection time information

This command will display information about the amount of time the WiModem232 has been powered up, the current connection duration, and the last connection duration.

ATI4 – Static IP setup information

This command will display information about the network mode, static IP address, gateway address, and subnet mask.

ATL[x] – Speaker volume level [0/1/2/3/4]

This command was used to set the speaker volume level with old dial-up modems. It doesn't do anything with the WiModem232, but it is supported so that old terminal and BBS software will work without errors.

ATM[x] – Speaker mode [0/1/2/3/4]

This command was used to set the speaker mode with old dial-up modems. It doesn't do anything with the WiModem232, but it is supported so that old terminal and BBS software will work without errors.

ATO – Go online

This command will exit COMMAND mode and return to ONLINE mode. This command has no affect when OFFLINE and in COMMAND mode.

ATQ[x] – Quiet mode [0/1]

This command will change the quiet mode. When the quiet mode is 1 (on), no responses are returned when commands are entered. When the quiet mode is 0 (off), responses are shown. Default is 0.

ATS[x][=] – S-Registers

This command will change the current S-Register value. To see a particular S-Register value (such as S2) you would enter:

```
ATS2?{RETURN}
```

To set a S-Register value (such as S2 to 43) you would enter:

```
ATS2=43{RETURN}
```

S-Registers currently supported:

S0 – Auto-answer rings (0 is default, 0 means auto-answer off)

S2 – ESCape character (43 is default, '+' character)

S12 – Guard time value (50 is default, 1 second)

ATV[x] – Verbose mode [0/1]

This command will change the verbose mode. When the verbose mode is 1 (on), responses are shown as descriptive ASCII text. When the verbose mode is 0 (off), responses are shown as numbers that represent the actual response. Default is 1.

ATX[x] – Extended response control [0/1]

This command turns on/off the extended responses. With the value set to 1, the response "CONNECT" will include the connection speed (ie CONNECT 9600 for 9600 baud). Default is 0.

ATZ – Reset settings

This command will reload the last stored settings. Note: The baud rate is not changed! ATZ0 is also allowed to be fully compatible with the Hayes command set.

AT*B[baud] – Set baud rate [baud]

This command will set the baud rate. One of the valid baud rates shown below must be entered. An invalid baud rate will return an error. A valid baud rate will respond with "OK", and then change the actual baud rate. After the OK response you need to change the baud rate of your terminal software to match the entered baud rate.

For example, to change the baud rate to 1200 you would enter:

```
AT*B1200{RETURN}
```

Possible baud rates are: 300, 600, 1200, 2400, 4800, 9600, 14400, 19200, 38400, 57600, 115200, and 230400. Default is 300.

AT*BL[x] – Set buffer limit [limit]

This command will set the buffer limit used before CTS is asserted. Default is 512, with a range of 64 to 1460.

AT*BUSY[x] – Set BUSY message [message]

This command will set the message that is displayed to an incoming connection when there is already a connection established. The message is limited to 80 characters and can include space characters.

AT*C[x] – CTS polarity [0/1]

This command will change the CTS polarity. 0 = Normal, 1 = Inverted. Default is 0.

AT*D[x] – DCD polarity [0/1]

This command will change the DCD polarity. 0 = Normal, 1 = Inverted. Default is 0.

AT*FLIP – Flip OLED screen orientation

Each time this command is received, the WiModem232's OLED screen will be flipped top to bottom or bottom to top .

AT*GW=[gateway address] – Set gateway address

This command will set the gateway address, used by the router. This is necessary when setting the network to use a static IP address (see AT*NET).

AT*HELP – HELP menu

This command will display the list of available commands.

AT*HELP! – Detailed HELP menu

This command will display the list of available commands along with the command's usage syntax.

AT*IP=[IP address] – Set static IP address

This command will set the static IP address used by the router. This is necessary when setting the network to use a static IP address (see AT*NET).

AT*L[port number] – Set incoming (listening) port number

This command will change the port number that is used for incoming connections. Default is 6400.

AT*LED[x] – Set LED brightness [0-9]

This command will change the brightness of the LED. A value of 0 turns off the LED completely. Default is 5.

AT*N – Scan for available networks

This command will show all of the networks (routers) that are within usable distance from the WiModem232. The signal strength and encryption type is also shown.

AT*NS[number]<,passphrase> – Setup router using network list

This command will change the router connection. The number (0-99) is the number shown in the list of networks when the AT*N command is used. If your router uses an encryption you can also enter the passphrase (with a comma separating the number and passphrase).

AT*NET=[DHCP/STATIC] – Set network type

This command will set the network to either use a DHCP or static IP address connection to the router. You enter either DHCP or STATIC as the network type. You **must** set the static IP address, gateway address, and subnet mask prior to using the STATIC option.

AT*P[port number] – Default outgoing port number

This command will change the port number that is used when no port number is included with the ATDT command. Default is 1541.

AT*R[x] – RTS polarity [0/1]

This command will change the RTS polarity. 0 = Normal, 1 = Inverted. Default is 0.

AT*REBOOT – Reboot the WiModem

This command can be used to reboot the WiModem232 if ever necessary.

AT*SCAN – Re-scan for last used router

This command can be used to re-scan for the last used router. This is handy in cases where the signal is blocked during power up.

AT*SSID[name]<,passphrase> – Setup router connection

This command will change the router connection. The name is the name of the router to connect to. If your router uses an encryption you can also enter the passphrase (with a comma separating the name and passphrase). See example at the beginning of this manual.

AT*SUB=[subnet mask] – Set subnet mask address

This command will set the subnet mask address used by the router. This is necessary when setting the network to use a static IP address (see AT*NET).

AT*T[x] – Translation mode [0/1]

This command will change the translation mode. 0 = none, 1 = TELNET. If you want to log into a telnet specific site you must first change this setting to 1. Other translation types will be added in the future. Default is 0.

AT*UPDATE – Update firmware

This command updates the WiModem232's firmware by contacting the CBMSTUFF.COM server, fetching the latest version, and then re-flashing itself. During a firmware update the status LED will be purple.

AT*WPS – Start WPS

This command will start a WPS session to make a secure connection with your router and automatically set the SSID and passphrase.

A WPS session will erase the last connection information if a failure occurred. During a WPS session the status LED will be white.

AT&C[x] – DCD operating mode [0/1]

This command will change the DCD mode. 0 = always connected, 1 = DCD follows server connection. Default is 1.

AT&F – Restore factory settings

This command will restore all of the settings to the factory defaults. The phone book and spoof number entries are not cleared with this command. Baud rate is reset to 300.

AT&FS – Clear spoof number entries

This command clears all of the spoof number entries.

AT&FP – Restore factory phone book

This command will restore all of the phone book entries to the factory defaults.

AT&K[x] – Hardware flow control mode [0/1/2/3]

This command will change the hardware handshaking mode. 0 = off, 1+ = on. Default is 0.

AT&SN? – Show all spoof number entries

Spoofing a number is the ability to convert an incoming phone number into a url:port number. A good example of why you would need to do this is for special programs like Q-Link that connected using their own custom program through a local phone number. Software like this required a phone number consisting of only numeric digits. You can connect to Q-Link today by spoofing the number.

To show all of the spoof entries you would enter:

```
AT&SN?{RETURN}
```

AT&SN[x]? – Show spoof number entry

To see a particular spoof entry (such as entry 3) you would enter:

```
AT&SN3?{RETURN}
```

Nothing is displayed when the spoof entry has not been set.

AT&SN[x]= – Set spoof number entry

This command can change the spoof phone number entry specified by [x]. The value of x can be 0 to 9. To set the spoof entry, enter:

```
AT&SN[x]=phone number,url<:port number>{RETURN}
```

The port number is optional. If you do not include the port number then the default port number (set using the AT*P command) will be used when connecting. To set entry 0 for Q-Link you would enter:

```
AT&SN0=5551212,Q-LINK.NET:5190 {RETURN}
```

AT&V – View settings

This command will show all of the settings that are stored.

AT&W – Write settings permanently

This command will store the current settings permanently so that reboots will use the same settings. AT&W0 is also allowed to be fully compatible with the Hayes command set.

AT&Z? – Show all phone book entries

The phone book is a great way to store your most favorite url's, making them easy to connect to by using the ATDS=x command. Of course the WiModem232's "phone book" is really URL's, not phone numbers.

To show all of the phone book entries you would enter:

```
AT&Z?{RETURN}
```

AT&Z[x]? – Show phone book entry

To see a particular phone book entry (such as entry 3) you would enter:

```
AT&Z3?{RETURN}
```

Nothing is displayed if the phone book entry has not been set.

AT&Z[x]= – Set phone book entry

This command can change the phone book entry specified by [x]. The value of x can be 0 to 9. To set the phone book entry, enter:

```
AT&Z[x]=name<:port number>{RETURN}
```

The port number is optional. If you do not include the port number then the default port number (set using the AT*P command) will be used when connecting. To set entry 3 to COMMODORESERVER.COM with a port of 1541 you would enter:

```
AT&Z3=COMMODORESERVER.COM:1541{RETURN}
```

EMERGENCY RESET

In the event that the WiModem232 is “locked out” (due to the baud rate being set to a something that a terminal program can not use) you can short the two larges pads on the bottom side of the WiModem232 **while applying power** to the WiModem232. Shorting these two pads together for 3 or more seconds will make the LED turn blue, indicating that the baud rate has been set to 300 baud. At this point you can remove the short between the two pads and the WiModem232 will reboot with the new baud rate. If you short the two pads for more than 10 seconds the LED will flash red/blue until you remove the short. Doing this resets ALL of the settings (AT&F).

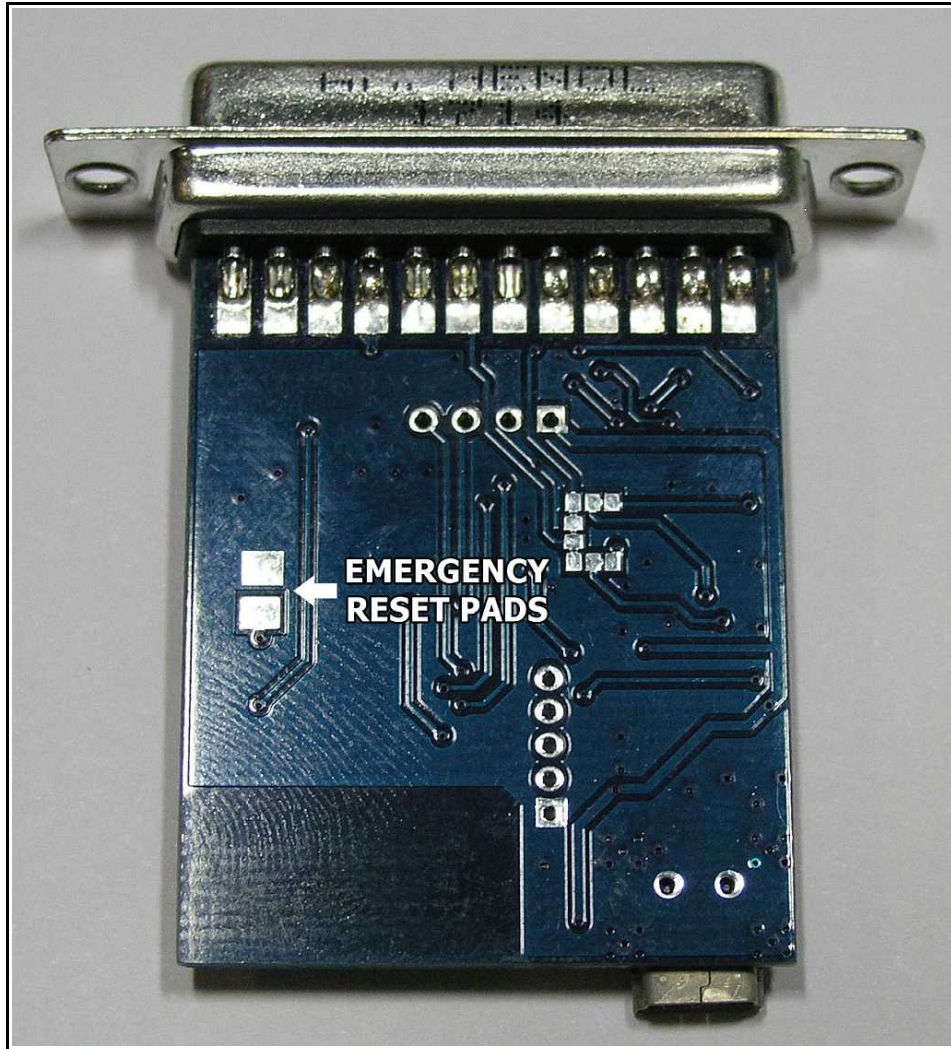


Figure 2 – Location of Emergency Reset pads

HARDWARE FLOW CONTROL

The WiModem232 can be configured for hardware handshaking. Typically this will be RTS/CTS, but some devices (like printers) may need DTR or DSR instead. **By default, RTS/CTS handshaking is enabled and there is a bridge between DTR and DSR.**

There are a series of jumper pads on the bottom of the WiModem232 board. If the device you are using the WiModem232 with can't have a DTR/DSR bridge you can cut the connection point shown with the red arrow in Figure 3. If you need to set the hardware handshaking to use either DTR or DSR then you **MUST** cut the connections between the IN and RTS, and/or OUT and CTS, and then solder across the proper pads. See Figure 4.

NOTE: You can **not** have the DSR/DTR bridged if you are using either for handshaking.

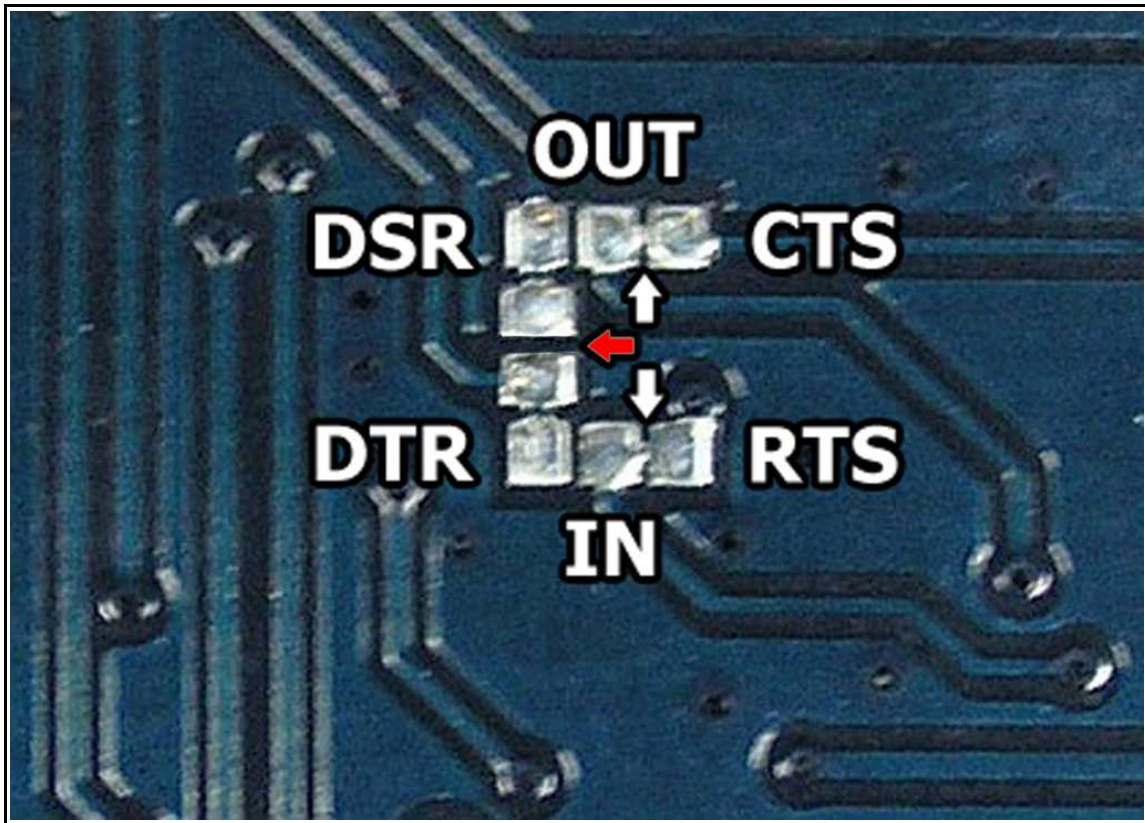


Figure 3 – Cut connection at red arrow to disable DTR/DSR bridge

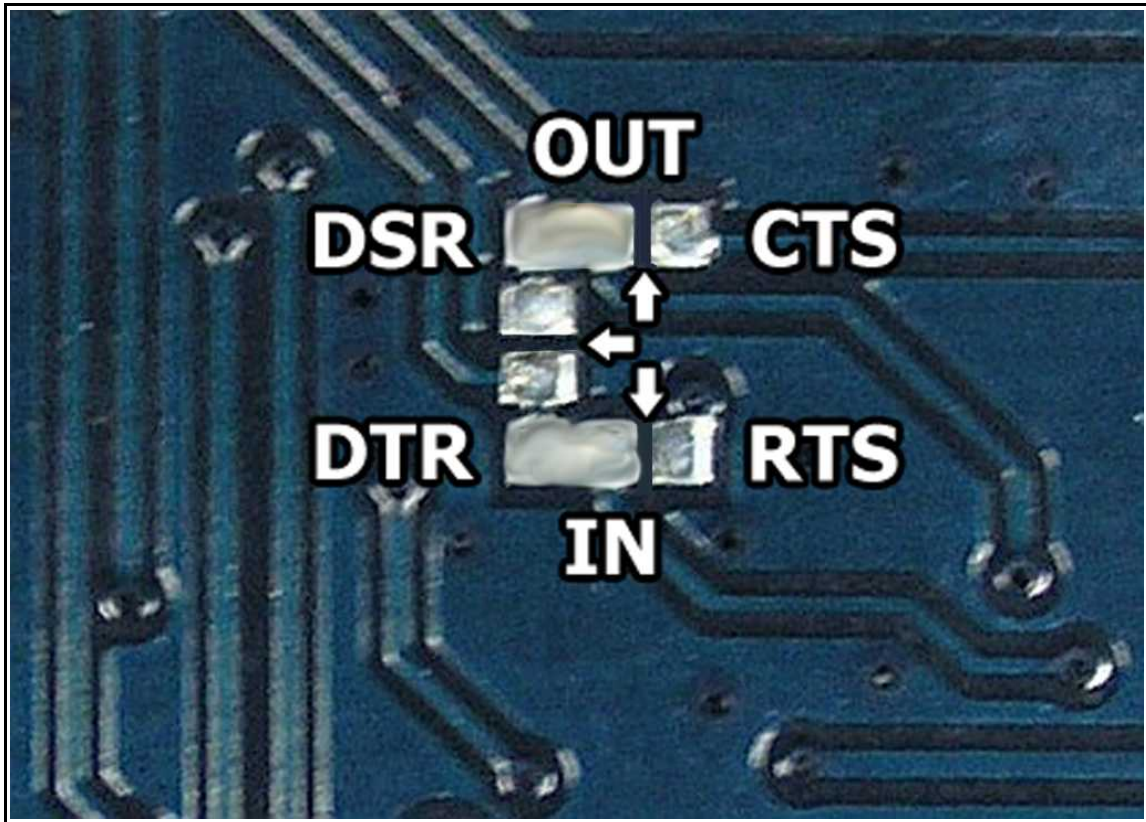


Figure 4 – Cut all connections at arrows and solder between the IN and either DTR or RTS, and/or OUT and either DSR or CTS

The above example shows DTR/DSR handshaking. This is **ONLY** needed for old printers and devices that actually used DTR/DSR handshaking. This is extremely rare! Even devices like the Apple IIc that did in fact only have DTR/DSR still had these connected to RTS/CTS on the DB25 end of the cable. So, you would still be using RTS/CTS for flow control! Cut these connections and make jumpers **only** if you know absolutely for fact that your DB25 cable requires DTR/DSR for handshaking.

SECTION 3 – TROUBLE SHOOTING

Problem: The WiModem232 won't power up.

Solution: Make sure that you have a USB mini-B cable connected to the WiModem232 with the other end of the cable plugged into a suitable 5vdc power source (phone charger, USB port, etc.)

Problem: The WiModem232 won't connect to my router.

Solutions:

- Make sure that your router SSID does not contain space characters. If it does, you will need to use the AT*NS command to set the router SSID/Passphrase.
- Make sure that your router is close enough to the WiModem232. You can use the AT*N command to determine the signal strength of the router.
- Make sure that your router is not too close! You need to have a few feet of separation between the WiModem232 and your router.
- Make sure your terminal program is in ASCII or ANSI mode while entering the SSID and Passphrase. The SSID and Passphrase are case sensitive!

Problem: After connecting to a Telnet system, the WiModem232 just sits there or disconnects immediately.

Solution: Telnet specific systems (like tty.sdf.org:23) require that the translation mode be set to 1 (AT*T1).

Problem: I connected to a BBS and when I start a download it immediately starts having bad blocks and retries.

Solution: Make sure that the translation mode is set to 0 (AT*T0). This turns off the Telnet translation.

Problem: When I type I don't see the text show up on the terminal.

Solutions:

- Make sure the baud rate of the WiModem232 matches the baud rate set in the terminal software.
- Make sure the terminal is set correctly for handling DCD.

Problem: When I connect to a BBS, the baud rate changes.

Solution: Change the terminal software and/or serial interface card to handle DCD.

SECTION 4 – FAQ

Q: Can I use the WiModem232 for connecting to a BBS?

A: Yes.

Q: Can I use the WiModem232 for operating a BBS?

A: Yes! RING/ATA, DCD, and RI are supported.

Q: Can AT commands be sequential (ie. ATE0C0&K1)?

A: Yes. When more than one command is grouped in sequence, the only response that will be returned is either OK or ERROR. Only commands that set a value can be used in a group. For example, ATE0 is acceptable but ATE? is not, and will generate an ERROR response.

Q: How much power does the WiModem232 use?

A: The WiModem232 uses an average of ~80mA while transmitting and ~25mA while receiving. OLED option uses ~10mA more current.

Q: What are the LED colors, and what do they mean?

A: RED – No WiFi connection
YELLOW – COMMAND mode, not connected to a server
GREEN – ONLINE (connected to server)
TEAL – COMMAND mode, connected to server
PURPLE – UPDATE mode, firmware is being downloaded/flashed
WHITE – WPS mode
BLUE – Baud rate reset (by shorting jumper pads0
BLUE/RED flashing – WiModem232 settings reset to factory defaults

Q: Can I set the WiModem to use a static IP address?

A: Yes! You need to do the following:

Set the IP address you want to use by using the command AT*IP.

Set the gateway address by using the command AT*GW=.

Set the subnet mask by using the command AT*SUB=.

Finally, set the network type by using the command AT*NET=STATIC. To restore the WiModem to use a DHCP connection, use the command AT*NET=DHCP.

Please join our support forum at www.cbmstuff.com/forum.



Model: ESP-12F
FCC ID: 2AHMR-ESP12F

The enclosed device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: *(i.)* this device may not cause harmful interference and *(ii.)* this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.



WARNING: To satisfy FCC RF exposure requirements for mobile transmitting devices, a separation distance of 20 cm or more should be maintained between the antenna of this device and persons during device operation. To ensure compliance, operations at closer than this distance is not recommended. The antenna used for this transmitter must not be co-located in conjunction with any other antenna or transmitter.

