

C64Net WiFi Firmware 3.1 (C)2016-2017 Bo Zimmerman
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Intro:

This firmware code, "C64Net WiFi Firmware", provides an api for communication between a serial terminal and the ESP8266. It simulates the old-style Hayes "AT" commands, so that the ESP8266 appears to the terminal as if it were a Hayes modem. These "AT" commands may then be issued to the ESP8266 in order to force it to connect to a wireless access point, and from there to make one or more manageable connections to the internet. It also includes a streaming serial "telnet" mode, and server/port listener capabilities.

The default baud rate that the firmware establishes is 1200. Be sure to use the commands below to set this to the proper baud rate for your terminal/host computer. If you plan on using the Commodore 8-bit utilities, keep the firmware baud rate saved at 1200.

Building:

This firmware was built using Arduino IDE rev1.6.11 with the Arduino Generic ESP8266 Module installed from the head dev at <https://github.com/esp8266/Arduino>. Using that version of the library not the official Boards Manager distribution (via Additional Boards Manager URL http://arduino.esp8266.com/stable/package_esp8266com_index.json) was important to resolving several problems (specifically 300ms/byte socket write times). How you get there from here was tricky. I followed the standard instructions for installing an ESP board, found where it dropped the package (on Windows 10, it was in:
c:\users\\AppData\Local\Arduino15\packages\esp8266\hardware\esp8266\... I dropped the new stuff from github in there instead of the old stuff, and then went into the new "tools" directory and ran get.py.

Using:

Upon initialization, or any time the ESP8266 is reset, the modem will display its version, and some information about the host hardware, and then read a configuration file from the internal SPIFFS to re-establish the previously set baud rate, and to attempt to re-connect to the previously connected wireless router. The first time it is run, the firmware will set a baud rate of 1200 and display INITIALIZED to let you know that no previous wifi configuration was found. Once the serial terminal displays READY, it is ready to receive commands.

The first command you'll probably want to enter is ATW to list your wireless routers, and then ATW "<<wireless router ssi>>,<<wireless password>>" to connect to the router, then AT&W to save it.

If you plan to use this primarily from a computer that doesn't need linefeeds, such as the C64, you'll want to enter ATR0 to go into carriage-return only mode, and then at&w to save this setting as well.

If you want to operate at a higher baud, you'll want to enter ATB9600 (or whatever baud rate you want to try), and then reconnect your terminal program to the modem at that new baud rate. If everything looks good, and you want to keep the new baud rate across restarts, don't forget to save the new baud rate with AT&W.

If you want to connect to a remote telnet server, eg coffeemud.net, port 23, you'll want to enter ATDT"coffeemud.net:23". Don't forget to set your terminal program to the proper translation mode (ANSI, ASCII, or whatever).

If you are using a Commodore Graphics terminal program and want to connect to a Commodore BBS, eg cottonwoodbbs.dyndns.org port 6502, you'll want to enter ATD"cottonwoodbbs.dyndns.org:6502".

If you want to use Q-Link, you need to add a phone number alias first. To do this, enter ATP"5551212=q-link.net:5190". Then select "Hayes compatible" 1200 baud modem in the Q-Link client.

If you want to run a Commodore BBS program using the modem, you'll want to configure the BBS program to the same idle baud rate that your modem is using (1200 baud by default), configure it for a Hayes style modem (or the C=1670), and use an initialization string of "ATR0E0S0=1S41=1A6400" plus any

other recommended settings from the BBS program. This creates a listener at port 6400 that switches directly to stream mode on the first ring, with no linefeed carriage returns, and no keystroke echo. Your BBS program may require you add certain other settings, such as V0 or X1.. which you should also do.

Command Set:

The command set is as follows (not case sensitive):

ATZ : closes all open socket connections (preserving the Access Point connection), stops all listeners, and resets the state of the Command processor to the saved configuration, preserving the current baud rate and wifi connection.

ATI : re-shows the startup message, including wifi connection information.

ATI0 : same as ATI

ATI1 : Shows the current common variable settings, common 'S' registers.

ATI2 : Shows the modem's current IP address

ATI3 : Shows the modem's current Wireless Router connection

ATI4 : Shows only the firmware current version

ATI5 : Shows all the current variable settings, all 'S' registers.

ATA : If a server listener has generated a RING, then ATA will switch the last rung connection to Stream mode (see ATD).

ATA/ : Repeats the previous command (no idea why...)

ATAn : Causes the modem to create a server listening on port n. When a connection is received, the terminal will generate 1 or more RINGs according to the ATS0 register, followed by a normal CONNECT response. At this point, all other commands related to connections may be used normally, unless ATS41 is > 0, in which case incoming connections are automatically sent to Stream mode as per ATD or ATA. Listeners are listed along with other connections using ATC0.

ATAPn"[HOSTNAME]:[PORT]" : Adding a P modifier causes all incoming connection input to be translated to PETSCII

ATATn"[HOSTNAME]:[PORT]" : Adding a T modifier causes connection streaming input to be translated per TELNET when the changed to Stream mode

ATAEn"[HOSTNAME]:[PORT]" : Adding a E modifier causes connection terminal echo to be enabled when the changed to Stream mode

ATAXn"[HOSTNAME]:[PORT]" : Adding a X modifier causes connection XON/XOFF flow control to be enabled when the changed to Stream mode

ATN0 : Shuts down all listeners, leaving client connections open

ATNn : if n > 0 then same as ATAn

ATE0 : Turns serial terminal echo off for command mode.

ATE1 : Turns serial terminal echo on for command mode.

ATV0 : Turns off verbose responses mode (Uses Terse Numeric response mode)

ATV1 : Turns on verbose responses mode (Uses Word response mode)

ATX0 : Turns off extended response codes (1/CONNECT instead of 5/CONNECT 2, etc..)

ATX1 : Turns on extended response codes (5/CONNECT 2 instead of 1/CONNECT, etc..)

ATF0 : Turns on rts/cts flow control.

ATF1 : Turns on xon/xoff flow control.

ATF2 : Turns on xon/xoff flow control, sets XON mode (if necessary), and, in command mode, will immediately go to XOFF when a single connection packet is received. This is very useful when the client wants to ensure it only receives one packet to process. You can think of this as an alternative way to use xon/xoff by having XOFF automatic between packets.

ATF3 : Similar to ATF2 except that the default is XOFF, and, in command mode, a XON code from the user will immediately trigger either an empty packet response [0 0 0], or a real packet if one is available. After this, as in ATF2, XOFF is automatically set.

ATF4 : Turns off flow control for command mode

ATQ0 : Turns off quiet mode (Sends response codes)

ATQ1 : Turns on quiet mode (Stops sending response codes)

ATR0 : Suppresses linefeed (\n \$0a) in end of lines. Will only send carriage return (\r \$0d).
 ATR1 : Sends \r\n (\$0d0a) as end of line string.
 ATR2 : Sends \n\r (\$0a0d) as end of line string.
 ATR3 : Suppresses carriage return (\r \$0d) in end of lines. Will only send linefeed (\n \$0a).

ATBn : Sets a new serial Baud Rate. Takes effect immediately.
 ATB"n,xYz" : Sets baud rate n, bits x, parity (E,O,M, or N) for Y, and stop bits z.

ATW : List all wireless network access points scanned within range. The response for each entry is the SSID, following by the RSSI, followed by an * character is the connection is encrypted.
 ATWn : Where n > 0, this lists up to n wireless network access points scanned within range. The response for each entry is the SSID, following by the RSSI, followed by an * character is the connection is encrypted.
 ATW"[SSID],[PASSWORD]" : Connects to the wireless access point with the given SSI, using the given password.
 ATWP : Adding a P modifier is the same as all forms of ATW, with both arguments and results presented in PETSCII.

ATD : Start a streaming connection between the current opened connection. Use "+++" to exit back to Command mode.
 ATDn : Where n > 0, this will start a streaming connection between the previously opened connection with an id the same as n. Use "+++" to exit back to Command mode.
 ATD"[HOSTNAME]:[PORT]" : This opens a streaming connection between the terminal and the given host/port. Use "+++" to disconnect and exit back to command mode.
 ATDP"[HOSTNAME]:[PORT]" : Adding a P modifier causes connection input to be translated to PETSCII during the streaming session.
 ATDT"[HOSTNAME]:[PORT]" : Adding a T modifier causes connection input to be translated per TELNET during the streaming session.
 ATDE"[HOSTNAME]:[PORT]" : Adding a E modifier causes terminal echo to be enabled that streaming session.
 ATDX"[HOSTNAME]:[PORT]" : Adding a X modifier causes XON/XOFF flow control to be enabled that streaming session.
 ATDnnnnnn : Where n=0-9, if the digits exist in the phonebook (see ATP), it will try connect to that host, with those modifiers, from the phonebook.

ATC : Shows information about the current network connection in the following format "[CONNECTION STATE] [CONNECTION ID] [CONNECTED TO HOST]:[CONNECTED TO PORT]"
 ATC0 : Lists information about all of the network connections in the following format "[CONNECTION STATE] [CONNECTION ID] [CONNECTED TO HOST]:[CONNECTED TO PORT]", including any Server (ATA) listeners.
 ATCn : Where n > 0, this changes the Current connection to the one with the given ID. If no connection exists with the given id, ERROR is returned.
 ATC"[HOSTNAME]:[PORT]" : Creates a new connection to the given host and port, assigning a new id if the connection is successful, and making this connection the new Current connection. The quotes and colon are required.
 ATCP"[HOSTNAME]:[PORT]" : Adding a P modifier causes all connection input to be translated to PETSCII
 ATCT"[HOSTNAME]:[PORT]" : Adding a T modifier causes streaming input to be translated per TELNET when the changed to Stream mode
 ATCE"[HOSTNAME]:[PORT]" : Adding a E modifier causes terminal echo to be enabled when the changed to Stream mode
 ATCX"[HOSTNAME]:[PORT]" : Adding a X modifier causes XON/XOFF flow control to be enabled when the changed to Stream mode

ATH : Hangs up (disconnects and deletes) all open connections. Does not close Server listeners.
 ATH0 : Hangs up (disconnects and deletes) the current opened connection.
 ATHn : Hangs up (disconnects and deletes) the open connection with the given id. Closing a Server (ATA) listener does not close any connections received from that listener.

ATO : Re-enters a Streaming session (see ATD) under the previous settings, with the current (previous) connection.

ATP : Lists all existing phonebook entries, with the format phone number followed by ATD modifiers, followed by the host and port
 ATP"[NUMBER]=[HOSTNAME]:[PORT]" : Adds or Modifies an entry to the phonebook with the given 7 digit

number, host, and port. Use ATDnnnnn.. to connect.

ATPP"[NUMBER]=[HOSTNAME]:[PORT]" : Adding a P modifier causes connection input to be translated to PETSCII when connected to that entry.

ATPT"[NUMBER]=[HOSTNAME]:[PORT]" : Adding a T modifier causes connection input to be translated per TELNET when connected to that entry.

ATPE"[NUMBER]=[HOSTNAME]:[PORT]" : Adding a E modifier causes terminal echo to be enabled when connected to that entry.

ATPX"[NUMBER]=[HOSTNAME]:[PORT]" : Adding a X modifier causes XON/XOFF flow control to be enabled when connected to that entry.

ATP"[NUMBER]=DELETE" : Removes the phonebook entry with the given number.

ATS0=n : Changes the number of RING messages received before a CONNECT response is sent, on incoming Server listeners.

ATS1=n : Unimplemented, always returns OK

ATS2=n : Change the escape character (n = 0-255), Defaults to ASCII decimal 43 ("+")

ATS3=n : Change the Carriage Return Character (n = 0-127), Defaults to ASCII decimal 13 (Carriage Return)

ATS4=n : Change the Line Feed Character (0-127), Defaults ASCII decimal 10 (Line Feed)

ATS5=n : Change the Backspace Character (0-32), ASCII decimal 8 (Backspace)

ATS6 ... 39=n : Unimplemented, always returns OK

ATS40=n : Change the size of the connection packets (n > 0), Defaults to 127 bytes

ATS41=n : When n > 0, all incoming Server listener connections are immediately sent to Stream mode. If n=0, connections remain in normal command mode (default).

ATS42=n : Set the CRC8 for an attached Transmit command. e.g. ATS42=123T"[MESSAGE]" returns error unless 123 is CRC8 of "[MESSAGE]".

ATS43=n : Sets a standby baud rate n for the next incoming or outgoing connection only. ATZ clears.

ATS44=n : Sets an automatic delay of n milliseconds after most bytes written to the Serial port.

This is for computers that support a baud rate, but can't really keep up, and you don't want to use flow control.

ATS45=n : Changes how packet and at&g data is delivered. 0 is normal binary with normal headers, 1 is 78 char HEX digit streams followed by EOLN with hex digit headers, 2 is decimal digits followed by EOLN, with decimal digit headers.

ATS46=n : Changes DCD status. n=0 is default DCD=HIGH=online. n=1 is DCD=LOW=online

ATS47=n : Changes CTS status. n=0 is default CTS=HIGH=active. n=1 is CTS=LOW=active

ATS48=n : Changes RTS status. n=0 is default RTS=HIGH=active. n=1 is RTS=LOW=active (N/A on ESP01)

ATS49=n : Changes DCD pin number, n=2 is default

ATS50=n : Changes CTS pin number, n=0 is default on ESP01, and default is 5 otherwise

ATS51=n : Changes RTS pin number, n=4 is default (N/A on ESP01)

+++ : With a 1 second pause with no other characters afterwards, this will disconnect the current opened connection.

ATT"[MESSAGE]" : Transmit the given text string, with \r\n at the end, on the current connection.

ATTn : Where n > 0, this starts a transmit of exactly n bytes to the current connection. The \n from entering this command must be followed by the n bytes to transmit.

ATTP"[MESSAGE]" : Transmit the given text string, translating petSCII to ascii, with \r\n at the end, on the current connection.

ATTPn : Where n > 0, this starts a transmit of exactly n bytes to the current connection, translating petSCII to ascii. The \n from entering this command must be followed by the n bytes to transmit.

ATT+ "[MESSAGE]" : A + argument may be used to force the 'T' command to return the CRC8 of the message instead of OK, when successful.

ATL0 : Re-sends the most recently sent data packet again

ATLn : Re-sends the most recently sent data packet for connection id n.

AT&L : Reloads the saved configuration.

AT&W : Saves the current configuration: WiFi settings(ATW), baud rate (ATB), end of line (ATR) settings, flow control (ATF), echo mode (ATE), extended responses (ATX), verbose responses (ATV), quiet responses (ATQ), PETSCII mode (AT&P1), DCD status (ATS46), CTS status (ATS47)

AT&F : Restores the modem to factory default settings.

AT&On : n is 1 to turn on internal serial-reception log, n is 0 to turn off or view a previously turned-on log.

AT&H : Shows a help file from the web, or brief help otherwise.

AT&U : Checks the firmware home page to see if a new version is available.

AT&U6502 : Will update the firmware from the home page on the web.

AT&U=x: Will update the firmware from the web to custom version x.

AT&Pn : Where n > 0, all command mode input and output will be translated to/from PETSCII before internal processing. This will not affect received packet data, or the stream mode.

AT&Nx : Shows the status of ESP8266 I/O pin x

AT&Mn : Adds the byte denoted by n to a list of mask-out bytes. These are bytes that are not transmitted to the serial port in command mode incoming packets. If this command is followed by a C, N, or A command on the SAME LINE, then the setting will apply ONLY to that connection or listener.

AT&M : Resets the mask-out bytes list. No bytes will be masked-out. If this command is followed by a C, N, or A command on the SAME LINE, then the setting will apply ONLY to that connection or listener.

AT&Dn : Adds the byte denoted by n to a list of delimiter bytes. These are bytes that will compose the last byte in a command-mode incoming packet that is still shorter than the limit set by ATS40. This is useful for CR-LF formatted data. If this command is followed by a C, N, or A command on the SAME LINE, then the setting will apply ONLY to that connection or listener.

AT&D : Resets the delimiter bytes list. No bytes will be delimited, and packets will contain as many bytes as are received and allowed by ATS40. If this command is followed by a C, N, or A command on the SAME LINE, then the setting will apply ONLY to that connection or listener.

AT&G"[HOSTNAME]:[PORT]/[FILENAME]" : Streams a file from an HTTP source on the internet. The header contains channel 0, file length, and an 8-bit sum of all the bytes in the forthcoming file, followed by the bytes of the file, all formatted as a normal packet. An ASCII 3 (CNTRL-C) received during the transfer will abort. The S44 register can be used to create artificial delays in this output.

XON/XOFF Flow control also remains in effect with, on a byte-by-byte basis for the auto and manual flow control systems.