

Encoded Solutions, LLC NMEA-to-WIFI Multiplexer



Users Guide

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Installing the Multiplexer

Wiring

The NMEA0183 standard is a serial protocol that is essentially the same as the RS422 standard, which is a differential signal carried on two wires. The Encoded Solutions NMEA-to-WIFI multiplexer uses the two-wire differential signal RS422 standard and is fully compatible with NMEA0183.

The multiplexer has a pluggable connector in order to facilitate making the wire connections. To remove the connector, loosen the two screws that hold it to the multiplexer and pull gently to separate it from the multiplexer. The connectors have a snug fit, so you might find it more convenient to pull it apart before you mount the multiplexer. You can also connect the wires without separating the connector if you prefer. After you've connected all the wires and re-plugged the connector, don't forget to gently snug up the two screws that hold the connector to the multiplexer.

The connections are as follows:

1	2	3	4	5	6	7	8	9	0	-	+
Input 1		Input 2		Input 3		Input 4		Output		DC Ground	DC+ 12 to 30 V
B	A	B	A	B	A	B	A	B	A	-	+

To make wire connections, *completely* loosen the set screw for the desired connection location, insert the stripped wire end into the hole below the screw, and tighten the screw. Do not over-tighten the screws! Ensure that the bare stripped end of the wire, not the insulation, is clamped in the connector. We've included a screw driver with your multiplexer that fits these tiny screws.

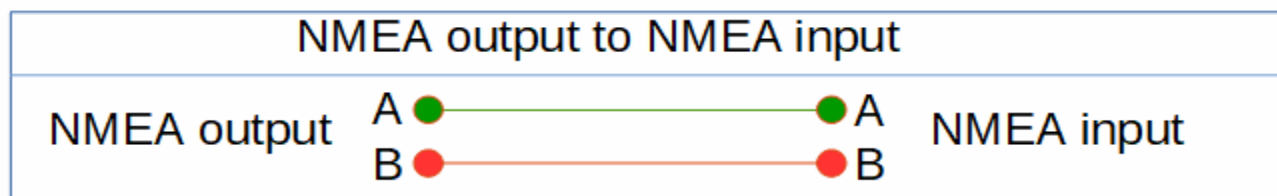
Input ports 2 and 3 are always at 4,800 baud to accommodate NMEA inputs. The output port speed can be set to either 4,800 baud to accommodate sending to a NMEA device, or at 38,400 baud to allow the sending of AIS data. If the output port is set to 38,400 baud then input 4 will also be at 38,400 baud and will be your "AIS Input" port. If the output port is set to 4,800 baud and you have an input port set to 38,400 baud then that port will be input 1, and you must connect your AIS there. This selection is made on the setup screen.

Some devices have wires already connected which send or receive the NMEA data. Whether in the form of a connector, or wires, we will refer to them as connections. NMEA data connections are typically labeled "A" and "B", but may also be labeled "+" and "-" or "signal" and "ground".

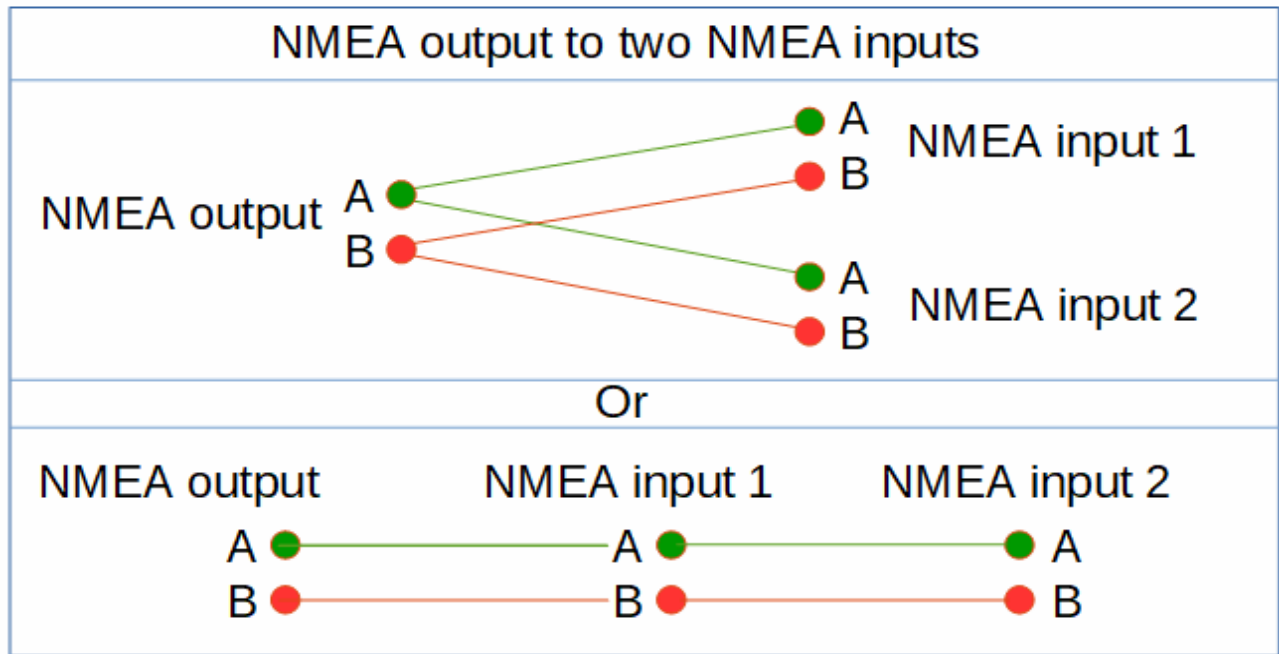
Some NMEA devices have only “send” or “output” connections, some have only “receive” or “input” connections, and some have both. Others have a single connection pair that can act as either “sender” or “receiver”, which may require settings in the device to control whether it sends or receives data.

Each pair of data wires between NMEA devices is a one-way data path that has a single “talker” at one end which is sending the NMEA sentences. There will typically be a single “listener” at the other end which is receiving the NMEA sentences, but it is possible to connect more than one “listener” to a single “talker”. Two “talkers” cannot be connected directly together to combine their data, as they can not coordinate with each other, and will interfere with each other when they send messages at the same time. This is why you need a multiplexer to combine data from multiple NMEA0183 talkers.

There will usually be a single one-way two-wire data path between two NMEA devices, where one device produces the data (GPS, Depth, Wind, etc) and sends it to another device that can also use that data (Chart Plotter, Auto Pilot, Multiplexer, Display, etc). To pass data from one NMEA device to another, connection “A” of the talker’s output is connected to connection “A” of the listener’s input, and connection “B” of the talker’s output is connected to connection “B” of the listener’s input, as shown here.



To pass data from one NMEA “talker” to more than one NMEA “listener”, connection “A” of the talker’s output is connected to connection “A” of each listener’s input, and connection “B” of the talker’s output is connected to connection “B” of each listener’s input, as shown here.



When making the data connections to the multiplexer, if you get the wires reversed (A and B swapped), or if you connect the “-” of a single-wire device to the “B” of the multiplexer, you won’t do any damage, it just won’t pass data. If you connect an instrument to the multiplexer and the multiplexer is not passing data from that instrument, you can safely swap the A and B data wires to see if that is the problem. If that does not solve the problem, you can safely try using just the “+” or “data” wire from the instrument to the multiplexer without connecting the “data ground” or “-” to the multiplexer’s “b’ connection.

Mounting

The multiplexer is designed to be mounted on a vertical surface with the connector at the bottom. It can be mounted using the supplied mounting screws which are sized to go in the open slots on each side of the multiplexer. We recommend that you drill 7/64 pilot holes in the mounting surface for the screws. The multiplexer should be mounted:

- in a clean, dry, protected location without excess heat
- where large metallic objects will not block the WIFI signals
- where there is room for the connector and the wires attached to it
- where the status LED can be seen and the buzzer can be heard
- where there is access to the incoming and outgoing NMEA data wires
- where it is not close to high voltage wires
- where it is not co-located with other transmitting devices or receivers

Setting Up the Multiplexer

Connecting Your Computer to the Multiplexer via WIFI

When the multiplexer has not been initialized it will start in setup mode. When it is powered up, the LED will be lit steady red which indicates that the multiplexer requires setup before it will process NMEA data. In setup mode the multiplexer's network name is **nmea2wifi** and it is unsecured, meaning it does not require a password. Connect your computer to the multiplexer via WIFI like you connect to any other WIFI host device. After you connect your computer to the multiplexer you can access the setup page to configure the multiplexer.

NOTE: When the multiplexer is not in setup mode you must use the network name and password which you previously specified in order to connect to it.

Accessing the Setup Page

The multiplexer setup page is accessed using a web browser on a computer that is connected to the multiplexer via WIFI. The setup page is accessed by typing **10.11.12.1** into the browser's address field. The address field is where you would normally type a web address, such as www.encodedsolutions.com.

If you have previously changed the “Multiplexer IP Address” of the multiplexer, then you must type that IP address instead of 10.11.12.1 to access the setup page.

When the multiplexer is connected to a remote WIFI and the option to “Allow Setup from Remote WIFI” is enabled, the setup page can also be accessed from computers that are connected to the remote WIFI. To access the setup page from a computer that is connected to the remote WIFI, use the IP address that was assigned to the multiplexer by the remote WIFI instead of 10.11.12.1. That IP address will be shown on the setup page after the multiplexer is connected to the remote WIFI; see Connection Status below.

Multiplexer Parameters

The multiplexer parameters section of the setup page contains parameters that apply to operation of the multiplexer as a WIFI host. The parameters are described in detail below.

Multiplexer IP Address

The “Multiplexer IP Address” is the IP address the multiplexer will use when it operates as a WIFI host. It is also used by the multiplexer to determine what IP addresses will be assigned to computers that are connected via WIFI directly to the multiplexer.

The default IP address of the multiplexer is 10.11.12.1 and computers connecting directly to the multiplexer will be assigned an IP address in the range of 10.11.12.2 to 10.11.12.254. Under normal circumstances, you do not need change the multiplexer IP address.

The multiplexer IP address is restricted as shown below. The four individual parts of an IP address that are separated by the “.” are referred to as octets.

- the first octet must be 10, 172, or 192
- if the first octet is 10, the second octet may be 0 to 255 inclusive
- if the first octet is 172, the second octet must be 16 to 31 inclusive
- if the first octet is 192, the second octet must be 168
- the third octet may be 0 to 255 inclusive
- the fourth octet must be 1 (you cannot change this on the setup screen)

So, valid address ranges for the multiplexer are in the ranges shown below:

- 10 . [0 to 255] . [0 to 255] . 1
- 172 . [16 to 31] . [0 to 255] . 1
- 192 . 168 . [0 to 255] . 1

If you change the multiplexer’s IP address you will need to use the new IP address instead of the default IP address to access the setup page.

Tech Note: The multiplexer’s IP address is the same as the multiplexer IP address except that it ends in 0 instead of 1. The network mask for the multiplexer is always 255.255.255.0 so IP’s assigned to computers connecting directly to the multiplexer will be the same as the multiplexer IP address except that they will end in a number from 2 to 254. The multiplexer uses DHCP and does not allow for static IP address assignment.

Network Name (SSID)

The “Network Name” field, also known as SSID, is the name used to identify the multiplexer as a WIFI host. This is the name that you will use to connect your computer via WIFI to the multiplexer.

The network name must be from 1 to 32 characters long and it can contain any printable characters from the ASCII character set, including spaces (ASCII characters with values 32 to 126 inclusive).

New Password

The “New Password” field is used to set or change the password you will use to connect to the multiplexer via WIFI. You should only enter a password in this field when you want to change the multiplexer’s password. Otherwise, leave this field blank; the existing password will not be affected. The multiplexer is required to have a password, so you cannot erase the password, you can only change it to another valid password.

The password must be from 8 to 64 characters and it can contain any printable characters from the ASCII character set, including spaces.

WIFI Channel

Using the “WIFI Channel” field you can select the WIFI channel that the multiplexer uses. If the multiplexer is located within close proximity to another WIFI host, there is less potential for the devices to interfere with each other if the WIFI channels on the two hosts are different. When the multiplexer connects to a remote WIFI, the multiplexer will switch its channel to the channel used by that WIFI and will disregard the WIFI Channel selected here while it is connected.

Protocol

The multiplexer can use either Transmission Control Protocol (TCP) or User Datagram Protocol (UDP) to transmit and receive NMEA data via WIFI.

TCP is a connection-based protocol that inherently provides receipt verification, error detection, and re-transmission functions. When the protocol is TCP, the multiplexer will only allow four simultaneous TCP connections. This includes TCP connections with computers that are connected directly to the multiplexer’s WIFI, and TCP connections with computers that are communicating with the multiplexer

through a remote WIFI. Only four computers will be able to send and receive NMEA data through the multiplexer when the protocol is TCP.

UDP is a connection-less protocol and, while relatively reliable, is a “send and forget it” protocol with no receipt verification, error detection, or re-transmission functions. When the protocol is UDP, the multiplexer supports NMEA data send and receive with four computers connected directly to the multiplexer’s WIFI and, if the multiplexer is connected to a remote WIFI, it simultaneously supports NMEA data send and receive with any number of computers that are connected to that same remote WIFI, limited only by the capacity of the remote WIFI.

TCP Port

The “TCP Port” field is used to specify the TCP port on the multiplexer that software on the WIFI-connected computers must connect to in order to send and receive NMEA sentences. When a TCP connection is made with the multiplexer, the port on the computer (the “other end” of the connection) is automatically assigned, so only one port is specified in order to make a TCP connection.

Valid values for TCP Port are 1024 to 65535 inclusive. The default TCP Port is 10110. This is the official port assigned by the Internet Assigned Numbers Authority for the transmission of NMEA0183 data.

“TCP Port” is applicable only when “Protocol” is TCP, and is ignored if “Protocol” is UDP.

UDP Send Port

The “UDP Send Port” field is used to specify the UDP port to which the multiplexer will send the NMEA sentences. You must specify separate send and a receive ports when using the UDP protocol in order to have bi-directional NMEA data.

In order to receive NMEA sentences via UDP on a WIFI-connected computer, in the software on the remote computer you must specify the same port for its UDP receive (or UDP input) as you have specified here for “UDP Send Port”.

Valid values for UDP Send Port are 1024 to 65535 inclusive. The default UDP Send Port is 10110. This is the official port assigned by the Internet Assigned Numbers Authority for the transmission of NMEA0183 data.

“UDP Send Port” is applicable only when “Protocol” is UDP, and is ignored if “Protocol” is TCP.

UDP Receive Port

The “UDP Receive Port” field is used to specify the UDP port that the multiplexer will use to receive NMEA sentences. The multiplexer will “listen” on this UDP port for NMEA sentences sent by WIFI-connected computers.

In order to send NMEA sentences to the multiplexer via UDP from a WIFI-connected computer, you must specify the same UDP send (or UDP output) port in the software on that computer as you have specified here for “UDP Receive Port”.

Valid values for UDP Receive Port are 1024 to 65535 inclusive. The default value for UDP Receive Port is 10111. This is an available port that is directly adjacent to the official port (10110) that is assigned by the Internet Assigned Numbers Authority for the transmission of NMEA0183 data.

“UDP Receive Port” is applicable only when “Protocol” is UDP, and is ignored if “Protocol” is TCP.

Ports at AIS Speed (38,400)

Use the “Ports at AIS Speed (38,400)” selector to choose which of the multiplexers ports are set to 38,400 baud to accommodate AIS connections. You may choose

- None
- Input 1 (1:2)
- Input 4 (7:8), Output (9:0)

If you choose “None” then all input ports, and the output port, will be at 4,800 baud for NMEA data.

If you choose “Input 1 (1:2)” then only input port one on pins 1 and 2 will be at 38,400 baud. In this situation, you should connect the device outputting AIS data to input port 1. The output port will still be at 4,800 baud, so if you try to send input 1 direct to output, it will cause an output port overflow.

If you choose “Input 4 (7:8), Output (9:0)” then both input 4 on pins 7 and 8, and the output port, will be set to 38,400 baud. Inputs 1, 2, and 3 will be at 4,800 baud. This will allow you to pass AIS data received on input 4 directly to the output without overflowing the output port. The device that you have attached to the output port must have its connected receive port set to 38,400 baud too, or it won’t be able to receive the data. Note that most NMEA devices are not capable of receiving data at anything other than 4,800 baud.

Send direct to Output

When the multiplexer receives data on it’s four wired input ports, it can forward that data directly to its wired output port independently of the WIFI operations. In other words, it can act as a standard wired multiplexer.

To enable direct input/output port forwarding, select “Yes” from the selection box in front of the port(s) you want forwarded directly to the wired output port in the “Send direct to Output” section of the setup screen. To help ensure that the relationship of the port number and the pin connectors on the cable are clear we’ve included both the port number and, in parentheses, it’s pins on the connector.

The output port is buffered to enable more than one input port to be forwarded directly to the output port without overflowing the output port, but the output port speed is still limited in it’s capacity. If the total amount of data you are trying to send on the output port exceeds that which can be carried at the speed it is currently set, either 38,400 or 4,800 baud, the output port will overflow and data will be lost. Keep in mind that NMEA sentences received via WIFI from connected computers are also sent out on the NMEA output port. The multiplexer will beep and flash blue when the amount of data to be sent to the output port exceeds the capacity of the NMEA output port.

Note that if the output port is set to 4,800 baud and you are receiving AIS data on input 1 at 38,400 baud and you forward that port to the output, you will almost certainly overflow the output port buffer when AIS data is received.

Remote WIFI Parameters

While it is serving as a WIFI host to computers connecting directly to it, the multiplexer can also connect as a client to another WIFI host. When it is connected to the remote WIFI the multiplexer can send NMEA data to, and receive NMEA data from, computers that are connected to that remote WIFI. The remote WIFI connection parameters apply only to the operation of the multiplexer as a client on the remote WIFI. They have no affect on computers connected directly to the multiplexer via WIFI.

Each remote WIFI connection parameter field is described below.

Connect to a Remote WIFI

Use this selector to specify whether the multiplexer can connect to a remote WIFI host or not. If you select “Yes”, you must also specify the name (Remote WIFI Name) and password (Remote WIFI Password) for the WIFI host you want to connect to.

When the multiplexer is set up to connect to a remote WIFI and it has not yet connected to that remote WIFI its state will depend upon whether or not there are any devices connected to the multiplexer via WIFI. In either case, the multiplexer will not send or receive NMEA sentences via WIFI until it is connected to the remote WIFI, but it is processing NMEA sentences received on its wired input ports and, if set up to do so, sending those sentences out the wired output port.

If there are no devices connected to the multiplexer via WIFI then the green light will be lit steady and the red light will flash dimly. This indicates that the multiplexer is trying to connect to the remote

network. It will continue to try to connect to the remote WIFI until it connects successfully, or a device connects to the multiplexer via WIFI.

If there are one or more devices connected to the multiplexer via WIFI then the light will flash alternately green and red. This indicates that the multiplexer is set up to connect to a remote WIFI, but it has not done so, and is not trying to make that connection. The multiplexer will again try to make that connection when there are no more devices connected to it via WIFI.

When the LED is blinking alternately red and green you can connect your computer directly to the multiplexer via WIFI and access the setup page. The connection status is shown on the setup and status pages, and the status page also shows all WIFI connections to the multiplexer, which is important at this time because in order to allow the multiplexer to again try to connect to the remote network you will need to either terminate all WIFI connections to the multiplexer, change the remote network name or password using the setup screen, or reboot the multiplexer.

Tech Note: Because the multiplexer has a single WIFI chip, when that chip changes channels to scan for the remote network to make its network connection, it causes devices that are connected to it via WIFI to lose their connection. Therefore, if the multiplexer didn't stop trying to connect to a remote network when you connect your device to it via WIFI then you wouldn't be able to access the setup page and would be stuck being unable to change any settings, including the remote network connection settings!

Allow Setup from Remote WIFI

This selector controls whether or not computers that are attached to the same remote WIFI as the multiplexer can access the multiplexer's setup page. If "Allow Setup from Remote WIFI" is "Yes", any computer that is connected to the remote WIFI, as well as any computer connected directly to the multiplexer, can access the multiplexer's setup page. If it is "No" then only computers connected directly to the multiplexer can access its setup page. To access the setup page from a computer connected to the remote WIFI host, you must use the IP that the remote WIFI has assigned to multiplexer instead of the multiplexer's IP address in your browser's address window.

Remote WIFI Name (SSID)

The "Remote WIFI Name" field is used to specify the name of the remote WIFI host to which the multiplexer will connect. The remote WIFI name must be from 1 to 64 characters long and it can contain any printable characters from the ASCII character set (ASCII characters with values 32 to 126 inclusive).

Remote WIFI Password

The "Remote WIFI Password" field is used to specify the password of the remote WIFI host to which the multiplexer will connect. The remote WIFI password may be empty for an unprotected WIFI, or up

to 64 characters for a protected WIFI. This field can contain any printable characters from the ASCII character set, including spaces (ASCII characters with values 32 to 126 inclusive).

Note that the actual remote WIFI password is never shown on the multiplexer setup screen. If a remote WIFI password has previously been entered, you will see a hidden password indicator in this field. To change the remote WIFI password, simply replace the hidden password indicator with the new password. You can delete the remote WIFI password by clearing this field before saving. If you change the remote WIFI password field, but leave some of the hidden password indicator characters in the password field, they will be included in your password, and it will probably not match the remote network!

UDP Send-to

The “UDP Send-to” field is applicable only when the multiplexer is connected to a remote WIFI host and the “WIFI Protocol” is UDP. The options are as follows:

- | | |
|--------------|---|
| All | NMEA sentences will be sent to the broadcast address of the remote WIFI and so will be available to all computers connected to the remote WIFI. |
| Specified IP | NMEA sentences will be sent to the exact IP address specified in the “UDP Send-to IP Address” field. |
| Disabled | NMEA sentences will not be sent to computers connected to the remote WIFI. |

UDP Send-to IP Address

The “UDP Send-to IP Address” is applicable only when the multiplexer is connected to a remote WIFI host, the “WIFI Protocol” is UDP, and the “UDP Send-to” field is set to “Specified IP”. NMEA sentences will be sent to the single computer that is connected to the remote WIFI and that has the exact IP address you specify here. If the IP address you specify here is not the valid IP address of a single computer on the remote WIFI then NMEA sentences will not be sent to this IP address.

Allow Receive-from

The “Allow Receive-from” field is applicable only when the multiplexer is connected to a remote WIFI. This field applies to both TCP and UDP protocols. When the protocol is TCP, computers on the remote WIFI must have a TCP connection with the multiplexer to send NMEA data to it. When the protocol is UDP, any computer with a WIFI connection to the remote WIFI can send NMEA data to the multiplexer. This feature allows you to further limit which computers on the remote WIFI can send NMEA data to the multiplexer.

The options are as follows:

All	For UDP, NMEA sentences will be accepted from any and all computers connected to the remote WIFI. For TCP, the computer must also have a TCP connection with the multiplexer.
Specified IP	For both TCP and UDP, NMEA sentences will be only be accepted from the computer on the remote WIFI with the exact IP address specified in the “UDP Receive-from IP Address” field. For TCP, the computer having this exact IP address must also have a TCP connection with the multiplexer.
Disabled	NMEA sentences will not be accepted from any computer on the remote WIFI.

Allow Receive-from IP Address

The “Allow Receive-from IP Address” field is applied only when the multiplexer is operating as a client on a remote WIFI and the “Allow Receive-from” field is set to “Specified IP”. The multiplexer will only accept NMEA sentences from the computer that is connected to the remote WIFI that has the exact IP address specified. If “WIFI Protocol” is TCP, the computer must also have a TCP connection with the multiplexer.

Connection Status

When “Connect to a Remote WIFI” is “yes”, the status of the multiplexer’s connection with the remote WIFI will be shown here. This is not a user-entered field, but provides important information. If the multiplexer is connected to the remote WIFI then the multiplexer’s IP address on the remote WIFI will be shown here, and the LED will be steady green. If the LED is alternating red and green or green with a lightly flashing red then the connection status with the remote WIFI will be shown here.

Reminder: “Connection Status” will not change while you are connected to the multiplexer via WIFI because the multiplexer will not try to connect to the remote network while there are devices connected to it via WIFI.

Current Password

In order to prevent unauthorized changes to the settings you must enter the current password in the “Current Password” field before pressing the “Save” button. If the multiplexer has not been initialized you will not be prompted for a current password.

LED Brightness for Normal Operation

During normal operation the green LED will be lit steady. You may want the LED to be bright during the day to see the operational status, and dim during night, so it does not disrupt your nighttime vision.

You can change the brightness of the green “Normal Operation” LED by selecting the desired brightness in the “Green LED Brightness” field of the setup form and pressing the “Update Brightness” button. It is not necessary to enter the Current Password to change the brightness. The setup page will be refreshed with the new brightness value.

Please note that the “Green LED Brightness” value only affects the brightness of the steady green LED when the multiplexer is operating normally. When setup is required, or for alarms or when flashing or blinking to provide notifications, the LED will be at full brightness.

It is also possible to change the brightness directly without accessing the multiplexer setup page. You can access a brightness setting page by entering 10.11.12.1/bri in your web browser. You can also set the brightness directly by entering 10.11.12.1/bri=X where 10.11.12.1 is the IP address of the multiplexer and X is any numeric value from 0 (off) to 10 (full bright). The format of the entry in the address bar is important:

- there are no spaces
- the IP address is followed by a /
- bri is lower case, followed by =
- the brightness value is 0 to 10

The multiplexer will respond by changing the brightness of the LED and sending your browser the brightness setting page showing the current brightness value. If you do not want the multiplexer to send you a response page, you can append /n to the address like this:

10.11.12.1/bri=10/n (for full brightness)

10.11.12.1/bri=0/n (to turn the light off)

When you include the /n, the only indication you have that this command was successful is that the brightness of the LED will change. If you do this from within your browser, your browser will wait for a while for the multiplexer to respond before eventually timing out, unless you cancel it or close your browser.

HINT: You can create shortcuts in your browser for the brightness setting commands and, with a single click, set the desired daytime or nighttime LED brightness.

NOTE: Before version 2.1.5, a colon was required after the brightness value, like 10.11.12.1/bri=8:

The Status Page

The status page contains several sections which provide information about the current state of the multiplexer.

Accessing the Status Page

The multiplexer status page is accessed using a web browser on a computer that is connected to the multiplexer via WIFI. The setup page is accessed by typing **10.11.12.1/status** into the browser's address field. The address field is where you would normally type a web address, such as www.encodedsolutions.com.

Please note that the address for the setup page is case-sensitive; the word "status" must be in lower case letters. If you have previously changed the "Multiplexer IP Address" of the multiplexer, then you must type that IP address instead of 10.11.12.1 before the "/status" to access the status page.

NMEA Sentence Counts

This information can be very useful when you are connecting your NMEA instrument to the multiplexer and want to see if the multiplexer is properly receiving the NMEA sentences from that instrument. This area of the status page contains a table that reflects the port name, its connector pins, the port speed, and the count of NMEA sentences that have been received or transmitted on that port since power-up.

NMEA sentences are processed as long as the multiplexer status is not in "Setup Required" state indicated by a steady red light. The received sentence counts will increase whenever a NMEA sentence is received on an input port whether or not it is sent out via WIFI or directly to the output port. Sentence counts on the output port will only increment when sentences are actually transmitted on that port, either because a NMEA sentence has been received from a device connected via WIFI, or because the Send direct to Output is set to "Yes" for an input port that is receiving NMEA sentences.

The status page is static, so in order to update NMEA sentence counts on your screen, simply refresh the status page in your browser. The NMEA sentence count for each port is limited in size to 4,294,967,295. Once this limit is reached the count for that port will restart at 0.

Current Multiplexer State

This area provides the state of the multiplexer, and some information about what that state means in terms of operation of the multiplexer. The following states may be shown:

- **Ready** – The multiplexer is fully operational
 - NMEA sentences are being processed
 - NMEA sentence counts above will increase as NMEA sentences are received and processed
(*The status page is static; to see updated counts you must refresh the page*)
- **Setup is Required** – The multiplexer must have a password assigned using the "Setup" screen

- NMEA sentences are NOT being processed
- The multiplexer will not accept TCP connections to its NMEA TDP Port
- NMEA sentence counts above will not change
- **Not Connected to Remote WIFI** – The multiplexer is set up to connect to a remote WIFI, but has not been able to connect to that WIFI-connected
 - NMEA sentences are NOT being sent via WIFI
 - If input port data is being sent direct to the output port, it WILL be sent
 - The multiplexer will not accept TCP connections to its NMEA TCP Port
 - The multiplexer will continue to try to connect to the remote WIFI about every 10 seconds ***unless a device is connected to the multiplexer via WIFI***
 - NMEA sentence counts will increase as NMEA sentences are received and sent via the wired ports. *(The status page is static; to see updated counts you must refresh the page)*
- **Other** – The multiplexer was busy performing some other internal action. Reloading the status page will provide an updated status.

Remote WIFI

This section provides information about the status of the multiplexer’s WIFI connection to a remote WIFI host. For detail about remote WIFI connections, see the section [Connect to a Remote WIFI](#) in the setup page section of this document.

Current Protocol

This section shows the settings you have specified for protocol (TCP or UDP) and ports associated with the selected protocol.

Current Connections

This section provides information about the devices that are connected directly to the multiplexer via WIFI. The table includes the following columns:

Device ID – the internal device ID used by the multiplexer

IP Address – the IP address of the remote device used

Remote Port - if the current protocol is TCP then the table will contain this column. The value in this column reflects the port on the remote device that the multiplexer is using to send and

receive NMEA sentences. This port is assigned at random by the remote device when software on that device makes the TCP connection to the multiplexer. If there is no TCP connection then this value will be 0.

If the current protocol is UDP then the table will not contain this column.

Factory Reset

It is possible to reset the multiplexer to its factory defaults. (If you forget your password, for example, and can no longer change the multiplexer parameters!) To perform a factory reset do the following steps:

- power the multiplexer down
- push and hold the reset button located inside the cover to the left of the connector
- while continuing to hold the reset button power up the multiplexer
- continue to hold the reset button until the multiplexer beeps and the red light comes on (about 5 seconds)

The multiplexer will then be set to it's factory defaults and the LED will be solid red. After doing a factory reset you must set up the multiplexer and assign it a password before the multiplexer will process your NMEA data. The network name will be **nmea2wifi** and there will be no password.

NOTE: when you power up the multiplexer while holding the reset button, the LED will not be lit until the multiplexer beeps and the red light comes on. If the LED is lit before the beep, the button was not properly pressed on power-up and the multiplexer will not reset. Power down and try again.

Lights and Sounds

The following table describes the meaning of the various lights and sounds that are used by the multiplexer to notify you of unusual events. Under normal conditions, the multiplexer should not flash lights or make sounds unless you have taken some action like changing parameters.

Green steady	<p>The multiplexer is operating normally.</p> <p>NMEA data is being processed on all ports, NMEA TCP connections can be established, and the setup page can be accessed.</p> <p>NOTE: The “normal operation indicator” green LED can be turned off, so the multiplexer may be operating normally without any LED’s being lit.</p>
Red steady	<p>Set-up is required before normal operation can begin.</p> <p>You must connect directly to the multiplexer WIFI using default parameters to access the setup page and set a password.</p> <p>NMEA data is not being processed, NMEA TCP connections cannot be established.</p>
Alternating green and red	<p>The multiplexer has been set up as client on a remote WIFI, but has not yet connected to the remote WIFI. There are one or more devices connected to the multiplexer via WIFI.</p> <p>Computers can connect to the multiplexer and access the setup page. The multiplexer will not try to make a connection to the remote WIFI until all devices are disconnected</p> <p>NMEA data is not being sent via WIFI, but is being sent to output if input ports are sending their data there, NMEA TCP connections cannot be established.</p>
Green steady with flashing light red	<p>The multiplexer has been set up as client on a remote WIFI, but has not yet connected to the remote WIFI. There are no devices connected to the multiplexer via WIFI.</p> <p>Computers can connect to the multiplexer and access the setup page. The multiplexer will try to make the connection to the remote WIFI without intervention.</p> <p>NMEA data is not being sent via WIFI, but is being sent to output if input ports are sending their data there, NMEA TCP connections cannot be established.</p>
Red flash and beep	<p>An overflow occurred on one of the input ports which are set to 4,800 baud.</p> <p>The NMEA sentences that caused the overflow are discarded and the multiplexer will continue to process NMEA data.</p>
Purple flash and beep	<p>An overflow occurred on the input port which is set to 38,400 baud.</p> <p>The NMEA/AIS sentences that caused the overflow are discarded and the multiplexer will continue to process NMEA data.</p>
Blue flash and beep	<p>An overflow occurred on the output port.</p> <p>The NMEA sentences that caused the overflow are discarded and the multiplexer will continue to process NMEA data.</p>
Cyan flash and beep	<p>An overflow occurred on the WIFI input or output.</p> <p>We’ve never been able to make this happen in all our testing, and we tried hard, but it may be possible. The NMEA/AIS sentences that caused this will be discarded.</p>
Red pulsing and siren	<p>The multiplexer is locked and needs to be powered down and re-started. It will not accept connections, serve the setup page, or process NMEA data.</p>

Overflow Conditions

During normal operation, input port overflows should never occur. If you are experiencing overflows on the input ports, the most common cause is that the multiplexer is receiving data that is not properly formatted or corrupted. Properly formatted NMEA sentences cannot be longer than 79 characters, must start with \$, and must be terminated by the ASCII carriage return/line feed combination. AIS sentences are similar, but start with a ! instead. The line feed characters are used to define the end of the sentence, so if a line feed character is missing an error will occur.

Improperly formatted sentences may be caused by reversed data wiring between the NMEA device and the multiplexer, by data loss between the two devices, or by incorrect baud rates. Data loss can be caused by interference on the wires, broken wires, or poor connections.

A blue flash and beep indicates an overflow on the output port. The output port can operate at 4,800 baud; about 530 characters, or about 8 or 9 average-length NMEA/AIS sentences per second, or at 38,400 baud; about 3180 characters, or about 48 to 54 average-length NMEA/AIS sentences. All NMEA sentences that are sent from computers connected to the multiplexer via WIFI are forwarded to the NMEA output port. Additionally, you may have chosen to forward NMEA or AIS data from any of the incoming input ports directly to the NMEA output port too. If the combined number of NMEA sentences exceeds the capacity of this port, it will overflow. The only way to correct this is to reduce the amount of data being sent to the NMEA output port.

If you send AIS data to the NMEA output connection when the output port is not set to 38,400 baud, it will almost certainly overflow when AIS data is received because of the higher capacity of the high speed AIS connection and the fact that AIS data is usually received a few sentences at a time.

Legal

Suitability for your use

The Encoded Solutions NMEA-to-WIFI multiplexer is designed to pass NMEA0183 sentences between WIFI devices and wired NMEA0183 devices aboard your boat. There is no other implied purpose. The reliability of the transmission of data between devices connected to the multiplexer is subject to a multitude of factors which can cause the multiplexer to fail to pass any or all NMEA sentences to or from devices that are connected to it at any time. We neither claim nor imply that this device is suitable for any particular application; it is entirely up to you to determine whether or not this device is suitable for your particular application.

Software Copyright and Licensing

The multiplexer contains copyrighted software. You may not copy or reproduce the copyrighted software in any form. In addition to the copyrighted software, the Encoded Solutions NMEA-to-WIFI multiplexer utilizes the avr-libc software libraries in an unmodified format.

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Additions and corrections to this file are welcome.

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FCC Statement

The Encoded Solutions NMEA-to-WIFI multiplexer contains the WIFI module FCC ID: 2AC7Z-ESPWROOM02. The following statement relates to this WIFI module only.

This device has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This device generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this device does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- *Reorient or relocate the receiving antenna.*
- *Increase the separation between the equipment and the receiver.*
- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*
- *Consult the dealer or an experienced radio/TV technician for help.*

Any changes or modifications to this device not expressly approved by Espressif may cause harmful interference and void the user's authority to operate this module. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This device complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

This device must not be co-located or operating in conjunction with any other antenna or transmitter.

