

# Wi-Fi Remote Antenna Switch & Power Meter (WAS6)



## Features

- Six to One coax switch. Unused ports are grounded.
- Power handling 2000W at SWR < 2.
- 1.8MHz to 54MHz, SWR < 1.15, Isolation 1.8-30MHz >60dB, 53dB on 50MHz
- 2.4GHz WiFi 802.11n network interface. Typical coverage ~100m.
- WEB server that can display operating frequency, choose available antenna on that band, displays transmitting power and SWR on PC/ MAC or tablet. WEB page is fully customizable.
- Tandem Match Power / SWR sensor inside, rated up to 2000W.
- Hot-switching protection. Switching request while transmitting will be postponed.
- Power requirement: 10-16VDC / 0.3A. through coax cable or locally.
- Listens to RadiInfo UDP packets sent by N1MM+, DXLabs and other logging software to extract radio operating frequency and select antenna. Can be used with any radio that can be interfaced to those loggers.
- Connects directly to Flex 6x00 series radio and follows transmit frequency. Can be used remotely without PC.
- Provides a fast *websocket* interface for *Node-RED* integration.
- Aluminum enclosure. Can be mounted on a wall or mast (25 to 50mm diameter).
- Dimensions (enclosure) 7.25 x 4.75 x 2.25in (187 x 120 x 55mm)

# 1 Setup / Installation

WAS6 can be mounted on a wall or a tower / mast / pipe with up to 52mm diameter by using provided clamps.

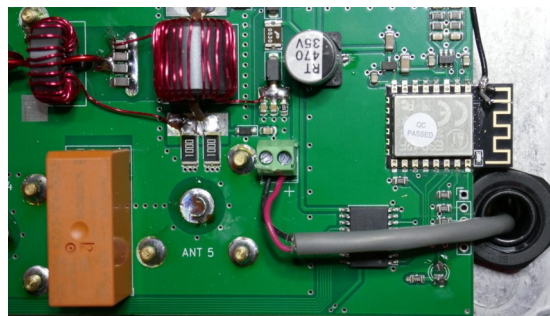
WiFi coverage in free space can reach up to 100m, similar to a smartphone.

When mounted outside, all coax connectors needs to be waterproofed.



Power supply requirements for WAS6 are 10Vdc to 16Vdc, current draw is 0.3Amax.

Power can be provided remotely, trough the coax cable using Bias-Tee DC Power Injector like a MFJ-4117.



Alternatively power can be provided locally.

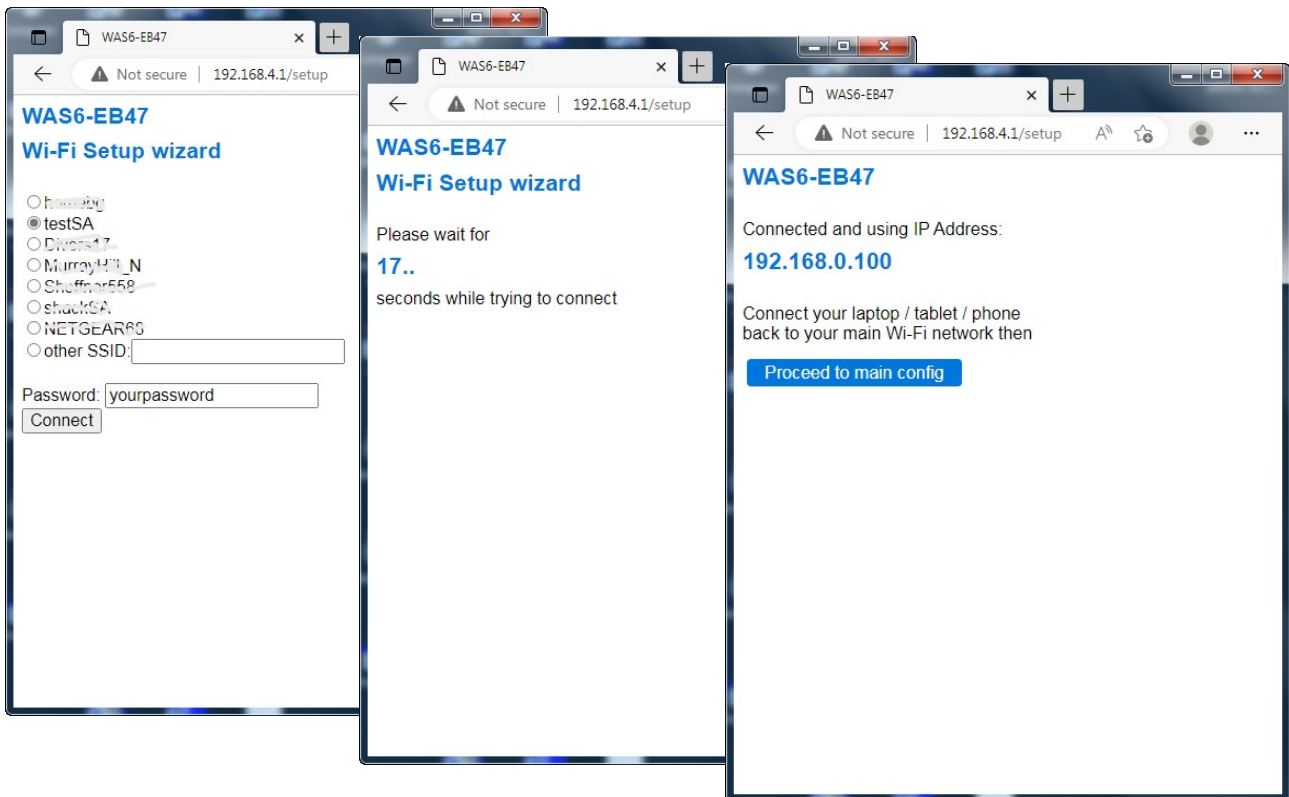
Open the cover by removing 6 screws, route power cable trough the strain relief grommet and connect it to the terminals.

## 2 Wi-Fi Setup

WAS6 can be set and operated in two modes:

**Access point (AP)** mode will provide access to a Wi-Fi network with DHCP for up to 5 devices. You can connect your device (laptop / tablet / smartphone) to operate while portable or use it to enter credentials to your existing Wi-Fi network. LED blinks once per second to indicate AP mode.

In **Station (STA)** mode WAS6 will connect to an existing 2.4GHz Wi-Fi Access point and network using DHCP or fixed IP address. You need to enter name (SSID) and password (key) of the network you wish to connect. When connected, LED blinks twice per second. If it can't establish the connection, it will switch to **AP** mode, while trying periodically to reconnect.



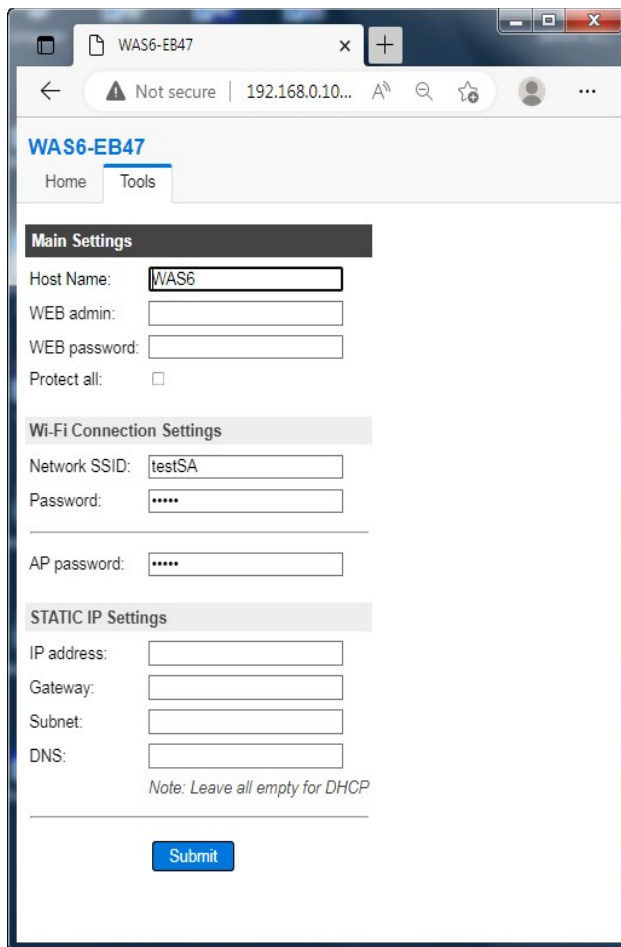
When started for the first time WAS6 will be in **AP** mode. Connect your laptop / tablet / smartphone to a Wi-Fi network named **WAS6-xxxx**, using password **2config4**, then open a browser and go to IP: 192.168.4.1/setup.

WAS6 will scan for Wi-Fi networks and present a list.

Select the desired network or write its name, enter the password and press Connect.

After establishing the connection, a page with the new DHCP assigned IP address will be present.

Connect your laptop / tablet / phone back to the same Wi-Fi network and press the button to connect and continue to main configuration page.



**Host Name** field is used to identify this device into the network. Host name in your network, Network SSID in AP mode. Max. 26 chars, no spaces.

**WEB admin** and **WEB password** – locks access to the WEB interface with an username and password. Leave it empty for free access.

**Protect all** – the /switch page can be left unprotected and used without knowing the WEB admin password.

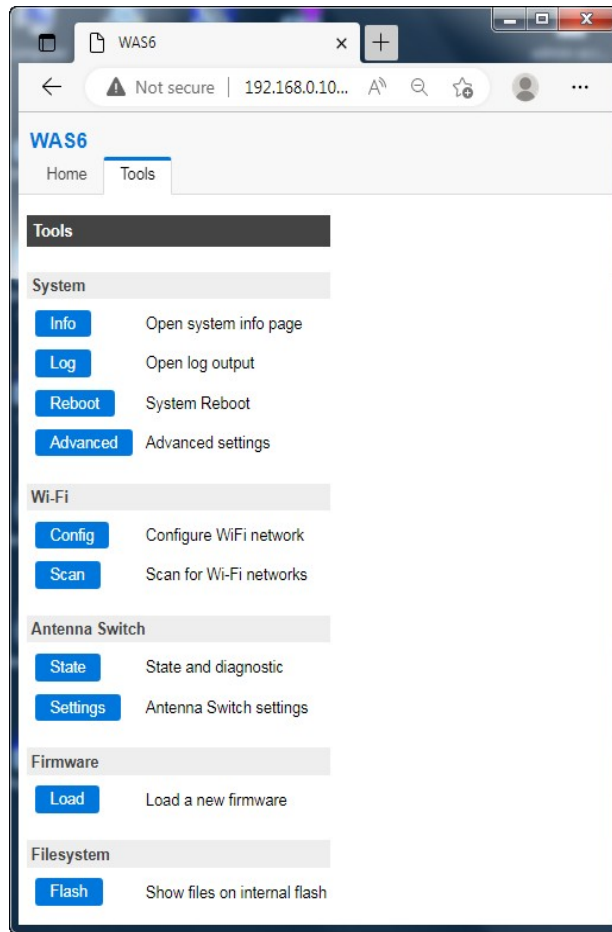
**Network SSID** – name of the network to connect to in STA mode. Leave it empty for AP mode.

**Password** – STA mode password (key). Minimum 8 chars.

**AP password** – access point mode password. Default is 2config4. Minimum 8 chars.

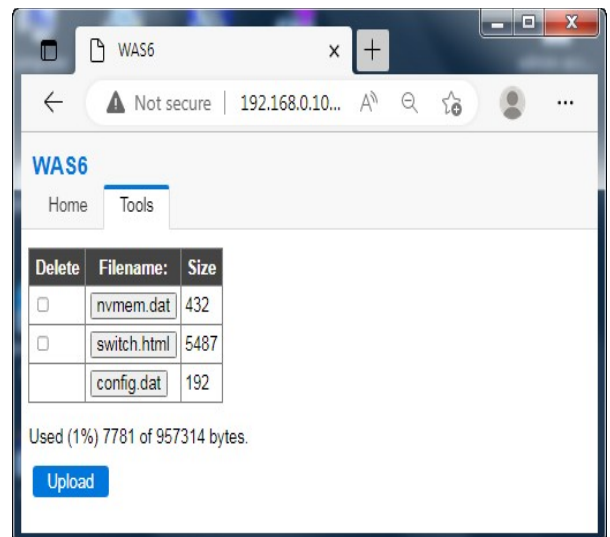
**Static IP Settings** – fill-out this section to use fixed IP address and restart. Leave it empty to use DHCP dynamically assigned IP address.

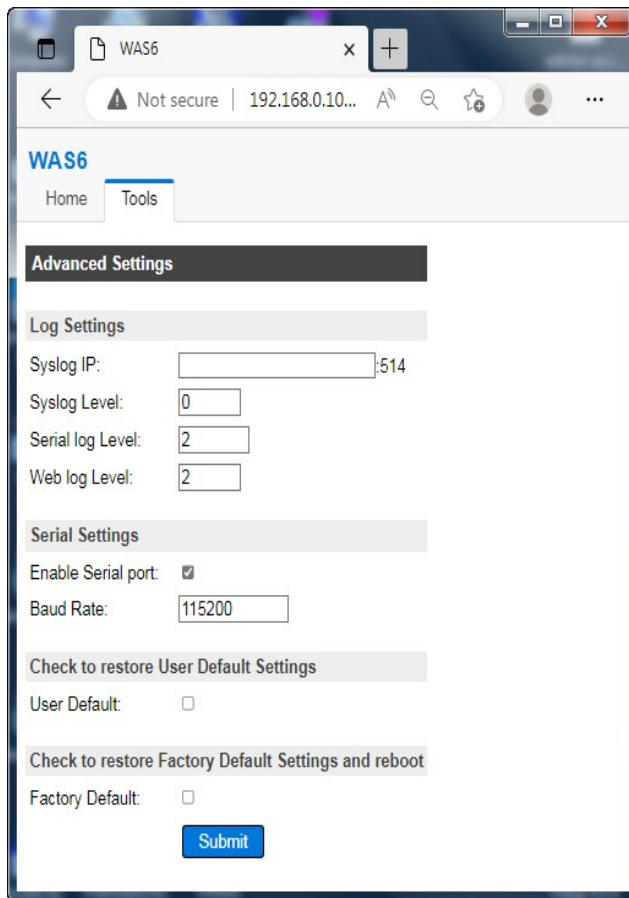
Tools tab reveals access to other pages and settings.



Firmware can be updated by uploading it through WEB interface. Suspend other communications before starting the update. Major updates can clear User Settings to their defaults.

Files can be stored the internal flash file system and downloaded trough the WEB interface. Click on the file name to download. File will be deleted if the box is checked.





**Syslog IP** – UDP log messages can be send to this address on port 514

**Syslog Level** – [0..4] 0 – no messages send

**Serial log Level** – [0..10] Serial port messages level: 1= only errors, 2= +info, 3= +debug1 4= +debug2

**Web log Level** – [0..4] Web interface ToolsLog messages level.

**Enable Serial port** – output program status and debugging information at specified **Baud Rate**.

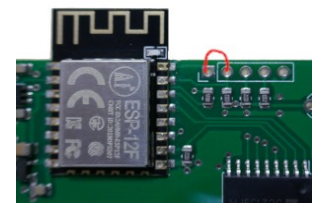
**User Default** – restore all user settings to their defaults.

Will not disconnect or change Wi-Fi network name and password.

**Factory Default** – restores all User Default settings, re-formats file system and clears Wi-Fi network name and password. System will reboot in Wireless Access Point mode.

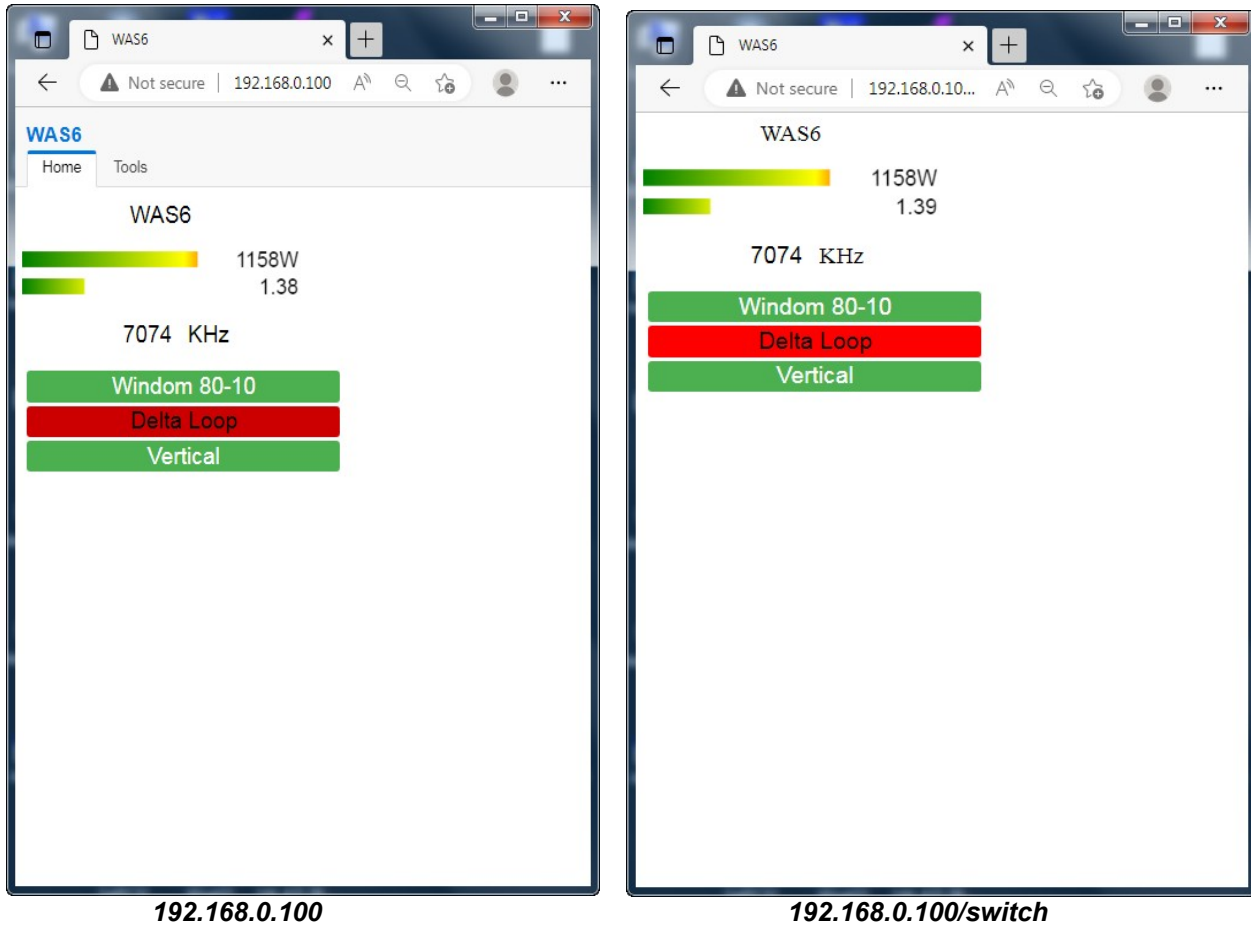
If WEB interface is not accessible, factory defaults can be restored with a jumper:

- turn off power and place a jumper between two pads as shown
- turn power on. When the blue LED starts to rapidly blink remove jumper
- wait about 30-40 sec, the LED should begin to slowly blink.
- module is reset and ready in Wireless Access Point mode.



### 3 WEB Interface

The WEB Interface serves the file *switch.html* as default page with menu toolbar that can be password protected or at *your-ip/switch* without menu tab.



Displayed is the transmitting power, SWR, operating frequency and defined antenna selections for that band.

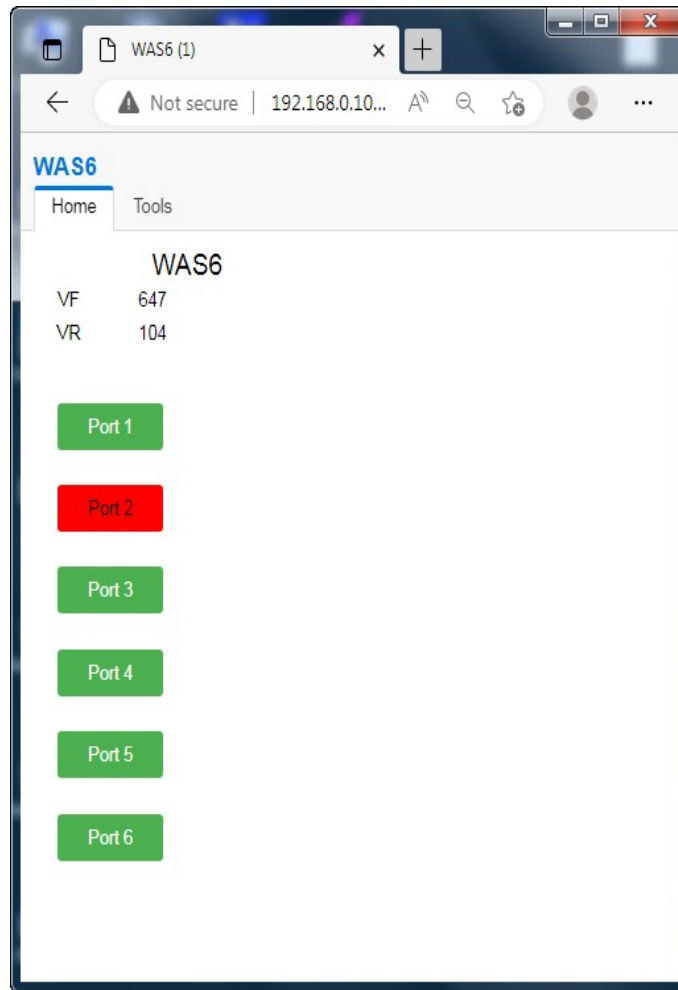
Click or touch to change antenna. Antenna changing request while transmitting will postponed and executed after there is no transmitting power.

Each WEB page uses *websocket* for fast updates that can be adjusted down to a 200ms refresh rate.

Interface can be customized by editing *switch.html* and uploading it to the Flash File system to change styles and color.

WAS6 will serve any file uploaded to the Flash File file system.





**192.168.0.100/state**

This WEB page is accessible from Tools > State or by entering *your-ip/state*.

It's used for diagnostic and functional test.

VF shows the Forward power and VR shows the Reflected power as voltages read by the 10bit ADC in 0 to 1023 range.

Click or touch will toggle the corresponding antenna relay.

WEB request for *your-ip/state.html* will serve this page, without the menu tabs.

This WEB page uses *websocket* that can be used for Node-RED integration. Description is in the technical reference section.



## 4 Configuration

The screenshot shows the WAS6 configuration page in a browser. The page title is 'WAS6' and the URL is '192.168.0.100/settings'. There are two tabs: 'Home' and 'Tools'. The 'Tools' tab is active, showing the 'Antenna switch Settings' section. This section includes several input fields: 'WEB update time [msec]' (500), 'Power meter calibration' (0.0028), 'Transmit power sense [W]' (5), 'ADC offset' (0), 'UDP RadiInfo port' (0), 'RadiInfo antenna select' (checkbox), 'FlexRadio name' (ShackSA), and 'FlexRadio state' (Connected 0 days 0 hours 20 minutes). Below these settings is a table with 7 columns: 'BANDS', '1 Windom 80-10', '2 Delta Loop', '3 Vertical', '4 Mosley MP-33', '5 Antenna #5', and '6 Antenna #6'. The table contains 15 rows of frequency bands with checkboxes for each antenna type. A 'Submit' button is located at the bottom left of the table area.

BANDS	1 Windom 80-10	2 Delta Loop	3 Vertical	4 Mosley MP-33	5 Antenna #5	6 Antenna #6
1800 to 2000 KHz	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3500 to 4000 KHz	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5330 to 5407 KHz	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7000 to 7300 KHz	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10100 to 10150 KHz	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14000 to 14350 KHz	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18068 to 18168 KHz	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21000 to 21450 KHz	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24890 to 24990 KHz	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28000 to 29700 KHz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
50000 to 54000 KHz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0 to 0 KHz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0 to 0 KHz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0 to 0 KHz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0 to 0 KHz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0 to 0 KHz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Web interface update time** defines how fast the Web page is updated. Default is 0.5 second.

**Power meter calibration** calibrates the 10bit ADC readings for each transceiver for Power and SWR readings calculated by formulas: Forward power =  $V_f^2 * C$  and Reflected power =  $V_r^2 * C$

**Transmit power sense (watts)** If WAS6 detects any power level greater than this setting, it will consider the station to be transmitting, displaying power/SWR meters and enable hot-switching protection.

**ADC offset** 0 means automatically to calibrate ADC on power-up.

**UDP RadiInfo port** is where N1MM and DXLabs sends radio status data. Default is 12040.

See [N1MM External UDP Messages](#) page how to setup.

**RadiInfo antenna select** Check it to allow N1MM+ to change antenna selection with Alt-F9.

**FlexRadio name** Enter the FlexRadio Name of your Flex 6x00 transceiver you want to connect too. WAS6 will follow the transmit frequency.

The Table is used to define a **band** segment's start and end frequency. Set check mark under each **Antenna Port Name** to define which antenna is available on each band segment.

## 5 Technical reference

WAS16 has *websocket* server that is used by *state.html* to display and control available resources. JavaScript code in *state.html* is a good reference and can be used for testing and as base for mod's.

WEB page can be opened locally, without uploading it into the WS16 file system.

Edit the two lines of code, including your WS16 IP address:

```
var wscURI = 'ws://192.168.0.100/wsstate';  
//var wscURI = 'ws://' + location.hostname + ':' + location.port + '/wsstate';
```

Open the modified file in your WEB browser.

Edit and save *html* file and refresh browser to see the modified page.

Data between Server and Client is exchanged in JSON format.

### **/wsstate status update (Server to Browser)**

This JSON is send to all clients every update interval.

```
{  
  "pwr":1158, "swr1":"1.38",      // Transmitting power and SWR  
  "khz":7047,                    // radio TX frequency  
  "out":[0,1,0,0,0,0],          // Port 2 is ON.  
  "vf":598,"vr":119,            // Forward and reverse analog inputs.  
  "txing":1                      // TX state.  
}
```

This JSON is send to all clients on event of frequency change or antenna selection.

```
{  
  "alist":["Window 80-10","Delta Loop","Vertical"], // Array of antennas available  
  "aidx":1 // index of the antenna selected  
}
```

### **/wsstate commands (Browser to Server)**

```
{  
  'outs':2, 'outc':1, // set(ON) Antenna#2, clear(OFF) Antenna#1  
  'qsy':14222, // change frequency . Connected radio can change it back  
  'antn':3, // select Antenna#3  
  'aidx':0, // select first antenna from the list of available on the band  
  'utime':200 // change status update interval in msec.  
}
```

Each command can be send separately or grouped together.