AOR®

AR-DV1 Tablet App Interface

Small size communication device with WIFI enabled Web API

(Requires AR-DV1 firmware 1903A or newer)

Quick start guide

First edition
2019.04

AOR Ltd.

Authority On Radio Communications

1. Introduction

- This product is a WEB API operated single board computer device set-up to operate the AR-DV1 receiver in VFO mode. Included are: RPI 3B+ with case, AC adapter, SD card containing the special operating system, USB audio adapter, USB cable, user manual, Web API documentation. Source code available on Github.

- With the supplied webAPI you can control the AR-DV1 and listen to the received audio, through your tablet's web browser. This system is limited to a 1 receiver / 1 client configuration.

- Network-related functions

    1. Wireless LAN access point function (WPA2, passphrase authentication). You can connect your tablet directly to the adapter device.

    2. Wired LAN connection function (DHCP client). You can connect to an existing wired LAN with DHCP service.

    3. Wired LAN network sharing function
        By connecting the wired LAN port to the Internet, you can connect to a time server while the device is connected to the receiver through WIFI. It is possible to connect to a server different than a time server, however unlike with dedicated equipment, high-speed communication is not recommended in that case.

    4. Wired LAN port access control function (password authentication)
        The client terminal that connects to the wired LAN uses password authentication when using the Web App.

- Receiver Clock setting function
    Possibility to sync the receiver's clock to the tablet clock.

- The web app has been confirmed to work on ipad Safari, Amazon Silk and Android Chrome (*) in their latest version of 2018.

    (*): The built-in sample web app is limited in screen size and is not recommended for use on smartphones, Android tablets, or Kindle Fire tablets.

- For web app developers
  The supplied web app allows web app developers to easily create a control app for AR-DV1 even if they are not familiar with the receiver's serial communication port control commands. However creating web apps requires knowledge such as HTML5, CSS, JavaScript, jquery, or jquery Mobile.

  You can also create your app to fit various screen sizes.

  For details regarding receiver commands, please refer to the AR-DV1 command list manual.

  As you will be using JavaScript environment node.js on the server-side, you need to be familiar with the Raspbian operating system environment for feature changes and additions.

  AOR Ltd. will provide no technical support for the creation of web apps.

- External web app hosting
  The web app html and javascript files location is not limited to the RPI, and can be hosted on another network's web server capable of simultaneous communication between the RPI and the tablet.

- Instruction manuals, WEB API technical documents
  This documentation is available for download at www.aorja.com .

● Features overview

1	Network connection and authentication	・Wireless access point	Tablet and other devices can be wirelessly connected, using WPA2 passphrase authentication DHCP server function (wireless port only)
		・LAN connection	Connect to an existing LAN, DHCP client function (wired LAN port only) WebAPI access Control (CORS), password authentication
2	Wired LAN connection sharing function	・By connecting the wired LAN port to the Internet, you can connect to a time server (such as NTP) while the device is connected to the receiver through WIFI.	
3	VFO mode operation	・See API list	
4	Features of the sample web app	・Frequency tuning ・Settings	Frequency input by number keys on the web app, and change frequency per step (1x, 10x) Receiver power on/off, volume, squelch value, demodulation mode, IF bandwidth, frequency step, step-adjust, CTCSS, DCS, D-CR (NXDN) 15 bit descramble code、digital signal info on/off, basic spectrum display(span, IF bandwidth, signal level detection latency)
		・Log ・Spectrum ・Waterfall ・Set receiver time	Receive log display Simple spectrum display (0.4-10 MHz bandwidth). Audio disabled during spectrum display. Simple waterfall display (0.4-10 MHz bandwidth). Audio disabled during waterfall display. Receiver clock is synced to the tablet clock during operation (corresponds to the time zone of the terminal)
5	Sample web app system management functions	・Settings	Changing the password while connected via wired LAN Wireless adapter information display (MAC address, IP address) Wireless adapter configuration changes (wireless LAN channel, country code, SSID, passphrase) Ethernet adapter information display (MAC address, IP address)
		・Shutdown ・Reboot ・SSH	Shutdown of the adapter device (imperative before power disconnection) Reboot of the adapter device (imperative after system changes) Enable/disable the SSH function of the adapter device

2. Table of contents

- Safety precautions
  Please refer to "Raspberry Pi safety instructions and quick start guide" for the computer that is included in this product.

3. Scope and technical data of this document

This document explains how to setup and operate the AR-DV1 Tablet App Interface, of which function is to control the AR-DV1 and listen to the received audio, through your tablet's web browser.

If you wish to create a web application using the Web API of this adapter device, please refer to the technical information available at the following addresses:
www.aorja.com/receivers/ar-dv1tai.html
www.aorja.com/receivers/ar-web-api.html

4. Supplied items

| 1	16GB SDHC card	1	Contains the special operating system "AR-DV1 Tablet App Interface"
2	Single board computer	1	Raspberry Pi 3 Model B+
3	Case	1	Specific to this single board computer
4	USB audio adapter	1	Audio codec: C-Media HS-100B
5	AC adapter	1	DC5V 2.5A, AC100〜240V(50/60Hz) with microUSB plug
6	USB cable	1	USB A (Male) – Micro B (Female) Left L-type
7	Audio cable	1	3.5mm Stereo, L-type
8	Safety guide	1	Raspberry Pi SAFETY INSTRUCTIONS AND QUICK START GUIDE
9	Quick start guide	1	Printed

5. Network connection methods

1. Your tablet can use a direct wifi connection (WPA2, passphrase) with the adapter device. The AR-DV1 receiver clock is automatically synced to the clock of the tablet device, when the web app is connected.
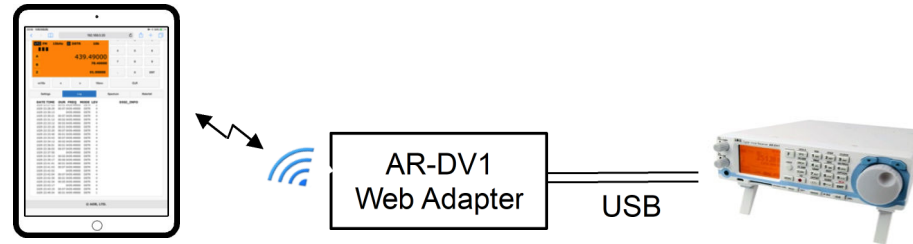
2. Through the web adapter device, your tablet can synchronize time with a time server on Internet.
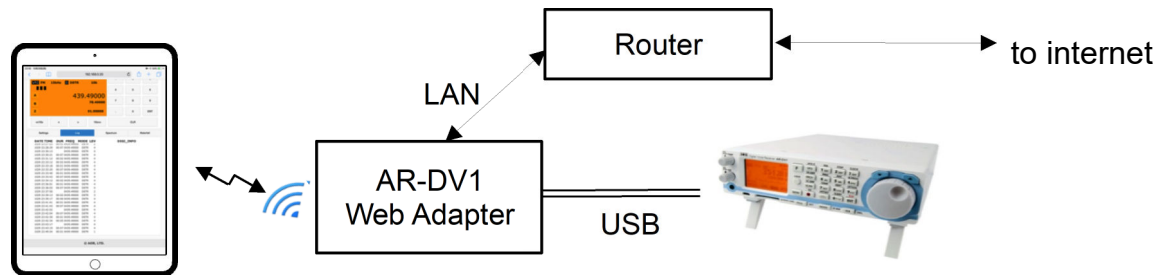
3. Your tablet is connected to your router's wifi. The web app uses password authentication when connecting to the API.

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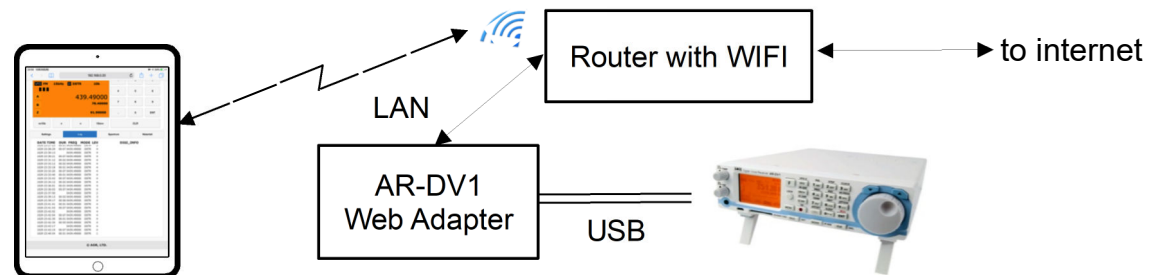
6. What to do before use

○ Following items are required, in addition of the supplied items:

- One AR-DV1 receiver connected to a power supply and an antenna suited for the bands you want to receive.
- One tablet PC with wifi, such as an ipad.

The supplied web adapter (RPI) requires one AC power outlet.
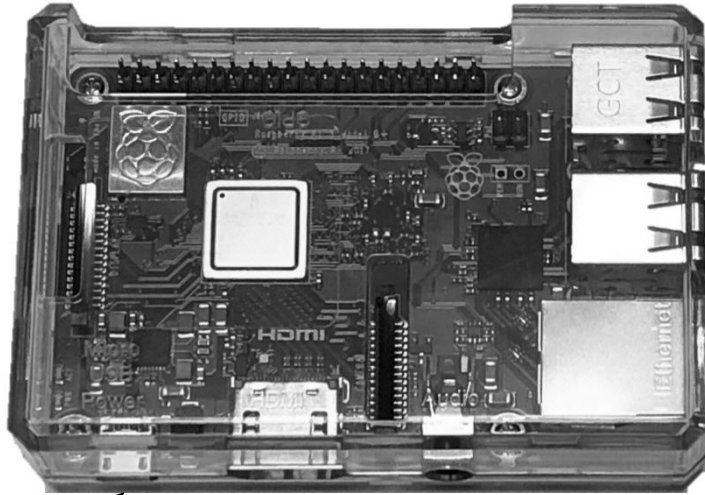
○ Might also be required, depending on your type of use:

When connecting the web adapter to Internet, through LAN.

- A router with an available LAN port（Router capable of automatic IP address assignment via DHCP. You also need to assign a fixed IP to the MAC address of the RPI. Refer to your router's manual for instructions.）
- One LAN cable (RJ45 connector, Cat5 or higher)

7. Description of supplied hardware

Single board computer (top)

USB audio adapter

Green: Audio out (unused)

Pink: Audio in

4 USB sockets
(only 2 used)

LAN socket (only used when connection
to your router is required)

MicroUSB socket for power
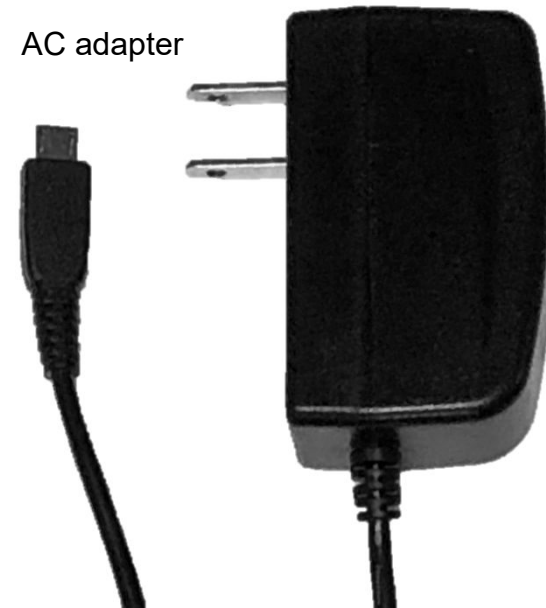
Other ports unused

Single board computer (bottom)

AC adapter

SD card slot for
operating system
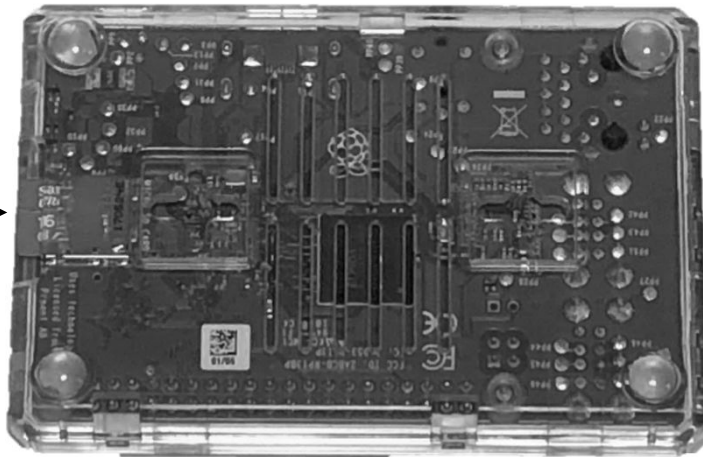
Note: The color of the supplied case is different than depicted.

Note: Pin shape might vary depending on the world zone.

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8. How to connect the hardware

Audio cable

From AR-DV1 front panel's PHONES socket

USB audio adapter

Single board computer

USB (top)

USB (bottom)

To pink audio input

From AR-DV1 front panel's micro-USB socket

USB cable

LAN socket. Connect to your router if required. LAN cable not supplied.

Power (MicroUSB)

Other ports unused

From AC adapter

Connect the AC adapter to a power outlet only after all other hardware has been connected, as the single board computer will boot into its operating system immediately after power is applied.

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□ Single board computer to receiver connections

Note:
Do not touch the pins on top of the PCB
Do not obstruct the case openings as these are required for heat dissipation.

Audio cable

USB cable
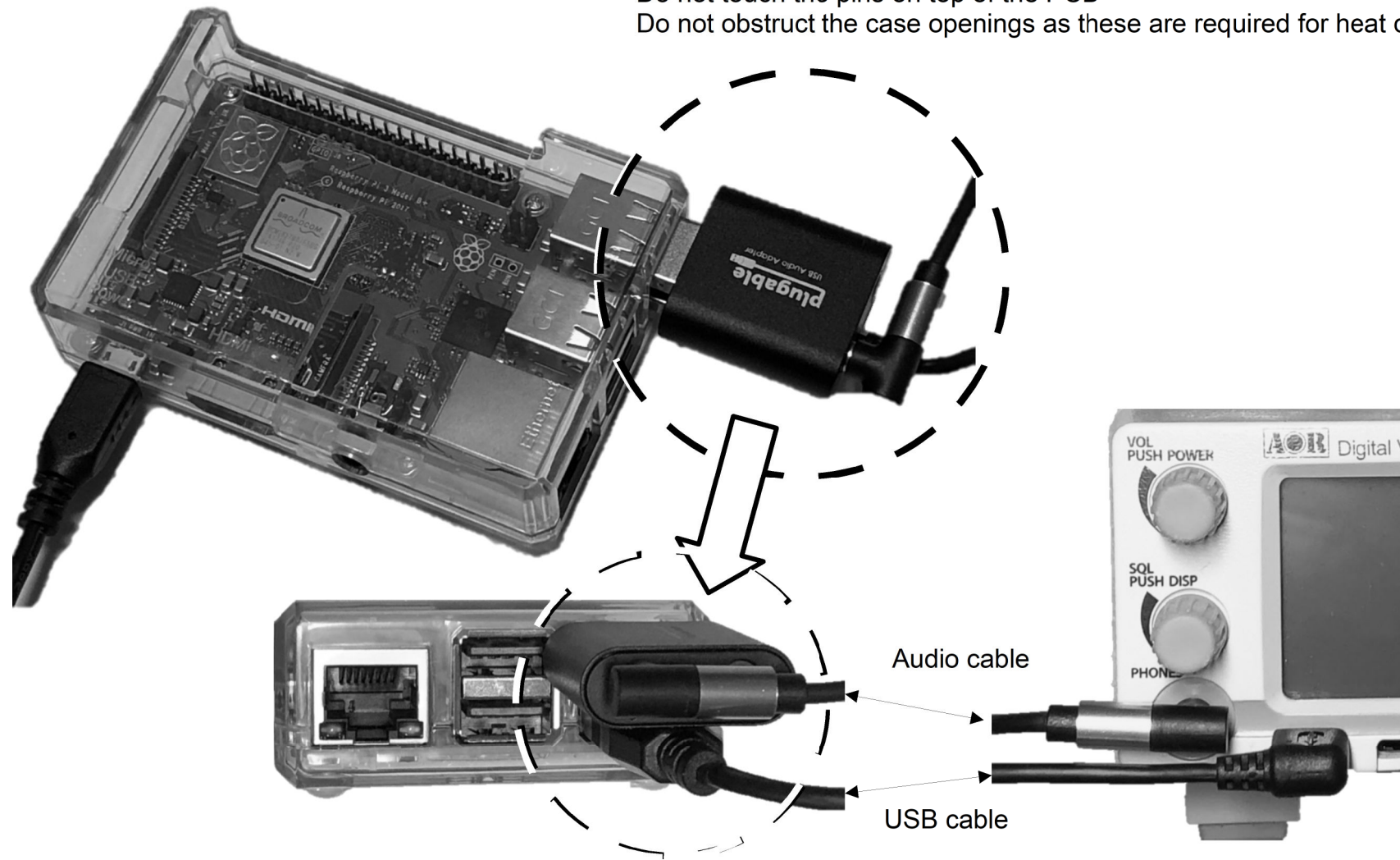
9. Default connection details

For increased security if necessary you may change the following values during initial setup.
#1, 2 and 6 can be modified in our sample web app under ADAPTER SETTINGS, Menu > Settings.

	Item	Default values	How to access
1	Wireless network SSID	AR-WEB-RECEIVERXXXX XXXX depends on the device and corresponds to the last 4 digits of the MAC address.	Your tablet's settings＞Wi-fi Then find and connect to the desired SSID.
2	Wireless network passphrase	arwebreceiverXXXX XXXX is the same than XXXX in your SSID.	Displayed on the SETTINGS page of our sample web app.
3	Wireless connection URL	http://192.168.0.20:3000/receiver.html	Same for all devices.
	The settings below are only used when your tablet connects to the interface via your router (and the interface is connected to the router via LAN). Check and change if necessary.IP address is automatically assigned by the DHCP server		
4	LAN (Ethernet) port MAC Address, IP Address	IP address is automatically assigned by the DHCP server (note 1)	Displayed on the SETTINGS page of our sample web app.
5	URL when connecting from LAN	http://nn.nn.nn.nn:3000/receiver.html nn.nn.nn.nn is the IP address on your LAN	IP address as in #4.
6	Login and password when connecting from LAN	arwebreceiverXXXX	XXXXis the same as XXXX in SSID as in #1.
	The settings below concern the interface's wireless device. It is necessary to comply to the laws of your country.		
7	Wifi Channel	1CH (2.4G)	Displayed on the SETTINGS page of our sample web app.
8	Channel settings as per country code regulation	ISO/IEC 3166-1 country code (2 letters). See note 2.	Displayed on the SETTINGS page of our sample web app.

Note 1: You can also assign a fixed IP to the MAC address of the RPI. Refer to your router's manual for instructions.
Note 2: Country codes are for example: FR for France, GB for the UK, US for the USA. For other Alpha-2 codes as per ISO/IEC 3166-1, please check https://www.iso.org/obp/ui/#search/code/

10. Power supply

1. Turn the power on

    1. After connecting the device to the receiver, insert the AC adapter in a power outlet.

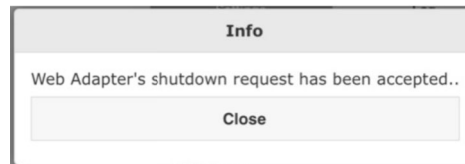   <div style="border:1px solid black; display:inline-block; padding:4px;">Insert in power outlet</div>
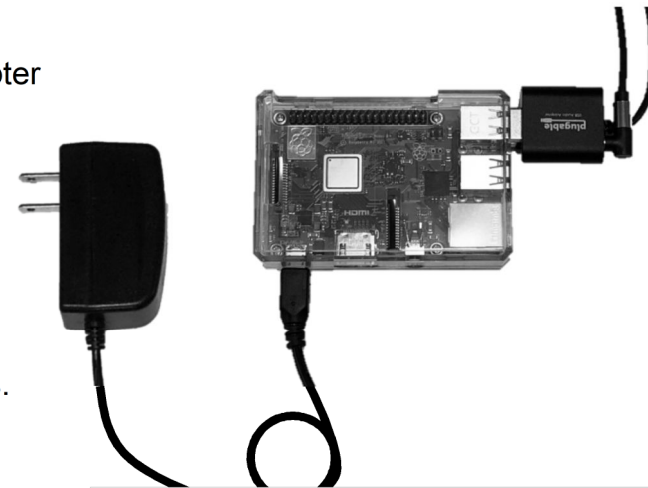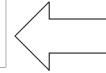
    ○ The device will immediately start the boot and wifi connection procedure. It will be complete and ready to use after 60 seconds.

2. Shut down and power off

    ・Before disconnecting power, it is imperative to shutdown the device first, as described below:

    1. In the sample web app, [Menu] > [Shutdown].

    ○ This confirmation window will appear and the shutdown procedure will be completed after 10 to 20 seconds.

    Info

    Web Adapter's shutdown request has been accepted..

    Close

    ・Finally, click [Close].

    192.168.0.20

    AR WEB RECEIVER   Menu

    ADAPTER

    Settings

    Shutdown

    Reboot

    AOR Digital Voice Re

    VFO FM   15k

    B Level

    A

   2. Remove the AC adapter from the power outlet. (There is no switch to turn the power off.)

    * This device is a computer therefore if you turn off the power during operation, the files in the boot media may be corrupted.

    * If the device and receiver are not connected, the shutdown procedure may not work.

    * If the shutdown is not accepted, stop the connection from your tablet and turn off the power of the device.

11. Access the device

Warning：Do not use the boot media originating from another device setup previously, as the IDs and network information will be different!

1. Using your tablet, connect to the device's wireless network.
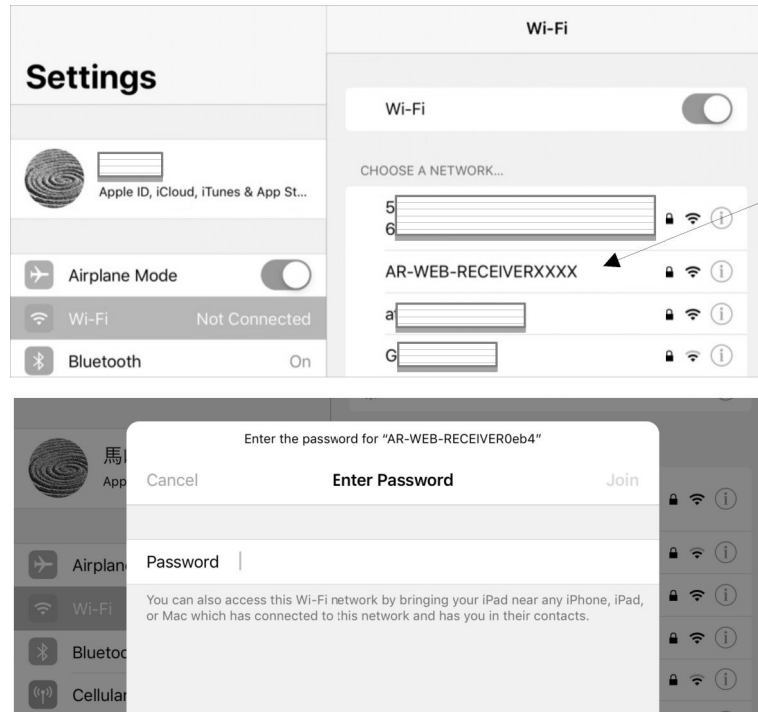
-   From the list of nearby SSIDs, find and connect to
    AR-WEB-RECEIVERXXXX

    (XXXX corresponds to the last 4 digits of the device's MAC address.)

    For example: XXXX = 0eb4

-   The password format is as follows:

    arwebreceiverXXXX

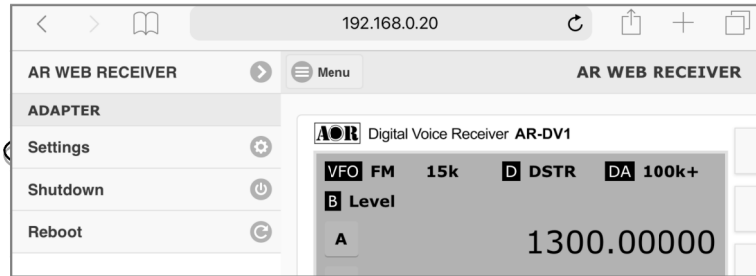   XXXX being he last 4 digits of the device's MAC address.

    For example with XXXX = 0eb4, the password would be:

    arwebreceiver0eb4

2. Input http://192.168.0.20:3000/receiver.html in the tablet's browser to open the sample web app AR WEB RECEIVER.
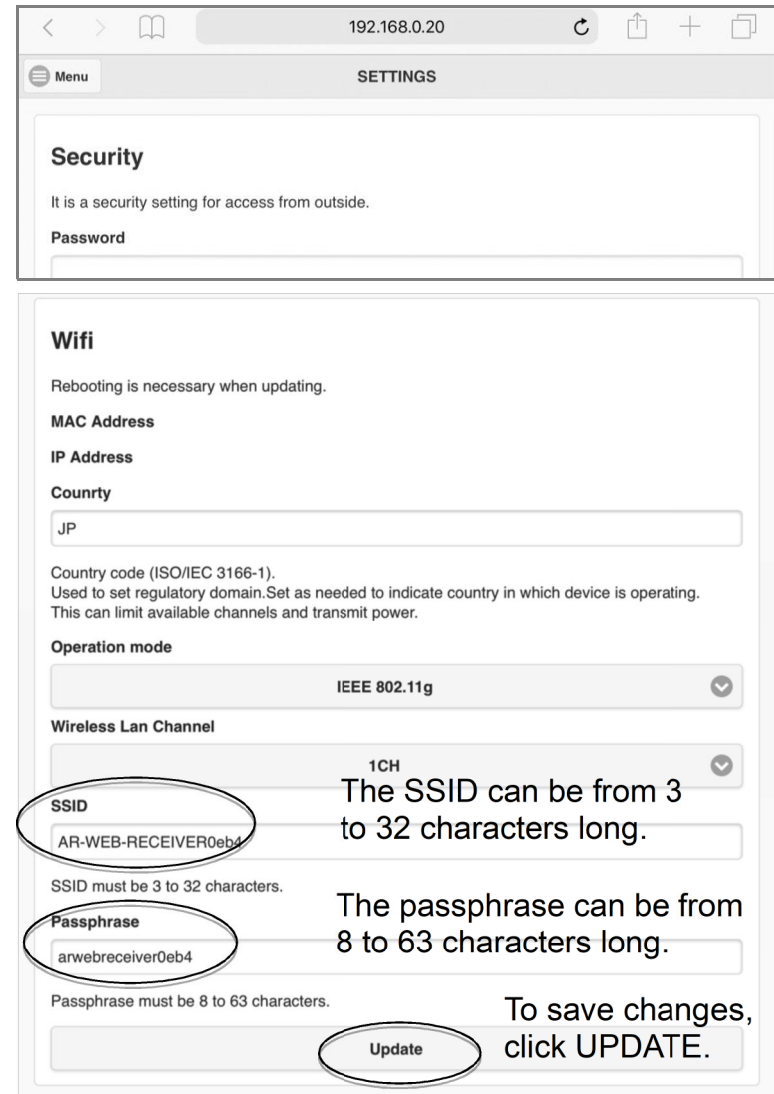
3. On the sample web app go to [Menu] > [Settings] to open the ADAPTER-SETTINGS page.

4. Wifi settings can be modified here. A device reboot is necessary to reflect the changes.

- We recommend that you change the SSID and passphrase from the default, for improved security.

- In case the currently used wifi channel is congested, you can switch to another channel.

Important: To comply to your country's regulations on wifi channels, it is imperative that the set country code matches the location where the device is to be used.

The SSID can be from 3 to 32 characters long.

The passphrase can be from 8 to 63 characters long.

To save changes, click UPDATE.

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5. If you use a wired LAN connection:
It is recommended that you change the password in the security column of the SETTINGS page.

Enter your new password in the PASSWORD field and again in the PASSWORDCONFIRM field, then click UPDATE. The current password will not be displayed.

The password must be at least 8 characters long. The characters which can be used are listed at the bottom of this window.

Re-enter the same password for confirmation

To save changes, click UPDATE.
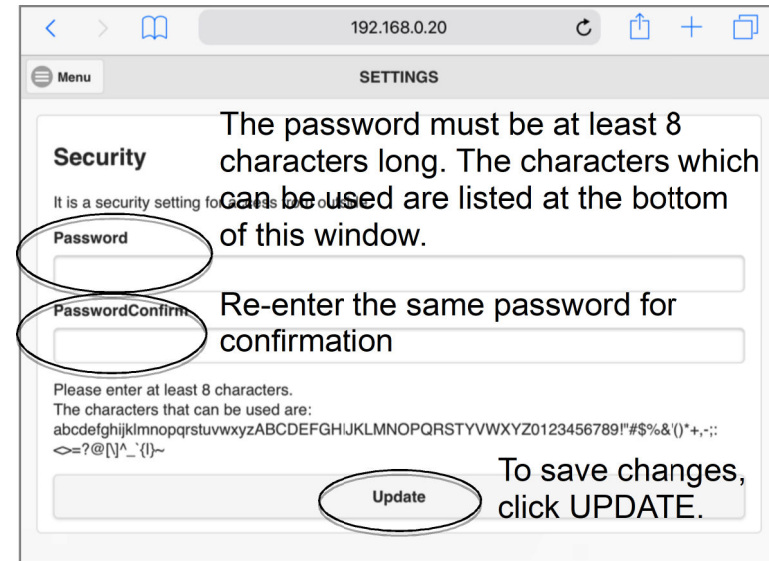
6. To connect from your tablet while the device is connected to the router via LAN, you will need to know the device's MAC address as displayed in the Ethernet section of the SETTINGS page.

- To secure the IP address of the device's LAN port, use the device's MAC address information to assign a fixed IP address via your router's DHCP server function.

- The IP address information displays the IP address that is currently assigned. If LAN is not connected when the device is started, no IP address will be displayed.

This MAC address of the LAN port of this device.

The device's IP address assigned to its LAN.
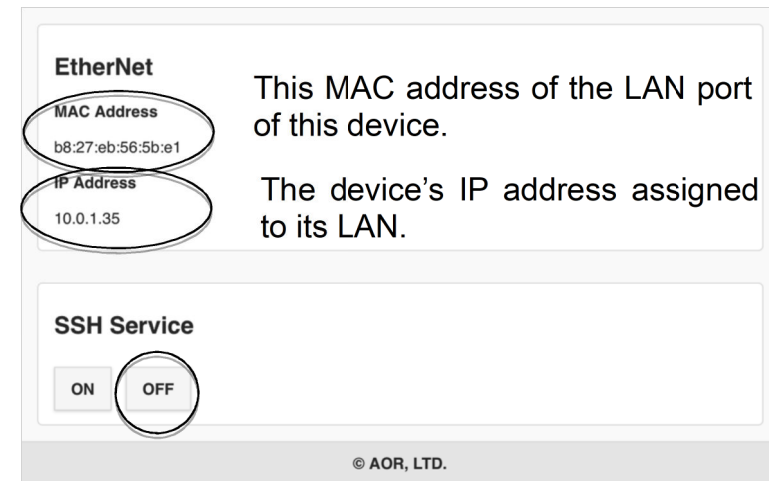
7. Click SSH Service "OFF". (The current state is not displayed.) (Default OFF)

- SSH service allows to log into this device remotely, and to execute commands. As it is not needed for this system, it is recommended to let it OFF.

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8. Go to MENU > REBOOT to reflect the changes.

    ○ The INFO window indicates that the reboot request has been accepted.

    ・Click the CLOSE tab.
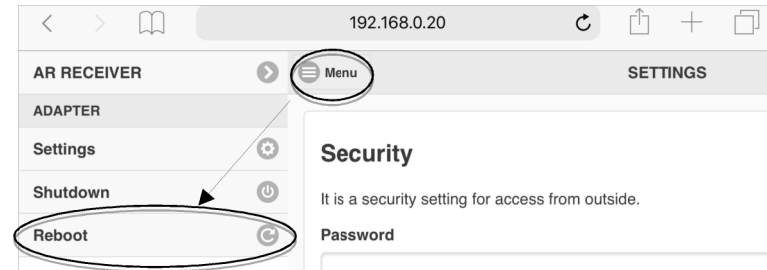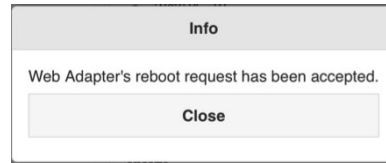
9. After reboot, make sure that you can connect from the tablet with the new connection settings.

12. How to use the sample web app

Note: Do not reload your web browser page while in communication with the receiver, or the communication and currently used settings will be lost.
Password authentication is only required when accessing the device through a router.

1. Access the sample web app with your tablet's web browser, with the address http://192.168.0.20:3000/receiver.html
2. To connect to the receiver, click on POWER ON to turn it on.
    ○ The web app connects to the receiver and turns the receiver on and into remote mode. (This operation is required for the connection even if the receiver is already turned on.)
    ○ The receiver starts and can be operated (From receiver off to on state, it takes about 20 seconds.
    ○ At start-up the receiver time will be synced to the tablet's time. （The web app will check and synchronize the time every hour.)
3. You can operate the receiver in VFO mode.

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☐ Receiver control panel

VFO-A / B / Z switch

Frequency tuning:
   Frequency step
   < lower （<<10x 10 times）
   > higher （10x>> 10 times)

☐ [Settings] tab

Connect, Power, volume, squelch

Power on to connect to
the receiver

Enter frequency via keypad,
in MHz, followed by ENT.
CLR to delete the last
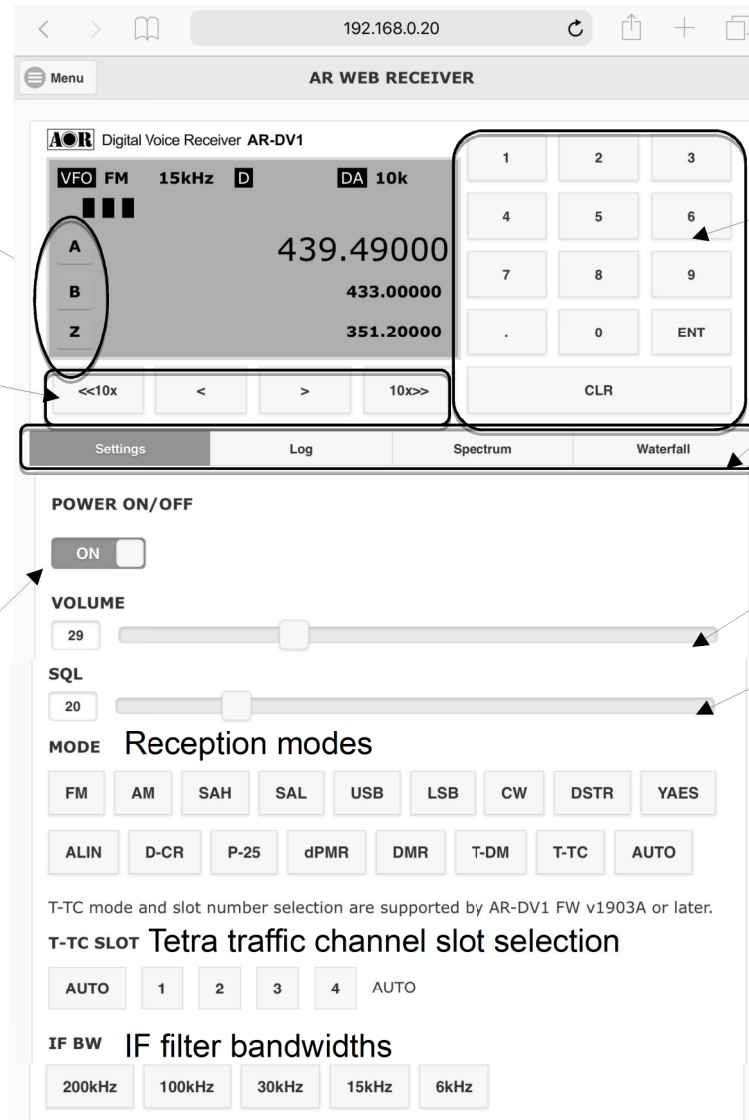entered digit.

☐ Display type switch
   Settings
   Log
   Spectrum
   Waterfall

Volume level slide bar

Squelch level slide bar

192.168.0.20

≡ Menu   **AR WEB RECEIVER**

AOR Digital Voice Receiver **AR-DV1**

VFO FM **15kHz** D   DA **10k**

■ ■ ■

A

B

Z

439.49000

433.00000

351.20000

1	2	3
4	5	6
7	8	9
.	0	ENT

CLR

| <<10x | < | > | 10x>> |

| Settings | Log | Spectrum | Waterfall |

POWER ON/OFF

ON

VOLUME

29

SQL

20

MODE Reception modes

| FM | AM | SAH | SAL | USB | LSB | CW | DSTR | YAES |

| ALIN | D-CR | P-25 | dPMR | DMR | T-DM | T-TC | AUTO |

T-TC mode and slot number selection are supported by AR-DV1 FW v1903A or later.

T-TC SLOT Tetra traffic channel slot selection

| AUTO | 1 | 2 | 3 | 4 | AUTO |

IF BW IF filter bandwidths

| 200kHz | 100kHz | 30kHz | 15kHz | 6kHz |

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☐ **[Settings] tab (continued)**

STEP Frequency steps

10Hz	50Hz	0.1kHz	0.5kHz	1kHz	2kHz	5kHz

6.25kHz	7.5kHz	8.33kHz	9kHz	10kHz	12.5kHz	15kHz

20kHz	25kHz	30kHz	50kHz	100kHz	500kHz

STEP ADJ Frequency step adjustments

0Hz	50Hz	0.25kHz	0.5kHz	1kHz	2.5kHz	3.12kHz

3.75kHz	4.16kHz	4.5kHz	5kHz	6.25kHz	7.5kHz	10kHz

12.5kHz	15kHz	20kHz	25kHz	50kHz

CTCSS CTCSS tone code squelch
OFF / SRCH

OFF ⌄

SRCH ⌄

DCS DCS digital code squelch
OFF / SRCH

OFF ⌄

SRCH ⌄

ENC.CODE NXDN/D-CR 15 bit descramble code

00000

Get	00000	Set

GET: Copy here the code obtained automatically by the receiver
SET: Manually input the code

ENC.CODE range: 00000 ... 32767

DIGI.DISP

[ON] Toggle digital signal information on/off

Note:
-Buttons which cannot be selected will be grayed-out.
-The currently active settings will not be displayed.

□ **[Settings] tab (continued)**

SPECTRUM PRAM defines parameters related to spectrum and waterfall displays.

This web app has an experimental demo screen that creates a simple spectrum and waterfall display by automatically

shifting the frequency of the VFO around the receive frequency, to plot signal levels at 80 different points/frequencies.

(See examples below)

- Clicking a mark inside the graphs does tune the receiver to this frequency.

○ Audio output is disabled while a spectrum or waterfall is created.

SPAN
- Bandwidth of the displayed graph.
- Click [MHz] to apply this span.
- Adjustable from 0.4MHz to 10.0MHz

MODE
- Receive mode while creating a graph is fixed to FM.

IFBW
- IF filter bandwidth used to plot signal levels
- AUTO: Chooses the best value for a spectrum display span divided into 80 points.
- Can be selected manually between 6kHz and 200kHz

WAIT TIME
- Time to hold for signal level retrieval after changing the frequency
- Click on [ms] to apply the value.

NUMBER OF DOTS
- The number of measurements to get and display the signal level (fixed to 80 points)

SPECTRUM PRAM

SPAN

| 10.0 | **MHz** |

Input range: 0.4MHz-10MHz

MODE

FM

IFBW

| **AUTO** | ⌄ |

AUTO is determined by SpectrumStepFrequency.

SpetctrumStepFrequency > 100kHz : 200kHz

100kHz => SpetctrumStepFrequency > 50kHz : 100kHz

50kHz => SpetctrumStepFrequency > 12kHz : 30kHz

12kHz => SpetctrumStepFrequency > 6kHz : 15kHz

SpetctrumStepFrequency < 6kHz : 6kHz

WAIT TIME

| 50 | **ms** |

Default: 50ms

NUMBER OF DOTS

80dots

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□ **[Log] tab**

This is an experimental demo screen that displays a reception log.

-Displayed information is date, time, signal duration, received frequency, reception mode, signal level and digital signal information. Date and time are based on the actual time of the tablet. The log is based on the opening and closing of the squelch.

-You may not be able to get accurate information, for example if the signal is very short of the station is transmitting continuously. It is not recommended to use for a long time because it does not delete the log contents. Reload the browser and reconnect.

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□ SPECTRUM and WATERFALL tabs

Experimental demo screen for creating a simple spectrum and waterfall display.

-It starts plotting signal levels when you select the corresponding tab. Audio output will stop while the graphs are drawn.

-You can adjust the IFBW or wait time depending on the SPAN (the bandwidth you want to display).

-Clicking on the graph's signal interpretation will tune the receiver to that frequency. (Acquisition and graph creation will be discontinued.)

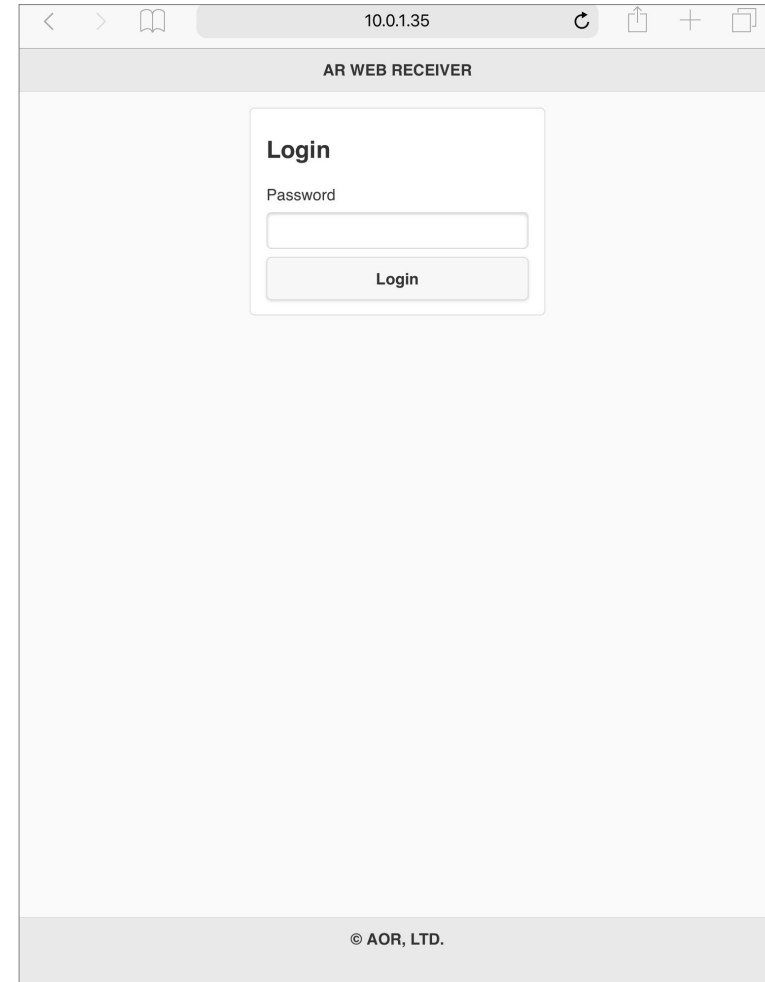-If you want to resume plotting and charting, tap the same tab again.
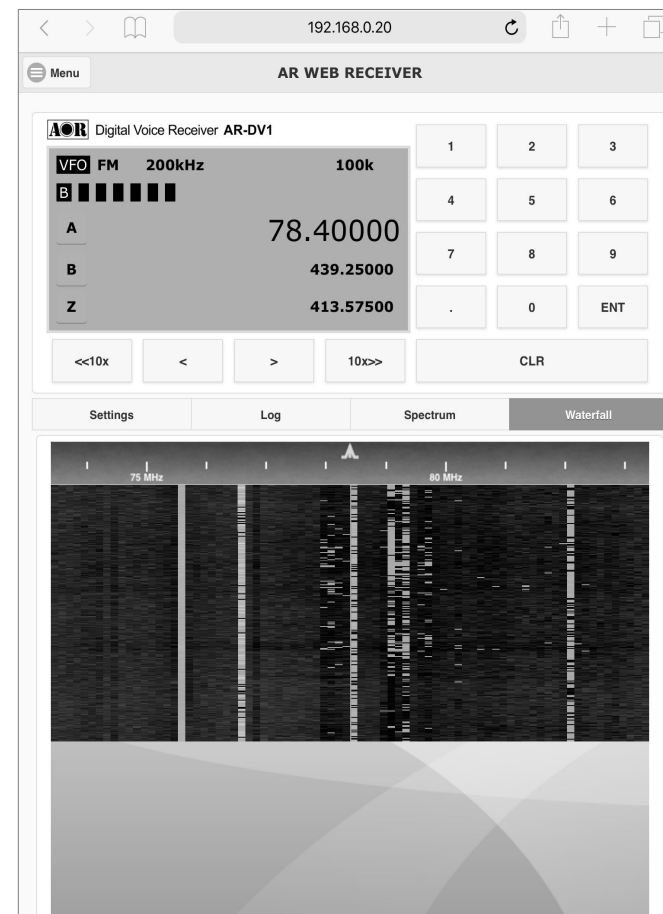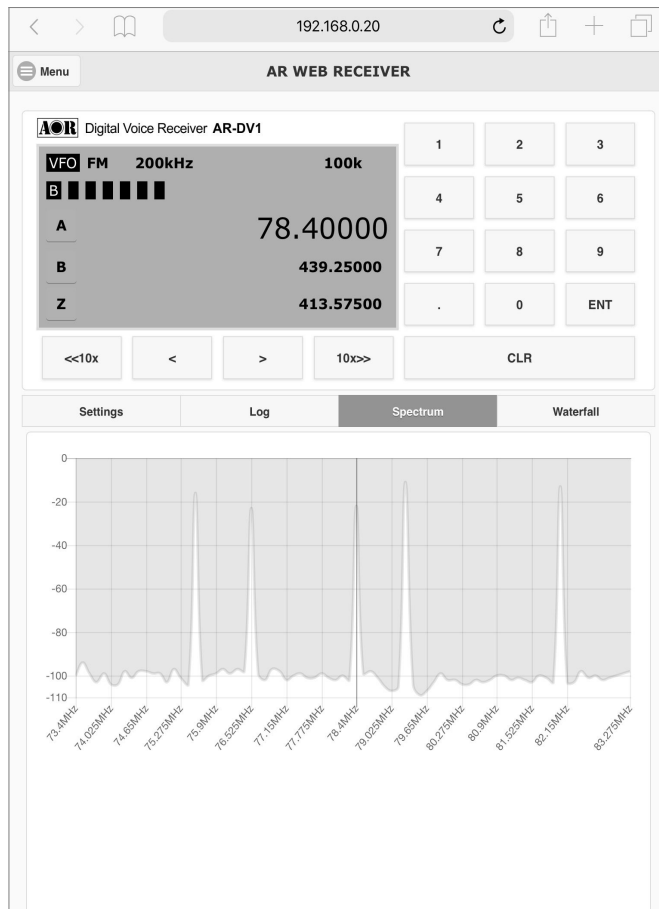
◎ **Connecting via wired LAN**

- When accessing the interface connected via LAN to your router, use the URL corresponding to the fixed IP address as set in the router's DHCP server section.

       http://nn.nn.nn.nn:3000/receiver.html
       nn.nn.nn.nn is the interface's IP address on your LAN

- Password authentication is required.

- Use the password created during initial setup.

10.0.1.35

AR WEB RECEIVER

Login

Password

Login

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13. Specifications

1	Operating environment (supplied hardware)	Single board computer	Raspberry Pi 3 Model B+
		Audio input adapter	USB audio adapter to connect to the computer's USB port
		Boot media	microSDHC 16GB (Class 10 UHS-I A1), installed in the computer's card slot
2	Compatible receiver (not supplied)	AOR's AR-DV1 Digital Voice Receiver (Only one receiver can be controlled per system) (Not compatible with the AR-DV10 hand-held receiver as some commands are different)	
3	Connections with receiver	Receiver control	USB Type-A socket (computer side)
		Audio input	3.5mmφ jack (mono input via USB audio adapter)
4	Network connection	Wireless access point	802.11b/g/a - 2.4/5GHz WPA2 (only possible mode) DHCP service
		LAN	10/100/1000BASE-T DHCP client (Static IP setup via router's DHCP is recommended)
5	Computer power supply	AC adapter	DC5V 2.5A, AC100～240V(50/60Hz) with microUSB plug
6	PC case & other dimensions	Case 62mm(W) x 26mm(H) x 92mm(D) When inserted, the USB audio adapter adds another 33mm to the case's length.	
7	Boot media	MicroSDHC card16GB Class 10 UHS-I A1 AR-DV1 Tablet App Interface (built-in software) Base operating system package: Raspbian Stretch Lite 2018-11-13 Kernel 4.14	
8	Software configuration	Node.js web server, audio server JavaScript library for AR-DV1 receiver VFO mode jQuery, jQuery.mobile, Chart.js, sdr.js, mathbox.js, moment.js, and others.	
9	Number of concurrent clients	1 (either via wifi or LAN)	
10	Communication ports	Control	TCP 3000 (fixed)
		Audio transmission	TCP 3000 (fixed)
11	Confirmed browser compatibility (as of Dec.2018)	・iPad – Safari ・Kindle Fire HD - Amazon Silk* ・Android Tablet – Chrome* (*: The built-in sample app has limited screen size, therefore not recommended.) ◎ WebAPI is available for various browsers that support HTML5 and recent JavaScript for creating Web apps for different screen sizes.	

14. API list

No.	Name	Description
1	Autenticate	Set authentication parameters
2	Power	Turn the receiver on or off
3	ReceiverState	Get the state of the receiver
4	Time	Set the receiver clock
5	Frequency	Set the receive frequency
6	DemodulateMode	Set the demodulation mode
7	IFbandwidth	Set or get the IF bandwidth
8	FrequencyStep	Set the frequency step
9	FrequencyStepAdjust	Set the step adjust value
10	DigitalDataOutput	Toggle the digital header information on or off and get its state
11	LevelSquelch	Set or get the level squelch value
12	Volume	Set or get the receiver volume value
13	VFO	Set or get the VFO parameters
14	DigitalAdditionalInfo	Get the digital header information
15	SpectrumCenter	Set or get the spectrum's center frequency
16	SpectrumSpan	Set or get the spectrum's span value
17	SpectrumData	Get the spectrum graph data
18	Smeter	Get the S-Meter values
19	ReceiverStateNotification	Set the receiver state notifications interval
20	Adapter	Operate the "AR-DV1 Tablet App Interface Web Adapter" hardware
21	CTCSS	Set or get information from the tone squelch.
22	DCS	Set or get information from the DCS squelch
23	DCREncryptionCode	Set or get the DCR/NXDN 15bit digital scrambling code value
24	TTCSlot	Select the slot number of the Tetra traffic channel

WebSocketAPI

No.	Name	Description
w-1	Sound	API to get sound from the receiver
w-2	ReceiverState	API that gets periodic notifications from the receiver
w-3	DigitalAdditionalInfo	API to receive notifications when the receiver receives digital collateral information

15. License information

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