

# CBRS Connection to the Production Google SAS

## Introduction

In our companion guide, [CBRS Configuration and Testing](#), we discussed initial set up and configuration of a CBRS radio, and how you can connect to the Google Test SAS. In this document, we show the settings for a Mesh Rider CBSD-B device. Please read through [CBRS Configuration and Testing](#) before attempting this configuration. The set up for the EUD, the PC, and IP address settings are not repeated in this guide.

## CBSD-B Configuration

### General and Owner Information

Fig. 1 shows the "General" and "Owner Information" sections in the CBRS Configuration menu.

The screenshot displays the configuration interface for a Citizens Broadband Radio Service Device. The interface is titled "Citizens Broadband Radio Service Device" and features a sidebar menu on the left with options like "Smart Radio", "Status", "System", "Services", "Network Configuration", "Interfaces", "Wireless", "Citizens Broadband Radio Service Device", "Mesh Configuration", "DHCP and DNS", "Basic Settings", and "Logout". The main content area is divided into two sections: "General" and "Owner Information".

**General**

- CBSD client disabled
- SAS Server:   
ⓘ e.g. https://sas.server.com:443/
- CA file location:    
ⓘ Optional.
- SSL certificate location:
- SSL private key location:    
ⓘ Pass phrase protected private key is not supported.

**Owner Information**

- User identifier:   
ⓘ Mandatory parameter when operating mode is set to CBSD.
- Call sign:
- Name:   
ⓘ eg. First Name, Last Name.
- Contact Phone:
- Contact Email:

Fig. 1 General and Owner Information sections

General settings applicable to all modes of operation. In this section,

- The parameter **CBSD client disabled** must be unchecked.
- The parameter **SAS Server** must have the full URL (provided by the SAS provider).

- The parameter **CA file location** can be left as is.
- The parameter **SSL certificate location** must have the certificate of the CBSD (provided by Doodle Labs).
- The parameter **SSL private key location** must have the private key of the CBSD (provided by the SAS provider).

In the section "Owner Information",

- The parameter **User identifier**, also called "userId", must have the information which was provided by the SAS provider.
- The remaining parameters on this section are optional.

## Transmission Parameters and Operating Mode

Fig. 2 shows the "Transmission Parameters" and "Operating Mode" sections.

The screenshot displays the configuration interface for a Smart Radio. On the left is a blue sidebar with the 'DOODLE LABS' logo and navigation links: Status, System, Services, Network Configuration (highlighted), Interfaces, Wireless, Citizens Broadband Radio Service Device, Basic Settings, and Logout. The main content area is divided into three sections:

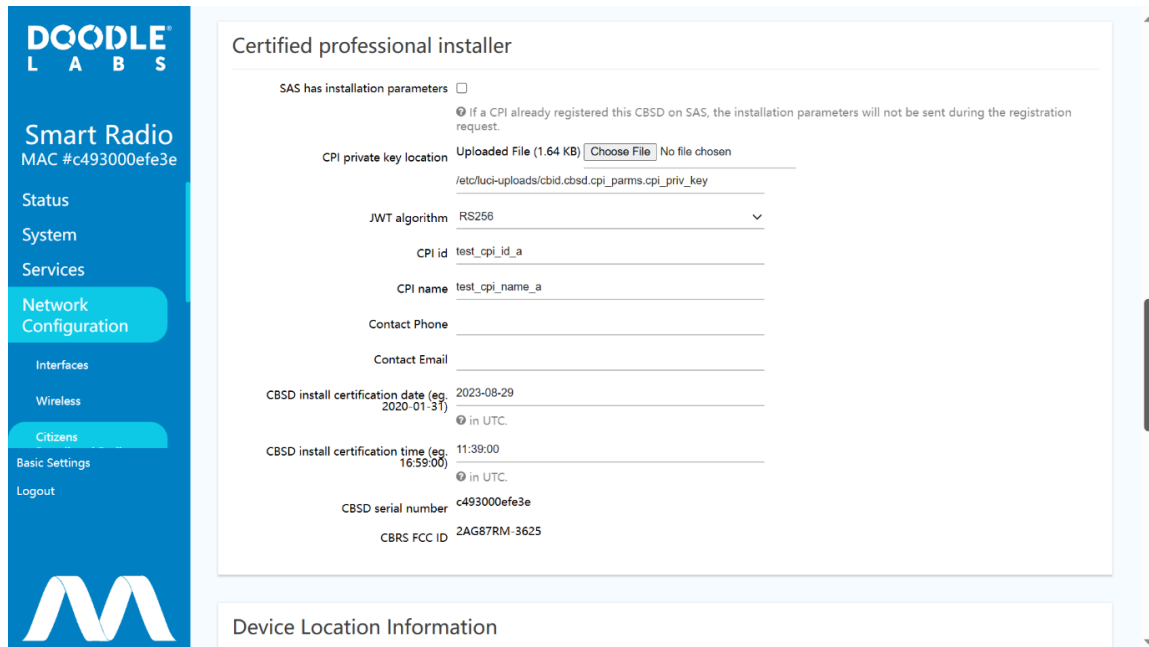
- Transmission parameters:**
  - Maximum EIRP: 23 (radio button selected). Note: Ignored in EUD mode. Minimum of -137 (dBm/MHz), maximum of 20 (dBm/MHz) for cat A CBSD or maximum of 37 (dBm/MHz) for cat B CBSD.
  - Low frequency: 3600 MHz (dropdown menu). Note: Low frequency of operation. Ignored when operating mode is set to EUD, used when set to CBSD mode.
  - High frequency: 3610 MHz (dropdown menu). Note: High frequency of operation. Ignored when operating mode is set to EUD, used when set to CBSD mode.
- Operating Mode:**
  - Current setting: CBSD-B (dropdown menu). Note: Wireless throughput can be improved by adjusting the distance setting. It can be changed [here](#).
- Certified professional installer:**
  - SAS has installation parameters:  (radio button selected). Note: If a CPI already registered this CBSD on SAS, the installation parameters will not be sent during the registration request.
  - CPI private key location: Uploaded File (1.64 KB) | Choose File | No file chosen | /etc/ucd-uploads/cbid.cbsd.cpi\_parms.cpi\_priv\_key
  - JWT algorithm: RS256 (dropdown menu)
  - CPI id: test\_cpi\_id\_a
  - CPI name: test\_cpi\_name\_a

**Fig. 2 Transmission Parameters and Operating Mode sections**

- The **maximum EIRP** is
  - 33 dBm/10 MHz in CBSD-B mode
  - 30 dBm/10 Mhz in CBSD-A mode
  - This number is ignored in EUD mode
- **Low Frequency** and **High Frequency** are user limits for the requested frequency of operation (provided by the SAS)
- The **Operating Mode** should be set to CBSD-B for the purposes of this guide.

## CPI Information

Fig. 3 shows the "CPI Information" (Certified Professional Installer) section. CPI certification is mandatory for CBSD-B installation. Certification is a simple matter of registering for and completing an online course which can be completed in a few days. More information is available [here](#).



The screenshot shows the 'Certified professional installer' configuration page. The left sidebar contains the DOODLE L A B S logo and navigation menu items: Smart Radio (MAC #c493000efe3e), Status, System, Services, Network Configuration (highlighted), Interfaces, Wireless, Citizens, Basic Settings, and Logout. The main content area is titled 'Certified professional installer' and contains the following fields:

- SAS has installation parameters:  (unchecked)
- ⓘ If a CPI already registered this CBSD on SAS, the installation parameters will not be sent during the registration request.
- CPI private key location: Uploaded File (1.64 KB) | Choose File | No file chosen  
/etc/luci-uploads/cbid.cbsd.cpi\_parms.cpi\_priv\_key
- JWT algorithm: RS256 (dropdown menu)
- CPI id: test\_cpi\_id\_a
- CPI name: test\_cpi\_name\_a
- Contact Phone: (empty text field)
- Contact Email: (empty text field)
- CBSD install certification date (eg. 2023-08-29): 2023-08-29  
ⓘ in UTC.
- CBSD install certification time (eg. 16:59:00): 11:39:00  
ⓘ in UTC.
- CBSD serial number: c493000efe3e
- CBRS FCC ID: 2AG87RM-3625

Below the main form is a section titled 'Device Location Information'.

Fig. 3 CPI section

In the section "Certified professional installer",

- The parameter SAS has installation parameters must be left unchecked.
- The parameter CPI private key location must have the private key of the CPI.
- The parameter JWT algorithm can be set as RS256 unless otherwise specified.
- The parameter CPI id must have the id of the CPI.
- The parameter CPI name must have the name of the CPI.
- The parameter Contact Phone and Contact Email are optional.
- The parameter CBSD install certification date must have the date of installation.
- The parameter CBSD install certification time must have the time of installation.

## Device Location Section

Fig. 4 shows the "Device Location" section.

The screenshot displays the configuration interface for a Smart Radio. On the left is a blue sidebar with the 'DOODLE LABS' logo and navigation options: Status, System, Services, Network Configuration (highlighted), Interfaces, Wireless, Citizens, Basic Settings, and Logout. The main content area is divided into two sections:

**Device Location Information**

- Latitude:** 43.517320
- Longitude:** -115.994672
  - ⓘ These coordinates will be used instead of the ones provided by the GPS receiver, during a locally certified professional installation. Please remove both values to use the ones provided by the GPS, when available.
- Indoor deployment:** No (dropdown menu)

**Antenna Information**

- Peak gain:** 18
  - ⓘ Must be set between -127 and 128 (dBi). Mandatory parameter for all operating modes.
- Height:** 10
  - ⓘ Minimum of -10000 (m) and maximum of 10000 (m). It will be used instead of the one provided by the GPS receiver, during a locally certified professional installation.
- Height type:** AGL (dropdown menu)
  - ⓘ Above Ground Level or Above Mean Sea Level. It will be used instead of the ones provided by the GPS receiver, during a locally certified professional installation.
- Azimuth:** 270
  - ⓘ Boresight direction of the horizontal plane of the antenna in degrees with respect to true north. Must be set between 0 and 359 degrees.
- Downtilt:** 0
  - ⓘ Antenna down tilt in degrees. Must be set between -90 and 90 degrees. A negative value means the antenna is tilted up (above horizontal).

**Fig. 4 Device Location section**

In the section "Device Location Information",

- The parameters **Latitude** and **Longitude** must have the exact installation coordinates, superseding the GPS provided ones. If left blank, the coordinates provided by the GPS receiver will be used, once available;
- The parameter **Indoor deployment** can have the value of **Yes** or **No**, depending on where the CBSD is installed indoors or not.

## Antenna Information and Measurement Capabilities Sections

Fig. 5 shows the "Antenna Information and Measurement Capabilities" sections.

**DOODLE LABS**  
Smart Radio  
MAC #c493000efe3e

Status  
System  
Services  
**Network Configuration**  
Interfaces  
Wireless  
Citizens Broadband Radio Service Device  
Basic Settings  
Logout

### Antenna Information

**Peak gain** 18  
ⓘ Must be set between -127 and 128 (dB). Mandatory parameter for all operating modes.

**Height** 10  
ⓘ Minimum of -10000 (m) and maximum of 10000 (m). It will be used instead of the one provided by the GPS receiver, during a locally certified professional installation.

**Height type** AGL  
ⓘ Above Ground Level or Above Mean Sea Level. It will be used instead of the ones provided by the GPS receiver, during a locally certified professional installation.

**Azimuth** 270  
ⓘ Boresight direction of the horizontal plane of the antenna in degrees with respect to true north. Must be set between 0 and 359 degrees.

**Downtilt** 0  
ⓘ Antenna down tilt in degrees. Must be set between -90 and 90 degrees. A negative value means the antenna is tilted up (above horizontal).

**Beamwidth** 360  
ⓘ Antenna beamwidth is the angle measured between -3 dB points of main lobe. Must be set between 0 and 360 degrees. A value of 360 means that the antenna has an omnidirectional radiation pattern in the horizontal plane.

**Sum of RF loss** 2  
ⓘ The sum of cable, insertion and other RF losses. Must be set between 0 and 200 (dB). Mandatory parameter for all operating modes.

### Measurement Capabilities

Send empty measurement capability   
ⓘ SAS provider specific.

**Fig. 5 Antenna Information and Measurement Capabilities sections**

In the section "Antenna Information",

- The parameter **Peak gain** must have the peak antenna gain value, which generally is the default value.
- The parameter **Height** must have the exact installation height, superseding the GPS provided one. If left blank, the altitude provided by the GPS receiver will be used, once available.
- The parameter **Height type** must have the exact installation height type and is only used when the parameter **Height** is set.
- The parameters **Azimuth**, **Downtilt** and **Beamwidth** can have any valid value since those will not be used.
- The parameter **Sum of RF loss** must have the sum of all losses between the RF port and the antenna connector. Generally should be left the default value.

In the section "Measurement Capabilities", the parameter **Send empty measurement capability** must be active unless a SAS provider does not support it.

## Overview Page

Once you have finished with you configuration, please click on "SAVE & APPLY" to save and apply them. After that, you can navigate to the **Status -> Overview** page, and take note of the CBRS messages.

**DOODLE LABS**  
Smart Radio  
MAC #c493000efe3e

**Status**

- Overview
- Firewall
- Routes
- System Log
- Kernel Log
- Processes
- Realtime Graphs
- System
- Services
- Network
- Basic Settings
- Logout

**Wireless**

Mesh Rider (radio0)

SSID: wireless-hotspot  
Mode: CBSD  
Channel: 12 (3.419 GHz)  
Bitrate: 7 Mbit/s  
BSSID: CA:93:00:0E:FE:3E  
Encryption: WPA2 PSK (CCMP)

**Associated End User Devices**

Network	MAC-Address	Host	Signal / Noise	RX Rate / TX Rate
No information available				

**GPS data**

Latitude	Unknown
Longitude	Unknown

**Citizens Broadband Radio Service Device**

latest log entries

```

B625/30d338dcea27911fe7eae2e38a78b03183870086/8571237959119556941
Thu Aug 31 06:44:47 2023 daemon.notice /usr/sbin/cbsd: GRANTED
Thu Aug 31 06:44:48 2023 daemon.notice /usr/sbin/cbsd: AUTHORIZED
Thu Aug 31 06:44:48 2023 daemon.notice /usr/sbin/cbsd: Set max. tx power to 17 based on configuration parameters
Thu Aug 31 06:44:49 2023 daemon.notice /usr/sbin/cbsd: Enable transmitter
Thu Aug 31 06:45:51 2023 daemon.notice /usr/sbin/cbsd: Got heartbeat response
Thu Aug 31 06:46:26 2023 daemon.notice /usr/sbin/cbsd: Got heartbeat response
Thu Aug 31 06:47:01 2023 daemon.notice /usr/sbin/cbsd: Got heartbeat response
Mon Sep 11 03:29:40 2023 daemon.notice /usr/sbin/cbsd: Got heartbeat response

```

Fig. 6 Overview Page

## Google SAS Portal

After everything is configured, you can navigate to the [Google SAS portal](#) to view the status of your deployment.

SAS Portal Doodle Labs - Deployment 1

Sites

In view Recent

Search

1 of 2

c493000efe3e / 2AG87RM-3625

Map showing location of c493000efe3e / 2AG87RM-3625 in Boise, Idaho.

**c493000efe3e / 2AG87...**

Config Status Coex History

CBSD category B  
Radio type Basestation  
User ID SAS-doodle-labs  
FCC ID 2AG87RM-3625  
Serial number c493000efe3e  
Device type Outdoor  
Max EIRP 33 dBm/10MHz

**Antenna**

Antenna model empty  
Max gain 18 dBi  
Beamwidth 360 °  
Height 10 m  
Height type AGL  
Azimuth 270 °  
Mech. downtilt 0 °  
Horiz. accuracy 50 m  
Vert. accuracy 3 m

**Measurement capability**

Fig. 7 Google SAS Portal Sample 1

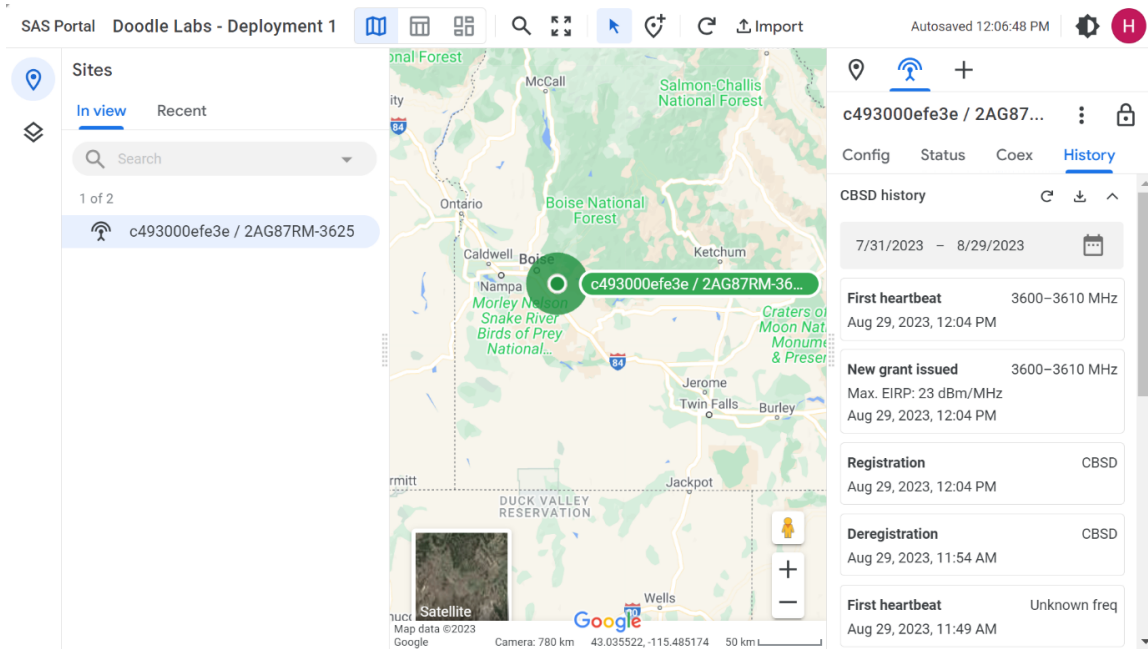


Fig. 8 Google SAS Portal Sample 2

## Troubleshooting

If you are experiencing problems with your configuration, you can either look at our [troubleshooting pages](#) or contact us for [Technical Support](#).