

uGPS Manual

(ugps-tunnel-v1)

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Table of Contents

Device Parts	2
Device Setup	4
Signal Generation	오류! 책갈피가 정의되어 있지 않습니다.

FCC information

FCC notice "Declaration of Conformity Information"

This equipment 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 equipment 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 equipment 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:

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

FCC Conditions

This equipment has been tested and found to comply with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference
- (2) This device must accept any interference received, including interference that may cause undesired operation.

FCC Notice "Equipment Authorization" Information

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 is authorized under Title 47 CFR 15.519 (the FCC Rules and Regulations).

The operation of this device is subject to the following restriction:

The changes or substitutions of the antennas which are furnished with the device is prohibited.

FCC Radiation Exposure Statement:

This equipment 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 & your body.

Device Parts

1. Local Server :

This is the main controller device on the installation site. Currently IDCITI is using Intel NUC10FNH running Windows 10. This device is responsible for updating the local rinex database, along with controlling the client devices connected to it over a Local Area Network (LAN).

2. Client Device :

The client device is where all software related to signal generation are stored and managed. It is connected to the local server over a LAN, and is controlled using a designated protocol. Currently IDCITI uses single-board computers called Odroid-N2 running Ubuntu Mate 18.04 as client devices.

3. Software Defined Radio (SDR) :

Attached to the client device is an SDR board that generates the Global Navigation Satellite System (GNSS) signal. It is controlled by a client device connected to it over a USB cable.

Device Setup

1. Local Server Setup

- a. Connect the local server to a power source.
- b. Install MySQL on the local server.
- c. Create a user for the database with username “local_user” and a password for the user.
- d. Create the “idciti_ugnss” database.
- e. Create tables “gps_rinex”, “glo_rinex”, and “status” in the database “idciti_ugnss”.
- f. Change the port configuration for MySQL from default (3306) to 11924.
- g. Copy the “IDCITI” directory to the local server.
- h. Move to the “IDCITI/IDCITI_SW-master-cpy/sdr_controller” directory.
- i. Start the “onsite_dbUpdate_editted.py” file to start updating the rinex database from the main server.
- j. Check the Internet Protocol (IP) address of the local server, which is necessary for setting up the rinex server on the client device.

2. Client Device Setup

- a. Check the ntp time configuration using the command “date”.
- b. If the time configuration is not set to the current time, run the following commands.
 - i. `systemctl stop ntp`
 - ii. `ntpdate <ip address of local server>`
- c. Run “`sudo nano /root/apps/gnss_rinex/gnss_rinex_app.ini`”.
 - i. Change the IP address in the “URL=” field in the file to the IP address of the local server; there are 2 of these “URL=” fields in the file, one for [MYSQL_GPS] and another for [MYSQL_GLO]. Make sure to change both fields with the local server’s IP address, and save the file.
- d. Check the ip address of the client device with the “ifconfig” command, as the local server needs it to send control messages.

Signal Generation

1. Initiating Required Software

- a. The `autorun.sh` file in `/root/` will trigger the execution of the necessary software to have the board ready for signal generation.
- b. Run “`ps -ax | grep gnss`” command to check that all three of the following software are running.
 - i. `gnss_rinex_app.out`
 - ii. `gnsssim_app.out`
 - iii. `gnss_reportmon.out`
- c. If any one of the software in “b” is not running:
 - i. Reboot the client device and check again.
 - ii. If the reboot does not resolve the issue, rename the `autorun.sh` to `autorun.sh.bak`
 - iii. Run the “`kill.sh`” in the `/root/` directory.
 - iv. Run each software on separate terminals manually.
- d. Once all three software are running without issue, the SDR is ready for signal generation.

2. Signal Generation Through Local Server

- a. Open “`onsite.json`” file in “`/IDCITI/IDCITI_SW-master-cpy/sdr_controller/`” directory with a preferred editor.
 - i. The “`GENERATE_LIST`” key will contain the necessary information to send the control message from the local server to each client device. The list of values are IP address, signal type, latitude, longitude, and altitude, in that order.
 - ii. Update these fields accordingly; add more lists as more client devices are added to the system.
 - iii. The “`SITENAMES`” key labels information about where the device status comes from; update to where the system is being installed.
- b. Open “`sdr_controller_v2.0.1.py`” in `/IDCITI/IDCITI_SW-master-cpy/sdr_controller`” directory with a preferred editor; Visual Studio Code is recommended.
 - i. Travel down to the main function of the script.
 - ii. Calls to the “`control`” function with different configurations are predefined.
 - iii. Following are descriptions of the parameters that go into the control function.

* IPs :

List of IP addresses parsed from the `onsite.json` file;
modification unnecessary.

* start :

When set to True, indicates signal generation message.
When set to False, indicates signal stop message.

* `n_gps` :
Number of gps satellites to apply when generating signal

* `n_glo` :
Number of glonass satellites to apply when generating signal

* `gen_all` :
Determines whether to use all available satellites. When set to True, the control function ignores the `n_gps` and `n_glo` parameters.

- iv. Call the control function with a desired configuration or with a predefined one; once the message is properly delivered to the client device, the client device will react accordingly.