GPS

GPS features in Cleanflight are experimental. Please share your findings with the developers.

GPS works best if the GPS receiver is mounted above and away from other sources of interference.

The compass/mag sensor should be well away from sources of magnetic interference, e.g. keep it away from power wires, motors, ESCs.

Two GPS protocols are supported. NMEA text and UBLOX binary.

Configuration

Enable the GPS from the CLI as follows:

1. [configure a serial port to use for GPS. (Serial.md)](Serial.md)
2. set your GPS baud rate
3. enable the `feature GPS`
4. set the `gps_provider`
5. connect your GPS to the serial port configured for GPS.
6. save and reboot.

Note: GPS packet loss has been observed at 115200. Try using 57600 if you experience this.

For the connections step check the Board documentation for pins and port numbers.

GPS Provider

Set the `gps_provider` appropriately, for example `set gps_provider=UBLOX`

Value
NMEA
UBLOX

GPS Auto configuration

When using UBLOX it is a good idea to use GPS auto configuration so your FC gets the GPS messages it needs.

Enable GPS auto configuration as follows `set gps_auto_config=ON`.

If you are not using GPS auto configuration then ensure your GPS receiver sends out the correct messages at the right frequency. See below for manual UBlox settings.

SBAS

When using a UBLOX GPS the SBAS mode can be configured using `gps_sbas_mode`.

The default is AUTO.

Value	Region

AUTO   Global
EGNOS Europe
WAAS   North America
MSAS   Asia
GAGAN India

If you use a regional specific setting you may achieve a faster GPS lock than using AUTO.

This setting only works when `gps_auto_config=ON`

GPS Receiver Configuration

UBlox GPS units can either be configured using the FC or manually.

UBlox GPS manual configuration

Use UBox U-Center and connect your GPS to your computer. The CLI `gpspassthrough` command may be of use if you do not have a spare USART to USB adapter.

Note that many boards will not provide +5V from USB to the GPS module, such as the SPRacingF3; if you are using `gpspassthrough` you may need to connect a BEC to the controller if your board permits it, or use a standalone UART adapter. Check your board documentation to see if your GPS port is powered from USB.

Display the Packet Console (so you can see what messages your receiver is sending to your computer).

Display the Confiation View.

Navigate to CFG (Configuration)

Select `Revert to default configuration`.
Click Send.

At this point you might need to disconnect and reconnect at the default baudrate - probably 9600 baud.

Navigate to PRT (Ports)

Set `Target` to `1 - Uart 1`
Set `Protocol In` to 0+1+2
Set `Protocol Out` to 0+1
Set `Buadrate` to 57600 115200
Press Send

This will immediatly "break" communication to the GPS. Since you haven't saved the new baudrate setting to the non-volatile memory you need to change the baudrate you communicate to the GPS without resetting the GPS. So `Disconnect`, Change baud rate to match, then `Connect`.

Click on PRT in the Configuration view again and inspect the packet console to make sure messages are being sent and acknowledged.

Next, to ensure the FC doesn't waste time processing unneeded messages, click on MSG and enable the following on UART1 alone with a rate of 1. When changing message target and rates remember to click Send after changing each message.:

```
NAV-POSLLH
NAV-DOP
NAV-SOL
NAV-VELNED
NAV-TIMEUTC
```

Enable the following on UART1 with a rate of 5, to reduce bandwidth and load on the FC.

```
NAV-SVINFO
```

All other message types should be disabled.

Next change the global update rate, click `Rate (Rates)` in the Configuration view.

Set `Measurement period` to 100 ms.
Set `Navigation rate` to 1.
Click Send.

This will cause the GPS receive to send the require messages out 10 times a second. If your GPS receiver cannot be set to use 100ms try 200ms (5hz) - this is less precise.

Next change the mode, click `NAV5 (Navigation 5)` in the Configuration View.

Set to `Dynamic Model` to Pedestrian and click Send.

Next change the SBAS settings. Click `SBAS (SBAS Settings)` in the Configuration View.

Set Subsystem to Enabled.
Set `PRN Codes` to Auto-Scan.
Click Send.

Finally, we need to save the configuration.

Click `CFG (Configuration` in the Configuration View.

Select `Save current configuration` and click Send.

UBlox Navigation model

Cleanflight will use `Pedestrian` when gps auto config is used.

From the UBlox documentation:

- Pedestrian - Applications with low acceleration and speed, e.g. how a pedestrian would move. Low acceleration assumed. MAX Altitude [m]: 9000, MAX Velocity [m/s]: 30, MAX Vertical, Velocity [m/s]: 20, Sanity check type: Altitude and Velocity, Max Position Deviation: Small.
- Portable - Applications with low acceleration, e.g. portable devices. Suitable for most situations. MAX Altitude [m]: 12000, MAX Velocity [m/s]: 310, MAX Vertical Velocity [m/s]: 50, Sanity check type: Altitude and Velocity, Max Position Deviation: Medium.
- Airborne < 1G - Used for applications with a higher dynamic range and vertical acceleration than a passenger car. No 2D position fixes supported. MAX Altitude [m]:

50000, MAX Velocity [m/s]: 100, MAX Vertical Velocity [m/s]: 100, Sanity check type: Altitude, Max Position Deviation: Large

Hardware

There are many GPS receivers available on the market.
Below are some examples of user-tested hardware.

Ublox

###U-Blox

NEO-M8

Module	Comments
U-blox Neo-M8N w/Compass	Pinout can be found in Pixfalcon manual. SDA and SCL can be attached to I2C bus for compass, TX and RX can be attached to UART for GPS. Power must be applied for either to function.
Reyax RY825AI	NEO-M8N, 18Hz UART USB interface GPS Glonass BeiDou QZSS antenna module flash. eBay (http://www.ebay.com/itm/RY825AI-18Hz-UART-USB-interface-GPS-Glonass-BeiDou-QZSS-antenna-module-flash/181566850426)

NEO-7

Module	Comments
U-blox Neo-7M w/Compass	HobbyKing (http://www.hobbyking.com/hobbyking/store/__55558__Ublox_Neo_7M_GPS_with_Co You have to set align_mag in the CLI to get the magnetometer working correctly: se forget to save.

NEO-6

Module	Comments
Ublox NEO-6M GPS with Compass	eBay (http://www.ebay.com/itm/111585855757)

Serial NMEA

MediaTek

Module	Comments
MTK 3329	Tested on hardware serial at 115200 baud (default) and on softserial at 19200 baud. The baudrate and refresh rate can be adjusted using the MiniGPS software (recommended if you lower the baudrate). The software will estimate the percentage of UART bandwidth used for your chosen baudrate and update rate.