Pulse Per Second (PPS)

Some guides on the internet:

[SynchNTPtoGPS.md](#)

[gpsd howto](#)

Importantly:

- Connect a **PPS-capable GPS receiver** to one of your serial or USB ports. A random cheap consumer-grade GPS receiver won't do; you may have to do some hunting to find a usable one.
  Test connection:

```shell
1  stty -F /dev/ttyF0 ispeed 115200 && cat </dev/ttyF0
2  ldattach pps /dev/ttyF0
```

Create symbolic links:

```
sudo ln -s /dev/ttyF0 /dev/gps0
sudo ln -s /dev/pps0 /dev/gpspps0
```

Set [AppArmor](#) policy to `/usr/sbin/ntpd`

```
sudo aa-complain /usr/sbin/ntpd
```

Add `KERNEL=="ttyF0", SYMLINK+="gps0"` to udev rules

```
sudo vim /etc/udev/rules.d/80-gps-pps-custom.rules
```

Reboot, if this works, you should see `/dev/gps0` after reboot.

```
# Make sure there aren't any instances of gpsd running already
sudo service gpsd stop
# stop processes that are using your device:
lsof -n | grep /dev/ttyF0
# run gpsd
sudo gpsd -n -N -D3 /dev/ttyF0
```

Add to `/etc/ntp.conf`:

```
server 127.127.28.0 minpoll 4
fudge 127.127.28.0 refid GPS
server 127.127.28.1 minpoll 4 prefer
fudge 127.127.28.1 refid PPS0
```

TODO:
run gpsd automatically at startup `/etc/default/gpsd` ?
NOTE:
It takes a few minutes for the clock to synchronize nicely with the PPS, check synch with ntpq:

```
ntpq -p
```

TODO:
adjust GPS offset time 1 parameter so that the PPS synch gets better... (guess: 0.910, -0.910)

More details:

Use the gpsd daemon, edit to the following: `/etc/default/gpsd`

- Start the gpsd daemon automatically at boot time: `START_DAEMON="true"`
- Use USB hotplugging to add new USB devices automatically to the daemon: `USBAUTO="false"`
- Devices gpsd should collect to at boot time. They need to be read/writeable, either by user gpsd or the group dialout. `DEVICES="/dev/ttyF0"`
- Other options you want to pass to gpsd: `GPSD_OPTIONS="-n -D3"`
- Add the following to run at startup at : `/etc/rc.local`:

```
stty -F /dev/ttyF0 ispeed 115200
service gpsd restart
```

- if the gpsd daemon is working properly, run: `sudo service gpsd status`. You should see something like:

```
Jul 22 17:47:43 boreas gpsd[1450]: gpsd:INFO: PPS:/dev/ttyF0 Assert hooks
called clock:  1626990463.000070278 real:  1626990463.000000000: accepted
```

- final step, run: `ntpq -p`

- And check that your offset wrt PPS is less than 1 ms, then you're good to go.