

Using an Icom IC-705 as a GPS Time Standard for a Raspberry Pi

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This is my configuration for using the GPS receiver in the Icom IC-705 as a time standard for a Raspberry Pi. I am absolutely not an expert in either gpsd or ntp. There's a lot of confusing and sometimes complex instructions on the Internet and in man pages. If you know of a better way to do this, please let me know. I'm particularly uncertain about needing the fudge line in ntp.conf. It shows up in a lot of ntp.conf examples. But it works for me.

First, you must make the GPS signal available on the IC-705's USB cable. Do the following on your IC-705:

MENU button -> SET -> Connectors -> USB (B) Function -> GPS Out, set to ON

Here's the contents of my /etc/default/gpsd file.

```
# Default settings for the gpsd init script and the hotplug wrapper.
# Start the gpsd daemon automatically at boot time
START_DAEMON="true"
# Use USB hotplugging to add new USB devices automatically to the daemon
USB_AUTO="true"
# Devices gpsd should collect to at boot time.
# They need to be read/writeable, either by user gpsd or the group dialout.
# Name of USB interface to IC-705 for GPS data
DEVICES="/dev/serial/by-id/usb-Icom_Inc._IC-705_IC-705_12003770-if02"
# Other options you want to pass to gpsd
GPSD_OPTIONS="-n"
```

To see if this is working, run "cgps -s" at the command prompt.

```
Time:      2020-11-17T22:45:25.000Z
Latitude:  40.49008166 N
Longitude:  79.89746499 W
Altitude:  788.386 ft
Speed:     0.81 mph
Heading:   269.8 deg (true)
Climb:     0.00 ft/min
Status:    3D FIX (80 secs)
Longitude Err: +/- 36 ft
Latitude Err: +/- 37 ft
Altitude Err: +/- 113 ft
Course Err: n/a
Speed Err: +/- 51 mph
Time offset: 0.034
Grid Square: FN00bl

PRN:  Elev:  Azim:  SNR:  Used:
 3   37   250   22   Y
 4   47   310   32   Y
16   64   200   37   Y
22   27   226   23   Y
26   72   062   17   Y
27   11   165   16   Y
29   15   045   18   Y
31   37   070   20   Y
 9   10   313   24   N
32   07   135   00   N
```

I added these two lines to my /etc/ntp.conf file.

```
server 127.127.28.0 minpoll 4 prefer
fudge 127.127.28.0 time1 0.0 refid NEMA
```

To verify your Raspberry Pi is using the GPS receiver as its primary source of time, enter this command:

```
ntpq -p
```

The entry for GPS time will be labelled *SHM(0). The asterisk indicates that the GPS receiver is the primary source of time.

```
=====
*SHM(0) .NEMA. 0 l 5 16 377 0.000 -0.044 0.154
0.debian.pool.n .POOL. 16 p - 64 0 0.000 0.000 0.002
1.debian.pool.n .POOL. 16 p - 64 0 0.000 0.000 0.002
2.debian.pool.n .POOL. 16 p - 64 0 0.000 0.000 0.002
3.debian.pool.n .POOL. 16 p - 64 0 0.000 0.000 0.002
-198.46.248.36 ( 130.207.244.240 2 u 19 64 17 24.359 -2.067 20.684
-99-104-170-138. 132.163.97.1 2 u 20 64 17 39.603 2.631 9.202
-srcf-ntp.stanfo 171.64.7.67 2 u 24 64 17 64.154 3.548 17.525
#y.ns.gin.ntt.ne 249.224.99.213 2 u 16 64 17 13.107 12.530 14.465
#clock.team-cymr 132.163.96.2 2 u 20 64 17 29.624 5.025 33.780
#ec2-34-194-39-1 209.51.161.238 3 u 18 64 17 14.534 2.942 17.839
+time.cloudflare 10.16.15.99 3 u 15 64 17 13.102 10.586 7.428
+108.61.73.244 128.59.0.245 2 u 22 64 17 18.827 4.139 17.714
#puppet.kenyonra 80.72.67.48 3 u 23 64 17 73.252 21.187 21.269
#ntp.nexcess.net 83.157.230.212 3 u 92 64 6 68.919 35.629 14.016
-ipv4.ntpl.rbaum 69.89.207.99 2 u 21 64 17 22.650 15.851 14.456
-ntp.backplannedn 152.2.133.55 2 u 19 64 17 33.967 4.161 17.941
#mis.wci.com 216.218.254.202 2 u 16 64 17 69.665 19.159 16.215
-clock.nyc.he.ne 127.67.113.92 2 u 18 64 17 14.700 2.469 18.573
#tick.srs1.ntfo. 206.55.64.76 3 u 21 64 17 72.718 10.943 18.099
-dedicated.logip 129.134.26.123 2 u 20 64 17 46.192 7.834 23.700
=====
```

ntp avoids changing your Raspberry Pi's clock in large jumps. If the current time on the Raspberry Pi is in error by more than 1000 sec (16.6 min), it may take a very long time for ntp to slowly sync the time to the GPS receiver. The simplest way to fix this is to manually set the Raspberry Pi's time. The time you pick does not need to be terribly accurate, it just needs to be within 1000 sec of the GPS time. The time on your watch or cellphone will be good enough.

The command to manually set the time is "date". Below is an example. You must run as root with the sudo command.

```
sudo date -s "2020-11-21 18:35:00"
```

Alternately, you can add the following line to your `/etc/ntp.conf` file. You will not need to manually enter the date. `ntp` will set your system time as soon as your GPS receiver obtains a fix.

```
tinker panic 0
```

If you do not see the GPS receiver being used as an input to NTP, try restarting the `gpsd` and `ntp` daemons with these commands:

```
sudo systemctl restart gpsd.service  
sudo systemctl restart ntp.service
```