Setting Mac OS X Clock with IC-705 GPS - off grid

I'm writing this up after successfully setting my system clock with the
IC-705. There is no warranty that this works, you are on your own. My setup
includes a MBP 14" running Monterey and the IC-705

the IC-705 feeds a GPS message protocol called NMEA - there is an additional
feed called PPS which to my knowledge , is not available on the IC-705, but
is considered more accurate. the

Warning - your are embarking on a saga that could destroy your computer and
the universe itself - be careful, you will be using root privileges and all
that entails - consider yourself warned!

Step 1 - Set up IC-705 to feed NMEA GPS messages

http://www.w1hkj.com/W3YJ/Pi_IC-705_GPS.pdf

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

Start by making sure you can get data from your GPS, otherwise the later steps will be
very frustrating. In this command:

Suggested Command

stty -F /dev/ttyXXX ispeed 4800 && cat </dev/ttyXXX

Ultimate working command of my system (modem port depends on your system)

stty -f /dev/cu.usbmodem1203 ispeed 9600 && cat </dev/cu.usbmodem1203

Step 2 - increase a couple Shared Memory limits on the Mac

see what your shared memory setup is:

sysctl -a l grep sysv.shm

(I think I needed to change one item: "sudo sysctl -w kern.sysv.shmseg=32")

Persisting shared memory limits on OS X 12 Monterey

add a text file "plist" to /Library/LaunchDaemons
the file name is immaterial - I found a useful file (com.wsjtx.sysctl.plist) and edited it to my needs
the text file plist is very sensitive - beware of spaces in value strings and misspellings

sudo launchctl load com.wsjtx.sysctl.plist

(if you mess it up or need to retry - unload then load)
sudo launchctl unload com.wsjtx.sysctl.plist

the text of the file I used ultimately is:

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE plist PUBLIC "-//Apple//DTD PLIST 1.0//EN" "http://www.apple.com/DTDs/PropertyList-1.0.dtd">
<plist version="1.0">
<dict>
    <key>Label</key>
    <string>com.wsjtx.sysctl</string>
    <key>Program</key>
    <string>/usr/sbin/sysctl</string>
    <key>ProgramArguments</key>
    <array>
        <string>/usr/sbin/sysctl</string>
        <string>kern.sysv.shmmax=52428800</string>
        <string>kern.sysv.shmall=25600</string>
          <string>kern.sysv.shmmni=128</string>
          <string>kern.sysv.shmseg=32 </string>
    </array>
    <key>RunAtLoad</key>
    <true/>
</dict>
</plist>
```

Step 3 - Download homebrew and install and configure gpsd

*note - use the 705's GPS information screen to make sure you have a good gps satellite signal - this can take an hour or more to stabilize if you are doing this after a long time of not using GPS or changing locations

https://gpsd.gitlab.io/gpsd/installation.html

/bin/bash -c "$(curl -fsSL https://raw.githubusercontent.com/Homebrew/install/HEAD/install.sh)"

as per homebrew build instructions add brew to path

echo 'eval "$(/opt/homebrew/bin/brew shellenv)"' >> /Users/marc/.bash_profile

eval "$(/opt/homebrew/bin/brew shellenv)"

Install gpsd via brew:

https://formulae.brew.sh/formula/gpsd

start up gpsd (use your usb port name)

*note - There are ways to start and stop brew daemons via command line, and ways to set up command line args - for now just run this in the foreground (-ND4 is for verbose debug logging) :

sudo gpsd -n /dev/cu.usbmodem1203   -ND4

There are ways of testing the feed "ntpq -p" and "ntpshmmon"

Step 4 - download ChronyControl and install

https://whatroute.net/chronycontrol.html#macosdateandtime

added these lines to chrony.conf (/etc/chrony.d/chrony.conf)

Marc - add GPSD shared memory ref

refclock SHM 0 refid GPS precision 1e-1 offset 0.9999 delay 0.2
refclock SHM 1 refid PPS precision 1e-7

Marc - faster update
makestep 1 3

ChronyControl has a couple useful screens, tracking and sources show a lot of what's happening

starting ChronyControl app takes Mac off timed clock control

chrony will now set the system clock using the GPS and other configured sources (NTP servers)

Step 5 - Testing

Turned off Wifi

Then reset clock manually to 10 mins fast via system prefs

if chronyd is running - it slowly adjusts back to NMEA GPS time - you can see this happening on the tracking screen

if you stop and start chronyd (via ChronyControl) it updates the system clock within a minute or so