GPS Driver & Hardware Integration Report

Task: GPS Module

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Date: 22-04-2025

GitHub repo: https://github.com/salah0eldin/GPS Module STM32

Driver Development (Home Phase)

• Wrote a bare-metal UART driver in C to parse NMEA sentences from a 9600 baud GPS.

- Worked exclusively on real hardware; no simulation tools were used.
- Lacking a physical GPS, emulated one by flashing a spare ESP32 board to stream continuous NMEAlike strings over UART at 9600 baud.
- Verified that the STM32 received and parsed all test sentences correctly.
- Pushed all source code, and a minimal README to GitHub (see link above).

Initial Bench Test with the Real GPS Module (At collage)

- Connected the GPS module to a laptop through its on-board USB bridge.
- Expected full NMEA frames (GGA, RMC, etc.), but only partial sentences appeared—most numeric fields were blank.
- Suspected poor satellite lock → moved outdoors under open sky; output remained unchanged.

```
afterfix - Notepad
                                                /dev/ttyACM0 - Pu
                                                                  File Edit Format View Help
$GPGGA,,,,,,0,00,99.99,,,,,,*48
                                                                 $GPGLL,3015.8564,N,07802.0411,E,072844.00,A,A*65
$GPGSA, A, 1, , ,
                                                                 $GPGSA,A,3,04,08,09,27,,,,,,,9.3,3.7,8.5,1*2C
                           .,,,,99.99,99.99,99.99*30
                                                                  $GPGSV,2,1,07,04,52,152,32,08,55,104,29,09,79,247,25,16,16,044,,0
$GPGSV,1,1,00*79
                                                                  $GPGSV,2,2,07,20,02,307,,21,02,135,,27,37,060,27,,,,0*52
                                                                  $GPRMC,072844.00,A,3015.8564,N,07802.0411,E,0.5,139.1,300122,,,A,V
$GPGLL,,,,,,V,N*64
                                                                  $GPVTG,139.1,T,,M,0.5,N,1.0,K,A*03
$GPRMC,,V,,,,,,,,,N*53
                                                                  $GPZDA,072844.00,30,01,2022,,*68
                                                                  $GPGGA,072845.00,3015.8565,N,07802.0409,E,1,04,3.7,592.1,M,-34.8,M
$GPVTG,,,,,,,,,N*30
                                                                  $GPGLL,3015.8565,N,07802.0409,E,072845.00,A,A*6C
$GPGGA,,,,,,0,00,99.99,,,,,*48
                                                                  $GPGSA,A,3,04,08,09,27,,,,,,9.3,3.7,8.5,1*2C
                                                                  $GPGSV,2,1,07,04,52,152,32,08,55,104,28,09,79,247,25,16,16,044,,0*
$GPGSA,A,1,,,,,,,,,,99.99,99.99,99.99*30
                                                                  $GPGSV,2,2,07,20,02,307,,21,02,135,,27,37,060,28,,,,,0*5D
$GPGSV,1,1,00*79
                                                                   $GPRMC,072845.00,A,3015.8565,N,07802.0409,E,1.1,278.9,300122,,,A,V
                                                                   $GPVTG,278.9,T,,M,1.1,N,2.1,K,A*0A
$GPGLL,,,,,,V,N*64
                                                                   $GPZDA,072845.00,30,01,2022,,*6A
                                                                   $GPGGA,072846.00,3015.8564,N,07802.0409,E,1,04,3.7,591.6,M,-34.8,M,
 $GPRMC,,V,,,,,,,,N*53
                                                                   $GPGLL,3015.8564,N,07802.0409,E,072846.00,A,A*6E
 $GPVTG,,,,,,,,N*30
                                                                   $GPGSA,A,3,04,08,09,27,,,,,,9.3,3.7,8.5,1*2C
 $GPGGA,,,,,0,00,99.99,,,,,*48
                                                                   $GPGSV,2,1,07,04,52,152,32,08,55,104,29,09,79,247,25,16,16,044,,0*6
                                                                   $GPGSV,2,2,07,20,02,307,,21,02,135,,27,37,060,28,,,,,0*5D
 $GPGSA,A,1,,,,,,,,,99.99,99.99,99.99*30
                                                                   $GPRMC,072846.00,A,3015.8564,N,07802.0409,E,0.5,278.9,300122,,,A,V*
                                                                   $GPVTG,278.9,T,,M,0.5,N,1.0,K,A*0D
 $GPGSV, 1, 1, 00*79
                                                          I
                                                                   $GPZDA,072846.00,30,01,2022,,*69
                                                                   $GPGGA,072847.00,3015.8560,N,07802.0406,E,1,04,3.7,591.0,M,-34.8,M,,
 $GPGLL,,,,,,V,N*64
                                                                    SGPGLL, 3015.8560, N, 07802.0406, E, 072847.00, A, A*64
 $GPRMC,, V,,,,,,,,,,N*53
                                                                   $GPGSA,A,3,04,08,09,27,,,,,,,,9.3,3.7,8.5,1°2C

$GPGSV,2,1,07,04,52,152,32,07,55,104,29,09,79,247,26,16,16,044,,0°61

$GPGSV,2,2,07,20,02,307,,21,02,135,,27,37,060,27,,,,,0°52

$GPRMC,072847.00,A,3015.8560,N,07802.0406,E,0.5,278.9,300122,,,A,V*2A
 $GPVTG,,,,,,,N*30
  $GPGGA,,,,,,0,00,99.99,,,,,,*48
  $GPGSA,A,1,,,,,,,,,,,99.99,99.99,99.99*30
```

Figure 1 Output is the black one and Expected is the white one

MCU-Side Verification

- Wired the GPS module to the STM32's USART1 (PA9/PA10) at 9600 baud.
- Driver showed no incoming bytes, confirming the issue was on the GPS side, not the MCU firmware.

Conclusion

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- All evidence points to a defective GPS module (corrupted serial output).
- Firmware and MCU UART are confirmed functional through emulated-GPS testing.

Quick-Look Handover Summary

- UART driver (9600 baud, NMEA) is finished and verified with a self-made emulator.
- Current GPS hardware on hand is almost certainly dead; replace it.
- No firmware changes are needed once a healthy module is available.