Using VisionFive UART to Read GPS Data Application Note

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About This Manual

Introduction

This application note provides steps to use VisionFive's UART to read GPS data through an example program.

Revision History

Version	Released	Revision
V1.0	2021-12-15	Preliminary release.
V1.1	2021-12-29	• Updated the Makefile content format. • Updated the Makefile description. • Added description for the `rsync` command. • Added description for `<User_Name>`.

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1 Preparation

Before executing the demo program, make sure you have prepared the following:

1.1 Preparing Hardware

Table 1-1 Hardware Preparation

Type	M/O	Item	Notes
General	M	A Single Board Computer	The following boards are applicable: • StarLight • VisionFive
General	M	• 16GB (or more) micro-SD card • micro-SD card reader • Computer (PC/Mac/Linux) • USB to serial converter (3.3 V I/O) • Ethernet cable • Power adapter (5 V / 3 A) • USB Type-C Cable	These items are used for flashing Fedora OS into a micro-SD card.
UART Demo	M	• GNSS HAT • Dupont Line	This is a GNSS HAT based on MAX-7Q, which supports positioning systems including GPS, GLONASS, QZSS, and SBAS. It features accurate and fast positioning with minor drifting, low power consumption, outstanding ability for anti-spoofing and anti-jamming, and so on. For detailed specifications, refer to MAX-7Q GNSS HAT.

*M/O: M (Mandatory)/ O (Optional)

1.1.2 Hardware Setup

The following table and figure describe how to connect GNSS HAT to the 40-pin header:

Table 1-2 onnect GNSS HAT to the 40-Pin Header

GNSS HAT	Pin Number
PPS	18
TXD	37
RXD	35
GND	6
5V	2

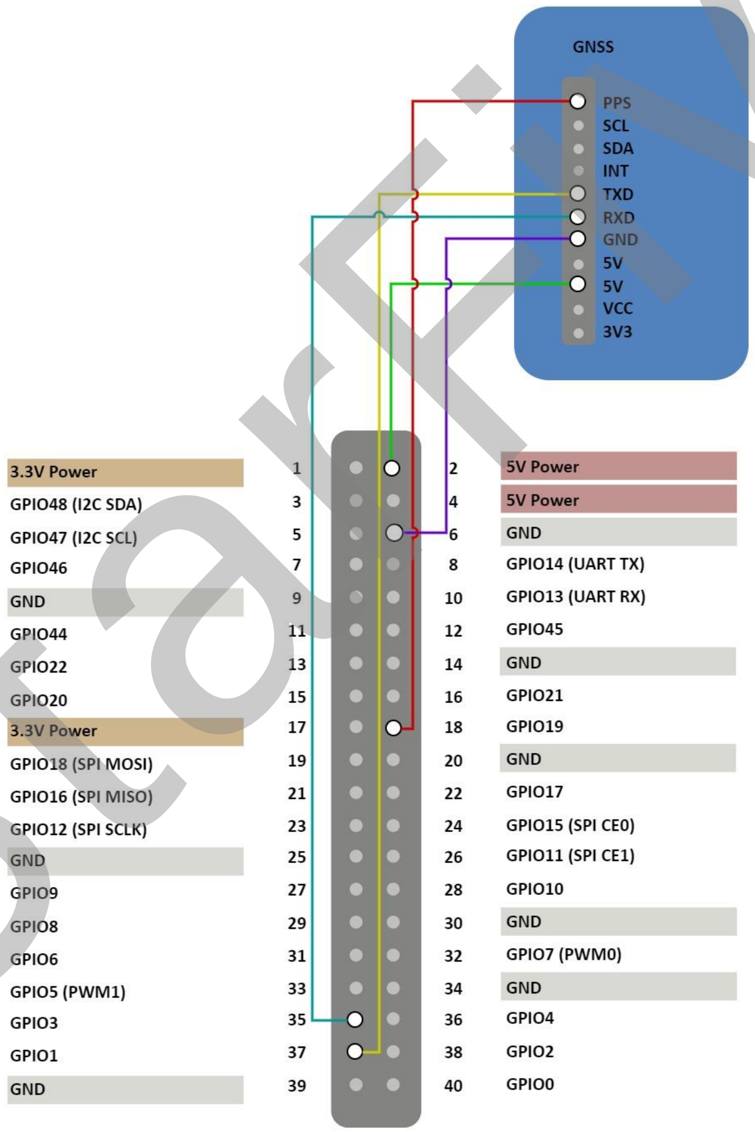

Figure 1-1 Connect GNSS HAT to the 40-Pin Header

1.2 Preparing Software

1.2.1 Software Environment

- PC: Ubuntu 20.04
- RISC-V Platform: Linux 5.16.0

1.2.2 Preparing Toolchain

Install the tool to compile. The following is an example to install:

```
sudo apt-get install gcc-riscv64-linux-gnu
```

Information:

This step can be skipped if the tool has been installed.

After successful installation, check the version by running: `linus@starfive$ riscv64-linux-gnu-gcc -v`. The following is the example output:

```
Thread model: posix
gcc version 9.3.0 (Ubuntu 9.3.0-17ubuntu1~20.04)
```

Figure 1-2 Example Output

1.2.3 Preparing UART GPIO

Make sure the following procedures are performed:

1. Flash Fedora OS into a Micro-SD card and compile and replace dtb files as described in the *Preparing Software* section in *StarFive 40-Pin GPIO Header User Guide*.
2. Configure the GPIO pin as UART by setting the dts file as described in the *Configuring UART GPIO* section in the *StarFive 40-Pin GPIO Header User Guide*.

Information:

You can configure the unoccupied pins as UART. The following is an example table for the mapping:

Table - UART and Pin Name Mapping

UART	GPIO (Pin Name)
Uart1	• GPIO3 • GPIO1
Uart2	• GPIO2 • GPIO0

2 Running Demo Codes

To run the demo codes, perform the following:

Step 1 Create `test-gps` file under app directory to save test file.

Step 2 Download the source code from: test-gps.c.

Step 3 Execute the following to create Makefile:

```
touch Makefile
```

Step 4 Copy the following to the Makefile, save and exit:

```
EXEC   = test-gps
OBJS     = test-gps.o

#CROSS  = riscv64-unknown-elf-
CROSS   = riscv64-linux-gnu-
CC  = $(CROSS)gcc
STRIP  = $(CROSS)strip
CFLAGS  = -O2

all:  clean $(EXEC)

$(EXEC):$(OBJS)
                $(CC) $(CFLAGS) -o $@ $(OBJS)
                $(STRIP) $@

clean:
                -rm -f $(EXEC) *.o
```

Step 5 Execute `make` to generate the executable `test-gps` file.

Step 6 Execute `file` command to check if it is a RISC-V file. The following is an example output:

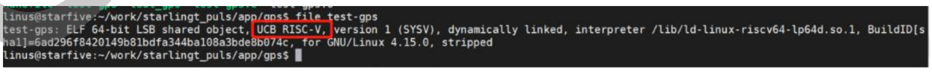

Figure 2-1 Example Output

Step 7 Execute the following command in Ubuntu to upload the executable file `test-gps` to your desired directory of the board, for example, `test`:

```
rsync ./test-gps <User_Name>@<Board_IP_Ad-
dress>:/home/riscv/test
```

Information:

- `<User_Name>`: Your user name of the board. For example, riscv.
- `<Board_IP_Address>`: The board IP address. For example, 192.168.92.133.

Example:

```
rsync ./test-gps riscv@192.168.92.133:/home/riscv/test
```

Step 8 Execute the following command on VisionFive to run the demo codes:

```
./test-gps -d /dev/ttyUSB1 -b 9600
```

Result:

The following output indicates the execution is successful:

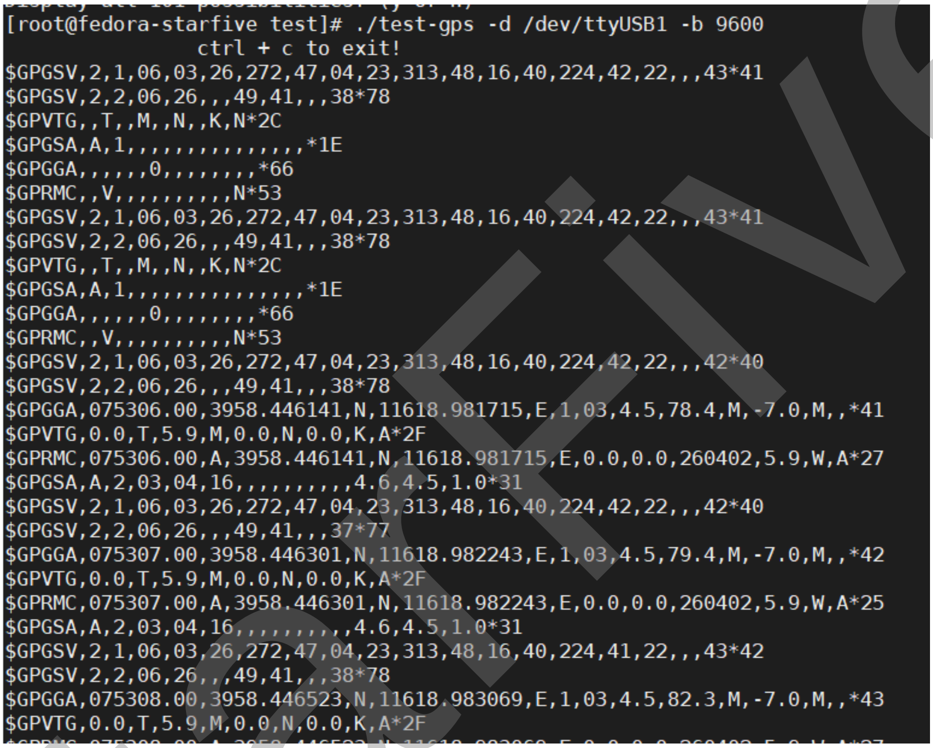

Figure 2-2 Example Output

Refer to http://aprs.gids.nl/nmea/ for how to analyze the GPS data.