MR-VMU-RT1176

Mobile Robotics Vehicle Management Unit reference
design using **i.MX RT1176** Crossover MCU

About the MR-VMU-RT1176

The MR-VMU-RT1176 features an i.MX RT1176 dual core MCU with one Arm® Cortex®-M7 core at 1 GHz and one Arm Cortex-M4 at 400 MHz. The i.MX RT1176 MCU offers support over a wide temperature range and is qualified for consumer, industrial and automotive markets. The MR-VMU-RT1176 is the default VMU for CogniPilot's Cerebri, a Zephyr RTOS based Autopilot.

Features

Vehicle management unit

- i.MX RT1176 crossover MCU with dual cores
  - Arm Cortex-M7
  - Arm Cortex-M4
- 64 MB external flash memory
- 2 MB RAMTF socket for SD card
- Ethernet
  - 2 wire 100BASE-T1
- USB
  - USB-C 2.0 connector and JST-GH pin header
- Power
  - Redundant dual picoflex power port
- Debug
  - 10-pin debug and serial console adapter bord to 20-pin JTAG debugger and USB-C serial port

- Sensors
  - BMI088 6-axis IMU
  - BMM150 magnetometer
  - Dual BMP388 barometer
  - Dual ICM-42688 6-axis IMU
  - IST8310 3-axis magnetometer
  - U-blox NEO-M8N GNSS module
- UART JST-GH connectors
- I²C JST-GH connectors
- CAN bus JST-GH connectors
- RC IN
 - RC input connector for SBUS compatible receivers

Get to know the MR-VMU-RT1176

i.MX RT1176
crossover MCU

Power 1

Power 2

Get to know the MR-VMU-RT1176 Continued

RC input
PWM out

AUX

RC IN   FMU PWM OUT

12 11 10 9 8 7 6 5 4 3 2 1
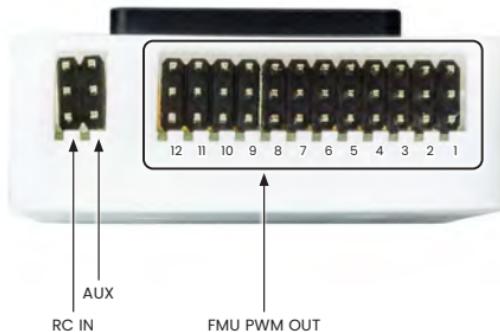
Get to know the MR-VMU-RT1176 Continued

USB Type-C
I²C and CAN side

USB Type-C

AD&IO   CAN2   CAN1   I²C   USB
(JST-GH connector)
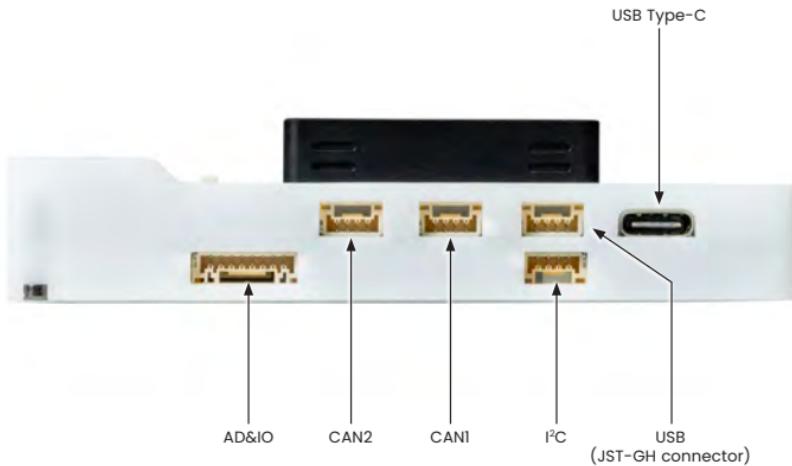
Get to know the MR-VMU-RT1176 Continued

Telemetry, ETH, UART and Debug side

CAN3

UARTand I²C

T1-ETH   TELEM1   TELEM2   TELEM3   Debug + HW
serial console
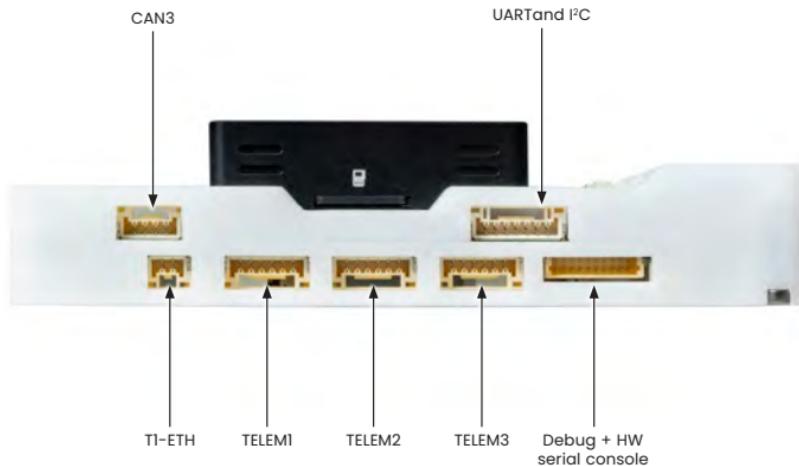
GPS and SPI port side

DSM — GPS1

GPS2   NFC   SPI
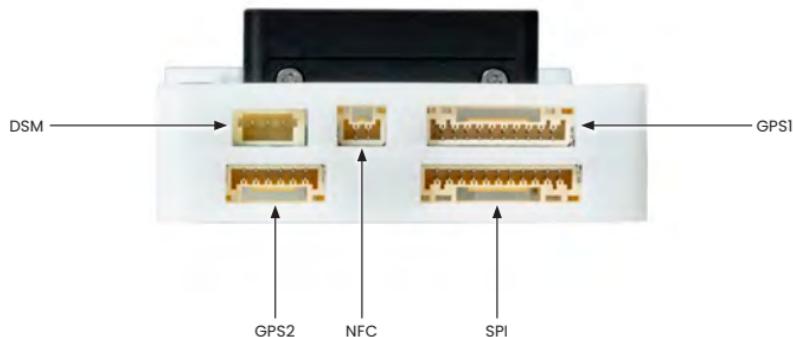
The default configuration can be found on GitHub:

https://github.com/zephyrproject-rtos/zephyr/blob/main//boards/nxp/ vmu_rt1170/doc/index.rst

Other hardware features are not currently supported by the port.

Getting started

Unpack the kit

The VMU-RT1176 is shipped with the items listed in Table 1. Ensure the items are available in the EVK box.

Table 1	Kit contents
Item	**Description**
MR-VMU-RT1176 unit	MR-VMU-RT1176 Vehicle Management Unit • Enclosed in 3D printed enclosure
Battery power adapter	PM02D V1.4 Battery Power adapter • Connects to Li-Po battery • Shrouded connector can be connected to VMU-RT1176's POWER1 or POWER2 ports
Communications cables	• 2x Power cables • 1x 8-pin SPI cable • 1x 10-pin Debug cable • 3x 6-pin Telemetry and GPS2 cables • 1x 8-pin AD&I/O cable • 1x 7-pin UART&I^{2}C port cable • 4x 4-Pin cables for CAN and I2C ports • 1x 3-pin Servo / RC control cable • USB-C to USB-A cable
Software	PX4 bootloader may be pre-loaded, please follow PX4 build instructions Please refer to the procedure in the following Link: **https://cognipilot.org/**
Documentation	MR-VMU-RT1176 block diagram

Setting up the system

The MR-VMU-RT1176 is shipped with the items listed in Table 1.
Ensure the items are available in the EVK box.

1 Settings before power-up

Locate the following:

- PM02D battery adapter board
- 1x VMU-RT1176 Power cable
- USB-A to Type-C cable
- Li-Po Battery

Connect the cables and adapter boards to VMU-RT1176.

The VMU unit is shipped with pre-built NuttX image.

2 Connect Li-Po battery

Power on the VMU-RT1176 by plugging in a Li-Po battery to the battery adapter board (PM02D). The VMU-RT1176 will power up — the pilot LED labeled as PWR located by the CAN3 port should be on. All other LED should be off.

3 Programming the VMU-RT1176

Connect your PC's USB port to MCU-Link-MR's USB Type-C port. Connect the MCU-Link-MR's UART port to VMU-RT1176's UART and I2C port. Make sure the VMU-RT1176 is powered up. Build the Zephyr application image on your PC's workspace. Once the Zephyr application build is complete, check the connections to each module then type the following command, **west flash -- runner pyocd**, from your Zephyr workspace to update the firmware.

Setting up the system Continued

4 Connect USB-A to Type-C Cable

Connect to Type-C port on the VMU-RT1176. Connect the other end of the cable to a PC acting as a host terminal. One UART connection will appear on the PC.

Open the serial console application (e.g. PuTTy for Windows, Minicom on Linux), choose the COM port number and set the baud rate to 115200.

5 Start testing

If the boot was successful, in the terminal it will show the prompt with:

nsh>

Congratulations, you are up and running.

Now with the VMU-RT1176 setup complete, you can start to install other software packages and run your own code.

If the user wishes to build and run a Zephyr image, please refer to the material located at: **docs.zephyrproject.org/**

⬇ Get started

Follow getting started under "Jump Start Your Design" at **www.nxp.com/VMU-RT1176/start**.

Support

Visit **www.nxp.com/support** for a list of phone numbers within your region.

Warranty

Visit **www.nxp.com/warranty** for complete warranty information.