GW-USB-05

FW v1.07

IQRF USB Gateway

User's Guide

Smarter wireless. Simply.

Description

GW-USB-05 is an IQRF gateway with USB connectivity. It is intended as an interface between IQRF network and PC or similar devices with USB.

The user can implement specific functionality by software for internal TR module.

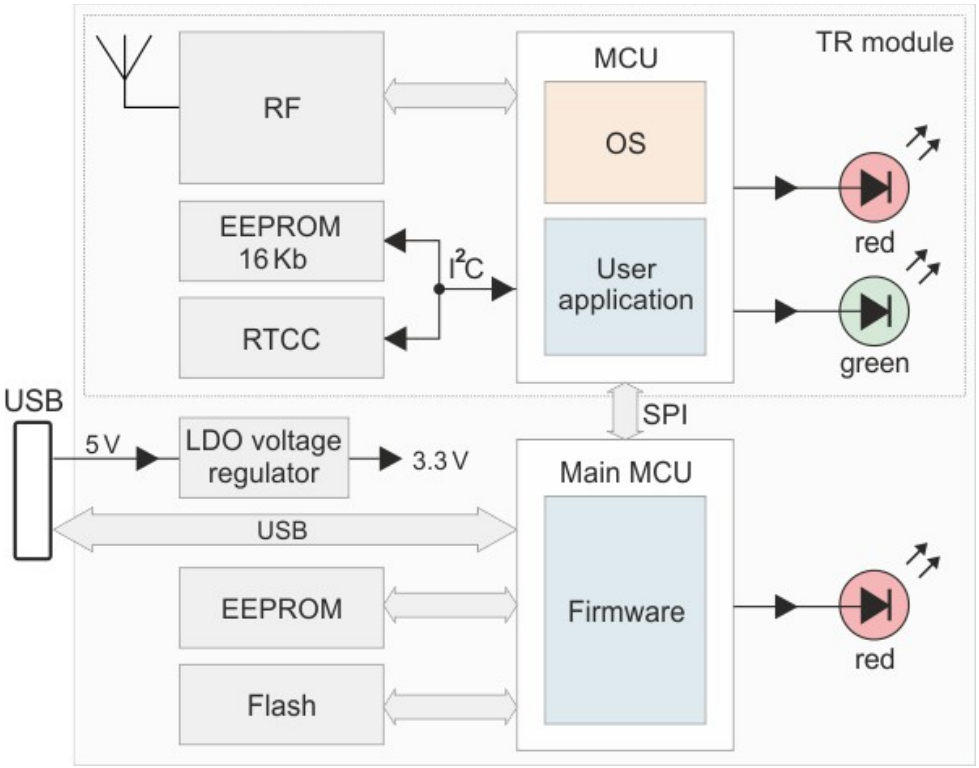
Applications

- IQRF – PC interface
- IQRF gateway
- Diagnostic tool
- Wireless programmer (RFPGM) for TR modules

Key features

- PC connectivity via USB interface
- USB interface (CDC and Custom device, MICRORISC VID & PID)
- Custom device, CDC IQRF, CDC SPI and CDC UART modes
- TR module and internal antenna, bidirectional RF
- TR module programming via USB and IQRF IDE
- RTCC (real-time clock/calendar)
- 3 LEDs
- Compact USB-stick style
- Bootloader for firmware upgrade

Block diagram



Electrical specifications

*(**typical values** unless otherwise stated)*

Power supply	5.0 V supplied from USB
USB	V2.0 Compliant SIE
Supply current (TR in Sleep mode)	14 mA
Aditional supply current due to TR module	1 mA (TR in Run mode) up to 24 mA (TX mode, max. output power)
Temperature range	0 °C to +70 °C
TR module	TR-52D compatible, without temperature sensor
Antenna	Built-in PCB
Frequency band	868 MHz / 916 MHz, SW selectable
RF output power	Up to 3.5 mW, programmable
Dimensions	59.3 mm x 23.5 mm x 12.3 mm (including the cover)
Weight	12 g (including the cover)

Absolute maximum ratings

Stresses above those values may cause permanent damage to the device. Exposure to maximum rating conditions for extended periods may affect device reliability.

Supply voltage (VCC)	5.5 V
Storage temperature	-40 °C to +85 °C

Hardware

GW-USB-05 consists of main MCU, memories and the TR-52D compatible circuitry with RTCC added. Firmware of the main MCU is fixed. Specific functionality of the device can be implemented by user software for the TR module. Application for TR module inside (except of RTCC usage) can also be developed using the CK-USB-04A development kit. For detailed information refer to CK-USB-04A User's guide.

Power supply

GW-USB-05 is intended to be supplied from a host via USB connector. LDO voltage regulator converts 5 V from USB to 3.3 V for all internal circuitry. RTCC has a temporary backup by decoupling capacitors, see below.

Reset

Reset can be invoked by connecting a disconnected GW-USB-05 to USB or by the *Reset USB Device* command in CDC IQRF mode. Actual reset is executed ~5 s after the command is issued. This delay allows to disconnect USB communication on host side in time. See the user's guide *CDC Implementation in IQRF USB devices*.

USB

GW-USB-05 supports Custom device and three types of CDC USB modes. Proper USB driver(s) must be installed in the host device.

TR module

Wireless IQRF transceiver module compatible with TR-52D, without temperature sensor. Refer to the TR-52D datasheet for details.

Antenna

PCB antenna on GW-USB-05 board.

RTCC

Real-time clock / calendar MCP7940NT by Microchip shares the I2C serial bus with serial EEPROM. It can be controlled from TR module. Decoupling capacitors ensure RTCC backup for 30 s after disconnecting power supply which allows to quickly replug the device from one host USB to another keeping the RTCC running.

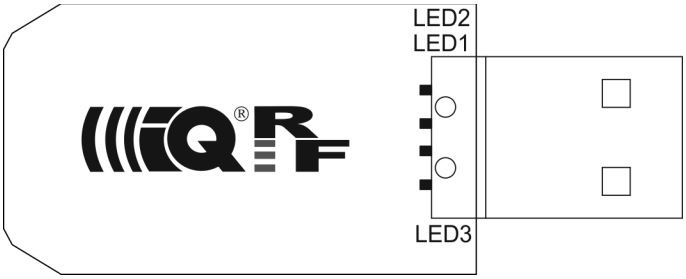
RTCC is supported by demo user software example.

Serial Flash memory

Flash memory 8 Mb with serial SPI interface is connected to main MCU. It is not supported in current firmware version, reserved for future use and optional on request.

LEDs

LED1 (red) and LED2 (green) are dedicated to TR module (compatible with LEDs on discrete TR modules). LED 3 indicates USB modes and other status information.



Firmware

Firmware upgrade

GW-USB-05 firmware can be upgraded by the user with new versions possibly released by the IQRF manufacturer using the IQRF IDE 4.23 or higher, menu *Tools – IQRF Device Manager – Upload FW*. See IQRF IDE Help.

LED 3 indication

After GW-USB-05 reset (by reconnecting the USB cable), current USB mode is indicated by a series of flashing of LED 3 as follows:

- Custom Device: 1 x
- CDC IQRF: 2 x
- CDC SPI: 3 x
- CDC UART: 4 x

In idle state LED 3 is not flashing (Custom Device mode) or flashes with 1 s period (CDC xxx mode). If it is needed to find out the current USB mode, the reset of the device must be performed.

LED3 flashes 3x after the *Indicate USB Device* command (key *F11*) in respective IQRF IDE (to identify the kit in case of multiple IQRF USB devices or IDE instances).

LED3 flashing in 300 ms period means missing firmware (see *Firmware upgrade* below).

USB modes

GW-USB-05 supports four USB modes:

- Custom Device
- CDC IQRF
- CDC SPI
- CDC UART

Proper USB drivers must be installed in the host equipment. See the IQRF document Install_Guide_USB_Drivers. If used with IQRF IDE, both USB drivers (Custom Device and CDC) are installed transparently within the IQRF IDE installation.

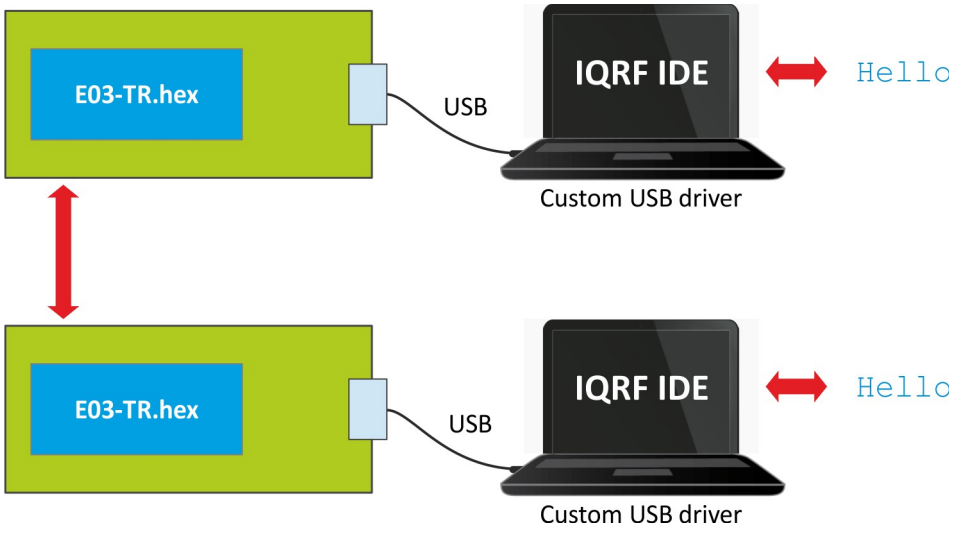
USB mode selection

- Using IQRF IDE: Menu *Tools – USB Classes* (for all modes, see IQRF IDE Help).
- Using commands in CDC IQRF protocol (from CDC IQRF mode only). See the *CDC Implementation in IQRF USB devices* User's guide (`User_Guide_CDC_xxxxxx.PDF`).
- Using the sequence *1 s inactive *** 1 s inactive* sent from a USB host application (for switching from CDC SPI or CDC UART to CDC IQRF only). The switching is performed after about 5 s.

See chapter *LEDs* for indication of current mode. The last selected mode is restored after start-up or reset.

Custom Device mode

Full communication with the IQRF IDE is enabled in this mode.

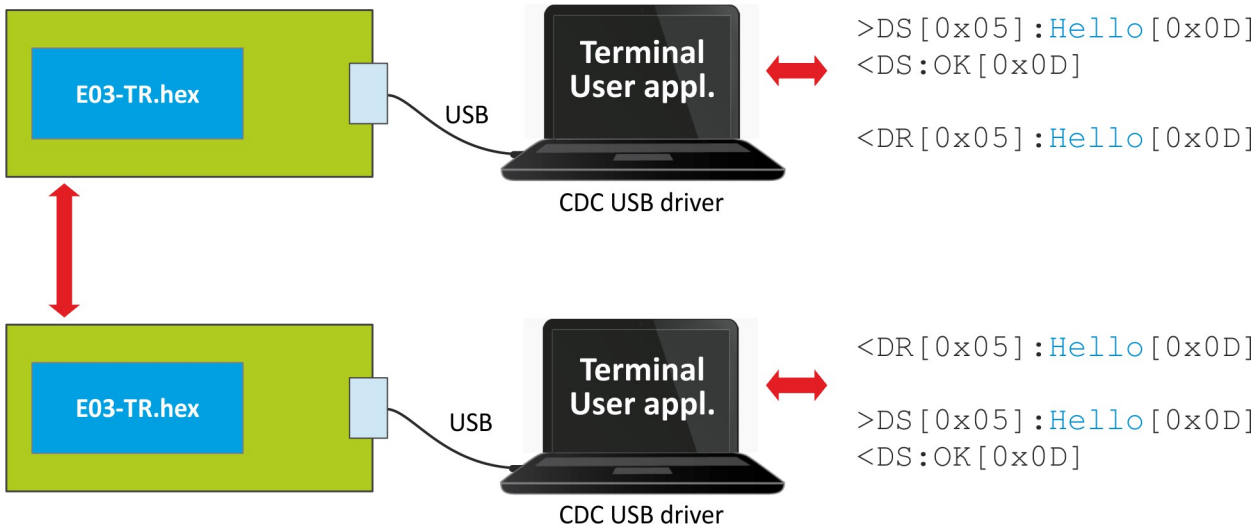


CDC IQRF mode

After connecting to PC a virtual serial port is created in this mode. The user can create one's own PC program and communicate via this port using the protocol described in document *CDC Implementation in IQRF USB devices User's guide*.

This protocol enables:
- Communication with TR module
- Communication with the USB device itself
- Confirmation of commands
- Information about error states

This mode is recommended for communication with custom (USB host) applications and is supported by the IQRF SDK (Software Development Kit, open source). The application in TR transceiver must use SPI communication.



Tip

For testing a communication in CDC mode various SW terminals operating with PC serial ports are available. Select a terminal enabling to issue direct byte commands and data. Refer to the communication protocol described in *CDC Implementation in IQRF USB devices User's guide*.

Recommended terminal: Docklight, **`www.docklight.de`**. There is a project containing all supported commands for this terminal available at **`www.iqrf.org/218`**. It is necessary just to select the COM port used.

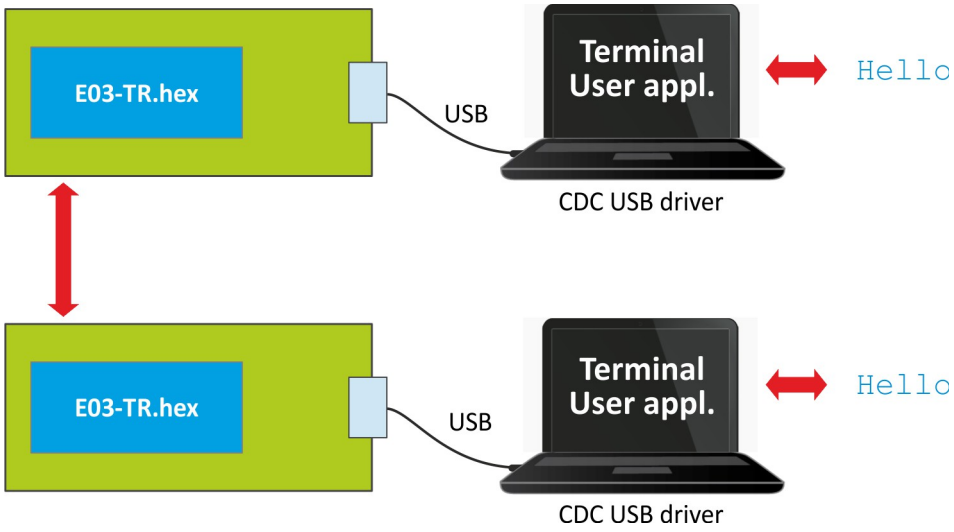
Unsuitable terminals: Windows Hyperterminal and Tera Term.

CDC SPI mode

After connecting to PC a virtual serial port is created in this mode.

This mode is intended for testing of user application for TR transceiver utilizing SPI communication. It works similarly as the CDC IQRF mode but it has no protocol implemented and the data is transferred transparently. It can be used also in case when the user (a USB host) application does not allow to implement any proprietary protocol. Otherwise, the CDC IQRF mode is recommended.

The application in TR transceiver must use SPI communication.



CDC UART mode

After connecting to PC a virtual serial port is created in this mode.

Application

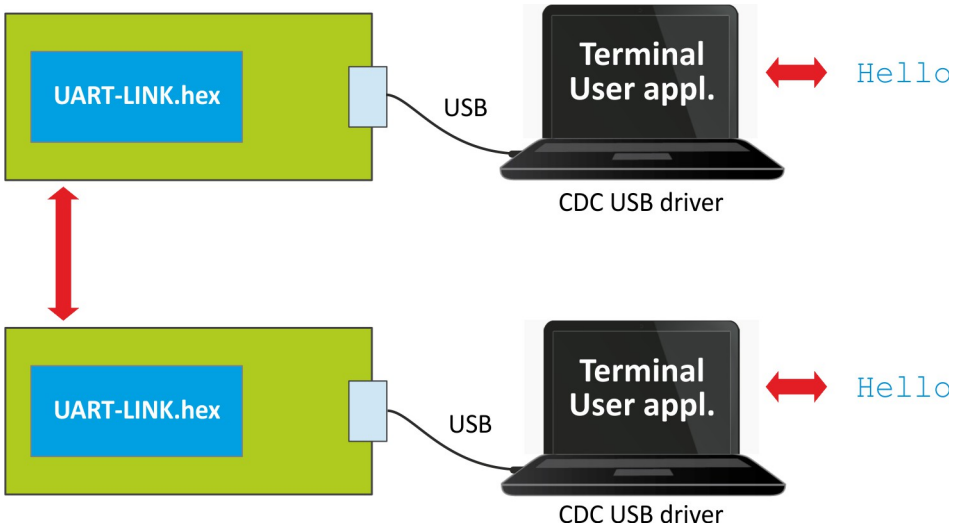
Testing of user applications for TR transceiver using UART communication

UART parameters

- Voltage levels: 3 V
- Baud rates: 150, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 76800, 115200 Bd
- Data bits: 8
- Parity: None, Odd, Even, Mark, Space
- Stop bits: 1
- Operation: duplex
- Number of data bytes in a packet: max. 64
- End of packet detection timeout: cca 3 * transmission time for one byte (with respect to given baud rate)

This mode has no protocol implemented and the data is transferred transparently.

The application in TR transceiver must use UART communication.



Application

The functionality of TR module inside the GW is fully user programmable. Factory default application is E03-TR (one of basic IQRF examples).

Installing

See the IQRF Quick Start guide and IQRF IDE Help.

Programming

Programming the application is similar to the CK-USB-04A development kit usage. See the IQRF Quick Start guide, CK-USB-04A User's guide and IQRF application examples (www.iqrf.org/examples).

Upload

GW-USB-05 enables to upload an application code into IQRF TR modules in following ways:

- Wired upload using IQRF IDE running in the GW-USB-05 host.
- Wireless upload (RFPGM – RF Programming ™), e.g. when the GW is hosted on an equipment not supporting IQRF IDE. Switching between RFPGM and operation modes must be solved in the application in this case. See IQRF OS User's guide (Appendix RFPGM) and IQRF IDE (Programming → RF programmer).

Debug

The application in internal TR module can be debugged similarly as in discrete TR modules. See the IQRF Quick Start guide, IQRF IDE Help and IQRF application example E06-RAM (www.iqrf.org/examples).

Product information

White dot as an identification mark added at the case since April 2016.

Pack list

- GW-USB-05 USB gateway, with E03-TR example uploaded in TR module.

Ordering code

- GW-USB-05 USB gateway (serial Flash memory included).

Document history

- 160405 Updated for FW v1.07 (with three CDC modes). RTCC demo SW example available. Identification mark at the case added.
- 130220 Serial Flash memory is a standard for GW-USB-05 but not an option.
- 130125 First release.

Sales and Service

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