Manual of KWR112401/01B

FCC Statement

FCC Part 15.19
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) this device may not cause harmful interference and
(2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE:
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-- Reorient or relocate the receiving antenna.
-- Increase the separation between the equipment and receiver.
-- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
-- Consult the dealer or an experienced radio/TV technician for help.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate the equipment.

No special accessory is required to enable the equipment to comply with the emission limits.

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1. Introduction

1.1 General description

The KWR112401/01B remote control is based on the GP500C communication controller chip.
The chip is fully compliant with the IEEE 802.15.4 standard, providing robust spread spectrum data communication with a highly secure encrypted data flow. It features a radio transceiver, integrated real-time MAC, an event scheduler, a security processor, advanced power management features, and a high-speed SPI interface to a microcontroller.

A RF4CE remote control unit can be build with a GP500C plus a microprocessor, supporting the keyboard scanner and the IR interface for compatibility with legacy targets.

1.2 Frequency synthesis and modulation

The GP500C is using a PLL circuit with a VCO on 2 times the transmit frequency. The VCO is directly modulated by the digital signal processor (DSP). The modulation is fully compatible with the offset quadrature phase-shift keying (O-QPSK) as required by the IEEE802.15.4 standard.

1.3 RF interface

The GP500C does have two RF outputs: RF1 and RF2. Both RF ports are bidirectional and will be used for both transmit (TX) and receive (RX) mode. The signal configuration of the RF ports is differential. The differential configuration is maintained up to the antenna, so the remote control is using a differential matching and low pass filters and also differential antennas.

Biasing of the power amplifier (PA) and diversity switch is supplied by the VCM pin of the GP500C and is injected into the low pass filters

1.4 Antenna diversity

The GP500C is supporting antenna diversity over two antennas. For every received packet the digital signal processor in the GP500C will select the antenna with the best signal. The decision is made at the very beginning of the packet. Normally the transmitter will use the antenna that was used to receive the last packet. The result of the antenna diversity mechanism is that either RF port 1 or RF port 2 can be used for transmit; there is only one antenna transmitting at the time.

2. Radio Information

2.1 Applicable frequency range

The RF4CE application supports **only** 3 RF-channels; these channels are the following IEEE802.15.4 channels:

- CH15 2425 MHz
- CH20 2450 MHz
- CH25 2475 MHz

3. RF Evaluation Application - Operating Manual

The commands required to perform the Certification Test are listed in Table 1: Reference Evaluation Application command set.

Table 1: Reference Evaluation Application command set

Key	Function	Description	Default at start-up
Volume up/down	Tx power up/down*	Change TX output level 1 short LED blink @ key press 1 long LED blink, upper/lower limit reached	0 dBm
Zoom in/out	Channel up/down**	Change TX transmit channel 1 short LED blink @ key press 1 long LED blink, upper/lower limit reached	Ch 20
Call	Turn RX on/off	Turn RX on 2 short LED blinks: OFF 1 long LED blink: ON (**make sure TX is OFF by either power cycle (RESET) or changing the RF channel**)	OFF
Hold	Antenna Diversity	2 short LED blinks: OFF 1 long LED blink: ON	ON
Views	Toggle RF port	2 short LED blinks: RF1 selected 1 long LED blink: RF2 selected	RF1
Up (at front of the RC)	Modulated CW	Turn TX ON, Modulated CW 1 long LED blink: ON To switch OFF change channel or power cycle	OFF
Down (at front of the RC)	Un-modulated CW	Turn TX ON, Un-modulated CW 1 long LED blink: ON To switch OFF change channel or power cycle	OFF

* The XR3 supports the following power levels:
  RF1: +3dBm to -12dBm in ~ 1dB steps.
  RF2: 0dBm to -15dBm in ~ 1dB steps.
** The channel number is incremented / decremented in steps of 1 channel.

NOTE: To RESET XR3 to default settings, remove batteries and re-insert!

4. RF Testing

Devices for certification test are loaded with Evaluation Software. With this software application it is possible to perform all radio tests.

4.1 Set-up procedure for TX modes

4.1.1 Select +0dBm output power level

- The default power setting at startup is “0 dBm”,
  this complies with 0 dBm power on the RF1 port and -3dBm on the RF2 port
- Increase power in 1 dB steps, press “Volume Up”
- Decrease power in 1 dB steps, press “Volume Down”

4.1.2 Select RF4CE channel

- Ch 20 – default at start-up
- Ch 15 – from default/RESET, press 5 times “Zoom out”
- Ch 25 – from default/RESET, press 5 times “Zoom on”

4.1.3 Select RF port/antenna

- Press “Views” key
  - 2 short blinks: RF1 port selected
  - 1 long blink: RF2 port selected

4.1.4 Turn TX on, un-modulated CW

- Press “Down” key
  - make sure key press is acknowledged by 2 short LED blinks
- To Turn OFF TX, change channel or RESET by removing batteries.

4.1.5 Turn TX on, modulated CW

- Press “Up” key
  - make sure key press is acknowledged by 2 short LED blinks
- To Turn OFF TX, change channel or RESET by removing batteries.

4.2 Set-up procedure for RX mode

Before the RX test please RESET the remote control by removing batteries and re-insert!

4.2.1 Select RF4CE channel

- Ch 20 – default at start-up
- Ch 15 – from default/RESET, press 5 times “Zoom out”
- Ch 25 – from default/RESET, press 5 times “Zoom in”

4.2.2 Turn RX on

- Press “Call” key
  - 1 long blink: ON
  - 2 short blinks: OFF

4.2.3 Antenna Diversity and Antenna Selection

If antenna diversity is “ON” and the XR3 is in receiving mode, the remote control automatically switches between the RF1 and RF2 antenna.

Set antenna diversity:

- Press “Hold” key
  - 1 long blink: ON
  - 2 short blinks: OFF

If a RF port is selected manually, antenna diversity is switched to “OFF”.

Set RF port:

- Press “Views” key
  - 2 short blinks: RF1 port selected
  - 1 long blink: RF2 port selected