MOTOBLINKERS MBK1
REMOTE CONTROLLED HORSE BRIDLE

ELECTRONICS AND FIRMWARE
OPERATIONAL DESCRIPTION

DATE	VERSION	AUTHOR	SUBJECT
2022/05/15	1	A.SIMOES	CREATION

SUMMARY

PRESENTATION

The MOTOBLINKERS MBK1 electronic system is made up of 3 subsets:

- A RXG board mounted on the left side blinder (with microcontroller MCU, Bluetooth®, motor and 9V battery)
- A RXD board mounted on the right side blinder (with microcontroller MCU, Bluetooth®, motor and 9V battery)
- A TX board carried on a driver hand (with microcontroller MCU, Bluetooth®, push button and 3V battery)

The TX board is equipped with a push button used as a remote for the RXG and RXD motors.

The radio remote system is based on a Bluetooth® RN4870 module (RN4870 will be used from now on).
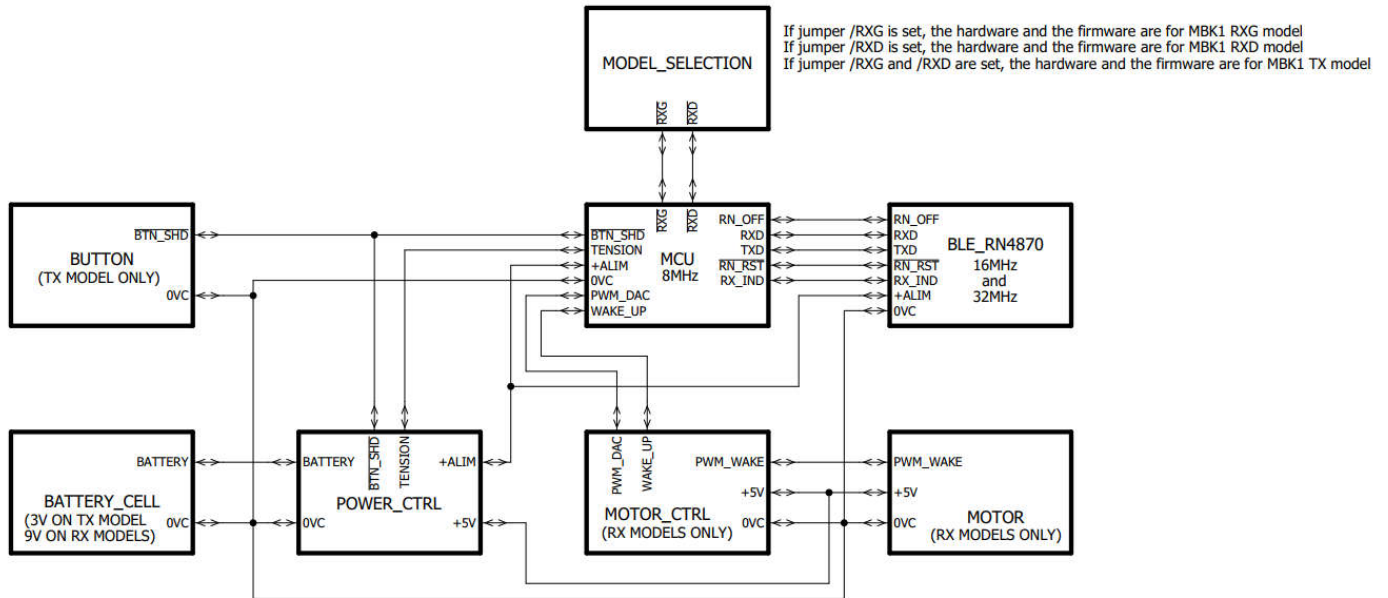
Each board embeds a microcontroller (MCU will be used from now on).

The 3 boards are equipped with the same PCB, the same MCU + firmware and the same RN4870.

The RX boards are identically populated while the TX board is specifically populated.

The common firmware knows the target it is running on thanks to jumpers (solder drops).

COMMON BLOCK DIAGRAM

MBK1 TX (REMOTE CONTROL) ELECTRONICS DESCRIPTION

The MODEL_SELECTION block jumpers specify the target to the firmware.

The TX board is powered with a 3V battery which directly supplies the MCU and the RN4870.

The POWER_CTRL block includes:

- A protection against reversed supply
- A fuse
- A divider for battery voltage measurement by the MCU
- A supply capacitive filtering.

The BLE_RN4870 block includes:

- An over UART controlled Bluetooth® module (RN4870) for remote control and voltage transmission
- A transistor based switch (to switch on or off the RN4870).

The BUTTON block only includes a push button.

The MCU block includes the MCU which controls the whole board and specially the RN4870 over UART.

MBK1 TX (REMOTE CONTROL) FIRMWARE DESCRIPTION

The firmware knows it is running on a TX board thanks to the jumpers.

After firmware boot, the TX board automatically enters sleep mode when its button is released.

During sleep mode, the RN4870 is switched off and the MCU is in low power mode.

The wake up of the TX board is triggered each time the button is pressed.

After waking up, the TX board sends a radio message with the requested position of the blinders and the battery voltage, and waits for the release of the button.

MBK1 RXG AND RXD (MOTORIZED BLINDERS) ELECTRONICS DESCRIPTION

The MODEL_SELECTION block jumpers specify the target to the firmware.

The RXG and RXD boards run the same code except to drive their motor (angles reversed).

The RX boards are powered with a 9V battery which, when converted, provides 3VDC and 5VDC.

The POWER_CTRL block includes:

- A protection against reversed supply
- A fuse
- A divider for battery voltage measurement by the MCU
- A capacitive filtering for the battery voltage
- A permanent 9VDC to 3VDC converter
- A 9VDC to 5VDC converter with shutdown control
- A capacitive filtering for the 3VDC supply
- A capacitive filtering for the 5VDC supply.

The BLE_RN4870 block includes:

- An over UART controlled Bluetooth® module (RN4870) for remote control and voltage transmission
- A transistor based switch (to switch on or off the RN4870).

The MOTOR_CTRL block includes:

- A buffering gate for the PWM motor input
- A diode + resistors protection for the MCU input that detects the voltage generated by forced rotation of the blinder

The MOTOR block only includes a 5VDC servo.

The MCU block includes the MCU which controls the whole board and specially:

- The RN4870 over UART
- The 5VDC power shutdown
- The PWM output (to drive the motor)

MBK1 RXG AND RXD (MOTORIZED BLINDERS) FIRMWARE DESCRIPTION

The firmware knows it is running on a RXG or a RXD board thanks to the jumpers.

The RXG and RXD boards run the same code except to drive their motor (angles reversed).

After firmware boot, a RX board stays in active mode and automatically enters sleep mode after 60 minutes of non-use or manually by forcing a quick rotation to either side on the associated blinder.

Before entering sleep mode, a RX board sends a radio message with its battery voltage.

During sleep mode, the RN4870 is switched off, the 5VDC converter is shutdowned and the MCU is in low power mode.

The wake up of a RX board is triggered by forcing a quick rotation to either side on the associated blinder.