

Wired Remote Control User's Manual

Rugged Remote Control with Six Analog Axes, Eight Programmable Buttons, Status LCD, and Simple Integration Interface



FORT's Wired Remote Control is a wired controller designed from the ground up to enable the operation of remote and automated systems. It provides a rugged, ergonomic, and easy-to-understand controller to ensure consistent and reliable control.

1. Applications

- Control of remote, tele-operated, semi- or fully autonomous robotic systems.
- Monitoring of fixed or mobile industrial systems requiring sophisticated control.
- Pan & tilt controls for security and surveillance.

2. Key Features (Wired Remote Control – WRC)

- Direct USB interface for easy integration into existing systems
- Six fully proportional analog control axes using hall effect, non-contact controls for rugged and reliable performance
- Low-latency control response
- Eight programmable buttons
- Active User Sensing
 - Free-fall/drop detection
 - Orientation detection
 - Idle controller detection – automatic pause for unattended controls
- Sunlight-readable graphic LCD display
- Dual vibration functions for non-visual directional feedback
- Real-time status display as well as system information display in menu
- IP66 rated enclosure
- Designed to meet MIL-STD-810 for ruggedness
- -20°C to 60°C operation
- Dual lanyard attachments for flexible harnessing options

3. Specifications

Parameter	Minimum	Typical	Maximum	Unit
Operating Temperature	-20		+60	°C
Operating Voltage	4.5	5	5.5	V
Operating Current			2.0	A
Ingress Protection	IP66			
Ruggedness	Designed to meet MIL-STD-810			
Weight		454		g
Connector		USB A		

Table 1 - Wired WRC Specifications

4. Wired Remote Control Integration

The WRC can be directly connected to the integrator’s control computer. All command and control communication over the USB interface is available in two options, the first is a USB HID Game Controller device, and the second is in the FORT Packet Protocol. When using the HID Game Controller, the device is implemented as a USB HID device. On most operating systems it will show up as a standard Game Controller device and can be used the same as any off-the-shelf USB game controller. When using the USB interface, the device is implemented as a CDC device. On most operating systems it will show up as a serial port (`/dev/tty.usbserial`, `/dev/ttyACM0`, etc).

5. Operation

The Wired Remote Control has three modes: Operational, Menu, and Pause. The basic features of these modes are summarized in the table below. The WRC features 6-axis control and 8 buttons. The joystick and button data are only available when the system is in operational mode as described below.

Mode	Heartbeat	Joysticks	Buttons
Operational	Nominal	Active	Active
Menu	Nominal	Zeroed	Zeroed
Pause	Nominal	Zeroed	Zeroed

Table 2: WRC Modes of Operation

5.1. Pause Mode

When in Pause Mode, the WRC has established a communication link with the computer on the user’s equipment, however no motion is intended. The WRC display will appear as the following in Pause Mode.

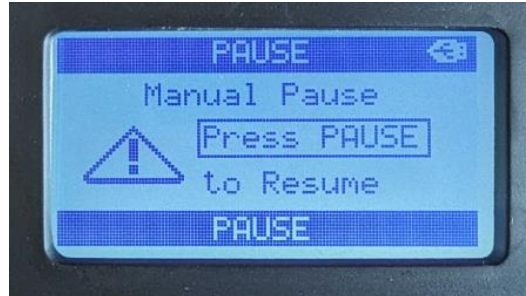


Figure 1: Pause Mode

Pause Mode will be entered upon any of the following conditions:

- 1) Whenever the Pause Button is pressed on the WRC
- 2) Upon any of the following triggers
 - a. Orientation Detection
 - b. Free-fall Detection
 - c. Inactivity Timeout

If in Pause Mode, the WRC will continue to output the joystick messages with all values set to 0 to guarantee no motion will occur.

5.2. Menu Mode

Menu Mode is used to modify device settings on the WRC. When in Menu Mode, the WRC has established a communication link with the user’s equipment, however no motion is intended. The WRC LCD display will show it is in Menu Mode. If in Menu Mode, the WRC will continue to output the joystick messages with all values set to 0 to guarantee no motion will occur.

Pressing the Menu Button on the WRC is the only way to enter Menu Mode. The WRC display will appear as follows in Menu Mode.

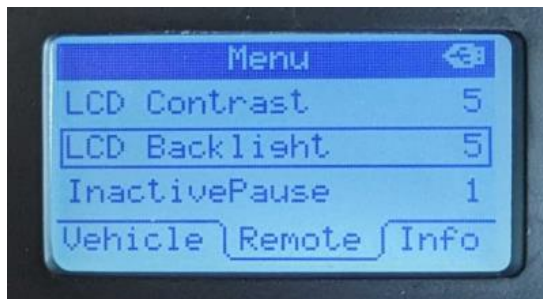


Figure 2: Menu Mode

There are three tabs in the menu display, from left to right: Vehicle, Remote, and Info. The Vehicle menu tab displays the 9 user values that can be updated through the interfaces available on the wireless versions of the WRC, however it is unused on this wired version. The Remote menu tab contains setting specific to the WRC as shown below. The Info menu tab displays related information pertaining to the device, specifically the firmware version information and serial number of the device.

Menu Item	Description	Values
<i>LCD Contrast</i>	Controls the contrast setting on the LCD screen.	0 - 16
<i>LCD Backlight</i>	Controls the backlight setting on the LCD screen. When set to 0, the backlight is disabled.	0 - 16
<i>InactivePause</i>	Controls the time before the WRC goes into Pause Mode because of an Inactivity Timeout. The time before going into Pause Mode is the InactiveTime + 1 in minutes.	0 - 10
<i>InactiveEnable</i>	Controls whether or not the WRC will go into Pause Mode because of inactivity. Time required to trigger the Pause is controlled by <i>InactivePause</i> .	ON – OFF
<i>AutoOffEnable</i>	Controls whether or not the WRC will automatically power off after being inactive for 2 minutes after going into Pause Mode because of an Inactivity Timeout.	ON – OFF
<i>OrientPauseEn</i>	Controls whether or not the WRC will go into Pause Mode because of being held upside down.	ON – OFF
<i>FreeFallEnable</i>	Controls whether or not the WRC will go into Pause Mode because of being dropped.	ON – OFF
<i>Calibrate Axes</i>	Function to calibrate the joystick axes. Typically this is only used during device production.	N/A
<i>Axis Values</i>	This changes the display to temporarily show the Raw and Calibrated axes values as they are being read by the processors on the WRC.	N/A
<i>Button Test</i>	This changes the display to temporarily show the current status of the buttons being pressed. Typically this is only used during device production.	N/A
<i>Dust Test</i>	This changes the display to temporarily clear all text and maximize the backlight to help clean dust off of the screen. Typically this is only used during device production.	N/A
<i>Accel Test</i>	This changes the display to temporarily show the raw values of the accelerometer.	N/A

Table 3: Remote Menu Options

5.3. Operational Mode

Operational Mode is the only state where motion is allowed in the system. When in Operational Mode, the WRC has established a communication link and motion is intended. The WRC LCD display will show it is in Operational Mode. At this point, all joystick movement, and button presses on the WRC will be output from the user’s computer to the equipment.

6. Interfacing using USB HID Device Protocol

When using the HID Game Controller Protocol, the device is implemented as a standard USB Human Interface Device. On most operating systems it will show up as a standard Game Controller device and can be used the same as any off-the-shelf USB game controller. This USB interface is implemented as a CDC device and on most operating systems it will show up as a serial port (/dev/tty.usbserial, /dev/ttyACM0, etc.)

6.1. Packet Structure

The WRC uses the standard HID device data bytes to transfer information about the measured status of the X, Y and Z-axis of a joystick, and the state of buttons. The WRC uses custom raw data bytes to transfer the heartbeat and key-value pair information.

6.2. Message Types

Type	Description	Direction	Frequency
Input Report	Standard Message describing sticks and buttons	From WRC	~16 Hz

Table 4: Message Types

6.2.1. Input Report (From WRC)

The Input Report message from the WRC includes the 6 primary axes (Left X, Left Y, Left Z, Right X, Right Y, Right Z), 4-button Directional-Pad, the 4 numbered buttons, the state of the WRC, and the status of the E-STOP. HID class devices are encouraged, where possible, to use a right-handed coordinate system. If a user is facing a device, report values should increase as controls are moved from left to right (X), from far to near (Y) and from high to low (Z).

Byte Offset	Size (bits)	Description	Value
0	8	Left X Joystick Value	Increasing left to right from -127 to 127
1	8	Left Y Joystick Value	Increasing far to near from -127 to 127
2	8	Left Z Joystick Value	Increasing high to low from -127 to 127
3	8	Right X Joystick Value	Increasing left to right from -127 to 127
4	8	Right Y Joystick Value	Increasing far to near from -127 to 127
5	8	Right Z Joystick Value	Increasing high to low from -127 to 127
6.0	4	Directional-Pad	Increasing clockwise from Up (0-7) 0 = Up 2 = Right 4 = Down 6 = Left 8 = Not set
6.4	4	Numbered Buttons	Bit 1 = Button 1 Bit 2 = Button 2 Bit 3 = Button 3 Bit 4 = Button 4
7	1	WRC State	TBD

Table 5: Input Report from WRC

7. Limited Warranty

The End-User Agreement can be viewed here at <https://fortrobotics.com/end-user-agreement/>

The OEM Supply and License Agreement can be viewed here at <https://fortrobotics.com/oem-agreement/>



8. Revision History

Version	Date	Changes
A	4/29/2024	Initial Release

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