RevKit Core Kit & Desktop Interface Quick Start Guide

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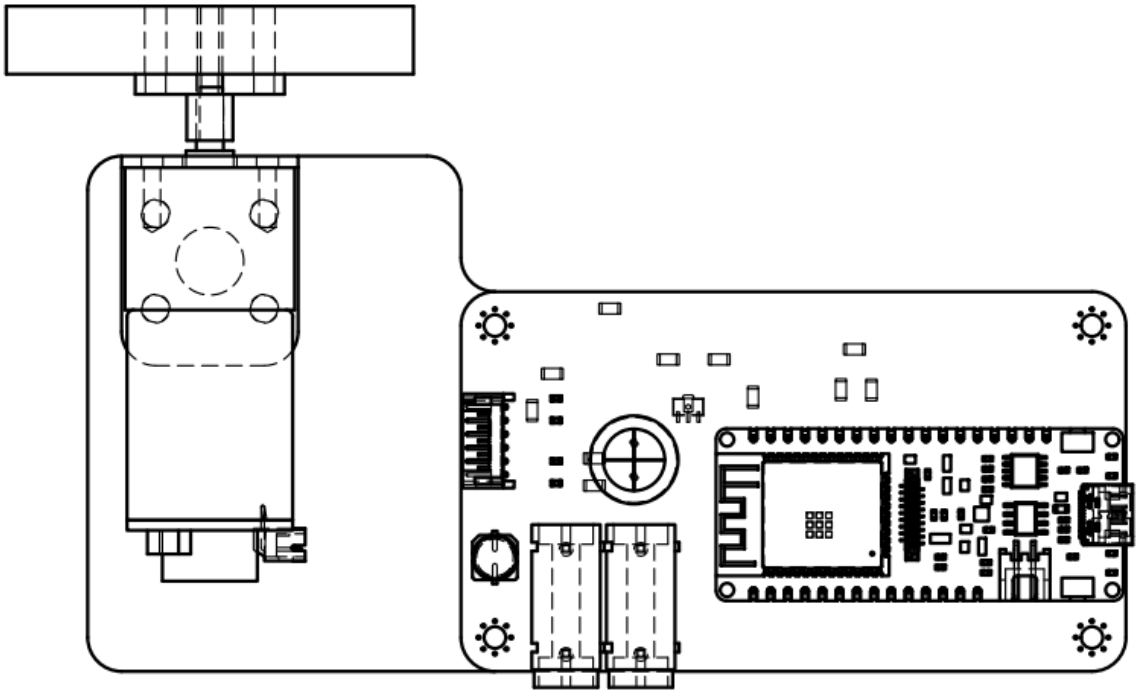

Overview

The RevKit Core Kit was developed to support the teaching of core control system concepts through hands-on experimentation. Combined with the RevKit Desktop Interface, a Python-Cored GUI built with Tkinter and Matplotlib, this platform allows users to interactively tune PID parameters, observe real-time motor RPM, and visualize system behavior in response to sine or square wave setpoints. The Core Kit includes a microcontroller, a DC motor with encoder feedback, and supporting circuitry for closed-loop control. Together, the hardware and software provide a modular, intuitive environment that bridges the gap between theoretical control principles and practical implementation.

Contents

1 RevKit Overview

The RevKit Core Kit is shown in Figure 1. It has one USB-C port to connect it to the PC and two sockets for a 12V power supply.

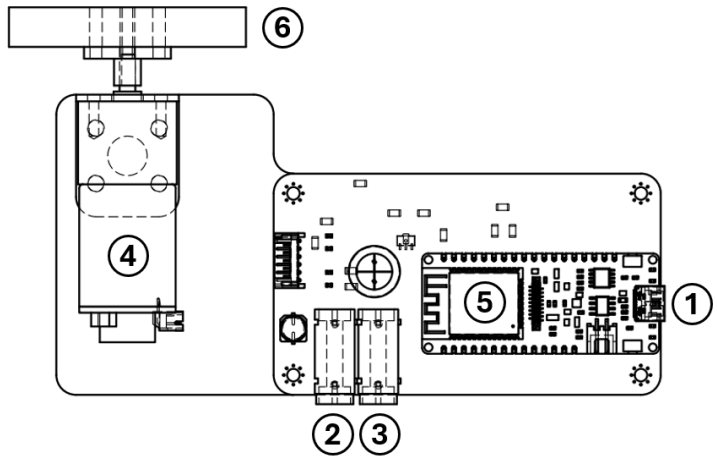

Figure 1: Labeled RevKit Core Kit.

1.1 RevKit Core Kit Components

1. USB-C Port
2. Positive (+) Socket
3. Ground (-) Socket
4. DC Motor
5. Firebeetle 2 ESP32-E Microcontroller
6. Motor Flywheel

2 Using RevKit Desktop Interface

2.1 Prerequisites

1. Install Arduino IDE.
2. Extract the compressed folder `revkit.zip`.
3. Connect the RevKit Core Kit to your computer via USB-C.
4. Connect two banana cables to the (+) and (-) terminals.

2.2 RevKit Desktop Interface

Upon running the RevKit Desktop Interface, users are presented with tools to control the motor and PID (Figure 2).

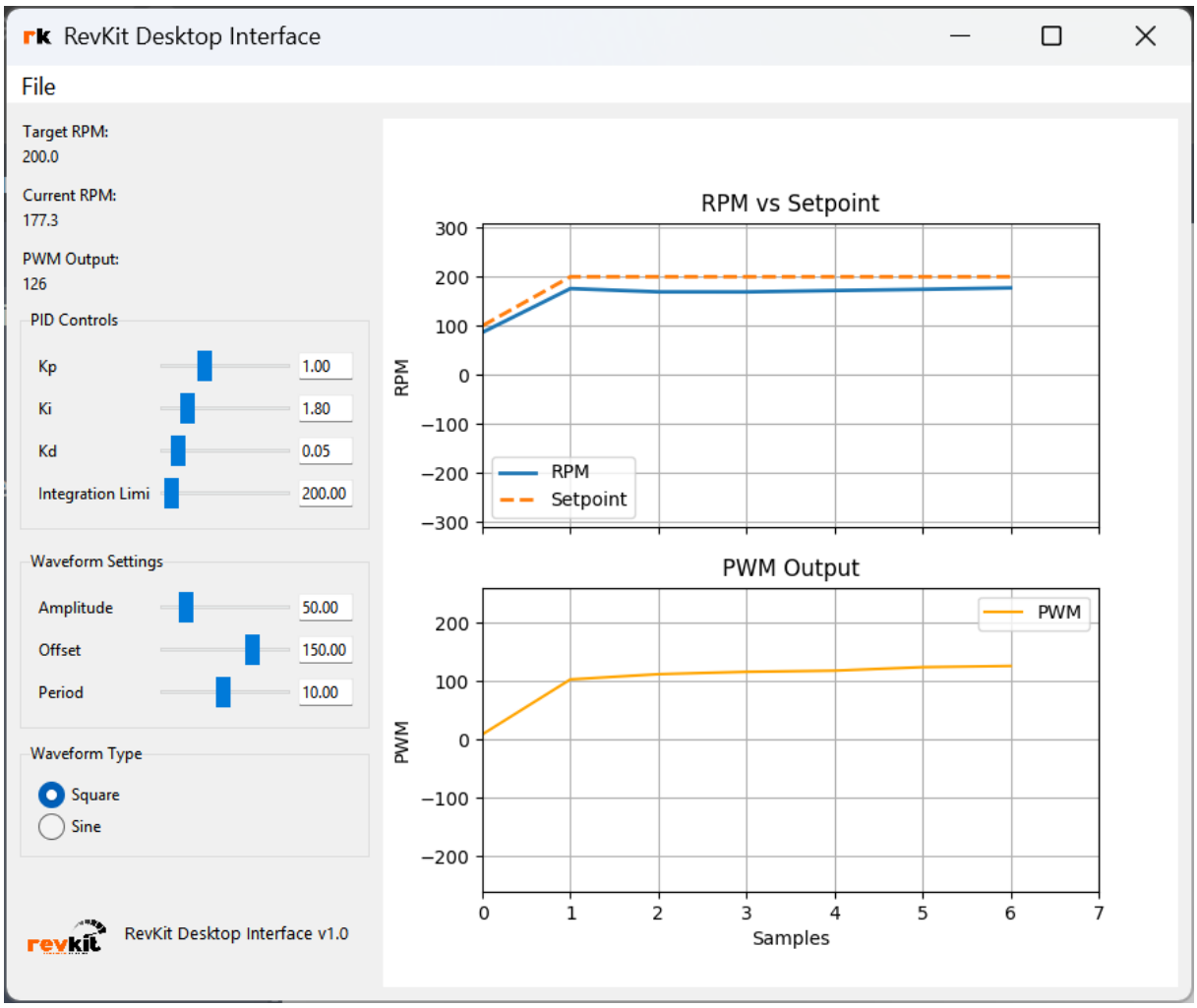

Figure 2: RevKit Desktop Interface.

2.3 GUI Features

- **Live Plotting**: Shows both the measured motor RPM and desired setpoint.
- **PID Controls**: Tune Proportional (P), Integral (I), and Derivative (D) values in real time.
- **Waveform Setpoints**: Generate square wave setpoints using amplitude, offset, and period sliders.
- **PWM Display**: View the current magnitude and direction of control effort.

A Appendix: Electrical and Mechanical Specifications

Parameter	Specification
Power Supply Voltage	12 V DC (regulated recommended)
Power Supply Current	Recommended 2.2 A minimum to ensure stable operation under blockage
Microcontroller	DFRobot FireBeetle ESP32-E with onboard WiFi and Bluetooth capabilities
Motor Type	GA25-370 geared DC motor with integrated encoder for feedback
Encoder Type	Hall-effect encoder providing pulse feedback for RPM measurement
Operating Temperature	0°C to 50°C recommended for reliable performance
USB Interface	USB-C port for communication and power supply to the microcontroller
PWM Control	Supports bidirectional PWM signal with separate direction pin control
Max Motor Voltage	12 V DC nominal
Max Motor Current	Continuous current up to 2.2 A, peak current up to 3 A (short duration)
Protection Features	Reverse polarity protection recommended on power input; no onboard fuse
Dimensions	Approx. 160 mm × 100 mm × 60 mm (L × W × H) including connectors and motor
Weight	Approx. 350 g including motor and controller board
Communication Baud Rate	115,200 bps (default serial communication speed)
Operating System Compatibility	Compatible with Windows, macOS, Linux via USB serial interface
Recommended Power Supply Characteristics	Regulated DC supply with low ripple and noise, capable of sustaining transient motor load currents without voltage drop