

## Earth People Technology CycloFlex

# CycloFlex Cyclone 10 FPGA Development Board

## User Manual

Brand: Earth People Technology | Model: CycloFlex

## 1. INTRODUCTION

The CycloFlex is a powerful FPGA development board designed around the Altera Cyclone 10 FPGA. This board provides a robust platform for developing and testing FPGA-based designs, from simple logic circuits to complex soft-core processors like RISC-V.

Key features include a 16,000 Logic Element FPGA, 504 Kbits of SRAM Memory, and a 128Mbit Serial Flash chip for user code storage. It offers extensive I/O capabilities with three seven-segment LED displays, an RGB LED, eight user LEDs, and 65 I/O pins available at board connectors. Two pushbuttons are also integrated for user input.

The board is equipped with a 50MHz oscillator and four DLLs within the FPGA, providing flexible clocking options. Power can be supplied via USB-C or a barrel connector, offering versatility for various development environments.

## 2. GETTING STARTED & SETUP

To begin using your CycloFlex development board, ensure you have the necessary components and software installed. An external JTAG programmer is required for programming the FPGA.

### 2.1. Powering the Board

The CycloFlex offers two primary methods for power input:

- **USB-C Connector:** Connect a standard USB-C cable from your computer or a +5VDC USB-C charger to the USB-C port on the board. This method adheres to the USB 2.0 specification for power delivery.
- **Barrel Connector:** Use a power supply providing +4.5VDC to +5.5VDC at 3 Amps connected to the barrel connector.

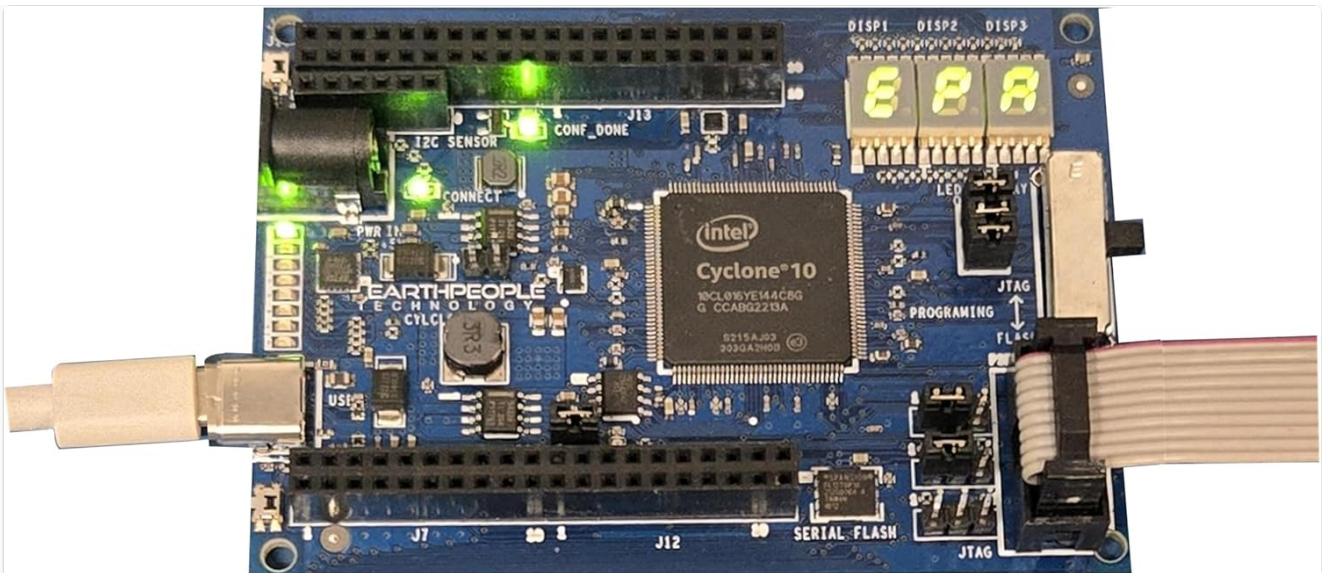


Figure 2.1: CycloFlex board connected to a USB-C power source and an external JTAG programmer.

## 2.2. Software and Drivers

The CycloFlex Development Kit includes a downloadable package containing the User Manual, Data Sheet, Drivers, Schematics, and various compiled and source code projects. It also features a comprehensive tutorial on getting started with FPGA development, including setting up the ModelSim/Questa simulation tool.

- Download and install the necessary drivers for the board to be recognized by your computer.
- Install FPGA development software such as Intel Quartus Prime (for Altera FPGAs) and simulation tools like ModelSim/Questa.
- Refer to the included tutorial for detailed instructions on software setup and initial project creation.



Figure 2.2: Typical setup showing the CycloFlex board connected to a computer and a JTAG programmer for development.

## 3. OPERATING INSTRUCTIONS

This section outlines the basic operation of the CycloFlex board's features.

### 3.1. FPGA Programming

The Altera Cyclone 10 FPGA on the CycloFlex board is programmed using an external JTAG programmer. Connect the JTAG programmer to the JTAG header on the board. Use your FPGA development software (e.g., Intel Quartus Prime) to compile your VHDL/Verilog code and download the bitstream to the FPGA.

The 128Mbit Serial Flash chip allows for non-volatile storage of user code, enabling the FPGA to configure itself upon power-up without requiring a constant connection to the programmer.

## 3.2. Using On-Board Peripherals

- **Seven Segment Displays:** The three green seven-segment LED displays are directly drivable from the FPGA I/O pins. Refer to the board schematics for pin assignments.
- **User LEDs:** Eight green user LEDs are available for general-purpose indication and can be controlled directly from FPGA pins. One RGB LED is also included for multi-color indication.
- **Pushbuttons:** Two pushbuttons provide user input to your FPGA designs. These are typically debounced in software or hardware within your FPGA logic.
- **I/O Connectors:** 65 general-purpose I/O pins are accessible via the board connectors, allowing for expansion and connection to external circuits.

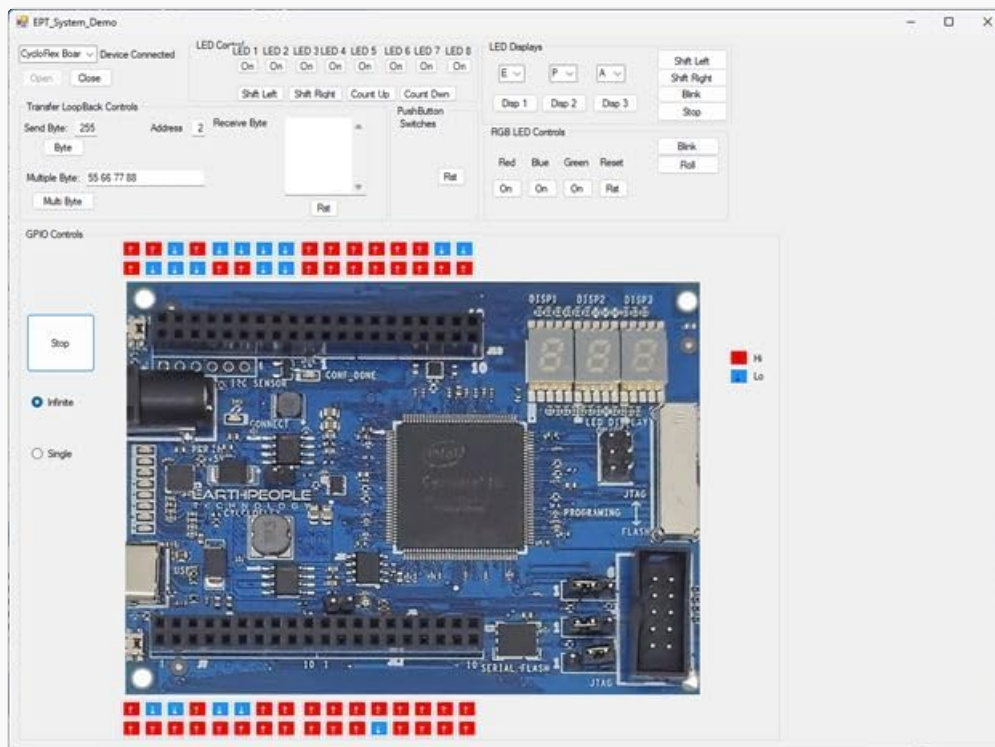


Figure 3.1: Example of a software interface used to interact with and control the CycloFlex board's peripherals.

## 3.3. Clocking Options

A 50MHz oscillator provides the primary clock signal for the CycloFlex board. The Altera Cyclone 10 FPGA includes four Digital Locked Loops (DLLs) which can be used to generate various clock frequencies by multiplying or dividing the input clock. This flexibility allows for precise timing control in your designs.

## 4. COMPONENTS AND FEATURES OVERVIEW

The CycloFlex board is designed with a comprehensive set of features to facilitate FPGA development. Below is an annotated diagram highlighting the main components.

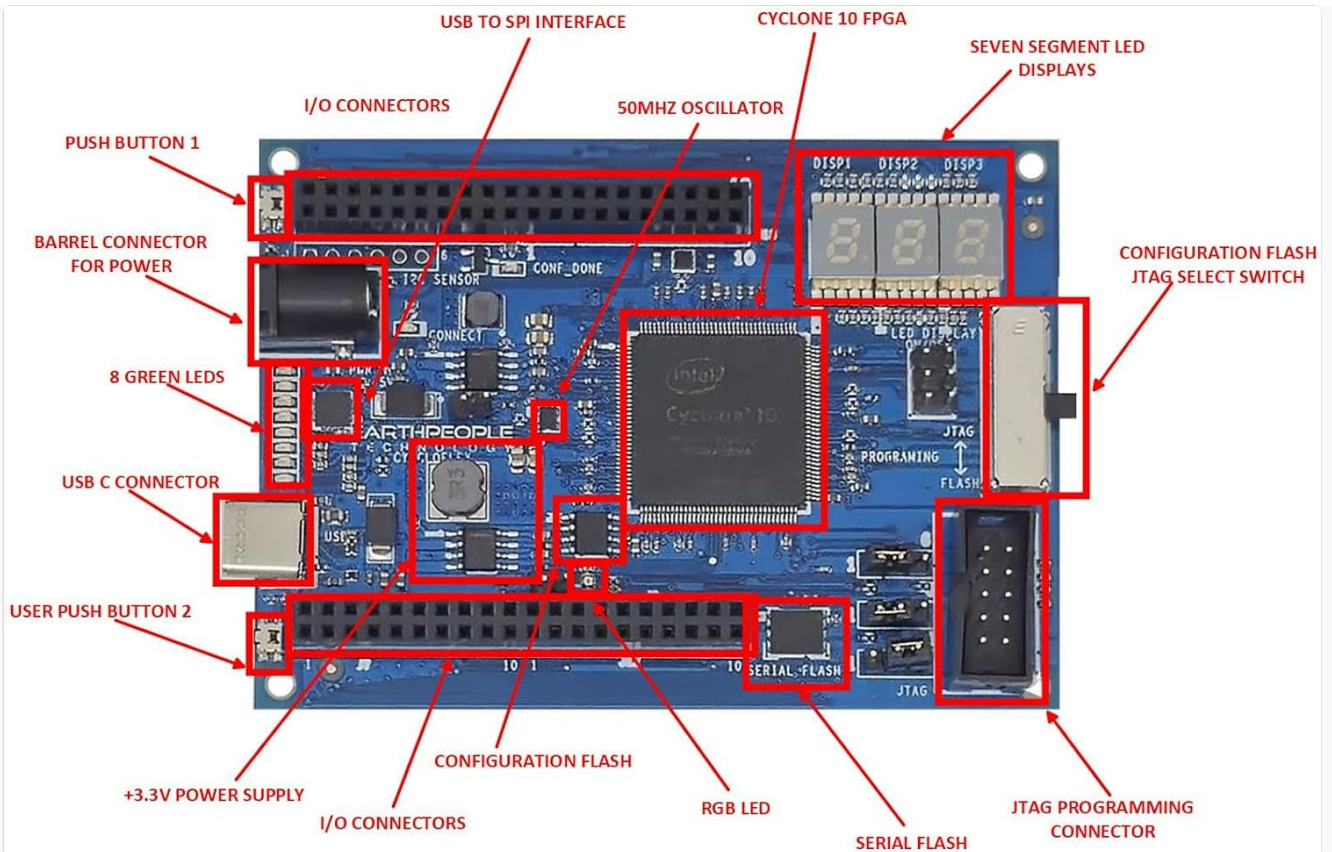


Figure 4.1: Annotated diagram of the CycloFlex board's main components.

- **Altera Cyclone 10 FPGA (10CL016):** The central processing unit with 16,000 Logic Elements and 504 Kbits of SRAM.
- **128Mbit Serial Flash:** For storing FPGA configuration and user code.
- **Three Seven Segment Displays:** Green LED displays for numerical or character output.
- **Eight Green User LEDs:** General-purpose indicators.
- **One RGB LED:** For multi-color status indication.
- **Two Pushbuttons:** User-definable input switches.
- **65 FPGA I/O Pins:** Accessible via board connectors for external interfacing.
- **50MHz Oscillator:** Provides the main clock signal.
- **USB-C Connector:** For power and data communication (USB 2.0).
- **Barrel Connector:** Alternative power input (+4.5VDC to +5.5VDC).
- **JTAG Programming Header:** For connecting an external JTAG programmer.

## 5. SPECIFICATIONS

Feature	Detail
Brand	Earth People Technology
Model Name	CycloFlex
FPGA	Altera Cyclone 10 (10CL016)

Feature	Detail
Logic Elements	16,000
SRAM Memory	504 Kbits
Serial Flash	128 Mbit
I/O Pins	65 (available at board connectors)
On-board Displays	3 Green Seven Segment LED Displays
On-board LEDs	8 Green User LEDs, 1 RGB LED
On-board Inputs	2 Pushbuttons
Clock Source	50MHz Oscillator (with 4 FPGA DLLs)
Power Options	USB-C (+5VDC), Barrel Connector (+4.5VDC to +5.5VDC @ 3A)
Connectivity Technology	USB
Product Dimensions	3.2 x 2.4 x 0.5 inches
Item Weight	8 ounces

## 6. MAINTENANCE

The CycloFlex development board is designed for durability and reliability. To ensure its longevity and optimal performance, follow these general maintenance guidelines:

- **Handling:** Always handle the board by its edges to avoid touching components, especially the FPGA chip, which can be sensitive to static electricity.
- **Storage:** Store the board in an anti-static bag when not in use, and keep it in a dry, dust-free environment.
- **Cleaning:** If necessary, gently clean the board with a soft, dry brush or compressed air to remove dust. Avoid using liquids or abrasive cleaners.
- **Power Supply:** Always use power supplies that meet the specified voltage and current requirements to prevent damage to the board.
- **Connections:** Ensure all connections (USB, JTAG, I/O) are secure but not forced, to prevent damage to connectors or pins.

## 7. TROUBLESHOOTING

If you encounter issues with your CycloFlex board, consider the following common troubleshooting steps:

- **No Power/LEDs Off:**
  - Verify that the power supply (USB-C or barrel connector) is correctly connected and providing the specified voltage and current.
  - Ensure the power source is active.

- **FPGA Not Programming:**

- Check the connection of your external JTAG programmer to the board and your computer.
- Ensure the correct drivers for the JTAG programmer are installed.
- Verify that your FPGA development software is configured to detect the programmer and the Cyclone 10 device.
- Confirm that the JTAG chain is correctly detected in your software.

- **Unexpected Behavior of Peripherals:**

- Review your FPGA code for correct pin assignments and logic for controlling LEDs, displays, and reading pushbuttons.
- Ensure proper clocking is provided to your logic.

- **Software Communication Issues:**

- Verify USB-C cable connection and ensure it's a data-capable cable if using for communication.
- Check device manager for proper driver installation for the USB interface.

For more in-depth troubleshooting and specific error codes, refer to the comprehensive downloadable User Manual and the provided tutorial materials.

## 8. WHAT'S IN THE BOX

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The CycloFlex Development Kit typically includes the following items:

- CycloFlex Cyclone 10 FPGA Development Board
- USB-C Cable
- Access to downloadable User Manual, Data Sheet, Drivers, Schematics, compiled/source code projects, and a comprehensive FPGA tutorial.

## 9. SUPPORT AND RESOURCES

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Earth People Technology provides extensive resources to assist you with your CycloFlex development board:

- **Downloadable DVD Content:** The development kit comes with access to a downloadable package that includes:
  - Full User Manual and Data Sheet
  - Device Drivers
  - Detailed Schematics
  - Compiled and Source Code Projects
  - An entire tutorial on Getting Started with FPGA, covering ModelSim/Quarta setup, simple code creation, advanced Test Benches, and full projects for PC communication.
- **Online Support:** For further assistance, please visit the official Earth People Technology website or contact their customer support.

## 10. WARRANTY INFORMATION

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For specific warranty terms and conditions regarding your CycloFlex Cyclone 10 FPGA Development Board, please refer to the documentation included with your product packaging or visit the official Earth People Technology website. Warranty coverage typically addresses manufacturing defects and material flaws under normal use conditions.

It is recommended to register your product, if applicable, to ensure you receive all relevant warranty benefits and support notifications.



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