ED4 Quick Start Guide, v1.3

The US Digital ED4 is a color display with touchscreen that is easily configured to show the readings from a pair of incremental, analog or PWM encoders simultaneously. The ED4 is configured over USB with a Graphical User Interface (GUI) PC Application.

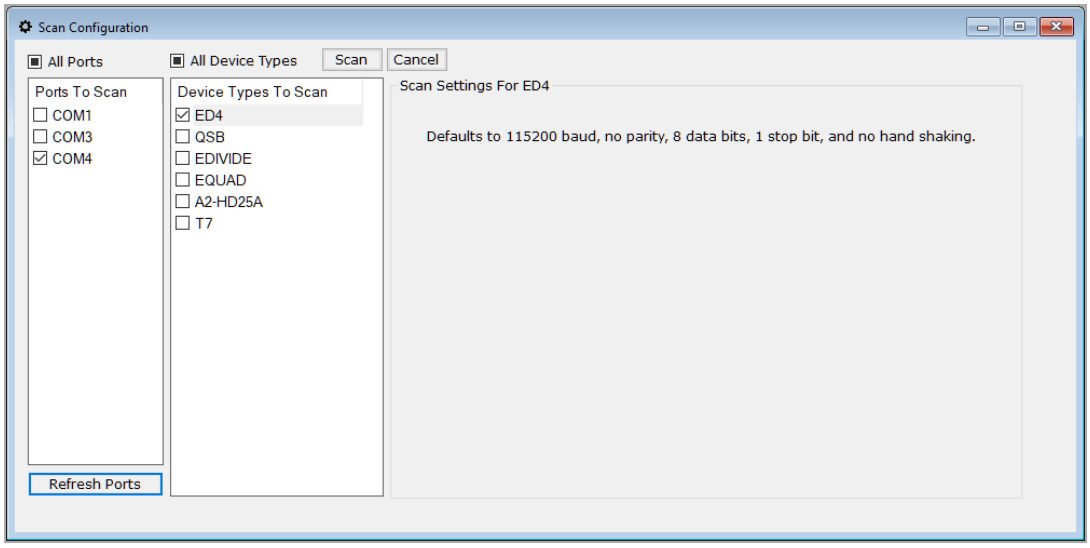
Software Installation and Operation

1) Download and install the “US Digital Device Explorer” software from the link: https://www.usdigital.com/support/resources/downloads/software/ed4-software/ on a Windows 10/11 PC.

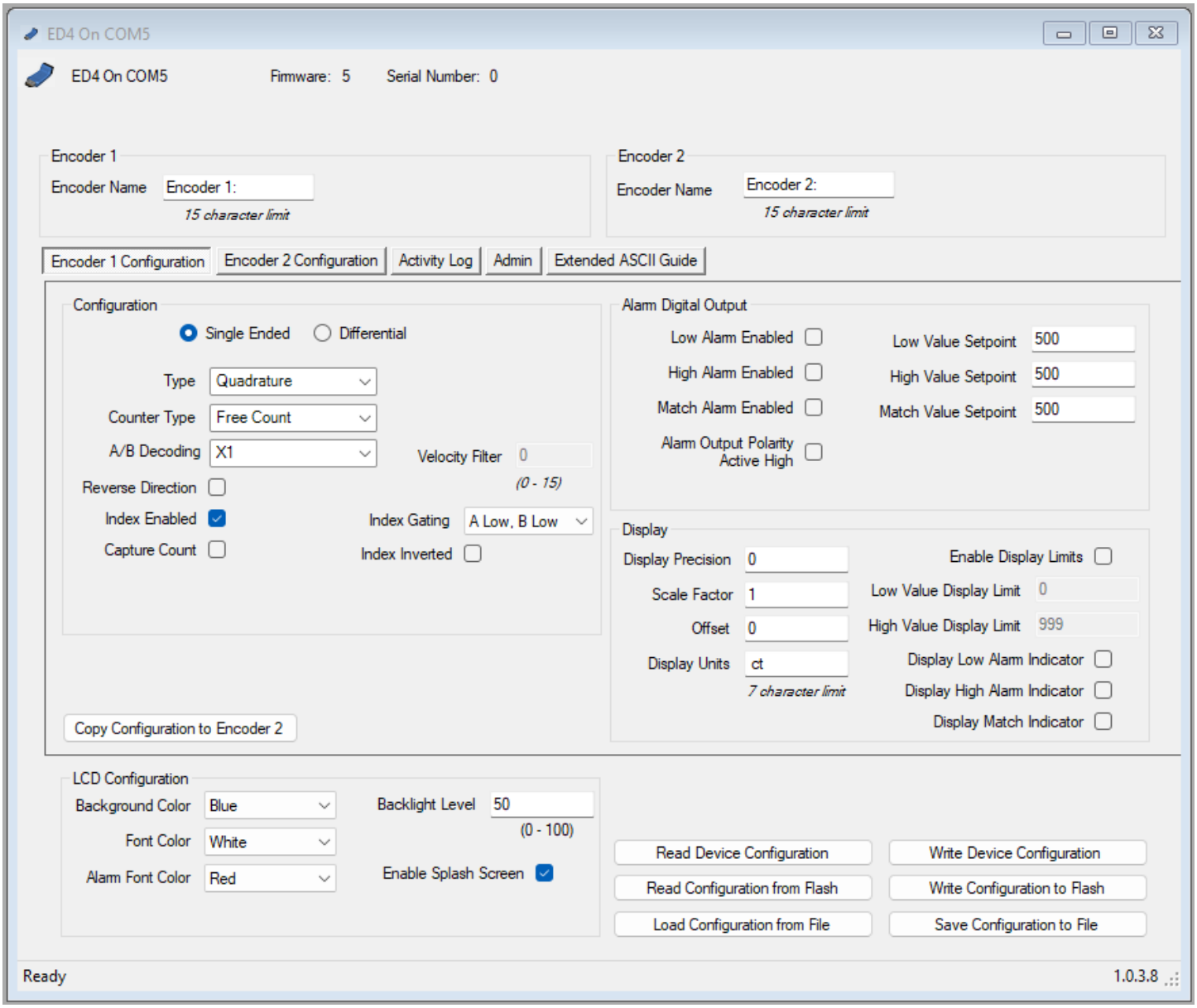
2) After installation completes, connect the ED4 to the PC using a USB-A to USB-B connector cable. The ED4 will be USB bus powered if an external supply is not connected. Configuration can be done with encoders plugged in. If the ED4 is already in “HV Quadrature” mode” (Red LED lit on the back panel), do not plug in 5V powered encoders until the unit is reconfigured to be in standard Quadrature mode.

3) Run the “US Digital Device Explorer” program.

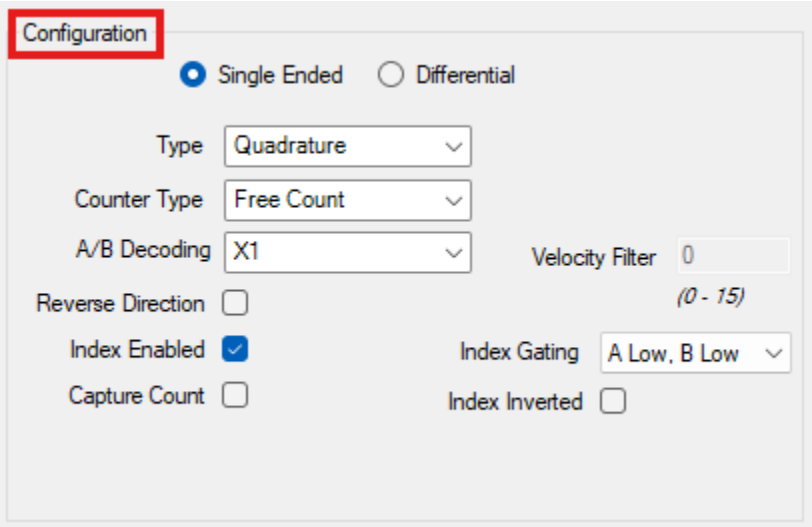
4) A **Scan Configuration** window will appear as shown below. Select a COM port to scan, select **ED4** as the device type to scan and click the “Scan” button.



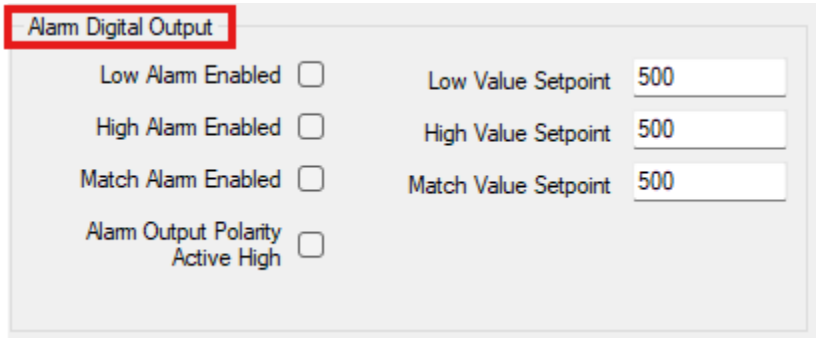
5) The main ED4 configuration window will appear if an ED4 device is found.



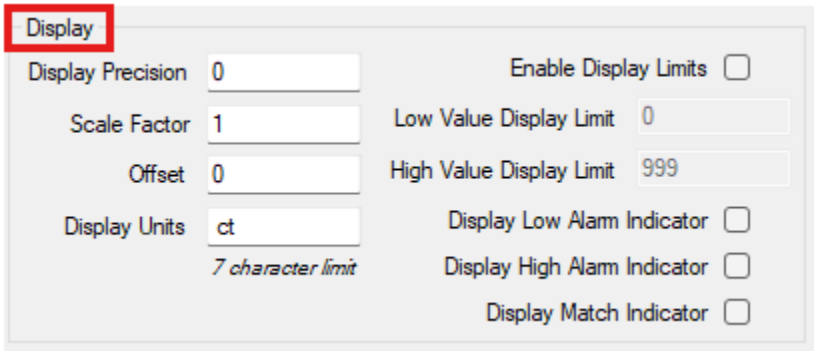
- The displayed encoder name for each channel can be changed in the **Encoder Name** field.
- Hover the mouse over each setting in the window to see a tool tip that explains the setting. An overview of the features is provided below.



- The ED4 supports two independent Encoder Channels. Each Encoder Channel can be configured as **Single Ended** (5 pin connector) or **Differential** (10 pin connector).
- The **Type** field supports Analog, PWM, Quadrature and HV-Quadrature encoder types.
  Analog mode will display 0 to 4095 for 0 to 5V input voltages. The voltage is input on the A input pin in Single Ended mode. Differential mode is not supported for Analog input.
  PWM mode will display 0 to 65535 for input duty cycles from 0 to 100%. The PWM is input on the A input pin in single ended mode and A+/A- in differential mode.
  Quadrature mode is A/B/Index quadrature with options for x1/x2/x4/step-dir decoding, index enable/gating and reverse direction.
  HV-Quadrature mode powers the encoder directly from the 7.5-28VDC power on the green I/O connector instead of 5VDC. Do not enable this option if 5V encoders are connected to the ED4 as it will damage the encoders. A red LED will light up near each connector to indicate if it is in HV mode.
  When the HV-Quadrature/Quadrature mode is changed, a power cycle is required for the setting to take effect.
- In **Quadrature**/**Free Count** or **Quadrature/Modulo with Index** mode, the **Capture Count** checkbox will capture the current quadrature count and update the display only when a falling edge is detected on the CAP1/CAP2 digital inputs of the green I/O connector.
- In **Quadrature** mode with **x4** or **Step & Direction** inputs, the ED4 can measure velocity in counts per second.



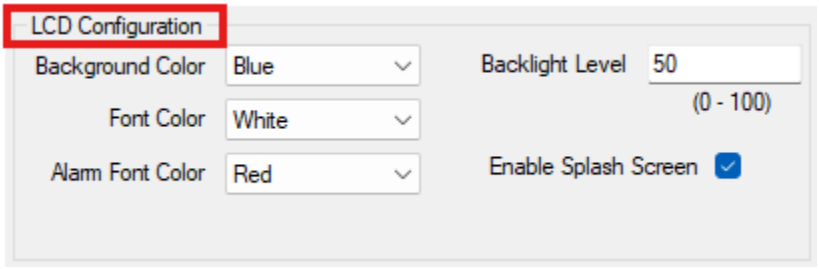
- The ED4 has an alarm function on each encoder channel that can be enabled to output the alarm state on the ALM1/ALM2 digital outputs of the green I/O connector and/or the LCD display. The checkboxes in the GUI are used to select these functions and the fields to the right are used to enter the setpoint value.
- The alarm can be set to happen when the displayed reading is less than or equal to, greater than or equal to or matches the values in the **Low/High/Match Setpoint** fields.
- The ALM1/ALM2 outputs are open drain and the output will be switched to GND when any one of the selected alarm conditions occur. The output polarity can be inverted by selecting the checkbox next to **Alarm Output Polarity Active High**.
- To enter a decimal value for the alarm setpoints, the **Display Precision** field must be set to the desired number of decimal places.



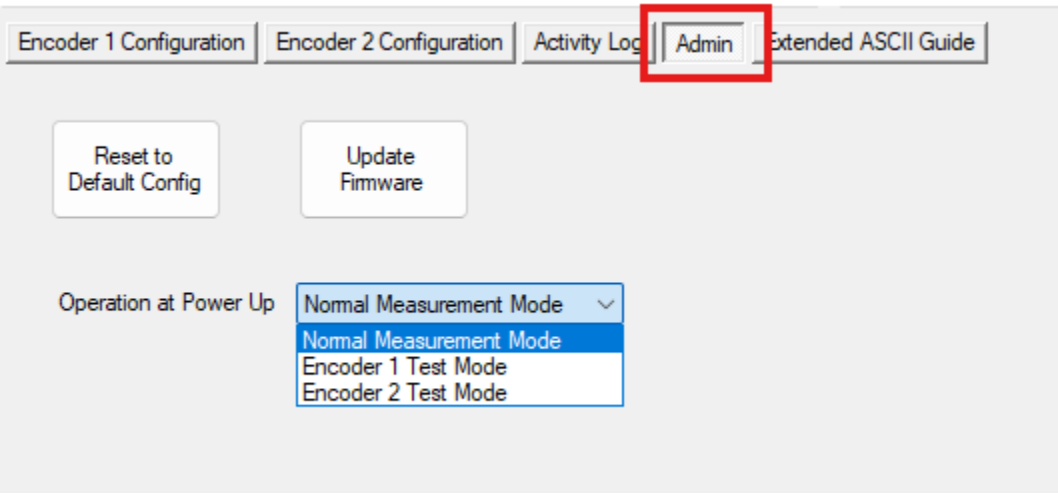
- The **Display Precision** sets the number of decimal places to display. Set to 0 to show only integer values.
- The **Scale Factor** and **Offset** fields are used to apply a floating point multiplicative scale factor and an additive offset to an encoder reading before displaying the value. The scale factor is applied first, then the offset is added. This feature can be used to scale the encoder readings so the output is in meaningful unit such as meters, degrees, etc. Scientific notation is supported when entering the values of the scale and offset parameters.
- The **Display Units** field is used to display a string after the encoder reading as the unit of measurement (e.x. feet, deg, etc.). The **Extended ASCII Guide** tab shows a table of supported symbols that can be

used in the name strings. The symbols can be copied and pasted in or entered by holding down the ALT and typing the number using the numeric keypad on the PC keyboard. Use the **Scale Factor** and **Offset** fields to convert the raw encoder value to the desired unit.

- The **Low Value Display Limit** and **High Value Display Limit** settings limit the display range when the **Enable Display Limits** checkbox is selected. When the **Counter Type** is set to **Modulo,** the **Enable Display Limits** checkbox is always enabled and the user must set the Low and High Limits to match the encoder PPR range. For example, with a 1024 CPR encoder in **Modulo** mode and **Counter Input** x2, set **Low Value Display Limit** = 0 and set **High Value Display Limit** = 1024 x 2 – 1 = 2047.

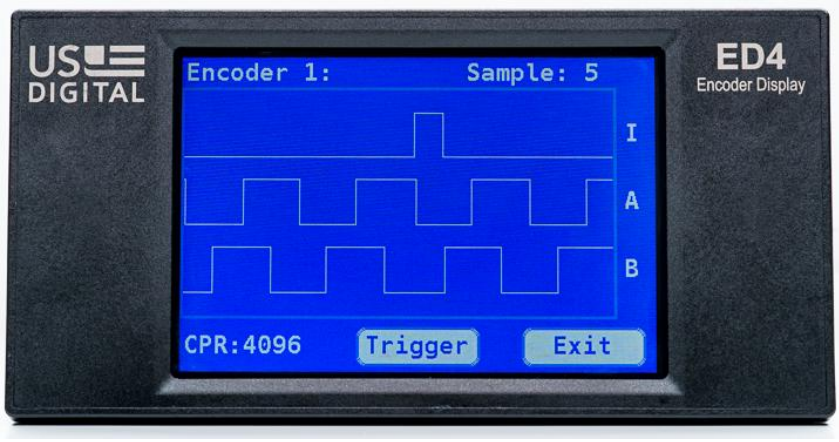


- The LCD backlight level and text/background color can be selected in this section of the GUI.
- Enabling the “Splash Screen” will display the US Digital logo on power up. Touch the screen to return to the standard display. This feature can be used to detect that the ED4 experienced a power supply interruption; if the splash screen is displayed, then the power was cycled. The splash screen will be displayed only in Normal Measurement Mode and not Waveform Test Mode.



- The Admin button allows the user to reset all ED4 settings to the default configuration, update the firmware or select whether the ED4 powers up in the normal measurement mode or waveform test mode.

Waveform Test Mode



- The ED4 can be placed in “Waveform Test Mode” for Channel 1 and 2 using the touchscreen (Menu->More->Test 1 or Test 2). This mode provides a quick way to test if a quadrature, PWM or analog encoder is working correctly. The ED4 can be configured to automatically start one of the channels in “Waveform Test Mode” in the “Admin” tab of the GUI in the **Operation at Power Up** pulldown.
- If a channel is in Quadrature mode, ED4 will trigger, capture and display A/B/Index edges as a scope plot whenever an index occurs. The measured CPR of the encoder is also displayed once the encoder rotates enough to capture additional indexes. If the encoder has no index, pressing the “Trigger” button will force a manual capture.
- If a channel is in PWM mode, the test mode will display the PWM waveform in real time as a scope plot. The duty cycle and PWM frequency are also displayed.
- If a channel is in analog mode, the test mode will display the analog waveform in real time as a scrolling scope plot. The + and – buttons control the zoom. The “Stop” button will stop the sampling. When stopped, the left and right arrow (-> and <-) buttons can be used to scroll the display.

Saving Settings

- After changing the settings in the GUI, the settings must be written to the ED4 for the settings to take effect. There are 6 buttons in the lower right of the main window.
  Read Device Configuration will load the GUI with settings from the ED4’s RAM.
  Read Configuration from Flash will load the GUI settings and ED4’s RAM from flash memory.
  Load Configuration from File will load the GUI settings and ED4’s RAM with data from an xml formatted file.

Write Device Configuration will write the GUI settings to the ED4's RAM. The settings take effect but will not be retained on a power cycle. This setting is useful to experiment with settings without overwriting the flash.
Write Configuration to Flash will save the GUI settings to the ED4's RAM and flash memory. The settings will take effect and be retained on a power cycle.
Save Configuration to File will save the GUI settings to the ED4's RAM and an xml formatted file.

Sample Configurations

- The installer includes several example xml configuration files that can be used to set up the ED4.

  Analog_and_PWM.xml: sets up channels as follows:

  Encoder Channel 1 is Analog encoder, scale factor of 0.001221001 applied so 12-bit ADC reading is displayed as 0.00 to 5.00 volts.

  Encoder Channel 2 is single-ended PWM. Scale factor of 0.001525902 applied so 0-65535 PWM reading is displayed in as 0.00 to 100.00%

  Quadrature.xml: sets up channels as follows:

  Encoder Channel 1: Single Ended, index enabled, x4 quadrature with 1024 CPR encoder (4096 PPR), Modulo-N mode

  Encoder Channel 2: Differential, index disabled, x2 quadrature with 1024 CPR encoder (2048 PPR), Free Count mode.

Touchscreen Settings

After the ED4 is configured and the settings saved to flash, the PC connection is no longer required. The ED4 will start and operate standalone with 7.5-28 VDC power from the green screw terminal plug or USB bus power. The LCD touchscreen has a Menu selection in the lower left that provides some basic functions as shown below:

1. <Menu>
    1.1. Display
        1.1.1. Light
            1.1.1.1. + (increases the backlight level)
            1.1.1.2. – (decreases the backlight level)
            1.1.1.3. <-Back (return to the previous menu level)
        1.1.2. deGhost (writes a black screen to the LCD. Touch the display to exit this mode)
        1.1.3. Off (turns off the backlight. Touch the display to exit this mode)
        1.1.4. <-Back
    1.2. Offset
        1.2.1. Enc #1
            1.2.1.1. Set (adds an Offset value to make the current displayed value equal to 0)
            1.2.1.2. Clear (clears the Offset value)
            1.2.1.3. <-Back
        1.2.2. Enc #2
            1.2.2.1. Set (adds an Offset value to make the current displayed value equal to 0)
            1.2.2.2. Clear (clears the Offset value)
            1.2.2.3. <-Back
        1.2.3. <-Back
    1.3. More
        1.3.1. Info (Displays the ED4's serial number and firmware version)
        1.3.2. Test 1 (Enters waveform test mode for Channel 1)
        1.3.3. Test 2 (Enters waveform test mode for Channel 2)
        1.3.4. <- Back
    1.4. Exit