HEDS-9920EVB and HEDS-9920PRGEVB

Evaluation Board and Programming Kit

User Guide
Version 1.2

Table of Contents

1 HEDS-9920EVB Evaluation Board

1.1 Top and Bottom Views

Figure 1: Bottom Side of the PCB HEDS-9920EVB 225 LPI

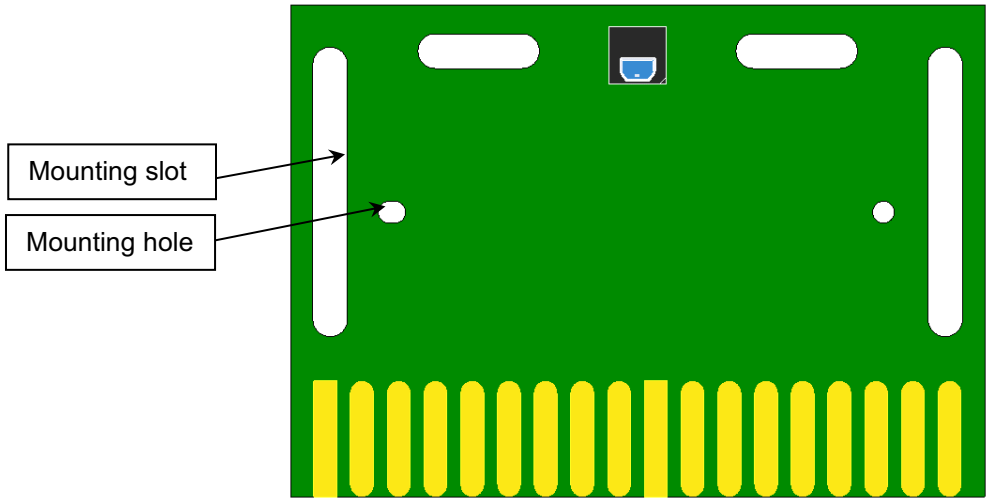
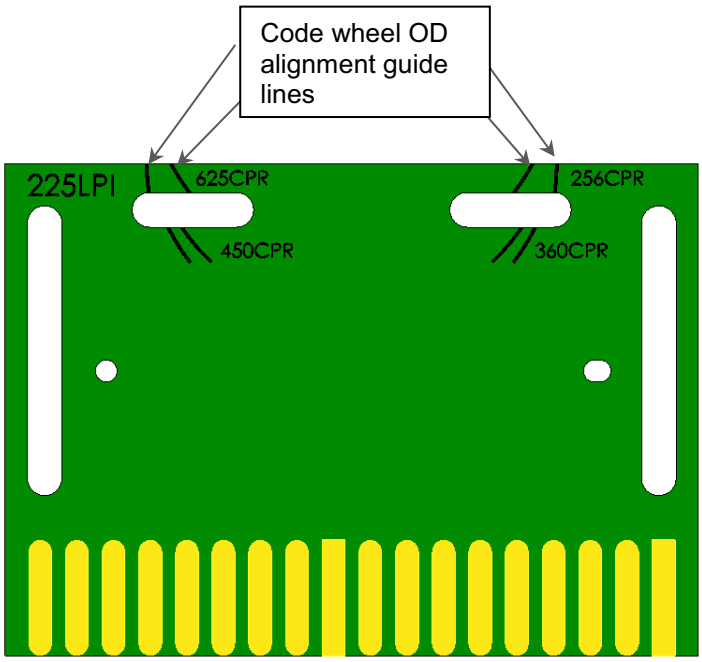


Figure 2: Top Side of the PCB HEDS-9920EVB 225 LPI



NOTE: Remove the protective kapton tape covering the encoder ASIC before use.

The silkscreen-printed guideline on the PCB provides visual alignment of the codewheel edge (outer diameter) for each of the different Rop (CPR) tracks. A sample diagram showing the position when encoder is aligned to 625 CPR track is shown in Figure 3.

Figure 3: Top of PCB with CW OD Visual Guidelines for Different CPR Values

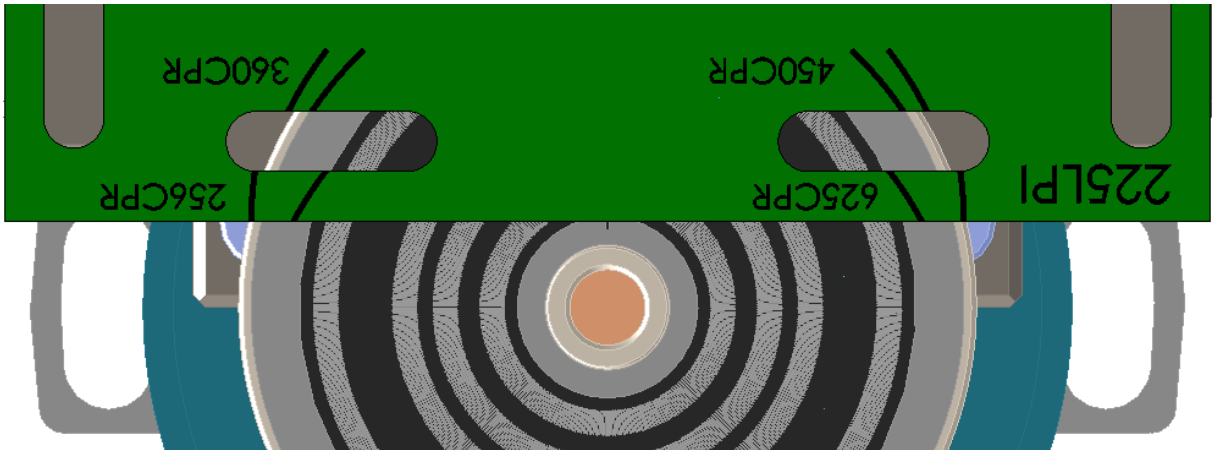
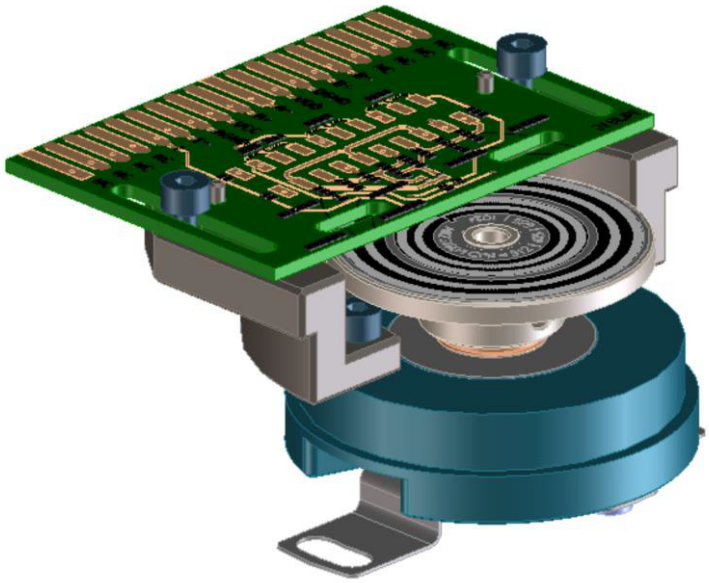


Figure 4: Sample Evaluation Board Mounting with Reference to Codewheel



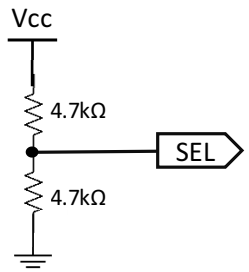
2 Select Options

2.1 Selection Table

Table 1: Selection Table for AEDR-9920 225 LPI

SEL 1	SEL 2	IND SEL	Interpolation Factor	Index	Max. Output Frequency	CPR at ROP 4.6 mm	CPR at ROP 11.23 mm
Open	Open	Low	1X	Gated 90 edeg	0.1 MHz	256	625
		High		Gated 180 edeg			
		Open		Ungated raw			
Open	Low	Low	2X	Gated 90 edeg	0.2 MHz	512	1250
		High		Gated 180 edeg			
		Open		Gated 360 edeg			
High	High	Low	4X	Gated 90 edeg	0.5 MHz	1024	2500
		High		Gated 180 edeg			
		Open		Gated 360 edeg			
Low	Low	Low	8X	Gated 90 edeg	1.0 MHz	2048	5000
		High		Gated 180 edeg			
		Open		Gated 360 deg			
High	Low	Low	16X	Gated 90 edeg	2.0 MHz	4096	10000
		High		Gated 180 edeg			
		Open		Gated 360 edeg			
Open	High	Low	32X	Gated 90 edeg	2.0 MHz	8192	20000
		High		Gated 180 edeg			
		Open		Gated 360 edeg			
Low	High	Low	64X	Gated 90 edeg	2.0 MHz	16384	40000
		High		Gated 180 edeg			
		Open		Gated 360 edeg			
High	Open	Low	128X	Gated 90 edeg	2.0 MHz	32768	80000
		High		Gated 180 edeg			
		Open		Gated 360 edeg			
Low	Open	High	256X or SPIMode output	Gated 90 edeg or SPI Mode output	2.0 MHz	65536	160000
		Low	SPI Mode	SPI Mode: Enable Program Selection	N/A	N/A	N/A

NOTE: Open selection must be connected to middle of a voltage divider circuit.



Recommended to use 2 x 4.7kΩ resistors (Vcc-GND)

The preceding digital interpolation factor may be used with the following equations to cater to various rotational speeds (RPM) and counts per revolution (CPR).

RPM = (Count Frequency × 60) / CPR

The CPR (at 1X interpolation) is based on the following equation that is dependent on radius of operation (ROP).

CPR = LPI × 2π × ROP (inch) or CPR = LP mm × 2π × ROP (mm)

NOTE: LPmm (lines per mm) = LPI / 25.4.

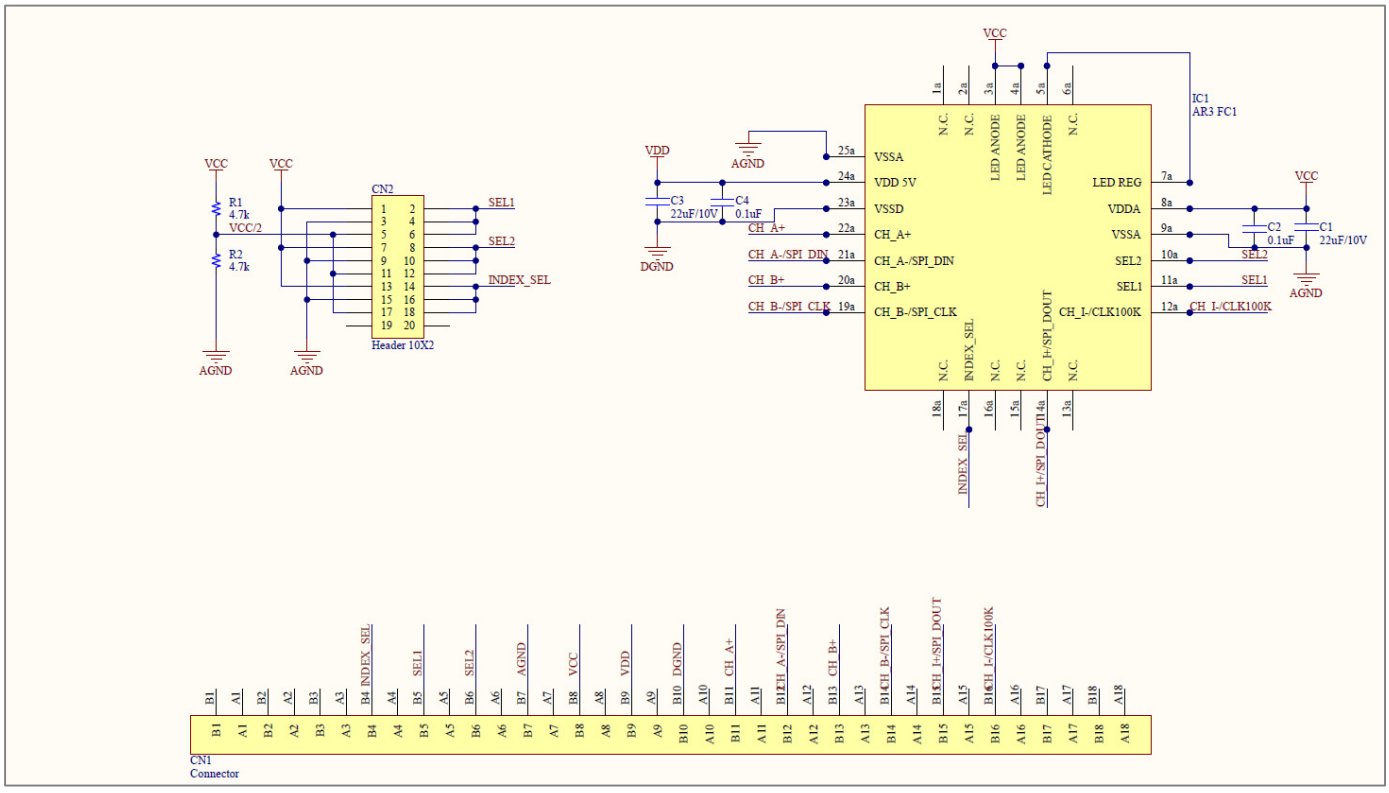
2.2 Programmable Select Options

SPI is programmable with an interpolator factor from 1x to 512x.

1. Configure the external selection to SPI Mode: Program Selection.
2. For signal output after configuration, set the external selection to SPI Mode: Output Enabled.

3 Board Schematic and Pin Assignment

Figure 5: HEDS-9920EVB Evaluation Board Schematic



3.1 Connector Assignment

Table 2: Connector 1 Pin Assignment

Connector 1 (Top Side)	Label
1	NC
2	NC
3	NC
4	INDEX_SEL
5	SEL1
6	SEL2
7	AGND/VSSA
8	VCC
9	VDD
10	DGND/VSSD
11	CH_A/A+
12	CH_A/A- (SPI_DIN)
13	CH_B/B+
14	CH_BB/B- (SPI_CLK)
15	CH_I/I+(SPI_DOUT)
16	CH_I/I-
17	NC
18	NC

The finger design of Connector 1 matches either of the following card edge connectors:

- EDAC, CONN EDGE DUAL FMALE 36POS 0.100, P/N# 395-036-520-202
- SULLINS, CONN EDGE DUAL FMALE 36POS 0.100, P/N# EBC18DREH

The use of the preceding card edge connectors is not needed if the necessary connections can be made using manual soldering to the relevant card edge fingers.

For simplification of connections, VDD and VCC, and AGND and DGND can be shorted.

Table 3: Connector 2 Pin Assignment

Connector 1 (Top Side)	Label	State
1	SEL1	VCC
2		AGND
3		OPEN
4	SEL2	VCC
5		AGND
6		OPEN
7	INDEX_SEL	VCC
8		AGND
9		OPEN
10	NC	

NOTE: See Table 1 for the various selection options available by changing the respective jumper position.

4 Codewheel Drawing

For the AEDR-9920 evaluation board sample, the matching codewheel sample drawing is as shown in Figure 6.

Figure 6: 225 LPI 4-Track (CPR) Codewheel Drawing

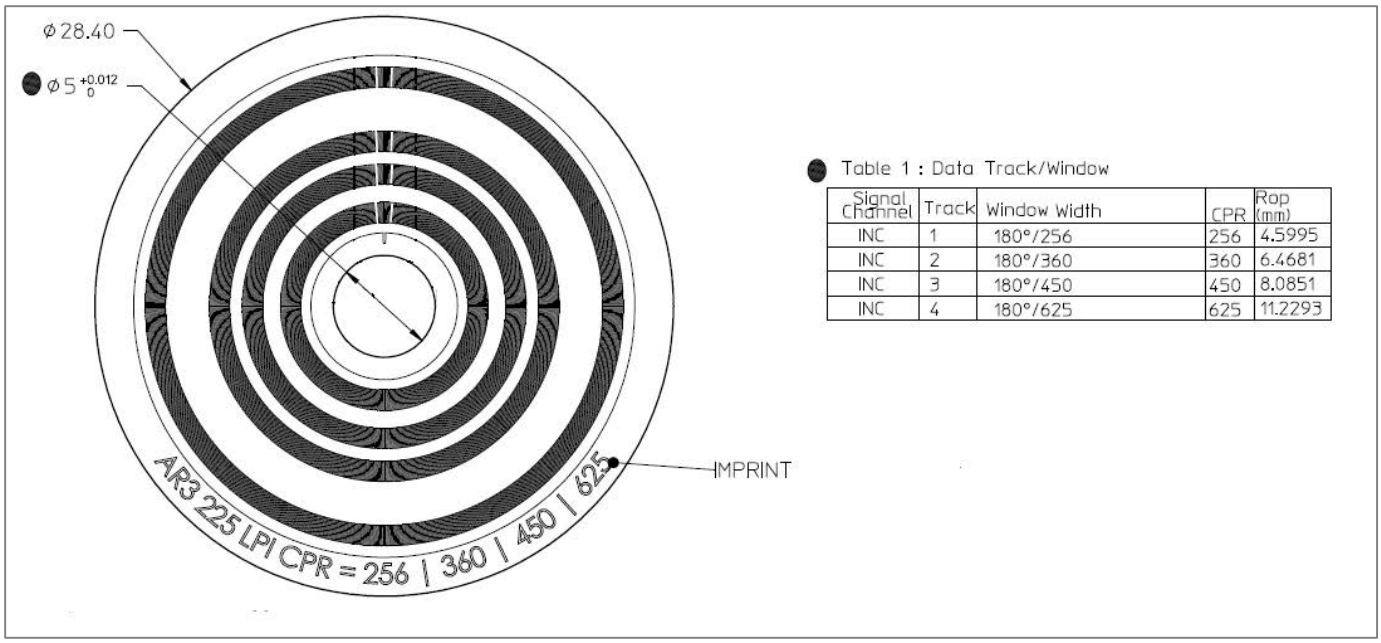


Table 1 : Data Track/Window

Signal Channel	Track	Window Width	CPR	Rop (mm)
INC	1	180°/256	256	4.5995
INC	2	180°/360	360	6.4681
INC	3	180°/450	450	8.0851
INC	4	180°/625	625	11.2293

For the detailed drawing of the sample codewheel, ask your regional Sales/FAE.

5 HEDS-9920PRGEVB Programming USB-SPI Kit

To program interpolation value other than the ones offered in Table 1 using the SEL1 and SEL2 option pins, you may connect to the AEDS-9920 encoder ASIC using the SPI interface.

Broadcom offers a simple USB-to-SPI programming kit, together with a PC-based custom program for you to program the desired interpolation value.

Figure 7: HEDS-9920PRGEVB USB to SPI Programmer Kit

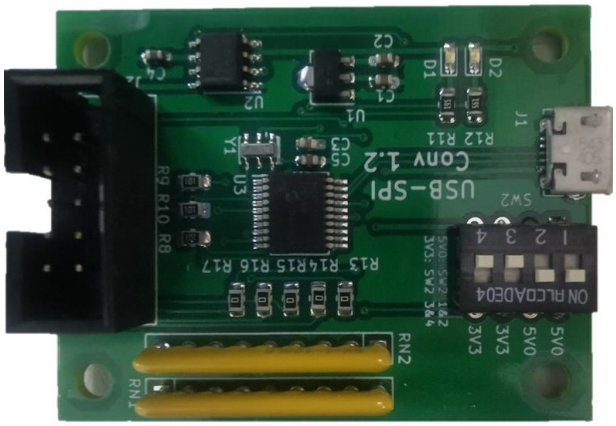


Figure 8: HEDS-9920PRGEVB USB to SPI Programmer Kit Schematic

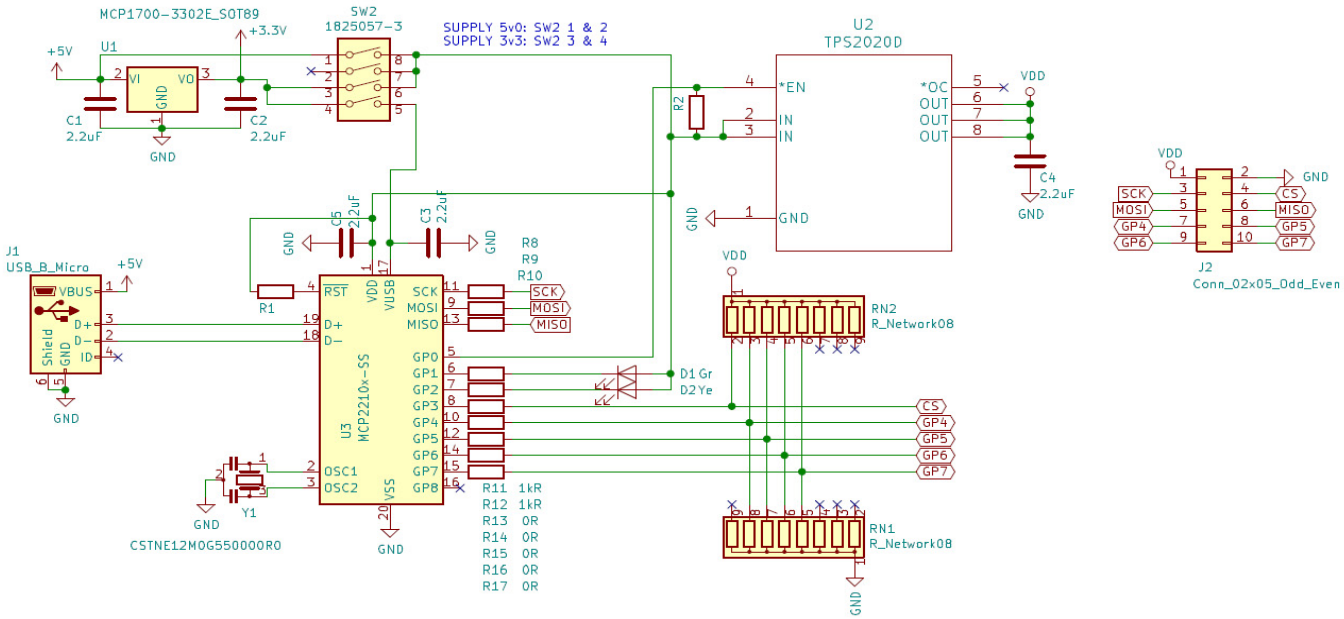
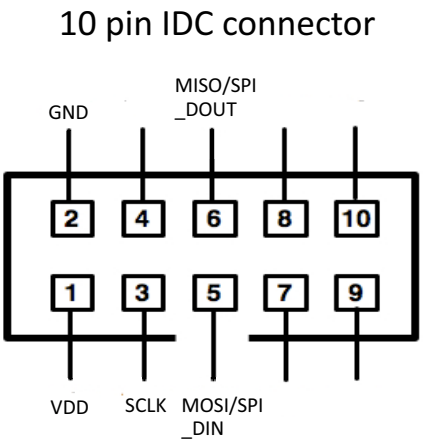


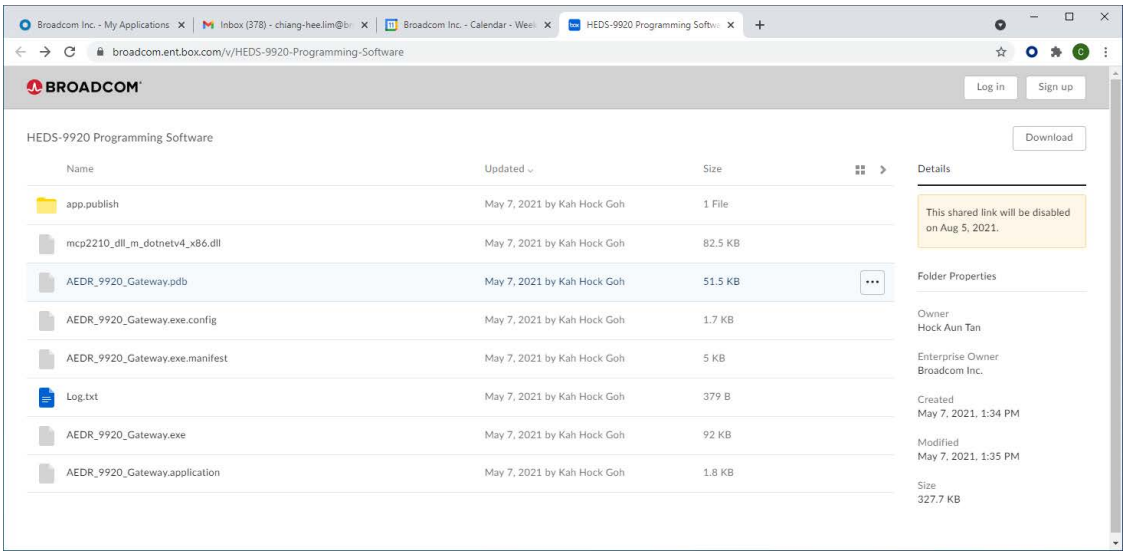
Figure 9: USB SPI Cal Kit 10-Pin IDC Pin Assignment or Connection



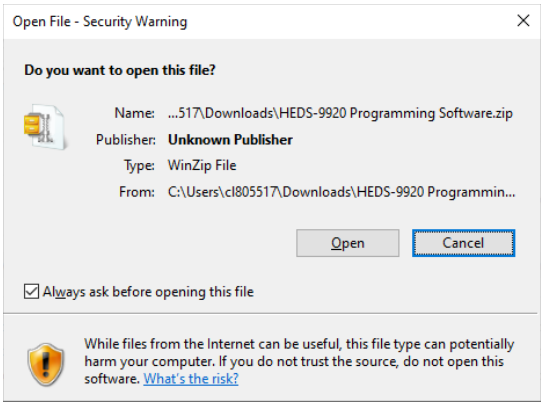
6 AEDR-9920 Gateway Programming GUI

Use the HEDS-9920PRGEVB kit together with the **AEDR-9920 Gateway.exe** to program the desired interpolation factor into the encoder ASIC.

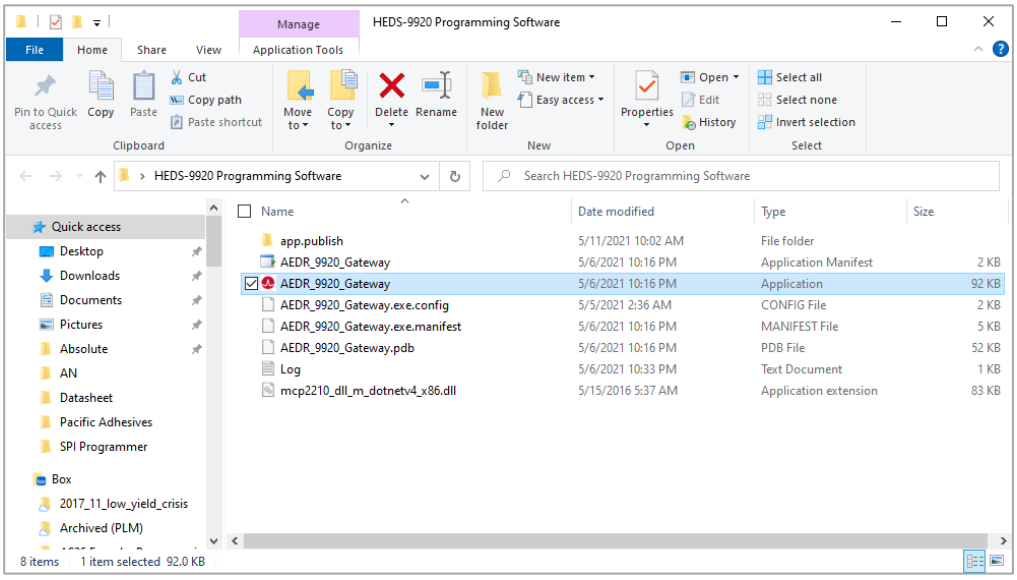
1. Download the zip file from:
   https://broadcom.box.com/v/AEDR-9920-Programming-Software
2. Save the zip file into a PC local drive.



3. Unzip the `HEDS-9920 Programming Software.zip` to a local folder of choice.

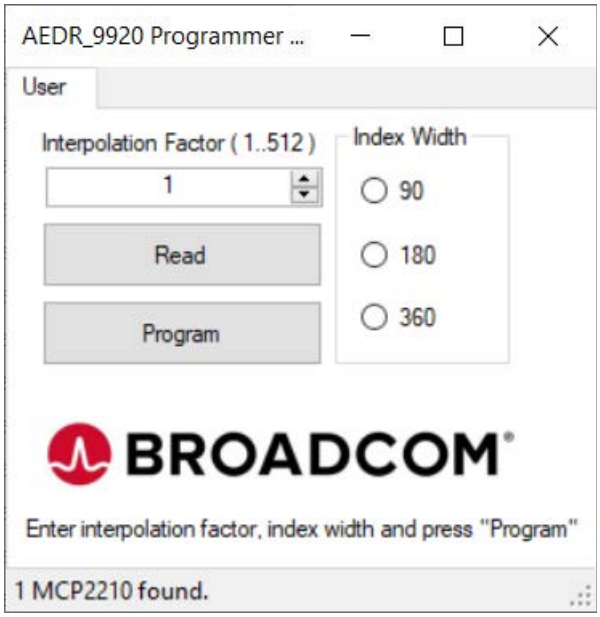


4. Select and double-click **AEDR-9920 Gateway.exe** file to run.



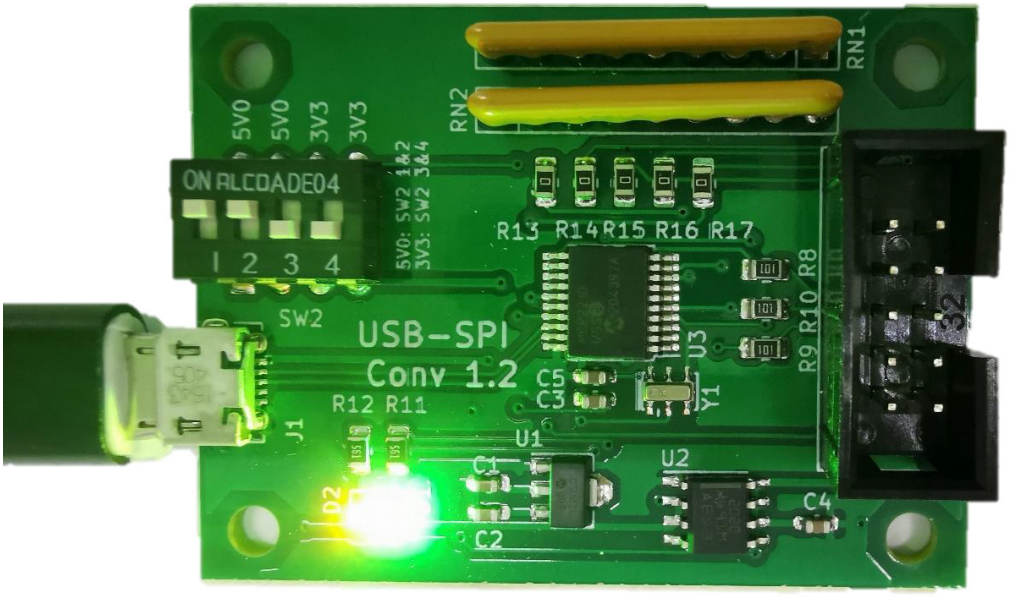
When the **AEDR-9930 Gateway.exe** program is running, the board should be detected.

Figure 10: User Interface of the AEDR-9920 Programmer Program

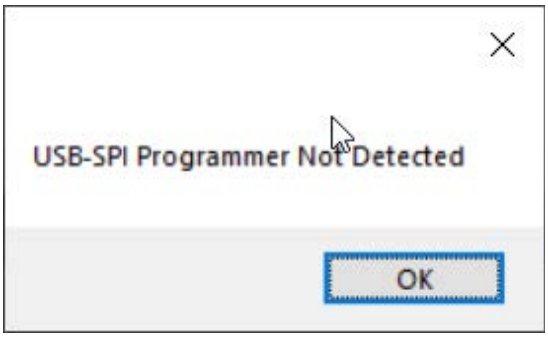


Both amber and green LEDs turn on when plugged into the USB port and the HEDS-9920PGREVB program is running.

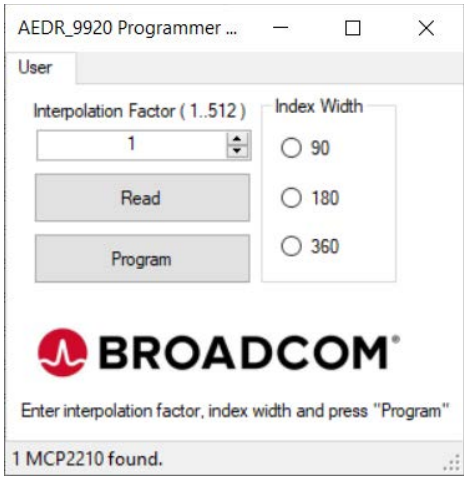
Figure 11: LEDS Indicating Program Is Running

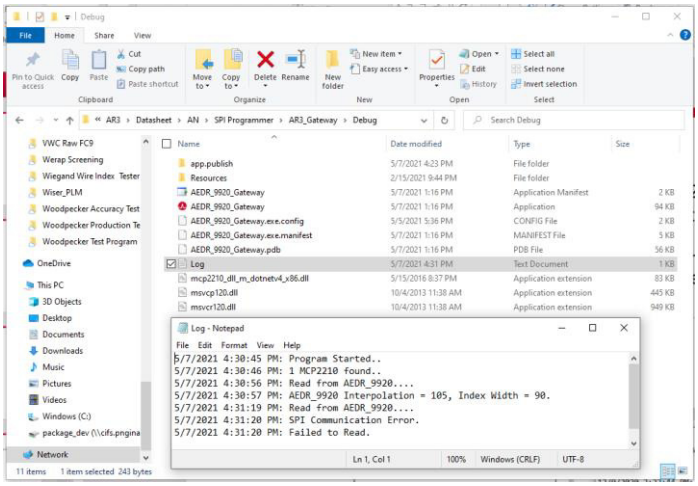


5. If the following message appears, check the board connections and try again.

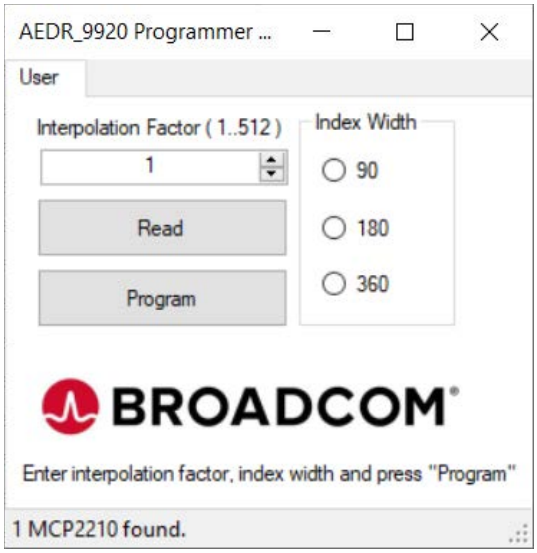


6. Click **Read** to read back the saved settings from AEDR-9920 encoder ASIC,
   – If the existing settings are read out successfully, the Interpolation Factor and Index Width settings saved message is displayed as shown in the following example on the left.
   – If the AEDR-9920 is not connected or detected, the program terminates. Refer to the `log.txt` file in the same folder to check the failure status; see the picture on the right.
   – If a communication failure with AEDR-9920 exists, the program exits. Refer to the `log.txt` file in the same folder to check on the error message; see the picture on the right.

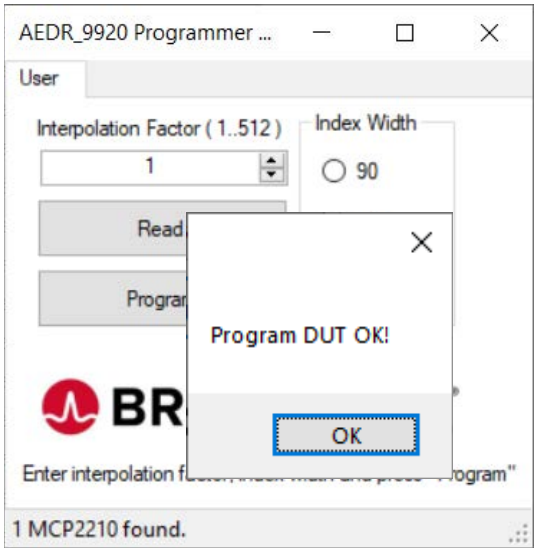




7. Enter the interpolation factor required (1 to 512) and index width setting, and click **Program** to save the settings into AEDR-9920.



The Program DUT OK! message is displayed when the settings are saved successfully into the AEDR-9920.



Revision History

Version 1.2, December 16, 2021

Initial document release.