

Introduction

This document provides guidelines for controlling the F0448 dual RF digital variable gain amplifier using IDT's RF Digital Control Software. The F0448 is not directly referenced in the software. This document describes how to download the software, how to make proper connections on the evaluation board, and how to control the F0448.

IDT will supply the controller board, USB cable, and connection wires. For the purposes of this document, the RF Digital Control Software will be referred to as GUI.

Requirements for GUI Automation

Computer or laptop:

- Must run the Microsoft Windows Operating System (Windows 7 or 8)
- Must use a powered USB port on the computer or laptop to the RF Digital Control Board

Power supply:

- Must provide a separate regulated 3 to 5 V input to the Product EV_{KIT} connection

How to Download the RF Digital Software Control

- Download the RF Digital Control Software from www.idt.com/document/swt/rf-digital-control-software-installer
- See instructions on installing the software in application note, [AN-896 RF Products EVS Digital Control Software Guide](#)

Controlling the F0448

The F0448 uses both a serial communication mode to control a 23dB digital step attenuator and parallel communication mode to control a total of three digital attenuators in each path for a total of six digital attenuators. The serial mode controls a 23dB step attenuator with a step size of 1dB in the path. The parallel mode controls step attenuators in each path. The parallel mode is used for faster switching rates for the attenuation. Both parallel and serial modes can be used together to get the full attenuation, 47dB, of the device.

Serial Control of the F0448

The F0448 does not have a standalone GUI nor has it been included in our latest software. The F1950 serial word is a superset of the F0448 serial word. When controlling the F0448 with the F1950 serial word, no effect in the attenuation will occur when the attenuation is a fraction of a whole number (x.25, x.50, and x.75 dB).

Figure 1. F0448 Serial Register Data Flow Diagram (LSB Clock in First)

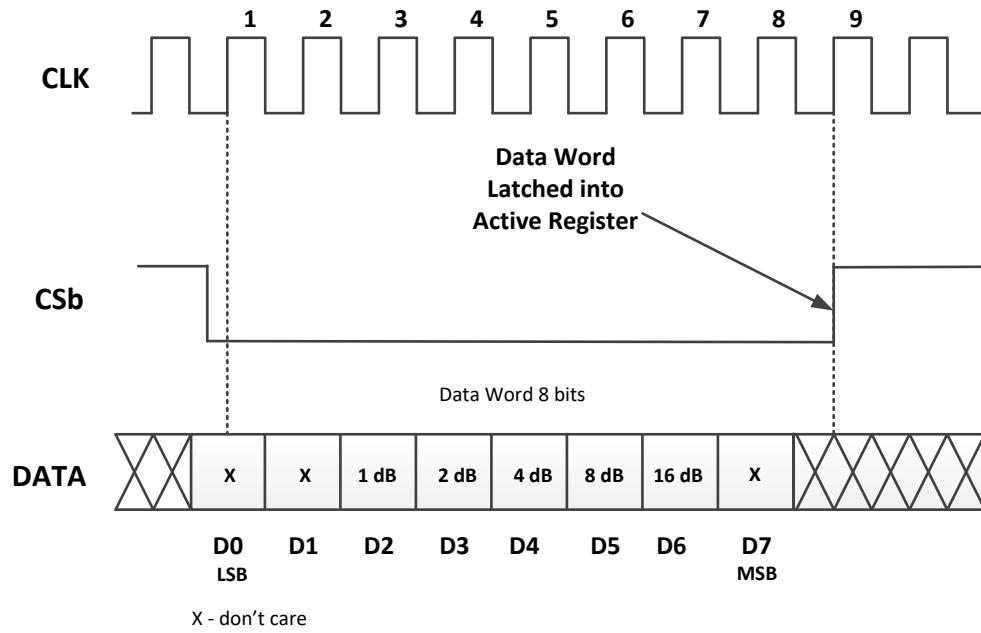


Table 1. Serial Mode Pin Connection for F0448

RF Digital Control Board	Wire Color	F0448 EVB Board Pin
GND	Red	J13 – Pin 1
D1	Yellow	J13 – Pin 2
D2	Orange	J13 – Pin 3
D3	Blue	J13 – Pin 4

Figure 2 shows the pin connection on the RF Digital Control Board. The ribbon cable is connected to the right-side header (when looking into the USB connector). Make the brown cable align with the 5V pin and the black cable with pin D7.

Figure 2. Cable Connections of RF Digital Control Board – Top and Side Views

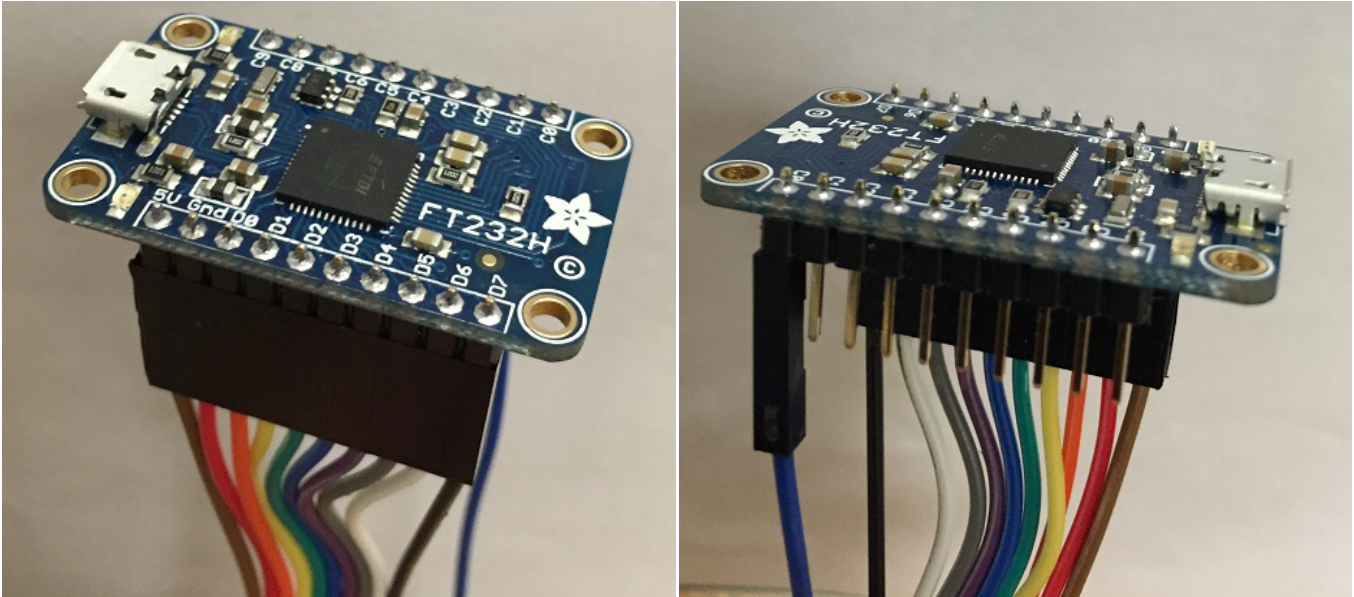


Figure 3 shows how the ribbon cable connection to the F0448 evaluation board is used to control DSA1 for both channels.

Figure 3. Serial Cable Connection to the F0448 Evaluation Board

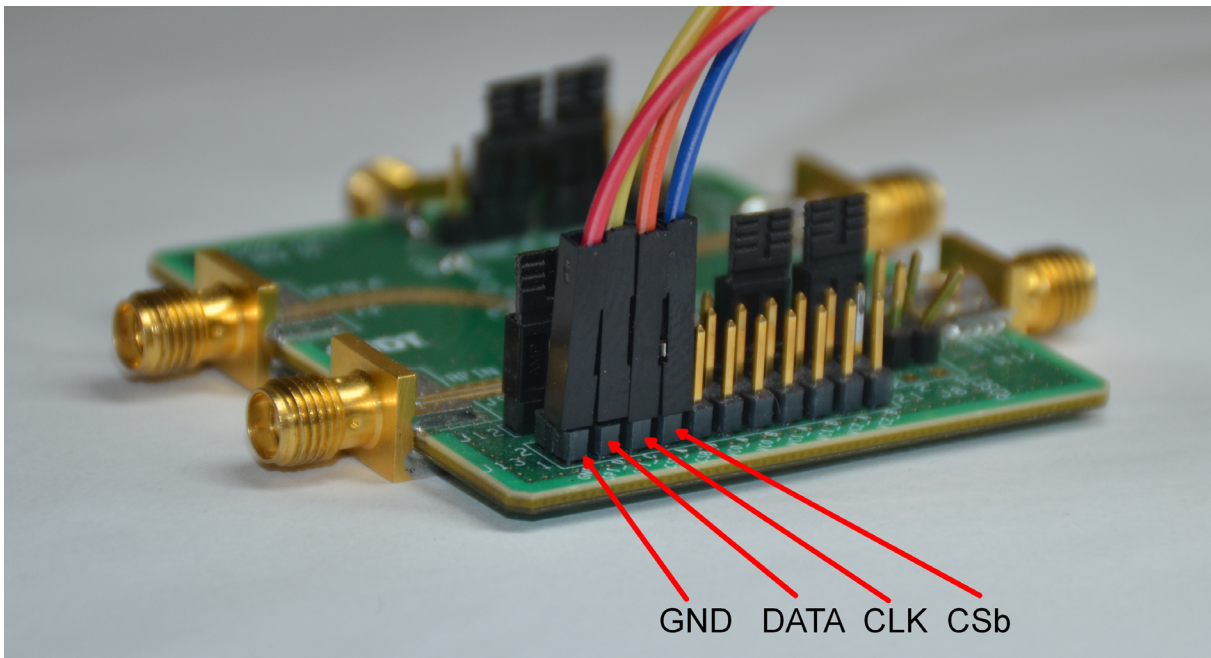
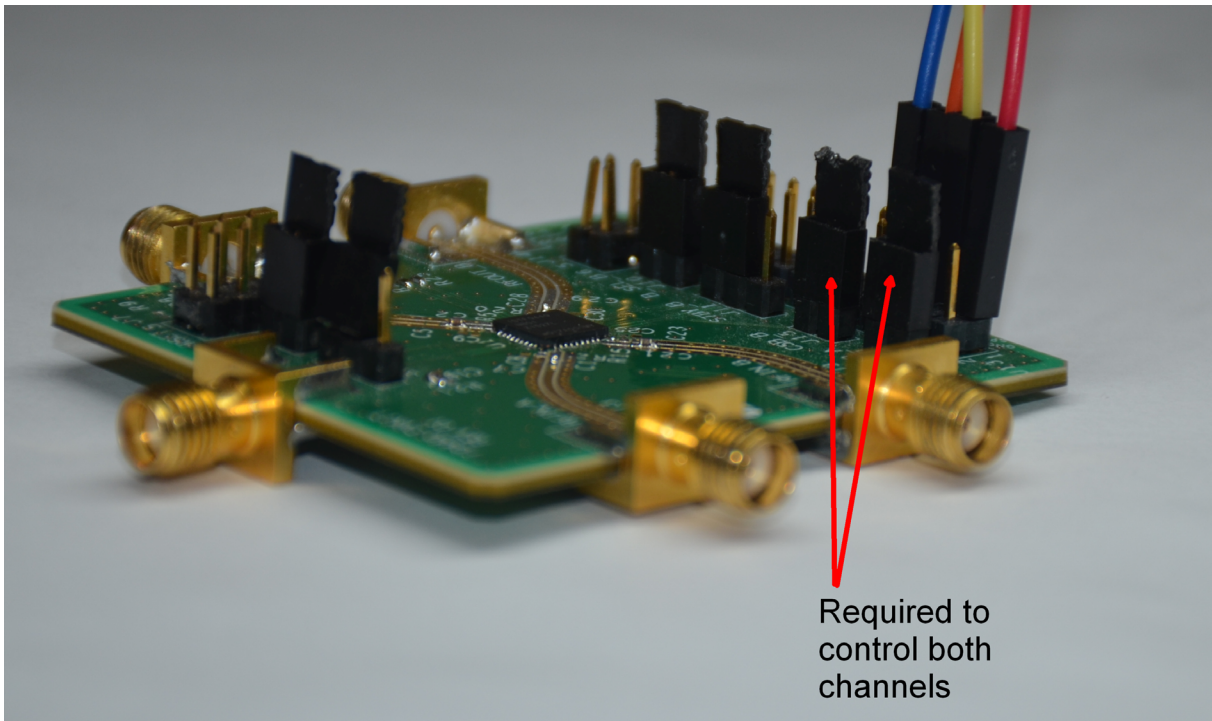


Figure 4 shows the two required jumpers so that CSb_A and CSb_B can be controlled simultaneously.

Figure 4. Required Connections to Control DSA1 for Both Channels

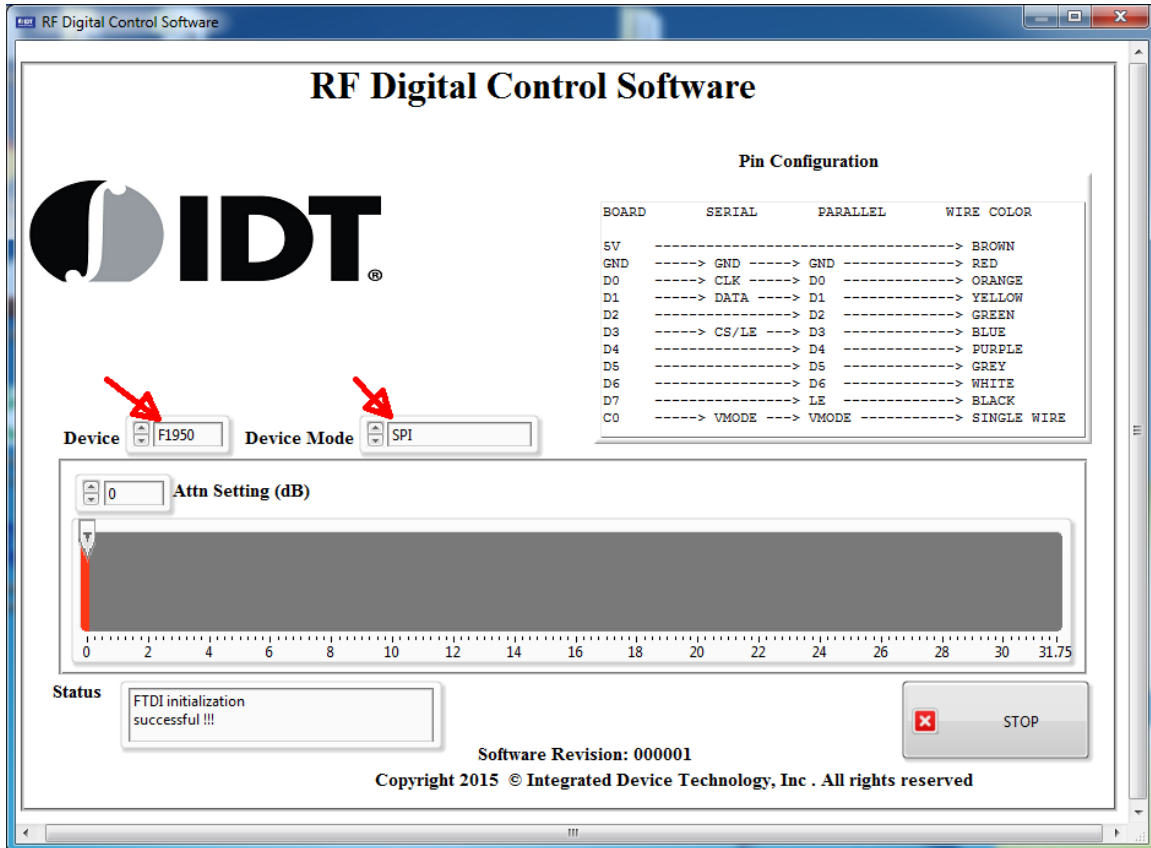


Using the GUI

Users should connect a supply voltage between 3.3V to 5V to V_{DD} of the F0448EVB (Product EVKIT).

After all connections are made, per the previous section, and the device is powered up per the datasheet, start the RF Digital Control Software. If successful, a screen similar to the one displayed in Figure 5 will appear. For the **Device** option, select F1950.

Figure 5. RF Digital Control Software Screen



The scale will be from 0 to 31.75 dB in 0.25dB steps. The F0448 will change to the appropriate attenuation state for any integer value between 0 and 23 dB. All non-integer attenuation values (x.25, x.50, and x.75) will not affect the attenuator, nor will any attenuator integer values between 24 and 31 dB. Table 2 and Table 3 show how the F0448 will change for all the F1950 states.

Table 2. F0448 Attenuation using the F1950 Commands

F1950 Attenuation (dB)	F0448 Attenuation (dB)	Comment
0.00	0	
0.25	0	Not Recommended
0.50	0	Not Recommended
0.75	0	Not Recommended
1.00	1	
1.25	1	Not Recommended
1.50	1	Not Recommended
1.75	1	Not Recommended
2.00	2	
2.25	2	Not Recommended
2.50	2	Not Recommended
2.75	2	Not Recommended
3.00	3	
3.25	3	Not Recommended
3.50	3	Not Recommended
3.75	3	Not Recommended
4.00	4	
4.25	4	Not Recommended
4.50	4	Not Recommended
4.75	4	Not Recommended
5.00	5	
5.25	5	Not Recommended
5.50	5	Not Recommended
5.75	5	Not Recommended
6.00	6	
6.25	6	Not Recommended
6.50	6	Not Recommended
6.75	6	Not Recommended
7.00	7	
7.25	7	Not Recommended
7.50	7	Not Recommended
7.75	7	Not Recommended

F1950 Attenuation (dB)	F0448 Attenuation (dB)	Comment
8.00	8	
8.25	8	Not Recommended
8.50	8	Not Recommended
8.75	8	Not Recommended
9.00	9	
9.25	9	Not Recommended
9.50	9	Not Recommended
9.75	9	Not Recommended
10.00	10	
10.25	10	Not Recommended
10.50	10	Not Recommended
10.75	10	Not Recommended
11.00	11	
11.25	11	Not Recommended
11.50	11	Not Recommended
11.75	11	Not Recommended
12.00	12	
12.25	12	Not Recommended
12.50	12	Not Recommended
12.75	12	Not Recommended
13.00	13	
13.25	13	Not Recommended
13.50	13	Not Recommended
13.75	13	Not Recommended
14.00	14	
14.25	14	Not Recommended
14.50	14	Not Recommended
14.75	14	Not Recommended
15.00	15	
15.25	15	Not Recommended
15.50	15	Not Recommended
15.75	15	Not Recommended

Table 3. F0448 Attenuation using the F1950 Commands (Cont.)

F1950 Attenuation (dB)	F0448 Attenuation (dB)	Comment
16.00	16	
16.25	16	Not Recommended
16.50	16	Not Recommended
16.75	16	Not Recommended
17.00	17	
17.25	17	Not Recommended
17.50	17	Not Recommended
17.75	17	Not Recommended
18.00	18	
18.25	18	Not Recommended
18.50	18	Not Recommended
18.75	18	Not Recommended
19.00	19	
19.25	19	Not Recommended
19.50	19	Not Recommended
19.75	19	Not Recommended
20.00	20	
20.25	20	Not Recommended
20.50	20	Not Recommended
20.75	20	Not Recommended
21.00	21	
21.25	21	Not Recommended
21.50	21	Not Recommended
21.75	21	Not Recommended
22.00	22	
22.25	22	Not Recommended
22.50	22	Not Recommended
22.75	22	Not Recommended
23.00	23	
23.25	23	Not Recommended
23.50	23	Not Recommended
23.75	23	Not Recommended

F1950 Attenuation (dB)	F0448 Attenuation (dB)	Comment
24.00	22	Not Recommended
24.25	22	Not Recommended
24.50	22	Not Recommended
24.75	22	Not Recommended
25.00	23	Not Recommended
25.25	23	Not Recommended
25.50	23	Not Recommended
25.75	23	Not Recommended
26.00	22	Not Recommended
26.25	22	Not Recommended
26.50	22	Not Recommended
26.75	22	Not Recommended
27.00	23	Not Recommended
27.25	23	Not Recommended
27.50	23	Not Recommended
27.75	23	Not Recommended
28.00	22	Not Recommended
28.25	22	Not Recommended
28.50	22	Not Recommended
28.75	22	Not Recommended
29.00	23	Not Recommended
29.25	23	Not Recommended
29.50	23	Not Recommended
29.75	23	Not Recommended
30.00	22	Not Recommended
30.25	22	Not Recommended
30.50	22	Not Recommended
30.75	22	Not Recommended
31.00	23	Not Recommended
31.25	23	Not Recommended
31.50	23	Not Recommended
31.75	23	Not Recommended

Parallel Control of the F0448

The F0448 evaluation board parallel pins for the other attenuators cannot be controlled through the GUI. Therefore, each parallel pin must have logic levels supplied externally. Internally, the parallel pins for the device are set for logic LOW.

Figure 6. Parallel Pin

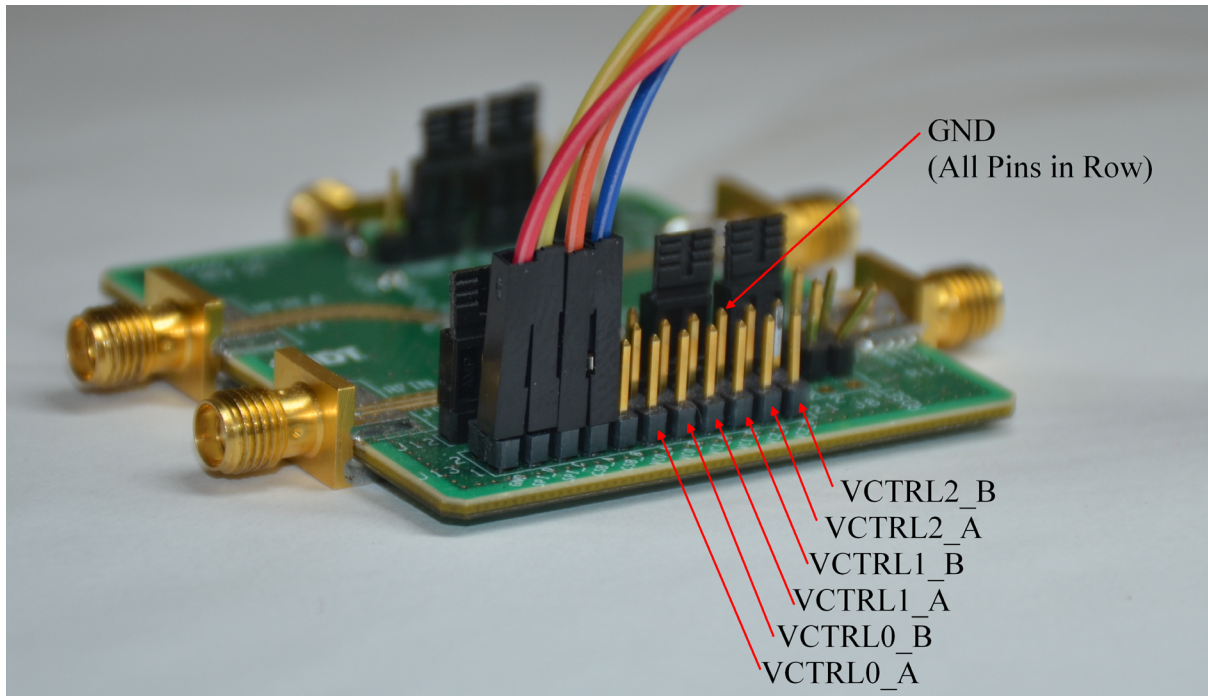


Table 4. Channel A DSA0 (DSA0_A) Truth Table

VCTRL0_A LOGIC LEVEL	DSA0_A ATTENUATION
LOW	0dB
HIGH	6dB

Table 5. Channel B DSA0 (DSA0_B) Truth Table

VCTRL0_B LOGIC LEVEL	DSA0_B ATTENUATION
LOW	0dB
HIGH	6dB

Table 6. Channel A DSA2 (DSA2_A) Truth Table

VCTRL1_A	VCTRL2_A	DSA2_A ATTENUATION
LOW	LOW	0dB
HIGH	LOW	6dB
LOW	HIGH	12dB
HIGH	HIGH	18dB

Table 7. Channel B DSA2 (DSA2_B) Truth Table

VCTRL1_B	VCTRL2_B	DSA2_B ATTENUATION
LOW	LOW	0dB
HIGH	LOW	6dB
LOW	HIGH	12dB
HIGH	HIGH	18dB

Revision History

Revision Date	Description of Change
September 20, 2018	Initial release.

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