Multi-Cal-Interface PCA Evaluation Module

This user's guide describes the characteristics, operation, and the use of the Multi-Cal-Interface PCA evaluation module (EVM). It covers all pertinent areas involved to properly use this printed circuit assembly (PCA), including details regarding hardware design and usage. The document includes the physical printed circuit board (PCB) layout, schematic diagrams, and circuit descriptions.

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1 Overview

The Multi-Cal-Interface PCA Evaluation Module is a set of EVMs that is used to calibrate multiple PGA308 sensor modules. The PGA308 is a programmable analog sensor signal conditioner. All components in the Multi-Cal-Interface can be expanded to calibrate up to 64 sensors simultaneously. For a more detailed description of the PGA308, refer to the product data sheet (SBOS440) available from the Texas Instruments web site at http://www.ti.com. Additional support documents are listed in the section of this guide entitled *Related Documentation from Texas Instruments* .

The Multi-Cal-Interface is part of a set of evaluation modules that is used to calibrate multiple PGA308 sensor modules. The complete Multi-Cal-System contains a series of PCAs, and can be expanded to meet your specific system requirements.

Throughout this document, the abbreviation *EVM* and the term *evaluation module* are synonymous with the Multi-Cal-Interface PCA Evaluation Module.

1.1 Multi-Cal-Interface PCA Hardware Options

Figure 1 shows the hardware included with the Multi-Cal-Interface PCA. Contact the factory if any component is missing.

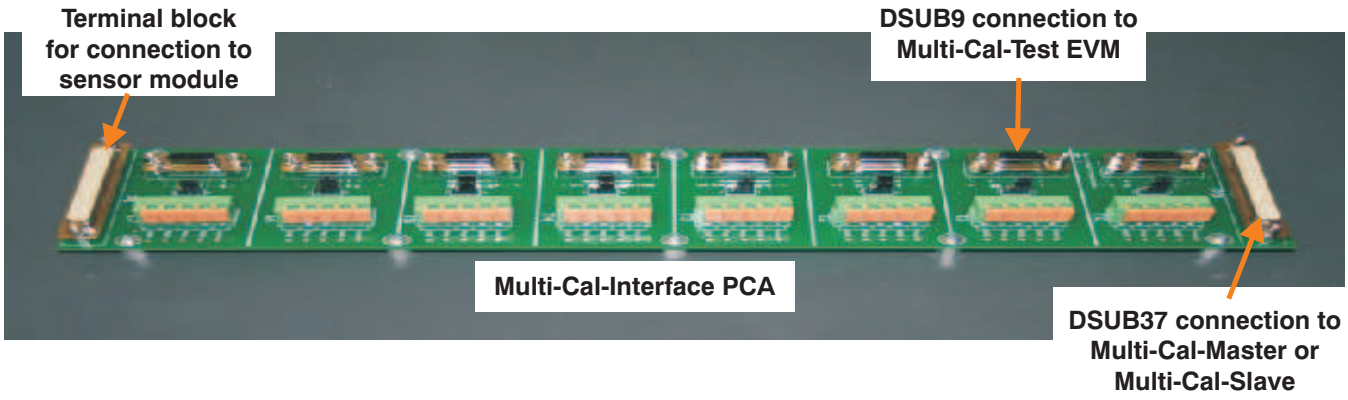

Figure 1. Hardware Included with the Multi-Cal-Interface PCA EVM Kit

The Multi-Cal-Interface PCA provides a way to connect sensor modules to the calibration system. The Multi-Cal-Interface includes a *screwless* terminal block to connect wires from the sensor module. It also includes DSUB9 connectors for connection of the Multi-Cal-Test PCA. Signals from the Multi-Cal-Master or Multi-Cal-Slave are delivered via two, 37-pin DSUB connectors.

1.2 Related Documentation from Texas Instruments

The following document provides information regarding Texas Instruments integrated circuits used in the assembly of the Multi-Cal-Interface PCA EVM. This user's guide is available from the TI website under literature number SBOU093. Any letter appended to the literature number corresponds to the document revision that is current at the time of the writing of this document. Newer revisions may be available from the TI web site at http://www.ti.com/, or call the Texas Instruments Literature Response Center at (800) 477-8924 or the Product Information Center at (972) 644-5580. When ordering, identify the document by both title and literature number.

Document	Literature Number
PGA308 Product Data Sheet	SBOS440
XTR115 Product Data Sheet	SBOS124A
USB DAQ Platform User's Guide	SBOU056
Multi-Cal-System EVM User's Guide	SBOU087
Multi-Cal-Test User's Guide	SBOU088
Multi-Cal-Master EVM User's Guide	SBOU089
Multi-Cal-Slave EVM User's Guide	SBOU094
Multi-Cal-Cable User's Guide	SBOU092

1.3 Electrostatic Discharge Warning

Many of the components on the Multi-Cal-Interface PCA are susceptible to damage by electrostatic discharge (ESD). Customers are advised to observe proper ESD handling precautions when unpacking and handling the EVM, including the use of a grounded wrist strap at an approved ESD workstation.

CAUTION

Failure to observe ESD handling procedures may result in damage to EVM components.

1.4 Applications Questions

If you have questions about this or other Texas Instruments evaluation modules, post a question in the *Amplifiers* forum at http://e2e.ti.com. Include in the subject heading the product in which you are interested.

2 Theory of Operation for Multi-Cal-Interface PCA Hardware

2.1 Multi-Cal-Interface PCA

Figure 2 shows the block diagram of the Multi-Cal-Interface PCA. Note that channels 0 to 3 signals are connected to J0; channels 4 to 7 are connected to J1.

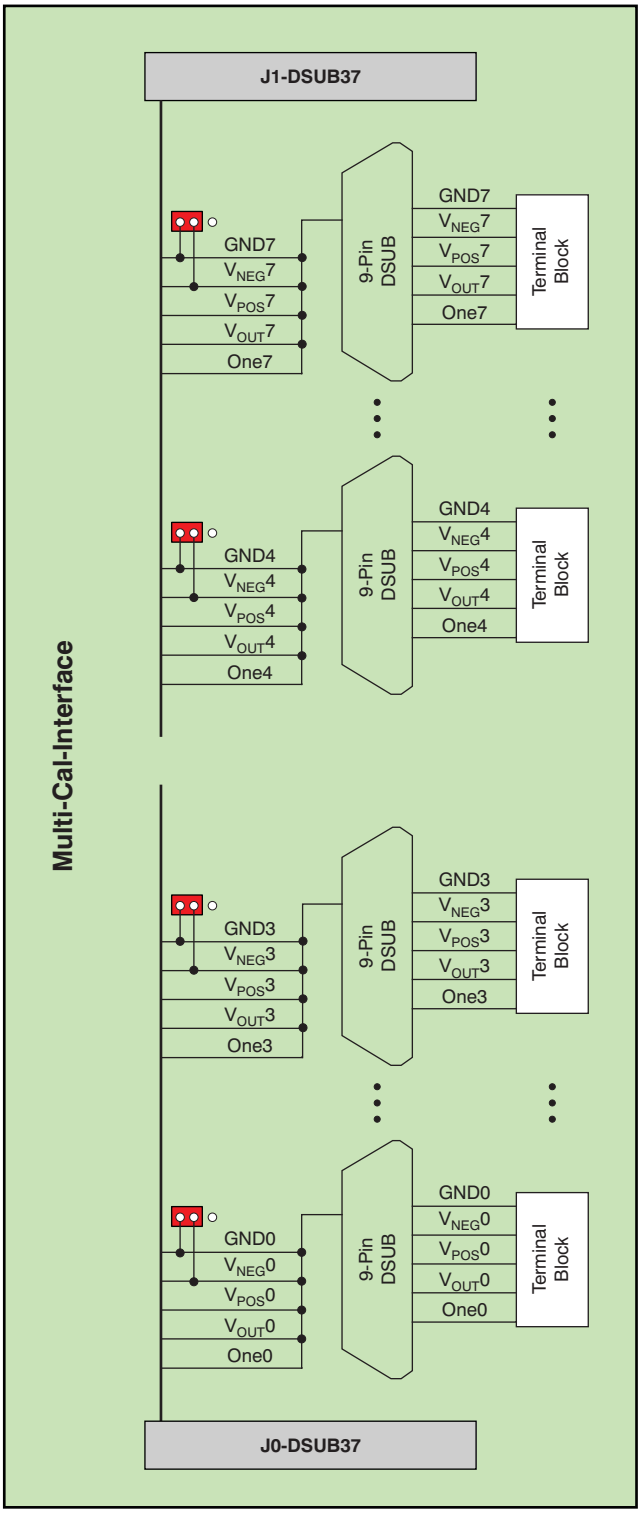

Figure 2. Multi-Cal-Interface Block Diagram

3 Multi-Cal-Interface PCA Configuration

3.1 Connection with Multi-Cal-System

Figure 3 shows a block diagram of the Multi-Cal-System configured to calibrate pressure sensors. Note that this system uses three Multi-Cal-Interface boards, so it can calibrate a maximum of 24 sensors (in other words, 3 x 8 = 24). The Multi-Cal-Interface board is designed to be placed adjacent to rows of sensors (for example, pressure manifolds between the interface boards). The Multi-Cal-Interface board is also designed to be placed in an oven (–55°C to +125°C).

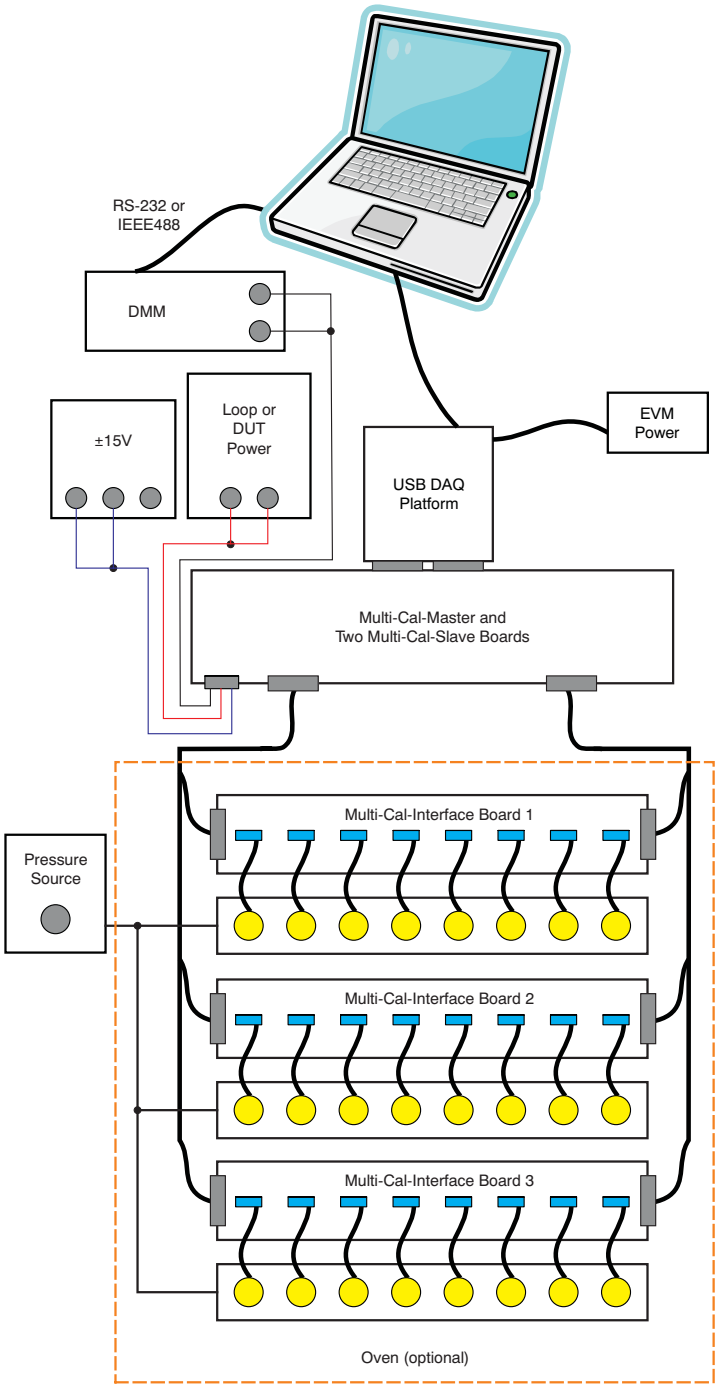

Figure 3. 24-Channel Multi-Cal-System Example

Figure 4 is a photograph of a 16-channel system. Note that two rows of interface boards are connected to four cables. In this example, test boards act as the sensor modules. A final application typically has sensor modules between the two interface boards.

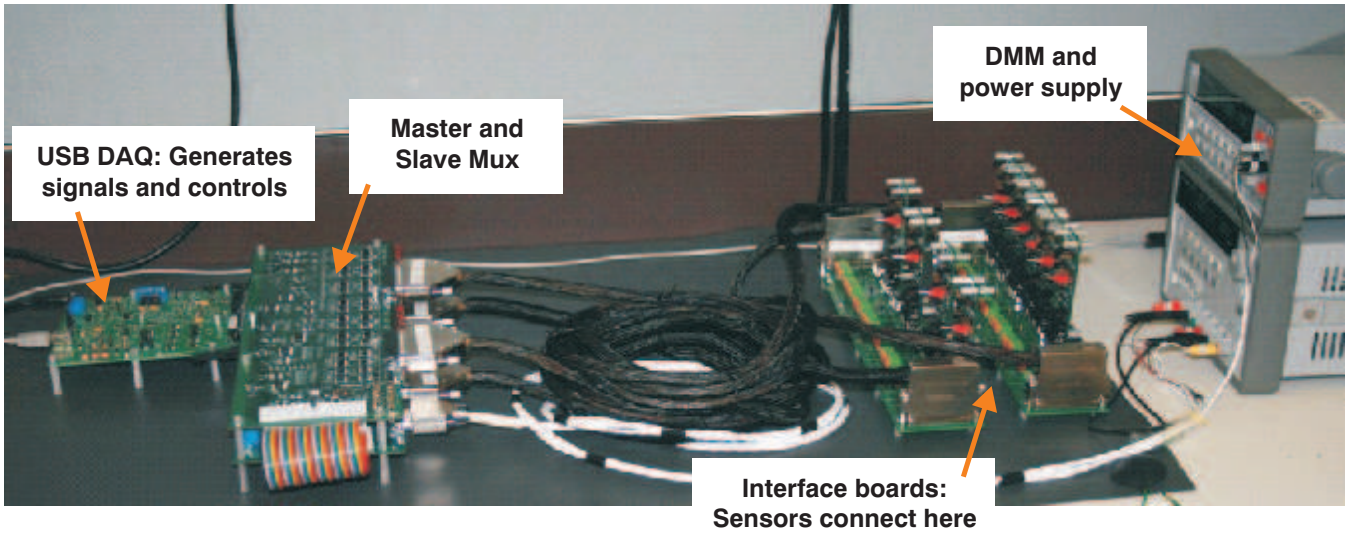

Figure 4. 16-Channel Multi-Cal-System Example

Figure 5 illustrates how wiring from a real-world sensor is connected to the screwless terminal blocks. A screwdriver can be used to push down the spring tab to open the contact area for insertion of a wire.

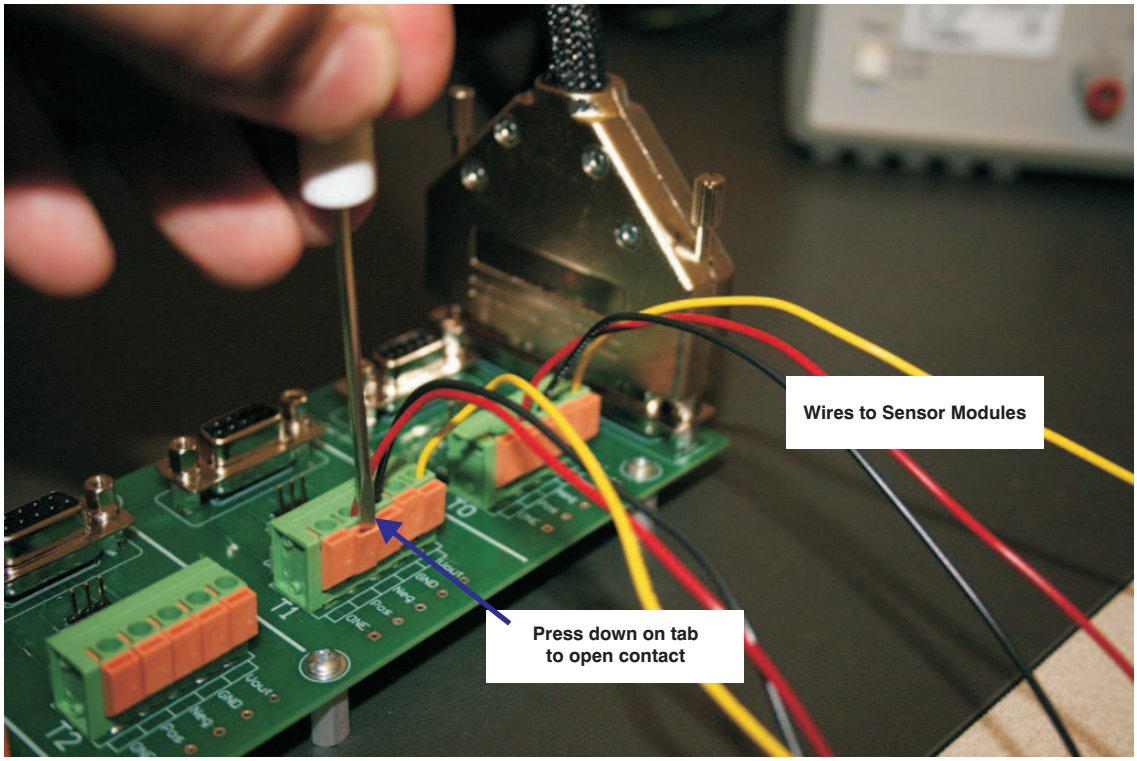

Figure 5. Using the Screwless Terminal Blocks

Within the Multi-Cal-System architecture, the Multi-Cal-Test boards are used for system verification. Figure 6 shows how several Multi-Cal-Test modules can be plugged directly into the interface board.

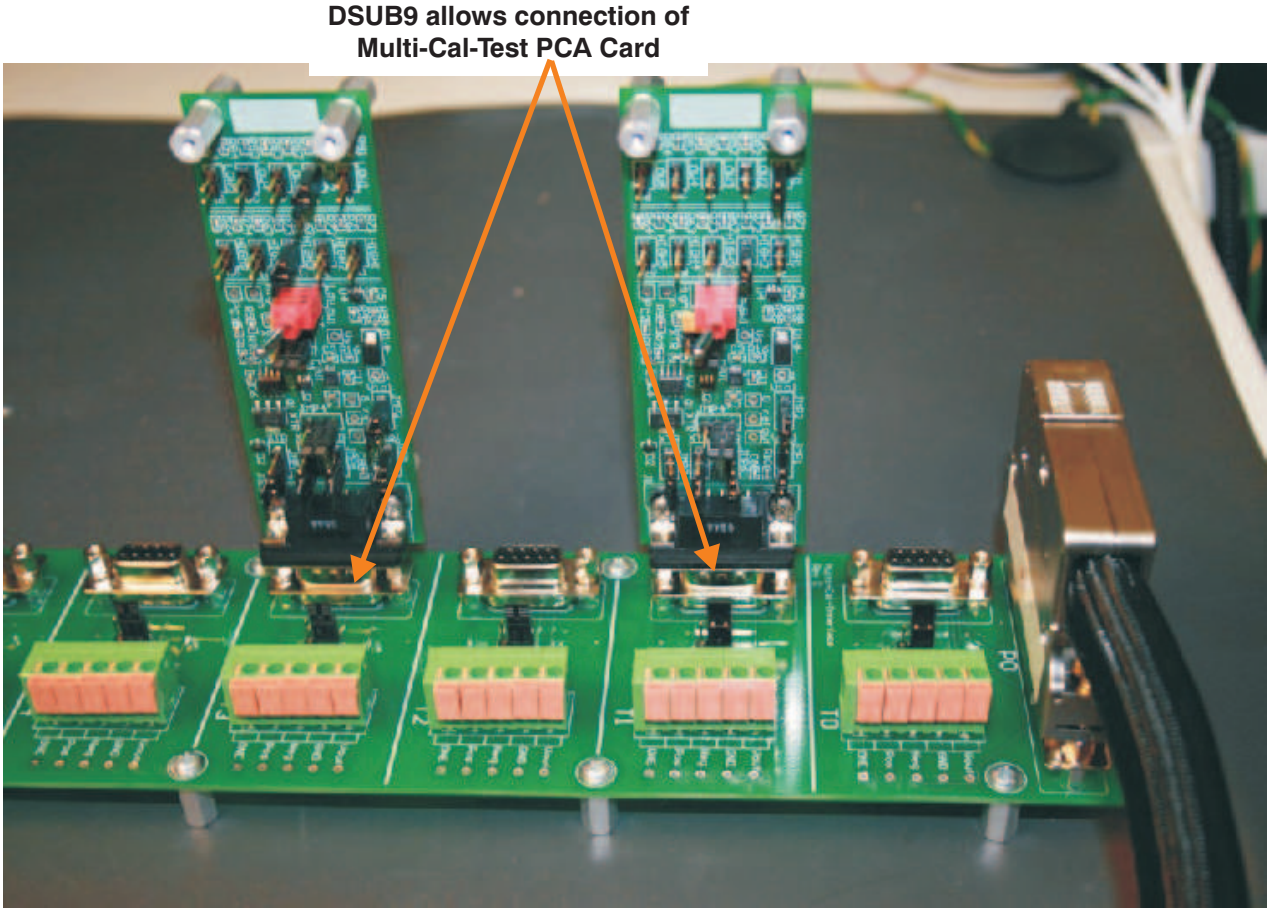

Figure 6. Connecting the Multi-Cal-Test Boards

Figure 7 shows the jumpers on the Multi-Cal-Interface board. The jumper is used to select between *voltage out* and *current out* modes. In current output mode, the jumper is not connected. In voltage output mode, the jumper shorts ground to the negative supply. Figure 8 illustrates a block diagram of the jumper-selected output mode.

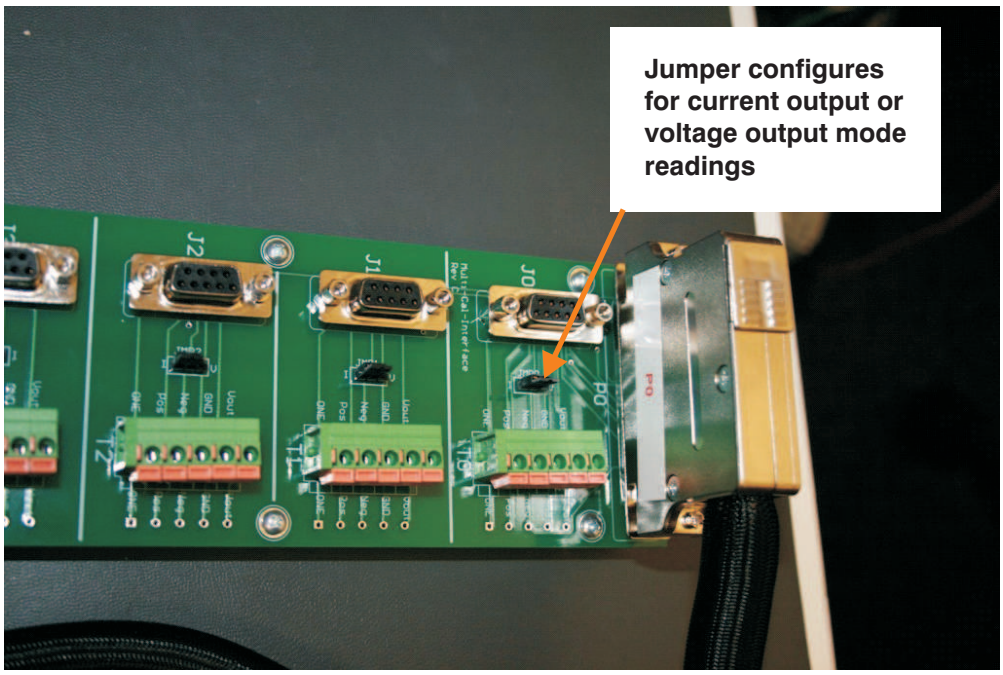

Figure 7. Multi-Cal-Interface Jumper Configuration

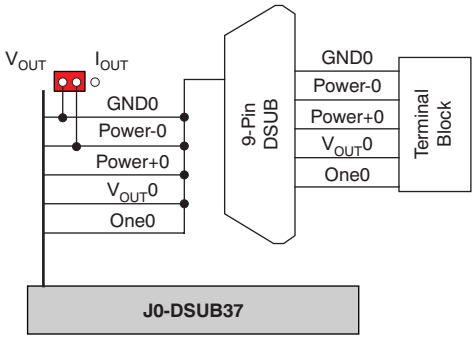

Figure 8. Jumper-Selected Output Mode

3.2 Signal Definitions

Table 1 and Table 2 summarize the signal definitions on the Multi-Cal-Interface cable.

Table 1. Signal Definitions on P0

Pin P0	Signal	Function on P0
1	Chassis ground	Chassis ground
2	One0	One-wire digital communication line.
3	Pos0	Positive device supply.
4	Neg0	Negative device supply.
5	GND0	Ground force for current modules. Ground sense for voltage modules.
6	$V_{OUT}0$	Output voltage measurement.
7	SCK0	SPI SCK for XTR108
8	CS0	SPI CS0 for XTR108
9	IO0	SPI Input / Output for XTR108
10	Chassis ground	Pins 10 to 18 repeat the function of pins 1 to 9 for channel 2
11	One1	
12	Pos1	
13	Neg1	
14	GND1	
15	$V_{OUT}1$	
16	SCK1	
17	CS1	
18	IO1	
19	—	No connection
20	Chassis ground	Pins 20 to 28 repeat the function of pins 1 to 9 for channel 3
21	One2	
22	Pos2	
23	Neg2	
24	GND2	
25	$V_{OUT}2$	
26	SCK2	
27	CS2	
28	IO2	
29	Chassis ground	Pins 29 to 37 repeat the function of pins 1 to 9 for channel 4
30	One3	
31	Pos3	
32	Neg3	
33	GND3	
34	$V_{OUT}3$	
35	SCK3	
36	CS3	
37	IO3	

Table 2. Signal Definitions on P1

Pin P1	Signal	Function on P1
1	Chassis ground	Chassis ground
2	One4	One-wire digital communication line.
3	Pos4	Positive device supply.
4	Neg4	Negative device supply.
5	GND4	Ground force for current modules. Ground sense for voltage modules.
6	$V_{OUT}4$	Output voltage measurement.
7	SCK4	SPI SCK for XTR108.
8	CS4	SPI CS0 for XTR108
9	IO4	SPI Input / Output for XTR108
10	Chassis ground	Pins 10 to 18 repeat the function of pins 1 to 9 for channel 2
11	One5	
12	Pos5	
13	Neg5	
14	GND5	
15	$V_{OUT}5$	
16	SCK5	
17	CS5	
18	IO5	
19	—	No connection
20	Chassis ground	Pins 20 to 28 repeat the function of pins 1 to 9 for channel 3
21	One6	
22	Pos6	
23	Neg6	
24	GND6	
25	$V_{OUT}6$	
26	SCK6	
27	CS6	
28	IO6	
29	Chassis ground	Pins 29 to 37 repeat the function of pins 1 to 9 for channel 4
30	One7	
31	Pos7	
32	Neg7	
33	GND7	
34	$V_{OUT}7$	
35	SCK7	
36	CS7	
37	IO7	

4 Bill of Materials

Table 3 shows the parts list for the Multi-Cal-Interface PCA EVM.

Table 3. Multi-Cal-Interface PCA EVM Parts List

Qty	Ref Des	Description	Vendor	Part Number
2	P0, P1	Connector, DB37 female solid dip nickel	Norcomp Inc.	172-E37-213R911
8	J0, J1, J2, J3, J4, J5, J6, J7	Connector, DB9 female dip, solid nickel	Norcomp Inc.	171-009-213R911
8	T0, T1, T2, T3, T4, T5, T6, T7	Terminal block, 5-position, top entry, 5.08mm	Tyco Electronics	1776260-5
8	JMP0, JMP1, JMP2, JMP3, JMP4, JMP5, JMP6, JMP7	Connector, Header 50-position .100" SGL Gold	Samtec Inc	SSW-150-02-T-S
8	JMP0, JMP1, JMP2, JMP3, JMP4, JMP5, JMP6, JMP7	Shunt LP w/Handle, 2-position 30AU	Tyco Electronics	881545-2
6	N/A	Standoffs, Hex , 4-40 Threaded, 0.500" length, 0.250" OD, Aluminum iridite finish	Keystone	2203
6	N/A	Machine Screw, 4-40x3/8" Phillips pan head, Steel, Zinc-plated	Building Fasteners	PMS 440 0038 PH

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EVM Warnings and Restrictions

It is important to operate this EVM within the input voltage range of 5.7V to 9V and the output voltage range of 0V to 5V.

Exceeding the specified input range may cause unexpected operation and/or irreversible damage to the EVM. If there are questions concerning the input range, please contact a TI field representative prior to connecting the input power.

Applying loads outside of the specified output range may result in unintended operation and/or possible permanent damage to the EVM. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative.

During normal operation, some circuit components may have case temperatures greater than +25°C. The EVM is designed to operate properly with certain components above +25°C as long as the input and output ranges are maintained. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors. These types of devices can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during operation, please be aware that these devices may be very warm to the touch.

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