CSM-10A AND CSM-200MA CURRENT SHUNT MODULES

This installation guide describes how to install and use the National Instruments current shunt module (CSM) family of products.

Introduction

The CSM-10A and CSM-200mA modules measure current by measuring the voltage drop across a precision resistor. You can use the current shunt modules in systems with a 0.75 in. banana plug spacing, such as the DAQMeter DAQCard-4050 digital multimeter PC card.

What You Need to Get Started

- ❑ One of the following current shunt modules:
  - CSM-10A
  - CSM-200mA
- ❑ *CSM-10A and CSM-200mA Current Shunt Modules Installation Guide*
- ❑ DAQMeter DAQCard-4050 and documentation
- ❑ DAQMeter DAQCard-4050 cable
- ❑ One pair of test probes (red and black)
- ❑ Your computer

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Safety Instructions

Caution: ***DO NOT OPERATE THIS DEVICE IN AN EXPLOSIVE ATMOSPHERE OR WHERE THERE MAY BE FLAMMABLE GASES OR FUMES.***

Equipment described in this document must be used in an Installation Category II environment per IEC 664. This category requires local level supply mains-connected installation.

DO NOT OPERATE DAMAGED EQUIPMENT. The safety-protection features built into this device can become impaired if the device becomes damaged in any way. If the device is damaged, do not use until service-trained personnel can check its safety. If necessary, return the device to National Instruments for service and repair to ensure that its safety is not compromised.

Do not operate this equipment in a manner that contradicts the information specified in this document. Misuse of this equipment could result in a shock hazard.

DO NOT SUBSTITUTE PARTS OR MODIFY EQUIPMENT. Because of the danger of introducing additional hazards, do not install unauthorized parts or modify the device. Return the device to National Instruments for service and repair to ensure that its safety is not compromised.

Connections that exceed any of the maximum signal ratings on the CSM current shunt module can create a shock or fire hazard or can damage any or all of the devices connected to the CSM current shunt module. National Instruments is NOT LIABLE FOR ANY DAMAGES OR INJURIES resulting from incorrect signal connections.

Clean devices and terminal blocks by brushing off light dust with a soft, nonmetallic brush. The unit must be completely dry and free from contaminants before returning to service.

Using Your Current Shunt Module

Figure 1 shows how to attach your current shunt module to the DAQCard-4050 digital multimeter cable. The current to be measured should be connected to the HI (red) terminal. The current will return through the LO (black) terminal. The voltage between either the HI terminal or the LO terminal must never exceed 250 V above earth ground. The current must never exceed the maximum input current specification for the shunt you are using (10 A for the CSM-10A, 200 mA for the CSM-200mA).

Caution: ***To prevent possible safety hazards, the maximum voltage between either of the inputs and ground of the measuring device should never exceed ±250 V or 250 V_{rms}.***

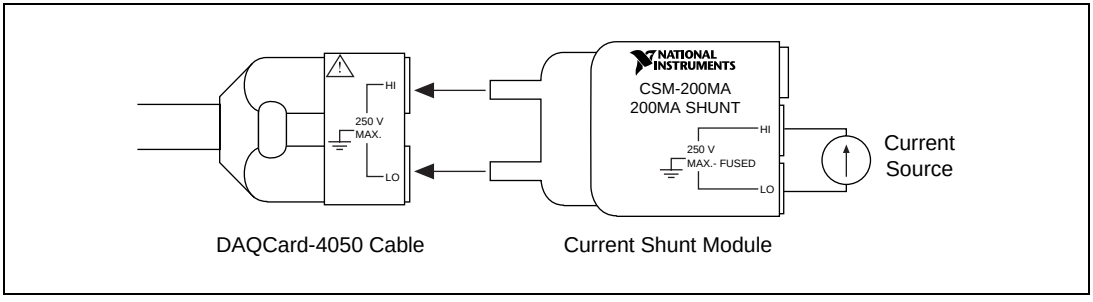

Figure 1. Current Shunt Module Connections

The current shunt module operates by passing the input current through a precise resistor. Figure 2 shows the internal circuitry of the current shunt module. You can find the value of the precision resistor in the *Specifications* section of this document.

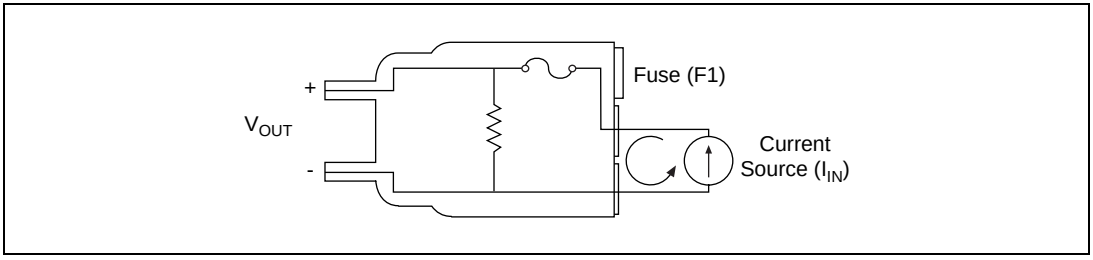

Figure 2. CSM Internal Construction

The resistor develops a voltage drop across it that you can measure with a standard voltmeter connected to the other end of the shunt. You can measure both DC and AC rms current with the current shunt module, provided your voltmeter is capable of measuring DC and AC rms voltage.

After you have measured the voltage using the current shunt module, you can calculate the current using Ohm's Law: The current (I) is equal to the voltage (V) divided by the resistance (R). The following is an example using the CSM-200mA current shunt module.

Voltage measured across the shunt: V_{out} = 50 mV
Resistor value of shunt (found in the *Specifications* section): R = 1 Ω

$$I_{in} = \frac{V_{out}}{R}$$

$$50\ mA = \frac{50\ mV}{1\ \Omega}$$

Replacing the Fuse in Your Current Shunt Module

Caution: ***For continued protection against fire, replace fuses only with fuses of the same type and rating.***

Figure 3 shows the location of the fuse (F1) on the front panel of your CSM current shunt module. The fuse protects the current shunt resistor if inputs exceed the maximum specified current rating as defined in the *Specifications* section of this document.

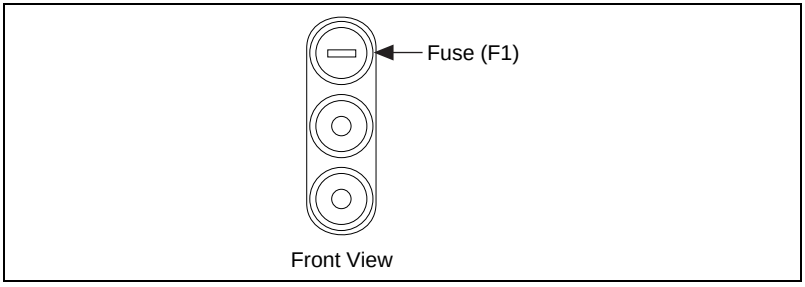

Figure 3. CSM Fuse Holder Location

The fuse is a 5 by 20 mm quick-acting fuse. Table 1 lists the different current shunt modules available and their appropriate fuse values.

Table 1. CSM Fuse Values

Module	Fuse Rating	Manufacturer	Part Number
CSM-10A	12.5 A / 250 V	Schurter	SP 001.1015
CSM-200mA	500 mA / 250 V	Schurter	FSF 034.1513

Use the following procedure to replace the current shunt module fuse:

1. Power down all equipment connected to the current shunt module.
2. Remove all connections from the current shunt module.
3. Turn the fuse holder counter-clockwise with a screwdriver and pull the fuse holder out to expose the fuse in the housing.
4. Remove the old fuse.
5. Install the new fuse.
6. Push the fuse holder back into the housing and turn it clockwise until it tightens completely.

Specifications

This section lists the specifications of the CSM-10A and CSM-200mA. These specifications are typical at 25° C, unless otherwise stated.

☞ **Note:** ***These specifications are for the current shunt modules only. To calculate your system's final accuracy, add the current shunt module accuracy error to the accuracy error of the mode and range of your voltmeter.***

CSM-10A

Current shunt.....10 A

Conversion factor.....1 mV = 100 mA

Max working current
HI to LO.....10 A

Max working voltage
HI to earth ground.....250 V max
LO to earth ground.....250 V max

Sense resistor value.....0.01 Ω

Accuracy (DC–25 kHz).....± 0.15%

Sense resistor
temperature coefficient.....20 ppm/°C

Burden voltage.....400 mV

Fuse type.....12.5 A/250 V
5 x 20 mm
quick-acting

Banana jack spacing.....0.75 in. (19 mm)

Safety.....Designed in accordance with
IEC 1010-1 and UL3111 for
measuring and testing
equipment;
Installation Category II
Double Insulated
Indoor use only

Altitude	For use up to 2,000 m
Operating temperature	0° to 55° C
Storage temperature	–55° to 150° C
Relative humidity	5% to 90% noncondensing

CSM-200mA

Current shunt	200 mA
Conversion factor	100 mV = 100 mA
Max working current	
HI to LO	200 mA
Max working voltage	
HI to earth ground	250 V max
LO to earth ground	250 V max
Sense resistor value	1 Ω
Accuracy (DC–25 kHz)	± 0.075%
Sense resistor temperature coefficient	20 ppm/°C
Burden voltage	325 mV
Fuse type	500 mA/250 V 5 x 20 mm quick-acting
Banana jack spacing	0.75 in. (19 mm)
Safety	Designed in accordance with IEC 1010-1 and UL3111 for measuring and testing equipment; Installation Category II Double Insulated Indoor use only
Altitude	For use up to 2,000 m

Operating temperature.....0° to 55° C

Storage temperature.....–55° to 150° C

Relative humidity .....5% to 90% noncondensing

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