

i410/i1010 AC/DC Current Clamp

Service Information

⚠ Warning

To avoid electric shock:

- Do not service this Current Clamp unless you are qualified to do so. The service information provided in this document is for use by qualified personnel only.
- Always remove input signals from the Current Clamp before opening the case.
- Be careful when working with voltages that exceed 30V ac rms, 42.4V pk, or 60V dc.
- The Current Clamp is protected throughout by double insulation. When servicing the Current Clamp, use only specified replacement parts.

Caution

- If the Current Clamp is to be Calibrated, you must have a replacement decal. See the Replacement Parts section for further details.
- This Current Clamp contains parts that can be damaged by static discharge. Follow the standard practices for handling static sensitive devices.

Introduction

Service Information covers the following service-related areas for the *i410/i1010 AC/DC Current Clamps*:

- Product specifications
- Required equipment
- Performance test procedure and test values
- Preparing for calibration
- Calibration procedure
- Reassembly procedure
- Replacement parts

Usually, service information in this document applies to both models (i410 and i1010). Information applicable to only one model is so noted. For operating information, refer to the *Instruction Sheet* that came with the Current Clamp.

Service Under Warranty

The Current Clamp is warranted to be free from defects in material and workmanship for one year.

The warranty does not cover abuse, batteries, or damage caused by using the Current Clamp outside its rated specifications or operating environment. The complete warranty statement appears in the Current Clamp *Instruction Sheet*.

For repairs:

- In the USA or Canada, call 1-800-323-5700
- Outside the USA, contact your nearest Fluke Distributor or Service Center.

Service, repairs, and replacement parts are warranted for 90 days.

Specifications

General specifications are shown in Table 1. Range and accuracy specifications are shown in Table 2.

The accuracy of the Current Clamp is specified for one year after calibration, at 18°C to 28°C (64°F to 82°F), with relative humidity to 90%.

Table 1. General Specifications

Operating Temperature	-10 to 50°C (14 to 122°F)	Current x Hz Product	≤ 240,000
Storage Temperature	-20 to 60°C (-4 to 140°F)	Output Signal	1 mV per amp dc or ac
Relative Humidity	0 to 95% (0 to 30°C) 0 to 75% (30 to 40°C) 0 to 45% (40 to 50°C)	Working Voltage	600V CAT. III maximum at input
Altitude		Maximum Conductor Size	1 ea. 30 mm (1.18 in.) diameter 2 ea. 25 mm (0.98 in.) diameter
Operating	0 - 2000m		
Non-operating	0 - 12000m		
Battery Type	9V (alkaline)	Load Impedance	≥1 MΩ, ≤100 pF
Battery Life	60 hrs typical (continuous with alkaline)	Temperature Coefficient	+/- (0.05 x accuracy per °C (0 -18°C, 28-50°C))
Safety	<input checked="" type="checkbox"/> Double Insulation, 600V, CAT. III	Size	209 x 78 x 48 mm (3.09 x 8.21 x 1.87 in.)
		Weight	0.5 kg (17.6 oz.)

Table 2. Range and Accuracy Specifications

	i410	i1010
Specified Current Range	1 - 400A ac rms * 1 - 400A dc	1 - 600A ac rms * 1 - 1000A dc
Usable Current Range	0.5 - 400A	0.5 - 1000A
DC Accuracy (zero adjusted, conductor centered)	3.5% + 0.5A (0 - 400A)	2.0% + 0.5A (0-1000A)
AC Accuracy	3.5% + 0.5A, 45 - 400 Hz, Crest Factor ≤ 3. (1 - 400A)	2.0% + 0.5A, 45 - 400 Hz, Crest Factor ≤ 3. 3.0% + 0.5A, 400 Hz - 2 kHz sine wave. (1 - 600A)
Bandwidth	3 kHz	10 kHz

* With a true-rms DMM, the minimum ac current is limited to the low end of the specified mV ac range.

Required Equipment

Equipment required for the performance test and calibration procedure is shown in Table 3.

Table 3. Required Equipment

Equipment	Recommended Model
Calibrator	Fluke 5700A, 5720A, or 5500A
Transconductance Amplifier	Fluke 5220A
Digital Multimeter (DMM)	Fluke 45 or equivalent
Current Coil	Fluke 5500A/Coil (50-Turn)
Calibration tool	(slotted, as required)
Decal (replace to calibrate)	PN 642584 (i410) or 642592 (i1010)

Performance Test

⚠ Warning

To avoid electric shock, do not execute the performance tests unless the Current Clamp is fully assembled.

The Battery LED and Measurement Accuracy tests verify that the Current Clamp is working properly and performs to specification.

Battery LED Test

Complete the following procedure to verify that the Battery LED threshold is set correctly:

1. Turn on the Calibrator and allow it to warm up and stabilize for 30 minutes.
2. Place the Current Clamp face down.
3. Remove the screw securing the battery cover to the back of the Current Clamp.
4. Remove the battery cover.
5. Connect the Calibrator to the Current Clamp battery snap connectors.
6. Set the Calibrator to 6.70V dc. Check that the Current Clamp LED is off.
7. Set the Calibrator to 7.30V dc. Check that the LED is on.
8. Replace the battery cover and securing screw.

Measurement Accuracy Tests

Connect the Current Clamp and test equipment as shown in Figure 1. Then perform the appropriate steps shown in Table 4. Most tests apply to both the i410 and the i1010, with resulting DMM readings listed separately for each model. Some tests apply to only one model; the model not being tested is then marked with "NA".

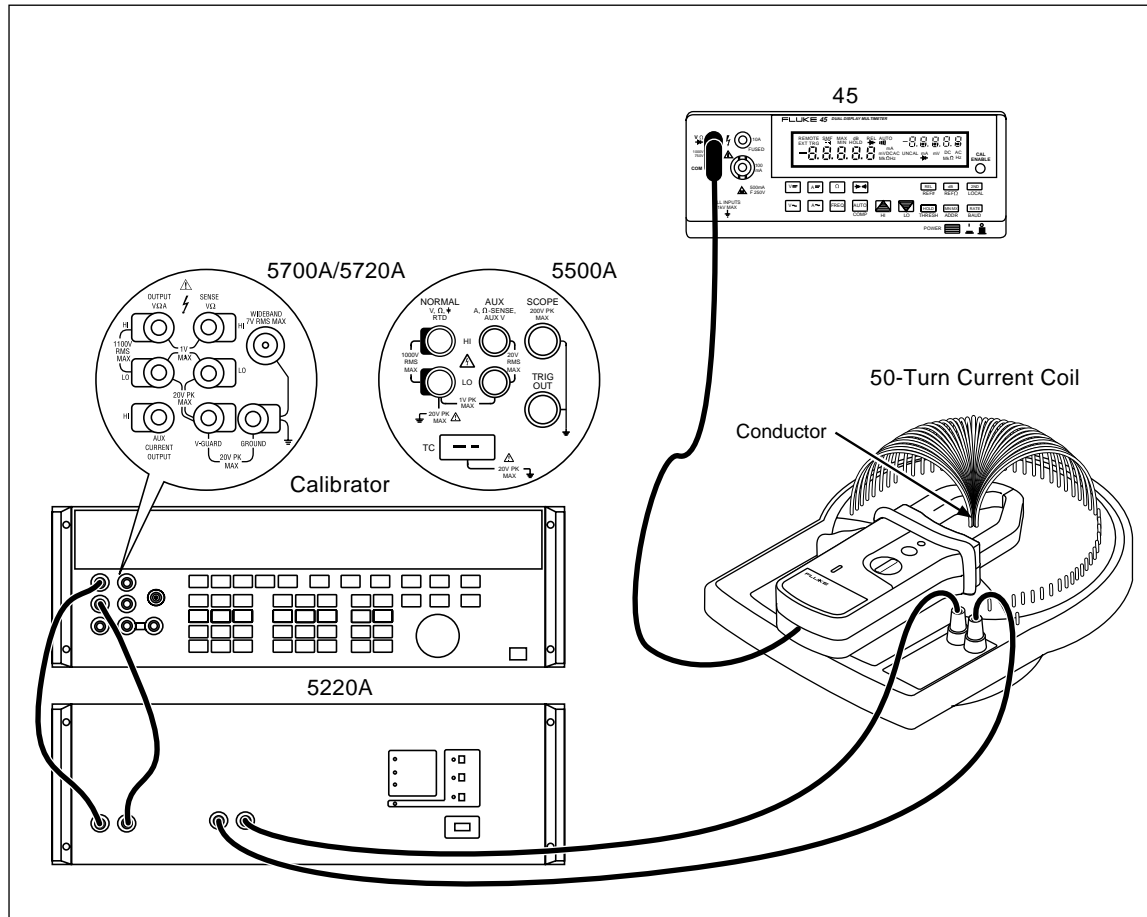


Figure 1. Equipment Connections

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Preparing for Calibration

Before calibrating the Current Clamp, do the following:

1. Calibration necessitates removal of the decal on the case top. Plan to install a new decal when calibration is complete. See “Replacement Parts” for decal ordering information.
2. Turn on the Calibrator and allow it to warm up and stabilize for 30 minutes.
3. Place the Current Clamp face down.
4. Remove the screw securing the battery cover to the back of the Current Clamp.
5. Remove the battery cover.
6. Connect the DMM to the Current Clamp battery terminals.
7. Press the green power button on and verify that the battery voltage is at least 7V. If the battery voltage is too low, replace the battery before proceeding.
8. Carefully remove the Current Clamp decal to uncover a set of five holes in the case top. These holes allow direct access to calibration potentiometers.
9. Continue with the calibration procedure that follows.

Table 4. Performance Test Values

Step	Calibrator Setting	50T Coil Current	Measure	i410 Lo mV	i410 Hi mV	i1010 Lo mV	i1010 Hi mV
DC Amps Zero Test							
1	0.0 (ZERO knob CW)	NA	Pos. span	3.0	15.0	3.0	15.0
2	0.0 (ZERO knob CCW)	NA	Neg. span	-15.0	-3.0	-15.0	-3.0
DC Amps Test¹							
3	0.04A dc	2.0A dc	2.00 mV	1.43	2.57	1.46	2.54
4	0.4A dc	20.0A dc	20.0 mV	18.8	21.2	19.1	20.9
5	-0.4A dc	-20.0A dc	-20.0 mV	-21.2	-18.8	-20.9	-19.1
6	1.2A dc	60.0A dc	60.0 mV	57.4	62.6	58.3	61.7
AC Amps Test							
7	0.40A, 45 Hz, 400 Hz	20.0A ac	20.0 mV	18.8	21.2	19.1	20.9
8	0.40A, 2 kHz	20.0A ac	20.0 mV	NA	NA	18.9	21.1
9	1.0A 45 Hz, 400 Hz	50.0A ac	50.0 mV	47.7	52.3	48.5	51.5
10	1.0A 2 kHz	50.0A ac	50.0 mV	NA	NA	48.0	52.0
11	2.0A, 45 Hz, 400 Hz	100.0A ac	100.0 mV	96.0	104.0	97.5	102.5
12	2.0A, 1 kHz	100.0A ac	100.0 mV	NA	NA	96.5	103.5
DC Amps Balance Test							
13	4.0A dc	200.0A dc	200.0 mV	1.0A maximum change from Center of Jaw Reading to Top or Bottom of Jaw Readings.			
DC Amps Test							
14	4.0A dc	200.0A dc	200.0 mV	192.5	207.5	195.5	204.5
15	8.0A dc	400.0A dc	0.4000V	0.3855V	0.4145V	0.3915V	0.4085V
16	-8.0A dc	-400.0A dc	-0.4000V	-0.4145V	-0.3855V	NA	NA
17	-12.0A dc	-600.0A dc	-0.6000V	NA	NA	-0.6125V	-0.5875V
18	20.0A dc	1000.0A dc	1.0000V	NA	NA	0.9795V	1.0205V
19	-20.0A dc	-1000.0A dc	-1.0000V	NA	NA	-1.0205V	-0.9795V
AC Amps Test							
20	2.4A, 45 Hz, 400 Hz	120.0A ac	120.0 mV	115.3	124.7	117.1	122.9
21	2.4A, 800 Hz	120.0A ac	120.0 mV	NA	NA	115.9	124.1
22	5.0A, 45 Hz, 400 Hz	250.0A ac	250.0 mV	240.7	259.3	244.5	255.5
23	8.0A, 45 Hz, 400 Hz	400.0A ac	0.4000V	0.3855V	0.4145V	NA	NA
24	12.0A, 45 Hz, 65 Hz	600.0A ac	0.6000V	NA	NA	0.5875V	0.6125V
Notes:							
1. Prior to performing DC Amp tests, adjust ZERO so that the DMM reads 00.0 +/- 00.1 mV without current applied.							

Calibration and Adjustment

Always complete the Performance Test prior to Calibration. If Performance Test results are satisfactory, calibration is not necessary. Otherwise, to ensure that the Current Clamp performs to specification, calibrate the Battery Indicator, DC Zero, and DC Amps and check the AC Amps function on a yearly basis.

When it is needed, be sure to complete the full calibration procedure (Battery Indicator, DC Zero, DC Amps Calibration and AC Amps Check.) Partial completion of this procedure will not ensure that the Current Clamp performs to specification.

Adjustment points are shown in Figure 2.

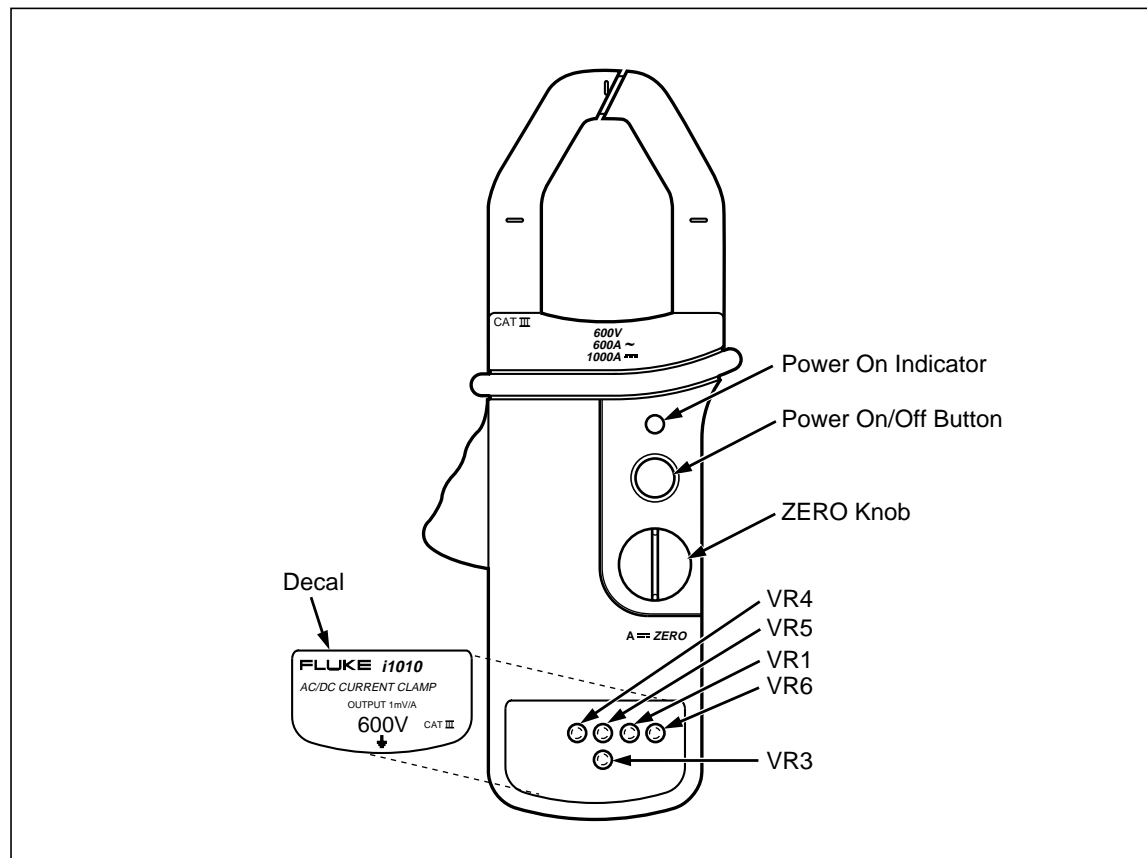


Figure 2. Calibration Adjustment Points

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Calibrating the Battery Indicator

Use the following procedure to calibrate the low battery indicator:

1. Set the DC voltage generator to 9.0V dc.
2. On the Current Clamp, disconnect the battery from the battery clip.
3. Connect the DC voltage generator to the battery snap.
4. Connect the Current Clamp output cable to a DMM. Check that the DMM reads 9.0V dc.
5. On the Current Clamp, press the green power button on and check that the LED is on.
6. Set the DC voltage generator to 7.0V dc. (The LED may be on or off at this point.)
7. Adjust VR4 on the Current Clamp to the point where the LED cycles from on to off.

Calibrating DC Zero

Use the following procedure to calibrate the ZERO control:

1. Set the DMM to measure 3V dc to four decimal places.
2. Rotate the ZERO knob to mid-range (ZERO knob bar vertical.)
3. Adjust VR3 so that the DMM reads 0.0000.
4. Turn ZERO (VR2) fully CCW. Check that the DMM reads 0.0050 or higher.
5. Turn ZERO (VR2) full CW. Check that the DMM reads -0.0050 or lower.

Calibrating the DC Amps Function

Use the following procedure to calibrate the DC Amps function:

1. Clamp and center the Current Clamp onto the current coil.
2. Set the DMM to 300 mV dc range at medium speed.
3. Rotate the ZERO knob so that the DMM reads 000.0.
4. Apply 4A dc (200 ampere-turns) to the current coil. Check that the DMM reads 200 mV.
5. Move the coil conductor within the Current Clamp jaws as you observe reading differences on the DMM.
6. Adjust VR5 so that multimeter readings vary by no more than 0.2% (199.6 to 200.4 mV).
7. Remove the Current Clamp jaws from the current coil and check that the DMM reads 000.0. If necessary, adjust the ZERO knob to obtain 000.0.
8. Apply 4A dc (200 ampere-turns) to the current coil.
9. Clamp the Current Clamp jaws onto the current coil.
10. With the coil conductor centered in the jaws, adjust VR6 to its mid-range. Then adjust VR1 so that the DMM reads 199.9 to 200.1. If necessary, adjust VR6 to fine tune this reading.

Checking the AC Amps Function

To check the AC Amps function, do the following:

1. Make sure that the Calibrator, Transconductance Amplifier, DMM, and Current Coil are connected as shown in Figure 1.
2. Set the DMM to the 300 mV ac range.
3. Clamp the Current Clamp around the Current Coil, taking care to align the conductor with the alignment marks on the jaws of the Current Clamp.
4. Apply 5A ac (250 ampere-turns) at 50 or 60 Hz to the Current Coil.
For the i410, the DMM should read between 240.7 and 259.3 mV ac. For the i1010, the DMM should read between 244.50 and 255.50 mV ac.
5. If you do not obtain readings within the limits of step 4, repeat "Calibrating the DC Amps Function."

Reassembling the Current Clamp

After you have completed the last calibration step and checked the AC Amps function, do the following:

1. Replace the decal over the potentiometer access holes.
2. Replace the battery cover and its securing screw.

The Current Clamp is now ready for normal operation.

Replacement Parts

Replacement parts are listed in Table 5 and shown in Figure 3. To obtain replacement parts, call Fluke Corporation at 1-800-526-4731.

Table 5. Replacement Parts

Part Description	Part No.
i410 Case Top Decal	642584
i1010 Case Top Decal	642592
Battery Door	642600
Top Case and Zero Knob	642618
PCB Assembly	642626
Case Screw	642634
Jaw Spring	642642
Bottom Case	642645
Brass Cable Clamp	642659
Power On/Off Button (green)	642675
Output Cable Assembly	642683
Jaw Assembly	603602
Poron Ring	642535

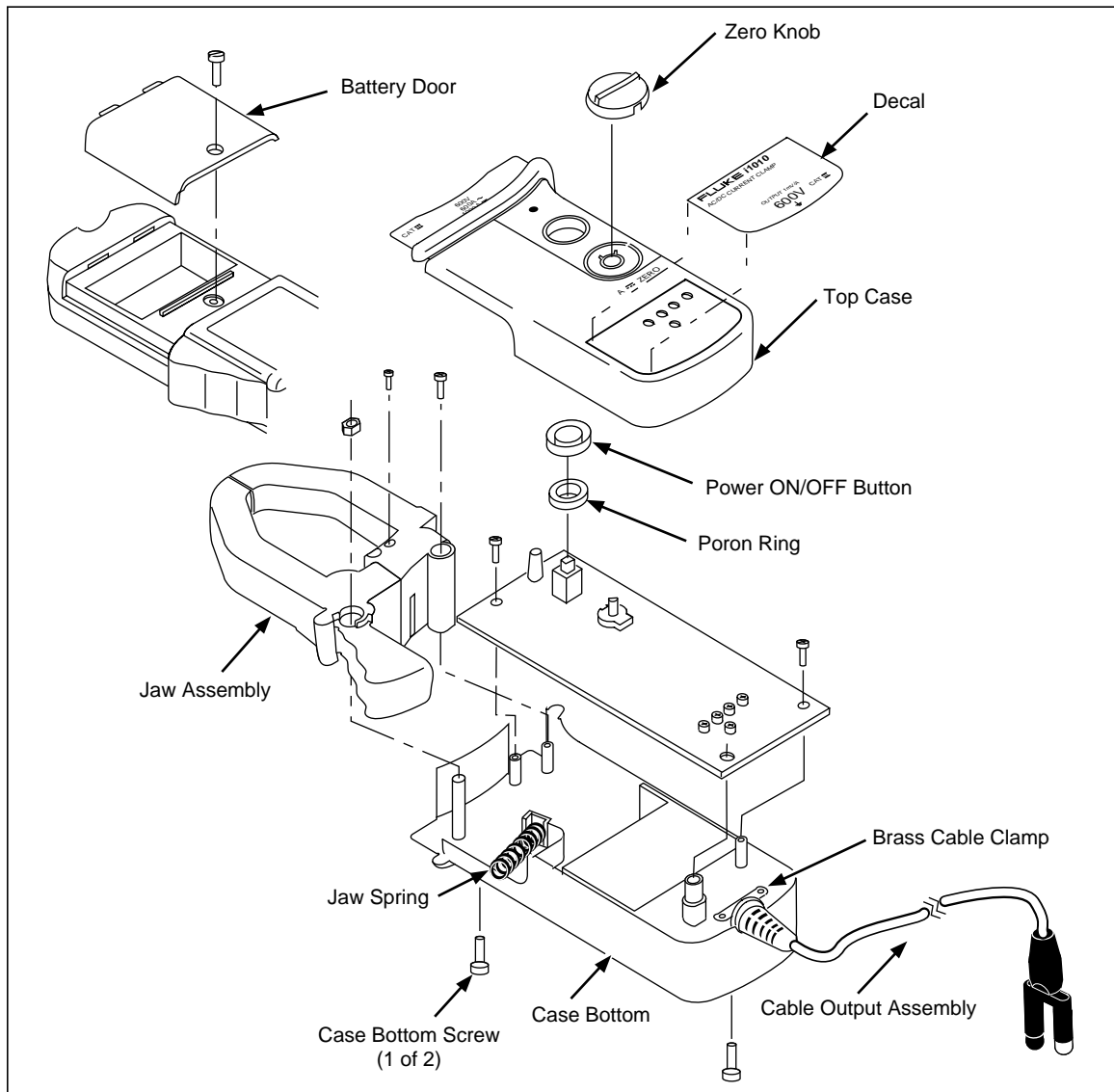


Figure 3. Replacement Parts

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