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FLUKE®

709/709H

Precision Loop Calibrator

Users Manual

January 2013

LIMITED WARRANTY AND LIMITATION OF LIABILITY

This Fluke product will be free from defects in material and workmanship for three years from the date of purchase. This warranty does not cover fuses, disposable batteries, or damage from accident, neglect, misuse, alteration, contamination, or abnormal conditions of operation or handling. Resellers are not authorized to extend any other warranty on Fluke's behalf. To obtain service during the warranty period, contact your nearest Fluke authorized service center to obtain return authorization information, then send the product to that Service Center with a description of the problem.

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Introduction

The Fluke 709 Precision Loop Calibrator and 709H Precision HART Loop Calibrator (the Product or the Calibrator) can be used for installation, calibration, and troubleshooting of field transmitters, valves, and other control system components at process plants. Primary functions are source and measure mA signals in the 0 mA to 24 mA range. The Product can also produce 24 V dc loop power.

The 709H includes HART communication functionality and supports a select set of HART universal and common-practice commands. The Product can be used as a loop calibrator or basic function communicator.

Product functions include:

- Current measurement, sourcing, and a selectable 24 V supply
- 30 V dc measurement
- Valve test capability
- A selectable HART 250 Ω loop resistor
- Output step and ramp

Product features include:

- Large backlit display
- Digital selection knob with selectable decade control for easy data entry
- Interactive menus
- Communicator mode reads basic device information, does diagnostic tests, and can be used to trim the calibration of most HART-enabled transmitters.

Note

All figures in this Manual show the 709H.

How to Contact Fluke

To contact Fluke, call one of the following telephone numbers:

- Technical Support USA: 1-800-44-FLUKE (1-800-443-5853)
- Calibration/Repair USA: 1-888-99-FLUKE (1-888-993-5853)
- Canada: 1-800-36-FLUKE (1-800-363-5853)
- Europe: +31 402-675-200
- Japan: +81-3-6714-3114
- Singapore: +65-6799-5566
- Anywhere in the world: +1-425-446-5500

Or, visit Fluke's website at www.fluke.com.

To register your product, visit http://register.fluke.com.

To view, print, or download the latest manual supplement, visit http://us.fluke.com/usen/support/manuals.

Safety Information

A **Warning** identifies conditions and procedures that are dangerous to the user. A **Caution** identifies conditions and procedures that can cause damage to the Product or the equipment under test.

⚠⚠ Warning

To prevent possible electrical shock, fire, or personal injury:

- **Read all safety Information before you use the Product.**
- **Use the Product only as specified, or the protection supplied by the Product can be compromised.**
- **Examine the case before you use the Product. Look for cracks or missing plastic. Carefully look at the insulation around the terminals.**
- **Do not use test leads if they are damaged. Examine the test leads for damaged insulation and measure a known voltage.**
- **Do not use and disable the Product if it is damaged.**
- **Do not use the Product around explosive gas, vapor, or in damp or wet environments.**
- **Do not touch voltages >30 V ac rms, 42 V ac peak, or 60 V dc.**
- **Do not apply more than the rated voltage, between the terminals or between each terminal and earth ground.**
- **Do not connect directly to mains.**
- **Do not exceed the Measurement Category (CAT) rating of the lowest rated individual component of a Product, probe, or accessory.**
- **Keep fingers behind the finger guards on the probes.**
- **Remove all probes, test leads, and accessories before the battery door is opened.**
- **Remove the batteries if the Product is not used for an extended period of time, or if stored in temperatures above 50 °C. If the batteries are not removed, battery leakage can damage the Product.**
- **Replace the batteries when the low battery indicator shows to prevent incorrect measurements.**
- **The battery door must be closed and locked before you operate the Product.**

Symbols

Symbols used on the Product and in this manual are explained in Table 1.

Table 1. Symbols

Symbol	Meaning	Symbol	Meaning
⏚	Earth ground		Conforms to relevant North American Safety Standards.
~	AC- alternating current	CE	Conforms to European Union directives.
⎓	DC- direct current	N10140	Conforms to relevant Australian standards.
⚠	Risk of danger. Important information. See manual.		This product complies with the WEEE Directive (2002/96/EC) marking requirements. The affixed label indicates that you must not discard this electrical/electronic product in domestic household waste. Product Category: With reference to the equipment types in the WEEE Directive Annex I, this product is classed as category 9 "Monitoring and Control Instrumentation" product. Do not dispose of this product as unsorted municipal waste. Go to Fluke's website for recycling information.
⚠	Hazardous voltage. Risk of electrical shock.		Examined and licensed by TÜV Product Services.

Table 1. Symbols (cont.)

	Battery.		Double insulated
CAT II	Measurement Category II is applicable to test and measuring circuits connected directly to utilization points of low voltage mains installation.	CAT III	Measurement Category III is applicable to test and measuring circuits connected to the distribution part of the building's low-voltage MAINS installation.
CAT IV	Measurement Category IV is applicable to test and measuring circuits connected at the source of the building's low-voltage MAINS installation.		
The CAT ratings apply to the handheld accessories only. The Product is rated to 30 V maximum.			

Standard Equipment

Items included with the Product are listed in Table 2 and shown in Figure 1.

Table 2. Standard Equipment

Item	Description
①	Two AC72-1 alligator clips (709)
②	TL-75-4201 test leads (709)
③	754-8016 alligator clip set (709H)
④	75X-8014 stackable lead set (709H)
⑤	TP220-4201 test probes (709H)
⑥	AC280-5001 Suregrip hook clips (709H)
⑦	Soft Case
Not Shown	Six AAA batteries (installed)
	709/709H Product Manual CD-ROM
	709/709H Quick Reference Guide
	709/709H Safety Information

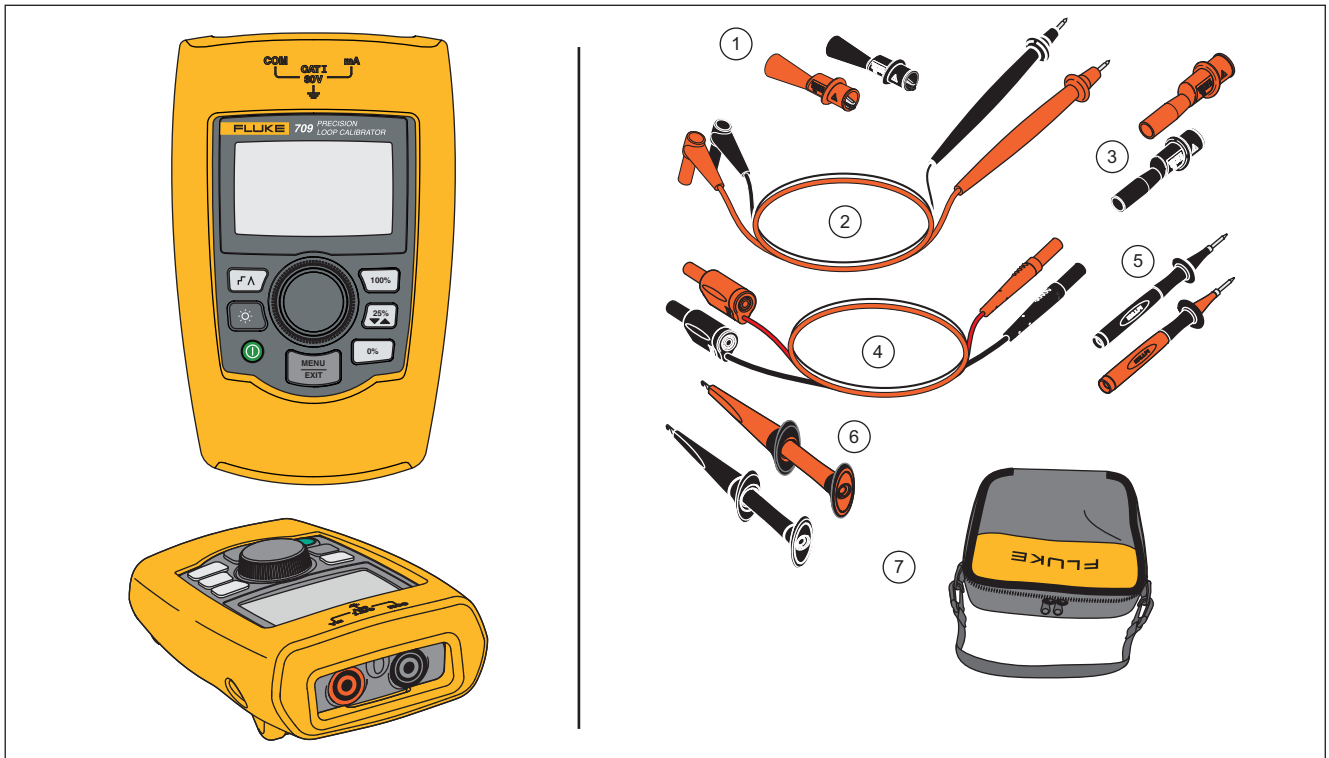

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Figure 1. Standard Equipment

The Product

The subsequent sections are about the features and functions of the Product.

The Buttons

Figure 2 and Table 3 show the location and brief descriptions of the Product buttons.

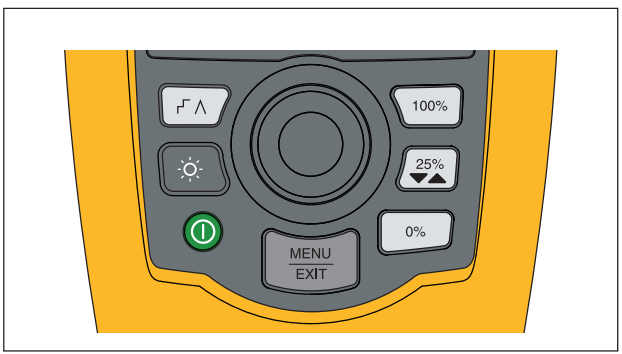

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Figure 2. Buttons

Table 3. Buttons

Button	Function
	Push to enable step or ramp.
	Push to turn on or turn off the backlight.
	Push to turn on and turn off the Product.
100%	Push to set the output to 20 mA when in mA Source or mA Simulate modes. In Measurement mode the button does not set the output current.
25%	Push to step the output up or down by 25 % increments (4, 8, 12, 16, 20 mA).
0%	Push to set the output to 4 mA when in mA Source or mA Simulate mode. In Measurement mode the button does not set the output current
MENU EXIT	Push to enter the Main menu. Push a second time to exit the Main menu. See the “Main Menu” section.

The Selection Knob

The selection knob lets you select and control necessary functions and navigate through the Product menus. Turn the selection knob to highlight a menu item or adjust a value. When the necessary selection is highlighted, push the selection knob to do the selected action, or push and hold to save any changes that have been made. Push MENU EXIT to go to the main screen with no action.

In the output modes (mA Source, mA Simulate):

- Push the selection knob to move the display cursor to the next digit.
- Turn the selection knob to increment or decrement the output in steps shown by the selected decade.
- Push 0%, 25%, or 100% to set the output to preset values.
- Push ⌐∧ to select and stop these advanced modes.

Main Menu

Push MENU EXIT to show the Main menu, choose the primary operation mode of the Product, access the Product setup menu, or to use HART mode. See Figure 3.

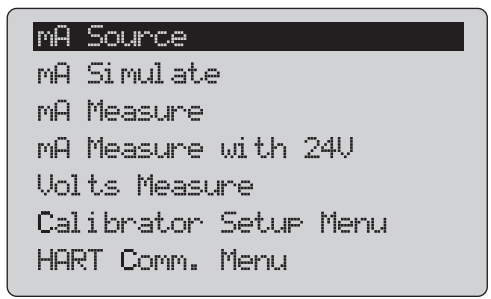

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Figure 3. Main Menu

The first five items shown on the Main menu change the Product operation mode accordingly and once selected, change the Product menu to a “home” screen for the selected function. The operation modes are explained in the subsequent sections of this manual.

For the last two items of the Main menu, see “The Calibrator Setup Menu” and “Hart Comm. Menu” sections.

Note

The “HART” menu items only apply to the 709H.

Note

Some menus have multiple screens. When this is the case, the lower-left corner of the menu shows ▼ when additional screens follow the current screen. ▲ is shown when additional screens precede the current screen. Both icons are shown when additional screens follow and precede the present screen.

mA Source

In the **mA Source** mode, the Product outputs a signal from 0 mA to 24 mA into a load of up to 1000 Ω (750 Ω if the internal HART resistor is switched on).

Figure 4 shows the mA Source home screen and typical connections for this mode.

To use mA Source:

1. Select **mA Source** from the Main menu.
2. Push the selection knob to move the decade cursor.
3. Turn the selection knob to increment or decrement the output in steps indicated by the selected decade.
4. Push 0%, 25%, or 100% to set the output to preset values.
5. Push ⌐Λ to select and stop these advanced modes. When automatic step or ramp is active, one of the subsequent icons is shown in the lower left corner:

   Automatic step: ⌐

   Automatic ramp: Λ
6. Push MENU EXIT to go to the Main menu.
7. Push MENU EXIT again to go to the mA Source home screen.

   - **Valve Test** is shown in the lower center when the valve test function has been enabled on the Setup menu. See the “Valve Test” section of this manual.
   - **250Ω** is shown in the lower right corner when the HART resistor has been enabled on the setup menu.

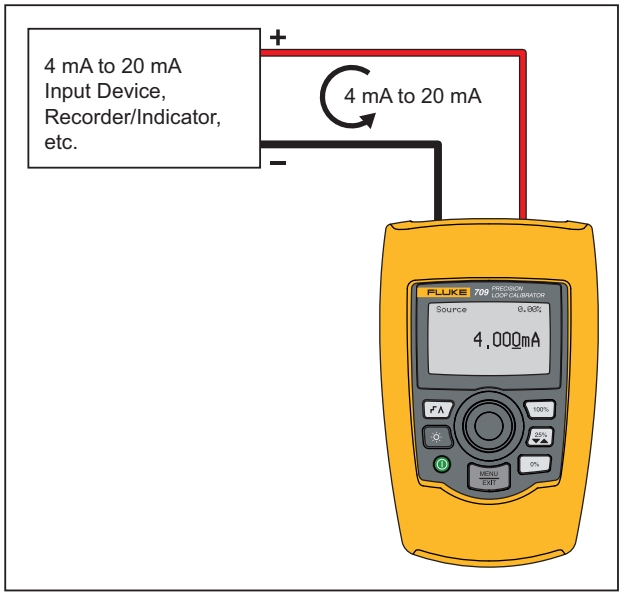

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Figure 4. mA Source Connections

mA Simulate

In the **mA Simulate** mode, the Product functions like a 2-wire transmitter and controls the loop current from an external power supply. This function can test a loop with the transmitter removed.

Figure 5 shows the mA Simulate home screen and typical connections for this mode.

To use mA Simulate:

1. Select **mA Simulate** from the Main menu.
2. Push the selection knob to move the decade cursor.
3. Turn the selection knob to increment or decrement the output in steps indicated by the selected decade.
4. Push 0%, 25%, or 100% to set the output to preset values.
5. Push ⌐Λ/ to select and stop these advanced modes. When automatic step or ramp is active, one of the subsequent icons is shown in the lower left corner:
   - Automatic step: ⌐
   - Automatic ramp: Λ
6. Push MENU EXIT to go to the Main menu.
7. Push MENU EXIT again to go to the mA Simulate home screen.

- **Valve Test** is shown in the lower center when the valve test function has been enabled on the Setup menu. See the “Valve Test” section of this manual.
- **250Ω** is shown in the lower right corner when the HART resistor has been enabled on the setup menu.

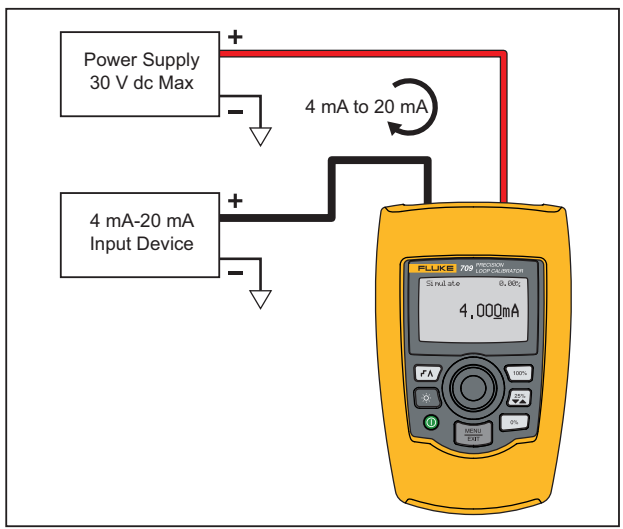

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Figure 5. mA Simulate Connections

mA Measure

In the **mA Measure** mode, the Product shows the loop current measurement. This mode is without 24 V.

Figure 6 shows the mA Measure home screen and typical connections for this mode.

To use mA Measure:

Select **mA Measure** from the Main menu. Once selected, the Product changes to the mA Measure home screen.

250Ω is shown in the lower right corner when the HART resistor has been enabled on the setup menu.

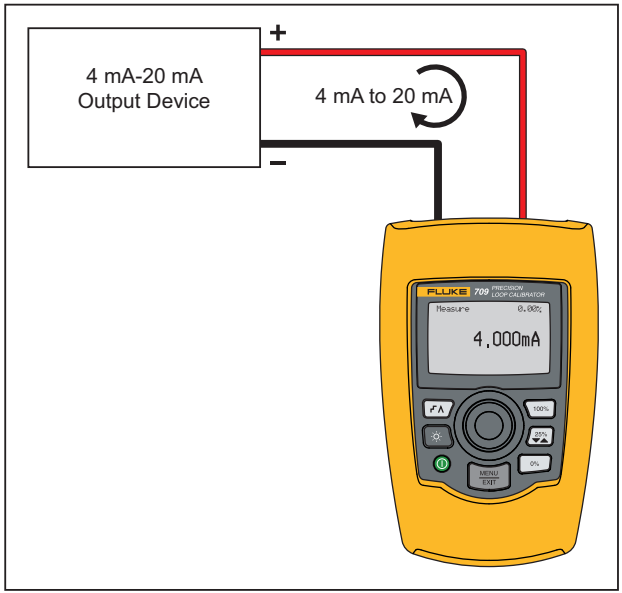

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Figure 6. mA Measure Connections