Actuator Commissioning Tool

Product Description

The 985-047 Actuator Commissioning Tool provides a portable instrument for exercising, calibrating, and testing resistive, proportional (voltage/current), floating, and on/off actuators. LED display shows feedback voltages or output. LEDs indicate operating mode selection and auxiliary switch contact closure. The Commissioning Tool combines accurate and reliable technology in a user-friendly, yet economical package.

The Commissioning Tool saves on installation time and is compatible with all Siemens actuators and most competitors' models. A plug-in transformer or 24 Vac power supply input enables the Commissioning Tool to output resistance, AC voltage, DC voltage, and current for controlling an actuator. It requires no controller hook-up, which makes equipment calibration, setup, and adjustment a quick and easy process.

Features and Benefits

- **Universal Compatibility**
  Works with all Siemens actuators, most competitors' actuators, and other voltage, current, or resistance controlled equipment

- **Compact Portable Unit**
  Allows easy handling in the field

- **Pushbutton Selectable Output/Feedback Modes**
  Gives user a complete testing device. No separate instruments are required for field testing

- **Digital and LED feedback Displays**
  Provides user with clearly readable voltage and auxiliary switch feedback in dimly lit conditions

- **Plug-in Terminal Block Test Lead Connections**
  Accommodates easy interchangeability of multiple sets of test leads

Contents

- Actuator Commissioning Tool
- Plug-in transformer
- Terminal blocks, set of three (extra)
- Carrying case

Required Tools

- Test leads
- 1/8 in. tip flat-blade screwdriver

Product Number

985-047
Installation Conventions

**WARNING**  
Personal injury/loss of life may occur if a procedure is not performed as specified.

**CAUTION**  
Equipment damage, or loss of data may occur if the user does not follow procedure as specified.

Figure 2. Actuator Commissioning Tool, Carrying Case, Plug-in Transformer, and Three Extra Terminal Blocks.

Application Overview

The Actuator Commissioning Tool has four pushbutton selectable modes of operation as follows:

<table>
<thead>
<tr>
<th>Mode of Operation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistive *</td>
<td>0 to 135 ohms or 0 to 1k ohms for use with resistive input actuators.</td>
</tr>
<tr>
<td>Voltage</td>
<td>0 to 20 Vdc for use with proportional actuators</td>
</tr>
<tr>
<td>Current</td>
<td>0 to 20 mA for use with proportional actuators</td>
</tr>
<tr>
<td>Floating Control</td>
<td>24 Vac (nominal) for use with floating control and on/off actuators</td>
</tr>
</tbody>
</table>

* The resistive mode is the default operating mode when the commissioning tool is not powered. To select other operating modes, the ON/OFF switch must be turned ON. LEDs indicate which mode is active.

The Commissioning Tool also provides additional testing features as follows:

<table>
<thead>
<tr>
<th>Feature</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power for Actuators</td>
<td>A 24 Vac (nominal) signal is provided to power actuators that are not externally powered.</td>
</tr>
<tr>
<td>Bias (for feedback potentiometers)</td>
<td>A 5 Vdc bias signal is provided through a 330 ohm resistor for resistive feedback testing (for feedback potentiometers).</td>
</tr>
<tr>
<td>Voltmeter</td>
<td>Measures 0 to 30 Vdc signal.</td>
</tr>
<tr>
<td>Switch Testing</td>
<td>LEDs display auxiliary contact closure. Use with dry contacts only!</td>
</tr>
</tbody>
</table>

The Commissioning Tool receives power by either:

- Applying 24 Vac (nominal) to the INPUTS terminal block, or
- Connecting the 120V plug-in transformer (provided) to its power jack.

Dimensions

Figure 3. Commissioning Tool Dimensions (in./mm).
Operation

WARNING:
Shock Hazard.
Disconnect all power supplies to the Commissioning Tool and actuator or control device before wiring to avoid possible electrical shock or equipment damage.

Powering Commissioning Tool

CAUTION:
Equipment Damage Hazard.
Contact with water may result in damage to the Commissioning Tool.

1. Apply 24 Vac (nominal) power from a remote transformer or controller to Terminals 8 (COM) and 9 (24 Vac) of the INPUTS terminal block on the Commissioning Tool.

Or connect the plug-in 24 Vac transformer (provided) to the power jack located on the bottom of the Commissioning Tool (Figure 4).

Figure 4. Applying Power to the Commissioning Tool.

2. Turn the Commissioning Tool power switch, located on the lower left side, to the ON position. The green LED at the bottom left corner of the Commissioning Tool lights, indicating that the Commissioning Tool is powered.

CAUTION:
Equipment Damage Hazard.
This device is only 24 Vac nominal. Applying higher voltages could damage the device.

Powering a Non-externally Powered Actuator or Control Device

CAUTION:
Equipment Damage Hazard.
Controlled equipment loading from Terminals 1 and 2 must be limited to 25 VA maximum.

NOTE: For 115-230 Vac actuators, the Commissioning Tool can be used to provide signal, but must be externally powered.

1. To provide a 24 Vac (nominal) power signal, connect Terminals 1 (24 Vac) and 2 (COM) of the OUTPUTS terminal block on the Commissioning Tool to the supply input connections of the actuator or device being powered (Figure 5).

NOTE: The output signal at Terminals 1 (24 Vac) and 2 (COM) is equivalent to the input signal that powers the Commissioning Tool.

Figure 5. Connecting External Power to an Actuator or Control Device.

Resistive Mode (Ω)

CAUTION:
Equipment Damage Hazard.
Use the Commissioning Tool Resistive Mode with only solid-state actuators and control devices. Use with electromechanical devices will cause damage to the Commissioning Tool.

The resistive mode can be used with or without power supplied to the Commissioning Tool. When power is not supplied to the Commissioning Tool, the resistive mode is active. When power is initially supplied to the Commissioning Tool, it defaults to the resistive mode.
NOTE: When power is not supplied to the Commissioning Tool, LEDs do not activate. The digital display is not used, and reads zero in this mode.

1. To supply a resistive signal, connect Terminals 3, 4, and 5 (POT WIPER) of the OUTPUTS terminal block to the control inputs of the actuator or device being controlled (Figure 6). Also see the appropriate actuator documentation for wiring application information.

![Figure 6. Resistive Signal Connections.](image)

2. If the actuator is externally powered, skip to Step 3. See the Powering a Non-externally Powered Actuator or Control Device section for a procedure to apply power to the device from the Commissioning Tool.

3. Use the toggle switch (Figure 7) to select the resistance range of 0 to 135 ohms or 0 to 1k ohms.

NOTE: If a three-wire variable resistance is desired, select the 0 to 1k ohm resistance range.

4. See the Powering Commissioning Tool section for a procedure to apply power to the Commissioning Tool.

5. If the resistive mode green LED (Figure 7) does not light, depress the SELECT MODE pushbutton to activate the resistive mode. The green LED should then light and indicate that the resistive mode is active.

6. Turn the dial (Figure 7) to adjust the level of resistance.

![Figure 7. Resistive Mode.](image)

Proportional Voltage Mode (Vdc)

1. To supply a 0 to 20 Vdc signal, connect Terminals 2 (COM) and 3 (Vdc) of the OUTPUTS terminal block to the actuator or device being controlled (Figure 8). Also see the appropriate actuator documentation for wiring application information.

![Figure 8. Voltage Signal Connections.](image)

2. If the actuator is externally powered, skip to Step 3. See the Powering a Non-externally Powered Actuator or Control Device section for a procedure to apply power to the device from the Commissioning Tool.

3. Use the toggle switch (Figure 9) to select the OUTPUT display mode.

4. See the Powering Commissioning Tool section for a procedure to apply power to the Commissioning Tool.

5. Depress the SELECT MODE pushbutton to activate the voltage mode. A green LED should light and indicate that the voltage mode is active (Figure 9).
6. Use the rocker switch located on the upper left side of the Commissioning Tool (Figure 9) to adjust the voltage level from 0 to 20 Vdc. The digital display shows the level of the output voltage. (Adjustment increments increase 0.1V during the first five seconds and then increase rapidly after that, allowing for quick adjustment of the output control signal.)

![Figure 9. Voltage Mode.](image)

**Proportional Current Mode (mA)**

1. To supply a 0 to 20 mA signal, connect Terminals 2 (COM) and 3 (mA) of the OUTPUTS terminal block to the actuator or device being controlled (Figure 10). Also see the appropriate actuator documentation for wiring application information.

![Figure 10. Current Signal Connections.](image)

2. If the actuator is externally powered, skip to Step 3.

   See the Powering a Non-externally Powered Actuator or Control Device section for a procedure to apply power to the device from the Commissioning Tool.

3. Use the toggle switch (Figure 11) to select the OUTPUT display mode.

4. See the Powering Commissioning Tool section for a procedure to apply power to the Commissioning Tool.

5. Depress the SELECT MODE pushbutton to activate the current mode. A green LED should light and indicate that the current mode is active (Figure 11).

![Figure 11. Current Mode.](image)

**Floating Control Mode (Vac)**

NOTE: The digital display is not used and reads zero in this mode.

1. Connect Terminals 2 (COM), 3 (CCW), and 4 (CW) of the OUTPUTS terminal block to the actuator or device being controlled (Figure 12). Connect Terminal 1 (24 Vac) for spring return actuators (Figure 5).

   NOTE: On removal of the Terminal 1 connection, the actuator spring return activates. Also see the appropriate actuator documentation for wiring application information.

![Figure 12. Floating Control Signal Connections.](image)

2. See the Powering Commissioning Tool section for a procedure to apply power to the Commissioning Tool.
3. Depress the SELECT MODE pushbutton to activate the floating control mode. A green LED should light and indicate that the floating control mode is active (Figure 13).

**NOTE:** The level of the floating control output control signal is equivalent to the level of the 24 Vac power signal coming into the Commissioning Tool.

4. Use the toggle switch (Figure 13) to select CCW, STOP, or CW. A green LED should light and indicate selection of CCW or CW.

- When the toggle switch is in the STOP position, 0 Vac (nominal) is output from Terminals 2 (COM) and 3 (CCW), and Terminals 2 (COM) and 4 (CW) of the OUTPUTS terminal block.
- When the toggle switch is in the CCW position, 24 Vac (nominal) is output from Terminals 2 (COM) and 3 (CCW) of the OUTPUTS terminal block.
- When the toggle switch is in the CW position, 24 Vac (nominal) is output from Terminals 2 (COM) and 4 (CW) of the OUTPUTS terminal block.

**Figure 13. Floating Control Mode.**

### Digital Display Modes

**OUTPUT Display Mode**

When the OUTPUT/DC FEEDBACK toggle switch (Figure 11) is in the OUTPUT position, the digital display reads the level of the voltage or current control signal that is output from the Commissioning Tool during the proportional voltage and current modes.

**NOTE:** During the floating control or resistive modes, the digital display is not used and reads zero.

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### DC Feedback Display Mode

**CAUTION:** Equipment Damage Hazard.

Do not apply signals greater than 30 Vdc or any AC signals to Terminal 7 (DC FEEDBACK) or damage to the Commissioning Tool can result.

When the OUTPUT/DC FEEDBACK toggle switch is in the DC FEEDBACK position, the Commissioning Tool functions as a voltmeter. The digital display shows the level of the DC voltage signal that is applied between Terminals 7 (DC FEEDBACK) and 8 (COM) of the INPUTS terminal block.

### Additional Testing Features

**Bias**

The +5 Vdc Bias output can be used in conjunction with the DC FEEDBACK and COM inputs to verify proper operation of floating control actuators with feedback potentiometers.

1. Connect output Terminal 6 (BIAS) to one end of the feedback potentiometer (Figure 14).
2. Connect input Terminal 7 (DC FEEDBACK) to the wiper of the feedback potentiometer (Figure 14).
3. Connect Terminal 8 (COM) to the other end of the feedback potentiometer (Figure 14).
4. Use the toggle switch (Figure 11) to select the DC FEEDBACK display.
5. See the Powering Commissioning Tool section for a procedure to apply power to the Commissioning Tool.

**NOTE:** The digital display shows the level of the DC voltage between Terminal 7 (DC FEEDBACK) and Terminal 8 (COM).
Warning:

Shock Hazard.
Disconnect all power supplies to the Commissioning Tool and actuator or control device before wiring to avoid possible electrical shock or equipment damage.

The DC FEEDBACK input may be used as a DC voltmeter to measure up to 30 Vdc.

1. Connect Terminal 7 (DC FEEDBACK) of the INPUTS terminal block to the positive side of the voltage to be measured (Figure 15).

2. Connect Terminal 8 (COM) of the INPUTS terminal block to the minus or common side of the voltage to be measured.

3. Use the toggle switch (Figure 11) to select the DC FEEDBACK display mode.

4. See the Powering Commissioning Tool section for a procedure to apply power to the Commissioning Tool.

NOTE: The digital display shows the level of the DC voltage applied between Terminal 7 (DC FEEDBACK) and Terminal 8 (COM).

Auxiliary Switch Testing

CAUTION:

Equipment Damage Hazard.
Do not apply power to the switch being tested or to the Commissioning Tool auxiliary switch inputs. The Commissioning Tool provides a signal to the switch contacts being tested.

Auxiliary switch testing can be used independently or while supplying a control signal to the field devices. LEDs display auxiliary switch contact closure.

NOTE: Connect the auxiliary switch terminals to dry contacts only.

1. Connect the control device’s auxiliary switch terminals to the applicable Commissioning Tool auxiliary switch input terminals (Figure 16).

2. See the Powering Commissioning Tool section for a procedure to apply power to the Commissioning Tool.

3. LEDs at the bottom right of the Commissioning Tool activate or de-activate when their respective switch contact closes or opens. Also see the appropriate actuator documentation for switch wiring information.

Repair

CAUTION:

Field repairs must not be made.
### Specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power Requirements</strong></td>
<td>Commissioning Tool: 24 Vac nominal (20 to 30 Vac) at 50/60 Hz, 3 VA, Class 2</td>
</tr>
<tr>
<td></td>
<td>Plug-in Transformer (provided): 120 Vac at 60 Hz</td>
</tr>
<tr>
<td><strong>Input DC Feedback</strong></td>
<td>0 to 30 Vdc</td>
</tr>
<tr>
<td><strong>Electrical Connection</strong></td>
<td>Screw Terminals: 24 to 12 AWG</td>
</tr>
<tr>
<td></td>
<td>Transformer Jack: 0.08 in. (2.11 mm) diameter pin, 0.25 in. (6.35 mm) diameter plug</td>
</tr>
<tr>
<td><strong>Input Impedance</strong></td>
<td>Voltmeter: 1 Megohm (nominal)</td>
</tr>
<tr>
<td><strong>Output Signal</strong></td>
<td>AC Power: 24 Vac nominal (20 to 30 Vac), 25 VA maximum (Terminals 1 and 2). Output AC voltage is equivalent to the input AC voltage and frequency.</td>
</tr>
<tr>
<td></td>
<td>Resistive: 0 to 135 ohms ±7%, 2W or 0 to 1k ohms ±5%, 2W (Terminals 3, 4, and 5).</td>
</tr>
<tr>
<td></td>
<td>Proportional: Voltage — 0 to 10 Vdc (500 ohms minimum); 0 to 20 Vdc (6.8k ohms minimum) (Terminals 2 and 3); Current — 0 to 20 mA (680 ohms maximum) (Terminals 2 and 3).</td>
</tr>
<tr>
<td></td>
<td>Floating Control: 24 Vac nominal (20 to 30 Vac), 25 VA maximum (Terminals 2, 3, and 4). Output AC voltage is equivalent to the input AC voltage and frequency.</td>
</tr>
<tr>
<td><strong>Bias</strong></td>
<td>5 Vdc with 330 ohm series resistor (Terminal 6).</td>
</tr>
<tr>
<td><strong>Accuracy</strong></td>
<td>± 2% of full scale at 77°F (25°C)</td>
</tr>
<tr>
<td><strong>Resolution</strong></td>
<td>0.1 Vdc, 0.1 mA</td>
</tr>
<tr>
<td><strong>Auxiliary Switch</strong></td>
<td>Provides 24 Vac at 4 mA to auxiliary switch contacts (dry contacts only).</td>
</tr>
<tr>
<td><strong>Testing</strong></td>
<td>Provides 24 Vac at 4 mA to auxiliary switch contacts (dry contacts only).</td>
</tr>
<tr>
<td><strong>Response Time</strong></td>
<td>Proportional, Voltage: 0 to 20 Vdc in 20 seconds</td>
</tr>
<tr>
<td></td>
<td>Proportional, Current: 0 to 20 mA in 20 seconds</td>
</tr>
<tr>
<td><strong>Ambient Conditions</strong></td>
<td>Operating: –4 to 122°F (–20 to 50°C); 10 to 90% RH, non-condensing</td>
</tr>
<tr>
<td></td>
<td>Storage: –40 to 158°F (–40 to 70°C); 5 to 95% RH, non-condensing</td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td>Commissioning Tool (overall): 7.7 in. x 4.5 in. x 2.2 in. (196 mm x 113 mm x 55 mm)</td>
</tr>
<tr>
<td></td>
<td>Transformer: 4.2 in. x 3.0 in. x 2.4 in. (107 mm x 76 mm x 61 mm)</td>
</tr>
<tr>
<td></td>
<td>Carrying Case: 10.4 in. x 12.7 in. x 4.2 in. (263 mm x 322 mm x 107 mm)</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>Commissioning Tool: 0.9 lb (0.4 kg)</td>
</tr>
<tr>
<td></td>
<td>Transformer: 1.7 lb (0.8 kg)</td>
</tr>
<tr>
<td></td>
<td>Carrying Case: 2.0 lb (0.9 kg)</td>
</tr>
<tr>
<td><strong>Total Shipping Weight</strong></td>
<td>5.4 lb (2.5 kg)</td>
</tr>
</tbody>
</table>

The performance specifications are nominal and conform to acceptable industry standards. Siemens Building Technologies, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.