TEL-TRU MANUFACTURING COMPANY

MODEL 530
4-20 mA LOOP CALIBRATOR

➤ FEATURES:

4 to 20 mA Loop Functions
- Source and Read 0.000-24.000 mA
- Simulate 2-Wire Transmitters 0.000-24.000mA
- Power 2-Wire Transmitters and Read 0.000-24.000 mA
- Display current in mA or -25.00-125.00% of 4-20 mA

Read Voltage Function
- Read 0.00 to ± 30.00 VDC with 4X over range ability

Full 5 Digit Display
- True ±0.012% of reading accuracy
- Bar graph for quick reference of input and output levels
- High contrast graphic display viewable in all lighting conditions and angles

EZ-Dial™ Knob
- Easily adjust output by 0.001 mA (0.01%) or 0.100 mA (1.00%)

EZ-Check™ Switch with EZ-Step™ Button
- 3-position tactile switch with push button for true one-handed calibrations
- Push button for stepping through calibration points
- 6 different step sizes
- Hands-free auto step and auto ramp modes

Uses a standard 9V Alkaline Battery
- Superior battery life up to 40 hours under typical continuous usage
- Easy access to battery compartment

240 VAC Tolerant
- Fuse-less protection from accidental misuse

Lightweight and rugged with a solid feel
- Convenient Velcro® hand strap allows for a firm confident grip or attachment to pipes and ladders.

HART® protocol compatibility mode
User selectable 250O resistor in series with the output for compatibility with HART protocol enabled devices.
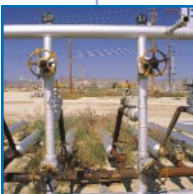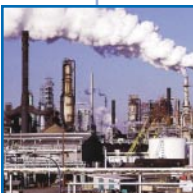
CE APPROVED!

➤ DESCRIPTION:

The Model 530, designed for use in the process control industry, has simple, easy to use controls featuring a large high contrast display with easy visibility without the need for contrast adjustments. The Model 530 is designed to be a tool with all the practical functions required to get the job done easily without the confusing extras or reading through a complicated manual. The Model 530 can source and read current in the process loop and simulate, power and measure 2-wire transmitters. It can read voltage to 30.00 VDC with over 4X over range ability.

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▶ GENERAL SPECIFICATIONS:

(Unless otherwise indicated all specifications are rated from a nominal 23 °C, 70 % RH for 1 year from calibration)

Operating Temperature	-20 to 60 °C (-5 to 140 °F)
Storage Temperature Range	-30 to 60 °C (-22 to 140 °F)
Relative Humidity	10% ≤RH ≤90% (0 to 35 °C), Non-condensing 10% ≤RH ≤70% (35 to 60 °C), Non-condensing
Size	7.00 X 3.30 X 2.21" (177.8 X 83.8 X 56.1mm)
Weight	12.0 oz (340 grams)
Battery	9V Alkaline Optional 120 VAC 50/60 Hz AC adaptor available
Miscellaneous	Low battery indication with nominal 1 hour of operation left Over-voltage protection to 120 Vrms (rated for 30 seconds) or 240 Vrms (rated for 15 seconds) Bar graph display with 1% resolution of 4-20 mA signal scale High contrast graphic liquid crystal display with 0.45" (11.4 mm) high digits

▶ COMMON SPECIFICATIONS FOR ALL CURRENT MODES:

Ranges	0.000 to 24.000 mA, -25.00 to 125.00% of 4-20 mA
Accuracy	≤ ± (0.012% of Reading + 0.004 mA)
Temperature Affect	≤ ± 50 ppm/°C of Range
Resolution(s)	0.001 mA and 0.01%

▶ SOURCE/POWER AND MEASURE 2-WIRE TRANSMITTER SPECIFICATIONS:

Loop compliance voltage	≥ 24 Volts
Loop drive capability	1200 Ω at 20 mA for entire battery life
Miscellaneous	Open loop or out of compliance conditions are indicated by appropriate error display Battery life in: 　Source mode ≥ 18 hrs at 12 mA typical (HART disabled) 　Power measure ≥ 10 hrs at 12 mA typical HART protocol mode is a selectable option at turn on. HART protocol mode places a 250Ω resistor in series with the output Selectable EZ-Step(s) for Source Mode/2-Wire Transmitter Simulation: 　In mA mode: 0.001, 0.010, 0.100, 1.000, 4.000 (default), 8.000 mA 　% of 4-20 mA mode: 0.01, 0.10, 1.00, 10.00, 25.00 (default), 50.00%

▶ READ mA SPECIFICATIONS:

Voltage burden	≤ 2V at 20 mA
Overload/Current limit protection	24 mA nominal
Battery life	Typical ≥ 40 hours

▶ 2-WIRE TRANSMITTER SIMULATION SPECIFICATIONS:

Voltage burden	≤ 2V at 20 mA
Overload/Current limit protection	24 mA nominal
Loop voltage limits	2-60 VDC
Miscellaneous	Open loop or out of compliance conditions are indicated by appropriate error display Battery life ≥ 40 hour typical Selectable EZ-Step(s) for Source Mode/2-Wire Transmitter Simulation: 　In mA mode: 0.001, 0.010, 0.100, 1.000, 4.000 (default), 8.000 mA 　% of 4-20 mA mode: 0.01, 0.10, 1.00, 10.00, 25.00 (default), 50.00%

▶ VOLTAGE READ SPECIFICATIONS:

Range	0.00 to 30.00 VDC (with 4X over range)
Accuracy	≤ ± (0.1% of Reading ± 0.1 V)
Temperature effect	≤ ± 200 ppm/°C of Reading
Resolution	0.01 V
Input resistance	≥ 1 MΩ Battery life > 40 hour typical Flashing indicator for over range

▶ ORDERING INFORMATION/OPTIONS:

MODEL 530 - 4-20 milliamp loop calibrator

Order Code:	Model 530

Available Options:

AC adaptor	020-0100
Carrying Case	020-0200

▶ WARRANTY:

Our equipment is guaranteed against defective material and workmanship (excluding batteries) for a period of three years from the date of shipment. Claims under guarantee can be made by returning the equipment prepaid to our factory. The equipment will be repaired, replaced or adjusted at our option. The liability of Tel-Tru Manufacturing Co. is restricted to that given under our guarantee. No responsibility is accepted for damage, loss or other expense incurred through sale or use of our equipment. Under no condition shall Tel-Tru Manufacturing Co. be liable for any special, incidental or consequential damage.

TEL-TRU
MANUFACTURING CO.
World-Class Thermometers

Model 530
4-20 Milliamp Loop Calibrator
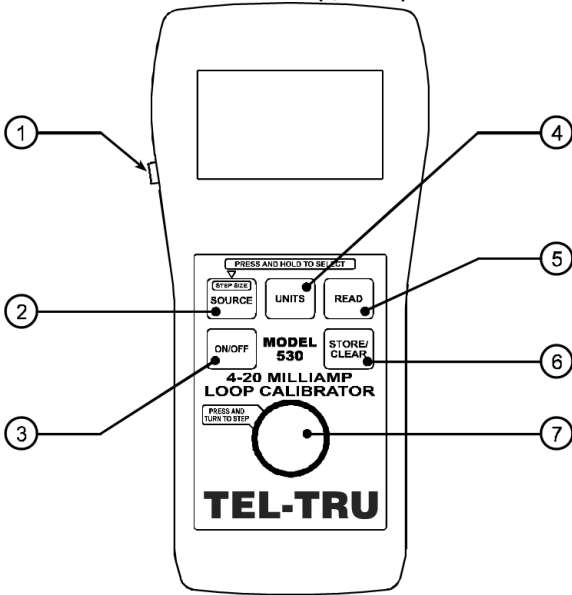**Operating Instructions**

A. Basic Keypad Operations

① EZ-Check™ Switch/EZ-Step™ Pushbutton

Slide the switch to select the user stored values for calibration points. Press the button to adjust the output by the user defined step size. Press and hold the button to activate the auto step/ramp mode.

②SOURCE/STEP SIZE Button

Press **SOURCE** to change source modes. These are:
- Source Milliamps
- 2-Wire Transmitter Simulate

③ON/OFF Button

Press **ON/OFF** to turn the Model 530 on or off.

④ UNITS Button

Press **UNITS** to change how current is displayed – either in milliamperes or % of 4-20 mA. Voltage is only displayed in Volts.

⑤ READ Button

Press **READ** button to change read modes. These are:
- Read Milliamps
- Power and Measure 2-Wire Transmitter
- Read Volts

⑥ STORE/CLEAR Button

In any source mode:
Press **STORE/CLEAR** to save the current reading in the EZ-Check HI or LO position. The EZ-Check switch must be set to HI or LO. The display will flash "STORED" to confirm.

In any read mode:
Press **STORE/CLEAR** to clear the values saved in the EZ-Check HI and LO positions. The display will flash "CLEARED" to confirm.

⑦ EZ-Dial™ Knob

Turn the EZ-Dial knob to adjust the output level. Press and turn to adjust 100X faster.

B. EZ-Dial Knob

Adjust the output up and down with the EZ-Dial knob. The increment is 0.001 mA (or 0.01% if display units are % of 4-20 mA.) Press while turning to adjust 100X faster – 0.100 mA (or 1.00%.)

C. EZ-Check Switch

The EZ-Check switch has three positions -- high, set, and low. Its position is shown at the left edge of the display with "HI" and "LO" indicators. Neither indicator indicates the middle position. Use of the EZ-Check switch depends on mode.

Source Modes:

Slide the EZ-Check switch to the HI and LO positions to recall the settings stored in those positions. While in the HI and LO positions, dial the EZ-Dial knob to change the display. Press **STORE/CLEAR** to save new settings in the HI and LO positions. The display will flash "STORED" to confirm.

Hint: For faster calibrations, the position of the switch can be felt. This feature allows continuous monitoring of the device being calibrated without looking back at the Model 530 display. This is also useful in poor lighting or under difficult operating conditions.

Read Modes:

In read modes, the Model 530 calibrator records the maximum and minimum readings observed in each mode. Slide the EZ-Check switch to the HI and LO positions to display the readings. Press **STORE/CLEAR** to clear the readings. The display will flash "CLEARED" to confirm.

By default, the Model 530 has EZ-Check HI/LO Readings OFF. Refer to Model 530 Configuration, section H.

D.   EZ-Step Pushbutton

The EZ-Step pushbutton is a feature only in source modes.

Press and hold the EZ-Step pushbutton for less than one second to cause the output to step up or down by the EZ-Step size. The EZ-Step direction is indicated on the display (▼ or ⌐). Press the EZ-Dial knob to change the step direction.

Press the EZ-Step pushbutton for more than one second to activate auto step/ramp mode. The Model 530 will automatically step by the EZ-Step size. Press the EZ-Step pushbutton again to deactivate auto step/ramp mode.

Stepping and auto step/ramp limits are defined by the EZ-Check HI and LO settings. The step direction changes when a limit is reached.

By default, the Model 530 has EZ-Step OFF. Refer to Model 530 Configuration, section H.

E.   EZ-Step Size and Direction

To Change the EZ-Step Size:

1. Press and hold the **SOURCE/STEP SIZE** button for more than ¾ of a second.
2. The display will indicate "EZ-STEP SIZE".
3. Turn the EZ-Dial knob to select other step sizes. The choices are:
   - mA display - 0.001, 0.010, 0.100, 1.000, 4.000, 8.000
   - % display - 0.01, 0.10, 1.00, 10.00, 25.00, 50.00
4. Press the **SOURCE/STEP SIZE** button again return to the normal display.

Note: If the EZ-Step option is turned off, the display will indicate "EZ-STEP OFF". Refer to Model 530 Configuration, section H.

To Change the EZ-Step Direction:

1. Press the EZ-Dial knob.
2. The display will change to show the EZ-Step direction selected (▼ or ⌐).

F.   Auto Step/Ramp

Auto step/ramp times are given in Table 1. In step modes (EZ-Step sizes 8, 4, and 1 mA or 50, 25 and 10%) the output will change in discrete steps. In ramp modes, the output is approximately continuous.

Table 1 assumes the default EZ-Check LO/HI of 4/20 mA and scales ratiometrically with the EZ-Check span. Soak Time does not change with EZ-Check span.

The Model 530 will detect high loop resistance/low supply in step modes. In ramp modes, these error conditions are not detected.

Table 1

Auto	EZ-Step Size		Step Time	Ramp Time (4-20 mA or 0-100 %)	Soak Time
Step	8.000 mA	50.00%	10 seconds	(30 seconds)	20 seconds
	4.000 mA	25.00%	10 seconds	(50 seconds)	20 seconds
	1.00 mA		1.9 seconds	(34 seconds)	3.8 seconds
		10.00%	1.8 seconds	(21 seconds)	3.6 seconds
Ramp		1.00%		20 seconds	
		0.10%		25 seconds	
	0.100 mA			32 seconds	
	0.010 mA			40 seconds	
		0.01%		83 seconds	
	0.001 mA			134 seconds	

G.   Quick Reference Bar Graph

The Quick Reference Bar Graph indicates the input and output level to the Model 530 in % of 4-20 mA with 1% resolution. If the input or output signal is outside the normal operating range of the Model 530 the Quick Reference Bar Graph is replaced by an error message (see section I for errors.)

H.   Model 530 Configuration

Auto Off -   ON (default)/OFF
If Auto Off is ON, the unit will turn off after 30 minutes to save battery life, if there is no user activity. If Auto Off is OFF the unit will stay on until it is turned off from the keypad. This is typically useful for manual loading or continuous use.

EZ-Step -   ON/OFF (default)

If EZ-Step is ON the step size is adjustable as described in the instructions. If EZ-Step is OFF the EZ-Step pushbutton will be disabled and the step direction indicator will not be displayed.

HART® Compatibility Mode -   ON/OFF (default)

The Model 530 has a HART Compatibility Mode. This mode is useful when the devices being powered communicate using the HART protocol. In this mode the Model 530 connects a 250 Ω load resistor in series with the output in both Source and Power Measure 2-Wire transmitter modes. This eliminates the requirement of an external 250 Ω load resistor. This resistor is typically shown in connection diagrams and manuals for HART devices.

If HART Compatibility Mode is ON, a 250 Ω load resistor is automatically switched in series with the output in Source and Power Measure 2-Wire Transmitter modes. The output compliance with HART Compatibility Mode ON is 950 Ω at 20 mA.

If HART Compatibility Mode is OFF there is no 250 Ω load resistor in series with the output. This will increase the output compliance voltage to drive 1200 Ω at 20 mA.

EZ-Check HI/LO Readings   ON/OFF (default)

If the EZ-Check HI/LO Readings option is ON, the highest and lowest readings will automatically be saved in the HI and LO EZ-Check positions.

If this option is OFF the HI and LO positions will show the current reading.

Factory Reset   ON/OFF (default)

If Factory Reset is ON, the unit will restore all factory defaults when the Model 530 is turned OFF and back ON. This will reset any changes made in the Model 530 Configuration options, returning the unit to its simplest factory configuration.

Instructions for Enabling and Disabling the Configuration options in the Model 530
1. Turn the Model 530 on.
2. Press the EZ-Dial knob while the "PRESS EZ-DIAL KNOB FOR CONFIGURATION" message is displayed.
3. Select options by turning the EZ-Dial knob until the arrow points to the desired option.
4. The option can be enabled or disabled by tapping the EZ-Dial knob.
5. Turning the Model 530 off to exit configuration.

I.   Error Conditions

Source Milliamps:
   "HIGH Ω" flashes in place of bar graph

Power Measure:
   "CURRENT LIMITED" flashes in place of bar graph

2-Wire Transmitter Simulate:
   "LOW SUPPLY" flashes in place of bar graph

Read Milliamps:
   "CURRENT LIMITED" flashes in place of bar graph

Read Volts:
   "OVERRANGE" flashes in place of bar graph

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