AT Series Load Cell Simulator

Model AT-350

User's Manual

Advance Instrument Inc.
service@advanceinstrument.com
Phone:+886-2-8695 1100 • Fax:+886-2-2693 1460

USER'S MANUAL
AT Series Load Cell Simulator
Model AT-350

MODEL AT-350
LOAD CELL SIMULATOR

SECTION 1: DESCRIPTION

GENERAL

The AT-350 Load Cell Simulator is a passive instrument designed to simulate strain gage transducers circuits for the purpose of statically calibrating the indicator or conditioner to which they would be connected.

True Wheatstone bridges circuits: full bridge of 350Ω can precisely be simulated by the AT-350 Load Cell Simulator.

Output selection is by 12-position rotary switch, plus a reversing switch for full bridge, so that any sensitivity up to ±7.5 mV/V can be selected; no range change or rewiring is necessary over this full range. The instrument is direct-reading in mV/V for full or half bridges.

Strain gage transducers can also be simulated to an output range of ±7.5 mV/V by 12-position rotary switch.

SPECIFICATIONS

Accuracy	0.05% of setting ± 0.0005 mV/V , max.
Repeatability	(± 0.0005 mV/V), max.
Stability	(0.005% of setting ± 0.0005 mV/V) /℃, max.
Thermal emf	1.0μv per volt of excitation, max.
Bridge Resistances	AT-350 for 350Ω
Circuit	True -ΔR in one adjacent arm, plus three fixed arms for bridge completion.
Simulation	One active arm
Range	Half and Full bridge: transducer: 0.00, ±0.25, ±0.5, ±0.75, ±1.00, ±1.50, ±2.00, ±2.50, ±3.00, ±4.00, ±5.00, ±7.50 mV/V
Output @ 0	0.025 mV/V, max.
Excitation	To meet accuracy and repeatability specifications: 350Ω: 0-10V ac or dc Maximum permissible: 350Ω: 17V ac or dc
Environment	Temperature: +10°C to +38°C (+ 50°F to +100°F) Humidity: up to 70% RH, non-condensing
Size	202 × 87 × 60 mm 8 Lx 3.5 W x 2.4 H inches
Weight	1.3 kg (2.9 lb)

AT-350 Model:
Model: AT-350 standard connector, D-sub 9p Female
Model: AT-350-C2 Optional connector, Bendix PT06A-12-10S Receptacle 10p
Model: AT-350-C3 Optional KYOWA connector, Tamjimi PRC03-21A10-7F Receptacle 7p
Model: AT-350-Cx Optional customer connector, part number supply by user,
Connector Diameter < 37 mm

Optional Connector Plug:
Plug-AT-350-P Standard connector, D-sub 9p Male
Plug-AT-350-C2 Optional plug, Bendix PT06A-12-10P(SR) Plug 10p
Plug-AT-350-C3 Optional KYOWA plug, Tajimi PRC03-12A10-7M5 Plug 7p
Plug-AT-350-Cx Optional customer plug, part number supply by user

FUNCTIONAL DESCRIPTION

☐ BINDING Posts

An active bridge is between IN+ and Vo-, while a fixed resistor is in between IN- and Vo-. And two fixed resistors is also in between IN+ and Vo+ / IN+ and Vo- post respectively, these forms a half bridge.

☐ IN + and IN - Posts

Excitation input posts for use with half or full bridge connections.

☐ Vo+ and Vo- Post

Simulator output posts for use with half or full bridge connections.

☐ GND Post

GND post provide a convenient grounding point. This post eliminate or reduce electrical noise picked by connecting the GND to the ground of the strain indicator chassis.

☐ POLARITY Switch

The polarity toggle switch reverses the polarity of the excitation voltage applied to the internal bridge circuits.

This enables the user to simulate tension and compression loads on half and full bridge connections

☐ ±ZERO Adjustments

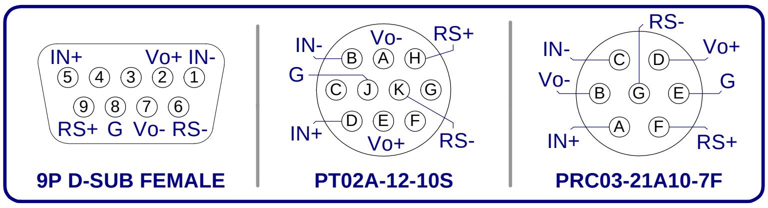
The trim pot enables the user to trim the networks to eliminate zero-crossing errors (that is, so that the outputs at " + " and " - " are identical).

☐ 12-Position Rotary Switch

This 12-position rotary switch sets the desire output of mV/V.

☐ Transducer Connector

Simulator input and output posts for use with half or full bridge connections.



SECTION 2: INDICATOR CALIBRATION

2-1 While the following instructions explain proper use of this instrument in detail, a brief instructions found on the instrument rear lid will normally be adequate for subsequent use.

CONNECTIONS

2-2 Check proper calibrator requirement: AT-350 for 350Ω resistance. Choose the circuit arrangement desired, and bridge configuration (see Fig. 1).

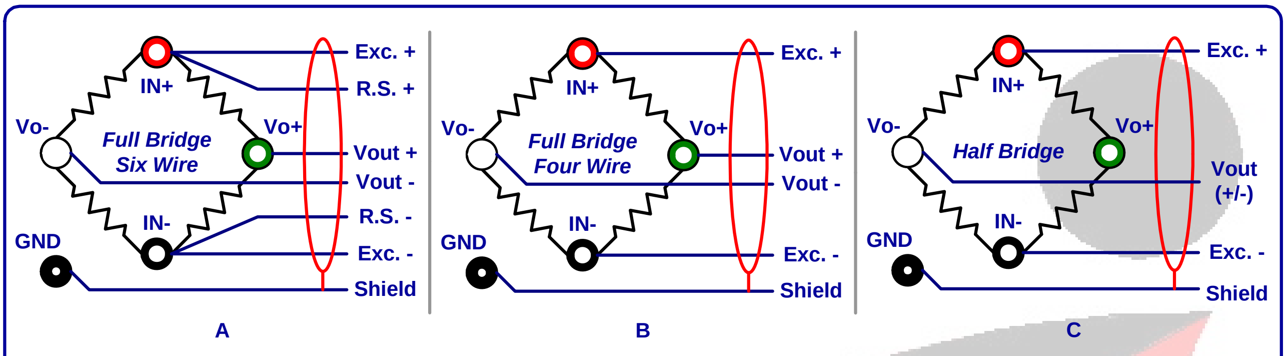


Figure 1

☐ Full Bridge Six Wire (Fig. 1A):
Connect the indicator as shown in Figure 1A.

☐ Full Bridge Four Wire (Fig. 1B):
Connect the indicator as shown in Figure 1B.

☐ Half Bridge Three Wire (Fig. 1C):
Connect the indicator as shown in Figure 1C.

Note：

Exc. + ：Positive bridge excitation
R.S. + ：Remo sense lead for the positive bridge excitation
Exc. - ：Negative bridge excitation
R.S. - ：Remo sense lead for the negative bridge excitation
Vout + ：Positive simulator signal output
Vout - ：Negative simulator signal output
Shiedld ：Connection to indicator GURAND or negative bridge excitation

2-3 The resistance of the lead-wires between the calibrator and indicator is somewhat critical and can produce several effects:

a. Reduced calibrator output (usually called lead-wire desensitization).

b. Unstable zero due to changes in lead resistance with ambient temperature.

c. Span errors when the indicator is "calibrated" by shunt-calibration of arms external to the indicator.

All the above effects are proportional to the ratio of the lead resistance to the gage (or bridge arm) resistance. Using relatively heavy leads (AWG #18 or 1 mm diameter) will minimize errors; this is especially important when using the 350Ω circuit. However, if the purpose is to simulate an actual transducer installation, use lead-wires of the same size and length as would be used in the actual installation.

Good zero stability with temperature requires complete symmetry in the total bridge. To achieve this with the half bridge, use nearly identical wires for all leads (size and length) and keep them grouped together to minimize temperature differentials.

CALIBRATOR SET-UP

2-4 Rotate the switch to "0". ◦

2-5 Apply bridge excitation. Excellent stability will be achieved with normal excitations (up to 10V on AT-350). Maximum permissible excitation (AT-350 17V, respectively) may produce some warm-up drift; readings should not be recorded until stable, which may take up to a couple minutes at each selected output under extreme conditions.

2-6 If it is anticipated that readings on half and full bridge will be taken through zero (that is, both POLARITY buttons will be used), check that "+0" and "-0" both yield the same reading. If not, adjust ±ZERO slightly to achieve this.

INDICATOR SET-UP

2-7 Where an initial zero or bridge balance control is provided on the indicator, it would be normal practice to set this to achieve a zero reading so that data need not be corrected for initial offset.

Note: An unbalance of up to 0.025 mV/V can be encountered with the AT-350 Calibrator where no indicator balance control is used.

2-8 Set the indicator scale factor as desired. A transducer indicator may read directly in mV/V, percent input for a fixed or settable span, or it may read directly in engineering units (pounds, Newton, etc.) for a selected transducer. Any indicator above can be accurately calibrated with the AT-350 calibrator, although some simple data reduction is generally necessary (see paragraph 2-9).

DATA REDUCTION

2-9 Transducer Indicator (full bridge input)

a. mV/V Readout: mV / V

Ideal mV/V reading = calibrator setting

(See the far right column of Table 1 for the calibrator setting)

b. Percent Readout:

Ideal percent reading = calibrator setting / k x 100%

where k = full-scale output of transducer in mV/V.

For example:

k =1.75mV/V, full-scale output of transducer in mV/V.

calibrator setting 0.75mV/V,

Ideal indicator reading :

0.75mV/V / 1.75mV/V x 100% = 42.857% full-scale output of transducer

c. Direct-reading in Engineering Units.

Ideal reading = calibrator setting x TR / k

where TR = rated input to transducer in engineering units (pounds, newtons, etc.)

k = transducer output in mV/V at rated input.

For example:

TR=1000N , k =1.964mV/V at 1000N

calibrator setting 1.000mV/V,

Ideal indicator reading = 1.000mV/V x 1000N / 1.964 mV/V = 509.17N

Table 1. Simulate mV/V		
Rotary Switch position	Standard	Include Error Range
(mV/V)	(mV/V)	(mV/V)
0.00	0.00	0.00 ± 0.000500
0.25	0.25	0.25 ± 0.000625
0.50	0.50	0.50 ± 0.000750
0.75	0.75	0.75 ± 0.000875
1.00	1.00	1.00 ± 0.001000
1.50	1.50	1.50 ± 0.001250
2.00	2.00	2.00 ± 0.001500
2.50	2.50	2.50 ± 0.001750
3.00	3.00	3.00 ± 0.002000
4.00	4.00	4.00 ± 0.002500
5.00	5.00	5.00 ± 0.00300
7.50	7.50	7.50 ± 0.00425

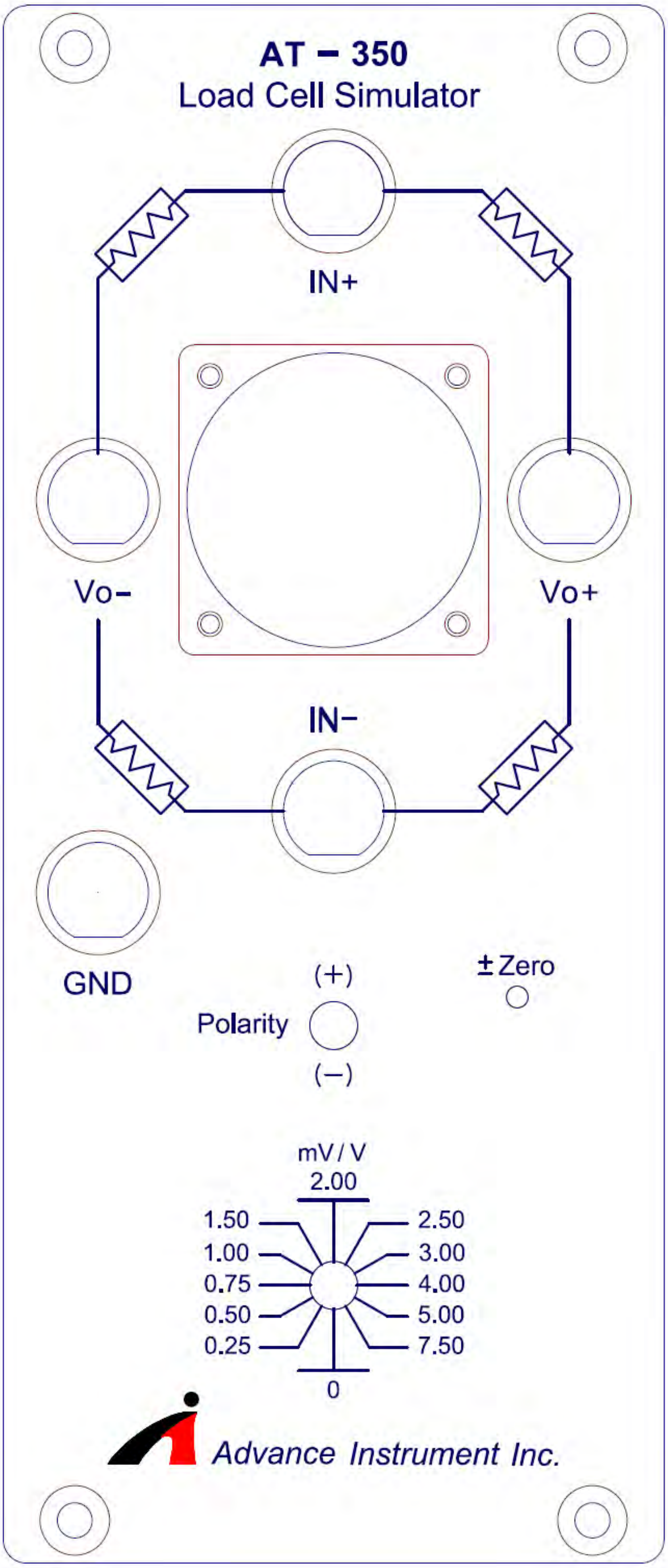

AT – 350
Load Cell Simulator
IN+
Vo-
Vo+
IN–
GND
(+)
Polarity
(–)
± Zero
mV / V
2.00
1.50
1.00
0.75
0.50
0.25
2.50
3.00
4.00
5.00
7.50
0
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Figure 2

SECTION 3: SERVICING

3.1 The AT-350 Load Cell Simulator is a completely passive device consisting of only switches and precision resistors. Routine or preventive maintenance is not required.
In view of the intended purpose of this instrument as a "standard”, it should be accorded more than the normal care in handling. Avoid storing in areas of unusual environment, such as extremes temperature, high humidity, or areas containing corrosive atmospheres.

3.2 Should it be necessary to replace any resistors in the networks, it is strongly suggested that such replacements be obtained from Advance Instrument Inc. to maintain the superior quality of these resistors with special regard to stability with time and temperature. All resistors have a tolerance of 0.01 to 0.1%.

www.advanceinstrument.com
service@advanceinstrument.com