SR1 Strain Gage Indicator

Model SR1

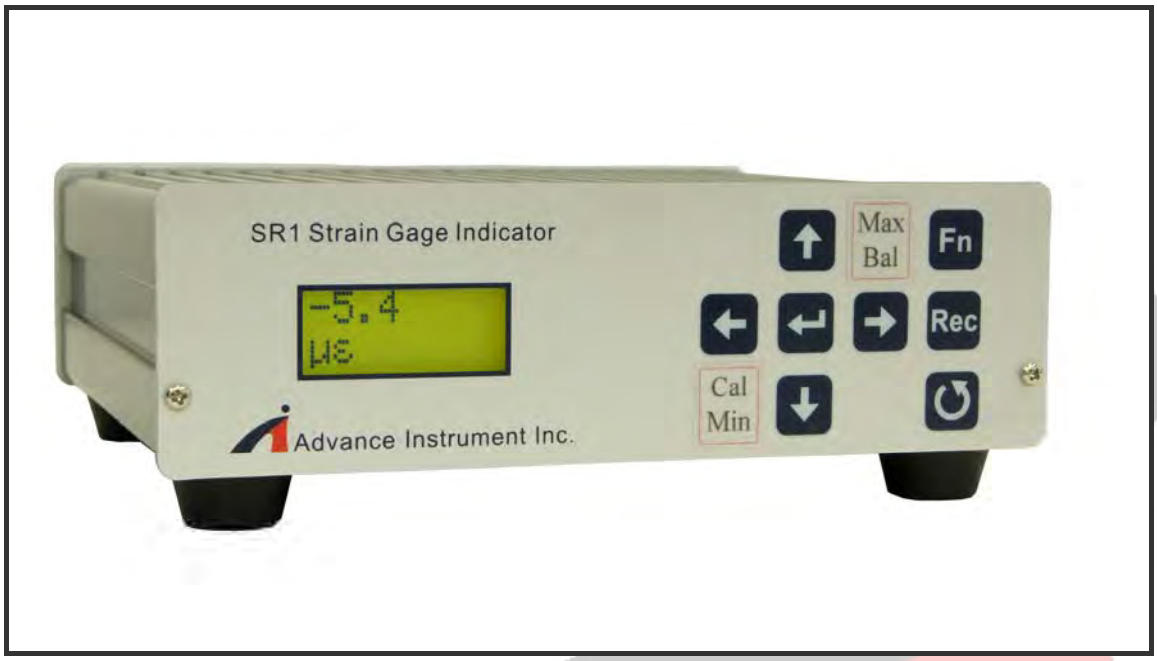
User's Manual

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

INSTRUCTION MANUAL
Strain Gage Indicator
Model SR1

Model SR1
Strain Gage Indicator

SECTION 1: DESCRIPTION

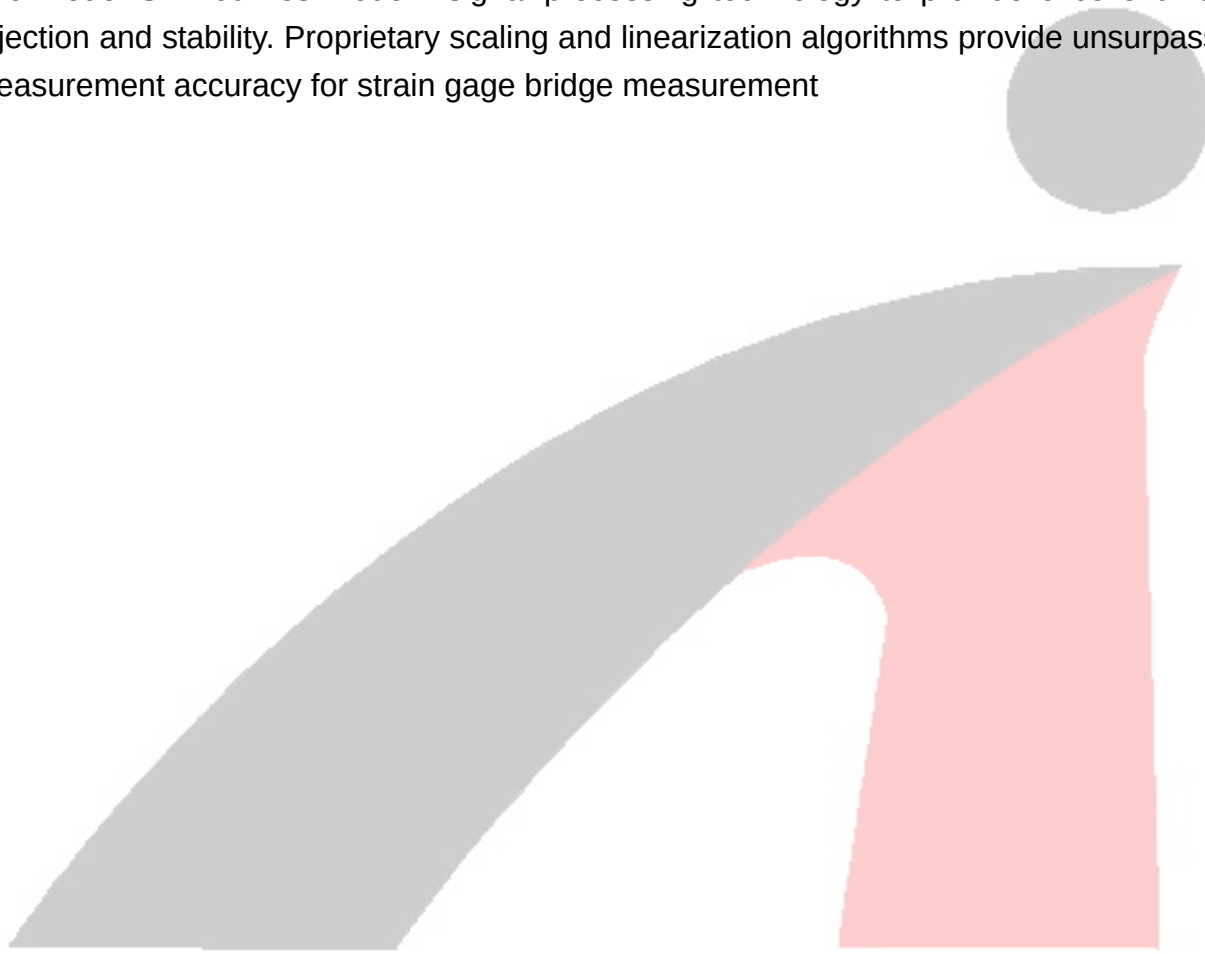


1.1 GENERAL

The Model SR1 Strain Gage Indicator is a quick, easy and tool-free installation instrument that is carefully designed with dust and moisture-resistant. It is a portable, high precision instrument for use with resistive strain gages and strain-gage-based transducers.

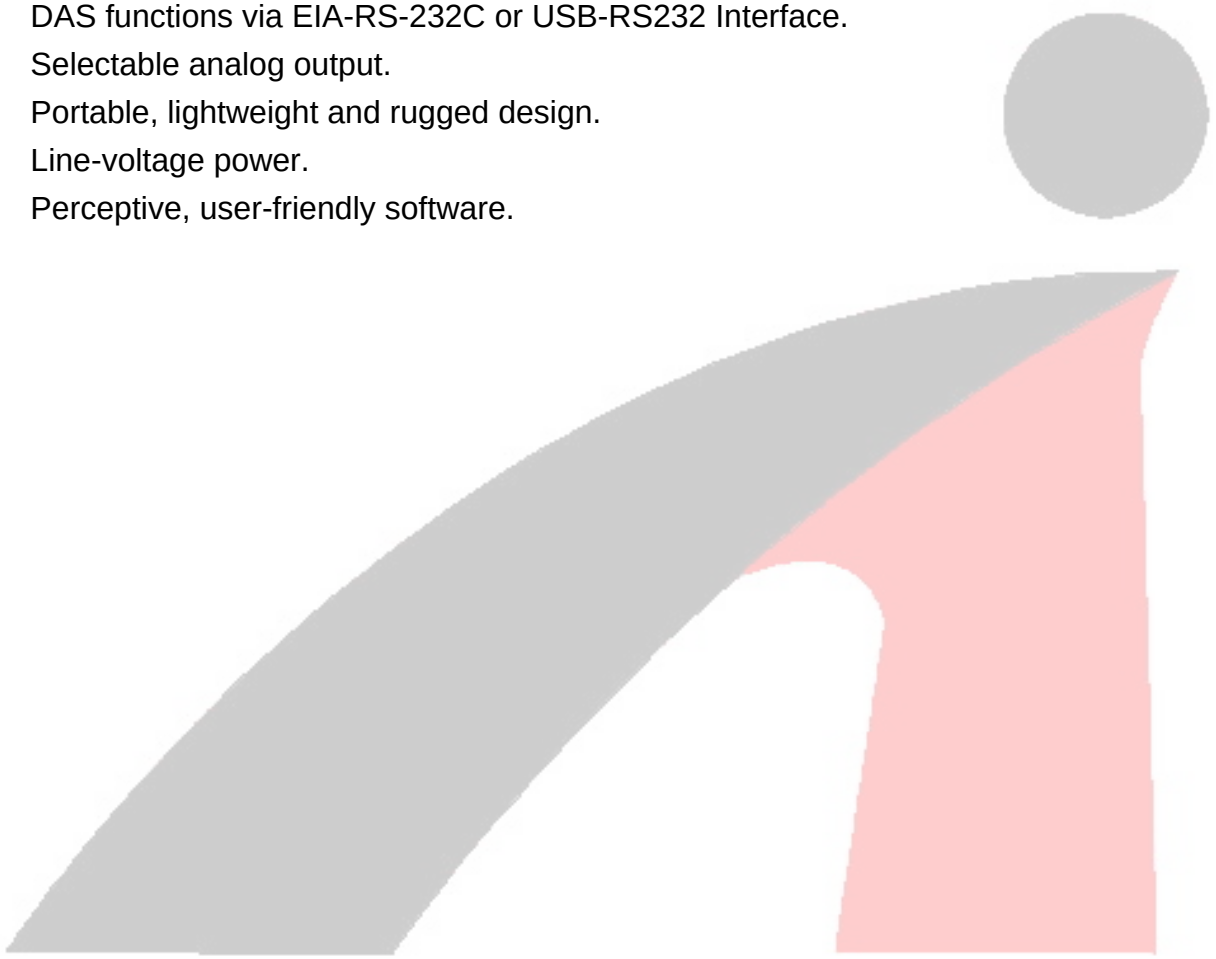
Equipped with all required bridge components for 120-, 350- ohm bridges, the Model SR1 recognizes full-, half- and quarter-bridge inputs signal.

Designed using menu-driven commands, operation of the Model SR1 is straightforward and intuitive, it can be controlled from the front panel keypad.
The Model SR1 utilizes modern signal processing technology to provide excellent noise rejection and stability. Proprietary scaling and linearization algorithms provide unsurpassed measurement accuracy for strain gage bridge measurement



1.2 FUNCTIONAL FEATURES

- ☐ The Model SR1 Strain Gage Indicator incorporates the following features:
- ☐ Direct-reading, backlit LCD display.
- ☐ Hardware and software support for quarter-, half- and full-bridge circuits.
- ☐ Built-in precision bridge completion for 120-, 350- ohm on half- and quarter-bridges.
- ☐ Automatic and manual zero-balance and calibration.
- ☐ Gage resistance measuring for Quarter bridges connection
- ☐ Lead wire line resistance measuring for 3-wire Quarter bridges connection
- ☐ Intuitive, menu-driven operations.
- ☐ DAS functions via EIA-RS-232C or USB-RS232 Interface.
- ☐ Selectable analog output.
- ☐ Portable, lightweight and rugged design.
- ☐ Line-voltage power.
- ☐ Perceptive, user-friendly software.



SECTION 2: SPECIFICATIONS

Note: Performance may be degraded at high levels of repetitive electrostatic discharge; however, no damage to the unit will occur.

2.1 INPUT CONNECTIONS

Highly reliable gold plated spring type binding post terminal for independent bridge inputs.
Accommodates 10-36 AWG (3.0 to 0.127 mm dia.) lead wire.
D-Sub 9 pin terminal for use on independent bridge or transducer inputs.

2.2 BRIDGE CONFIGURATIONS

Quarter-, half-, and full-bridge circuits
Internal bridge completion provided for 120 Ω and 350 Ω on quarter-bridges
60 Ω to 2 kΩ on half- or full-bridge

GF Sensitivity Type

Bridge Types

- ♦ Quarter-bridge
- ♦ Half-bridge, adjacent arms, equal and opposite strains
- ♦ Half-bridge opposite arms equal strains
- ♦ Shear bridge, 2 active arms
- ♦ Poisson half-bridge
- ♦ Full-bridge 4 fully active arms
- ♦ Shear bridge, 4 active arms
- ♦ Full-bridge, Poisson gages in opposite arms
- ♦ Full-bridge, Poisson gages in adjacent arms

mV/V Sensitivity Type

Bridge Types

- ♦ Undefined full-bridge
- ♦ Undefined half-bridge; quarter-bridge

2.3 DISPLAY

2 rows of 8 characters full dot-matrix FSTN positive, gray translucence LCD with backlight.
Display updates twice per second

2.4 DATA CONVERSION

24 Bits high-resolution sigma-delta converter.
50 and 60Hz noise rejections.

2.5 MEASUREMENT RANGE / RESOLUTION

± 31,000 με (± 0.3 με resolution) at Gage Factor = 2.000
± 0.00006 mV/V resolution at F.S. mV/V = 2.000

2.6 MEASUREMENT ACCURACY

± 0.1% of reading ± 3 counts. (Normal mode operation at Gage Factor = 2.000)
Gage resistance with Lead wire line resistance measuring for Quarter bridges connection
D120, 3-wire Quarter bridges resistance measuring ± 0.025Ω
D350, 3-wire Quarter bridges resistance measuring ± 0.05Ω

2.7 GAGE FACTOR and mV/V CONTROL

GAGE FACTOR: Range 0.500 to 10.00
mV/V: Range 0.5 to 10.00

2.8 BALANCE CONTROL

Single key operation to initiate automatic software balance
- Automatic
- Manual offset adjustment
- Disabled

2.9 BRIDGE EXCITATION

DC 2.5V±1mv%

2.10 SHUNT CALIBRATION

Location: Across bridge completion resistors
Control: Software
Values:
- P- to D120: 11.9KΩ ±0.1% (5000με at GF = 2.00)
- P- to D350: 34.8KΩ ±0.1% (5000με at GF = 2.00)

Remote calibration supported via accessible switch contacts at input female D-sub.

2.11 UNITS

Strain, Stress, Weight, Force, Pressure, Torque, Length, Acceleration, Angle, Temperature, Resistance

2.12 ANALOG OUTPUT

16-Bits DAC, Output 2.5 VDC ± 2V, Data rate 4.5 / 8.2 / 10 Hz
Ranges: by DAC FULL SCALE function set up
Typical error: 0.1% of output voltage ±1mV
Output Load: 1000Ω
Connector: Two Pin Terminal Block

2.13 COMMUNICATION INTERFACE

EIA-RS-232C Serial Bus with type D connector. Used for transferring data and firmware

2.14 POWER

110 or 220 VAC ± 10% by switch, 50 or 60 Hz, 0.5 A

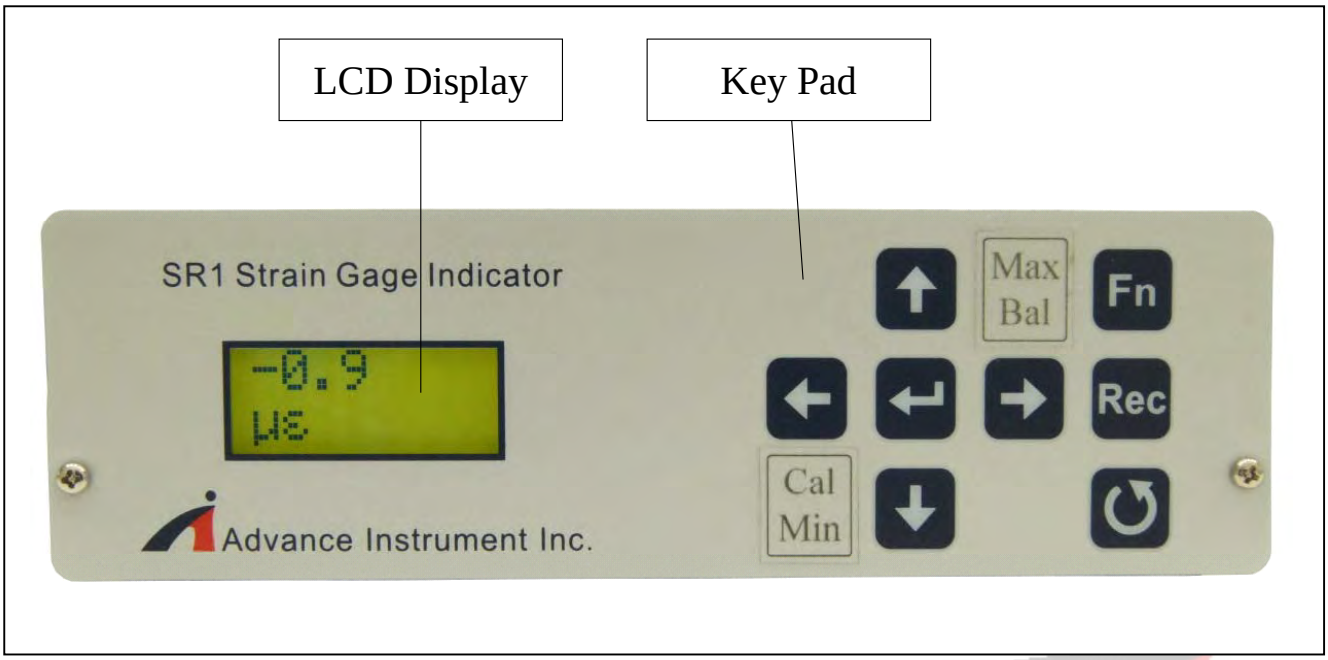
2.15 OPERATIONAL ENVIRONMENT

Operating temperature: 0°C ~ 50°C
Storage temperature: -15°C ~ 65°C
Humidity: Below 90% RH, non-condensing

2.16 CASE & SIZE & WEIGHT

6.3" × 6.3" × 2.4" (160 mm X 160 mm X 60 mm)
Material: Aluminum, 2.6 Lb (1.2 Kg)

SECTION 3: FRONT PANEL



3.1 LCD DISPLAY

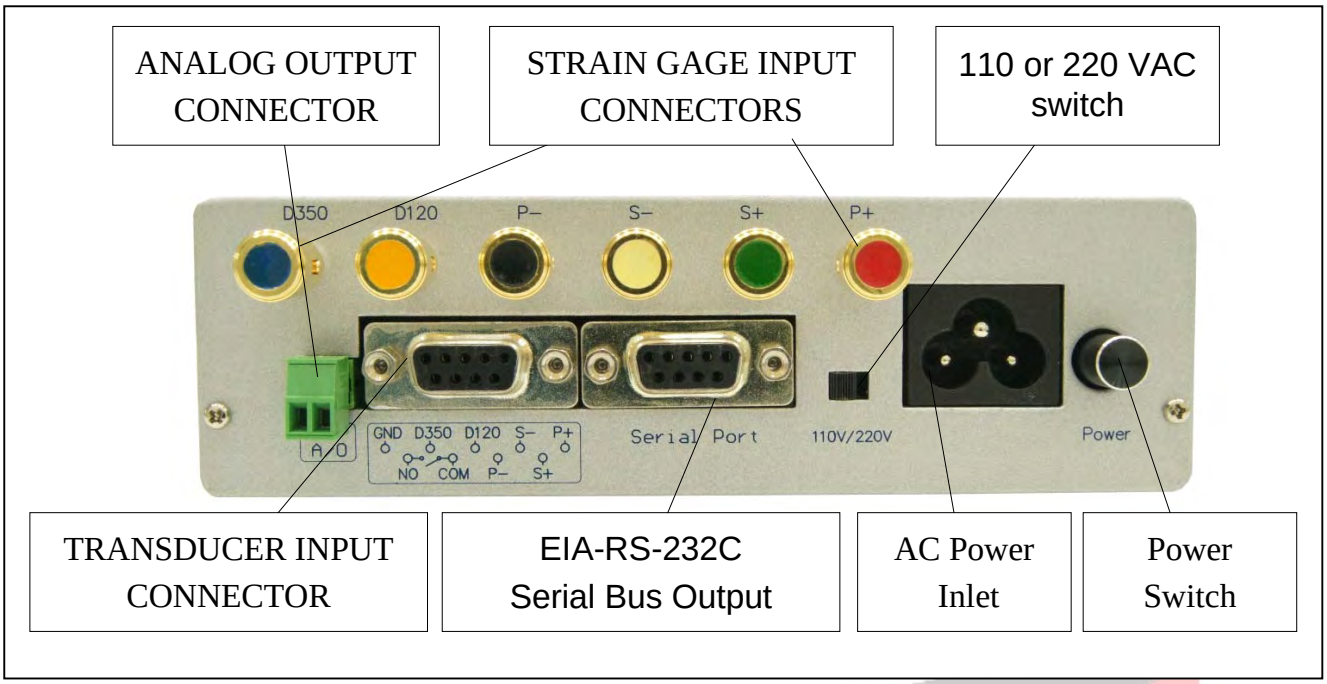
The LCD display provides the visual interface to control, setup, and monitor the SR1.

3.2 KEYPAD DESIGNATION

The keypad is a membrane-switch type. Functionality of the keys is described in the Operation section.

- **Fn**: Function key, tasks as function selection key during set-up mode, and as RUN mode under measuring process.
- **Rec**: Record key, saves setting during setup and preserve reading under measuring operation.
- ↺: Esc or Refresh key, key to return to the normal measuring mode.
- ⬆ / ⬇: Up / down key, use for changing numbers from 0 to 9; "." Decimal point and "-" negative sign.
- ⬅: Left key, use to change functionality setting during set-up and as shunt calibration during measurement
- ➡: Right key, use to change functionality setting during set-up and as balance during measurement
- ↵: Enter key, command use to finish an entry and proceed to next process

SECTION 4: REAL PANEL



4.1 STRAIN GAGE INPUT CONNECTORS

Six (6) highly reliable gold plated spring type binding post terminal with indications of D350 ; D120 ; P- ; S- ; S+ ; P+ from left to right.

4.2 ANALOG OUTPUT CONNECTOR

A set of analog output jack provides a 2.5 VDC ± 2V, Data rate 4.5 / 8.2 / 10 Hz output signal that corresponds to the displayed value. The output range is function set up.

4.3 TANSDUCER INPUT CONNECTOR

The Transducer Input Connector facilitates connection of strain gage based transducers.

4.4 EIA-RS-232C CONNECTOR

The EIA-RS-232C Connector is for use as data transfer and firmware communication port

4.5 POWER CONNECTOR

A common AC power jack is designed to accommodate line-in power source of 110 or 220 VAC ± 10% by switch found on the lower left side of the power connector, 50 or 60 Hz source (0. 5A max). And an “ON / OFF” push button switch is located in the right side of the power connector.

SECTION 5: OPERATION

5.1 GETTING STARTED

The Model SR1 is designed for ease of use; we had thoroughly test our instrument before it is deliver. It is ready for use upon unpacking from the box. This section describes the operation of the Model SR1 Strain Gage Indicator.

5.2 POWER UP

Whilst SR1 is ready to use as received, it is equally important first step to check proper power source (110 or 220 VAC) before switching ON the instrument. Erroneous use of power source may result in serious damage to the instrument.

When the unit is powered ON, the firmware is loaded onto the MCU. After approximately two seconds, unit will display the opening screen. The manufacturer logo with initial AII will be shown in the LCD.

5.3 INPUT CONNECTIONS

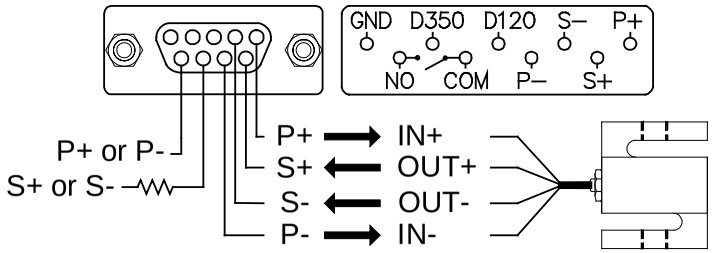
Strain gages and strain gage-based transducers are connected to the SR1 through the input terminals. To connect the lead wire to the spring type post terminal, push the desired post terminal cap, insert the lead wire all the way into the post terminal, and release post terminal cap to clamp the wire to the terminal. Input connections can be made whether the SR1 is turn ON or OFF.

In addition to bridge wiring, a switch closure (TRANSDUCER INPUT CONNECTOR) is provided for an external shunt calibration resistor. This feature is normally used to implement shunt calibration of the transducer according to the transducer manufacturer's recommendation.

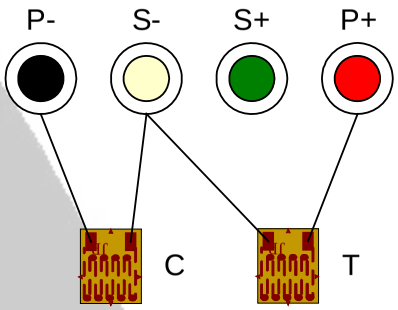
The transducer manufacturer will generally specify exactly how a specific value of shunt calibration resistor is to be connected. In some cases, the manufacturer may also supply lead wires integral to the transducer assembly, which are used for this purpose. In any case, the transducer manufacturer's recommendations should be followed.

Parameter \ Bridge	Quarter	Half	Full	Transducer
Sen.Type	GF	GF	GF	mV/V
BridgeTy	Quarter	Hbadj e	FB4 act.	Undef FB
GageFact	2.0	2.0	2.0	x
Sen mV/V	x	x	x	2.0
Phys.FS	x	x	x	100
Cal.Type	Au.	Au.	Au.	Sh.
Sh.Vaule	x	x	x	100
DAC FS	4000	4000	4000	50
Filter	Low	Low	Low	Low
Unit	0	0	0	22
Auto Bal	ON	ON	ON	ON

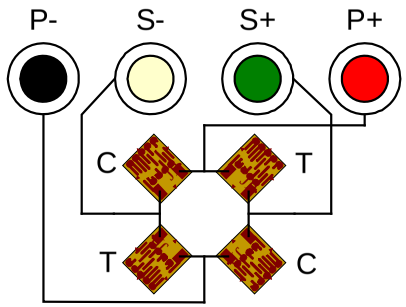
Transducer



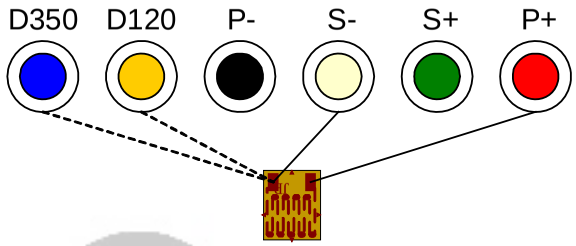
Half



Full



Quarter



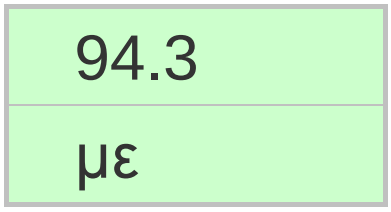
Website:www.advanceinstrument.com

5.4 OPERATION MODES

The Model SR1 has two operational modes: the RUN (measuring) and FUNCTION (set-up) mode.

5.4.1 RUN MODE OPERATION (MEASURING)

The instrument is immediately ready for measuring once it is turn ON with all inputs wiring already connected to it. It will be in the run mode, the LCD display's the status of latest measuring value and parameters.



☐ 5.4.1a Peak Read Menu (Max and Min)

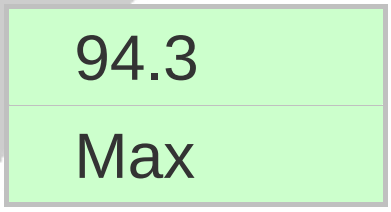
In addition, the Model SR1 can be used as a peak hold indicator.

The peak hold function is accessed by using the ⬆ (Up) / ⬇ (Down) arrow keys.

Pressing the Up key (Maximum Peak) will update the display if a value larger than the currently displayed value is measured.

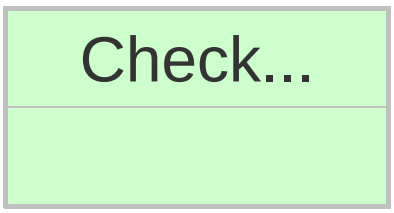
Pressing the Down key (Minimum Peak) will update the display if a value lower than the currently displayed value is measured.

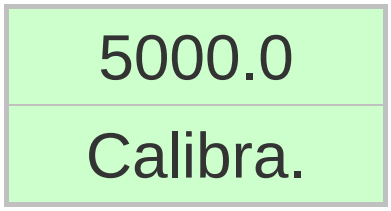
To reset the peak display, press the ↺ (Esc) key to return to the normal measuring mode.

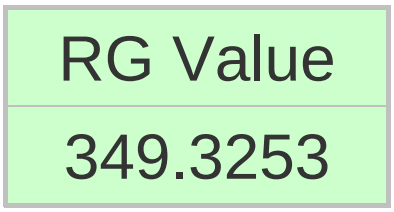


☐ 5.4.1b Calibration Menu (Cal)

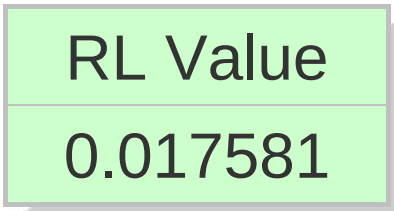
The calibration switch may be started while in the run mode by pressing the cal key (⬅). When activated, a precision shunt resistor is placed between the P- and the appropriate dummy (D120 or D350) resistor, additionally, the Remote Cal switch closed. The internal shunt calibration resistors simulate an equivalent strain of 5000 micro-strain at a gage factor of 2.000







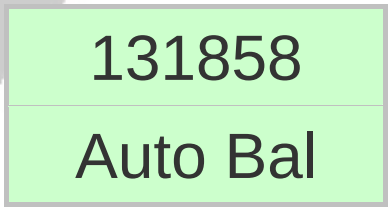
Note: Gage resistance measuring for Quarter bridges connection



Note: Lead wire line resistance measuring for 3-wire Quarter bridges connection

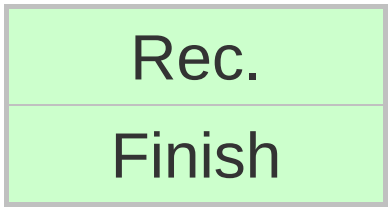
☐ 5.4.1b Auto Balance Menu (Bal)

Pressing the BAL key (➡) will initiate the auto balance sequence. The auto balance sequence requires confirmation to avoid unintentional rebalance of the signal.



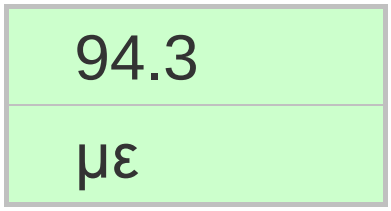
☐ 5.4.1d Recording Menu (Rec)

To save the settings, press the **(Rec)** key, all setup information will be saved. Should a new setting is not preserve for subsequent usage, the instrument will automatically recall last save parameter when it is turn ON again. Preset factory default setting are stored inside the instrument, refer to 6.15 for complete information.



☐ 5.4.1e ESC Menu (↺)

To reset the function menu, press the Esc (↺) key to return to the normal measuring mode.



5.4.2 FUNCTION MODE OPERATION (SET-UP)

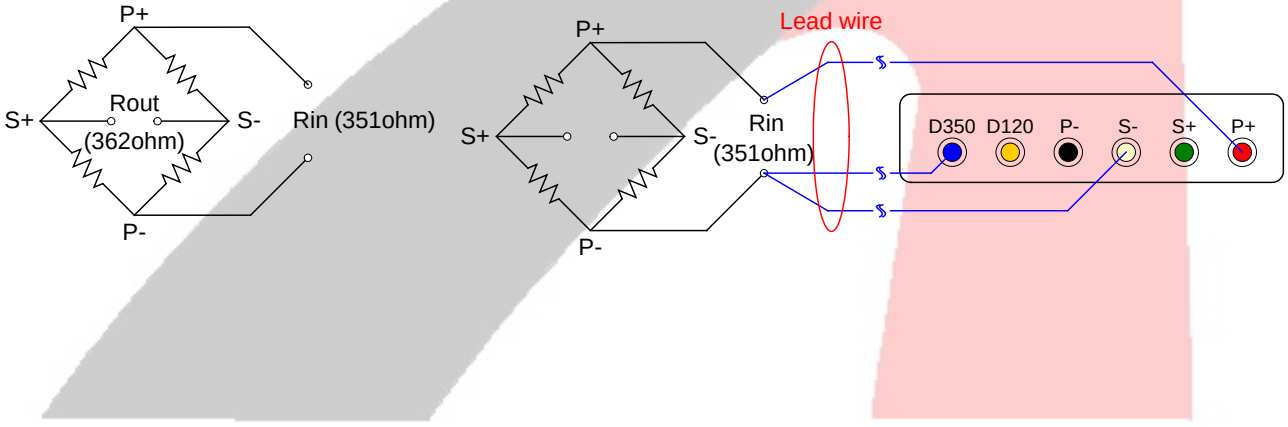
The function mode is entered when the user is in the run mode. Pressing the function (**Fn**) key will activate the function menu. Characters beginning with Err will be shown in the LCD should a wrong input have been applied.

Pressing the ↵(Enter) key get access to each function selection parameter.

Choose parameter by pressing ⬅,➡ key; or ⬆,⬇ key for desire value until such desire setting is achieve. In every parameter change, the following ending sequence should be followed to achieve proper result: ⬅, ➡ followed by ↵to enter temporary settings. The system is now ready to enter into next succeeding function, presses Fn now to proceed with next operation.

5.5 TRANSDUCER LEAD WIRE LINE RESISTANCE MEASURING PROCEDURE

1. Using power meter to measure ohms (Ω) value of transducer's input and output impedance.
   P+(red)、P-(black) resistance (Transducer's input impedance = Rin)
   S+(green)、S-(white) resistance (Transducer's output impedance = Rout)
2. Using SR1 in measuring transducer's lead wire line resistance condition and wiring Rin or Rout needs to be equivalent to 350±3.5Ω or 120±1.2Ω to avail the use of SR1 in performing transducer lead wire line resistance measurement.
   Using SR1in performing Transducer lead wire line resistance needs a quarter-bridge with 3-wire connection method.
   Under 350±3.5Ω value on Rin or Rout, either Rin or Rout position can be use with quarter bridge connected to SR1 P+, S- and D350 position.
   Under 120±1.2Ω value on Rin or Rout, either Rin or Rout position can be use with quarter bridge connected to SR1 P+, S- and D120 position.
3. Execute Balance, then redo Calibration
4. After Calibration, measured line resistance will be shown in SR1 display for about 6 seconds.

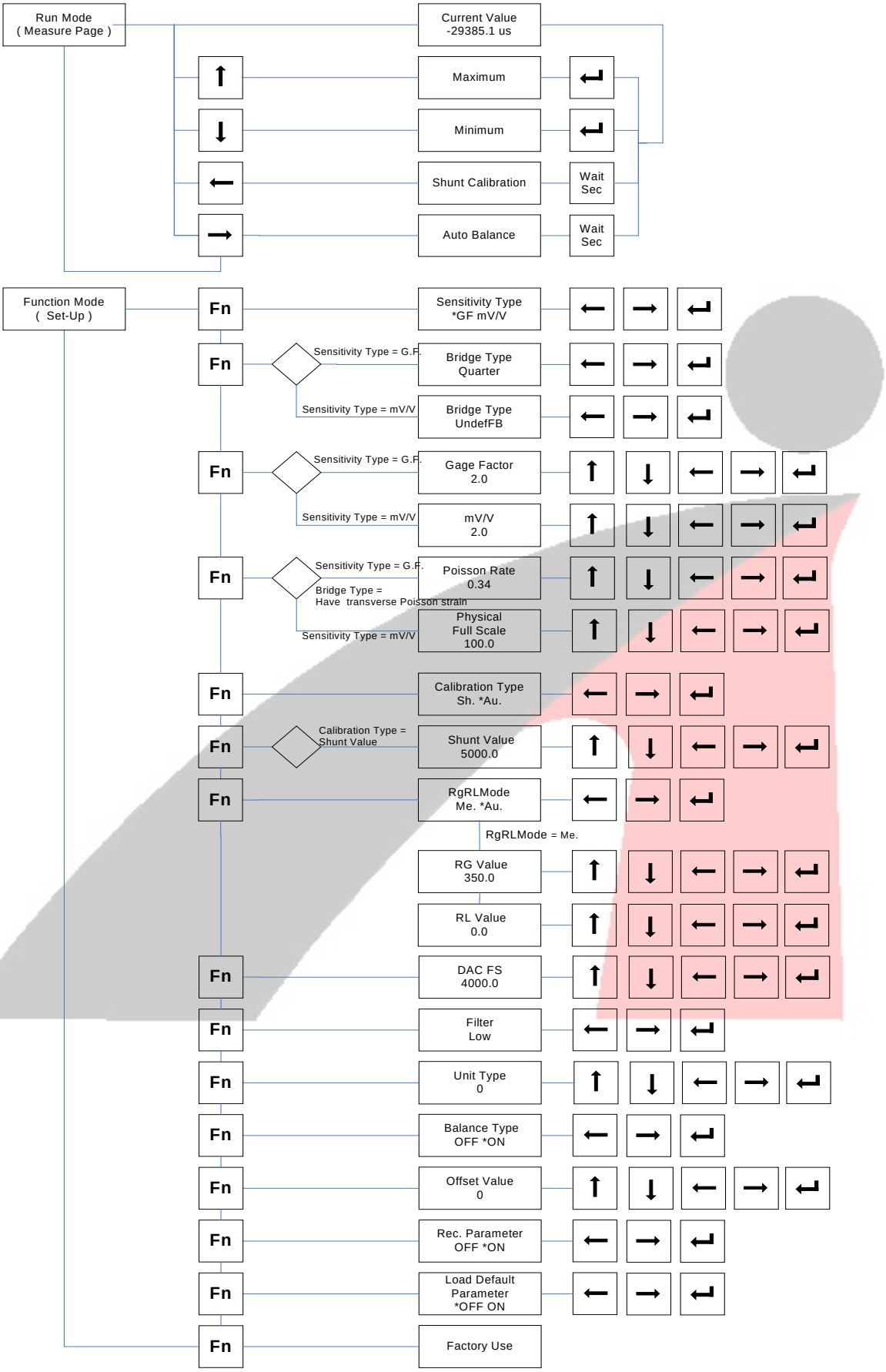


SECTION 6: MENU FUNCTIONS

Function	Predefined Setting	Function Definition	Range
Run Mode	-29385.1με	Current Measuring Value	± 31,000 με
Sen.Type	*GF mV/V	Sensitivity Type	
BridgeTy	Quarter / UndefFB	Bridge Type	
GageFact	2.0	Gage Factor	0.5~10
Poisson		Poisson Rate	0~1
mV/V	2.0	Bridge Sensitivity	0.5~10
Phys.FS		Physical Full Scale Value	Six digit
Cal.Type	Sh. *Au.	Calibration Type	
RgRLMode	Me. *Au.	Gage resistance and lead wire line resistance measuring for 3-wire Quarter bridges connection	
RG Value		Gage resistance setting	Six digit
RL Value		Lead wire line resistance setting	Six digit
DAC FS	4000.0	(Digital /) Analog Output Full Scale	Six digit
Filter	Low	Filter	
Unit	0 (με)	Unit Type	
Auto Bal	OFF *ON	Balance Type	
Offset	0	Offset Value	Six digit
Rec Par	OFF *ON	Recorder Parameter	
Fact Par	*OFF ON	Load Default Parameter	
Fact Use			

“*” Sign in front represent the parameter in use.

The functions menu arranged in chronological order are predefined as follow:

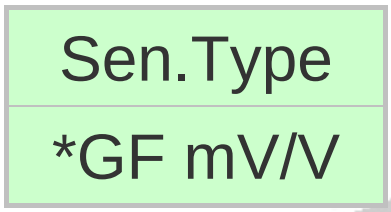


6.1 SENSITIVITY TYPE MENU (Sen.Type)

Sensitivity Type allows user to select the measuring signal type of input. GF is for use under the Strain Gage Strain/Stress mode, and mV/V is for Transducer mode.

GF (Strain Gage Strain/Stress mode): Applied to defined quarter-, half- and full-bridge type. This mode compensate for non-linear and Poisson rate for stress and strain analysis.

mV/V (Transducer mode): Applied to undefined quarter-, half- (UndHB/QB) and (UndefFB) full-bridge type. This mode does not compensate for non-linear and Poisson rate for transducer and mV/V measuring.



6.2 BRIDGE TYPE MENU (BridgeTy)

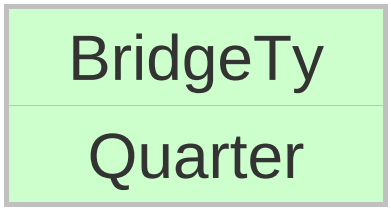
The Bridge Type menu allows user to select the type of bridge connected to SR1. Selection of bridge type is accessible by pressing ⬅, ➡ followed by ↵keys.

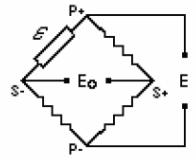
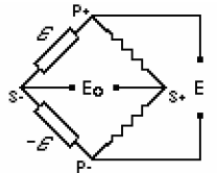
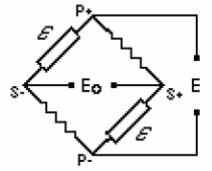
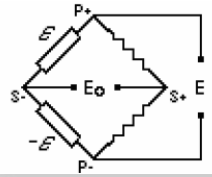
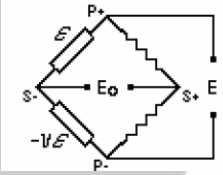
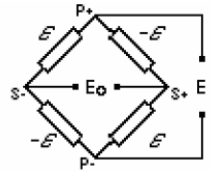
The bridge type determines whether the internal half-bridge is used, and also determines the appropriate scaling/linearization algorithm based upon the bridge type selected.

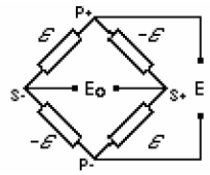
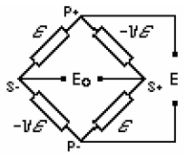
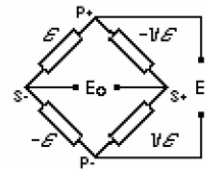
Bridge type configuration table can be refer to below table..

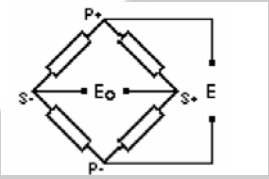
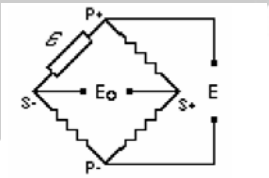
The following bridge configuration examples assume that the raw strain data is to be reduced to equivalent uniaxial strain with the nonlinearity correction applied where appropriate.

The "UndefFB" or “UndHB/QB” bridge, is selected when the net output of the active strain gages without mathematical correction for either Bridge configuration or nonlinearity applied is desired.



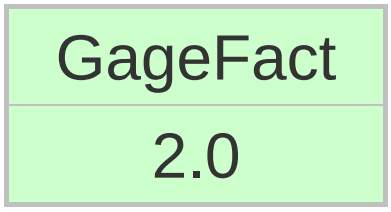
Bridge Type : When Sensitivity Type = GF		
Bridge Type	Bridge Diagram	Description
Quarter		Single active gage in uniaxial tension or compression.
HB adj ε:-ε		Two active gages with equal and opposite strains -- typical of bending-beam arrangement.
HB opp ε:-ε		Two active gages with equal strains of the same sign -- used on opposite sides of column with low thermal gradient (bending cancellation, for instance.)
HB shear ε:-ε		Two active gages with equal and opposite strains aligned with the maximum and minimum principal strains to measure shear strain.
HB adj ε:νε		Two active gages in uniaxial stress field-- one aligned with maximum principal strain, the other with transverse "Poisson" strain. Default Poisson's Ratio = 0.3.
FB 4 active		Four active gages with pairs subjected to equal and opposite strains (beam in bending or shaft in torsion)

FB shear		Four active gages with pairs subjected to equal and opposite strains (beam in bending or shaft in torsion).
FB v opp		Four active gages in uniaxial stress field-- two aligned with maximum principal strain, the other two with transverse "Poisson" strain (column). Default Poisson's Ratio = 0.3.
FB v adj		Four active gages in uniaxial stress field - two aligned with maximum principal strain, the other two with transverse "Poisson" strain (beam). Default Poisson's Ratio = 0.3.

Bridge Type : When Sensitivity Type = mV/V		
Display	Bridge Diagram	Description
UndefFB		Undefined full-bridge circuit. No correction for Wheatstone Bridge nonlinearity or active arms.
UndHB/QB		Undefined half or quarter bridge circuit. No correction for Wheatstone Bridge nonlinearity or active arms.

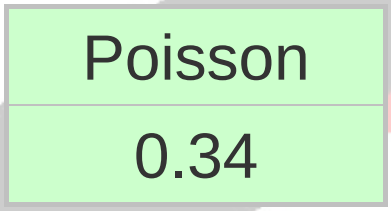
6.3 GAGE FACTOR MENU (GageFact), When Sensitivity Type = GF

Sensitivity type preset at GF, nominal value 2.0 applied. This nominal value is applied to defined bridge type only.



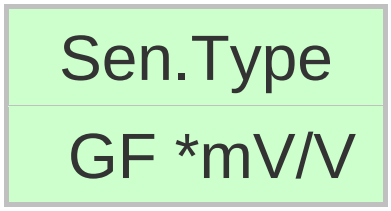
6.3.1 POISSON RATE MENU, When Bridge Type have transverse “Poisson” Strain

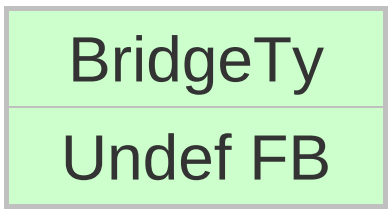
Sensitivity type preset at GF, nominal ratio 0.34 applied. Poisson’s ratio is used to calculate strain in bridge configurations which are dependent to Poisson rate only.



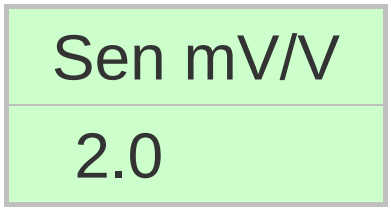
6.4 mV/V MENU (mV/V) , When Sensitivity Type= mV/V

Sensitivity type preset at mV/V, applying for undefined bridge type. Under mV/V, no scaling is necessary as the mV/V units are natively measured using sensor’s full-scale output voltage sensitivity value set.



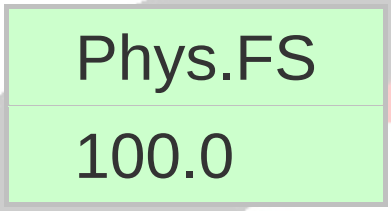


The full scale mV/V value must be between +10.000 mV/V and -10.000 mV/V. A value of 0 is not permitted. The default value is 2.000.



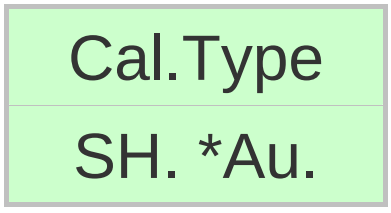
6.4.1 PHYSICAL FULL SCALE MENU (PhysFS)

In order to properly scale the data, it is necessary to supply the transducer full-scale value and the mV/V output at the full scale value. SR1 default value is 100. While value range is preset at –99999.9 to 99999.9 for selection, with zero (0) not permitted for use.



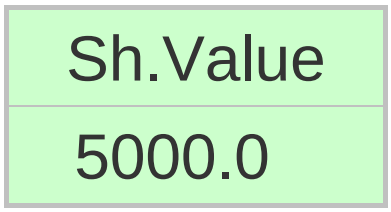
6.4.2 CALIBRATION TYPE MENU (Cal.Type)

Allows user to choose on Sh. (shunt) or Au. (auto) value calibration, This function works only when sensitivity type is mV/V. SR1 is preset at nominal auto which allows instrument self-calibration; selecting shunt calibration requires external resistor is to be connected. The transducer manufacturer will recommend the specific value for use.



6.5 SHUNT VALUE MENU (Sh.Value), When Calibration Type = Shunt

The Shunt Calibration menu allows the user to adjust the sensitivity of the (gage factor or full scale value) while a calibration signal is applied. In this menu, the shunt calibration is preset at 5000.0 as the nominal value.



6.6 RG RL MODE MENU (RgRLMode)

Gage resistance (RG) and lead wire line resistance (RL) measuring and RL compensation setting. This function will work under quarter bridge mode only.

Select auto (Au) to execute RG and RL measuring function. While selecting menu (Me) will execute lead wire RL compensation setting.

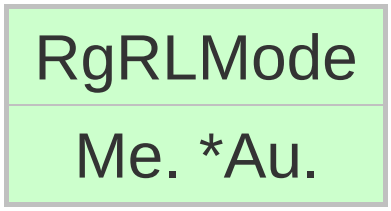
Upon execution of Au, press cal key (⬅) during Run Mode, and would enable RG and RL measuring. (Effective performance of this function can be achieve only through the use of 3-wire diagram quarter bridge)

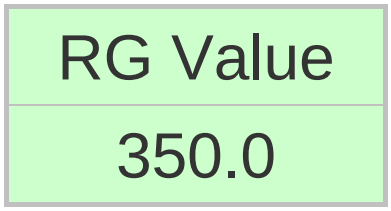
Upon execution of Me, user can set gage resistance under RG Value and set lead wire line resistance compensation under RL value.

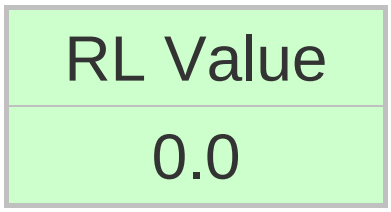
General Operation:

1. First, operate using Au function under Run Mode, press BAL key (➡) followed by cal key (⬅) will read RG and RL value. Record these values.

2. Then, change setting to Me and input RG and RL value. Under Run Mode, press the BAL key (➡) follows by pressing the cal key (⬅) will complete line resistance compensation and calibration.

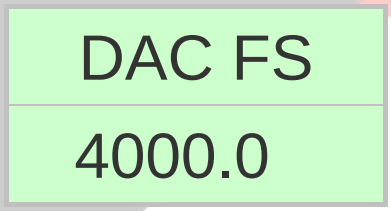






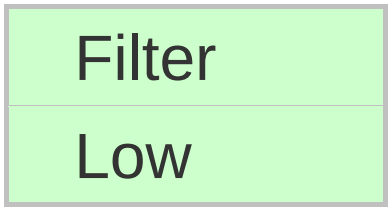
6.7 DAC FULL SCALE MENU (DAC FS)

It is preset at full scale normal 4000.0 display value to analog output equal 4.5V. Value display at 0.0, analog output equal 2.5 VDC.



6.8 FILTER MENU

Digital filters can be change to optimize the noise rejection from power line frequencies. Choose between Low, Medium or High on data output rate 4.5 / 8.2 / 10 Hz respectively at 16-Bits DAC.



6.9 UNIT MENU

For convenience, SR1 complete engineering units are provided below.

Unit
0

Strain	
0	$\mu\ \varepsilon$
2	μm/m
4	%
5	ε

Weight	
20	mg
21	g
22	kg
23	ton
98	oz
99	lb
100	klb

Pressure	
38	kg/mm^2
39	kg/cm^2
110	psi
111	psia
112	psid
113	Bars
114	In_H2O
115	In_Hg
116	mm_Hg
117	torr
118	Pascals
119	Atmos

Length	
52	nm
53	μm
55	mm
56	cm
57	m
129	mill
130	inch
131	feet

Angle	
68	deg
69	rad
Temperature	
73	˚C
75	°F
77	˚K
79	°T

Stress	
10	Pa
11	kPa
12	MPa
13	GPa
14	kgf/mm^2
15	kgf/cm^2
16	kgf/m^2
93	SI
94	kSI

Force	
27	mN
28	N
29	kN
30	MN
31	mg-f
32	g-f
33	kg-f
34	ton-f
104	oz-f
105	lb-f
106	klb-f

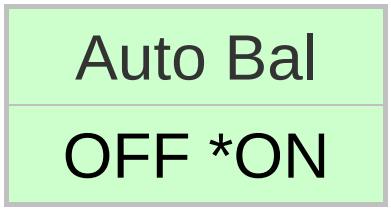
Torque	
43	N-cm
44	N-m
45	kN-cm
46	g-cm
47	kg-cm
48	kg-m
123	oz-in
124	lb-in
125	lb-ft

Acceleration	
61	g
62	mm/sec^2
63	cm/sec^2
64	m/sec^2
135	in/sec^2
136	ft/sec^2

Resistance	
84	μΩ
86	mΩ
88	Ω

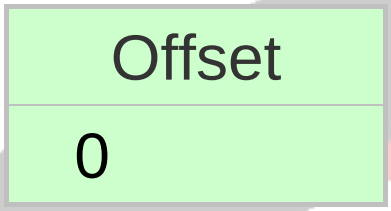
6.10 AUTO BALANCE ENABLE MENU (Auto Bal)

The auto balance is set “ON” allowing the user execute auto balance at run mode by pressing ➡ key. And press ⬅ and ↩will disable the auto balance function.



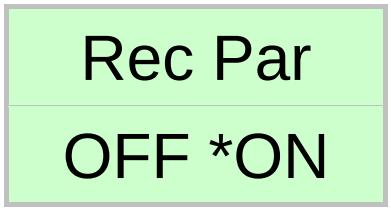
6.11 OFFSET VALUE MENU (Offset)

SR1 is designed to accept offset measuring; the preset value is at zero “0” which means the offset function is closed. Offset value range is –99999.9 to 999999. If an offset value is entered, the value will automatically add up or reduced in the final reading.



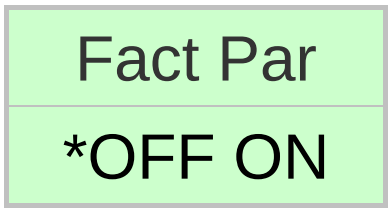
6.12 RECORDER PARAMETER ENABLE MENU (Rec Par)

Recorder parameter functions as the temporary setting memory for the instrument in use. The “Rec” key in “ON” allows the user to execute recording function at run mode by pressing “Rec” key. Setting the Rec Par to “OFF” will disable the recording function of the “Rec” key.



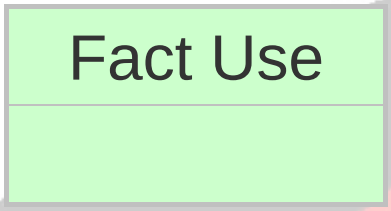
6.13 FACTORY PARAMETER MENU (Fact Par)

Factory parameter is the initial factory default setting stored inside the instrument, it can be restore once the Fact Par function is set to ON, then ↵ wait for display to return to Fact Par window, then press Rec to finish recalling factory default setting in the instrument.



6.14 FACTORY USE MENU (Fact Use)

This menu is for factory use only; no relevant information regarding the instrument will be retrieve from it.

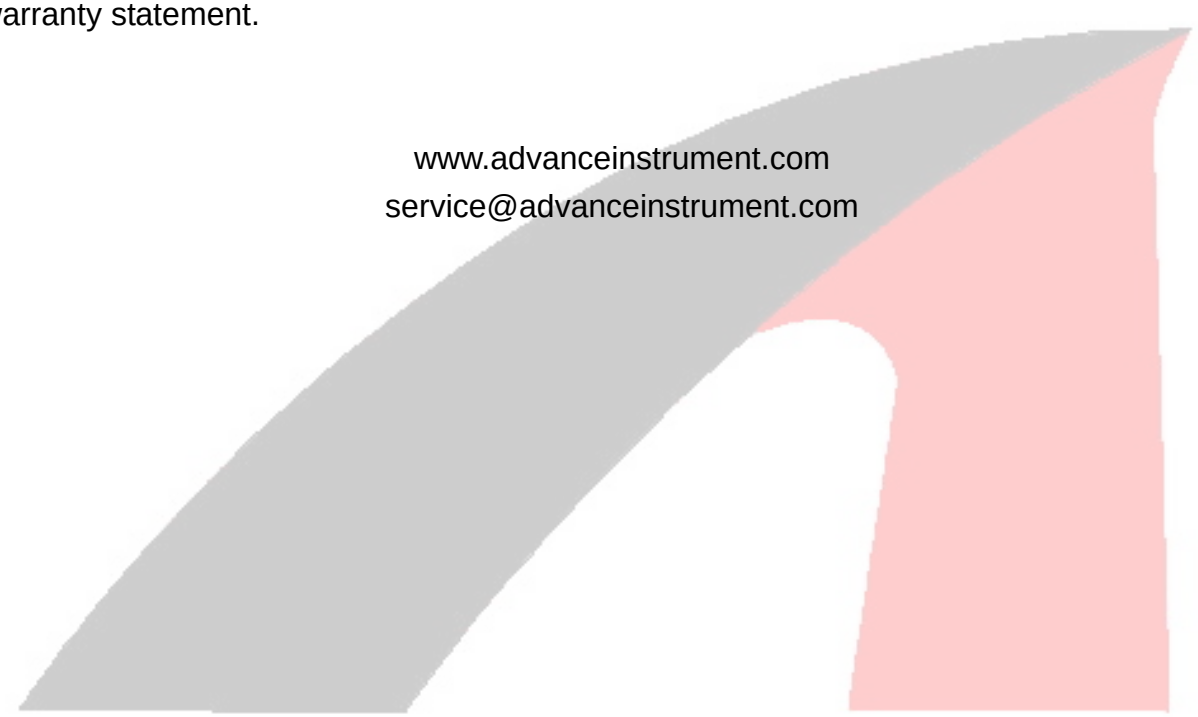


SECTION 7: Warranty

Advance Instrument Inc. warrants all instruments free from defects in materials, components and workmanship for one year from the date of purchase. Any instrument found defected by Advance Instrument Inc. within the warranty period shall be repaired or replaced at Advance Instrument's discretion.

The warranty is not applicable to the defects or physical damage resulting from abuse, neglect, accident, improper repair, alteration, or unreasonable use of the unit, resulting in (but not limited to) cracked or broken cases or parts, or units damaged by excessive heat.

To order the service prescribed by the warranty statement, you should include proof of purchase, including date and place of purchase, date and place of purchase (a copy of your purchase receipt). Otherwise, we are no liable for repairs or replacement prescribed by the warranty statement.



www.advanceinstrument.com
service@advanceinstrument.com