LD142-M7-R-0,2-I1/S773

DIGITAL READOUT

USER GUIDE

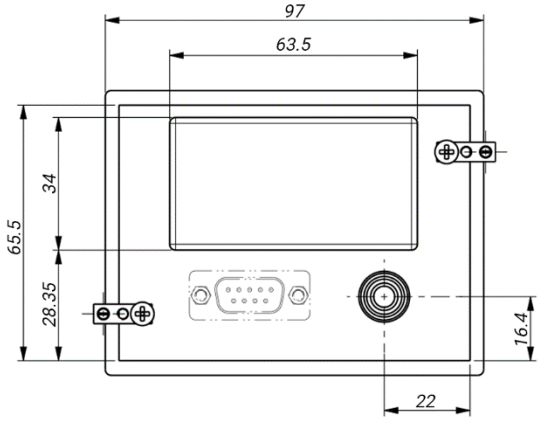
Version 2021-1

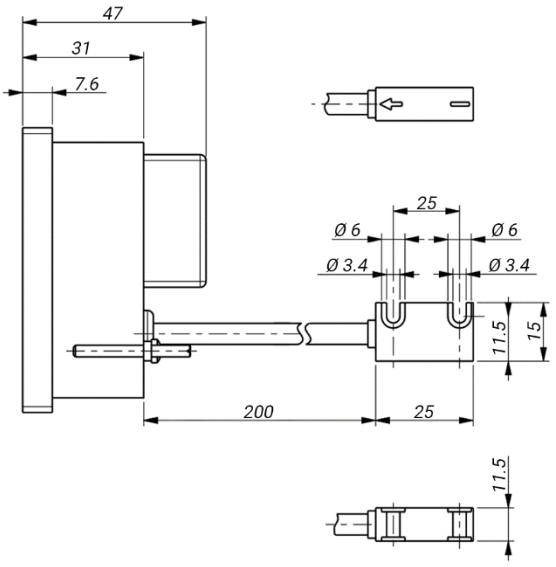
kentuckygauge.com

Table of Contents

1. Technical Specifications

Display resolution	0.001”, 0.01mm, 1/64”
System accuracy	±0.05 typ.
Repeat accuracy	± 1 digit
Display range	-999999 to 999999
Measurement speed	up to 5 m/s
Operating temperature range	32° to 122°F 0° to 50°C
Storage temperature range	-4° to 176°F -20 to 80°C
Protection level	IP60 front IP40 back
Power supply	(1) C battery (1.5V)
Consumption	~ 700 µA





*dimensions in mm

2. Safety Summary

We strongly recommend the user manual and the installation guidelines to be read and followed carefully:

- Sensor head should be installed as close as possible to the display.
- Avoid running the sensor cable near high voltage power cables (e.g. drive cables).
- Avoid mounting the sensor head near capacitive or inductive noise sources such as relays, motors and switching power supplies

2.1. General safety

- Always adhere to the professional safety and accident prevention regulations applicable to your country during device installation and operation.
- Installation must be carried out by qualified personnel only, with power supply disconnected and stationary mechanical parts.
- The device must be used only for the purpose appropriate to its design: use for purposes other than those for which it has been designed could result in serious personal and/or the environment damage, and warranty will be void.
- High current, voltage and moving mechanical parts can cause serious or fatal injury.
- Do not use in explosive or flammable areas.
- Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the equipment.
- Failure to comply with any guidelines in the manual will result in all warranties becoming void.
- Hymark assumes no liability for the customer's failure to comply with these requirements.

2.2. Electrical safety

Read carefully the instructions given in this user guide, which is an integral part of the device documentation.

- Turn OFF power supply before connecting the device.
- In compliance with 2014/30/EU norm on electromagnetic compatibility, following precautions must be taken:

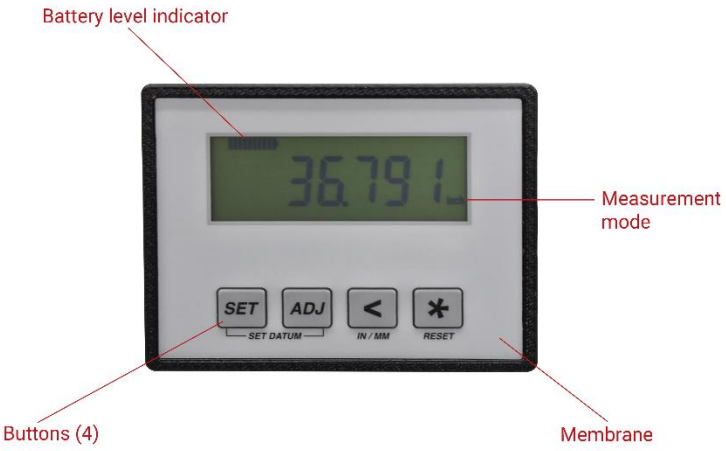
- before handling and installing the equipment, discharge electrical charge from your body and tools which may come in touch with the device.
- power supply must be stabilized without noise; install EMC filters on device power supply if needed.
- always use shielded cables (twisted pair cables whenever possible).
- avoid cables runs longer than necessary.
- avoid running the signal cable near high voltage power cables.
- mount the device as far as possible from any capacitive or inductive noise source; shield the device from noise source if needed to guarantee a correct working of the device.
- avoid using strong magnets on or near by the unit.
- minimize noise by connecting the shield to ground. Make sure that ground is not affected by noise. The connection point to ground can be situated both on the device side and on user's side. The best solution to minimize the interference must be carried out by the user. Provide the ground connection as close as possible to the unit.

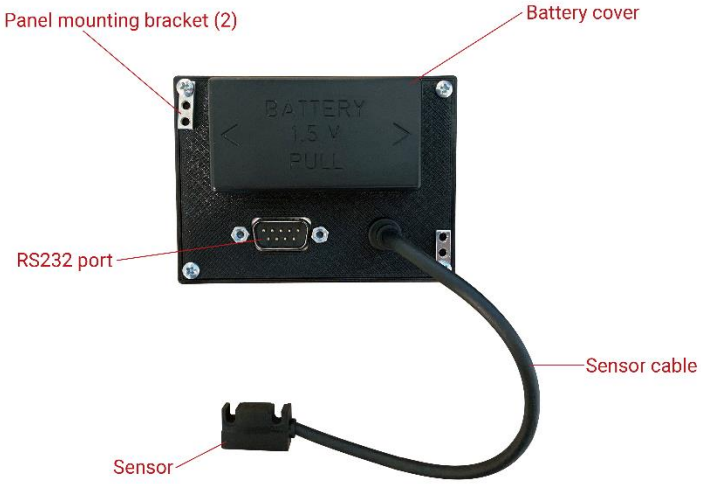
2.3. Mechanical safety

Read carefully the instructions given in this user guide, which is an integral part of the device documentation.

- Install the device following strictly the information in the "Mounting Instructions" section.
- Mechanical installation must be carried out with stationary mechanical parts.
- Do not disassemble the device unless otherwise indicated in the documentation.
- Do not tool the device unless otherwise indicated in the documentation.
- Delicate electronic equipment: handle with care; do not subject the device to knocks or shocks.
- Respect the environmental characteristics of the product.
- We suggest installing the sensor in a manner that provides protection against waste, especially swarf as turnings, chips, or filings. Should this not be possible, please make sure that adequate cleaning measures (as for instance brushes, scrapers, jets of compressed air, etc.) are in place to prevent the sensor and the magnetic tape from jamming.

3. Component Identification





Note: DRO is powered by (1) C battery and will not power off. The battery will need to be replaced approximately every 9-12 months depending on use and battery capacity. An industrial grade battery is recommended for maximum battery life.

4. Installation Instructions

4.1. Mounting the display

There are two options for mounting the display:

1. Panel mount using the supplied hardware
2. Mount using a U-bracket (sold separately)

It is recommended to mount the display as close to the sensor as possible and ensuring adequate protection from physical or electrical damage.

Panel mounting

1. Insert the display without panel mounting brackets through the panel cut-out (about 94 W x 68 H mm).
2. Fasten the panel mounting brackets to the back of the display and then tighten the two M3 x 30 screws in the bars against the panel frame, ensuring the display is fixed and stable.

4.2. Mounting the sensor

The sensor can be fixed by means of two M3 screws inserted in the buttonholes.

Make sure that the gap between the sensor and the magnetic tape complies with the values in Figure 1 along the entire measuring length.

Avoid contact between the parts. You can check planarity and parallelism between the sensor and the magnetic tape using a feeler gauge.

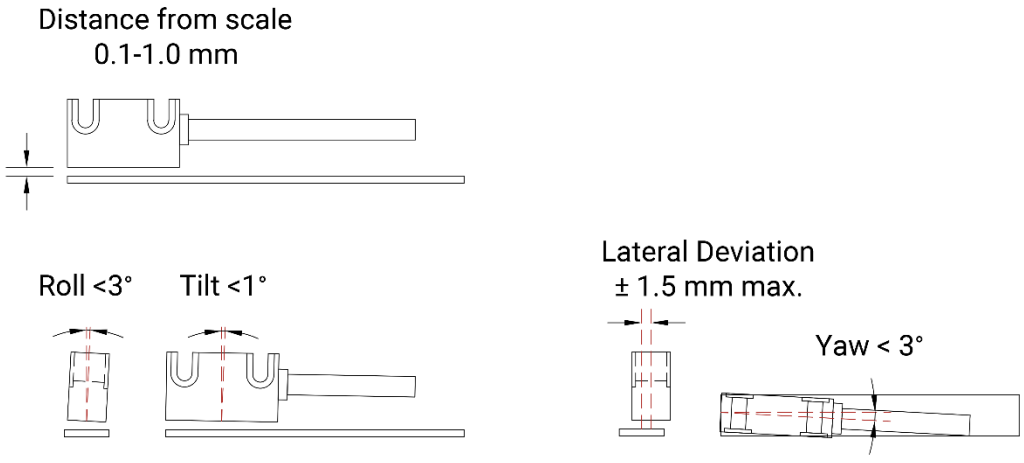


Figure 1

5. Setup

5.1. Button functions

5.2. Quick functions (button shortcuts)

By default, quick functions are disabled. Quick functions can be individually enabled in the parameter settings.

Reset (zero-setting)

Press * button for 3 seconds to access the reset function ("rESEt" will be displayed).

Press SET button to exit the function (no reset).

Press * button twice to confirm the reset operation ("donE" will be displayed).

Displayed value = rEF + OFS1 + OFSx (where OFSx is the Offset value currently set if F_oFS is set to "YES").

The reset function is enabled only if F_rSt parameter is set to "YES".

Incremental/absolute measurement

Press SET and ✱ buttons simultaneously to switch from absolute (decimal point lit solidly) to incremental (blinking decimal point) measurement and vice versa.

Zero setting in incremental mode (refer to section 6.2.1 Reset (zero-setting)) does not change the absolute value in the background.

The function is enabled only if F_rEL parameter is set to "YES".

Inch/metric display mode

Inch/mm display mode can be switched by pressing < button for 3 seconds.

The function is enabled only if F_mm I parameter is set to "YES".

Changing the Offset value

Press SET and < buttons simultaneously to display the Offset value 1 (OFS 1). Use < and ADJ buttons to change the value and save pressing ✱ button.

OFS 2 and OFS 3 Offset values can be changed only in set up menu.

Offset function is enabled if F_oFS parameter is set to "YES".

< button scrolls through OFS 1, OFS 2 and OFS 3 values.

OFS 1 = current value + OFS 1 + rEF

OFS 2 = current value + OFS 1 + OFS 2 + rEF

OFS 3 = current value + OFS 1 + OFS 3 + rEF

Fractional inch offset display

The fractional inch display mode allows to set offset values (oFSx) in the following way:

- 1st digit blinking -- increases 1/64" pressing ADJ button.
- 2nd digit blinking -- increases 1/32" pressing ADJ button.
- 3rd digit blinking -- increases 1/16" pressing ADJ button.

- 4th digit blinking -- increases 1/8” pressing ADJ button.
- 5th digit blinking -- increases 1” pressing ADJ button.
- 6th digit blinking -- increases 10” pressing ADJ button.

Reference (Preset) setting

Press SET and ADJ buttons simultaneously to display the Preset value rEF. Use ADJ and < buttons to change the value and save pressing * key.

This function is enabled only if F_rEF parameter is set to “YES”.

5.3. Parameter settings (MENU 1)

The DRO has two menu levels

1. MENU 1: parameter settings
2. MENU 2: RS-232 serial interface (refer to section 5.4 MENU 2)

To enter the parameter settings menu, press and hold SET button for 3 seconds, "SEtUP" will be displayed. Press ADJ button to enter MENU 1 or Press * button to enter MENU 2.

Entering MENU 1 will display "Un it". Press SET button to cycle through MENU 1 parameters.

Press and hole SET button for 3 seconds to exit the setup at any point.

The following chart outlines all the possible options for the various parameters in the DRO.

Note – Factory settings are highlighted in Red and ***Bolded*** *in the following table. The DRO can be rest to default parameters by executing the following procedure:*

1. *Remove the battery and wait 10 seconds.*
2. *Press * button while inserting the battery. "dEFPAr" will be displayed to indicate the default parameters have been set.*

Parameter	Description
Unit	Determines what type of measuring the DRO will perform (linear or angular) as well as, the unit of measure (inches, mm, degrees). **dEc – Linear measurement display in decimal** FrEE – Display with conversion factor dG1 – Angular display (-∞...-0.1°...0.0°...+0.1°...+∞) dG2 – Angular display (...359.9°...0.0°...359.9°...0.0°...) IdEc – Inch display mode IFrct – Fractional inch mode (separated with decimals, e.g. 15 13/64” would display 15.13.64) [*] = save [SET] = next parameter [SET] for 3 seconds = exit

con	**parameter only available when Unit = FrEE, dG1, or dG2.* Allows operator to set a conversion factor to display non-metric units, angles, or used as a scaling factor to correct linear inaccuracies. When active, the scaling factor is always on and affects the measurements throughout the entire measuring range. Value range: FrEE = 0.00001-9.99999 (**1.00000**) dG 1, dG2 = 0.00001 – 9.99999 **Example 1** We want to display a 90° angle (from 0° to 90°) with 0.1° resolution on a 250 mm diameter rotary table. The measurement length is 250 * 3.14 = 785.4 mm on 360°, thus it is 785.4 / 4 = 196.35 on 90.0°. con = 900 / 19635 = 0.045836 **Example 2** We want to display angles with 0.1° resolution on a 114.5 mm diameter magnetic ring. The circumference is 114.5 * 3.14 = 359.53 mm con = 3600 / 35953 = 0.10013 **Example 3** In a linear measurement application, the display is reading longer than the actual distance. The displayed measurement is 1.510, but the actual distance is 1.500. con = 1.510 / 1.500 = 0.993377 [*] = save [SET] = next parameter [SET] for 3 seconds = exit

rES	**parameter only available when Unit = dEC, FrEE, dG1, dG2, or IdEC* Sets the resolution of the display. Options: Unit (dEc, FrEE, dG1, or dG2) – 0.001, 0.005, 0.01, 0.05, 0.1, 0.5, 1 Unit (IdEc) – 0.0001, 0.0005, **0.001**, 0.005, 0.01, 0.05, 0.1 [*] = save [SET] = next parameter [SET] for 3 seconds = exit
dIr	Sets the counting direction of the sensor. **UP – up (standard counting direction)** dn – down (inverted counting direction) [*] = save [SET] = next parameter [SET] for 3 seconds = exit

F_mm i	Enables switching back and forth between inches and millimeters by holding down  . YES – enabled (holding  for 3 seconds changes the unit of measure) **no – disabled (can only change unit of measure in parameters menu)**  = save  = next parameter  for 3 seconds = exit
F_rEL	Enables the absolute/incremental measurement function. YES – Enabled (allows changing the DRO to incremental measuring by pressing  and  simultaneously) **no – Disabled (DRO stays in absolute measuring)**  = save  = next parameter  for 3 seconds = exit

F_rSt	Turns the referencing/zeroing function on or off. YES – Enabled (holding down  for 3 seconds will reference the DRO to the datum value + any programmed offsets -- rEF + oFS1 + oFSx where oFSx is the Offset value currently set.) no **– Disabled**  = save  = next parameter  for 3 seconds = exit
F_rEF	Allows modification of the datum value (Preset) the DRO references to by pressing  and  simultaneously. YES – Enabled no **– Disabled**  = save  = next parameter  for 3 seconds = exit

F_oFS	Allows adding offset values to the DRO measurements. oFS1 can be adjusted by pressing SET and < simultaneously. oFS2 and oFS3 can be adjusted in the parameter menu only. Operators can select which offsets to apply by pressing ADJ. YES – Enabled no – **Disabled** **If F_oFS was previously set to YES and a value is entered for oFS1, the value must be changed to 0 before changing F_oFS to no or the offset will continue to be applied* ✱ = save SET = next parameter SET for 3 seconds = exit
rEF	This value is your datum/Preset (the value that the DRO resets to when ✱ is held down for 3 seconds). Value can be changed either in parameters menu or by pressing SET and ADJ simultaneously Value range (-999999 to 999999, **000000**) **this parameter is only available if F_rSt is set to YES.* ✱ = save SET = next parameter SET for 3 seconds = exit

OFS 1	This is the first offset value; it is added to the current position value. This value can be adjusted by pressing SET and < simultaneously Value range (-999999 to 999999, **000000**) **this parameter is only available if F_oFS is set to YES* ✱ = save SET = next parameter SET for 3 seconds = exit
OFS 2	This is the second offset value; it is added to the current position value + oFS 1. This value is only adjustable through the parameter menu. Value range (-999999 to 999999, **000000**) **this parameter is only available if F_oFS is set to YES* ✱ = save SET = next parameter SET for 3 seconds = exit

OFS 3	This is the third offset value; it is added to the current position value + oFS 1 + oFS 2. This value is only adjustable through the parameter menu. Value range (-999999 to 999999, **000000**) **this parameter is only available if F_oFS is set to YES* [*] = save [SET] = next parameter [SET] for 3 seconds = exit
rESEt	When the setup is carried out, the display shows rESEt. Press [*] button twice to reset the display and exit the set up (Preset and Offset values are calculated). "donE will be displayed. Press [*] button to exit the set up without resetting the display. "no rSt" will be displayed.

5.4. Parameter settings (MENU 2)

Parameter	Description
Ad xx	Device address (00 - 31, **00**) Sets the device address for serial connection. Valid values are from 01 to 31, 00 is reserved to broadcast mode. Use SET and < buttons to set the address * = save SET = next parameter SET for 3 seconds = exit
H cntr	Hour meter (1/10 h) Elapsed time indication (display connected to battery). Resolution is 1/10 of an hour (6 minutes). * = save SET = next parameter SET for 3 seconds = exit

6. Changing the Battery

The battery is located on the rear of the DRO behind a plastic cover. To remove the cover, push in on the ends and pull straight out.

With the cover removed, you can see that the battery is held in by two plastic fingers, one on top and one on the bottom.

Push one of these fingers away from the battery while removing the positive end, as shown.

Pivot the battery from the negative end until it clears the plastic fingers and can be fully removed.

Note – During battery replacement, you should never use tools to remove the battery or pry against the DRO housing. This can result in the battery compartment pulling loose from the DRO or the solder joints between the battery connectors and the circuit board being pulled loose. For proper battery removal push out on the tabs securing the battery while pulling out on the positive end and it will come free.

Damage caused by improper battery removal will not be covered under warranty

7. RS-232 Serial Interface

Communication can be made with the DRO using the equipped RS-232 serial interface on the back of the readout.

Paramters: 9600 Baud rate, 8Bit, no Parity, 1 Stop bit, Xon/Xoff

7.1. Serial commands

Serial commands must have the following structure:

|ADCMND=XCRLF

|	Vertical bar; PC keyboard symbol. Indicated beginning of a command.
AD	Device address (01 to 31), must be two digits.
CMND	Command (see Command list)
X	Value to be sent if requested
CR	Carriage return = message completed
LF	Line feed = new command in the following line

Upon receipt of a wrong command, the DRO will respond with the same command + ? and checksum.

Example: sent command is |02azs, the response 02azs?EF

Any common terminal program can be used for communication with the DRO (e.g. Hyperterminal). Commands will be sent after confirmation by ENTER key (Carriage Return)

Responses have the following structure:

ADCMND:SXXXXXXXXCHKSCR

AD	Device address
CMND	Command

S	+/- sign
XXXXXXXX	Value
CHKS	Checksum The checksum corresponds to the least significant byte resulting from the sum of the hex values of all transmitted characters. Example: The displayed position is 8.29. The position of the device with address 01 is read by means of the |01TPOS command: |01TPOSCRLF = 7C 30 31 54 50 4F 53 0D 0A The response is: 01TPOS:+000008299FCR = 30 31 54 50 4F 53 3A 2B 30 30 30 30 30 38 32 39 9F 0D The sum of hex values of all characters is as follows: 30+31+54+50+4F+53+3A+2B+30+30+30+30+30+ 38+32+39 = 39F The least significant byte of 39F is 9F which is the checksum.
CR	Carriage return = message completed

7.2. Serial command list

The device address in each command in the following table is indicated with **AD**. Unless otherwise indicated, the device address must be set to a value between 01 and 31 for the serial commands to function.

|00RSET	The address of all connected devices is set to zero (0).
|00INIT=X	[01 to 31] Sets the address of all connected devices to X (must be set to a value between 01 and 31)
|00DADR	Displays the device address until SET button is pressed.
|**AD**RADR=X	Changes the current device address (AD) to X. Response: ADTADR:+XCHKSCR (CHKS is the checksum, X is the value, CR is the Carriage Return).

|**AD**TPOS	Shows the current position of the device. Resolution is 0.01 mm or 0.001 inch depending on DRO settings.
|**AD**RDIR=X	[0, 1] Sets the counting direction. 0: Up – standard direction 1: dn – reverse direction Response: ADTDIR:+0000000XCHKSCR
|**AD**RUNI=X	[0-5] Sets the measurement unit and the display mode. 0: dec – decimal mode 1: free – free conversion factor 2: dG1 – Angular display (-∞...-0.1°...0.0°...+0.1°...+∞) 3: dG2 – Angular display (...359.9°...0.0°...359.9°...0.0°...) 4: Idec – decimal inch display mode 5: IFrct – fractional inch display mode (separated with decimals, e.g. 15 13/64” would display 15.13.64) Response: ADTUNI:+0000000XCHKSCR
|**AD**TUNI	Shows the measurement unit currently set. Response: ADTUNI:+0000000XCHKSCR
|**AD**RRES=X	[1, 5, 10, 50, 100, 500, 1000] Sets the linear resolution in mm or *inch.* 1: 0.001 or *0.0001* 5: 0.005 or *0.0005* 10: 0.01 or *0.001* 50: 0.05 or *0.005* 100: 0.1 or *0.01* 500: 0.5 or *0.05* 1000: 1 or 0.1 Response: ADTRES:+XCHKSCR

|**AD**TRES	Shows the current resolution setting. Response: ADTRES:+XCHKSCR
|**AD**RCON=X	Sets the conversion factor (cOn). [FrEE: 0.00001 – 1.00000] [dG1 or dG2: 0.00001 – 9.99999] Response: ADTCON:+XCHKSCR
|**AD**TCON	Shows the value of the current conversion factor (cOn). Response: ADTCON:+00X.XXXXCHKSCR
|**AD**RMMI=X	[0,1] Sets the display mode between mm and inch. 0: mm 1: inch Response: ADTMMI:+0000000XCHKSCR
|**AD**RRAE=X	[0, 1] Enables the absolute/incremental measurement function. 0: Off 1: On Response: ADTRAE:+0000000XCHKSCR
|**AD**TRAE	Shows the current setting of the absolute/incremental function. 0: Off 1: On Response: ADTRAE:+0000000XCHKSCR

|**AD**RRLA=X	[0, 1] Switches from absolute display mode to incremental display mode. 0: absolute 1: incremental Response: ADTRLA:+0000000XCHKSCR
|**AD**TRLA	Shows the absolute/incremental display mode currently set. 0: absolute 1: incremental Response: ADTRLA:+0000000XCHKSCR
|**AD**RRSE=X	[0, 1] Enables the Reset function (holding  button to reset/zero the display). 0: Off 1: On Response: ADTRSE:+0000000XCHKSCR
|**AD**TRSE	Shows the current setting of the Reset function. 0: Off 1: On Response: ADTRSE:+0000000XCHKSCR
|**AD**RRFE=X	[0, 1] Enables the Preset function (pressing the  and  buttons simultaneously). 0: Off 1: On Response: ADTRFE:+0000000XCHKSCR

|**AD**TRFE	Shows the current setting of the Preset function. 0: Off 1: On Response: ADTRFE:+0000000XCHKSCR
|**AD**ROFE=X	[0, 1] Enables the Offset function (pressing the SET and < buttons simultaneously). 0: Off 1: On Response: ADTOFE:+0000000XCHKSCR
|**AD**TOFE	Shows the current setting of the Offset function. 0: Off 1: On Response: ADTOFE:+0000000XCHKSCR
|**AD**RREF=X	[-999999 to 999999] Sets the Reference (or Preset) value for the measurement system. The value has a resolution of 0.01 mm or 0.001 inch depending on the display settings. Response: ADTREF:XCHKSCR
|**AD**TREF	Shows the current Reference value. Response: ADTREF:XCHKSCR
|**AD**ROF1=X	[-999999 to 999999] Sets the Offset1 value (oF5 1). The value has a resolution of 0.01. Response: ADTOF1:XCHKSCR

|**AD**TOF1	Shows the current Offset1 value (oF51). Response: ADTOF1:XCHKSCR
|**AD**ROF2=X	[-999999 to 999999] Sets the Offset2 value (oF52). The value has a resolution of 0.01. Response: ADTOF2:XCHKSCR
|**AD**TOF2	Shows the current Offset2 value (oF52). Response: ADTOF2:XCHKSCR
|**AD**ROF3=X	[-999999 to 999999] Sets the Offset3 value (oF53). The value has a resolution of 0.01. Response: ADTOF3:XCHKSCR
|**AD**TOF3	Shows the current Offset3 value (oF53). Response: ADTOF3:XCHKSCR
|**AD**TALL	Commands the transmission of all parameter settings. The display sends back the responses reported under each parameter in sequence.

7.3. SPC accessories

Using our SPC accessories, you can quickly and easily export the current displayed value to a PC by pressing SET button. The SPC accessories function as a keyboard wedge and can transmit the current displayed value to any PC program that can accept a keyboard input.

SPC Cable

Wireless SPC

8. Troubleshooting

Problem	Solution
DRO will not power on	The DRO is constantly under power. If your DRO is not on, the battery may be dead. Replace the battery.
DRO will not zero/reference	If you cannot get your DRO to zero or reference, the "F_rSt" parameter has been changed to "no". Follow the procedures for changing "F_rSt" to "Yes". If your DRO allows you to reset to zero but does not allow you to change the Preset value, parameter "F_rEF" has been changed to "no". Follow the procedure for changing "F_rEF" to "Yes".
When resetting the DRO, it resets to a value other than zero	If you are attempting to zero the system and your DRO resets but it resets to a value other than zero, a Preset value has been entered in the DRO. To change the Preset back to zero, press SET and ADJ buttons simultaneously and change the displayed value to 0.0. Press SET button to exit.
DRO reading erratically or measurements are off varying amounts at various points	Examine the magnetic tape for signs of damage. If there is no damage, check the mounting tolerances of your sensor to ensure they are within the required mounting tolerances.

9. Warranty

Hymark warrants this product for a period of twelve (12) months from the date of shipment. During the warranty period, under authorization from Hymark, return component parts freight prepaid. The company will repair or replace, at its option, any part found to be defective in material or workmanship, without charge to the owner for parts, service labor, or associated shipping costs. This same protection will extend to any subsequent owner during the warranty period. It does not apply to damage caused by accident, misuse, fire, flood, acts of God, or from failure to properly install, operate, or maintain the product in accordance with the printed instructions provided.

This warranty is in lieu of any other warranties, expressed or implied, including merchantability or fitness for a particular purpose, which are expressly included. The owner agrees that Hymark´s liability with respect to this product shall be set forth in this warranty, and incidental or consequential damages are expressly excluded.

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