Instruction Manual

HI9017 - HI9218 HI9219 - HI9318 Microprocessor Bench-top pH Meters with RS232C





Dear Customer,

Thank you for choosing a Hanna Instruments Product.

Please read this instruction manual carefully before using the instrument.

This manual will provide you with all the necessary information for the correct use of the instrument, as well as a precise idea of its versatility in a wide range of applications.

These instruments are in compliance with CSA, UL and C ε directives (EN 50081-1 and EN50082-1).

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PRELIMINARY EXAMINATION

Remove the instrument from the packing material and examine it to make sure that no damage has occurred during shipping. If there is any damage, notify your Dealer.

Note: Save all packing material until you are sure that the instrument functions correctly. All defective items must be returned in the original packing with the supplied accessories.

GENERAL DESCRIPTION

HI9017, HI9218, HI9219 and HI9318 are microprocessor-based benchtop meters designed to meet the most stringent demands of the laboratory. They feature:

- user friendly rubber keyboard
- automatic calibration with memorized buffers values
- automatic or manual temperature compensation
- storage of calibration data even after the meters are shut off

• error codes to guide the user in calibration and troubleshooting All these models incorporate a standard **RS232C** output for communication with a computer.

The **HI76405** electrode holder provided will hold your pH electrode and temperature probe directly over the sample vessel which can be placed on the enamel coated base of the holder. A magnetic stirrer can also be placed on the enamel coated base if sample agitation is required. The enamel coating is impervious to most chemicals and the heavy steel base will not tip over easily.

These meters are perfect for use in Q.C. labs, R&D labs, environmental testing, industrial processing, chemical treatment, waste water treatment, drinking water analysis, titration, hydroponics, general agriculture, food processing and anywhere accurate pH measurements are required.

 HI9017 pH/mV/°C meter automatically recognizes three standard calibration buffer values (pH 4.01, 7.01, 10.01). The pH and temperature values are shown separately on the LCDs. A wide mV range and high resolution allow for ORP or ion-selective measurements (the range automatically switches from ISE to ORP when readings exceed ± 399.9 mV).

HI9017 comes supplied with HI1131B glass-body combination pH electrode (with 1m/3.3' cable), HI7669/2W temperature probe

(with 1m/3.3' cable), 12VDC adapter (HI710005 or HI710006), pH 4.01 & pH 7.01 buffer solutions (20 mL each), HI7071 electrolyte solution (30 mL), HI76405 electrode holder and a dust cover.

HI9218 and HI9219 are programmable pH/°C meter with builtin printer. They print pH values together with temperature, time and date. These meter provide you with pH and temperature readings simultaneously and separately on the LCDs and feature a unique stability indicator. When the pH electrode stabilizes in the sample, the "NO" on the LCD changes to "YES". This indicates that the reading is correct and can be recorded. They automatically recognize three standard buffers (4.01, 7.01 and 10.01 pH) for calibration purposes. These meters are extremely user-friendly, giving step-by-step instructions on the printer at every stage to help the user.

HI9218 has been specifically designed for the food industry.

HI9218 comes supplied with FC100B plastic-body combination pH electrode (with 1m/3.3' cable) while HI9219 comes with HI1131B glass-body combination pH electrode (with 1m/3.3' cable). HI9218 and HI9219 are also supplied with: HI7669/2W temperature probe (with 1m/3.3' cable), 12VDC adapter (HI710005 or HI710006), pH 4.01 & pH 7.01 buffer solutions (20 mL each), HI7071 electrolyte solution (30 mL), 5 replacement rolls of printer paper, HI76405 electrode holder and a dust cover.

HI9318 is a pH/mV/°C meter designed for logging data in various applications. This programmable printing meter prints pH or mV values as well as sample number, temperature, time and date. The pH/mV and temperature values are displayed on separate LCDs for ease of reading. It recognizes and memorizes three different standard buffers (pH 4.01, 7.01 and 10.01) for calibration purposes. The printer can be programmed to print in one of 6 different languages (English, French, German, Italian, Spanish or Swedish). Once your language is selected you can simply prompt the meter to calibrate and it will print step-by-step instructions through the entire process making this meter perfect for use by even non-technical staff members.

HI9318 comes supplied with HI1131B glass-body combination pH electrode (with 1m/3.3' cable), HI7669/2W temperature probe (with 1m/3.3' cable), 12VDC adapter (HI710005 or HI710006), pH 4.01 & pH 7.01 buffer solutions (20 mL each), HI7071 electrolyte solution (30 mL), 5 replacement rolls of printer paper, HI76405 electrode holder and a dust cover.

FRONT PANEL AND Specifications of H19017



1. Program descriptions

Briefly describes the 6 programs

2. Temperature LCD

This LCD displays the temperature measured by the HI7669/2W probe or the value that was manually set through the keyboard. If the temperature has been set manually, the " $^{\circ}C$ " symbol will flash.

When the temperature probe is connected the measured temperature is displayed and the " $^{\circ}\text{C}$ " symbol stops flashing.

When the temperature measured by the probe is out of range (-10 to 125° C) the "Err3" signal appears.

3. pH and mV LCD

This LCD displays the pH or mV reading (pH and mV is toggled with the RANGE key). The corresponding pH or mV symbol will be displayed along with the measured value.

An error signal ("Err1", "Err2", "Err4" or "Err5") will appear on this display to indicate that the range is exceeded or that the buffer used for calibration is not recognized by the meter's microprocessor.

4. Keyboard

ENTER A key used in programming.

ENTER B key used in programming.

CLEAR key to clear entry or silence alarm.

PGM key to select a program.

ON key	to switch the instrument on.
OFF key	to switch the instrument off.
RANGE key	to switch range from pH to mV or vice versa.
CAL key	used in calibration with standard pH buffers (pH
	4.01, 7.01, 10.01)
CON key	confirmation of calibration data
+/- key	entering negative values
TEMP key	used for manual temperature adjustment
0 to 9 keys	numeric and Decimal keys for numeric data input

SPECIFICATIONS	HI 9017
Range pH	0.00 to 14.00
ISE	\pm 399.9 mV
ORP	\pm 1999 mV
°C	-10.0 to 125.0
Resolution pH	0.01
ISE	0.1 mV
ORP	1 mV
°C	0.1
Accuracy pH	±0.01
(@ 20°C/68°F) ISE	\pm 0.2 mV
ORP	$\pm 1 \text{ mV}$
°C	± 0.5
Typical EMC pH	±0.02
Deviation ISE	\pm 0.2 mV
ORP	$\pm 1 \text{ mV}$
°C	± 0.5
Calibration	2 point with automatic recognition of 3
	buffers (pH 4.01, 7.01, 10.01)
Temperature	-10° to $+125^{\circ}$ C (14 to 257 °F) completely
	automatic with H1/669/2W temperature
Comp Interfere	probe; manual by means of keyboard
Comp. Intertace	KSZSZL
Electrode	nH electrode (included)
Temperature Probe	HI7669/2W Temperature probe (included)
	10 ¹² 0hm
Power	Power socket for 12VDC
Environment	0 to 50°C (32 to 122°E). RH 95%
Dimensions	230 x 170 x 70mm (9.1 x 6.7 x 2.7")
Weight	1.3 Kg (2.9 lb.): kit w/holder 3.2 Kg (7 lb.)
l	1.0 Ng (2.7 10.7, NI W/101001 0.2 Ng (7 10.)

FRONT PANEL AND SPECIFICATIONS OF H19218 & H19219



1. Printer

Plain paper printer

2. Temperature LCD

This LCD displays the temperature measured by the **HI7669/2W** probe or the value that was manually set through the keyboard. If the temperature has been set manually, the " $^{\circ}C$ " symbol will flash. When the temperature probe is connected the measured temperature is displayed and the " $^{\circ}C$ " symbol stops flashing. When the temperature measured by the probe is out of range (-10.0 to 125.0°C) the "Err3" signal appears.

3. pH LCD

This LCD displays the pH reading. The corresponding pH symbol will be displayed along with the measured value. An error signal ("Err1", "Err4" or "Err5") will appear on this display to indicate that the range is exceeded or that the buffer used for calibration is not recognized.

4. Small LCD

This LCD normally displays the time. When the DATE button is pressed, the date will be displayed. When the READY key is pressed, the display shows "NO" while the electrode is stabilizing and "YES" once the reading is stable.

5. Keyboard

ON/OFF key to switch the instrument "ON" or "OFF".

Note: Press OFF before unplugging instrument, otherwise, calibration data and time setting could be lost.

DATE/TIME key	o display date and time.			
CAL key	to enter calibration mode.			
CFM key	to confirm memorized buffers	o confirm memorized buffers 7.01 and 4.01/10.01.		
UP/DOWN key	to set manual temperature com	o set manual temperature compensation and date/time.		
PAPER key	manual paper feed control.	nanual paper feed control.		
PRINT key	prints pH value together with temperature, date			
	and time.			
READY key	stability indicator to ensure	correct pH reading or		
	to enable calibration.			
SPECIFICATIONS	5 HI9218	HI9219		
Ranges pH	0.00 to 14.0)0		
	100.100			

JILCIIICATIONS	1117210 1117217		
Ranges pH	0.00 to 14.00		
°C	-10.0 to 125.0		
Resolution pH	0.01		
°C	0.1		
Accuracy pH	±0.01		
(@20°C/68°F) °C	± 0.5		
Typical EMC pH	±0.04		
Deviation °C	±1.5		
Calibration	2 point with automatic recognition of 3 buffers (pH 4.01, 7.01, 10.01)		
Temperature	-10° to 125°C (14 to 257°F) Completely		
Compensation	automatic with HI 7669/2W temperature		
	probe; manual by means of keyboard		
Comp. Intertace	KS232C		
Electrode	HI9218: FCTOUB plastic body combination		
	HI0210.HI1121B Class holy combination		
	nH electrode (included)		
Temperature	HI7669/2W Temperature probe (included)		
Probe			
Input Impedance	1012 Ohm		
Display	2 large 4-digit LCD for pH and temperature		
	with symbols 1 small LCD for date/time and		
-	stability indicator		
Printer	1 x 16 line dot matrix printer,		
	paper width: 44 mm,		
	roll diameter: 35 mm		
Power Supply	Power socket for 12VDC		
Environment	0 to 50°C (32 to 122°F); RH 95%		
Dimensions	230x170x70mm (9.1x6.7x2.7")		
Weight	1.3 Kg (2.9 lb.);		
	kit w/holder 3.2 Kg (7 lb.)		



- 1. Program descriptions Briefly describes the 9 programs
- 2. **Printer** Plain paper printer
- 3. Temperature LCD This LCD displays the temperature. If the temperature has been set manually, the "°C" symbol will flash. When the temperature probe is connected the measured temperature is displayed and the "°C" symbol stops flashing. When the temperature measured by the probe is out of range (-10 to 125°C) the "Err3" signal appears.
- 4. pH and mV LCD This LCD displays the pH or mV reading (pH and mV is toggled with the RANGE key). The corresponding pH or mV symbol will be displayed along with the measured value. An error signal ("Err1", "Err2", "Err4" or "Err5") will appear on this display to indicate that the range is exceeded or that the buffer used for calibration is not recognized.
- 5. Sample LCD Displays the sample number of the current lot.
- Time and Date LCD Displays the Time as HH.MM. and the date as MM.DD. This LCD also displays any numeric data entered from the keyboard to show the user the entered values.
- 7. Keyboard
- PAPER key manual paper feed control. Press and hold this button and the printer will advance the paper roll
- $\label{eq:print} \textbf{PRINT} \ \text{key} \quad \text{prints the time, date, sample } \#, \ \text{and } \ \text{pH/mV} \ \text{values}$
- CLEAR key cancels wrong data entered during programming
- **ON** key to switch the instrument on
- **OFF** key to switch the instrument off.
- DATE key allows to display the month and day or time in hours and minutes

RANGE key	selects pH or mV readings to be displayed on the right LCD				
CAL key	to enter into the calibration mode				
CON key	for confirmation of buffer value during calibration				
+ / - key	select + o	r - value for manual temperature compensation			
TEMP key	allows to	select temperature manually when the			
1	temperatu	ture probe is not connected			
PGM kev	selects any	v of the 9 available programs			
0 to 9 kevs	numeric a	nd Decimal keys for numeric data input			
SPECIFICAT		HI9318			
Kanges	рн	0.00 to 14.00 0 to -+ 299.9 mV			
		0.10 ± 377.7 IIIV 0 to ± 1999 mV			
	۰۲ ۲	-10.0 to 125.0			
Resolution	nH	0.01			
	ISE	0.1mV			
	ORP	1 mV			
	°C	0.1			
Accuracy	рН	±0.01			
(@20°C/68	°F) ÍSE	\pm 0.2 mV			
	ORP	$\pm 1 \text{ mV}$			
	°C	± 0.5			
Typical EMC	рН	± 0.04			
Deviation	ISE	$\pm 2.5 \text{ mV}$			
	ORP	$\pm 3 \text{ mV}$			
	ຶເ	±1.5			
Calibration		Automatic at pH 4, 7, 10 or at any two			
0.00		butter values with program 2			
Uffset		±1pH			
Slope		From 85 to 105%			
Input Imped	lance	10 ¹² Ohm			
Temperatur	е	-10° to 125°C (14 to 257°F) completely			
Compensation		automatic with HI 7669/2W temp. probe;			
		manual by means of keyboard			
Display		2 large 4 digit LCDs for pH/mV and			
		Temperature with symbols and one			
Distant					
Printer	1	Dof matrix, 44mm wide paper			
Power Supp	IY	Power socket for 12VUL			
Languages		English, German, French, Spanish, Italian & Swadish			
Electrode		HI1121B Class body combination			
LICUIUUE		nH electrode (included)			
Temperatur	e Prohe	HI7669/2W Temperature probe (included)			
Environmen	+	$0 \text{ to } 50^\circ \text{C} (32 \text{ to } 122^\circ \text{E})$. DH 0.50%			
Dimensions	I	230 x 170 x 70mm (9 1 x 6 7 x 2 7")			
Woight		2.00 x 170 x 7011111 (7.1 x 0.7 x 2.7)			
weigili		i.jky (z.7 id.); nii: 3.4 ny (7.41d.)			

REAR PANEL CONNECTIONS



- BNC male connector for single or combination electrode. Will accept any pH or ORP electrode with a standard BNC connector.
- 2) Jack bush connector for reference electrode
- 3) Banana bush connector for reference electrode

When the electrode attached to the BNC does not have a reference, connect the reference to one of these sockets (2 choices for different diameters).

- 4) Temperature probe socket for use with the HI7669/2W.
- 5) Reset button.
- 6) RS 232C socket for serial communication.
- 7) DC Power Socket (for HI710005 or HI710006).

Electrode and probe connections

For combination **pH (or ORP for HI9017 and HI9318)** electrodes (with internal reference) plug the electrode's BNC to the socket provided (#1).

For electrode with separate reference (see page 58), connect the measuring electrode's BNC to the BNC socket (#1) and the reference electrode's jack to the socket provided (#2 or #3).

For **temperature** measurements and automatic temperature compensation connect the temperature probe to the $^{\circ}C$ socket (#4).

RESET button

The RESET button (#5) is used when the instrument displays erroneous messages due to strong electrical interference or when the instrument's power supply was disconnected before the meter was switched off. Press the RESET button and restart the entire operation.

Power connection

Plug the 12VDC adapter (HI710005 or HI710006) into the DC socket (#7).

Plug the adapter into the mains.

Note: The instrument uses the following configuration.



It is recommendable to use the Hanna **HI7710005** or **HI710006** voltage adapters (supplied witht the meters) that use the proper polarity configuration.

The meters can also be used with other adapters. In this case, remember to check the correct polarity of your adapter before connecting it to the meter.

Note: Make sure the main line is protected by a fuse.

Note: HI9017, HI9218, HI9219, HI9318 use a rechargeable battery to retain the pH calibration data only. It lasts approximately one month when fully charged. The battery is automatically charged any time the meter is plugged-in (either turned on or off).

Notes:

- If you need to unplug the instrument, press the OFF key before disconnecting the meter from the mains. Only in this case will the instrument retain the memorized data. Otherwise, the instrument needs to be re-calibrated. In the case of a power failure while the instrument is operational, re-calibration is required.
- 2) When the instrument is initially switched on, the microprocessor checks if any calibration data is in memory (i.e. if the offset is within ± 1 pH and the slope between 70 105%). If the calibration data are not memorized, the offset and slope of the instrument will be set to 0 mV and 100% respectively.

OPERATIONAL GUIDE

TAKING PH MEASUREMENTS

Make sure that the instrument has been calibrated for pH before taking pH measurements (see page 18).

Connect the pH electrode (combination-type) or the electrode half cells to the appropriate connectors on the rear panel (see page 11).

If automatic temperature compensation is required, connect the HI7669/2W temperature probe to the proper socket on the rear panel (see page 11).

Press the ON key to turn the meter on. The meter will automatically default to the pH measurement mode.

Immerse the electrode and the temperature probe in the sample and shake briefly. Wait for 30 seconds before taking readings.



Press READY: "YES" confirms the reading is stable.



ON

The LCD on the right shows the pH reading compensated for temperature. The temperature reading is displayed on the LCD on the left.



Note: the electrode should be submerged approximately 4cm (11/2") into the solution.



If the temperature probe is used, it should be located as close to the pH electrode as possible.

If measurements are taken in different samples successively, it is recommended that the electrode is rinsed thoroughly for better conditioning and to eliminate cross-contamination of the sample. For the rinsing process, it is recommended to use a liberal amount of the next solution to be measured.

Using refillable electrodes

Unscrew the small refill cap to open the refill hole during measurements. After measurements replace the refill hole cap.

This will increase the pressure and give a faster response.



FOR HI 9218, HI 9219, HI 9318 ONLY

Press the PRINT key to get a printout at any time. All the printouts will be complete with date, time, sample No. (for **HI9318** only), temperature and pH (or mV with HI9318 only) value.

DATE : 01-02-96	DA
TIME : 12:21 Hr	T
°C : 17.9	SA
рН : 7.18	٥(
	pł

DATE	1/02
TIME	12:21
SAMPLE	1
°C	17.9
рH	7.18

HI9318

PRINT

НІ9218/НІ9219

Sample Printouts

MANUAL TEMPERATURE COMPENSATION

When the temperature probe is not connected, take the temperature of the solution with a **ChecktempC** or a glass thermometer.

FOR HI 9017 ONLY

To manually set a temperature value (e.g. 37.2°C) proceed as follows:



- press 3press 7
- press the key displaying decimal point "."
- press 2
- press TEMP



With negative temperature values (e.g. -7.3°C) use the +/- key

- press 7
- press decimal point
- press 3
- press +/-
- press TEMP



Notes:

- 1) For negative value inputs, always key in the value followed by the +/- key.
- 2) If the +/- key is pressed twice it will toggle back to the positive value.

The value will be displayed on the left LCD and " $^{\circ}\mathrm{C}$ " symbol will be flashing.

FOR HI 9218 AND HI 9219 ONLY

Use the UP or DOWN keys to manually adjust the display reading to the value of the **ChecktempC** or the glass thermometer (e.g. 20° C). The value will be displayed on the left LCD and "°C" symbol will be flashing.



FOR HI 9318 ONLY

Press the +/- key (for negative figures) followed by the noted temperature on the numeric keypad (e.g. 20° C). The value will be displayed on the small LCD. Then^{°C} press the TEMP. key and the manually set temperature will be displayed on the left LCD with the "°C" symbol blinking.



Note: with the temperature probe connected, the "°C" symbol is displayed continuously and it is not possible to manually set the temperature.

TAKING TEMPERATURE MEASUREMENTS

Taking a temperature measurement is very easy. Turn the instrument ON.

Make sure the temperature probe is connected and

allow the reading to stabilize (1 or 2 minutes).

The temperature value will be displayed on the left LCD.



TAKING ORP MEASUREMENTS (FOR HI 9017 AND HI 9318 ONLY)

HI9017 and HI9318 have the capability to take ORP measurements, using an ORP electrode. Hanna Instruments offers a variety of ORP electrodes for this purpose (see page 59). Contact your Dealer for more information.

Just as pH measurements allow the acidity or the alkalinity of a substance to be expressed in numbers, oxidation-

reduction potential (redox) measurements provide the quantification of the oxidizing or reducing power of any liquid.



Connect the ORP electrode to the meter and sub-

merge the tip $(4 \text{ cm} / 1\frac{1}{2}")$ into the sample to be tested.

Note: ORP measurements are taken without temperature compensation.

Press the RANGE key once to enter the mV mode. Allow a few minutes for the reading to stabilize. The display will indicate the absolute mV value (positive or negative).



(positive or negative). When values are less than ± 400 mV, tenths of 10^{mV} mV, the decimal digit disappears.



Note that the change in scale (from 0.1 mV to 1 mV as resolution) is automatic.

"Err2" appears if the value exceeds ± 1999 mV $\vec{z} \in \vec{z}$ (out of range).



<u>FOR HI 9318 ONLY</u>

Press PRINT key to get a printout at any time. All the printouts will be complete with date, time, sample No., temperature and mV value.

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~					
DATE	1/02				
TIME	12:40				
SAMPLE	5				
°C	20.5				
mV	-350.0				

### AFTER MEASUREMENTS

Press the OFF key to switch the instrument OFF.

See page 50 for storage, cleaning and maintenance procedures for electrodes.



OFF

### **PH CALIBRATION**

### **IMPORTANT**

The instrument's pH range should be re-calibrated:

- When the meter is new.
- Whenever the pH electrode is replaced.
- At least once a month.
- After testing aggressive chemicals.
- After cleaning procedure and changing the reference electrolyte.
- For greatest accuracy.

### **INITIAL PREPARATION**

Pour small quantities (about 4cm / 1½" as level) of pH7.01 (HI7007 or HI8007) and pH4.01 (HI7004 or HI8004) or pH 10.01 (HI7010 or HI8010) solution into clean beakers. If possible use plastic beakers to minimize any EMC interferences.



If you are measuring in the acid range use pH4.01 as second buffer or pH 10.01 if you are measuring in the alkaline range.

Note: with H19017 and H19318, different pH values can be selected for calibration purposes. See page 29 and 39 respectively.

For accurate calibration, use two beakers for each buffer solution; the first for rinsing the electrode, the second for calibration. In this way, contamination of the buffer is minimized.



#### PH CALIBRATION FOR HI 9017

Procedure

• Switch the instrument on after connecting the pH electrode and the temperature probe.



• Immerse the pH electrode and the ATC probe into pH7.01 buffer solution. Shake briefly and wait 1-2 minutes for thermal equilibrium.



CAL

- **Note:** the electrode should be submerged approximately 4 cm (1½") into the solution. The temperature probe should be positioned as close to the pH electrode as possible.
- Press the CAL key. The temperature compensated value of the buffer solution will appear on the left LCD and the pH symbol will be blinking.

E.g. if the buffer temperature is at 25°C, the display on the right will show "pH7.01". If the buffer temperature is at 20°C, the display will show "pH 7.03" (see page26).

If a wrong buffer is used or the electrode is faulty, "Err4" will appear on the left display.

• Allow 1-2 minutes for the pH reading to stabilize.

Note: If you are not using the ATC probe, refer to page 25 to manually correct for temperature.

Press the CON key to accept the buffer value.
"Err5" will appear on the left display and the buffer value will be transferred to the right LCD.
The first point calibration is now complete.

**Note:** If a single point calibration is required, press the CAL key to leave the calibration mode. However, it is always better to proceed as follows for a 2-point calibration.

• Rinse the electrode and the temperature probe before immersing them into pH 4.01 or pH10.01 calibration buffer, shake briefly and wait for thermal equilibrium.



At this moment, "Err5" will disappear. The display will show the temperature compensated value of the second buffer solution and the pH symbol will be blinking.



If a wrong buffer or a faulty electrode has been used, "Err5" remains on the left display.

CON

• Press the CON key to confirm the pH value. The left display value is then transferred to the right display. The left LCD will show the temperature value to indicate that the meter is now calibrated.

- Note: The display on the left will indicate the temperature compensated buffer value e.g. if the temperature is at 25°C, the display will show "pH 4.01" or "pH 10.01", depending on the solution used. If the temperature is at 20°C, the display will show respectively "pH 4.00" or "pH 10.06" (see page 26).
- **Note:** During calibration the pH symbol blinks on the left display, and the right display always shows the measured value.

### PH CALIBRATION FOR HI9218 & HI9219

#### Procedure

- Turn the instrument ON after connecting the pH ______ electrode and the temperature probe.
- Immerse the temperature probe together with the electrode into pH 7.01 buffer solution or manually set the temperature to the temperature of the buffer (if you are not using the temperature probe HI7669/2W see page 25).
- Note: the electrode should be submerged approximately 4 cm  $(1\frac{1}{2}")$  into the solution. The temperature probe should be positioned as close to the pH electrode as possible.
- Shake briefly and then press the CAL button.



ON

The printer will print this step by step procedure instructions.

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Dip electrode
in the pH 7
solution, wait
for 'YES' to
appear and then
press CFM

At the same time, the pH symbol will flash to indicate calibration is in progress.





The temperature compensated pH value will be displayed. "Err4" appears if the electrode is in the wrong buffer.



• After about 30 seconds, the small display will show "YES": press the CFM key to confirm the calibration.

The LCD will show "Err5" to indicate that the electrode is now ready for slope calibration and another step of instruction procedures will be printed.



• Rinse and immerse the pH electrode and temperature probe in pH 4.01 or pH10.01 solution.

The LCD shows the corresponding buffer value at the working temperature. If "Err5" does not disappear this means that the buffer is not recognized as pH4 or pH10.





- After about 30 seconds, the small LCD confirms the reading by displaying "YES".
- Press the CFM key and the printer will confirm that the pH calibration is completed.

Calibration is now completed.

PH CALIBRATION FOR HI9318

<u>Procedure</u>

- Switch the instrument on after connecting the electrode and temperature probe.
- Immerse the pH electrode and the ATC probe into pH 7.01 buffer solution. Shake briefly and wait 1-2 minutes for thermal equilibrium.



ON

- Note: the electrode should be submerged approxi
 - mately 4 cm $(1\frac{1}{2})$ into the solution. The temperature probe should be positioned as close to the pH electrode as possible.
- Press the CAL key.



The printer will then print step by step instructions for the calibration procedure.

Dip the electrode in the pH 7 solution; wait 30 sec and then press CON

At the same time, the pH symbol will flash to indicate that calibration is in progress. The pH value at the measured (or manually) adjusted temperature will be displayed (see page 26). If "Err4" appears on the display it means the electrode is in the wrong buffer. Check to make sure that the electrode is in the pH 7.01 beaker and wait for the "Err4" to disappear.

• After approximately 30 seconds, press the CON key to confirm the calibration.

The printer will print further instructions for the calibration procedure.



Now dip the electrode in 2nd solution, wait 30 sec and then press CON The LCD will show "Err5" to indicate that the electrode is now ready for slope calibration.



The calibration is now complete.

CALIBRATION WITH MANUAL TEMPERATURE COMPEN-SATION

If for some reason the temperature probe is defective, or it is required to calibrate with manual temperature compensation, follow the procedure below:

- Unplug the temperature probe from the meter.
- Note the temperature of the buffer with a **ChecktempC** or a glass thermometer.



For HI9017 only

To manually set a temperature value (e.g. 20.0°C) proceed as follows:

- press 2 key
- press 0 key
- press TEMP key.



The value will be displayed on the left LCD and $"^{\circ}\text{C"}$ symbol will be flashing.

• For HI9218 and HI9219 only

Use the UP or DOWN keys to manually adjust the display reading to the value of the reference thermometer (e.g. 20° C). The value will be displayed on the left LCD and "°C" symbol will be flashing.



• For HI9318 only

Press the +/- key (for eventual negative figures) followed by the noted temperature on the numeric keypad. The value will be displayed on the small LCD. Then press the TEMP key and the manually set temperature will be displayed on the right LCD with the "°C" symbol blinking.



• Follow the calibration procedure as for pH calibration with temperature probe connected (see page 18 for HI9017 or page 21 for HI9218/HI9219 or page 23 for HI9318).

PH VALUES AT VARIOUS TEMPERATURE

The calibration buffer solutions are effected by temperature changes to a lesser degree than normal solutions.

	nH Buffers			
HI9017 and program $#2$ for HI9318) please refer to the following chart.				
When manually entering the calibration values (see program $\#1$ fo				
0				

			р	H Butters	1 Butters		
°C	°F	4.01	6.86	7.01	9.18	10.01	
0	32	4.01	6.98	7.13	9.46	10.32	
5	41	4.00	6.95	7.10	9.39	10.24	
10	50	4.00	6.92	7.07	9.33	10.18	
15	59	4.00	6.90	7.04	9.27	10.12	
20	68	4.00	6.88	7.03	9.22	10.06	
25	77	4.01	6.86	7.01	9.18	10.01	
30	86	4.02	6.85	7.00	9.14	9.96	
35	95	4.03	6.84	6.99	9.10	9.92	
40	104	4.04	6.84	6.98	9.07	9.88	
45	113	4.05	6.83	6.98	9.04	9.85	
50	122	4.06	6.83	6.98	9.01	9.82	
55	131	4.07	6.84	6.98	8.99	9.79	
60	140	4.09	6.84	6.98	8.97	9.77	
65	149	4.11	6.85	6.99	8.95	9.76	
70	158	4.12	6.85	6.99	8.93	9.75	
75	167	4.14	6.86	6.99	8.91	9.74	
80	176	4.16	6.86	7.01	8.89	9.73	
85	185	4.17	6.87	7.02	8.87	9.74	
90	194	4.19	6.88	7.03	8.85	9.75	
95	203	4.20	6.89	7.04	8.83	9.76	

When using automatic calibration, the appropriate value will be displayed. For instance, if the buffer temperature is at 25° C, the display will show "pH 4.01" or "7.01" or "10.01". If the buffer temperature is at 20° C, the display will show "pH 4.00"/"7.03"/"10.06". If the buffer temperature is at 50° C, the display will show pH "4.06"/"6.98"/"9.82".

TEMPERATURE CALIBRATION

All Hanna bench-top meters have been accurately pre-calibrated in temperature at the factory.

We recommend that you have your bench-top meters re-calibrated in temperature once a year. Your nearest Hanna Service Center is available to quickly service your meter. Contact your Dealer or the nearest Hanna Service Center for more information.

HOW TO SET DATE AND TIME (HI 9218 & HI 9219)

Press the PRINT key to get a printout of date and time. If you want to change them, proceed as follows.

To set the date, press and hold	MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
the DATE key.	Press UP or DOWN
,	key to set
	year, or press
	DATE key again
L AL	to continue
1	Press UP or DOWN
	logge to got

The meter will give all instructions to set this function.

Press UP or DOWN key to set year, or press DATE key again to continue Press UP or DOWN key to set month, or press DATE key again to continue Press UP or DOWN key to set

day, or press DATE to end DATE: 21-01-96

DD-MM-YY



PROGRAMS OF HI9017



There are all together 6 programs in the instrument. To select a particular program, press the program number on the numeric keyboard followed by the PGM key.

E.g. To select program 1

• press 1

• press PGM



x refers to program number that you had pressed and y refers to ENTER A or ENTER B). The right display always shows the measured value of pH or mV depending on the selected range.

Whenever a numeric value is entered, the entry appears on the left display. There will be a long beep after either ENTER A or ENTER B is pressed, when the entered value is either wrong or not acceptable by the particular program.



The 6 programs stored in the instrument are:

Program 1: To manually enter calibration buffer values

Program 2: To set upper and lower pH alarm limits

Program 3: To set upper and lower mV alarm limits

Program 4: To set upper and lower temperature alarm limits

Program 5: To set end point and alert value pH alarms

Program 6: To set RS232C Esc code (Default value is 16 decimal)

To stop or exit any program:

- press 0
- press PGM



Note: the instrument must be in pH mode for program 1, 2 and 5.

Likewise the instrument must be in mV mode for program 3. Otherwise a long beep will sound.

PROGRAM # 1 (HI 9017)

Setting of calibration buffer values other than those already memorized (pH 4, 7 and 10), e.g. pH 6.86 (HI7006 or HI8006) and pH 9.18 (HI7009 or HI8009):

- set the instrument to the pH mode
- press 1

• press PGM

At this stage, the left display shows "P1-1", and the



right display shows the measured pH value.

Dip the electrode and the temperature probe into **H17006** or **H18006** (pH6.86) buffer solution. Wait for 30 seconds. Check the appropriate value for the buffer at the measured buffer temperature from standard charts (see page 26).



RANGE

e.g. 6.95 at 5°C:

- press 6
- press decimal point
- press 9
- press 5
- press ENTER A



Value 6.95 appears on the left display with pH symbol blinking. If there is a difference of 1 pH between the two displays, there will be a long beep.

Otherwise,



The left display value is transferred to the right display and the left display shows "P1-2".

Rinse the electrode and dip it with the temperature probe into the second solution **HI7009** or **HI8009** (pH 9.18), the value of which for example is 9.39 at 5°C (read from the standard charts). Wait for 30 seconds.



CON

- press 9
- press decimal point
- press 3
- press 9
- press ENTER B



The value "9.39" appears on the left display with a blinking pH symbol. If there is a difference of 1 pH between the two displays, there is a long beep.

Otherwise,

• press the CON key.

CON

The left display value is transferred to the right display and the left display shows the temperature value.

|--|--|--|

The instrument is now completely calibrated and switches back to the normal operating mode.

Notes:

Oľ

- If you wish to calibrate the instrument with the offset only, exit the program by pressing 0 and PGM keys after the first CON key is pressed.
- The instrument accepts any 2 buffers provided the difference between the buffer values is at least 2 pH units. Any buffer can be used first.
- E.g. pH 4.01 (HI7004 or HI8004) and pH10.01 (HI7010 or HI8010)
 - pH 4.01(H17004 or H18004) and pH6.86 (H17006 or H18006)

PROGRAM # 2 (HI 9017)

Setting the upper and lower pH alarm limits.

When either limit is reached, the alarm will be activated and the value will flash simultaneously.



CLEAR

When the CLEAR key is pressed, the alarm will be deactivated while the value will remain flashing. To stop:

- press 0
- press PGM.



E.g. activation of alarm for values higher than 9.32 and lower than pH 6.03.

- set the instrument to the pH mode
- press 2
- press PGM

At this stage, the left display shows "P2-1", and the right display shows the measured pH value.



PROGRAM # 3 (HI 9017)

Setting of upper and lower mV alarm limits.

When either limit is reached, the alarm will be activated and the value will flash simultaneously.



When the $\ensuremath{\mathsf{CLEAR}}$ key is pressed, the alarm

will be deactivated.

For negative values:

e.g. -100.9 mV and -500mV, -100.9 mV should be treated as larger than -500mV.

To stop:



E.g. activation of alarm for values higher than 500 mV and lower than -20.3 mV.



At this stage, the left display shows "P3-1", and the right display mV value.



• press decimal point

• press 3

• press +/-

• press ENTER B.



<u>PROGRAM # 4 (HI 9017)</u>

Setting of upper and lower temperature alarm limits.

When either limit is reached, the alarm will be activated and the value will flash simultaneously.



When the CLEAR key is pressed, the alarm will be deactivated while the value will remain flashing.





E.g. activation of alarm for values higher than 49.3 $^{\circ}\mathrm{C}$ and lower than -6.3 $^{\circ}\mathrm{C}.$

• press 4

• press PGM.



At this stage, the left display shows "P4-1".

- press 4
- press 9
- press decimal point
- press 3



The left display then shows "P4-2".

- press 6
- press decimal point
- press 3
- press +/-
- press ENTER B



PROGRAM # 5 (HI 9017)

Setting of endpoint and alert pH alarm values.

When the alert value is reached i.e. between the final value and the alert value, there will be a single alert beep.

) pH

CLEAR

When the endpoint value is reached, the alarm will be activated continuously and the value will simultaneously flash.

To clear the alert or alarm, press the CLEAR key.

To stop:



• press PGM.



E.g. activation of alarm for an endpoint value of pH 9.32 and alert value of pH 9.03.



At this stage, the left display shows "P5-1" and the right display shows the measured pH value.

- press 9
- press decimal point
- press 3
- press 2
- press ENTER A.



The left display then shows "P5-2".

• press 9

• press decimal point

press 0

• press 3

• press ENTER B.



Setting of RS232C ESC code.

E.g. ESC code is 20 (decimal).

• press 6

• press PGM.



• press 2

• press 0

• press ENTER A.



Note: the ESC code should be between 0 - 127 decimal, the default is 16.

PROGRAMMING LOGGER FUNCTIONS OF H19318

The following section explains how each of the HI 9318's logging programs work.

Each program has up to 3 functions defined by the A, B and C key. For program #4, #5 and #6 only, you can log pH or mV values depending on the RANGE key selection.

PROGRAM #1 (HI9318)

This program allows the user to set sample number, time and date. Values entered into program 1 are kept in memory even when programs 2 to 9 are used.

To enter program 1:

1) Push the 1 key and then the PGM key. The printer will then define



the three functions: **A** is the sample number, **B** is time, **C** is the date.

A set sample no. B set time C set date

 To set the sample number (A) choose any number from 1 to 999. Push the desired number followed by the A key and the printer prints the value.

Samples after 999 will be reset to zero and the sample number will automatically advance from 0 to 999 in increments of 1, each time the instrument logs and/or prints a reading.

E.g. sample number 200





3) The time value (B) can be set for a 24 hour clock. 2 P.M., for example equals 14.00. Push "14.00" followed by "B".



\sim	$\sim \sim \sim$	~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
PR	OGRA	AM 1	
A	set	sample	no.
В	set	time	
С	set	date	
Sa Ti	mple .me	e numbei	200
			14.00
\mathbb{L}	\sim	~~~~~	سسسا

4) When setting the date (C), enter the month first. Separate month and day with a decimal point. E.g. February 4th is entered as "2.04" followed by "C".



PROGRAM #2 (HI9318)

This program lets you calibrate with buffer values other than 4, 7 and 10 pH which are pre-programmed into memory.

To enter program 2, press the 2 key and then the PGM key.



The buffers can be anywhere between 0 and 14 pH.

Example:

To calibrate with NBS buffers 6.86 pH and 9.18 pH at a temperature of $10^\circ\text{C}.$

The corresponding pH values at this temperature are 6.92 and 9.33 respectively.

Immerse the pH electrode and the temperature probe into the 1st buffer (e.g. pH 6.86).



PG/

Check the appropriate value for the buffer at the measured buffer temperature (see page 26).

After about 30 seconds enter the 1st buffer value at the working temperature followed by "A". E.g. 6.92 (at 10° C).





Check the appropriate value for the buffer at the measured buffer temperature (see page 26).

After about 30 seconds enter the 2nd buffer value at the working temperature and then press "B". E.g. 9.33 (at 10° C).



Press the O key followed by the PGM key. The calibration is now complete.

PROGRAM #3 (HI9318)

9

This program prints the date, time, the offset and slope characteristics of the pH electrode.

Note: the offset and the slope characteristics of the electrode are referred to the last performed pH calibration.

No programming is required. Simply press the 3 key and the PGM 3 key.



Changes in an electrode's performance can be determined from this information.

If the electrode's offset is within 0.50 pH and 1.00 pH or -0.50 pH and -1.00 pH, it indicates contamination. If the value exceeds ± 1

nH the electrode should be	the electrode should be		
pri nic ciccitode snooid be	PROGRAM 3		
replacea.	DATE	2/04	
The slope characteristic is in	TIME	14:04	
percentage of the theoreti-	OFFSET	0.16	
cal value of 58.16 mV per	SLOPE	95.3%	
pH unit at 20°C.	۱		

PROGRAM # 4 (HI9318)

This program logs and prints pH/mV and temperature values at a preset interval between 1 minute and 24 hours.

To enter the program press the 4 key and the PGM key.



A, B and C:

The printout defines functions PROGRAM 4 **A** is a start time, A enter start

B is the time interval.

C is the finish time.

Hours and minutes must be separated by a decimal point.

The minimum time interval is

time B enter time interval C enter end time

1 minute.

E.g. Starting time 10:20, finishing time 11:30 with a printout interval of 5 minutes.



the end time, press the O key plus the PGM key.

PROGRAM #5 (HI9318)

This is the same as program 4 except that function "C" allows you to select an interrupt value for pH/mV instead of end time.

When this interrupt value is exceeded, the program prints the hour and minute of the endpoint.

To enter the program press the 5 key plus the PGM key.

5 PGV

The printout defines functions A, B and C:

A is a start time, B is the time interval,	PROGRAM 5
C is the interrupt value of pH/mV.	A enter start time
Hours and minutes must be separated by a decimal	B enter time in- terval
point. The minimum time in- terval is 1 minute.	C enter end pH/mV value

E.g. Starting time 10:30, a printout interval of 1h and 30 minutes, pH interruption value 3.50.



If you need to interrupt the program before the endpoint is reached, press the 0 key plus the PGM key or enter into any other program.

PROGRAM #6 (HI9318)

To enter the program press the 6 key plus the PGM key.



This program allows you to set upper and lower limits for pH/mV values. A beeper will sound whenever the measured value exceeds the limit.

PROGRAM 6 A set lower limit B set upper limit C clear alarm

E.g. lower limit 6.5, upper limit 7.5.



To stop the beeper from sounding when the limit is exceeded, press the ${\sf C}$ key.

To definitely exit the program press the 0 plus the PGM key.

<u>PROGRAM #7 (HI9318)</u>

This program allows the user to select a different working language.

Press the 7 key and then the PGM 7 (key.



March 100 March

PROGRAM 7 The printer will print out a list of languages available. A select the lan-The default working language: guage is English. 1. English To choose a language, key 2. Deutch in the corresponding num-3. Français 4. Español ber then press the A key. 5. Italiano E.g. how to select French. 6. Svenska 3 Français ~~~~~~~~~~~

Press the PRINT key and the printout will be in French.



	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
DATE (M/J)	2/04
HEURE	10.20
ECHANTILLON	215
°C	20.0
рH	6.52

### PROGRAM #8 (HI9318)

This program prints out the ion concentration in  $\ensuremath{\mathsf{M}}$  for the pH value measured.



To activate the program, press the 8 key and then the PGM key.

······	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
PROGRAM	8
3.88	pH
0.132	mM H+

8

Note: Make sure the meter is in pH mode, otherwise a long beep will be heard.

#### PROGRAM #9 (HI9318)

For more details see "Interface with computer" section on page 46.

Press the 9 key and then the PGM key.



Enter the ASCII Code of the desired prefix character and then press the

A key. E.g. 64 6 A enter ASCII code for escape character



44

## TROUBLESHOOTING GUIDE

Symptoms are:	The problem is:	Possible Solutions:
The instrument does not work with the ATC probe.	A defective ATC probe	Replace the probe.
The meter fails to calibrate or gives er- roneous results.	A defective pH elec- trode	Replace the electrode and repeat the pH cali- bration
The meter is slow in responding or gives erroneous readouts	The electrode is not working or the dia- phragm is clogged	Leave the electrode in a storage solution after cleaning the junction. If the problem is not solved, replace the electrode and re- calibrate the pH scale.
The meter does not accept the 2nd buffer solution	A defective pH elec- trode	Try the cleaning procedure. If this does not work, re- place the electrode.
The reading drifts	A defective pH electrode	Replace the electrode.
"Err1" on the display	Out of range on the pH scale	a) Verify the pH electrode is connected. b) Make sure the sample's pH is included between 0 and 14 c) Check the level of the electrode's filling electro- lyte and the state of the electrode itself.
"Err2" on the display (for H19017 and H19318 only)	Out of range in mV	<ul><li>a) Verity the pH electrode</li><li>is connected.</li><li>b) Make sure the mV is</li><li>within ±1999 range.</li></ul>
"Err3" on the display	Out of range in tem- perature	Make sure the temperature is within -10 and 125°C
"Err4" on the display	Erroneous buffer so- lution used for offset calibration Defective electrode	Make sure that the buffer solution used is pH 7 and replace if necessary. Replace the electrode and re-calibrate pH
"Err5" on the display	Erroneous buffer so- lution used for slope calibration Defective electrode	By sure the correct pH solution is being used for slope calibration. Check the electrode and
		replace if necessary.

Note: when the temperature display is showing "Err3" the pH display is always showing "Err1".

### **INTERFACE WITH COMPUTER**

Data transmission from the instrument to the PC is now much easier with the new HI92000 Windows[®] compatible application software offered by Hanna Instruments. User friendly, HI92000 offers a variety of features and has an on line help feature to support you throughout all situations.



**HI92000** allows you to use the powerful means of the most diffused spread sheet programs (e.g. Excel^{$\odot$}, Lotus 1-2-3^{$\odot$}). Simply run your favorite spread sheet and open the file downloaded by **HI92000**. It is then possible to make any elaboration available with your software (e.g. graphics, statistical analysis).

To install **HI92000** you need a 3.5" drive and few minutes to follow the instructions conveniently printed on the disk's label.

Contact your Hanna Dealer to request a copy.

To connect your Hanna Instruments bench meter to the PC use **H1920010**, available through your Hanna Dealer. Make sure that your meter is switched off and plug the connectors, one into the meter RS232C connector, the other into the serial port of your PC.

**Note:** Cables different from the **HI920010** may use a different configuration. In such case any communication between the meter and the PC is not possible.

#### SETTING THE BAUD RATE

The transmission speed (baud rate) of the meter and the external device must be identical. The meter is factory set to 1200.

If you wish to change this value, please contact your nearest Hanna Center.

#### SENDING COMMANDS FROM PC

With terminal programs such as, for example, Telix[®], Windows Terminal[®], it is possible to remotely control your Hanna Instruments bench meter. Use **HI920010** cable to connect the meter to the PC, start the terminal program and set the communication options as follows: 8, N, 1, no flow control.

#### **COMMAND TYPES**

To send a command to the pH meter the scheme is:

<DLE> < command> < CR>

Excel® Copyright of "Nicrosoft Co." Lotus 1-2-3® Copyright of "Lotus Co." Windows:® and Windows Terminal ® are registered Trademark of "Microsoft Co." TELIX® is registered Trademark of "Deltacomm" This line makes the computer send a Data Link Escape character (the command expressed as a number or a 3-character sequence) and a CR character.

Note: Windows Terminal[®] and all the other terminal programs that support the ANSI escape sequence, represent the DLE character by the string '  $^{\circ}$  P' and the CR character by the string '  $^{\circ}$  M'. E.g. the line '  $^{\circ}$  PPHR  $^{\circ}$  M' sets the range to pH.

#### TYPE OF COMMANDS

#### Commands not requiring an answer from the pH meter.

- PHR sets the range to pH
- MVR sets the range to mV

#### Commands requiring an answer:

PH? Causes the pH meter to send the pH value through the serial interface. If the reading is out of range ("Err1"), "Err1" is sent instead of the pH value.

If the range is set to mV (no pH reading available), "Err6" is sent (for H19218 and H19219 only).

- MV? Causes the pH meter to send the mV value through the serial interface. If the reading is out of range ("Err2"), "Err2" is sent; if the range is set to pH, "Err6" is sent.
- TM? Causes the pH meter to send the temperature value. If this is out of range, an "Err3" signal is sent instead.
- For **HI9218**, **HI9219** and **HI9318** only:
- HM? This orders the pH meter to send the time value (in hours and minutes), A 5-character string is sent in HH.MM format.
- MD? This orders the pH meter to send the data value (in months and days). A 5 character string is sent in MM.DD format.

These commands may be sent with either capital or small letters. The characters sent by the meter are always capital letters.

#### For HI9318 only:

- a) Numerical data: a command line containing figures , the minus sign and the decimal point will be interpreted by the pH meter as if that number was sent by means of the keyboard. The maximum number of figures allowed is 4.
- b) Commands which do not require a response by the pH meter:
- CAL is equivalent to pressing the CAL key
- CON is equivalent to pressing the CON key
- AKY is equivalent to pressing the A key

Windows Terminal ® is registered Trademark of "Microsoft Co."

- BKY is equivalent to the B key
- CKY is equivalent to pressing the C key
- PGM is equivalent to pressing the PGM key
- TEM is equivalent to pressing the TEMP key
- PRT is equivalent to pressing the PRINT key
- CLR is equivalent to pressing the CLEAR key
- PHR brings the instrument into pH measurement range
- MVR brings the instrument into the mV measurement range
- PAP causes the paper to advance by one tenth of a line. In order to advance the paper by one entire line, send a RETURN character.
- TIM causes the time to be shown on the date/time display
- DAT causes the date to be shown on the date/time display
- CHP sets the printer in the character printout mode
- PPR sets the printer in the graph printout mode
- KBS after this command, the keys pressed on the pH keyboard are no longer recognized by the pH meter itself, but instead provoke the transmission of a string to the host computer. Only the OFF and the PAPER keys retain their proper functions. In this way, the keyboard may also function as an input device to the host computer, as well as command the pH meter. Naturally the pH meter continues to obey the commands which

are equivalent to the keys pressed and sent by means of serial interface.

KBU cancels the KBS command

The 4 commands IDL, SEP, SEV and RV? are reserved for future use and are not described here.

#### **INTERFACE WITH PC**

If you are not using Hanna Instruments **H192000** application software, please find here below some additional information to help your connection to the PC.

#### HOW TO CHANGE THE COMMAND PREFIX CHARACTERS (FOR HI9017 & HI9318 ONLY)

It is sometimes necessary to change the character used to indicate that a command is to follow.

If the computer connection already makes use of DLE of other functions, its use as a prefix for "c"-type commands may cause problems to the operating system.

In order to change the prefix character run program #6 for **H19017**, by pressing the 6 key and then the PGM key or run program #9 for

HI9318 by pressing the 9 key and then the PGM key.

Enter the ASCII Code of the desired prefix character and then press the ENTER A key for **HI9017** or the A key for **HI9318**.

It is advisable to use a control character as a prefix (not RETURN, which already performs other functions) or a non-control character which is not being used for other purposes, for example the "@" sign (ASCII Code64).

#### MORE ABOUT KBS COMMAND (FOR HI9318 ONLY)

The KBS Command (KeyBoard Send) disconnects the keyboard from the pH meter and connects it to the RS 232C interface.

Whenever a key is pressed on the keyboard, a string of characters which represents the key itself is sent by means of interface, followed by a RETURN character.

The strings corresponding to the various keys are the following:

- the figures from 0 to 9 for the numbered keys;
- the minus sign (-) for the +/- key;
- the full stop (.) for the decimal point.

The other keys (CAL, CON, A, B, C, DATE, RANGE, PGM, TEMP, PRINT and CLEAR) are represented by their own abbreviations.

The OFF and PAPER keys maintain their own functions and are not sent to the computer.

#### **<u>GRAPHIC PRINTOUT</u>** (FOR HI9318 ONLY)

The HI 9318 printer may also be programmed for graphic mode printing for the reproduction of bit graphs and maps: every 16 bytes of data received from the pH meter produce an elementary line of dots rather than a line of text.

In order to print one or more lines of dots (96 dots per line), the computer must first send the PPR command to set the printer in the graphic mode, then:

- divide the 96-dot line into 16 segments of 6 dots long,
- interpret each segment as a binary number (the left most dot will be the most significant bit),
- add hexadecimal 20 or decimal 32 to each binary number and
- send the 16 numbers as 16 characters.

### ELECTRODE CONDITIONING AND MAINTENANCE



### **PREPARATION**

Remove the protective cap.

DO NOT BE ALARMED IF ANY SALT DEPOSITS ARE PRESENT.

This is normal with electrodes and they will disappear when rinsed with water.

During transport tiny bubbles of air may have formed inside the glass bulb. The electrode cannot function properly under these conditions. These bubbles can be removed by "shaking down" the electrode as you would do with a glass thermometer.

If the bulb and/or junction are dry, soak the electrode in **H170300** or **H180300** Storage Solution for at least one hour.

### For refillable electrodes:

If the filling solution (electrolyte) is more than 1 cm (1/2") below the fill hole, add HI7082 or HI8082 3,5M KCI Electrolyte Solution for double junction or HI7071 or HI8071 3,5M KCI + AgCl Electrolyte Solution for single junction electrodes.

For a faster response, unscrew the fill hole screw during measurements.

#### For AmpHel electrodes:

If the electrode does not respond to  $\mathsf{pH}$  changes, the battery is run down and the electrode should be replaced.

#### **MEASUREMENT**

Rinse the electrode tip with distilled water.

Immerse the tip (4 cm  $/1\frac{1}{2}$ ") in the sample and stir gently for at least 30 seconds.

For a faster response and to avoid cross contamination of the samples, rinse the electrode tip with a few drops of the solution to be tested, before taking measurements.

#### **STORAGE**

To minimize clogging and assuring a quick response time, the glass bulb and the junction should be kept moist and not allowed to dry out. Replace the solution in the protective cap with a few drops of HI70300 or HI80300 Storage Solution or, in its absence, Filling Solution (HI7071 or HI8071 for single junction or HI7082 or HI8082 for double junction electrodes).

Follow the Preparation Procedure above before taking measurements. Note: NEVER STORE THE ELECTRODE IN DISTILLED WATER OR DRY.

#### PERIODIC MAINTENANCE

Inspect the electrode and the cable. The cable used for connection to the meter must be intact and there must be no points of broken insulation on the cable or cracks on the electrode stem or bulb. Connectors must be perfectly clean and dry.

If any scratches or cracks are present, replace the electrode.

Rinse off any salt deposits with water.

#### For refillable electrodes:

Refill the reference chamber with fresh electrolyte (HI7071 or HI8071 for single junction or HI7082 or HI8082 for double junction electrodes). Allow the electrode to stand upright for 1 hour. Follow the Storage Procedure above.

#### **CLEANING PROCEDURE**

General Soak in Hanna H17061 or H18061 General Cleaning Solution for approximately 1 hour.

Removal of films, dirt or deposits on the membrane/junction:

- *Protein* Soak in Hanna H17073 or H18073 Protein Cleaning Solution for 15 minutes.

- *Inorganic* Soak in Hanna H17074 or H18074 Inorganic Cleaning Solution for 15 minutes.

- *Oil/grease* Rinse with Hanna H17077 or H18077 Oil and Fat Cleaning Solution.

**IMPORTANT:** After performing any of the cleaning procedures rinse the electrode thoroughly with distilled water, drain and refill the reference chamber with fresh electrolyte, (not necessary for GEL filled electrodes) and soak the electrode in **HI70300 or HI80300 Storage Solution** for at least 1 hour before taking measurements.

#### **TROUBLESHOOTING**

Evaluate your electrode performance based on the following.

- Noise (Readings fluctuate up and down) could be due to:
- Clogged/Dirty Junction: Refer to the Cleaning Procedure above.
- Loss of shielding due to low electrolyte level (in refillable electrodes only): refill with fresh HI7071 or HI8071 for single junction or HI7082 or HI8082 for double junction electrodes.
- Dry Membrane/Junction: Soak in Storage Solution HI70300 or HI80300 for at least 1 hour.
- Drifting: Soak the electrode tip in warm Hanna Solution HI7082 or HI8082 for one hour and rinse tip with distilled water. Refill with fresh HI7071 or HI8071 for single junction electrodes and HI7082 or HI8082 for double junction electrodes.
- Low Slope: Refer to the cleaning procedure above.
- No Slope: Check the electrode for cracks in glass stem or bulb and replace the electrode.
- Slow Response/Excessive Drift: Soak the tip in Hanna Solution HI7061 or HI8061 for 30 minutes, rinse thoroughly in distilled water and then follow the Cleaning Procedure above.

### TEMPERATURE-RESISTANCE CORRELATION FOR HANNA pH SENSITIVE GLASS

The resistance of glass electrodes partially depends on the temperature. The lower the temperature, the higher the resistance. It takes longer time for the reading to stabilize if the resistance is higher. In addition, the response time will suffer to a greater degree at temperatures below  $10^{\circ}$ C.



Since the resistance of the pH electrode is in the range of 200 Mohm, the current across the membrane is in the pico Ampere range. Large currents can disturb the calibration of the electrode for many hours. For these reasons **high humidity environments, short circuits and** 

static discharges are detrimental for a stable pH reading.

The pH electrode's life also depends on the temperature. If constantly used at high temperatures, the electrode life is drastically reduced.

Typical Electrode Life	
Ambient Temperature	1-3 years
90 °C	Less than 4 months
120°C	Less than 1 month

High concentrations of sodium ions interfere with readings in alkaline solutions; the pH at which the interference starts to be significant depends upon the composition of the glass. This interference is the alkaline error and causes the pH to be underestimated. Hanna's glass formulations have the indicated characteristics.

### Alkaline Error

Sodium Ion Correction for the Glass at 20-25°C		
Concentration	рН	Error
0.1 Mol L ⁻¹ Na+	13.00	0.10
	13.50	0.14
	14.00	0.20
	12.50	0.10
	13.00	0.18
1.0 Mol L-1 Na+	13.50	0.29
	14.00	0.40

### ACCESSORIES

#### pH CALIBRATION SOLUTIONS

HI 70004P	pH 4.01 Buffer Sachets, 20mL, 25 pcs
HI 70007P	pH 7.01 Buffer Sachets, 20mL, 25 pcs
HI 70010P	pH 10.01 Buffer Sachets, 20mL, 25 pcs
HI 7004L	pH 4.01 Buffer Solution, 460 mL
HI 7006L	pH 6.86 Buffer Solution, 460 mL
HI 7007L	pH 7.01 Buffer Solution, 460 mL
HI 7009L	pH 9.18 Buffer Solution, 460 mL
HI 7010L	pH 10.01 Buffer Sol., 460 mL

#### pH CALIBRATION SOLUTIONS IN FDA APPROVED

#### **BOTTLES**

HI 8004L	pH 4.01 Buffer Solution, 460 mL
HI 8006L	pH 6.86 Buffer Solution, 460 mL
HI 8007L	pH 7.01 Buffer Solution, 460 mL
HI 8009L	pH 9.18 Buffer Solution, 460 mL
HI 8010L	pH 10.01 Buffer Solution, 460 ml

#### **ELECTRODE STORAGE SOLUTION**

HI 70300L Storage Solution, 460 mL

### **ELECTRODE STORAGE SOLUTION IN FDA APPROVED**

### **BOTTLES**

HI 80300L Storage Solution, 460 mL

### **ELECTRODE CLEANING SOLUTIONS**

- HI 70000P Electrode Cleaning Sachets, 20 mL, 25 pcs
- HI 7061L General Cleaning Sol., 460 mL
- HI 7073L Protein Cleaning Sol., 460mL
- HI 7074L Inorganic Cleaning Sol., 460mL
- HI 7077L Oil & Fat Cleaning Sol.,460 mL

#### ELECTRODE CLEANING SOLUTIONS IN FDA APPROVED BOTTLES

- HI 8061L General Cleaning Solution, 460 mL
- HI 8073L Protein Cleaning Solution, 230 mL
- HI 8077L Oil & Fat Cleaning Solution, 460mL

#### **<u>REFILL ELECTROLYTE SOLUTIONS</u>**

- HI 70713.5M KCl + AgCl Electrolyte, 4x50mL, for single junction electrodesHI 70721M KNO, Electrolyte, 4x50 mL
- HI 7082 3.5M KCl Electrolyte, 4x50 mL, for double junction electrodes

#### **REFILL ELECTROLYTE SOLUTIONS IN FDA APPROVED BOTTLES**

- HI 8071 3.5M KCl + AgCl Electrolyte, 4x50mL, for single junction electrodes
- HI 8072 1M KNO₃ Electrolyte, 4x50 mL
- HI 8082 3.5M KCI Electrolyte, 4x50 mL, for double junction electrodes

#### **ORP PRETREATMENT SOLUTIONS**

- HI 7091L Reducing Pretreatment Solution, 460 mL
- HI 7092L Oxidizing Pretreatment Solution, 460 mL

#### pH ELECTRODES

All electrodes part numbers ending in B are supplied with a BNC connector and 1 m (3.3) cable.



### HI 1043B / HI1040S

Glass-body, double junction, refillable, combination **pH** electrode. Use: strong acid/alkali.



### HI 1053B / HI1050S

Glass-body, triple ceramic, conic shape, refillable, combination **pH** electrode. Use: emulsions.



### HI 1083B

Glass-body, micro, Viscolene, non-refillable, combination **pH** electrode. Use: biotechnology, micro titration.



#### HI 1131B / HI1111S

Glass-body, single junction, refillable, combination **pH** electrode. Use: general purpose.



#### HI 1330B / HI1310S

Glass-body, semimicro, single junction, refillable, combination **pH** electrode. Use: laboratory, vials.



#### HI 1331B / HI1311S

Glass-body, semimicro, single junction, refillable, combination **pH** electrode. Use: flasks.



### HI 1230B / HI1210S

Plastic-body (Ultem  $^{\circledast}),$  double junction, gel-filled, combination pH electrode. Use: general, field.



### HI 2031B / HI2020S

Glass-body, semimicro, conic, refillable, combination **pH** electrode. Use: semisolid products.



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#### HI 1332B / HI1312S

Plastic-body (Ultem®), double junction, refillable, combination **pH** electrode. Use: general purpose.



### FC 100B

Plastic-body (Kynar®), double junction, refillable, combination **pH** electrode. Use: general purpose for food industry.



### FC 200B / FC200S

Plastic-body (Kynar[®]), open junction, conic, Viscolene, non-refillable, combination **pH** electrode. Use: meat & cheese.



### FC 210B

Glass-body, double junction, conic, Viscolene, non-refillable, combination **pH** electrode. Use: milk, yogurt.



### FC 220B

Glass-body, triple-ceramic, single junction, refillable, combination **pH** electrode. Use: food processing.



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### FC 911B

Plastic-body (Kynar®), double junction, refillable with built-in amplifier, combination **pH** electrode. Use: very high humidity.



### HI 1413B / HI1410S

Glass-body, single junction, flat tip, Viscolene, non-refillable, combination  $\mathbf{pH}$  electrode. Use: surface measurement.



### HALF-CELL ELECTRODES:

### HI2110B

Glass-body, **single half-cell pH** electrode. Use: general purpose.



### HI5311

Glass-body, Ag/AgCl **reference half-cell** electrode, double junction, refillable with 4mm plug with 1m (3.3') cable. Use: general purpose with wide temperature range.



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### HI5412

Glass-body, single Calomel **reference half-cell** electrode, refillable with 4mm plug with 1m (3.3') cable. Use: general purpose with constant temperature range.



### ORP ELECTRODES:

### HI3131B / HI3111S

Glass-body, refillable, combination platinum **ORP** electrode. Use: ti-tration.



### HI3230B / HI3210S

Plastic-body (Ultem  $^{\mbox{\tiny (B)}}$  ), gel-filled, combination platinum ORP electrode. Use: general purpose.



#### HI4430B / HI4410S

Plastic-body (Ultem[®]), gel-filled, combination gold **ORP** electrode. Use: general purpose.



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## EXTENSION CABLES FOR SCREW-TYPE ELECTRODES

### ONLY (SCREW TO BNC CONNECTOR):

HI7855/1	Extension cable 1m (3.3') long
HI7855/3	Extension cable 3m (9.9') long
HI7855/5	Extension cable 5m (16.5') long
HI7855/10	Extension cable 10m (33') long
HI7855/15	Extension cable 15m (49.5') long

HI 7855 SERIES CABLE CONNECTORS CONNECTOR AND 3.0 mm (0.12") CABLE WITH BNC				
CONNECT TO SCREW TYPE ELECTRODES		\$\$ <b></b> \$ <b></b> \$	CONNECT TO THE BNC SOCKET OF THE METER	

### POWER UNITS:





### **OTHER ACCESSORIES**

ChecktempC	Pocket-size thermometer with penetration probe and	
	0.1°C resolution (range -50.0 to 150.0°C)	
HI 76405	Electrode holder	
HI 7669/2W	Temperature probe with 1 m (3.3') screened cable	
HI 8427	pH and ORP electrode simulator with 1 m (3.3') coaxial	
	cable ending in female BNC connectors	
HI 710032	Paper roll (10 pcs) (not for HI9017)	
HI 710033	Ink catridge (1pc) (not for HI9017)	
HI 92000/16	Windows [®] 3.11 compatible software for data transfer	
	to PC (for H198240 and H198240D only)	
HI 92000/32	Windows [®] 95 compatible software for data transfer to	
	PC (for HI98240 and HI98240D only)	
HI 920010	RS232 connection cable (25-pin)	
HI 920010/9	RS232 connection cable (9-pin)	
HI 931001	pH and ORP electrode simulator with LCD display 1 m	
	(3.3') coaxial for H19824 and H198240 only)	
MANPHBN2R3 Instruction manual		

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## ELECTRODE APPLICATION REFERENCE GUIDE

Application	Electrodes
1. Aquarium	HI 1332B, HI 1911B, HI 1312S
2. Bath-water	НІ 1910В, НІ 1130В, НІ 1110S
3. Beer	НІ 1131В, НІ 1111S
4. Bread	HI 2031B, FC 200B, HI 2020S, FC 200S
5. Cheese	FC 200B, FC 200S
6. Dairy products	FC 911B, FC 100B
7. Dirty water	HI 1910B, HI 1912B
8. Emulsions	HI 1053B, HI 1050S
9. Environment	HI 1230B, HI 1210S
10. Flasks	HI 1331B, HI 1310S
11. Food industry general use	FC 911B, FC 100B
12. Fruit	FC 200B, FC 220B, FC 200S
13. Fruit juices, organic	FC 210B
14. Galvanizing waste solution	HI 1130B, HI 1912B, HI 1110S
15. Heavy-duty applications	HI 1135B, HI 1115S
16. High purity water	HI 1053B, HI 1050S
17. Horticulture	HI 1053B, FC 200B, HI 1050S, FC 200S
18. In-line applications	HI 1134B, HI 1135B, HI 2114B, HI 2910B, HI 1114S, HI 1115S
19. Laboratory general use	HI 1131B, HI 1230B, HI 1332B, HI 1330B HI 1111S, HI 1210S, HI 1312S, HI 1310S
20. Leather	HI 1413B, HI 1410S
21. Lemon juice	FC 100B
22. Meat	FC 200B, HI 2031B, FC 200S, HI 2020S
23. Micro plate sampling of less than 100 mL	HI 1083B, HI 1080S
24. Milk and Yogurt	FC 210B
25. Paints	HI 1053B, HI 1050S
26. Paper	HI 1413B, HI 1410S
27. Photographic chemicals	HI 1230B, HI 1210S
28. Quality control	HI 1332B, HI 1312S
29. Sausages	FC 200B, HI 2031B, FC 200S, HI 2020S
30. Semi-solid products	HI 2031B, HI 2020S
31. Skin	HI 1413B, HI 1410S
32. Soil samples	HI 1230B, HI 1210S
33. Solvents	HI 1043B, HI 1040S
34. Strong acid	HI 1043B, HI 1040S
35. Submersion application	HI 1130B, HI 1110S
36. Surface measurements	HI 1413B, HI 1410S
37. Swimming pool	H I1130B, HI 2114B, HI 2910B
38. Titrations with constant temperature range	HI 1131B, HI 1111S
39. Titrations with wide temperature range	HI 1131B, HI 1111S
40. Very high humidity	FC 911B, HI 1912B, HI 1911B
41. Vials and test tube	HI 1330B, HI 1310S
42. Wine processing	FC 220B

B = BNC-type connector

S = Screw-type connector

### WARRANTY

All Hanna Instruments **meters are warranted for two years** against defects in workmanship and materials when used for their intended purpose and maintained according to instructions. **The electrodes and the probes are warranted for a period of six months**. This warranty is limited to repair or replacement free of charge.

Damages due to accident, misuse, tampering or lack of prescribed maintenance are not covered.

If service is required, contact the dealer from whom you purchased the instrument. If under warranty, report the model number, date of purchase, serial number and the nature of the failure. If the repair is not covered by the warranty, you will be notified of the charges incurred. If the instrument is to be returned to Hanna Instruments, first obtain a Returned Goods Authorization number from the Customer Service department and then send it with shipping costs prepaid. When shipping any instrument, make sure it is properly packaged for complete protection.

To validate your warranty, fill out and return the enclosed warranty card within 14 days from the date of purchase.

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Hanna Instruments reserves the right to modify the design, construction and appearance of its products without advance notice.

## CE DECLARATION OF CONFORMITY



#### **Recommendations for Users**

Before using these products, make sure that they are entirely suitable for the environment in which they are used.

Operation of these instruments in residential area could cause unacceptable interferences to radio and TV equipments, requiring the operator to take all necessary steps to correct interferences.

The glass bulb at the end of the electrode is sensitive to electrostatic discharges. Avoid touching this glass bulb at all times.

During operation, ESD wrist straps should be worn to avoid possible damage to the electrode by electrostatic discharges.

Any variation introduced by the user to the supplied equipment may degrade the instrument's EMC performance.

To avoid electrical shock, do not use these instruments when voltages at the measurement surface exceed 24VAC or 60VDC.

To avoid damages or burns, do not perform any measurement in microwave ovens. In particular cases H19017 could turn off. In such cases, turn it on by pressing the ON

## HANNA LITERATURE







Water Analysis Handbook

WATER ANALYSIS HANDBOOK



ENVIROCARE

HANNA General Catalog

GENERAL CATALOG

These and many others catalogs, handbooks and leaflets are available from Hanna. To receive your free copy, contact your dealer or the nearest Hanna Customer Service Center.



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