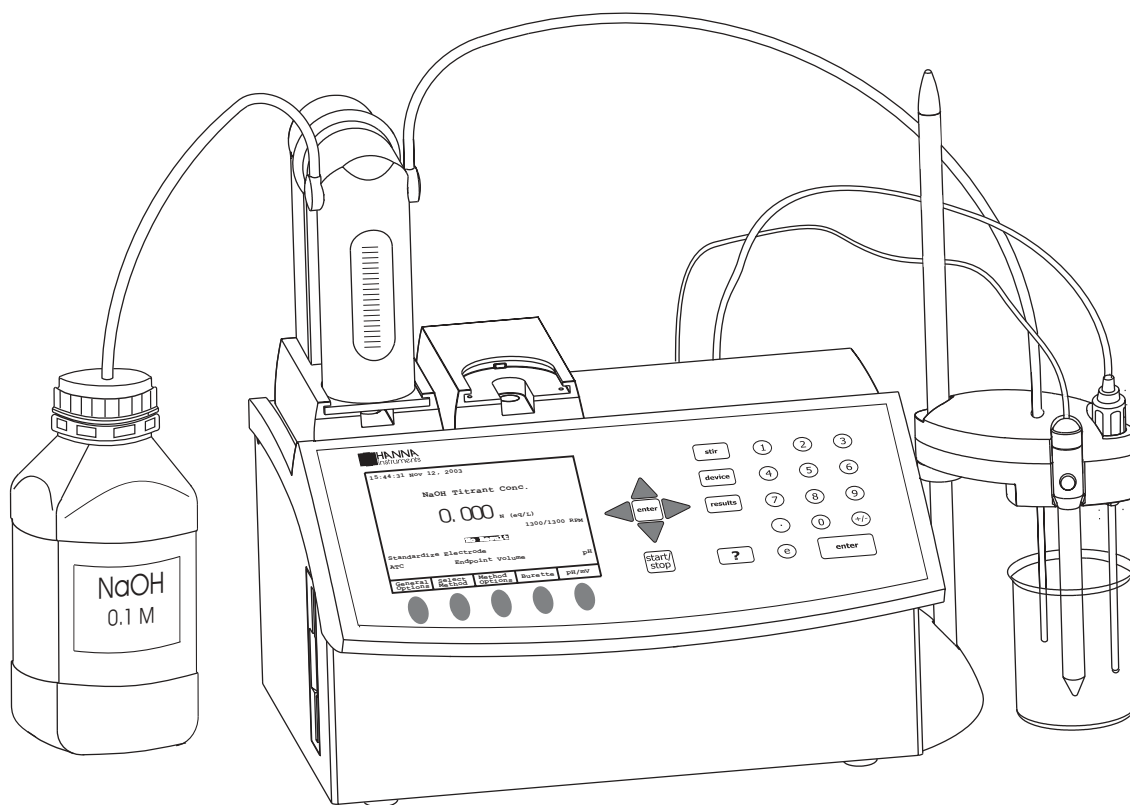

QUICK START GUIDE

HI 901 / HI 902

AUTOMATIC TITRATOR



QUICK START GUIDE

Dear customer,

Congratulations on choosing a Hanna Instruments Product.

This guide has been written for the HI 901 and HI 902 Titrators.

Please read this Quick Start Guide carefully before using the instrument. This guide will provide you with the necessary information for the correct use of the instrument.

The purpose of this guide is to present a quick overview of setting up and using the instrument.

For detailed information illustrating the extensive capabilities of your titrator, please refer to the Instruction Manual.

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INTRODUCTION

The HI 901 / HI 902 automatic titrators are designed to perform a wide variety of potentiometric titrations with a high accuracy, flexibility and reproducibility, allowing the user to obtain both good results and high speed analysis.

The titrators can perform end point or equivalence point titrations, by measuring the pH/mV and temperature of the analyzed solutions.

The user can attach an external keyboard for an added convenience, connect a printer for listing reports and titration parameters, to interface with a PC application and to connect an auxiliary display for better viewing.

An on-board floppy disk drive allows the user to transfer methods, titration reports and pH/mV logging reports.

How can I find certain information?

1. This **Quick Start Guide** will help the user learn how to operate the titrator within a short period of time. The first analysis will be performed with the aid of the factory stored methods.
2. The **Instruction Manual** provides a complete description of the operating principles (user interface, general options, methods, titration mode, pH & mV mode, maintenance, etc.).
3. The contextual **Help** screens contain detailed explanations about what kind of data can be set or viewed in every displayed screen.
4. The **Titration Theory** booklet outlines the basic concepts of titration.

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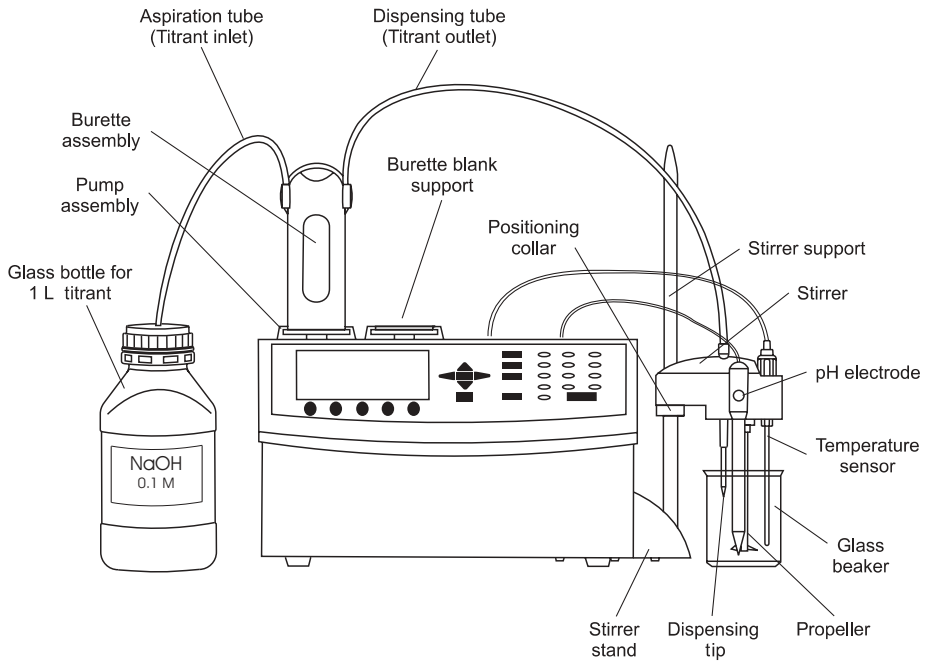
SAFETY MEASURES

The following safety measures must be followed:

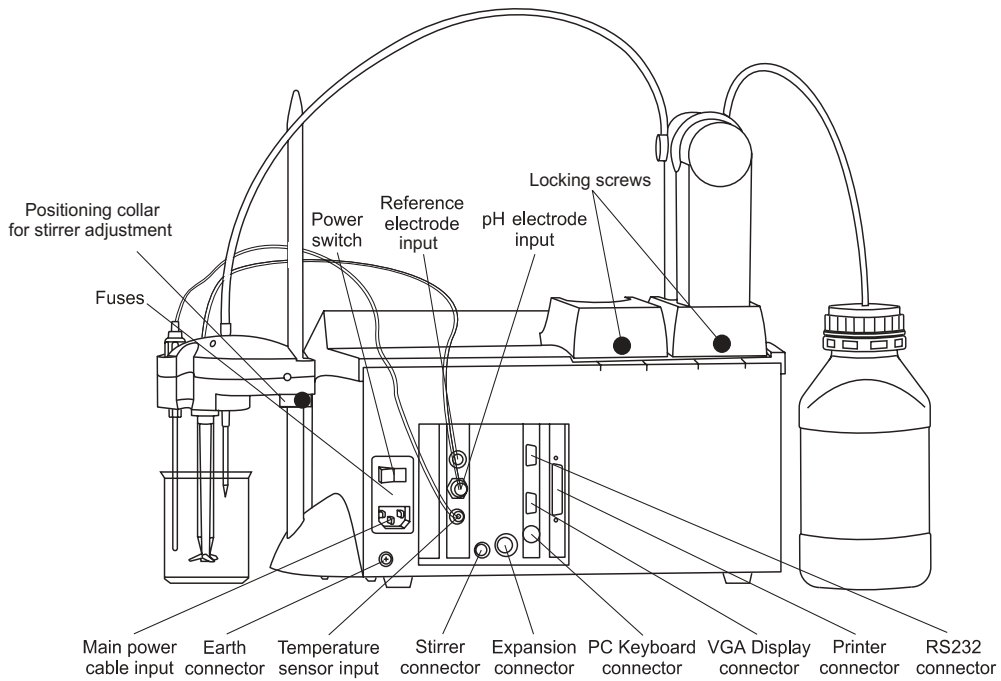
1. Always ensure that the power-supply cable is connected to a grounded main power plug.
2. Never connect or disconnect the pump assembly with the titrator turned on.
3. Verify that the burette and the attached tubing are as described in this guide.
4. Always check that the titrant bottle and the titration beaker are placed on a flat, stable surface.
5. Always wipe up spills and splashes immediately.
6. Avoid the following environmental working conditions:
 - Severe vibrations
 - Direct sunlight
 - Atmospheric relative humidity above 95% non-condensing
 - Environment temperatures below 10°C and above 40°C and a normal humidity range.
 - Explosion hazards
7. Have the titrator serviced by qualified service personnel only.

TITRATOR CONNECTIONS

Front View



Rear View

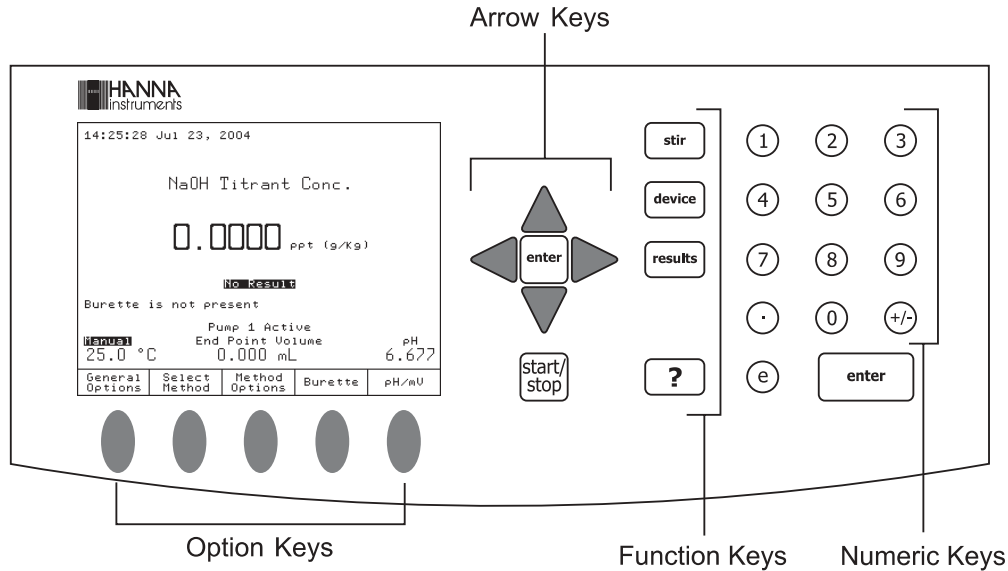


QUICK START GUIDE

USER INTERFACE

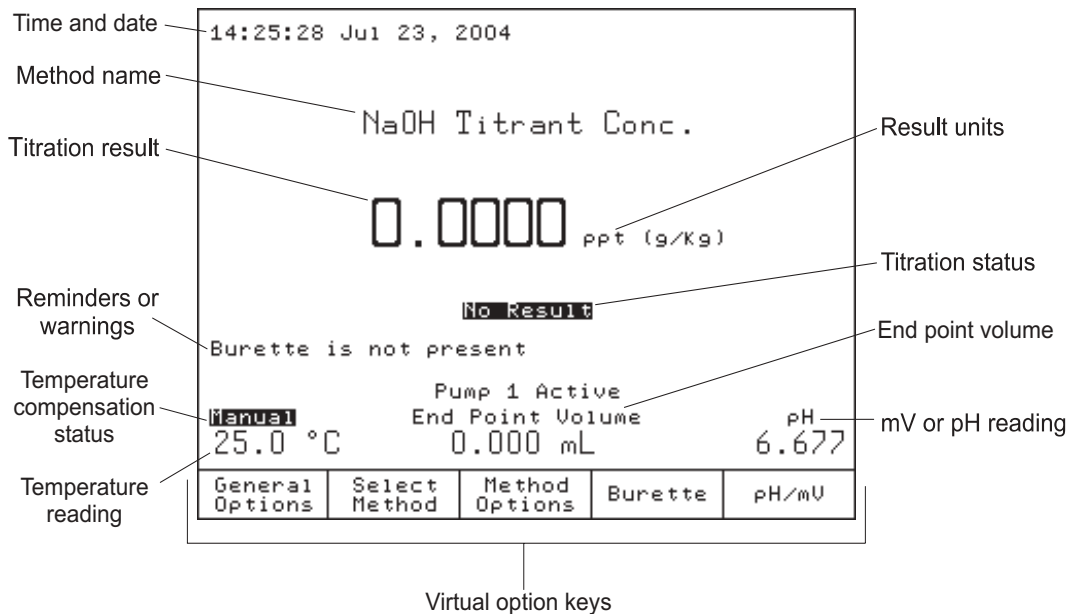
Keypad

The titrators have their own keypad with 29 keys grouped in four categories, as follows:



Display

The titrators have a 7.5 " graphical backlight display. The main screen is shown below with short explanations.

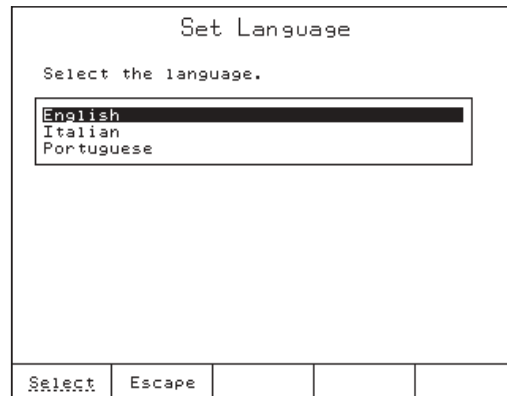


The user interface contains several screens. In each screen, many information fields are present at the same time. The information is displayed in an easy to read manner, using different size fonts. Warnings and other critical information are displayed in **reversed** font.

Virtual option keys describe the function performed when the corresponding option key is pressed.

HOW TO SELECT YOUR LANGUAGE

To change the language, press **General Options** from the main screen. Highlight the *Language* option and then press **Select**. Using the \triangle and ∇ keys select the language from the options listed in the **Set Language** screen and press **Select**. Restart the titrator in order to apply the new language setting.



HOW TO USE THE CONTEXTUAL HELP

Any information about the titrator can be easily accessed by pressing **?**. The contextual help can be accessed at any time and it provides useful informations about the current screen.

METHODS

The HI 901 / HI 902 titrators can store up to 100 methods: up to 50 standard methods and the rest are user defined methods.

Standard Methods

Each titrator is supplied with a customized package of standard methods. Standard method packs are developed in the Hanna Instruments laboratories to meet analysis requirements of specific industries (eg. water treatment, wine, dairy etc.).



User Defined Methods

These titrators allow the user to create and save his own methods. Each new method is typically based on a saved method and altered for a specific application.

QUICK START GUIDE

HOW TO CALIBRATE A pH ELECTRODE

Calibration is performed using the **Electrode Calibration** method.

- To select the **Electrode Calibration** method press from the main screen, highlight the **Electrode Calibration** and press .
- After having selected the **Electrode Calibration** method, you must first press and then .
- From the **pH Menu** screen highlight the *Edit Buffer Set* option using the  and  keys and then press .
- Highlight the buffers you want to use for calibration and then press to toggle buffer selection.

Hanna: 4.01, 6.86, 7.01, 9.18, 10.01

CRC: 1.68, 3.56, 4.01, 6.87, 7.41, 9.18, 12.46

DIN: 1.09, 3.06, 4.65, 6.79, 9.23, 12.75

NIST: 4.01, 6.86, 7.42

- After having selected the buffers to be used, press .
- Pour 50-60 mL of buffer solution into two 100 mL beakers. Do this for each buffer to be used.
- Slide the stirrer assembly over one of the beakers until it rests on the positioning collar of the stirrer support with the pH electrode's bulb completely immersed in the buffer solution and the reference junction 5-6 mm below the surface.
- Adjust the height of the stirrer by using the screw on the positioning collar to have the propeller as close as possible to the beaker's bottom.

Note: Make sure that the pH electrode, temperature probe and propeller do not touch each other, the beaker's bottom or the side walls.

- Press to rinse the electrode, the temperature probe and propeller.
- Press again to stop the stirrer.
- Take the second beaker and put it under the stirrer; position the stirrer assembly as before.
- Before the first buffer only clear standardization from the **pH Menu**.
- From the **pH Menu** screen highlight the *Add a buffer (Auto-Entry)* option and then press .
- Upon selecting the *Add a buffer (Auto-Entry)* option, the electrode calibration process starts automatically using factory pre-programmed parameters for: pre-titration stirring time, stirring speed and measurement mode.
- The buffer will be automatically recognized if the stability condition is achieved and

the **pH menu** screen will display 1 buffer.

- If more than one calibration point is required use the same procedure for each buffer.
- To view electrode calibration graph highlight the *Graph Standardization Data* option and then press .
- To view pH calibration data highlight the *pH Standardization Data* option and press .

Note: See the Instruction Manual for information about using the custom pH buffers.

HOW TO PERFORM THE FIRST TITRATION

Obtaining the Solutions

- Obtain at least 500 ml of Sodium Hydroxide (NaOH) 0.1 mol/L concentration, to use as a titrant.
- Transfer this solution (NaOH) to a titrant bottle.
- Obtain a solution of Hydrochloric Acid (HCl) 0.1 mol/L concentration, to use as a sample.
- Obtain deionized distilled water.

Note: Analytical grade reagents and deionized distilled water should be used for accurate results.

Priming the Burette

- Insert the aspiration tube in the titrant bottle and the dispensing tube in a waste beaker.
- From the main screen press .
- Highlight the *Prime Burette* option and then press .
- Enter the number of burette rinses. At least 3 rinses with the solution used for titration are recommended (allowing air bubbles to be evacuated).
- Press to start.
- The message "Executing..." will be displayed.

Note: Make sure you have a continuous liquid flow inside the burette. Do not use during normal filling of the burette if you are not sure that air bubbles have been completely evacuated. For accurate results, the aspiration tube, the dispensing tube and the syringe must be air bubble free.

QUICK START GUIDE

Method Selection

For this analysis we will use the **Neutralization w / NaOH** standard method.
To select this method:

- Press . Use the \triangle and ∇ keys to highlight the **Neutralization w / NaOH** method.
- Press .

After accomplishing these operations, the main screen of the titrator becomes active and the method's name will be displayed on the top line.

Setting Method Parameters

To display the method parameters press . The **View/Modify Method** screen will be displayed.

Only certain parameters from the standard methods can be changed.

For this titration, only the NaOH titrant concentration value and the size of the HCl sample need to be entered as in the screen shown below.

To accomplish this:

- Highlight *Titrant Conc.* option from the **View/Modify Method** screen and then press .
- The **Titrant Concentration** screen will be displayed.
- Input the correct value, then press .
- The **View / Modify Method** screen will become active on the display.
- Highlight *Analyte Size* option.
- Press .
- Input the volume of the sample (ex: 5 mL).
- Press .
- Press .
- Highlight *Save Method* option and then press .

Titrant Concentration				
Enter the titrant concentration.				
0.1000 M (mol/L)				
ACCEPT	Escape	Delete Digit		

Sample Volume				
Enter the initial sample volume in milliliters.				
5 mL				
This volume will be used when Fixed sample size is selected.				
ACCEPT	Escape	Delete Digit		

Setting Titration Report

Allows selection of fields that will be stored for each titration performed.

To obtain proper information at the end of the titration, perform the following operations:

- From the main screen, press and the **Data Parameters** screen will be displayed.
- Highlight the *Setup Titration Report* option and press .
- Mark the fields to be included with the "*" symbol using the \triangle and ∇ keys and press to toggle the selection.
- Press and then press to return to the main screen.

Preparing and Placing the Sample

- Add about 50 to 65 mL of water to the titration beaker (for accurate results use deionized and distilled water).
- Use a pipette or burette to add a sample of 5.0 mL Hydrochloric Acid (HCl) 0.1 M into the same beaker.
- Slide up the stirrer assembly.
- Place the beaker under the stirrer assembly.
- Lower the stirrer assembly until it rests on its positioning collar.
- Adjust the height of the stirrer assembly by moving the positioning collar as close as possible to the bottom of the beaker.
- Adjust the level of the sample solution so that the pH electrode bulb is completely immersed in the sample and the reference junction of the electrode is 5-6 mm below the surface.

Note: Make sure that the pH electrode, temperature probe and propeller do not touch each other, or the beaker.

Performing a Titration

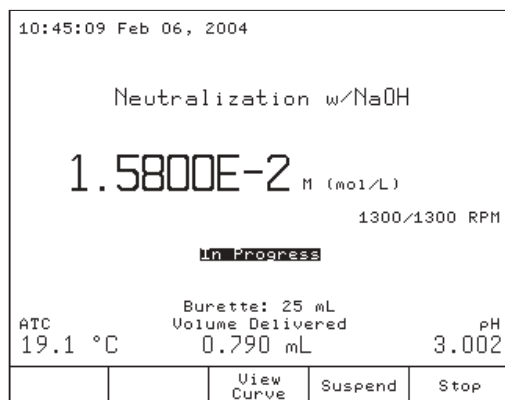
- From the main screen press . You will be prompted to enter the analyte size, set 5 mL and press . The titrator will start the analysis according to the selected method.
- At the end of the titration, the message "Titration Completed" will appear on the titration status, together with the final concentration of the analyte in the sample and the equivalence end point volume.

QUICK START GUIDE

Understanding the Displayed Information

When the titration is initiated the stirrer starts and, after the pre-titration stir time has elapsed, the pump begins to dispense the titrant. Titration information will be displayed on the display.

During titration the following screen is displayed:



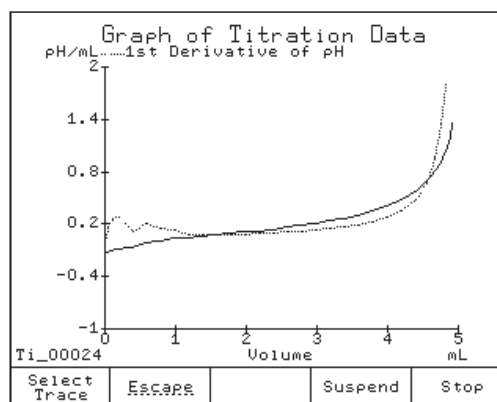
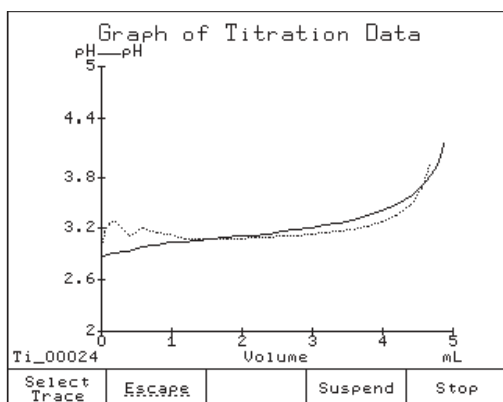
Viewing Graph During Titration

After a few doses are dispensed will become active. Press to display the real time titration graph.

The curves that are simultaneously generated on the graph represent the pH and the 1st derivative versus Titrant Volume (for details, see the Instruction Manual).

The two graphs are scaled to fit in the same screen window and, by pressing , the ordinate (y) axis shows either the pH values or the selected derivative values (of pH).

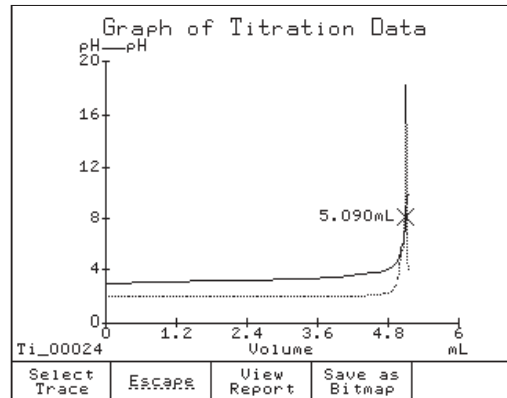
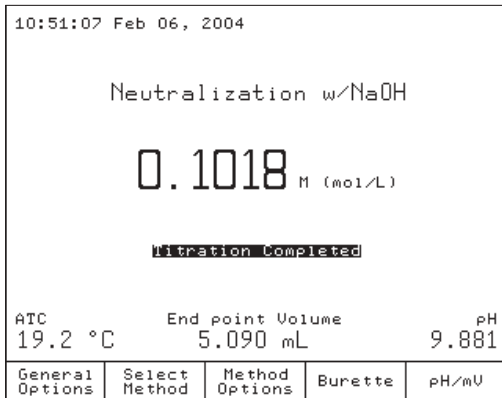
The titration ID is also displayed in the graph window. This corresponds to the name of the titration report file.



Correct Ending of Titration

The titration is normally terminated when the first equivalence end point is detected according to the selected algorithm. To ensure the correct detection and interpolation of the equivalence end point, the titration algorithm dispenses a few more doses after the ending condition is reached.

The titration end can be displayed either in the main screen or in the **Graph of Titration Data** screen, as presented in the figures below.



When the titration has ended, the titrator will display the equivalence end point volume and the final concentration of the analyte together with the **Titration Completed** ending status. The actual temperature and mV value of the solution in the titration beaker will be displayed and not the value corresponding to the equivalence end point.

To view the titration graph, press .

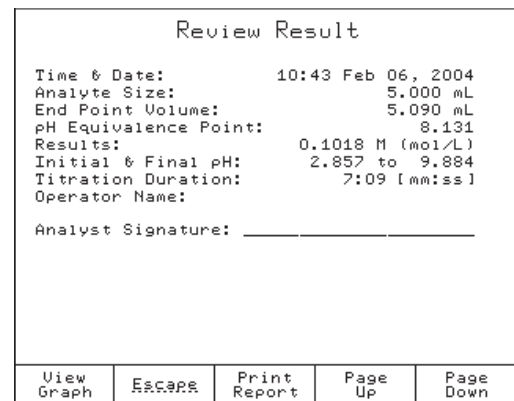
When the titration ends, an "x" will mark the end point coordinates on the pH versus titrant volume curve in the **Graph of Titration Data** screen. The value of the end point volume is also displayed next to the inflection point.

Results

The results obtained from titration are stored in a report file, that can be displayed, transferred to a floppy disk or to a PC, or printed.

Viewing the last titration data

- From the main screen, press .
- The **Data Parameters** screen will be displayed.
- From the **Data Parameters** screen highlight the **Review Last Titration Report** option and press .
- The **Review Result** screen will be displayed.
- Use the and keys to display information related to the latest titration performed. See *titration report* on page 15.






Printing the titration report

Connect a DOS / Windows compatible printer directly to the DB 25 connector located on the back of the titrator.

Note: To connect the printer, please turn off the titrator and then the printer.







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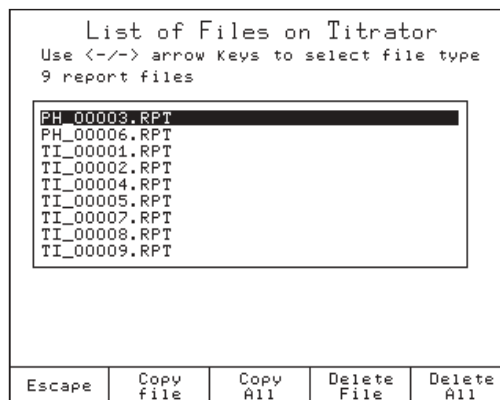
Printing out the report:

- From the **Review Report** screen, press .
- During the information transfer to the printer, the message "Printing" will be displayed on the screen.
- Press , to return to the **Data Parameters** screen.
- Press  again to return to the main screen.

Saving the data on a floppy disk

This feature allows saving the results of titrations or pH / mV logging sessions on a floppy disk.

- From the main screen, press . The **General Options** screen will be displayed.
- Highlight the *Save Files to Diskette* option using the \triangle and ∇ keys.
- Insert a 3.5" floppy disk into the floppy disk drive.
- Press . The **List of Files on Titrator** screen will be displayed.
- Use the \triangleleft or \triangleright keys to select the file type: "report files".
- Press  to transfer all the available reports to the floppy disk, or highlight the name of the report file to be transferred to the disk and press  to transfer only the selected report file.
- File types *.rpt, *.bmp, *.log can be transferred to a floppy disk. If the transfer was performed correctly, the "Copy successful" message will appear on the screen. If the operation fails, the "Copy unsuccessful" message will appear on the screen.
- Press , to return to the **General Options** screen.
- Press  again, to return to the main screen.



Titration report

While scrolling with the Page Up and Page Down keys, the fields below can be seen on the titrator display (also, they can be printed via the printer). The same information is available on the saved report file (Ti_00024.rpt in this example).

Titration Report

Method Name: Neutralization w/NaOH
Time & Date: 10:43 Feb 06, 2004
Titration ID: Ti_00024

Standardization Data

Buffer	Potential	Efficiency	Temperature
4.006pH	169.9mV	100.7%	A 22.0°C
	9:20 Feb 06, 2004		
7.020pH	-7.8mV	96.5%	A 22.0°C
	9:23 Feb 06, 2004		
10.040pH	-178.6mV	96.5%	A 21.9°C
	9:25 Feb 06, 2004		

GLP & Instrumentation Data

Sample Name: Sample HCl-1
Company Name: Hanna Instruments
Operator Name:
Electrode Name: HI 1131 NO -2
Field 1: Any text
Field 2: Any text
Field 3: Any text
Titrator Software Version: v1.2_B5
Base Board Software Version: v1.0
Pump 1 Software Version: v1.1
Base Board Serial Number: 04120101
Analog Board Serial Number: 04123001
Pump 1 Serial Number: 04127001
Factory Calibration Date: Jan 28, 2004

Method Parameters

Name: Neutralization w/NaOH
Dosing Type: Dynamic
min Vol: 0.015 mL
max Vol: 0.200 mL
delta E: 4.500 mV
End Point Mode: pH Equival., 1st Der
Recognition Options:
Threshold: 20 mV/mL
Range: NO
Filtered Derivatives: NO
Pre-Titration Volume: 0.000 mL
Pre-Titration Stir Time: 10 Sec
Measurement Mode: Signal Stability
delta E: 0.3 mV
delta t: 1.5 Sec
t min wait: 5 Sec
t max wait: 30 Sec

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```

Electrode Type:                               pH
Calculations:                               Sample Calc. by Volume
Titrant Name:                               NaOH
Titrant Conc.:                               0.1000 M (mol/L)
Analyte Size:                               5.000 mL
Analyte Entry:                               Manual
Maximum Titrant Volume:                     25.000 mL
Stirring Speed:                             1300 RPM
Potential Range:                             -2000.0 to 2000.0 mV
Volume/Flow Rate:                           25 mL / 50.0 mL/min
Signal Averaging:                           1 Reading
M (mol/L) -> M (mol/L)

```

```

V mol mol
-*---
  L mol

```

```

mL L
-*---
 1000mL

```

V = volume dispensed in liters.
 0.100 mol/L -> titrant conc.
 1.000 mol/mol -> (sample/titrant)
 5.000 mL -> sample volume

Nr	Volume[ml]	mV	pH	Graphic	Temp[°C]	Time
0	0.000	235.2	2.857	0.0 A	19.1	00:00:00
1	0.050	234.6	2.866	-10.2 A	19.0	00:00:21
2	0.100	233.9	2.880	-15.8 A	19.1	00:00:27
3	0.200	232.2	2.908	-16.7 A	19.1	00:00:39
4	0.390	231.1	2.928	-6.0 A	19.1	00:00:45
5	0.590	228.6	2.970	-12.3 A	19.1	00:01:04
6	0.790	226.9	3.000	-8.7 A	19.1	00:01:20
7	0.990	225.5	3.024	-6.9 A	19.1	00:01:37
8	1.190	224.7	3.038	-4.0 A	19.1	00:01:43
9	1.390	223.9	3.051	-4.0 A	19.1	00:01:49
10	1.590	223.0	3.066	-4.3 A	19.1	00:01:55
11	1.790	222.1	3.082	-4.6 A	19.1	00:02:01
12	1.990	221.2	3.098	-4.6 A	19.1	00:02:06
13	2.190	220.1	3.115	-5.1 A	19.1	00:02:11
14	2.390	219.0	3.134	-5.6 A	19.1	00:02:17
15	2.590	217.8	3.155	-6.0 A	19.1	00:02:23
16	2.790	216.5	3.177	-6.6 A	19.1	00:02:29
17	2.990	215.1	3.202	-7.3 A	19.1	00:02:34
18	3.190	213.4	3.231	-8.4 A	19.1	00:02:40
19	3.390	211.5	3.263	-9.3 A	19.1	00:02:46
20	3.590	209.2	3.302	-11.4 A	19.1	00:02:51
21	3.790	206.6	3.348	-13.4 A	19.1	00:02:57
22	3.990	203.2	3.406	-16.8 A	19.1	00:03:02
23	4.190	198.9	3.479	-21.4 A	19.1	00:03:08
24	4.390	193.1	3.578	-29.0 A	19.1	00:03:14
25	4.556	186.2	3.697	-41.7 A	19.1	00:03:20
26	4.670	179.6	3.810	-57.8 A	19.1	00:03:25
27	4.753	172.9	3.925	-81.2 A	19.1	00:03:31

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28	4.812	166.4	4.036	-110.0	A	19.2	00:03:37
29	4.856	160.1	4.144	-143.5	A	19.2	00:03:43
30	4.889	153.7	4.253	-189.9	A	19.2	00:03:54
31	4.915	147.1	4.367	-259.9	A	19.2	00:04:00
32	4.934	141.0	4.471	-322.7	A	19.2	00:04:11
33	4.949	135.2	4.571	-388.0	A	19.2	00:04:17
34	4.964	127.5	4.702	-512.0	A	19.2	00:04:23
35	4.979	117.3	4.877	-680.0	A	19.2	00:04:29
36	4.994	104.2	5.102	-875.3	A	19.2	00:04:35
37	5.009	87.9	5.381	-1088.0	A	19.2	00:04:41
38	5.024	69.6	5.695	-1221.3	A	19.2	00:04:50
39	5.039	51.2	6.010	-1226.0	A	19.2	00:05:08
40	5.054	31.6	6.344	-1301.3	A	19.2	00:05:36
41	5.069	7.3	6.762	-1625.3	A	19.2	00:06:07
42	5.084	- 37.9	7.557	-3010.0	A	19.2	00:06:38
43	5.099	-120.0	9.024	-5476.0	A	19.2	00:06:48
44	5.114	-144.7	9.464	-1642.7	A	19.2	00:06:54
45	5.129	-158.2	9.705	-900.7	A	19.2	00:07:01
46	5.144	-168.1	9.883	-664.0	A	19.2	00:07:08

Titration Results

Method Name: Neutralization w/NaOH
Time & Date: 10:43 Feb 06, 2004
Analyte Size: 5.000 mL
End Point Volume: 5.090 mL
pH Equivalence Point: 8.131
Results: 0.1018 M (mol/L)
Initial & Final pH: 2.857 to 9.884
Titration Duration: 7:09 [mm:ss]
Operator Name:

Analyst Signature: _____

QS 901/902
07/04 R0