


Measure - Ion


ppm channel 1

17

10.0



100



STNDS
Last std: Sep 17 @ 10:17 am

- Touch meas to measure sample

or

- Touch std to access standardize mode or measure blank

September 17, 1997		11:11 am	
ID#	00000	ATC	25.0 °C
NH3		slope	102.2%
auto read	OFF	mV	0.0

● std

● meas

● setup

○ print

○ mode

○ help

The accumet AR50 meter offers you unparalleled versatility with respect to ion analysis. You can choose one of 6 methods of analysis, the specific electrode you will be working with and also the units that you would like the meter to use when reporting the ion concentration. The Ion Measure screen displays the direct readout of sample concentration in the desired units, as well as the time and date of the last calibration. The standards used in the calibration and the slope of the electrode are also displayed on the screen. It is important to note that the concentration reported by the meter is actually the concentration of free uncomplexed ions in your solution.

At the Basic Procedural level the only setup options that you can access are the Electrode Type, the Print Interval and the number of Significant Digits. If you need to change any other parameter such as Ion method or measurement units you will need to set the Procedural Level to Advanced in the System Setup screen. Any values previously saved in the Ion Setup screen at the Advanced Procedural Level will become the default values for the Basic Procedural Level.

Connect the electrodes you will be using to the meter. See page 10 for details.



Remember to setup your Ion measuring mode parameters. Refer to pages 90-103 for Ion setup instructions.



Remember, HELP is always just a touch of the button away.

Standardize - Ion

ppm channel 1

STNDS	Last std: Sep 17 @ 10:17 am		
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- Touch clear to delete previous standards

Insert electrode into standard and stir

- Touch std to standardize new standard

September 17, 1997		11:11 am	
ID#	00000	ATC	25.0 °C
NH3		slope	100.2%
auto read	OFF	mV	0.0

std
meas
setup
clear
mode
help

Standardize - Ion

ppm channel 1

STNDS	Not standardized		
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- Touch std to standardize new standard

September 17, 1997		11:11 am	
ID#	00000	ATC	25.0 °C
NH3		slope	NA
auto read	OFF	mV	0.0

std
meas
setup
clear
mode
help

Standardize - Ion

ppm channel 1

Concentration

STNDS			
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Insert electrode into standard and stir

- Touch std to standardize new standard

Sep			
ID#	00000	ATC	25.0 °C
NH3		slope	NA
auto read	OFF	mV	0.0

std
meas
setup
clear
mode
help

There are two direct reading methods: Direct Reading with standards and Direct Reading with Blank offset. These types of measurements allow you to directly read the concentration of your sample after standardizing the meter with ion standards of known values or blank values.

Direct Reading with Standards

This is the most common method of ion measurement. You can directly read the concentration of the sample after standardizing the meter with ion standards. An ionic strength adjuster (ISA) is added to both the standards and the sample. Two to five standards are used to standardize the meter. The standards should bracket the expected value of the sample.

To Standardize the Meter

You must use a minimum of two standards to standardize the meter.

- 1** Touch std on the Ion Measure screen to access the standardization screen.
- 2** Touch clear to remove a previous standardization.
- 3** Add ionic strength adjuster to your standard.
- 4** Immerse the ion selective electrode and the appropriate reference electrode (or combination ISE) into the standard containing the lowest concentration of the ion of interest. Stir.
- 5** Touch std again to initiate the standardization process.
- 6** Use the numeric keypad to enter the value of the standard.
- 7** Touch enter on the keypad to accept this value. If you have entered a value in error, touch BS to clear the value and key in a new value.

OR

Touch exit to return to the Ion Measure screen without entering a standard value.
- 8** Repeat steps 3-7 with up to 5 standards. A minimum of two standards is required to standardize the meter in this mode.



Generally, it is important that an ionic strength adjuster (ISA) is added to both samples and standards to obtain accurate results.

If the meter has not been standardized with at least 2 standards, a series of dashes will appear in place of a measurement value.

Measuring ion concentration in the Direct Reading
with Standards Mode

With Auto Read on

- 1** Add Ionic strength adjuster to the sample.
- 2** Immerse the ion selective electrode in the stirring sample.
- 3** Touch meas to begin measuring your sample. The meter will accept the reading and display STABLE when the measurement meets the selected stability criteria. The measure screen will fix onto this measurement and will not deviate until meas is touched.
- 4** Repeat steps 1-3 with additional samples.

With Auto Read off

- 1** Add Ionic strength adjuster to the sample.
- 2** Immerse the ion selective electrode into the stirring sample. The meter will continually monitor the ion concentration value. When the meter recognizes the reading as stable, STABLE is displayed on the measure screen. With the Auto Read function deactivated, the display on the measure screen will indicate any deviation in the concentration.
- 3** Repeat steps 1-2 with additional samples.

Standardize - Ion

ppm channel 1

STNDS | Not standardized

Insert electrode into standard and stir

- Touch std to standardize new standard or measure blank

September 17, 1997	11:11 am
ID# 00000	ATC 25.0 °C
NH3 BLK	slope NA
auto read OFF	mV 0.0

std
meas
setup
clear
mode
help

Standardize - Ion

ppm channel 1

ISE Standardize

You have selected Direct Reading with Blank offset operation.

Is this reading a STANDARD or BLANK?

STND BLANK

STNDS | Not standardized

Insert electrode into standard and stir

- Touch std to standardize new standard or measure blank

September 17, 1997	11:11 am
ID# 00000	ATC 25.0 °C
NH3 BLK	slope NA
auto read OFF	mV 0.0

std
meas
setup
clear
mode
help

Standardize - Ion

ppm channel 1

STNDS | Not standardized

Insert electrode into standard and stir

- Touch std to standardize new standard or measure blank

September 17, 1997	11:11 am
ID# 00000	ATC 25.0 °C
NH3 BLK	slope NA
auto read OFF	mV 0.0

std
meas
setup
clear
mode
help

Standardize - Ion

ppm channel 1

Concentration

1 2 3
4 5 6
7 8 9
- 0 .
BS exit enter

STNDS | Not standardized

Insert electrode into standard and stir

- Touch std to standardize new standard or measure blank

September 17, 1997	11:11 am
ID# 00000	ATC 25.0 °C
NH3 BLK	slope NA
auto read OFF	mV 0.0

std
meas
setup
clear
mode
help

Direct Reading with Blank Offset

This method presents you with the ability to measure samples with low level concentrations of the ion of interest. It eliminates background interference by subtracting the value of a blank concentration from the value for the sample. See ISE Theory page 174.

To Standardize the Meter

You will need to standardize the meter with one blank and a minimum of two standards.



Remember, HELP is always just a touch of the button away.

- 1** Touch STD on the Ion Measure screen to access the standardize screen.
- 2** Touch clear to delete the previous standards.
- 3** Add ionic strength adjuster to the standards and the blank.
- 4** Immerse the ion selective electrode in the standard containing the lowest concentration of the ion of interest.
- 5** Stir the standard and/or blank.
- 6** Touch STD again to initiate the standardization process. At this point, the meter will display the question "Is this a standard or a blank?"
- 7** Touch STND if the sample that the electrode is immersed in is an ion standard solution.

OR

Touch BLANK if the sample that the electrode is immersed in is the blank solution.

If you touched STND

- 8** Use the keypad to enter the value of the standard.
- 9** Touch enter to accept the value. The meter will accept the standard value when it recognizes the reading as stable.
- 10** Repeat steps 4-7 with additional standards or steps 4-7 and 11 with a blank sample.

If you touched BLANK

- 11** The meter will return to the Ion Measure screen and a beaker icon labeled blank will be displayed.

Repeat steps 4-9 if the meter has not been standardized with at least 2 standards of known ion concentration.

Measuring Ion Concentration in the Direct Reading with Blank Mode

With Auto Read on

- 1** Add ionic strength adjuster to the samples.
- 2** Immerse the ion selective electrode in the stirring sample
- 3** Touch meas. When the meter recognizes the reading as stable, STABLE will appear on the screen. The value that appears on the screen is the value of the sample minus the value of the blank reading. The measure screen will fix on this measurement and will not deviate until meas is touched again.
- 4** Repeat steps 1-3 with additional samples. The meter will update the reading each time meas is touched.

With Auto Read off

- 1** Add ionic strength adjuster to the sample.
- 2** Immerse the ion selective electrode in the stirring sample. The meter will continually monitor the ion concentration value. When the meter recognizes the reading as stable, STABLE is displayed on the measure screen. With the Auto Read function deactivated, the display on the measure screen will indicate any deviation in the concentration reading.

Standardize - Ion

ppm channel 1

10.0 100

STNDS Last std: Sep 17 @ 10:17 am

- Touch clear to delete previous standards

Insert electrode into standard and stir

- Touch std to standardize new standard

September 17, 1997	11:11 am
ID# 00000	ATC 25.0 °C
NH3 IM	slope 100.2%
auto read OFF	mV 0.0

std
meas
setup
clear
mode
help

Standardize - Ion

ppm channel 1

10.0 100

STNDS Not standardized

Insert electrode into standard and stir

- Touch std to standardize new standard

September 17, 1997	11:11 am
ID# 00000	ATC 25.0 °C
NH3 IM	slope NA
auto read OFF	mV 0.0

std
meas
setup
clear
mode
help

Standardize - Ion

ppm channel 1

Concentration

1	2	3
4	5	6
7	8	9
-	0	.
BS	exit	enter

STND

Insert

- Touch

Sep	
ID# 00000	ATC 25.0 °C
NH3 IM	slope NA
auto read OFF	mV 0.0

std
meas
setup
clear
mode
help

The incremental methods which include known addition, known subtraction, analate addition and analate subtraction and are particularly useful with samples containing complex ionic backgrounds which cannot be matched in standards. They are also useful with occasional samples whose temperatures vary. More information on these methods is available in the ISE Theory Section (see page 174).

Standardizing the meter for all incremental methods

Prior to conducting an analysis using any of the incremental methods, it is necessary to standardize the meter with at least two standards. This will establish a slope value for the electrode in use. The slope value is required in the incremental method calculations which yield the ion concentration of the sample. See ISE Theory page 174.

- 1** Touch std on the Ion Measure screen to access the standardize screen.
- 2** Touch clear to remove the previous standardization from the memory of the meter.
- 3** Add ionic strength adjuster to the standards.
- 4** Immerse the ion selective electrode in the stirring standard. Always begin standardization with the least concentrated ion standard.
- 5** Touch std again to initiate standardization.
- 6** Use the keypad to enter value of the standard.
- 7** Touch enter on the keypad to accept this value. If you have entered a value in error, touch BS to clear the value and key in a new value.
- 8** Repeat steps 3-7 with additional standards.



Remember, HELP is always just a touch of the button away.

Measure - Ion

mV channel 1

0.0

1.00 10.0 100

STNDS Last std: Sep 17 @ 10:17 am

● Touch std to access standardize mode

September 17, 1997	11:11 am
ID# 00000	ATC 25.0 °C
NH3 KA	slope 102.2%
auto read OFF	mV 0.0

std

KA

setup

print

mode

help

Measure - Ion

mV channel 1

0.0

STNDS Not Standardized

Insert electrode into standard and stir

● Touch std to standardize new standard

September 17, 1997	11:11 am
ID# 00000	ATC 25.0 °C
NH3 KA	slope 102.2%
auto read OFF	mV 0.0

std

KA

setup

print

mode

help

Measure - Ion

mV channel 1

Sample Volume

1 2 3

4 5 6

7 8 9

- 0 .

BS exit enter

STNDS

Insert

● Touch

Sep	
ID# 00000	ATC 25.0 °C
NH3 KA	slope NA
auto read OFF	mV 0.0

std

neas

setup

clear

mode

help

Measure - Ion

mV channel 1

Standard Volume

1 2 3

4 5 6

7 8 9

- 0 .

BS exit enter

STNDS

Insert

● Touch

Sep	
ID# 00000	ATC 25.0 °C
NH3 KA	slope NA
auto read OFF	mV 0.0

std

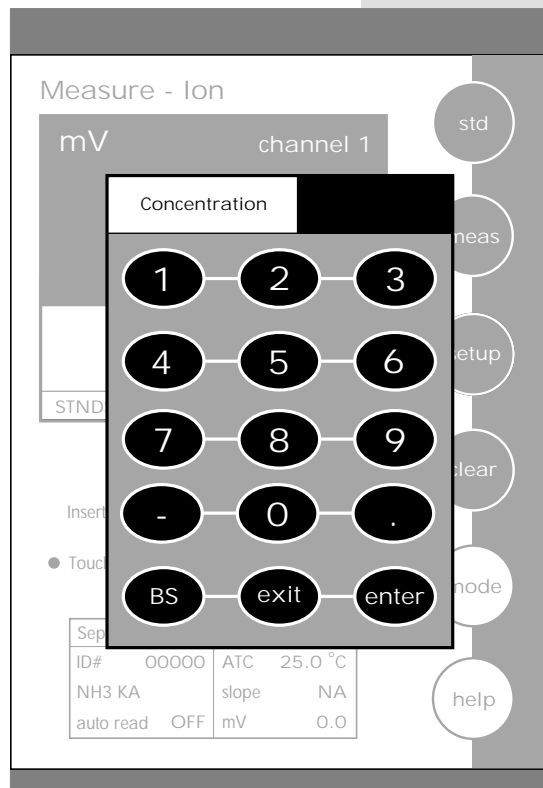
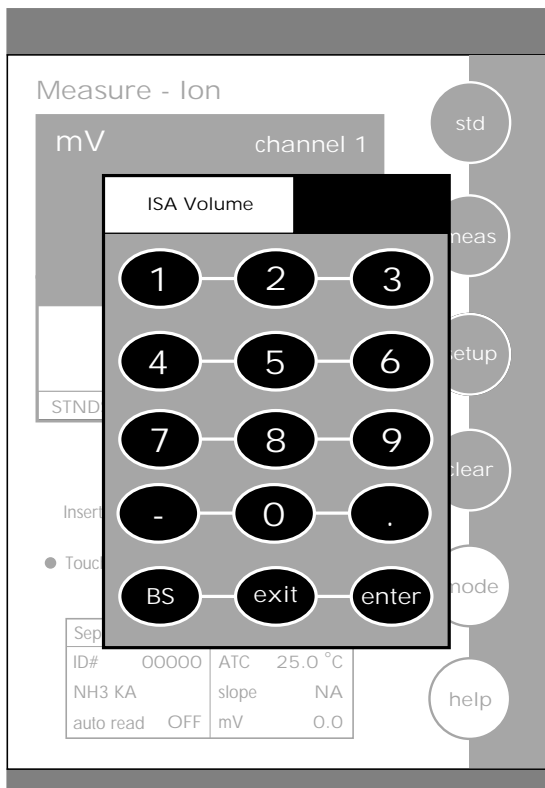
neas

setup

clear

mode

help



Known Addition Result

12.2^{ppm}

Calculated Slope:	58 mV
Reading 1:	222.7 mV
Reading 2:	200.6 mV
Sample Volume:	50
Standard Volume:	10
ISA Volume:	50
Standard Concentration:	100 ppm

OK
print

Measuring Ion Concentration in Samples Using the Incremental Methods

When performing known addition, you will add an aliquot of standard solution containing the ionic species of interest to a known volume of your sample. The mV readings of the sample are taken before and after the addition of the standard. The concentration of the sample can then be calculated based upon the difference in the mV readings. The use of the incremental methods requires that certain parameters be identified. In addition to the millivolt outputs of the electrode(s) in both the sample and the sample plus the standard, it is necessary to enter into the meter the volume of the sample, the volume of the standard, the volume of the Ionic Strength Adjuster (ISA) if used, the concentration of the standard and as previously stated the slope of the electrode in use. Your accumet research meter will prompt you through the method, permitting you to enter the appropriate parameters at the appropriate time. When the meter has all of the data needed for the calculation, it will display the ion concentration of the sample as well as the parameters entered for the calculation.

The standard concentration should be high enough to nearly double the sample ion concentration after its addition. However, the standard volume should not significantly impact the sample volume. A 1:100 ratio of standard to sample ratio is optimal. For a monovalent electrode, the standard addition should result in a 15-30 mV change. For a divalent electrode, a 7-10 mV change is adequate. If the millivolt change is too high, the addition of the standard may affect the ionic strength and therefore the activity coefficients. This could result in inaccurate measurements. If the millivolt change is too small, readability errors are enhanced. See ISE Theory page 174.

To take a measurement

- 1** Immerse the ion selective electrode in a known volume of the sample solution.
- 2** Stir the sample.
- 3** Touch KA to take the first mV reading of sample.
Wait for the reading to stabilize (STABLE will appear).

OR
Touch KA to accept the current reading.
- 4** Add a known volume of standard solution to the sample.
- 5** Touch KA to take the second mV reading of sample.
Wait for the reading to stabilize (STABLE will appear).

OR
Touch KA to accept the current reading.
- 6** Use the keypad to enter the sample volume.
- 7** Touch enter to accept the value.
- 8** Use the keypad to enter the standard volume.
- 9** Touch enter to accept the value.
- 10** Use the keypad to enter the volume of ionic strength adjuster used.
If no ISA was used, enter a value of zero.
- 11** Touch enter to accept the value.
- 12** Use the keypad to enter the concentration of the standard solution added to the sample.
- 13** Touch enter to accept the value. Your Known Addition result is now displayed.
- 14** Touch print to send the data to memory if a sample ID# has been assigned or to print the data on the screen.

OR
Touch OK to return to the Measure screen for a new measurement.

The procedure for known subtraction is very similar to that for known addition method. An aliquot of standard is added to a known volume of the sample. The difference is that the standard does not contain the same ionic species that you are trying to measure in the sample. Instead, it contains an ion that will complex or precipitate the ion of interest, removing it from the sample. Like known addition, the mV readings are taken before and after the standard is added to the sample and the difference in mV values can be used to calculate the concentration of free ions of interest in the sample. This method will also require you to enter values of certain parameters in order to obtain an ion concentration. See ISE Theory page 174.

To take a measurement



Remember, HELP is always just a touch of the button away.

- 1** Immerse the ion selective electrode in a known volume of the sample solution.
- 2** Stir the sample.
- 3** Touch KS to take the first reading.
Wait for the reading to stabilize (STABLE will appear).

OR

Touch KS to accept the current reading.
- 4** Add a known volume of standard solution to the sample.
- 5** Touch KS to take the second reading.
Wait for the reading to stabilize (STABLE will appear).

OR

Touch KS to accept the current reading.
- 6** Use the keypad to enter the sample volume.
- 7** Touch enter to accept the value.
- 8** Use the keypad to enter the standard volume.
- 9** Touch enter to accept the value

- 10** Use the keypad to enter the volume of ionic strength adjuster used.
If no ISA was used, enter a value of zero.
 - 11** Touch enter to accept the value.
 - 12** Use the keypad to enter the concentration of the standard solution added to the sample.
 - 13** Touch enter to accept the value.
Your Known Subtraction result is now displayed.
 - 14** Touch print to send the data to memory or to print the information on the screen.
- OR
- Touch OK to return to the Measure screen for a new measurement.

The analate addition method is useful when your sample is at an elevated temperature and you want to negate the effect that temperature will have on the concentration calculation. This method is also useful if you have only a small amount of sample available. The analate addition method differs only slightly from the known addition method. The difference being the solution that you are taking your initial mV reading in is actually the standard and not the sample of interest. The difference in mV readings of the standard before and after the sample is added is used to calculate the concentration of the ion of interest. With the analate addition method, both the sample and the standard solution contain the ionic species of interest. See ISE Theory page 174.

To take a measurement



Remember, HELP is always just a touch of the button away.

- 1** Immerse the ion selective electrode in a known volume of the standard solution.
- 2** Stir the standard.
- 3** Touch AA to take the first reading.
Wait for the reading to stabilize (STABLE will appear).

OR

Touch AA to accept the current reading.
- 4** Add a known volume of sample solution to the standard solution
- 5** Touch AA to take the second reading.
Wait for the reading to stabilize (STABLE will appear).

OR

Touch AA to accept the current reading.
- 6** Use the keypad to enter the sample volume.
- 7** Touch enter to accept the value.
- 8** Use the keypad to enter the standard volume.
- 9** Touch enter to accept the value.

- 10** Use the keypad to enter the volume of ionic strength adjuster used.
If no ISA was used, enter a value of zero.
- 11** Touch enter to accept the value.
- 12** Use the keypad to enter the concentration of the standard solution.
- 13** Touch enter to accept the value.
Your Analate Addition result is now displayed.
- 14** Touch print to send the data to memory or send the information
to a printer.

OR

Touch OK to return to the Measure screen for a new measurement.

The analate subtraction method is useful when no ion specific electrode is available to measure the ion of interest directly. Like known subtraction the sample and the standard contain different ionic species. However, the ion being measured is in the standard and not in the sample. The reduction of free ions in the standard solution is proportional to the concentration of the ion of interest in the sample. See ISE Theory page 174.

To take a measurement

- 1** Immerse the ion selective electrode in a known volume of the standard solution.
- 2** Stir the standard.
- 3** Touch AS to take the first reading.
Wait for the reading to stabilize (STABLE will appear).

OR

Touch AS to accept the current reading.
- 4** Add a known volume of sample solution to the standard.
- 5** Touch AS to take the second reading.
Wait for the reading to stabilize (STABLE will appear).

OR

Touch AS to accept the current reading.
- 6** Use the keypad to enter the sample volume.
- 7** Touch enter to accept the value.
- 8** Use the keypad to enter the standard volume.
- 9** Touch enter to accept the value.



Remember, HELP is always just a touch of the button away.

10 Use the keypad to enter the volume of ionic strength adjuster used.
If no ISA was used, enter a value of zero.

11 Touch enter to accept the value.

12 Use the keypad to enter the concentration of the standard solution.

13 Touch enter to accept the value.
Your Analate Subtraction result is now displayed.

14 Touch print to send the data to memory or send the information
to a printer or computer.

OR

Touch OK to return to the Measure screen for a new measurement.