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# MT Series Operation Manual

# For MT-10, MT-30 and MT-100 Systems



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#### 1.0 Getting Started

#### 1.1 Preparing the System: Hardware

The following is a daily guide for ensuring the system will perform optimally. Use this checklist prior to starting a run.

- 1. Check electrodes
  - Ensure that the electrodes are filled with the appropriate reference fill solution (4M KCl or KNO3). Daily top-ups are recommended, however electrodes should be drained and filled with fresh solution every few days for best results. Also ensure that the fill hole remains open to allow for proper flow of fill solution, if applicable.
- 2. Check the system set-up
  - Check that any needles used to aspirate sample, buret tips, temperature probes, electrodes and stirrers are placed in a way that they will be submerged in solution as far as they can go without hitting the bottom of the sample vessels and/or TitraSip cells. Dosing tips should be raised high enough so that they will not be submerged below the liquid level when running samples.
- 3. Check chemicals and reagents
  - Check that all reagent bottles are adequately full, and pump lines are primed.
  - Purge burets to fill with fresh titrant and ensure that the syringes are clear of bubbles before running titrations. See section **5.0 Manual Control** for details.
- 4. Check water / waste reservoirs
  - Check that the rinse water reservoir is adequately full so that it does not run out of rinse water during a run.
  - Check that the waste carboy is adequately empty so that it does not overflow, and that any drain lines will not become submerged in liquid. Drains are usually gravity-fed, so if lines become submerged the waste will not drain.
- 5. Calibrate electrode(s) and meters, as required
  - Electrodes, conductivity probes and PeCODs should be calibrated at the beginning of each run of samples, or at a minimum, daily.
  - Spectrophotometers can be calibrated weekly, or until QC checks fall outside of specified limits.
  - Turbidity meters can be calibrated every 3 months, or until QC checks fall outside of specified limits.

#### **1.2** Software Initialization

If the system has been shut off, power up the system and initialize the software:

Turn the power on to all instrumentation and to the computer. To start PC-Titrate, double click the PC-Titrate V3 icon found on the desktop screen. If passwords have been enabled, log on to the system with a valid user name and password.

- In the "Enter User Name" box, enter the user name.
- In the "Enter Password" box, enter the password.
- Click **OK** to enter these settings and obtain access to the program main menu.

#### 1.3. AutoRun Buttons

The below picture is an example of a main menu screen of PC-Titrate software. The icons in the bottom left corner are AutoRun buttons, which are fully customizable and used for quick access to templates containing analyses and calibrations.

Note that your home screen may look different depending on the methods and AutoRun buttons set up for the system.

AutoRun buttons can easily be added/removed/edited as required. See **Appendix B** for details.



#### 1.4. Running Samples

Each AutoRun button opens a timetable screen with samples and tests preloaded. Add or remove samples from the timetable by using the buttons found at the bottom of the screen. This screen may also be accessed by navigating to the **Titrator – Run Titration** tab, located in the main menu. This will open an empty timetable grid. Build a timetable from scratch or load an existing template by clicking the **Load Template** button.

PC-Titrate For Windows V3 - Timetable Setup									
Timetable / Sample Entry - Template: Nor	ne								
# Schedule	Order Number	Sample Name	Vial	Weight	Volume	Start Date	Start Time	Customer	
TTRSP PH CALIBRATION	20140506-1	pH cal	1						
Tampista Maintananca Commande									
<ul> <li>Clear Template</li> <li>Load Ter</li> </ul>	nplate	Auto-Generate Or	der N	lumber	1	Add	L x Pows	1	
Clear Template Load Ter	nplate	Auto-Generate Or	rder N	lumber		Add	l x Rows		
Clear lemplate     Load Ter     Append to Template     Save     Save <u>As</u> Delete	nplate New	Auto-Generate O	rder N	lumber		Add Clear 1	l x Rows Fimetable G	Grid	
Clear lemplate     C Append to Template     Save     Save As     Delete      Other Template Commands	nplate	Auto-Generate Or	rder N ed Sa	lumber mple		Add Clear 1 Cheo	I x Rows Fimetable G	e	
Clear lemplate     C Append to Template     Save     Save As     Delete      Other Template Commands      Lick To AutoRup	New	Auto-Generate Or	rder N ed Sa	lumber mple		Add Clear 1 Cheo Print Exi	I x Rows Fimetable G ck Timetabl	e able	

#### Adding Rows

Add x Rows...

To add samples to a timetable, click on the Add x Rows button. Type in the number of samples to add and click OK. Drag and drop the empty rows into the appropriate sample row. Be sure to fill in all necessary information required:

- 1. **Schedule** Required field. Double click and select from the list. To copy the same schedule to other lines, drag and drop. Hold down the SHIFT key while dragging and dropping to populate the same schedule for all lines.
- 2. Order number Required field. Type a number or use Auto-Generate Order Number button. To copy the same order number to other lines, drag and drop. Hold down the SHIFT key while dragging and dropping to populate the same order number for all lines.
- 3. **Sample name** Required field. Must be unique for each line. If the same name is desired (e.g. running duplicates), drag and drop to auto-increment the name, e.g. Sample-1, Sample-2.
- 4. Vial # if the system has an Autosampler, this is a required field.
- 5. Weight required only if sample calculations are using weight instead of volume.
- 6. **Volume** this will populate automatically from the Titration Method and must only be changed if the sample volume used is different than what is showing, for beaker and standalone systems only. This changes the volume used in the calculations, therefore this value <u>must not be changed for TitraSip systems</u> as set sample volume is programmed for automatic pumping.
- 7. **Start Date** leave blank if beginning the run immediately. If the run date is not today (e.g. setting up the system to run a calibration in the morning before operator arrival), double click to select the start date. Holding down the SHIFT key, drag and drop to copy the date to additional lines.
- 8. **Start Time** leave blank if beginning the run immediately. If the run time is being delayed (e.g. setting up the system to run a calibration in the morning before operator arrival), double click to select the time. If the rest of the run can begin in sequence, only fill in the first line. To schedule each remaining sample for specific times, hold down the SHIFT key and drag and drop to additional lines. This will prompt the operator to select a time increment (e.g. analyze every 1 hour, every 30 minutes, etc.)
- Customer customizable; can be left blank. Double click to see a list of options. The list is user-entered under the tab, Utilities – Utility Databases – Edit Customer Database. Enter the customer information, then click the + button to name the entry. Then click the checkmark button to save.

#### Removing Rows Delete Highlighted Sample

To remove sample rows from a timetable, click on the sample to remove then click on the **Delete Highlighted Sample** button. This will remove the sample from the list. To clear the entire timetable and start over, click the **Clear Timetable Grid** button.

#### Printing a Timetable

Print Existing Timetable

Once the timetable of samples is complete, print a copy by clicking on the **Print Timetable** button.

Clicking **Save** or **Save As** to save the timetable, if desired. **Save** will overwrite the original template (if loaded from an existing template or AutoRun button), and **Save As** will create a new template (prompted for a name).

**NOTE:** template names cannot be reused, even if the template has been deleted. It is best to just overwrite the original unless access is required at a later date. Additionally, if the original template has been linked to an autorun button, the original template remains linked to it, i.e. saving the template as a new name will require a new autorun button to be created. See **Appendix B** for details.

When the samples are ready and loaded into the Autosampler rack, begin sample analysis by clicking the **Start** button. If a message that says "Timetable contains errors" is displayed, click the **Check Timetable** button. This will indicate the cause of the error, such as missing required information.

#### The Schedule Tab

When a run is in progress, the **Schedule** tab displays a step-by-step list of actions as a sample is being analysed. Steps such as Activate Pump, Assign UDV, Titration, etc will be displayed in real time.

PC-Titrate For Windows V3 - Run	Titration - TURBIDITY - RUNNING	
Titration Schedule - TURBIDITY		Start
Assign UDV -Subroutine -Schedule -If Sampler Setup -Subroutine -Subroutine -Subroutine -If Digital Off Digital Off Digital Off Digital Off Sampler Move -Schedule -Ctvate Pump Stirrer On Digital On Activate Pump Stirrer Off Digital Off	Scheduler Event> Wait Until Condition Time Delay 30	Priority! Resume
		<u>o</u> k
Status		
DI-1	Time Delay Countdown (s)	
Total - 00:00:57	Time Delay: 2.00 seconds	
Press "Esc "Key to Interrupt Sche	dule Step	
<u>Timetable/Samples</u>	h (Results/Raw Data (UDV Results (Eguation Results (Calibration Results /	

#### The Graph Tab

When a run contains titrations, the **Graph** tab can be used to view titration curves in real-time as the curve is being plotted. The blue line is the titration plot, and the red line is the first derivative (when selected to appear). Any inflection endpoints found will also be indicated on the curve.



#### The Results / Raw Data Tab

During a titration, this tab displays the electrode reading (usually mV or pH) and the total volume of titrant added for each injection. It will also indicate any endpoints and pKas found.

ndpoints Detected	Raw D	ata				Sta
the later all (a) (	5	0.1599	10.10	0.00	0.0	
volume pr/mv	6	0.3906	9.89	0.00	0.0	
	7	0.6125	9.60	0.00	0.0	Prio
	8	0.7667	9.25	0.00	0.0	
	9	0.8557	8.85	0.00	0.0	
	10	0.9000	8.46	0.00	0.0	
	11	0.9224	8.13	0.00	0.0	Rest
	12	0.9359	7.93	0.00	0.0	
	13	0.9495	7.82	0.00	0.0	
Kas Detected	14	0.9750	7.72	0.00	0.0	
# \/olume pk/m\/	15	1.0255	7.57	0.00	0.0	
+ volume promv	16	1.0948	7.39	0.00	0.0	
	17	1.1703	7.23	0.00	0.0	
	18	1.2646	7.07	0.00	0.0	_
	19	1.3807	6.90	0.00	0.0	ST
	20	1.5203	6.68	0.00	0.0	01
	21	1.6484	6.47	0.00	0.0	_
	22	1.7693	6.29	0.00	0.0	
	23	1.9026	6.11	0.00	0.0	
	24	2.0500	5.89	0.00	0.0	
	25	2.1828	5.58	0.00	0.0	
	26	2.2693	5.25	0.00	0.0	
	27	2.3224	4.96	0.00	0.0	
	•			1	•	아
tatus						
ALK 100-3						
Total - 00:52:26	Pumping: 22.50 s	econds				

#### The UDV Results Tab

This screen displays the values for all UDV results, although only current sample UDVs are shown. **Appendix A** defines the standard UDVs which may be formula results, electrode readings, etc. Note that UDV definitions may vary from the standard, and some will not be applicable.

#         UDV Value           1         0.000000           2         0.000000           3         0.000000           4         0.000000           5         0.000000           6         0.000000           7         0.000000           8         0.000000           9         0.000000           10         0.000000           12         0.000000           13         0.000000           15         0.000000           16         0.000000           17         0.000000           18         0.000000           19         0.000000           120         0.000000
I         0 0000000           2         0 0000000           3         0 0000000           4         0 0000000           5         0 0000000           6         0 0000000           7         0 0000000           9         0 0000000           10         0 0000000           11         0 0000000           12         0 0000000           13         0 0000000           14         0 0000000           15         0 0000000           17         0 0000000           18         0 0000000           19         0 0000000           20         0 0000000
2 0,0000000 3 0,0000000 5 0,0000000 6 0,0000000 8 0,0000000 9 0,0000000 11 0,0000000 11 0,0000000 12 0,0000000 13 0,0000000 14 0,0000000 15 0,0000000 16 0,0000000 17 0,0000000 17 0,0000000 18 0,0000000 19 0,0000000 20 0,0000000
3         0.0000000           4         0.000000           5         0.000000           6         0.000000           7         0.000000           8         0.000000           9         0.000000           10         0.000000           11         0.000000           13         0.000000           14         0.000000           17         0.000000           18         0.000000           19         0.000000           20         0.000000
4         0.0000000           5         0.0000000           6         0.0000000           7         0.0000000           8         0.0000000           9         0.0000000           10         0.0000000           11         0.0000000           12         0.0000000           13         0.0000000           15         0.0000000           16         0.0000000           17         0.0000000           19         0.0000000           20         0.0000000
5         0.0000000           6         0.000000           7         0.000000           8         0.000000           9         0.000000           10         0.000000           11         0.000000           12         0.000000           13         0.000000           14         0.000000           15         0.000000           17         0.000000           18         0.000000           19         0.000000           20         0.000000
6 0,0000000 7 0,0000000 9 0,0000000 10 0,0000000 11 0,0000000 12 0,0000000 13 0,0000000 14 0,0000000 15 0,0000000 16 0,0000000 17 0,0000000 18 0,0000000 19 0,0000000 20 0,0000000
7         0.000000           8         0.000000           9         0.000000           10         0.000000           11         0.000000           12         0.000000           13         0.000000           15         0.000000           16         0.000000           17         0.000000           18         0.000000           19         0.000000           20         0.000000
8         0.0000000           9         0.000000           10         0.000000           11         0.000000           12         0.000000           13         0.000000           14         0.000000           15         0.000000           16         0.000000           17         0.000000           18         0.000000           19         0.000000           20         0.000000
9         0.0000000           10         0.0000000           11         0.0000000           12         0.0000000           13         0.0000000           14         0.0000000           15         0.0000000           16         0.0000000           17         0.0000000           18         0.0000000           19         0.0000000           20         0.0000000
10         0.000000           11         0.000000           12         0.000000           13         0.000000           14         0.000000           15         0.000000           16         0.000000           17         0.000000           18         0.000000           19         0.000000           20         0.000000
11         0.000000           12         0.000000           13         0.000000           14         0.000000           15         0.000000           16         0.000000           17         0.000000           18         0.000000           19         0.000000           20         0.000000
12         0.0000000           13         0.0000000           14         0.0000000           15         0.0000000           16         0.0000000           17         0.0000000           18         0.0000000           19         0.0000000           20         0.0000000
13         0.000000           14         0.000000           15         0.000000           16         0.000000           17         0.000000           18         0.000000           19         0.000000           20         0.000000
14         0.000000           15         0.000000           16         0.000000           17         0.000000           18         0.000000           19         0.000000           20         0.000000
15         0.000000           16         0.000000           17         0.000000           18         0.000000           19         0.000000           20         0.000000
16         0.000000           17         0.000000           18         0.000000           19         0.000000           20         0.000000
17         0.000000           18         0.000000           19         0.000000           20         0.000000
18 0.000000 19 0.000000 20 0.000000
19 0.0000000 20 0.0000000
20 0.0000000
21 0.0000000
22 0.0000000

#### The Equation Results Tab

This tab shows the results of any formulas that are utilized within the timetable. The different formula sets will have tabs along the top of the screen, and appear as they become saved. Sample data will also appear as they become available (they will be append to the list).

				(	- (L		<u> </u>	
ample ID	cond	рН	palk	talk	bcarb	carb	hydro	Priority
ample 02/18/00-2	0.000	9.648	19.969	49.682	9.745	39.937	0.000	Chorky
ample 02/18/00-3	0.000	9.628	19.821	49.478	9.836	39.642	0.000	
ample 02/18/00-4	0.000	9.629	18.954	49.235	11.327	37.909	0.000	
ample 02/18/00-5	0.000	9.640	18.799	49.177	11.579	37.598	0.000	Resume
ample 02/18/00-6	0.000	9.624	19.037	49.216	11.142	38.074	0.000	
ample 02/18/00-7	0.000	9.630	18.854	49.340	11.633	37.707	0.000	
ample 02/18/00-8	0.000	9.619	18.997	49.519	11.524	37.995	0.000	
ample 02/18/00-9	0.000	9.635	19.042	49.785	11.701	38.084	0.000	
ample 02/18/00-10	0.000	9.603	18.083	49.058	12.892	36.167	0.000	
ample 02/18/00-11	0.000	9.616	18.188	49.117	12.741	36.376	0.000	STO
ample 02/18/00-12	0.000	9.634	18.209	48.889	12.472	36.417	0.000	
ample 02/18/00-13	0.000	9.608	18.240	49.432	12.952	36.481	0.000	
							Þ	
Track Current Sample			Print	]		<b>V</b> S	Show Grid	Ōĸ
atus								
mple ID - Sample 02/18/	00-13							
tal Tima Elanaad - 62:26	28							

#### **The Calibration Results Tab**

This tab shows the resulting data for all calibrations carried out during the present run. The calibrations will appear in the order they are analyzed.

ample 02/18/00-1	Cal ID: PH (	AL 4-7-10 C	al Record #: 21	2 Valid: TRUE	Start
Date: 02/18/2000	Time: 4:52:4	19 PM	•• •• ••		
Channel: 1	Temperature:	294.42 K 21	.27 C		Priority
	Results	Minimum	Maximum		
Slope:	-57.758	-65.000	-45.000		
Intercept:	18.877	-100.000	100.000		
Corr Coeff.:	0.9999	0.9900	0.0000		Resum
Equation: $Y = (-5)$	7.758 ) X + (	18.877 )			
Calibration Data:	Standard	Reading			
	4.000	193.720			
	7.000	15.740			
	10.000	-152.830			
					I STO
		Copy Data to Clip	oboard		<u>o</u> k
atus					
ample ID - Sample 02/18/00-13					
otal Time Elapsed - 63:33:39					
ess "Esc "Key to Interrunt :	Schedule Sten				

The Cal Record # shown at the top of the screen can be used to identify and find calibration results in historical calibration data.

NOTE: The Valid:TRUE result shown at the top of the screen can only be trusted for single-line fit calibrations (usually only

#### 2.0 Stopping / Pausing a Run

There are 3 ways to stop a run:

#### **The STOP Button**

Clicking the STOP button will stop the run in the middle of its current task and abort the timetable. Use with caution.

#### **The Priority Button**

This button is used to interrupt the timetable to allow for modifications to the timetable – e.g. insertion of a priority sample, adding additional samples, etc. Click on this button and the system will wait until the current sample is finished analyzing, then the system will pause and allow for use of the edit buttons.

From the Timetable/Samples tab, make the desired modifications. Once the system pauses, the timetable buttons will reappear to add rows. The empty rows will be added to the bottom of the timetable. Once all necessary information is enter, either leave the rows at the bottom to be analyzed at the end of the run OR drag and drop to the top of the timetable by selecting the desired row and dragging to the top of the list. Click on the Resume button to continue the run.

NOTE: if making changes to the physical position of any samples on the Autosampler, be sure to modify the vial numbers.

#### The Esc Key

Press the Esc key on the keyboard pauses the run. This will stop the system almost immediately, and give users the choice of continuing normally, breaking out of the current schedule step, aborting the titration,

or aborting the entire run. This is useful to pause the system immediately (e.g. to obtain more rinse water, empty a waste carboy, etc.) without terminating the run.

#### 3.0 Viewing Historical Reports

#### 3.1. Reports

All data is saved in the database in a historical report. Once the "in-run" report is closed, that data will append to the historical report. To access the report, follow the below instructions.

- 1. From the main menu, click on the AutoRun button labelled "Historical Data Report".
- 2. The "Run Timetable" template will appear. Click START.
- 3. After a few moments, the report will generate. This report will contain ALL historical data unless a previous filter has been specified. To filter for specific information (e.g. date, order number) click on the **Define Search** tab.

<u>S</u> tert
Priority!
Resume
STOP
Ōĸ

🦊 Shazam R	leport Wizard	l: C:\Program	n Files\Hinter	land\PC-Tit	rate V3\Repo	rts\Water ana	lysis histor	ical data repo	ort.SRW		
File Edit Vie	w Help										
🖰 🖻 🔒	🖶 🗟 🗖	P 😪 🧉 🗆	វិ 🗖								
Define Sea <u>r</u> ch	Layout Page	View S <u>Q</u> L   <u>P</u> rev	view Report								
_											
Runlist Number									WATE ID Runi	RANALYSISE(	QUATIONSET
DateSta TimeSta DateFin TimeFin RunNar Operato ExtraSt ExtraFla TimeZo	arted arted iished ne rr gal pat1 ne		Samples Sample RunNu Sched OrderN Sample Sample Sample Date Time	eNumber Imber JuleUsed Jumber eName eName eWeight eVolume		Schedu Numb Name Create Modifi Disco Curre Activa Extra	e er ed ntinued ntiversion sted String1		Sam Orde Sam Run Run TTN conr pH palk talk bcar carb	pleNumber erNumber pleID Date Time Number d	
			QCNo			Extra	loat1		fird	x	
•			Luston			Datel	redleu		CI		
HEADER	SampleNumber	RunNumber	OrderNumber	SampleID	RunDate	BunTime	cond	Гон	palk	talk	bcarb
TABLE	WATERANALYS	WATERANALY	WATERANALY	WATERANA	LY: WATERANA		Y WATERAN	IALY: WATERAN	ALY: WATERAN	IALY: WATERAN	ALY: WATERAN
FIELD	SampleNumber	RunNumber	OrderNumber	SampleID	RunDate	RunTime	cond	pH	palk	talk	bcarb
SHOW	Show	Show	Show	Show	Show	Show	Show	Show	Show	Show	Show
SORT	A-Z	None	None	None	None	None	None	None	None	None	None
FILTER 1											
FILTER 2											
FILTER 3											

- 4. Note the grid on the lower half of the screen. Looking at the HEADER row, find the parameter to filter by. For example, to display only today's results use the **RunDate** column. To create a filter, double click in the **Filter 1** cell within the desired column.
- 5. An **Edit** window will appear. In the drop-down menu under the Filter 1 of 5 header, select a filter parameter (e.g. Is Equal To), then type a filter value into the first empty text box. For example, to see data from April 1 2017, type 04/01/2017. The format is usually **MM/DD/YYYY** but can be verified by looking at the date format in the current report on the Preview Report tab (prior to setting filters).
- 6. Click **OK** and then click on the **Preview Report** tab. After a moment the report will be generated. Navigate through pages by using the arrows at the top of the screen. The arrow with the line next to it links to the last page.
- 7. To print this report, click on the Print icon or go into the File menu and then Print Report. A Print dialog box will appear. Select the printer of choice and then click OK.
- 8. To export a report as a text file (which can then be imported into Excel), go to **File**, **Export**. In the "File Type" dropdown menu, select ASCII Delimited File (TXT) or Fixed Field ASCII File (TXT). Click the "..." button next to "File Name" text box to choose a location and file name. Click OK, and a message will appear indicating that the export file has been successfully created.
- 9. When closing the report, a prompt to save changes to the current report before closing will appear. To save the report with the filter in place, click Yes (the report will remain queried as defined and will not list all data the next time it is opened), otherwise click **No.** Note that the filter can easily be changed/removed.

Edit WATE	RANALYSISEQUATIONS	T.RunDate		
Field <u>P</u> ropert	ies Custom <u>E</u> xpression			
<u>H</u> eader	RunDate	Filter 1 of 5		<u>C</u> ancel
<u>Т</u> уре Сћани	Date	Is Equal To	• Or	Clear
<u>S</u> ort	Show		Or	+ +
<u>F</u> ormat			Or	<b>↓</b>
<u>₩</u> idth Alian	8		Or	Help
Angn	Hight 🗾	, Use BLANK for empty	fields	

**NOTE:** reports can also be accessed "off-line" (without connection to an interface) by navigating to the **Reporting**, **Prepare and/or Print Shazam Reports** tab from the main menu. Click the "Open File" icon at the top of screen and a list of reports will appear.

See Appendix E for details on how to make modifications to reports.

#### 3.2. Replay Titration

To view previous titration information (including graphs and all equation results), open the **Replay Titration** screen located within the **Titrator** menu. This is a good place to start when troubleshooting problems with titrations.

When first opening the replay screen, an empty graph will display. Click the Load button to open a previous run.

		PC-T	itrate For	Windows	V3 - Titrat	ion Repla	y - nc	file	
Gra	ph						-		
	1.0						_		
		PC-Titrate For	Windows	V3 - Titra	tion Searc	h Form			
Run List									
Run Nur	nber DateStarted	TimeStarted Operator		^				Sort Run List by	
	270 2014-02-12 271 2014-02-12	10:37:25 AM 1:16:29 PM						C Operator	
	272 2014-02-12	1:16:53 PM		~				O Date/Time	
			,						
Samples -	imber	SampleName	Date	Time	Customer	Status	Vi	Sort samples by	
201402	12-1	test	2014-02-12	10:41:26 AM		Normal End		Run Number	<u>L</u> oad
								Sample Name	
<							>	Order+Sample Name	
Titrations									<u>о</u> к
Titration	Number Stop Co	ndition						Cancel	
								Select	
	h / Results/Ra <u>w</u>	yData ∫UDV Results / Re	eplay Equation	n Results /					

In the Run List section, select the run you wish to view. The most recent runs are at the bottom of the list. Note that only titrations run can be opened and viewed.

Run Number	DateStarted	TimeStarted	Operator	^
295	2014-02-24	3:11:39 PM		
296	2014-02-25	9:45:33 AM		
297	2014-02-25	9:45:54 AM		

In the Samples section, select a sample to view.

Γ.	Sa	mples						
		OrderNumber	SampleName	Date	Time	Customer	Status	^
		20140224-4	factor	2014-02-24	3:17:28 PM		Normal End	
	Þ	1111	sample 1	2014-02-24	3:22:24 PM		Normal End	
		2222	sample 2	2014-02-24	3:26:38 PM		Normal End	Υ.
	<						>	

In the Titrations section, select the titration to open. Note that this step can be skipped if the sample run contained only one titration.



Click the **Select** button to load a sample. The first screen is the **Graph** page which displays the titration curve. The blue line is the titration plot and the red line is the first derivative (only applicable for inflection endpoints). Any inflection endpoints will be indicated on the curve.

The **Analysis** section at the bottom indicates the current smoothing and filter settings. For set endpoint methods (e.g. alkalinity) this section is not applicable. For methods relying on inflection endpoints, smoothing is used to average the slopes of the first derivative curve to prevent the selection of noise as a true endpoint. More smoothing will make endpoints harder to detect, so if the true inflection is small the smoothing should be set lower.

The filter setting is used to further isolate the correct inflection endpoint by filtering out noise in the first derivative curve, indicated by the solid red line. The ideal filter is set above the flat part of the first derivative and below the peak. The "x Largest" drop down menu allows the user to select how many endpoints to view on the curve, if found. Note that any changes made here are not permanent. To change settings for all future samples, see **Appendix C** for information about titration method changes.



The **Results/Raw Data** tab displays the volume and electrode reading (either pH or mV) at each injection. Any endpoints or pKas detected will also be indicated.

points Detected	Raw Da	ta				
Volume pH/mV	Point	Volume (ml)	Input 1 pH/mV	Input 2 pH/mV	pH/	
0.390 0.247	1	0.0000	4.08	0.00	0.0	
	2	0.0099	4.09	0.00	0.0	
	3	0.0349	4.10	0.00	0.0	
	4	0.0599	4.11	0.00	0.0	
	5	0.0849	4.12	0.00	0.0	
	6	0.1099	4.13	0.00	0.0	
is Detected	7	0.1349	4.15	0.00	0.0	
Volume nK/mV	8	0.1599	4.16	0.00	0.0	
volume promv	9	0.1849	4.17	0.00	0.0	
	10	0.2099	4.19	0.00	0.0	
	11	0.5599	4.37	0.00	0.0	
	12	0.9099	4.52	0.00	0.0	
	13	1.2599	4.66	0.00	0.0	
	14	1.6099	4.78	0.00	0.0	
	15	1.9599	4.80	0.00	0.0	Los
	16	2.3099	4.89	0.00	0.0	<u></u>
	17	2.6599	4.99	0.00	0.0	
	18	3.0099	5.09	0.00	0.0	Drin
	19	3.3599	5.19	0.00	0.0	<u>E</u> (m)
	20	3.7099	5.29	0.00	0.0	
	<				>	<u>0</u> H
lvsis						
mes To Smooth Smoothing Points Filter	x Largest					
2000 - 2 - 10.00						

The **UDV Results / Replay Equation Results** tab will display the UDV values for that sample as well as all equation results, presented in the order they are saved. Note that if the titration method uses inflection endpoints, changing the smoothing settings will slightly change the results displayed as smoothing affects the location of the endpoint.

IDV #	UDV Value	Equation Replay Results		
DV 1	-1.0000000 🔺	ACIDITY	<b>^</b>	
DV 2	4.0844431	ep2 xvol(8.3)	6.399 mL	
DV 3	-1.0000000			
DV 4	-1.0000000	ACIDITY		
DV 5	-1.0000000	svol svol	35.000 mL	
DV 6	-1.0000000			
DV 7	-1.0000000	ACIDITY		
DV 8	-1.0000000	tcon tcon	0.020 N	
DV 9	182.8385468	ACTDIMY		
DV 10	-1.0000000	magid wwol(2,7) *teop*50000/avo	0.000 mm	
DV 11	-1.0000000	macia xvoi(3:7)*ccon*30000/500.	- 0.000 ppm	
DV 12	27.8357544	ACTDITY		
DV 13	-1.0000000	tacid xvol(8.3)*tcon*50000/svo	l 182.839ppm	
DV 14	-1.0000000			
DV 15	-1.0000000	WATER ANALYSIS EQUATION SET		
DV 16	-1.0000000	cond udv1	-1.000 umhos	
DV 17	159.4199982			Load
DV 18	10073.78125	WATER ANALYSIS EQUATION SET		
DV 19	10131.34277	pH udv2	4.084 pH	
DV 20	0.0000000			Print.
DV 21	0.0000000	WATER ANALYSIS EQUATION SET		
n\/ ?? (	0 000000	palk udv3	-1.000 ppm	
	,	1	· · · ·	<u>0</u> K
alysis				
	ath Consething Deinte	Either and encoded		
imes to Smo	oth Smoothing Points	riter x Largest		
Once	▼ 3 ▼	10.000		

#### 4.0 Calibrations

#### 4.1. Calibration Templates

Calibration Templates define details of each calibration, including type, stability criteria and standards used.

To determine which calibration template the calibration schedule is using, go to the **Setup** tab, **Analysis Schedule**. Click the **Load** button and select the calibration schedule to view.

PC-Titrate For Windows V3 - Schedule Editor	
Analysis Schedule	Edit Eunctions
	Select Events to See/Use     All     O Titrations
Schedule Search Form - Select Schedule To	o Use uting ecial
Enter Search Text: PH CALIBRATION Available Selections: PH ALKALINITY PH ALKALINITY GRANS ANALYZE EX ACIDITY CONDUCTIVITY METER CAL CONDUCTIVITY MULTIPOINTCAL PH CALIBRATION MAINTENANCE MANUAL SPARE PARTS LIST	y) Event t Event lit Remove
Left     Current Selection:       PH CALIBRATION       Load       Save       Save       New       Print       Delete	<u>Cancel</u> <u>QK</u>
	Done

Click on the **Calibration** folder in the schedule steps listed on the left side of the screen. Look in the bottom right corner above the white comments box. It will indicate the name of the calibration template used. In this example the template name is PH.

PC-Titrate For Windows V3 - Schedule Editor	
Analysis Schedule - PH CAL Version 2	
Analysis Schedule - PH CAL Version 2	Edit Eunctions          Stirrer Off         Select Events to See/Use            • All
Load Save Save As New Print Delete	
	Done

Change the calibration template in use by clicking the **Edit** button and selecting a new template.

TRUE or FALSE will appear beneath the calibration template name indicating whether the calibration report will be printed automatically after completion (TRUE means it will print). To change the current setting, click the Edit button and reselect the template currently in use. The system will then ask if the user wishes to print the calibration.

If any changes were made, be sure to SAVE your updated schedule.

#### To view/edit a Calibration Template:

Go to the **Setup** tab, and select **Calibration Template**. Click the **Load** button and select the calibration to view.

PC-Titrate For Windows V3 - Probe Calibration	_
Select Class of Calibration	
Probe Identification Calibration Search Form - Select Calibration Setup to Open	
Port     1       Probe Type     PH       Available Selections:       AMMONIA COLOR       COLOR       COUDULCTIVITY	
Stability (applies t Stability Type TURBIDITY	
C Rate of Chan     Current Selection:       C Delta mV / De     Current Selection:       PH     QK	
General Information	
Calibration Template Commands       Load     Save       Save     Save As         Delete         Delete	]
Calibration Setup/	

There are three tabs to choose from.

The **General Information** tab defines information such as the class of calibration (i.e. electrode or meter), the applicable electrode/meter port, probe type, temperature compensation information and stability criteria.

PC-Titrate For Windows V3 - Probe Calibration	
Calibration Setup - PH 4 7 10 Version 1	
Select Class of Calibration	
Probe Identification	
Probe ID PH ELECTRODE	
Port 1 - Add Probe ID	
Probe Type PH  Units	
Record Temperature C None C Manual  Automatic	
Stability (applies to Automated Calibration only)	
Stability Type     Stability Time Out (s)     90	
Rate of Change     Delta mV / Delta Time     Delta mV / 0.30     Delta Time 10	
General Information Standards (Validation /	
Calibration Template Commands	
Load     Save     Save As     Delete	<u>0</u> K
Calibration Setup	

The **Standards** Tab defines which standards are being used in the calibration, and the fit type. Fit type options include Single Line fit (line of best fit) or Multi-Point (point-to-point) curve. Some calibration types also provide an option for Quadratic Fit.

PC-Titrate For Windows V3 - Probe Calibration	
Calibration Setup - PH 4 7 10 Version 1	
Standards	Number         Standard           1         4.0000           2         7.0000           3         10.0000
Replicates	
Analysis Type Single Line Fit Multiline Line Fit	
\General Information <mark>\Standards</mark> Validation / Calibration Template Commands 	Delete Print OK
Calibration Setup/	

Add or remove standards by clicking the arrows under Standards to the left or right. Then enter the standard value(s) in the list on the right side of the screen. You can also change the values of the current standards listed. Note that standards must be in ASCENDING order, and the minimum value to enter is 0.000000001. Keep this in mind when deleting old values as a message indicating that the value is below minimum will be displayed.

The **Validation** tab displays validation criteria (applicable for single line fit only). Define the acceptable ranges for slope, intercept and correlation coefficient.

Validation Validation				
Slope (mV/pH) Intercept (mV) Correlation	Minimum         Maximum           -65.00         -53.00           -100.00         100.00           0.99500         -			
QC Regime	PH FLECTRODE SLOP	Use Q(	2C Selection.	
Intercept	PH ELECTRODE OFFS	Use Q(	QC Selection	
General Information / Calibration Template	Standards <mark>(Validation)</mark> Commands Save Save <u>A</u> s De	lete	Print	-

If any changes were made, be sure to SAVE the updated template. To keep both the old and new template, select SAVE AS. If choosing Save As, see **Appendix D** for instructions on how to implement the new calibration template.

#### 4.2. Viewing / Printing Historical Calibration Data

All historical calibrations are saved within the database for future viewing/printing. To view a historical calibration:

- 1. Go to the Titrator menu, and select Examine Calibrations.
- 2. Using the drop-down menu, choose the port the electrode is plugged into (pH is usually on port 1, fluoride is on port 2). For serial devices (e.g. conductivity meter), select Serial.

PC-Titrate For Windows V3 - Examine C	alibrations	
Select Calibration		
Port Type Probe ID Serial PH V Serial 2 3 4	Calibration ID	
Calibration ID Probe ID Date Time		
Port Probe type Temperature K Temperature entry None Type of fit No. of standards No of Reps Operator Calibration Valid	No Calibrations Available For Your Selected Combination	
	\ <u>Giraph (Data</u> /	
Image: Calibration #:       Record 0 of 0	Print this Calibration	
		<u>0</u> K

3. Choose the probe type, the Probe ID and Calibration ID using the drop-down menus.

PC-Titrate For Windows V3 - E	Examine Calibrations		
-Select Calibration			
Port Type	Probe ID FELECTRODE	Calibration ID FLUORIDE	

4. For a color, conductivity or turbidity calibration, the probe type should be Linear and the Probe ID drop-down menu will provide a list of all serial devices connected to the interface. Note that "Man-Tech 991" is a conductivity meter.

PC-Titrate For Windows V3 - E	Examine Calibrations		
Select Calibration			
Port Type Serial ▼ Linear ▼	Probe ID 2. Device Man-Tech Turbidity <b>2. Device Man-Tech Turbidity</b> 3. Device Man-Tech 991 4. Device Shimadzu UV 1240	Calibration ID TURBIDITY	•

5. The most recent calibration will appear. Use the arrows at the bottom of the screen to scroll and view past calibrations.

PC-Titrate For Windows V3 - Examine Calibrations	
Select Calibration	1
Port Type Probe ID Calibration ID	
Calibration ID PH Probe ID PH ELECTRODE Date 03/09/2011 Time 10:53:16 AM         Pott       1 Probe type pH Temperature 296.2 K 23.0 C Temperature entry Auto Type of fit         Single Line Fit         No. of Reps       1 Operator         Calibration Valid       Yes         Calibration Valid       Single Line Fit         Departor       6.0         Calibration Valid       Yes         Calibration Valid       Yes         Calibration IV and       Entry Attack         Expected       Entry Attack         Protected       Entry Attack	
Record 1 of 5	<u>O</u> K

- 6. General calibration information (e.g. date, time) will appear on the left of the screen, and the calibration record # at the bottom of the screen. On the right, the calibration graph will be displayed. View information like slope(s), intercepts(s) and readings in the **Data** tab.
- 7. Print the calibration report by clicking the **Print this Calibration** button and selecting the printer destination. Choose to print to the screen, printer, or export the data. Then click Print. When finished, click **Done** to exit the window, and **OK** to exit the screen and go back to the main menu.

C-Titrate For Windows V3 - Print Rep	prt(s)	×
Report Lists Available         Name       AUTHORITY LEVELS         AUTORUN       CALIBRATION MULTI LINE         CALIBRATION QUADRATIC       CALIBRATION SINGLE LINE         CALIBRATION VIEW CHANGES       CALIBRATION VIEW CHANGES         Reports in the Selected List         Report       calrprt2.srw	<ul> <li>Print Options</li> <li>All Reports in List</li> <li>Indicated Report</li> <li>Destination</li> <li>Screen</li> <li>Printer</li> <li>Export</li> <li>Print</li> </ul>	
•	•	<u>D</u> one

### 5.0 Manual Control

The user may manually control all hardware that is connected to the system through the **Manual Control** menu, located in the **Titrator** tab.

The **Digital** tab allows control of all digital inputs/outputs such as pumps, drains and stirrers. Identify the digital input/output number(s) by looking at the cable connected to the back of the module. Select the toggle switch for the appropriate digital number. Ensure the module switch is set to AUTO mode, where applicable.

PC-Titrate For N	Windows V	/3 - Manual	Control				
Digital Outputs	Output 1 Ou	Output 3	Output 4				 Continuous Scan Interval - 1000ms
Digital Inputs	L.	put 2 Input 3	لے لیے Input 4 Inpu	<b></b> it 5 Input 6	上 Input 7	L Input 8	Scan Digital
Digital I/O 9-16			0 1/0 12 1/0	) () 13 1/0 14 0 1 0	() 1/0 15	() 1/0 16	Scan A <u>n</u> alog
Digital I/O 17-24	() 1/0 17 1/4 1 0	(0)     (18)     (19)     (10)     (10)     (10)		● ● 21 1/0 22 0 ⊥ 0	● 1/0 23 ⊥0	() 10 24	Stirrer Speed(%) - 0
Digital (Analog	√ Serial Devi	ices ( Autosar	ipler /				 OK
	)(		····)				 

The **Analog** tab is where manual readings of electrodes or temperature probe are displayed.

P	C-Titra	ate For Windows V	3 - Manual Contro	l				Continuous Scen
			non-Calibrated	Calibrated				Interval - 1000ms
		Temperature (Celcius	s) mV		с			
	Scan		non-Calibrated	Calibrated		Temp Comp	Use Cal	Scan Digital
		Electrode 1					_	Continuous
		Calibration - None	mv		Units	NO		Scan Analog
		- Flootrada 2						Continuous
	◄	Calibration - None	m∨		Units	No		
	-	Electrode 3						Stirrer Speed(%) - 0
	<b>•</b>	Calibration - None	m∨		Units	No		
	_	Electrode 4						
		Calibration - None	m∨		Units	No		
		Temperature Compen C None C Ma	sation Type Inual C Thermisto	)r				
	\ Digital	<u>Analog</u> (Serial Devid	ces (Auto <u>s</u> ampler /					<u>o</u> k
_								

Select the "Scan" box next to the desired electrode port(s), and select the "Use Cal" box to see calibrated readings. Select which calibration to use when prompted. See section 4.2 for details.

To turn on the stirrer plugged into the back of the interface, use the scroll bar on the right side of the screen to select a speed. 20 - 30% is standard.

To take an electrode or temperature reading, click the "Continuous" box, then select Scan Analog.

The Serial Devices tab controls all serial devices such as burets and meters. Each serial device has its own tab.

Buret Volume: 25 ml Syringe Buret Type Burivar II	Setup	Continuous Scan Interval - 1000ms
Reset Buret       Perform Purge         Purge Buret       1 Ime(s)         Syringe Full Down       Syringe Full Up	Dispense 10% Dispense 1% Dispense 0.1% Dispense Xml 0.000 Clear Bubbles (Xml) 0.000	Scan Digital
Burivar II TIS1 √No Device TIS2/ gital / <u>A</u> nalog <u>\ Serial Devices</u> / Auto <u>s</u> ampler /		<u>o</u> k

For meters, this screen allows the user to take a reading. Choose either Calibrated or Uncalibrated. If choosing Calibrated, select which Calibration Template to use.

For burets, this tab performs purges of the syringe (full empty/refill cycle), and injections.

C-Titrate For Windows V3 - Manual Control		
General Home Sampler Vial Operations Load Tray from Folder Tray Loaded> Zones	Go to this Location XYZ	Continuous Scan Interval - 1000ms Scan Digital Continuous Scan Analog Continuous
Z Arm Z Target (mm from Current position) Move to Z Target C 1 C 2 C 3	Go To this Location XY Only	
Digital ( <u>A</u> nalog ( <u>S</u> erial Devices <u>)</u> <u>Autosampler</u> /		<u></u> K

The Autosampler tab allows the user to manually move the autosampler to various locations.

To begin, load the tray file and select "**Home Sampler**". Once the sampler moves to the home position, use the Zones and Tubes drop-down menus to select the desired location to move the sampler. Racks are labelled with position numbers.

Once a location has been selected, move the sampler XY or XYZ. Moving XY will move the arm above the position selected but it will not move down into the vessel. The Z motion can be controlled independently by entering in values for Z Target (in mm). Moving down requires a negative number and moving up positive. Change the speed of the Z-arm movement by selecting speed level 1, 2 or 3 (3 is fastest). Note that 3 is the recommended speed.

## 6.0 Storage and Maintenance

#### 6.1. Backing up the Database

It is recommended that a database backup is performed on a regular basis, preferably every couple of weeks, or if any changes have been made to the database. It is recommended to save copies of the backup files to a safe location such as on a network, or memory stick in case of a hardware crash.

Since databases can become quite large, it is recommended to zip (compress) the database. This makes for easier storage and transfer (if necessary). To zip the database, locate the active Hinterland folder in **C:\Program Files.** Right click on the folder to compress and rename the folder to give it a descriptive name (i.e. date and brief description of changes made).

#### 6.2. Restoring the Database

To restore a backed-up copy of the database, follow these instructions.

- 1. Close all PC-Titrate V3 software.
- 2. Rename the current database to ensure that a current copy of the software is available should any problems occur when unzipping. To rename the Hinterland folder:
  - i. Select the C:\Program Files\Hinterland folder.
  - ii. Right click on the Hinterland folder, and select Rename.
  - iii. Rename the folder to something that will be easily recognized, such as *Hinterland company name + date*.
- 3. Extract the database backup, ensuring to select the correct unzipping location (to C:\Program Files).
- 4. If the database unzipped correctly, this backup is now the active database and can be accessed by double-clicking on the PC-Titrate V3 icon on your desktop. Double-check the path of the shortcut is correct before using it by right clicking and selecting properties. It should be C:\Program Files\Hinterland\PC-Titrate V3.

NOTE: The working database name must match the path.

#### 6.3. Archiving

Archiving is the process of cleaning out the database of old results and storing them elsewhere. MANTECH recommends regularly archiving the database to keep it working in top working order. How often archiving id done depends on how often the system is run and how much data has accumulated.

Archiving removes all of the data from the last time an archive was run, including recent data. All titration data and results (but not calibration data) will be removed from the database.

- 1. Users may wish to first print out all old reports and file them that a hard copy exists. The archived data can be retrieved electronically, when the system is not running.
- 2. Create a new folder entitled "Archived Data" on the computer hard drive in which to store all archived data.
- 3. Within this folder, create another folder using today's date. Note that the data must be sent to an empty folder otherwise the contents of the folder will be overwritten with the current archived data. For future archives, create another folder within the Archived Data folder, date stamp and send the new data there.
- 4. Create a backup of the database by following the steps detailed in section **6.1** of this document. This is recommended in case something goes wrong during the archiving process.
- 5. Go to C:\Program Files\Hinterland\PC-Titrate V3 and locate the V3bigarchivesystem application.
- 6. Right click on the application and select "Run as Administrator". When the Database Archive Wizard window opens, click **Next**.
- 7. Click **Browse**, select the disc location to store the archived files (use the folder just created), and click **OK**.

۲	PC-Titra	ate For Windows	V3 - Main Menu	
File	Titrator Setup	Quality Control Int	terface Reporting Utilities Audit Trail Help	
	V3bigarch	nivesystem - Data	abase Archive Wizard 🛛 🔀	
		Select the disk I	t Archive Location	
		archive files.	Select Directory	×
		c:\ Browse The next page v	Directory Name: C:Varchived Data Directories: C:V Archived Data May 8 2014	
		archiving select		
ć			Drives:	ndeuro0. e.el
		< <u>B</u> ack		naows8_osj
			ОК	ancel <u>H</u> elp

- 8. Click **Next**, and a message warning that all data will be erased from the database and stored to the disc location specified in Step 7 will be displayed.
- 9. Click **OK** and the data archiving process will begin. Click **Finish** when complete.

#### 6.4. Retrieving Archived Data

When viewing retrieved data, open a special copy of the software that gives access to the archived results, including reports, titration and calibration data. Note that in this copy of the software the user will only be able to access the archived data and will not have access to any current data that has been run since the last archive nor will the system run.

To retrieve archived data:

- 1. Open the **Utilities** menu from the main page of PC-Titrate software.
- 2. Select the Database Records submenu, and then select Archive/Retrieve.
- 3. When the Database Archive Wizard window opens, click Next.
- 4. Select **RETRIEVE a previously archived Database**, and click **Next**.
- 5. Click the **Browse** button, and select the disc location where you have stored your archived results and Click **OK**.
- 6. Click Next twice more, and then click Finish.
- 7. Archived results may now be accessed normally through the software. Remember that certain screens will be locked. When finished, simply close the software and open it again to restore the current database.

#### 6.5. System Storage

#### **Overnight/Daily Storage**

ELECTRODES – ensure all electrodes are placed in appropriate storage solution. If the system is running overnight, the storage vial is usually the next vial position after the last sample OR the last vial position in the rack. Use pH 4 buffer for pH electrodes and a low standard for ion selective electrodes (e.g. use ~0.1ppm Fluoride standard for storing Fluoride electrodes).

#### Long Term Storage

If planning to shut down the system for a long period of time (> 1-2 weeks) follow the information described below to ensure proper operation of the system upon restart.

- ELECTRODES drain all reference solution from the electrodes, and rinse with deionized water. For pH electrodes, refill them with fill solution, cover the fill hole with parafilm and place a bottle or protective cap over the electrode bulb. For Ion Selective Electrodes, place the protective caps over the sensing membranes and store them dry in their boxes.
- 2. PUMPS Remove the aspirate line and place it in deionized water. Run the pump manually, filling the lines with DI water.
- 3. BURETS Remove the aspirate line and place the line into DI water. Purge the buret three to four times to fill the line, syringe and valve with DI water.
- 4. DATABASE create a backup of the database by following the instructions outlined in section **6.1**.
- 5. POWER turn off all electrical power to the system.

## 7.0 Appendices

#### 7.1. Appendix A – UDV Definitions

WATER ANALYSIS EQUATION SET							
UDV	Description	Application					
1	cond	Conductivity					
2	рН	рН					
3	palk	Alkalinity					
4	talk	Alkalinity					
5	bcarb	Alkalinity					
6	carb	Alkalinity					
7	hydrx	Alkalinity					
8	flrd	Fluoride					
9	Cl	Chloride					
10	NH3	Ammonia					
11	NTU	Turbidity					
12	Temp	Temperature					
13	Acid	Acidity					
14	TotalHD	Total Hardness					
15	Color	Color					

#### 7.2. Appendix B – Creating / Editing AutoRun Buttons

See section **1.3 – 1.4** for information about AutoRun buttons and instructions for creating and saving a template.

#### Creating a new autorun button:

1. Create/modify a template according to the instructions in section **1.4**. Once created, save the template and click the Link to AutoRun... button.

Timetab	ble / Sample Entry - Template: 01-1	PC-Titra 9-09PH Versio	ate For Windows	s V3	- Time	etable	Setup			
# Sc	chedule	Order Number	Sample Name	Vial	Weight	Volume	Start Date	Start Time	Custome	r
I PH	H CALIBRATION	20140512-1	pH Cal	1						^
P	н	20140512-1	pH 7.0	4						
3 PI	н	20140512-1	L724770-1	5						
4 PI	н	20140512-1	L724770-2	6						
5 PI	н	20140512-1	L724770-3	7						
6 PI	н	20140512-1	L724770-4	8						
7 PI	н	20140512-1	L724770-5	9						
- Templ (C) Cli C) Ap Sav -Other Li	late Maintenance Commands lear Template Load Tem ppend to Template Delete Template Commands ink To AutoRun Load from T	New	Current Timetable C Auto-Generate Or Delete Highlight	comma rder N ed Sa	ands — lumber mple		Add Clear T Cheo Print Exi	I x Rows Fimetable G ck Timetable isting Timet	e able	

2. In the window that opens, select the new template name from the time table drop-down list. New templates/timetables will appear at the bottom of the list.

Button/icon Description:		
TimeTable		<u>.</u>
	-	• •
No Template Selected	^	Change Icon
HISTORICAL DATA REPORT		-
HOME AUTOSAMPLER		
F MEASUREMENT		
KAPPA RUN		Print
TURBIDITY CALIBRATION	~	

- 3. Using the arrows, scroll through the list of available icons and make a selection.
- 4. Click the **Save As** button, and give the new AutoRun button a name. This name will be what is displayed when hovering the mouse over the button on the home screen. Icons will appear in alphabetical order from left to right. Including spaces at the beginning of the name which will put it at the top of the list.

5. Click OK to exit the window.

#### To edit an existing AutoRun button:

- 1. From the main menu, go to **Utilities, Edit AutoRun buttons**.
- 2. Click the Load button, and select the AutoRun button you wish to edit.
- 3. Edit the timetable/template used with this AutoRun button and/or change the icon associated with it by following the instructions above (steps 2-4 in the previous section). AutoRun buttons may be deleted by clicking the **Delete** button, and choosing an AutoRun button to delete. NOTE: once an AutoRun button has been deleted, the name can never be reused as it is still saved in the history.

#### 7.3. Appendix C – Titration Method Settings

Titration Methods contain details about titrations, including titrant concentration, electrode(s) used to plot/monitor the curve, stability time, stopping criteria, etc. Before any changes are made to Titration Methods, you must first determine which methods are in use.

- 1. Navigate to the Setup, Analysis Schedule menu.
- 2. Load the desired schedule containing a titration to view/modify.
- 3. Locate the Titration step in the list of schedule steps on the left side of the screen. Select it, then look at the section above the white comments box in the bottom right corner of the screen. This will indicate the name of the Titration Method in use. Note this name.
- 4. Repeat the step above for any other Titration or Linked Titration steps found in the schedule, noting the names.



- 5. From the main menu, go to Setup, Titration Method.
- 6. Load the titration method noted earlier and click OK.

PC-Titrate For Wind	dows V3 - Titration Method Definition	
Method Name:Non	e	
- Identification		
Sample Inform	Methods Definition Search Form - Select Definition to Open	
Name Volume (ml)	Enter Search Text:	
Weight (g)		
Туре	Available Selections:	<b>-</b>
Comments	ALKALINITY - 35ML	
	ALKALINITY-L - 35ML ALKALINITY-L OW	
	BASE INTO ACID	
	Cancel	
	Current Selection:	
1		
	J	
<u>L</u> oad	Save Save As Delete Print	<u>ок</u>
Lidentification <u>Ele</u>	ectrodes <u>{Control</u> <u>Analysis</u> <u>Display</u>	

7. The first tab is the **Identification** tab. This tab defines sample and titrant information, including sample volume and titrant concentration. It also defines the sample/titrant as the cation (+) or anion (-), which indicates to the system the direction of the titration curve. Note that information on this screen must be identical for Titrations and associated Linked Titrations.

entification ———			
Sample Information	n	Titrant Information	
Name	water	Name	0.10 N NaOH
Volume (ml)	25.000	Concentration	0.1000000
Weight (g)	0.000	Concentration Units	N
Туре	CATION	Туре	ANION
omments This method will de	temine the total acidity (pH=8.3).		
omments This method will de	temine the total acidity (pH=8.3).		

8. The **Electrodes** tab is where the active electrode is indicated. This tab is also used to define any valid calibrations, and whether temperature compensation is in use (only for pH electrodes). Note that information on this screen must be identical for Titrations and associated Linked Titrations.

	PC	-Titrate For Wi	ndows V3 - Tit	ration	Method Definiti	ion
Method Name:	ACIDITY V	ersion 4				
Г						
	Use?	l Port		Use?	Calibration (	Current
Plotting	$\overline{\mathbf{v}}$	1 💌		$\checkmark$	РН	
Monitoring		1 -			(uncalibrated)	
		1 -			(uncalibrated)	
		1 -			(uncalibrated)	
Temperatur	re Compensa	tion Measurement—				
C None	C Manu	ual C Single	Continuous			
Load	Sav	e Save As	Delete		Print	OK
<u></u> oud	<u></u>				<u></u>	<u> </u>
│ <u>\</u> dentification	∖ <u>E</u> lectrodes	<u> (Control (Analysi</u>	s / Display /			

9. The **Control** tab is where injection sizes, stability settings and stopping criteria are defined.

PC-Tit	rate For Windows V3 - Titration Method Definition	
lethod Name: ACIDITY Vers	ion 4	
Titration Control Titrant Injection Injection Control C Constant ml C Const. pH / mV Buret C 1 © 2 C 3 C 4	PreInjection (ml) 0.0000 delta pH/mV to Hold (mpH or mV) First Injection (ml) 0.0100 Minimum Single Injection (ml) Maximum Single Injection (ml)	300 0.0100 0.5000
Control to Use Control to Use C Time C Slope C Detta mV / Detta Time	Time between Injections (s) 3	
Titration Stopping Criteria Stopping pH / mV (pH/mV) Maximum Volume to Inject (ml	8.5000         Maximum Run Time (m)         20.000         Prompt for new S Criteria during Titr (generally unched)           0         Max. Inflection EndPoints         10         (generally unched)	topping   ation ked)
Load Save	Save <u>A</u> s <u>D</u> elete <u>Print</u>	0 <u>K</u>
Identification ( <u>E</u> lectrodes ) <u>C</u>	ontrol / Analysis / Display /	

The control tab allows the user to choose a constant mL injection, or dynamic injection control in which a maximum and minimum injection size are specified, and the system determines the size of injection to use depending on the change in mV or pH from the last injection. This setting is called the "delta pH/mV to Hold" and it is specified in mpH (mill-pH units) or mV, depending on the type of titration. Stability can be determined based on change in mV over time (Delta mV/Delta Time), slope (not often used), or by a simple time delay between injections.

There are various stopping criteria defined, with only one setting being the target stopping point. The others are used simply as back-ups so that titrations do not go on infinitely in case of a problem with the system. Usually the main criterion is a stopping pH or an inflection. A maximum time and maximum volume are also defined in case these criteria are not met.

10. The **Analysis** tab contains settings that help the system determine the correct endpoint. For inflection endpoint selection, the main settings used are usually curve smoothing and the first derivative filter. This is outlined in more detail in section **3.02**. Other settings in this screen are not often used. Note that information on this screen must be identical for Titrations and associated Linked Titrations.

ithod Name: ACIDI	Y Version 4			
Times C None C Once C Twice	ints 3 <sup>(7</sup> 7 5 <sup>(6</sup> 9	First Derivative Filter (dp Return 2 Larg Use Endpoint Limit	H/dV) 2000.000 est Endpoints pH/mV Endpoint Limit 0.00	10
Specify Titration An	alysis Window(s) (ma ndows	aximum of 4) Begin at	End at	
Specify Titration An Use Endpoint Wir NOTE: Individual	alysis Window(s) (ma ndows	aximum of 4) Begin at default	End at	
Specify Titration An Use Endpoint Wit NOTE: Individual begin/end entries MUST be made in	alysis Window(s) (ma ndows Window 1 Window 2 Window 3	default v default v default v	End at default default default default	
Specify Titration An Use Endpoint Wit NOTE: Individual begin/end entries MUST be made in ascending (numerically) order.	alysis Window(s) (ma ndows Window 1 Window 2 Window 3 Window 4	Begin at Begin at default v default v default v default v	End at default default default default	

11. The **Display** tab allows you to define the scaling of the curve, and whether the First Derivative should be plotted on the graph. Note that this is usually only used for titrations using inflection endpoints.

PC-Titrate For Windows V3 - Titration Method Definition						
Method Name: ACIDITY Version 4						
Plot Scaling X-Axis Scaling Type Automatic scaling Full range scaling Specified range scaling Plot Display Items Show First Derivative	Y-Axis Scaling Type Automatic scaling Full range scaling Specified range scaling					
Load Save Save As Del	lete Print OK					
↓ ↓Identification / Electrodes / Control / Analysis / Display /						

#### 7.4. Appendix D – New Calibration Templates

To create a new calibration template, see section 4.01.

Once the new template is created, follow the instructions below to implement it. Note – this procedure does not need to be followed when modifying an existing calibration template (i.e. when SAVING rather than SAVING AS).

1. Go to the **Setup** Menu, **Analysis Schedule**. Click the **Load** button and select the calibration schedule you wish to modify to incorporate the new calibration template.

PC-Titrate For Windows V3 - Schedule Editor				
Analysis Schedule	Edit <u>Functions</u>			
	Select Events to See/Use			
Schedule Search Form - Select Schedule	e To Use uting ecial			
Enter Search Text: PH CALIBRATION	y) Event			
Available Selections: PH ALKALINITY PH ALKALINITY GRANS ANALYZE EX ACIDITY CONDUCTIVITY METER CAL CONDUCTIVITY MULTIPOINTCAL PH CALIBRATION MAINTEINANCE MANUAL SPARE PARTS LIST	■ III Remove			
Left	<u>C</u> ancel <u>Q</u> K			
Load Save Save As New Print Delete				
	Done			

2. Click on the **Calibration** folder in the schedule steps listed on the left side of the screen and then click the **Edit** button.

PC-Titrate For Windows V3 - Schedule Editor	
Analysis Schedule - PH CALIBRATION Version 7	Edit <u>Functions</u> Stirrer Off Select Events to See/Use  All C Titrations
Subroutine Subroutine Sampler Move Stirrer On Wait Until Calibration Calibration Calibration Measure Stirrer Off Sampler Move Schedule Stirrer On Activate Pump Wait Until Stirrer Off Stirrer Off Stirrer On Activate Pump Wait Until Stirrer Off Stirrer Off	<ul> <li>Burets</li> <li>Burets</li> <li>Digital I/O</li> <li>Special</li> <li>Select Add Level (for Add Only)</li> <li>Add as a Child to Current Event</li> <li>Add as a Sibling to Current Event</li> <li>Add Insert</li> <li>Edit</li> <li>Remove</li> <li>Snippet</li> <li>Scheduler Event&gt; Calibration</li> <li>Calibration Template</li> </ul>
Image: Sampler Move       Image: Sampler Move       Image: Sampler Move       Image: Left       Image: Down       Image: Left       Image: Down       Image: Load       Save       Save       Save       Save       Save       Save       Save       Save	FALSE Comments
	Done

- 3. A list of templates will appear on the screen. Select the new calibration template, then click OK.
- 4. The system will then ask if you wish to print the calibration automatically after completion. Select Yes or No as desired.
- 5. Click SAVE to overwrite the existing schedule, or SAVE AS to enter a new name and keep both the original and new schedules.

## The user will need to run this calibration before the new calibration template can be implemented into sample schedules.

Once the new calibration has been run, update all schedules containing the parameter for which the calibration template has changed as well as any titration methods using that electrode. For example, if creating a new pH calibration template, any schedules containing pH will need to be modified in addition to any titration methods using the pH electrode (such as Alkalinity or Acidity). Follow the below instructions to make these modifications:

#### Schedule Changes:

- 1. Go into Setup, Analysis Schedule.
- 2. Click on the Load button and select the schedule that you wish to modify, then click OK.

PC-Titrate For Windows V3 - Schedule Editor				
Analysis Schedule	Edit <u>F</u> unctions			
	Stirrer Off			
	Select Events to See/Use			
	All     O Titrations			
Schedule Search Form - Select Schedule To	o Use uting			
Enter Search Text:				
PH	V)			
	t Event			
Available Selections:				
PH	▲ Jit Remove			
PH ALKALINITY				
ANALYZE EX ACIDITY				
PH CALIBRATION	<b>-</b>			
Current Selection:				
PH	OK			
Left				
Load Save As New Print Delete	3			
	0			
	<u>D</u> one			

- 3. Look at the schedule steps on the left of the screen and locate a series of **Assign UDV** steps.
- 4. The second is the calibrated electrode reading. To be sure this is the correct step, look at the area in the bottom right corner above the comment box. If it indicates that it is an electrode reading, and it says something resembling a method name (in this example, it says PH) along with a series of numbers, this is the correct UDV step. Click the Edit button.



5. In the window that opens, use the dropdown menu for **Select Calibration** to choose the active calibration and click OK. Note that the new calibration template will only be available for selection after the calibration has been run.

C-Titrate For Windows V3 - UDV Setup						
Available UDV's UDV UDV 2	Type trode Reading					
Select Electrode	Stability Information Stabilize by Time O Slope O Delta					
Select Calibration PH (uncalibrated) PH C None	Stability Time Out (90					
<ul><li>Manual</li><li>Thermistor</li></ul>	Delta mV 0.30 Delta Time 10					
<u>C</u> ancel <u>O</u> K						

6. Click SAVE to overwrite the existing schedule, or SAVE AS to enter a new name and keep both the original and new schedules. **NOTE:** The above steps must be completed for EVERY schedule containing electrode readings. Using the above example (pH), this means the PH schedule, along with the COND-PH, PH-ALK, etc will need to be modified.

Any titrations using this electrode also require modifications which occur in another menu. Please see **Appendix C** in section **7.03** for instructions on determining which Titration Methods are in use.

Once the Titration Method has been identified, follow the below instructions to update the calibration template selected.

- 1. From the main menu, go to **Setup, Titration Method**.
- 2. Load the first titration method noted (Acidity in this example) and click OK.

PC-Titrate For Win	dows V3 - Titration Method Definition	
dentification		
Sample Inform Name Volume (ml) Weight (g) Type Comments	Methods Definition Search Form - Select Definition to Open         Enter Search Text:         ACIDITY         Available Selections:         ACIDITY         ACIDITY         ACIDITY         ACIDITY         ACIDITY         ACIDITY         ALKALINITY         ALKALINITY- 35ML         ALKALINITY-LOW         BASE INTO ACID	•
	Current Selection:	
Load	Save As Delete Print	<u>0K</u>
Lentification El	ectrodes <u>{ C</u> ontrol <u>{ A</u> nalysis <u>{</u> Display <i>]</i>	

3. Click on the **Electrode tab** along the bottom of the window. Click on the **Use?** check box below the **Calibration** header.

PC-Titrate For Windows V3 - Titration Method Definition								
Method Name:ACIDITY Version 3								
Plotting Monitoring	Use? ✓ ✓ ✓ Ure Compe C Ma	tt Port 1 ▼ 1 ▼ 1 ▼ 1 ▼ 1 ▼	Use?	Calibration PH (uncalibrated) (uncalibrated) (uncalibrated)	Current			
Load	<u>S</u> a	ve Save <u>A</u> s	Delete	<u>P</u> rint	0 <u>K</u>			
\ <u>I</u> dentification	∖ <u>E</u> lectrod	les / <u>C</u> ontrol / <u>A</u> nalysis	s / Display /					

4. In the window that opens select the electrode port, type, probe ID and calibration ID to use, click **OK**.



5. Click on the **Save** button and then **OK** to save changes and exit the screen.

#### 7.5. Appendix E – Report Modifications

#### Modifying the report location:

The final report that is populated at the end of a run can be sent to the following locations:

- 1. Screen (i.e. the report will pop up on the screen when the run is finished)
- 2. Printer
- 3. Export location (e.g. LIMS, network location, etc.)

To modify the location to which the report is sent, first determine the name of the report in use.

- 1. From the main menu, go to **Setup**, **Analysis Schedule** option.
- 2. At bottom left hand corner of window, click the **LOAD** button and select one of the active sample analysis schedules (not a calibration schedule).
- 3. Scroll down to the bottom of the list on the left side of the screen and click on the **Specify Report** step. Note the name of the report list by looking at the bottom right hand corner, above the white comments box.
- 4. If there is no Specify Report step, look for a Subroutine called END REPORT. Click Load to search for this Subroutine, and locate the report name by following step 3 above.

PC-Titrate For Windows V3	3 - Schedule Editor
Analysis Schedule - END REPORT Version 1	Edit <u>Functions</u>
E Specify Report	Select Events to See/Use     All     C Titrations     Burets     C Bounds     C Digital VO     C Special
	Select Add Level (for Add Only)  Add as a Child to Current Event  Add as a Sibling to Current Event  Add Insert Edit Remove  Snippet  Scheduler Event> Specify Report  Report List name WATER ANALYSIS TABLE REPORT
Left Up Right Down Load Save Save As New Print Delete	27 Comments This step prints out a report. To change the report that will be printed use the edit button, above.
	Done

- 5. Click **Done** to exit.
- 6. From the main page of the PC-Titrate software, click the **Reporting** menu, **Create/Edit a Report List**
- 7. Click the **Load** button and select the Report List noted above, usually WATER ANALYSIS TABLE REPORT.
- 8. In the white area of the screen, the report name and destination of the report is displayed. Change the location by clicking one of the Report Destination radio buttons at the top of the screen.

PC-Titrate For Window	s V3 - Report L	ist Creation	
Select Shazam <u>R</u> eport	Report Destinati	on	
Shazam Reports (Crystal Re	eports/		
Report List WATER AN	ALYSIS TABLE RE	PORT Versio	on 1
Report Name	Destination	Export Mode	Export File
Water analysis report.SRV	V Screen		

- 9. To add a second or third location (e.g. to set up the report to print to the screen AND export to an external location), click on the 'Select Shazam Report' button and select the same report name that is shown in the existing report list table.
- 10. Once this is selected, a new line will appear in the report list table. Select the report destination to use. If selecting Printer, the report will print to the default printer selected for the computer. If Export is selected, an additional three boxes appear on the right-hand side of the screen.

P	PC-Titrate For Windows V3 - Report List Creation									
	Select Shazam <u>R</u> eport	Report Destination Screen Printer Export	Dn Export Mode: Table T Expo	Details Create new table (over ype: Fixed field text file ( .TX	top'Exported	if it already exists) 	•		oname B	rowse
7	Shazam Reports (Crystal Rep	orts/								
Γ	Report List WATER ANAL	LYSIS TABLE RE	PORT Versio	on 1						
	Report Name	Destination	Export Mode	Export File	AutoName	Printer	Rpt Type	Mail To	Copies	Mail Sub
	Water analysis report.SRW	Screen					Shazam			
	Water analysis report.SRW	Export	3	C:\Documents and Settings\De	True		Shazam			
										>

If choosing Export:

- In the mode box select "Create new table"
- In the Table Type select 'fixed field text file (.TXT)'
- Click on the browse button and select the location to send the files to. (It is best to make a folder in the location desired. Also, give the file a generic name or else the autoname function below will not work).
- Click on the autoname box so that a check mark appears. This is will create a new name each time the data is exported so the original is not overwritten.

- 11. Click on the Save button at the bottom on the screen.
- 12. Click the Done button to exit.

#### How to modify the report layout/formatting:

Before making modifications to the report, determine the name of the report in use. An autorun button on the main screen comes standard with most databases and will open the report (see section **3.01**) but if not, follow steps 1 - 7 above to access the Report List screen.

1. Look in the Report List Table and note all report names listed.

PC-Titrate For Window	s V3 - Report L	ist Creation		
Select Shazam <u>R</u> eport	Report Destinati Screen Printer Export			
Shazam Reports (Crystal Re	eports/			
Report List WATER AN	ALYSIS TABLE RE	PORT Versio	on 1	
Report Name	Destination	Export Mode	Export File	4
Water analysis report.SRV	V Screen			

- 2. Click Done to Exit.
- 3. From the main screen go to the **Reporting** tab and select **Prepare and/or Print a Shazam Report.**
- 4. Go to File, Open Report and load the report you want to modify. This may be an in-run report or a historical report; typically changes are made to both.
- 5. After a few moments a report will appear on the screen. The screen should be on the **Define Search** tab and may look similar to the one below.

🖊 Shazam F	🕨 Shazam Report Wizard: C: 🏽 rogram Files Hinterland 🖓 C-Titrate V3 Reports \ Fat Analysis Historical Report. SRW									
File Edit Vie	w Help									
🔥 🖻 🖥		୨ 😴 🗹 🗗	r 🗖							
Define Search	Layout Page	View S <u>Q</u> L Prev	riew Report							
F	Aunlist Number DateStarted TimeStarted DateFinished TimeFinished RunName Operator ExtraString1 ExtraFloat1 TimeZone		Samples Sampl RunN Sched Ordert Sampl Vial Sampl Sampl Date Time QCNo	eNumber Imber IuleUser Iumber eName eWeigh eVoluma		Schedule Number Name Created Modified Discontinued CurrentVersi Activated ExtraString1 ExtraFloat1 DateCreated	E A	ATSEQUATION ID RunNumber SampleNumber SampleID RunDate RunDate RunTime TTNNumber Soap AV NaCI	SET	
HEADER	ID	RunNumber	SampleNumber	OrderNumber	SampleID	RunDate	RunTime	TTNNumber	Soap	NaCl
TABLE	FATSEQUATIO	FATSEQUATIO	FATSEQUATION	FATSEQUATIO	FATSEQUATION	FATSEQUATION	FATSEQUATIO	FATSEQUATIO	FATSEQUATIO	FATSEQUATION
FIELD	ID	RunNumber	SampleNumber	OrderNumber	SampleID	RunDate	RunTime	TTNNumber	Soap	NaCl
SHOW	Show	Show	Show	Show	Show	Show	Show	Show	Show	Show
SORT	None	None	A-Z	None	None	None	None	None	None	None
FILTER 1										

On the lower half of the screen a grid that contains all of the data types found in the report is displayed. Here the user can define filters (see section **3.01**) and change the number of decimal places reported for each parameter. To change the number of decimal places, double click under the parameter header to modify.

An **Edit** window will then appear. In the **Field Properties** tab, type in the number of decimal places in the **Format** textbox. For example, if 3 decimal places are desired, type 0.000. Click **OK** to exit the window.

Edit FATSEQUATIONSET.RunDate							
Field Propert	Field Properties Custom Expression						
<u>H</u> eader	RunDate	Filter 1 of 5		<u> </u>			
<u>Т</u> уре	Date	Is Equal To	-	Clear			
<u>S</u> how	Show 💌		Or				
<u>S</u> ort	None 💌		Or	<b>▲ ▲</b>			
<u>F</u> ormat			Or	♦ 4			
<u>W</u> idth	8		Or	Help			
<u>A</u> lign	Right 💌						
		Use BLANK for empty	y fields				

Additional formatting changes can be made on the Layout Page tab.

dit View Help Control Control	▼ 14 ▼ B Z U E Ξ Ξ	
MANTECH	MANTECH INC Water Analysis Report	Report Date: @DATE : @TIME
Run Number         [RunNumber           SampleID         RunDate         Run           [SampleID]         [RunDate]         Run           Page: @PAGENO of @PAGECOUNT         Page: @PAGENO of @PAGECOUNT         Page: @PAGENO of @PAGECOUNT	Order Number         [OrderNumber]           Time         Temp LoC1         cond (uS1)         pH         palk-ppm         talk-ppm         bcarb-ppm         carb           Time]         [Temp]         [cond]         [pH]         [palk]         [talk]         [bcarb]         [cond]	b-ppm hydr-ppm Galk NTU ORP (mV) Oxycen Carb] [hydrx] [Galk] [NTU] [ORP] [DisO] WATER ANALYSIS REPORT SRW
3		
4		
d 0 1 1 - - - - - - - - - - - - -	it View Help	It View Help

Here the user can modify headers/titles (anything without square brackets around them), by clicking on the field to highlight it, then right clicking and selecting **Edit Caption**. Type in the name to use, then close the window. Fields containing square brackets should not be modified as they are linked to the result for that parameter.

Fields can be moved by dragging and dropping the desired box. The fields must not touch the lines however, or the links associated with those parameters will not work. You can also change font and other formatting by clicking on fields to highlight them, and using the font editing tools at the top of the screen.

Fields can be deleted by clicking to highlight, then clicking the Delete button on the keyboard.

The sizes of the fields can be adjusted by clicking to highlight, then dragging to adjust field width/height.

If modifying a Historical report, click on the **Preview Report** tab to see a preview of the changes. No preview is available for in-run reports unless you have a run is in progress.

To save changes, click **File**, **Save**. Saving As is not recommended as proper linking will not be in place.

#### 7.6. Appendix F – Troubleshooting Guide

The following tables give a list of possible problems that could arise. They have been divided into different categories of problems, and include a variety of solutions with each issue.

Table	1: Star	ndard/Sa	ample	Results	incorrect
-------	---------	----------	-------	---------	-----------

Category	Potential Problems	Solutions
	Titrant off/contaminated	<ul> <li>Standardize titrant</li> <li>Use fresh titrant</li> </ul>
	Chemical interferences from leaky tips	<ul> <li>Raise reagent tips (all except for burets) out of solution</li> <li>Move reagent bottle down below pump to reduce head pressure</li> <li>Tighten fittings</li> <li>Replace tubing/fittings</li> </ul>
	Reagents contaminated	<ul> <li>Check expiry date</li> <li>Make/use fresh solutions</li> </ul>
Chemical	Incorrect/not enough ISA being added	<ul> <li>Use correct ISA</li> <li>Check that ISA pump is plugged in/turned on and set to AUTO.</li> <li>Make sure software is programmed to add enough ISA from correct digital output number.</li> </ul>
	Sample carryover	<ul> <li>Use clean or new beakers</li> <li>Check for loose fittings or air bubbles in rinse lines</li> <li>Adjust tubing height at rinse station to ensure adequate rinsing of tips and probes</li> <li>Check that rinse station is not clogged and that water is draining adequately</li> <li>Increase rinse volume/time</li> <li>Ensure that tips are not blocking drain hole</li> <li>Check for sticky drain tubing – if stuck, cut off that portion and reattach</li> </ul>
	Rinse water contaminated	<ul> <li>Check conductivity of water supply (should be &lt;30µS)</li> </ul>
	Electrode not conditioned	Rinse out electrode, refin with fill solution, soak in pH 4 buffer or low standard for at least an hour
	Electrode old	• Replace electrode (depending on use and care, lasts 6 months - 1 year)
	Electrode broken/cracked	Replace electrode
Electrode	Calibration invalid	Clean, refill, and soak in pH 4 buffer or low standard before recalibrating
	Fill solution low	Top up fill solution
	Fill solution incorrect	Use correct fill solution
	Low flow rate	<ul> <li>Make sure fill hole is open</li> <li>Rinse out electrode to clear out any salt crystals blocking junction</li> </ul>

	Electrode junction not covered	Lower electrode farther into solution
	Electrode not connected properly	<ul> <li>Ensure secure connection to TIS on correct port</li> <li>Unscrew and reconnect avoiding cross-threading</li> <li>Remove o-ring from cap of electrode</li> <li>Replace cable</li> </ul>
	Incorrect Grounding	<ul> <li>If there is an electrode in port 1, remove all red jumpers</li> <li>If port 2, 3 or 4 electrodes are in a separate solution from the electrode in port 1, use grounding switches</li> <li>If there is no electrode in port 1, use a jumper cable between port 1 and the port in use</li> </ul>
	Electrode not stabilizing	<ul> <li>Increase stability settings in titration method or schedule</li> <li>Rinse, refill and soak electrode in pH 4 buffer or low standard to recondition it</li> <li>Replace electrode</li> </ul>
	Stirrer not working	<ul> <li>Take out rod and clean and then push back in securely</li> <li>Check that the paddle is not hitting against other tips, electrodes, or the sides of the beaker</li> <li>Check that cable is connected to TIS securely</li> <li>Replace stirrer</li> </ul>
	Buret tip is out of solution	Move tip below the liquid level
	Flow rate of reagent/sample pumps are off	<ul> <li>Check flow rates and enter the value into the Hardware Setup</li> </ul>
	Sample/reagent pumps leaking	<ul> <li>Replace gaskets and lip seals in pumps and replace pump head securely</li> <li>Tighten fittings</li> </ul>
Hardware	Sample pump is erratic	<ul> <li>Ensure pump head is on securely</li> <li>Replace belt</li> </ul>
	Sample needle is not submerged	<ul><li>Adjust height of sample needle</li><li>Fill tubes/beakers with more sample</li></ul>
	Buret Valve Sticking	<ul><li>Clean out valve</li><li>Replace valve</li></ul>
	Drain is leaking	<ul><li>Check that tubing is in drain valve completely</li><li>Replace drain valve</li></ul>
	Reagent pump not turning on	<ul> <li>Check that pump is turned on/plugged in</li> <li>Check that pump is in auto mode (if applicable)</li> <li>Check that power bar is turned on/plugged in</li> <li>Check outlet</li> <li>Check fuse</li> <li>Check power cord</li> </ul>
	Electrode board blown	• Use port 2 if port 1 blown, and port 4 if port 3 blown. Be sure to change the Titration Method and

			Calibration Template to reflect this change, and adjust grounding if taking electrode off port 1.
	Incorrect sample weight entered in template	•	Manually calculate the results using the correct weights, and remember to enter weights next time
	Incorrect flow rate of reagent pumps		
	entered into Hardware Setup	•	Check flow rate and enter into Hardware Setup
	Incorrect syringe size set up in Hardware Setup	•	Set up correct syringe size in Hardware Setup
	Sample volume in titration method(s) does not match volume pumped into TitraSip in schedule.	•	Change so that volumes match
Software	False endpoint being selected	•	Increase filter Increase smoothing settings
	Endpoint being missed	•	Decrease filter Decrease smoothing
	Error in equation	•	Check equations for missing brackets, decimal places or incorrect terms
	Titration Settings not Ideal	•	Change injection control settings Change stability control settings
	Wrong calibration template selected in schedule	•	Use correct calibration template
	Incorrect electrode port set up in Titration Method	•	Setup Titration Method for correct port

#### Table 2: Calibration Invalid

Category	Potential Problems	Solutions
	Electrode not conditioned	• Rinse out electrode, refill with fill solution, soak in pH 4 buffer or low standard for at least an hour
	Electrode old	• Replace electrode (depending on use and care, lasts 6 months - 1 year)
	Electrode broken/cracked	Replace electrode
Electrode	Fill solution low	Top up fill solution
	Low flow rate	<ul> <li>Make sure fill hole is open</li> <li>Rinse out electrode to clear out any salt crystals blocking junction</li> </ul>
	Fill solution incorrect	Use correct fill solution
	Electrode junction not covered	Lower electrode farther into solution
	Electrode not connected properly	<ul> <li>Ensure secure connection to TIS</li> <li>Unscrew and reconnect avoiding cross- threading</li> </ul>

		<ul> <li>Remove o-ring from cap of electrode</li> <li>Replace cable</li> </ul>
	Incorrect Grounding	<ul> <li>If there is an electrode in port 1, remove all red jumpers</li> <li>If port 2, 3 or 4 electrodes are in a separate solution from the electrode in port 1, use grounding switches</li> <li>If there is no electrode in port 1, use a jumper cable between port 1 and the port in use</li> </ul>
	Electrode not stabilizing	<ul> <li>Increase stability settings in Calibration Template</li> <li>Rinse, refill and soak electrode in pH 4 buffer or low standard to recondition it</li> </ul>
	Buffers/standards in wrong order	Recalibrate with buffers in correct (ascending)     order
	Buffers/standards contaminated	Use new buffers
Chemical	Carryover from previous buffer/standard	<ul> <li>Check for loose fittings or air bubbles in rinse lines</li> <li>Adjust tubing height at rinse station to ensure adequate rinsing of tips and probes</li> <li>Ensure that the rinse station and TitraSip are not clogged and is draining adequately between buffers/standards</li> <li>Increase rinse volume</li> </ul>
	Rinse water contaminated	
		Check water supply
Hardware	Stirrer not working	<ul> <li>Replace stirrer</li> <li>Take out rod and push back in securely</li> <li>Check that the paddle is not hitting against other tips or the sides of the beaker or tube</li> <li>Check that cable is connected to TIS securely</li> </ul>
	Electrode board blown	• Use port 2 if port 1 blown, and port 4 if port 3 blown. Be sure to change the Titration Method and Calibration Template to reflect this change, and adjust grounding if taking electrode off port 1.
Software	Validation Settings too tight	<ul> <li>Change validation settings:</li> <li>Slope = -65 to -53, Intercept = +/- 100, Correlation</li> <li>= 0.995 for a pH calibration</li> </ul>
	Incorrect electrode port set up in Calibration Template	Setup template to look at correct port
	Wrong buffers set up in Calibration Template	<ul> <li>Setup correct standards in the Calibration Template</li> </ul>

#### **Table 3: Possible Titration Problems**

Symptom	Problem	Solutions
False	Filter set too low	Increase filter setting
endpoint	Smoothing set too low	Increase smoothing settings
selected	1st/largest endpoint is not the correct one	• Set up equation to use ve2 instead of ve1 as the endpoint, and check the box "Return 2 largest endpoints" in Titration Method
	Filter set too high	Decrease filter
Endpoint	Smoothing set too high	Decrease smoothing
being missed	Endpoint windows being used, electrode has drifted and endpoint moved	Stop using endpoint windows or adjust window
Injection sizes too	Injection sizes set too large/too small in titration method	Change injection sizes
small	If injections too large through endpoint, hold is too high	Reduce hold
Titration taking too	Injection sizes too small	Increase maximum injection size
long	Stability control settings set too high	Reduce stability time out
	Electrode not stabilizing	<ul> <li>Change stability control settings</li> <li>Recondition electrode</li> <li>Recalibrate electrode</li> <li>Replace electrode</li> </ul>
Choppy/noisy	Electrode is not in solution	Submerge electrode so that the junction is completely covered
curves	Electrode fill solution low	Top up fill solution
	Low flow rate of electrode fill solution	<ul> <li>Make sure fill hole is open</li> <li>Rinse out electrode to clear out any salt crystals blocking junction</li> </ul>
	Bad electrode cable connection	<ul> <li>Unscrew from top of electrode and reconnect avoiding cross-threading</li> <li>Remove oring from cap of electrode</li> </ul>

	<ul> <li>Make sure connection is secure at TIS end of cable</li> <li>Replace cable</li> </ul>
Incorrect Grounding	<ul> <li>If there is an electrode in port 1, remove all red jumpers</li> <li>If port 2, 3 or 4 electrodes are in a separate solution from the electrode in port 1, use grounding switches</li> <li>If there is no electrode in port 1, use a jumper cable between port 1 and the port(s) in use</li> </ul>
Stirrer not working	<ul> <li>Replace stirrer</li> <li>Take out rod and push back in securely</li> <li>Check that the paddle is not hitting against other tips or the sides of the beaker</li> <li>Check that cable is connected to TIS</li> </ul>
Buret tip is not fully su	• Submerge buret tip below the liquid level

#### **Table 4: Common Error Messages**

Error Message	Potential Problem	Solutions
Cannot Perform Injection	No power to buret	<ul> <li>Check that buret is turned on/plugged in</li> <li>Check that power bar is turned on/plugged in</li> <li>Check power cord</li> <li>Check outlet</li> <li>Check fuse</li> </ul>
	Buret has lost communication with TIS	Check serial cable connection/reset     power to buret
	Buret not set up in hardware setup	Set up buret in Hardware Setup
	Buret port in titration method does not match the physical setup	• Change the buret port in titration method or physically change the port to match the titration method.
Buret/Meter Not	No power to buret/meter	<ul> <li>Check that buret/meter is plugged in and turned on</li> <li>Check that power bar is plugged in and turned on</li> <li>Check power cord and outlet</li> <li>Check fuse</li> </ul>
Found on Port 1/2/3/4	Serial cable not plugged in or has come loose	• Ensure there is a secure serial cable connection between meter and TIS
	Buret/meter not set up in hardware setup	Set up buret in Hardware Setup
	Buret/meter port in titration method does not match the physical setup	Change the buret/meter port in titration method or physically

		change the port to match the titration method.
Cannot connect to TIS	No power to TIS Communication cable between TIS	<ul> <li>Check that TIS is plugged in and turned on</li> <li>Check that power bar is plugged in and turned on</li> <li>Check power cord and outlet</li> <li>Check fuse</li> <li>Plug in/tighten cable connection</li> </ul>
	and computer not connected	
	Communication cable physically connected to different com port than setup in Hardware Setup	Connect cable to correct com port     (com port 2)
	Com port numbers assigned incorrectly in Control Panel	Change com port settings in Control Panel
Unable to open Com Port	No power to TIS	<ul> <li>Check that TIS is plugged in and turned on</li> <li>Check that power bar is plugged in and turned on</li> <li>Check power cord and outlet</li> <li>Check fuse</li> </ul>
	Communication cable between TIS and computer not connected	Plug in/tighten cable connection
	Communication cable physically connected to different com port than setup in Hardware Setup	Connect cable to correct com port (com port 2)
	Com port numbers assigned incorrectly in Control Panel	Change com port settings in Control Panel
Com 1 error (when schedule attempts to communicate with PeCOD)	Software cannot connect to PeCOD	<ul> <li>Ensure Com port drivers are installed (part of PeCOD Pro software package).</li> <li>Ensure Com port driver is set to Com 6 in Device Manager and Hardware Setup.</li> <li>Ensure USB cable is connected.</li> <li>Unplug/re-connect USB cable.</li> </ul>
Index out of data	Files that are being assessed have	a laskall hashers films (hashers darish
index out of date	become corrupted	<ul> <li>Install backup files/backup database</li> <li>Run Paradox Utility program</li> </ul>

Table does not exist	Files that are being accessed have been corrupted or removed	<ul> <li>Install backup files/backup database</li> <li>Run Paradox Utility program</li> </ul>
Timetable contains errors*	Timetable has been setup incorrectly	<ul> <li>Make sure there are no empty cells under the Schedule, Order Number, Sample Name, and Vial columns.</li> <li>Make sure you have not used the same sample name more than once</li> </ul>
Autosampler Time Out Exceeded	No power to autosampler	<ul> <li>Check that autosampler is plugged in/turned on</li> <li>Check that power bar is plugged in/turned on</li> <li>Check that power cord/outlet</li> <li>Check fuse</li> </ul>
	Autosampler has lost communication with computer	Tighten communication cable/Reset     power to autosampler
	Com port setup in Hardware Setup is incorrect.	Change com setting in Hardware     Setup
Unknown Gilson Error	Sampler arm has felt resistance	Move source of resistance and reset     power to autosampler
Z motor position error	Sampler arm has felt resistance	Move source of resistance and reset     power to autosampler
Z-arm height exceeded	Sampler is being told to move outside the possible limits	<ul><li>Check sampler move step for errors</li><li>Reload tray file</li></ul>
Z target less than minimum	Unknown	<ul><li>Check sampler move step for errors</li><li>Reload tray file</li></ul>
Unable to open driver GSIOC32.dll	Problem with autosampler communication	<ul> <li>Check sampler com port setting and baud rate</li> <li>Reserve com port for sampler</li> <li>Using incompatible Windows version/computer issue</li> </ul>
Output file error	Trying to print to nonexisting printer	Set up printer/take off automatic printing

The software has performed an illegal operation	Computer/network issue	Reboot/remove network connection
	Database too large	Archive database
Invalid field name	Report does not exist/field in report does not exist/linking become corrupt	Create report/field, Re-link     report/field.
An unspecified error has occurred	General error message	Shut down the software and restart it
Fatal Error: Aborting Timetable	General error message	• Shut down the software and restart it
Database Error	General error message	Shut down the software and restart it
"String to Number"	Unknown	Computer Regional settings must be
or "Number to		set to US English Palink stan that error occurs on
conversion error		<ul> <li>Run Paradox Utility program</li> </ul>
Invalid floating	Unknown	Re-boot computer
point operation		<ul> <li>Re-link step that error occurs on</li> <li>Run Paradox Utility program</li> </ul>
Range Check Error	Unknown	<ul> <li>Re-boot computer</li> <li>Re-link step that error occurs on</li> <li>Run Paradox Utility program</li> </ul>
Z target less than minimum Z - Is the Vial Number	Unknown	• Shut down the software and restart it

Missing or		
Incorrect?		
Inject? OK	Unknown	Click OK, and your run will continue
Z target less than minimum Z - Is the Vial Number Missing or Incorrect?	A sampler move step has attempted to move beyond the set range of motion	<ul> <li>Shut down the software and restart it</li> </ul>
Inject?	A communication error has occurred between the interface and the buret	Click OK, and your run will continue
Exception on event date conversion YYYY/MM/DD	PeCOD system-related error message. The computer's date format is likely incorrect	<ul> <li>Check that the Regional Settings of the computer are set to US English. Dates must be set up MM/DD/YYYY.</li> </ul>
Exception on run date conversion YYYY/MM/DD		

\*There is a "Check Timetable" button that can be selected after setting up a timetable that will highlight any errors.

\*\* Always shut down the software after getting any sort of error, otherwise other general error messages will populate. Always write down exactly what the error message says, or take a screen shot. If known, take note of exactly what was done when the error occurred. If in the middle of the run, take note of what step the error occurred on.



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