

DSX[®]

ELISA SYSTEM

OPERATOR MANUAL





DSX[®] Automated System
Enzyme-Linked Immunosorbent
Assay (ELISA)
Operator Manual

Part No. 91000061

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Manufacturer and European Authorized Representative



DYNEX Technologies, Inc.
14340 Sullyfield Circle
Chantilly, Virginia 20151 USA
Phone: +1 (800) 288-2354
Fax: +1 (703) 631-7816

EU Importer: DYNEX Technologies GmbH
Heerweg 15D, 73770
Denkendorf, Germany
Phone: +49 (0) 711-900349-66
Fax: +49 (0) 711-900349-68



DYNEX Technologies, Inc.
Second Floor,
3 Liverpool Gardens,
Worthing,
West Sussex, BN11 1TF
United Kingdom



Acorn Regulatory Consultancy Services Limited
Knockmorris,
Cahir, Co. Tipperary,
E21 R766 Ireland

Technical Support

For technical support please contact DYNEX Technologies.

USA AND CANADA

Phone: +1 (800) 288-2354 option #4 for USA and Canada
Email: techservice@dynex.com
Fax: +1 (703) 803-1441 for US and Canada

EUROPE

Phone: +49 (0) 711-900349-66

Email: dynexgermany@dynex.com

Fax: +49 (0) 711-900349-68

ASIA

Email: dynex-asia@dynex.com



At the end of life for the DSX instrument, contact DYNEX technical support to arrange for disposal.



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Chapter 1: Safety Information

This chapter describes the text conventions and symbols that are used in this manual and it provides important safety information that must be read and understood before operating the DYNEX DSX[®] system:

- Safety icons and messages that are in this manual
- Warning labels that are on the DYNEX DSX system or its components
- Safety precautions that must be followed when operating the DYNEX DSX instrument
- Instructions for disposal of the instrument.

1.1 Intended Use

The DYNEX DSX is an analyzer with open functionality for processing chemical assays.

It is the customer's sole responsibility to determine the DSX system's suitability for a particular application, including any clinical application. DYNEX makes no representations, warranties or performance claims with respect to the performance of DSX for any specific application, including clinical application or for the use of the DSX instrument with any reagents, assays or other products.

The customer is responsible for validating the system for its intended use.

1.2 Use of the Operator Manual

Before using the DYNEX DSX instrument, it is essential that the contents of this *Operator Manual* and any labels on the instrument or its packaging are read and understood by the operator.

Always keep this *Operator Manual* near the instrument for easy access to operating instructions and safety information.

1.3 Text Conventions Used in this Manual

To convey information readily and consistently, certain text conventions are used throughout this manual. The text conventions are as follows:







Table 1: Text Conventions

Text Convention	Purpose
Numbered Lists	Numbered procedures that should be implemented in order during an operation: <ol style="list-style-type: none"> 1. Disconnect the liquid waste container. 2. Remove the waste cap.
Bold Type	Designating a term that is being described or navigation path: <p>Single - using one test wavelength</p> <p>Dual - using one reference wavelength and one test wavelength</p>
	Designating the name of an operation button: <p>Click Browse and navigate to the Plates Data directory.</p>
Italics	Designating another section of this manual that should be consulted or designating the name of a screen: <p>Refer to the <i>Labels on the Instrument</i> section for additional information.</p>
	Designating the name of a screen or a field on a screen: <p>The commands are listed in the <i>Data Reduction</i> menu, starting with the <i>Assay Title</i> dialog box.</p> <p>The <i>Reader operation</i> is automatically added to a new assay by <i>REVELATION DSX</i> Software.</p>
Screenshots	Screenshots shown in this publication are for illustrative purposes only. The screenshots are not necessarily exact representations of the latest software release.
DYNEX	Used to represent DYNEX Technologies Inc..

1.4 Labels Used in This Manual

Certain labels are used in this manual to provide a ready visual reference. The labels are as follows:

Table 2: Labels Used in the Manual

Labels	Description
	Warning: Indicates a potential hazardous situation which if not avoided can result in death or serious personal injury.
	Warning: Indicates a potential hazardous situation which if not avoided can result in death or serious personal injury due to exposure to biohazardous material.
	Caution: Indicates a possible hazardous situation which if not avoided can result in minor or moderate personal injury.
	Important: Indicates a possible hazardous situation which if not avoided can result in damage to the system.
	Note: Provides background or incidental information concerning the current topic or procedure.
	Complies with relevant EU directives regarding safety, health and environmental protection.








1.5 Labels on the Instrument

1.5.1 Instrument Serial Number Label

The serial number label provides information regarding the instrument, its intended use, power requirements and where the instrument is manufactured and marketed.

Symbols that are included on the serial number label are described in Table 3.

Table 3: Labels on the Instrument


Symbol	Description
	Complies with relevant EU directives regarding safety, health and environmental protection.
	In-vitro diagnostic.
	Manufacturer of the instrument.
	Product has been independently tested and meets the applicable published standard in USA and Canada.
	Regulatory Compliance Mark (RMC).
	To identify the country of manufacture of products
	This symbol is used on the outer box to show the date when the lot completed manufacturing (PI). The serial number of the instrument (DI).






1.5.2 Warning Labels

The DYNEX DSX instrument has labels attached that provide information and/or warn the user of a hazard. Potential personal injury to the operator can result if instructions on warning labels are not followed.

Warning labels that are on the DYNEX instruments are listed below. Familiarize yourself with each label and what it means.

Table 4: Warning Labels


Label	Description
	Biohazard.

Label	Description
	Do not stare into the beam.
	Hot surface.
	Risk of electric shock.
	Risk of piercing from a pipette tip.
	Warning symbol

1.5.3 Instrument Disposal Label

A label adjacent to the serial number label provides information regarding disposal of the instrument (Table 5).

Table 5: Instrument Disposal Label

Symbol	Description
	Do not dispose of the instrument. Contact DYNEX for disposal instructions.

1.6 General Precautions

The following general precautions will aid in the safe and efficient use of the DYNEX DSX instrument.

The instrument must be positioned so that it can be readily disconnected from the power supply.

Ethyl alcohol, 70% isopropyl alcohol or laboratory disinfectants containing quaternary ammonium sulfates are approved for use to clean and disinfect the DYNEX DSX instrument.



Important: Do not use cleaning agents or decontaminating agents that could cause a hazard as a result of reaction with parts of the equipment or with the material contained in it. Contact your DYNEX representative if there is any doubt about the compatibility of a cleaning or disinfecting agent with the DYNEX DSX instrument.

All parts, accessories and consumables for the DSX instrument are required to be supplied only by DYNEX or its approved partners. The use of non-approved parts will affect the instrument warranty and will adversely affect performance.

This equipment has been designed and tested to the Federal Communications Commission (FCC) 15: Part B, ICES-003 for Class A device. Use of the equipment in a domestic

environment may cause radio interference and measures to mitigate the interference may be required.

Appropriate precautions must be taken when working with biohazardous material. Technicians must be trained in the safe handling and cleanup of potential blood borne pathogens. Universal precautions, appropriate hygiene and decontamination of surfaces are recommended.

Do not touch the instrument work area while the cover for the DYNEX DSX instrument is open unless the instrument instructs you to input materials or to intervene.

Attend to error messages when the system prompts and stops. These messages indicate a need for user action.

When loading sample tubes into a sample rack, press the tubes down into the sample rack to prevent the pipette module from being obstructed.

Periodic backup of assay and data files is recommended. The files should either be copied to a flash drive for transfer to storage or archived on a secure server.

The DYNEX DSX instrument is designed to scan sample tube barcode labels in accordance with *Clinical and Laboratory Standards Institute (CLSI) AUTO 12-A*, which specifies the quality, position and orientation of the barcode labels.



Important: *Use of high-quality barcode labels is critical for obtaining consistent results when scanning. The use of non-standard barcodes or barcodes with poor print quality must be avoided.*

Barcode labels must be applied vertically on the sample tubes. Sample tubes must be placed in the sample rack so that the barcode label faces out of the opening in the sample rack.

Appropriate personal safety precautions must be made when opening and closing the system cover. When the cover is opened and the run has started, do not encroach upon the work area unless prompted by the software for user input of materials or manual intervention.

Use of this instrument in a dry environment (especially if synthetic materials such as synthetic clothing or carpets, etc. are present) may cause damaging static discharges that may cause erroneous results.

It is the user's responsibility to ensure that a compatible electromagnetic environment for the equipment can be maintained in order that the device will perform as intended. The electromagnetic environment should be evaluated prior to operation of the DYNEX DSX instrument.

Do not use this instrument in close proximity to sources of strong electromagnetic radiation (e.g., unshielded intentional radio frequency [RF] sources) as these may interfere with proper operation.

If the DYNEX DSX instrument is used in an unspecified manner, the protection provided by the equipment may be impaired.

The removable workspace components must be seated properly on the workspace pins. This is necessary for the component coordinates to be properly aligned.

When loading sample tubes into a sample rack, press the tubes down into the sample rack to prevent the pipette module from being obstructed.

Sample racks must be properly placed into the sample caddy, with the tube opening facing the washer module (and scanner module). Seat the "V" on the rack into the notch on the

caddy. Racks should be level and flush (Arranged with adjacent sides, surfaces, or edges close together).

Different rack configurations exist to accommodate sample tubes of varying heights. Ensure to use the proper rack for the sample tubes being used.

Periodically inspect the retaining springs in each sample rack to ensure that samples tubes are properly aligned. Replace the springs if needed.

The most current model sample caddy must be used for sample tube barcode scanning. This sample caddy accepts the most current model pick-up type racks required to scan tube barcodes. There are a few ways to tell the two caddies apart:

- Latest caddy has handle holes on the side and a full base.
- Old model caddy has solid sides and a see through base.
- Small gap between the racks when they are seated in the latest caddy.

Periodic backup of assay and data files is recommended. The files should either be copied to a flash drive for transfer to storage or archived on a secure server.


Changes to assay files may affect the suitability and plotting of data using the Levey-Jennings control-charting feature.

1.7 Safety Precautions

The following safety precautions must be followed when using the DYNEX DSX instrument.



1.7.1 Biohazard Precautions

Table 6: Biohazard Precautions

	<p>Warning: If biological specimens are being tested the specimens and used sample tips are potentially infectious. Use universal precautions in the handling of specimens and used sample tips in accordance with local regulations.</p>
	<p>Warning: If biological specimens are being tested the liquid waste is potentially infectious. Use universal precautions in the handling of liquid waste in accordance with local regulations.</p>
	<p>Warning: While the DYNEX DSX alone does not present a biohazard biological samples that are used and all parts and consumables in contact with the samples must be considered biohazardous.</p> <p>Appropriate precautions must be taken when working with biohazards. Technicians must be trained in the safe handling and clean-up of potential blood borne pathogens. Universal precautions appropriate hygiene and decontamination of surfaces are recommended.</p>
	<p>Warning: Never remove the cap of the liquid waste container cap while the container is in the instrument. Always remove the container first stand it upright on the bench with the cap pointed up then remove the cap.</p>

1.7.2 Electrical Power Precautions

Table 7: Electrical Power Precautions

Icon	Description
	<p>Caution: The DYNEX DSX instrument must be connected to a properly grounded electrical outlet. Obtain assistance from a qualified electrician to verify that your electrical outlet is properly grounded.</p>
	<p>Caution: Power is on to the system whenever the indicator light above the barcode readers is illuminated.</p>
	<p>Warning: Always disconnect the power to the DYNEX DSX instrument before performing maintenance.</p>

1.7.3 Barcode Scanner Precautions

The horizontal barcode reader is a Light-Emitting Device (LED) barcode scanner. The vertical barcode reader is a laser barcode scanner

1.7.3.1 Class I Laser

DYNEX DSX instrument contains a Center for Devices and Radiological Health (CDRH) Class I laser vertical barcode scanner.



Laser radiation. Class I invisible laser radiation present (Coplies with the European Standard IEC/EN 60825-1). Avoid long-term viewing of the laser. A warning label is attached to the system near the vertical barcode scanner.

1.7.4 Instrument Movement Precautions



Warning: Be cognizant of placing your hand into the area of the moving pipettor. The instrument should always be run with the cover closed.

- Periodically inspect the retaining springs in each sample rack to ensure that samples tubes are properly aligned. Replace the springs if needed.
- Check the gas spring by closing the cover of the instrument and lifting the cover approximately eight inches. If the cover stays open or closes slowly, the gas spring is acceptable. If the cover falls down rapidly, the gas spring must be replaced
- Place the sample racks securely into the system. Push the rack firmly towards the back of the system so that the rack clicks in place.

Chapter 2: Overview

The DYNEX DSX Automated ELISA Processing System is a flexible system for performing a broad range of automated ELISA assays.

To run an assay, the operator loads the samples, creates a worklist indicating the assay(s) to be run on each sample, verifies that a sufficient quantity of consumables, reagents and wash fluid are loaded, loads the plate(s) and starts the run.

The DYNEX DSX instrument is intended for use in clinical, research and life science laboratories.



Figure 1: DYNEX DSX Instrument

2.1 Assays

The flexible open-system design of the DYNEX DSX is ideal for performing a wide variety of ELISA assays. Reagents can be prepared at your facility or they can be obtained from a DYNEX reagent kit manufacturer as test kits with all reagents and a plate for the assay.

Each operation that is performed for an assay is specified in an assay file that is loaded on the DYNEX DSX instrument computer. Assay files are created using DYNEX *REVELATION DSX™* software that is provided with the DYNEX DSX instrument. An assay file can be created to either match the package insert from a test kit manufacturer or to support a user-defined assay.

Each assay file is specific for a particular test and controls pipetting of samples, dispensing of reagents, incubation of the plate, washing of wells and reading of wells as well as calculation, exporting and reporting of results.



Important: Validation studies must be performed by your facility to assure proper performance of a user-defined assay before the assay is used for testing samples.

2.2 Principles of Operation

2.2.1 Samples

Patient samples are prepared for analysis by the operator and placed in typical laboratory sample tubes. Up to 96 patient samples can be physically loaded on the instrument at one time. Sample identifications can be automatically read from a barcode label on each sample tube, manually entered by the operator or automatically assigned by the software.

The DSX can be used with different fluid sample types. Specimens containing large particulate matter, such as stool, tissue homogenates or culture media, can also be used. It is recommended that these specimens be processed through a mesh filter prior to loading onto the system to assure sample homogeneity and pipetting precision.



Important: *It is the end user's responsibility to perform full validation on their sample matrix.*

2.2.2 Assay Test Kit

Assay test kits to run the assay are not provided by DYNEX.

2.2.3 Reagents

Test reagents are transferred by the operator into 25 milliliter (mL) reagent tubes. Each filled reagent tube is then loaded by the operator into the position specified by the system after the worklist is scheduled. Up to twenty-four 25 mL reagent tubes can be loaded at one time.



Important: *The fluids (reagents, calibrators and controls) that are used in an assay are specified by the user during assay definition (Chapter 6.4.1 and 6.4.2). Before a fluid can be specified for an assay, a record for that fluid must exist in the database (Chapter 5.4.6.5).*

2.2.4 Calibrators and/or Controls

Calibrators and/or controls are transferred by the operator into 2 mL control tubes. Filled tubes are loaded onto a separate rack that contains up to 33 standard/control tubes. The tubes are available from your supplier.

2.2.5 Pipetting

Pipetting of samples, standards/controls and reagents is performed by the pipette module using custom-designed disposable pipette tips to assure pipetting precision and eliminate possible cross-contamination. Reagent tips pipette from 25 μ L to 1 mL of reagents and sample tips pipette from 10 μ L to 300 μ L of samples or standards/controls.



Note: *The sample tips (part number 65910) and reagent tips (part number 65920) are defined as accessories as only the DYNEX tips have been found to meet the stated precision and accuracy specifications. Use of unauthorized third-party pipette tips will affect the performance of the DSX system. The DYNEX tips are CE Marked.*

2.2.6 Incubation

The DYNEX DSX instrument can incubate plates at room temperature (ambient plus 7° Celsius [C]) or at elevated temperatures. The instrument can accommodate up to four temperature-controlled plate incubators. Each incubator can be set to a different temperature ranging from ambient plus 7° C to 50° C \pm 1° C and each plate can be shaken during incubation.

The incubation time, incubation temperature, shake duration and shake intensity are specified in the parameters that are included in the assay file.

2.2.7 Washing

All eight wells in a single column of a test plate are washed simultaneously by a multiwell wash head (Chapter 4.5.1). During operation, the wash head assembly is lowered and raised. When the wash head assembly is lowered, the well contents can be aspirated or a bottom wash can be performed. The wash head assembly is raised to move the wash pins from one column to another or to fill the wells.

Five sweep mode selections are available for aspirating fluid from the wells during washing. These are described in Chapter 6.4.4.1.1.

The wash solutions and volumes that are dispensed, number of wash cycles and sweep mode are specified in the assay file.

2.2.8 Reading of Optical Density

The reader module contains a lamp and up to six wavelength filters. Light from the lamp passes through an optical wavelength filter and is then directed through a well and to a detector by optical fibers. The detector senses the transmission of light through the well and the percent transmission of light through the well and its contents at that wavelength is converted to optical density (OD) by the system software.

A blank well can be specified for measuring 100% transmission, corresponding to an OD of zero. If no blank wells are specified, air is used for the 100% transmission readings. If more than one blank wells are specified, the average optical density of the blank wells is subtracted from each of the other wells on the plate.

Readings can be obtained at a single wavelength (the primary test wavelength at or near the maximum (max) absorbance of the reaction product) or at two wavelengths if a reference wavelength outside the maximum absorbance band is also specified in the assay file. If readings are made at two wavelengths, the difference between the two readings is used since this can reduce errors caused by dirt and scratches on the bottom of the wells. These artifacts tend to scatter radiation equally regardless of wavelength.

Specifications of the assay file (Chapter 6.5.3) are as follows:

- time when wells are read
- use of one or more blank wells
- use of shaking
- use of wavelengths.

2.2.9 Scheduling and Execution of a Worklist

A worklist consists of the samples and the tests that are to be performed on the samples. The system automatically performs the operations that are needed for executing the worklist in the manner and order specified for each operation in the assay file.

A worklist can be created manually or by the Laboratory Information System (LIS) for your facility. Optional LIS-Link software must be installed and configured in order to use the LIS to create worklists.

Once a worklist has been created, the run can be started. The system prompts the operator to load the microplates and consumables that are required by the worklist. You can observe worklist progress by displaying the timeline (Chapter5.3).

The optical density results for each well on each microplate in the worklist are analyzed according to the criteria that were specified during assay definition. When the microplate processing is complete, the results of the run are displayed on the screen.

2.3 Materials Provided

The following materials are provided with the DYNEX DSX instrument:

Table 8: DYNEX DSX Instrument Materials

Item	Quantity
4 millimeter (mm) Allen Wrench	1
8-way Wash Head	1
Alignment Fixture	1
Cleaning Wires (Aspirate and Dispense)	2 Each
Compact Disk (CD) Read Only Memory (CD-ROM) Containing <i>REVELATION DSX</i> Software Setup Program and Electronic Operator Manual	1
Consumables Sample Kit	1
Control Rack	1
Deep Well Base	2
DSX Instrument	1
Instrument Power Cable	1
Liquid Waste Container	1
Plate Holders	4
Printer (Parallel) Cable	1
Purge Trays	5
Reagent Rack and Tip Funnel	1 each

Item	Quantity
Recommended Standard 232 (RS232) Communication Cable	1
Sample Caddy	1
Sample Racks	7
Shipping Check List	1
Tip Waste Container	1
Wash Buffer Containers	4
Washer Plate Holder	1

2.3.1 Materials Required but Not Provided

The following materials are required but are not provided with the DYNEX DSX instrument.

- Detergent and a detergent bottle
- Keyboard
- Monitor
- Mouse
- Personal computer (PC)
- Printer
- Sample tube labels
- Uninterruptible Power Supply (UPS)

► **Note:** Not required for operation of the system but use of a UPS is recommended.

- Wash head cleaning fluid container

2.3.2 Consumables and Other Accessories

DYNEX certified consumables are specially designed and produced for DYNEX instruments, ensuring proper fit with superior accuracy, performance and continued warranty compliance.

Table 9: Consumables and Other Accessories

Consumables	Part Number
1 mL Deep Well Microplates (each)	65930
Deep Well Dilution Strips (250 x 8-well)	62910
► Note: It can be used instead of Deep well Dilution Plates requires Deep Well Dilution Strip Holders,	24900310
Racked Reagent Tips (4 x 108)	65920

Consumables	Part Number
Racked Sample Tips (4 x 108)	65910
Reagent Bottles, 25 mL (10/pack)	62920
Reagent Bottles, 25 mL (24/pack)	65950
Standard Control Bottles (33/pack)	65940
Other Accessories	Part Number
In-line Wash Buffer Filters	43000600
O-ring Lubricant, Silicone, ½ ounce (oz.) package	47000030

2.4 Specifications for the DYNEX DSX Instrument

2.4.1 Instrument Dimensions

Item	Metric	Imperial
Width	<1060 mm	42 in
Depth	<910 mm	36 inches (in)
Height	<800 mm	32 in
Footprint	<1060 x 610 mm	42 x 24 in
Bench weight	136 kg maximum (max)	300 pounds (lbs) max
Ship weight	244 kg max	537 lbs. max

2.4.2 Power Requirements

Unit	Voltage
Voltage	100 - 240 Volt (V) automatic conversion
Frequency	50/60 hertz (Hz)
Power Consumption	<800 Volt-Ampere (VA) Online Universal Power Supply (UPS) recommended

2.4.3 Reader Specifications

Specification	Amount
Photometric range	0.000 to 3.000 OD
Spectral range	405 nanometers (nm) to 690 nm
Precision	±0.010OD at 0.000 to 0.500 OD

Specification	Amount
	<1% Constant Voltage (CV) at 0.501 to 2.000 OD <1.5% at 2.001 to 2.500 OD
Accuracy	±0.01 OD or 2.5% (0.000 to 3.000 OD) whichever is greater
Read time	<10 seconds, single wavelength <20 seconds, dual wavelength ▶ Note: Measured reading time is an average depending upon run conditions.

2.4.4 Washer Specifications

Specification	Amount
Manifold configuration	8-way
Programmable volumes	50 – 999 microliters (µL)
Wash containers	4 wash bottles at 2.0 liters (L), with low-level sensing
Waste container	8 L with waste full sensor
Residual wash volume	<3 microliters (µL) per well with dual-axis sweep in a flat-bottom plate
Residual wash volume	<3 µL per well with dual-axis sweep in a flat-bottom plate
Dispense precision	≤ 5% CV (with 300 µL in a 96 well plate)

2.4.5 Incubator Specifications

Specification	Amount
Number of incubators	Up to 4
Temperature range	Room Temperature (RT) + 7
Temperature accuracy	±1° Celsius (C)
Shaking	>15Hz periodic or continuous

2.4.6 Instrument Capacity

Specifications	Amount
Controls and/or Standards	33
Reagent Pipetting Tips	41
Reagents	24

Specifications	Amount
Sample Pipetting Tips	432
Samples	98 samples
Wash Buffer Bottles	4 bottles, 2 L each
Waste Container	8 L

2.4.7 Pipetting Specifications

Specifications	Amount
Number of plates	4
Number of assays	1 assay per strip or up to 12 assays per plate
Number of sample tubes	98
Number of reagents	24
Number of standard/control bottles	33
Number of pipettes	1

2.4.8 Reagent Pipetting Specifications

Specification	Amount
Reagent tip size	1300 μ L
Number of reagent tips	41
Reagent pipetting volume	25 – 1000 μ L
Reagent pipetting precision	\leq 3% CV at 10 shots at any volume in operating range above 50 μ L
Reagent pipetting accuracy	\pm 2% of target volume at 50 μ L or greater in operating range (single-shot mode)

2.4.9 Process Security

Item	Option
Liquid-level sensing	Yes (reagents, controls and samples)
Level-sensor system	Pressure differential
Clot detection	Yes
Dispense-anomaly detection	Yes
Tip detection	Yes
Well-fill verification	Yes
Alarms	Yes

2.4.10 Sample Pipetting Specifications

Specification	Amount
Sample tip size	300 μ L
Sample pipetting volume	10 – 250 μ L 10 – 250 μ L single-shot 25 – 100 μ L multi-shot
Estimated cycle time for sample pickup to delivery on plate	<8 seconds
Time to dispense	19 minutes (typical): 50 μ L of 96 samples to plate from sample tubes or deep well plates
Sampling time with dilutions	<26 minutes (typical) For example: 2 stage dilution, 20 μ L sample to 400 μ L buffer in < 26 minutes
Single-shot sample pipetting precision	\leq 3% CV at any operating volume above 10 μ L
Single-shot sample pipetting accuracy	\pm 2% of target volume at any operating volume above 10 μ L
Dilution range	1 part in 190 one-stage dilution 1 part in 36,100 two-stage dilution
Number of sample tips loaded	4 racks of 108
Sample tube dimensions	Sample Rack Options Short: 40-75 mm tubes Long: 75-100 mm tubes

- **Note:** Typical pipetting time is an average. For any give system the result may vary, either shorter or longer than 15 minutes.

2.4.11 Assays

Specification	Type
Additional Data Analysis	<ul style="list-style-type: none"> • Curve fit • Quality Control (QC) equations • Ratio • Spreadsheet • Threshold
Blanking	<ul style="list-style-type: none"> • Air <ul style="list-style-type: none"> ○ Individual ○ Paired ○ Average wells • Whole plate or last plate <ul style="list-style-type: none"> ○ Row ○ Column • Each well on the plate
Flexible Template	<ul style="list-style-type: none"> • Up to eight different well types
Standard Curves	<ul style="list-style-type: none"> • Akima • Cubic • Linear • Polygon • Quadratic • Quartic • Sigmoid • Spline
Wavelength Modes	<ul style="list-style-type: none"> • Single • Dual • Multiple

2.4.12 Environmental

Type	Ranges
Operating Range	<ul style="list-style-type: none"> • 15° C to 30° C • 59° F to 86° F • 15% to 85% relative humidity (non-condensing) • 0 to 2,000 meters Altitude • 0 to 1.24 miles Altitude

2.4.13 Computer Interface

Item	Options
Baud Rate	<ul style="list-style-type: none"> • 19200 • Character format
Character Format	<ul style="list-style-type: none"> • 7 data bits • 1 stop bit • No parity
Ports	RS-232 serial port

2.4.14 Regulatory Compliance

Refer to *Declaration of Conformity* for a list of regulatory documentation.

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Chapter 3: Installation

The DYNEX DSX instrument will be installed by DYNEX factory trained and authorized technicians. The instrument will then be tested to verify the installation and ensure that the instrument is operating properly.



Caution: *The DYNEX DSX instrument must be connected to a properly grounded electrical outlet. Obtain assistance from a qualified electrician to verify that your electrical outlet is properly grounded.*



Note: *Depending upon local electrical codes and electrical service quality, an optional uninterruptible power supply (UPS) may be required in your laboratory. The use of a UPS is optional but strongly recommended. A UPS can be purchased either from DYNEX or an electronics supply house.*

3.1 Placement of the Instrument

The DYNEX DSX instrument must be positioned on a sturdy and level laboratory bench that is not supporting other devices such as a centrifuge or shaker bath that produce vibration. The instrument must be located so that it can be readily disconnected from the power supply.



Important: *Do not locate the instrument where it may be subjected to direct sunlight or strong internal lighting, as this may interfere with tip sensing and barcode reading during loading of consumables and samples.*

The DYNEX DSX instrument requires bench space that is approximately 106 cm (41.8 inches) wide, 91 cm (35.8 inches) deep and 80 cm (31.5 inches) high. There must be at least 20 cm (7.9 inches) clearance at the rear of the instrument to allow for sufficient ventilation. The bench must be able to support the weight of the instrument (110 Kg or 240 lbs) plus accessories and other materials.



Caution: *The DYNEX DSX instrument is heavy. Four people are needed when lifting the DYNEX DSX instrument.*

Additional bench space that is approximately 54 cm (21.3 inches) wide, 75 cm (29.5 inches) deep and 54 cm (21.3 inches) high is needed next to the DYNEX DSX instrument for the PC, monitor, keyboard, mouse and printer that will be connected to the instrument.

3.1.1 Operating Environment

The DYNEX DSX instrument can be operated at:

- Temperatures ranging from 15° C to 30° C (59° Fahrenheit [F] to 85° F)
- Relative humidity of 15 to 85% (non-condensing)
- Altitude of less than 2,000 meters (6,500 feet).

If possible, avoid locating the DYNEX DSX instrument in a dry environment where synthetic materials such as synthetic clothing or carpets may cause damaging static discharges that may cause erroneous results.

3.1.2 Storage Environment

If the DYNEX DSX instrument will not be used for an extended period of time, the instrument can be stored at:

- Temperatures ranging from -10°C to 70°C (14°F to 158°F)
- Relative humidity of 5 to 95% (non-condensing)
- Altitude of less than 10,000 meters (32,800 feet).

3.2 Handling or Shipping the Instrument

While the DYNEX DSX alone does not present a biohazard, biological samples that are used and all parts and consumables in contact with the samples must be considered biohazardous.



Figure 2: Biohazard Symbol

Appropriate precautions must be taken when working with biohazards. Technicians must be trained in the safe handling and clean-up of potential blood borne pathogens. Universal precautions, appropriate hygiene and decontamination of surfaces are required.

If the instrument must be shipped, contact DYNEX Technical Support.

3.3 Connect a PC to the Instrument

The user interface to the DYNEX DSX instrument is provided by DYNEX *REVELATION DSX* software running on a PC.

The PC and its keyboard, mouse, monitor and printer are not provided. They must be obtained and connected to the instrument at your facility.

3.3.1 PC Requirements – Windows 7

Minimum PC requirements:

- Intel® Core™/Core2 0153/Pentium®/Celeron® family (or compatible processor) recommended
- 10 gigabyte (GB) or larger hard drive with at least 100 megabyte (MB) of free space
- Microsoft® Windows® 7 Professional operating system (32- or 64-bit)
- Super Video Graphics Array (SVGA) compatible display adapter (card or built into motherboard) with 24-bit (true-color setting) or more colors at 1024 x 768 or more resolution
- Display properties should be set to a desktop area of at least 600 x 800 pixels and a color palette of at least 256 colors
- Minimum 256 MB of Random Access Memory (RAM)
- One unused RS232 serial port is required for connecting the computer to the DSX instrument
- One unused USB port
- Mouse or other pointing device (i.e., trackball) supported by Microsoft Windows
- Microsoft Windows compatible printer (color recommended)
- Compatible sound card
- Network/Local Area Network (LAN) connection, 10/100 network interface (optional).
- 1.8 gigahertz (GHz) minimum processor clock speed required (2 GHz or higher processor clock speed recommended).
- Serial port (optional for LIS interfacing).
- Microsoft Windows compatible Compact Disk-Read Only Memory (CD-ROM) or Digital Video Disk (DVD) drive..

3.3.2 PC Requirements - Windows 10 (Professional Version)

Minimum PC requirements:

- 1 gigahertz (GHz) or faster processor or system-on-a-chip (SoC) 10 gigabyte (GB) hard drive disk with at least 100 MB of free space
- 2 GB for 32-bit or 4 GB for 64-bit RAM
- Microsoft Windows 10 (32-bit or 64-bit) operating system (OS)
- 16 GB for 32-bit OS or 20 GB for 64-bit OS hard drive disk space
- DirectX 9 or later with Windows Display Driver Model (WDDM) 1.0 driver graphics card
- Display properties should be set to a desktop area of at least 600 x 800 pixels and a color palette of at least 256 colors
- One unused RS232 serial port is required for connecting the computer to the DSX instrument
- One unused USB port is required for connecting the computer to the DSX instrument
- Mouse or other pointing device supported by Microsoft Windows
- Any printer that is supported by Microsoft Windows can be used

- Compatible sound card.

▶ **Note:** *Windows XP is no longer a supported OS platform for REVELATION DSX.*

3.3.3 Connect PC to DSX

DSX is connected to a PC that runs *REVELATION DSX* software using an RS232 serial cable.

1. Place the computer, keyboard, monitor, mouse and printer next to the DSX instrument.
2. Plug the RS232 communication cable into an unused RS232 port on the computer. If the computer does not have a serial port and only has a USB port available, a USB/RS232 adapter may be necessary. Note the computer port (e.g., COM1 or COM2) that is used.

▶ **Note:** *Refer to the instructions accompanying the computer for the location of the ports and connecting components.*

3. Plug the other end of the RS232 communication cable into the RS232 port at the right side of the instrument (Figure 3).
4. Connect the keyboard, monitor, mouse and printer to the computer.
5. Connect power to the computer, monitor and printer.

i **Important:** *Refer to the instructions accompanying the computer, monitor and printer for instructions and precautions regarding the power source for these devices.*

▶ **Note:** *Depending upon local electrical codes and electrical service quality, an optional uninterruptible power supply (UPS) may be required in your laboratory. The use of a UPS is optional but strongly recommended. A UPS can be purchased either from DYNEX or an electronics supply house.*



Figure 3: View of the Right Side of the DSX Instrument

3.4 Install *REVELATION DSX* Software

REVELATION DSX software is provided on a CD-ROM. Table 10 lists the prompts that will be displayed.


► **Note:** *The installation of Revelation 6.40 must follow the sequence listed below:*

1. *Prerequisites*
2. *Database installer*
3. *Revelation application software.*

Table 10: REVELATION DSX Software Installation Prompts

Prompt	Description
User Name	Computer's registered owner
Company Name	Computer's registered organization
Type of Installation	All or selected files
Default Workspace	Type of sample caddy used on your system

1. Start Microsoft Windows.
2. Insert the installation CD-ROM. The InstallShield® Wizard for *REVELATION DSX* Software starts automatically.

► **Note:** *If the InstallShield Wizard does not start automatically, select **Start** then select **Run** from the Windows task bar. In the Run window, browse to **setup.exe** on the CD-ROM drive, click **Open** and click .*

*To stop the installation, click **Cancel***

3. Click **Next** and follow the wizard instructions.

► **Note:** *Click **Back** at any time to repeat a step or review previous selections.*

4. Click **Yes** to install a local Microsoft Structured Query Language (SQL) Desktop Engine (MSDE) 2000 database if prompted to do so.
5. The installation CD-ROM includes Adobe® Acrobat® Reader, which is required to view the Operator Manual online. If Adobe Acrobat Reader is not already installed on your computer, click Yes to install it.
6. InstallShield Wizard Complete displays when the installation is done. Click Finish and remove the installation CD-ROM.
7. Access REVELATION DSX software from the Windows program list in the Start menu: *DYNEX Technologies → REVELATION DSX → Revelation DSX.*

3.4.1 Place *REVELATION DSX* Software Shortcut on Desktop

A *REVELATION DSX* software shortcut icon  can be placed on your computer desktop for convenient access.

1. Open Microsoft® Windows Explorer.
2. Navigate to *C:\Program Files\DYNEX Technologies\Revelation DSX*.
3. Right-click **revel.exe**.
4. Select **Create Shortcut** from the Windows popup menu.
5. Resize the window so the desktop is visible.
6. Drag and drop the shortcut on to the desktop.
7. Close Microsoft Windows Explorer.

3.4.2 Unlock Licensed Software Features

Based on agreements with some partners and to ensure features are used correctly, several features are available only when accompanied by a software license. DYNEX distributes software licenses via a physical dongle (a small USB device) that needs to be connected to the computer.



Figure 4: Physical Dongle

When a DSX instrument is purchased, the *REVELATION DSX* software is accompanied by a dongle which contains the license that enables the functionality to handle multi-tube assays with Boolean operations.

If you are going to be running an assay that requires this feature, connect the dongle to an unused USB port on the computer running the *REVELATION DSX* software. The indicator light on the dongle will illuminate when recognized.

The dongle provided with the instrument is updatable, as new features are rolled out that you wish to take advantage of. Contact your DYNEX representative or DYNEX Technical Support to arrange for the purchase of the license. Currently a dongle is required if software is to be used for multi-tube sample handling and analysis as well as the plural read functionality in *REVELATION DSX* software.

3.4.3 Customize for Windows 7

REVELATION DSX software was initially designed to work with Windows XP for versions before 6.27. Subsequent to that version - *REVELATION DSX* was designed to work with Windows 7. The earlier versions of *REVELATION DSX* software can also be run in Windows 7 using the compatibility mode option.

1. Right-click the *REVELATION DSX* shortcut icon or the installation file (*C:\Program Files\DYNEX Technologies\Revelation DSX*).
2. Select **Properties**.
3. Select the **Compatibility** tab.
4. Check *Run this program in compatibility mode for*.
5. Select Windows XP (Service Pack 3) from the drop-down list.

The DSX online help is delivered in the form of an *.hlp* file (Revel.HLP). To view *.hlp* files on Windows 7, you need to install *WinHlp32.exe*. This program is available for download from the Microsoft website.

► **Note:** *Installers for Revelation DSX 6.40 and later do not require the user to download and install the legacy WinHlp32.exe help engine from Microsoft as the Revelation DSX installer already includes the required files.*

3.5 Connecting the Instrument to a Power Source



Caution: *The DYNEX DSX instrument must be connected to a properly grounded electrical outlet. Obtain assistance from a qualified electrician to verify that your electrical outlet is properly grounded.*

► **Note:** *Depending upon local electrical codes and electrical service quality, an optional UPS) may be required in your laboratory. The use of a UPS is optional but strongly recommended. A UPS can be purchased either from DYNEX or an electronics supply house.*

1. Verify that the PC has been connected to the DYNEX DSX instrument as described on page 24.
2. Obtain the power cord for the DYNEX DSX instrument.
3. Plug the power cord into the power connector at the rear of the instrument (Figure 3).
4. Connect the other end of the power cord to the laboratory electrical supply outlet or UPS.

3.6 Installing LIS-Link Software

The DYNEX LIS-Link application is an optional software package that can be installed on the DSX PC. LIS-Link allows the DSX to communicate with the LIS to download pending test orders and to upload completed assay results.

Using LIS-Link: the DSX can send queries, consisting of barcode-scanned or manually entered sample IDs (or a query all) to the LIS. The DSX then accepts test orders from the LIS for the specific samples and properly checks which samples are to be run when the user enters those orders in the DSX worklist. Upon completion of the actual testing, the results are paired with the correct patient orders and put in a holding queue for user confirmation and subsequent transmission to the LIS.

The customer's Information Technology (IT) personnel are responsible for setting up the bidirectional LIS-Link interface via RS232 serial connection or Transmission Control Protocol/Internet Protocol (TCP/IP) network protocols. Details for setting the configuration are in the *LIS-Link Programmer's Guide*. DYNEX Technical Support can also be of assistance in this aspect of the configuration.

► **Note:** *LIS-Link 2.00 or higher is required to transmit standards and controls. REVELATION DSX 6.20 works with LIS-Link 1.08 and earlier, but standards and controls will not be transmitted.*

Once the LIS-Link interface is successfully configured, use the *REVELATION DSX* software LIS Tab to configure options for transmitting result data to the LIS.

Chapter 4: Hardware Assemblies, Reagents and Consumables

This chapter describes the principal hardware assemblies, reagents and consumables of the DYNEX DSX instrument. User interface is by means *REVELATION DSX* software via a controlling PC.

Locations of the principal hardware components of the DSX Automated ELISA System are shown in Figure 5.

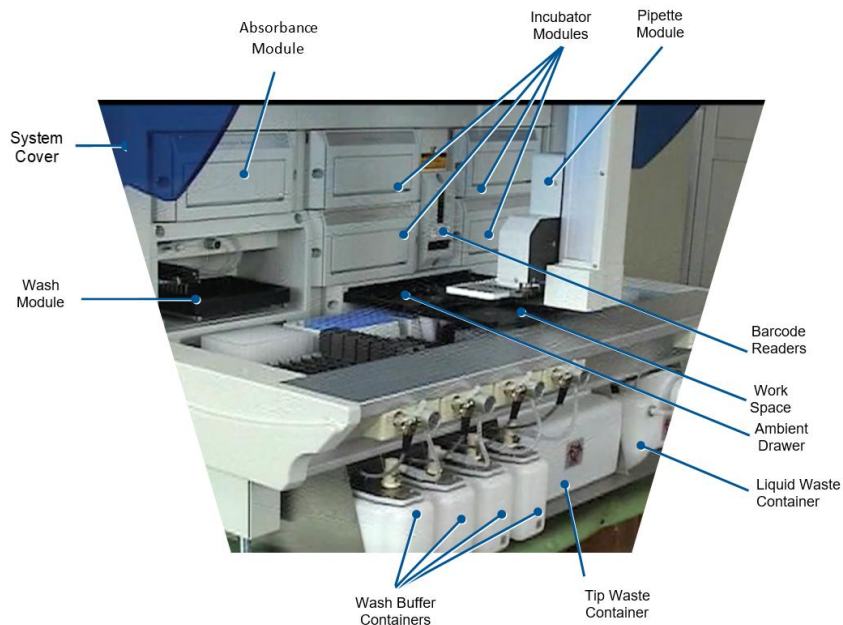


Figure 5: Location of Principle Hardware Components

4.1 System Cover

The system cover encloses the workspace and pipette module. The cover must be closed during operation to prevent the pipette module from accidentally contacting an operator or bystander. An electrical interlock prevents operation of the pipette module and unattended operation of the laser barcode reader when the system cover is open.



Warning: *The electrical interlock for the system cover prevents accidental contact with the pipette module and/or robotic arm. Never disable the interlock unless instructed to do so by DYNEX Technologies personnel.*



Laser radiation: *The system cover attenuates the beam of the laser barcode reader, preventing inadvertent exposure. Never disable the interlock for the system cover unless instructed to do so by DYNEX Technologies personnel.*

To open the cover, lift the handle until the cover is in the upright position (Figure 6). To close the cover, push down on the handle until the cover is fully closed and locked. The system cover rests on the **cover stop** when it is fully closed.



Warning: Pinching hazard. Ensure that your hands and fingers are clear of the cover stop when closing the system cover.



Figure 6: System Cover

4.2 Workspace Area

Samples, reagents, standards, controls and consumables are loaded onto the workspace (Figure 7). Sample tubes are contained in seven sample racks. Each sample rack contains 14 sample tubes and, although up to 98 samples can be contained on the system at one time, 98 tubes are used in routine operation. Sample tubes of uniform size must be used.

- ▶ **Note:** The particular size sample tube that is used and the position of the barcode label on the sample tube are specified during configuration of the DSX.

The sample racks are contained in two **sample caddies**. A specific type of sample caddy will be used on your system.

- ▶ **Note:** The DSX workspace file for the sample caddy is specified during configuration of the DSX.

Standards or controls are contained in the **control rack**, which contains up to 33 standard/control tubes. A specific 2-mL tube is required for standards or controls. The tubes can be obtained from your supplier.

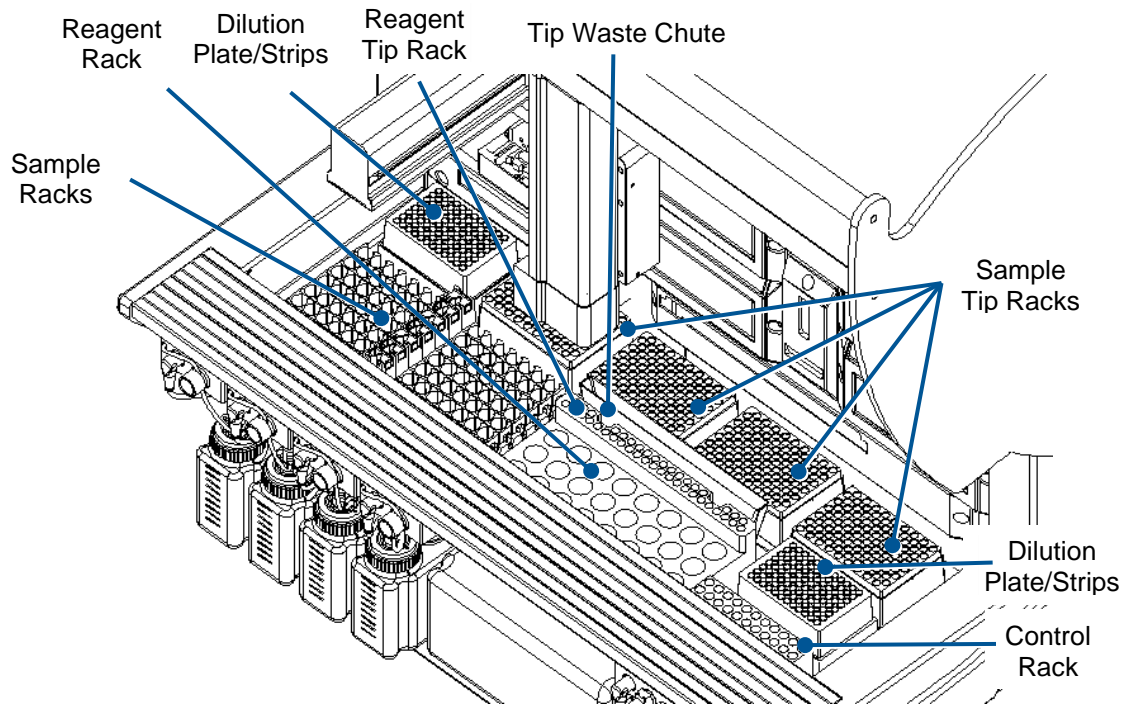


Figure 7: Workspace

Sample tips are used for pipetting samples and standards/controls. They are contained in four sample tip racks. Each rack contains 108 sample tips. A total of 432 sample tips can be loaded onto the system. A specific sample tip is required and can be obtained from your supplier.

Reagent tips used for pipetting reagents are contained in a reagent tip rack. Up to 41 reagent tips can be loaded onto the system. A specific reagent tip is required and can be obtained from your supplier.

Reagent tubes are contained on the reagent rack, which contains up to 24, 25 mL reagent tubes. A specific reagent bottle is required and can be obtained from your supplier.

There are two locations for deep well dilution plates or deep well dilution strips. When using deep well dilution strips, 24 strips can be loaded on the system (12 per deep well dilution strip holder). The dilution plates or deep well dilution strips are used for predilution of a sample before the sample is pipetted into a microplate well. The DSX will accommodate either dilution plates or deep well dilution strips.

After a sample tip or reagent tip has been used, the pipette module ejects the tip over the tip waste chute. The tip waste chute directs the used sample tip or reagent tip into the waste container.

4.3 Pipette Module

The pipette module is used to transfer microplates between modules, to hold microplates or sample racks in front of the barcode reader, to pipette samples, controls and standards, to dispense reagents and to perform dilutions. The pipette module travels in the *x*-, *y*- and *z*-directions to access the samples, controls, reagents, microplates and consumables on the workspace. The pipette module is shown in Figure 8. Table 11 describes the pipette module functions.

Table 11: Pipette Module Functions

Function	Purpose
Microplate Handling	The pipette module transfers a microplate between the ambient drawer, an incubator module, the wash module and the absorbance module by gripping the microplate holder, moving it to its new location and releasing it. The microplate handler also positions a microplate in front of the barcode reader so that the barcode can be read.
Pipetting (automatic liquid level sensor)	The pipette module pipettes samples, standards and controls (using disposable sample pipette tips) and reagents (using disposable reagent pipette tips). Each pipette tip is automatically discarded into the waste bin after use. A new pipette tip is obtained from the sample tip rack or reagent tip rack when it is needed.
Sample Rack Handling	The pipette module positions a sample rack in front of the barcode reader so that the barcode labels of the sample tubes can be read.
Tip Ejection Detection	The pipette module verifies that a used tip was ejected before obtaining a new tip.

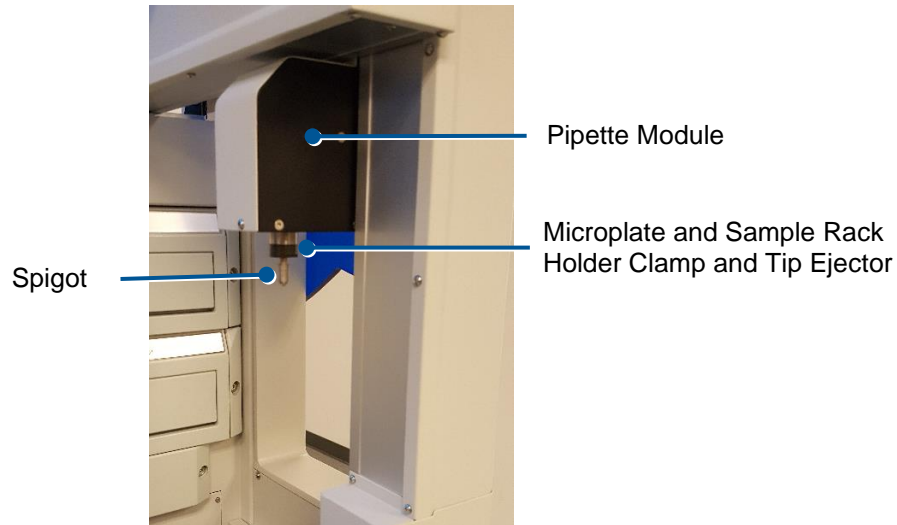


Figure 8: Pipette Module

The pipetting profile specifies the rate at which fluids are aspirated or dispensed from the pipette tip. Separate pipetting profiles ranging from 1 to 5 can be specified for any fluid except wash buffer.



Important: *DYNEX Technologies calibrates and verifies all pipettes gravimetrically using distilled water and a NIST traceable scale*

It is important to note that the calibration and traceability is related only to the calibration fluid and not to any other fluid type. For most applications, the differences in delivered volumes for common fluid types and the calibration fluid used in manufacturing are insignificant. At low sample dispense volumes (<20 μL) these may become more apparent.

After changing any parameters in an assay protocol or after creating a new protocol, it is strongly recommended to execute a full verification and validation of the protocol before applying it in routine use. The user must perform validation studies to assure proper assay performance.



Caution: *Changing the pipetting profile can affect accuracy and precision of an assay.*

The pipetting profile used for samples is specified by selecting Settings → Runtime Options from the *Timeline* menu. The pipetting profiles used for standards and controls are specified during fluid definition. The default dispenses profile for samples, standards and controls is **4**. The default aspirate profile for samples, standards and controls is **1**.



Note: *Refer to the procedure to define worklist runtime parameters. Refer to the procedure to define assay operations.*

The DSX includes Electronic Signature Pipetting (ESP)[™] software for automatic detection of gross pipetting inaccuracies.

4.3.1 Sample Mixing During Dilution

The user can program up to 9 dispense/aspirate mix cycles during dilution steps to achieve optimal mixing of samples during dilution.

The DSX can perform a pre-dilution of samples before they are assayed. Pre-dilution can be performed in a single stage in standard microplates or in two stages using deep well microplates or deep well dilution strips. Dilutions are performed in deep well dilution plates or deep well dilution strips for dilutions above 1:60.

The system can be programmed to add diluent to a plate before or after the sample is added.

The dilution modes are described below:

Table 12: Dilution Mode

Dilution Mode	Dilution Range
Microplate Dilution	Ratios of sample to diluent range from 11:1 to 1:59 (e.g., 5 μ L sample combined with 295 μ L of diluent to yield a 1:59 dilution).
Deep Well Plate/Deep Well Strip Dilution	Ratios of sample to diluent range from 2:1 to 1:190 (e.g., 5 μ L sample combined with 950 μ L of diluent to yield a 1:190 dilution).
Deep Well Plate plus Microplate Dilution	Ratios of sample to diluent range from 22:1 to 1:11,210 (e.g., 5 μ L sample combined with 950 μ L of diluent in a deep well to form a new sample from which 5 μ L is combined with 295 μ L of diluent in a microplate to yield a 1:11,210 dilution).
Deep Well Plate plus Deep Well Plate Dilution	Ratios of sample to diluent range from 4:1 to 1:36,100 (e.g., 5 μ L sample combined with 950 μ L of diluent in a deep well to form a new sample from which 5 μ L is combined with 950 μ L of diluent in another deep well to yield a 1:36,100 dilution).

4.4 Absorbance Module

The absorbance module measures the optical density (OD) of the final reaction mixture in the microplate wells. The wavelength mode that is used and the wavelength(s) at which the optical density is measured are specified during assay definition.

- ▶ **Note:** Procedures for specifying the wavelength mode and the wavelength(s) at which the optical density is measured are defined during assay definition.

The current version of REVELATION DSX software supports endpoint measurements.

During operation, each microplate is transferred to the absorbance module at the appropriate time. The optical densities of the wells specified during worklist definition are read, the various calculations (**Example:** Blanking, QC Raw Data, Threshold or Curve Fitting) are applied and the calculated results for the microplate are reported.

- ▶ **Note:** Procedures for specifying the manner in which assay results are calculated and reported are defined during assay definition.

The location of the absorbance module is shown in Figure 9.



Figure 9: Absorbance Module

4.4.1 Single and Dual Wavelength Modes

The reader is able to take readings in two different modes:

Single - using one test wavelength

Dual - using one reference wavelength and one test wavelength

The single wavelength mode is sufficient for most applications.

The dual wavelength mode can be used if it is necessary to reduce errors caused by dirt and scratches on the bottom of the wells.

The choice of test and reference wavelengths for the dual wavelength mode depends on the particular enzyme/substrate system being tested. The following rules are recommended:

- The test wavelength (λ_t) should be at or near the maximum absorbance.
- The reference wavelength (λ_r) should lie outside the absorbance band.

The reader subtracts the absorbance at the reference wavelength (λ_r) from the absorbance at the test wavelength (λ_t) to minimize the effect of systematic errors.

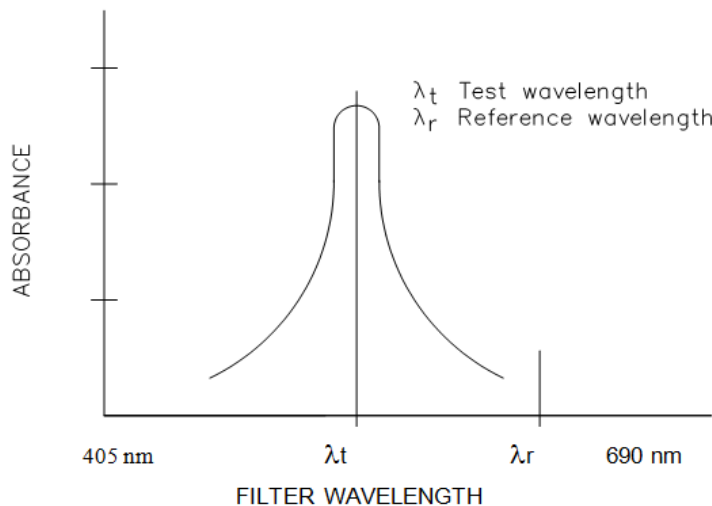


Figure 10: Dual Wavelength Selection

4.4.2 Blanking

The reader lets you subtract a reference value from all the ODs. It automatically uses air as a reference, but for certain applications other reference levels may be more appropriate.

Example: *The user may want to eliminate the absorbance of a reagent solution from the test result. The reader can hold the OD of this reagent solution in memory and subtract it from all subsequently read ODs.*

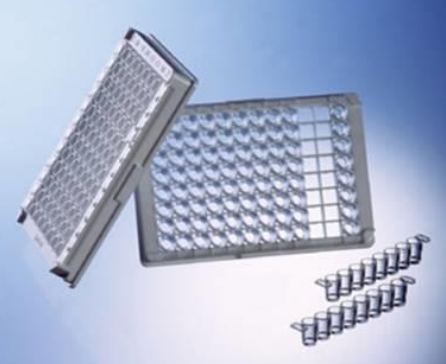


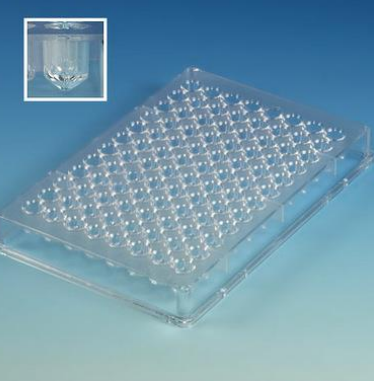
The reader may be blanked on a single well or an average of multiple wells.

4.5 Wash Module

The microplate is washed in the wash module (Figure 11). The wash module is designed to wash all 8 wells in one column of an 8x12 microplate simultaneously. The washing protocol can be defined to wash partially filled plates containing complete columns.

Different user-defined wash protocols can be programmed on the system. In addition, different plate types can be defined. The system can accommodate the following microplates:

Table 13: Microplate Types

<p>C- bottom</p>		<p>U- bottom</p>	
<p>Flat- bottom</p>		<p>V-bottom</p>	

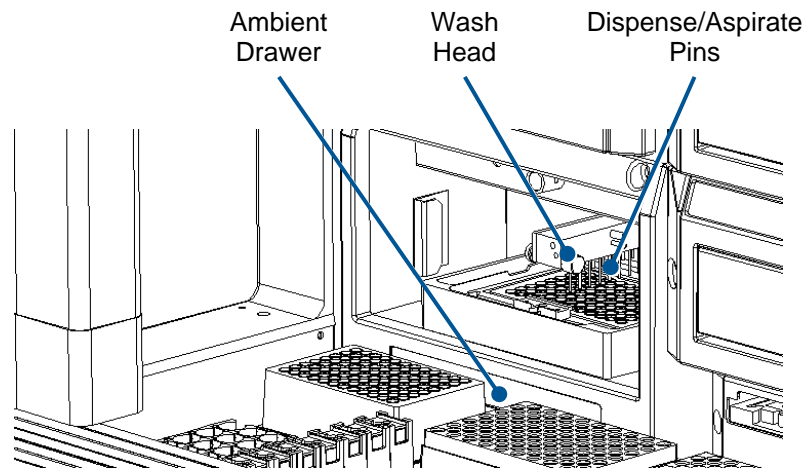


Figure 11: Wash Module

4.5.1 Wash Head

The wash head contains two sets of wash pins. The shorter pins (the dispense pins) dispense fluid and the longer pins (the aspirate pins) aspirate fluid. The aspirate pins and the dispense pins are closely spaced so that fluid can be aspirated from and dispensed into wells at the same time.

The wash pins are fixed to the wash head. During operation, the wash head assembly is lowered and raised. When the wash head assembly is lowered, the well contents can be aspirated or a bottom wash can be performed. The wash head assembly is raised to move the wash pins from one column to another or to fill the wells.

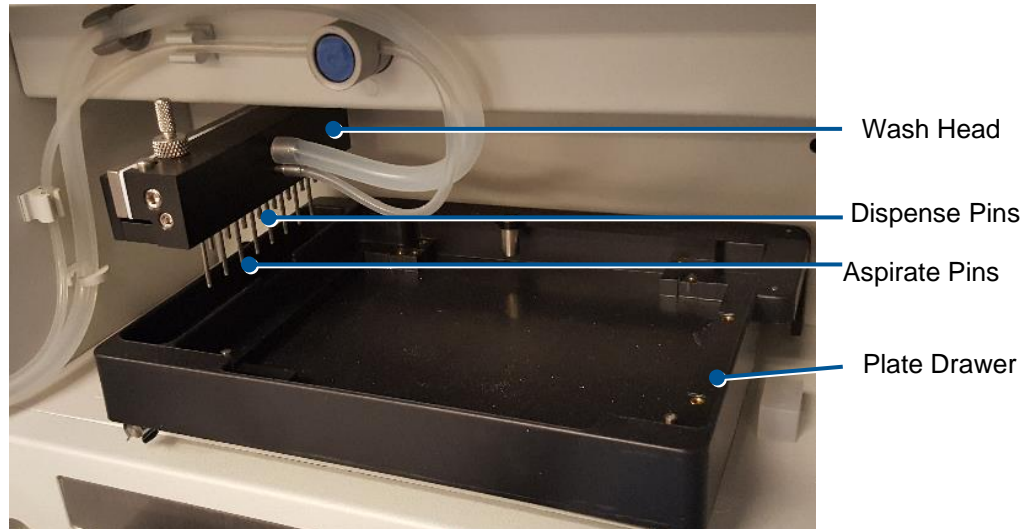


Figure 12: Wash Head with Wash Pins

► **Note:** Shape of wash head may differ from Figure 12.

The plate drawer holds the microplate in a known position so that the wash pins are precisely positioned in the wells during various wash protocol operations. The plate drawer allows linear shaking of the plate.

4.6 Incubator Modules

Microplates are incubated and shaken in the incubator modules. The DSX accommodates up to four incubator modules which allows different microplates to be incubated at different temperatures with or without shaking. The incubation temperature and shake duration are specified during definition of an assay.

► **Note:** Refer the procedures to define an assay. A microplate can also be incubated at ambient temperature without shaking in the ambient plate drawer.

The particular incubator modules that are used during a worklist as well as the temperature and shaker settings of each incubator are automatically set by the system when the worklist is created. Processing of the worklist will not commence until the temperature of each required incubator module is at the correct value.

► **Note:** The incubator modules are labeled as **1, 2, 3 and 4** and are designated as such in REVELATION DSX software. The incubator modules will control microplate temperature at any specified temperature ranging from ambient plus 7° C to 50° C.

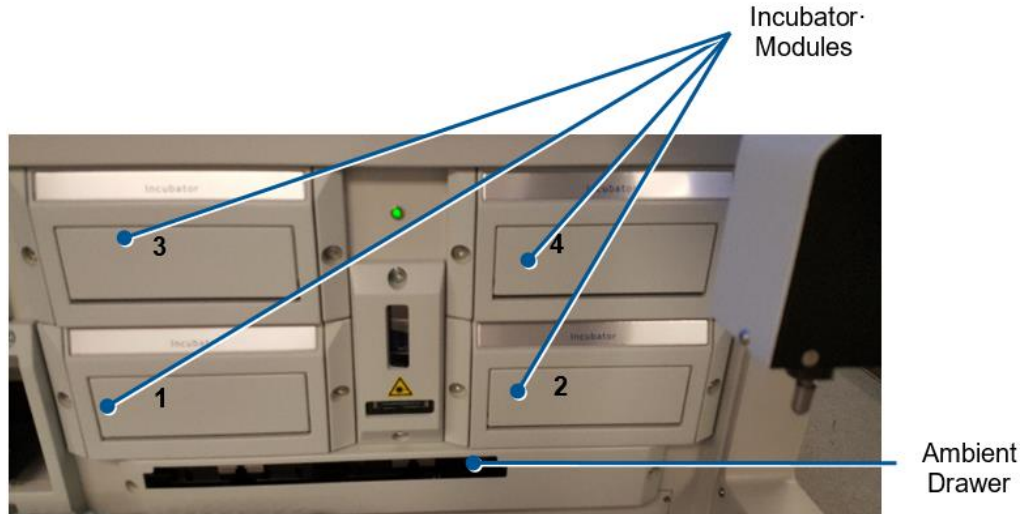


Figure 13: Incubator Modules

4.7 Barcode Readers

Two barcode readers (Figure 6) are available to read barcode labels on sample tubes and microplates. The horizontal barcode reader is an LED barcode scanner. The vertical barcode reader is a laser barcode scanner.



Laser radiation. Obey the warning labels that are attached to the system in the vicinity of the vertical barcode scanner (Chapter 1.7.3).

Either the horizontal barcode reader or the vertical barcode reader can be used. The barcode reader used, the barcode symbology and the location coordinates of barcode labels on sample tubes and microplates are specified during configuration of the DSX instrument.

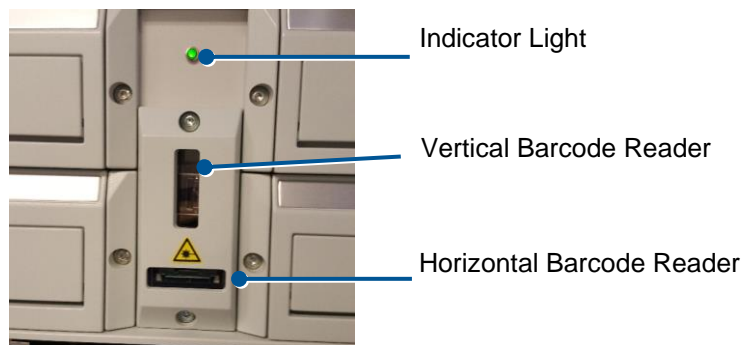


Figure 14: Barcode Readers

4.7.1 Indicator Light

The system contains an indicator light (Figure 14) above the barcode readers that is illuminated whenever the system power is ON.



Caution: Power is on to the system and to the incubator heaters whenever the indicator light is illuminated. A thermal hazard is present.

4.8 Ambient Drawer

The ambient drawer is used to store microplates during room temperature incubations. The ambient drawer extends into the workspace during pipetting.

When setting up a worklist, plate holders (Chapter 4.8.1) are placed in each of the ambient drawer positions (Figure 15) and the microplates are placed into the plate holders.

► **Note:** The microplate positions are numbered from 1 to 4. Refer to Chapter 7.3 for instructions on preparing a worklist.

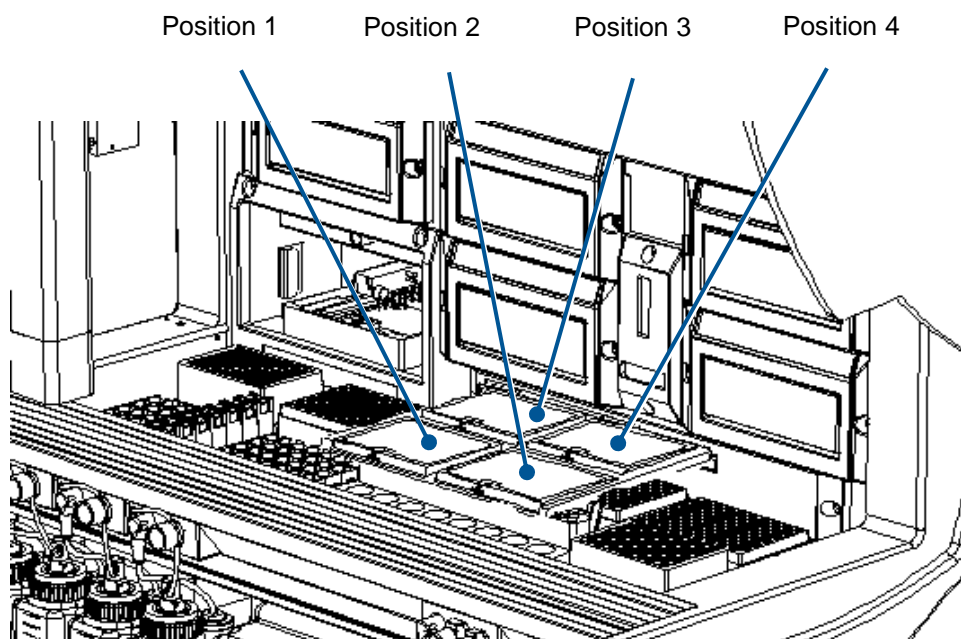


Figure 15: Ambient Drawer

4.8.1 Plates

A plate for an assay is either prepared by your facility or obtained as part of a test kit from a DYNEX reagent kit manufacturing partner. The test plate consists of either a 96-well microplate with eight rows of twelve wells (Figure 16) or a plate frame into which up to twelve eight-well test strips are inserted (Figure 17).

Each plate must be placed in a plate holder (Figure 16) before it is loaded. Plate holders have gripping slots to allow the pipette module to transfer the microplate between modules or to position a microplate in front of the barcode reader.

- **Note:** The microplate must always be seated in the plate holder with well A1 positioned and the barcode label attached as shown in Figure 16.

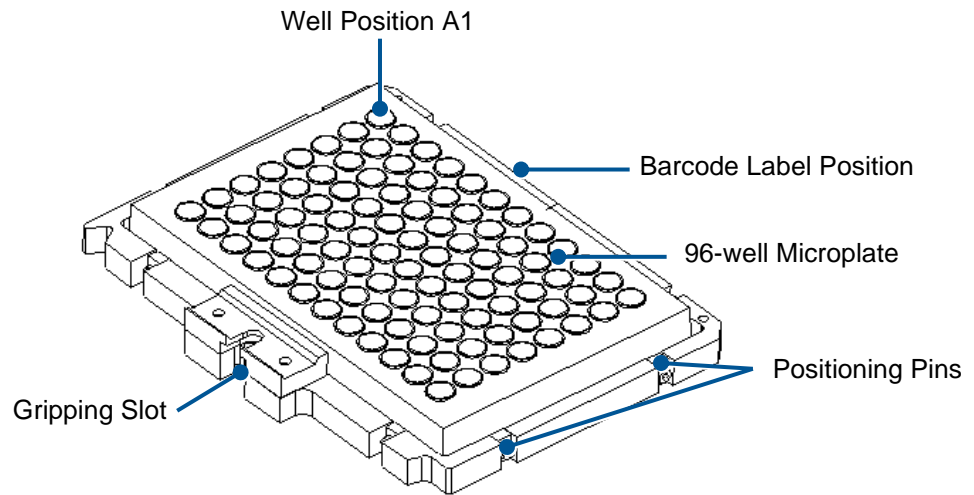


Figure 16: Plate Holder Containing a 96-Well Microplate

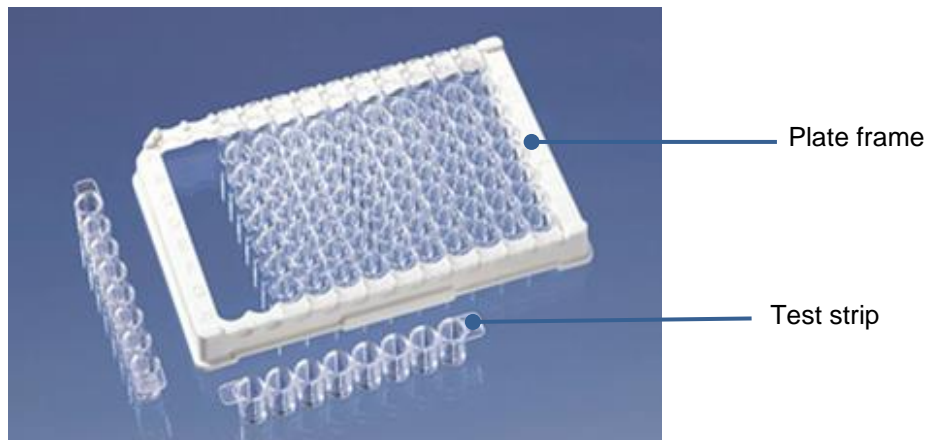


Figure 17: Plate Frame Containing Twelve-Well Test Strips

4.9 Wash Buffer Containers

Up to four different washing and/or dispensing reagents are contained in the system in wash buffer containers. The wash buffer containers are located in the front of the instrument (Figure 18).

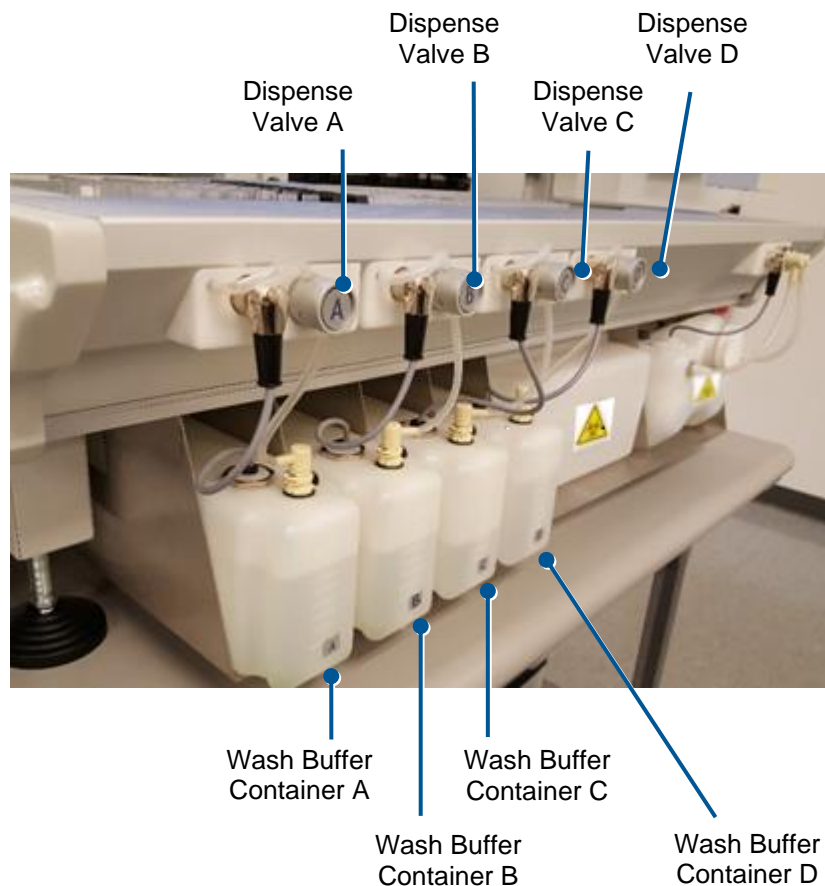


Figure 18: Wash Buffer Containers and Wash Buffer Dispense Valves

Each container holds up to two liters of fluid. The specified fluid is dispensed into wells during a dispense or fill operation. Each wash buffer container must contain at least 500 mL of fluid in order to be used. Make sure that the dispense tubing is routed through the appropriate pinch valve at the front of the instrument.

i **Important:** When loading the wash buffer bottle back into the instrument ensure that they are connected to the correct plug. If they are loaded in the correct position but connected the wrong way, the wrong wash buffer is used and wrong results will be produced.

► **Note:** The particular wash buffer that is used and the dispense, fill or purge operations are defined during assay definition.

The wash buffer containers each contain up to two liters.

DO NOT OVERFILL.

To remove the wash buffer container, dislodge the quick connect fitting and the level sensor/pump connector (Figure 19). Disconnect the wash line by pressing on the metal tab of the quick connect fitting and gently pulling up on the wash line to remove it. Disconnect the level sensor and pump connector by pulling it out of the connector socket.

Fill (or empty) a wash buffer container using the filler cap at the rear of the container.

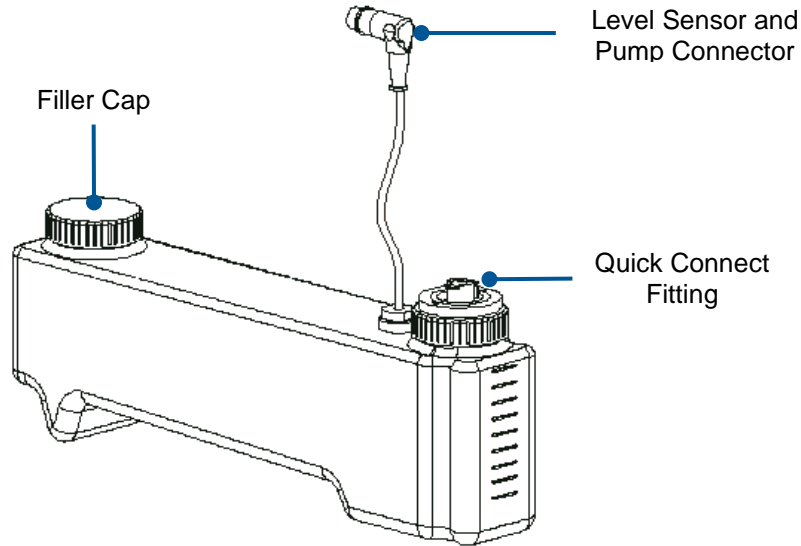


Figure 19: Wash Buffer Container Details

4.10 Waste Containers

Fluid that is removed during purging and washing is collected in the liquid waste container. Used sample and reagent pipette tips are collected in the tip waste container. Both waste containers are located in the front of the instrument (Figure 20).



Warning: *If biological specimens are being tested, the specimens and the used tips are potentially infectious. Use universal precautions in handling specimens and used sample tips in accordance with local regulations.*

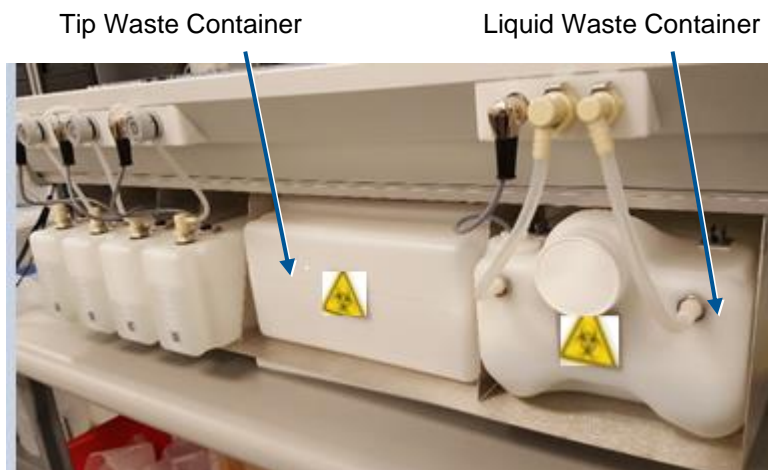


Figure 20: Waste Containers

The tubing for the liquid waste container is routed through the routing holes inside the front panel of the instrument.

The liquid waste container (Figure 21) holds up to eight liters of waste. A liquid level sensor alerts the operator when the liquid waste container is full.

Two quick connect fittings connect the liquid waste and vacuum lines to the liquid waste container. Disconnect each fitting by pressing on the metal tab of the quick connect fitting and gently pulling on the line to remove it.

- ▶ **Note:** *The connectors for the vacuum tubing and the waste tubing are a different size so they cannot be reversed.*

Ensure that the waste tubing and the vacuum tubing are not pinched or crimped.

Disconnect the level sensor connector by pulling it out of the connector socket. Empty the liquid waste container by removing the waste cap at the front of the container. Re-connect the level sensor cable.

- ▶ **Note:** *Ensure that the waste cap is securely tightened. A vacuum leak will cause the software to create a vacuum error condition if the cap is not securely tightened.*

Clean the liquid waste container with 70% ethyl alcohol or with disinfectant. Bleaching is not recommended.

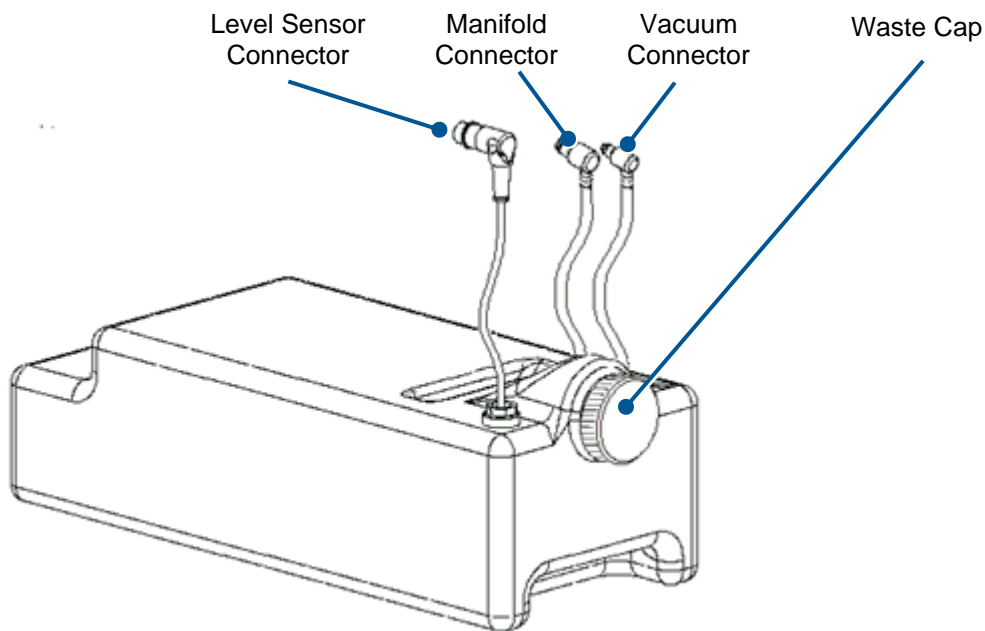


Figure 21: Liquid Waste Container

Chapter 5: Software Description

REVELATION DSX software is used to control the DSX microplate processing system. The software automates the sample distribution, incubation, reagent addition and washing and detection phases of microplate assays. It also provides the user interface for configuration of the instrument and management of consumables.

REVELATION DSX software includes an extensive menu of assay definition options that allow you to customize reading, calculations, QC checks and results format for an assay.

5.1 REVELATION DSX Software

The *REVELATION DSX* software shortcut displays on the Windows desktop or taskbar.

1. Refer to Chapter 7.2 for information on powerign on the system.
2. Select the shortcut to start *REVELATION DSX* software. The *REVELATION DSX* dialog box is displayed.



Figure 22: REVELATION DSX Dialog Box

3. Select the operating mode:
 - a. **Connect to DSX (on Port1)** to operate the instrument.
 - b. **Connect in Demo Mode** to exercise the software without operating the instrument (only available during software setup).
 - c. **Configure Hardware** to display the Setup DSX dialog box.
 - d. **Quit Revelation** to close *REVELATION DSX* software.

► **Note:** If **Connect to DSX (on Port1)** is selected, the instrument initializes, performs self-tests and displays the self-test report.

If **Connect in Demo Mode** was selected, a sample self-test report displays without initializing the instrument.

4. After selecting the operating mode, click  and if prompted to do so, login.

5.2 REVELATION DSX Software Screen Components

An example *REVELATION DSX* software screen is shown in Figure 23.

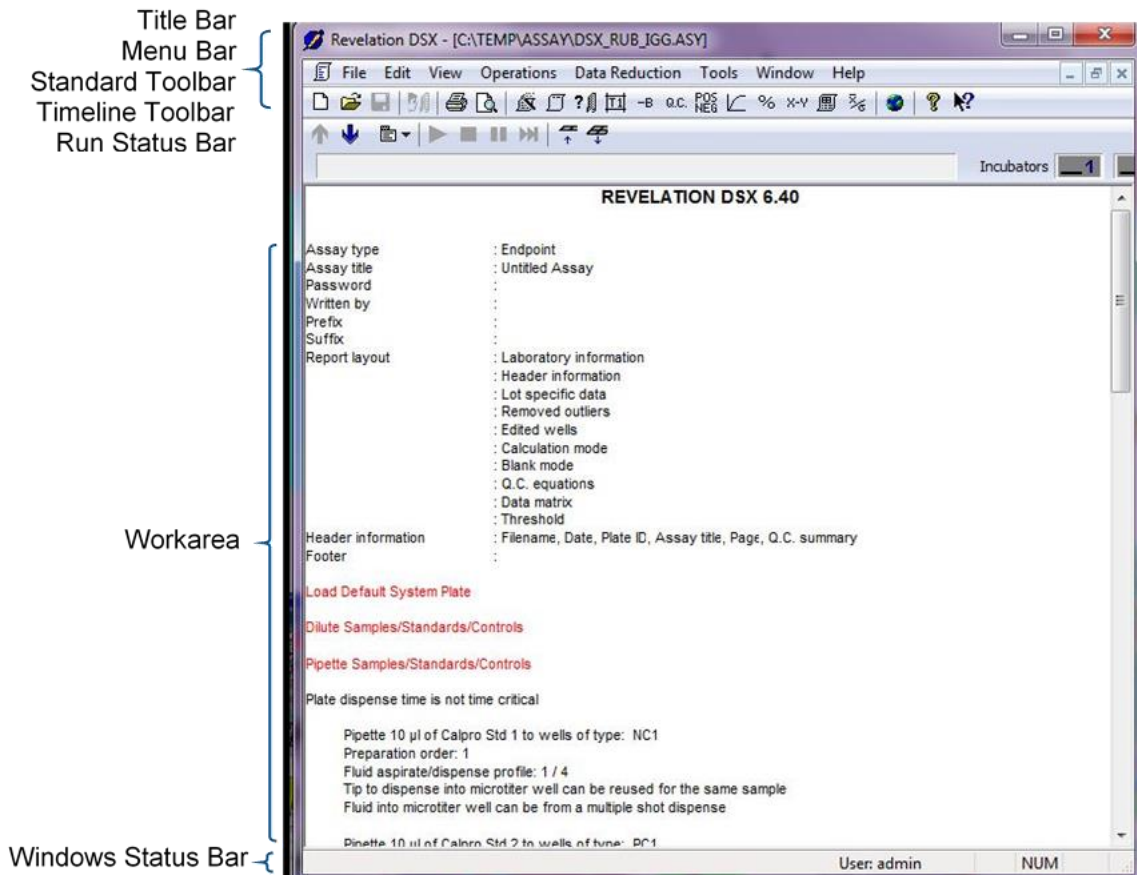


Figure 23: REVELATION DSX Software Example Screen

The work area changes based on the current activity and type of file that is open.

5.2.1 Title Bar

The title bar is located along the top of the *REVELATION DSX* software window. It contains the application icon, application name and name of the currently open file on the left and iconize, minimize (or maximize) and close buttons on the right.

► **Note:** You can move dialog boxes by dragging the title bars.

5.2.2 Menu Bar

The menu bar contains all of the commands needed to:

- customize the DYNEX DSX system
- modify or create an assay, assay samples and manage results.

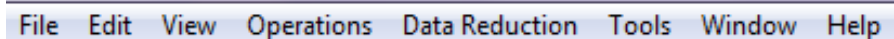







Figure 24: Menu Bar

The following menus are accessible from the menu bar, depending on the type of file that is open and the access rights of the current operator.

5.2.3 File Menu

The *File* menu is used to manage assay and worklist files. Files can be opened, saved or printed. Some of the *File* menu commands can also be accessed from tools on the standard toolbar or by using Windows short cut keys (shown in parenthesis).

Table 14: File Menu Commands

Tool	Command	Purpose
	New	Create a new assay or worklist.
	Open (Ctrl+O)	Open an existing file.
	Close	Close a file. If you made changes to the file since you last saved it, <i>REVELATION DSX</i> software prompts you to save the changes.
	Save (Ctrl+S)	Save the file currently named in the title bar. If the file has not yet been named, the Save As dialog box displays.
	Save As	Save a file under a new filename.
	Print (Ctrl+P)	Print the file currently named in the title bar. Choose the printer, range of pages and number of copies to print.
	Print Preview	Display the file as it will look when it is printed.
	Print Setup	View and update the printer settings including the page orientation (portrait or landscape) and paper source.
	Recent...	Re-open an assay, plate or worklist file you worked on recently.
	Exit	Close <i>REVELATION DSX</i> software.

5.2.4 Edit Menu

The *Edit* menu contains commands that allow assay protocol operations to be easily updated. Edit commands can also be accessed using Windows short cut keys (shown in parenthesis).

The *Edit* menu is available when an assay protocol is open.

Table 15: Edit Menu Commands

Command	Shortcut Keys	Purpose
Copy	Ctrl+C	Copies the selected operations block to the clipboard. The operations block can then be pasted to another location in the assay.
Cut	Ctrl+X	Removes the selected operations block and places it on the clipboard. The operations block can then be pasted to another location in the assay.
Delete	Del	Deletes the selected operations block.
Edit	F2	Opens the dialog box associated with the selected operations block.
Paste	Ctrl+V	Pastes the cut or copied operations block to the selected location in the assay.

5.2.5 View Menu

The *View* menu is used to show or hide the *REVELATION DSX* software toolbar and status bar, to select the language and to view the event log, assay data or result data.

Table 16: View Menu Commands



















Command	Purpose
Select Language	Select the language <i>REVELATION DSX</i> software uses for menus and dialog boxes.
Status Bar	Show or hide the status bar. A check \surd next to Status Bar indicates the status bar is visible.
View Assay	View assay data (when plate data is open).
View Event Log	View a chronological listing of the current worklist activity in the event log (when a worklist is open).
View Results	View the selected results (when plate data are open).

5.2.5.1 View Event Log

- **Note:** To view previous log files, select **File → Open** from the menu bar, set Files of Type to Log Views (*.log). Double-click the file you want to examine.

The following symbols are used in the event log:

Table 17: View Event Log Symbols

Symbol	Indicates
	Command was sent from <i>REVELATION DSX</i> software to the DSX
	Command execution timing report
	DSX error message
	DSX warning message
	Fluid was aspirated
	Fluid was dispensed
	General system message
	Plate incubation occurred
	Plate was aborted
	Plate was loaded on the DSX
	Plate was moved
	Plate was read
	Plate was removed from the DSX
	Plate was washed
	Timeline started
	Timeline was stopped
	User actions (login, etc.)
	Worklist was paused/unpaused.











When viewing an event log, the *View* menu contains the following menu options:

- **View all events:** Displays all log file entries
- **Exclude commands:** Hides low-level DSX commands

5.2.5.2 View Results

If data files are open, the *View* menu allows you to view assay data. The following commands are listed in the *View* menu and are also available from the toolbar.

Table 18: View Results Commands

Tool	Command	Purpose
	All Results	View all results in the current plate data file.
	Kinetic Graphs	Functionality not currently available.
	Data Matrix	View the raw data for the plate.
	Area Statistics	View the area statistics for the plate.
	Calculations	View the spreadsheet processing data for the plate.
	Ratio	View the ratio processing data for the plate.
	Curve Fit	View the curve fit results data for the plate.
	Conc. Graph	View the curve fit concentration graph.
	Threshold	View the threshold results for the plate.
	Histogram	View the threshold results histogram for the plate.

5.2.6 Operations Menu

The *Operations* menu is used during assay protocol creation to add operations to an assay protocol. In addition to the default operation that determines how the plate is read and how the results are processed, *REVELATION DSX* software allows other operations that control dispensing, washing, etc. to be added.

Open the assay protocol to be modified. Select an operation from the *Operations* menu to display the operation programming dialog box.

The *Operations* menu is available when an assay protocol is open.

Table 19: Operations Menu Commands

Command	Purpose
Insert Dilute Samples/Stds/Ctrls	Define dilutions. This command is only accessible if a pipetting operation (<i>Insert Pipette Samples/Stds/Ctrls</i>) is defined first (Chapter 6.4.1). Allows a dilution operation to be added.
Insert Dispense Fluid	Specify reagent fluid and volume being dispensed and the wells the reagent will be dispensed to.
Insert Incubate Plate	Specify incubation time, temperature, location and shake duration and speed. Specify error-handling options.








Command	Purpose
Insert Pipette Samples/Stds/Ctrls	Define plate templates. Define volume of sample, standard or control to pipette. Define the fluid associated with each standard or control. Specify tip use for samples, standards and controls. Define dilutions. Specify pipetting timing parameters. Add standard and control fluids to the database if not previously entered.
Insert Wash Plate	Specify wash methods and wash buffer volumes. Specify details for the purge and clean cycles. Specify details for the soak and shake options.
Insert Well Fill Verify	Specify read and absorbance criteria to determine if sample and/or reagent were successfully added to specified wells.

5.2.7 Data Reduction Menu

Use the *Data Reduction* menu to create and edit assays protocols and to select options that determine how the assay data are processed and printed. The following commands are listed in the *Data Reduction* menu and are also available from the toolbar.

The *Data Reduction* menu is available when an assay protocol is open.

Table 20: Data Reduction Menu Commands

Tool	Command	Purpose
	Wizard	Display the <i>Data Reduction</i> dialog boxes in the order they are listed in the menu, starting with <i>Assay Title</i> dialog box.
	Assay Title	Define assay title, author, code and password.
	Reader Control	Define assay read wavelength(s), wavelength mode and shake options prior to reading.
	Template	Define the use (sample, control, blank, etc.) of each well on the plate, including the number of replicates, replicate orientation and fill direction.
-B	Blank Mode	Select a pre-defined blank mode or define a custom blank mode. The default blank mode is to blank on air.
Q.C.	QC Raw Data	Define quality control equation(s) to be applied to the raw data for assay validation.
POS NEG	Threshold	Define threshold equations, positive/negative Q.C. ranges, threshold Q.C. equations and the results output format.
	Curve Fit	Define the parameters required to obtain quantitative results with a user-defined curve fit. Define curve fit quality control equations and output format.
%	Ratio	Define the ratio equation and output format.
X-Y	Spreadsheet	Perform arithmetic calculations on values from different wells. The results of these calculations are output as a matrix or table of data.
	Report Options	Define the information displayed on the reports. Enable the assay report to be exported to a file.
	Assay Options	Define statistics to be performed on different groups of wells. Define the data reduction processing order and the sample ID setup.

5.2.8 Tools Menu

The *Tools* menu is used to configure *REVELATION DSX* software and the DSX instrument for your laboratory environment. The *Tools* menu also contains the Levey-Jennings functionality. Levey-Jennings analysis is useful for quality control purposes.

- ▶ **Note:** Some commands are only available to users with Administrator access privileges.

Table 21: Tools Menu Commands

Command	Purpose
EPP Assay Mapping	Maps the Tecan Plate List (TPL) file to an associated assay number and its corresponding mapping in EPL mode/DSX mode and the LIMS mapping and also allows the end user to Edit/Copy/Delete/Add the mappings.

- ▶ **Note:** Can only be performed by an administrator.

Command	Purpose
Configure System	Select the COM port connecting the DSX to the PC. Enable LIS support if an LIS will be connected to the DSX. Choose which sample caddy is installed on your system. Specify the absorbance filters that are used and the absorbance data conversion limits. Select the barcode symbology and the location coordinates of barcode labels on sample tubes and/or microplates. Indicate whether the washer float switch is enabled. Enable debug logging.
Edit Databases	Modify the consumables and fluids descriptions.

- ▶ **Note:** Can only be performed by an administrator.

Command	Purpose
Edit ESP Detection Database	Define ESP reference profiles.

- ▶ **Note:** Can only be performed by an administrator.

Command	Purpose
Edit User Access	Create and edit password protected user accounts. ► Note: <i>Editing and creating user accounts can only be performed by an administrator. Ensure that there is at least one user account at the administrator level other than the default administrator account.</i>
Levey Jennings	Specify the assay, well type and plates for which a Levey-Jennings analysis is to be performed.
Options	<ul style="list-style-type: none"> • Create shortcut buttons for commonly used assays and worklists. • Select the text colors for different well types. • Set the default directories for saving and locating different file types. • Enter the laboratory name and address to be printed on results reports.
Results Font	Select the font, font style, size and color to be used for printed results reports.
<i>REVELATION DSX</i> Manual Control	Provides a dialog box listing DSX hardware modules and allows the operator to manually control the movement of the instrument.

► **Note:** *Manual control should only be used by operators trained to use this functionality.*

Command	Purpose
View system test results	Display DSX self-test results.

5.2.8.1 Edit Databases

REVELATION DSX software stores the list and description of all DSX consumables and fluids in a database. Once a consumable or fluid is defined in the database, it can be selected from a drop-down list during assay definition.

Modify the consumables and fluids descriptions by selecting **Tools → Edit Databases** from the menu bar. The types of fluids and consumables that are stored in the database are summarized below:

Table 22: Types of Fluids and Consumables

Database	Purpose
Bottles	Specify the dimensions, capacity and shape of reagent and standard/control bottles.

► **Note:** The bottles database is only available to DYNEX Factory Trained Technicians.

Database	Purpose
Dilutions	Define the dilution profile for a specific dilution process including the dilution name, diluent used, number of mix cycles and the various dilution settings (sharing wells, using new tips, etc.). Dilution profiles are assigned to fluids during the pipette operation.
Pipette Fluids	Define reagent and standard/control fluids and specify whether they are time-sensitive. If they are time-sensitive, specify the maximum on-system use time. Select the pipette profile used when dispensing the fluid. The profile should be set to 4 unless otherwise required. Select the pipette profile used when aspirating the fluid. The profile should be set to 1 unless otherwise required. Associate the fluid with a previously defined bottle type and (optional) select the fluid load position.

► **Note:** Specifying a fluid load position is not recommended.

Database	• Purpose
Plates	<ul style="list-style-type: none"> Specify the plate name and define the plate well characteristics for each plate in use on the system: Click the Define Washer Settings button to define the height of the wash head for various washing positions (Chapter5.4.6.4). Specify the sweep mode parameters. Enable the ability to perform bottom washing (optional).

Database	Purpose
Sample Racks	Define the position of sample tubes in a sample rack using the previously defined sample tube types.
Tips	Define the length, capacity and maximum fill volume for each type of pipetting tip that is used.

► **Note:** *The Tips database is only available to DYNEX Factory Trained Technicians.*

Database	Purpose
Tubes	Specify the sample tube name, dimensions and shape for each type of sample tube that is used.
Washer Fluids	Define the fluids that are used for washing, cleaning and purging and (optional) select their load position.

► **Note:** *Specifying a fluid load position is not recommended, except when specifying DI Water in a specific wash bottle.*

5.2.8.2 EPP Assay Mapping

REVELATION DSX software stores the list and description of all DSX consumables and fluids in a database. Once a consumable or fluid is defined in the database, it can be selected from a drop-down list during assay definition.

Modify the EPP Assay name, EPP File Type, EPP Revelation Assay, DSX Revelation Assay, Assay Name and EPP Expiration descriptions by selecting **Tools** → **Edit Databases** from the menu bar.

Table 23: EPP Assay Mapping

Database	Purpose
EPP Assay Map	Define the External Pipetting Assay Mapping. Maps the TPL file assay number to assay names Revelation understands and helps running the assays in the correct mode.

5.2.9 Window Menu

The *Window* menu is used to manage the *REVELATION DSX* software desktop. Windows can be duplicated organized and rearranged using the *Window* menu.

Table 24: Window Menu Commands

Command	Purpose
Bottom of the menu	Shows a list of all the windows that are currently open in <i>REVELATION DSX</i> software. To bring any one of these windows to the front of the screen, click the window title.
Arrange Icons	Arrange any minimized window icons in an evenly spaced line.

Command	Purpose
Cascade	Arrange and re-size all open windows in a cascade, allowing you to see all their title bars at once.
New Window	Create a new window exactly the same as the current window. The old window is titled " <i>originalname:1</i> " and the new window is titled " <i>originalname:2</i> ". Changes made to the copied window display in the original as well.
Tile	Arrange and re-size all open windows, placing them side by side so they fill the whole screen and the contents of each can be viewed.

5.2.10 Help Menu

The *Help* menu contains commands to access the *REVELATION DSX* software online help and to view *REVELATION DSX* software version information. Some of the *Help* menu commands can also be accessed from buttons on the toolbar or pressing <F1> on the keyboard.

Table 25: Help Menu Commands

Command	Purpose
About Revelation DSX	View <i>REVELATION DSX</i> software copyright and version information.
Help Topics	Display online Help for the <i>REVELATION DSX</i> software.
Using Help	Describe how to use the Help system.

5.2.11 Data Menu

The *Data* menu options are used to change the way plate data are calculated. When a plate data file is opened in *REVELATION DSX* software, the *Data* menu becomes visible, although some of the options will be unavailable.

Table 26: Data Menu Commands

Command	Purpose
Fit Information	View the name, fit type and axes fit for each curve in the data file and to store curve parameters. Only available if the assay contained curve fit processing.
Kinetic Graphs	Not currently used.
Lot Specific Data	Enter the lot number, expiration date, standard values, comments and expected ranges for controls for different lots of reagents you are using.
Outlier Removal	Flag a suspect well to remove readings for the well.











Command	Purpose
Refresh	Recalculate plate data by modifying the original assay parameters.
Sample ID Filename	Select an external file to assign sample IDs to well positions in the plate data file.
Select New Assay	Recalculate the plate data using a different assay.
Titration Multiplier	Change the values of all the steps in a dilution operation. Only available if the assay contained a dilution operation.

5.2.12 Standard Toolbar

The standard toolbar is located directly below the menu bar. The standard toolbar can be used instead of the menu bar for commands that are most commonly used.

► **Note:** Additional tools display on the Standard toolbar when an assay protocol is open (Chapter 5.2.7) and when plate data are displayed (Chapter 5.2.5.2).

Table 27: Standard Toolbar Tools

Tool	Command	Description
	New	Displays the <i>New</i> dialog box and choose to create a new assay or new worklist.
	Open	Open an existing file.
	Save	Save the currently open file.
	N/A	This tool is disabled.
	Print	Print the current view on the default printer.
	Print Preview	Display an on-screen preview of current report data.
	Wizard	Launch the Assay wizard.
	Language	Select the language <i>REVELATION DSX</i> software uses for menus and dialog boxes.
	About	Display <i>REVELATION DSX</i> software version information.
	Context Sensitive Help	Click the cursor on a screen element to obtain information about that element.

5.2.13 Status Bar

REVELATION DSX software contains a run status bar located just below the *Timeline* toolbar. The left portion of the run status bar is shown below. It displays the status of the run and prompts the operator for the next step.

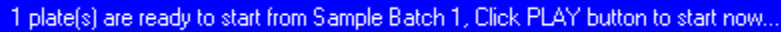


Figure 25: Run Status Bar – Left Portion

The right portion of the run status bar is shown below. It displays the status of each incubator module. Click an incubator icon and the temperature displays. If the incubator is not in use the status is *off*.



Figure 26: Run Status Bar – Right Portion

There is an additional status bar at the bottom of the *REVELATION DSX* software window. It contains messages and tool tips appropriate to the current activity, keyboard settings and the name of the operator.

5.2.14 Online Help System


REVELATION DSX software has a context sensitive online help system to assist you in finding information about the software quickly and conveniently. Context sensitive means that wherever you are located within the application software, choosing the help system displays information relating to that area of the software. The Help system provides information available in the Operator Manual in a convenient manner, when and where you need it.

5.2.14.1 Accessing Online Help

There are three main entry points for the help system: via the *Help* menu on the main menu bar, by pressing the <F1> key on the keyboard or by using the *Context Sensitive Help* button on the standard toolbar. The information displays in a new *REVELATION DSX Online Help* window.

5.3 Timeline

The Timeline is a real-time display of scheduled worklist activity. Using the Timeline screen, the operator can examine worklist details, view the plate layout, list consumables, view the sample caddy layout and review the run settings.

Click  on the *Timeline* screen and the screen displays (Figure 27).

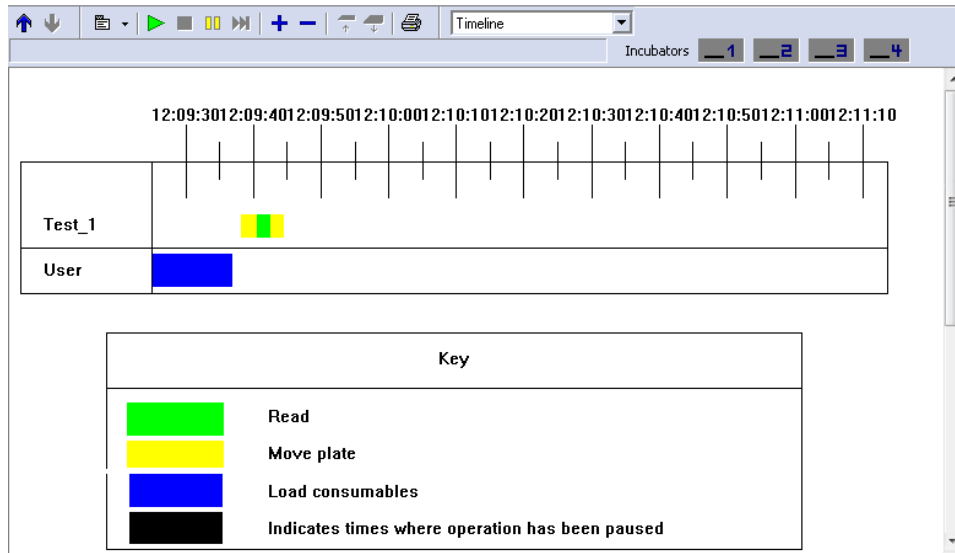


Figure 27: Timeline Screen

► **Note:** Click  to return to the previous screen.

The top rows show the automatic operations that will be performed by the DSX (in Figure 27, one plate is being moved and read).

The bottom row shows operations that require operator intervention (in Figure 27, *User* to load consumables).

The *Key* at the bottom gives an explanation of symbols used in the timeline (Chapter 5.3.3).

Double-click any operation to view operation details.











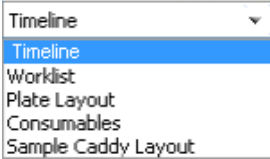


Select the view from the drop-down list at the top of the screen to view other run features.

► **Note:** When *Plate Layout* is displayed, the assay can be selected from the second drop-down menu.

5.3.1 Timeline Toolbar

The Timeline toolbar contains tools for starting and stopping the run, changing the display and setting run options. Certain tools may not be available depending on the run status.

Table 28: Timeline Toolbar Tool Descriptions

Tool	Description
	Drawer In. Closes the ambient plate drawer. This icon is inactive when a worklist is in progress.
	Drawer Out. Opens the ambient plate drawer. This icon is inactive when a worklist is in progress.
	Fast Forward. Allows the operator to advance through some scheduled waiting periods.
	Hide Timeline. Collapses the timeline display and returns to the previous screen.
	Pause Run. Temporarily halts the worklist.
	Print. Prints the current screen.
	Show Timeline. Displays the timeline screen. Diagrams of the timeline, the worklist, the plate layout, the consumable status and the sample caddy can be selected from this screen.
	Start Run. Begins worklist execution.
	Stop Run. Stops the system from running.
	Timeline Menu. Displays a menu of additional commands and settings to start and control worklist activities.
	Use the View selection box to change the active view.
	Zoom In. Increases magnification of the timeline. This icon is only visible when the timeline screen is displayed.
	Zoom Out. Decreases magnification of the timeline. This icon is only visible when the timeline screen is displayed.

5.3.2 Timeline Menu




Display the *Timeline* menu by clicking the *Timeline* menu tool  or by right-clicking anywhere in the *Timeline* window. The *Timeline* menu can be used to start and control worklist activities, to customize the timeline display and to manually control the DSX.

Table 29: Timeline Menu Commands

Command	Purpose
Manual Control	Provides a dialog box listing DSX hardware modules and allows the operator to manually control the movement of the DSX instrument.  Note: <i>Manual Control should only be used by operators trained to use this functionality.</i>
Open Cover	When the worklist is paused, choosing this option allows the operator to open the DSX cover.
Open Drawer	When the worklist is paused, choosing this option opens the ambient plate drawer.
Close Drawer	When the worklist is paused, choosing this option closes the plate drawer.
Raise Wash Head	Used during maintenance procedures to clean the wash head assembly. Can also be used during troubleshooting especially in the event that an error trapped/jammed the plate during the wash. The operator can use this command to raise the wash head in order to remove the plate.
Lower Wash Head	Used during maintenance and troubleshooting procedures.
Abort All Plates	Cancels processing for all plates in the current worklist.
Abort Plates	Displays the list of plates in the worklist and allows the operator to cancel processing for selected plate.
Pause Washer	When the worklist is paused during a wash step, selecting <i>Pause Washer</i> temporarily suspends the washer.
Log Operator Message	Allows the user to enter a free text note that will be appended to data for the run. Entered text is flagged with the operator-input symbol. 

Command	Purpose
Settings	Displays a submenu of options: <ul style="list-style-type: none"> Runtime Options. Select the consumable types, consumable load times and the pipette profiles. Error Recovery. Enable automatic error recovery and learning mode. Edit Symbols. Determine the color and shape of timeline symbols.
Timeline Execution	Displays a submenu of worklist execution commands: <ul style="list-style-type: none"> Start. Start the worklist execution. Stop. Stop the system from running. Pause. Temporarily halt the worklist execution. Fast Forward. Advance through a scheduled waiting period. <ul style="list-style-type: none"> ✓ (If an operation is running) Start a load consumables operation early. ✓ (If no operations are running) Start the next operation early. ✓ (In demo mode) Advance the current time to the next operation.
View	Displays a submenu of options: <ul style="list-style-type: none"> Zoom In. Increase magnification of the timeline. Zoom Out. Decrease magnification of the timeline.

5.3.3 Customizing Timeline Symbols

► **Note:** Timeline symbols cannot be modified if a worklist is currently running.

1. Select the **Timeline menu icon**  and select **Settings** → **Edit Symbols** from the drop-down menu.

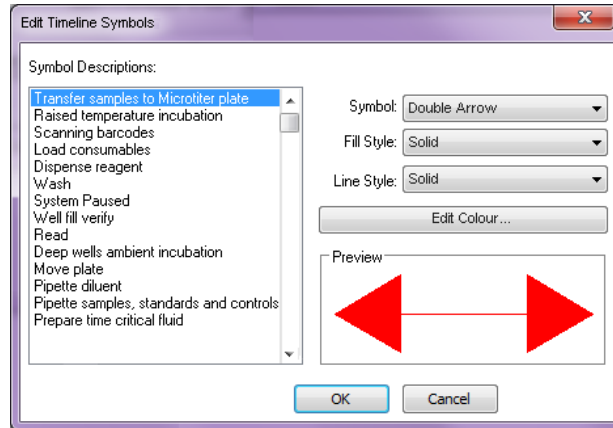











Figure 28: Edit Timeline Symbols Dialog Box

2. Select an activity in the left panel (e.g., *Transfer samples to Microtiter plate*).
3. Select a symbol from the drop-down symbol list.

Examples of available symbols, line styles and colors are shown below.

Description	Symbol	Desceiption	Symbol
Bar		Left Arrow	
Box		Double Arrow	
Thin Bar		Zig Zag	
Right Arrow			

4. Select a fill style and line style using the drop-down lists.
5. To modify the color, click  and:
 - a. Click one of the colors in the *Windows Color* dialog box and click . The dialog box closes and the color displays in the *Preview* panel.

- OR -

 - b. Click the **Define Custom Colors** button to expand the *Windows Color* dialog box.
6. Select a custom color by using the scrollbar at the far left, by clicking the mouse on the chosen color in the color display panel or by manually entering the hue, saturation, lamination and Red, Green and Blue (RGB) values.

- Click **Add to Custom Colors** to save the selected color as one of the sixteen custom colors or click to select the color without adding it to the custom color list. The dialog box closes and the new color displays in the *Preview* panel.

5.4 Configuring the System

The DSX can be configured for particular uses in your laboratory. Configuration options are available from the *Tools* menu.

5.4.1 Setting up the DSX

- Select **Tools → Configure System** from the menu bar. The *Setup DSX* dialog box displays.

► **Note:** *The Setup DSX dialog box can also be displayed by selecting Configure Hardware from the REVELATION DSX dialog box that displays when the software is started.*

- Specify the settings for each of the configuration options using available tabs.

5.4.1.1 RS232 Tab

The DSX is connected to the PC that runs *REVELATION DSX* software using an RS232 serial cable.

- Select **Tools → Configure System** from the menu bar.
- Select the *RS232* tab to choose the COM port connection and demo mode option.

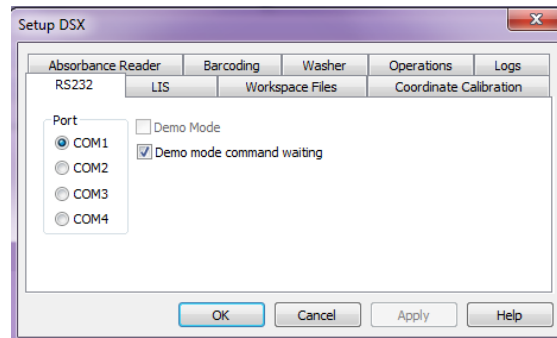


Figure 29: Setup DSX RS232 Tab

Table 30: RS232 Tab Options

Option	Description
Demo Mode	Use this option to exercise <i>REVELATION DSX</i> software when the instrument is not connected to the computer. Only available during software setup.
Demo Mode Command Waiting	Can be enabled in Demo Mode to simulate the actual time that would be spent during an assay run on the instrument.
COM Port	Select the COM port on the PC where the RS232 serial cable is connected. The default COM port is 1. If the DSX must be connected to another COM port on the PC, select that COM port.

5.4.1.2 LIS Tab

Select **Tools** → **Configure System** from the menu bar and select the **LIS** tab to enable transmission of results data to an attached Laboratory Information System (LIS). Once the DSX is connected to the LIS thru LIS-Link®, click in the **Enable LIS support** checkbox.

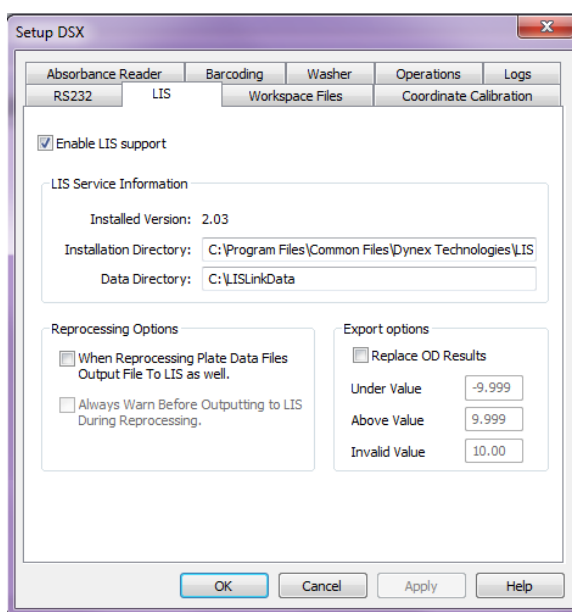


Figure 30: Setup DSX LIS Tab

Table 31 lists and describes the LIS tab options.

Table 31: LIS Tab Options

Option	Description
Installation Directory	Pathname for the LIS server software.
Data Directory	Pathname for result files.
When Reprocessing Plate Data Files Output File to LIS as well.	If checked, <i>REVELATION DSX</i> software automatically transmits plate data after they are reprocessed with a new assay.
Always Warn Before Outputting to LIS During Reprocessing.	If checked, <i>REVELATION DSX</i> software prompts before transmitting reprocessed plate data. Only available if the previous option is checked.
Replace OD Results	If checked, out of range values are converted to the indicated values in the results record that is transmitted to the LIS.

5.4.1.3 Workspace Files Tab

Select **Tools** → **Configure System** from the menu bar and select the *Workspace Files* tab to choose which sample caddy is installed on your system.

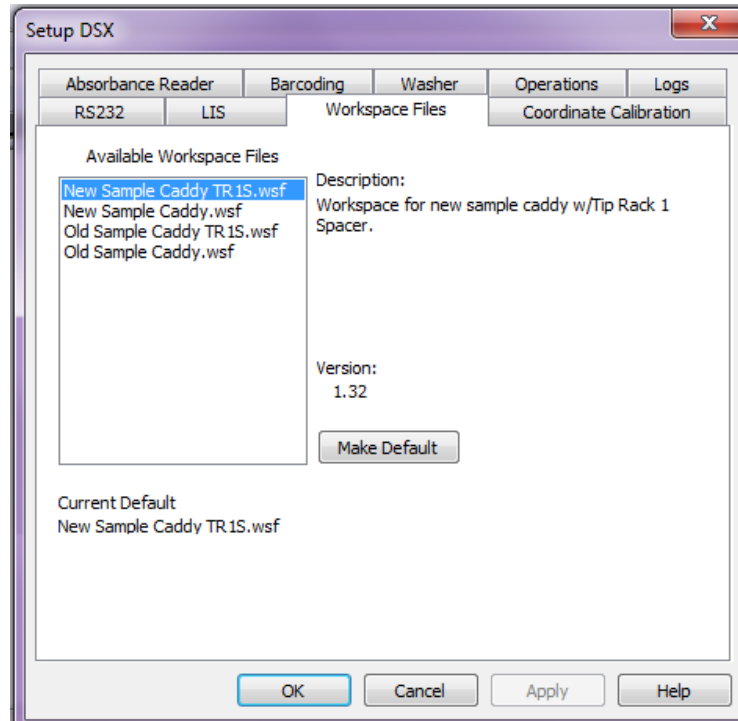


Figure 31: Setup DSX Workspace Files Tab

Four available workspace files:

- New sample caddy with tip rack spacer
- New sample caddy without tip rack spacer
- Old sample caddy with tip rack spacer
- Old sample caddy without tip rack spacer.

There are a several ways to tell the two caddies apart:

- There is a small gap between the racks, when they are seated in the new caddy.
- The most current caddy has handle holes on the side and a full base.
- The old caddy has solid sides and a see through base.

Choose the sample caddy installed on your system and click

Make Default

5.4.1.4 Coordinate Calibration Tab

This function is reserved for DYNEX service personnel.

5.4.1.5 Absorbance Reader Tab

Select **Tools** → **Configure System** from the menu bar and select the **Absorbance Reader** tab to show the filter wavelengths and data conversion options.

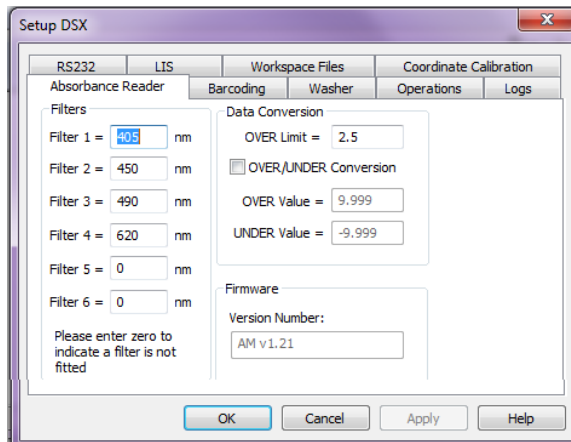


Figure 32: Setup DSX Absorbance Reader Tab

Table 32 lists all options and describes the absorbance reader tab options.

Table 32: Absorbance Reader Tab Options

Option	Description
OVER Limit	The OVER limit is used to create a range for expected readings. If values fall outside the OVER/UNDER range, they are classed as OVER or UNDER.
OVER/UNDER Conversion	If ODs fall outside the OVER or UNDER limits, they cannot be used in QC equations unless they are converted into numerical values. Check this option if you wish to convert OVER or UNDER readings into values that can be used into quality control calculations.
OVER Value	Enter the number that all OVER values should be converted to (if you checked the Conversion box). Minimum: 0.000. Maximum: 9.999.
UNDER Value	Enter the number that all UNDER values should be converted to (if you checked the Conversion box). Minimum: -9.999. Maximum: 0.000.
Firmware	Displays the firmware version number.
Filter 1-6	Enter the filter wavelengths into the relevant text boxes. Remember that filter 1 (which is the filter with the lowest wavelength) should be in position 1 in the filter wheel and so on in ascending order of wavelength.

5.4.1.6 Barcode Tab

1. Select **Tools** → **Configure System** from the menu bar and select the **Barcoding** tab to:
2. Select the barcode symbologies used in your laboratory.
3. Enter the positions at which the barcode labels should be read.

► **Note:** *There are two barcode scanners (a horizontal barcode scanner and a vertical barcode scanner) on the DSX. Obey the warning labels that are attached to the system near the vertical barcode scanner (Chapter 1.7.3).*

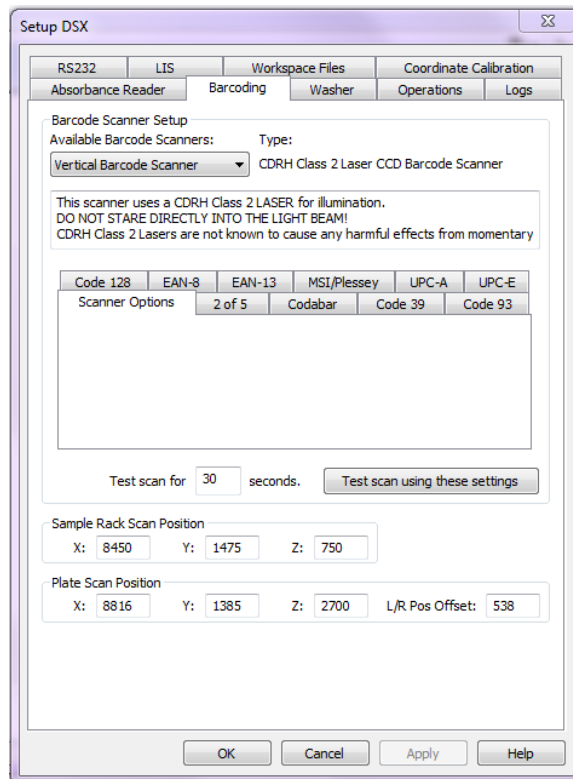
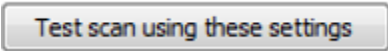




Figure 33: Setup DSX Barcoding Tab

5.4.1.6.1 Enabling and Configuring a Barcode Scanner

1. Select the barcode scanner to be used (Horizontal Barcode Scanner or Vertical Barcode Scanner) from the drop-down list.
2. Select the tab (s) that corresponds to the type of barcode symbologies used on sample tubes in your laboratory. Ensure there is a check mark in the appropriate **Enable** box (or boxes).
 - ▶ **Note:** *To improve scanning performance, select the tabs for all symbologies that are not used and uncheck the Enable boxes.*
3. (If necessary) Edit the **X**, **Y** and **Z** coordinates for the sample rack barcode scanning position.
4. (If necessary) Edit the **X**, **Y** and **Z** coordinates and the horizontal (L/R) offset for the plate barcode scanning position.
 - ▶ **Note:** *Do not edit the coordinates or horizontal offset unless necessary. Contact your nearest DYNEX Technologies representative for assistance.*
5. Test the scanner after it has been enabled and configured:
 - a. Place a barcode labeled sample tube or plate in the reading position.
 - b. Enter the length of time (i.e., 30 seconds) for which the test scan should be performed.
 - c. Click .
 - d. Verify that the correct barcode ID is read.
6. Click  to save changes.
7. Click  when all barcode settings are configured.
8. The following recommendations are suggested for optimizing the success of barcode label reading on sample tubes and plates:
 - When using an Ink Jet label maker, large dot spacing may increase the number of blank scans. Therefore, test the labels before using them in an assay. The print quality is very important to reliable scans.
 - Ensure the barcode density selected is between 5.0 mils and 20.0 mils. High quality barcodes are required to read 5.0 mils to 7.0 mils density.
 - The vertical scanner can read test tube barcodes up to 85mm in length, including the 5 mm Quiet Zone on each side of the barcode. This length may vary, depending upon the code type and barcode density. The operator should test to ensure that a specific barcode topology can be reliably scanned.
 - The horizontal scanner can read barcodes that are between 26mm and 50mm in length.
9. Check that the Quiet Zone is sufficiently wide at both ends of the barcode label. This distance must be at least 5 mm from the actual barcode to the end of the label. Ensure that the Quiet Zone is not reduced at the corner of a plate; otherwise a blank scan could occur.

10. The test tube barcodes must be properly aligned so that the barcode label faces out of the sample rack slot.
11. For plate barcode scanning, ensure that the selected scan area (left, right or center) is consistent with the placement of the barcode labels on the plates.
12. Place the printed side of the barcode label as close to the top of the plate as possible. This requirement is dependent upon the barcode type and density and may require trimming the top of the label.
13. Check that the digits, letters and other characters are correct for the barcode symbology that is being used. Use the correct number of data digits for a specific barcode symbology.
14. The following symbologies are supported by the DSX: Coda bar, Code 39, Code 93, Code 128, Standard 2 of 5, Interleaved 2 of 5, MSI/Plessey and UPC/EAN/JAN. Symbologies with poor internal verification or partial decodes (such as Interleaved 2 of 5, Standard 2 of 5 and MSI/Plessey) should be avoided if possible.
15. Enable only the barcode symbology (or symbologies) that will be used in *REVELATION DSX* software.
16. Ensure that the barcode scanner module windows are unobstructed, clean and unscratched.

5.4.1.7 Washer Tab

1. Select **Tools** → **Configure System** from the menu bar.
2. Select the **Washer** tab to show that the level sensor switch in the wash bottles is enabled.

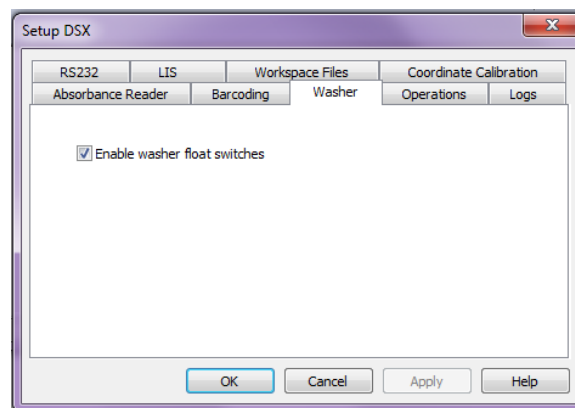


Figure 34: Setup DSX Washer Tab

3. The checkbox to enable the washer float switches is checked by default.

► **Note: Never uncheck the Enable washer float switches option.**
Disabling this option can cause damage to the system.

5.4.1.8 Operations Tab

1. Select **Tools**→ **Configure System** from the menu bar and select the **Operations** tab to enable Boolean function assays.

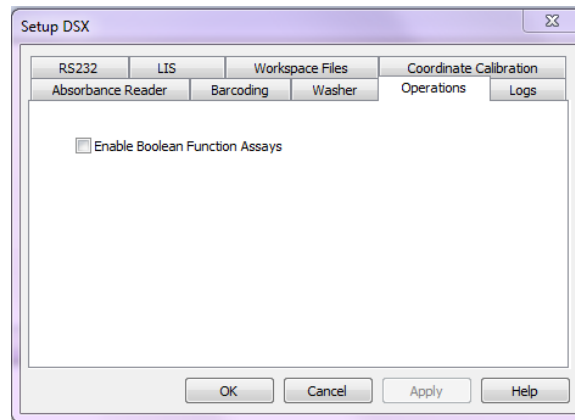


Figure 35: Setup DSX Operations Tab

2. Check **Enable Boolean Function Assays** if you are running a spreadsheet Boolean function such as the multi-tube per sample feature.

5.4.1.9 Logs Tab

1. Select **Tools**→ **Configure System** from the menu bar and select the **Logs** tab to view the debug logging option.

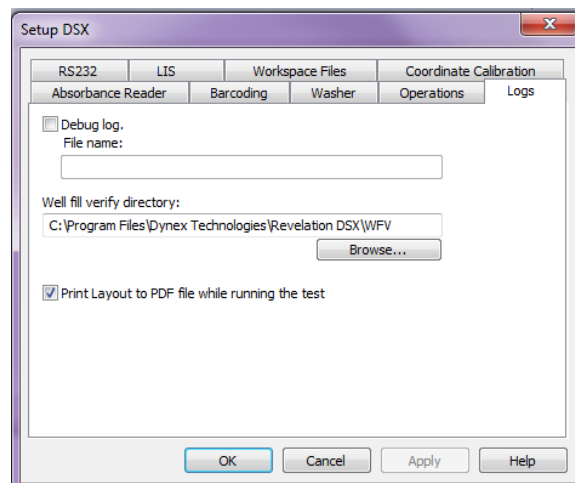


Figure 36: Setup DSX Logs Tab

2. Place a check mark next to **Debug log** to enable creation of a debug log file and enter the name of the log file. The debug log creates a file of the instrument process communication.
3. The *Logs* tab also shows the directory where Well Fill Verify (WFV) (Chapter 6.4.6) files are stored. *C:\Program Files\DYNEX Technologies\Revelation DSX\WFV* is the default directory. Click **Browse...** and select a different directory if required.
4. Place a check mark next to **Print Layout to PDF file while running the test** to print a PDF file containing the sample IDs, locations in the sample rack and the plate map when a worklist is started IDs.

5.4.2 Selecting Results Font

The font that is used when results reports are printed is operator selectable.

1. Select **Tools** → **Results Font** from menu bar. The *Font* dialog box displays.

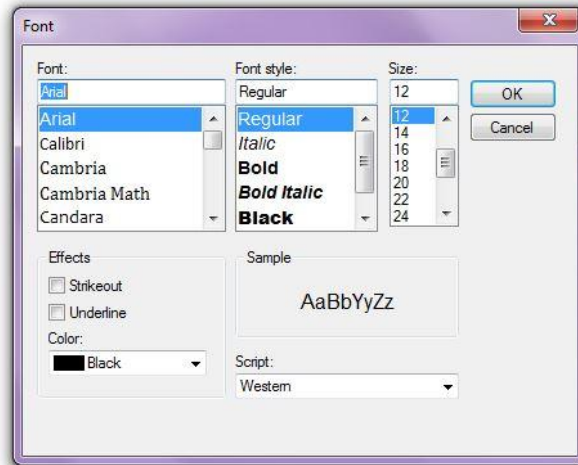


Figure 37: Font Selection Dialog Box

2. Select the font, font style, size and color to be used for printed results reports.

5.4.3 Setting Preferences

The *Options* dialog box allows the user to create assay shortcut buttons, select colors for different well types, set default directories for data storage and enter the laboratory information to be printed on results reports.

1. Select **Tools**→ **Options** from the menu bar. The *Options* dialog displays.
2. Specify the settings for each of the configuration options using the available tabs.

5.4.3.1 Buttons Tab

You can create up to eight different shortcut buttons that are displayed on a button bar just below the *REVELATION DSX* software toolbar. When you click a shortcut button, *REVELATION DSX* software opens the associated assay or worklist (a template must be created and saved prior to creating a button).

1. Select **Tools**→ **Options** from the menu bar and select the *Buttons* tab.

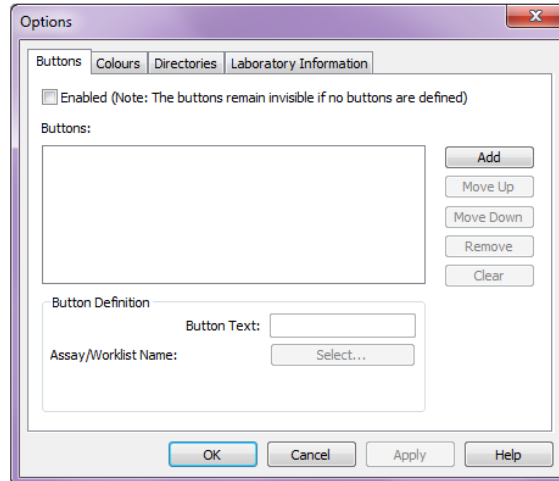


Figure 38: Buttons Tab - Options Dialog Box

3. Check **Enabled** to turn on the button bar display.

► **Note:** If **Enabled** is not checked, the button bar is not visible.

4. Click to open an entry for a new button.
5. Click and choose an assay or worklist from the corresponding dialog box.

► **Note:** Text can be any length, but there is only room for eight or nine letters on the button.

6. Type the text to display on the button.
7. Repeat steps 3 through 5 to create up to eight buttons.
8. Click or to reposition a button in the list.

► **Note:** The position of a button in the list corresponds to its position on the button bar. The button at the top of the list displays on the left side of the button bar.

9. Click to delete a selected button from the list.
10. Click to delete all buttons from the list.
11. Click .

5.4.3.2 Colours Tab

Customize the colors of well types on the template and in printouts. *REVELATION DSX* software uses the selected colors on template displays and in printouts, if you have a color printer.

1. Select **Tools**→**Options** from the menu bar and select the *Colours* tab.

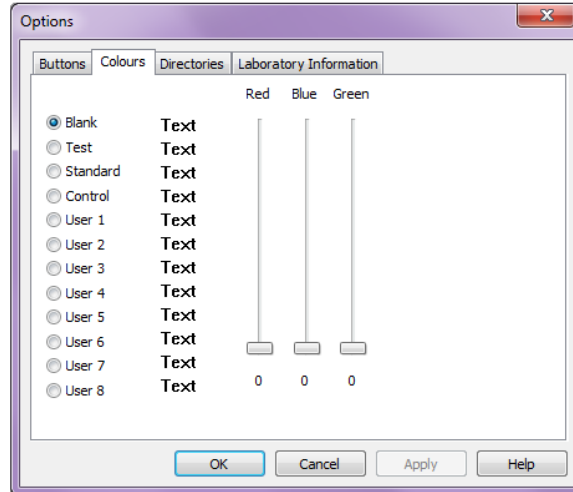



Figure 39: Colours Tab - Options Dialog Box

2. Select a well type by clicking to mark its corresponding radio button. The text color changes to show the current color for the selected well type.
3. Use the color scrollbars to select a new color.
4. Repeat steps **2** and **3** for additional well types.
5. Click .

► **Note:** Colors may be mapped to the closest color in the Windows color palette.

5.4.3.3 Directories Tab

REVELATION DSX software has a default Directory Structure (Chapter 9.2) that stores certain file types in dedicated directories.

1. Select **Tools** → **Options** from the menu bar and select the *Directories* tab to change the default directory structure.

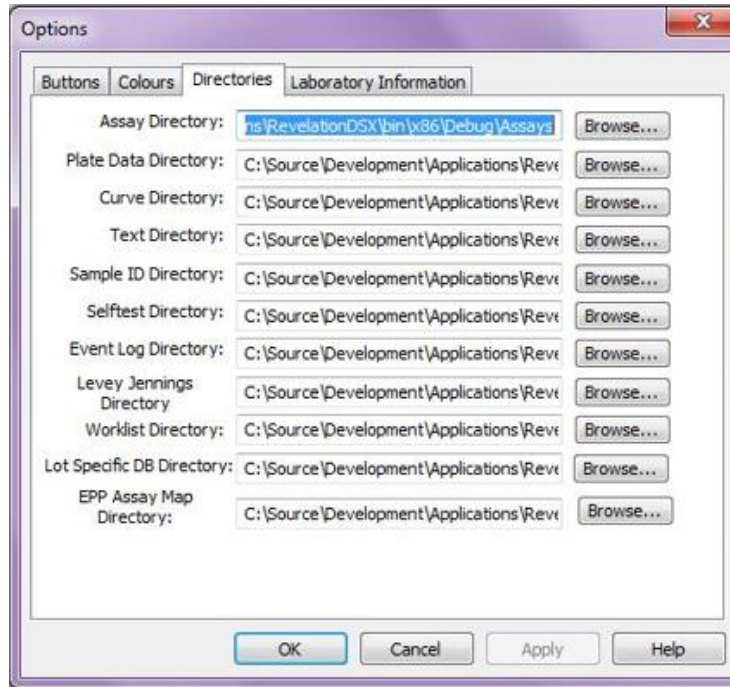


Figure 40: Directories Tab Options

2. Type the directory name or click to select an existing directory for each file type.
3. Click .

5.4.3.4 Laboratory Information Tab

1. Select **Tools**→ **Options** from the menu bar and select the *Laboratory Information* tab to enter laboratory demographics to display at the top of the results printouts.

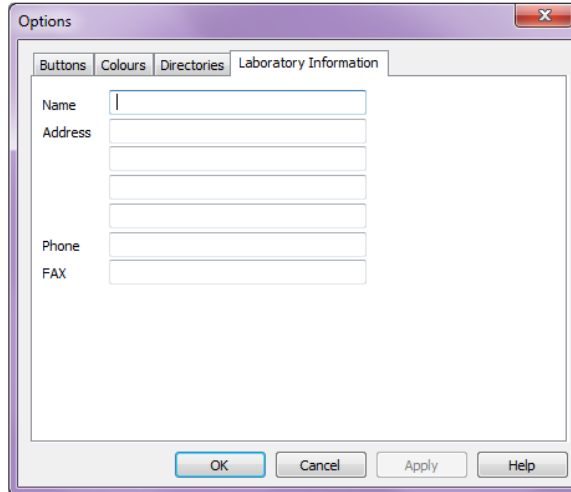



Figure 41: Laboratory Information Tab

5.4.4 Managing Users

Access to *REVELATION DSX* software is protected by a secure login and user activities are captured in an event log. When the system is first installed, no users are defined and the login prompt is not displayed.

1. Select **Tools** → **Edit User Access** from the menu bar.
2. If the *Login* dialog box displays, enter an Administrator user name and password.
3. Click .
4. The *Edit Database* dialog box displays. *Users Database* is selected.

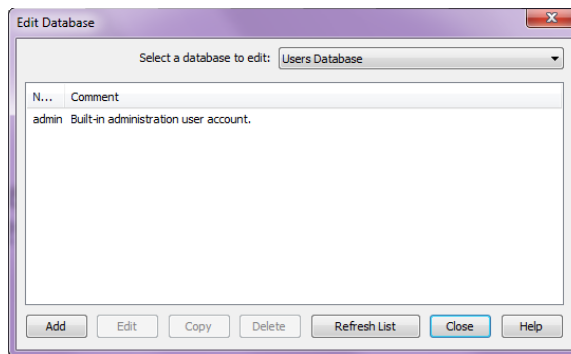


Figure 42: Edit Database

► **Note:** An administrator login is required to edit the Revelation Users Database. At least one Administrator level user must be entered into the system in addition to the default Administrator.

5.4.4.1 Add a User

1. Click  to add a new user.

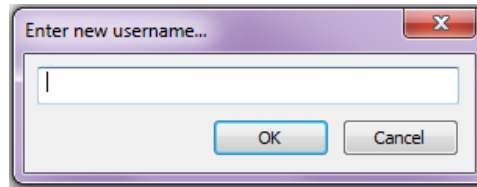


Figure 43: New User Dialog Box

2. Enter the user name in the *Enter new user name* dialog box and click .

► **Note:** *The user name is not case sensitive in the Login dialog box.*

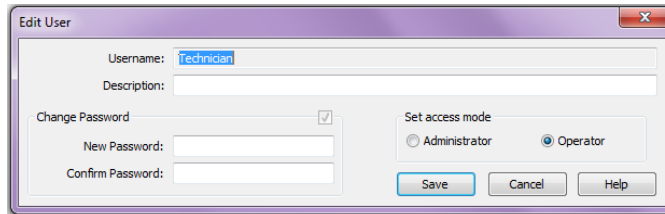


Figure 44: Edit User

3. Enter a user description (optional) in the *Description* text box.
4. Enter a password in the *New password* and *Confirm* password text boxes.

► **Note:** *The password is case sensitive in the Login dialog box.*

5. Click to select either *Administrator* or *Operator* access privileges and click **Save**.

► **Note:** *An operator has privileges to create and run a worklist, but is restricted from updating REVELATION DSX software databases, creating and modifying assays, configuring the system or performing any manual DSX functions. These functions require Administrator privileges.*

5.4.4.2 Delete a User

1. Highlight the user to be deleted and click **Delete**.
2. A confirmation dialog box displays.
3. Click **Yes** to confirm the deletion.

5.4.4.3 Modify a User

1. Highlight the user to be modified and click **Edit**.
2. Follow the *Add a User* instruction above.

► **Note:** *Click to check Change Password to update a user's password.*

5.4.5 Specifying Levey-Jennings Criteria

Levey-Jennings statistical charts allow the user to select a specific control from within a specific Assay template and view variation over time in a graphical format. Levey-Jennings charts can be displayed against raw OD values or against calculated results (concentrations

or ratios). Westgard rules may also be applied. Levey Jennings criteria are specified during the Levey Jennings analysis.

1. Select **Tools** → **Levey Jennings** from the menu bar. A Windows dialog box is displayed for assay selection (.asy file).
2. Select the assay for which the Levey-Jennings verification will be performed. A dialog box displays to select the well type to be analyzed.

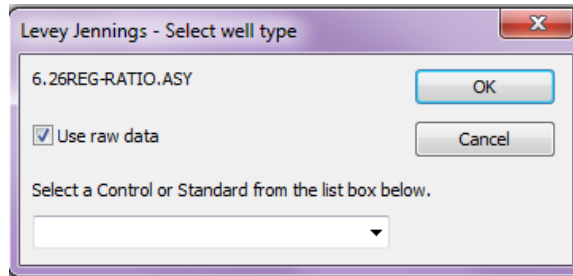


Figure 45: Levey Jennings

3. Enter the well type that corresponds to the control (or other sample type) on which the analysis is carried out. The Levey-Jennings window displays. All available plate files for the specified assay are listed in the *Source plate panel on the left*.
 - ▶ **Note:** *The plate file (*.dat) for each plate that is to be included in the Levey-Jennings analysis must be in the Plates folder on the system.*
4. Select the period (Example: last 30 days) over which the Levey-Jennings analysis is to be carried out.
5. Click . The plate files corresponding to the selected period are displayed in the target plate panel on the right.
 - ▶ **Note:** *Click >> to move plates to the target panel. Use the << button to move plates back to the source panel.*
6. If pass/fail criteria are to be included in the Levey-Jennings analysis, select **Quality control options** from the Levey-Jennings menu and select the appropriate criteria.
7. Select either the saved mean and standard deviation or select manual entry and type these values in the provided text boxes.
8. Click **Run**. The plotted results are displayed in the upper portion of the window.
 - ▶ **Note:** *Additional tools in the upper portion of the Levey-Jennings window allow the user to customize the plot and print the plot after it has been prepared. Pause the mouse over a tool to see a popup window that lists the tool's function.*

5.4.5.1 The Levey-Jennings Menu

The *Levey-Jennings* menu is added to the menu bar during a Levey-Jennings analysis of data.

Table 33: Levey-Jennings Menu

Command	Purpose
Change Well Type	Select a different well type for the Levey-Jennings analysis.
Quality Control Options	Select pass/fail criteria to be used in the Levey-Jennings analysis.

5.4.6 Defining Consumables

REVELATION DSX software maintains a database of all consumables and fluids used on the DSX. Once a consumable or fluid is defined in the database, it is available for selection from a drop-down list during assay creation.

5.4.6.1 Defining Bottles

Bottle dimensions are used by the DSX hardware to determine the proper pipetting position. Bottles entered in the *Bottles Database* display as selections in the *Define Pipette Fluid* dialog box.

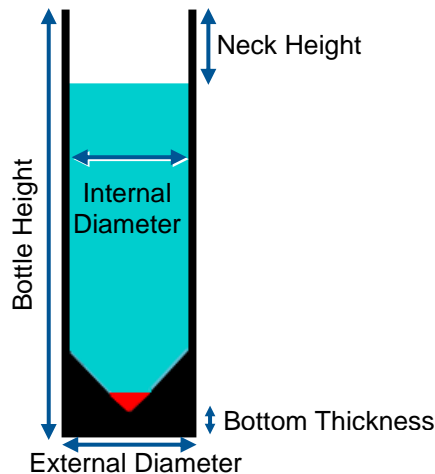


Figure 46: Bottle Dimensions

► **Note:** The bottles database is only available to DYNEX Factory Trained Technicians.

5.4.6.2 Defining Tubes

1. Select **Tools** → **Edit Databases** from the menu bar.
2. Select the **Tubes Database** using the drop-down menu.

► **Note:** Names of currently defined tubes are displayed. Highlight a name and click **Edit** to modify an existing definition.

3. Click **Add**.
4. Enter a unique name in the **Enter a name for the new tube** edit box and click .
5. Enter an optional description in the provided text box.
6. Enter the tube size in the *Characteristics* panel.

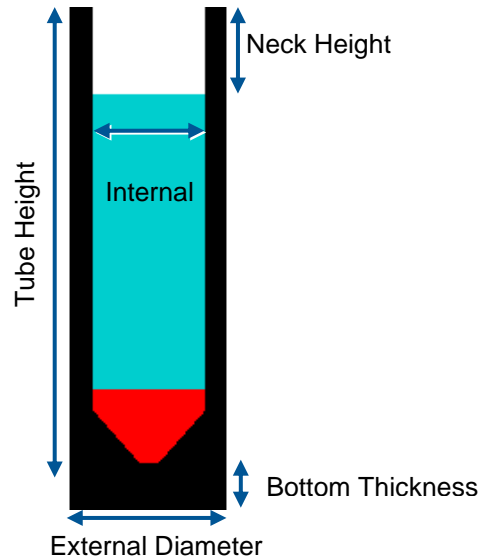


Figure 47: Tube Dimensions

- ▶ **Note:** Tube dimensions are used by the DSX hardware to determine the proper pipetting position. Make sure values are accurate. Invalid dimensions are flagged. Click the **Show Error** button to determine the parameter that is error.

7. A preview of the tube displays using the provided dimensions.
8. Click **Save**.
9. Highlight a tube name and click **Delete** to delete an existing tube type.

- ▶ **Note:** Tubes entered here display as selections on the Define Sample Rack dialog box.

5.4.6.3 Defining Plates

1. Select **Tools**→ **Edit Databases** from the menu bar.
2. Select the **Plates Database** using the drop-down menu.
 - ▶ **Note:** Names of currently defined plates are displayed. Highlight a name and click **Edit** to modify an existing definition.
3. Click **Add**.
4. Enter a unique name in the **Enter a name for the new plate** edit box.
5. Click .

6. Enter an optional description in the provided text box.
7. Use the drop-down arrow to select how the plate will be used: **for tests** or **for dilutions**.

► **Note:** *If **for tests** is selected, washer settings can be entered (Chapter 5.4.6.4).*

8. Enter the plate dimensions in the *Plate Characteristics* panel.
9. Enter the well dimensions in the *Well Characteristics* panel.

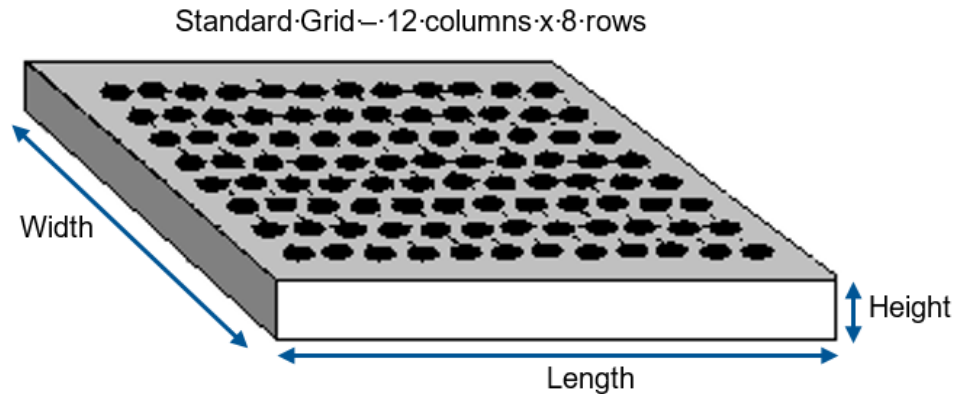


Figure 48: Plate Dimensions

► **Note:** *Dimensions are used by the DSX hardware to determine the proper pipetting position. Make sure values are accurate. Invalid dimensions are flagged. Click the **Show Error** button to determine the parameter that is error.*

10. A preview of a plate well displays using the provided dimensions.
11. Click **Save**.
12. Highlight a plate name and click **Delete** to delete an existing plate type.

► **Note:** *When a new assay is created the plate block is set to **Load Default System Plate**, double-click this entry to substitute a user-defined plate.*

5.4.6.4 Defining Washer Settings - Wash Head Positions

1. Select **Tools**→ **Edit Databases** from the menu bar.
2. Select the **Plates Database** using the drop-down menu.
3. Select an existing plate or add a new plate (Chapter 5.4.6.3) that is used **for tests**.
4. Click **Define Washer Settings**.

The definable wash head positions are described below. Each wash head position can be specified by the user to within 0.1 mm.

Table 34: Wash Head Position Descriptions

Wash Head Position	Description
Aspiration Height	Positions the aspiration pins close to the bottom of the well so that the contents of the wells can be completely aspirated.
Bottom Wash Height	During a bottom wash cycle, this is the height the wash head is lowered to during dispense so that the force of the dispensed fluid can wash the bottom of the wells.
Dispense Height	Defines the aspirate pin position when fluid is dispensed. While it is often desirable to set this height just above the top of the well in order to form a positive meniscus, the user should ensure that an overflow does not occur.
Sweep Height	Raises the aspiration pins slightly above the <i>Aspiration Height</i> (see above) so that the aspiration pins can be moved back and forth in the well without scratching the bottom of the plate.
Sweep Stroke	Defines the horizontal movement used during a sweep operation.
Top of Well	Positions the aspiration pins so they are slightly above the dispense height. At this position, the aspirate pins can clear the top of the well as the wash head moves from column to column.

Click the **Show** button next to each position to move the wash head to the selected position so the height can be checked.

5.4.6.5 Defining Pipette Fluids


Define reagent and standard/control fluids and specify whether they are time-sensitive. If they are time-sensitive, specify the maximum on-system use time.

► **Note:** *Fluids entered here are available during assay definition from the Pipette Samples/Standards/Controls and Dispense Fluids dialog boxes.*

Select the pipette profile used when aspirating and dispensing the fluid. The profile should be set to four unless otherwise required. Associate the fluid with a previously defined bottle type and (optional) select the fluid load position.

1. Select **Tools** → **Edit Databases** from the menu bar.
2. Select the **Pipette Fluids Database** using the drop-down menu.

► **Note:** *Names of currently defined fluids are displayed. Highlight a name and click **Edit** to modify an existing definition.*

3. Click **Add**.
4. Enter a unique name in the **Fluid name** text box.
5. Click .

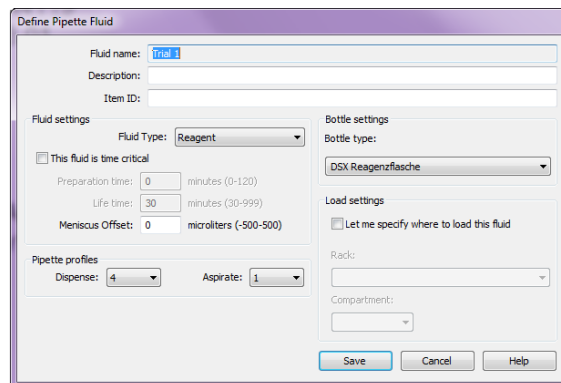


Figure 49: Define Pipette Fluid Dialog Box

6. Enter an optional **Description** in the provided text box.
7. Enter an optional **Item ID**.
8. Select the fluid type **Standard/Control** or **Reagent** using the drop-down list.
9. If the fluid has limited stability, click to mark **This fluid is time critical**, then enter the preparation time and lifetime.

Table 35: Fluid Preparation Time and Lifetime

Term	Definition
Preparation Time	Number of minutes before the fluid is required that the operator should be prompted to prepare it.
Lifetime	Number of minutes after the fluid is loaded onto the system that the system considers the fluid unusable.

- Enter the **Meniscus Offset** in microliters. The meniscus is the curve seen at the top of a liquid. The meniscus can be either concave (a minus offset) or convex (a positive offset). This value is used to position the reagent pipette tip in the fluid bottle.

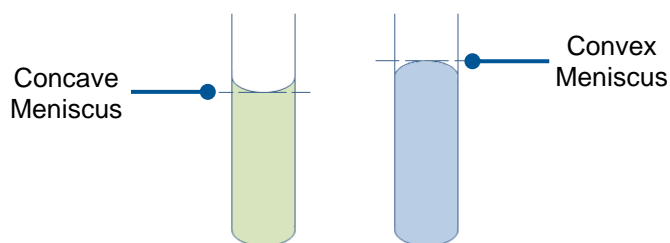


Figure 50: Visualization of Meniscus Offset

- Enter the **Pipette profile**.

- ▶ **Note:** The pipette profile determines the acceleration, top speed and breaking speed of the pipette plunger. Differing profiles produce differing fluid dispense characteristics. Generally, 1 produces a slow movement of fluid and 5 a fast movement. The default dispenses profile for samples, standards and controls is 4. The default aspirate profile for samples, standards and controls is 1.

- Use the drop-down list to select the type of bottle the fluid is stored in.

- Under **Load Settings** click **Let me specify where to load this fluid** if you want to define the position where the operator will be instructed to load the fluid at run time.


- ▶ **Note:** Allowing REVELATION DSX software to manage the positions of consumables eliminates conflicts. Predetermining fluid positions maybe preferable in certain circumstances. Leave this option un-checked if you are uncertain.

- Click **Save** to save the fluid.

- To delete an existing fluid, highlight a fluid name and click **Delete**.

5.4.6.6 Defining Washer Fluids

Define the fluids that are used for washing and purging and (optional) select their load position.

1. Select **Tools** → **Edit Databases** from the menu bar.
2. Select the **Washer Fluids Database** using the drop-down menu.
 - ▶ **Note:** Names of currently defined fluids are displayed. Highlight a name and click **Edit** to modify an existing definition.
3. Click **Add**.
4. Enter a unique name in the **Enter a name for the new wash fluid** edit box and click .

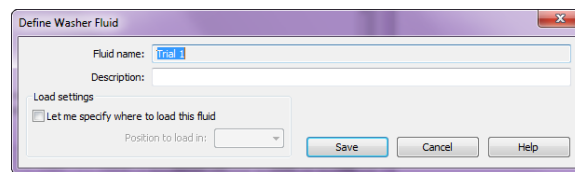


Figure 51: Define Washer Fluid Dialog Box

5. Enter an optional description in the provided text box.
6. Under **Load Settings** click **Let me specify where to load this fluid** to define the position (A, B, C or D) where the operator will be instructed to load the fluid at run time.

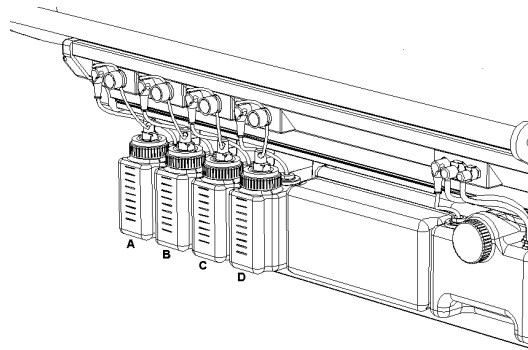


Figure 52: Location and Naming Convention of Bottles

- ▶ **Note:** Allowing REVELATION DSX software to manage the positions of consumables eliminates conflicts. Predetermining fluid positions may be preferable in certain circumstances. Leave this option un-checked if you are uncertain.
7. Click **Save**.
 8. Highlight the fluid in the *Fluids* panel then click **Delete** to delete an existing fluid.
 - ▶ **Note:** Fluids entered here are available during assay definition from the Wash Plate dialog box.

5.4.6.7 Defining Tips

Define the length, capacity and maximum fill volume for each type of pipetting tip that is used. Tip dimensions are used by the DSX hardware to determine the proper pipetting position. Tips entered in the *Tips Database* display as selections on the *Runtime Options* dialog box

- ▶ **Note:** Only DYNEX sample tips and reagent tips have been found to meet the stated precision and accuracy specifications.

The Tips Database is only available to DYNEX Factory Trained Technicians.

5.4.6.8 Defining Dilutions

Define the dilution process including the dispense and mix procedure and incubation time.

1. Select **Tools** → **Edit Databases** from the menu bar.
2. Select the **Dilutions Database** from the drop-down menu.

- ▶ **Note:** Names of currently defined dilutions are displayed. Highlight a name and click **Edit** to modify an existing definition.

3. Click **Add**.

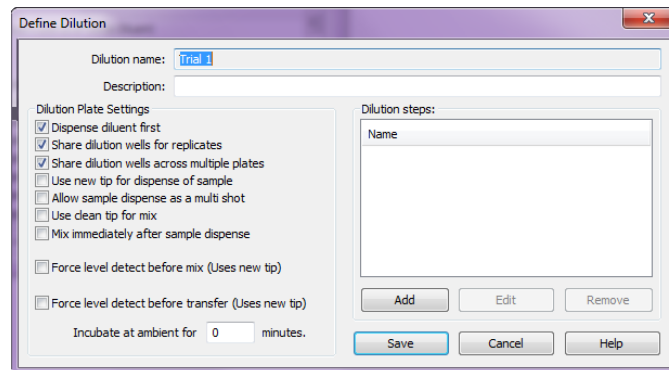


Figure 53: Define Dilution

4. Enter a unique name in the **Dilution name:** text box.
5. Click **Save**.
6. Enter an optional description in the text box.
7. Place a check mark next to each option to be included in the dilution:

Table 36: Dilution Descriptions

Dilution	Description
Dispense diluent first	Uncheck this option if neat samples, standards or controls should be pipetted first. Leave this option checked if diluent should be added first. Leave checked if unsure.
Share dilution wells for replicates	Replicates defined in the template may share a common dilution or replicates may be diluted separately. Check this option to use a common dilution. Leave checked if unsure.
Share dilution wells across multiple plates	Check this option to share a common diluted fluid across multiple plates. Leave unchecked if unsure.
Use new tip for dispense of sample	Check this option to ensure a fresh sample tip is used when pipetting a common fluid. Using the same tip reduces the number of tips required for pipetting replicates. Depending on the fluid properties, residual volumes can adversely affect the precision of results. Leave checked if unsure.
Allow sample dispense as a multishooting	Check this option to allow multi-shooting of fluids reducing the number of tips required for replicates. Depending on fluid properties and volume, multi-shooting may reduce precision. Leave unchecked if unsure.
Use clean tip for mix	Check this option to ensure that mixing is carried out with a clean tip. Leave unchecked if unsure.
Mix immediately after sample dispense	Check this option to ensure that mixing is carried out with the same tip used for sample dispense. Leave checked if unsure.
Force level detect before mix (Uses new tip)	Check this option to verify the well liquid level before mixing. Leave unchecked if unsure.
Force level detect before transfer (Uses new tip)	Check this option to verify the well liquid level before transfer. Leave unchecked if unsure.
Incubate at ambient for XX minutes.	Enter the number of minutes that the sample needs incubated at ambient.

1. Enter the ambient incubation time in minutes.
2. Specify the dilution steps (Chapter 5.4.6.8.1).

► **Note:** *The dilution profiles entered here are available during assay definition from the Pipette Samples/Standards/Controls dialog box and during worklist creation.*

5.4.6.8.1 Defining Dilution Steps

Dilutions can be performed directly in the microplate or they can be performed in a deep well plate or deep well dilution strip. Dilutions exceeding a total volume of 300 μL must be performed in the deep well plate or deep well dilution strip.

1. Click **Add** in the *Define Dilution* dialog box (Chapter 5.4.6.8).
2. Enter a name to identify the dilution steps.
3. Use the drop-down list to select the **Dilution area**.
4. Use the drop-down list to select the **Diluent**.
5. If the required fluid is not displayed, it can be defined by clicking the **Fluids** button.
6. Enter dilution ratio as **dilute 1 in ... or dilute 1 to ...** or by entering an absolute **diluent volume** in μL .

► **Note:** *If dilution in a microplate has been selected then the neat and diluent constituents must add up to the Target well volume displayed at the top of the Dilution Steps dialog box. The target well volume is defined in the Pipette Samples/Std/Ctrls dialog box.*

7. If absolute volumes are entered **Allow volume usage optimization** is enabled. Click this option to allow *REVELATION DSX* software to scale up the constituent volumes.
8. The ability for *REVELATION DSX* software to automatically scale up constituent volumes are useful if a worklist contains multiple assays with a requirement for a common fluid with common dilution properties. The automatic scaling up process ensures sufficient diluted fluid is available for the target microwells.

Example: A programmed deep well dilution of 100 μL to 400 μL could potentially yield 3 aliquots of 100 μL (assuming a 100 μL void volume in the deep well). Allowing volume usage optimization would allow *REVELATION DSX* software to automatically scale up to a potential 200 μL to 800 μL yielding 9 aliquots should a combination of assays within a worklist require this.

9. Enter the **Minimum sample volume**.
10. This instructs *REVELATION DSX* software to use a minimum volume of *neat* fluid when diluting. While the DSX is capable of pipetting volumes as low as 5 μL it is recommended that a minimum volume of 10 μL be used for optimum precision.
11. Enter the **Number of mix cycles** (deep well dilutions only).

5.4.6.9 Defining Sample Racks

Define the position of sample tubes in a sample rack using the previously defined sample tube types.

1. Select **Tools** → **Edit Databases** from the menu bar.
2. Select the **Sample Racks Database** using the drop-down menu.
 - ▶ **Note:** Names of currently defined sample racks are displayed. Highlight a name and click **Edit** to modify an existing definition.
3. Click **Add**.
4. Enter a unique name in the **Enter a name for the new sample rack** edit box and click .
5. Enter an optional description in the provided text box.
6. The current sample rack layout displays. Rack positions are numbered to indicate the type of sample tube expected in each position. Numbers correspond to the assignment in the legend above the sample rack drawing.
7. Highlight the position(s) that needs changed.

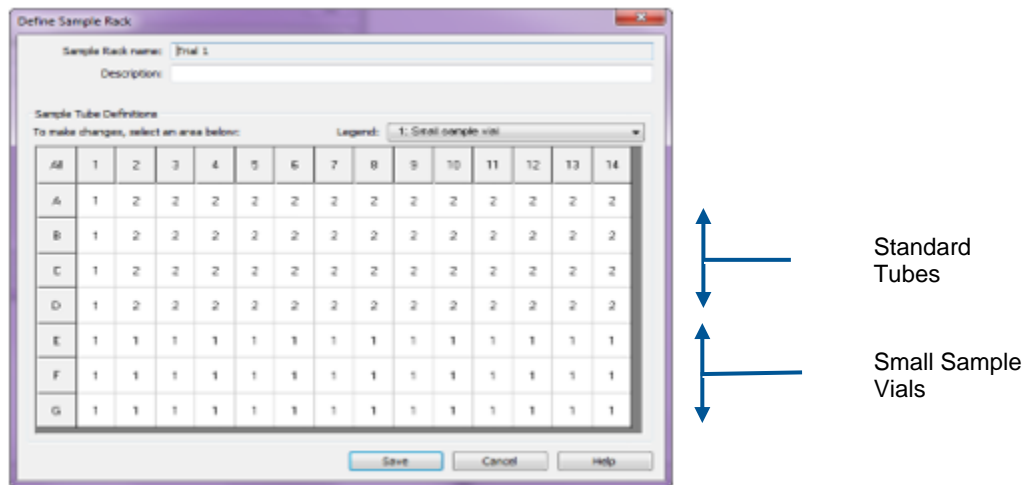


Figure 54: Define Sample Rack Dialog Box

- ▶ **Note:** One or more rows, columns or the entire rack can be highlighted by selecting the row identifiers (A-H), column identifiers (1-12) or the entire plate (ALL).
8. Select the tube type from the **Please pick a sample tube to use** dialog box.
9. Click **Save**.
10. Highlight a rack name and click **Delete** to delete an existing sample rack.
 - ▶ **Note:** Sample rack layouts entered here display as selections during worklist creation in the Sample Batch Selection dialog box.

5.4.6.10 Defining External Pipetted Plate Assay Mapping

1. Select **Tools** → **EPP Assay Mapping** from the menu bar.
2. The EPP Assay Map Database should automatically be selected.

▶ **Note:** Names of currently defined EPP mappings are displayed. Highlight a name and click **Edit** to modify an existing definition.

3. Click **Add**.

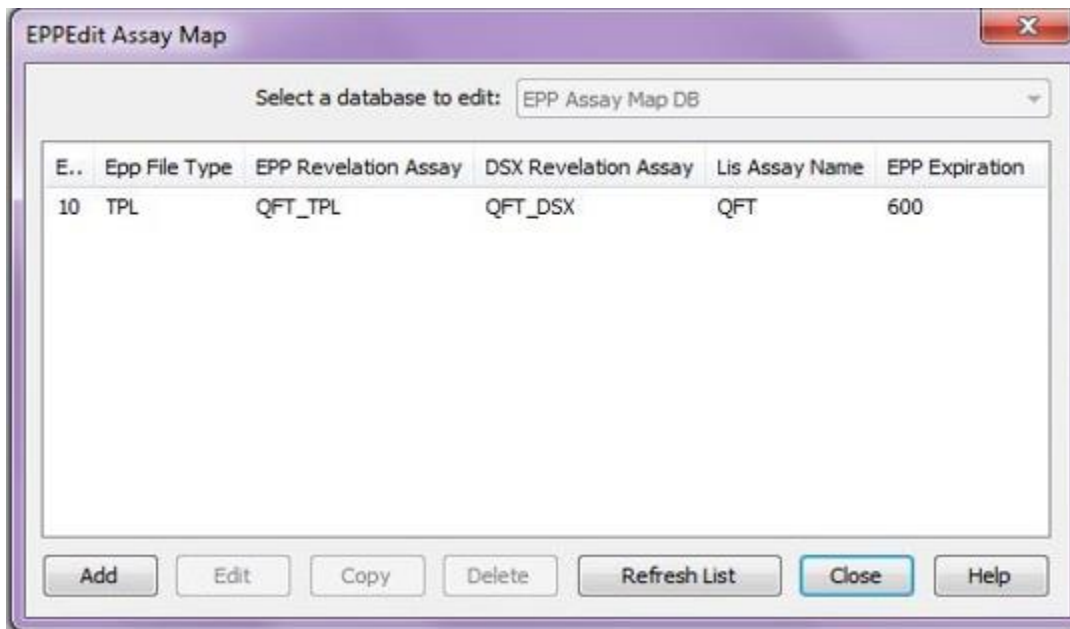


Figure 55: EPPEdit Assay Map

4. Enter a unique name in the **Enter a number for the new EPP Test name** edit box and click .

Figure 56: Edit EPP Assay Mapping

5. Enter the EPP File Type. (TPL – for external Pipetted plates and DSX for normal mode) in the provided text box.
6. Browse to the EPP Revelation Assay Name folder and select the EPP assay name.
7. Browse to the DSX Revelation Assay Name folder and select the DSX assay name.
8. Browse to the LIS Assay Name folder and select the LIS Assay Name.
9. Enter the Expiration Date.

► **Note:** *The assay name mapping is very important and critical for the Results reporting to the LIM Systems.*

5.5 Error Detection and Recovery

► **Note:** *Do not modify system level options for the DSX from the default values if unsure of consequences.*

REVELATION DSX software is supplied with a series of error recovery options for most error scenarios. If an error occurs the operator is informed through audible and visual alarms. In many instances, it may be desirable to have the DSX automatically recover from minor errors without notifying the operator or stopping the normal workflow. By default, automatic error recovery and the ability to *teach* the DSX the automatic recovery sequence is disabled. Regardless of whether an error stops the system or automatically recovers, a description of the error is recorded in the event log (Figure 57). Refer to Chapter 5.2.5.1 for additional information.

Time	Date	Plate ID	Event
12:38:33 PM	01/04/2016		Revelation started.
2:02:41 PM		Test_1	Getting plate from drawer 1
2:02:50 PM		Test_1	Putting plate in reader
2:03:09 PM		Test_1	Reading (410.*).
2:03:09 PM		Test_1	Getting plate from reader
2:03:16 PM		Test_1	Putting plate in drawer 1
2:03:44 PM			Stat results reported

Figure 57: Event Log

5.5.1 Enabling Error Recovery and Learning

Enabling the following two options allows the DSX to be taught the operators preferred automatic error recovery sequence should an error occur. Enabling the ability to *learn* a preferred error recovery sequence does not mean that the DSX will automatically recover from errors. It merely means that the DSX can be taught how to recover from errors on the first occasion of an error such that it will automatically recover from the same error should it occur a second time. This feature is most effective when the instrument is used repeatedly with the same assays and sample types.

► **Note:** *Error Recovery Options are not accessible if a worklist is currently running.*

1. Select **Settings** → **Error Recovery** from the Timeline menu. The *Error Recovery Options* dialog box displays.

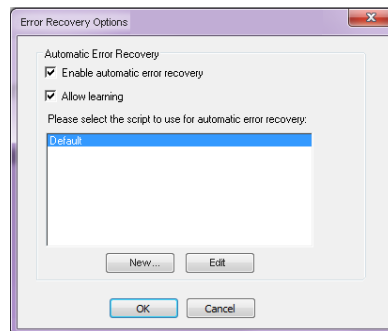


Figure 58: Error Recovery Options

2. Click to check the **Enable automatic error recovery** checkbox.
3. Click and enter a name for the new automatic error recovery file.
4. Click to check the **Allow learning** checkbox.
5. Click to save entered settings.

► **Note:** *Both checkboxes must be enabled for the DSX to learn new automatic recovery options.*

Creating a new error recovery script file is an advanced feature that should only be used by qualified DSX support personnel.

5.5.2 Configuring the Revelation User Contactor

REVELATION DSX software can be configured to display an error, sound an alarm or send an email when certain system events occur.

1. Double-click the **Revelation User Contactor** icon  in the Windows status bar. The *Configure Message Contact Options* dialog box displays.

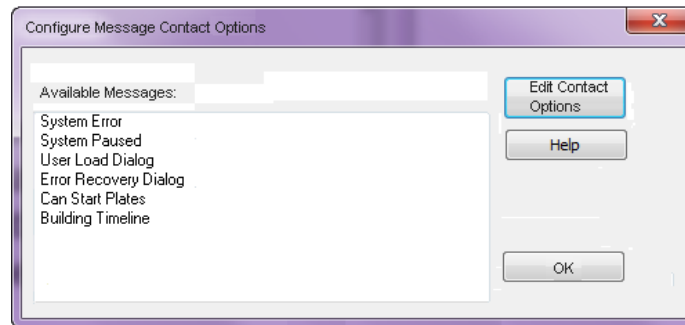



Figure 59: Configure Message Contact Options Dialog Box

2. Double-click an event (e.g., System Error) or highlight the event and click . The *Configure Message Contact Details* dialog box displays.

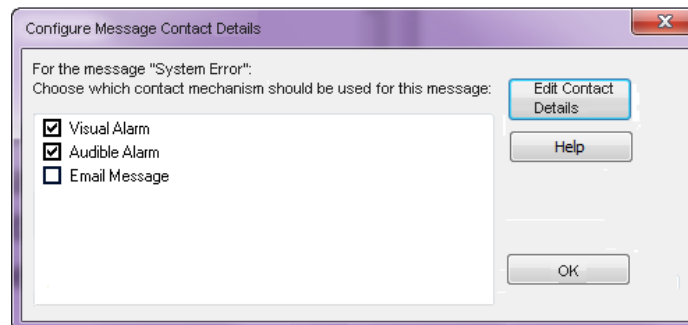







Figure 60: Configure Message Contact Details

3. Click in the box next to the type of notification that should occur when the selected event occurs. A checkmark is placed in the selected boxes.
4. Highlight the selection and click  to choose the alarm color, sound file and sound duration or email address to be used for the notification.

5.5.2.1 Activating a Visual Alarm


1. Start **Revelation User Contactor**, choose an event type and click .
2. Click to check **Visual Alarm**. If activated, an alarm displays when the DSX requires operator intervention.
3. Highlight **Visual Alarm** and click .
4. Click the **Foreground** or **Background** button to select the foreground (text) or background colors for alarm messages.
5. Click one of the forty-eight basic colors in the *Windows Color* dialog box and click . The dialog box closes and the new alarm color displays in the preview panel.

5.5.2.2 Activating an Audible Alarm

1. Start **Revelation User Contactor**, choose an event type and click **Edit Contact Options**.
2. Click to check **Audible Alarm**. If activated, an alarm sounds when the DSX requires operator intervention.
3. Highlight **Audible Alarm** and click  to select the sound file and sound duration for alarm messages.

5.5.2.3 Activating Email Notifications

► **Note:** *You must have an email client setup with MAPI support before using the email notification feature.*


1. Start **Revelation User Contactor**, choose an event type and click **Edit Contact Options**.
2. Click to check **Email Message**. If activated, an email is sent to the specified contact list when the DSX requires operator intervention.
3. Highlight **Email Message** and click  to create the contact list.
4. Click the **Add** button to display the *Address Book* dialog box.
5. Click **Find** to look up a name using an Internet directory search.

- or -

- a. Click **New Contact** to enter a new name.

- or -

- b. Click **Properties** to edit information for an existing name.

► **Note:** *For additional details, click the What's This Help  button then click anywhere in the dialog box. Microsoft Outlook Express Address Book information displays.*

6. Click to select a contact entry in the left panel (or use the **Shift+click** or **Ctrl+click** options to select multiple entries).
7. Click **Add** to add the selected name(s) to the list of people to receive email alerts.
8. Place a check next to the email recipient's name to turn on email notification for this contact.
9. To remove email contacts, click to highlight an existing email entry and click the **Remove** button to delete the name from the list of email contacts.

5.6 Data Backup

REVELATION DSX software allows the user to save all assays and worklists to avoid loss of data. The files should either be copied to a flash drive for transfer to storage or archived on a secure server.

Chapter 6: Assay Definition

Assays must be defined before a worklist can be prepared.



Caution: *Validation studies must be performed by your facility to assure proper performance of a user-defined assay before the assay is used for testing samples.*

Using the *Operations* menu, the defined consumables are assigned to a particular assay during assay definition. The pipetting, dilution, wash, read and incubation parameters are also defined during assay definition.

The arrangement of well types on the microplate, readings, calculations, QC checks and reporting options when running a test are also specified during assay definition. These options are defined using the *Data Reduction* menu.

After an assay has been created, it is used by the instrument to control pipetting of samples, dispensing of reagents, incubation and washing of wells, reading of the plate and calculation, exporting and reporting of results.

The process for creating an assay is summarized below.

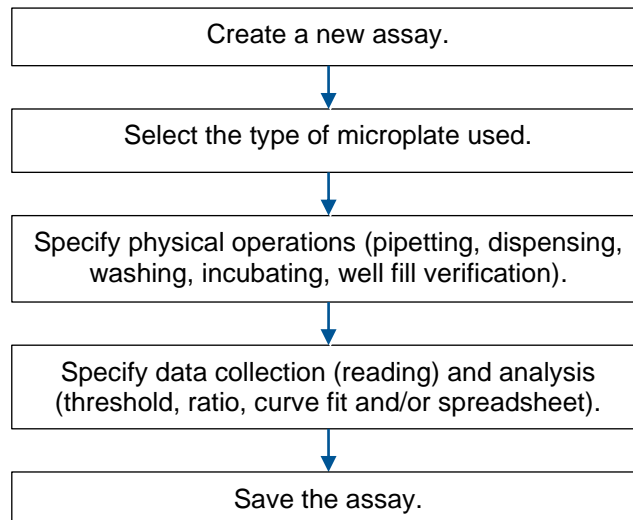


Figure 61: Workflow for Creating an Assay

6.1 Import an Assay

All revelation assays should end in the *.asy* extension. They are typically small files (a few Kb) and can be easily sent as an email attachment.






 AMP Specific Urine LP SING	6/21/2018 12:09 PM	ASY File	9 KB
 DSX QFT 4pt ver 6.25 READ ONLY	3/2/2017 12:01 PM	ASY File	9 KB
 DSX QFT 4pt ver 6.25	11/15/2017 5:04 PM	ASY File	12 KB
 DSX QFT 4pt ver5.00	3/2/2017 12:01 PM	ASY File	11 KB
 DSX QFT 8pt ver 6.25 READ ONLY	3/2/2017 12:01 PM	ASY File	9 KB

Figure 62: Example of the .asy file extension

To add an assay to revelation, simply copy/paste an assay file in to the Assays file located (by default) at **C:\Program Files(x86)\DYNEX Technologies\Revelation DSX\Assays**. The assay will now appear as an option when you create a new worklist.

After importing an assay into Revelation you may be presented with the screen below when you first use the assay. This means that the assay file was created elsewhere and uses a consumable or item that already exists in your instrument's database.

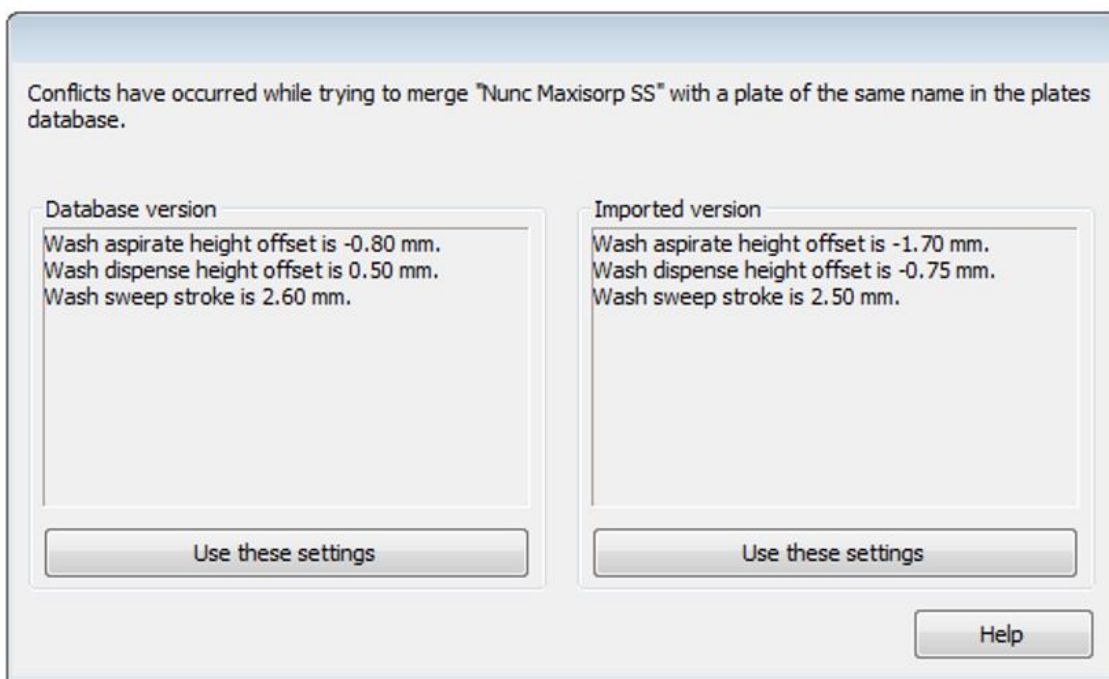


Figure 63: Pop-Up Screen Of Conflicting Machine Settings After an Import

It is recommended to use the database version of these parameters as they have been customized based on your instrument.

6.2 Create a New Assay

1. Select **File** → **New** from the menu bar.
2. The *New* dialog box displays.

3. Click .

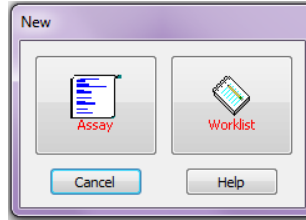


Figure 64: New Assay Dialog Box

4. A default assay displays.

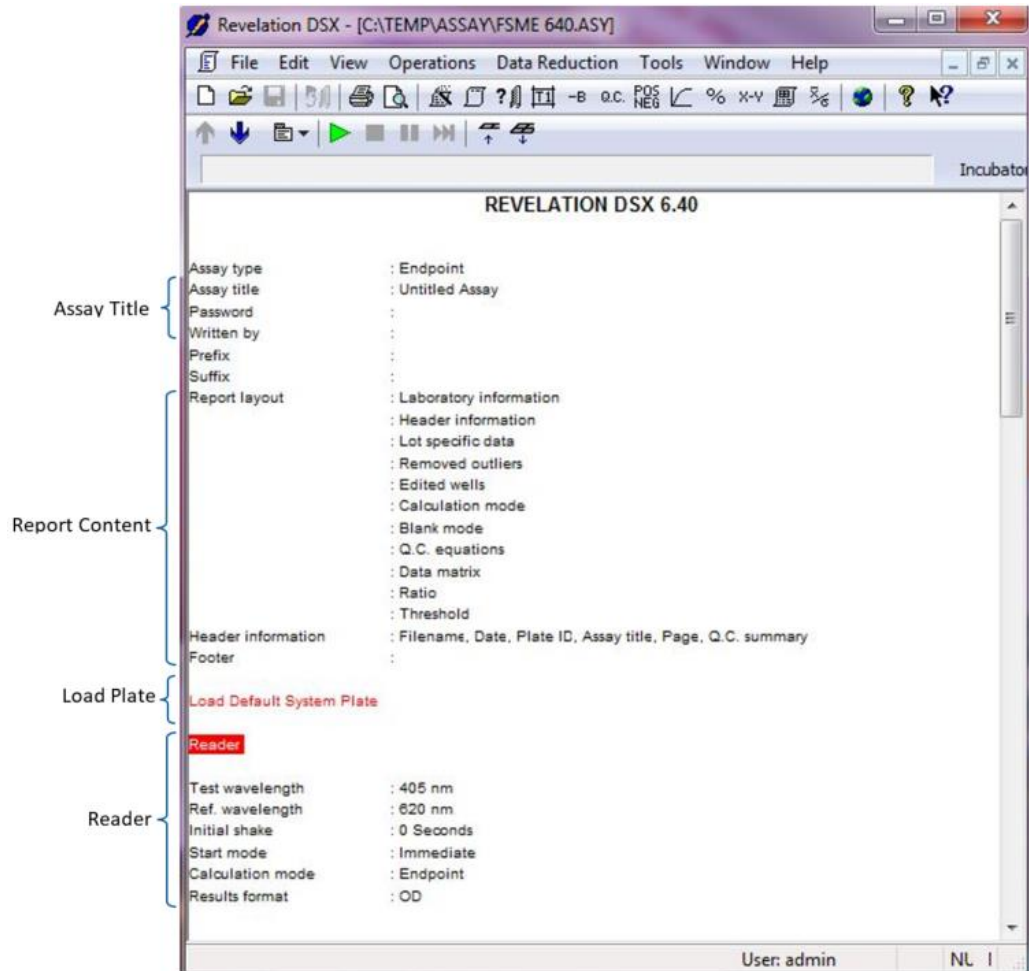


Figure 65: Default Assay

The default assay contains information defined using commands available from the menu bar (or toolbar):

The assay title - **Data Reduction → Assay Title**

The report content - **Data Reduction → Report Options**

The microwell plate to load - **Tools → Edit Databases → Plates**

How OD readings are measured - **Data Reduction → Reader Control**

► **Note:** The current version of REVELATION DSX software supports endpoint type assays.

Two of the entries, **Load Default System Plate** and **Reader**, are operation steps for running the assay.

Assays contain instructions for pipetting, dispensing, washing, incubating and reading the microwell plate. These instructions are referred to as operations. The following operations are defined:

- Load Plate
- Pipette Samples/Controls/Standards
- Dilute Samples/Controls/Standards
- Dispense
- Wash Plate
- Incubate
- Well Fill Verify
- Reader.

Operations display in **red** in the assay. The currently selected operation (*Pipette Samples/Standards/Controls* in the **example** below) is reverse-highlighted in red.

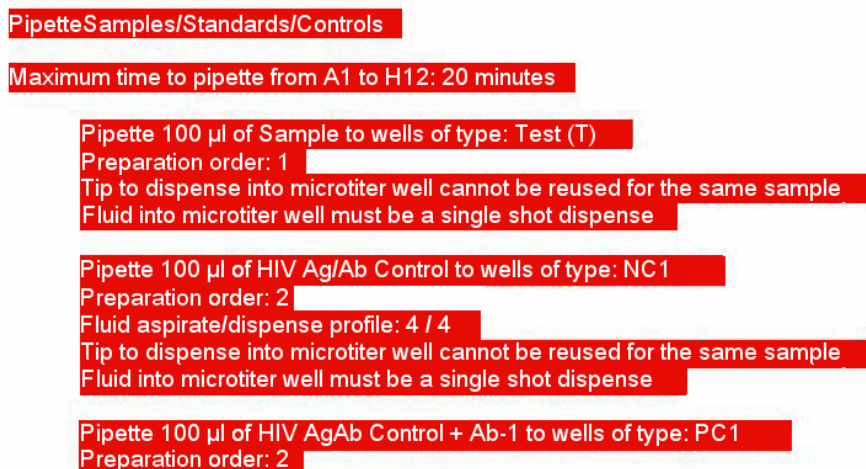


Figure 66: Pipette Samples/Standards/Controls Operation (Example)

Operation blocks can be cut, copied and pasted using the *Edit* menu options. Select **Edit** → **Edit** from the menu bar or double-click anywhere inside an operation block to display its associated dialog box.

► **Note:** REVELATION DSX software only permits new assays to contain operations for the hardware that is actually installed on the DSX.

Example: If the DSX does not support incubation, an Incubation operations block cannot be added.

6.3 Select the Microwell Plate

When a new assay is created, it contains a *Load Plate* operation

1. Double-click **Load Default System Plate** to change the microplate used for the assay.

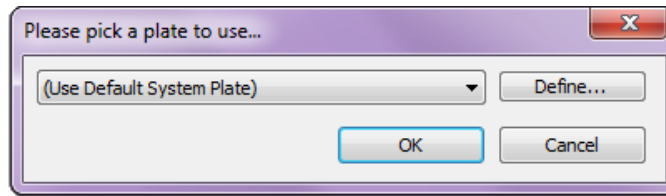



Figure 67 Plate Selection Dialog Box

2. A drop-down list displays containing all the plates defined in the consumables database.

► **Note:** If the microplate to be used is not in the list, select **Tools → Edit Databases** from the menu bar and select the **Plates Database** using the drop-down menu to define a new plate.

3. Select the required plate definition and click .

6.4 Define Assay Operations

Add instructions for pipetting, dispensing, washing and incubating the Microwell plate using commands available on the *Operations* menu.

Operation blocks can be cut, copied and pasted using *Edit* menu options. Select **Edit → Edit** from the menu bar or double-click anywhere inside an operation block to display its associated dialog box.

6.4.1 Pipette Samples/Standards/Controls

The *Pipette Samples/Standards/Controls* operation defines the pipetting operations that are to be carried out in the assay. This operation can occur at any point during the assay. Only one *Pipette Samples/Standards/Controls* operation is allowed per assay.

1. Select **Operations** → **Insert Pipette Samples/Std/Ctrls** from the menu bar.

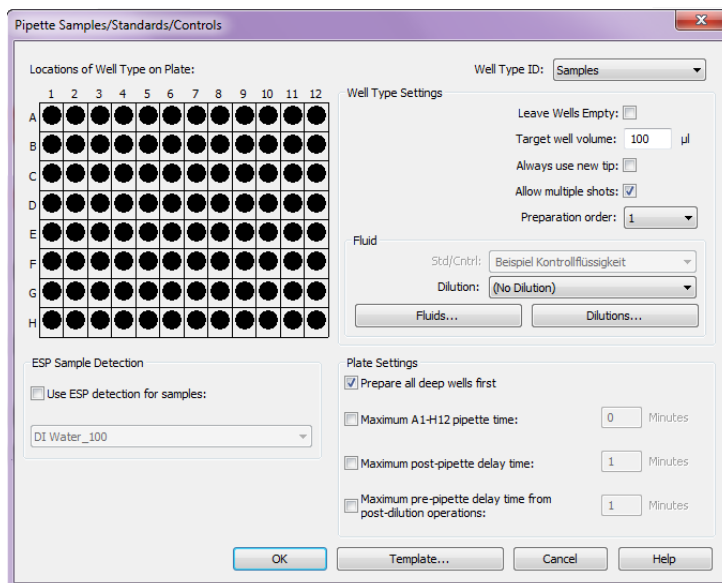


Figure 68: Pipette Samples/Standards/Controls Dialog Box

2. Click the **Template** button to define the layout of the microwell plate, programming the position of each well type on the plate. (Chapter 6.5.4) of the manual for more detailed information.)
 - a. Use the drop-down **Well Type ID** list to select a defined well type. Alternatively double-click one of the circles in the Microwell plate matrix.
 - b. All positions occupied by the selected well type are displayed in the colors defined for that well type. Non-selected well types are displayed in white.
3. Define the Well Type Settings.


- a. Click to uncheck the **Leave Wells Empty** checkbox. Pipetting options are now available for selection.

Target Well Volume: The volume to be dispensed into the Microwell is between 5 µL and 300 µL.

Always use new tip: You may choose to use a new tip for each replicate (if defined) or use the same tip. If *Always use new tip* is not selected, residues from the primary dispense may affect the accuracy of subsequent dispenses, depending on the type of sample fluid.

Allow multiple shots: You may choose to enable dispensing of multiple aliquots of fluid from a single aspiration. The number of aliquots from a given aspiration is calculated by *REVELATION DSX* software to comply with calibration requirements and tip capacity.

Preparation order: The order that fluid for the selected well type is dispensed into the microplate. If a protocol requires that a positive control is dispensed first, then the positive control should be assigned a preparation order of “1”. When processed concurrently with other assays (microplates) the ordering is interleaved on a worklist basis. This means all assays or plates containing well types with a preparation order of “1” are processed before any microplate with a well type with a preparation order of “2”.

4. Select the required fluid using the drop-down arrow. If the required fluid is not listed, it can be added by clicking the **Fluids** button. If dilution of the samples is required, use the dilution drop-down list. If the required dilution is not listed, it can be added by clicking the **Dilutions** button.
5. Repeat steps 3 and 4 for each well type that requires a pipette operation.
6. Select the Plate Settings:
 - a. **Prepare all deep wells first:** If this option is selected, all programmed pre-dilutions are completed prior to any transfer of diluted or undiluted fluids to the microplate. It is often desirable to complete all dilutions first so that the transfer of diluted samples, controls, etc. to the microplate can be processed faster. This mode minimizes assay drift across the microplate and requires the use of 2 disposable tips for each well. This setting has no effect for non-diluted samples.
 - b. **Maximum pipetting times:** *REVELATION DSX* software is able to automatically interleave and schedule processing of assays in order to obtain maximum efficiency. Often the most efficient way to schedule a series of assays is to pipette a common sample across multiple plates as one operation.
 - c. Changes in assay combinations give rise to increased or decreased parallel processing requirements, which in turn can affect the time taken between pipetting sample 1 and sample 2 for a given assay.
7. Click **Maximum A1-H12 pipette time** and enter a maximum allowable time to limit the amount of drift tolerable for the assay. The entered time is scaled appropriately at runtime depending on the number of samples processed. Assays are scheduled sequentially if parallel processes cause this time to be exceeded.
8. Define the **Maximum** pre-pipette delay time and **Maximum** post pipette delay time if needed.
9. Select **Use ESP detection for samples** (optional). Electronic Signature Pipetting utilizes a sophisticated method of pressure measurements to detect anomalies during aspiration or dispense of sample. The software allows the user to enable and define ESP profiles. This is only effective when such profiles have also been calibrated and stored. Select **Tools → Edit ESP Detection Database** from the menu bar to define ESP reference profiles.
10. Click  to save the operation and close the dialog box.

6.4.2 Dilute Samples/Standards/Controls

Whenever you insert a *Pipette Samples/Standards/Controls* operation into an assay another step is automatically added above it: *Dilute Samples/Standards/Control*.

The *Dilute Samples/Standards/Controls* operation enables *REVELATION DSX* software to minimize the time delay and to track the processing order of all assay steps before sample addition to the microplate. Another operation inserted in between the *Dilute Samples/Standards/Controls* the *Pipette Samples/Standards/Controls* operations will be executed as soon as possible after dilution and before sample addition.

6.4.3 Dispense Fluid

This feature allows a plate to be put into the ambient plate drawer for the reagent dispensing operation. In the assay this operation is entitled *Dispense*. This operation can occur at any point during the assay. There is no restriction in the number of *Dispense Fluid* operations per assay.

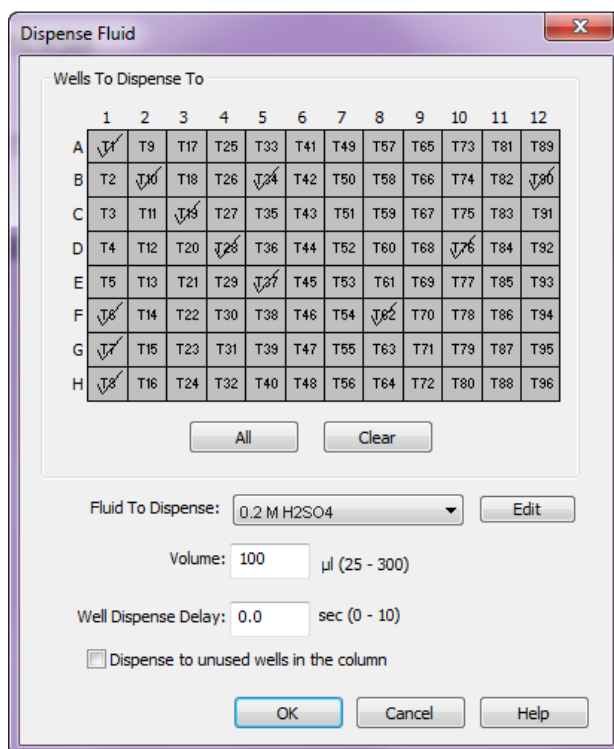


Figure 69: Dispense Fluid Dialog Box

1. Select **Operations** → **Insert Dispense Fluid** from the menu bar.
2. Mark the wells where reagent should be dispensed:
 - a. Click a well to select it; the selected well is marked with a check mark.
 - b. Click a previously selected well to deselect it and remove the check mark.
 - c. Click **All** to select all 96 wells. Click **Clear** to deselect all of the wells.
3. Use the drop-down list to select the fluid to be dispensed. If the required fluid is not listed, click the **Edit** button to add the fluid to the *Pipette Fluids* Database.
4. Enter the volume (between 25 and 300 µL) of reagent to dispense.

5. In the **Well Dispense Delay** field, enter the length of time (from 0 to 10 seconds) that the instrument should wait before dispensing fluid into the next well on the plate. This feature can be used to synchronize dispense timings for reagents in order to reduce assay drift.
6. Click the **Dispense to unused wells in the column** checkbox to fill unused wells with reagent. Use this option for assays with conjugate spheres.
7. Click to save your entry and close the *Dispense Fluid* dialog box.

6.4.4 Wash Plate

This feature places a plate into the washer module and washes per programming instructions. The assay titles the operation *Wash Plate*.

This operation can occur at any point during the assay. There is no restriction on the number of *Wash Plate* options per assay.

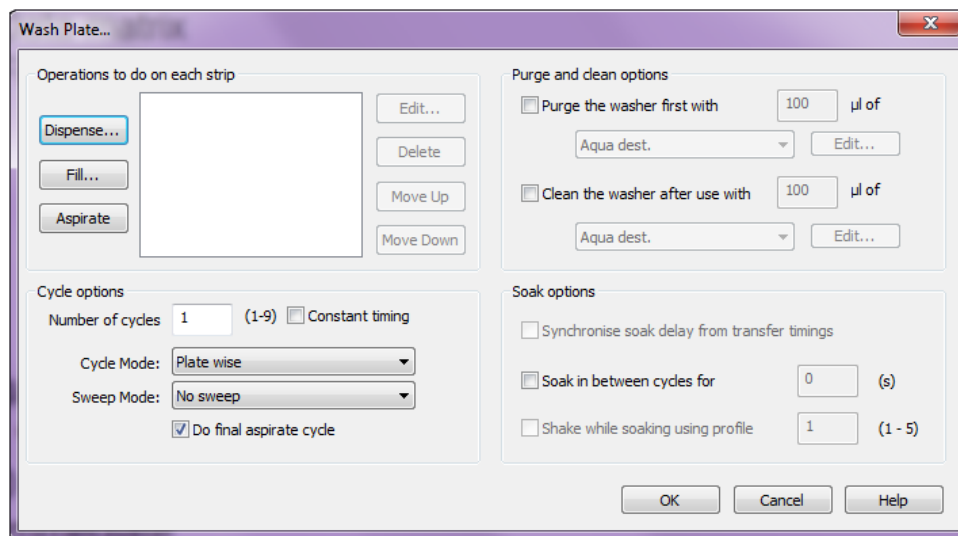


Figure 70: Wash Plate Dialog Box

1. Select **Operations** → **Insert Wash Plate** from the menu bar.
2. Click the Dispense, Fill and Aspirate buttons to enter the washing operations for each strip.
3. Click **Dispense** to aspirate the contents of the well and dispense a specified amount of fluid into the wells.
4. Select the fluid and determine if a bottom wash is performed in the *Wash Strip* dialog box.

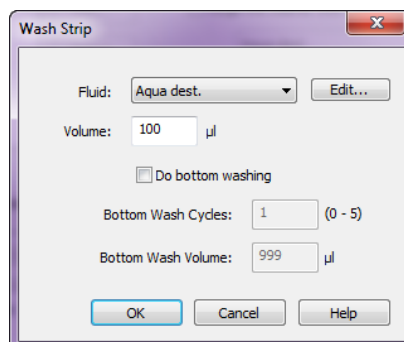


Figure 71: Wash Strip Dialog Box

- a. Select the washer fluid and volume (0-999 μL) of fluid to dispense.
- b. Determine if a bottom wash should be performed.
- c. If a bottom wash is specified, the wash head performs 1-9 additional simultaneous dispense and aspirate cycles at a lower level within the well. The lower level is defined as the *Bottom wash height* in the Plates Database. This optional function can be useful in lowering background values for assays that are particularly sensitive to washing. Including additional cycles at a lower position within the well provides a more concentrated wash in the area of the well where the majority of binding normally takes place.
- d. Click **Fill** to fill the wells with a specified amount of fluid. Select the fluid and volume (0-300 μL) in the *Fill Settings* dialog box.

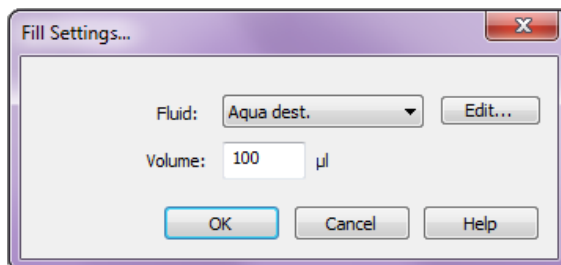




Figure 72: Fill Settings Dialog Box

- e. Click **Aspirate** to evacuate the contents of the wells by positioning the wash pins at the *aspiration height* and aspirate the liquid from the wells.
- f. The aspirate function should be selected at this point if the wells are to be left empty or *dry* following each dispense or fill. Normally wash protocols demand that fluid is left in the wells in order to provide a soak between each cycle. This can be achieved by not selecting the Aspirate function and enabling the **Do final aspirate cycle** in the main washer dialog box.

6.4.4.1.1 Modifying the Washing Steps

1. Click to highlight a previously entered *Dispense*, *Fill* or *Aspirate* step and click one of the following:
 - a. **Edit** to modify the selected operation
 - b. **Delete** to delete the selected operation
 - c. **Move up** to move the selected operation up in the wash order
 - d. **Move down** to move the selected operation down in the wash order
 2. Enter the **number of wash cycles** (1-9). All the steps listed in the operations panel are performed in their listed order for the specified number of times.
 3. Check **Constant timing** if all soak times should be kept consistent regardless of number of strips (samples) processed on a given plate. *REVELATION DSX* software adds waiting time when washing partial plates, in order to simulate the time to wash a complete plate.
 4. Select the cycle and sweep modes.
 - a. **Cycle Mode** –*REVELATION DSX* software can be programmed to wash plates in either *Strip-wise* or *Plate-wise* mode. If a 2 cycle wash is programmed in Strip-wise mode, then column 1 is washed 2 times before the wash is repeated on column 2. If a 2-cycle wash is programmed in Plate-wise mode then column 1 is washed once, followed by column 2 and repeated once for a total 2 complete cycles.
 - b. **Sweep Mode** – During a sweep mode, the aspiration tip moves from side-to-side during aspiration. The different sweep modes define the extent of the aspiration that takes places. Five sweep modes can be used:

<p>No sweep - Aspiration occurs by simply raising and lowering the aspiration pins.</p>	
<p>Always sweep - The aspiration pins move back and forth across the well after every cycle.</p>	
<p>Sweep on last cycle only - The aspiration pins move back and forth across the well during the last aspiration cycle.</p>	<p><u>Sweep</u></p>
<p>Always Super Sweep - The aspiration pins move in an X shaped pattern across the well after every cycle.</p>	
<p>Super sweep last cycle only - The aspiration pins move in an X shaped pattern across the well during the last aspiration cycle.</p>	<p><u>Super Sweep</u></p>
- ▶ **Note:** Select **No Sweep** for the sweep mode and disable bottom washing whenever a C-, U- or V-bottom plate is used.
5. To purge the washer before the wash operation starts, check the **Purge the washer** first checkbox and select the amount and type of wash fluid (1-9999 µL).

6. To clean the washer after the wash operation is complete, check the **Clean the washer** after use checkbox and select the amount and type of wash fluid (1-9999 μ L).
7. Click **Soak** in between cycles to select a soak option. The contents of the wells are allowed to equilibrate for the specified number of seconds. If Plate-wise mode is selected the soak delay occurs between complete plate cycles. If Strip-wise mode is selected the soak delay occurs between strips.
8. If Strip-wise washing is selected and the previous assay operation (excluding incubations) was a *Pipette Samples, Standards, Controls*, a further option **Synchronize soak delay from transfer timings** can be enabled. Checking this option causes a soak delay to be introduced between strips. This soak delay ensures that the first sample pipetted and the last sample pipetted incubates for the same duration. This function accounts for the drift traditionally caused by the time taken to pipette samples compared with the time taken to wash a plate.
9. To enable shaking during soak times, check **Shake while soaking using profile and** chose a shake profile between 1 and 5. Shake profiles vary by frequency and amplitude. Refer to the kit manufacturer for details if using this feature.
10. Click to save the operation and close the dialog box.

► **Note:** *Different assays may require additional washing and cleaning steps due to viscous nature of the solutions used. The end-user is responsible for adapting and validating the system for their specific assay and intended use.*

6.4.5 Incubate Plate

This operation schedules a plate to be put into the incubation module for incubation and shaking or the ambient plate drawer for incubation. The assay titles the operation *Incubate*.

This operation can occur at any point during the assay. There is no restriction in the number of *Incubate* operations per assay.

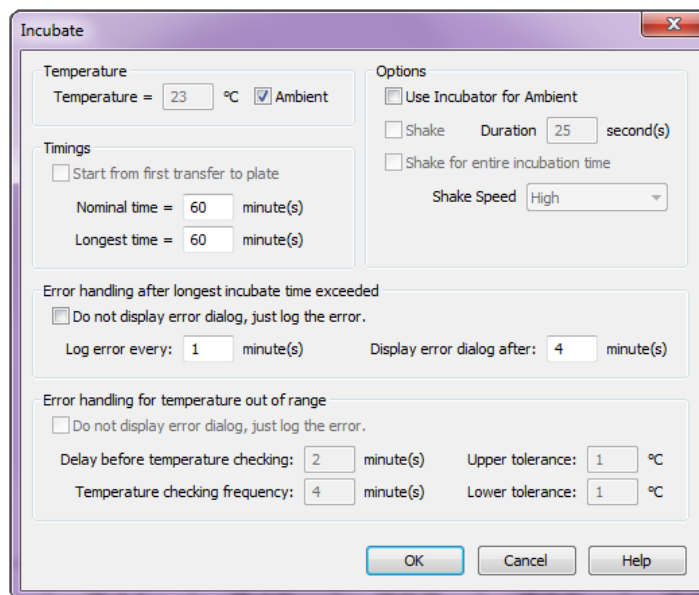


Figure 73: Incubate Dialog Box

1. Select **Operations → Insert Incubate Plate** from the menu bar.
2. Enter the **Temperature**.
 - a. Select **Temperature** or **Ambient**.
 - b. If temperature is selected, the temperature must be between 20° C and 50° C.
 - c. If ambient is selected, the plate is placed into its home position in the ambient plate drawer module.
3. Enter the **Timings**.
 - a. The **Start from first transfer to plate** checkbox is only available if a *Pipette Samples, Standards, Controls* operation is followed by an ambient incubation step.
 - This option causes the incubation time to start immediately after transfer of the first sample to the plate to prevent drift.
 - b. Enter a **Nominal** time and a **Longest time**.
 - The Nominal time is the shortest or ideal incubation time.
 - The Longest time is the longest time the plate can incubate.
 - Using a Longest incubation time that is different from the Nominal incubation time allows more flexibility when scheduling assays.
 - c. Enter the **Error Handling after longest incubation time exceeded**.
 - Enter the frequency at which timing errors should be logged in the event log.
 - If an error message should be displayed in addition to logging the error, uncheck the checkbox **Do not display error dialog, just log the error**.
 - Enter the delay before displaying the error message into the text box **Display error dialog after: x minute(s)**.
 - d. Enter on **Error handling for temperature out of range**.
 - This option is only available for incubations not taking place at ambient temperature.
 - Enter the upper and lower incubation temperature tolerances for triggering an error.
 - To display an error message as well as logging the error, place a check mark in the **Do not display error dialog, just log the error** checkbox.
 - If an error dialog will be displayed, define the delay time after starting incubation before the temperature is checked and the frequency at which the incubation temperature should be checked thereafter.
 - e. Select the **Options**.
 - Check the **Use Incubator for Ambient** checkbox to perform ambient incubations inside the incubator rather than in the ambient plate drawer.

- Select **Shake** to specify a shake duration for the plate during the incubation. Shaking can only occur when incubation is taking place inside an incubator module.

– or –

- Select **Shake for entire incubation time**.
- If shaking is selected, use the drop-down menu to specify the shaker speed:

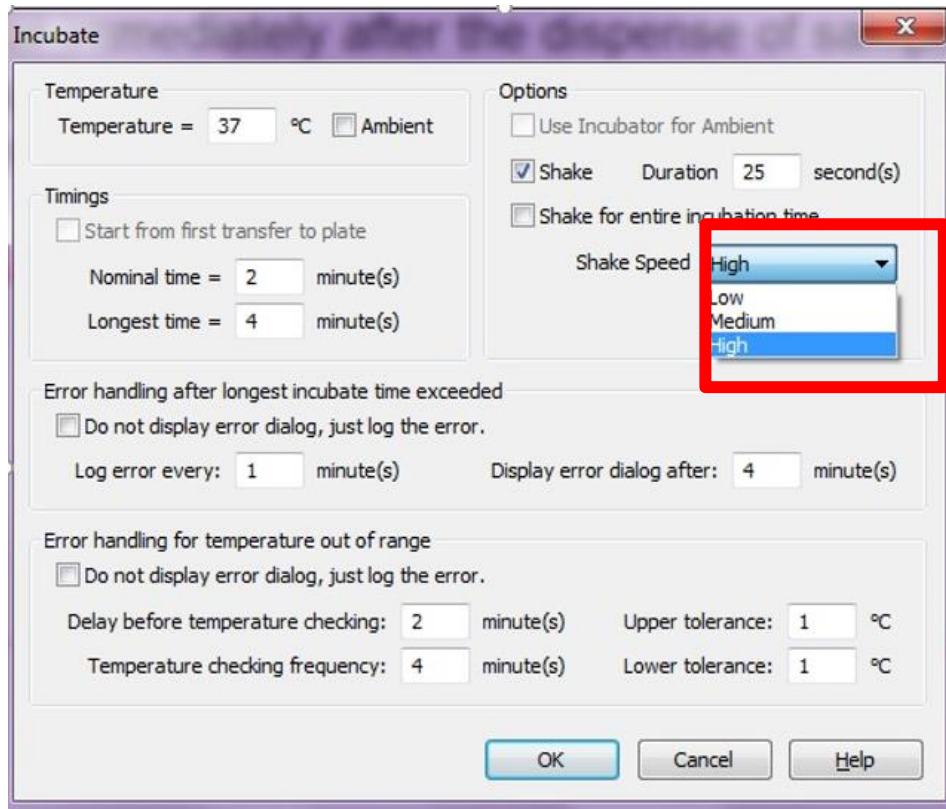


Figure 74: Shake Speed Drop-Down Selections

- Click  to save the operation and close the dialog box.

6.4.6 Well Fill Verify

This feature is a powerful tool that can verify that the wells of a plate have been filled. It verifies addition of fluid to wells by reading the plate following addition of sample and/or reagent. A colored solution must be in the plate in order for the wells to be read. A *Well Fill Verification* operation can occur at any point during the assay. There is no restriction in the number of *Well Fill Verification* operations that can be run during an assay.

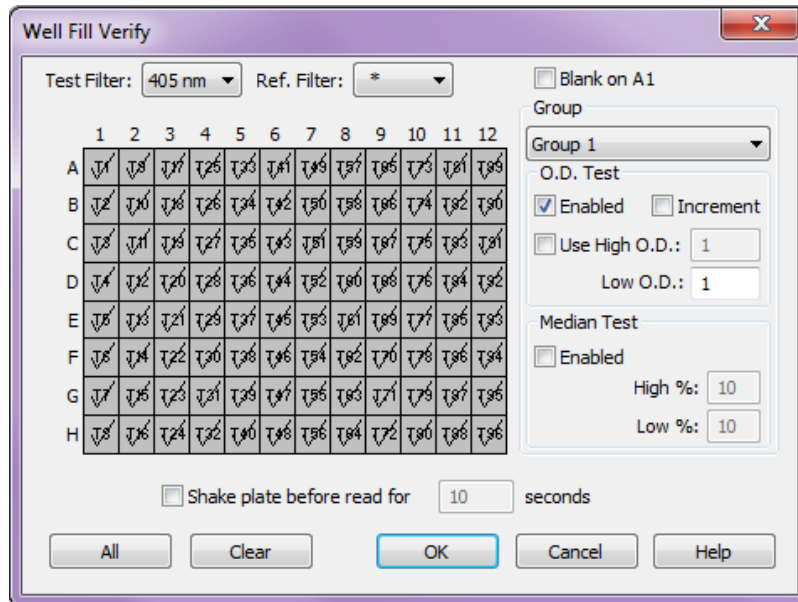


Figure 75: Well Fill Verify Dialog Box

1. Select **Operations** → **Insert Well Fill Verify** from the menu bar.
2. Enter the **Test Filter** and **Ref. Filter** at which the wells are read during well fill verification. Both are drop-down menus.

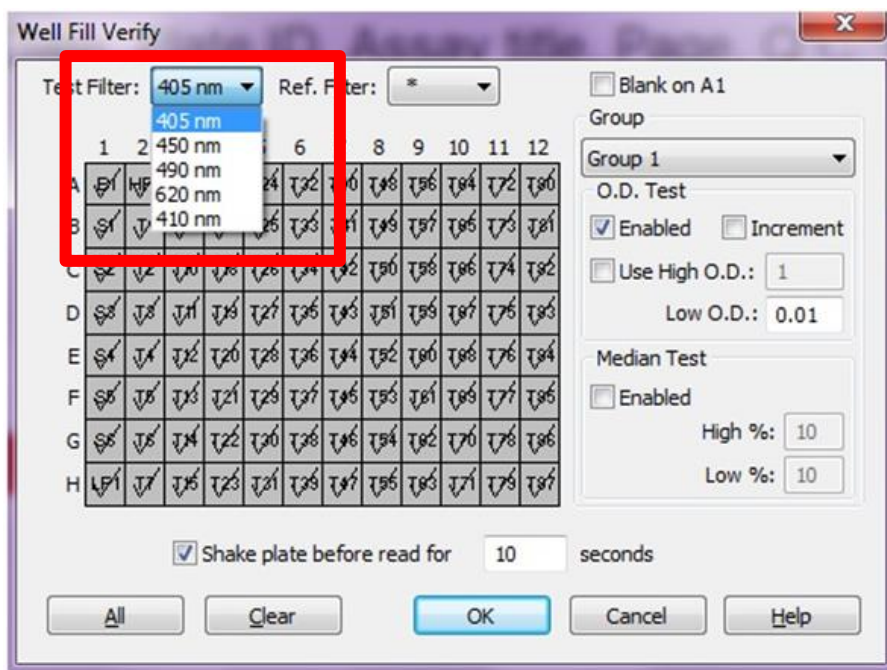


Figure 76: Test Filter Drop-down Selections

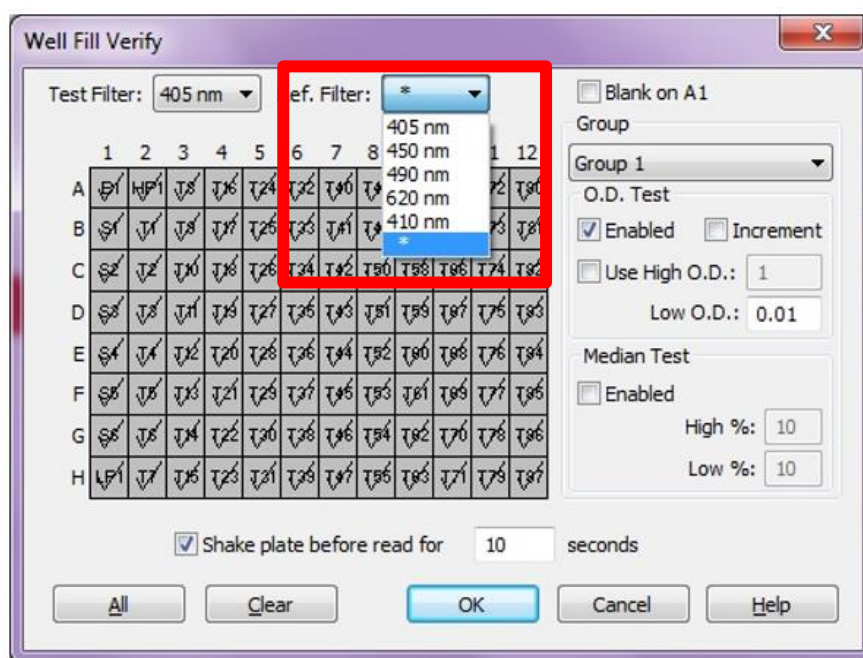


Figure 77: Ref. Filter Drop-Down Selections


3. Click the **Blank on A1** box if a blank well is located at well A1.
4. Click the required wells on the plate template to select the well locations for verification.
 - a. Select **All** to read all of the wells.
 - b. Select **Clear** to remove check marks from all of the wells.
5. Enable the Group but clicking on the drop-down menu.

6. Enable O.D. Test and/or Median Test.

a. **O.D. Test**

- Click on the **Enabled** checkbox to perform a verification based on optical density (OD).
- Click on the **Increment** checkbox if the previous well fill verification results should be subtracted from the active set before performing the test.
- Check **Use High O.D.** and enter values for the **High O.D.** and the **Low O.D.** to determine if the absorbance of each well falls within a specified OD range.
- Enter a value for **Low O.D.** only to determine if the absorbance of each well is above a minimum OD.
- Select **Increment** if the previous well fill verification results should be subtracted from the active set before performing the test.

b. **Median Test**


- To perform a verification test based on the specified percentage of the median OD of all selected wells, check the **Enabled** checkbox and enter values in the **High%** and **Low%** text boxes.
- To shake the plate prior to reading, click **Shake plate before read** and enter the number of seconds to shake the plate before the well fill verification is performed.
- Click  to save the *Well Fill Verify* operation.

6.5 Define Data Reduction Operations

REVELATION DSX software offers a broad spectrum of data reduction options.

Use the *Data Reduction* menu to create and edit assays and to select options that determine how the assay data are processed and printed. Some of the *Data Reduction* menu commands can also be accessed from buttons on the toolbar.



6.5.1 Assay Wizard

Select **Data Reduction** → **Wizard** from the menu bar or click the **Assay Wizard**  tool to start the assay wizard.

The assay wizard guides you step-by-step through all of the data reduction options as described in this chapter. The wizard displays the standard *Data Reduction* dialog boxes in the order they are listed in the *Data Reduction* menu, starting with the *Assay Title* dialog box.

The wizard dialog boxes contain buttons that allow navigation through the entire assay creation procedure.

6.5.2 Assay Title

1. Select **Data Reduction** → **Assay Title** from the menu bar or click the **Assay Title** tool  to enter the assay title, writer's name, password and an assay code to be checked against the plate ID at runtime. Change the default *Untitled Assay*.
 - a. Assay titles can consist of any characters you can type using the keyboard. The title is not the same as the assay file name. The file name is specified using the **Save As** command.
2. Enter the User ID or name of the person creating the assay in the **Written By** text box.
3. Enter (optional) a **password** to protect the assay. The password must be entered twice to confirm the entry.
 - a. Passwords can consist of any characters you can type using the keyboard and can be any length.
 - b. It is best to keep passwords short so that they are easier to remember. Each time you open a password protected assay, *REVELATION DSX* software prompts for the password.
 - c. If you enter the wrong password, *REVELATION DSX* software does not open the assay.
 - d. If you omit the password and click , *REVELATION DSX* software opens the assay in read-only mode.
4. Enter an optional plate prefix or suffix as the **Assay Code**.
 - a. The assay code can be used to help ensure that the correct plate is loaded for the selected assay.
 - b. If the prefix portion of the assay code is specified, the first characters of the Plate ID are checked to verify they match the prefix.
 - c. If the suffix portion of the assay code is specified, the final characters of the Plate ID are checked to verify they match the suffix.
 - d. If the corresponding characters of the Plate ID do not match the assay code, a warning message displays at the time the plate is loaded.
5. Click **Next**.

6.5.3 Reader Control

During operation, each microplate is automatically transferred to the absorbance module at the appropriate time and the optical densities of wells of the 96-well microplates are read. The *Reader* operation is automatically added to a new assay by *REVELATION DSX* software. The *Reader* operation contains:

- Read mode
- Filter(s) and wavelengths used
- Initial shake.

Edit the reader settings by positioning the cursor anywhere inside the *Reader* operation and double-clicking the mouse. There is only one *Reader* operation permitted per assay.

1. Select **Data Reduction → Reader Control** or select the **Reader Control** tool  to specify the read mode, filter wavelengths and to define a shake operation.

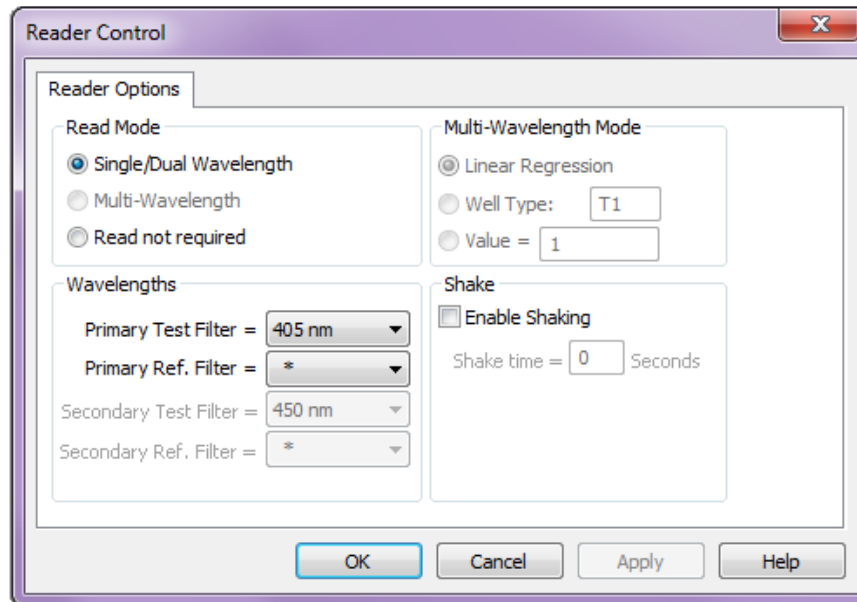




Figure 78: Reader Control Dialog Box

2. Select the **Read Mode**.
 - **Single/Dual Wavelength** - One reading is taken in single or dual wavelength mode. Dual mode uses a test filter and a reference filter for increased accuracy.
 - **Multi-wavelength** - Currently not supported.
 - **Read not required** - Bypasses the plate read. If a read is not required, select this option.
3. The reader can take readings in single **wavelength** mode (using one filter) or in dual wavelength mode (using two filters). If two filters are used, the first filter is the test filter and the second filter is the reference filter. Use of a reference filter can reduce errors caused by dirt and scratches on the bottom of wells. Use the drop-down list to select the test filter and reference filter (if required) wavelengths. The list of available filters is generated from values entered during configuration using the **Tools → Configure System → Absorbance Reader** tab.
6. Click the box to place a check mark next to **Enable Shaking** to shake the plate prior to reading to minimize interference of air bubbles with the reading and specify the duration (in seconds) of the shaking.
7. Click .

6.5.4 Template

The Template option is used to define the contents (sample, control, blank, etc.) of each well on the plate, including the number of replicates, replicate orientation and fill direction.

1. Select **Data Reduction** → **Template**.
2. Click the **Template** tool  or click the **Template** button on selected dialog boxes to display the *Template* dialog box.

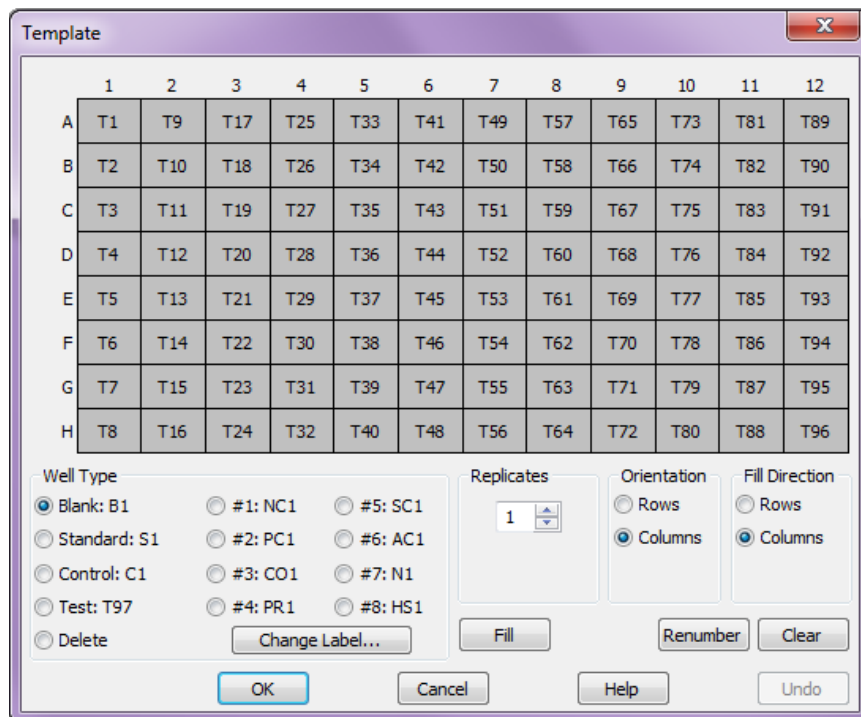


Figure 79: Template Dialog Box

The Template dialog box contains a list of descriptions for all of the selections in the template dialog box:

Table 37: Template Description

Field	Description
Diagram	8 x 12 microplate diagram showing the currently assigned well types. By default, all 96 well positions in the microwell template are set to well type T for test.
Well Type	
Blank: B1	Blank well
Standard: S1	Standard well
Control: C1	Control well
Test: T97	Patient test well

Field	Description
Delete	To delete a well type entry for a particular well, select the Delete radio button and click the required position on the template.
#1: NC1	Negative Control
#2: PC1	Positive Control
#3: CO1	Cut-off Control
#4: PR1	Positive Reference
#5: SC1	Serum Control
#6: AC1	Antigen Control
#7: N1	Negative Control
#8: HS1	Haemolyzed Sample
Replicates	
Drop-down box	Each well type can be copied into a number of replicates. Enter or select the number of replicates, from 1 to 96.
Orientation	
If more than one replicate is selected, use the orientation option to determine whether replicates are added across rows or down columns.	
Rows	
Columns	
Fill Direction	
Used with the fill command to select the direction in which the template wells will be filled by row or column.	
Buttons	
Change Label...	Rename the label name if needed.
Fill	Fill all the empty wells on the template with the current well type. Select the well type, number of replicates and the orientation of the replicates. Use the Fill Direction radio button to select the orientation of the samples and click Fill
Renumber	If samples were deleted while editing the template, there may be gaps in the numbered sequence of some well types. The Renumber option numbers all the samples of each well type sequentially.
Clear	Clear all the existing well assignments, so that you can redefine the template from scratch.

Field	Description
OK	System will perform the acts that the user has selected.
Cancel	System will cancel all acts that the user has selected. They will not be performed.
Help	The help documentation will be displayed.
Undo	The last command that was selected will be removed and will not be performed.


6.5.4.1 Change the Well Type

By default, all 96 well positions in the microwell template are set to well type **T** for test. To change the well type:

1. Select the radio button associated with the required **Well Type**.
2. Select the number of **Replicates**.
3. Select **Rows** or **Columns** orientation.
4. Double-click the microplate position for the first replicate.
5. The position(s) are labelled with the well type abbreviation and sequentially assigned a number. Well labels are identical for replicate wells.

► **Note:** *Samples are assigned according to available space. If you select a format that does not fit into the available space, REVELATION DSX software does not assign the samples.*

6.5.4.2 Change the Well Type Color-Coding

1. To modify well type color-coding, select **Tools** → **Options** from the menu bar and select the *Colors* tab.
2. Select the required well type radio button. The text color changes to show the current color for the selected well type.
3. Use the color scrollbars to select a new color. The selected color will be used on the template display on screen and on the printout if a color printer is used.
4. Click  to save the changes.

6.5.4.3 Change the Well Label

1. Select the radio button for the well type to be renamed.
2. Click the **Change Label** button. The *Change label* dialog box displays.

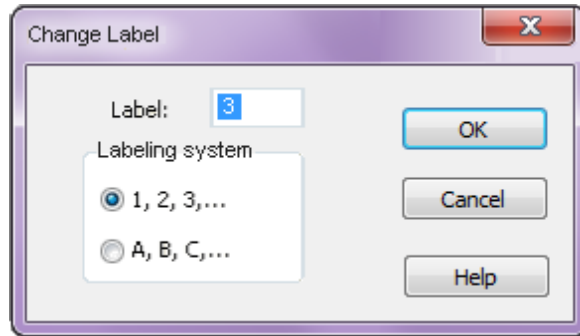


Figure 80: Change Label Dialog Box

3. Type the new label (up to 3 characters) to be used in place of the default abbreviation.
4. Select whether sequential numbers or letters should be used to identify the wells.
5. Click to save the changes to the well type definition.

6.5.5 Blank Mode

The reader automatically uses air transmission as a reference for 100% transmission. For certain applications other references may be more appropriate. To set a different blank mode, select **Data Reduction** → **Blank Mode** from the menu bar or select the **Blank Mode** tool.

Blanking is useful. **Example:** To eliminate the absorbance of a reagent solution from the result. *REVELATION DSX* software can store the OD value of this reagent solution in memory as a blank value and subtract it from the other well values on the plate.

REVELATION DSX software always subtracts the blank value from the individual well value before any other processing calculation is made. If any of the other wells are arranged in multiple replicates, the blank value is subtracted before the average of the replicates is calculated.

REVELATION DSX software allows you to choose from nine different blank modes (Figure 81). Some of these modes require a certain number of blanks on the template.

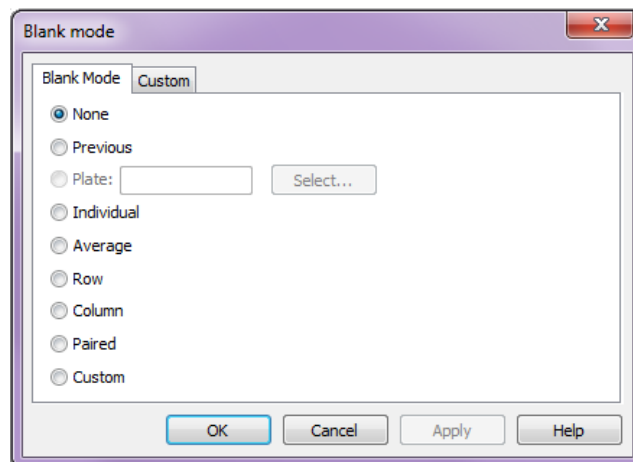


Figure 81: Blank Mode Dialog Box

The following is a list of the Blank Mode descriptions that are listed in the Blank mode dialog box.

Table 38: Blank Mode Descriptions

Field	Description
None	To use the transmission of air as the reference level for 100% transmission, select the None radio button.
Previous	<p>When <i>REVELATION DSX</i> software finishes reading a plate, it stores the plate's blank value. Previous blanking uses this stored blank value as the blank value for wells on the current plate. If the previous plate did not use blanking, then air transmission is used.</p> <p>No blank samples are required on the plate for Previous blank mode.</p>
Plate	<p>In Plate mode, <i>REVELATION DSX</i> software uses the data matrix from a previously read plate as a blank matrix for the current plate. Revelation prompts for the plate ID to use. It then subtracts the 96 values in the data file from the 96 wells on the current plate on a well-by-well basis.</p> <p>No blank samples are required on the plate for Plate blanking mode.</p>
Individual	<p>Individual blanking uses the last blank value read as the reference for subsequent readings.</p> <p><i>REVELATION DSX</i> software reads the plate column by column in the order A1 to H1, A2 to H2, etc. Each time it encounters a blank, it replaces the stored blank value with the new reading. This value is subtracted from all subsequent readings.</p> <p>► Note: <i>If a blank contains replicates that are all arranged down one column, only the last blank value is used as a reference in any calculations.</i></p>
Average	Average blanking mode requires one or more blank sample on the plate. The ODs for all blank samples are averaged and the averaged value is subtracted from every other reading on the plate.
Row	Row blanking averages all blanks in one row to create a reference for that row. This value is then subtracted from all other readings in the row.
Column	Column blanking averages all blanks in one column to create a reference for that row. This value is then subtracted from all other readings in the row.
Paired	Paired blanking associates one blank sample with each test, standard or control sample in the following order: tests, standards, controls, positive controls, negative controls, cut-off controls, user well types 1 to 8.

Field	Description
	<p>To use paired blanking, the number of blank samples on the template must equal the total number of all the other sample types.</p> <p>Example:</p> <p>If a plate contains three standard samples and eight test samples, 11 Blank samples are required. <i>REVELATION DSX</i> software assigns the blanks:</p> <ul style="list-style-type: none"> • Blanks 1-8 are assigned to test samples 1-8. • Blanks 9-11 are assigned to standard samples 1-3. • If the blank samples are arranged in multiple replicates, <i>REVELATION DSX</i> software averages the replicates to produce a total of 11 blank values. <p>The blank values are subtracted from the assigned samples. Blank value 1 is subtracted from Test 1; blank value 2 is subtracted from Test 2. If any of the Test or Standard samples contains more than one replicate, the blank value is subtracted from each replicate rather than from the whole sample average.</p>
Custom	<p>Custom works in a similar way to paired blanking, except that you can assign Blank samples to whichever non-Blank sample you want. To define the Custom blank mode settings, select the Custom tab.</p> <p>Every Blank sample is listed in the Blanks list box. Every non-Blank sample is listed in the Subtract list box.</p>

6.5.5.1 Custom Blank Mode

Custom blanking is similar to paired blanking except blank samples are manually paired with other samples.

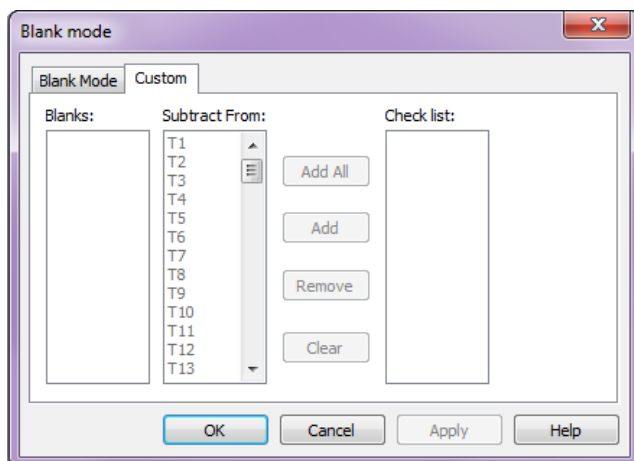


Figure 82: Blank Mode Custom Option

Blanks: list box: Lists all blank samples.

Subtract From: list box lists all non-blank samples.

Add All: Subtract the blank sample highlighted in the **Blanks** list box from all the samples on the plate.

Add: Subtract the blank sample highlighted in the **Blanks** list box from the samples highlighted in the **Subtract From:** list box.


Remove: Remove the pairing between the sample highlighted in the **Checklist** box and the blank highlighted in the **Blanks** list box.


Clear: Remove all pairing for the blank highlighted in the **Blanks:** list box.


Check list: To confirm selections, highlight a blank sample in the **Blanks:** list box. All paired samples are displayed in the **Check list:** box.

6.5.6 Quality Control (QC)

QC equations are used to validate data output from an assay. If the restrictions are not met, the results report contains a message indicating that the data failed QC. QC equations can be used with:

Raw Data – Select **Data Reduction** → **Q.C. Raw Data** from the menu bar or select the QC tool .

Threshold Data – Select **Data Reduction** → **Threshold** from the menu bar or select the Threshold tool  and select the *Threshold Q.C.* tab.

Curve Fit Data – Select **Data Reduction** → **Curve Fit** from the menu bar or select the Curve Fit tool  and select the *Calculated Q.C.* tab.

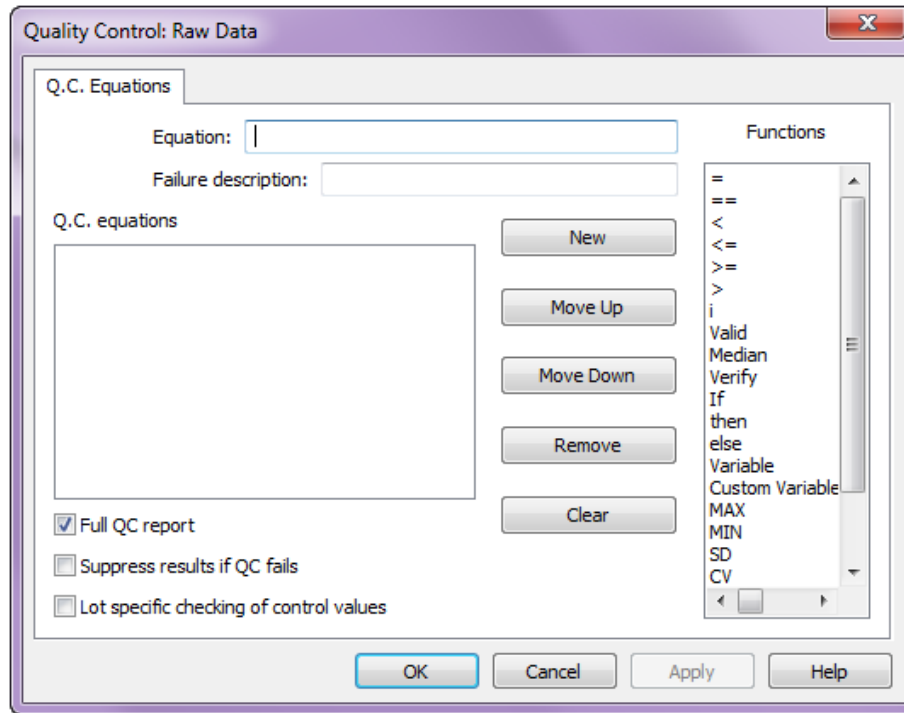


Figure 83: Quality Control: Raw Data Dialog Box

Table 39 lists controls for the *Q.C. equations* dialog box.

Table 39: Q.C. Equations Dialog Controls


Controls	Description
Equation	Type each new equation into the <i>Equation</i> text box. As you enter the equation, it displays in the <i>Q.C. equations</i> list below.
Failure description	Enter the message that is to be displayed if the Q.C. test does not pass.
Q.C. equations	As you enter each equation, it is added to equations list. The equations are processed in the order they are listed. The order can be very Important: Example: equations containing Validity expressions are used to check that a previous equation did not eliminate too many values. A Validity expression equation must be placed below the equation that is eliminating outlier values.
Functions	To add one of these functions into the equation, double-click the required item.
New	Click New to create a new equation.
Move Up/Down	These buttons are used to change the order of the equations in the <i>Q.C. equations</i> list box. To reposition an equation in the list, select it in the <i>Q.C. equations</i> list box and select Move Up or Move Down .
Remove	Removes the selected equation from the list.

Controls	Description
Clear	Clears all of the equations from the equation list.
Full QC report	To include all of the QC data (equations, values, etc.) in the results report, place a check mark in the <i>Full QC Report</i> checkbox. If only the QC equations that fail are to be included, leave the checkbox empty.
Suppress Results if QC fails	To prevent results from being printed if QC fails, place a check mark in the <i>Suppress results if QC fails</i> checkbox.
Lot specific checking of control values	To check recovered values on controls against lot specific values, place a check mark in the <i>Lot specific checking of control values</i> checkbox.

6.5.6.1.1 Entering Quality Control Equations

1. Use the keyboard to enter numbers, arithmetic operators, brackets and well values.
2. Quality Control equations can contain any numbers or characters but they can only contain spaces in conditional expressions. When using a conditional expression, you must insert a space after IF, before ELSE and before and after THEN.

For example: If {condition} then {expression} else {expression}

3. Double-click an entry in the **Functions** list box to enter a function
4. When finished entering the equations, click .
5. *REVELATION DSX* software checks each equation. If any of the equations are not valid, *REVELATION DSX* software displays an error message.

6.5.6.1.2 Quality Control Syntax

The following table displays some of the equation components syntax used for data reduction of an assay protocol.

Table 40: Equation Components and Values

Equation Components	Values
Numbers	0 to 9
Standard Arithmetic Operators	+ addition - subtraction/division * multiplication ** power of
Brackets	Up to six levels of parentheses are allowed.
Well Values	You can enter the average value of a well type or sample or you can enter the individual value of a sample replicate. The endpoint assay value in the well is an OD. Example: T represents the mean of all the test well values. T1 represents the mean of the replicates of T1 (if T1 contains multiple replicates) or the individual value of T1. T1.1 represents the value of the first replicate of T1.
Logarithmic Functions	Log: Base 10 logarithm Alog: Inverse base 10 logarithm Ln: Natural logarithm Exp: Inverse natural logarithm. (exponential function e^x).
Minimum/Maximum of a group of values	MIN or MAX represents the highest or lowest value on the plate or within a group of values. The group of values can be a well type or a sample if it contains multiple replicates. Example: MIN(PC) The lowest value of all the positive control samples. Example: MIN The lowest value on the plate.
Coefficient of Variation – CV()	CV represents the coefficient of variation within a group of values. The group of values can be a well type or a sample if it contains multiple replicates. Example: CV(T1) The value inserted into the equation will be the coefficient of variation between every replicate of Test 1.

Equation Components	Values
Standard Deviation - SD()	<p>SD represents the standard deviation within a group of values. The group of values can be a well type or a sample if it contains multiple replicates.</p> <p>Example: SD(T)</p> <p>The value inserted into the equation will be the standard deviation between every Test sample.</p>
Variables	<p>Variables represent values that must be entered at runtime. Five variables are allowed per assay.</p> <p>Example: variable1</p> <p>You will have to enter this number at runtime (Chapter 7.6).</p>
Each sample of a well type – i	<p>The i expression represents each sample of a well type.</p> <p>Example: $0.75 * C < C_i < 1.25 * C$</p> <p>Each Control sample must be within 25% of the mean of the Control samples or that well is removed from the calculations. Expressions containing “i” often lead to values being excluded from the calculations. If every value in a certain well type is excluded and this well type is used in other QC equations, the QC operation will not work properly. To solve this, each equation containing “i” should be accompanied by a Validity expression. This will ensure that if too many values are rejected the test will fail.</p>
Median of a group of values - Median()	<p>Median represents the median of a group of values. If all values in the group are listed, the median is the value in the middle of the list. If the list contains an even number of values, the median is the mean of the middle two values. The group of values can be a well type or a sample if it contains multiple replicates.</p> <p>Example: Median(C)</p> <p>The value calculated will be the median of all the Control values.</p>
Valid Number of Values - Valid()	<p>A Valid() expression indicates that a specified number of values within a group must pass the other QC equations otherwise the data fails QC. The group of values can be a well type or a sample if it contains multiple replicates.</p> <p>Example: Valid(PC)>=3</p> <p>The number of valid PC samples must be greater than or equal to 3 or the data fails QC.</p>

Equation Components	Values
Inequality Symbols	<p>> Greater than</p> <p>>= Greater than or equal to</p> <p>< Less than</p> <p><= Less than or equal to</p>
Equals comparison	<p>An equals comparison is represented by ==. It indicates that one value must be equal to another.</p> <p>Example: NC1.1==2.953</p> <p>The first replicate of NC1 must equal 2.953 or the data fails QC.</p>
Assignment	<p>An assignment expression is represented by =. It indicates that, depending on certain criteria, a well type, sample or replicate should be assigned a certain value.</p> <p>Example: If $NC_i < 0.0$ then $NC_i = 0.0$</p> <p>If every NC value is less than 0.0, then let every NC value be assigned a value of 0.0.</p>
Conditions - If, then and else	<p>Conditional expressions are represented by if, then and else.</p> <p>Format: If {condition} then {expression} else {expression}</p> <p>Example: If $PC < 0.2$ then $NC > 0.5$ else $NC > 0.1$</p> <p>If the average PC value is less than 0.2</p> <p>then the average NC value must be more than 0.5</p> <p>else the average NC value must be more than 0.1</p> <p>If these conditions are not met, the data fails QC.</p>
Verify Number of Values - verify()	<p>Verify() represents a verify values expression. This indicates that a specified number of values within a group must be within specified limits, otherwise the data fails QC. The group of values can be a well type or a sample if it contains multiple replicates. Verify expressions take the form:</p> <p>Verify(value,limit,mode)</p>
	<p>Value can represent:</p> <p>A well type, in which case <i>REVELATION DSX</i> software checks the number of verified samples in the specified well type.</p> <p>A sample, in which case <i>REVELATION DSX</i> software checks the number of verified replicates in the specified sample.</p>

Equation Components	Values
	<p>Mode is used to qualify the limit.</p> <p>Mode 0 indicates that the limit relates to the mean of all the values. Example: If the value is PC1, the limit is 50% and the mode is 0: <i>REVELATION DSX</i> software will average all the replicate values of PC1 and check that every replicate of PC1 is within 50% of the average value.</p> <p>Mode 1 indicates that the limit relates to the mean of every other value. Example: If the value is PC1, the limit is 50% and the mode is 1: <i>REVELATION DSX</i> software will average all the replicate values of PC1 except the value currently being processed. It will then check that the current replicate is within 50% of the average of all the other replicates.</p> <p>Mode 2 indicates that the limit relates to the median of all the values. Example: If the value is PC1, the limit is 50% and the mode is 2: <i>REVELATION DSX</i> software will calculate the median of the replicates of PC1 and check that every replicate of PC1 is within 50% of the median.</p>
	<p>Limit determines the range into which values must fall to be verified. A limit can be:</p> <p>A number Example: if the value is PC, the mode is 0 and the limit is 0.2: <i>REVELATION DSX</i> software checks that every PC sample is within 0.2 of the average of all the samples.</p> <p>A percentage Example: if the value is PC, the mode is 0 and the limit is 20%: <i>REVELATION DSX</i> software checks that every PC sample is within 20% of the average of all the samples.</p> <p>A standard deviation Example: if the value is PC, the mode is 0 and the limit is 1.5 SD: <i>REVELATION DSX</i> software checks that the standard deviation of the PC samples is within 1.5 SD.</p> <p>Example: <code>verify(T,10%,2)>=3</code> The number of verified test samples must be greater than or equal to 3. A verified sample is one that falls within 10% of the mean of all the other test samples.</p>

6.5.6.2 Data Processing Options

The assay wizard displays the *Data Processing Options* dialog box as the next dialog box after the *Quality Control: Raw Data* dialog box. Each of the four data processing options (Figure 84) can also be accessed via the corresponding tool or from the *Data Reduction* menu.

1. **Threshold**
 - a. Data are output as a table or matrix of symbols, denoting positive and negative results.
2. **Ratio**
 - a. Data are output as a matrix or table of results that have been scaled using an equation.
3. **Curve Fit**
 - a. In curve fit processing *REVELATION DSX* software measures the readings for standard samples of known concentrations. From this data it plots a graph that is used to read the concentrations of test samples.
4. **Spreadsheet**
 - a. Spreadsheet data are output as a matrix or table of results obtained by adding or subtracting well values from one another.

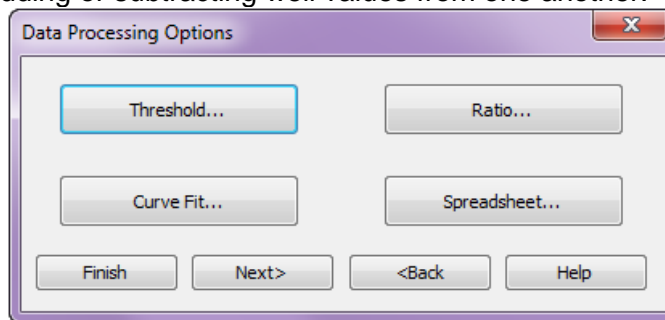


Figure 84: Data Processing Options Dialog Box

6.5.6.3 Output Format Tab

The *Output Format* tab is available for all four data processing options (Threshold, Ratio, Curve Fit and Spreadsheet).

Select **Data Reduction** → **Threshold**, **Ratio**, **Curve Fit** or **Spreadsheet** from the menu bar and select the *Output Format* tab to specify the output format for the data.

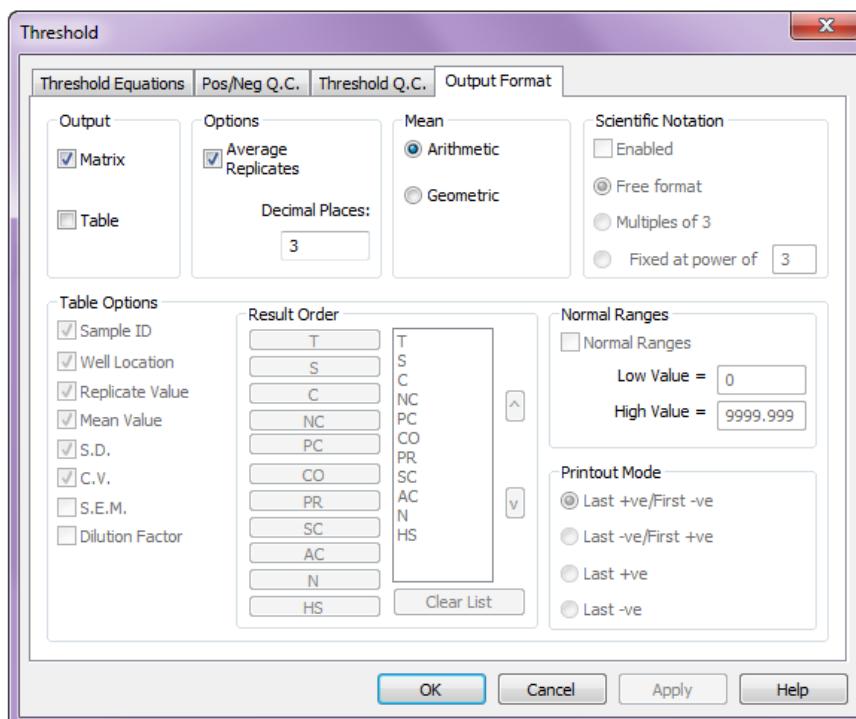


Figure 85: Output Format Tab

6.5.6.3.1 Output

Check the **Matrix** checkbox and/or the **Table** checkbox to output the data as a matrix and/or a table. Some options are only available if the *Table* option is selected.

Matrix displays the values obtained from each well location, in terms of its position on the plate.

Table shows the values obtained from each sample replicate in terms of its well type. *REVELATION DSX* software may overwrite sections of the data in the table output if too many different table options are selected. If data are overwritten, try using a matrix instead of a table or try removing some of the table options.

6.5.6.3.2 Options

% Error – Variation from the predicted concentration.

Arithmetic – Reports the arithmetic mean of replicate determinations.

Average Replicates – To average replicates, check the *Average Replicates* checkbox. The replicates are averaged before any other calculations take place.

C.V. – Coefficient of variation of the replicates for a particular well type or sample ID.

Decimal Places – Enter the required number of decimal places (0-6) for calculations to be rounded to in the output (Chapter 7.15.1).

Dilution Factor – Dilution of every sample (if you entered one).

Fixed at... – Allows you to enter an exponent manually.

Free format – Results are displayed in the most appropriate format.

Geometric – Reports the geometric mean (the antilog of the mean of the logarithms) of replicate determinations. Reporting the geometric mean is useful when the imprecision is directly proportional to the level.

Mean Value – Mean value of the all replicates for a particular well type or sample ID.

6.5.6.3.3 Means

Multiples of 3 – Limits the number of significant figures to multiples of three.

Predicted Conc. – Expected concentration for the well type.

Replicate Value – Raw data value for the well type or sample ID replicate.

S.D. – Standard deviation value of the replicates for a particular well type or sample ID.

S.E.M. – Standard error of the mean of the replicates for a particular well type or sample ID.

Sample ID – Sample Identification

6.5.6.3.4 Scientific Notation

Some options are not available for certain data processing options, while some are mandatory. Options that are unavailable are unchecked and grayed out. Options that are mandatory are checked and grayed out.

6.5.6.3.5 Table Options

Well location – Well location on the plate template the sample was pipetted (e.g., A1.)

6.5.6.3.6 Result Order

When *Table* output is selected, the data can be reported in order according to well type.

1. Select **Clear List** to change the output order.
2. Click the well types in the order you want them to display. All well types must be in the list prior to exiting the dialog box, even if a well type is not in use in the assay.
3. Double-click a well type to move it to the top of the list.

6.5.6.3.7 Normal Ranges (Threshold output format only)

Set a range within which you expect all normal results to fall. *REVELATION DSX* software flags any results that fall outside this range with an asterisk (*) character.

6.5.6.3.8 Printout Mode (Threshold output format only)

Use this option to identify the crossover between positive and negative in a dilution operation. This option exists to flag the change from positive to negative or from negative to positive, the last positive result or the last negative result.

6.5.6.4 Results Flagging Tab

Use results flagging to specify a phrase that either replaces a numerical result or displays next to the result. The phrase is output whenever the numerical result meets the specified criteria. Select **Data Reduction** → **Ratio**, **Curve Fit** or **Spreadsheet** from the menu bar and select the *Results Flagging* tab to flag results.

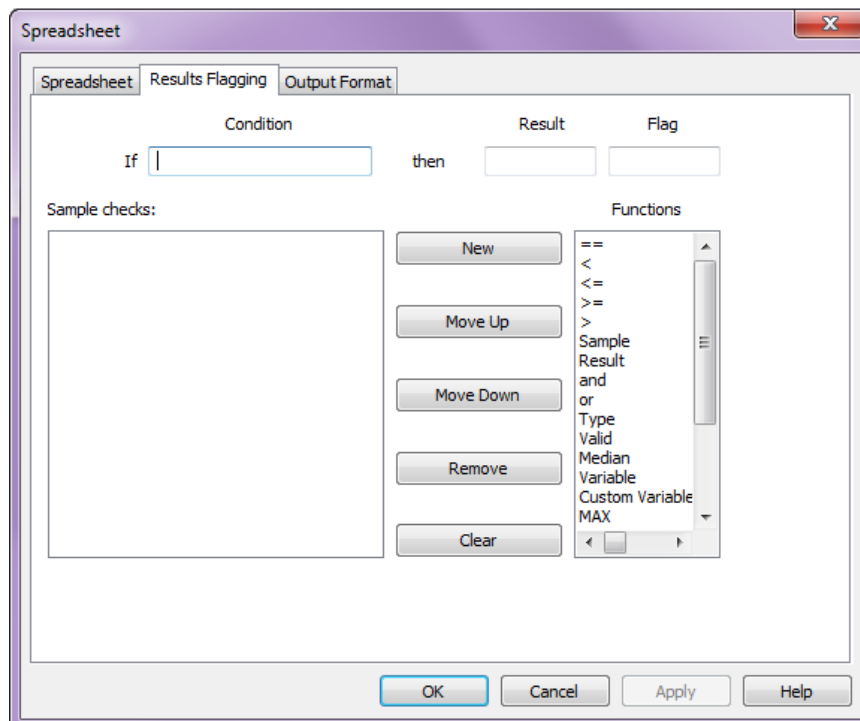


Figure 86: Results Flagging Tab

Results flagging can be used, Example: to report the phrase < 20 milligrams per deciliter (mg/dL) instead of the actual numerical result whenever results are less than 20 mg/dL. Or, *Abnormal High* can be displayed to flag results higher than a specified level.

6.5.6.4.1 Results Flagging Equations

Although several unique elements are used for constructing a results flagging expression, the expression is created in the same way described in Chapter 6.5.6.1.1.

Condition – Enter the results flagging expression in the *Condition* text box.

Result – If the numerical result is to be replaced by a phrase, enter the phrase in the *Result* text box.

Flag – If the numerical result is to be accompanied by a phrase, enter the phrase in the *Flag* text box.

An unlimited number of results flagging expressions can be defined for an assay. The following unique elements are available to create results flagging equations.


Type () – Use the **Type** keyword to designate the well type (Standards, Controls, Tests, etc.) that a results flagging equation is applied to. Example: the expression “Type(C)=0” means that this equation applies only to the control wells.

Sample (for OD values) - Use the **Sample** keyword to designate the absorbance or fluorescence of a particular sample, replicate or well type in the same manner used in Q.C. Raw Data equations.

Result (Sample) (for calculated values) - Use the **Result(Sample)** construct to designate the calculated concentration of a sample instead of the absorbance values that were obtained. Example: the expression “Result (Sample)<1.23” can be created to set a lower limit of 1.23 mg/ml for the calculated value for any test sample. Then, whenever the value of a sample is less than 1.23 mg/ml, the designated phrase is displayed.

and or operators – Use the **and** or the **or** operator in a results flagging expression to test multiple conditions.

6.5.7 Threshold

Select **Data Reduction** → **Threshold** from the menu bar or select the Threshold tool  to output data as a table or matrix of symbols denoting positive or negative results. To include threshold processing in the assay, check the **Enabled** checkbox in the *Threshold Equations* tab.

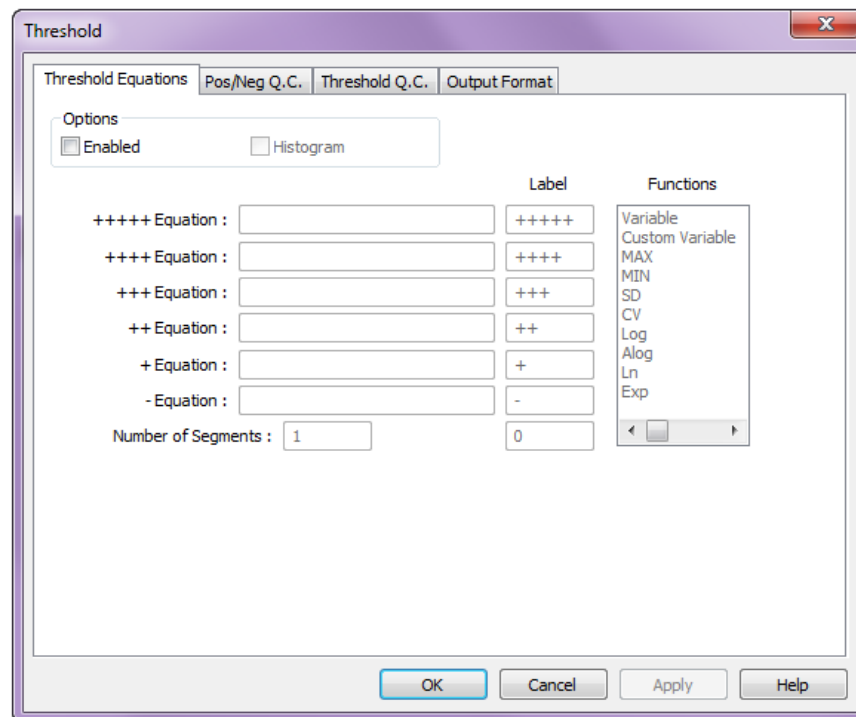


Figure 87: Threshold Dialog Box

6.5.7.1 Threshold Equations Tab

Select **Data Reduction** → **Threshold** from the menu bar or select the Threshold tool. The *Threshold Equations* tab is displayed by default.

6.5.7.1.1 Options

Check **Enabled** to include threshold processing in the assay and to activate fields in the *Threshold Equations* tab.

Check **Histogram** to include a histogram showing the spread of wells within each threshold range in the result reports.

6.5.7.1.2 Equations

In a threshold matrix, results are classified into positive and negative threshold ranges. These ranges are defined by threshold limits that are set using threshold equations.

A negative limit is set using the **-Equation** and a positive limit is set using the **+Equation**. Positive and negative limits are required, but four extra positive levels (++, +++, +++++, ++++++) are also available.

Threshold limits can be entered directly as absolute numbers. That is, a result is recorded as positive or negative if it falls above or below a certain number. In other cases it may be necessary to introduce conditions into the equation. Example: test samples could be qualified as positive or negative by comparing them to a control sample or the average of a number of samples.

The value resulting from the **-Equation** is called the **- value**. The value resulting from the **+Equation** is called the **+ value**.

If the **- value** is lower than or equal to the **+ value**, then:

ODs below the - value are negative.

ODs equal to and above the + value are positive.

If the **- value** is higher than the **+ value**, then:

ODs equal to and below the + value are positive.

ODs above the - value are negative.

ODs equal to the - value are borderline.

6.5.7.1.3 Label


To change the default labels, type the replacement label in the text box. Custom labels may contain up to five letters or symbols.

6.5.7.1.4 Number of Segments

If there is a large difference between the lower limit of the positive range and the upper limit of the negative range, many readings may fall between the two. This neutral area can be divided up into ten segments that are numbered 0 to 9. These segments are numbered upwards from the negative end of the neutral area. The highest number is the closest to a positive result.

Example: If there are two segments and the OD for well A1 falls into the second segment, it is shown in the results by the number 1. To insert more than one segment, type a number in the **Number of Segments** text box.

6.5.7.1.5 Entering Threshold Equations

1. Use the keyboard to enter numbers, arithmetic operators, brackets and well values. Threshold equations can contain any number or characters, but they cannot contain any spaces.
2. Double-click an entry in the **Functions** list box to enter a function.
3. When you have finished entering the equations, click .
4. *REVELATION DSX* software checks each equation. If any of the equations are not valid, *REVELATION DSX* software displays an error message.

Chapter 6.5.6.1.2 includes a description of the equation components available for threshold equations.

6.5.7.1.6 Examples

Values above the result of Cut-off Control 1 plus 0.4 are positive.

For the **+ positive** equation enter: **CO1+0.4**

Values above the result of Cut-off Control 1 plus 0.6 are double positive.

For the **++ positive** equation enter: **CO1+0.6**

Values below the result of Cut-off Control 1 minus 0.4 are negative.

For the **- negative** equation enter: **CO1-0.4**

6.5.7.2 Threshold Pos./Neg. Q.C. Tab

Select **Data Reduction → Threshold** from the menu bar or select the Threshold tool and select the **Pos./Neg. Q.C.** tab to assign expected positive and negative results to well types. This option allows you to assign an expected result (++++, +++, ++, + or -) to each well type (if the threshold Label was changed from the default, the new label must be used for Q.C.). All samples of that well type must fall into the required result range or the well type fails QC and a warning is displayed in the results report.

6.5.7.3 Threshold Q.C. Tab


Select **Data Reduction → Threshold** from the menu bar or select the Threshold tool and select the **Threshold Q.C.** tab to assign quality control restrictions to the threshold data. If the restrictions are not met, the data are processed as normal, but the results report contains a message showing that the threshold data failed Q.C.

6.5.7.4 Threshold Output Format Tab

Select **Data Reduction → Threshold** from the menu bar or select the Threshold tool and select the **Output Format** tab to specify the output format for the data (Chapter 6.5.6.3).

6.5.8 Curve Fit

In curve fit processing *REVELATION DSX* software measures the readings for standard samples of known concentrations. From this data it plots a graph that is used to read the concentrations of test samples. To include curve fitting in the assay, select **Data Reduction**

→ **Curve Fit** from the menu bar or select the Curve Fit tool .

To create a curve fit, you must define Standard samples on the template and each of these must be assigned a concentration. *REVELATION DSX* software does not allow curve fit creation before the Standard samples have been defined.

The number of fits included in an assay is unlimited, but there is a limit on the size of a data file. If more than four curves are added to the assay, *REVELATION DSX* software may have problems processing the file.

Each curve fit must be assigned a different name and must be added to the curve fit list. The settings entered using each tab are exclusive to the curve fit that is selected in the **Fit Name** text box in the *Fits* tab. The only tab that applies to the whole curve fit option and not an individual fit, is the *Output Format* tab.

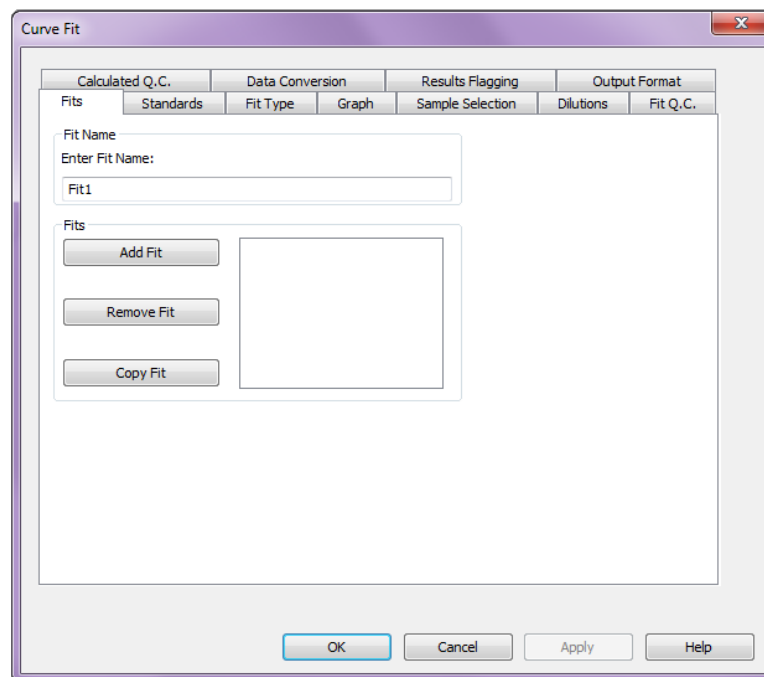


Figure 88: Curve Fit Dialog Box

6.5.8.1 Curve Fit Fits Tab

Select the **Curve Fit** tool and select the **Fits** tab to insert curves into the assay and define curve names.

Fit Name – By default, curves are named Fit1, Fit2 and so on. To include a fit in the assay, the other settings must be defined using the other tabs in the Curve Fit operation. Once the curve fit definition is complete, click **Add** on the fits tab to add the curve fit to the list.

Fits list box – All the curve fits included in the assay are listed in the *Fits* list box. To edit a curve fit, select it in the list box. Its name displays in the *Fit Name* text box. Any changes made in the other tabs apply to the specified curve fit only.

Add Fit – The name of the current curve fit is shown in the *Fit Name* box. To add this fit to the list of curves, click **Add Fit**.

Remove Fit – To delete a curve from the list of curves, click its name and select **Remove Fit**.

Copy Fit – To copy a fit from the list of curves, enter a name for the copied fit in the *Fit Name* box. Then click the fit to copy and click the **Copy Fit** button. The copied fit is added to the list under the new name.

6.5.8.2 Curve Fit Standards Tab

Select the **Curve Fit** tool and select the **Standards** tab to create a standards checklist and enter standard concentrations.

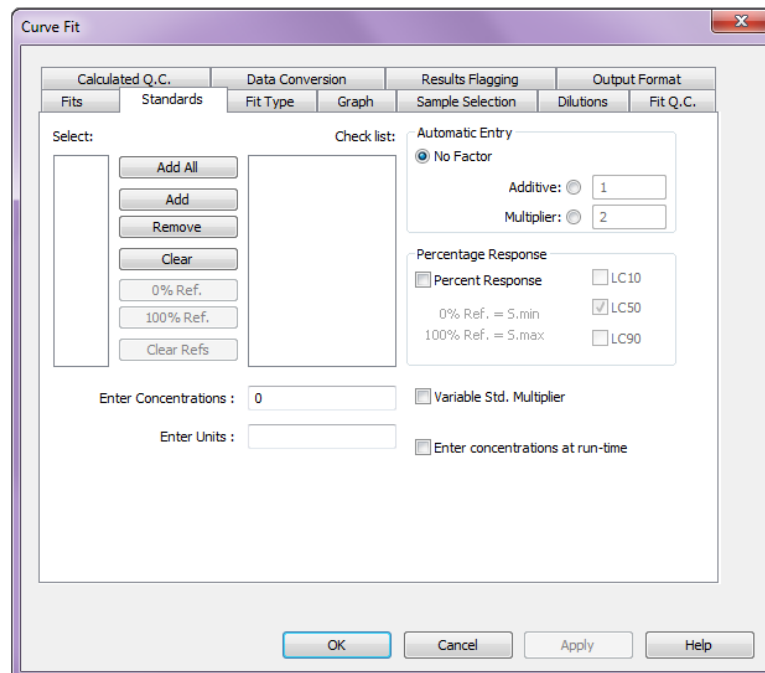


Figure 89: Curve Fit Dialog Box Standards Tab

To use curve fitting you must create a Standards checklist containing at least one Standard. The Standards on the checklist are used to create the standard curve. The actual number of Standards required depends on the curve fit type. The *Select* list box contains all of the available standards and the *Checklist* box shows all the standards being used in the curve fit calculation.

Add All – Add all the Standards to the checklist

Add – Add the Standard highlighted in the *Select* list box to the bottom of the checklist.

Remove – Remove the highlighted Standard from the checklist.

Clear – Clear all the Standards from the checklist.

0% Ref. – This option is used in *Percent Response* calculations.

100% Ref. – This option is used in *Percent Response* calculations.

Clear Refs – This option is used in *Percent Response* calculations.

Enter Concentration

Enter a concentration or titer value for the standard highlighted on the checklist. (The value does not automatically display. To apply the value, Click Enter on the keyboard or click the standard again).

Enter units

Enter the units for the x-axis of the graph. Units may contain up to 8 letters or symbols.

6.5.8.2.1 Automatic Entry

This option allows you to enter values automatically.

No Factor

No automatic entry is enabled.

Additive

To increment each successive value by a specified amount.

1. Click **Additive** and type in the incremental value.
2. Click the first item and type in its concentration.
3. Click **Enter** on the keyboard to apply the addition to each successive item.

Multiplier

To multiply each successive value by a specified amount.

1. **Multiplier** and type in the multiplication value.
2. Click the first item and type in its concentration.
3. Click **Enter** on the keyboard to apply the multiplier to each successive item.

6.5.8.2.2 Percent Response

The *Percent Response* option allows the operator to specify Standards as references for 0% or 100% or both. By default, *REVELATION DSX* software uses the lowest Standard sample OD (**Std.min**) as a reference point for 0% and the highest Standard sample OD (**Std.max**) as a reference point for 100%. When you use this option, the concentration graph is reported in terms of percentages rather than well readings.

If the operator wishes to specify different standards for 0 or 100%:

1. Place a check mark in the *Percent Response* checkbox.
2. Select the Standard to use for 0% and click the **0% Ref** button. The standard displays next to *0% Ref*.
3. Select the Standard you want to use for 100% and click the **100% Ref** button. The standard displays next to *100% Ref*.
4. To reset the references to the default values, click the **Clear Refs** button.
5. To report 10%, 50% and/or 90% lethal concentration values: Place a check mark in the **LC10, LC50 and/or LC90** checkbox.

6.5.8.2.3 Variable Std. Multiplier

A variable standard multiplier is a multiplication factor that is applied to all the Standard samples when the curve fit data are calculated at runtime. When *REVELATION DSX* software processes the data, the operator is prompted to enter this value. The value can be

changed after the plate has been run, by opening the plate data file and selecting **Data** → **Lot Specific Data** from the menu bar.

6.5.8.2.4 Enter Concentrations at Run Time

Concentrations of the Standards for curve fit calculations can be entered when the plate is run. If this option is chosen, a dialog box for entry of Standard concentration values displays when the plate is run.

6.5.8.3 Curve Fit Type Tab

Select the **Curve Fit** tool and select the **Fit Type** tab to choose a fit type that defines the best curve for the plate data. To select a fit type, click its radio button.

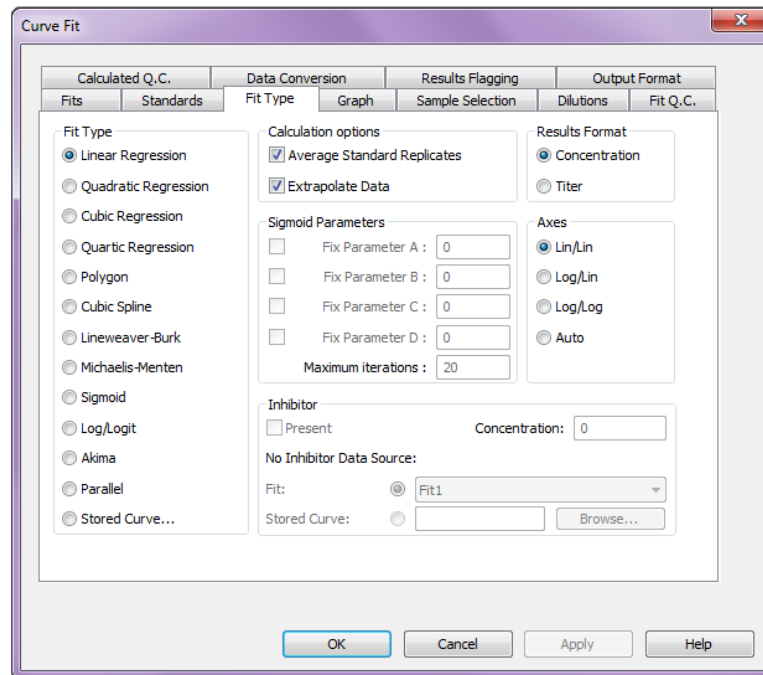


Figure 90: Curve Fit Dialog Box Fit Type Tab

The template (and the Standards checklist) must contain enough Standards for the curve fit type chosen. The list below gives a brief description of the characteristics of each type of curve and the number of Standards required for each type.

Table 41: Curve Types and Descriptions

Fit Type	Description	Standards
Linear Regression	Linear polynomial regression	1
Quadratic Regression	Quadratic polynomial regression	3
Cubic Regression	Cubic polynomial regression	4
Quartic Regression	Quartic polynomial regression	5
Polygon	Point to point straight line fit	3
Cubic Spline	Smooth curve cubic spline fit	3


Fit Type	Description	Standards
Lineweaver – Burk	Double-reciprocal plot	3
Michaelis – Menten	Hyperbolic fit	3
Sigmoid	S-shaped curve fit – four definable parameters	4
Log/Logit	S-shaped curve fit - with fixed parameters	4
Akima	Smooth curve that passes through all data points	3
Parallel Line Bioassay*	Parallel line bioassay	4
Stored Curve**	Curve saved from a previous test	0

***Parallel Line Bioassays** require a special number of Standard and Test samples.

Standard samples – At least two Standard samples in multiple replicates.

Test samples – The number of Test samples must be a multiple of the number of Standard samples and they must be arranged in the same number of replicates.

The **Stored Curve option allows you to apply a previously defined curve to the new data.

1. Click **Stored Curve**.
2. *REVELATION DSX* software lists the Curves index, with a summary of the Fit Information.
3. Click the curve you want to use and click .
3. If you select a stored curve, *REVELATION DSX* software uses the curve file to generate the axis fit, the curve fit type and standard concentrations (or the slope and y intercept). You do not have to enter any of these values for a stored curve calculation.

Curves are stored after the test has been run, using the *Fit Information* dialog box (select **Data** → **Fit Information** from the menu bar).

6.5.8.3.1 Calculation Options

Average Standard Replicates – Check this box to average the replicate values for individual standards before they are used for curve fitting.

Extrapolate Data – Check this box to extend the graph beyond the known data points. *REVELATION DSX* software does this by calculating extra data points based on the known data.

6.5.8.3.2 Sigmoid Parameters

Fix Parameters – All four parameters of the Sigmoid curve are operator-definable. Check the box of any parameter you want to define and type a number in the box.

Maximum iterations – The value entered here is the maximum number of times for *REVELATION DSX* software to attempt to construct a satisfactory plot before aborting the operation. The default value of 20 is suitable for most applications.

6.5.8.3.3 Inhibitor

To examine the effect of an Inhibitor when using Lineweaver-Burk or Michaelis-Menten fit types, place a check mark next to *Present* and enter the concentration of the inhibitor. Then, specify the data source for which no inhibitor is present by selecting the appropriate radio button:

Fit

Select another fit within the same assay.

Stored Curve

Select a stored Michaelis-Menten or Lineweaver-Burk curve. Use the **Browse** button to search for a file.

6.5.8.3.4 Results Format

Values for the Standard samples can be entered as concentrations or as titer values. Select the required units.

6.5.8.3.5 Axes

The Axes chapter shows the types of axes scaling available. Click the radio button associated with the required axes scaling option. When you choose a fit type, *REVELATION DSX* software grays out any axes fits that are not available for that type. If only one axes scaling option is available, *REVELATION DSX* software grays out all the scaling options and automatically selects the required fit.

6.5.8.4 Curve Fit Graph Tab

Select the **Curve Fit** tool and select the **Graph** tab to include a concentration graph in the results.

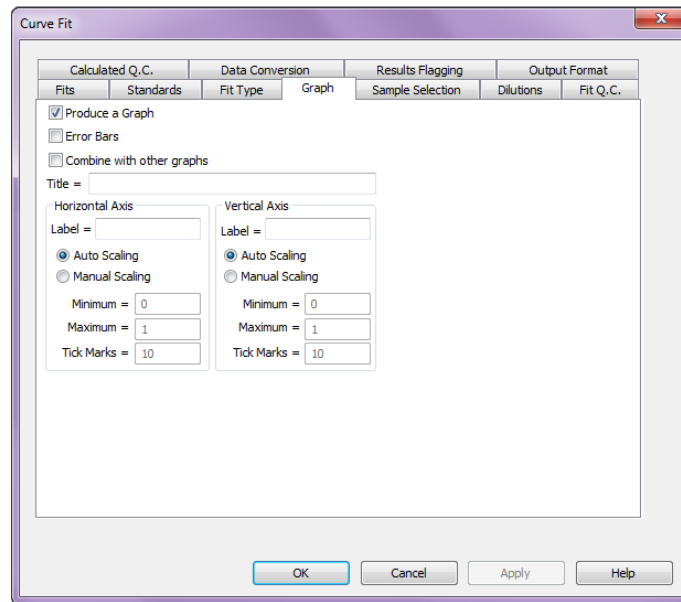


Figure 91: Curve Fit Dialog Box Graph Tab

Produce a Graph

Check this box to automatically include the concentration graph in the results report.

Error Bars

Check this box to include bars which show graphically the variation for each point.

Combine with other graphs

If more than one fit is included, this option allows different fits to be combined on the same graph.

1. Select the **Curve Fit** tool.
2. Select the **Fits** tab.
3. For each fit to be included:
 - a. Select the fit.
 - b. Click the **Graph** tab
 - c. Check the **Combine...**checkbox.

Title

Type in a title for the graph.

Label

Type in labels for the horizontal and vertical axes.

Scaling

Select **Auto Scaling** to let *REVELATION DSX* software determine the scale values for the axes or select **Manual Scaling** and enter the minimum and maximum values and spacing of the tick marks.

6.5.8.5 Curve Fit Sample Selection Tab

Select the **Curve Fit** tool and select the **Sample Selection** tab to exclude certain samples from the curve fit calculation.

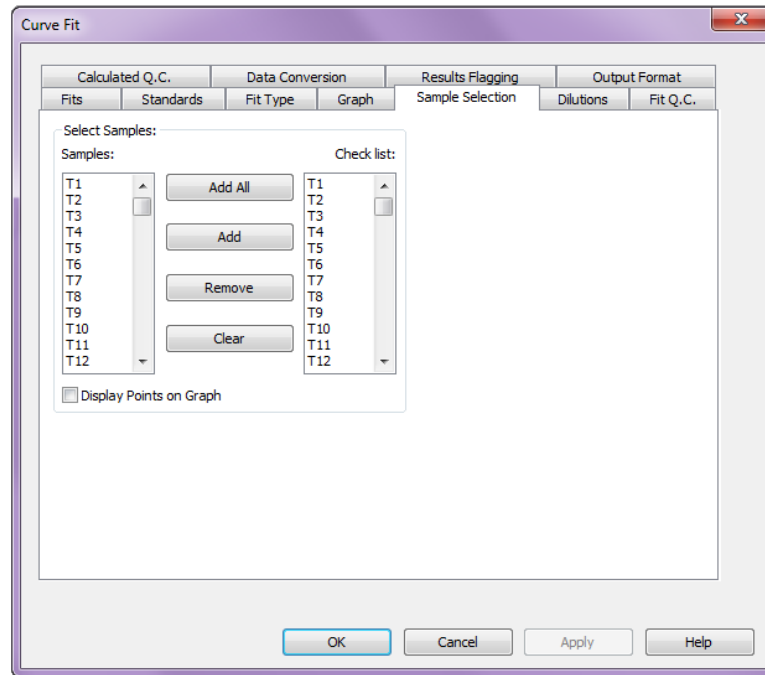


Figure 92: Curve Fit Dialog Box Sample Selection Tab

All of the samples assigned to the template are shown in the *Samples* box. The samples that are included in the curve fit calculation are shown in the *Checklist* box.

Add All: Add all the Test samples into the *Checklist*.

Add: Add the Test sample highlighted in the *Samples* box onto the end of the *Checklist*.

Remove: Delete the highlighted Test sample from the *Checklist*.

Clear: Delete all the Test samples form the *Checklist*.

Display Points on Graph: Check to show the individual data points used to create the curve.

6.5.8.6 Curve Fit Dilutions Tab

Select the **Curve Fit** tool. Select the **Dilutions** tab to enter dilutions for test and control samples.

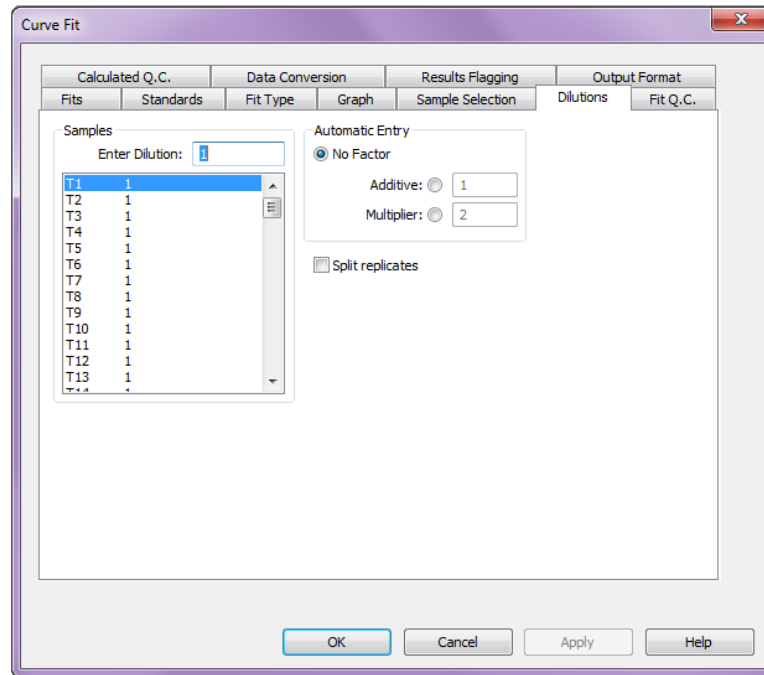


Figure 93: Curve Fit Dialog Box Dilutions Tab

The *Dilutions* list box lists all the test and control samples on the template. If you have diluted any of these, highlight it and type the dilution factor in the **Enter Dilution** text box. (The factor does not automatically display. To apply the value, press enter on the keyboard or click the selection again).

No Factor – No automatic entry is enabled.

Additive – To increment each successive value by a specified amount.

1. Click **Additive** and type in the incremental value.
2. Click the first item and type in its concentration.
3. Press enter to apply the addition to each successive item.

Multiplier –To multiply each successive value by a specified amount.

1. Click **Multiplier** and type in the multiplication value.
2. Click the first item and type in its concentration.
3. Click to apply the multiplier to each successive item.

If the test and control samples contain multiple replicates and you want to assign dilution values to these replicates, check the **Split Replicates** check box.

6.5.8.7 Fit Q.C. Tab

Select the **Curve Fit** tool. Select the **Fit Q.C.** tab to apply QC expressions to the curve fit.

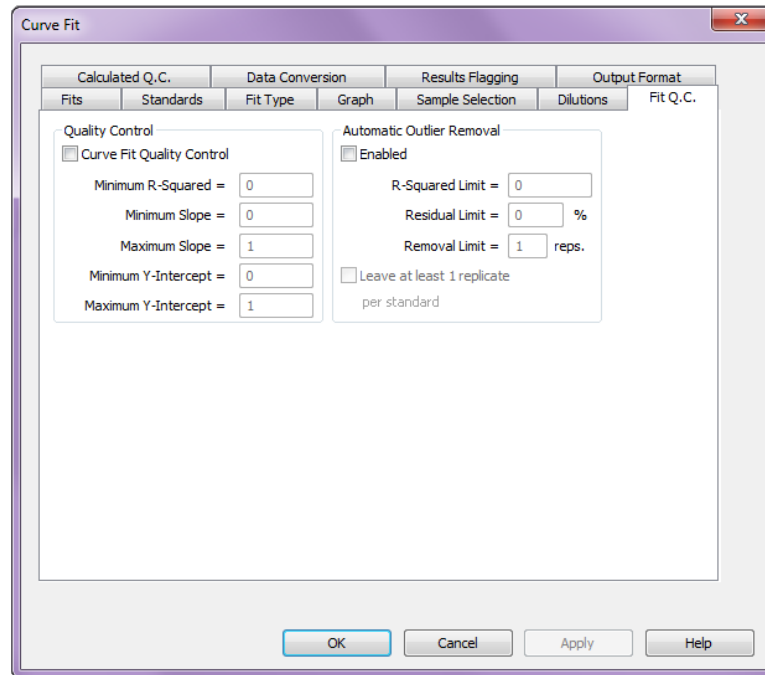


Figure 94: Curve Fit Dialog Box Fit Q.C Tab

If the curve fit does not meet the requirements of the expressions, a message is shown with the results to indicate which parameters failed and why.

Check the box to enable curve fit quality controls. Not all the quality control expressions apply to every curve fit type. When you enable curve fit quality controls, *REVELATION DSX* software grays out the expressions that are not available.

Minimum R-Squared

The minimum R² value. Enter a value between 0.0 and 1.0.

Minimum Slope

The minimum slope value for a linear fit.

Maximum Slope

The maximum slope value for a linear fit.

Minimum Y-Intercept

The minimum intercept of the plot through the y-axis.

Maximum Y-Intercept

The maximum intercept of the plot through the y-axis.

6.5.8.7.1 Automatic Outlier Removal

To automatically remove outlier values when the standard curve is calculated, check the **Enabled** checkbox. Criteria for removal of outliers are established by entering the R-Squared Limit, the Residual Limit and the Removal Limit.

R-Squared Limit

The proportion of the variance of values that can be attributed to the linear regression of the standard values. R-squared can range from 0 to 1.0. If R-squared is 1.0, there is no scatter in values.

Residual Limit

An estimate of the error of each observation. The residuals are expressed as the percentage of the value.

Removal Limit

The maximum number of values that can be removed.

Check the **Leave at Least 1 Replicate per Standard** checkbox to require that a least one replicate be retained for each standard level.

6.5.8.8 Curve Fit Calculated QC Tab

Select the **Curve Fit** tool and select the **Calculated QC** tab to assign quality control equations to the curve fit data.

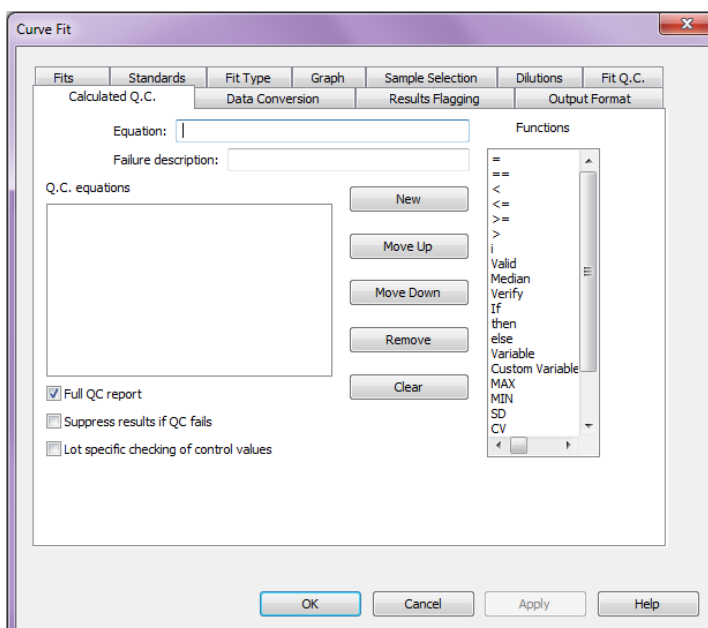


Figure 95: Curve Fit Dialog Box Calculated Q.C. Tab

Curve Fit Calculate Q.C. equations are used to specify criteria for the curve fit data. If the criteria are not met, the data are processed as normal but the results report contains a message showing that the curve fit data failed QC. Chapter 6.5.6.1.2 includes a description of the quality control equation components.

6.5.8.9 Curve Fit Data Conversion Tab

Select the **Curve Fit** tool. Select the **Data Conversion** tab to assign data conversion equations to the curve fit data.

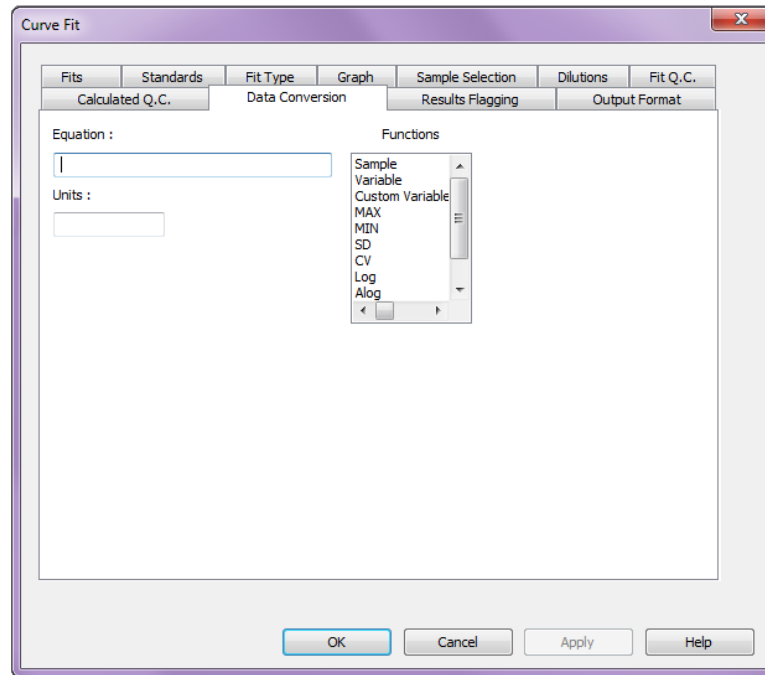



Figure 96: Curve Fit Dialog Box Data Conversion Tab

Data conversion equations are used to convert the data into different units. Curve fit data conversion equations work in the same way as standard data equations.

6.5.8.9.1 Entering Data Conversion Equations

1. Use the keyboard to enter numbers, arithmetic operators, brackets and well values.
2. Data conversion equations can contain any number or characters, but they cannot contain any spaces.
3. Double-click an entry in the Functions list box to enter a function.
4. When you have finished entering the equations, click .
5. *REVELATION DSX* software checks each equation. If any of the equations are not valid, *REVELATION DSX* software displays an error message.

Chapter 6.5.6 includes a description of most of the equation components available for data conversion equations. These additional components can be used in data conversion equations.

Table 42: Equation Components and Values

Equation Components	Values
Replicate n of every sample – $Sample_n$	<p>Sample_n represents the value of a specific replicate of every sample, where n is the replicate number.</p> <p>Example: sample2/3</p> <p><i>REVELATION DSX</i> software will divide the value of the second replicate of every sample on the plate by 3.</p>
Value of every well on the plate - $Sample$	<p>Sample represents the individual value of every well on the plat regardless of its well type.</p> <p>Example: sample/15</p> <p><i>REVELATION DSX</i> software divides the value of every well on the plate by 15.</p>


6.5.8.10 Curve Fit Results Flagging Tab

Select the **Curve Fit** tool and select the **Results Flagging** tab to specify a phrase that either replaces a numerical result or displays next to the result (Chapter 6.5.6.4).

6.5.8.11 Curve Fit Output Format Tab

Select the **Curve Fit** tool and select the **Output Format** tab to specify the output format for the data (Chapter 6.5.6.3).

6.5.9 Ratio

1. Select **Data Reduction** → **Ratio** from the menu bar or select the Ratio tool  to output data as a matrix or table of results that have been scaled using a ratio equation.

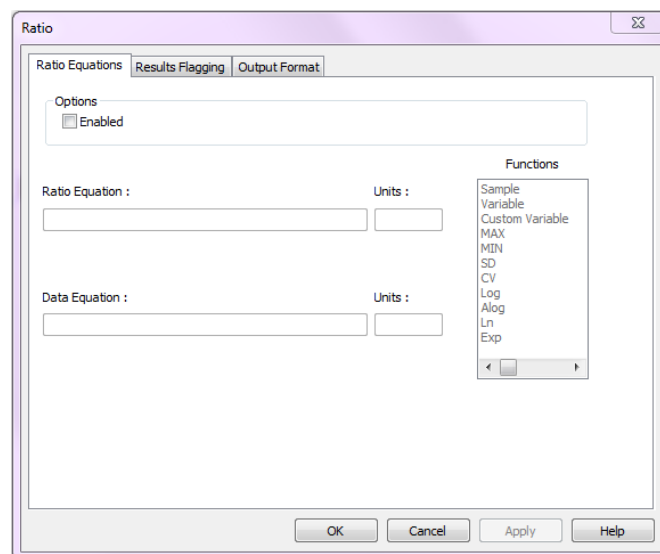


Figure 97: Ratio Dialog Box

2. To include ratio processing in the assay, check the **Enabled** checkbox in the *Ratio Equations* tab.

6.5.9.1.1 Ratio Equation

Convert raw assay data into a different scale. Every value on the plate is fed into the equation. The resulting value replaces the original value in the ratio matrix or table.

6.5.9.1.2 Data Equation

Convert raw assay data into different units. Every value on the plate is fed into the equation. The resulting value replaces the original value in the data conversion section of the ratio results.


6.5.9.1.3 Units

Type in the units to use for each set of calculated data. Units may consist of up to eight characters.

6.5.9.1.4 Functions

Enter equation components by double-clicking the required function.

6.5.9.1.5 Entering Ratio Equations

1. Use the keyboard to enter numbers, arithmetic operators, brackets and well values.
2. Ratio equations can contain any number of characters, but they cannot contain any spaces.
3. Double-click an entry in the Functions list box to enter a function.
4. When you have finished entering the equations, click .
4. *REVELATION DSX* software checks each equation. If any of the equations are not valid, *REVELATION DSX* software displays an error message.

Chapter 6.5.6.1.2 includes a description of most of the equation components available for ratio equations. These additional components can be used in ratio equations.

Table 43: Equations Components and Values

Equation Components	Values
Replicate n of every sample – Samplen	<p>Samplen represents the value of a specific replicate of every sample, where n is the replicate number.</p> <p>Example: sample2/3 <i>REVELATION DSX</i> software will divide the value of the second replicate of every sample on the plate by 3.</p>
Value of every well on the plate - Sample	<p>Sample represents the individual value of every well on the plat regardless of its well type.</p> <p>Example: sample/15 <i>REVELATION DSX</i> software will divide the value of every well on the plate by 15.</p> <p>▶ Note: <i>This option is only available if curve fit processing was selected as a data processing option.</i></p> <p>Example: sample/PC <i>REVELATION DSX</i> software will convert all values to a ratio of the average Positive Controls.</p>


6.5.9.2 Ratio Results Flagging Tab

Select the **Ratio** tool and select the **Results Flagging** tab to specify a phrase that either replaces a numerical result or displays next to the result (Chapter 6.5.6.4).

6.5.9.3 Ratio Output Format Tab

Select the **Ratio** tool and select the **Output Format** tab to specify the output format for the data (Chapter 6.5.6.3).

6.5.10 Spreadsheet

1. Select **Data Reduction** → **Spreadsheet** from the menu bar or select the Spreadsheet tool  to output data as a matrix or table of results obtained by adding or subtracting well values from one another.
2. To include ratio processing in the assay, check the **Enabled** checkbox in the *Spreadsheet* tab.

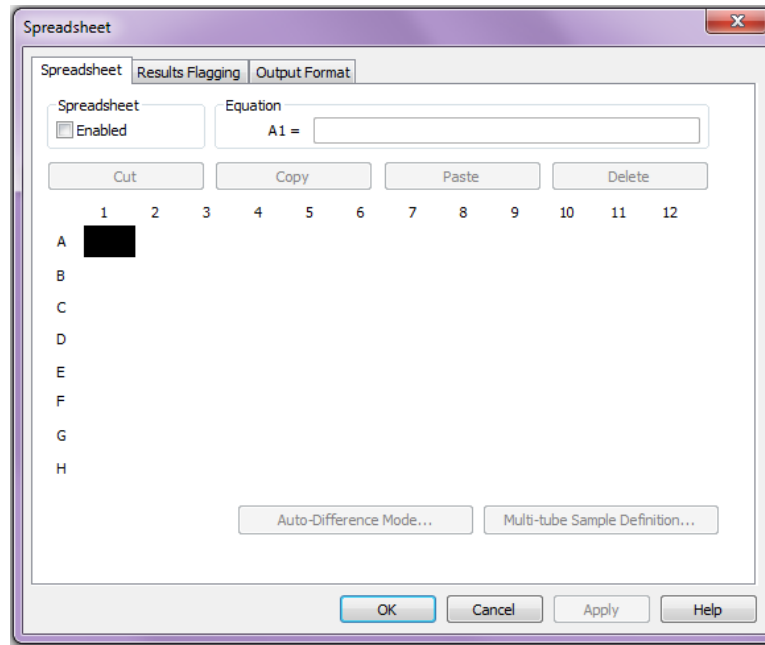



Figure 98: Spreadsheet Dialog Box

3. To define a spreadsheet equation, click the required well location and type the equation in the text box. In the results, wells without an equation in them are assigned the label “#####”.

6.5.10.1.1 Entering Spreadsheet Equations

1. Use the keyboard to enter numbers, arithmetic operators, brackets and well values.
2. Spreadsheet equations can contain any number of characters, but they cannot contain any spaces.
3. Double-click an entry in the Functions list box to enter a function.
4. When you have finished entering the equations, click .
5. *REVELATION DSX* software checks each equation. If any of the equations are not valid, *REVELATION DSX* software displays an error message.

Chapter 6.5.6.1.2 includes a description of the equation components available for spreadsheet equations.

6.5.10.1.2 Cut

Cut the equation from the highlighted well and place it in the *Equation* box.

6.5.10.1.3 Copy

Copy the equation from the highlighted well and place it on the clipboard.

6.5.10.1.4 Paste

Paste the contents of the clipboard into the highlighted well location. *REVELATION DSX* software automatically changes any well locations in the equation to make them relevant to the current well.

Example: A1-E1 when pasted into A12 becomes A12-E12. This can result in equations containing well locations that do not exist. To avoid this, you can insert the \$ sign. \$A\$1-\$E\$1 stays the same wherever you paste it.

6.5.10.1.5 Delete

Delete the equation from the highlighted well.

6.5.10.1.6 Example

To subtract the values in wells A1 to A12 from the corresponding value in wells E1 to E12:

1. In well A1 enter: E1-A1
2. Click **Copy** and highlight wells A2 to A12.
3. Click **Paste**.

6.5.10.1.7 Auto-Difference Mode

To use automatic subtraction equations, click **Auto-Difference Mode**.

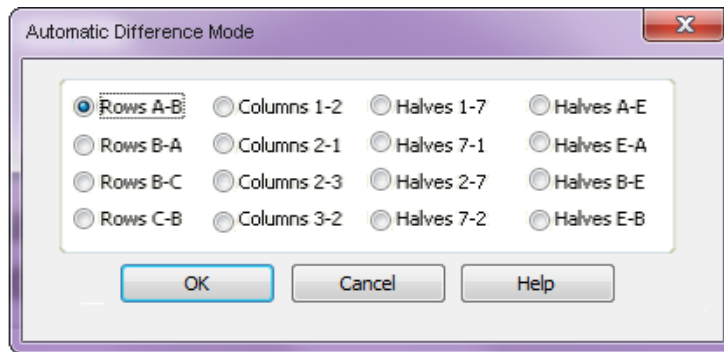


Figure 99: Automatic Difference Mode Dialog Box

This mode offers you a list of pre-programmed equations. These equations are summarized in the table below.

Table 44: Pre-Programmed Equations

Equations	Differences Calculated						
Rows A-B	A-B		C-D		E-F		G-H
Rows B-A	B-A		D-C		F-E		H-G
Rows B-C *	B-C		D-E		F-G		
Rows C-B *	C-B		E-D		G-F		
Columns 1-2	1-2	3-4	5-6	7-8	9-10	11-12	
Columns 2-1	2-1	4-3	6-5	8-7	10-9	12-11	
Columns 2-3 *	2-3	4-5	6-7	8-9	10-11		
Columns 3-2 *	3-2	5-4	7-6	9-8	11-10		
Halves 1-7	A1-A7.....H6-H12						
Halves 7-1	A7-A1.....H12-H6						
Halves 2-7 *	B2-B7.....G6-G11						
Halves 7-2 *	B7-B2.....G11-G6						
Halves A-E	A1-E1.....D12-H12						

Equations	Differences Calculated
Halves E-A	E1-A1.....H12-D12
Halves B-E *	B2-E2.....B11-E11
Halves E-B *	E2-B2.....E11-B11

*These options ignore Columns 1 and 12, Rows A and H


6.5.10.2 Spreadsheet Results Flagging Tab

Select the **Spreadsheet** tool and select the **Results Flagging** tab to specify a phrase that either replaces a numerical result or displays next to the result (Chapter 6.5.6.4).

6.5.10.3 Spreadsheet Output Format Tab

Select the **Spreadsheet** tool and select the *Output Format* tab to specify the output format for the data (Chapter 6.5.6.3).

6.5.11 Report Options

Select **Data Reduction** → **Report Options** from the *Data Reduction* menu or click  to choose the contents and order of the results report, to define data matrix settings and to specify special export formats.

The *Report Options* dialog box is divided into a number of tabs. When you select a tab, the dialog box changes to display the options and default settings for that tab. Any new settings you select take effect when you close the dialog box.

6.5.11.1 Report Layout Tab

Select **Data Reduction** → **Report Options** and select the **Report Layout** tab to define the content of the results report and the order of items on the report.

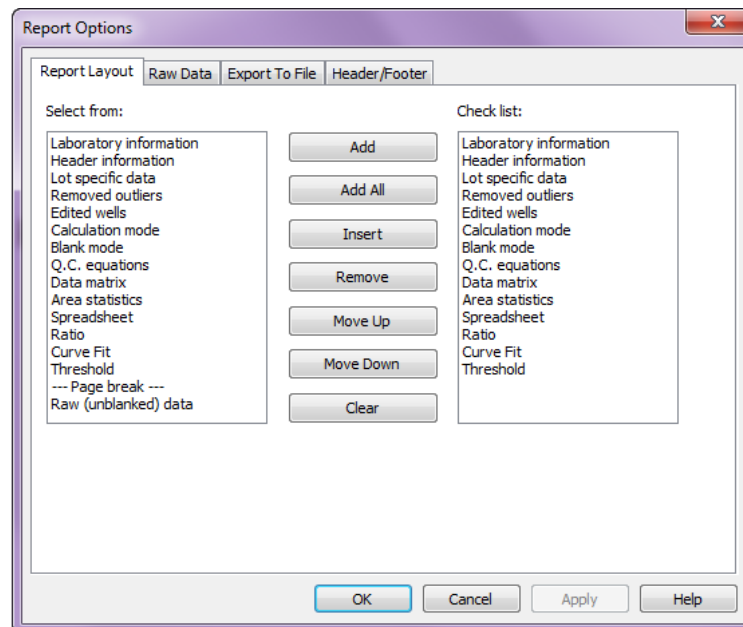
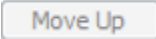
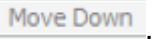


Figure 100: Report Options Dialog Box

The selection list on the left contains all the possible results items in the report. The check list shows the current order of the items.

Table 45: Buttons and Purpose

Button	Purpose
Add	Add the results item highlighted in the selection list onto the end of the Checklist .
Add All	Add all the results items onto the Checklist .
Insert	Insert the results item highlighted in the selection list into the checklist above the item currently selected.
Remove	Delete the highlighted item from the Checklist .
Move Up/Down	These buttons are used to change the order of the results items in the checklist. To move an item, select it in the Checklist box then click  or  .
Clear	Clears all of items from the Checklist .

6.5.11.2 Raw Data Tab

Select **Data Reduction** → **Report Options** and select the **Raw Data** to specify the manner in which raw data are presented.

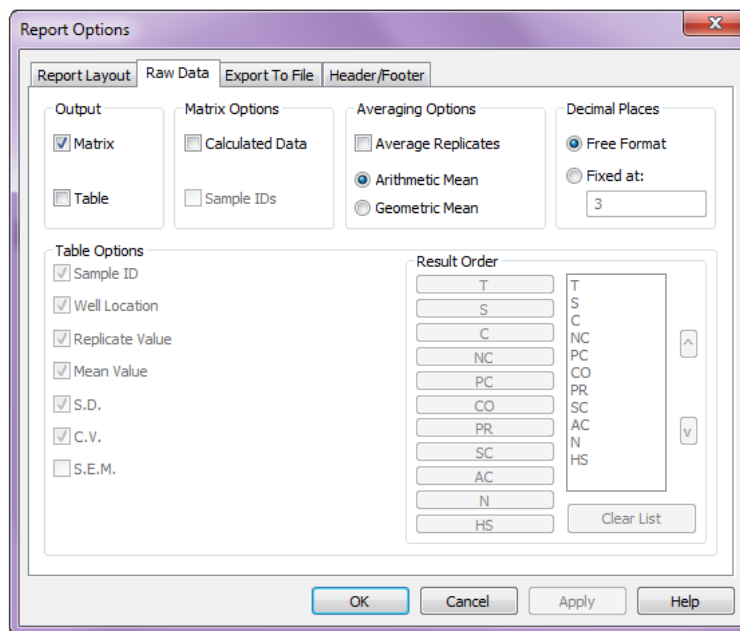


Figure 101: Report Options Dialog Box Raw Data Tab

6.5.11.2.1 Output

Check the **Matrix** checkbox and/or the **Table** checkbox to output the data as a matrix and/or a table. Matrix displays the values obtained from each well location in terms of its position on the plate. Table shows the values obtained from each sample replicate in terms of its well type. If many table options are selected, *REVELATION DSX* software may overwrite

sections of data in the output. If this happens, try using matrices instead of tables or remove some of the selected table options.

6.5.11.2.2 Matrix Options

If **Matrix** output is selected, check the **Calculated Data** checkbox to display the calculated values. Check the **Sample IDs** checkbox to display the sample ID for each sample.

6.5.11.2.3 Averaging Options

To report the average of the raw data replicates, check the **Average Replicates** checkbox. The average is calculated via one of two methods:

Arithmetic Mean – Reports the arithmetic mean of replicate determinations.

Geometric Mean – reports the geometric mean (the antilog of the mean of the logarithms) of replicate determinations. Reporting the geometric mean is useful when the imprecision is directly proportional to the level.

6.5.11.2.4 Decimal Places

Set the number of significant figures for reporting the raw data.

Free Format – Results are displayed in the most appropriate format.

Fixed at – Allows you to enter the number of decimal places to display.

6.5.11.2.5 Table Options

If **Table** output is selected, the following items can be included with the raw data value by checking the appropriate box.

Table 46: Table Options and Displays

Option	Displays
Sample ID	Sample ID (if one was entered).
Well Location	Well location.
Replicate Value	Raw data value.
Mean Value	Mean value of the whole well type.
S.D.	Standard deviation value of the whole well type.
C.V.	Coefficient of variation of the whole well type.
S.E.M.	Standard error of the mean for the well type.

6.5.11.2.6 Result Order

If **Table** output is selected, the data can be reported in order according to well type.

1. To change the output order, select Clear List.
2. Click the well types in the order you want them to display. All well types must be in the list prior to exiting the dialog box, even if a well type is not in use in the assay.
3. Double-click a well type to move it to the top of the list.

6.5.11.3 Export to File Tab

Select **Data Reduction** → **Report Options** and select the **Export To File** *tab* to output the results to a file.

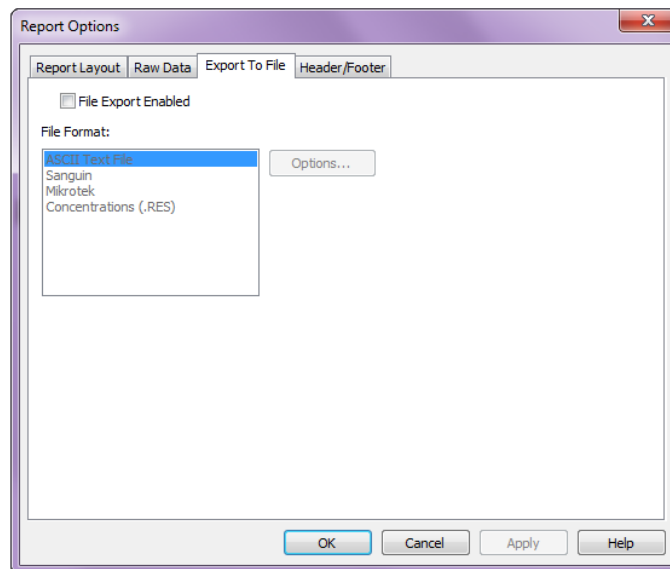


Figure 102: Report Options Dialog Box Export to File Tab

Click the **File Export Enabled** checkbox to mark with an X. Click **Options...** to further define the file format and content for ASCII and Sanguin formats.

6.5.11.3.1 American Standard Code for Information Interchange (ASCII) Export Options

The *ASCII Options* dialog box allows you to select the items to be included in the ASCII text file.

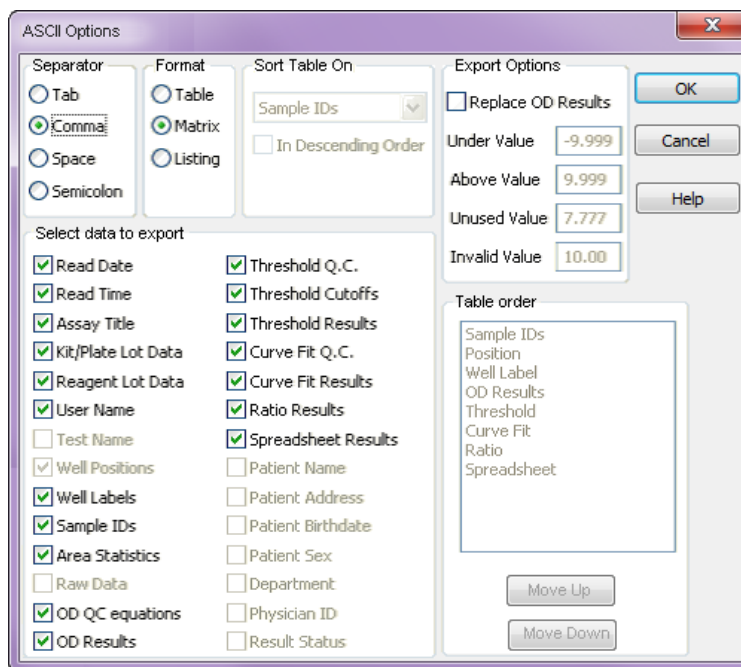


Figure 103: ASCII Options Dialog Box

Table 47: ASCII Options and Descriptions

Option	Description
Separator	Check the character (tab, comma, space or semicolon) used to separate fields.
Format	Check the way results are arranged (table, matrix or listing).
Sort Table On	Click the drop-down arrow to display the variables on which you can sort the data for presentation order. Then, click the parameter to sort on. Check the <i>In Descending Order</i> checkbox to sort in descending order.
Select Data to Export	Check any or all of the boxes to select the sections of data you want to output.
Export Options	<p>Non-numerical values cannot be included in evaluations unless they are converted into numerical values. Check the Replace OD Results checkbox to convert non-numerical values for export. and enter a number to be used to replace each of the following values:</p> <p>Under – OD value is below the expected reading for the assay.</p> <p>Above – OD value is above the expected reading for the assay.</p> <p>Unused – Well not included in the assay.</p> <p>Invalid – Error reading the well.</p>
Table Order	If <i>Table</i> format is selected, use the Move up and Move Down buttons to order fields in the table.

6.5.11.3.2 Sanguin Export Option

Sanguin produces a comma separated ASCII text file of reader values that can be imported into the Sanguin software package. The file is exported to the Text directory using the plate ID with a .DAT extension. Out of range values are converted into values defined in the *Sanguin Export Options* dialog box before being exported.

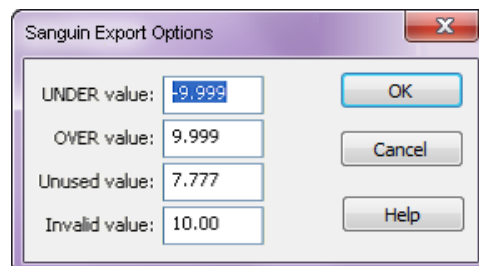


Figure 104: Sanguin Export Options

Table 48: Sanguin Export Options

Option	Description
UNDER value	OD value is below the expected reading for the assay. Example: UNDER values are saved as -9.999.
OVER value	OD value is above the expected reading for the assay. Example: OVER values are saved as 9.999.
Unused value	Well not included in the assay. Example: Unused values are saved as 7.777.
Invalid value	Error reading the well. Example: Invalid values are saved as 10.00.

The values are exported as a matrix with each row of data on a separate line.

Example:

A1,A2,...,A12

B1,B2,...,B12

...

H1,H2,...,H12

6.5.11.3.3 Mikrotek Export Option

Mikrotek produces a binary file of reader values that is suitable for import into the MicroWin software package. The file is exported to the Text directory using the plate ID with a **.DAT** extension.

6.5.11.3.4 Concentrations (.RES) Option

This produces an ASCII text file of concentration values. The file is exported to the Text directory using the plate ID with a **.RES** extension. Each sample is exported as a single line of *data.Header/Footer Tab*

The *Header/Footer* tab is used to define the information that is displayed in the header and footer of the results report.

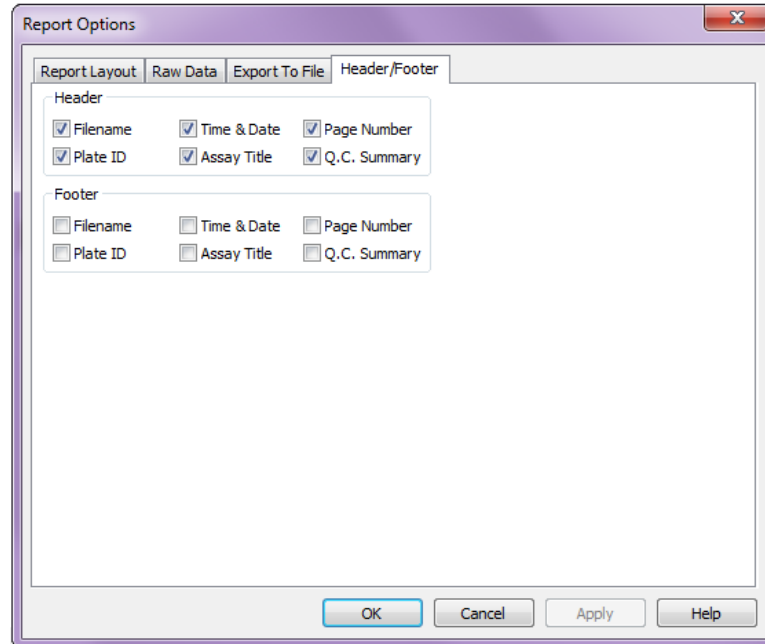



Figure 105: Report Options Dialog Box Header/Footer Tab

1. To specify header information, place a check mark in the checkboxes that correspond to the information that is to display in the header.
2. To specify footer information, place a check mark in the checkboxes that correspond to the information that is to display in the footer.

6.5.12 Assay Options

REVELATION DSX software allows you to define areas for data analysis, select the processing order of the data processing options and to define sample IDs. To access these options, select **Data Reduction → Assay Options** from the menu or select the Assay

Options tool .

The *Assay Options* dialog box is divided into a number of tabs. When you select a tab, the dialog box changes to display the options and default settings for that tab. Any new settings you select take effect when you close the dialog box.

6.5.12.1 Area Statistics Tab

Select the **Assay Options** tool. Select the **Area Statistics** tab to calculate statistical information for different areas on the plate.

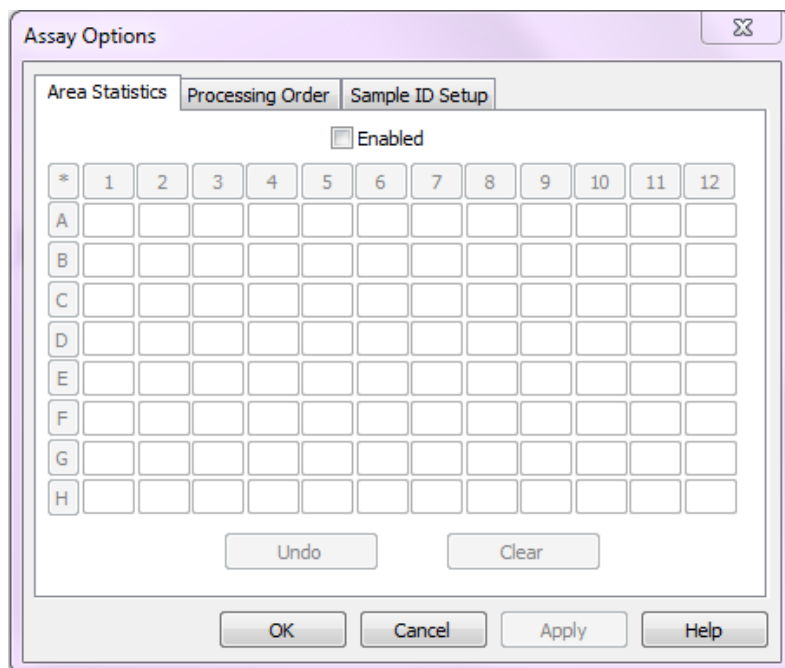


Figure 106: Assay Options Dialog Box Area Statistic Tab

Check the **Enabled** checkbox. A box represents each well location.

Undo – The Undo button clears the most recent change made.

Clear – Clears all the current area statistics assignments.

Creating an Area

1. Type a number into the relevant text box to place a single well location in an area.
2. Type an area number into the first well in the row and click the **letter** next to the row to place a row in an area.
3. Type an area number into the top well in the column and click the **number** above the column to place a column in an area.
4. Delete the area number from the relevant box using the **Delete** key to clear a single well location from an area.
5. Delete the area number from the first well in the row and click the **letter** next to the row to clear a row.
6. Delete the area number from the top well in the column and click the **number** above the column to clear a column.
7. Up to 96 areas can be created, labelled 0 to 95. Each area may contain as many wells as required, from anywhere on the plate. One well cannot be placed in more than one area.
8. *REVELATION DSX* software calculates the mean, standard deviation, standard error mean and coefficient of variation for each area.

6.5.12.2 Processing Order Tab

1. Select the **Processing Order** tab to determine the order of processing options.

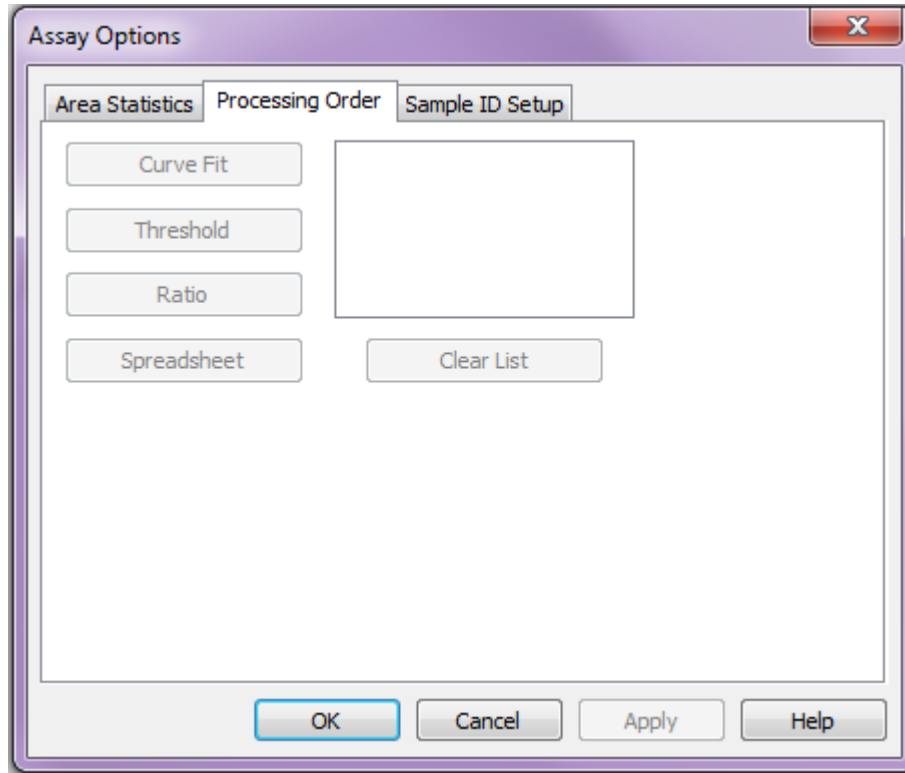


Figure 107: Assay Options Dialog Box Processing Order Tab

2. The *Processing Order* dialog box displays automatically each time you add a processing option. If more than one data processing option is selected, the operation order in the assay is very Important: Each option functions on the last options processed data.
3. To clear the list, select **Clear List**.
4. To add an operation, click the relevant button.
5. Processing options that are not included in the assay are grayed out.
6. Click on any option to move it to the top of the list.

6.5.12.3 Sample ID Setup Tab

Select the **Sample ID Setup** tab to define sample ID settings.

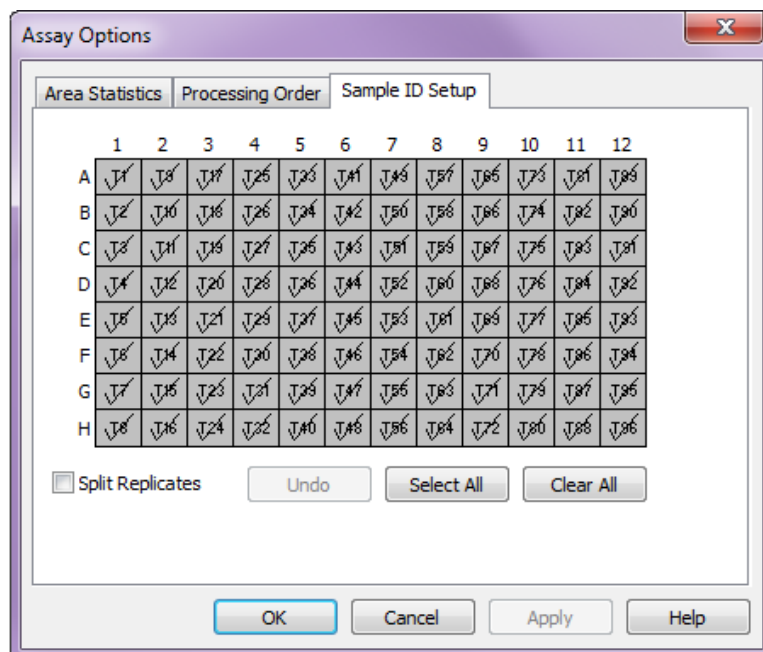


Figure 108: Assay Options Dialog Box Sample ID Setup Tab

REVELATION DSX software displays a template showing all the samples you defined. By default, every sample and replicate is ticked. This means that when a Sample ID (SID) file is assigned to the data, *REVELATION DSX* software looks for a sample ID in every well location.

Table 49: Buttons and Descriptions

Button	Description
	If SIDs should not be assigned to any of the wells or to begin with a clear template, click Clear All .
	The Undo button clears the last change made.
	To assign sample IDs to every well on the plate, click Select All .
<input type="checkbox"/> Split Replicates	To apply sample IDs to whole samples, regardless of the number of replicates, uncheck the Split Replicates checkbox. To assign sample IDs to every replicate, check the Split Replicates checkbox.

6.6 Save the Assay

Use options available on the *File* menu to save an assay and to open an assay for updates. Once created and saved, an assay can be modified at any time.

1. Select **File** → **Save** to save the file currently named in the title bar. If the file has not yet been named, the *Save As* dialog box displays.

2. Select **File** → **Save As** from the menu bar to save a file under a new filename.
3. Select **File** → **Open** from the menu bar to display the Windows *Open* dialog box, then select the assay (file extension *.asy*) to be modified and click **Open**.

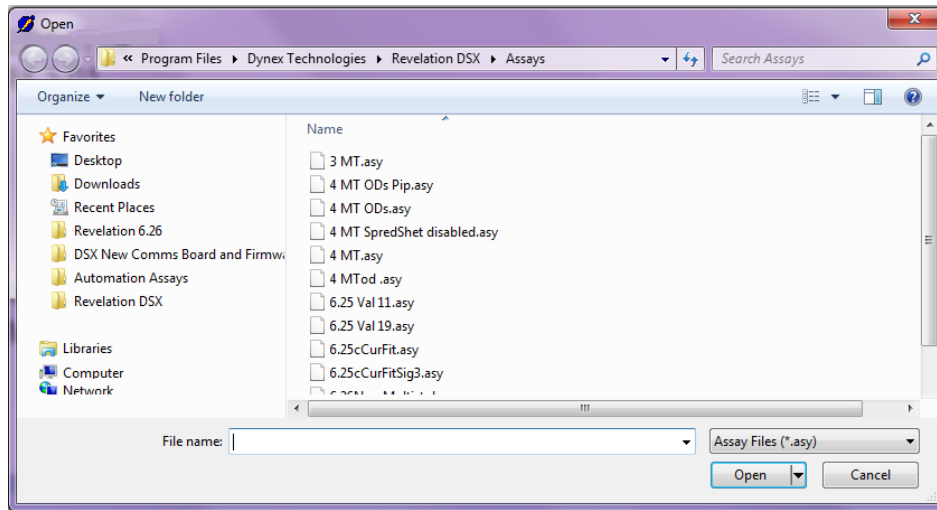



Figure 109: Open Dialog Box

► **Note:** Click , the cursor changes appearance. Click the mouse on a field in the dialog box for a description of the field.

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Chapter 7: Operations

7.1 Workflow

Workflow for operation of the DYNEX DSX system is summarized in Figure 110.

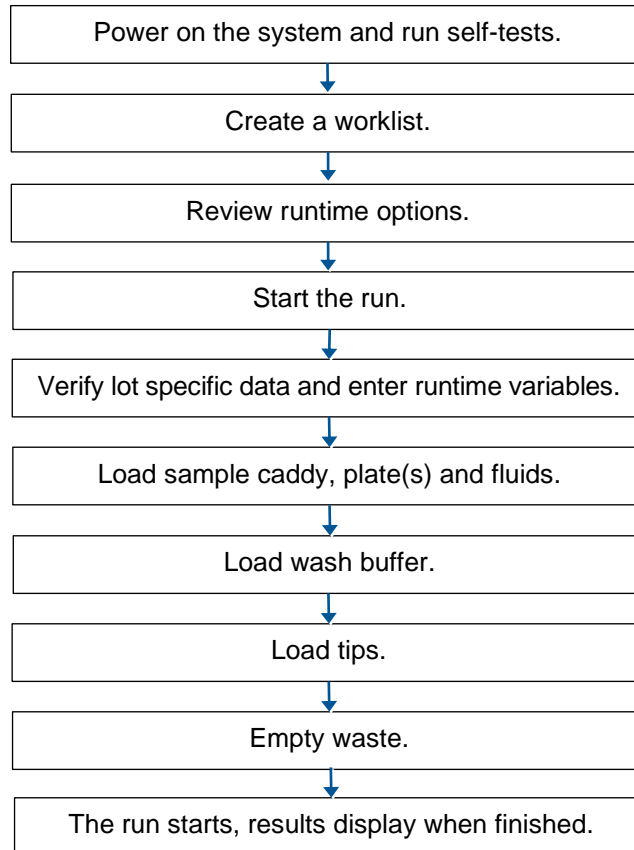


Figure 110: Workflow for Operating the DYNEX DSX System

7.2 Power On the System

The power button is located on the right side of the instrument (Figure 3).

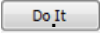



Caution: Before starting the system, ensure that all racks are properly seated and that lids are removed from all tubes, plates and sample tip racks. Power to the system is **on** when the indicator light is illuminated.

1. Turn the DSX system power switch ON.
2. If they are not already on, turn on t
3. he computer, monitor and printer.
4. Double-click the **REVELATION DSX** shortcut icon. Or, select **DYNEX Technologies** → **REVELATION DSX** → **REVELATION DSX** from the Windows Start menu program group. Startup choices are displayed.



Figure 111: Revelation Dialog Box

5. Select **Connect to DSX** to operate the DSX system.
6. Click 
7. The *Login* dialog box displays.
8. Login by entering your assigned user name and password and click .

► **Note:** *No login is required until users are added to the REVELATION DSX Users Database. Steps 6 and 7 will not occur if no users are added.*

7.2.1 Self-Tests

A series of self-tests is carried out when **Connect to DSX** is selected from the *Startup* dialog box. The following (Figure 112) is displayed while the self-tests are being performed.



Figure 112: Self-Testing All Modules

The self-test results are displayed upon completion of the tests.

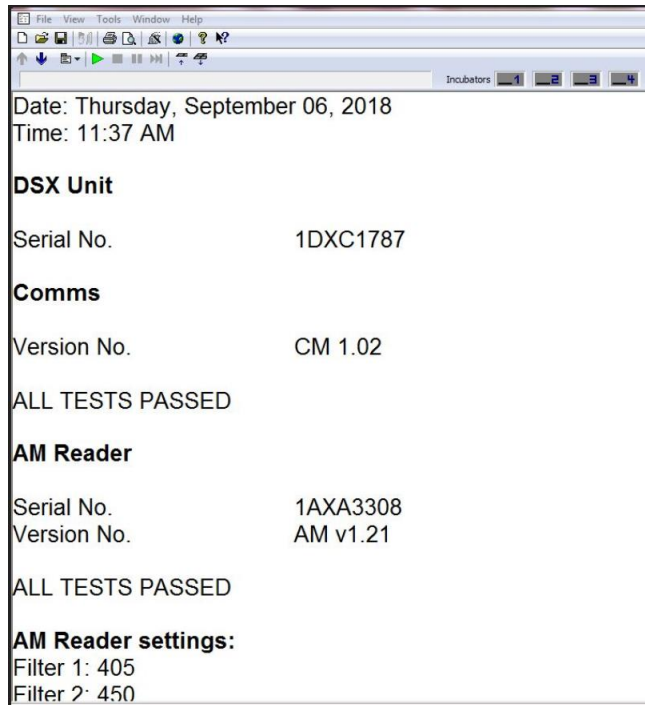


Figure 113: Self-Test Results

The self-test results should be printed on a monthly basis so that a record can be kept of the DSX system performance. Self-test results can be saved (the test results files are named *.tst) and opened at a later date for review or printout. After the session is ended by a shutdown, the self-test report for that session is no longer available unless it has been saved.

► **Note:** *The self-test results indicate whether the system is operating properly. If a failure is reported in the self-test window, call Technical Service.*

Select **File** → **Print** from the menu bar while the self-test results are displayed.

If the DSX data files have been corrupted, the DSX prompts for the serial number. The serial number is located on the DSX right panel.

► **Note:** *REVELATION DSX software prevents use of the DSX by disabling the Worklist function should a self-test failure occur.*

7.3 Create a Worklist

A worklist is created to run an assay. The worklist specifies the samples that are to be run, their location in the sample rack and the assay(s) to be run on each sample.

► **Note:** *A worklist can be created after at least one assay has been created (Chapter 6.1). The worklist can include assays run on up to four different microplates.*

More than one assay (up to 12) can be run on one plate if the assays have the same assay operation parameters.

Only one worklist can be open at a time.

7.3.1 Create a Worklist when Sample IDs are Scanned

1. Select **File** → **New** → from the menu bar.

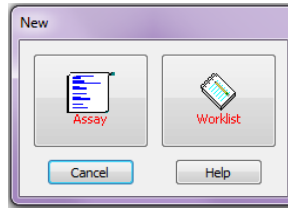


Figure 114: New Assay of Worklist Dialog Box

2. Click .
3. The *Sample Batch Selection* dialog box displays.

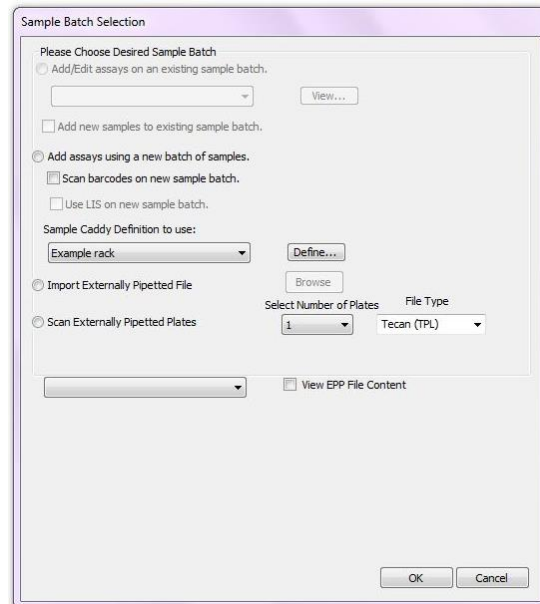


Figure 115: Sample Batch Selection Dialog Box

4. Select **Add assays using a new batch of samples**. The following screen is displayed.

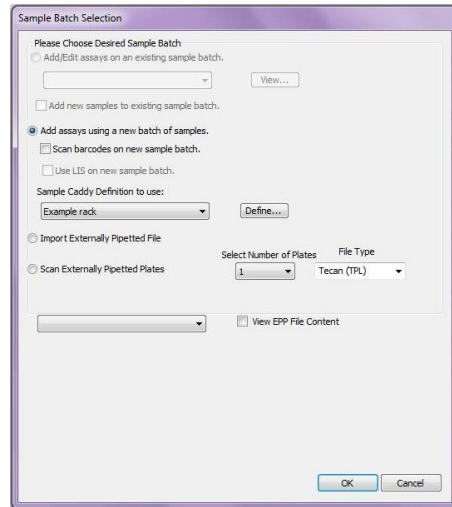



Figure 116: Sample Batch Selection

► **Note:** If additional samples are being added to an existing worklist or if a worklist is being modified, select **Add/Edit assays on an existing sample batch** and follow the instructions in Chapter 7.3.3.

5. Click on the box next to **Scan barcodes on new sample batch** to add a checkmark.
6. If data for the new batch should be sent to the LIS, click **Use LIS on new sample batch** to add a checkmark.
7. Select the sample rack layout being used from the drop-down list

► **Note:** If the layout is not shown in the list, click  to define a new sample rack layout.

8. Click .
9. The *Sample ID Barcode Scanning* dialog box is displayed.

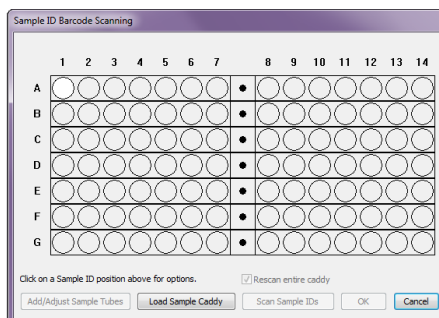
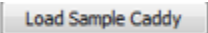


Figure 117: Sample ID Barcode Scanning Dialog Box

► **Note:** Circle icons are used to show sample tube positions in the sample rack.

10. Click the rack location for the last sample tube and select **Last Sample** from the popup menu. The sample tube positions for each rack location containing a tube are colored white.
11. Click .

12. The *Load Sample Caddy* dialog box displays.

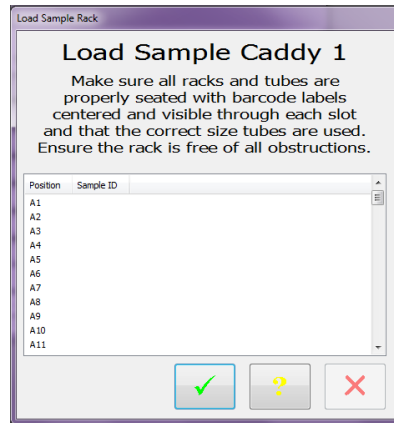


Figure 118: Load Sample Rack Dialog Box

13. Place the filled sample rack(s) on the sample caddy, following the instructions displayed on the *Load Sample Rack* dialog box.

14. Click  on the *Load Sample Rack* dialog box.

15. A message box displays requesting the operator to close the DSX cover.

16. Follow the instructions in the message box.

17. Click **Scan Sample IDs**.

18. The DSX scans the barcode labels of the sample tubes designated in step 10. The designated sample tube positions turn green as each sample tube is successfully scanned.

19. When the scan is complete, the *Edit Worklist* dialog box displays. The scanned sample IDs display in the corresponding sample rack positions in the *Sample ID* column.

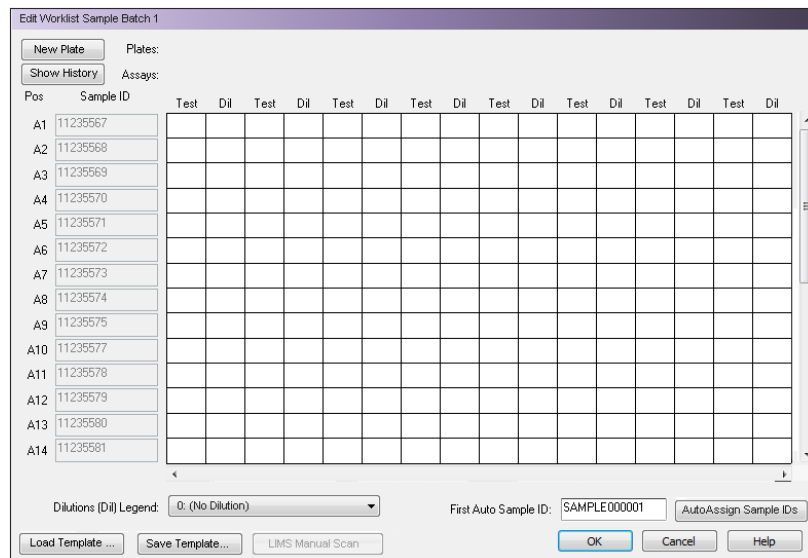



Figure 119: Edit Worklist Sample Batch Dialog Box

20. Click  to display a dialog box for selecting an assay.

21. Select the assay(s) to be run with the current sample batch and click Open. Multiple assays may be selected by holding the Ctrl button on the keyboard when selecting assays.
22. In the Test column under each assay selected, click the box associated with the required sample ID to run the sample with the specified assay. A check mark displays in the Test column to indicate the specified sample will be run with the assay.
23. To add a dilution for designated sample(s), highlight the box associated with the sample in the **Dil** column. Select multiple samples by clicking and dragging down the **Dil** column. Select the required dilution from the drop-down list in the *Please pick a dilution to use...* dialog box. A dilution identifier in the **Dil** column changes based on the dilution selected.

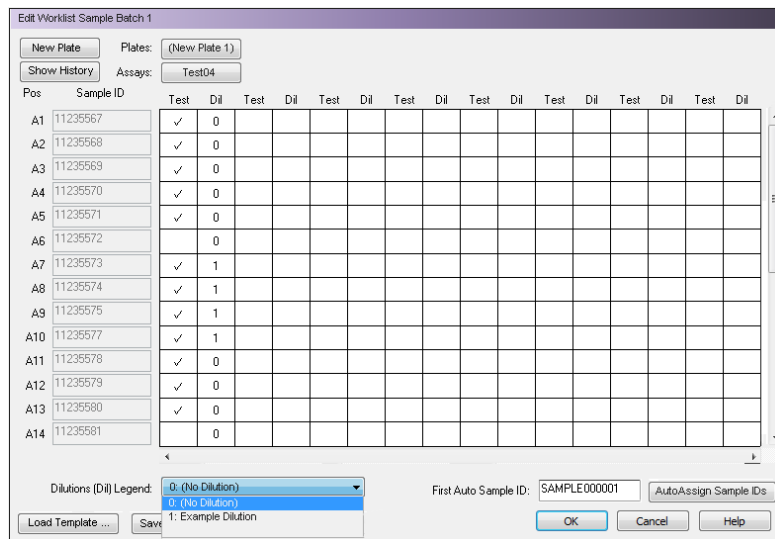

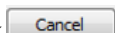



Figure 120: Example Edit Worklist Sample Batch Dialog Box

24. Repeat steps 20 through 23 as needed to order additional assays.
25. Click  to save the worklist.

► **Note:** Click  before clicking  to cancel the worklist. Once the worklist is saved, samples cannot be added to a worklist for scanned Sample IDs.

7.3.2 Create a New Worklist when Sample IDs are Manually Entered

1. Select **File** → **New** from the menu bar.

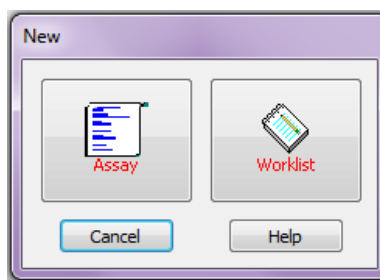


Figure 121: New Assay or Worklist Dialog Box

2. Click .
3. The *Sample Batch Selection* dialog box displays.

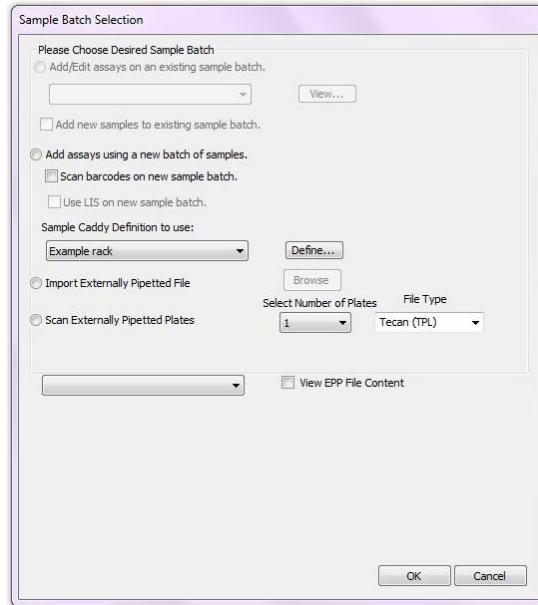


Figure 122: Sample Batch Selection Dialog Box

4. Select Add assays using a new batch of samples.
5. If data for the new batch should be sent to the LIS place a check mark next to Use LIS on new sample batch.

► **Note:** *If additional samples are being added to an existing worklist or if a worklist is being modified, select Add/Edit assays on an existing sample batch and follow the instructions in Chapter 6.2*

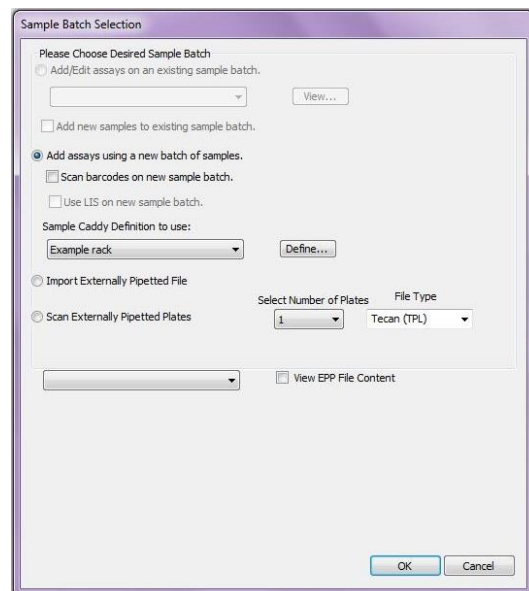


Figure 123: Add Assays Using a New Batch of Samples

6. Select the sample rack layout being used from the drop-down list.
 - ▶ **Note:** *If the layout is not shown in the list, click Define to define a new sample rack layout.*
7. Click .
8. The *Edit Worklist* dialog box is displayed..

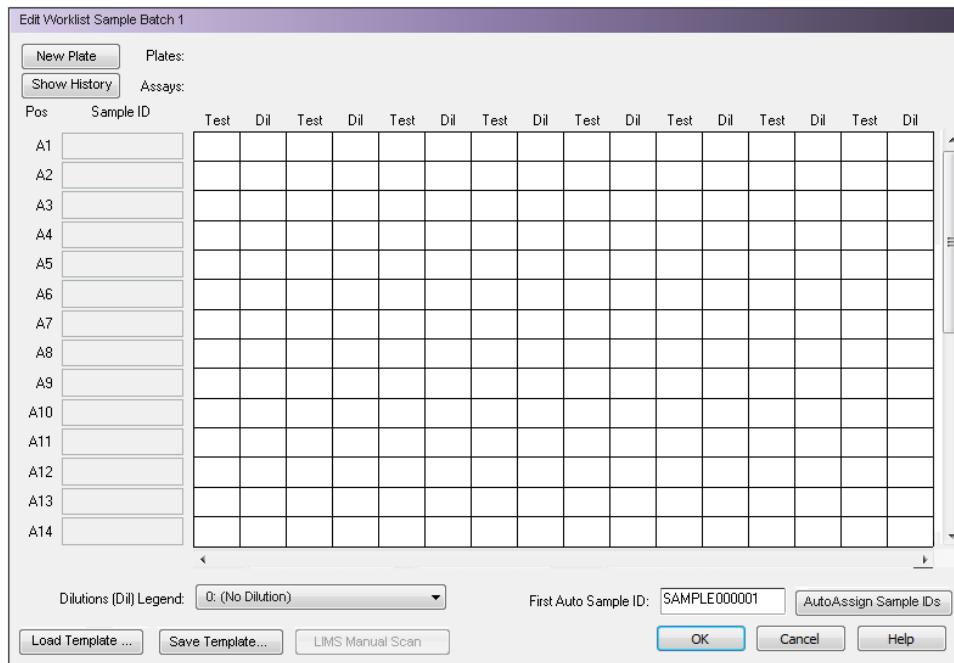


Figure 124: Edit Worklist

9. Click to display a dialog box to select a previously created assay file and add it to the worklist.
10. Select the assay(s) to be run with the current sample batch and click **Open**. Click the Ctrl button on the keyboard to select multiple assays.
11. In the **Test** column under each assay selected, click the box associated with the required sample rack position to run the sample with the specified assay. A check mark displays in the *Test* column to indicate the specified sample will be run with the assay.
12. To add a dilution for designated sample (s), highlight the box associated with the sample in the **Dil** column. Select multiple samples by clicking and dragging down the *Dil* column.
13. Select the required dilution from the drop-down list in the *Please pick a dilution to use...* dialog box. A dilution identifier in the *Dil* column changes based on the dilution selected.

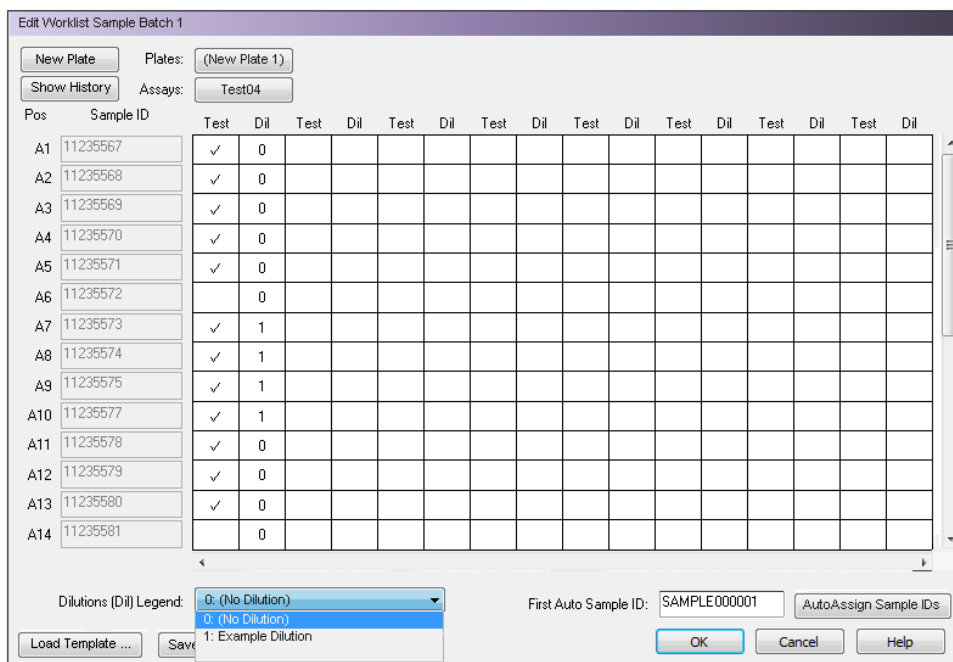


Figure 125: Example Edit Worklist Dialog Box

14. Repeat steps 9 through 12 as needed to order additional assays.
15. Type each sample ID into the box in the Sample ID column adjacent to the corresponding sample rack position.
16. Alternately, enter the starting sample ID into the First Auto Sample ID box and click Auto Assign Sample IDs to assign sequential Sample IDs to specified sample rack positions.
17. Click to save the worklist.

7.3.3 Create a New Worklist with EPP in Import File Mode

1. Select **File** → **New** from the menu bar.

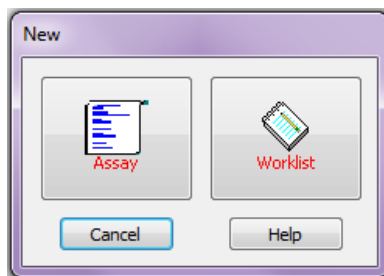


Figure 126: New Assay or Worklist Dialog Box

2. Click the **Worklist** button.
3. The *Sample Batch Selection* dialog box displays.

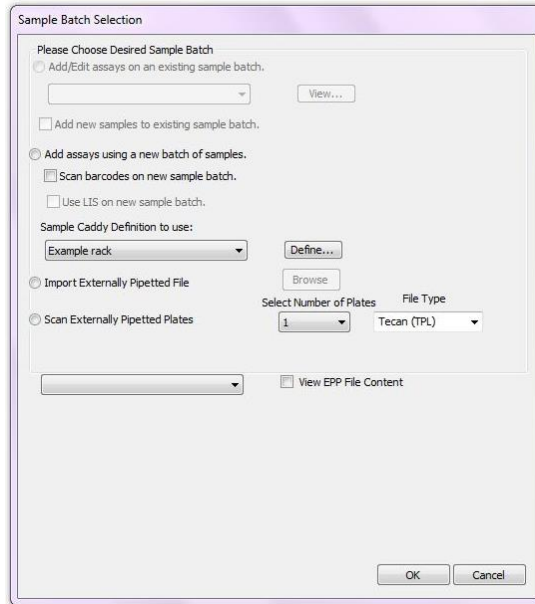


Figure 127: Sample Batch Selection

4. Select **Import Externally Pipetted File**.

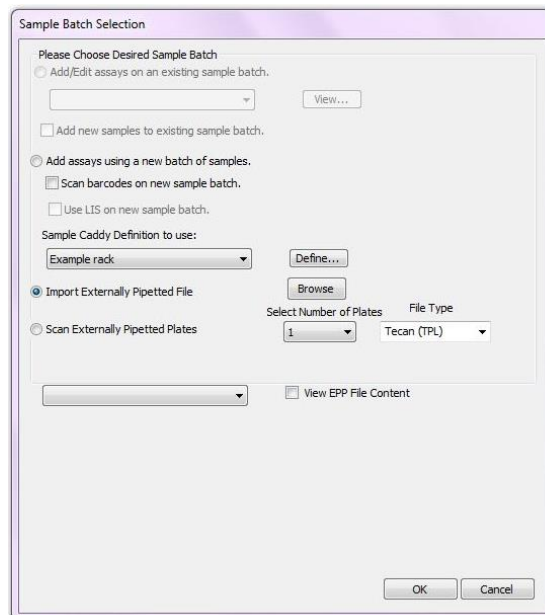


Figure 128: Import Externally Pipetted File

5. Click **Browse** and browse to the file location of the External Pipetted files.
6. Select one or multiple EPP files.

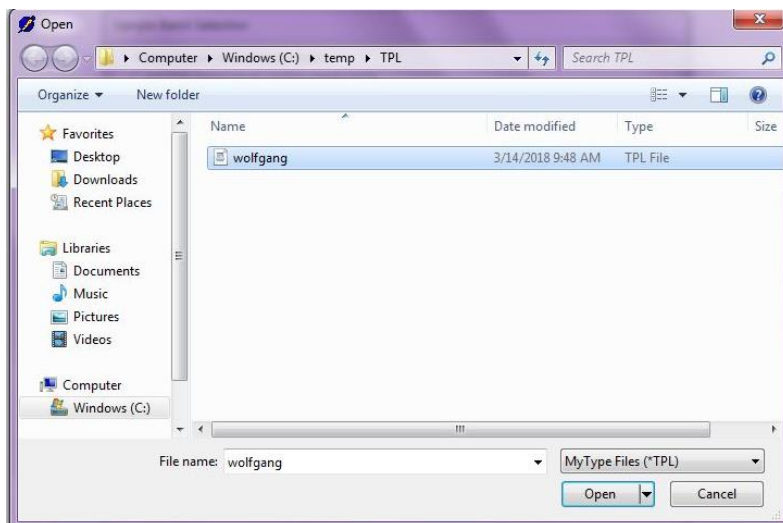


Figure 129: Browser Files

7. After selecting the worklist dialog would allow you to view the EPP file content on enabling the checkbox to view EPP file content.

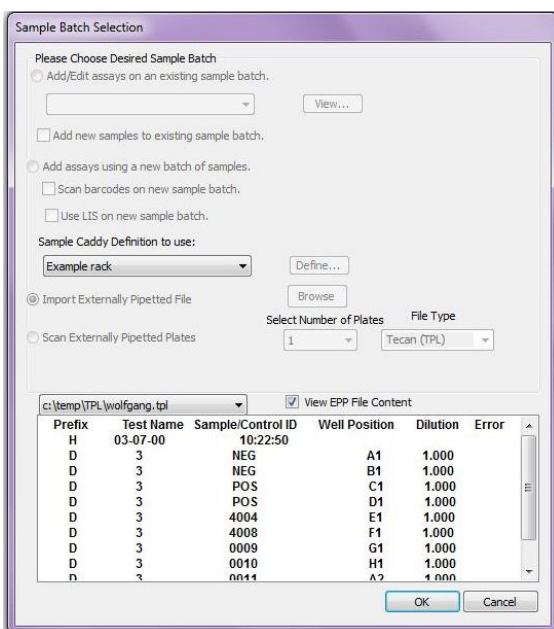


Figure 130: Sample Batch Selection – Import Externally Pipetted File

8. Select **OK** on this dialog. The worklist dialog with all the sample ID's for all the assays to be run on all the plates depending on the selected TPL files is displayed.
9. Click **OK** to save worklist.

7.3.4 Create a New Worklist with EPP in Scan EPP Plates Mode

1. Select **File** → **New** → from the menu bar.

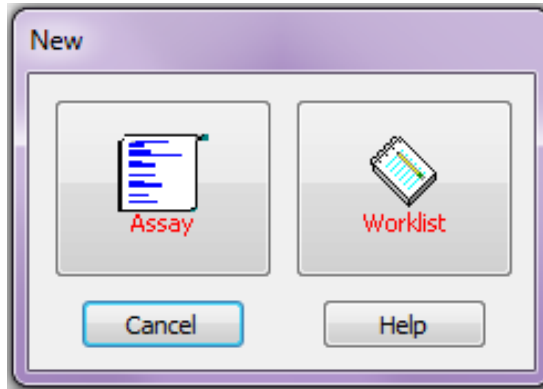


Figure 131: New Assay or Worklist Dialog Box

2. Click the **Worklist** button.
3. The *Sample Batch Selection* dialog box displays.

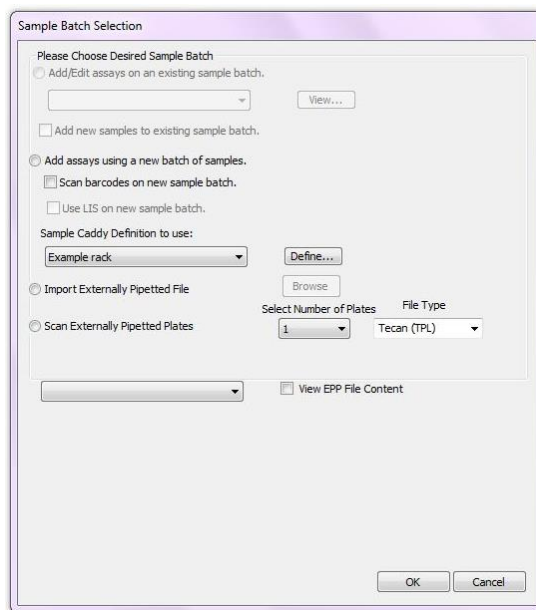


Figure 132: Sample Batch Selection

4. Select **Scan Externally Pipetted Plates** and press .

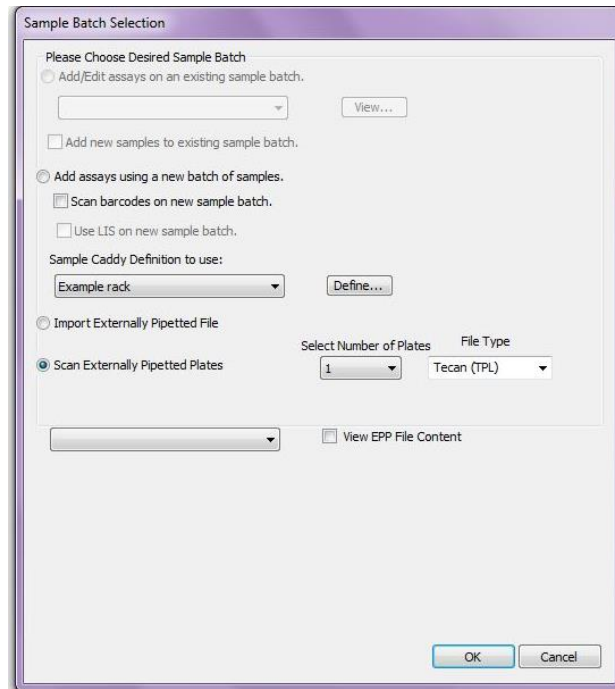


Figure 133: Sample Batch Selection – Scan Externally Pipetted Plates

5. Plate load dialog is displayed showing the location of where to load the plate.

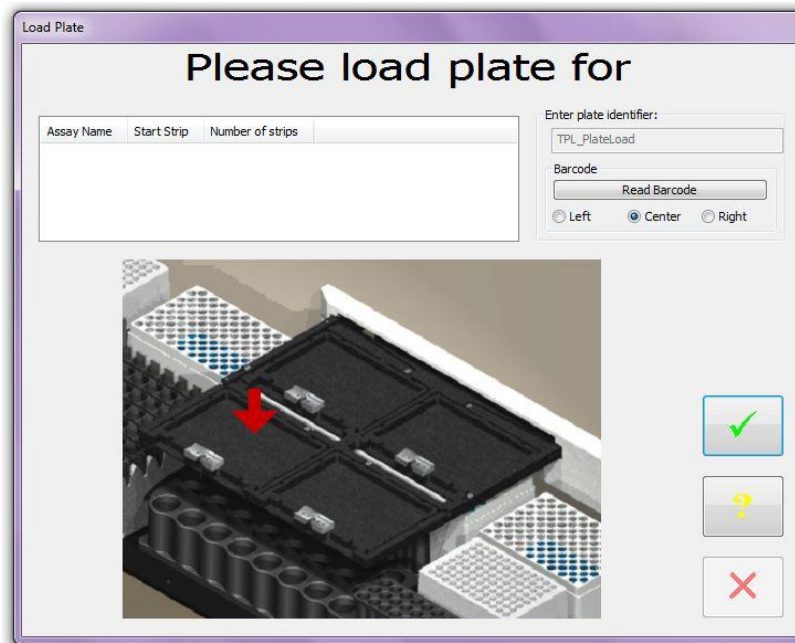



Figure 134: Load Plate

6. Click .
7. Repeat steps 4 and 5 as many times as needed, depending on the number of plates selected. Maximum of up to 4 plates.

- The worklist screen displays all the Sample IDs and plates as configured in the TPL file corresponding to the Plate Scan.

► **Note:** The bar code scan of the plates needs to match a TPL file in the configured TPL file folder, e.g., if the barcode scans “123” we expect a 123.tpl file in the TPL file folder.

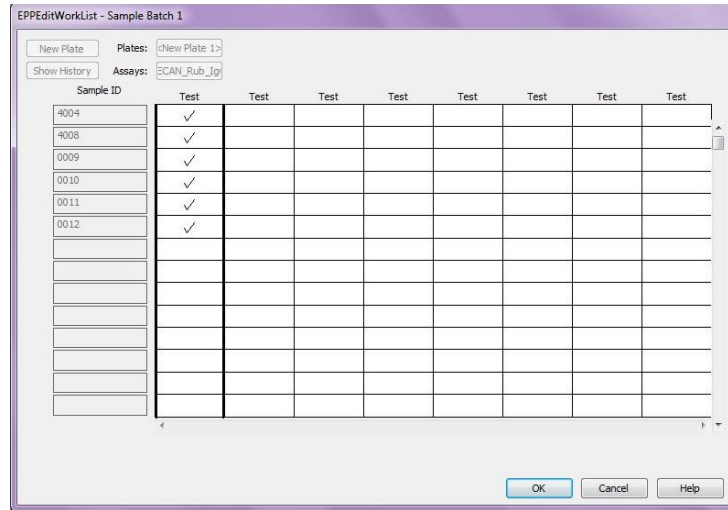


Figure 135: EPPEditWorkList – Sample Batch 1

- Click  to save worklist.

7.3.5 Modify a Worklist

A worklist containing manually entered sample IDs can be modified to insert additional assays and samples at any time.

- Select **File** → **New** from the menu bar.
- In the *New* window, select the **Worklist** button.
- The *Sample Batch Selection* dialog box displays.

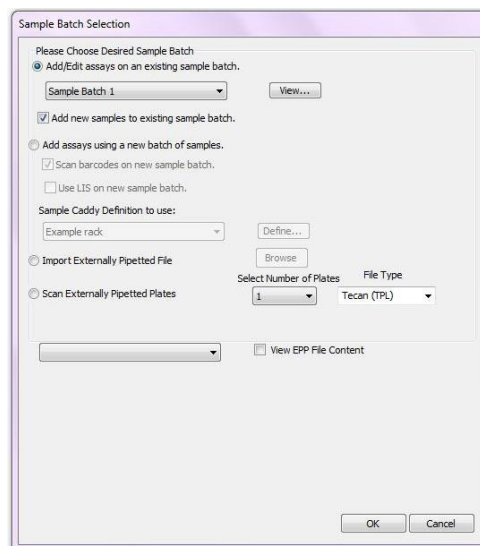




Figure 136: Sample Batch Selection Dialog Box

4. Select **Add/Edit assays on an existing sample batch**.
 - ▶ **Note:** This option is not available if a worklist containing manually entered sample IDs does not exist.
5. From the drop-down list, select the worklist that is to be modified.
 - ▶ **Note:** Click **View** to display the samples in the currently selected worklist.
6. Check the **Add new samples to existing sample batch** checkbox if additional samples are being added to the worklist.
7. Click .
8. The *Edit Worklist* dialog box displays containing information for the selected worklist.
9. Modify the worklist by adding assays or samples as needed.
10. Click  to save the changes to the worklist.

7.4 Review Runtime Options

REVELATION DSX software runtime settings, including the default pipette types, plates and pipetting profile, can be adjusted using the *Runtime Option* command available from the *Timeline* menu.

- ▶ **Note:** *Runtime Options* are not accessible if a worklist is currently running. The worklist must be paused to access *Runtime Options*.

Do not modify system level options for the DSX from the default values if unsure of consequences.

1. Click the Timeline menu tool  and select **Settings → Runtime Options** from the drop-down menu. The *Runtime Options* dialog box displays.

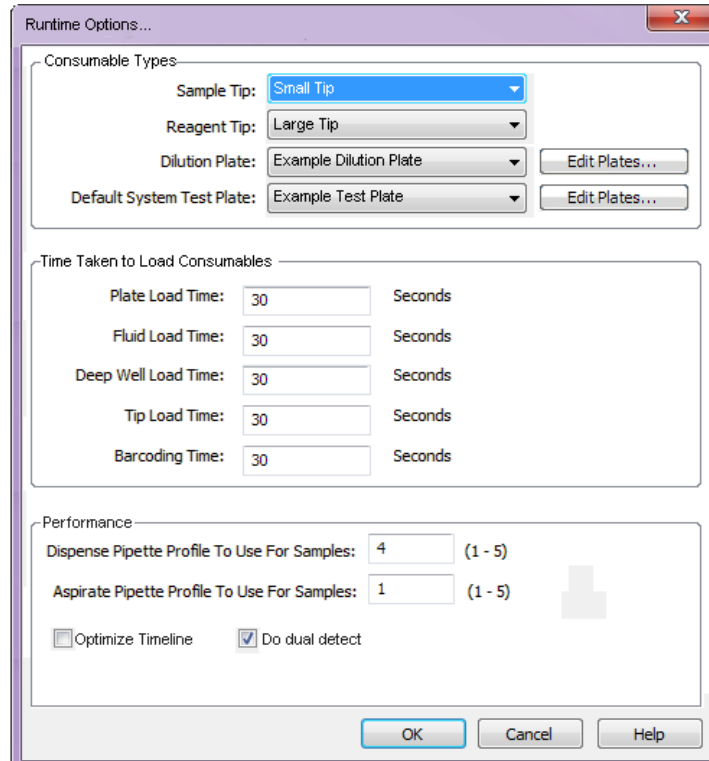



Figure 137: Runtime Options Dialog Box




2. Select the default sample tip, reagent tip, dilution plate and test plate using the drop-down list selections.

► **Note:** *If the required item is not displayed in the list, click the associated **Edit** button and add the new entry using the Edit Database dialog box.*

3. Adjust the timeline by entering the number of seconds (between 10 and 240) you expect it will take to load consumables. These values should not require adjustment.
4. Select the sample pipette profile. Pipetting profiles determine the acceleration, top speed and breaking speed of the pipette plunger. Differing profiles produce differing fluid dispense characteristics. Generally, 1 produces a slow movement of fluid and 5 a fast movement. Profile 4 is recommended if unsure.
5. Click to mark **Optimize timeline** if you want *REVELATION DSX* software to adjust plate start times in an attempt to reduce the overall running time of the worklist.
6. Click to mark **Do dual detect** if sample volume is generally greater than 50% of the selected sample tube fluid capacity. Leave un-checked if unsure.
7. Click to save the changes to the runtime options. Click **Cancel** to close the dialog box without saving changes.

7.5 Start the Run

Click  on the Timeline toolbar. DSX prompts to verify lot specific data and to load sample caddy, plate(s), fluids, tips and deep wells for dilution. The prompts that are displayed depend upon the worklist. Perform the requested task and click:

-  when the task is complete and the next prompt displays.
-  for online help.
-  to cancel the operation.

When the work is finished *REVELATION DSX* software displays the results on screen.

► **Note:** All racks are mounted on dowel pins. Ensure that each rack is securely seated and cannot move in either the *x*- or *y*- direction

7.6 Verify Lot-Specific Data and Enter Runtime Variables

The plate number, assay name, data processing variables and fluids defined for the current worklist are available in the *Lot Specific Data and Runtime Variable Entry* dialog box.

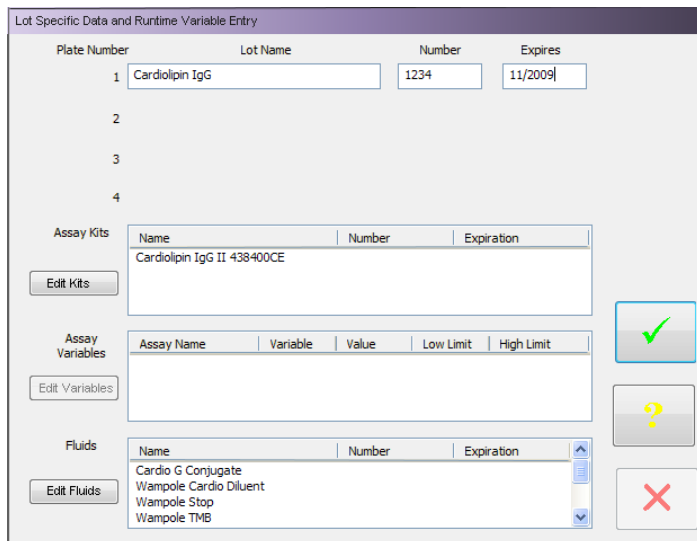


Plate Number	Lot Name	Number	Expires
1	Cardiolipin IgG	1234	11/2009
2			
3			
4			

Assay Kits	Name	Number	Expiration
Cardiolipin IgG II 438400CE			

Assay Variables	Assay Name	Variable	Value	Low Limit	High Limit

Fluids	Name	Number	Expiration
Cardio G Conjugate			
Wampole Cardio Diluent			
Wampole Stop			
Wampole TMB			

Figure 138: Lot Specific Data and Runtime Variable Entry Dialog Box

This dialog box displays when the worklist is started and can be accessed after plate data have been processed by selecting **Data → Lot Specific Data** from the menu bar.

To verify values obtained on controls against lot-specific control values, **Lot Specific Checking of Control Values** must be enabled on the *Q.C. Equations* tab of the *Quality Control: Raw Data* dialog box.

To use lot-specific standard values for preparing the standard curve, **Enter concentrations at run time** must be enabled on the *Standards* tab of the *Curve Fit* dialog box.

To verify calculated results on controls against lot-specific control values, **Lot Specific Checking of Control Values** must be enabled on the *Calculated Q.C.* tab of the *Curve Fit* dialog box (for a quantitative assay) or on the *Threshold Q.C.* tab of the *Threshold dialog* box (for a qualitative assay).

1. Click **Edit Kits** or **Edit Fluids** to enter the lot number and expiration date for consumables used in the worklist.
2. Click **Edit Variables** to enter equation components, variables or to enter the Variable Std. Multiplier used for the curve fit graph.
3. When finished, click the **Check mark** button to display the next prompt.

7.7 Load Sample Caddy

REVELATION DSX software prompts to load the sample caddy either when the worklist is created, if *Scan barcodes on new sample batch* is selected,

- or -

When the worklist is started the sample IDs are manually entered.

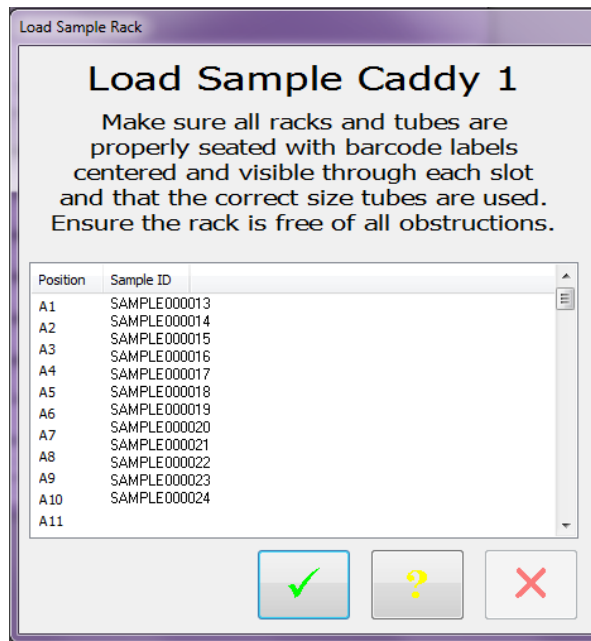


Figure 139: Load Sample Rack Dialog Box

The prompts that are displayed depend upon the worklist. In the **Example** shown, the samples have not yet been loaded on the system. If sample IDs are read automatically, the samples are already on the system and this prompt is not displayed.

1. Follow the instructions displayed on the screen.
2. When the sample rack is properly loaded, click the **Check mark** button to display the next prompt.

7.8 Load Plate Dialog Box

1. When the *Load Plate* dialog box displays, place the first microplate in a plate carrier and place it in the ambient plate drawer in the position shown.

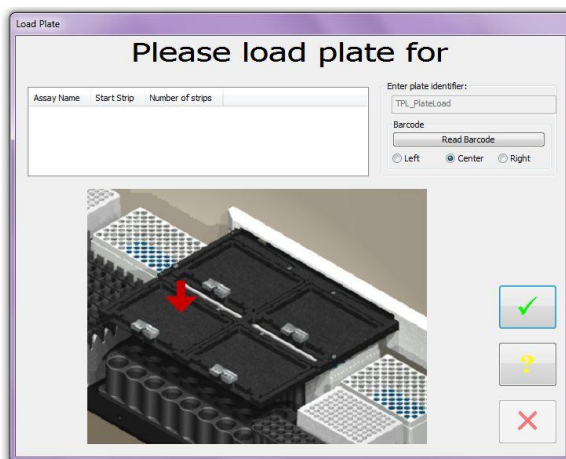


Figure 140: Load Plate Dialog Box

2. Enter the plate identifier or if the plate barcode label is to be read, designate the position of the barcode label on the microplate and click **Read Barcode**.
3. The plate identifier is used to name the report.
4. When the plate is properly loaded, click the **Check mark** button to display the next prompt.

7.9 Load Control Fluid Dialog Box

After the microplate(s) are loaded, *REVELATION DSX* software prompts to load standard and control fluids if the assay's *Pipette Samples/Standards/Controls* operation requires them.

1. Load the specified fluid in the indicated load position.

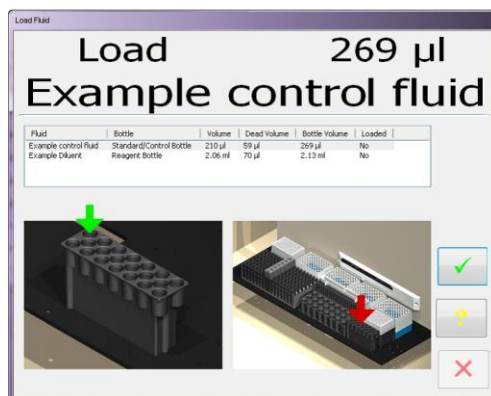


Figure 141: Load Control Fluid Dialog Box

2. As each requested standard or control is loaded into position, click the **Check mark** button to advance the load wizard to obtain information about the next standard or control fluid.

7.10 Load Reagent Fluid Dialog Box

1. When all standards and controls have been loaded, *REVELATION DSX* software prompts for loading reagent fluids.

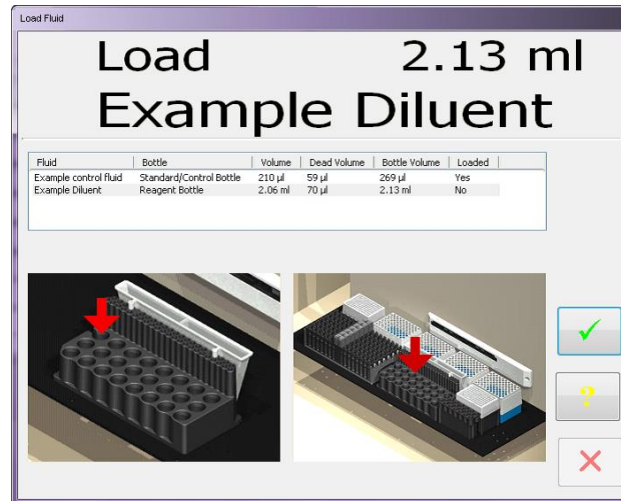


Figure 142: Load Reagent Fluid Dialog Box

2. Load the specified fluid in the indicated load position.
3. As each requested reagent fluid is loaded into position, click the **Check mark** button to advance the load wizard to obtain information about the next reagent fluid.

7.11 Load Wash Buffer Dialog Box

1. After all reagents have been loaded, *REVELATION DSX* software prompts for loading wash buffer.



Figure 143: Load Wash Fluid Dialog Box

2. Disconnect a wash buffer container (Chapter 4.9) and remove it from the system.
3. Remove the filler cap (Figure 19) and set the cap on a clean paper towel.
4. Fill the wash buffer container with the fluid that is to be used. **DO NOT OVERFILL.**

► **Note:** *If the fluid in a bottle is being changed, discard the contents of the bottle and thoroughly clean it before filling it with the new wash buffer.*

5. Replace the filler cap and tighten it.
6. Place the wash buffer container on the system and re-connect the fittings.

▶ **Note:** Ensure that the wash tubing is not pinched or crimped.

7. As each requested wash buffer container is loaded into position, click the **Check mark** button to advance the load wizard to obtain information about the next wash fluid.

7.12 Load Tips Dialog Box

After all fluids have been loaded, *REVELATION DSX* software prompts for loading the necessary sample and reagent tips.

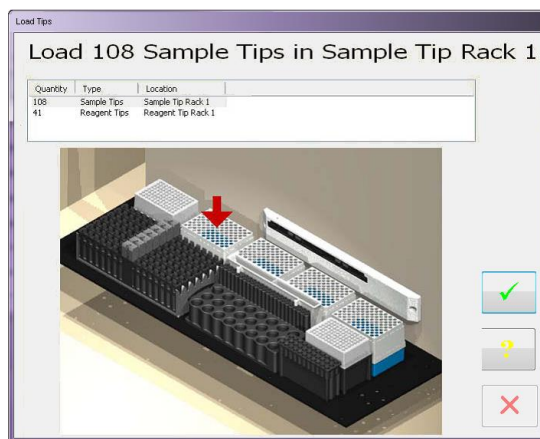



Figure 144: Load Tips Dialog Box

1. Load the specified tips in the indicated load position.
2. Click the **Check mark** button when the tips are properly loaded.

7.13 Empty Waste

Once all consumables have been loaded on the DSX, *REVELATION DSX* software prompts the user to empty the waste containers prior to beginning the worklist.

1. Disconnect the liquid waste container (refer to Section) and remove it from the system.
2. Remove the waste cap from the waste container and discard the waste in accordance with local regulations.
3. Rinse the waste container with DEIONIZED water. Discard the rinse water.
 - ▶ **Note:** *If required, the waste container can be disinfected with a laboratory disinfectant or 70% ethanol. The container must be thoroughly rinsed with deionized water before returning the waste container to the DSX, as residual disinfectants or alcohol may affect the results of ELISA assays.*
4. Replace and tighten the waste cap.
 - ▶ **Note:** *Ensure that the waste cap is securely tightened. If the cap is not securely tightened, there will be a vacuum leak and the software will generate a vacuum error.*
5. Place the waste container on the system and connect the fittings.
6. After completing the instructions in the dialog box, click .

7.14 Observe the Progress

The worklist begins. A .pdf file containing the sample IDs and locations in the sample rack, as well as the plate map is automatically saved in the *C:\Program Files\DYNEX Technologies\Revelation DSX\SID* folder. The file is named with the date followed by the time the run began.

You can observe worklist progress by displaying the timeline (Chapter 5.3).

7.15 View Test Results

When *REVELATION DSX* software finishes processing a microplate the results are displayed on the screen. Results are automatically named *xxx.dat* where *xxx* is the plate name. Results are stored in the **Plates Data** directory. Refer to Chapter 9 for instructions to view, edit and print results.

▶ **Note:** *Results are also transmitted to the LIS if LIS-Link is installed and **Enable LIS support** is checked in the LIS tab.*

▶ **Note:** *For external pipetted plates, the results are stored in the *TPL_RESULTS* folder as specified by the *TPL* folder location in *Tools* → *Options* → *Directories*.*



Important: *Do NOT rename the completed plate run files in this folder.*

7.15.1 Data Rounding

There can appear to be a discrepancy between the data values displayed and the final result designation with results close to the cut off when using threshold and Boolean function operations. In these instances, the final result displayed in the threshold or Boolean function is correct, the numerical data or manually calculated data seems discordant due to a rounding effect for the data display.

Each data reduction operation uses the raw, unrounded numbers. When the results are displayed in the report, *REVELATION DSX* software rounds the numbers to the decimal places specified for display purposes only.

Example:

Table 50: Data Rounding Example

Sample ID	Rounded (as displayed in report)	Unrounded (used in data reduction)
TB Ag – Nil	0.350	0.349844437003715
Mitogen – Nil	37.238	37.2376358938538
Nil	0.052	0.0517605644710079

In this instance, if the criteria were: “*is the result < 0.35*” would be true for TB Ag – Nil, as the unrounded value meets the criteria. The numerical value in the report would appear to reflect otherwise (showing 0.35) because it has been rounded to the number of decimal places requested for display. This rounded number is not used to perform data reduction. The rounded number is for display purposes only.

Additionally, there can be discrepancies between the mean of two values displayed on the report and the mean calculated manually when using the number displayed on the report (as well as %CVs, Standard deviations, etc.). The reason for this apparent discrepancy is the same as detailed above.

Where LIS-Link is concerned, the software passes what it is given. Therefore, if *REVELATION DSX* software provides a 3 decimal point data value, that is what the LIS-Link software transmits to the host. *REVELATION DSX* software fixes the decimal points in some cases so the number of decimal places configured by the user for the report display is not necessarily the same number of decimal places transmitted through LIS Link. The actual LIS-Link program does not do any data formatting. It expects results as text strings (formatting is an ELISA machine responsibility) and simply receives, stores and transmits them to the host.

Chapter 8: Quality Control

Multiple layers of quality control are automatically performed whenever the instrument is started and operated:

- Self-testing during startup
- Error detection and recovery during operation.

The use of quality control equations to automatically verify that a result is either within specified limits and can be reported or is outside of specified limits and will not be reported and/or will be flagged.

Additional quality control procedures are periodically performed by the operator:

- Including user-defined controls in each worklist
- Daily verification of the washer performance.

8.1 Quality Control Procedures Performed Automatically

8.1.1 Self-Testing During Startup

Proper operation of various instrument components is checked each time the instrument is started (Chapter 7.2.1). Upon completion of the instrument self-test, the results are displayed for review by the operator.

The results of all instrument self-tests must be passed in order for the instrument to be operated to perform tests. Self-test results can be saved (the test results files are named ***.tst**) and opened at a later date for review or printout.

8.1.2 Quality Control Equations

The manner in which results of an assay are read, analyzed and reported is specified in the assay file.

These specifications allow the assay creator to include one or more quality control equations to verify that a result is either within specified limits or is outside of specified limits. If the restrictions are not met, the results report contains a message indicating that the data failed QC (Chapter 8).

8.1.3 Use of ESP

ESP is a sophisticated technique used by the DSX instrument for detection of gross pipetting errors often caused by the presence of particulate matter, clots, foam or bubbles in the sample.

Use of ESP requires collecting pipetting pressure profiles from a specified number of acceptable sample transfers for a fluid with a specified pipetting profile and volume. These profiles are then stored in a database and are used as a comparison against each pipetting profile observed during routine pipetting of that fluid to detect and report an episode of insufficient sample transfer.

8.1.4 Well Fill Verification

A well fill verification can be included in an assay to verify that the proper volume of reagents has been dispensed. The well fill verification is performed by measuring the optical density of the contents of each designated well and then comparing the measured optical densities with expected values.

8.1.5 Levy-Jennings Plots

Levey-Jennings plots of control values can be included in an assay report to provide an indication of trends or shifts in an assay.

8.1.6 Error Detection and Recovery

An audible alarm sounds and the Error Recovery screen is displayed if an error occurs during operation of the DSX instrument. The error message screen indicates the error that has occurred and displays choices and instructions for resolving the error.

8.2 Quality Control Procedures Performed by the Operator

8.2.1 Testing of Controls

An assay can include one or more standards as well as negative, positive, cut-off, reference, serum and antigen controls.

The results for the standards and controls are included in the reports for the run. If these results are not within specified limits, the test can be rejected.

8.2.2 Periodic Verification of the Washer

DYNEX recommends creating an assay to verify the washer is working correctly prior to running any assays. This assay should be run at the beginning of each shift (Chapter 10.2).

DYNEX also recommends creating an assay to flush the wash head with distilled/deionized water as part of the daily shutdown procedure (Chapter 10.2).

Chapter 9: Reports

9.1 Results Reports

When *REVELATION DSX software* finishes processing a microplate the results are displayed on the screen. Results are automatically named *xxx.dat* where *xxx* is the plate name. Results are stored in the **Plates Data** directory.

► **Note:** You can select **Tools** → **Options** on menu bar to view or change the location of this directory.

9.1.1 Report Content

The content of results reports is defined when the assay is created using options available on the **Data Reduction** menu. Results reports contain the following information:

- Assay type, title, author and assay code (Chapter 6.5.2).
- Report header/footer, sample IDs, well locations, raw OD readings and more based on options selected in the *Report Options* (Chapter 6.5.11) dialog box.
- Additional result analysis (Chapter 6.5.6.2)
- Sample flags based on criteria defined in the Results Flagging tab (Chapter 6.5.6.4)
- A message indicating data failed QC if restrictions entered in the *Quality Control* dialog box (Chapter 6.5.6) are not met.

9.1.2 Report Format

Reports can also be customized to include:

- Laboratory demographics (Chapter 5.4.3.4)
- A font selection for printouts (Chapter 5.4.2)
- Unique colors used to identify well types (Chapter 5.4.3.2).

9.1.3 View Results Report

1. To open a previously saved results file, select **File** → **Open** from the menu bar.
2. Specify Files of type *.dat*. Click and navigate to the Plates Data directory.
3. Select the required results file and click **Open**.

Raw OD readings are included in the results report. You can decide to display the raw OD data in matrix or table format (Chapter 6.5.11.2). The matrix option (Figure 145) displays the value obtained from each well location in terms of its position on the plate.

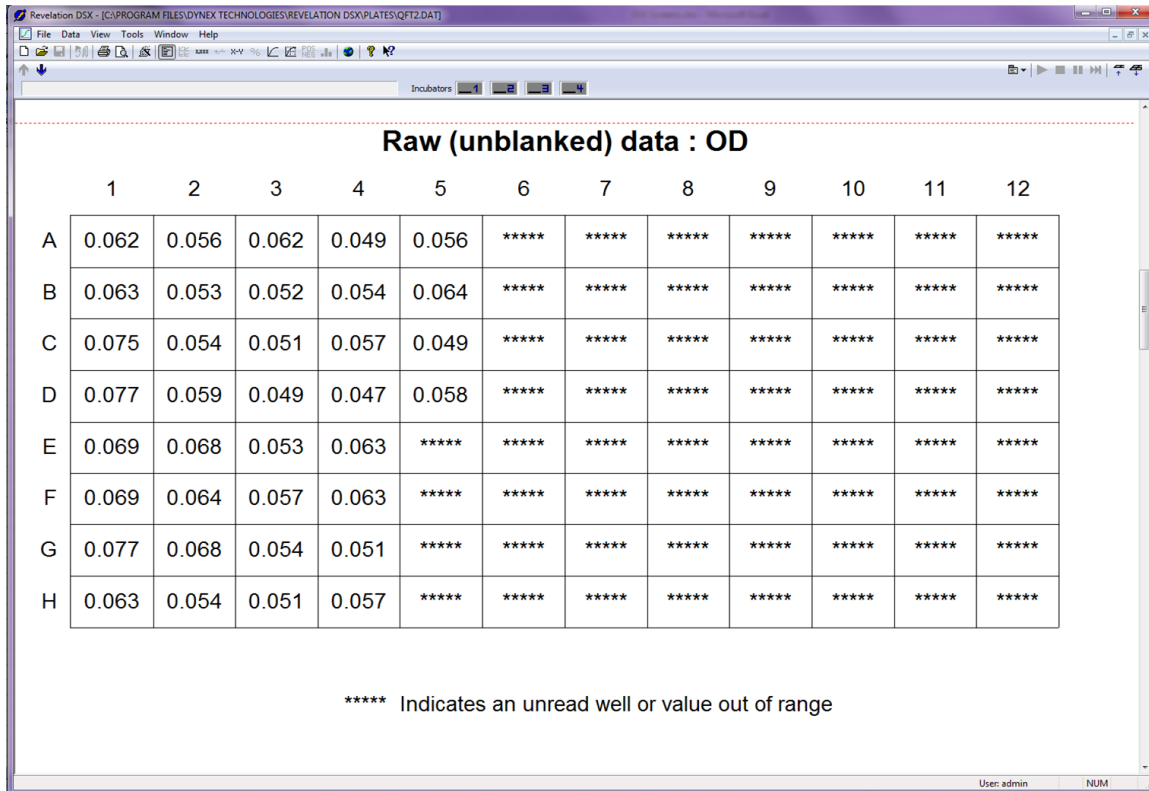


Figure 145: Example Matrix Output Format

The table option (Figure 146) shows the value obtained from each sample replicate in terms of its well type

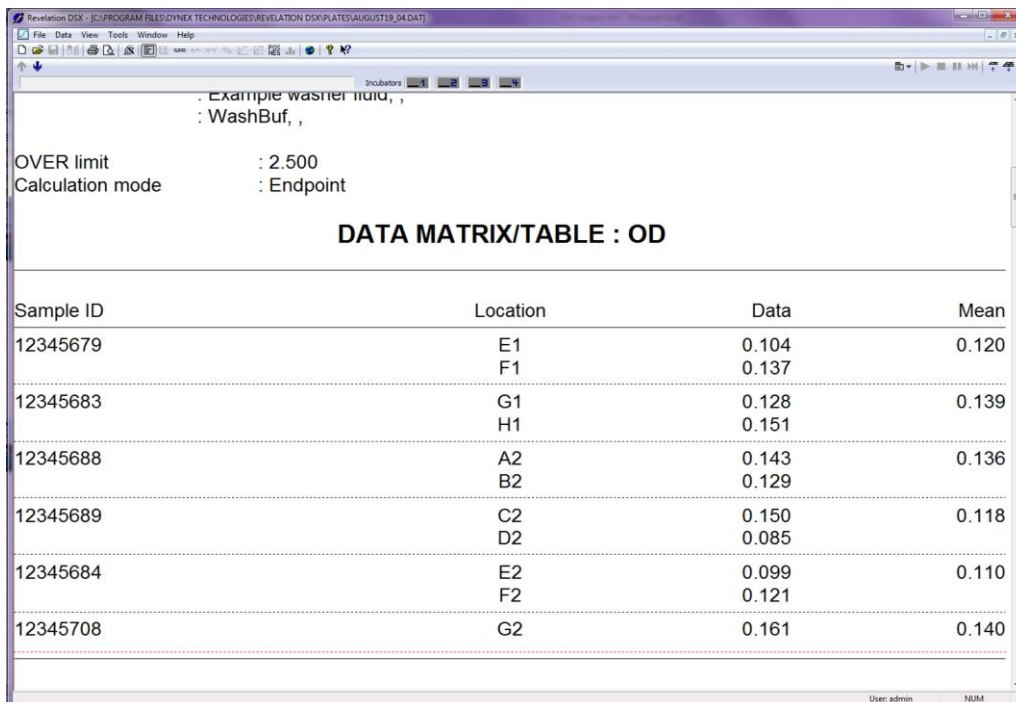


Figure 146: Example Table Output Format

When a plate data file is open, the *View Results* command (Chapter 5.2.5.2) is available on the *View* menu. This command provides access to display analysis that was performed on the result data.

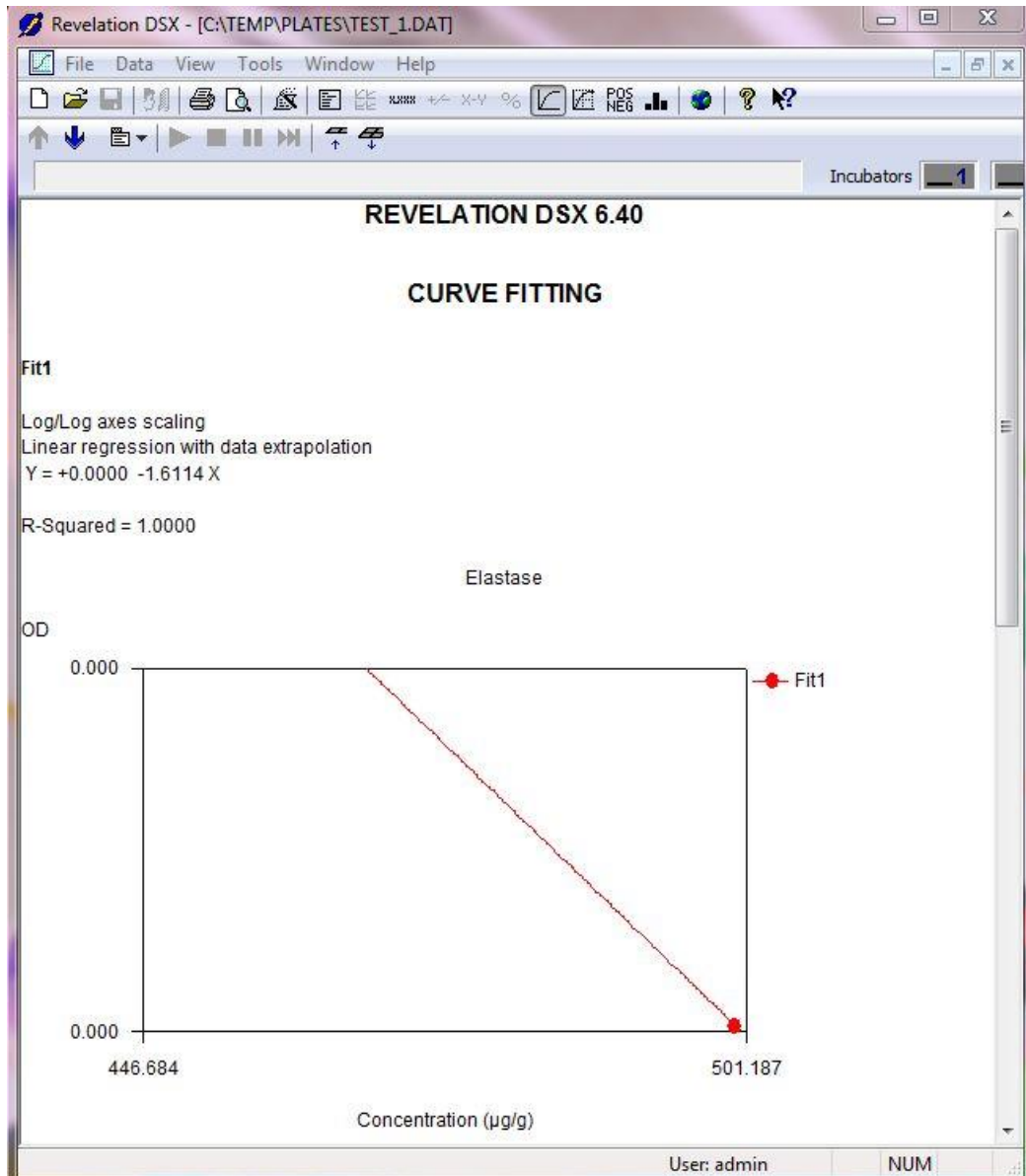


Figure 147: Example Curve Fit Concentration Graph

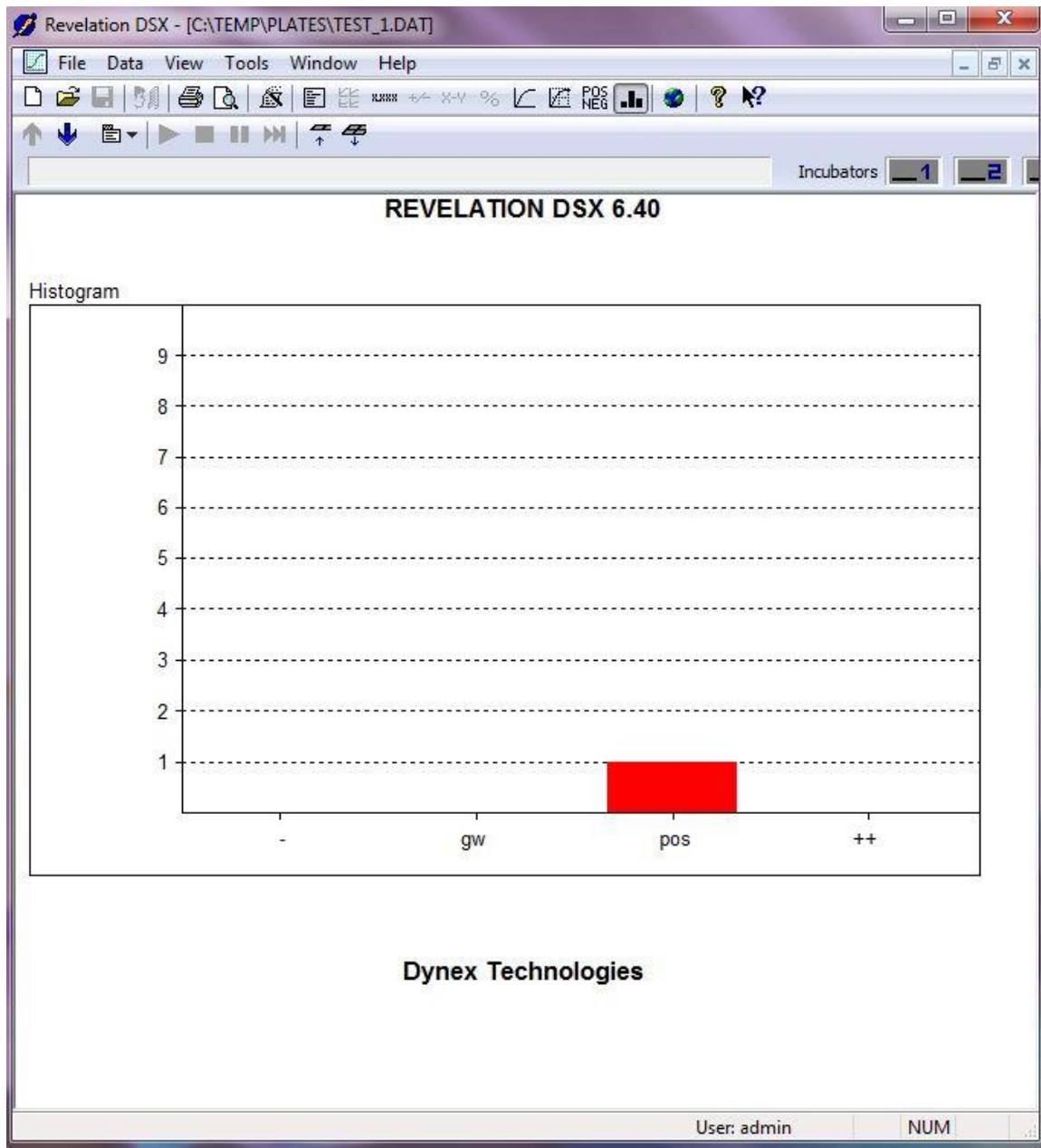


Figure 148: Example Histogram

9.1.4 Reprocess Results

The Data Menu (Chapter 5.2.11) includes options to change the way results are calculated. To use these options, first open the plate data file.

1. Select **File** → **Open** from the menu bar.
2. Specify *Files of type .dat*.
3. Click **Browse** and navigate to the *Plates Data* directory.
4. Select the required plate data file and click **Open**.

9.1.4.1 Refresh

Use **Refresh** to recalculate the currently displayed plate data file by modifying the original assay parameters.

1. Select **File → Open** from the menu bar and open the assay that was run to create the plate data file.

▶ **Note:** *The assay name is displayed in the TEST NAME field.*

2. Update the required parameters and save the assay file.
3. Select **Data → Refresh** from the menu bar to update the plate data file with the new assay parameters.


▶ **Note:** *A warning is added to the plate data to indicate results were reproduced using different settings to the original assay.*

9.1.4.2 Select New Assay

Use **Select New Assay** to recalculate the currently displayed plate data file using a different assay.

1. Select **Data → Select New Assay** from the menu bar.

▶ **Note:** *The original assay name is displayed in the TEST NAME field.*

2. Select a new assay and click  to update the plate data file with the new assay parameters.

▶ **Note:** *A warning is added to the plate data to indicate results were reproduced using different settings to the original assay.*

9.1.4.3 Lot Specific Data

Use **Lot Specific Data** to recalculate the currently displayed plate data using different standard values and expected ranges for controls.

1. Select **File → Open** from the menu bar to open the assay that was run to create the plate data file.

▶ **Note:** *The assay name is displayed in the TEST NAME field.*

2. Select **Data → Lot Specific Data** from the menu bar.
3. Edit the required fields.
4. Click the **Check mark** button to update the plate data file using the modified information.

9.1.4.4 Outlier Removal

Sometimes a well result falls outside the expected range, possibly because the well was dirty or contaminated. Use **Outlier Removal** from the menu bar to remove suspect well results from the currently displayed plate data.




Caution: This option should be used carefully as removing readings may affect the interpretation of results.

1. Select **Data** → **Outlier Removal** from the menu bar.

Table 51: Options and Descriptions

Option	Description
Mean/SD/CV	The mean, standard deviation and coefficient of variation for a selected well are shown to help decide whether the reading should be removed.
Remove	Exclude the replicate result currently highlighted in the main panel from all processing calculations. An * appears alongside a result when it is flagged for removal.
Restore	Include the replicate result currently highlighted in the main panel in all processing calculations.
Restore All	Include all results in all processing calculations


2. Make the required updates.
3. Click  to update the plate data file with the outliers removed.

► **Note:** Results reports list all removed results.

9.1.4.5 Titration Multiplier

Use **Titration Multiplier** to recalculate the currently displayed plate data after changing the value of all the steps in a dilution block.

► **Note:** This option is only available if the assay contained a dilution step.

1. Select **Data** → **Titration Multiplier** from the menu bar.
2. Type the required multiplier.
3. Click .

9.1.4.6 Fit Information

Use **Fit Information** to view the name, fit type and axes fit for each curve in the currently displayed plate data and to store curve parameters.


► **Note:** This option is only available if curve fit processing was selected as a data processing option.

All the curve fits that were successfully processed in this data file are listed in the selection box.

1. Select **Data** → **Fit Information** from the menu bar.
2. Choose the required options.

Table 52: Required Options for Fit Information


Option	Description
Value Inquiry	Type in a value for either axis, to view the corresponding value on the other axis.
Fit Information	View the name, fit type and axis fit of the curve fit selected in the selection box.
Include	Output the fit information of the curve highlighted in the selection box, with the other results.
Save	Save the settings of the curve highlighted in the selection box. These settings can be used in future assays to produce similar curve fits.

3. Revelation prompts for a file name, type in a filename.
4. Click .

9.1.4.7 Sample ID Filename

Sample ID files are automatically saved during worklist creation. Use **Sample ID Filename** to select a different SID file and assign new sample IDs to well positions in the currently displayed plate data.

► **Note:** *Sample IDs are only output if **Sample IDs** is checked as an option for the output report(s).*

1. Select **Data → Sample ID Filename** from the menu bar.
2. By default, in *REVELATION DSX* software looks in the SID directory for a SID file with the same name as the plate ID.
3. Click **Change** and browse to select the SID file to be used.
4. Choose the new SID file and click  to update the plate data file with the new sample IDs.

9.1.5 Print Results

Select **File → Print** from the menu bar to print the file currently displayed in the title bar. You can choose the printer, the number of pages and the number of copies of the report to print.

9.1.6 Send Results to an LIS

LIS-Link must be installed and the connection enabled to transmit results to the LIS. Once the connection is setup:

1. Select **Tools → Configure System** from the menu bar and select the **LIS** tab.
2. Check the **Enable LIS support** checkbox to automatically transmit completed results to the LIS.
3. Check the **Use LIS on new sample batch** checkbox on the *Sample Batch Selection* dialog box during worklist creation.
4. To have reprocessed data also sent to the LIS, check **When Reprocessing Plate Data Files Output File to LIS**.

- To be prompted before the reprocessed data are sent, check **Always Warn Before Outputting to LIS During Reprocessing**.

► **Note:** See also the *LIS-Link Programmer's Guide*.

DYNEX recommends that end users validate the transmittal of results to their LIS/LIMS when validating automated assay files. Possibilities may exist that can create discrepancies between the intended results and those transmitted to a LIS/LIMS system. The transmission of intended results, generated from automated assay files, through a LIS/LIMS system should be part of any validated procedure. DYNEX strongly advises that end users validate the complete utility of the automation of the assay, including transmittal of the assay's results to LIS.



Warning: Failure to validate that results are correctly transmitted to the laboratory information management system (LIS/LIMS) can lead to issuing incorrect test results.

9.1.7 Export Results

You can output the file currently displayed in the title bar to a location on disk.

- Select **Data Reduction** → **Report Options** from the menu bar.
- Select the Export to File tab (Chapter 6.5.11.3).
- Place a check mark in the **File Export Enabled** checkbox.
- Select the file format.

► **Note:** Use the **Options** button to further define the file format and content for ASCII and Sanguin formats.

- Click .

By default, exported files are stored in the **C:\Program Files\DYNEX Technologies\Revelation DSX\Text** directory.

9.2 Directory Structure

In addition to results reports, *REVELATION DSX* software stores assays, templates, scripts, log files and status reports in dedicated directories. The default storage location is *C:\Program Files\DYNEX Technologies\Revelation DSX\directory name*.

Table 53: Directory Names and Descriptions

Directory Name	Description
Assays	All data and instructions to direct the system to run an assay, calculate results and create reports
AutoErrorRecovery	Error recovery scripts
Curves	Curves stored after the test was run
Languages	Language files used for menus and dialog boxes
Levey Jennings	Control chart in which individual control measurements are plotted over time

Directory Name	Description
LIS-Link	LogDebugAction file, which captures incoming and outgoing transmissions between the instrument control computer and the host LIS.
Logs	Date/time stamped audit records of key software and <i>DSX</i> events
Plates	<i>REVELATION DSX</i> software results files
Reports	<i>Pdf files containing sample IDs and sample rack positions</i>
Self-tests	<i>DSX self-test reports</i>
SID	Template that can be used to assign sample IDs to well positions
Sounds	Sound files that play when an error occurs if audible alarms are configured
Text	Result files exported as: ASCII text file (.txt) Sanguin comma separated ASCII text file (.dat) Mikrotek binary file (.dat), Concentrations in an ASCII text file (.res)
WFV	Results from running a <i>Well Fill Verify</i> operation
Worklists	Assay selections that can be recalled to create another worklist

9.3 Log Files and Status Reports

The following log files and status reports capture system status information.

Self-test reports (.*tst* files) from each instrument startup. The self-test report for the current session can be saved and/or printed at any time during the session (Chapter7.2.1).

Debug logs (.*log* files) listing a trace of system operations. These reports are automatically saved for a specified period of time and can be retrieved for review and/or printing (Chapter5.4.1.9).

Well Fill Verify (.*wfv* files) containing the results of a Well Fill Verify operation added to an assay (Chapter) and can be retrieved for review and/or printing.

Sample IDs (.*pdf*) created when the worklist begins, a .pdf file of the sample IDs and locations in the sample rack, as well as the plate map is automatically printed to a folder in the *REVELATION DSX* folder called *Reports*. The file is named with the date followed by the time the run began.

These reports can be viewed and printed at any time:

1. Select **File** → **Open** from the menu bar.
2. Specify the correct *Files of type* (*tst*, *log*, *wfv* or *pdf*).
3. Click **Open**.
4. Select **File** → **Print** from the menu bar to print the displayed report.

9.4 Recovery Crash Files

REVELATION DSX 6.XX, running under the Windows XP operating system, creates two files when a software crash occurs. In this context, a crash refers only to the situation where Windows XP shuts down *Revelation.exe* and presents an error message: "*Windows has closed the Revelation.exe application...*". A crash does not refer to the *REVELATION DSX* application freezing or a situation where the instrument itself malfunctions and causes other types of *REVELATION DSX* error messages to appear.

These crash files contain technical details of the crash and record the state of the computer when the crash occurred. When these files are returned to DYNEX, software engineers can examine them using specialized debugging software and other utilities to help identify the line of code being processed when the crash occurred. These files are highly technical and casual examination of these files is probably not useful to the average end-user or support technician.

The files, **revel_crashXXX.dmp** and **revel_crashXXX.log**, may be located at *C:\Program Files\DYNEX Technologies\Revelation DSX*.

The **XXX** represents a number e.g. 001, 002, 003. The number automatically begins with 001 and increments as files accumulate. *REVELATION DSX* continues to accumulate these files until they are manually deleted. Each crash event produces a pair of files with the same number designation. After the system has been in use awhile, it is not unusual to see an accumulation of 5-10 pairs of these files. The user may routinely clear these files if required. They will not cause problems if they remain.

If requested by DYNEX Technical Support personnel, these files should be copied and attached to emails for transmission to DYNEX. Do not send all the files. Usually, only the last pair of files is necessary. The user may check the creation date of the files and select the pair that was created when the specific crash event occurred.

Ideally, it is also helpful to send the log file for that date and the associated assay files that were running. This often gives DYNEX **Use LIS on new sample batch** all the information necessary to advise the user concerning the problem encountered.

Chapter 10: Maintenance

Periodic maintenance procedures must be performed on the DYNEX DSX instrument. These procedures include:

- General cleaning and disinfection
- Daily maintenance including verifying wash dispense and aspiration
- Weekly maintenance
- Six-month maintenance
- Twelve-month maintenance
- As-needed maintenance.



Warning: Always disconnect the power to the DYNEX DSX instrument before performing all maintenance procedures except testing consistency of wash dispense and wash aspiration.



Note: In the event that an operator must perform maintenance to the DSX, which could possibly expose them to hazardous moving parts, the operator must contact DYNEX for proper safety precautions to avoid possible injury.

10.1 General Cleaning and Decontamination

The DYNEX DSX instrument is constructed from materials that resist chemical attack. Spills should be cleaned as soon as possible.

If you need to decontaminate the instrument (**Example:** before servicing the instrument), external surfaces of the instrument should be cleaned before the instrument is decontaminated.



Warning: While the DYNEX DSX instrument alone does not present a biohazard, the samples that are used and all parts and consumables in contact with the samples must be considered biohazardous and/or toxic. Always wear protective gloves and suitable eye protection when handling potentially infectious substances.



Important: Ethyl alcohol, 70% isopropyl alcohol or laboratory disinfectants containing quaternary ammonium sulfates are approved for use to clean and disinfect the DYNEX DSX instrument. Do not use cleaning agents or decontaminating agents that could cause a hazard as a result of reaction with parts of the equipment or with the material contained in it.

If you are in doubt about compatibility of a cleaning agent with parts of the DYNEX DSX instrument, contact DYNEX.

10.1.1 Checking Areas Adjacent to the Instrument

Areas immediately around the instrument should be free of materials such as books, supplies or objects that may interfere with airflow.

10.1.2 Cleaning External Surfaces of the Instrument

Clean external surfaces of the instrument, waste containers, wash buffer containers and tubing lines with a cloth moistened with mild laboratory detergent. If needed, dilute the laboratory detergent according to the manufacturer's instructions before using.

► **Note:** *If there is doubt about the compatibility of cleaning agents with parts of the DSX system, contact your DYNEX representative.*

10.1.3 Decontaminating the Instrument

1. Clean external surfaces of the instrument, waste containers, wash buffer containers and tubing lines with a cloth moistened with mild laboratory detergent.

i **Important:** *Bleach is not recommended as it attacks materials chemically and will shorten the useful life of many components. If bleach is used, remove residual bleach from surfaces with a cloth moistened with deionized water.*

2. Wipe external surfaces of the instrument, waste containers, wash buffer containers and tubing lines with a cloth moistened with a 70% (v/v) solution of alcohol.
3. Rinse the waste containers with 70% alcohol. Then thoroughly rinse the waste containers with deionized water to remove the alcohol before returning the waste container to the DSX, as residual disinfectants or alcohol may affect the results of ELISA assays.
4. Run 70% alcohol through all of the tubing lines. Then run deionized water through the tubing lines to remove the alcohol.

i **Important:** *Residual alcohol may affect the results of assays. Remove residual alcohol from surfaces with a cloth moistened with deionized water.*

10.2 Daily Maintenance

The following maintenance procedures must be performed on a daily basis to ensure reliable operation:

1. Verify that the self-test passes.

► **Note:** *Results of the self-test can be printed. Refer to Chapter 7.2.1 for more information on printing the self-test results.*

2. Verify the washer does not have clogs in the aspiration or dispense needles. Verify the washer is working correctly prior to running any assays. DYNEX recommends creating an assay to test the washer. This assay should be run at the beginning of each shift.

3. Shutdown the system. DYNEX recommends creating an assay to flush the wash head with distilled/deionized water as part of the daily shutdown procedure.
4. Empty and clean the tip waste container (Figure 20).



Warning: While the DYNEX DSX system does not present a biohazard, if biological samples are being tested the samples and all parts and consumables in contact with the samples must be considered as biohazards. Always wear protective gloves when handling potentially hazardous substances.

5. Empty and clean the liquid waste container (Chapter 7.13).



Note: If needed, the waste tip container and the liquid waste container can be disinfected with 70% ethanol or laboratory disinfectant solution.



Important: If containers are disinfected, they must be thoroughly rinsed with deionized water before replacing. Remove residual alcohol from surfaces with a cloth moistened with deionized water.

6. Wipe external surfaces, plate drawers, waste containers, wash buffer containers and tubing lines with a cloth moistened with a 70% (v/v) solution of alcohol. Pay special attention to the tip sensor area, the wash head sensor and the wash head assembly.
7. Clean the pipette spigot using a non-fibrous towel moistened with 70% alcohol.
8. After performing steps 4 through 7, remove any residual alcohol with a cloth dampened with deionized water.
9. Purge the washer with 50mL of deionized water.



Note: The deionized water used for purging should be placed in wash buffer container D (Figure 18).

10.3 Weekly Maintenance

The following maintenance procedure must be performed on a weekly basis:

1. Empty the wash buffer containers and clean them with disinfectant or 70% alcohol. Rinse the wash buffer containers with deionized/distilled water prior to returning them to the system.
2. Remove and clean the waste tip chute.



Note: If required, the waste tip chute can be disinfected with 70% alcohol or disinfectant. The tip waste chute must be thoroughly rinsed with deionized water.

10.4 Six-Month Maintenance

Six-month preventive maintenance is performed on the DSX instrument by trained DYNEX service personnel. The six-month preventive maintenance is described in *Technical Bulletin TB108* and includes the following:

1. Power up and perform self-test.
2. Perform PC maintenance (back up log files; scandisk; defragmentation [defrag]).
3. Clean reader optics and filters.
4. Replace reader lamp and fan filter.
5. Inspect Z-drive counter balance spring.
6. Inspect the Z-encoder mounting plate bearing.
7. Ensure pulley set screws are tight.
8. Inspect and clean the pipette collar mechanism.
9. Inspect and clean the spigot polytetrafluoroethylene (PTFE) or horizontal opening.
10. Inspect the spring clips on each plate holder, replace as needed.
11. Inspect and clean all locking lever mechanisms for each module.
12. Check that the blue cover will stay open.
13. Replace dispense and aspirate tubing.
14. Inspect O-rings on the bottle fittings
15. Perform the Tip Alignment Test – sample and reagent tips.
16. Perform the Sample Rack Pickup/Read Test (test all racks for 2 cycles).
17. Perform the Plate Cycle Test using all 4 plate carriers (18 cycles each).
18. Perform the Washer Dispense Verification for all 4 bottles.
19. Perform the Reader Verification Test.
20. Run the Pipette Check Assay.

10.5 Twelve-Month Maintenance

Annual preventive maintenance is performed on the DSX instrument by trained DYNEX service personnel. The annual preventive maintenance is described in *Technical Bulletin TB107* and includes the following:

1. Power up and perform self-test.
2. Perform PC maintenance (back up log files; scandisk; defrag).
3. Clean reader optics and filters.
4. Replace reader lamp and fan filter.
5. Inspect X-, Y-, Z-drives for debris build up and wear.
6. Inspect Z-drive counter balance spring.
7. Inspect the Z-encoder mounting plate bearing.

8. Ensure pulley set screws are tight.
9. Check belt tensions with Breco-flex meter.
10. Inspect and clean the pipette collar mechanism.
11. Inspect and clean the spigot PTFE or horizontal opening.
12. Inspect the spring clips on each plate holder, replace as needed.
13. Inspect and clean all locking lever mechanisms for each module.
14. Check that the blue cover will stay open.
15. Replace dispense and aspirate tubing.
16. Inspect O-rings on the bottle fittings.
17. Check the vacuum sensor setting.
18. Perform the *Tip Alignment Test* – sample and reagent tips.
19. Perform the *Sample Rack Pickup/Read Test* (test all racks for 2 cycles).
20. Perform the *Plate Cycle Test* using all 4 plate carriers (18 cycles each).
21. Perform the *Washer Dispense Verification* for all 4 bottles.
22. Perform the *Reader Verification Test*.
23. Run the *Pipette Check Assay*.

10.6 Removing a Module

The incubator modules, absorbance module and the wash module can be easily removed from the DSX.

10.6.1.1.1 Removing an Incubator Module

1. Loosen the fastener Figure 149) one-fourth ($\frac{1}{4}$) of a turn using a 4 mm Allen wrench.
 - ▶ **Note:** *The incubator modules and the absorbance module each have two fasteners.*
2. Pull the module out of the housing.
3. Replace the module by reversing the procedure.

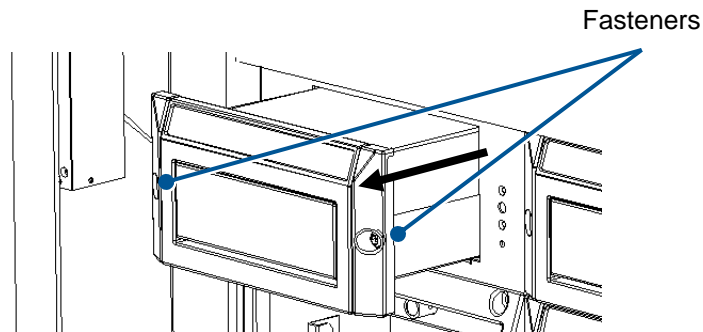


Figure 149: Fasteners on the Incubator Modules or Detection Module

10.6.1.1.2 Removing the Wash Module

1. Remove the wash head by loosening the thumbscrew.
2. Disconnect the tubing from the dispense valve on the washer module.
3. Loosen the fasteners one-fourth ($\frac{1}{4}$) of a turn using a 4 mm Allen wrench.

► **Note:** *The wash module has four fasteners.*

4. Pull the module out of the housing.
5. Replace the module by reversing the procedure.

10.7 Replacing the Absorbance Module Lamp



Caution: *The optics assembly may be hot. Allow at least five minutes for the instrument to cool before opening the optics assembly.*



Warning: *Be careful when removing the filter access panel, as there is a possibility that the bulb may have broken.*



Caution: *Failure to follow the lamp replacement procedures as described may result in personal injury.*



Important: *This procedure should only be performed by personnel trained to align the lamp following replacement. To properly align the lamp requires the use of Deesoft software.*

1. Remove the absorbance module from the system.
2. Remove the filter access panel to expose the optical assembly. The bulb is mounted in the upper portion of the optical assembly as shown in Figure 150.

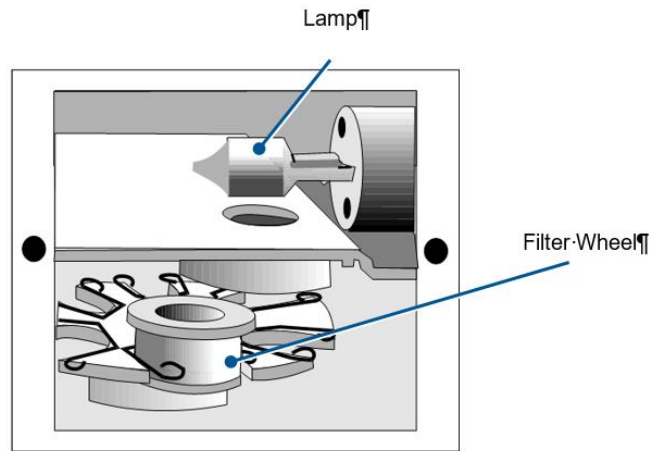


Figure 150: Optical Assembly

3. Put on a pair of rubber or latex gloves.



Caution: Gloves are necessary to prevent skin oils from damaging the lamp. Gloves are also worn as a safety precaution should the glass bulb accidentally break.

4. Grasp the lamp with plastic tweezers and pull the lamp out of its receptacle (Figure 151).



Important: Use a gloved finger to prevent the bulb from bumping into the metal sidewalls of the enclosure during removal.

5. Obtain a replacement lamp.
6. Grasp the lamp tines with plastic tweezers and align the tines with the corresponding holes in the lamp socket.
7. Firmly insert the lamp into the socket.
8. Replace the filter access panel.
9. Replace the absorbance module.

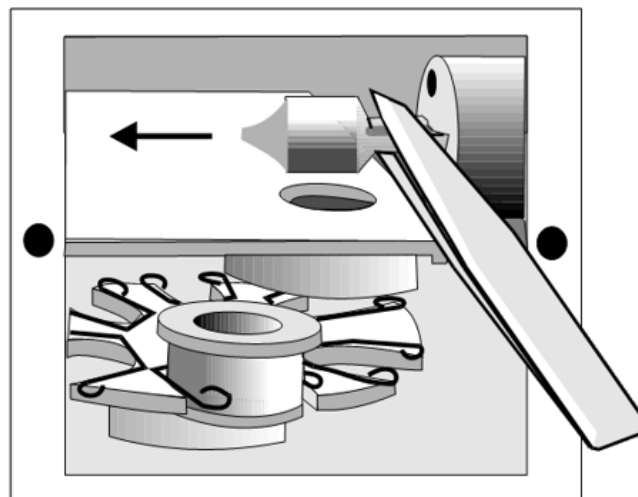


Figure 151: Removing the Lamp

10.8 Replacing an Absorbance Module Filter



Caution: The optics assembly may be hot. Allow at least five minutes for the instrument to cool before opening the optics assembly.



Warning: Also, be careful when removing the filter access panel, as there is a possibility that the bulb may have broken.

10.8.1.1.1 Removing a Filter

1. Remove the absorbance module from the system.
2. Remove the filter access panel. The filters are mounted on the filter wheel as shown in Figure 152.
3. Locate the filter that is to be removed.
4. Firmly grasp the exterior filter housing with a pair of needle nose pliers (Figure 152).
5. Pull the filter out of the spring-loaded slot.
6. Replace the filter access panel.

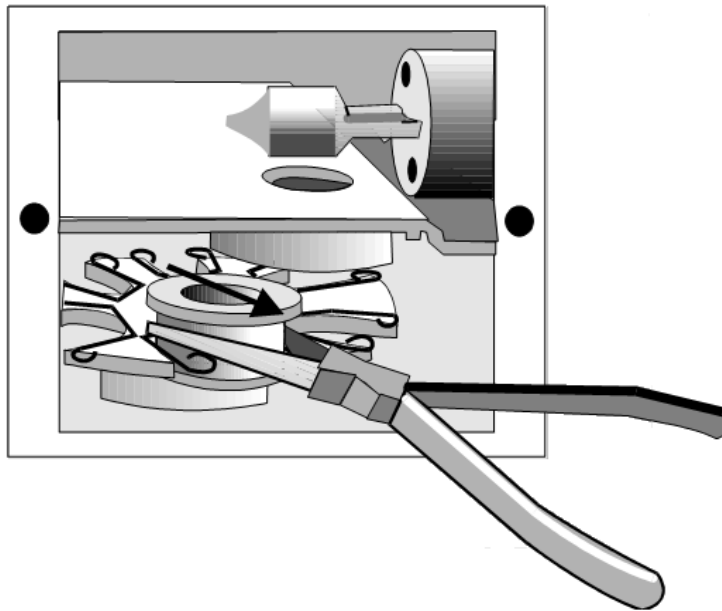


Figure 152: Removing a Filter

10.8.1.1.2 Installing a Filter

1. Remove the absorbance module from the system.
2. Remove the filter access panel. The filters are mounted on the filter wheel as shown in Figure 152.
3. Locate the filter position in which the filter will be installed.



Important: Filters must be installed in adjacent filter positions, in the order of their wavelength. There must not be any empty filter positions between the lowest wavelength and highest wavelength filters.



Note: If a new filter is installed in a previously empty position or if the wavelength is being changed, the wavelength of the new filter must be entered.



Important: The 405 nanometers (nm) filter must be installed in Filter Position 1. The self-test will fail if the 405nm filter is not installed in Position 1.

4. Firmly grasp the exterior filter housing with a pair of needle nose pliers.
5. Push the filter into the spring-loaded slot.
6. Replace the filter access panel.



Important: The bottom groove of the filter must be firmly seated in the filter wheel. If the groove is aligned with the spring on the filter wheel, then the filter has been installed incorrectly and will affect instrument performance.

7. Replace the absorbance module.

10.9 Replacing the Tubing



Note: The dispense tubing and aspiration tubing may need to be replaced more frequently than the scheduled six-months maintenance, depending upon the frequency of use and the severity of operating conditions. Contact DYNEX for information on replacement tubing.

Fluid droplets can creep into the DSX pipette tubing when the spigot gets contaminated from bubbles or splashing as a result of routine use with viscous foamy reagents. This fluid can dry inside the pipette tubing, causing liquid level detection, contamination and pipetting issues. Technical Bulletin TB195 contains instructions on how to clean this tubing in the event of accidental fluid aspiration which affects instrument performance.



Important: This cleaning procedure should only be performed by a trained service engineer and frequency is based on the contamination severity.

1. Lift the rear edge of the metal panel at the front of the system (Figure 153) to expose the tubing.

► **Note:** The metal panel is hinged at the front. When lifting the front panel, prevent it from dropping all the way forward.

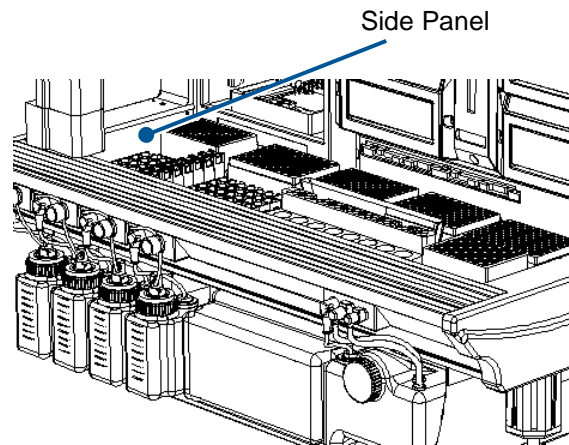


Figure 153: Lifting the Front Panel

2. Remove the four Pozi Pan Head screws from the left side panel, using a Pozi Pan (Phillips) screwdriver and remove the panel.
3. A diagram of the hydraulic tubing for the DSX Automated ELISA System is shown in Figure 154. Consult the diagram for routing of the tubing.

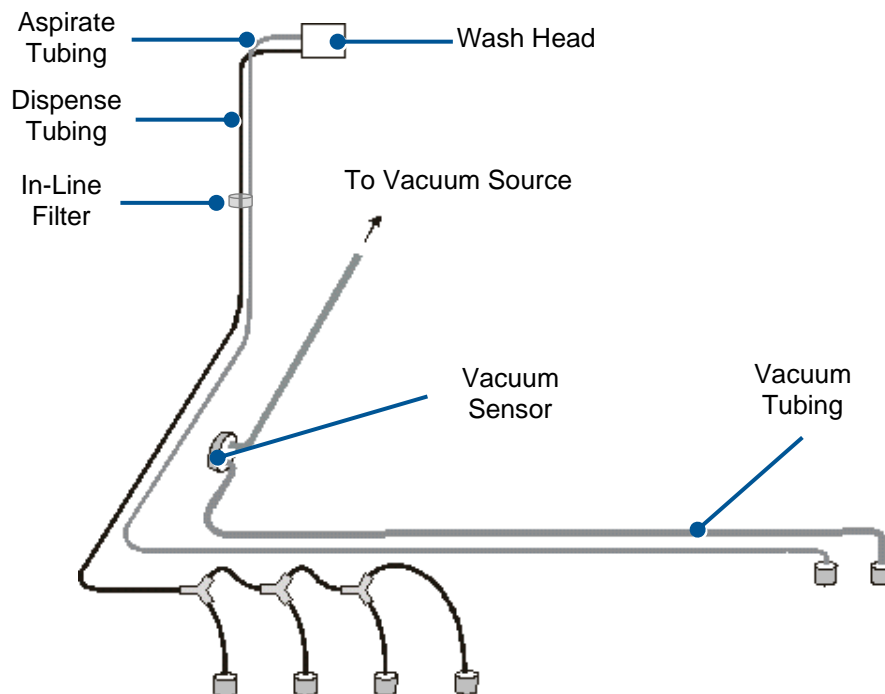


Figure 154: Hydraulic Tubing Diagram

4. Replace the tubing and fittings as required and replace the in-line filter.
5. Replace the side panel and secure it using the four Pozi Pan Head screws.



Figure 155: Pozi Pan Head Screw

6. Close the front panel.

10.10 Cleaning the Wash Head

1. Select **Lower Wash Head** from the *Timeline* menu. If the DSX has a floating wash head, grasp the wash head assembly and lift it up from the retaining cradle. If the DSX has a fixed wash head, the thumbscrew in the front of the wash head must be loosened. Hold the right side of the thumbscrew still, while loosening the left side of the thumbscrew. Once loosened, the wash head will lift off.
2. Shutdown and switch off the system.



Caution: Always disconnect the power before servicing the system.

3. Remove the wash head from its holder.
4. Remove the tubing from the wash head.
5. Put the wash head into a bath filled with a mild detergent solution and keep it there for time recommended by the detergent solution instructions.
6. Rinse the wash head thoroughly with distilled water to remove residual detergent.
7. Replace the wash head tubing and place the wash head back on the holder.
 - a. For the floating wash head, position the wash head assembly back in the retaining cradle.
 - b. For the fixed wash head, position the wash head in the cradle and tighten the thumbscrew until it is close to being tight.
 - c. Ensure that the wash head is level from front to back before completely tightening the thumbscrew.
8. Start the DSX and perform a test wash assay to ensure the wash head is positioned correctly and that the washer is functioning properly.

10.10.1.1.1 Unclogging the Wash Head Assembly

If some pins of the wash head are clogged and could not be unclogged by cleaning the wash head with a mild detergent solution, cleaning wires can be used to unclog the aspirate and dispense pins.

1. Select **Lower Wash Head** from the *Timeline* menu.
2. Shutdown and switch off the system.
3. Remove the wash head from its holder.
4. Remove the tubing from the wash head.
5. Pass the appropriate cleaning wire through the inside of each aspirate pin and dispense pin on the wash head. There are two sizes of cleaning wires. The thicker wire is for the aspirate pins and the thinner wire is for the dispense pins.
6. Move the cleaning wire gently up and down inside each pin to release the blockage.
7. Replace the wash head tubing and place the wash head back on the holder. For the floating wash head, position the wash head assembly back in the retaining cradle. For the fixed wash head, position the wash head in the cradle and tighten the thumbscrew until it is close to being tight. Ensure that the wash head is level from front to back before completely tightening the thumbscrew.
8. Start the DSX and perform a test wash assay to ensure the wash head is positioned correctly and that the washer is functioning properly.

10.11 Replacing the Fuse

If the DSX fails to power up and the power connections are correct, the main fuse may need to be replaced. The main fuse is positioned on the right side of the analyzer next to the on/off switch. To replace the fuse:

1. Turn the system power off (O).
2. Disconnect the power cord from the analyzer.



Figure 156: Replacing the Fuse

3. Pull out the fuse holder using a screwdriver or pointed object.
4. Remove and replace the fuse.
5. Insert the fuse holder carefully.
6. Reconnect the power cord.
7. Power on the system.

10.12 Returning Items to the Factory

When the DSX instrument or one of its components is returned to DYNEX, the instrument or component must be decontaminated before it is shipped. A Return Authorization Number must be obtained and a decontamination certificate must be submitted with the unit.



Warning: While the DYNEX DSX alone does not present a biohazard, biological samples that are used and all parts and consumables in contact with the samples must be considered biohazardous.



Note: Refer to Chapter 10.6 for module removal instructions. Refer to Chapter 10.1 for decontamination instructions.

A completed *Equipment in Transit* form must also be included in any shipment of returned items to DYNEX. Obtain a **Return Authorization Number (RA#)** from DYNEX before shipping the instrument or component and include the RA# on the form. For international shipments, contact your DYNEX representative.



Important: Complete this form for each product/instrument that is being returned and attach it to the product prior to it being shipped. If your instrument contains a hard drive please retain back-up copies of all or any stored files and remove any personal information to comply with HIPPA regulations. The Return Authorization (RA) for your product/instrument is listed below.

1. Contact DYNEX to obtain a **Return Authorization Number (RA#)**. For international shipments, contact your DYNEX representative.
2. Clean and decontaminate the module.
3. Fill out an *Equipment in Transit* form (Figure 157).
4. Pack the module and the *Equipment in Transit* form for shipment.
5. Ship the module to the nearest DYNEX Technologies facility.



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Repair Form and Declaration of Decontamination

IMPORTANT: Please complete this form for each product/instrument that is being returned and attach it to the product prior to it being shipped. If your instrument contains a hard drive, please retain back-up copies of all or any stored files and remove any personal information to comply with HIPPA regulations. The Return Authorization (RA) for your product/instrument is listed below.

To ensure your instrument is received safely and processed correctly, please note the following:

- Please pack the instrument appropriately, using the original materials and instructions from the manual, insuring instrument as needed.
- Return this signed form with the product/instrument. Verifying that the decontamination was completed in accordance with Dynex procedures. Failure to do so will delay repairs until the form is received.
- Place the RA number on the outside of the shipping container and in the attention line. **Failure to do so will delay processing and may cause your instrument to be returned to you COD.**

Contact: Dynex Technical Service, Phone: (800) 288-2354 option #4, Fax: (703) 803-1441

EQUIPMENT DECLARATION

Return Authorization/Case Number: _____
Product/Instrument Model: _____ Serial Number: _____
Customer Location Name: _____
Address: _____
City: _____ State/Prov: _____ Zip Code: _____
Contact Name: _____
Contact Phone: _____ Contact Fax: _____
Contact e-mail: _____
Brief Description of problem or error: _____

CERTIFICATE OF DECONTAMINATION

I certify that the equipment described above has been disinfected/decontaminated with 70% (by volume) solution of alcohol, per Dynex procedure in the manual, which includes all external surfaces and any surface that have come in contact with bio-hazardous materials and/or chemicals. It is clean, dry and fit for transport and poses no health or safety risk to the recipient.

Signed: _____ Date: _____
Printed Name: _____ Title: _____

(Dynex Technologies reserves the right to charge or refuse improperly cleaned equipment)

Shipping Address: Dynex Technologies
Attn.: (Above Return Authorization number)
14340 Sullyfield Circle
Chantilly, VA 20151-1621

DYNEX Technologies, Inc.
14340 Sullyfield Circle
Chantilly, VA 20151 U.S.A. www.dynex.com

Technical Support: (800) 288-2354 (option 4)
Email: Techservice@dynex.com
Fax: (703) 803-1441

Figure 157: Equipment in Transit Form

10.13 Warranty

10.13.1 Warranty and Special Provisions

DYNEX TECHNOLOGIES products are fully guaranteed for one year against defects in parts, materials, and workmanship. Defective parts and materials will be replaced or, at the discretion of DYNEX TECHNOLOGIES, repaired at no charge for a period of one year and labor required for such replacement or repair will be provided at no charge for a period of one year, provided that the products are utilized and maintained in accordance with the instructions in the applicable operating and servicing manual, and provided further that the products have not, as determined solely by DYNEX TECHNOLOGIES, been subject to misuse or abuse by the Customer or other parties unrelated to DYNEX TECHNOLOGIES. DYNEX TECHNOLOGIES makes no warranty, expressed or implied, as to the fitness of any product for any particular purposes other than those purposes described in the applicable operating and servicing manual, nor does DYNEX TECHNOLOGIES make any other warranty, whether expressed or implied, including merchantability, other than those appearing on the face hereof. Where DYNEX TECHNOLOGIES guarantees any product, whether under this Warranty or as a matter of law, and there is a breach of such guarantee, the Customer's only and exclusive remedy shall be the replacement or repair of defective parts and materials, as described above. This shall be the limit of DYNEX TECHNOLOGIES liability. Furthermore, DYNEX TECHNOLOGIES shall not be liable for incidental or consequential damages. Failure of the Customer to notify DYNEX TECHNOLOGIES of a claimed defect by registered mail within thirty days of the discovery thereof shall constitute a waiver of any claim for breach of warranty.

When a product is required by DYNEX TECHNOLOGIES to be installed by a DYNEX TECHNOLOGIES engineer or technician, the period of this Warranty shall begin on the date of such installation, provided that any use of the product prior to such installation shall, at the sole election of DYNEX TECHNOLOGIES, void this Warranty. When installation by DYNEX TECHNOLOGIES personnel is not required, the period of this Warranty shall begin on the date of shipment from DYNEX TECHNOLOGIES. The period of this Warranty shall begin as described above whether or not the product has been installed or shipped pursuant to a purchase order, and any trial period shall be deducted from the Warranty period that would otherwise apply under a subsequent placed purchase order for that product.

Limitation of Liability. Notwithstanding anything to the contrary contained herein, the liability of SELLER (whether by reason of breach of warranty, breach of contract, tort, or otherwise), including without limitation under any indemnification provision contained herein, shall be limited to replacement of goods returned to DYNEX TECHNOLOGIES which are shown to DYNEX TECHNOLOGIES 's reasonable satisfaction to have been nonconforming or to refund the purchase price, or, if not paid, to a credit amount of the purchase price therefore.

THE FOREGOING WARRANTIES ARE EXCLUSIVE AND ARE GIVEN AND ACCEPTED IN LIEU OF ANY AND ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION, THE IMPLIED WARRANTY OF MERCHANTABILITY AND THE IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE. NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INCIDENTAL, INDIRECT, SPECIAL, OR CONSEQUENTIAL DAMAGES.

Chapter 11: Troubleshooting

REVELATION DSX software displays a number of onscreen messages during normal operation. If a fault occurs, *REVELATION DSX* software may display an error message. These messages are designed to help you locate the cause of the problem and they often suggest possible solutions.

Errors that occur during the normal course of use are displayed onscreen. Errors that occur while results are being calculated are displayed in the results report output.

If any error message persists, contact DYNEX.

11.1 Error Messages and Descriptions

11.1.1 ___ nm filter not installed.

One of the filters specified in this assay is not installed in the reader.

Check that the filters are correctly entered in the Absorbance Reader tab and check the filter wavelengths in the Reader Control dialog box.

11.1.2 Aborted due to self-test failure.

The self-test was aborted.

Contact Technical Support.

11.1.3 Amplitude must be between 10 and 100 mm.

You have tried to enter an invalid amplitude parameter.

Enter a valid amplitude parameter.

11.1.4 Application Error REVEL caused a General Protection Fault.

A fault has occurred in the *REVELATION DSX* program.

Exit *REVELATION DSX* software and Windows and try again. If the problem persists, Contact Technical Support.

11.1.5 Assay ___ does not have the correct prefix/suffix code Proceed anyway?

REVELATION DSX software has checked the plate ID or barcode against the assay code defined in the assay and they do not match.

You can choose to carry on with the assay anyway (select **YES**) or to abort the assay (select **NO**).

11.1.6 Assay template does not match reader plate type.

The Reader plate format does not match the assay template.

Change the plate format setting, using Reader's onboard SETUP program or change the assay's plate format.

11.1.7 Background light level error.

There is excess light in the reading compartment.

Check that the plate carrier door closes correctly. If the problem persists, Contact Technical Support.

11.1.8 Barcode Not Found.

The barcode scanner could not read the barcode label.

Check that the barcode label is printed correctly and that it is positioned correctly on the side of the plate. Check that the barcode has been set up to scan the correct type of barcode.

Try scanning other barcodes of the same and different types.

11.1.9 Barcode retry error or barcode timeout error.

A fault has occurred in the interface between the barcode scanner and *REVELATION DSX* software.

Switch the Reader off and on again. If the problem persists, Contact Technical Support.

11.1.10 Both sample and set point temperatures must be at least ___C above ambient temperature.

The temperature controller is set to a temperature it cannot achieve.

Refer to Chapter 11.1.34 for more information.

11.1.11 Checksum Error in File.

A file has become corrupted.

If the file is a test, plate data or curve data file, you will have to recreate it.

11.1.12 COM error.

An error has occurred while initializing the RS232 port.

Check the communication settings and cables. Contact Technical Support if the error persists.

11.1.13 Command Failed

A memory conflict has occurred between applications.

Restart Windows and try again.

11.1.14 Command retry error or Command Time out.

An error has occurred while sending the commands to the Reader.

Check the communication settings and cables. Contact Technical Support if the error persists.

11.1.15 Computer control command error.

The *REVELATION DSX* software command was not accepted by the Reader.

Contact Technical Support.

11.1.16 Curve Fitting Error!

An error has occurred in the curve fit calculations.

Check your plate data and curve fit parameters.

11.1.17 Device already/not open.

Check the communication settings and cables. Contact Technical Support if the error persists.

11.1.18 Directory nnn does not exist.

REVELATION DSX software could not find the specified directory.

Make sure the drive and directory are correct.

11.1.19 Error ____ loading DLL ____.

REVELATION DSX software could not find the required program.

Try re-installing the program Revelation was trying to access. If the problem persists, Contact Technical Support.

11.1.20 Error building DCB.

Check the communication settings and cables. Contact Technical Support if the error persists.

11.1.21 Error importing file nnn.

REVELATION DSX software could not open the file you asked for.

Check that the file is of the correct type.

11.1.22 Error in default parameters.

Try repeating the command and Contact Technical Support if the error persists.

11.1.23 Error in quality control equation __, position __.

There is an error in the specified position of the specified quality control equation.

Correct the error and click  to check its validity.

11.1.24 Error opening file nnn.

REVELATION DSX software could not find the file you asked for.

Recreate the file.

11.1.25 Error reading assay.

REVELATION DSX software could not open the required assay file because it is not of the correct type.

Change the Reader settings to the type that was used to create the file.

11.1.26 Error setting comm state.

Check the communication settings and cables. Contact Technical Support if the error persists.

11.1.27 File ___ is not the correct version or a Revelation format file.

The file you tried to open is not a standard format used by this version of *REVELATION DSX* software.

11.1.28 Filter Motor Error 1 or 2.

The Reader cannot initiate the Filter motor.

Check that the number of filters specified in the Setup Reader box corresponds with the actual number of filters installed in the filter wheel. Check that the filter wheel index holes are not blocked.

11.1.29 Filter not installed.

One of the filters specified in this assay is not installed in the Reader.

Check that the filters are correctly entered in the Absorbance Reader tab (**Tools → Configure System**) and that they are installed in the filter wheel in the correct order.

11.1.30 Frequency must be between 5 and 20 Hz.

You have tried to enter an invalid frequency parameter.

Enter a valid frequency parameter.

11.1.31 Gain selection error.

Contact Technical Support.

11.1.32 H8

An error occurred in the communications between *REVELATION DSX* software and the temperature controller.

Try repeating the command and Contact Technical Support if the error persists.

11.1.33 Hardware not present.

Check the communication settings and cables. Contact Technical Support if the error persists.

11.1.34 Hot plate set point is below Ambient + $_C$. Heaters will be switched off.

The temperature controller is set to a temperature it cannot achieve.

Make sure the set temperature is above ambient + 7° C. Ambient is defined as the temperature in the thermal chamber. This temperature is higher than room temperature and increases with normal Reader activity, plate shaking, plate reading and other incubations. If you have been running a large number of readings or shake operations, allow the Reader to cool or set a higher temperature. If you have just run a high temperature incubation, *REVELATION DSX* software will only allow you to set the lower temperature if it is within range. You should allow the Reader to cool before inserting the plate.

11.1.35 Hot plate set point must be in the range 215 to 766 C.

An invalid temperature parameter was entered.

Enter a valid temperature parameter.

11.1.36 Hotplate Checksum, Controller, Shutdown or Time Out

An error occurred in the communication between *REVELATION DSX* software and the temperature controller.

Contact DYNEX Technical Support if the error persists.

11.1.37 Incorrect Format.

You tried to load a file containing a 10x4 format but *REVELATION DSX* software expected a 12x8 plate format.

Change the plate format using the Tools menu Edit Databases option.

11.1.38 Initial and retyped passwords do not match.

The passwords you typed in the **Enter** and **Retype** boxes do not match.

Delete the entries in both boxes and try again.

11.1.39 Installation Failure.

During installation, *REVELATION DSX* software tried to use a file that was being used by another Windows program.

Exit all other programs and run the Setup program again. If Microsoft Office is running, remove its icon from the Startup group and reload Windows. You can replace Office in the Startup group once *REVELATION DSX* software is loaded.

11.1.40 Insufficient Memory.

A memory conflict has occurred.

If you are running a complex test, try to simplify it. If you are running other applications, exit them. If the problem persists, Contact Technical Support.

11.1.41 Internal Application Error.

A fault has occurred in *REVELATION DSX* software.

Try repeating the command and Contact Technical Support if the error persists.

11.1.42 Invalid button. Button text must be entered and an assay.

You must assign an assay to each user-defined button.

Click **Select** to assign an assay to each button on the list.

11.1.43 Invalid byte size.

Check the communication settings and cables. Contact Technical Support if the error persists.

11.1.44 Invalid data file format.

The file you tried to open is not a standard format used by this version of *REVELATION DSX* software.

11.1.45 Invalid default plate ID Only the first five characters may be alphanumeric.

In default plate IDs, letters may only be included in the first four characters, all the characters after this must be numbers.

Change the plate ID.

11.1.46 Invalid number of replicates.

Samples may only consist of up to 96 replicates.

Enter a valid number of replicates.

11.1.47 Invalid or unsupported ID.

Check the communication settings and cables. Contact Technical Support if the error persists.

11.1.48 Invalid shake parameters.

The settings you entered for the User Shake facility are too high.

Choose a different combination of shake parameters.

11.1.49 Invalid well type.

The well type name you defined is invalid.

Enter a valid well type name.

11.1.50 Lamp error.

REVELATION DSX software cannot detect the lamp.

Check that the bulb is correctly installed and that it lights correctly. Replace it if necessary. Refer to the maintenance section of the Operator Manual.

11.1.51 Mathematical Error in an equation

The Reader found an error in an equation.

Check all equations to make sure that they are valid and edit them if necessary.

11.1.52 Minimum value must be less than maximum value.

The minimum value you have assigned on the graph scale is higher than the maximum value.

Correct the minimum or the maximum value.

11.1.53 Module Not Loaded.

This assay contains operations that are not available for your Reader model or you have set up *REVELATION DSX* software for the wrong Reader.

Remove the unsupported operation.

11.1.54 New result order definition must be completed before dialog can be closed!

You must add all the well types to the Results Order list before closing the Output format box, even if you are not using all the well types.

Complete the list before closing the box or moving to another tab.

11.1.55 No reader has been defined!

Exit all the files in the *REVELATION DSX* software window. Select **Tools → Configure System** from the menu bar and select the Reader type you are using.

11.1.56 No timers available.

REVELATION DSX software cannot run correctly because of memory conflicts.

Exit some of the other applications and try again or if the error persists try restarting the PC.

11.1.57 Nominal value should be between 1 and 999999.

You have tried to enter an invalid nominal value parameter.

Enter a valid nominal value parameter.

11.1.58 OLE 20 initialization failed.

Contact Technical Support.

11.1.59 Parallel line calculation error!

The parallel line fit contains too many lines.

Reduce the number of lines in the parallel line fit by removing test wells. Refer to Parallel Line Bioassay (Table 41).

11.1.60 Photodiode selection error.

Contact Technical Support.

11.1.61 Plate drive sensor error.

Try repeating the command and Contact Technical Support if the error persists.

11.1.62 Plate Motor Error 1 - 4

The Reader cannot start the Plate motor.

Check for obstructions to plate carrier movement and whether any of the plate carrier index holes is blocked, then press any key. If the plate carrier is stuck, you may carefully try to free it by hooking a suitable implement around the edge.

If the error occurs during an assay, exit all other applications (including Print Manager) and try again.

11.1.63 Plate speed cannot be less than the number of readings per well.

You entered an invalid plate speed parameter.

Enter a valid plate speed parameter.

11.1.64 Please enter a valid well location.

You entered a well location that does not exist.

Type in the correct well location.

11.1.65 Please enter an integer between x and y.

You entered a value that is out of range or not a whole number.

Enter a valid value.

11.1.66 Reader does not have the correct number of filters!

The number of filters specified in the Setup Reader box does not match the number of filters returned from the Reader.

Check the actual number of the filters installed in the filter wheel, then check that filters are correctly entered in the Absorbance Reader tab. If number of filters is correctly entered, the setting in the onboard SETUP program may be incorrect.

11.1.67 Reader does not support this speed.

The minimum plate speed setting is 4 or 8 depending on the Reader model. The maximum setting is 50.

Enter a valid plate speed setting.

11.1.68 Reader hardware not detected.

Check the communication settings and cables. Contact Technical Support if the error persists.

11.1.69 Reader not detected.

Check the communication settings and cables. Contact Technical Support if the error persists.

11.1.70 Reference voltage error.

Contact Technical Support.

11.1.71 Self-test failure

The Reader has failed one of its self-tests.

Contact Technical Support.

11.1.72 Self-test filter error.

The Reader has failed the filters self-test.

Check that none of the filters is missing or broken. Check that the actual number of filter installed matches the number of filters entered in the Reader's onboard SETUP program and in the Configure Reader dialog box. If the error persists, Contact Technical Support.

11.1.73 Self-test filter motor error.

The Reader has failed the filter motor self-test.

Check that the filter wheel index holes are not blocked and that the filter wheel is not obstructed. If the error persists, Contact Technical Support.

11.1.74 Self-test hotplate error.

The Reader has failed the temperature control self-test.

Contact Technical Support.

11.1.75 Self-test optic channel error.

The Reader has failed the optics self-test.

Contact Technical Support.

11.1.76 Sensor failure.

REVELATION DSX software cannot detect the plate motor sensor.

Check that the plate carrier moves freely in and out of the Reader and pull the plate carrier to the Out position and repeat the command. If the error persists, Contact Technical Support if the error persists.

11.1.77 Set point is below ambient + 4° C or set point is below ambient reading.

The temperature controller is set to a temperature it cannot achieve.

Refer to Chapter 11.1.34 for more information.

11.1.78 Settings do not match those returned by the reader Change settings?

The settings you entered in the Setup Reader box do not match the settings returned from the Reader.

Check that the settings are correct. If they are, the settings in the onboard Refer to the Operator Manual.SETUP program may be incorrect.

11.1.79 Shake time must be between 0 and 59 seconds.

You entered an invalid shake time parameter.

Enter a valid shake time parameter.

11.1.80 Stability failure.

An error occurred in the communication between *REVELATION DSX* software and the temperature controller.

Contact Technical Support if the error persists.

11.1.81 The temperature controller cannot be found.

An error occurred in the temperature controller.

Try repeating the command and Contact Technical Support if the error persists.

11.1.82 This file already exists. Replace existing file?

The filename you are trying to use is already being used.

To use the filename and overwrite the old file, select **Yes**. To use a different filename, select **No**.

11.1.83 Too few standards.

The template contains too few Standard samples for this type of curve fit.

Change the curve fit type or define more Standards. If you have edited Standards out (using the **Outlier removal** option), re-include them in the calculations.

11.1.84 Too many wells allocated!

The **Number of Wells** in the Run Plate option must not exceed 96 wells.

Reduce the number of wells.

11.1.85 Unable to allocate queues.

Check the communication settings and cables. Contact Technical Support if the error persists.

11.1.86 Unable to create OLE driver.

Some of the settings have become corrupted.

Re-install *REVELATION DSX* software.

11.1.87 Unable to find sample ID file __.

When you ran the plate, the **Search for Sample IDs** checkbox was checked. *REVELATION DSX* software searched for the SID file in the SID directory and it could not find it.

If necessary, use the Data Menu **Sample ID filename** option to apply an SID file to the data. If you have not yet created a sample ID file, you can do this using the Tools menu **Sample ID Setup** option.

11.1.88 Unable to find the system password!

REVELATION DSX software cannot find the user-defined system password.

11.1.89 Undefined result label.

All the results labels entered in the Threshold **Pos/Neg QCs** must be valid threshold results labels.

Check the labels defined in the **Labels** box and correct the labels in the **Pos/Neg QCs**.

11.1.90 Unsupported baud rate.

Check the communication settings and cables. Contact Technical Support if the error persists.

11.1.91 Warning! Limits are out of sequence.

The ++, +++ and ++++ threshold limits are not in sequence, relative to the positive and negative limits.

Change the limits so that they follow the sequence of the positive and negative limits.

11.1.92 Warning! Multiple wavelength calculation error.

The Multi-Wavelength mode calculation did not work correctly.

If you specified Well calculation mode, check that the well does exist on the template and check the OD for this well was not OVER. Check your data to make sure that the calculation mode specified could be used. Change the calculation mode if necessary.

11.1.93 Warning! Nominal value is out of range.

The dilution value you set for the change between positive and negative threshold ranges was not correct within the +/-2 tolerance.

Run the test again using a different nominal value or use the **.Titration Multiplier** to correct the value.

11.1.94 Warning! Plate ID does not match assay prefix/suffix format.

The plate ID you entered or the barcode scanned, does not match the code specified in the test.

Check that the plate in the carrier is the one you wish to process. If this message displays after a barcode scan, check that the label is not damaged and that the software is set up for the correct barcode type.

11.1.95 Warning! Unable to calculate percentage response values.

The Standard samples you have specified for use with this facility either do not exist or have not been included in the Curve Fit calculations.

Create or include the Standards or change the Percent Response samples to ones that are already included in the calculations.

11.1.96 Warning! Curve Fit multi-valued.

The curve has too many values.

Edit the plate to remove outlying ODs, using the Outlier Removal option.

11.1.97 Warning! Fit aborted after *num* iterations.

Data are a poor match for the defined Sigmoid curve.

Edit the plate to remove ODs that are a poor match, using the Outlier Removal option.

Example: *Warning! Fit aborted after 20 iterations.*

11.1.98 Warning! Invalid blank mode selected Blank mode has been modified.

The blank mode you chose was not appropriate for the template.

Change the blank mode or change the template.

11.1.99 WARNING! Plate retraction in __ seconds.

The plate is about to be retracted in the Reader.

You can alter the retraction interval. Choose **Configure Reader** from the Tools menu and in the Setup box, increase the **Sleep mode** interval.

11.1.100 Warning! QC Failed.

The criteria for the QC equations have not been met.

11.1.101 Warning! Too few standards for this fit type At least __ standard(s) required.

The template contains too few Standard samples for this type of curve fit.

Change the curve fit type or define more Standards. If you have removed Standards (using the Outlier Removal option), re-include them in the calculations.

11.1.102 Warning! Unable to contract template.

The software was unable to reduce the template in the way you specified. Templates cannot be reduced if:

- The original plate contained any empty wells.
- All the test samples will be removed.
- The templates combined onto the plate had different row and column orientations.

Rectify the problem and try again.

Appendix A: Acronyms

Acronym	Description
µL	microliter
2D	Two-Dimensional
ALM	Application Life Cycle Management
ASCII	American Standard Code for Information Interchange
ASTM	American Society for Testing Materials
C	Celsius
CD	Compact Disk
CDRH	Center for Devices and Radiological Health
CD-ROM	Compact Disk Read-Only Memory
CE	Conformité Européene
CFR	Federal Code of Regulation
CLSI	Clinical and Laboratory Standards Institute
cm	centimeter
CSA	Canadian Standards Association
CV	Coefficient of Variation
CV	Constant Voltage
DSX	DYNEX System X
DYNEX	DYNEX Technologies, Incorporated
EEA	European Economic Area
ELISA	Enzyme-Linked Immunosorbent Assay
EPP	Externally Pipetted Plates
ESP	Electronic Signature Pipetting
EU	European Union
F	Fahrenheit
FCC	Federal Communications Commission
FDA	Food Drug and Administration
GB	Gigabyte
GHz	Gigahertz
Hz	Hertz
IEC/EN	International Electrotechnical Commission/European Norm
in	Inches
Inc.	Incorporated
IREDD	Infrared-Emitting Diode
ISO	International Organization of Standardization
IT	Information Technology
IVD	In Vitro Diagnostic

Acronym	Description
kB	Kilobyte
kg	Kilogram
L	Liter
lbs	Pounds
LED	Light-Emitting Device
LIS	Laboratory Information System
max	Maximum
MB	Megabyte
mL	Milliliter
mm	Millimeter
NIST	National Institute of Standard Technology
nm	nanometers
OD	Optical Density
OLE	Object Linking and Embedding
OS	Operating System
oz	Ounce
PC	Personal Computer
PCB	Printed Circuit Board
PTFE	Polytetrafluoroethylene
QC	Quality Control
RAM	Random Access Memory
RF	Radio frequency
RGB	Red, Green and Blue
RMC	Regulatory Compliance Mark
RoHS	Restriction of Hazardous Substances
RS232	Recommended Standard 232
RT	Room Temperature
SD	Standard Deviation
SEM	Standard Error of Means
SFDA	State Food and Drug Administration
SID	Sample ID
SoC	System-on-a-chip
SQL	Structured Query Language
SVGA	Super Video Graphics Array
TCP/IP	Transmission Control Protocol/Internet Protocol
TFS	Team Foundation Server
TM	Trademark
TPL	Tecan Plate List
UK	United Kingdom

Acronym	Description
UPS	Uninterruptible Power Supply
USA	United States of America
USA	United States of America
V	Volt
VA	Virginia
VA	Volt-Ampere
WDDM	Windows Display Driver Model
WEEE	Waste Electrical and Electronic Equipment
WFV	Well Fill Verification

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Appendix B: Unpacking and Packing Instructions

Unpacking Instructions:

1. Uncrate the DSX instrument, computer and accessories.
2. Check the crate for physical damage. If damaged, take pictures and report it to the shipper.
3. Remove the five cover bolts from the crate.



4. Lift the crate cover off (straight up and high enough to ensure you do **NOT** hit the DSX).
5. Remove the Removable Front Support Assembly (RFSA).
6. Use four people to move DSX to a sturdy cart and then to the final bench top.
7. Check the instrument for physical damage.

▶ **Note:** If damaged, take pictures of the instrument and box and report it to the shipper and DYNEX.

8. Remove the accessory box and pink foam packing.

▶ **Note:** The two supports on top of the accessory box are taped to that box.

▶ **Note:** Save all packing materials for future use.

9. Use a bubble level to ensure the system is level on the bench. If necessary, you can level the system by loosening the nut at the top of a screwed in leg and turning the leg to make it shorter or longer.
10. After adjusting the legs, tighten the nut again.

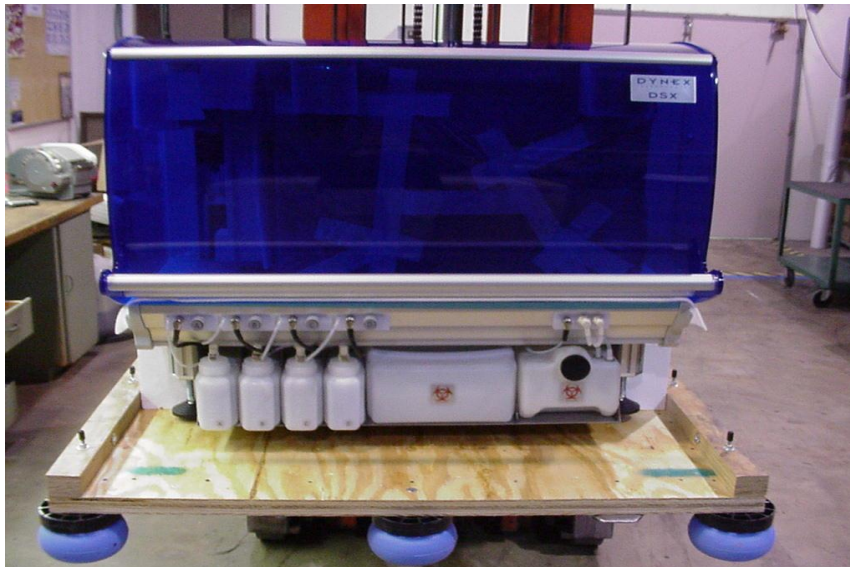


Note: Do **NOT** extend it too far or the foot may come out.

11. Refer to the *Instrument Configuration Report* and verify that all components are present.
12. Provide a copy of the configuration report to the customer.

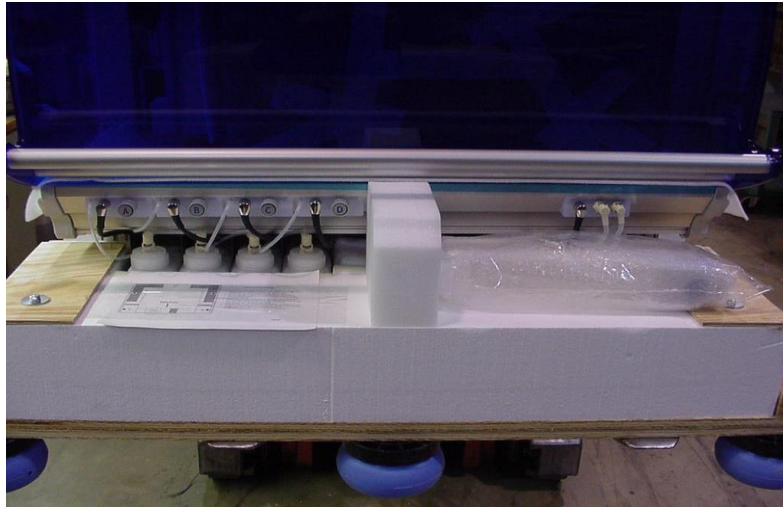
Packing Instructions:

1. Setup the DSX shipping crate (66100002) with crate top cover removed, RFSA disconnected and set aside.
2. The DSX instrument must be level with the crate base.
3. The DSX crate is designed for the DSX instrument to slide into the base.
4. Do **NOT** place unit in from the top or try to pick unit straight up or damage will occur to the DSX.
5. Do **NOT** pick up DSX instrument by the outside skins or cover. Pick up the instrument from the under frame only.
6. Use four people when lifting the unit.
7. Remove any contents in the carton.



8. Once the unit is in place, ensure that the DSX is pushed 100% into the base.
9. Check the plinth cross extrusion (aluminum bar under unit) in the back and make sure it is flush with the polyethylene on top of the main frame support platform.
10. Place the RFSA in front and insert the two bolts into the through holes. RFSA must be pressed flush with the crate base.

11. Verify that the RFSA is loaded against the front of the front foot support frame. If the foam is compressed approximately 1/8 of an inch or less, add a 1/8" foam shim, check again and repeat until the front is loaded.

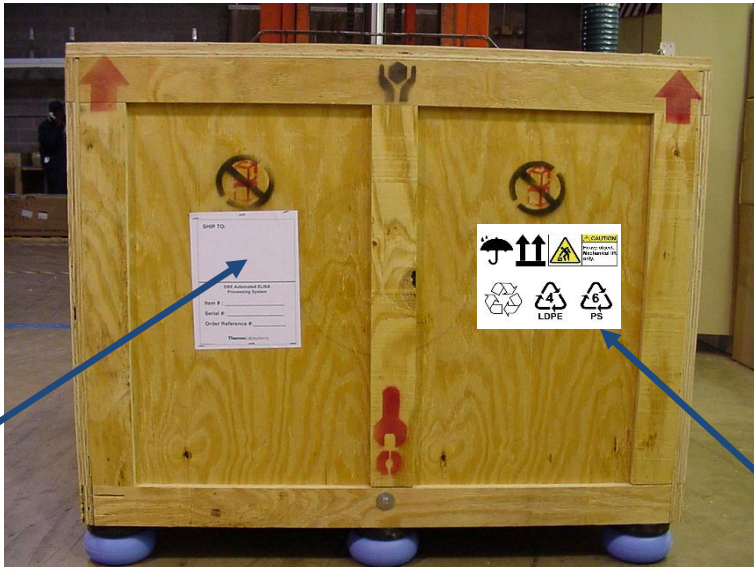


12. Once the front support is loading correctly then connect and tighten down the support bolts until the split lock washer starts to compress.
13. One side at a time is to be compressed until the RFSA is flush with the crate base.
14. Tighten one full turn after the split lock washer is compressed.
15. Use a large clear polyester bag (26000300) to cover the DSX instrument.
16. Leave approximately 6 inches of slack on top of the DSX instrument.
17. When the top is placed on the top cover support it will remove the excess slack.



18. Place the crate top cover on top of unit.
19. Gently rock the top back and forth until top is down.
20. Install each of the five cover bolts 3/4 of the way in until all have been installed.
21. Compress the split lock washer and turn bolts one full rotation.

22. Apply shipping label with staple gun on one side and on the top of the unit.



Shipping label

99002880 multiple symbol crate label (four places)

▶ **Note:** This label should already be on the crate.



Shipping label on top of crate

For more information on how DYNEX can help you achieve optimal laboratory proficiency, contact your local DYNEX business partner.

CORPORATE HEADQUARTERS

DYNEX Technologies, Inc.
14340 Sullyfield Circle
Chantilly, VA 20151
Tel: +1.703.631.7800
dynextechnologies.com

GLOBAL LOCATIONS

DYNEX Technologies, Ltd. - Germany
Email: dynexgermany@dynex.com

DYNEX Technologies, Ltd. - United Kingdom
Email: adminuk@dynex.com

DYNEX Technologies, Ltd. - China
Email: dynex-asia@dynex.com

