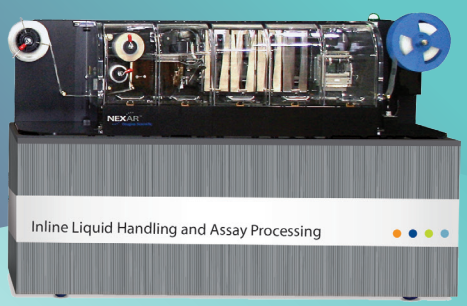
Original instructions



Nexar user's manual

GEN/0450/MW/0824

BIOSEARCH™ TECHNOLOGIES

GENOMIC ANALYSIS BY LGC

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General safety 1
Safety first 1
Safety symbols 1
Owner responsibilities 3
Operating area 5
Installation 5
Chemical spills 5

Nexar safety 6
General operating safety 6
General maintenance safety 6
Decommissioning instrument 8
Recognising safety precautions 9
Safety circuits 10
Nexar definitions 11

Installation 15
Utilities 15
Installation 17
Assembly 18
Required tools 18
Plumbing 20
Electrical supply 21
Software 21
Ethernet 21

Loading Array Tape 22
Component identification 22

General operation 25
Theory of operation 25
General production 25
General fault recovery procedure 25
Motion directions 26
Interpreting light status and instrument states 27
States, Transitions and Status Chart 28
Interpreting Array Tape 2D code 29
Interpreting Array Tape orientation 29
Operating joystick 30
Start up 31
Protocols 32
Shutdown 32
Unit controls 34

Nexar maintenance 50
Routine maintenance 50
Handling faults 52
System files 53
Resynchronising drive while running a protocol 53

Unwind_UW1111 54
Component identification 54
Decal Identification 55
Unwind Module_UW1111 controls 56
Unwind_UW1111 troubleshooting 60
Manager faults 60
Module faults 61

Unwind _UW1112 65
Component identification Unwind Module - UW1112 65
Decal Identification 66
Unwind Module_UW1112 controls 67
Unwind_UW1112 troubleshooting 71
Manager faults 71
Module faults 72

Plate Stacker Attachment_PS1211 . 74
Component identification 74
Plate Stacker_PS1211 controls 75
Maintenance 75
Plate Stacker PS_1211 troubleshooting ...77

Sonic Wash_SW0702 83
Component identification 83
Overview of components 84
Sonic Wash plumbing diagram 84
Sonic Wash_SW0702 controls 85
How to fill tank 86
How to drain tank 87
How to de-gas water 87
Sonic Wash_SW0702 troubleshooting 89

Positioning Rail_PR1201 92
Component identification 92
Positioning Rail Module_PR1201 controls 93
Positioning Rail_PR1201 troubleshooting 97

Dispense Jet_DJ1209 100
Component identification 100
Creating new Dispense Jet settings 106
Adjusting Dispense Jet settings 107
Calibrating a given dispense volume 109
Maintenance 112
Dispense Jet Attachment_DJ1209 troubleshooting 113

Dispense Jet_DJ1212 120
Component identification 120
Creating new Dispense Jet settings 126
Adjusting Dispense Jet settings 127
Deleting Dispense Jet settings 127
Faults 128
Calibrating a given dispense volume 130
Maintenance 133
Dispense Jet Attachment_DJ1212 troubleshooting 134

Dispense Jet_DJ1609 141
Component identification 141
Creating new Dispense Jet settings 148
Adjusting Dispense Jet settings 149
Calibrating a given dispense volume 151
Maintenance 154
Dispense Jet Attachment_DJ1609 troubleshooting 155

Dispense Pipette_DP1011 163
Component/decal identification 163
Dispense Pipette Manager_MGR_1011 controls 164
Manually dispensing into Array Tape 168
Creating new dispense pipette setting 168
Adjusting Dispense Pipette settings 169
Deleting Dispense Pipette settings 170
Faults 171
Maintenance 173
Dispense Pipette Manager_MGR_DP1011 troubleshooting 176
Manager fault messages 176

Dispense Pipette_DP1011 180
Component/decal identification 180
Dispense Pipette Manager_MGR_1011 controls 181
Manually dispensing into Array Tape 185
Creating new dispense pipette setting 185
Adjusting Dispense Pipette settings 186
Deleting Dispense Pipette settings 187
Faults 188
Maintenance 190
Dispense Pipette Manager_MGR_DP1011 troubleshooting 193
Manager fault messages 193

Positioning Rail_PR0904 197
Component identification 197
Positioning Rail Module_PR0904 controls 198
Positioning Rail_PR0904 troubleshooting 201

Scanning Rail_SR1209 203
Component identification 203
Scanning Rail_SR1209 204
Scanning Rail Sealer_SR1209 troubleshooting 206
Pipette Wash Attachment_PW1404 209
Overview 209
Component identification 211
Daily start-up routine 214
Shut-down prime and rinse 215
Pipette Wash settings 216
Maintenance 219
Pipette Wash_PW1404 troubleshooting .221

Jet Wash_JW0905 224
Component identification 224
Overview of components 225
Jet Wash_JW0905 controls 225
Maintenance 226
Jet Wash_JW0905 troubleshooting 227

Jet Wash Attachment_JW1209 228
Component identification 228
Overview of components 229
Jet Wash_JW1209 controls 229
Maintenance 230
Jet Wash_JW1209 troubleshooting 231

Tape Sealer Attachment_TS0902 . 232
Component identification 232
Loading Seal Tape 233
Adjusting Tape Sealer settings 235
Maintenance 236
Creating new Tape Sealer setting 238
Adjusting Tape Sealer settings 239
Deleting Tape Sealer settings 239
Maintenance 240
Tape Sealer_TS0902 Troubleshooting ...243

Tape Sealer_TS1209 244
Component identification 244
Loading seal tape 245
Creating new Tape Sealer setting 247
Adjusting Tape Sealer settings 248
Deleting Tape Sealer settings 249
Maintenance 250
Thermal Electric Attachment _TE1209 controls 252
Sealer_TS1209 troubleshooting 253
Module fault messages 253
Accumulator faults 255

Sealer_TS1402 260
Component identification 260
Loading seal 261
Creating new Tape Sealer setting 263
Adjusting Sealer settings 264
Deleting Sealer settings 265
Maintenance 266
Sealer_TS1402 troubleshooting 269
Module fault messages 269

Tape Sealer Attachment_TS1706 . 271
Component Identification 271
Loading Seal Tape 272
Creating new Tape Sealer setting 274
Adjusting Tape Sealer settings 275
Deleting Tape Sealer settings 276
Maintenance 277
Sealer_TS1706 troubleshooting 279
Module fault messages 279

Optical Reader_OR0904 281
Component identification 281
Creating new Optical Reader setting 285
Adjusting Tape Accumulator settings 285
Optical Reader Manager _MGR_OR0805 settings 288
Maintenance 290
Optical Reader_OR0904 troubleshooting 291
Manager faults 291
Module faults 293

Dehydrator_DH0904 295
Component identification 295
Dehydrator_DH0905 controls 296
Dehydrator Attachement_DH0904 troubleshooting 297

Air Dryer_AD0904 299
Component identification 299
Air Dryer_AD0904 components 300
Maintenance 300

Rewind Module_RW0904 301
Component identification 301
Rewind Module_RW0904 controls 302
Creating new Rewind setting 302
Adjusting Rewind settings 303
Deleting Rewind settings 304
Rewind_MGR_RW0904 Manager Settings 306
Rewind_RW0904 troubleshooting 307
Manager faults 307
Module faults 307

Array Tape platform software licenses 310
Open source software included with Bio-search Technologies products 310
Text of Open Source Software Licenses 318
OpenSSL License 334

Customer support 338
Customer support 338
Customer Support Portal 338
Customer community ticket logging 341

Mobile device case creation 342

General safety

⚠WARNING

Read and understand equipment operator's manual before operating or performing maintenance. Failure to do so could result in serious injury or death.

Safety first

Accidents can be prevented by recognising the causes or hazards before an accident occurs and doing something about them.

Safety symbols

Ensure all instrument operators are aware of dangers indicated by safety decals applied to instrument, and be certain they follow all safety decal instructions. Contact company for safety decal replacement.

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

⚠WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

Biosearch Technologies cannot anticipate every possible circumstance which involves potential hazard. Warnings and notifications in manual are not all inclusive.

Please obey following warning labels that are posted in potentially dangerous areas on instrument.

Indicates an electrical hazard. Turn off power and completely disconnect power supply to equipment before entering this area.

Indicates pinch point. When equipment is powered up, never put hand in these areas, a mechanical component could move unexpectedly and cause injury.

Indicates area where caution is required to prevent personal injury.

Indicates surface is hot and there is a burn hazard.

Waste Electrical and Electronic Equipment (WEEE)

EU Waste Electrical and Electronic Equipment (WEEE) Directive is to minimise volume of electrical and electronic waste disposal and to encourage re-use and recycling at the end of life. Products bearing this label should not be disposed of in a landfill or with municipal household waste in EU to prevent potential negative consequences to the environment and human health.

Biosearch Technologies offers a free of charge return and collection service for the disposal of these products. For a copy of Biosearch Technologies's Selective Treatment of Waste Electrical and Electronic Equipment and a list of hazardous materials outlined under Articles 14 and 15 and Annex VII of the EU WEEE Directive 2012/19/EU please contact Biosearch Technologies.

Owner responsibilities

Notice

Biosearch Technologies shall have no liability for loss of profit, loss of business or revenue, loss of data or business, loss of anticipated savings, depletion of goodwill, any third party claims, or any indirect or consequential loss or damage, which arises out of or in connection with any contract.

- Basic safety rules serve as a guide for proper operation of Biosearch Technologies equipment. All personnel who work with this instrument should learn this information.
- User must follow all procedures and precautions. Users should establish appropriate procedures for continued safe operation of instrument. Biosearch Technologies is not responsible for any deviations from instructions in this manual.
- Equipment is designed for generally accepted safety standards. Users are responsible for following the operating, maintenance, and servicing procedures outlined in this manual to ensure safe operation of this equipment.
- Do not allow persons to operate instrument until they have read user's manual and are completely familiar with all safety precautions.
- Always wear safety glasses/goggles and any other required safety equipment as required by your company's Personal Protective Equipment (PPE) policy.
- Do not allow persons under the influence of alcohol, medications, or other drugs that can impair judgment or cause drowsiness to operate or maintain instrument.
- Instrument should not be used to handle materials other than those which were specified as part of its design. It is operator's responsibility to be aware of instrument capacities.
- Ensure operator's area is clear of any distracting objects. Keep work areas clean and free of debris to avoid slipping or falling.
- Operators are responsible to know the location and function of all emergency stop and safety switches.
- Periodically check all guards, safety switches, emergency stop buttons and instrument structure. Replace or repair anything that could cause a potential hazard.
- If any safety devices are not functioning properly, do not use instrument. Remove it from service until it has been properly repaired. Contact Biosearch Technologies.
- Do not replace components or parts with other than factory-recommended parts. To do so could lead to injury or possible death. It may also decrease the effectiveness of the unit.
- When doing maintenance work on structural parts or repairing any moving parts: Disconnect and lockout and tagout all power sources. Know Occupational Safety and Health Standard (OSHA) requirements.
- Do not perform maintenance while instrument is running unless noted otherwise in a procedure within this manual.
- Modifying equipment using unapproved factory recommended service parts or consumables may result in death, injury, voided warranty, and/or decrease equipment effectiveness.
- Always use proper lifting techniques while operating, loading, maintaining, or troubleshooting equipment.
- Be aware of overhead objects while working in or around instrument to prevent head bumps or injury from falling objects.
- Be aware of cords/trailing cables while working around the instrument to prevent tripping.
- Always follow OSHA 1910 and also National Health and Safety Requirements.
- Operate and maintain this instrument in a safe manner and in accordance with all applicable local, state, and federal codes, regulations and/or laws; and in compliance with on-product labeling and this user's manual instructions.

- These are general safety considerations. Additional precautions may be necessary to operate your instrument in a safe manner. Be certain you are operating your equipment in accordance with all safety codes, OSHA rules and regulations, insurance requirements; and local, state, and federal laws.
- It is user's responsibility to ensure that a compatible electromagnetic environment for equipment can be maintained in order that device will perform as intended.
- Electromagnetic environment should be evaluated prior to operation of instrument.
- Do not use device in close proximity to sources of strong electromagnetic radiation (e.g. unshielded intentional RF sources), as these can interfere with proper operation.

Biosearch Technologies does not cover any defects or damage resulting from any of following:

- Neglect, carelessness, or misuse of instrument including without limitation any use which is not in accordance with documentation or contract, or improper or inadequate handling, storage and maintenance of instrument.
- Manufacture of instrument in accordance with custom specifications provided by customer.
- Any products of third parties purchased through Biosearch Technologies (such as third party computers and laptops that may be governed by third party manufacturer's own terms).
- Modification, servicing or repair of an instrument other than by Biosearch Technologies or a party authorised by Biosearch Technologies.
- Installation of any software or hardware, or use of instrument in combination with software or products that Biosearch Technologies did not supply or authorise.
- Any external sources, including without limitation any electrical surges, incorrect voltages, incorrect water supply or any damage caused by computer viruses or hackers.
- Transportation or relocation of an instrument by any party not authorised by Biosearch Technologies.
- Any events, circumstances or causes beyond Biosearch Technologies reasonable control, including without limitation any acts of God, governmental action, war or national emergency, acts of terrorism, riot, civil commotion, fire, explosion, flood, tornado, earthquake, hurricane, and lightning.

Operating area

- Only operator(s) and other authorised personnel should work within operating area during operation.
- Do not keep tools or other equipment within operating area.
- Always use instrument in a sufficiently lit area.

Lockout/Tagout

⚠WARNING

Failure to follow correct lockout and tagout procedures could result in death or serious injury.

Lockout and tagout procedures have three main purposes. First to prevent unexpected or accidental start-up of instrument, secondly, to notify other users when an instrument is unsafe to operate, and finally to prevent injury to personnel from energy that may be stored in devices installed on instrument.

To lockout and tagout, disconnect instrument from main power source. Disconnect air and release any stored pressure. Place one or more tags on instrument controls or access doors to inform other users that maintenance is being performed or that instrument is unsafe to operate.

According to 29 CFR part 1910 of OSHA (Occupational Safety and Health Administrations) regulations, employer must establish a lockout and tagout system of procedures, training, and periodic inspection before any employee operates, or services an instrument. All employees are responsible for seeing that instrument is locked out and tagged out to facilities policy.

Instrument must be locked out and tagged out under following circumstances:

- Any time repairs or maintenance is being performed on instrument.
- When cleaning or lubricating instrument.
- When cleaning blocked or jammed mechanisms.

If several users are working instrument, each person must apply their own tag and ensure all work is complete prior to instrument being powered on.

Installation

Only trained and authorised personnel should install electric and pneumatic power sources. Installations must comply with all applicable codes and standards, including those established by OSHA or equivalent.

Chemical spills

Chemical spills should be cleaned up immediately using recommendations listed in appropriate Safety Data Sheet.

Chemical safety

- Follow all Safety Data Sheet (SDS) recommendations.

Follow facility's safety requirements when working with samples.

Nexar safety

General operating safety

Before starting instrument

- Do not operate instrument unless trained to do so.
- Read and understand operating instructions and controls before operating instrument.
- Never operate instrument with a safety device or guard removed or disconnected.
- Always wear safety glasses and any other required safety equipment as required by your company's PPE policy.
- Never remove warnings displayed on instrument. Replace any torn or old labels.
- Ensure a clean work surface, including proper guarding of platform areas and ladders.

While instrument is operating

- Instrument is not designed to take weight of a person. Do not stand on any part of instrument.
- Never sit or stand on anything that could cause you to fall against instrument.
- Horseplay around an instrument at any time is dangerous and prohibited.
- Never operate instrument above specified needs, pressures, or temperatures.
- Keep alert and observe indicator lights and warnings that appear on instrument.
- Avoid placing fingers, hands, or any part of your body into instrument or near moving parts or pinch points when control circuits are energised.
- Do not reach around any guards.
- The Nexar™ has a 52.7 dbA noise level.
- The Araya™ has a 49 dbA noise level.

Stopping instrument

⚠CAUTION

Lift guard door only in an emergency.

- Always wait for instrument to come to a complete stop before opening a guard door.
- Know emergency stop procedure for instrument.

General maintenance safety

Notice

Biosearch Technologies is responsible for instrument repairs. Always contact a Biosearch Technologies representative before performing any repairs or maintenance on instrument.

- Do not operate faulty or damaged equipment. Always perform proper service and maintenance procedures.
- Do not service an instrument without thorough qualifications. Ensure familiarity with necessary service tasks.
- Never operate any controls while other people perform maintenance on instrument.
- Do not bypass a safety circuit.
- Always use proper tool for the necessary service.
- Never open covers that house electrical components.
- Only perform maintenance on an instrument in motion when properly trained and required to do so.
- Turn off all electrical power unless required for specific servicing. Unplug power source for maximum protection.
- Turn off and unplug power when replacing fuses.

Electrical safety

Before starting instrument

- Never operate an instrument with a safety device or guard removed, disconnected, jumpered, or bypassed.
- Ground and overload protect all electrical equipment.
- If status light is not lit after initial start-up delay, which could take several minutes, contact Biosearch Technologies.

Operating instrument

- Do not bypass a safety device.
- Never open covers that house electrical components.
- Always assume that power is on; treat all conditions as live. This practice assures a cautious approach that may prevent an accident or injury.

Stopping instrument

- When instrument is not in use, unplug power source for maximum protection.

Electrical maintenance

Only trained and authorised electricians should perform electrical/electronic maintenance and service. Call Biosearch Technologies with any electrical maintenance problems.

Cleaning safety

- Use caution while using toxic or flammable solvents to clean instrument.
- Always clean up spills around instrument as soon as possible.
- Keep operating area free of obstacles that could cause you to fall against instrument.
- Use a 70% ethanol solution for cleaning metal surfaces.
- Use a ready-to-use, non-streaking, anti-static glass, plastic, and hard surface cleaner on clear guards and end caps.

Electrical hazards

- Unplug electrical devices prior to cleaning instrument.
- For a cleaning cycle controlled from a remote or automated control center, establish fail-safe procedures to avoid automatic start-up while servicing equipment.
- Never wash down an instrument that is not washdown rated. Doing so could cause shock and electrocution.

Heat hazards

- Do not touch heated surfaces.

Chemical hazards

- Follow all SDS chemical sheet recommendations.
- Do not touch, ingest, or inhale samples.

Radiation hazards

- Do not operate any radiation-producing equipment without proper safety equipment.

Decommissioning instrument

Notice
All component and fluid disposal should be performed in compliance with local regulations.

- Remove any plates and discard.
- Remove nozzles from dispense jet using Lee Nozzle tool and discard.
- Drop off tips from dispense jet and discard.
- Disconnect compressed air source.
- Drain water and waste tank. Waste tank water may contain bleach or chemistry constituents.
- Drain thermal cycler heat exchanger system.
- Shut down HMI and turn off main power.
- Remove Hard Drive and discard.
- Remove electrical power cord and discard.

Recognising safety precautions

Notice
If any safety stickers are missing, contact Biosearch Technologies for replacements.

Danger safety precautions

Figure 1

Danger-Machine Starts Automatically *(Figure 1)* found on guard door.

Warning safety precautions

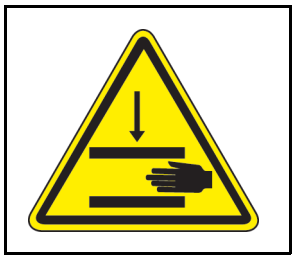


Figure 2

Warning-Pinch Point *(Figure 2)* found on tank doors and movable components.

Caution safety precautions

Figure 3

Caution-Burn Hazard *(Figure 3)* found on tank doors.

Electrical safety precautions

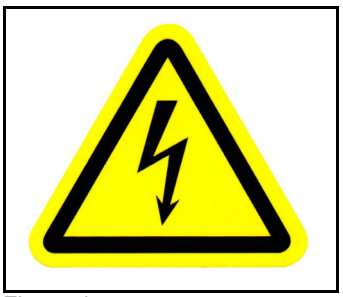


Figure 4

Lighting Bolt *(Figure 4)* indicates an enclosure that contains electrical parts.

Lighting Bolt *(Figure 4)* indicates an arc flash and shock hazard on panel door.

Safety circuits

Theory of operation

Safety relay is designed to monitor a double electrical circuit that surrounds entire instrument. Circuitry within safety relay will monitor safety circuit and will open up if either circuit is broken. Safety circuit is separate from and operates independently of PLC.

Guard door interlock switches

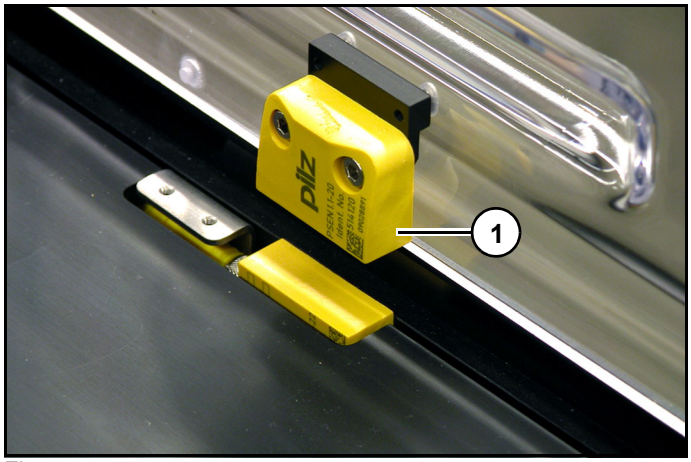


Figure 5

Guard door interlock switch (1) *(Figure 5)* is mounted on any guard door that can be opened without use of a tool.

Each guard door switch controls two parallel contacts. Guard door switches are connected in series, providing instrument with two series circuits. Circuits are monitored by a safety relay. If either set of contacts open, relay opens and immediately stops instrument. This protects operator from moving parts of instrument and reduces possibility of injury.

Under normal conditions, always stop instrument before opening a guard door. If a guard door is activated, instrument will stop immediately.

To close safety circuit, close door.

Nexar definitions

Attachment:

An assembly that forms a functional interchangeable section available for sale with a model number and serial number. An attachment is the same as a module only it is does not occupy a path (For example, _DP0702).

Following abbreviations stand for these attachments:

- AD (Air Dryer)
- AR (Air Regulator)
- CL (Cover Left)
- DH (Dehydrator)
- DJ (Dispense Jet)
- DP (Dispense Pipette)
- JW (Jet Wash)
- LM (Lint Master)
- OR (Optical Reader)
- PB (Push Button)
- PC (Process Computer)
- PS (Plate Stacker)
- PW (Pipette Wash)
- SR (Scanning Rail)
- SW (Sonic Wash)
- TS (Tape Sealer)
- UW (Unwind)
- XP (External Plate Stacker)

Auto operations:

Operations that are performed involving multiple modules in tandem though a manager screen or recipe.

Axis:

A stepper or servo motor.

Boot project:

Control program run by TwinCAT system. Runs all system operations.

Checkbox:

A graphical user interface (GUI) control used to select or deselect an option.

Client PC:

User-supplied PC that runs Chrome or Firefox.

Controlled fault:

Fault that allows instrument to finish its current action before stopping.

Controls:

A graphical object on GUI that can perform tasks or trigger an event.

Embedded PC:

PC that runs instrument. It is located in and is part of Unwind module.

GUI:

A graphical user interface used to provide graphical controls that are actuated via a pointing device or touch screen.

HMI:

Program that runs on embedded PC and allows user to interact with TwinCAT system.

Jet pattern:

Pattern file describes how liquid is dispensed in 16 x 24 Array Tape™ and what pattern liquid is dispensed in. This file is only used in non-contact dispensing (For example, _DJ0702). These files are contained in folder C:\HTSI\HTSI_Patterns\<JetPatternFilename>.jet

Label:

A GUI control that provides a static or dynamic value. Examples of a static value are mm, mm/sec, etc. A dynamic value example would be a motor position value.

List box:

A GUI control that allows user to select from a list. Only one item can be selected at a time from list box.

Liquid class:

Defines parameters specific to reagent used within various managers and modules.
Example:_MGR_DP0702 uses its liquid class parameters to determine correct volume overage. These parameters are contained in .xml files in folder C:\HTSI\HTSI_LiquidClass\<LiquidClassFilename>.xml.

Manager:

A collection or set of modules and attachments that collectively perform coordinated operations (example, _MGR_DP0702).

Manager Naming Convention:

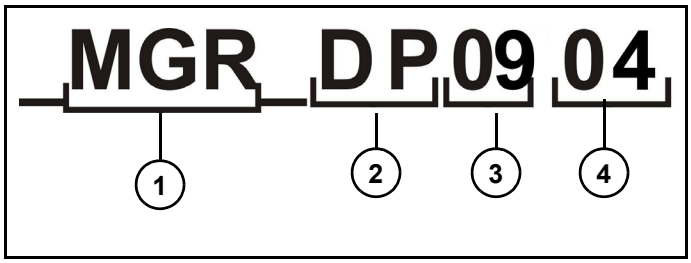


Figure 1

- Denotes manager (1) *(Figure 3)*.
- Abbreviated key module name (2) *(Figure 3)*.
- Year of release (3) *(Figure 3)*.
- Month of release (4) *(Figure 1)*.

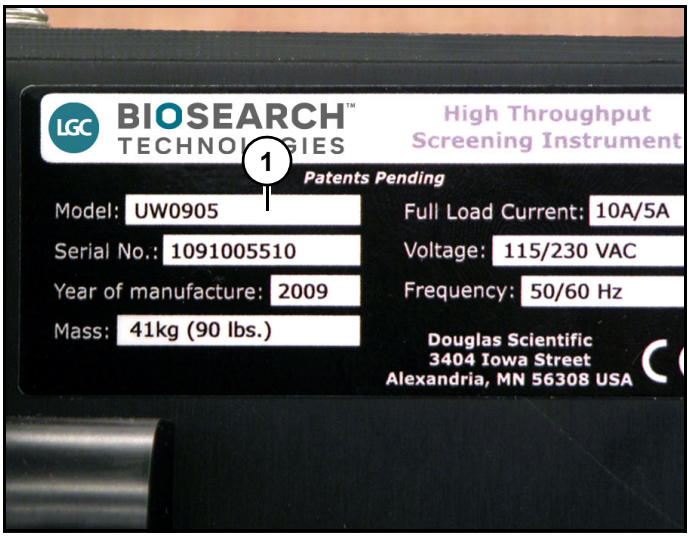


Figure 2

Year and month of release numbers used throughout manual are related to electrical hardware/software releases and will most likely not match naming convention numbers located on name tags of modules on instrument. Only letters (abbreviated module name) should be looked at for reference in manual.

Example: Module shown, is UW0905 (1) *(Figure 2)*, but will be referred to as UW0702 in manual.

Manager settings:

Certain managers have their process settings in .xml files in folder
C:\HTSI\HTSI_Settings.
These parameters affect coordinated operations for that manager.

Manual operation:

Operations that can be done on modules individually.

Module:

An assembly that forms a functional interchangeable section available for sale with a model number and serial number. Module must also occupy a path. Example: _PR0702).

Module Naming Convention:

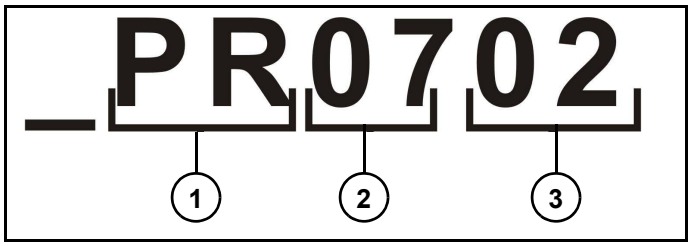


Figure 3

- Abbreviated module name (1) *(Figure 3)*.
- Year of release (2) *(Figure 3)*.
- Month of release (3) *(Figure 3)*.

Module Abbreviations:

- EB (Evaporation Block)
- PR (Positioning Rail)
- RW (Rewind)
- SR (Scanning Rail)
- TS (Sealer)
- UW (Unwind)

Plateware:

Defines source and assay plate parameters that are used within various managers and modules for process operation.
Example, _MGR_DJ0702 uses its plateware parameters to determine correct aspiration height. Parameters are contained in .xml files in folder C:\HTSI\HTSI_Plateware\<PlatewareFilename..xml

PMT:

A sensitive device for converting light into electrical signal (Photo Multiplier Tube).

Progress Bar:

A GUI control that shows the progress of an operation.

Pushbutton:

A GUI control designed to trigger a control event.

Pushbutton indicator:

A GUI control that reflects state of event that pushbutton triggered.

Radio buttons:

A GUI control that allows user to select between different options.

Recipe:

A procedure and formula description that completely describes a process batch. Recipes are .xml files contained in folder C:\HTSI\HTSI_Recipes.

Selector switch:

A GUI control that allows user to toggle between available states.

Text box:

A GUI control used to display and enter alphanumeric or text values.

TwinCAT system:

Engine that runs boot project. It supervises all operations of instrument and is hard-coded on embedded PC. It is contained in folder C:\TwinCAT\3.1\Boot Graphic appears in lower right corner of screen and can be in following states.

- Blue: config mode
- Red: stopped mode
- Green: run mode

Uncontrolled fault:

A fault that causes instrument to stop immediately.

Unit:

Multiple modules/attachments connected in a specific arrangement. An example is Nexar unit.

Unit settings:

Contains parameters applied to instrument-wide operations, such as motion, plate stacker chute calibrations, or instrument name. Recipes are.xml files contained in folder C:\HTSI\HTSI_Settings\UnitSettings.xml.

XML terms:

Attribute: A property associated with an.xml element that is also a named characteristic of element. An attribute also provides additional data about an element, independent of element content.

Example: red text in, <ChuteAdjustment index=4 >1.7</ChuteAdjustments>.

Element: A section of a document defined by start and end tags or an empty tag, including any associated content (Example, <DPOffset>-0.8</ DPOffset>).

Tag: Markup used to enclose an element's content. An empty element employs a single tag; a regular element has an opening and a closing tag (Example, <DPOffset).

Installation

⚠WARNING

Read and understand equipment operators manual before operating or performing maintenance. Failure to do so could result in serious injury or death.

Notice

Read entire user's manual before setting up instrument.

Space requirements

Measurement	Description
Width	Varies per number of attachments.
Height	Varies per attachments.
Depth	Varies per attachments.
Weight	Varies per attachments. Total unit may weigh up to 453 kg (1000 lb.)
Work space recommendations	Biosearch Technologies recommends a work space of at least 30.48 cm (12") be available around all sides of instrument for operation and maintenance.

Utilities

Air usage	Plant voltage
4.0 scfm @ 80 psi	120 V-1ph-60 hz
Air usage	**Plant voltage**
2.0 amps @ 120 V	100 L per 8 hour shift

*Air consumption is not continuous. It is only steady while drying.

Nexar installation requires the following facility connections:

Network:

- Embedded PC controller with Ethernet-based connectivity

Operating Temperature:

- 59-86 °F (15-30 °C)

Operating Humidity:

- 20-80%.

Estimated Amperage Load:

- Supply: 115/230 V, 50/60 Hz auto select Power rating: 400 W typical, 1,200 W max
- Fuse rating: 15 A (at 115 V)

Performance specifications

The Nexar is a modular, liquid handling and assay processing system engineered to support high-throughput processing of sub-microliter volumes in 96- and 384-well Array Tape. Using indexing holes along edge of Array Tape to accurately position and continuously feed reaction wells, instrument dispenses samples and reagents, seals Array Tape and winds it onto a dunker reel.

Pipette Dispensing

- Dispense Pipette features a CyBio head with 384 or 96 tips. It aspirates samples from sources

plate and stamps them in Array Tape. Dispense jet aspirates reagent from source plate and adds it to samples. Aspirate and dispense volumes, along with CVs, are determined by type and style of pipette and tip tray used.

Fluid handling

Product	Validated Volume Range	CVs	Manufacture Validated Volume Range
CyBio	600 nL to 800 nL	<4.7% with 10 µL tips < 6.6% with 25 µL tips	0.2-25 µL
Dispense Jet (DJ1209)	600-1000 nL 1150-1500 nL	< 5%	2 µL 5 µL
FlexJet™ (DJ1608/ DJ1609)	600-1000 nL 1150-1500 nL	< 5%	2 µL 5 µL

Note: With MDX customers, Artel dispensing at 3.8uL and hold that to a CV of ≤ 4%.

Nexar Plate Stacker

Stores source or reagent plates up to 335mm high.

Pipetting Head Specifications

CYBIO 384 HEAD (CYBIO)

Mechanism: Simultaneous air displacement

Manufacturer Suggested Volume Range: 0.2-10 µL/ 25.0 µL (dependent on tip vol.)

Manufacturer Precision: CV < 2%, at 1.0 µL

Dispense Jet

Four Tip Dispense Jet

Mechanism: Single jet solenoid micro-valve

Volume Range: 750 nL to 1250 nL

Precision: CV < 7%

Channels: 4

FlexJet

Mechanism: Micro-solenoid valves

Volume Range: 250 nL to 2,500 nL

Precision: CV < 7%

Channels: 4 or 8

Inline Sample Incubator Module

Incubator module allows for inline sample and reagent incubation with temperatures ranging from ambient to 70 °C.

Tape Sealer Module

Fiber optic sensor - measures a reflectivity signal directed at the cover seal roll

Rolling tape guide - additional precaution that prevents adhesive from reattaching to the tape guide

Walk away with confidence knowing the sensor will bring the instrument to a controlled pause.

Tape Sealer With Integrated Chiller

The array is chilled down to 15 °C within seconds to enable precise incubation and temperature.

Technical support department

Biosearch Technologies Technical Support	
Telephone	Technical Support: 888.300.9529
Parts and Array Tape Reorder	alx.service@LGCGroup.com
Address:	LGC Biosearch Technologies 3600 Minnesota Street Alexandria, MN 5630
Website:	www.douglasscientific.com

Installation

⚠WARNING

Modules may be unstable while unloading. Take care to prevent modules from tipping or falling.

Uncrating

After unloading instrument, place individually crated modules on a flat surface before removing shipping crate.

⚠WARNING

Ensure instrument's location can handle weight. The total unit may weigh up to 453 kg (1000 lb.)

Inspection

- Biosearch Technologies has carefully inspected instrument before shipment. Instruments has been crated securely to ensure delivery without damage or loss of component parts.
- Upon delivery, uncrate and inspect instrument immediately for any visible damage or missing parts. If there is any damage or shortages, record them on freight bill and have delivery driver sign it.

Contact Biosearch Technologies if you encounter any damaged shipments. This allows us to provide you with the best service possible.

Instrument serial number

Figure 1

Each module has a plate (1) *(Figure 1)* indicating module weight and serial number.

Note: Individual modules can weigh up to 68 kg (150 lb.). Every module must be manually handled only and by a minimum of two people.

Assembly

⚠ CAUTION

Be aware of pinch points between frames or resulting from component motion may occur during installation.

Notice

Modules and attachments need to be in correct order as specified. System is designed to be modular. Consult Biosearch Technologiesto modify order.

Required tools

- M5 hex wrench.
- Work gloves (during lifting).

1. Uncrate modules and place on flat surface.
2. Place first two modules side by side.

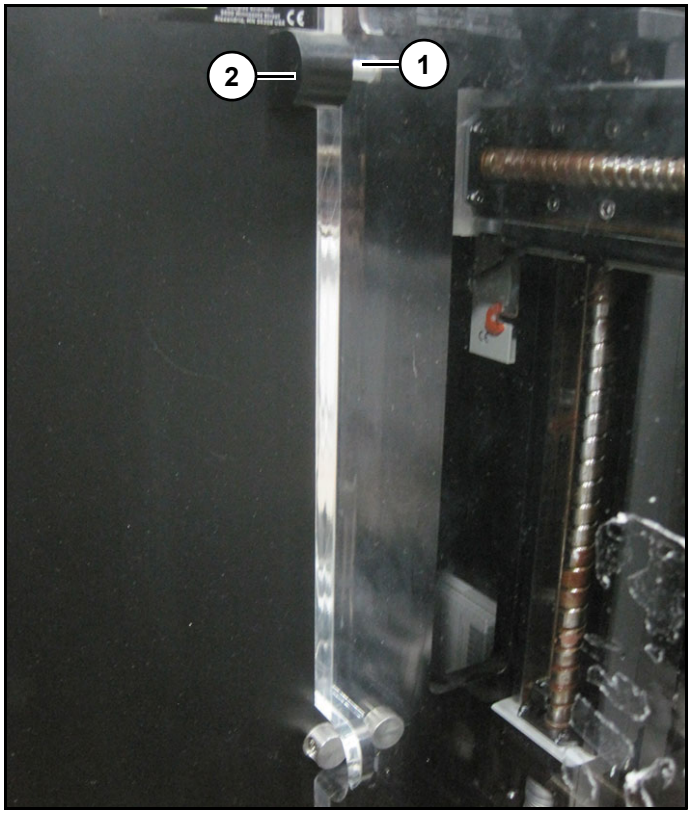


Figure 2

3. Each module has three alignment pins (1) on left side and three alignment sockets (2) on right side. *(Figure 2)*

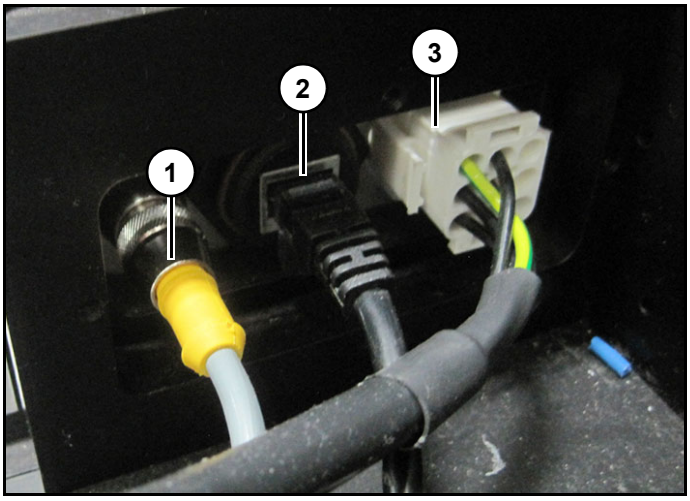


Figure 3

Each module has safety (1), network (2), and power cables (3) *(Figure 3)*.

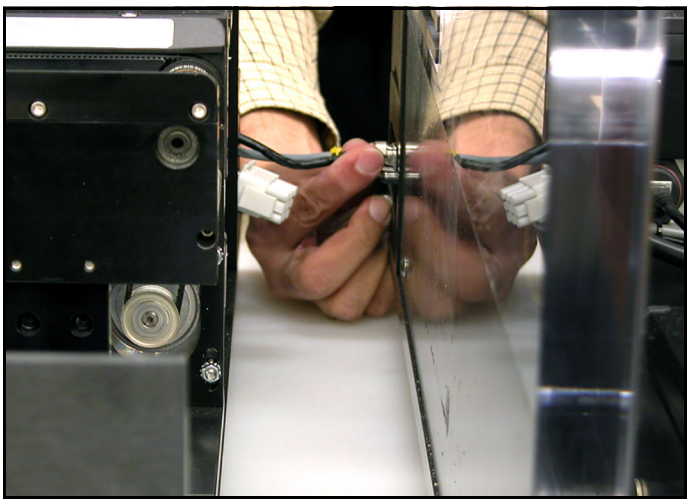


Figure 4

4. Align modules and connect cables to it's corresponding receptacle *(Figure 4)*.

Note: Use moderate force when hooking up power cable.

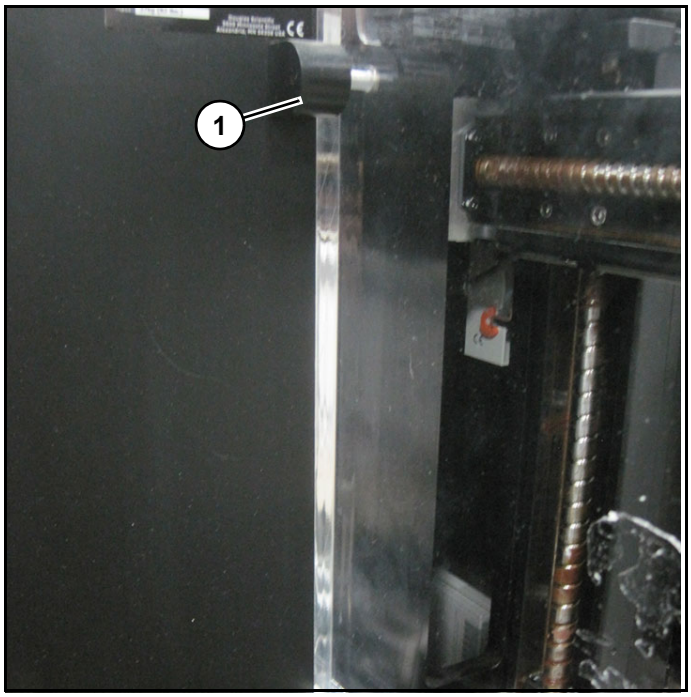


Figure 5

5. Align alignment pins (1) *(Figure 5)* with alignment sockets and push modules together until alignment pins snap into place.

Note: Do not pinch cables.

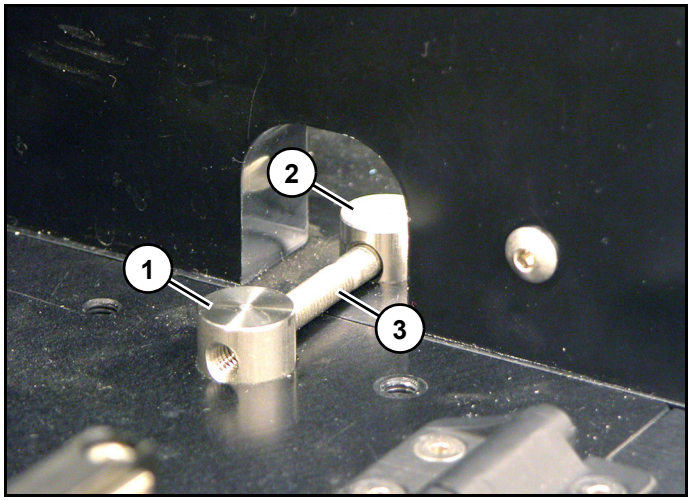


Figure 6

6. Two sets of clamps connect two modules together. Place first module clamp shaft into the bottom holes with counter-bored clamp shaft (1) in the right hole and tapped clamp (2) in left hole. *(Figure 6)*

7. Using M5 hex wrench, slightly tighten clamp bolt (3) *(Figure 6)*, but do not lock it down.

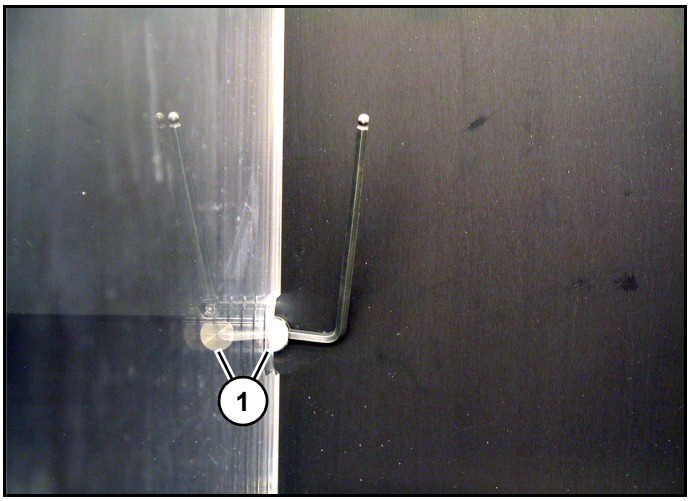


Figure 7

8. Place clamps (1) *(Figure 7)* into top holes and repeat steps 5 and 6.

9. Tighten bolts in clamps.

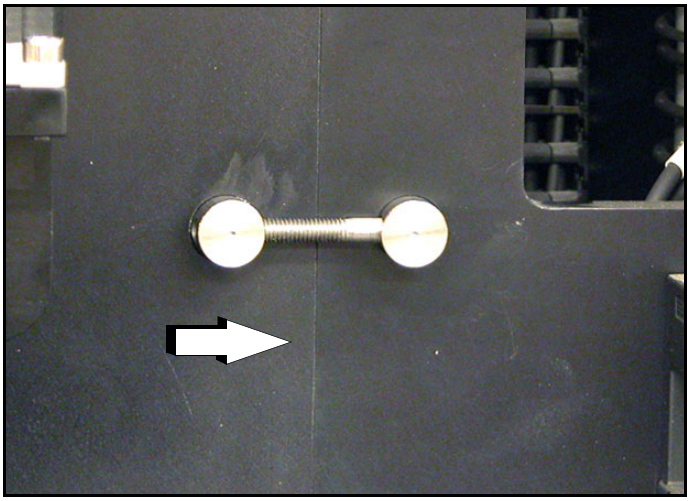


Figure 8

10. Assemble rest of modules, using method.

Note: There should be no gaps between any modules *(Figure 8)*, gaps could affect Array Tape motion.

Notice

Ensure main power switch is off before installing electrical connections.

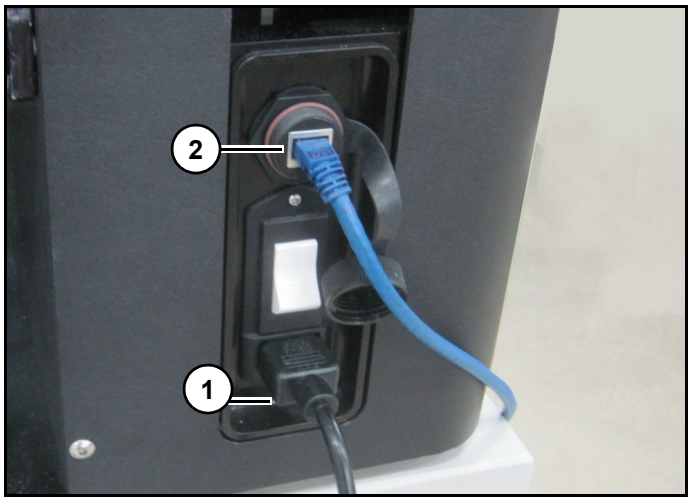


Figure 9

11. Plug in main power (1) and network connection (2). *(Figure 9)*

Plumbing

Water - two lines:

- Water in
- Waste out

Air - one line:

- Air in

Electrical supply

Notice
Biosearch Technologies is contracted to repair instrument; therefore, wiring schematics are not provided. Contact Biosearch Technologies technical support to resolve any electrical issues.

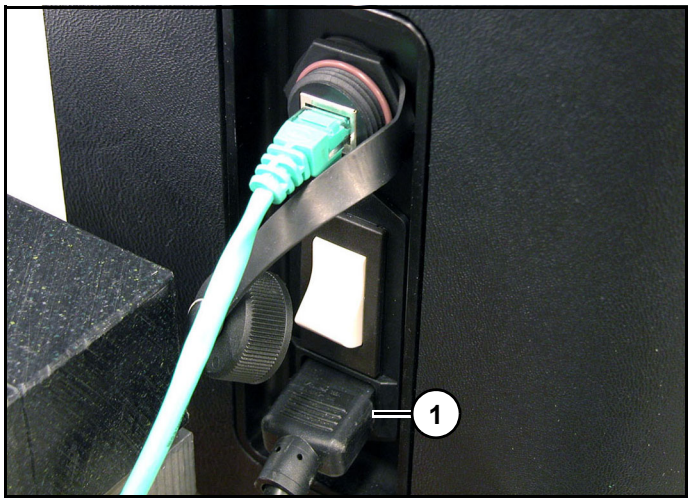


Figure 10

A standard 120 V-60 Hz-15 A socket with grounding is needed for electrical hook up (1) *(Figure 10)*.

Software

Central control device for instrument is an embedded PC (PC1607) that runs Windows embedded standard 7 64-bit. PC1607 attachment module is located in Unwind module. Refer to _SVXXXX Components section for more information. Correct software version can be found in the Unit Settings file. System details are as follows:

Item	Recommended
CPU	Intel® Atom™ E3845 1.91 GHz, 4 cores
Operating System	Microsoft Windows 10 IoT Enterprize 2019 LTSC, 64- bit
Memory	4 GB DDR3L-Ram 80 GB M.2 SSD, #D flash, extended temperature range

Ethernet

System is configured with a specific IP address. IP address needs to be known by user to connect instrument and communicate with external PC. This is provided by Biosearch Technologies, but can be changed by user.

Installation function check

- Instrument connected to power.
- Ethernet connected.
- Air connected.
- Water in connected.
- Waste line connected.
- HMI powered on.

Loading Array Tape

⚠WARNING

Read and understand equipment operators manual before operating or performing maintenance. Failure to do so could result in serious injury or death.

Component identification

Array Tape Unwind Module - Rewind Module

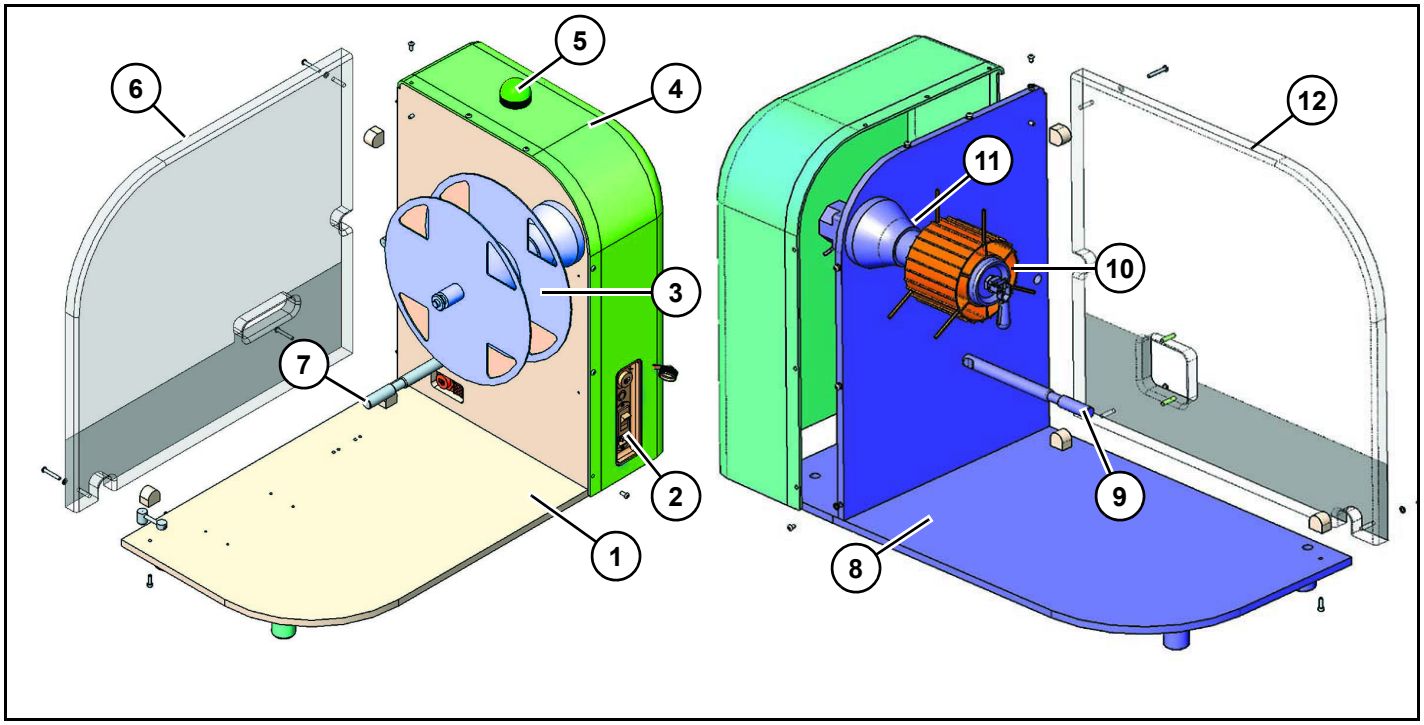


Figure 1

Ref #	Description	Ref #	Description
1	Unwind Module	8	Rewind Module
2	On/Off Switch	9	Array Tape Guide
3	Spindle Assembly	10	Dunker Spool Assembly
4	Outer Cover	11	Rewind Spindle
5	Fault Light	12	Guard Panel
6	Guard Panel		
7	Array Tape Guide Pin		

Loading Array Tape on Unwind Module

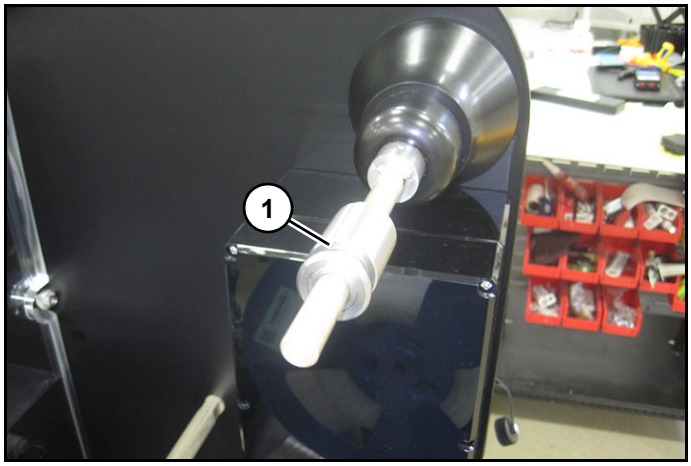


Figure 2

1. Remove spool collar (1) *(Figure 2)* by pressing in and pulling.

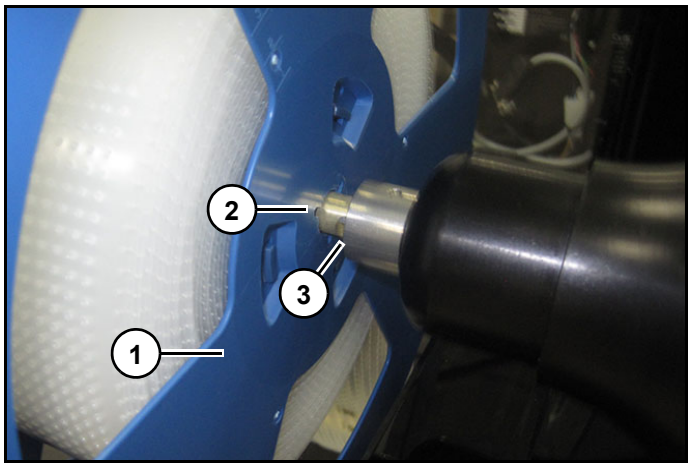


Figure 3

2. Load Array Tape spool (1) on spindle (2) by aligning grooves (3) of spool with keys on back of spindle. Turn spindle so keys lock. *(Figure 3)*

3. Replace spool collar (1) *(Figure 2)*.

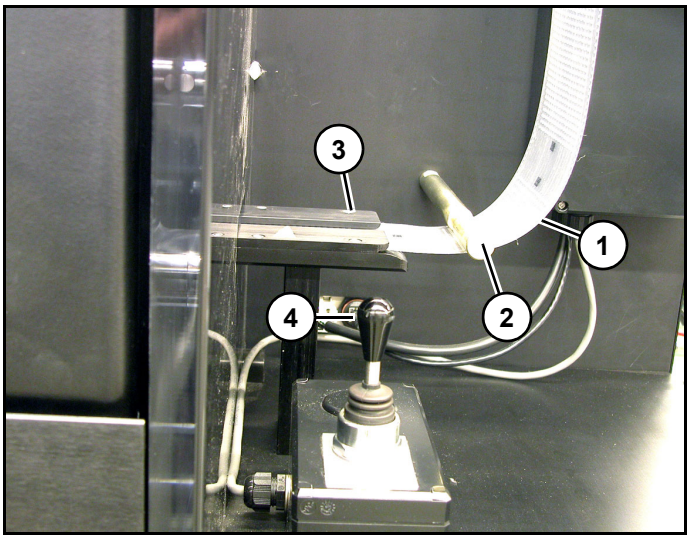


Figure 4

Refer to *(Figure 4)*.

4. Pull Array Tape (1) under guide pin (2).

5. Slide Array Tape (1) into manual feed assembly (3) while holding joystick (4) in "FWD" position until Array Tape locks and begins moving on its own.

Note: If Array Tape does not engage or is crooked, reverse Array Tape by holding joystick in "REV" position and attempt to load Array Tape again.

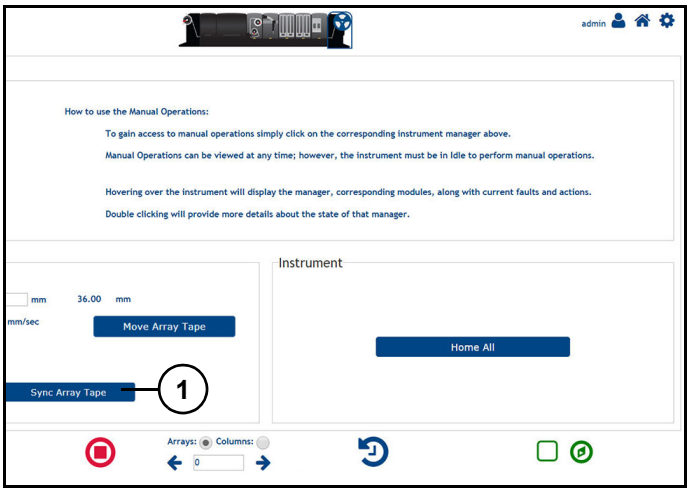


Figure 5

6. Press "Sync Array Tape" (1) *(Figure 5)*.

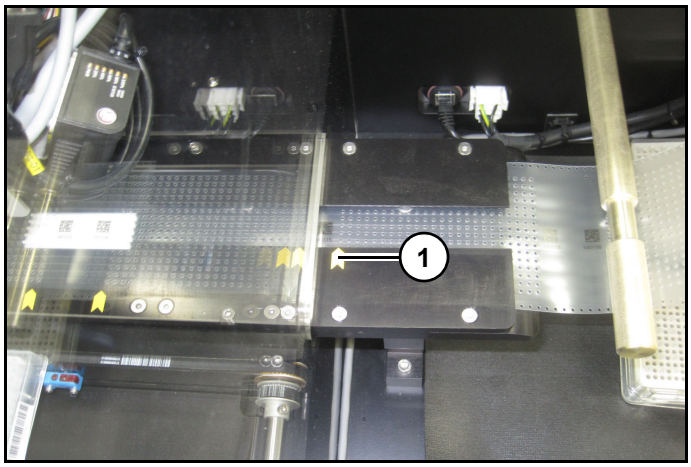


Figure 6

7. After Array Tape is properly engaged, jog Array Tape to its initial mark (1) *(Figure 6)* by holding joystick in "FWD" position.

Loading Array Tape on Rewind Module

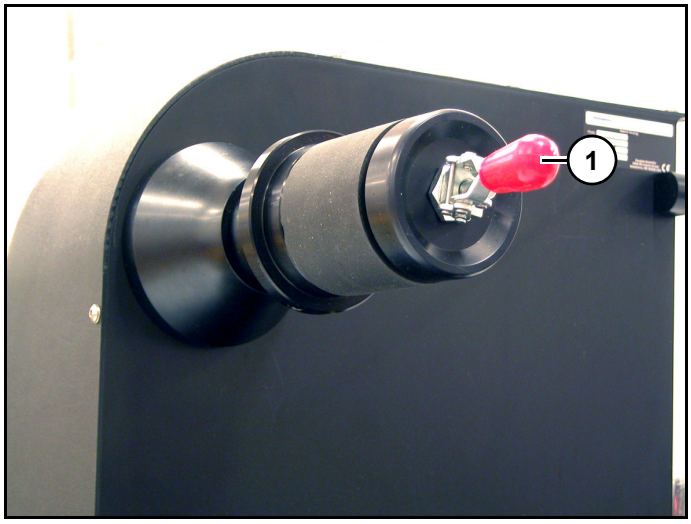


Figure 7

1. Release handle (1) on rewind spindle (2) *(Figure 7)*.

Note: Handle must be out straight.

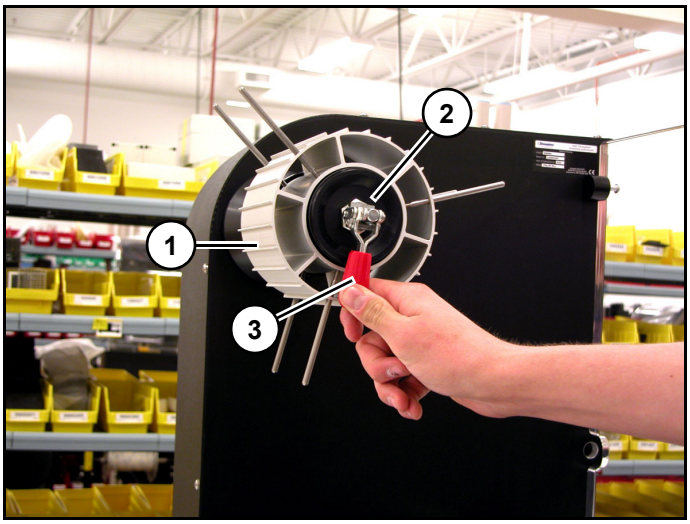


Figure 8

Refer to *(Figure 8)*.

2. Place dunker spool (1) on rewind spindle (2).
3. Clamp handle (3) down to secure dunker spool (1).

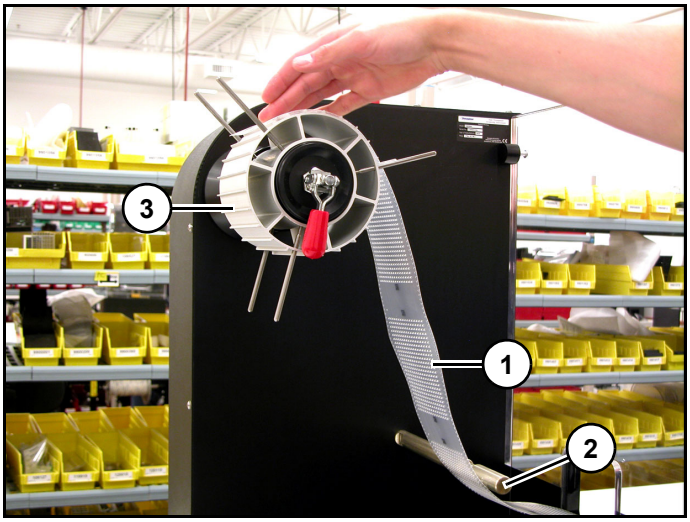


Figure 9

Refer to *(Figure 9)*.

4. Advance Array Tape (1) into rewind module and place under guide pin (2).
5. Hold Array Tape on top of dunker spool (3).
6. Turn dunker spool (3) counter-clockwise until Array Tape (1) is wrapped around enough times to secure it to spool.

General operation

⚠WARNING

Read and understand equipment operators manual before operating or performing maintenance. Failure to do so could result in serious injury or death.

Theory of operation

Nexar is a modular, liquid handling and assay processing system engineered to support high-throughput processing of sub-microliter volumes in 96- and 384-well Array Tape. Using indexing holes along edge of Array Tape to accurately position and continuously feed reaction wells, Nexar dispenses samples and reagents, seals Array Tape and winds it onto a dunker reel.

Before operating instrument:

- Examine instrument. Ensure guard doors are closed, instrument has power, and no obstructions are present.

Notice

Any operation that involves motion needs instrument to be in ready state (solid green status light).

General production

- Instrument will run as long as supplies are available.
- Faults will disable operation of instrument until fault is corrected.
- Instrument will not operate if a guard door is opened. Close door and press "Reset" button or push joystick to "Stop/Reset" position and release to restart.

General fault recovery procedure

1. If light status is flashing blue, a controlled fault has occurred. If light status is red, an uncontrolled fault has occurred. A yellow or flashing yellow state may also indicate an uncontrolled state. Refer to HMI to read fault code.
2. For basic fault recovery, solve fault. For hardware recovery faults, refer to Unit troubleshooting section of this document.
3. Reset instrument using joystick or "Reset" icon on landing page.
4. Follow start-up procedure to resume automatic operation.

Controlled fault:

Flashing blue indicator and typically occurs due to a Array Tape code read fault. May also be a customer initiated pause in which case we get a flashing green.

Recovery:

1. Reset using joystick or 'Reset' HMI button.
2. Wait until instrument returns to flashing green.
3. Click "Resume" to resume protocol normally.

Note: There's a small possibility that customer may move Array Tape off-position while instrument is paused.

Uncontrolled Fault:

A catastrophic instrument fault. Could also be a deliberate 'Abort' action from HMI or a Guard-door lift.

Recovery:

1. Reset using joystick or 'Reset' HMI button.
2. Wait until instrument returns to flashing green.

Note: At this point there is no guarantee that Array Tape is in correct position to resume.

3. Realign Array Tape by using joystick (or HMI).

Note: Array Tape is indexed 4.5 mm at a time until rightward yellow marker on feed slot points to second to last column on next-in-line Array Tape array. This ensures that interrupted Array Tape is in correct position to restart.

4. Hit 'Enable' to resume protocol normally.

Often, simplest recovery for a controlled or uncontrolled fault is to stop protocol, realign Array Tape to last known good Array Tape and simply redo protocol over again. Number of arrays already run does not matter because instrument will run arrays till designated count is exceeded or Array Tape runs out. Files are generated normally.

During both faults, fault will eventually appear during protocol run to indicate improper Array Tape position.

Motion directions

Motion directions Nexar

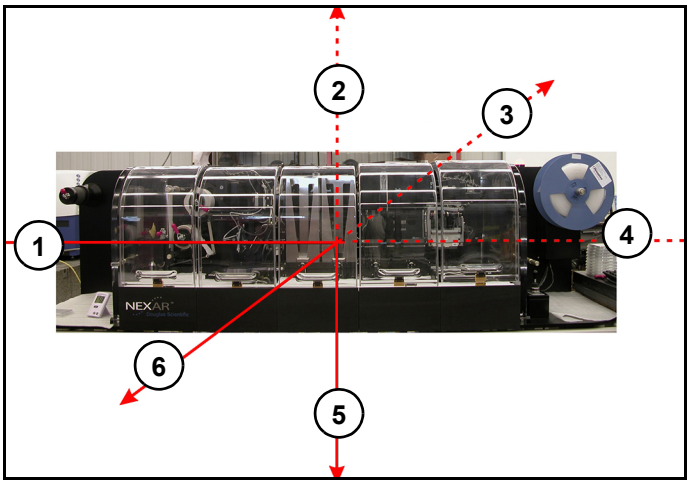


Figure 1

Motion directions Araya

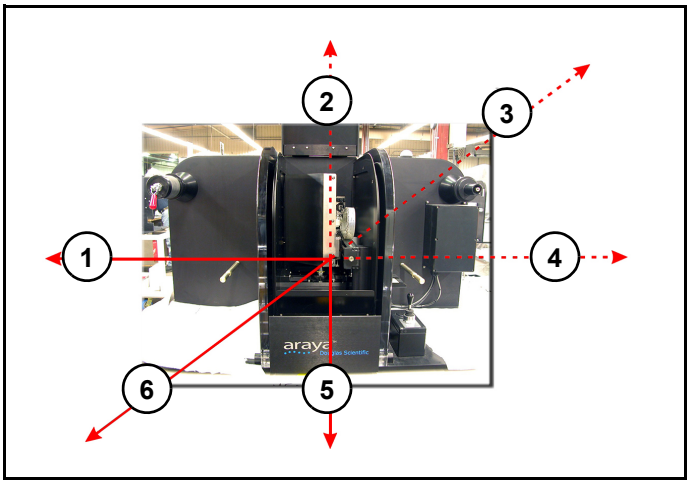


Figure 2

Refer to *(Figure 1) (Figure 2)*:

- Positive X (1).
- Negative Z (2).
- Negative Y (3).
- Negative X (4).
- Positive Z (5).
- Positive Y (6).

Interpreting light status and instrument states

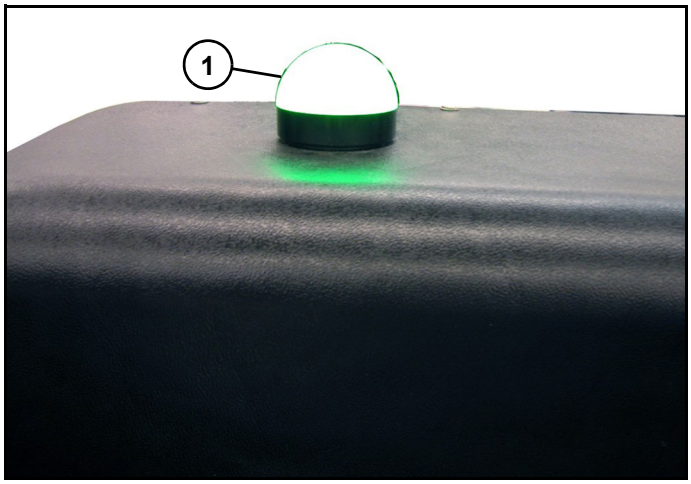


Figure 3

Status light (1) *(Figure 3)* reflects different states of instrument.

Light status/instrument state

Solid green

- Running, scanning.

Blinking green

- Idle (paused or Array Tape not synced).

Solid blue

- Resetting, recovering, waiting.

Blinking blue

- Faulted (controlled).

Amber

- Faulted (uncontrolled).

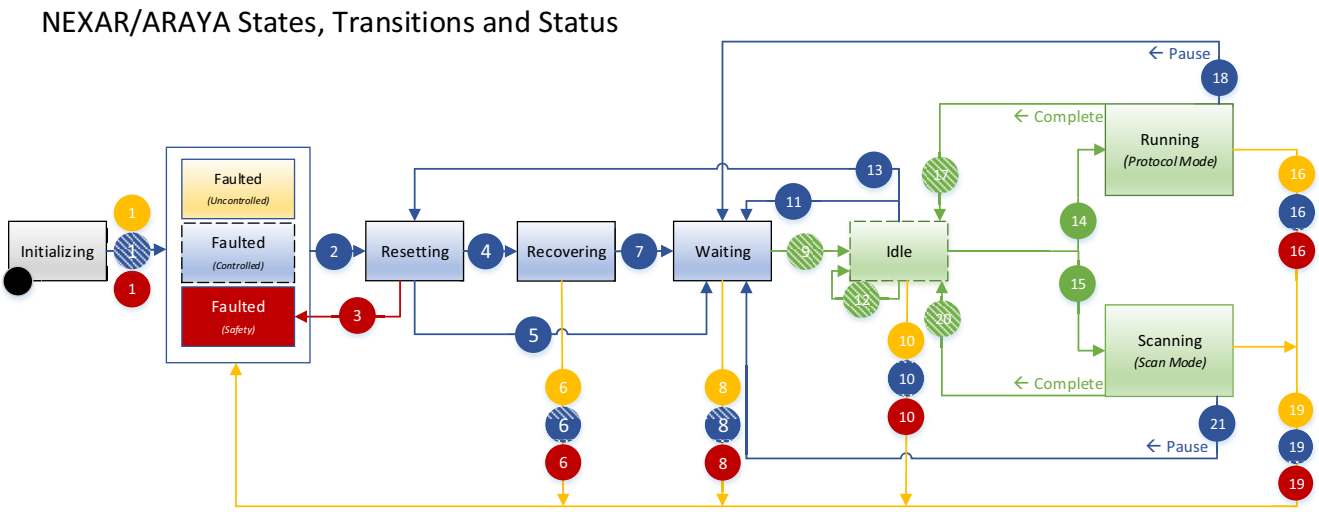
Red

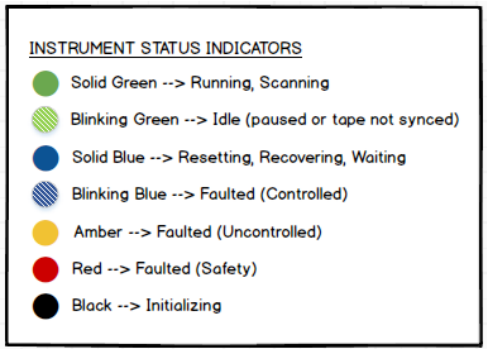
- Faulted (safety).

Black

- Initialising.

States, Transitions and Status Chart





Transitions			
	From	To	Event
1	Initialize	Fault (All)	Fault is detected during start up.
2	Fault (All)	Resetting	Reset button on HMI or joystick trigger.
3	Resetting	Fault (Safety)	Safety relay failure.
4	Resetting	Recovering	All managers requested to reset and safety reset.
5	Resetting	Waiting	Read settings requested.
6	Recovering	Fault (All)	Failure to reset fault or faulted.
7	Recovering	Waiting	Drives enabled and unit settings read.
8	Waiting	Fault(All)	Uncontrolled/Controlled/Safety fault.
9	Waiting	Idle	Homed, synced and all actions complete.
10	Idle	Fault(All)	Uncontrolled/Controlled/Safety fault.
11	Idle	Waiting	Homing and syncing from the HMI.
12	Idle	Idle	Abort playlist or abort scan.
13	Idle	Resetting	Reset button on HMI or joystick trigger.
14	Idle	Running	Start Playlist.
15	Idle	Scanning	Start Scan.
16	Running	Fault(All)	Uncontrolled/Controlled/Safety fault.
17	Running	Idle	Playlist complete.
18	Running	Waiting	Pause from HMI or controlled fault.
19	Scanning	Fault(All)	Uncontrolled/Controlled/Safety fault.
20	Scanning	Idle	Scan complete.
21	Scanning	Waiting	Pause from HMI or controlled fault.

Figure 4

Interpreting Array Tape 2D code

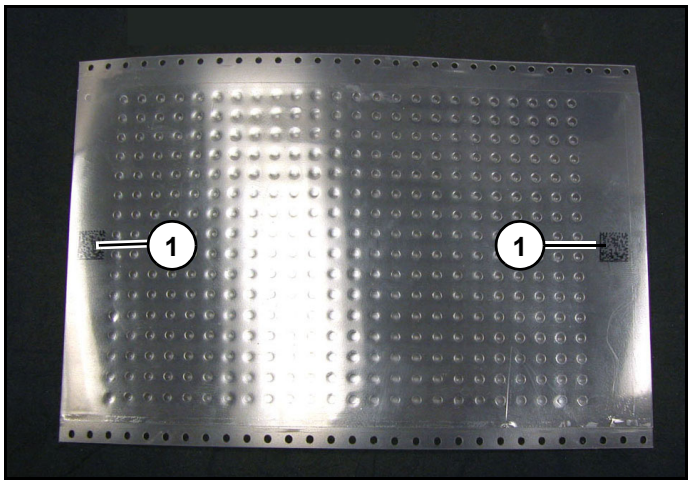


Figure 5

A 2D (data matrix) code (1) *(Figure 5)* is printed on either side of identifying array. 2D code is a unique parameter for array.

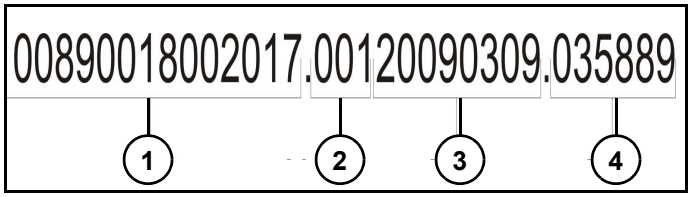


Figure 6

Refer to *(Figure 6)*

- GTIN (1): Global Trade Identification Number for Biosearch Technologies.
- Machine ID (2): Machine identification number on which Array Tape was manufactured.
- Time stamp (3): Time stamp in yyyymmdd format when Array Tape was manufactured.
- Array Tape ID (4): Unique identifier for each array. Numbers are in sequential order.

Interpreting Array Tape orientation

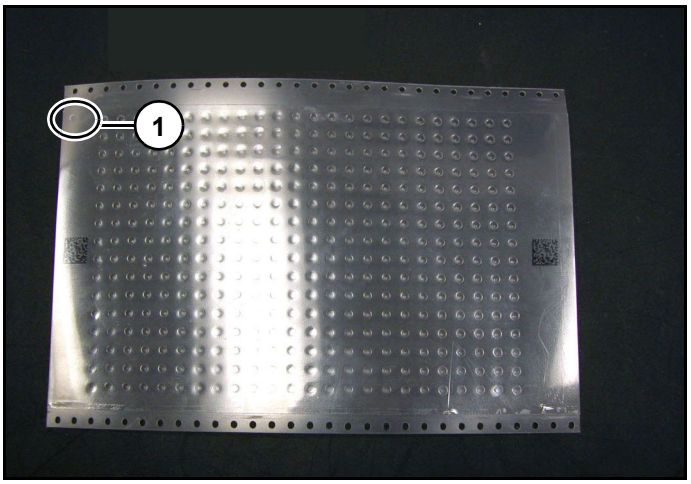


Figure 7

Array Tape can be loaded on instrument in either of the two following orientations:

0:

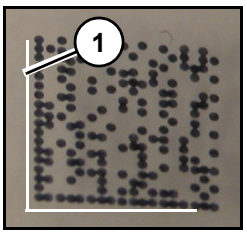


Figure 8

Well A1 is situated on top left corner of Array Tape when it is loaded. Punch hole (1) *(Figure 7)* denotes A1 well. "L" (1) *(Figure 8)* outlining outside of 2D code will be positioned on bottom and left edges of 2D code.

180:

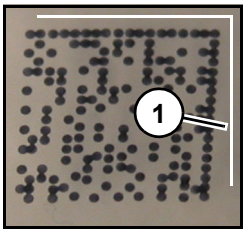


Figure 9

Well A1 is situated on bottom right corner of Array Tape when it is loaded. "L" (1) *(Figure 9)* outlining outside of 2D code will be positioned on top and right edges of 2D code.

Operating joystick

Notice
FWD and REV positions can only be used when instrument is in Ready or Paused state.

Figure 10

Joystick (1) *(Figure 10)* provides operator a quick and easy way to perform common tasks.

Stop/Reset:

When joystick is pulled and released towards "STOP/RESET" instrument is faulted, a fault reset is commanded. When joystick is pulled and released towards "STOP/RESET" while instrument is running or ready to run (instrument is in Ready state), a pause is commanded.

Start:

When joystick is pushed towards "START" and released instrument is ready to be homed, ready to run auto operations, or begins running auto operations (instrument is brought to a ready state).

Note: Only used in auto functions reads settings and resumes.

FWD:

When joystick is pushed towards "FWD" and released drives are synchronised, Array Tape advances in 4.5 mm steps.

When joystick is held in "FWD" position, it will advance Array Tape until joystick is released.

Note: If drives are not synchronised, pushing and releasing joystick in "FWD" position begins drive synchronisation.

REV:

When joystick is pushed towards "REV" and released, Array Tape reverses in 4.5 mm steps.
When joystick is held in "REV" position, it will reverse Array Tape until joystick is released.

Start up

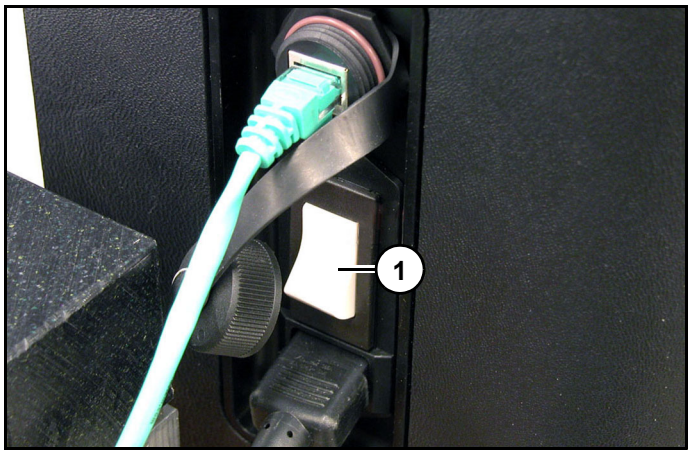


Figure 11

1. Turn main power switch (1) *(Figure 11)* on. Allow time for PC to boot up, status light will turn red after a few minutes.

Note: For new PC, wait for one minute before turning back on.

2. Ensure client PC is connected to embedded PC with an ethernet cable.

3. Open browser on client PC and launch instrument web application to open instrument screens.

Note: Allow for some delay when opening screens for first time.

4. Check that all guard doors are down and locked into position to ensure safety circuit is complete.

Figure 12

5. Reset safety circuit by pulling joystick (1) *(Figure 12)* towards "STOP/RESET" and release. There will be an audible clicking sound indicating relays are engaged. Status light and push button will turn yellow.

Note: To reset safety circuit from HMI, ensure Unwind Manager Auto Screen is displayed and press "Reset" icon.

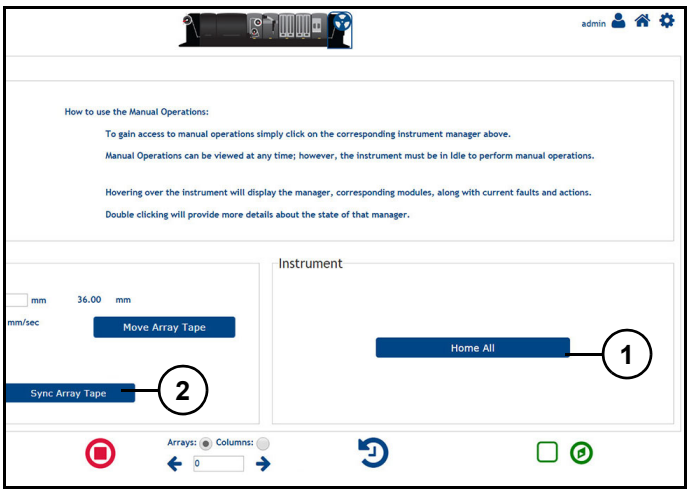


Figure 13

6. Press "Home All" (1) *(Figure 13)* to home Array Tape.

Note: "Home All" will turn yellow during homing process and will turn green when finished.

7. Push and release joystick (1) *(Figure 12)* towards "FWD" or press "Sync Array Tape" (2) *(Figure 13)*.

Note: "Sync Array Tape" will turn yellow during synchronising operation and will turn green when finished.

Array Tape will automatically move into position the first time. Sync will also occur from a move from joystick.

Protocols

Usual way of running instrument is through a protocol. protocols are .xml files that contain instructions and parameters for processing batches of arrays.

Refer to the protocol and Playlist Files sections for details.

Before running protocols, ensure instrument has following:

- Water in sonicator tank (if applicable).
- Source of supply water for tank.
- Drain dump for tank.
- Air is on.
- Array Tape is loaded and at initial marks.
- Seal is loaded.
- Chutes are correctly placed in Plate Stacker modules.
- Source plates are in chutes.

Note: Both Nexar and Araya can be operated through recipes.

Shutdown

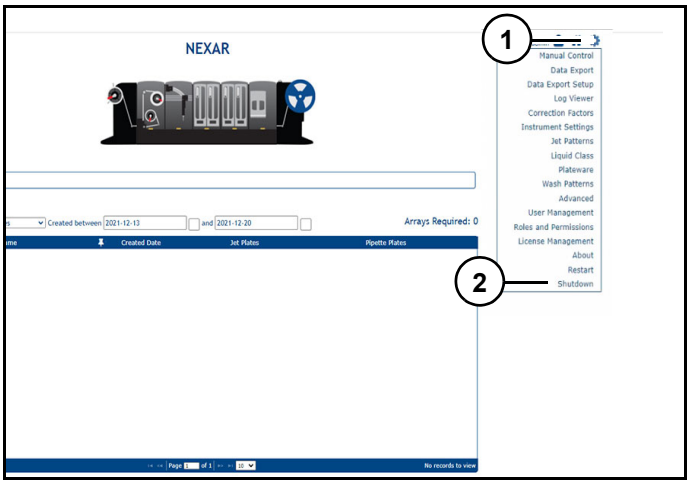


Figure 14

Refer to *(Figure 14)*.

1. Click "Settings" icon (1).
2. Click "Shutdown" (2).

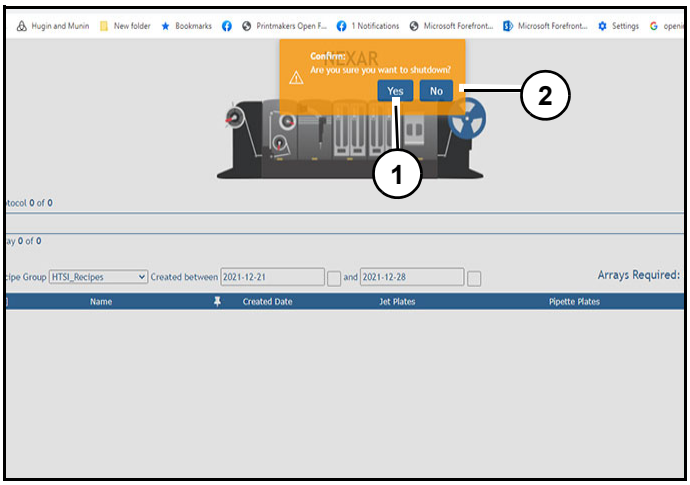


Figure 15

Refer to *(Figure 15)*.

3. Click "Yes" (1) to shut down instrument software.

Note: Click "No" (2) to about shutdown.

4. Turn main power switch off.

Shutting down for an extended period

1. Perform an 70% ethanol rinse on tips.
2. Wash tips.
3. Drain sonicator tank.

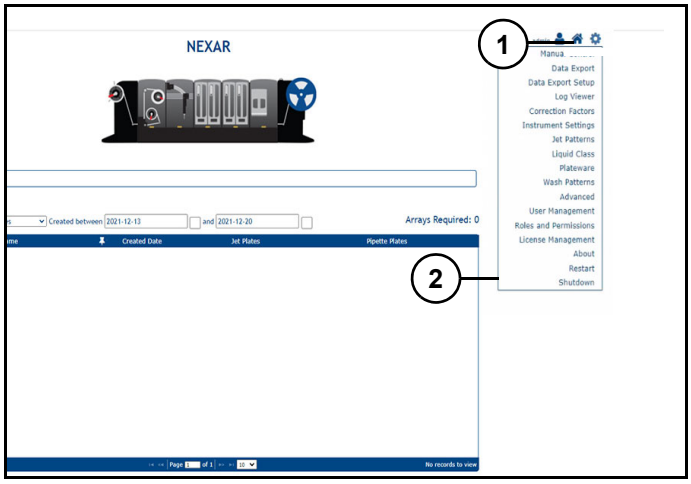


Figure 16

Refer to *(Figure 16)*.

1. Click "Settings" icon (1).
2. Click "Shutdown" (2).

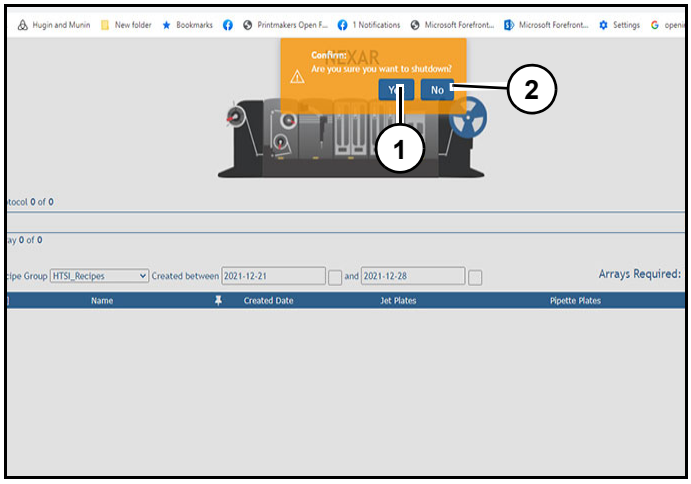


Figure 17

Refer to *(Figure 17)*.

3. Click "Yes" (1) to shut down instrument software.

Note: Click "No" (2) to abort shutdown.

4. Turn main power switch off.

Unit controls

Login page

Explanation of controls

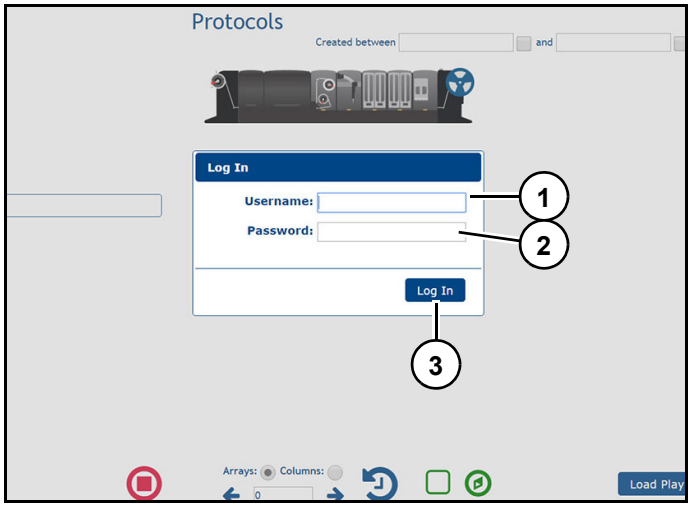


Figure 1

Refer to *(Figure 1)*.

Login page allows user to navigate to protected pages, such as module pages and .xml Editor page.

1. Enter Username (1) and Password (2).
2. Click "Submit" (3).

Home screen

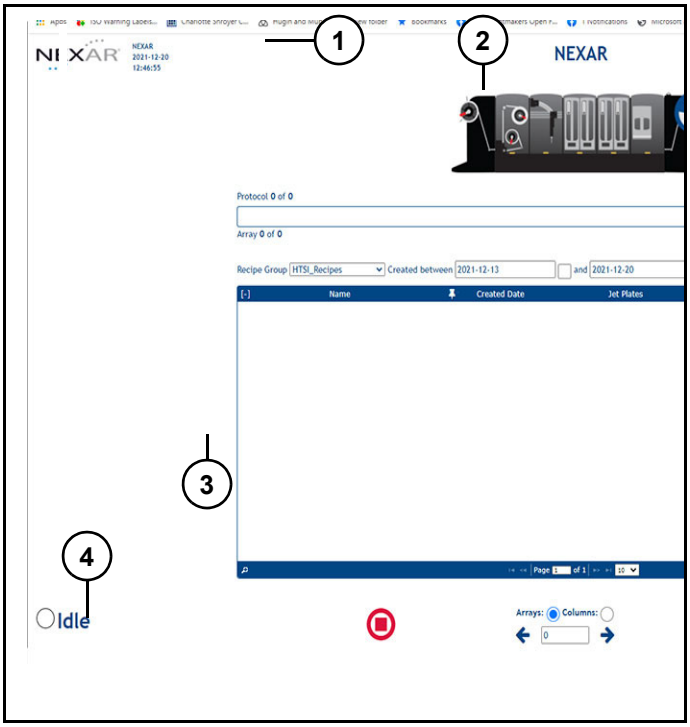


Figure 2

Refer to *(Figure 2)*.

Instrument information (1): Contains instrument name and date/time panel.

- Instrument name: Shows name of instrument.
- Date/time panel: Contains current date and time on controller.

Protocol information (2): Contains protocol name and date/time.

Navigation panel (3): Contains an illustration of instrument. Allows user to navigate between different managers. Each manager can have five states: hover state, selected state, action state, faulted state, and waiting state. Waiting and wash have detailed information such as time left, wash cycle.

Home screen identification (cont).

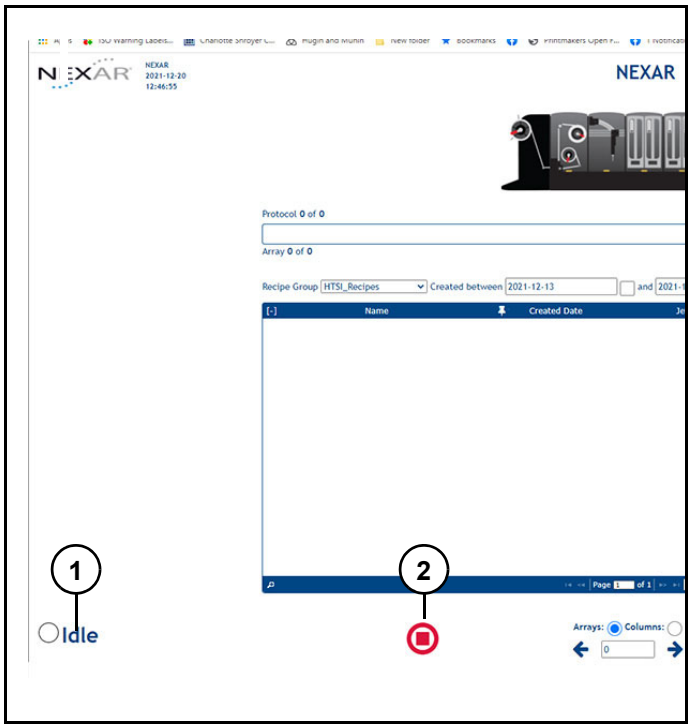


Figure 3

Refer to *(Figure 3)*.

Instrument state (1): Displays instrument state: Initialising, Faulted, Resetting, Recovering, Waiting, Idle, Running, Scanning.

Abort all actions (2): Aborts all running actions.

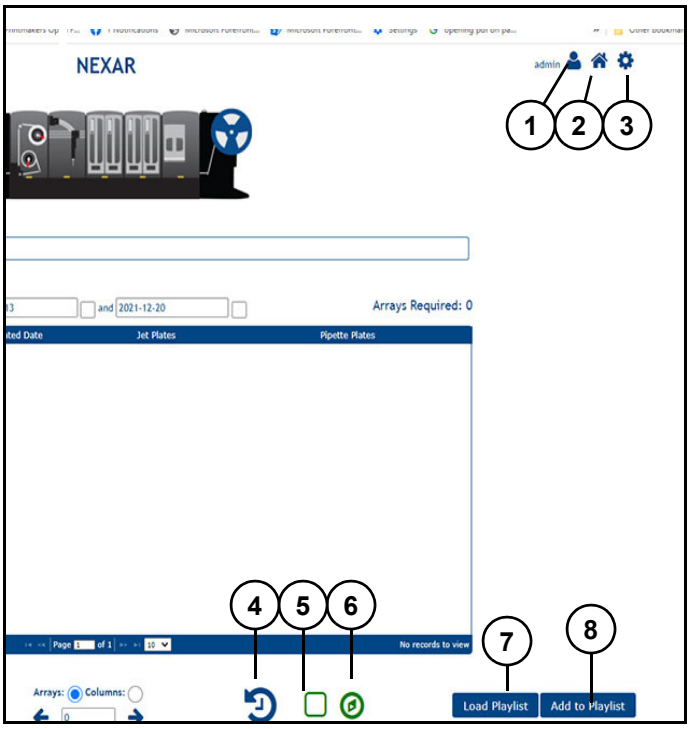


Figure 4

Refer to *(Figure 4)*.

User icon (1): Displays current user and allows user to log off or change password.

Home icon (2): Brings user to home page.

Settings icon (3): Displays advance settings.

Reset (4): Reset instrument after faulted state.

Synced (5): Displays green when Array Tape is synced, displays red when not synced. Click icon to sync Array Tape.

Instrument home (6): Displays green when instrument is homed, displays red when not homed. Click icon to home instrument.

Load Playlist (7): Loads existing playlist.

Create Playlist (8): Creates new playlist.

Home Screen identification/protocol

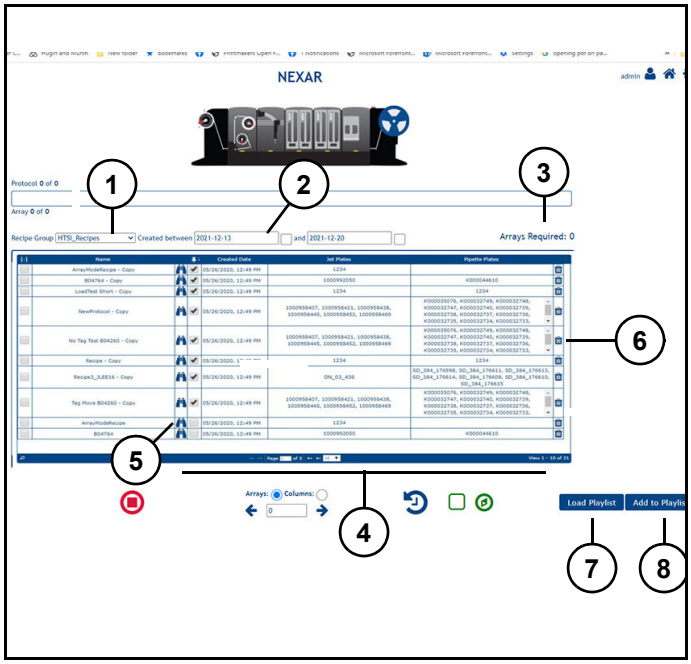


Figure 5

Refer to *(Figure 5)*.

Recipe Group (1): Displays recipe group.

Date display (2): Searches protocols by date.

Arrays Required (3): Displays array(s) required by selected protocol(s).

Protocol information (4): Displays recipe information, name, date created, ect.

Binocular icon (5): Displays selected protocol information.

Trash can icon (6): Deletes selected protocol from list.

Load Playlist (7): Loads selected protocol playlist.

Create Playlist (8): Creates playlist.

Creating playlist

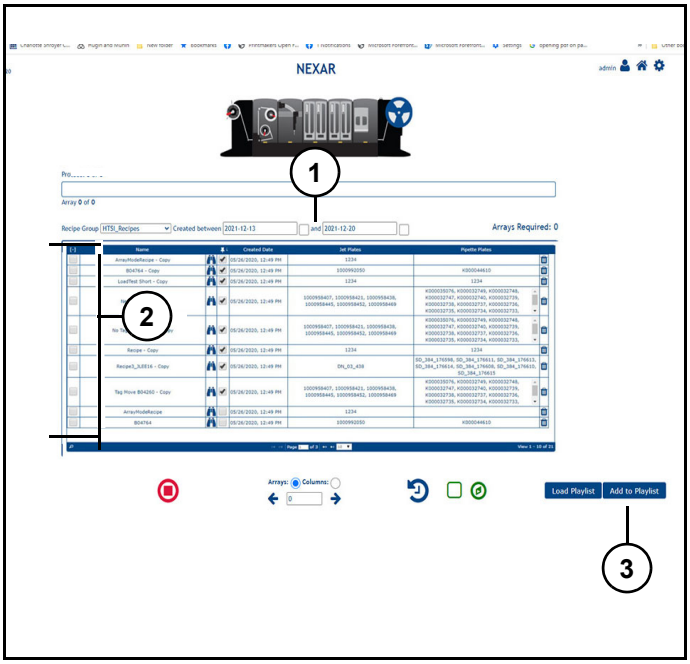


Figure 6

Refer to *(Figure 6)*

1. Enter protocol date range (1).
2. Check desired protocol(s) (2).
3. Click "Add to Playlist" (3).

Pinning a recipe

User's can "Pin" their favorite or most used recipe(s).

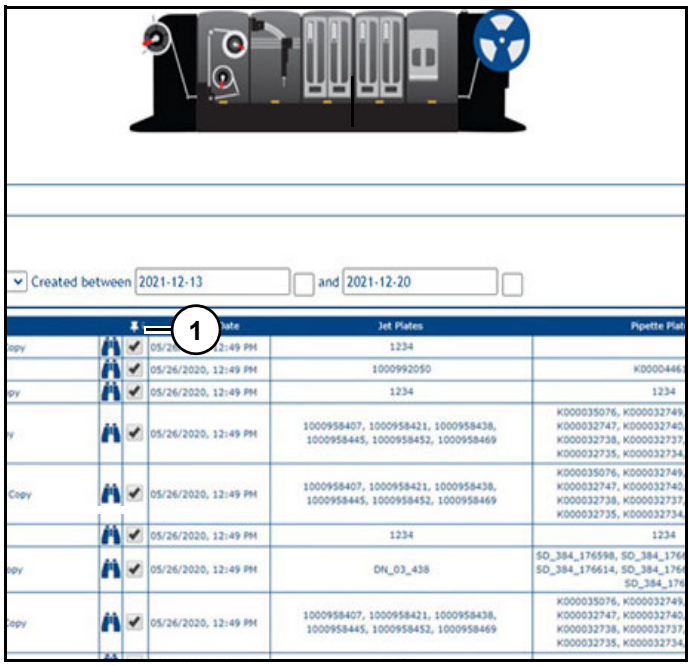


Figure 7

Refer to *(Figure 7)*

Checking "Pin icon" (1) will "Pin" a recipe and it will stay at top of recipe list. Simply unpin recipe to remove.

Home screen identification gear icon Manual Control

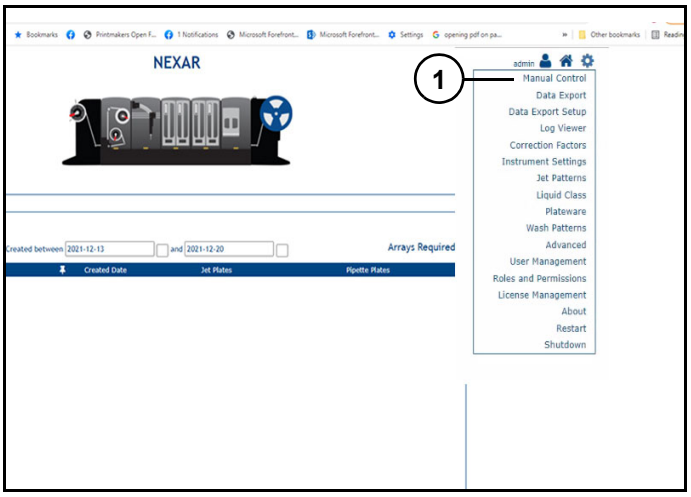


Figure 8

Manual Control (1) *(Figure 8)*: Accesses manual controls.

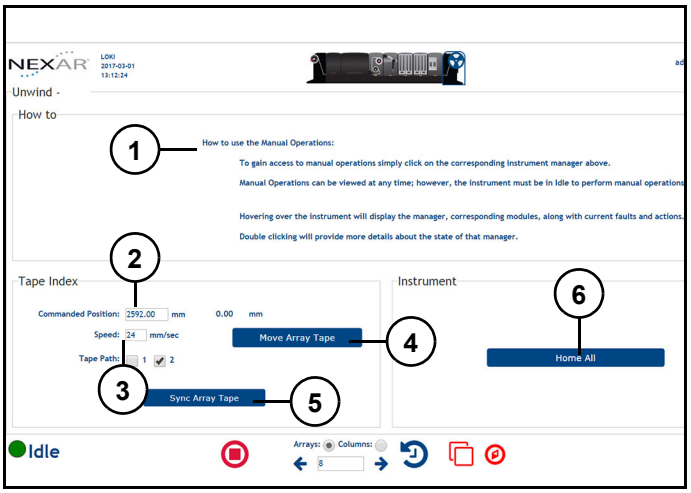


Figure 9

Refer to *(Figure 9)*.

How to (dialog box) (1): Displays how to information about screen.

Command Position (2): Displays command position of Array Tape in mm.

Speed (3): Displays speed of Array Tape in mm/sec.

Move Array Tape (4): Moves Array Tape to command position.

Sync Array Tape (5): Syncs Array Tape.

Home All (5): Homes instrument.

Home screen identification gear icon Data Export

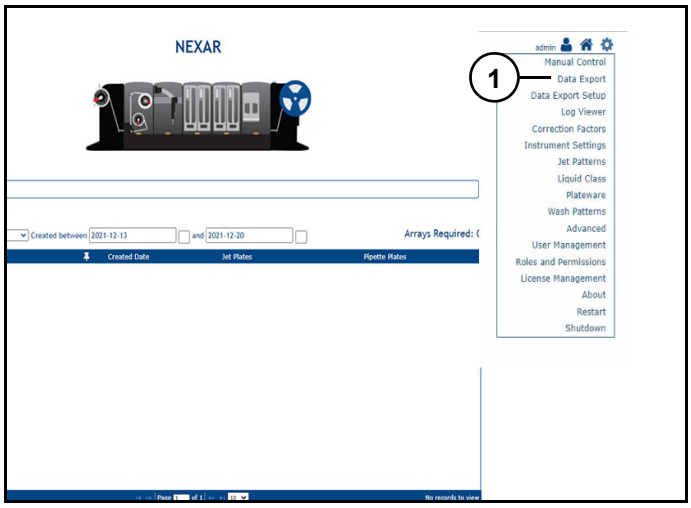


Figure 10

Data Export (1) *(Figure 10)*: Opens data export page.

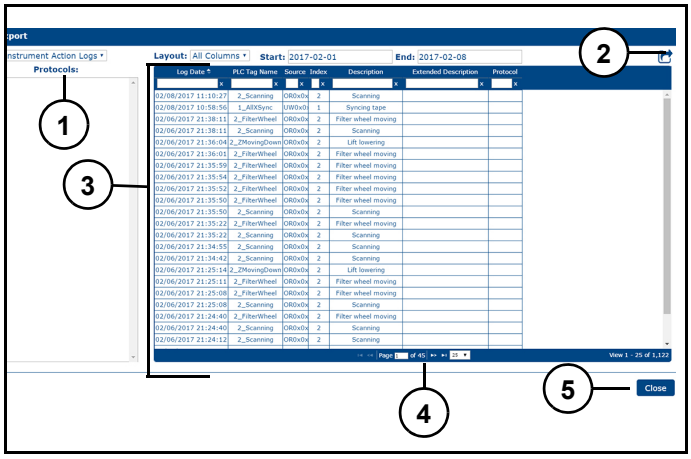


Figure 11

Refer to *(Figure 11)*.

Protocols (1): Displays list of protocols that have been run by start and end dates.

Export icon (2): Exports selected information.

Protocol information (3): Displays protocol information.

Page (4): Displays page information and scroll tools.

Close (5): Closes data export window.

Home screen identification gear icon Data Export Setup

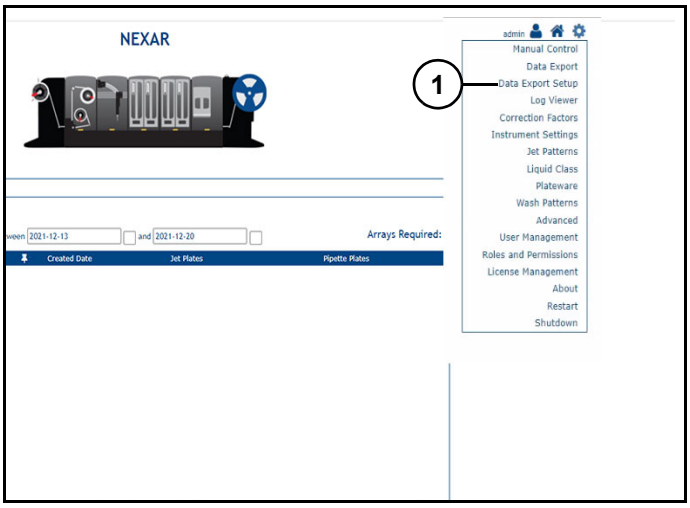


Figure 12

Data Export Setup (1) *(Figure 12)*: Opens data export setup page.

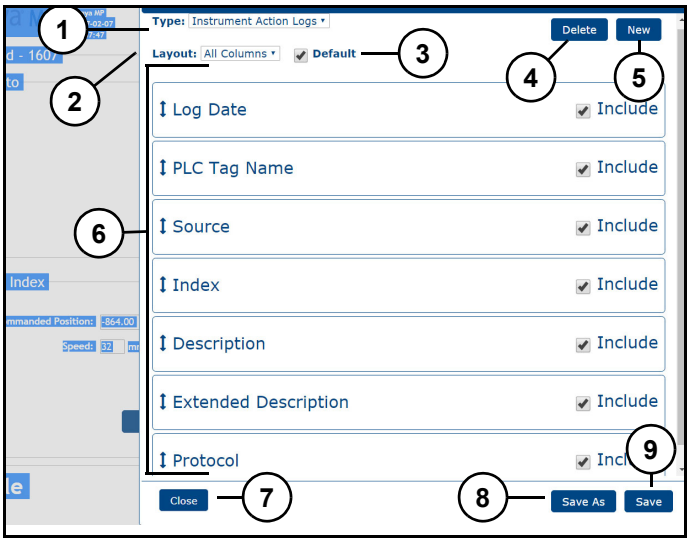


Figure 13

Refer to *(Figure 13)*.

Types (1): Displays logs and protocol reports.

Layout (2): Dropdown select layout.

Default (3): Selects default information when checked.

Delete (4): Deletes selected layout.

New (5): Created new layout.

Data window (6): Displays current data.

Close (7): Cancels any changes and return to previous page.

Save As (8): Saves data list as layout.

Save (9): Saves any changes made to layout.

Home screen identification gear icon Log Viewer

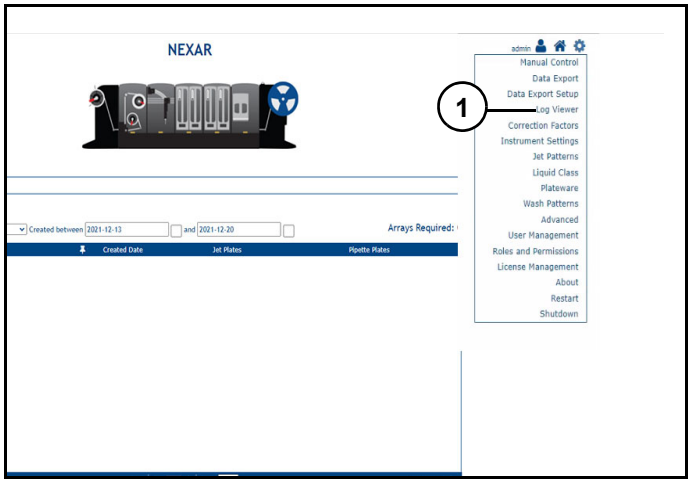


Figure 14

Log Viewer (1) *(Figure 14)*: Opens log viewer page.

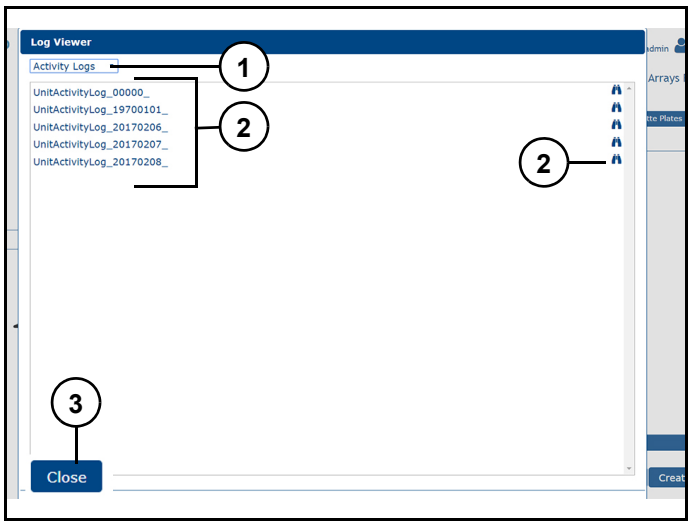


Figure 15

Refer to *(Figure 15)*.

Log drop-down (1): Displayed logs.

Binocular icon (2): Click to view selected log.

Close (3): Returns to previous page.

Home screen identification gear icon Correction Factors

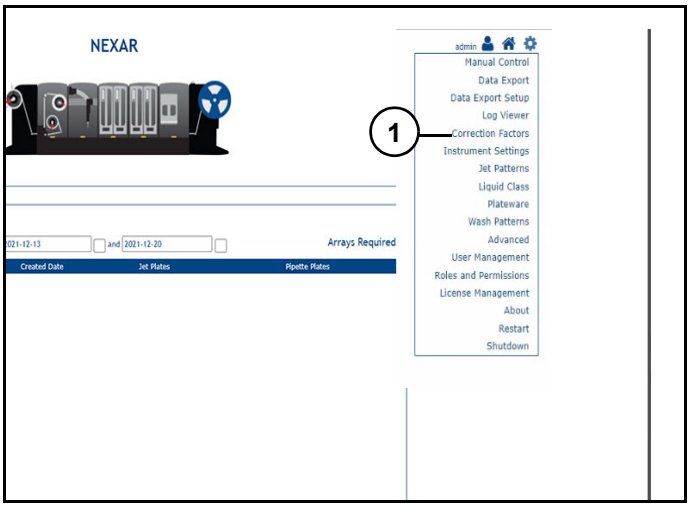


Figure 16

Correction Factors (1) *(Figure 16)*: Opens correction factors page.

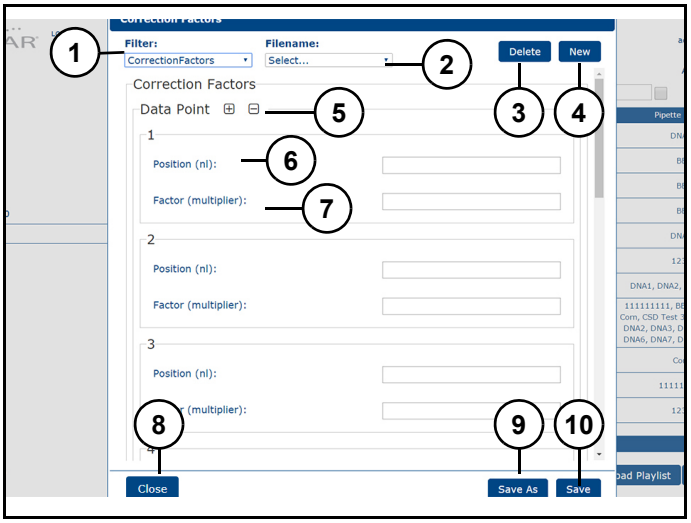


Figure 17

Refer to *(Figure 17)*.

Filters (1): Selects filter.

Filename (2): Selects file name.

Delete (3): Deletes selected setting.

New (4): Creates new setting.

Data Point (+) (-) (5): + adds new data point and - subtracts existing data point.

Position (nl) (6): Defines volume pipette dispense in nl.

Factor (multiplier) (7): Multiplier to target dispense volume.

Close (8): Cancels any changes made and return to previous screen.

Save As (9): Saves setting as new file.

Save (10): Saves changes.

Home screen identification gear icon Instrument Settings

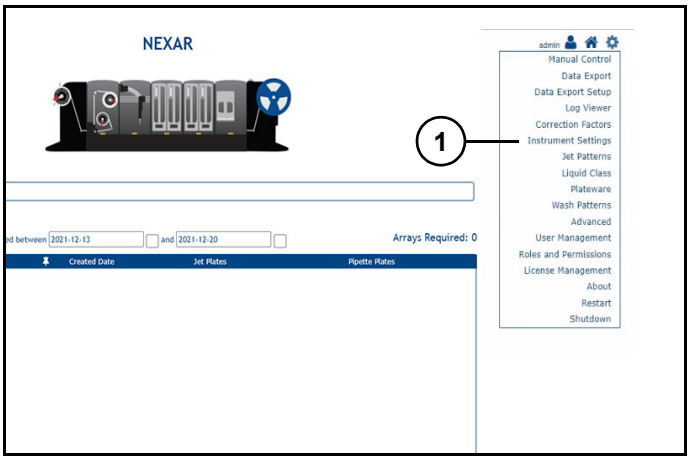


Figure 18

Instrument Settings (1) *(Figure 18)*: Opens instrument settings page.

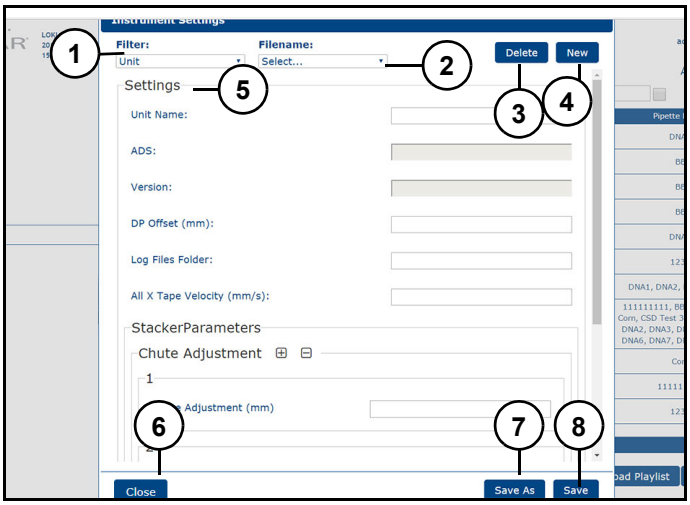


Figure 19

Refer to *(Figure 19)*.

Filters (1): Selects filter.

Filename (2): Selects file name.

Delete (3): Deletes selected setting.

New (4): Creates new setting.

Settings (5): Displays settings for selected filter.

Close (6): Cancels any changes made and return to previous screen.

Save As (7): Saves setting as new file.

Save (8): Saves changes.

Home screen identification gear icon Jet Pattern

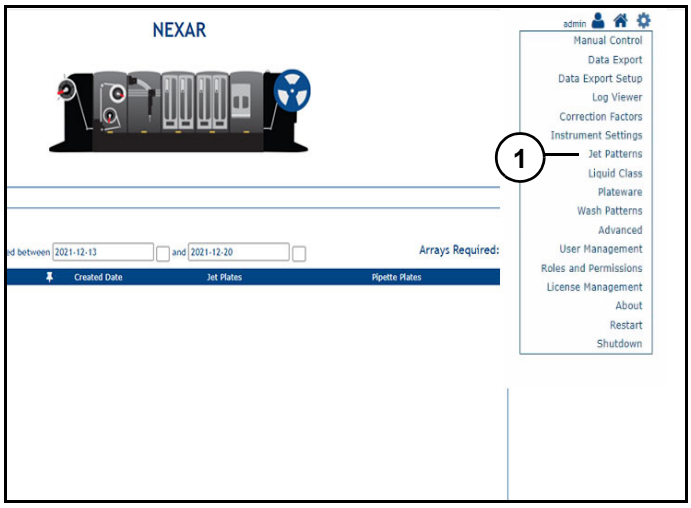


Figure 20

Jet Patterns (1) *(Figure 20)*: Opens jet patterns page.

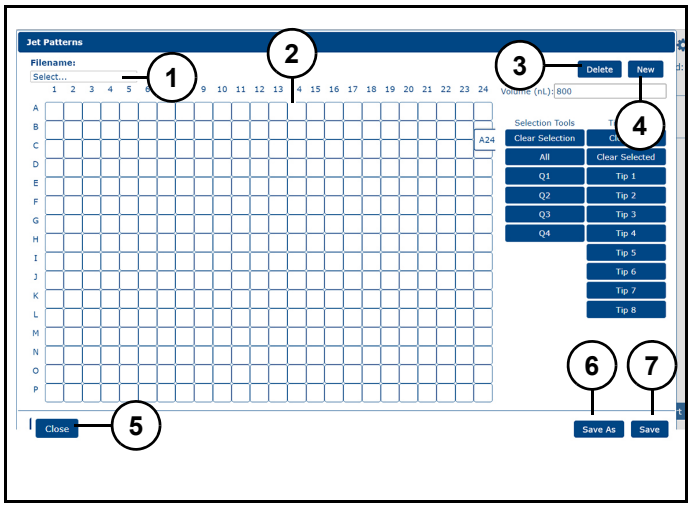


Figure 21

Refer to *(Figure 21)*.

Filename (1): Selects desired file.

Plate icon (2): Displays plate layout.

Delete (3): Deletes selected file.

New (4): Creates new file.

Close (5): Returns to previous page without saving changes.

Save As (6): Saves selected file as new file.

Save (7): Saves changes to selected file.

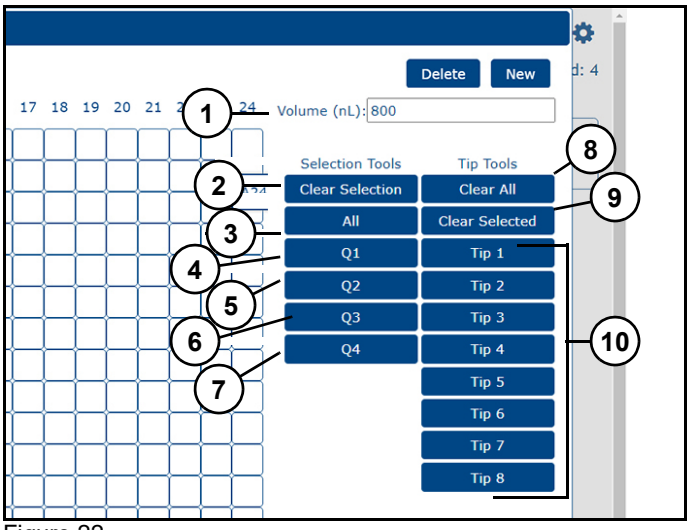


Figure 22

Refer to *(Figure 22)*.

Volume (1): Displays volume in nL.

Clear Selection (2): Clears all selected plate wells.

All (3): Selects all plate wells.

Q1 (4): Selects all quadrant 1 plate wells.

Q2 (5): Selects all quadrant 2 plate wells.

Q3 (6): Selects all quadrant 3 plate wells.

Q4 (7): Selects all quadrant 4 plate wells.

Clear All (8): Clears all tip selections.

Clear Selected (9): Clears selected tips.

Tip (1-8) (10): Selects tips 1-8 for dispense.

Home screen identification gear icon Liquid Class

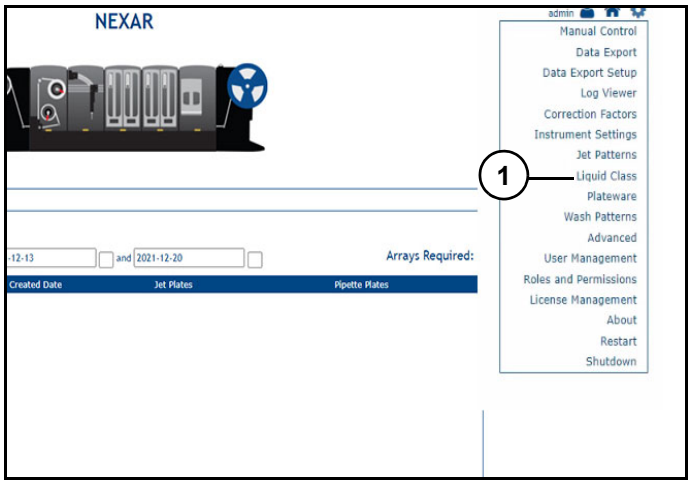


Figure 23

Liquid Class (1) *(Figure 23)*: Opens liquid class page.

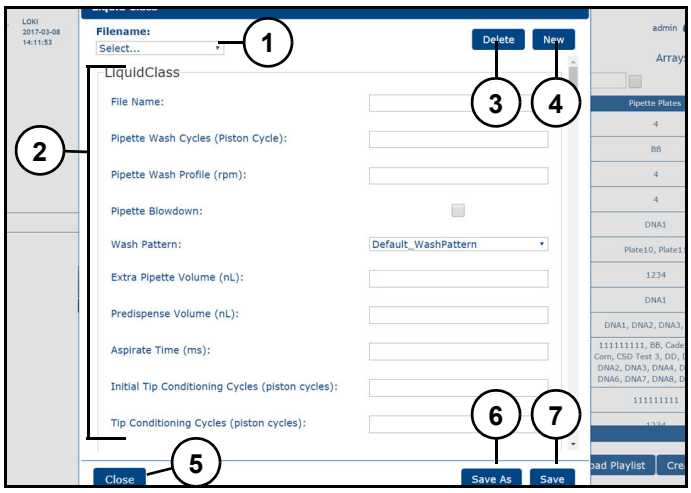


Figure 24

Refer to *(Figure 24)*.

Filename (1): Selects desired file.

Liquid Class (2): Displays liquid class settings.

Delete (3): Deletes selected file.

New (4): Creates new file.

Close (5): Returns to previous page without saving changes.

Save As (6): Saves selected file as new file.

Save (7): Saves changes to selected file.

Home screen identification gear icon Plateware

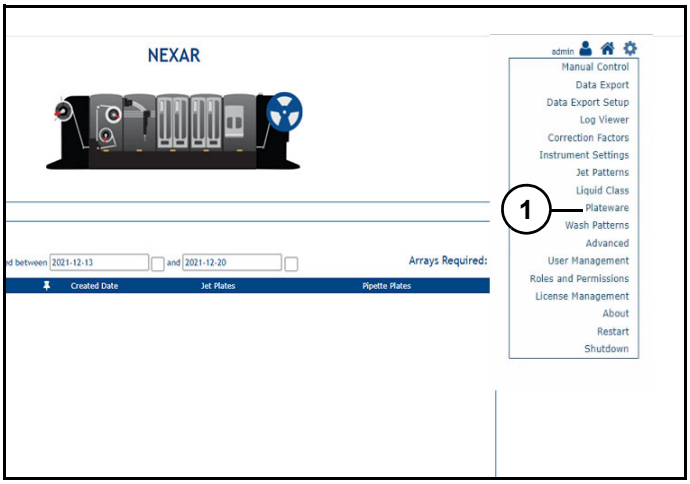


Figure 25

Plateware (1) *(Figure 25)*: Opens plateware page.

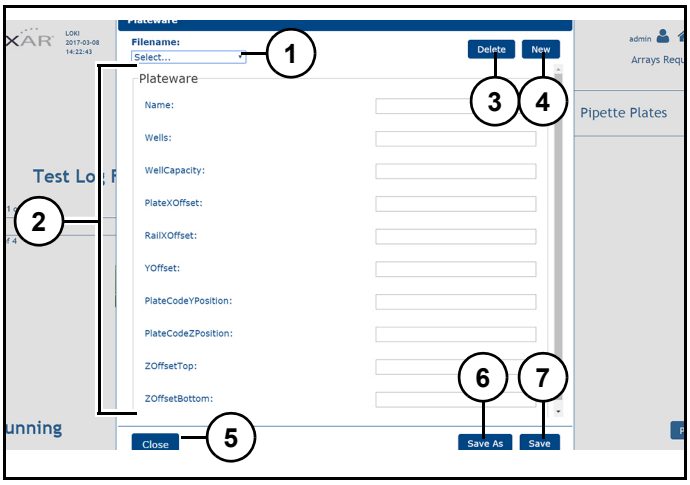


Figure 26

Refer to *(Figure 26)*.

Filename (1): Selects desired file.

Plateware (2): Displays plateware settings.

Delete (3): Deletes selected file.

New (4): Creates new file.

Close (5): Returns to previous page without saving changes.

Save As (6): Saves selected file as new file.

Save (7): Saves changes to selected file.

Home screen identification gear icon Wash Patterns

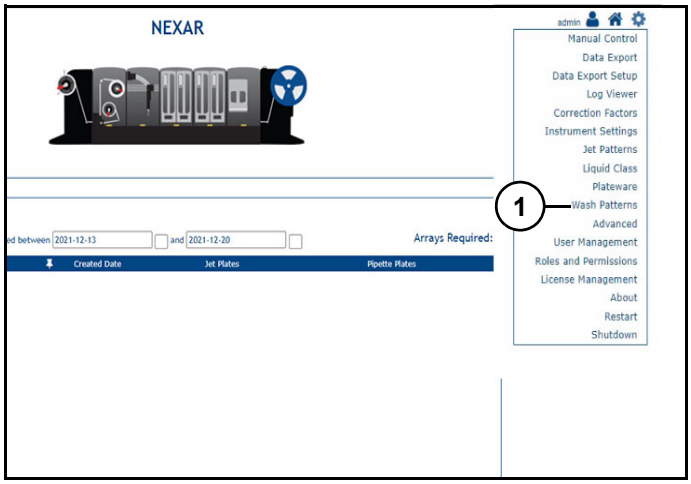


Figure 27

Wash Patterns (1) *(Figure 27)*: Opens wash patterns page.

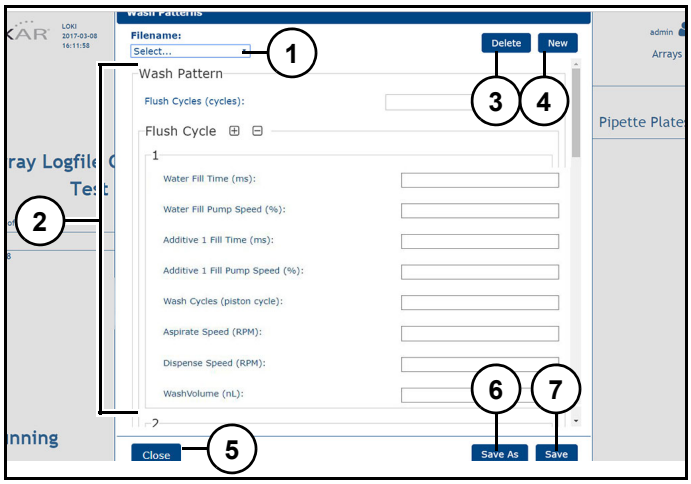


Figure 28

Refer to *(Figure 28)*.

Filename (1): Selects desired file.

Wash Pattern (2): Displays wash pattern settings.

Delete (3): Deletes selected file.

New (4): Creates new file.

Close (5): Returns to previous page without saving changes.

Save As (6): Saves selected file as new file.

Save (7): Saves changes to selected file.

Home screen identification gear icon Advanced

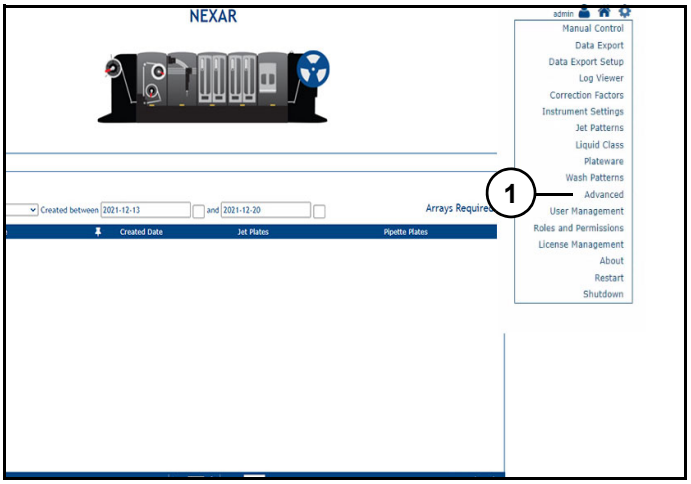


Figure 29

Advanced (1) *(Figure 29)*: Opens advanced options page.

Remote Support.

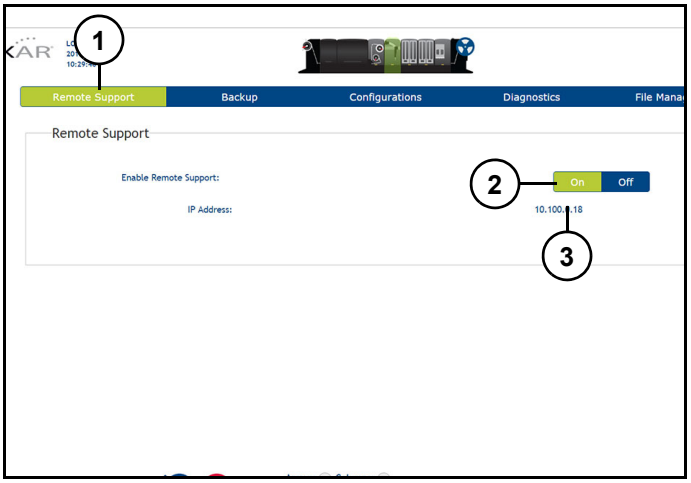


Figure 30

Refer to *(Figure 30)*.

Remote Support (1): Activates remote support screen.

On/Off (2): Enables/disables remote support option.

IP Address (3): Shows IP address of instrument.

Backup.

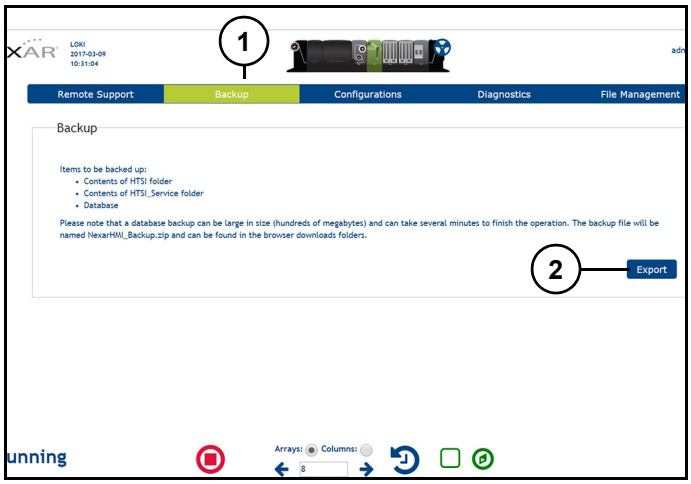


Figure 31

Refer to *(Figure 31)*.

Backup (1): Activates backup screen.

Export (2): Export file backup.

Configurations.

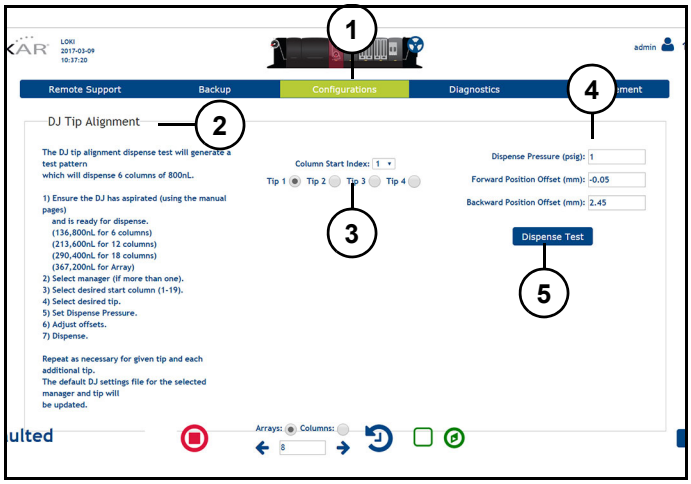


Figure 32

Refer to *(Figure 32)*.

Configurations (1): Activates configurations screen.

DJ Tip Alignment (2): Displays DJ tip information settings.

DJ tip settings (3): Displays DJ tip settings.

Dispense settings (4): Displays dispense settings.

Dispense Test (5): Starts dispense test.

Diagnostics.

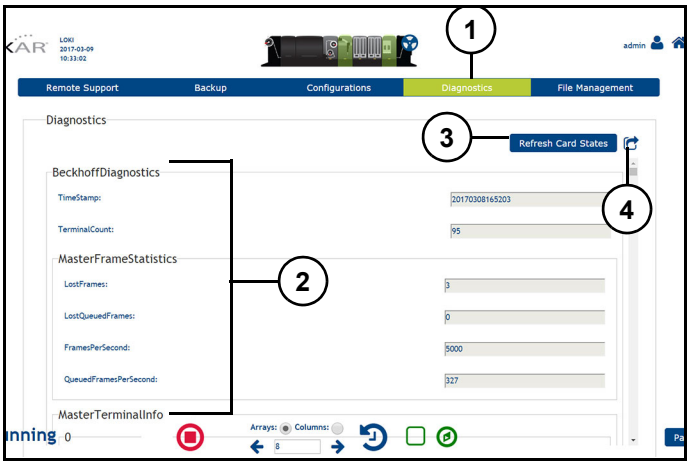


Figure 33

Refer to *(Figure 33)*.

Diagnostics (1): Activates diagnostics screen.

Diagnostics Settings (2): Displays diagnostics information.

Refresh Card States (3): Refreshes cards states.

Export icon (4): Exports terminal data.

File Management.

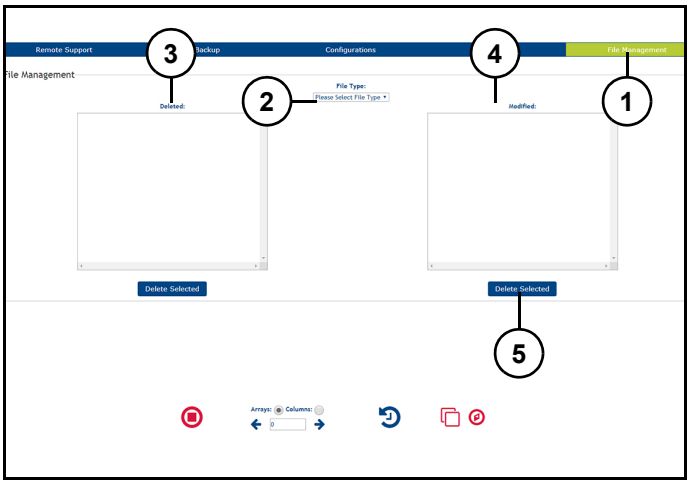


Figure 34

Refer to *(Figure 34)*.

File Management (1): Activates file management screen.

File Type (2): Searches via file type.

Delete (3): Shows deleted files.

Modified (4): Shows modified files.

Delete Selected (5): Deletes selected files.

Home screen identification gear icon User Management

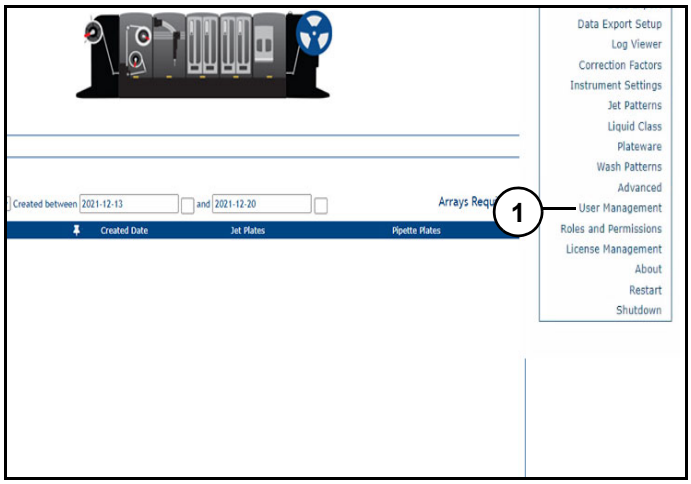


Figure 35

User Management (1) *(Figure 35)*: Opens user management page.

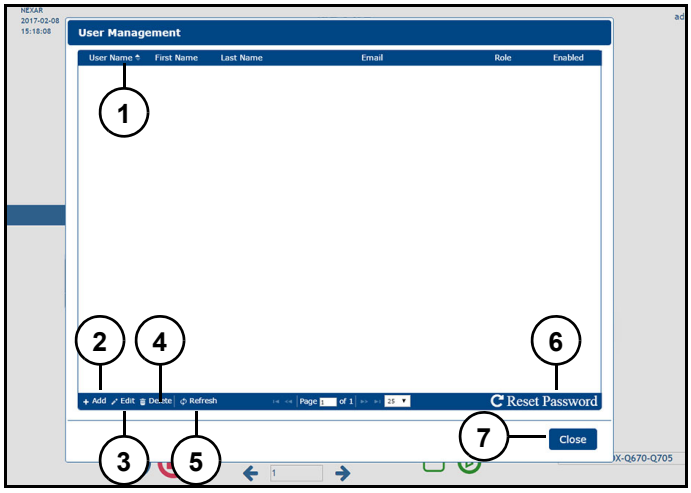


Figure 36

Refer to *(Figure 36)*.

User Name (1): Displays user name and information.

Add (2): Adds new user.

Edit (3): Edits selected user information.

Delete (4): Deletes selected user.

Refresh (5): Refreshes user management screen.

Reset Password (6): Resets password of selected user.

Close (7): Closes user management screen.

Home screen identification gear icon Roles and Permissions

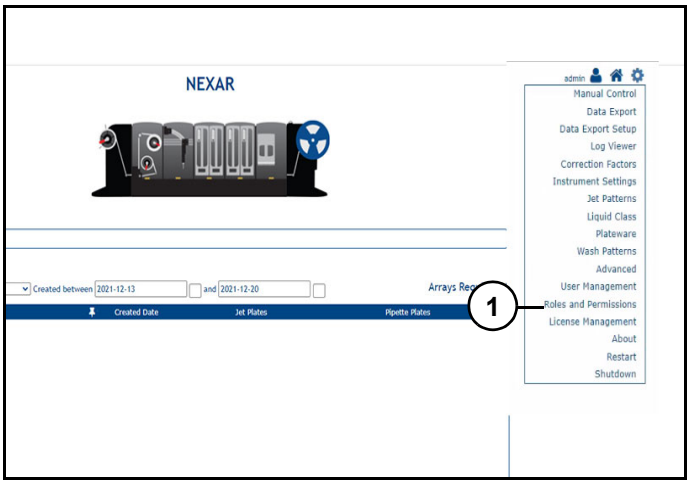


Figure 37

Roles and Permissions (1) *(Figure 37)*: Opens roles and permissions page.

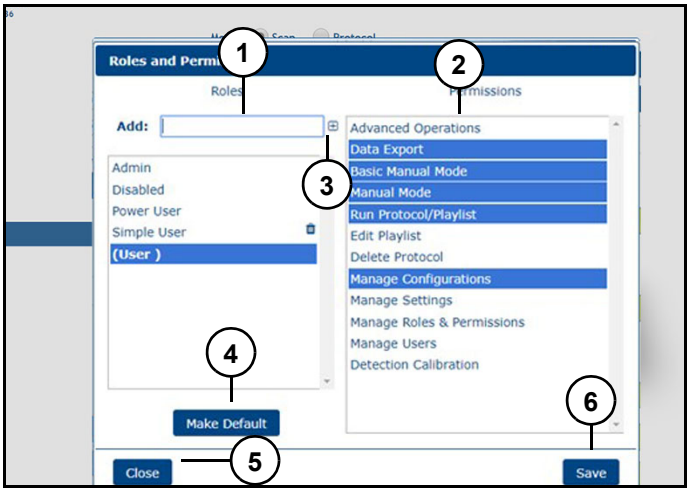


Figure 38

Refer to *(Figure 38)*.

Roles (1): Displays user roles types.

Permissions (2): Displays user permission types.

+ (3): Adds new user.

Make Default (4): Make selected role default for new users.

Close (5): Returns to previous page without saving changes.

Save (6): Saves any change made.

Home screen identification gear icon License Management

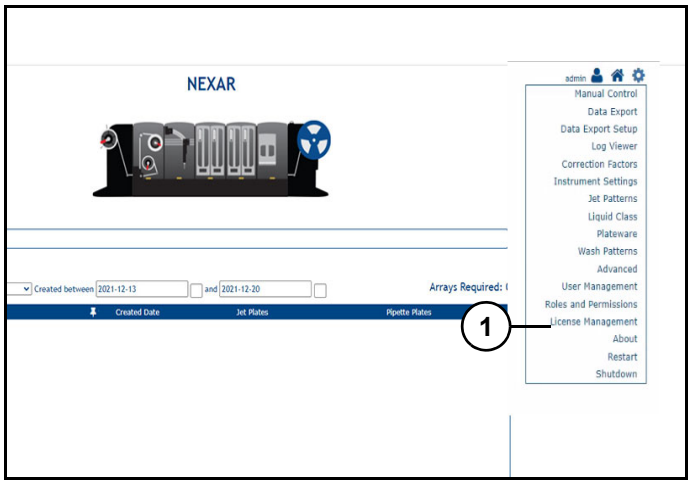


Figure 39

Licence Management (1) *(Figure 37)*: Opens licence management page (only active under certain software license).

Home screen identification gear icon About

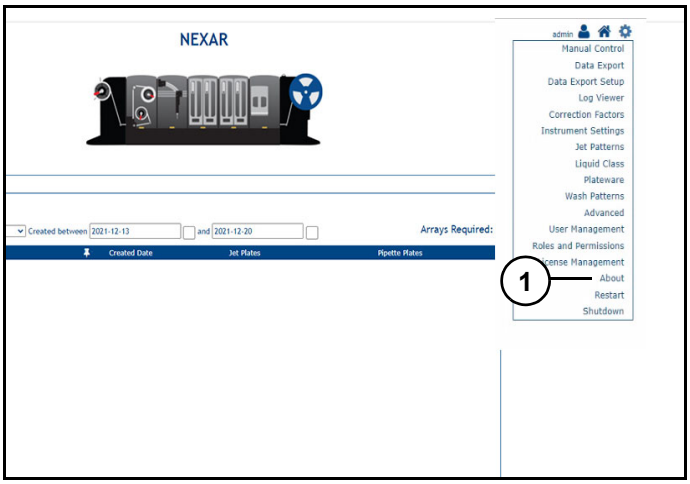


Figure 40

About (1) *(Figure 40)*: Opens about instrument page.

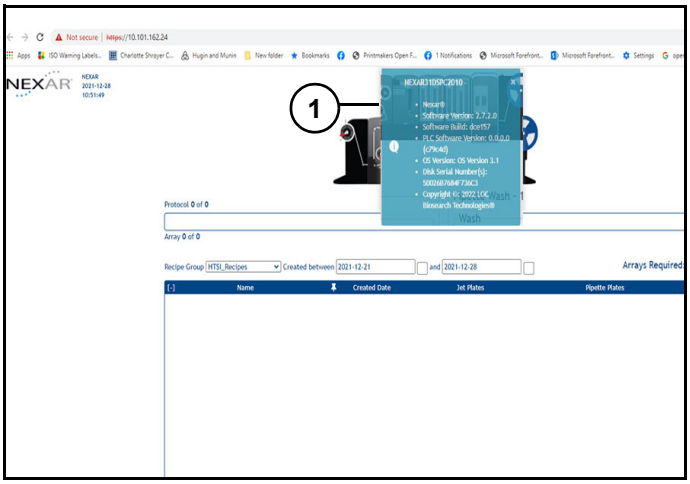


Figure 41

Information box (1) *(Figure 41)*: Displays instrument information including IP address, software version, etc.

Home screen identification gear icon Restart

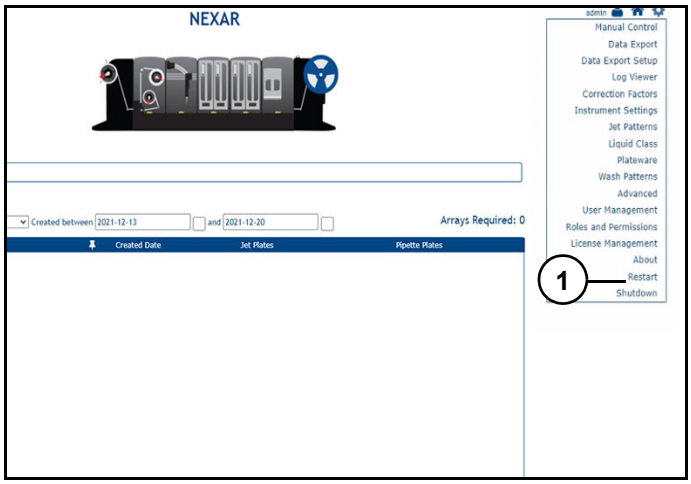


Figure 42

Restart (1) *(Figure 43)*: Restarts instrument software.

Home screen identification gear icon Shutdown

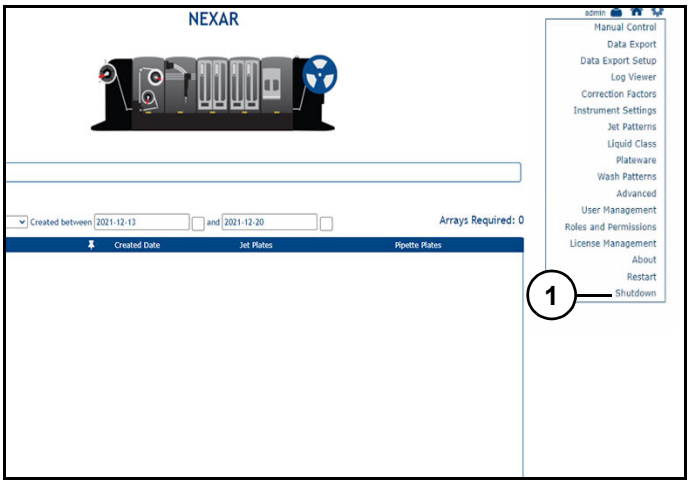


Figure 43

Shutdown (1) *(Figure 43)*: Shuts down instrument software.

Shutting down software.

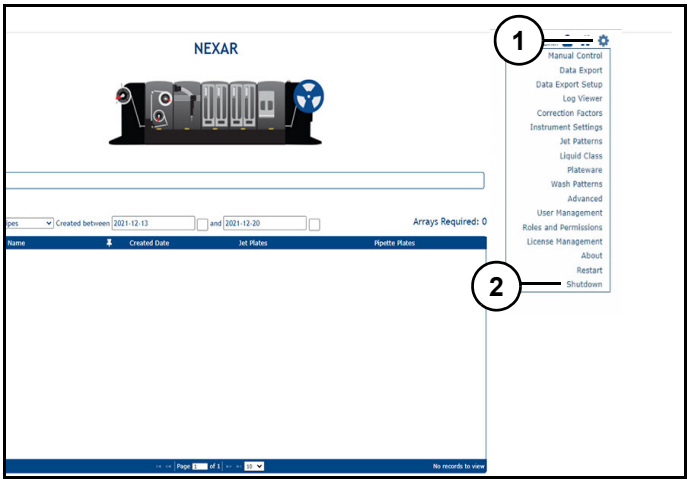


Figure 44

Refer to *(Figure 44)*.

1. Click "Settings icon" (1).
2. Click "Shutdown" (2).

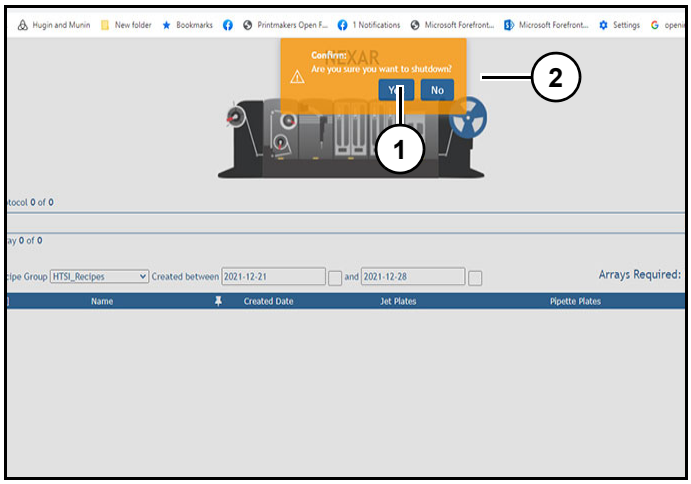


Figure 45

Refer to *(Figure 45)*.

3. Click "Yes" (1) to shut down instrument software.

Note: Click "No" (2) to abort shutdown.

Nexar maintenance

⚠WARNING

Read and understand equipment operators manual before operating or performing maintenance. Failure to do so could result in serious injury or death.

⚠WARNING

Shut down main power to instrument before performing any maintenance. Failure to do so could result in serious injury or death.

Notice

Biosearch Technologies recommends monthly checks of all guards, safety switches, emergency stop buttons and instrument structure. Replace or repair anything that could cause a potential hazard.

Routine maintenance

Daily (Performed by operator)	
Dispense Jet Ethanol wash, if equipped (before first run or after last run, or both)	
Pipette Wash bleach concentration verification, if equipped (before first run or after last run, or both)	

Weekly (Performed by operator)	
Dispense Pipette tips replacement, if equipped (each run-once weekly based on application needs)	
Wipe surfaces with alcohol based cleaner (or as issues arise)	

Weekly (Performed by operator)	
Pipette Wash basin, if equipped Soak with alcohol and rinse (or as issue arise)	
Dispense Pipette seal pad cleaning, if equipped (or as issues arise)	

Monthly (Performed by operator)	
Inspect source/waste-water tubing for leaks, mold growth, discoloration	
Inspect bleach supply line for leaks, cracks, discoloration. if equipped	
Inspect FlexJet degasser for cracks or air bubbles downstream of degasser (DJ1212, DJ1609)	

Annually (Performed by BiosearchTechologies Service Technic*an*)	
Replace PW carbon filter, if equipped	
Inspect air filters and replace as needed	
Inspect tape drives and belts, replace as needed	
Inspect plate conveyor/Plate Stacker belt tension, adjust as needed	
Remove, clean, and grease Plate Stacker lift guides using grease from care kit	
Ensure Plate Stacker chute magnets or detents are present and secure chutes properly	
Inspect Unwind, Tape Sealer, Rewind spindle rubber cores, replace as needed	
Grease all rails using grease from care kit	
Clean Jet Wash attachment, if equipped	
Clean Pipette Wash attachment, if equipped	
Replace source and waste-water tubing	

Handling faults

Interpreting faults

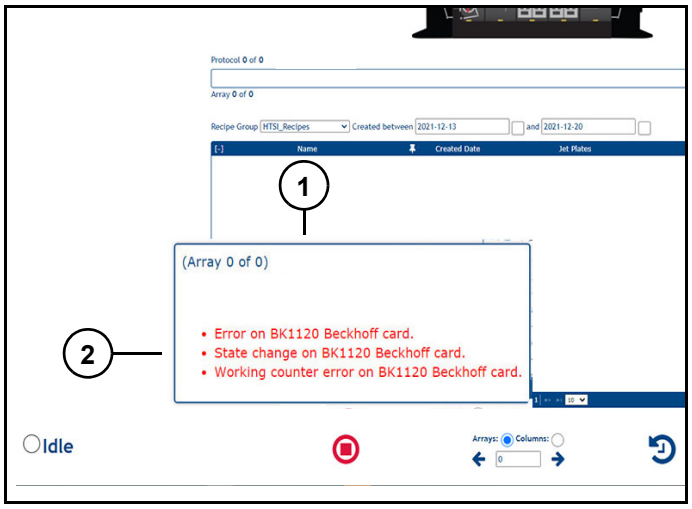


Figure 1

Refer to *(Figure 1)*.

When a fault occurs, a red highlight will highlight faulted manager (1) on Navigation icon of displayed screen.

Note: When a fault occurs, a pop-up screen (2) displaying currently faulted manager/module and fault message.

1. Double click highlighted manager (1).

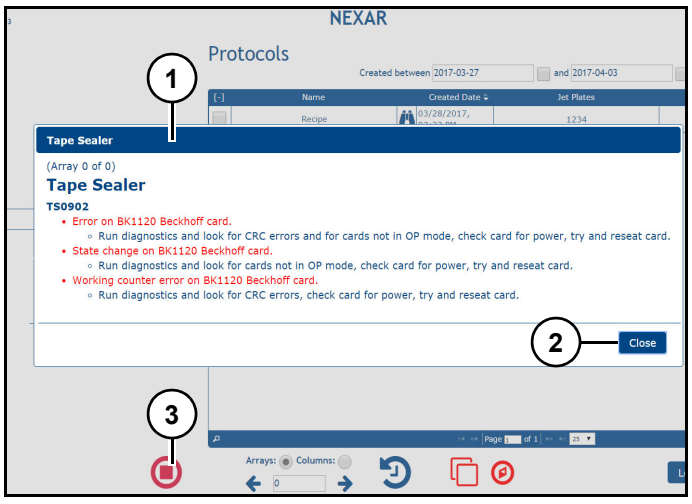


Figure 2

Refer to *(Figure 2)*.

2. Fault resolution pop-up will appear (1).
3. Resolve fault(s).
4. Click "Close" (3).
5. Click "Reset" (3).

Refer to Troubleshooting section for fault recovery information.

Resetting a fault without a protocol

Notice
Before resetting a fault, condition must be corrected.

1. To reset a fault press "Reset" or pull and release joystick at "Stop/Reset" position.
2. After resetting, wait a few seconds to see if fault condition disappears from navigation panel. When fault disappears, instrument is ready.

Resetting a Fault While Running a Protocol

Notice
If running a recipe, fault will interrupt instrument. • A controlled fault pauses recipe after completing its current operation. After recovering, recipe will automatically continue from where it paused. • After an uncontrolled fault, operation that was interrupted might be lost. After recovering, recipe will start next operation.

1. To reset a fault press "Reset" or pull and release joystick at "STOP/RESET" position.
2. After resetting, wait a few seconds to see if fault condition disappears from navigation panel. If it disappears, instrument is ready. If still faulted, refer to Troubleshooting section.
3. Push and release joystick to "Start" position, or press "Enable" button screen to resume recipe.

System files

Instrument generates and consumes following types of files:

- Protocol Settings: Protocol is a procedure and formula that completely describes a process batch. Refer to the Recipe Settings File section in Technical Manual for more information.
- System Settings: Instrument managers, modules, and components require certain variable parameters for their various functions. These parameters are user-adjustable and encapsulated in system settings files. Refer to System Settings File section in Technical Manual for more information.
- System Log Files: Log files are generated by certain managers and provide a record of specific operation performed by manager. Refer to System Log Files section in Technical Manual for more information.
- System Reports: Instrument has capability to generate two types of reports for completed recipes, as well as errors. Refer to Unwind Manager _MGR_UW0902 Controls section for more information.
- Activity Logs: Give detailed information about actions instrument has run. They also track what files read and when operations start and finish.

Resynchronising drive while running a protocol

Occasionally, drive might lose synchronisation during a protocol run and may need to be resynchronised without ending recipe. Causes could be:

- Excessive drag on Array Tape.
- Mechanical problems with drive.
- Proximity switches malfunctioning.

1. Place instrument into a paused state.
2. Press Sync Array Tape button on HMI page.
3. Realign Array Tape.
4. Enable instrument, using joystick or “Enable" button to resume recipe.

(Note: Refer to Unit Troubleshooting section for solutions.

Unwind_UW1111

⚠WARNING

Read and understand equipment operators manual before operating or performing maintenance. Failure to do so could result in serious injury or death.

Component identification

Unwind Module_UW1111

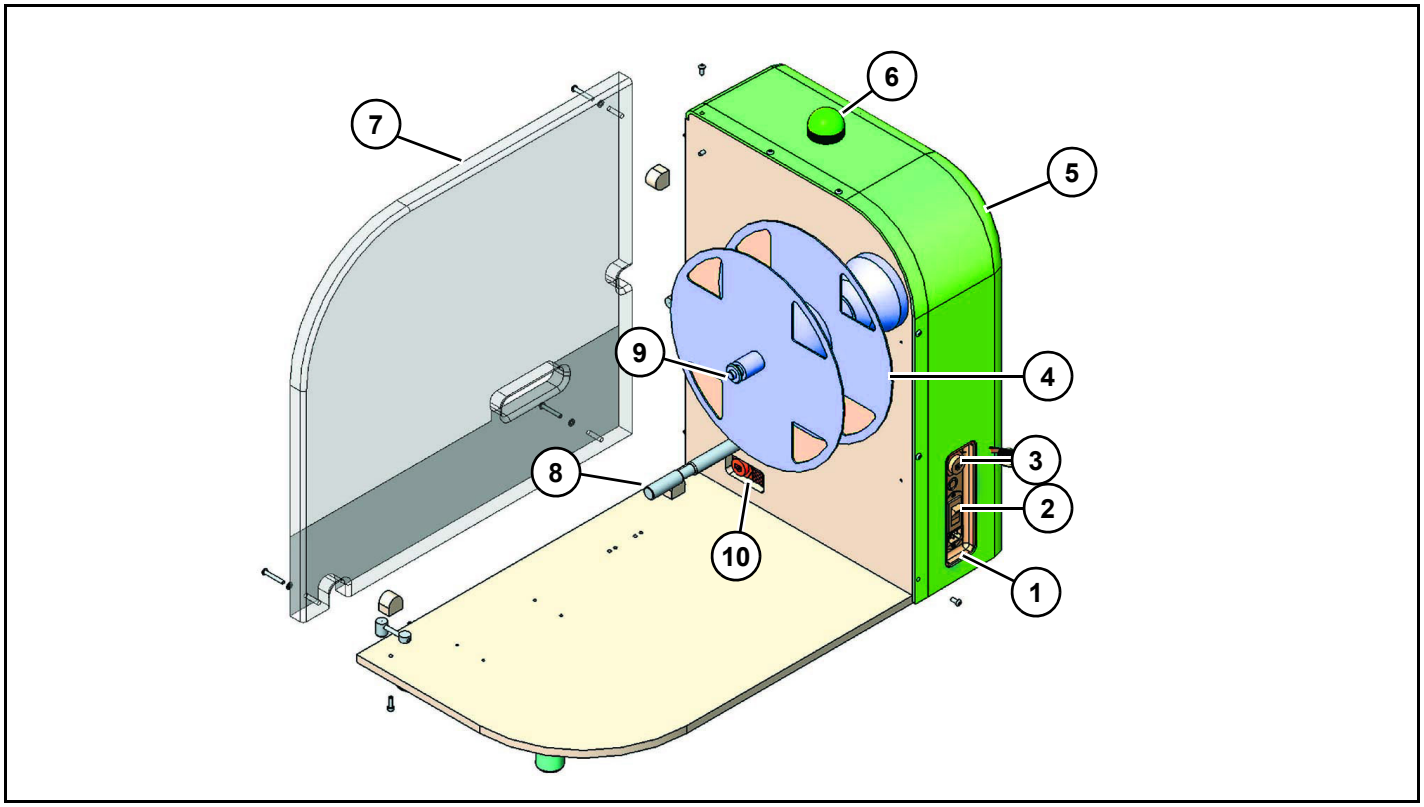


Figure 1

REF#	DESCRIPTION	REF#	DESCRIPTION
1	Main Power Receptacle	7	Guard Panel
2	Main Power Switch	8	Array Tape Guide Pin
3	Network Cable Receptacle	9	Spool Restrain Collar
4	Array Tape Spindle	10	Attachment Power and Network Receptacles
5	Electrical Enclosure		
6	Status Light		

Decal Identification

Unwind Module_UW1111

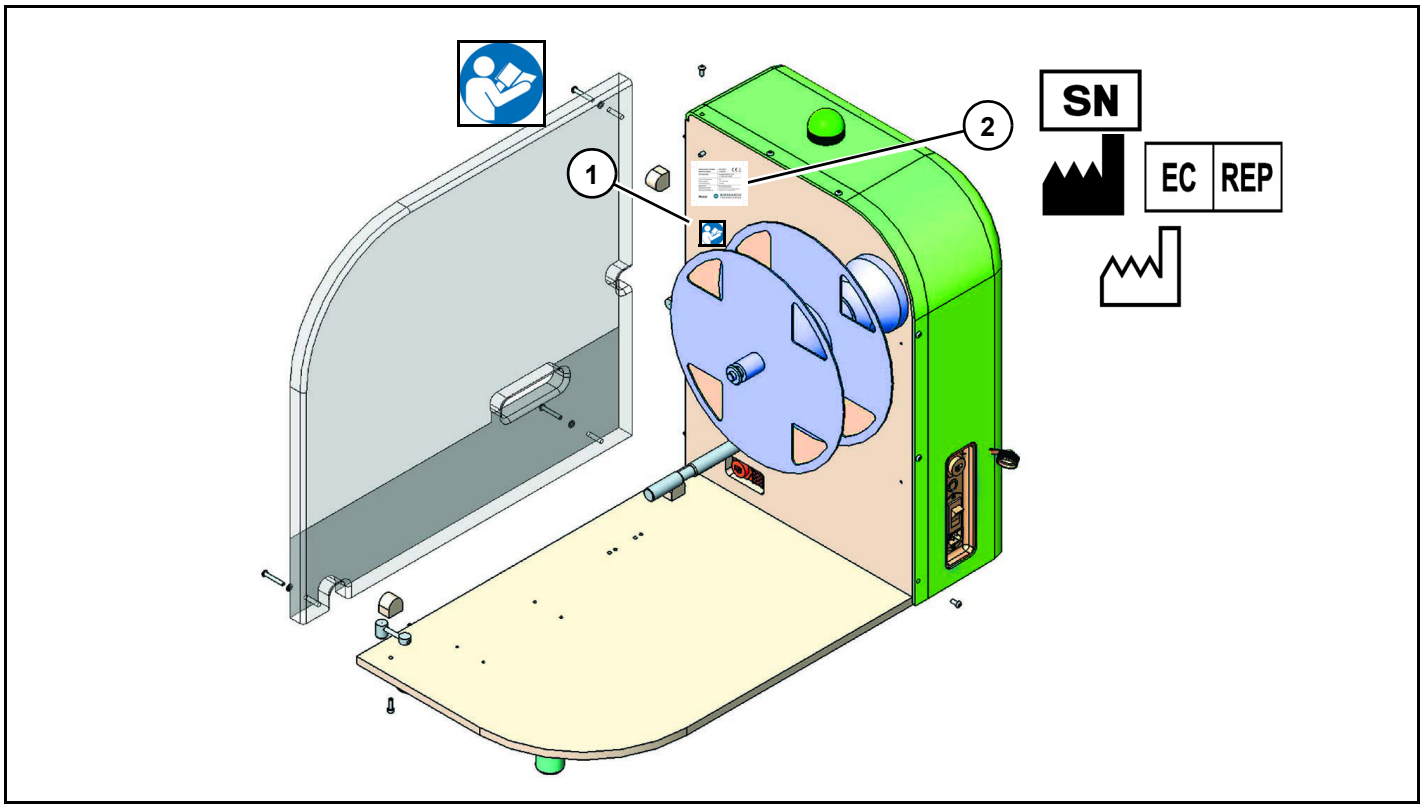


Figure 2

REF#	DESCRIPTION	REF#	DESCRIPTION
1	Read User Manual Decal (Qty-1)		
2	Serial Number of instrument Manufacturer Authorized Representative in EU Date of Manufacture		

Unwind Module_UW1111 controls

Notice

Controls on auto screen can only be activated when instrument is in an idle state.

Unwind Module screen

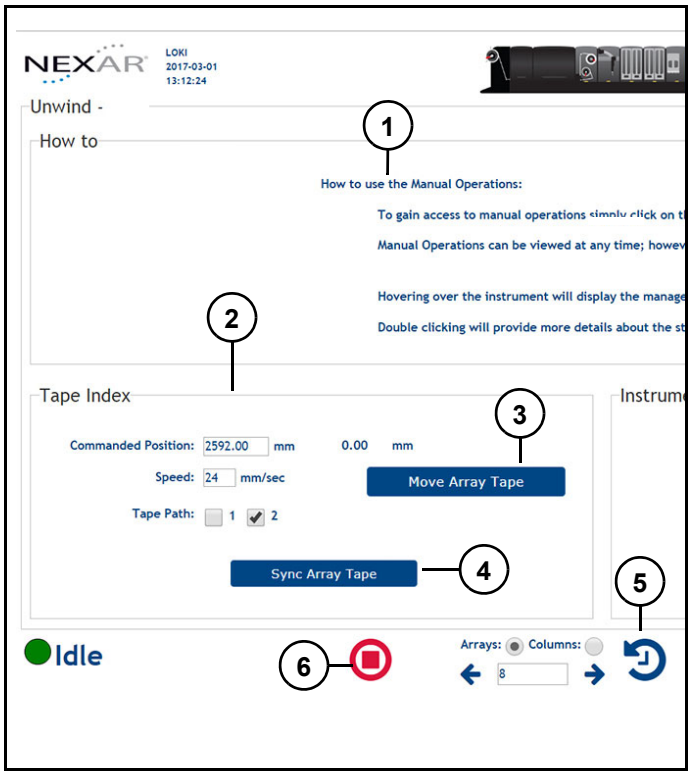


Figure 3

Refer to *(Figure 3)*.

Overview of controls

How to (1): Displays manual mode instructions.

Index (2): Displays and edits Array Tape information.

- Command Position: Display and edits Array Tape location in mm.
- Speed: Displays ad edits Array Tape speed in mm/sec.
- Path: Displays and edits Array Tape path.

Move Array Tape (3): Moves Array Tape to command position.

Sync Array Tape (4): Initiates tape drive synchronising operation. Synchronises individua tape drives on all modules for Array Tape movement.

Reset (5): Resets all faults for instrument. If instrument is running an operation or ready to run, a pause is commanded.

Reset indicator states:

Blinking green

- Idle (paused or Array Tape not synced).

Solid blue

- Resetting, recovering, waiting.

Blinking blue

- Faulted (controlled).

Abort (6): Aborts all running actions.

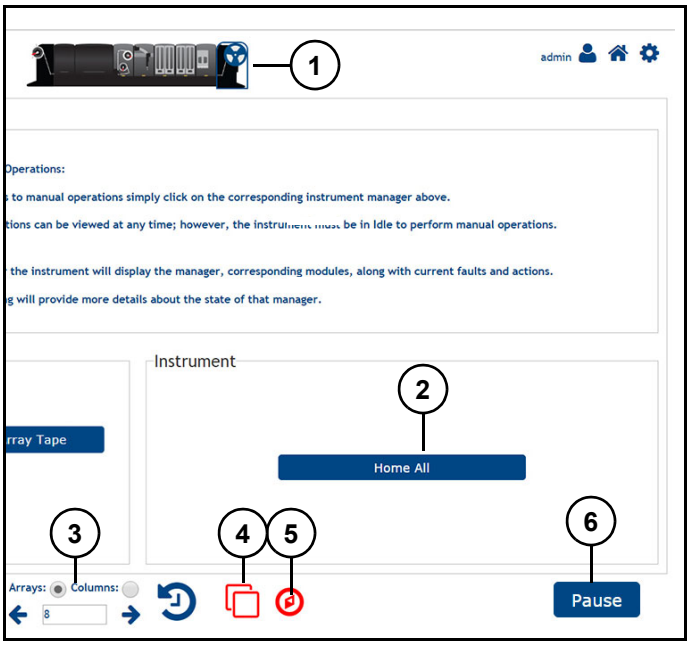


Figure 4

Refer to *(Figure 4)*.

Unwind Module (1): Displays module status.

- Default status indicator.
- Highlighted status indicator.
- Faulted status indicator.
- Faulted-highlighted status indicator.

- Highlighted blue: Module is active.
- Highlighted red: Module is faulted.

Home All (2): Commands all modules to run homing operation.

Arrays/Columns information (3): Displays Arrays, Columns, and number of arrays in protocol.

synced icon (4): Displays Array Tape sync status.

- Green: Array Tape is synced.
- Red: Array Tape is not synced.

Instrument homed icon (5): Displays instrument homing status.

- Green: Instrument is homed.
- Red: Instrument is not homed.

Pause/Resume/Abort (6): Pauses, resumes or aborts protocol.

How to start a protocol

1. Ensure all consumables are loaded properly.

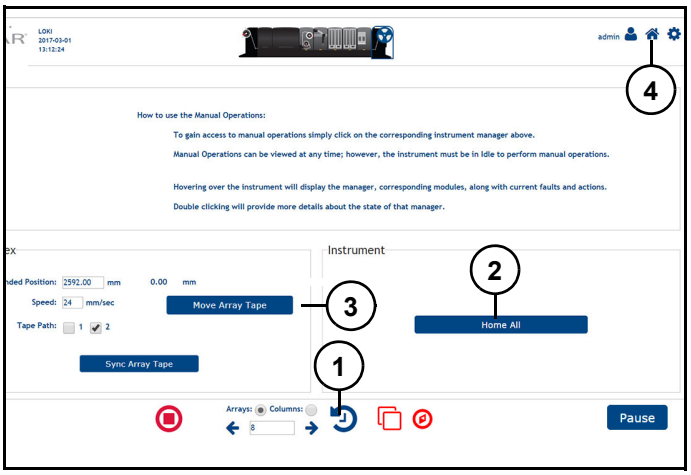


Figure 5

Refer To *(Figure 5)*.

1. Click "Reset" (1) to ensure all faults are clear.
2. Click "Home All" (2) if prompted.
3. Click "Sync Array Tape" (3) if prompted.
4. Click "Home" (4).

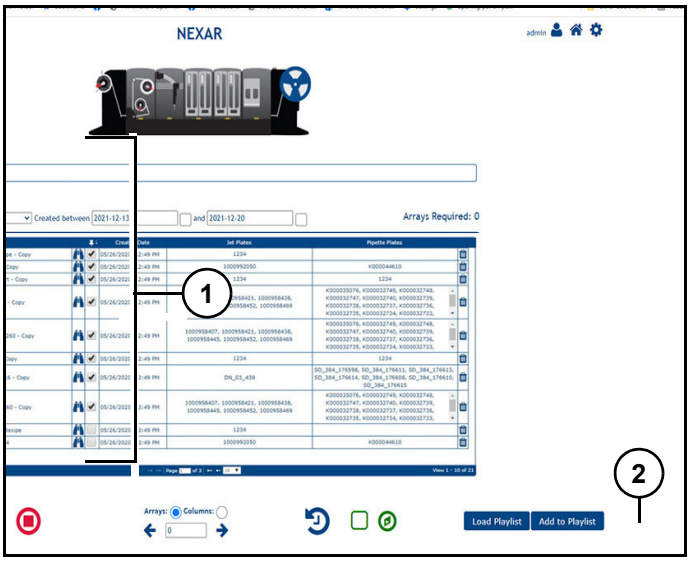


Figure 6

Refer to *(Figure 6)*

5. Select protocol(s) (1) to place in playlist in desired order.
6. Click "Create Playlist" (2).

Figure 7

7. Click "Start" (1) *(Figure 7)*.

Manually moving Array Tape

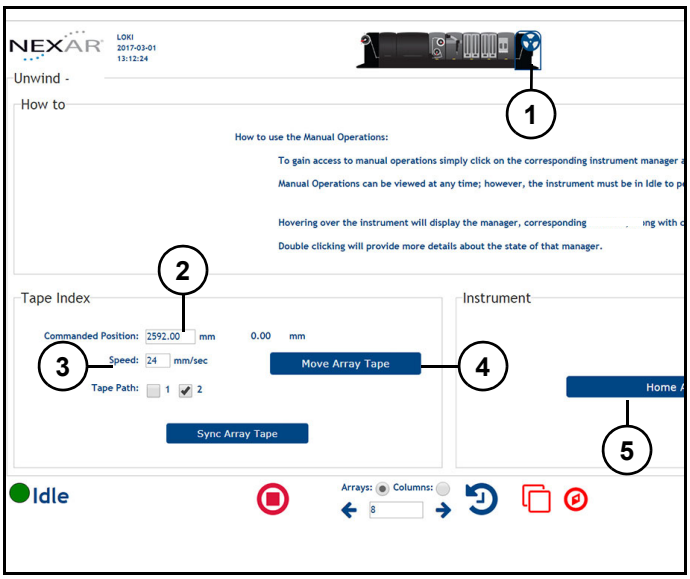


Figure 8

Refer To *(Figure 8)*.

1. Click "Unwind Module" (1).
2. Enter "Command Position" (2) in mm.
3. Enter "Speed" (3) in mm/sec.
4. Click "Move Array Tape" (4).
5. Click "Home All" (5).

Note: Manual moves other then 4.5 mm increments will leave instrument in a invalid position, re-sync is recommended.

Faults screen

Notice
Before resetting a fault, be sure condition is corrected.

Faults

For fault list See "Unwind_UW1111 troubleshooting" on page 60.

For fault descriptions See "Unwind_UW1111 troubleshooting" on page 60.

How to recover from fault

See "General Fault Recovery Procedure" on page 16.

Unwind_UW1111 troubleshooting

Notice
Before attempting any fault solution, refer to Handling Faults section. Colours Red: Safety fault. Yellow: Uncontrolled fault other than safety. Blinking Blue: Faulted (controlled). Blue: Recovering Green: Running Black: Initialising

Manager faults

Pause faults	Cause	Solution
OutOf:	No Array Tape detected.	Ensure there is enough arrays left on Array Tape spool before running.
NotSynced:	Tape drive needs to be synced.	Move Array Tape left.
ArrayNotRecognised:	Array Tape is not compatible with instrument.	Array Tape must be purchased from Biosearch Technologies.
CheckUnitSettings:	Settings file may be missing or incorrect for Unit Settings.	Check corresponding parent folder to see if file exists. Check specific file to ensure it isn't corrupt by opening it.
CheckTerminalHealth:	Failed to write card states file.	Verify "c\HTSI_Service\HTSI_Diagnostics" file structure and retry.
MasterLogFolder:	Test Log failed to create.	Verify "c\HTSI_Service\HTSI_LogFiles" file structure and retry.
MasterTestLogFolder:	Master create error Log file folder failed.	Verify "c\HTSI_Service\HTSI_LogFiles" file structure and retry.
CheckSettingsFile:	Settings file may be missing or incorrect.	Verify file {0} exists and that it is not corrupted.

Module faults

Abort faults	Cause	Solution
FRM0STATE:	PC Error.	Run diagnostics and look for CRC errors and for cards not in OP mode, check card for power, try and reseat card.
FRM0WCSTATE:	PC Error.	Run diagnostics and look for CRC errors and for cards not in OP mode, check card for power, try and reseat card.
DEVSTATE:	PC Error.	Run diagnostics and look for CRC errors and for cards not in OP mode, check card for power, try and reseat card.
EK1110a_STATE:	State change on EK1110 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
EK1100_STATE:	State change on EK1100 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_230_EL1014_STATE:	State change on EL1014 Beckhoff card at terminal 23.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_230_EL1014_WCSTATE:	Working counter error on EL1014 Beckhoff card at terminal 23.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_230_EL1114_STATE:	State change on EL1114 Beckhoff card at terminal 23.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_230_EL1114_WCSTATE:	Working counter error on EL1114 Beckhoff card at terminal 23.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
SAFETY_RELAY:	Safety door is open.	Check safety doors to ensure they are closed. Open and close all doors again.
BUS_B_FUSE:	Bus B fuse may be blown.	Check indicator light on fuse, replace fuse if necessary.
BUS_C_FUSE:	Bus C fuse may be blown.	Check indicator light on fuse, replace fuse if necessary.
BUS_D_FUSE:	Bus D fuse may be blown.	Check indicator light on fuse, replace fuse if necessary.
_310_EL2004_STATE:	State change on EL2004 Beckhoff card at terminal 31.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_310_EL2004_WCSTATE:	Working counter error on EL2004 Beckhoff card at terminal 31.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_320_EL2004_STATE:	State change on EL2004 Beckhoff card at terminal 32.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.

Abort faults	Cause	Solution
_320_EL2004_WCSTATE:	Working counter error on EL2004 Beckhoff card at terminal 32.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
EK1110b_STATE:	State change on EK1110 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
EK1122_STATE:	State change on EK1122 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_310_EL1114_STATE:	State change on EL1114 Beckhoff card at terminal 31.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_310_EL1114_WCSTATE:	Working counter error on EL1114 Beckhoff card at terminal 31.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

Push Button faults

Abort faults	Cause	Solution
_BK1120_COUPLER_STATE:	Error on BK1120 Beckhoff card.	Run diagnostics and look for CRC errors and for cards not in OP mode, check card for power, try and reseat card.
_BK1120_STATE:	State change on BK1120 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_BK1120_WCSTATE:	Working counter error on BK1120 Beckhoff card.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_EK1100_STATE:	State change on EK1100 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_220_EL1114_STATE:	State change on EL1114 Beckhoff card at terminal 22.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_220_EL1114_WCSTATE:	Working counter error on EL1114 Beckhoff card at terminal 22.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_230_EL1114_STATE:	State change on EL1114 Beckhoff card at terminal 23.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_230_EL1114_WCSTATE:	Working counter error on EL1114 Beckhoff card at terminal 23.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_240_EL2024_STATE:	State change on EL2024 Beckhoff card at terminal 24.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_240_EL2024_WCSTATE:	Working counter error on EL2024 Beckhoff card at terminal 24.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
CONVEYORXDRIVE:	Possible issue with PB conveyor drive system.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.
TILTCONVEYORXDRIVE:	Possible issue with PB tilt conveyor drive system.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.
TILTDRIVE:	Possible issue with PB tilt drive system.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.
TILTHOMEFAULT:	PB tilt conveyor wasn't able to home.	Ensure drive can move, check drive for obstructions, clear as nessessary. Check proximity sensor for damage and ensure it has power.
TopNestXDRIVE:	Possible issue with top nest drive system.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power

Abort faults	Cause	Solution
BottomNestXDRIVE:	Possible issue with bottom nest drive system.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.

Unwind _UW1112

⚠WARNING

Read and understand equipment operators manual before operating or performing maintenance. Failure to do so could result in serious injury or death.

Component identification Unwind Module - UW1112

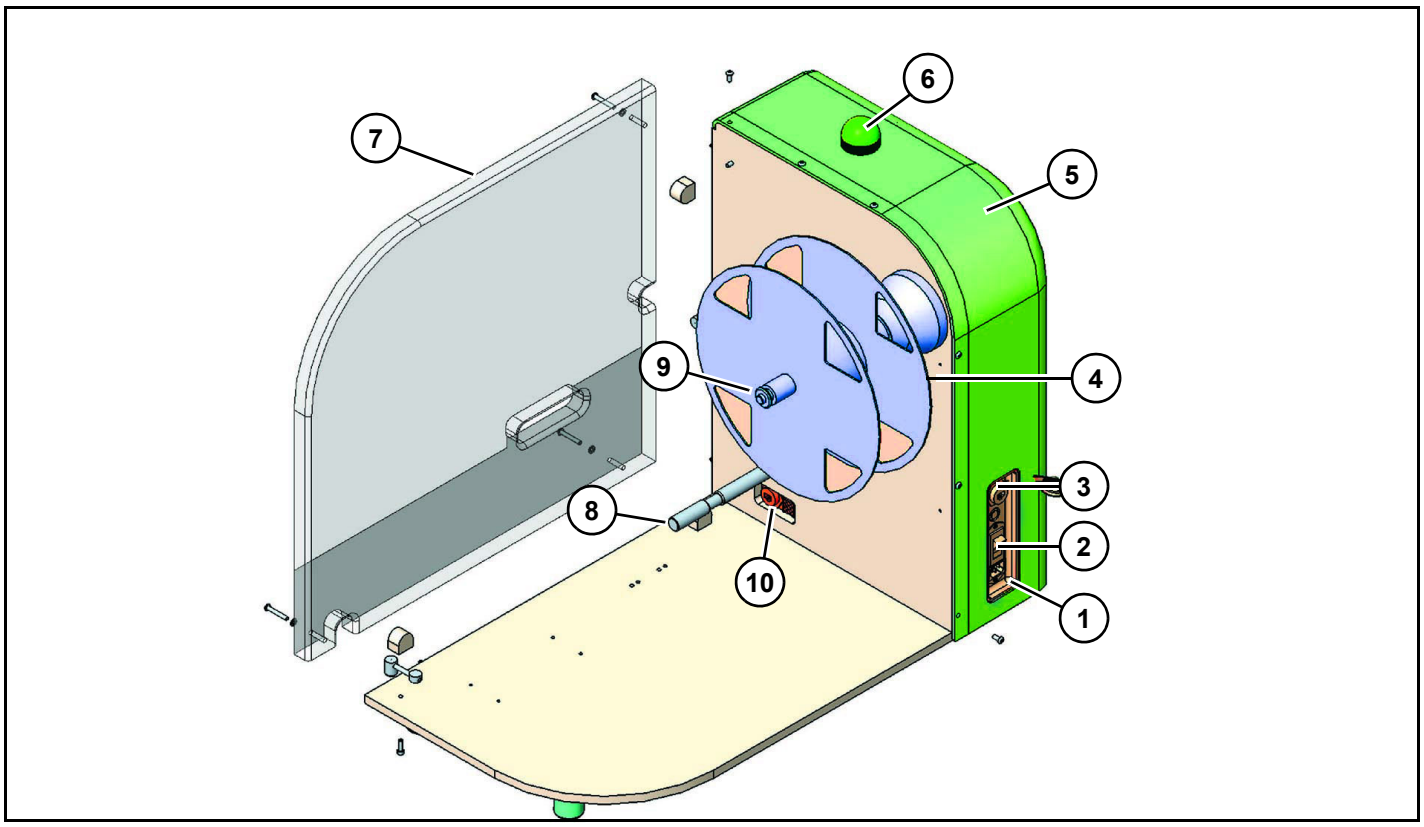


Figure 1

REF#	DESCRIPTION	REF#	DESCRIPTION
1	Main Power Receptacle	7	Guard Panel
2	Main Power Switch	8	Tape Array Guide Pin
3	Network Cable Receptacle	9	Spool Restrain Collar
4	Array Tape Spindle	10	Attachment Power and Network Receptacles
5	Electrical Enclosure		
6	Status Light		

Decal Identification

Unwind Module_UW1112

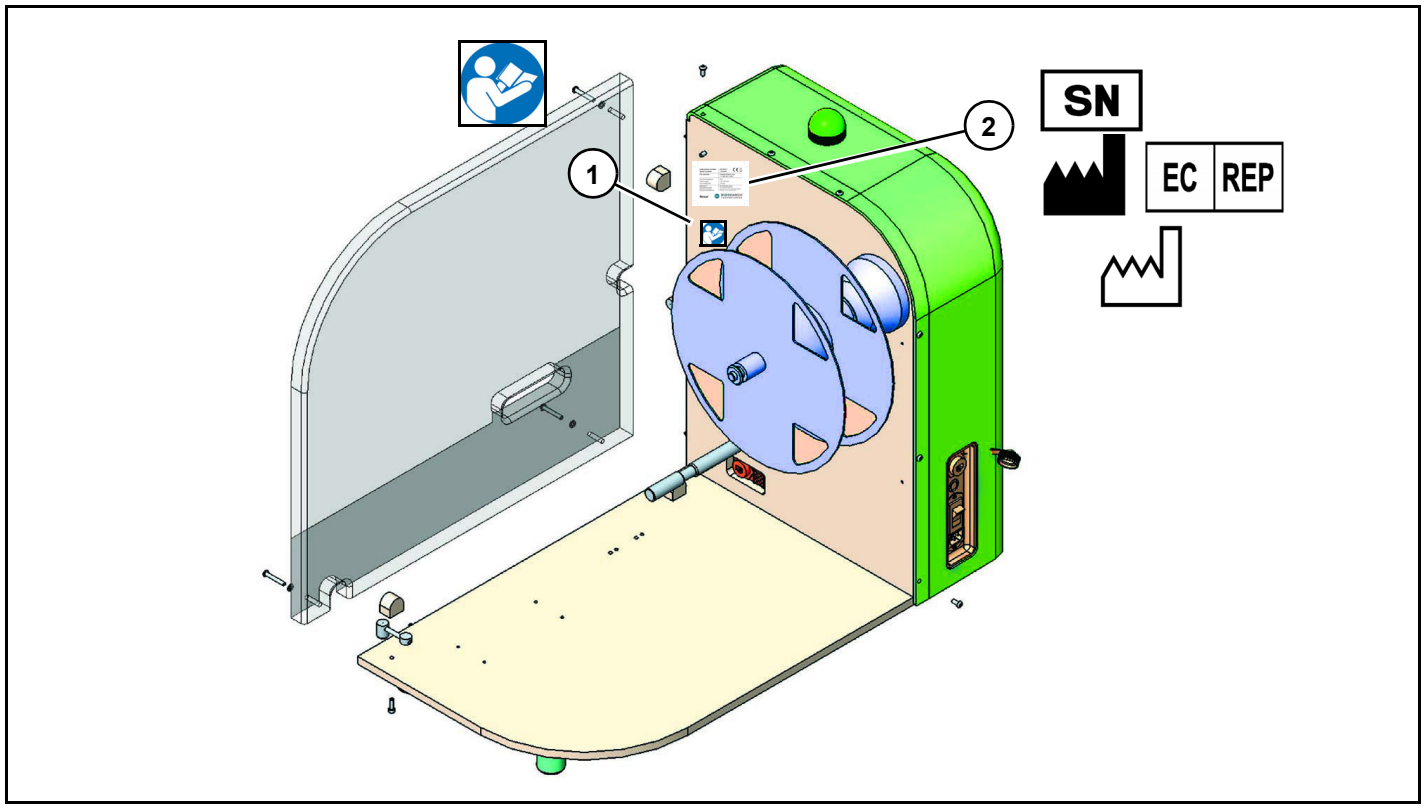


Figure 2

REF#	DESCRIPTION	REF#	DESCRIPTION
1	Read User Manual Decal (Qty-1)		
2	Serial Number of instrument Manufacturer Authorized Representative in EU Date of Manufacture		

Unwind Module_UW1112 controls

Notice

Controls on auto screen can only be activated when instrument is in an idle state.

Unwind Module screen

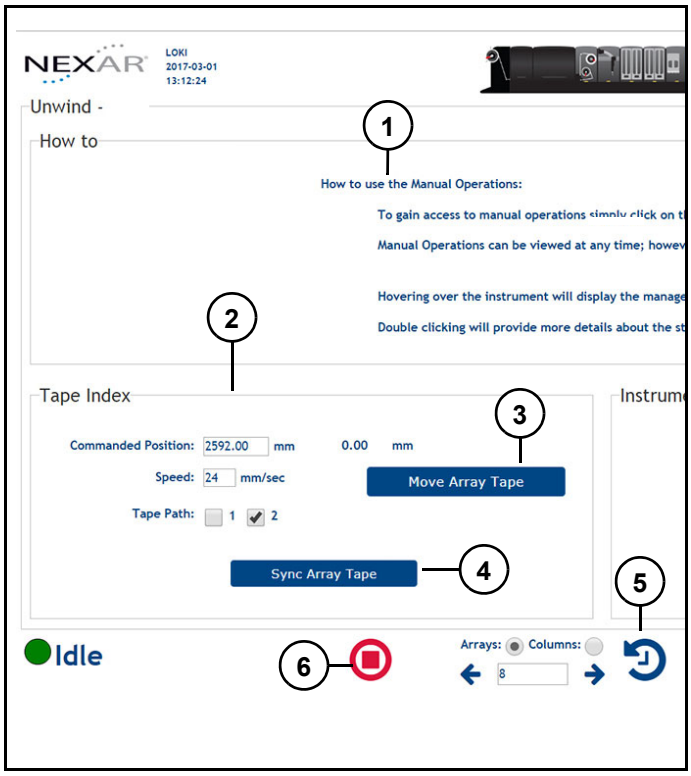


Figure 3

Refer to *(Figure 3)*.

Overview of controls

How to (1): Displays manual mode instructions.

Index (2): Displays and edits Array Tape information.

- Command Position: Display and edits Array Tape location in mm.
- Speed: Displays ad edits Array Tape speed in mm/sec.
- Path: Displays and edits Array Tape path.

Move Array Tape (3): Moves Array Tape to command position.

Sync Array Tape (4): Initiates tape drive synchronising operation. Synchronises individua tape drives on all modules for Array Tape movement.

Reset (5): Resets all faults for instrument. If instrument is running an operation or ready to run, a pause is commanded.

Reset indicator states:

Blinking green

- Idle (paused or Array Tape not synced).

Solid blue

- Resetting, recovering, waiting.

Blinking blue

- Faulted (controlled).

Abort (6): Aborts all running actions.

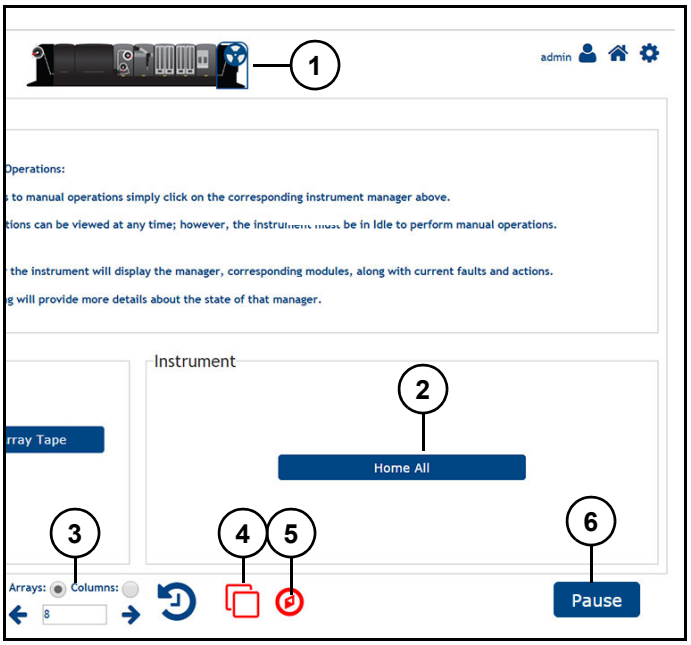


Figure 4

Refer to *(Figure 4)*.

Unwind Module (1): Displays module status.

- Default status indicator.
- Highlighted status indicator.
- Faulted status indicator.
- Faulted-highlighted status indicator.

- Highlighted blue: Module is active.
- Highlighted red: Module is faulted.

Home All (2): Commands all modules to run homing operation.

Arrays/Columns information (3): Displays Arrays, Columns, and number of arrays in protocol.

synced icon (4): Displays Array Tape sync status.

- Green: Array Tape is synced.
- Red: Array Tape is not synced.

Instrument homed icon (5): Displays instrument homing status.

- Green: Instrument is homed.
- Red: Instrument is not homed.

Pause/Resume/Abort (6): Pauses, resumes or aborts protocol.

How to start a protocol

1. Ensure all consumables are loaded properly.

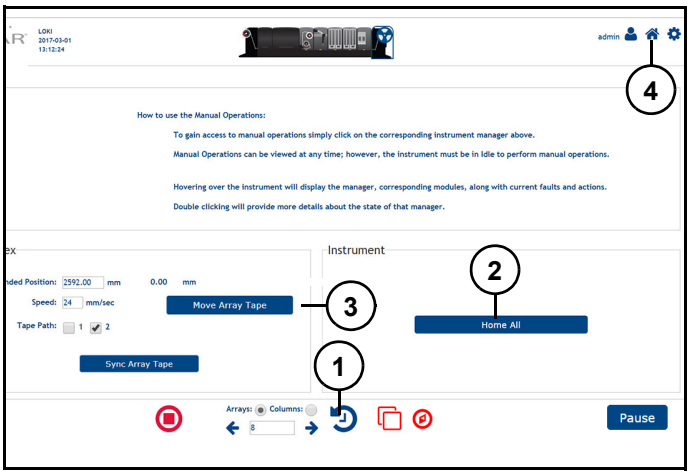


Figure 5

Refer To *(Figure 5)*.

1. Click "Reset" (1) to ensure all faults are clear.
2. Click "Home All" (2) if prompted.
3. Click "Sync Array Tape" (3) if prompted.
4. Click "Home" (4).

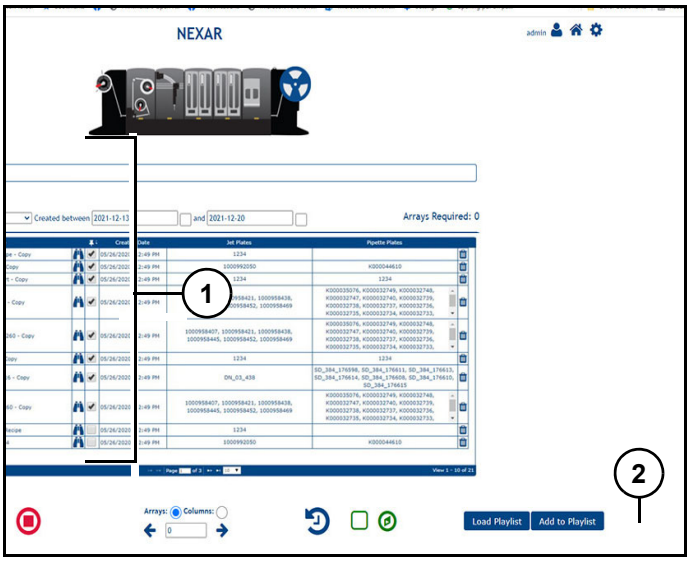


Figure 6

Refer to *(Figure 6)*

5. Select protocol(s) (1) to place in playlist in desired order.
6. Click "Create Playlist" (2).

Figure 7

7. Click "Start" (1) *(Figure 7)*.

Manually moving Array Tape

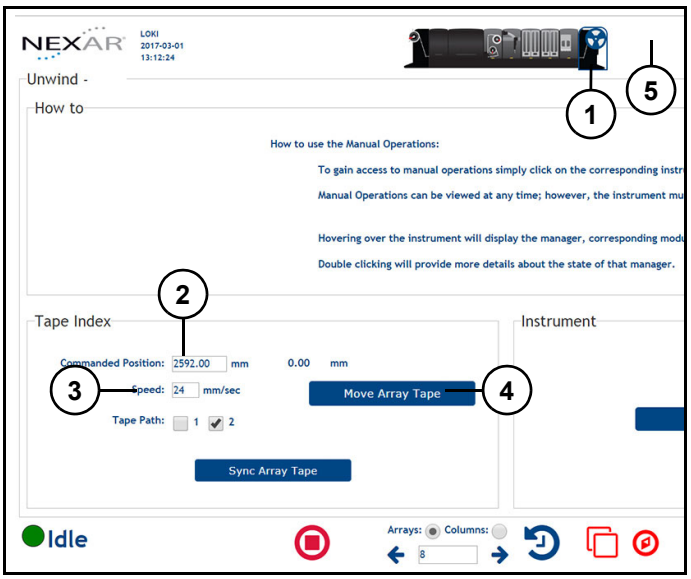


Figure 8

Refer To *(Figure 8)*.

1. Click "Unwind Module" (1).
2. Enter "Command Position" (2) in mm.
3. Enter "Speed" (3) in mm/sec.
4. Click "Move Array Tape" (4).
5. Click "Home" (5).

Note: Manual moves other then 4.5 mm increments will leave instrument in a invalid position, re-sync is recommended.

Faults screen

Notice
Before resetting a fault, be sure condition is corrected.

Faults

For fault list See "Unwind_UW1112 troubleshooting" on page 71.

For fault descriptions See "Unwind_UW1112 troubleshooting" on page 71.

How to recover from fault

See "General Fault Recovery Procedure" on page 16.

Unwind_UW1112 troubleshooting

Notice
Before attempting any fault solution, refer to Handling Faults section. Colours Red: Safety fault. Yellow: Uncontrolled fault other than safety. Blinking Blue: Faulted (controlled). Blue: Recovering Green: Running Black: Initialising

Manager faults

Pause faults	Cause	Solution
OutOf:	No Array Tape detected.	Ensure there is enough arrays left on Array Tape spool before running.
NotSynced:	Tape drive needs to be synced.	Move Array Tape left.
ArrayNotRecognised:	Array Tape is not compatible with instrument.	Array Tape must be purchased from Biosearch Technologies.
CheckUnitSettings:	Settings file may be missing or incorrect for Unit Settings.	Check corresponding parent folder to see if file exists. Check specific file to ensure it isn't corrupt by opening it.
CheckTerminalHealth:	Failed to write card states file.	Verify "c\HTSI_Service\HTSI_Diagnostics" file structure and retry.
MasterLogFolder:	Test Log failed to create.	Verify "c\HTSI_Service\HTSI_LogFiles" file structure and retry.
MasterTestLogFolder:	Master create error Log file folder failed.	Verify "c\HTSI_Service\HTSI_LogFiles" file structure and retry.
CheckSettingsFile:	Settings file may be missing or incorrect.	Verify file {0} exists and that it is not corrupted.

Module faults

Abort faults	Cause	Solution
FRM0STATE:	PC Error.	Run diagnostics and look for CRC errors and for cards not in OP mode, check card for power, try and reseat card.
FRM0WCSTATE:	PC Error.	Run diagnostics and look for CRC errors and for cards not in OP mode, check card for power, try and reseat card.
DEVSTATE:	PC Error.	Run diagnostics and look for CRC errors and for cards not in OP mode, check card for power, try and reseat card.
EK1110a_STATE:	State change on EK1110 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
EK1100_STATE:	State change on EK1100 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_230_EL1014_STATE:	State change on EL1014 Beckhoff card at terminal 23.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_230_EL1014_WCSTATE:	Working counter error on EL1014 Beckhoff card at terminal 23.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_230_EL1114_STATE:	State change on EL1114 Beckhoff card at terminal 23.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_230_EL1114_WCSTATE:	Working counter error on EL1114 Beckhoff card at terminal 23.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
SAFETY_RELAY:	Safety door is open.	Check safety doors to ensure they are closed. Open and close all doors again.
BUS_B_FUSE:	Bus B fuse may be blown.	Check indicator light on fuse, replace fuse if necessary.
BUS_C_FUSE:	Bus C fuse may be blown.	Check indicator light on fuse, replace fuse if necessary.
BUS_D_FUSE:	Bus D fuse may be blown.	Check indicator light on fuse, replace fuse if necessary.
_310_EL2004_STATE:	State change on EL2004 Beckhoff card at terminal 31.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_310_EL2004_WCSTATE:	Working counter error on EL2004 Beckhoff card at terminal 31.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_320_EL2004_STATE:	State change on EL2004 Beckhoff card at terminal 32.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.

Abort faults	Cause	Solution
_320_EL2004_WCSTATE:	Working counter error on EL2004 Beckhoff card at terminal 32.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
EK1110b_STATE:	State change on EK1110 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
EK1122_STATE:	State change on EK1122 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_310_EL1114_STATE:	State change on EL1114 Beckhoff card at terminal 31.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_310_EL1114_WCSTATE:	Working counter error on EL1114 Beckhoff card at terminal 31.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

Plate Stacker Attachment_PS1211

⚠WARNING

Read and understand equipment operators manual before operating or performing maintenance. Failure to do so could result in serious injury or death.

Component identification

Plate Stacker_PS1211

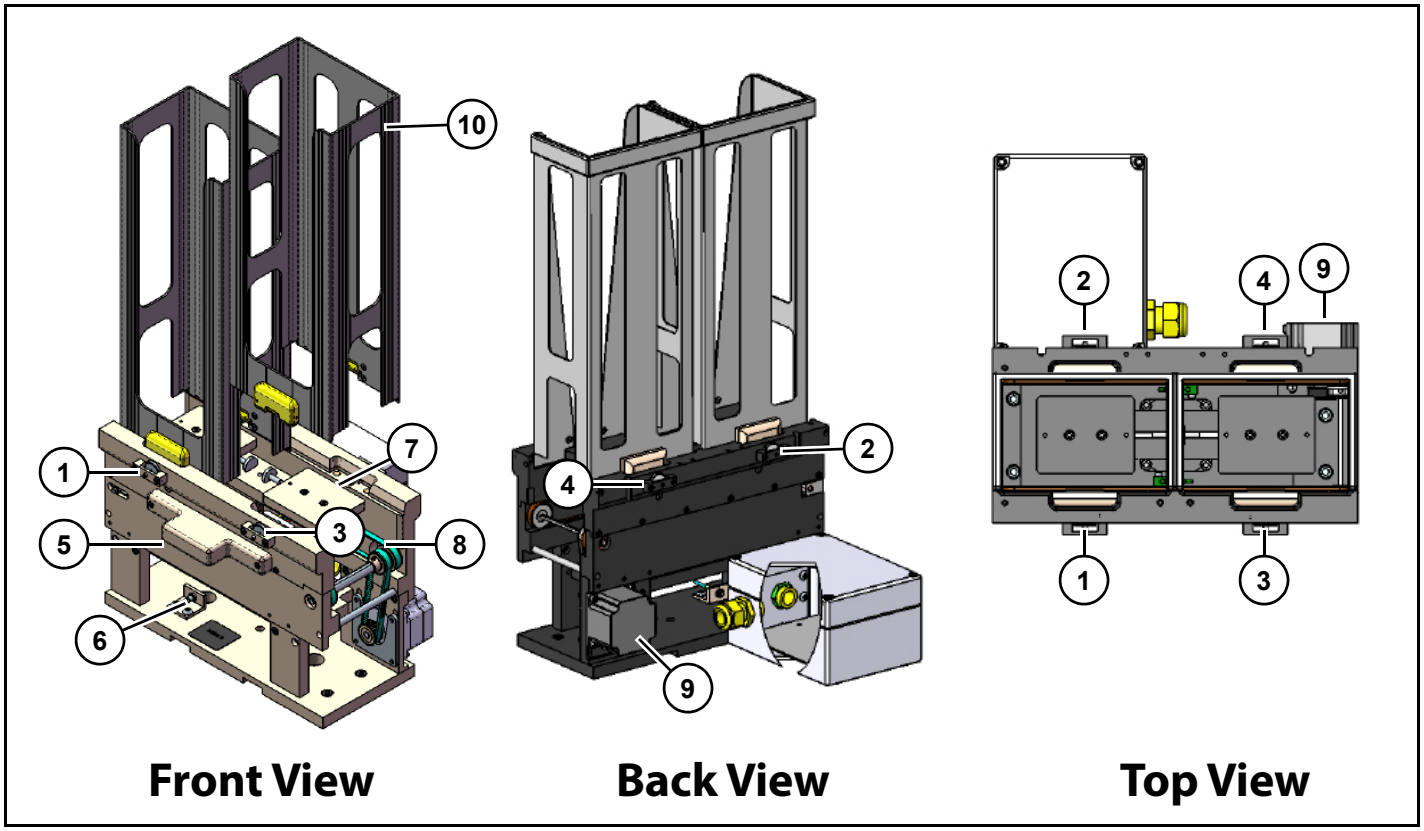


Figure 1

REF#	DESCRIPTION	REF#	DESCRIPTION
1	Left Front Stacker Chute Solenoid	6	Z Plate Height Sensor
2	Left Back Stacker Chute Solenoid	7	Plate Lift
3	Right Front Stacker Chute Solenoid	8	Plate Z Drive
4	Right Back Stacker Chute Solenoid	9	Plate Z Drive Motor
5	Photoeye Sensor	10	Plate Chute

Plate Stacker_PS1211 controls

Notice
Controls on Auto Screen can only be activated when instrument is in an idle state.

Overview of controls

There are currently no controls for Plate Stacker.

Faults

Notice
Before resetting a fault, be sure condition is corrected.

For fault list See "Plate Stacker PS_1211 troubleshooting" on page 77.

For fault descriptions See "Plate Stacker PS_1211 troubleshooting" on page 77.

For handling faults See "General fault recovery procedure" on page 25.

Maintenance

Add stacker chutes

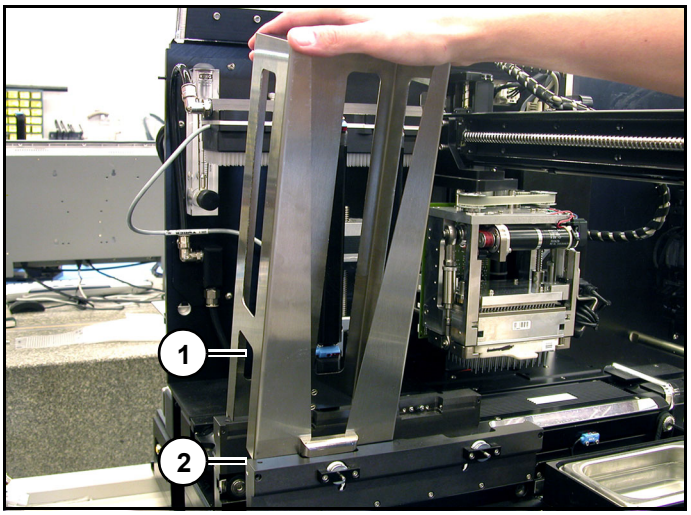


Figure 2

Refer to *(Figure 2)*.

1. Lean chute (1) into slots (2).
2. Push chute (1) in until it locks into place.

Loading plates into stacker chutes

There are two ways to load plates into stacker chutes, from bottom or from top.

Bottom loading.

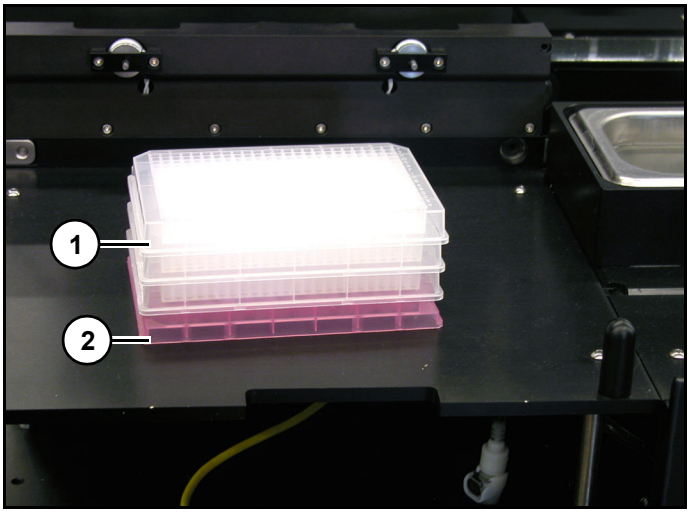


Figure 3

1. Set a stack of plates (1) on a flat surface with one extra plate (2) on bottom of stack. *(Figure 3)*

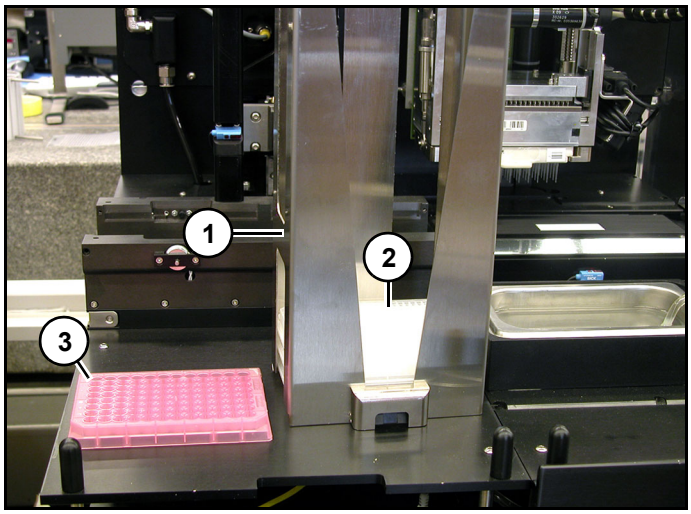


Figure 4

Refer to *(Figure 4)*.

2. Place chute (1) over stack (2).

Note: Plate stack will remain in chute, but extra bottom plate (3) will remain behind when chute is lifted.

Top loading.

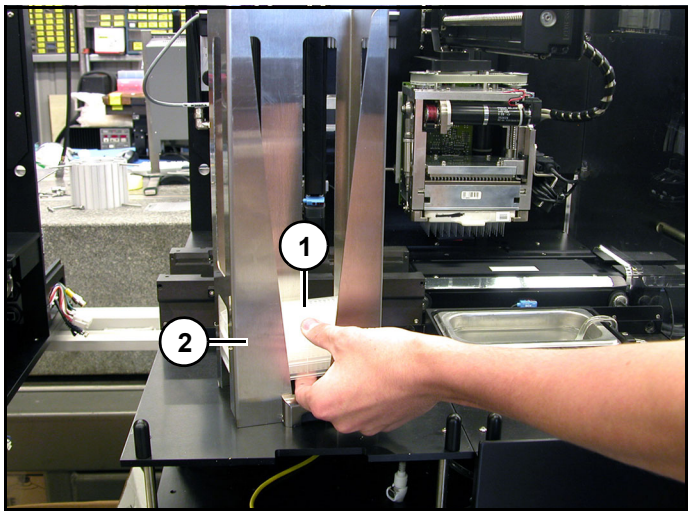


Figure 5

Carefully lower stack of plates (1) to bottom of chute (2). *(Figure 5)*

Note: Do not drop plates.

Plate Stacker PS_1211 troubleshooting

Notice
Before attempting any fault solution, refer to Handling Faults section. Colours Red: Safety fault. Yellow: Uncontrolled fault other than safety. Blinking blue: Faulted (controlled). Blue: Recovering. Green: Running. Black: Initialising.

Module faults

Abort faults	Cause	Solution
PLATEXCONVEYOR:	Possible problem with photo eye.	Check photo eye.
PLATEXDRIVE:	Possible problem with z-axis drive system.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.
PLATEZDRIVE:	Possible problem with z-axis drive system	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.
PLATEZHOMEFAULT:	z-axis lift was unable to home.	Ensure drive can move, check drive for obstructions, clear as necessary. Check proximity sensor for damage and ensure it has power.
_BK1120_COUPLER_STATE:	Error on BK1120 Beckhoff card.	Run diagnostics and look for CRC errors and for cards not in OP mode, check card for power, try and reseat card.
_BK1120_STATE:	State change on BK1120 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_BK1120_WCSTATE:	Working counter error on BK1120 Beckhoff card.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

Expansion block faults

Abort faults	Cause	Solution
_BK1120a_COUPLER_STATE:	Error on BK1120 Beckhoff card.	Run diagnostics and look for CRC errors and for cards not in OP mode, check card for power, try and reseat card.
_BK1120a_STATE:	State change on BK1120 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_BK1120a_WCSTATE:	Working counter error on BK1120 Beckhoff card.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_EK1100_STATE:	State change on EK1100 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_EK1100b_STATE:	State change on EK1100 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_110_EL1014_STATE:	State change on EL1014 Beckhoff card at terminal 11.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_110_EL1014_WCSTATE:	Working counter error on EL1014 Beckhoff card at terminal 11.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_110_EL1114_STATE:	State change on EL1114 Beckhoff card at terminal 11.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_110_EL1114_WCSTATE:	Working counter error on EL1114 Beckhoff card at terminal 11.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_330_EL1014_STATE:	State change on EL1014 Beckhoff card at terminal 33.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_330_EL1014_WCSTATE:	Working counter error on EL1014 Beckhoff card at terminal 33.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
BUS_B_FUSE_CHECK:	Bus B fuse may be blown.	Check indicator light on fuse, replace fuse if necessary.
BUS_C_FUSE_CHECK:	Bus C fuse may be blown.	Check indicator light on fuse, replace fuse if necessary.
BUS_D_FUSE_CHECK:	Bus D fuse may be blown.	Check indicator light on fuse, replace fuse if necessary.
_410_EL2004_STATE:	State change on EL2004 Beckhoff card at terminal 41.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_410_EL2004_WCSTATE:	Working counter error on EL2004 Beckhoff card at terminal 41.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

Abort faults	Cause	Solution
_EK1110b_STATE:	State change on EK1110 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_EK1122_STATE:	State change on EK1122 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_EK1122a_STATE:	State change on EK1122 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_EK1122b_STATE:	State change on EK1122 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_BK1250_COUPLER_STATE:	Error on BK1250 Beckhoff card.	Run diagnostics and look for CRC errors and for cards not in OP mode, check card for power, try and reseat card.
_BK1250_STATE:	State change on BK1250 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_BK1250_WCSTATE:	Working counter error on BK1250 Beckhoff card.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
XDRIVE:	Possible problem with Array Tape drive system.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.

Pause faults	Cause	Solution
DriveProx:	Drive Proximity has unexpectedly been triggered.	Check for jam. Verify proximity.
XJAM:	Something has caused drive to become out of sync.	Check path for obstructions and clear as necessary. Homing proximity may be bad, ensure it has power and is reading drive holes.
AirPressureLow:	Air Pressure is too low on Dispense Head.	Ensure air supply is on. Ensure gauge is in "green zone" on corresponding regulator. Pressure sensor may need to be adjusted.
TempOutOfRange:	Temperature set point has not been reached.	Ensure that preheat is done prior to running protocol. Check HMI to ensure temp is within normal range, if really high or really low you may need to replace the RTD. Ensure there is power up to heating element.
TempProbeFault:	Temperature probe may be faulty.	Check leads coming from temperature probe to ensure they are connected properly. If the temperature is over 200 °C check the probe.
CheckLiquidClassFile:	Liquidclass file is missing or incorrect.	Verify file exists and that it is not corrupted.
CheckRecipeFile:	Recipe file is incorrect, please check file for incorrect structure.	Verify file exists and that it is not corrupted.

Pause faults	Cause	Solution
CheckSettingsFile:	Settings file may be missing or incorrect.	Verify file exists and that it is not corrupted.
CheckUsageFile:	Usage file is may be missing or incorrect.	Verify file exists and that it is not corrupted.

Plate Transfer faults

Abort faults	Cause	Solution
PLATEXDRIVE:	Possible problem with x-axis drive system.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.
PLATELIFTDRIVE:	Possible problem with plate lift drive system.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.
PLATESTOPDRIVE:	Possible problem with plate stop drive system.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.
PLATESTOPHOMEFAULT:	Plate stop was unable to reach home position	Ensure drive can move, check drive for obstructions, clear as necessary. Check proximity sensor for damage and ensure it has power.
_EK1100_STATE:	State change on EK1100 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_220_EL7031_STATE:	State change on EL7031 Beckhoff card at terminal 22.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_220_EL7031_WCSTATE:	Working counter error on EL7031 Beckhoff card at terminal 22.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_310_EL7031_STATE:	State change on EL7031 Beckhoff card at terminal 31.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_310_EL7031_WCSTATE:	Working counter error on EL7031 Beckhoff card at terminal 31.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_230_EL4132_STATE:	State change on EL4132 Beckhoff card at terminal 23.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_230_EL4132_WCSTATE:	Working counter error on EL4132 Beckhoff card at terminal 23.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

Restrictor plate abort faults	Cause	Solution
_320_EL7031_STATE:	State change on EL7031 Beckhoff card at terminal 32.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_320_EL7031_WCSTATE:	Working counter error on EL7031 Beckhoff card at terminal 32.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

Restrictor plate abort faults	Cause	Solution
RAILXDRIVE:	Possible problem with Rail X drive system.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.
RAILXHOMEFAULT:	Rail X is unable to home.	Ensure drive can move, check drive for obstructions, clear as necessary. Check proximity sensor for damage and ensure it has power.
RESTRICTORINMOVEFAULT:	Restrictor plate was unable to move to aspiration location.	Ensure drive can move, check drive for obstructions, clear as necessary. Check proximity sensor for damage and ensure it has power.

Sonic Wash_SW0702

⚠WARNING

Read and understand equipment operators manual before operating or performing maintenance. Failure to do so could result in serious injury or death.

Component identification

Sonic Wash_SW0702

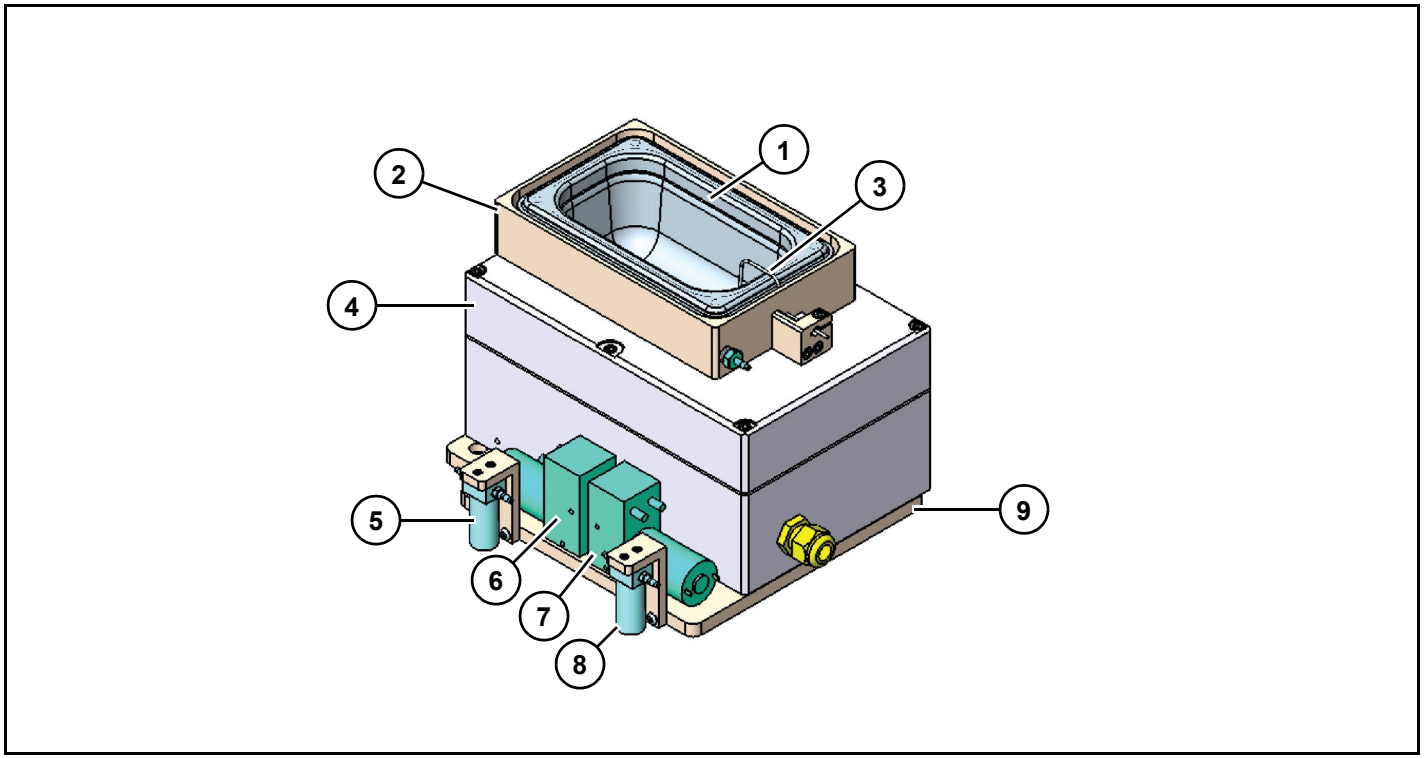


Figure 1

REF#	DESCRIPTION	REF#	DESCRIPTION
1	Sonic Wash Tank	6	Fill Pump
2	Sonic Wash Mount	7	Drain/Waste Pump
3	Water Line	8	Drain/Waste Valve
4	Sonicator Transducer	9	Sonic Wash Base Plate
5	Fill Valve		

Overview of components

Sonic Wash Tank (1): Holds wash water.

Sonic Wash Mount (2): Hold wash tank in place.

Water Line (3): suplies clean water to wash tank.

Sonic Tansducer (4): Creates ultrasonic vibrations in water for washing tips.

Fill Valve (5): Isolates fill pump from fill/drain tube.

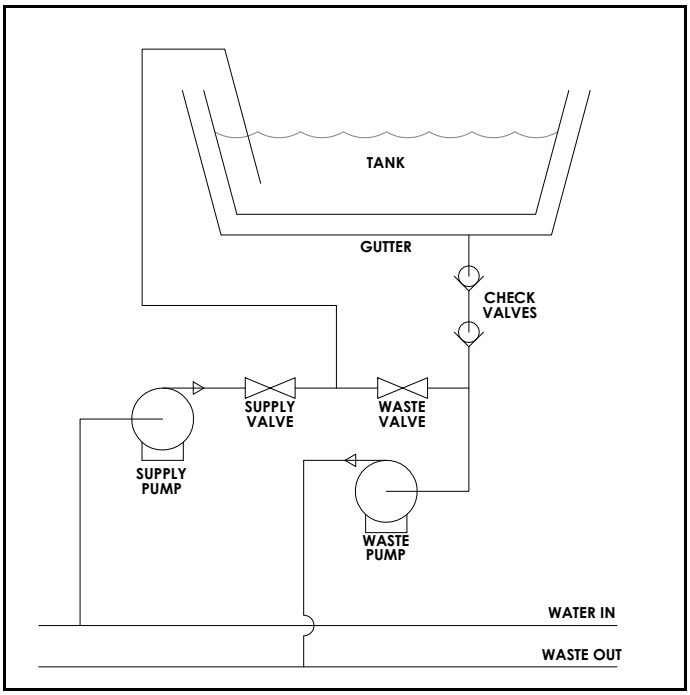
Fill Pump (6): Pumps water into wash tank.

Drain/Waste Pump (7): Pumps overflow waste water from waste gutter when drain valve is closed and pumps water from tank when drain valve is opened.

Drain/Waste Valve (8): When open, water is drained from tank by running drain/waste pump.

Sonic Wash Base Plate (8): Holds Sonic Wash assembly.

Sonic Wash plumbing diagram



Sonic Wash_SW0702 controls

Notice

Controls on Auto Screen can only be activated when instrument is in idle state.

If a change is made to Manager Settings file, it will take effect after a pause, start or enable.

⚠CAUTION

Do not run transducer without water in tank. Vibrations will cause damage to sonicator.

Do not run fill pump with fill valve off.

Do not run fill pump while unattended. Tank may overflow and damage instrument.

Manual screen

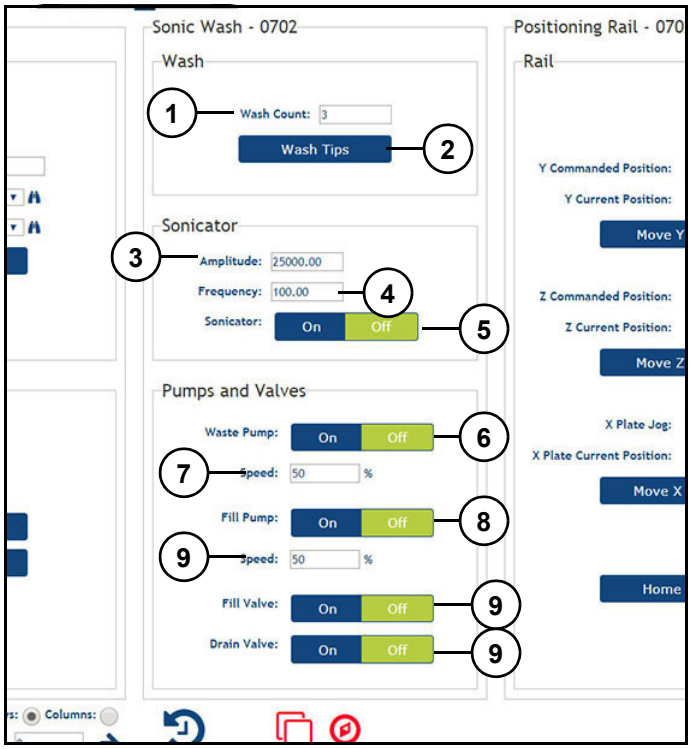


Figure 2

Refer to *(Figure 2)*.

Overview of Controls

Wash Count (1): Displays/sets number of washes.

Wash Tips (2): Starts tip wash.

Amplitude (3): Sets and displays intensity of transducer vibrations.

Units	Percent
Minimum	5000
Default	25,000
Maximum	32,767

Frequency (4): Sets and displays rate of change of amplitude, causing stirring action.

Units	Percent
Minimum	0.5
Default	100
Maximum	100

Sonicator On/Off (5): Turns sonicator transducer on/off.

When on, transducer vibrates and user should hear sonicator make a high-pitched sound.

Sonicator On/Off indicator can be in following states:

- Blue: Sonicator is off.
- Green: Sonicator is on.

Waste Pump On/Off (6): Turns waste pump on/off.

When on and drain valve closed, overflow waste water is removed from overflow gutter in tank.

In *On* mode with drain valve opened, entire sonic wash tank would be drained.

Waste pump On/Off indicator can be in following states:

- Green: Pump is running.
- Blue: Pump is off.

Speed (7): Sets and displays speed of waste pump.

Units	Percent
Minimum	15
Default	50
Maximum	100

Fill Pump On/Off (8): Turns fill pump on or off.

When on, fill pimp is activated and filled sonic wash tank.

Fill Pump On/Off indicator can be in following states:

- Green: Pump is running.
- Blue: Pump is off.

Speed (9): Sets and displays speed of fill pump.

Units	Percent
Minimum	15
Default	50
Maximum	100

Fill Valve On/Off (10): Opens or closes fill valve.

When on, fill valve is open. When pump is running allows fill pump water to flow to tank.

Fill Valve On/Off indicator can be in following states:

- Green: Fill operation is on.
- Blue: Fill operation is off.

Drain Valve On/Off (11): Opens or closes drain valve.

In on mode with waste pump on, entire sonic wash tank would be drained to waste.

In off mode with waste pump on, overflow waste water is removes from overflow gutter on tank.

Drain Valve On/Off indicator can be in following states:

- Green: Drain operation is on.
- Blue: Drain operation is off.

How to fill tank

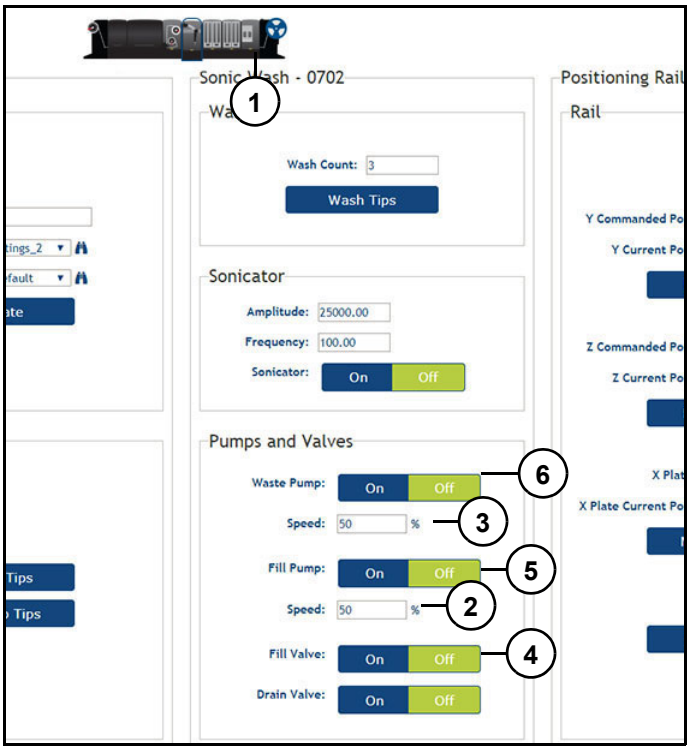


Figure 3

Refer to *(Figure 3)*.

1. Click "Sonic Wash" icon (1).
2. Set fill pump "Speed" (2) to desired percentage.

Note: Default is 50%.

3. Set waste pump "Speed" (3) to same value or greater than fill pump speed to avoid overflows.

Note: Default is 50%.

4. Click "Fill Valve" (4) to on.
5. Click "Fill Pump" (5) to on.
6. Click "Waste Pump" (6) to on.
7. When tank reaches desired level or is overflowing, click "Fill Pump" (5) off.
8. Click "Waste Pump" (6) to off.
9. Click "Fill Pump" (5) to off.

How to drain tank

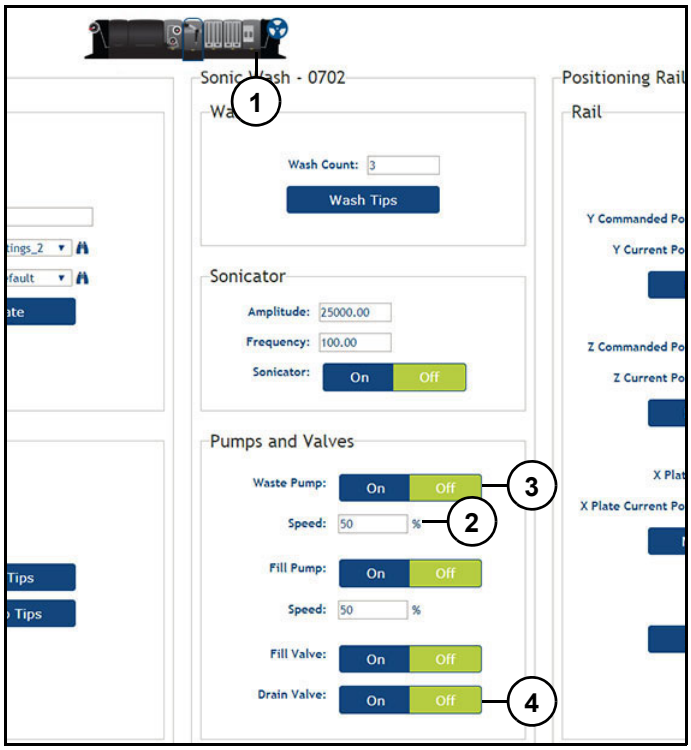


Figure 4

Refer to *(Figure 4)*.

1. Click "Sonic Wash" icon (1).
2. Set Waste Pump "Speed" (2) setting to desired percentage.
3. Click "Waste Pump On/Off" (3) to turn waste pump on. This will drain water from overflow gutter.
4. When gutter is empty, click "Drain Valve On/Off" (4) to turn on drain valve. This will drain main tank.
5. When tank is empty, click "Waste Pump On/Off" (3) to turn off pump.
6. Click "Drain Valve On/Off" (4) to turn off drain valve.
7. Wipe bottom of tank out with a clean towel.

How to de-gas water

De-gassing water substantially improves ultrasonic cleaning action.

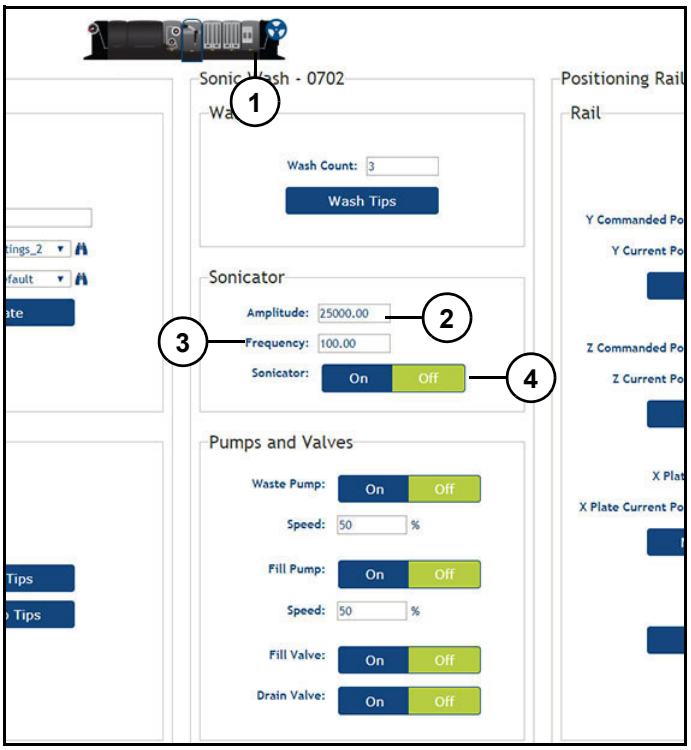


Figure 5

Refer to *(Figure 5)*.

1. Click "Sonic Wash attachment" (1).
2. Fill tank. See "How to fill tank" on page 86.
3. Set amplitude (2) to desired number.

Note: Default is 25,000.

4. Set frequency (3) to desired number.

Note: Default is 100.

5. Click "Sonicator On/Off" (4) to turn sonicator on. Wait 15 minutes.
6. Click "Sonicator On/Off" (4) to turn sonicator off.

Faults screen

Notice
Before resetting a fault, be sure condition is corrected.

Faults

For fault descriptions See "Sonic Wash_SW0702 troubleshooting" on page 89.

How to Recover from a Fault

For handling faults See "Handling faults" on page 52.

Sonic Wash_SW0702 troubleshooting

Notice
Before attempting any fault solution, refer to Handling Faults section. Colours Red: Safety fault. Yellow: Uncontrolled fault other than safety. Blinking blue: Faulted (controlled). Blue: Recovering. Green: Running. Black: Initialising.

Module fault messages

Abort faults	Cause	Solution
_EK1100_STATE:	State change on EK1100 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_220_EL2024_STATE:	State change on EL2024 Beckhoff card at terminal 22.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_220_EL2024_WCSTATE:	Working counter error on EL2024 Beckhoff card at terminal 22.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_230_EL2004_STATE:	State change on EL2004 Beckhoff card at terminal 23.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_230_EL2004_WCSTATE:	Working counter error on EL2004 Beckhoff card at terminal 23.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_240_EL2004_STATE:	State change on EL2004 Beckhoff card at terminal 24.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_240_EL2004_WCSTATE:	Working counter error on EL2004 Beckhoff card at terminal 24.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_240_EL1114_STATE:	State change on EL1114 Beckhoff card at terminal 24.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_240_EL1114_WCSTATE:	Working counter error on EL1114 Beckhoff card at terminal 24.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

Jet Wash abort faults	Cause	Solution
_230_EL2024_STATE:	State change on EL2024 Beckhoff card at terminal 23.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_230_EL2024_WCSTATE:	Working counter error on EL2024 Beckhoff card at terminal 23.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

Sonic Wash abort faults	Cause	Solution
_120_EL3202_STATE:	State change on EL3202 Beckhoff card at terminal 12.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_120_EL3202_WCSTATE:	Working counter error on EL3202 Beckhoff card at terminal 12.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_220_EL1014_STATE:	State change on EL1014 Beckhoff card at terminal 22.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_220_EL1014_WCSTATE:	Working counter error on EL1014 Beckhoff card at terminal 22.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
TRANSDUCER_DRIVE:	Sonicator circuit or transducer may be faulty.	Open cover of SW and ensure transducer is still securely mounted to wash basin. Check wires for proper connection. Ensure there is no leak into Sonic Wash electrical enclosure.
_310_EL4132_STATE:	State change on EL4132 Beckhoff card at terminal 31.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_310_EL4132_WCSTATE:	Working counter error on EL4132 Beckhoff card at terminal 31.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

Pipette Wash pause faults	Cause	Solution
FumeExtractorFanNotRunningFault:	Fan isn't running, when it should be on.	Check power going to Fan. Ensure there are no obstructions in fan blade path.
FumeExtractorFilterFull:	Filter is full and needs to be replaced.	Remove filter housing on Waste Tank and replace filter with new one.
WasteTankFloatSetupFault:	Issue with floats in waste tank detected.	Check for damage to floats. Ensure plug for floats is secure. Ensure there is nothing obstructing the float path.

Pipette Wash pause faults	Cause	Solution
WasteTankFullFault:	Waste tank is full and needs to be drained.	Drain pump setting may not be checked so it auto drains. Drain pump may be vapor locked. Drain line may be clogged. Manually drain out valve on bottom of tank.
WasteTankPumpOrLowFloatFault:	Waste pump or low float isn't working.	Drain pump may be vapor locked. Drain line may be clogged. Manually drain out valve on bottom of tank. Low float may need to be replaced, check connections.

Positioning Rail_PR1201

⚠WARNING

Read and understand equipment operators manual before operating or performing maintenance. Failure to do so could result in serious injury or death.

Component identification

Positioning Rail_PR1201

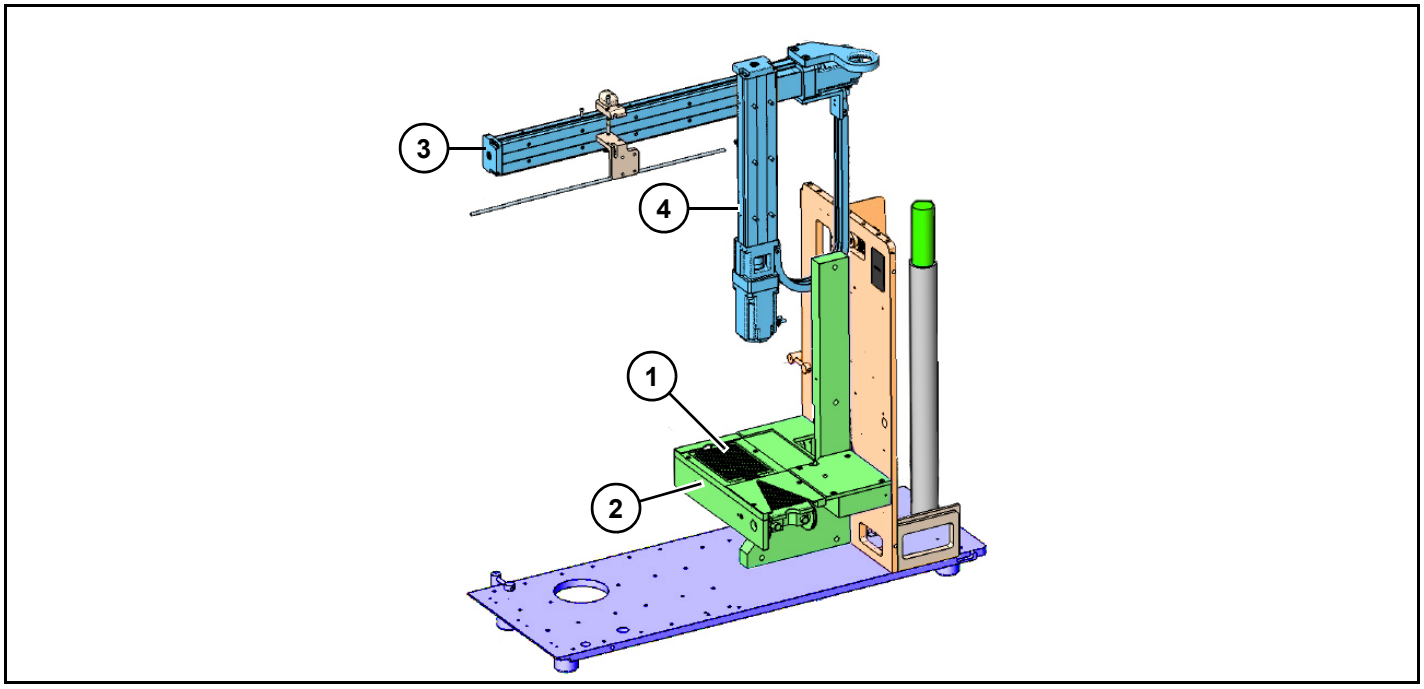


Figure 1

REF#	DESCRIPTION	REF#	DESCRIPTION
1	Drive	4	Z-Axis Rail
2	Photoeye (underneath deck)		Plate Conveyor (not shown)
3	Y-Axis Rail		

Explanation of components

3) Y-Axis Rail. : Provides Y-direction motion for positioning rail.

4) Z-Axis Rail. : Provides Z-direction motion for positioning rail.

NS) Plate Conveyor: Shuttles plates back and forth from plate stacker chutes.

Positioning Rail Module_PR1201 controls

Notice
Controls on auto screen can only be activated when instrument is in an idle state. If a change is made to Manager Settings file (See Manager Settings section) it only takes effect after a pause and idle action is performed (See Getting Started section).

⚠CAUTION
Although manual operation is limited, user can manually run dispense head into objects. Use caution to avoid damage.

Positioning Rail screen

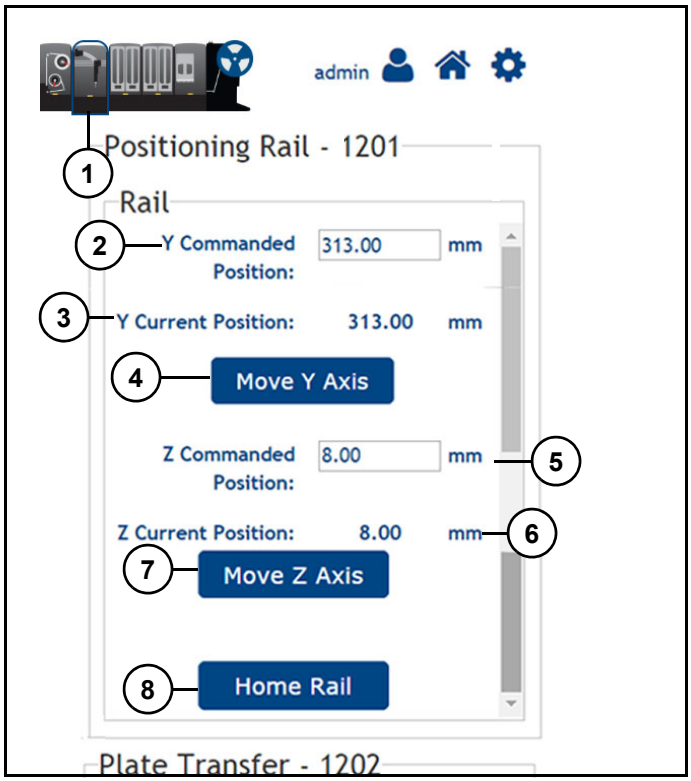


Figure 2

Refer to *(Figure 2)*.

Overview of Controls

Dispense Jet Module (1): Displays module status.

- Default status indicator.
- Highlighted status indicator
- Faulted status indicator
- Faulted highlighted status indicator
- Highlighted Blue: Module is active.

Y Command Position (2): Displays/selects desired y-axis position in mm.

Y Current Position (2): Displays current y-axis position in mm.

Move Y Axis (4): Moves head in y direction.

Units	Millimeters
Minimum	Rail limit
Default	Current position
Maximum	Rail limit

Note: A larger number indicates a position closer to front of module.

Z Command Position (5): Displays/selects desired z-axis position in mm.

Z Current Position (6): Displays current z-axis position in mm.

Move Z Axis (7): Moves head in z direction.

Units	Millimeters
Minimum	Rail limit
Default	Current position
Maximum	Nozzle limit on carriage

Note: A larger number indicates a position closer to front of module.

Home Rail (8): Homes rail independently from rest of instrument.

Plate Transfer screen

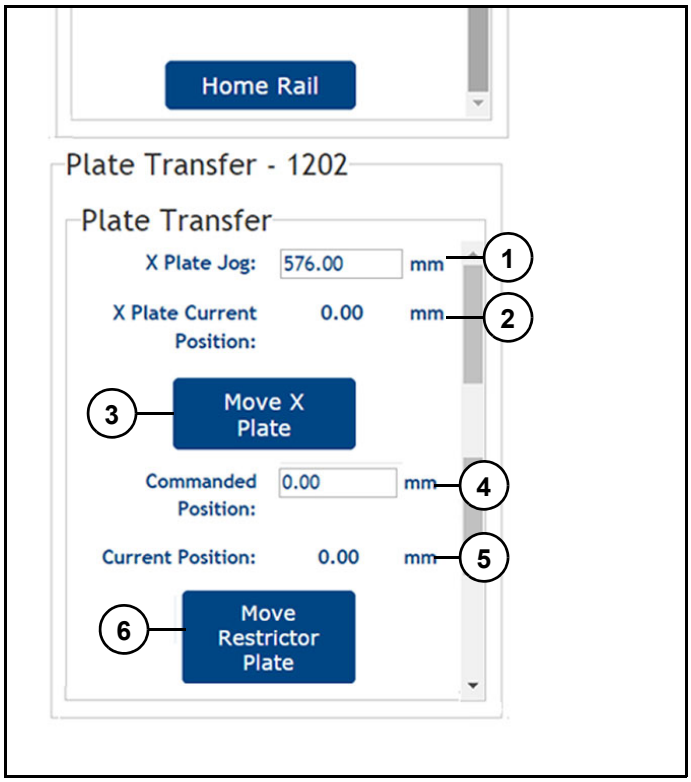


Figure 3

Refer to *(Figure 3)*.

X Plate Jog (1): Sets and displays distance plate moves. A positive number moves plate to left, a negative number moves plate to right

X Plate Current Position (2): Displays current X-Plate position in mm.

Move X Plate (3): Moves head in X-Plate direction.

Units	Millimeters
Minimum	-
Default	Current position
Maximum	-

Command Position (4): Displays/selects desired x-axis position in mm.

Current Position (5): Displays current x-axis position in mm.

Move Restrictor Plate (6): Moves head in x direction.

Faults

Fault List	
XDrive	_400_EL1014_State
PlateXDrive	_400_EL1014_WCState
XJam	Rail_Z_Axis_Drive_Fault
_EK1100a_State	Rail_Y_Axis_Drive_Fault
_230_EL4132_State	_420_EL2004_State
_230_EL4132_WCState	_420_EL2004_WCState
_EK1110a_State	_430_EL5101_State
_EK1100b_State	_430_EL5101_WCState
_330_EL1014_State	_440_EL5101_State
_330_EL1014_WCState	_440_EL5101_WCState
Safety_Contactor_Status	_EK1110b_State
Bus_B_Fuse_Check	_BK1120c_Coupler_State
Bus_C_Fuse_Check	_BK1120c_State
Bus_D_Fuse_Check	_BK1120c_WCState

For fault information See "Positioning Rail_PR1201 troubleshooting" on page 97.

For handling faults See "General fault recovery procedure" on page 25.

How to recover from a Array Tape jam

1. Remove jam by clearing path of Array Tape.
2. Reset instrument to clear Array Tape jam fault.
3. Press "Sync".
4. Enable instrument.
5. Resume operations. While in Recipe mode, process will resume where it was interrupted.

Note: Array Tape jams may result in lost data. Align Array Tape to dispense head prior to restarting operations.

Replacing a fuse

Tools needed:

- M3 hex wrench

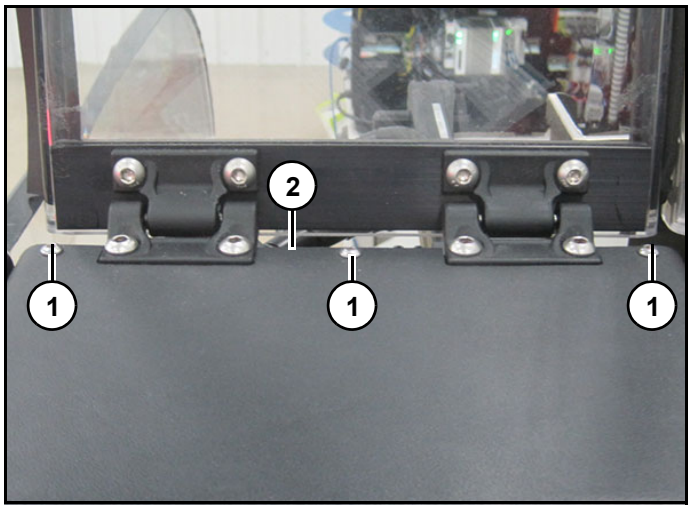


Figure 4

1. Using M3 hex wrench loosen three bolts (1) on top of back cover (2). *(Figure 4)*
2. Tilt cover back and lift up to remove.

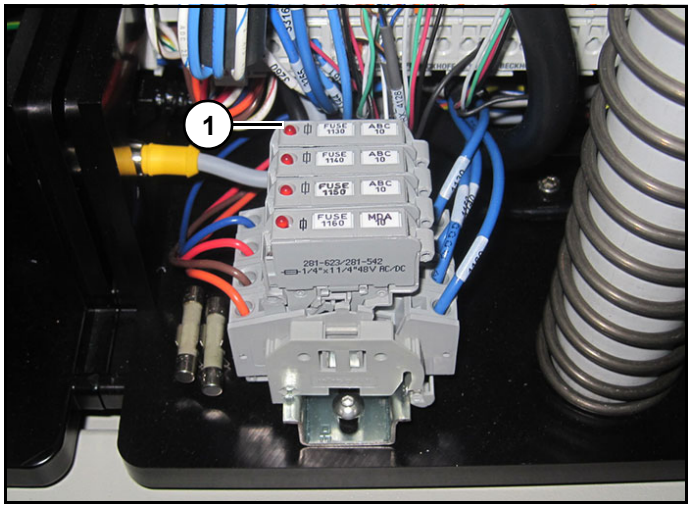


Figure 5

3. Check Bus B, Bus C, and Bus D fuses, light (1) *(Figure 5)* will be red on a blown fuse.

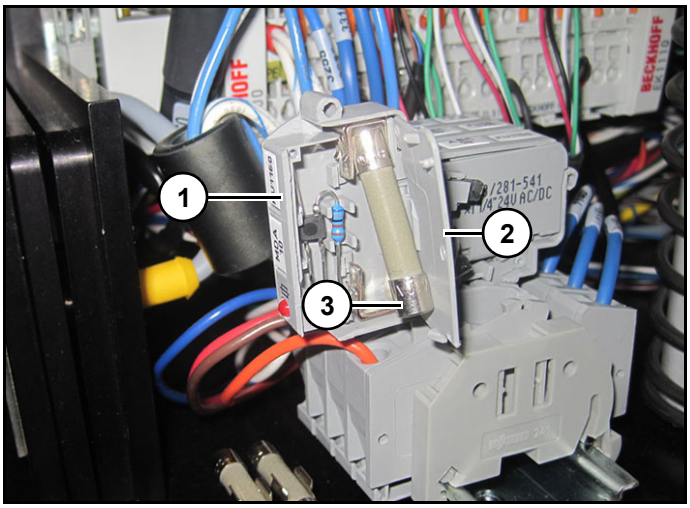


Figure 6

Refer to *(Figure 6)*.

4. Tip up blown fuse cover (1).
5. Pry fuse lid (2) open.
6. Remove fuse (3) and replace with a new fuse.

Note: Verify correct fuse ratings before installing.

7. Close fuse lid (2), fuse will lock into correct sockets.
8. Flip cover (1) down so it locks securely.
9. Replace back cover.
10. Replace and tighten bolts to secure.

Positioning Rail_PR1201 troubleshooting

Notice
Before attempting any fault solution, refer to Handling Faults section. Colours Red: Safety fault. Yellow: Uncontrolled fault other than safety. Blinking blue: Faulted (controlled). Blue: Recovering. Green: Running. Black: Initialising.

Module fault messages

Abort faults	Cause	Solution
XDRIVE:	Possible problem with Array Tape drive system.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.
PLATEXDRIVE:	Possible problem with x-axis drive system.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.
_EK1100a_STATE:	State change on EK1100 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_230_EL4132_STATE:	State change on EL4132 Beckhoff card at terminal 23.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_230_EL4132_WCSTATE:	Working counter error on EL4132 Beckhoff card at terminal 23.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_EK1110a_STATE:	State change on EK1110 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_EK1122a_STATE:	State change on EK1122 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_EK1100b_STATE:	State change on EK1100 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_330_EL1014_STATE:	State change on EL1014 Beckhoff card at terminal 33.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_330_EL1014_WCSTATE:	Working counter error on EL1014 Beckhoff card at terminal 33.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_330_EL1114_STATE:	State change on EL1114 Beckhoff card at terminal 33.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.

Abort faults	Cause	Solution
_330_EL1114_WCSTATE:	Working counter error on EL1114 Beckhoff card at terminal 33.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
SAFETY_CONTACTOR_STATUS:	Safety contactors may be faulty.	Contactors may be sticking, lightly tap and check. Ensure wires are properly terminated.
BUS_B_FUSE_CHECK:	Bus B fuse may be blown.	Check indicator light on fuse, replace fuse if necessary.
BUS_C_FUSE_CHECK:	Bus B fuse may be blown.	Check indicator light on fuse, replace fuse if necessary.
BUS_D_FUSE_CHECK:	Bus D fuse may be blown.	Check indicator light on fuse, replace fuse if necessary.
_400_EL1014_STATE:	State change on EL1014 Beckhoff card at terminal 40.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_400_EL1014_WCSTATE:	Working counter error on EL1014 Beckhoff card at terminal 40.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_410_EL1114_STATE:	State change on EL1114 Beckhoff card at terminal 41.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_410_EL1114_WCSTATE:	Working counter change on EL1114 Beckhoff card at terminal 41.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
RAIL_Z_AXIS_DRIVE_FAULT:	Possible problem with z-axis drive system.	Feedback loop may be faulty, check light for steady blinking on back of PR (means it's good). Check power wires to ensure not damaged and terminated properly. Ensure drives have power.
RAIL_Y_AXIS_DRIVE_FAULT:	Possible problem with y-axis drive system.	Feedback loop may be faulty, check light for steady blinking on back of PR (means it's good). Check power wires to ensure not damaged and terminated properly. Ensure drives have power.
_420_EL2004_STATE:	State change on EL2004 Beckhoff card at terminal 42.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_420_EL2004_WCSTATE:	Working counter error on EL2004 Beckhoff card at terminal 42.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_430_EL5101_STATE:	State change on EL5101 Beckhoff card at terminal 43.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_430_EL5101_WCSTATE:	Working counter error on EL5101 Beckhoff card at terminal 43.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

Abort faults	Cause	Solution
_440_EL5101_STATE:	State change on EL5101 Beckhoff card at terminal 44.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_440_EL5101_WCSTATE:	Working counter error on EL5101 Beckhoff card at terminal 44.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_510_EL7041_STATE:	State change on EL7041 Beckhoff card at terminal 51.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_510_EL7041_WCSTATE:	Working counter error on EL7041 Beckhoff card at terminal 51.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_EK1110b_STATE:	State change on EK1110 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_EK1122b_STATE:	State change on EK1122 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_BK1120c_COUPLER_STATE:	Error on BK1120 Beckhoff card.	Run diagnostics and look for CRC errors and for cards not in OP mode, check card for power, try and reseat card.
_BK1120c_STATE:	State change on BK1120 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_BK1120c_WCSTATE:	Working counter error on BK1120 Beckhoff card.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_YHOMEFAULT:	y-axis wasn't able to home.	Ensure drive can move, check drive for obstructions, clear as necessary. Check prox sensor for damage and ensure it has power.
_ZHOMEFAULT:	z-axis wasn't able to home.	Ensure drive can move, check drive for obstructions, clear as necessary. Check prox sensor for damage and ensure it has power.

Pause faults	Cause	Solution
DriveProx:	Drive Proximity has unexpectedly been triggered.	Check for jam. Verify proximity.
XJAM:	Something caused drive to become out of sync.	Check path for obstructions and clear as necessary. Homing proximity may be bad, ensure it has power and is reading drive holes.

Dispense Jet_DJ1209

⚠WARNING

Read and understand equipment operators manual before operating or performing maintenance. Failure to do so could result in serious injury or death.

Component identification

Dispense Jet_DJ1209

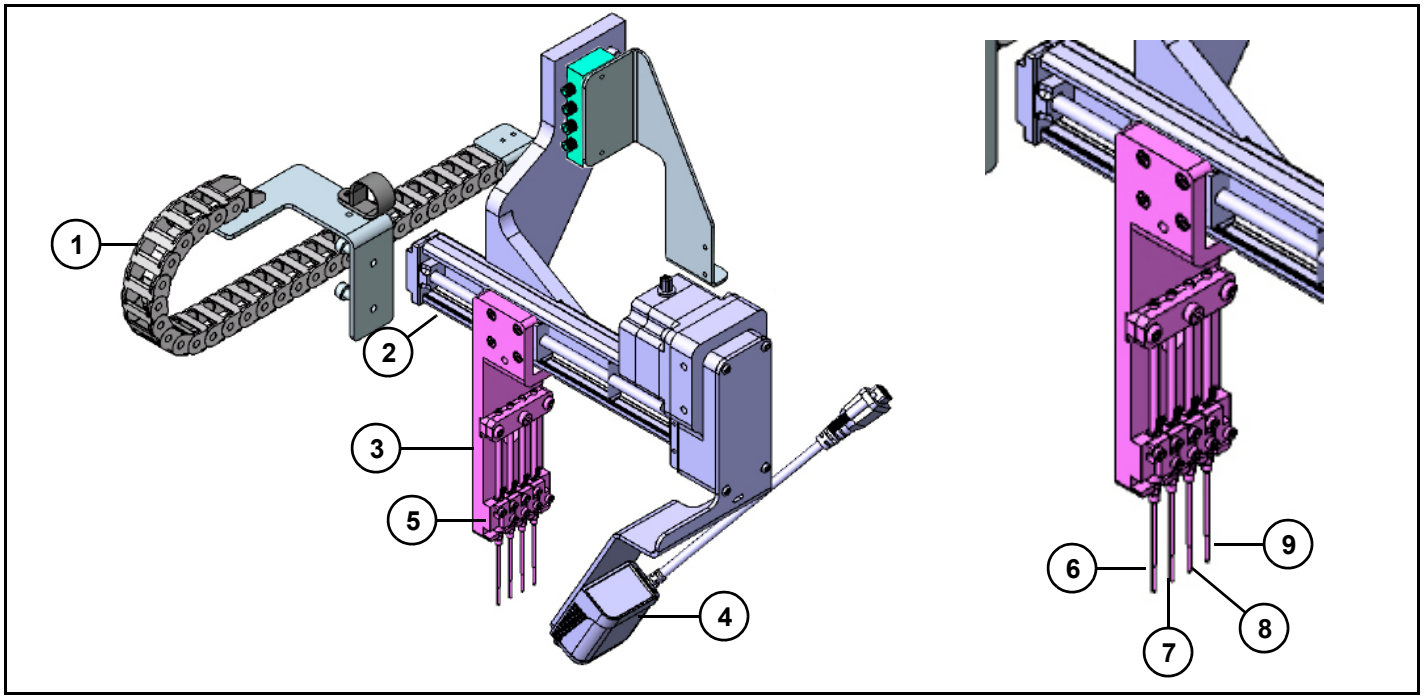


Figure 7

REF#	DESCRIPTION	REF#	DESCRIPTION
1	E-Chain	6	Tip 4
2	X-Rail Assembly	7	Tip 3
3	Dispense Head	8	Tip 2
4	Bar Code Reader	9	Tip 1
5	Dispense Tip Assembly		

Dispense Jet_DJ1209 manager controls

Notice

Controls on Auto Screen can only be activated when instrument is in an idle state.

If a change is made to Manager Settings file (See Manager Settings section) it only takes effect after a pause and idle action is performed (See Getting Started section).

Dispense Jet screen - Basic

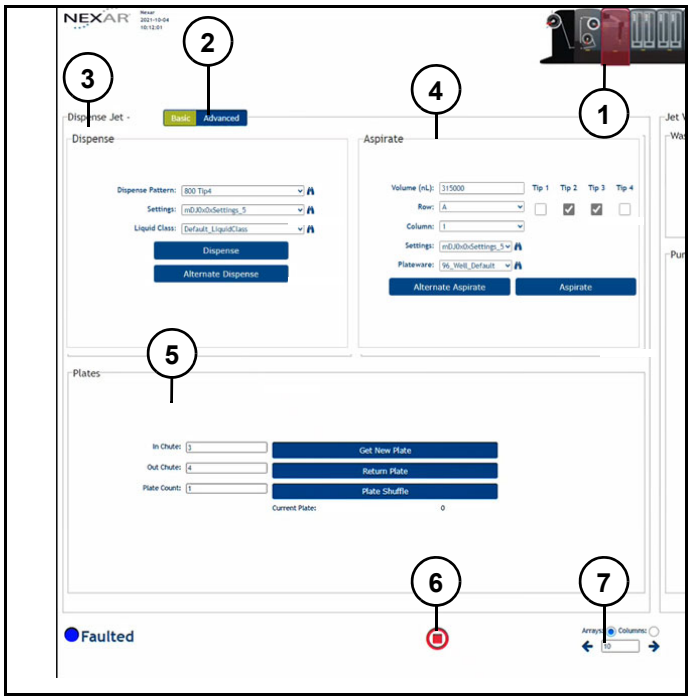


Figure 8

Refer to *(Figure 8)*.

Overview of controls

Dispense Jet (1): Displays module status.

- Default status indicator.
- Highlighted status indicator.
- Faulted status indicator.
- Faulted highlighted status indicator.
- Highlighted blue: Module is active.
- Highlighted red: Module is faulted.

Basic/Advanced (2): Switches between basic and advanced operations pages.

Dispense (3): Displays dispense settings.

Aspirate (4): Displays aspirate settings.

Plates (5): Displays plate settings.

Abort (6): Aborts all running actions.

Arrays/Columns (7): Displays Arrays, Columns, and number of arrays in protocol.

Dispense.

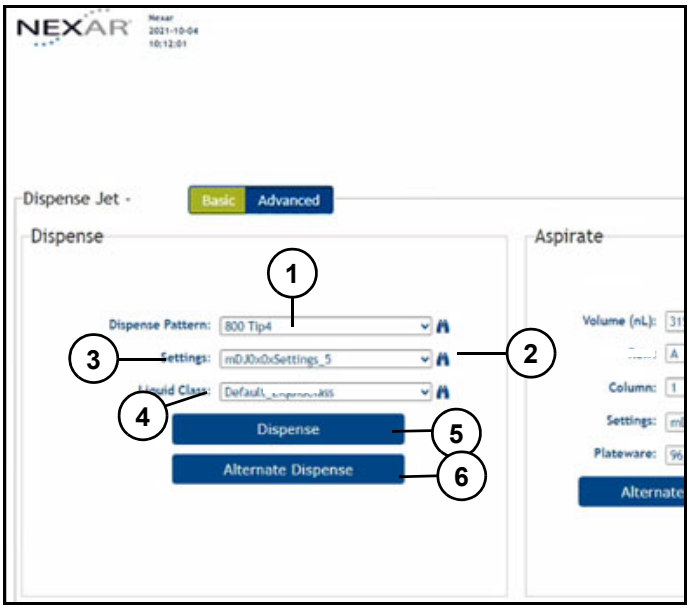


Figure 9

Refer to *(Figure 9)*.

Dispense Pattern (1): Selects dispense pattern.

Binocular icon (2): Displays settings for selected drop-down.

Settings (3): Displays and adjusts dispense pressure settings.

Liquid Class (4): Displays and adjusts liquid class settings.

Dispense (5): Initiates dispense sequence.

Alternate Dispense (5): Initiates alternate dispense sequence.

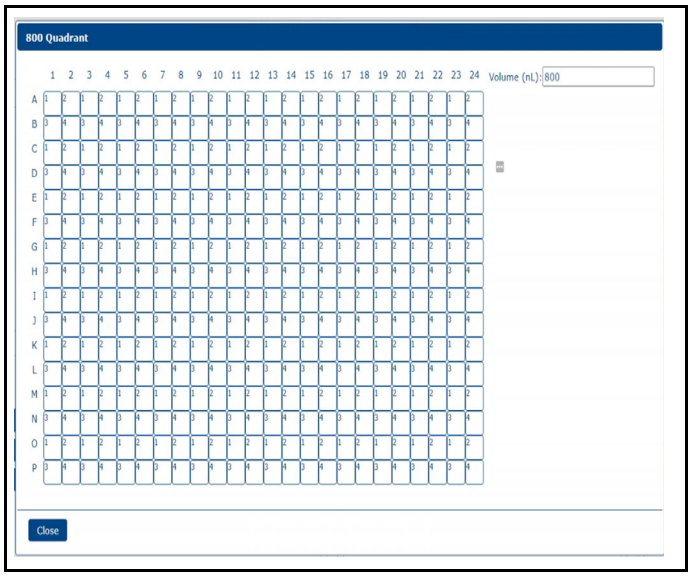


Figure 10

Array Tape Quadrant Diagram *(Figure 10)*.

Pattern text box (5): Dispenses 384-well Array Tape according to a given pattern, defined in pattern file list in .xml format.

When Pattern mode is selected, Pattern text box pops up, showing available pattern files. User can double-click any available pattern file.

Aspirate.

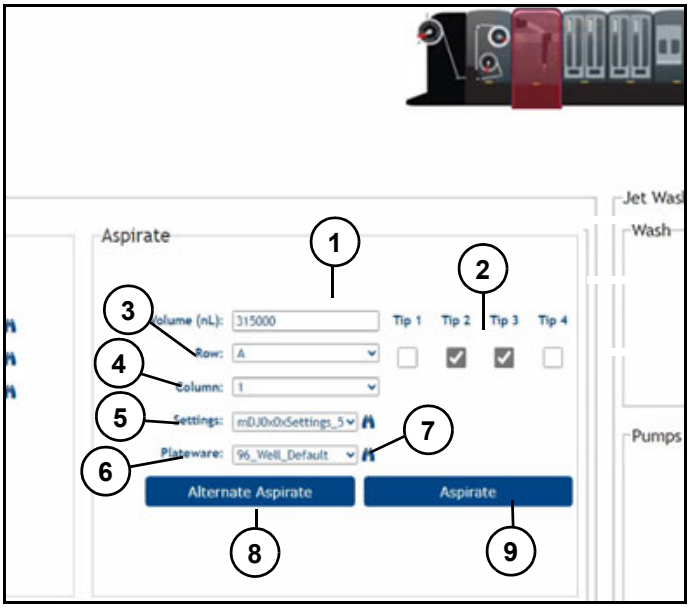


Figure 11

Refer to *(Figure 11)*.

Volume (nL) (1): Sets and displays volume aspirated from source plate.

Units	Nanoliters
Minimum	0
Default	78,800
Maximum	500,000

Tip check boxes (2): Selects which tip(s) should aspirate.

Row (3): Sets and displays source plate well tow location from which tip 1 will aspirate.

Column (4): Sets and displays source plate column tow location from which tip 1 will aspirate.

Settings (5): Sets and displays aspiration settings.

Plateware (6): Selects plateware setting.

Binocular icon (7): Displays settings for selected drop-down.

Alternate Aspirate (8): Initiates alternate aspirate sequence.

Aspirate (9): Initiates aspirate sequence.

Plates.

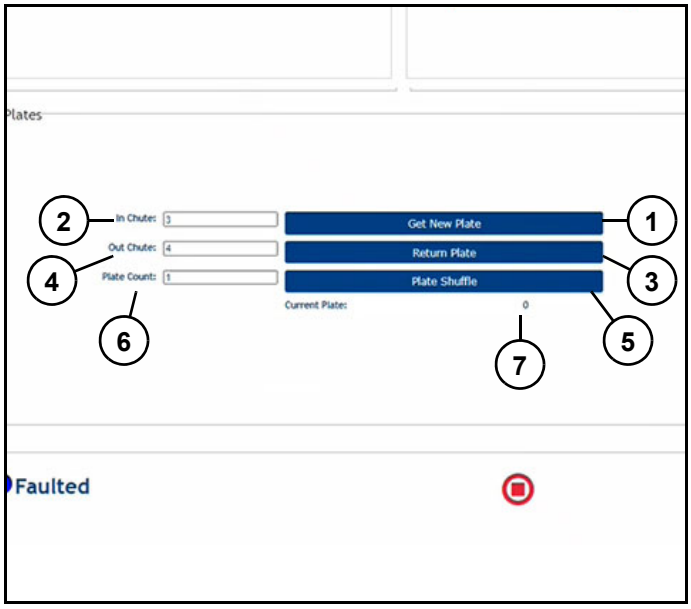


Figure 12

Refer to *(Figure 12)*.

Get New Plate (1): Initiates operation to retrieve a new plate from stack.

New plate is brought in from chute specified in In Chute (2). Plate will come down conveyor until it blocks photoeye sensor and stops at correct location.

In Chute (2): Sets and displays which chute will supply new plate. Chutes are numbered from right to left. Default setting can be specified in Dispense Jet settings.

Units	Number
Minimum	1
Default	1
Maximum	Number of chute on Instrument

Return Plate (3): Initiates operation to return plate to stack.

Plate goes down conveyor and is stacked in chute specified in Out Chute (4).

Out Chute Destination (4): Sets and displays which chute will receive plate. Chutes are numbered from right to left.

Units	Number
Minimum	1
Default	1
Maximum	Number of chute on Instrument

Plate Shuffle (5): Initiates (on/off) operation to transfer plates between stacks.

New plate is downstacked from chute specified in Plate Count (6). Plate is transferred and upstacked to chute specified in Out Chute (4).

Plate Count (6): Displays number of plates being used.

Current Plate (7): Displays plate currently being used.

Dispense Pipette screen advanced

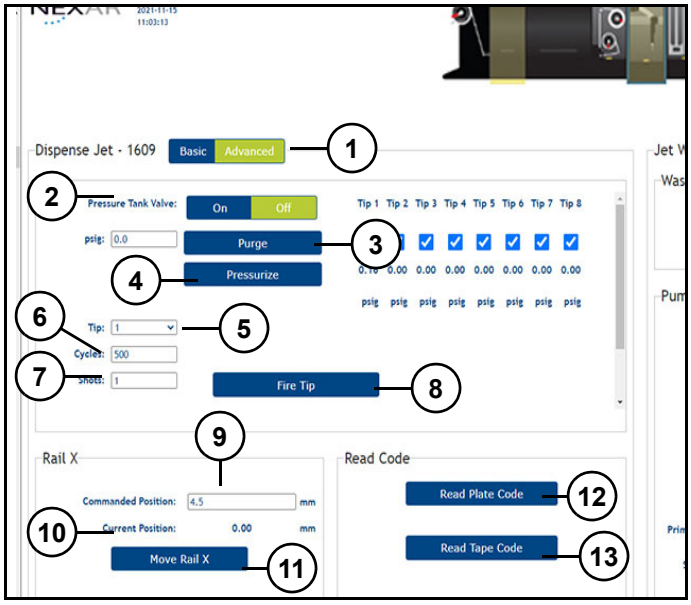


Figure 13

Refer to *(Figure 13)*.

Overview of controls

Pressure Tank Valve (1): Turns pressure tank valves on and off.

psig (2): Sets and displays purge pressure.

Purge (3): Purges water from pressure tank.

Pressurize (4): Pressurises DJ system to set point.

Units	PSIG
Minimum	0
Default	8
Maximum	12

Tips (5): Selects tip(s) to purge.

Cycles (6): Selects open time of valves.

Shots (7): Number of times valve turns on/off.

Tips, cycles, shots text boxes

Tips		Cycles		Shots	
Units	**#**	**Units**	**#**	**Units**	**#**
Min.	1	Min.	1	Min.	1
Default	1	Default	40	Default	1
Max.	5-Fires all tips at once	Max.	65,535	Max.	32,000

Fire Tip (8): Fires selected tips.

Command Position (9): Inputs position for X-Rail.

Current Position (10): Displays X-Rail's current position.

Move Rail X (11): Moves X-Rail to displayed command position.

Read Plate Code (12): Moves Dispense Jet to read plate code.

Read Code (13): Moves Dispense Jet to read Array Tape code.

Fault screen

Notice
Before resetting a fault be sure condition is corrected.

For fault list See “Manager fault messages” on page 113.

For fault descriptions See “Manager fault messages” on page 113.

For handling faults See “General fault recovery procedure” on page 25.

Purging pressure tank

Pressure tank is an air reservoir. Over time, water will creep in and air will leak out, causing a loss in reservoir capacity.

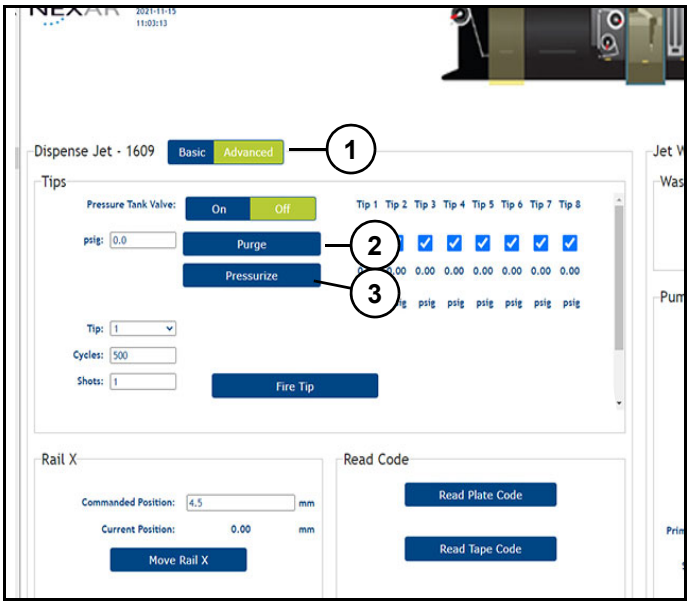


Figure 14

Refer to *(Figure 14)*.

1. Click "Advanced" (1).
2. Click "Purge" (2). Metering pump will remove water from pressure tube then expel through all four tips 1. Cycle is repeated five times.
3. Repeat process, if needed, until pressure reservoir is completely purged of water.
4. Click “Pressurize" (3) to return system to proper function.

Ethanol washing tips

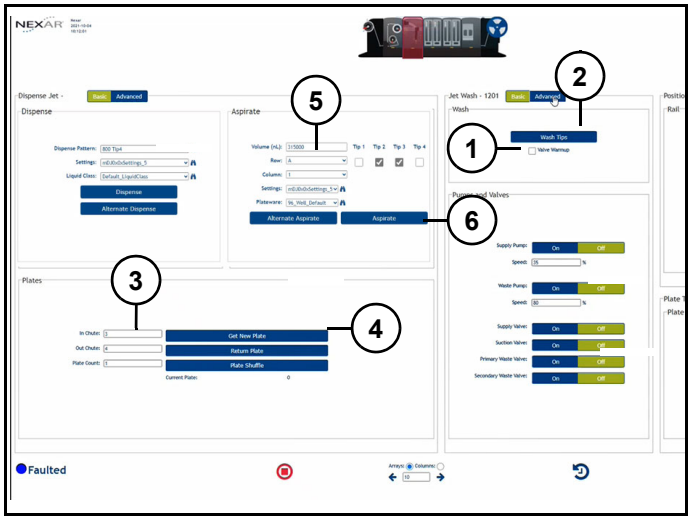


Figure 15

Refer to *(Figure 15)*.

1. Prepare a plate with 70% ethanol and place it into one of chutes.
2. Check "Valve Warmup" (1).
3. Click "Wash Tips" (2).
4. Identify "In-Chute" (3) where plate is located.
5. Click "Get New Plate" (4).
6. Enter aspiration amount in "Volume" (5).
7. Click "Aspirate" (6).
8. Click "Wash Tips" (2) with "Valve Warmup" (1) checked to remove 70% ethanol solution. Dispense jet is now ready for operation.

Creating new Dispense Jet settings

Users with administrator privileges can create new Dispense Pipette settings file.

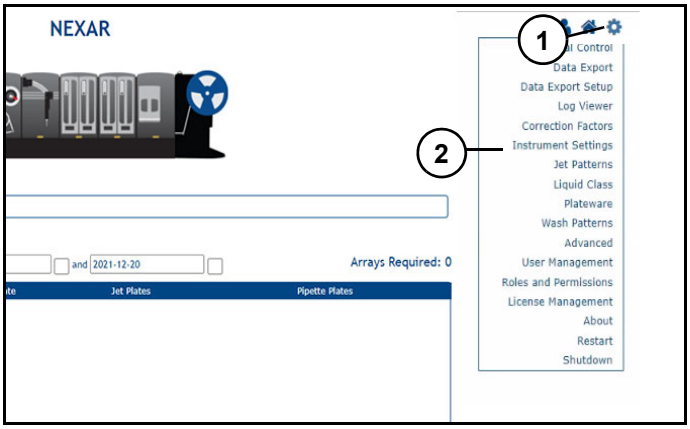


Figure 16

Refer to *(Figure 16)*.

1. Click "Settings" icon (1).
2. Click "Instrument Settings" (2).

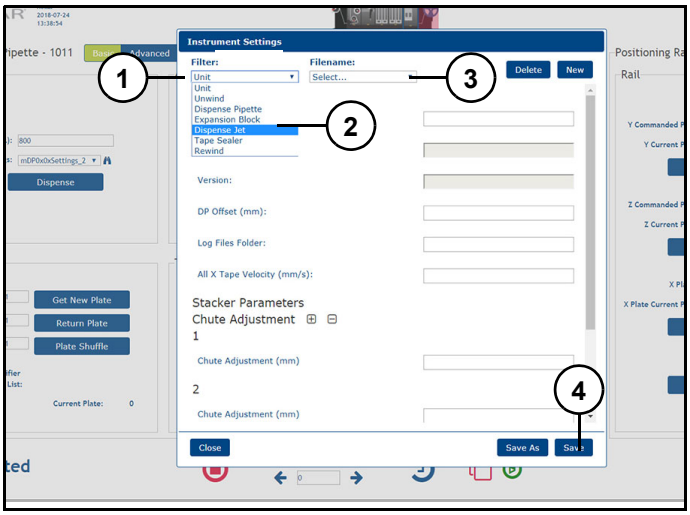


Figure 17

Refer to *(Figure 17)*.

3. Click "Filter" drop-down (1).
4. Select "DJ0X0X" (2).
5. Click "New" (3).
6. Enter desired settings on setting screen.
7. Click "Save" (4) to save changes.

Note: Click "Close" to exit without saving new file.

Adjusting Dispense Jet settings

Users with administrator privileges can change Dispense Jet parameters using Settings file.

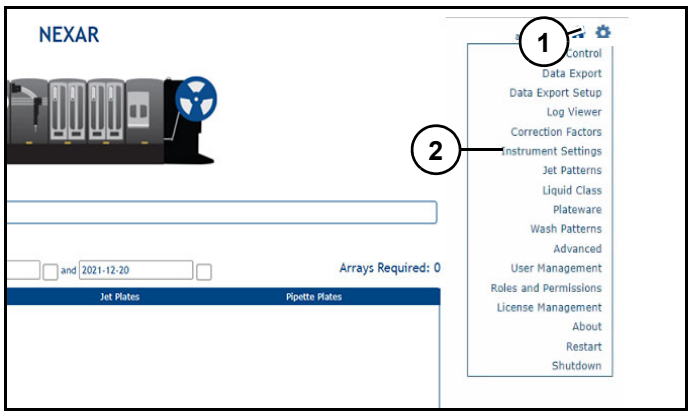


Figure 18

Refer to *(Figure 18)*.

1. Click "Settings" icon (1).
2. Click "Instrument Settings" (2).

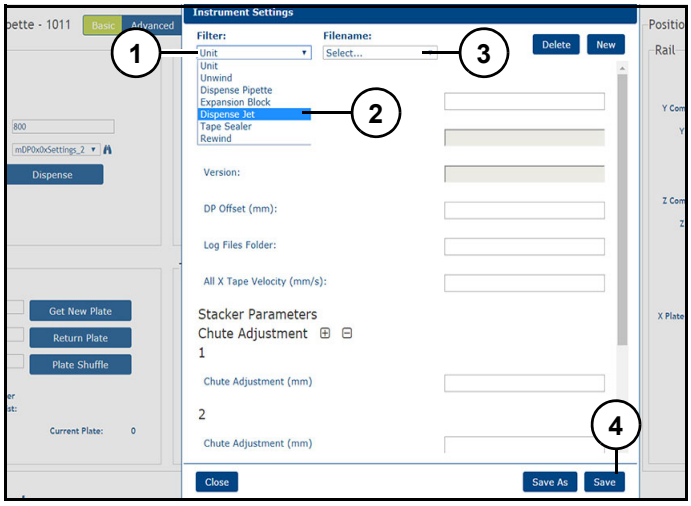


Figure 19

Refer to *(Figure 19)*.

3. Click "Filter" drop-down (1).
4. Select "Dispense Jet" (2).
5. Select "Filename" drop-down (3) and select file to edit.
6. Adjust desired settings on setting screen.
7. Click "Save" (4) to save changes.

Note: Click "Close" to exit without saving changes.

Setting descriptions

Dispense Tip 1 Y Offset: Offset in Y direction for tip 1 to start its dispense operation. Units: mm.

Rail X Dispense Offset: Offset in X direction for start of dispense operation (if DPOffset from UnitSettings.xml is zero). Units: mm.

RailX Wash Offset: Offset position head over wash station in X direction. Units: mm.

Y Dispense Velocity: Y direction speed of head during a dispense operation. Units: mm/s.

Y Wash Offset: Offset to position head over wash station in Y direction. Units: mm.

Y Torque Limit: Torque limit for Y rail units: Measured Drive amperage in counts.

Code Y Position: Position in Y direction to read Array Tape code. Units: mm.

Code Z Position: Position in Z direction to read Array Tape code. Units: mm.

ZTipOffset: Offset used for compensating for Z positions based on dispense tip length. Used in Dispense, Aspirate, and Wash Units: mm.

ZWash Offset: Offset defining Z where positions combined with ZTipOffset. Units: mm.

ZTorque Limit: Torque limit for Z rail units: Measured drive amperage in counts.

Run Continuous Bit: Define if sequential basic mode recipes should use new plates or continue to use current plate.

Continuous Pressurize: Define if pressurise function should run during dispensing or only before and after dispense action.

In Chute ID: Define chute where manager should pull plates from.

Out Chute ID: Defines chute where manager should return plates to.

Plate Dump: Define direction that plate dump chute is from the manager +1 is down stream -1 is upstream.

Error Mode: Define error that should display if an Array Tape code does not match expected recipe

Array Tape code "CheckRecipe" or previous managers stored Array Tapebar code "CheckArray".

Slot Sense: Define if Array Tape slot sensor is present in this module, for use with heated path only.

Plate Reposition: Define if plate should be repositioned each time an aspiration action occurs.

Restrictor Plate Operation: Define if automated restrictor plate will be used in aspiration action will move restrictor plate into position during aspiration sequence.

Pump Parameters: Torque limit for X rail Units: Measured drive amperage in counts.

Sampling Rate: Define number of task cycles to sample while scanning in time mode.

Tips 1-8.

- Volume Factor: Sets tip dispense volume.
- Forward Position Offset: Sets tip forward position.
- Backward Position Offset: Sets tip backward position.

Faults:

Priority 1 - Pause recipe and write fault to log file.

Priority 2 - Do not stop recipe and write fault to log file.

Priority 0 - Ignore fault and do not write to log file or stop recipe.

PlateCodeMatchFaultPriority: Triggered if plate code does not match code identified in recipe.

PlateCodeReadFaultPriority: Triggered if plate code read operation fails.

CodeArrayMatchFaultPriority: Triggered if Array Tapebarcode does not match previous manager and ErrorMode above is set to CheckArray.

CodeRecipeMatchFaultPriority: Triggered if Array Tapebarcode does not match recipe file and ErrorMode above is set to CheckRecipe.

TestFaultPriority: Triggered if ThrowFault operation is true and ThrowFault string is not blank in Array TapeMode recipe(for message faults in a recipe).

YTorqueLimitFaultPriority: Triggered if Y feedback amperage count reads a value higher than YTorqueLimit setting.

ZTorqueLimitFaultPriority: Triggered if Z feedback amperage count reads a value higher than ZTorqueLimit setting.

Calibrating a given dispense volume

Procedure is needed to account for different liquid properties. Volume dispensed into Array Tape depends on two system parameters - **<DispensePressure>** and **<DispenseValveOpenWidth>**. Same set of parameters will not work for every liquid encountered; therefore, calibration is necessary when changing liquids.

The **<DispensePressure>** and **<DispenseValveOpenWidth>** parameters work together and must be adjusted together to achieve desired result.

<DispensePressure> - Pressure propels liquid out of dispense tips. A higher pressure means a greater liquid velocity through tips. If liquid clinging at tips is observed, it is typically a sign of pressure that is too low. If pressure is too high, liquid will splash out of wells.

<DispenseValveOpenWidth> – Pressure Parameter changes time dispense valve stays open. Longer open time results in more volume dispensed at adjusted pressure. Maximum amount of time that valve can stay open is limited by speed of y-axis and amount of dispense pressure.

1. Ensure all utilities are connected.
2. Ensure Array Tape is loaded.
3. Synchronise drive and ensure Array Tape is advanced to dispense position.

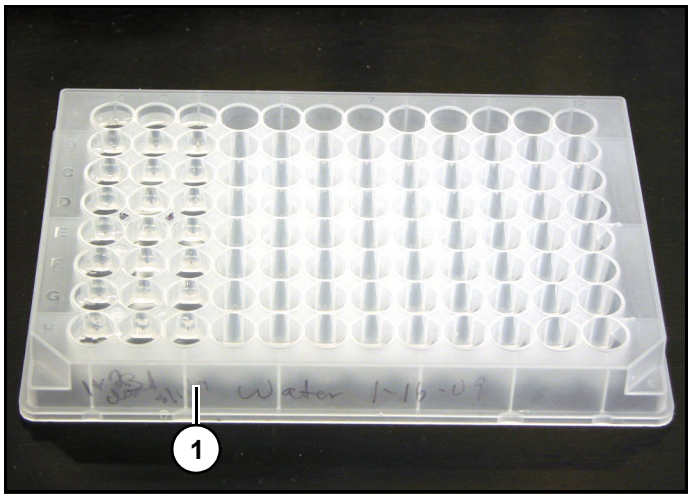


Figure 20

4. Prepare source plate (1) *(Figure 20)* with desired liquid at required volumes.
5. Load source plate in chute identified.
6. Ensure instrument is in idle state.

Figure 21

Refer to *(Figure 21)*.

7. Click "Get New Plate" (1) to receive prepared source plate.
8. Click "Wash Tips" (2) to wash tips multiple times.

Note: Ensure there are no air bubbles in dispense tubes. If bubbles are present wash again.

In "Liquid Class File Settings", choose a suitable setting for **<AirGapVolume>** parameter.

Note: This setting will depend on liquid and air gap size needed to separate liquids. Excessive air gaps will negatively effect dispense accuracy.

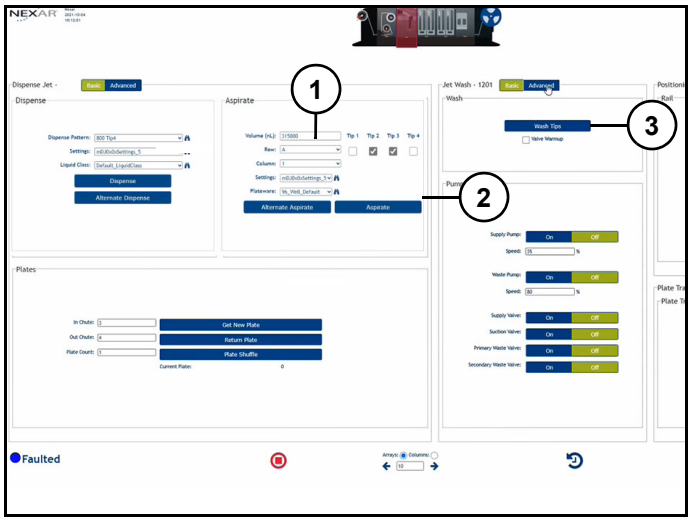


Figure 22

Refer to *(Figure 22)*.

9. In "Volume" (1) enter a small volume.

Note: Only enough liquid is needed so air gap is visible in beginning of tube. This will be final ending point for air gap.

10. Click "Aspirate" (2) and check air gap location when operation is finished.

11. If incorrect, repeat steps 8 through 11 until correct. Once correct, click "Wash Tips" (3) to empty dispense tips and tubes.

12. Add previous volume amount to volume amount needed to dispense.

13. Enter this new number into "Volume" (1).

14. Click "Aspirate" (2), air gap will rise farther up into tube.

Example: Volume is 65,000 nL. Reagent volume per well is 800 nL. Desired total dispense volume would be the volume per well multiplied by number of wells, which is 800 x 384 = 307,200 nL. Therefore, volume to enter for Step 14 would be 307,200 nL + (Predispense Volume x 2 x PrimaryPreDispenseCount)+Predispense Volume x SecondaryPreDispenseCount+ 65,000 nL (for maintaining the air gap above the valve) = 372,200 nL.

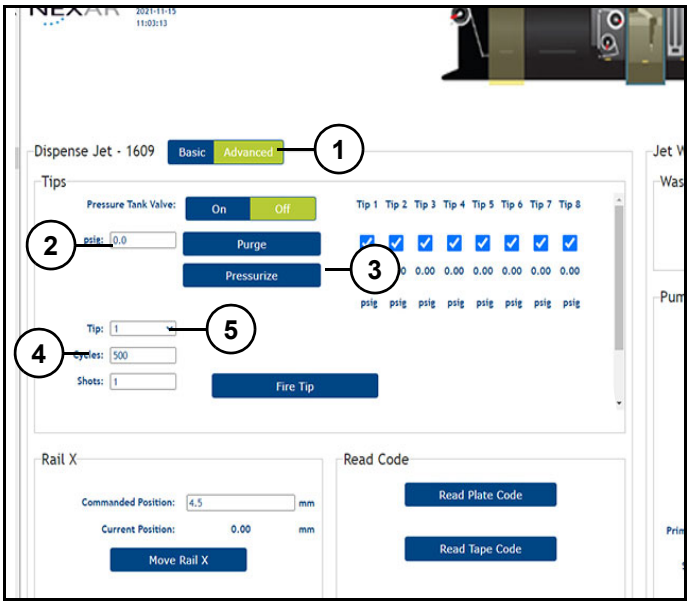


Figure 23

Refer to *(Figure 23)*.

1. Click "Advanced" (1).

2. Enter desired amount into "psig" (1).

3. Click "Pressurize" (3).

4. Set "Cycles" (4) to a suitable setting.

Note: Example for distilled water: A suitable pressure setting would be 1.2-1.8 psig and a suitable number of cycle settings would be 850.

5. Choose desired tip (5).

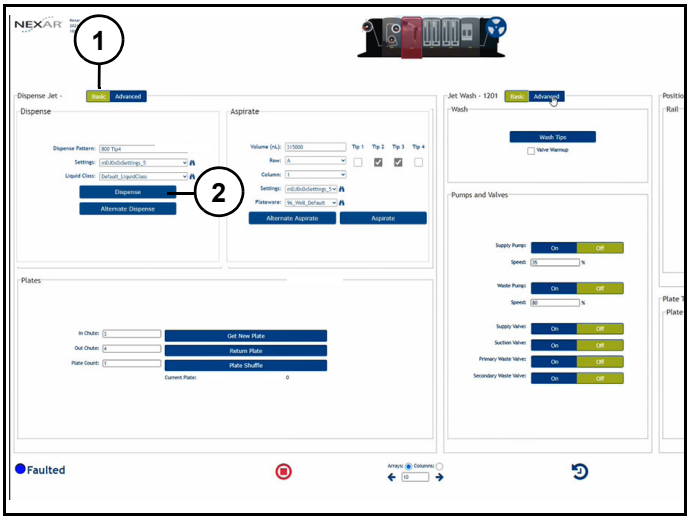


Figure 24

Refer to *(Figure 24)*.

6. Click "Basic" (1).
7. Click "Dispense" (2).
8. Check location of air gap in tube of tip selected. If air gap is not at correct ending point (as it was in Step 8), change value in "Cycles" (4) *(Figure 23)*.
9. Repeat steps 5 through 8, choosing next available tip. Repeat these steps until correct volumes are achieved. This process may require multiple wash and aspirate operations before results are successful.
10. Once correct, enter final setting into <DispensePressure> and <DispenseValveOpenWidth> parameters of Liquid Class File Settings.

Note: Volumes will be approximate.

Maintenance

Notice

When replacing tips of different lengths, change **<ZTipOffset>** parameter in _MGR_DJ1209 settings to avoid accidents. Refer to Handling Faults section.

- Replace tips when damaged.
- Refer to Microscan User's OEM manual for 2D/ Bar Code Reader maintenance.
- Perform an 70% ethanol wash when not running instrument for a period of time.

Replacing Dispense Jet tips

Tools required:

- Jet tip torque wrench (Provided by Biosearch Technologies).

Notice

The plastic valve nut (1) *(Figure 25)* that holds tip is very delicate. Use caution when engaging or disengaging torque wrench to avoid damage.

When removing tips, always start with front tip (2) *(Figure 25)* to avoid damaging tips.

When installing new tips, always start with back tip (3) *(Figure 25)* to avoid damaging tips.

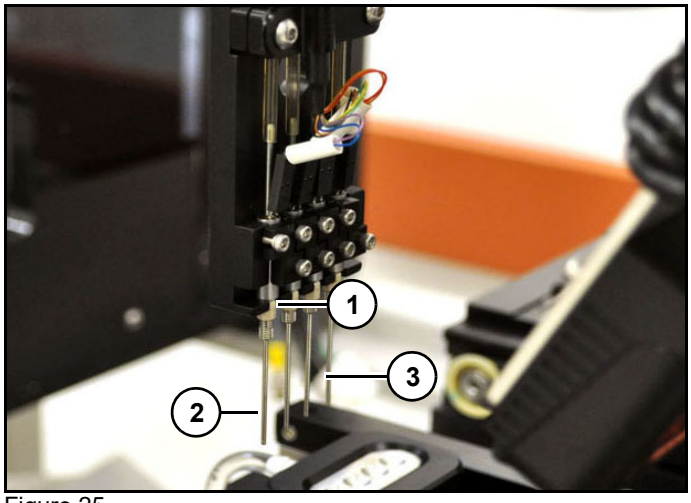


Figure 25

1. Gently loosen tip 4 (2) *(Figure 25)* by hand, turning counter-clockwise. If tip is screwed in too tight use provided torque wrench to loosen and then un-thread and remove by hand.
2. Loosen tip 3, tip 2, and then tip 1, using same procedure.

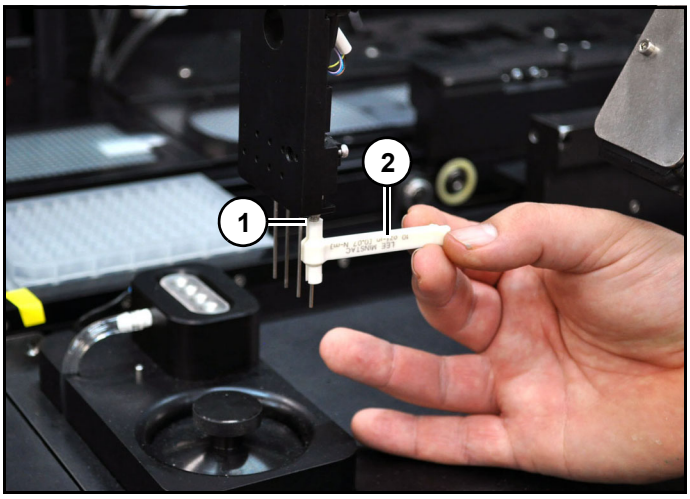


Figure 26.

Refer to *(Figure 26)*.

3. By hand, gently start to thread tip 1 into plastic nut on dispense head.
4. Carefully place torque wrench (2) onto tip and tighten.

Note: Make sure tips are not crooked, this will damage tips.

5. Place and tighten tip 2, tip 3, and tip 4 using same procedure.

Dispense Jet Attachment_DJ1209 troubleshooting

Notice
Before attempting any fault solution, refer to Handling Faults section. Colours Red: Safety fault Yellow: Uncontrolled fault other than safety Blinking blue: Faulted (controlled) Blue: Recovering Green: Running Black: Initialising

Manager fault messages

Settable priority	Cause	Solution
PlateCodeMatch:	Plate code doesn't match expected platecode.	Ensure plates are loaded in correct order. Verify that Array Tape wasn't advanced manually during protocol, adjust forward or backwards one array and try to resume.
PlateCodeRead:	Plate barcode was unable to be captured.	Camera read position may need to be optimised. Camera setting may need to be adjusted using "ESP" software. Ensure there is no glare on area of interest.
CodeArrayMatch:	Upstream barcode reader scanned doesn't match barcode scanned.	Verify that Array Tape wasn't advanced manually during protocol, adjust forward or backwards and try to resume.
CodeCheckPrevious:	Code out of sequence.	Verify that Array Tape wasn't advanced manually during protocol, adjust forward or backwards and try to resume.
CodeRead:	Code was unable to be captured.	Camera read position may need to be optimised. Camera setting may need to be adjusted. Ensure there is no glare on area of interest.
Code3NoReads:	Reader missed more than three barcodes in a row, check camera or barcodes.	Camera read position may need to be optimised. Camera setting may need to be adjusted using "ESP" software. Camera may need to be replaced.
CodeRecipeMatch:	Recipe barcode doesn't match scanned.	Ensure is aligned to the correct array. May have incorrect spool of Array Tape loaded on instrument.
CodeOrientation:	Orientation of does not match what is expected.	May need to be reversed and then resume protocol. Check protocol logic under "<Orientation>XXX</Orientation>" 0 is forward, 180 is backwards.

Pause faults	Cause	Solution
CheckDispenseVolumeFactorsFile:	Dispense Volume Factor file is missing or incorrect.	Verify file exists and that it is not corrupted.
CheckLiquidClassFile:	Liquid class file is missing or incorrect.	Verify file exists and that it is not corrupted.
CheckPatternFile:	Required jet pattern is missing.	Verify file exists and that it is not corrupted.
CheckPlatewareFile:	Required plate ware is missing.	Verify file exists and that it is not corrupted.
CheckRecipeFile:	Recipe file is incorrect, please check file for incorrect structure.	Verify file exists and that it is not corrupted.
CheckSettingsFile:	Settings file may be missing or incorrect.	Verify file exists and that it is not corrupted.
CheckUsageFile:	Usage file is may be missing or incorrect.	Verify file exists and that it is not corrupted.
ArrayFault:	User added fault to Array Tape mode recipe.	Verify file exists and that it is not corrupted.

Plate faults	Cause	Solution
PlateInFault:	Plate was not successfully delivered from chute.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.
PlateTransfer:	Plate failed to transfer from plate stacker on chute.	Check transfer path.
Stop:	Plate failed to stop.	Check photo eye.
CheckPlateSize:	Plate size does not match expected length.	Check photo eye and transfer deck.
MearsurementPosition:	Plate failed to position.	Verify plate is not caught on transfer deck.
NoClearedPlate:	No plate from Clear Position.	Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path and verify Plate is present.
ClearedPlateTransfer:	Plate failed to transfer from the plate stacker.	Check transfer path.
ClearedPlateStop:	Plate failed to stop.	Check photo eye.
ClearedPlatePosition:	Plate was not cleared successfully from conveyor.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.

Plate faults	Cause	Solution
PlateClear:	Plate was not cleared successfully from conveyor.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.
PlateInShuffleCycle:	Plate in shuffle failed on cycle of cycle(s) in chute.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.
PlateInShuffleCycle:	Plate out shuffle failed on cycle of cycle(s) in chute.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.
PlateReturn:	Plate failed to return to chute.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.
PlateNoDump:	No plate on deck to dump.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.

Abort faults	Cause	Solution
YTorqueLimitFault:	y-axis at position reached torque value.	Check for obstructions in the "front to back" path way of head. Ensure rail is properly lubricated. May need to adjust torque settings.
ZTorqueLimitFault:	z-axis at position reached torque value.	Check for obstructions in the "up and down" path way of head. Ensure rail is properly lubricated. May need to adjust torque settings.

Module fault messages

Abort faults	Cause	Solution
RAILXDRIVE	Possible problem with Rail X drive system.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.
RAILXHOMEFAULT	Rail X in unable to home.	Ensure drive can move, check drive for obstructions, clear as necessary. Check proximity sensor for damage and ensure it has power.
_BK1120_COUPLER_STATE	Error on BK1120 Beckhoff card.	Run diagnostics and look for CRC errors and for cards not in OP mode, check card for power, try and reseat card.
_BK1120_STATE	State change on BK1120 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_BK1120_WCSTATE	Working counter error on BK1120 Beckhoff card.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_EK1100_STATE	State change on EK1100 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_EK1100_STATE	State change on EK1100 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_EK1100_WCSTATE	Working counter error on EK1100 Beckhoff card.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_420_EL2262_STATE	State change on EL2262 Beckhoff card at terminal 42.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_420_EL2262_WCSTATE	Working counter error on EL2262 Beckhoff card at terminal 42.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_430_EL2262_STATE	State change on EL2262 Beckhoff card at terminal 43.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_430_EL2262_WCSTATE	Working counter error on EL2262 Beckhoff card at terminal 43.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_420_EL2004_STATE	State change on EL2004 Beckhoff card at terminal 42.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_420_EL2004_WCSTATE	Working counter error on EL2004 Beckhoff card at terminal 42.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_430_EL2004_STATE	State chance on EL2004 Beckhoff card at terminal 43.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.

Abort faults	Cause	Solution
_430_EL2004_WCSTATE	Working counter error on EL2004 Beckhoff card at terminal 43.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

DJ1212 fault	Cause	Solution
_512_PWS_1235_FUSE_CHECK	Fuse on FlexJet power supply may be blown.	Check fuse inside FlexJet to see if indicator light is on, replace fuse.

4 channel fault	Cause	Solution
_220_EK1100_STATE	State change on EK1100 Beckhoff card at terminal 22.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_310_EL2262_STATE	State change on EL2262 Beckhoff card at terminal 31.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_310_EL2262_WCSTATE	Working counter error on EL2262 Beckhoff card at terminal 31.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_320_EL2262_STATE	State change on EL2262 Beckhoff card at terminal 32.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_320_EL2262_WCSTATE	Working counter error on EL2262 Beckhoff card at terminal 32.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_330_EL2024_STATE	State change on EL2024 Beckhoff card at terminal 33.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_330_EL2024_WCSTATE	Working counter error on EL2024 Beckhoff card at terminal 33.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_340_EL2024_STATE	State change on EL2024 Beckhoff card at terminal 34.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_340_EL2024_WCSTATE	Working counter error on EL2024 Beckhoff card at terminal 34.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_410_EL3104_STATE	State change on EL3104 Beckhoff card at terminal 41.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_410_EL3104_WCSTATE	Working counter error on EL3104 Beckhoff card at terminal 41.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

4 channel fault	Cause	Solution
_420_EL6001_STATE	State change on EL6001 Beckhoff card at terminal 42.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_420_EL6001_WCSTATE	Working counter error on EL6001 Beckhoff card at terminal 42.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_430_EL7041_STATE	State change on EL7041 Beckhoff card at terminal 43.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_430_EL7041_WCSTATE	Working counter error on EL7041 Beckhoff card at terminal 43.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

8 channel fault	Cause	Solution
_610_EK1100_STATE	State change on EK1100 Beckhoff card at terminal 61.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_620_EL2262_STATE	State change on EL2262 Beckhoff card at terminal 62.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_620_EL2262_WCSTATE	Working counter error on EL2262 Beckhoff card at terminal 62.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_630_EL2262_STATE	State change on EL2262 Beckhoff card at terminal 63.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_630_EL2262_WCSTATE	Working counter error on EL2262 Beckhoff card at terminal 63.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_640_EL2024_STATE	State change on EL2024 Beckhoff card at terminal 64.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_640_EL2024_WCSTATE	Working counter error on EL2024 Beckhoff card at terminal 64.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_710_EL2024_STATE	State change on EL2024 Beckhoff card at terminal 71.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_710_EL2024_WCSTATE	Working counter error on EL2024 Beckhoff card at terminal 71.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_720_EL3104_STATE	State change on EL3104 Beckhoff card at terminal 72.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.

8 channel fault	Cause	Solution
_720_EL3104_WCSTATE	Working counter error on EL3104 Beckhoff card at terminal 72.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

Pumpnumber in string	Cause	Solution
EL7031_STATE_PUMP	State change on EL7031 Beckhoff card pump(s).	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
EL7031_WCSTATE_PUMP	Working counter error on EL7031 Beckhoff card pump(s).	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
MeteringDrive	Possible problem with metering pump drive(s).	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.
PressureLimitPump	Pressure is reading too high on DJ pump(s).	Try to PT Purge system. Ensure pressure reading is within normal reading range on HMI. Ensure pressure reading moves during pressurisation. Ensure electrical connections are good.
MeteringPumpHomeFault	Metering pump was unable to home.	Ensure drive can move, check drive for obstructions, clear as necessary. Check prox sensor for damage and ensure it has power.
WashPressureLimitPump	Pressure limit was reached during wash on tip.	Ensure pressure reading is within normal reading range on HMI. Wash speed may be too fast. DJ tip may be plugged.
PressurizeTimeOutPump	Failed to reach pressure on pump(s).	Try to PT Purge system. Ensure pressure reading is within normal reading range on HMI. Ensure pressure reading moves during pressurisation. Ensure electrical connections are good.

Dispense Jet_DJ1212

⚠WARNING

Read and understand equipment operators manual before operating or performing maintenance. Failure to do so could result in serious injury or death.

Component identification

Dispense Jet_DJ1212

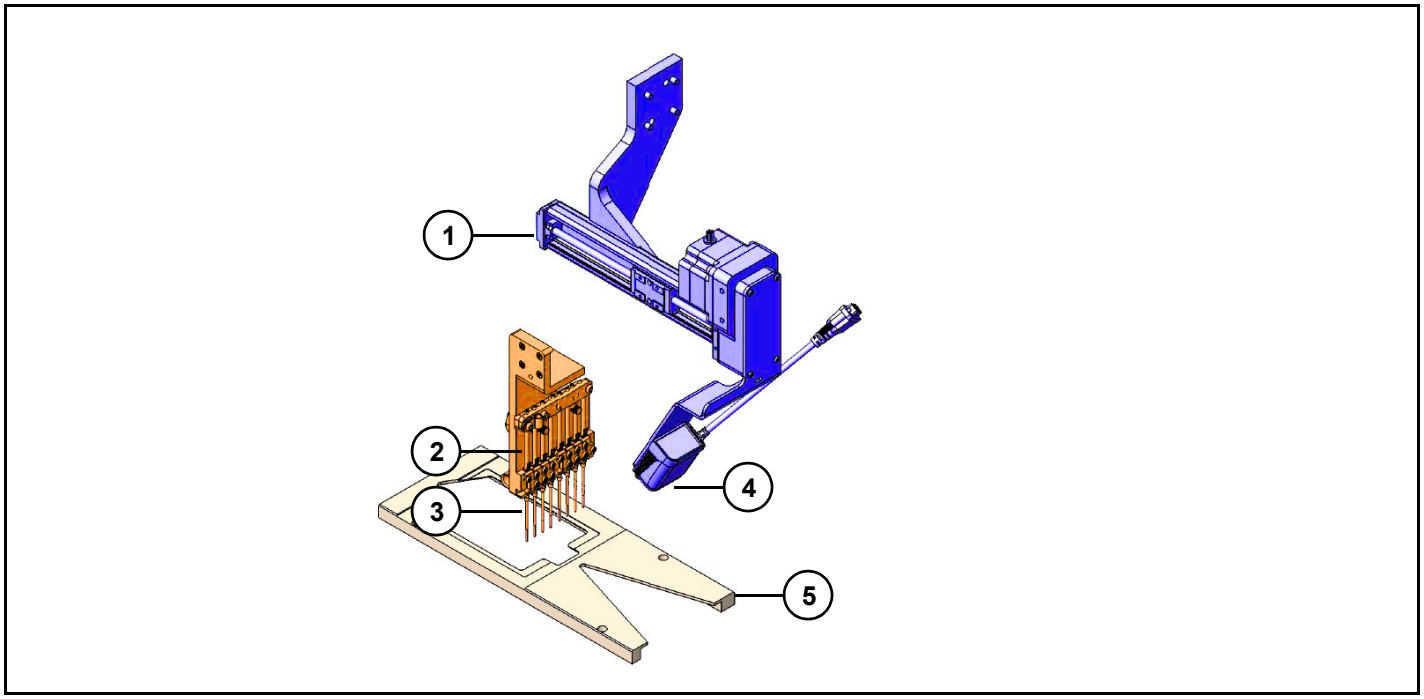


Figure 1

REF#	DESCRIPTION	REF#	DESCRIPTION
1	X-Rail Assembly	4	Bar Code Reader
2	Dispense Head	5	Hold Down Plate
3	Dispense Tips		

Dispense Jet Attachment_DJ1212 Manager controls

Notice

Controls on Auto Screen can only be activated when instrument is in an idle state.

If a change is made to Manager Settings file (See Manager Settings section) it only takes effect after a pause and idle action is performed (See Getting Started section).

Dispense Jet Attachment screen - Basic

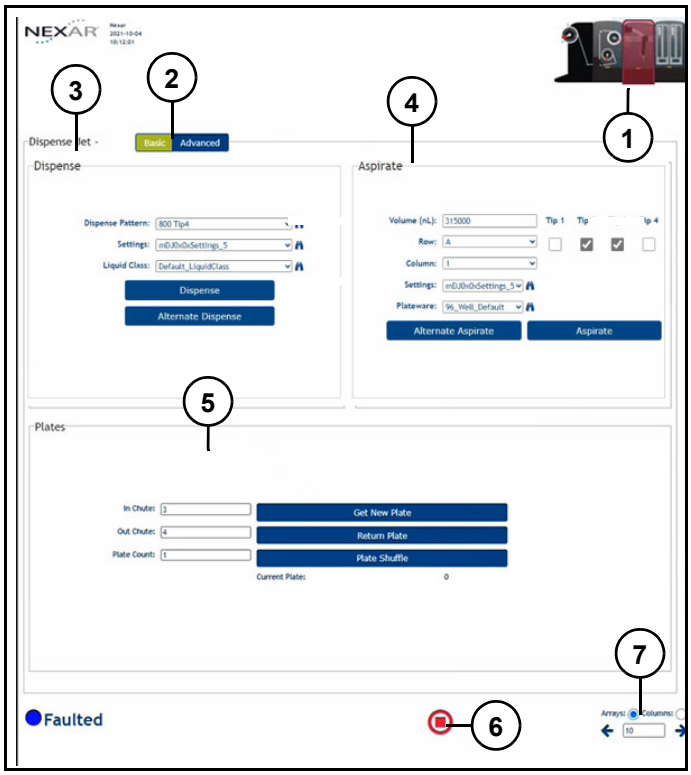


Figure 2

Refer to *(Figure 2)*.

Overview of Controls

Dispense Jet Attachment (1): Displays module status.

- Default status indicator
- Highlighted status indicator
- Faulted status indicator
- Faulted highlighted status indicator
- Highlighted blue: Module is active.
- Highlighted red: Module is faulted.

Basic/Advanced (2): Switches between basic and advanced operations pages.

Dispense (3): Displays dispense settings.

Aspirate (4): Displays aspirate settings.

Plates (5): Displays plate settings.

Abort (6): Aborts all running actions.

Arrays/Columns information (7): Displays Arrays, Columns, and number of arrays in protocol.

Dispense.

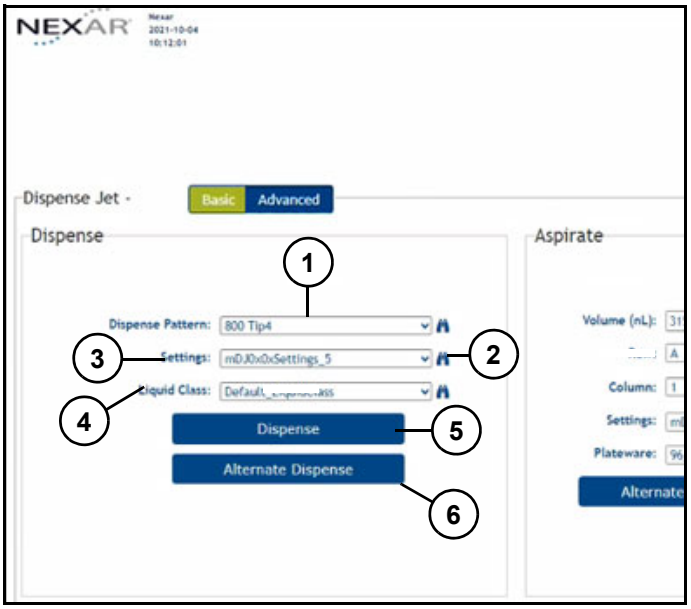


Figure 3

Refer to *(Figure 3)*.

Dispense Pattern (1): Selects dispense pattern.

Binocular icon (2): Displays settings for selected drop-down.

Settings (3): Displays and adjusts dispense pressure settings.

Liquid Class (4): Displays and adjusts liquid class settings.

Dispense (5): Initiates dispense sequence.

Alternate Dispense (6): Initiates alternate dispense sequence.

Aspirate.

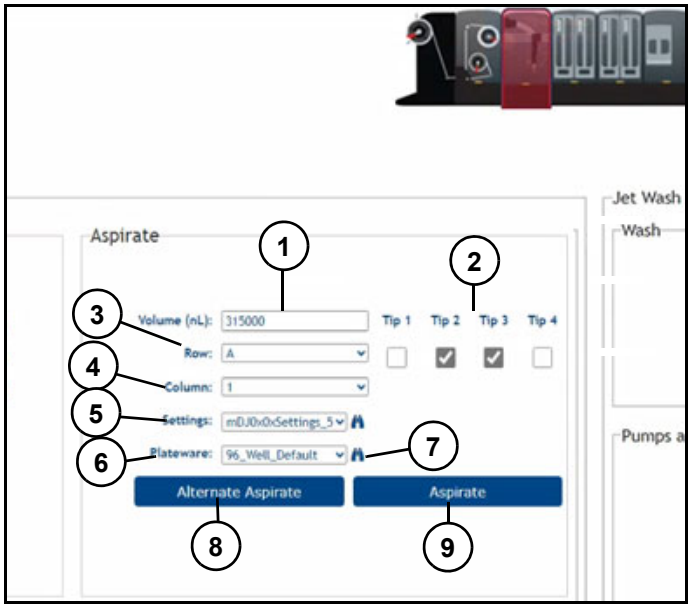


Figure 4

Refer to *(Figure 4)*.

Volume (nL) (1): Sets and displays volume aspirated from source plate.

Units	Nanoliters
Minimum	0
Default	78,800
Maximum	Varies

Tips Check Boxes (2): Selects which tip(s) should aspirate.

Row (3): Sets and displays source plate well to location from which tip 1 will aspirate.

Column (4): Sets and displays source plate column tow location from which tip 1 will aspirate.

Settings (5): Sets and displays aspiration settings.

Plateware (6): Selects plateware setting.

Binocular icon (7): Displays settings for selected drop-down.

Alternate Aspirate (8): Initiates alternate aspirate sequence.

Aspirate (9): Initiates aspirate sequence.

Plates.

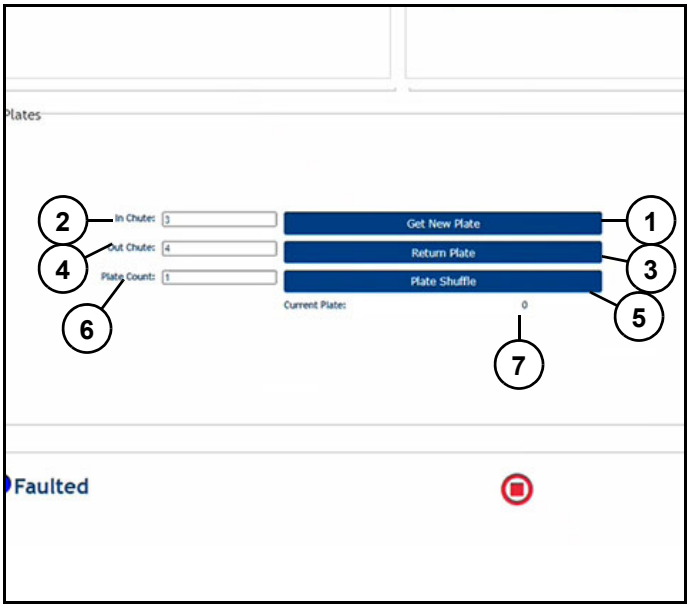


Figure 5

Refer to *(Figure 5)*.

Get New Plate (1): Initiates operation to retrieve a new plate from stack.

New plate is brought in from chute specified in In Chute (2). Plate will come down conveyor until it blocks photoeye sensor and stops at correct location.

In Chute (2): Sets and displays which chute will supply new plate. Chutes are numbered from right to left. Default setting can be specified in Dispense Jet settings.

Units	Number
Minimum	1
Default	1
Maximum	Number of chute on Instrument

Return Plate (3): Initiates operation to return plate to stack.

Plate goes down conveyor and is stacked in chute specified in Out Chute (4).

Out Chute (4): Sets and displays which chute will receive plate. Chutes are numbered from right to left.

Units	Number
Minimum	1
Default	1
Maximum	Number of chute on Instrument

Plate Shuffle (5): Initiates operation (on/off) to transfer plates between stacks.

New plate is downstacked from chute specified in Plate Count (6). Plate is transferred and upstacked to chute specified in Out Chute (4).

Plate Count (6): Displays number of plates being used.

Current Plate (7): Displays plate currently being used.

Dispense Jet screen - advanced

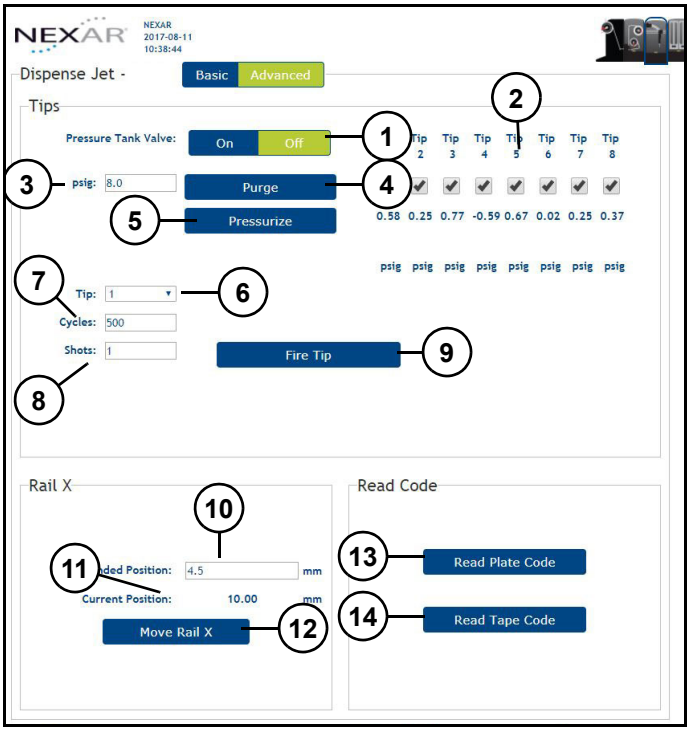


Figure 6

Refer to *(Figure 6)*.

Overview of controls

Pressure Tank Valve (1): Turns pressure tank valves on and off.

Tip 1-8 checkboxes) (2): Tip masks.

psig (3): Sets pressure.

Purge (4): Purges water from pressure tank.

Pressurize (5): Pressurises Dispense Jet system to set point.

Units	PSIG
Minimum	0
Default	8
Maximum	12

Tips (6): Selects tip(s).

Cycles (7): Selects open time of valves.

Shot (8): Number of times valve turns on/off.

Tips, Cycles, Shots text boxes

Tips		Cycles		Shots	
Units	#	Units	#	Units	#
Min.	1	Min.	1	Min.	1
Default	1	Default	40	Default	1
Max.	All	Max.	65,535	Max.	32,000

Fire Tip (9): Fires selected tips.

Command Position (10): Inputs position for X-Rail.

Current Position (11): Displays X-Rails current position.

Move Rail X (12): Moves X-Rail to displayed command position.

Read Plate Code (13): Moves Dispense Jet to read plate code.

Read Code (14): Moves Dispense Jet to read Array Tape code.

Faults screen

Notice

Before resetting a fault be sure condition is corrected.

For fault list See "Dispense Jet Attachment_DJ1212 troubleshooting" on page 134.

For fault descriptions See "Dispense Jet Attachment_DJ1212 troubleshooting" on page 134.

For handling faults See "General fault recovery procedure" on page 25.

Purging pressure tank

Pressure tank is an air reservoir. Over time, water will creep in and air will leak out, causing a loss in reservoir capacity.

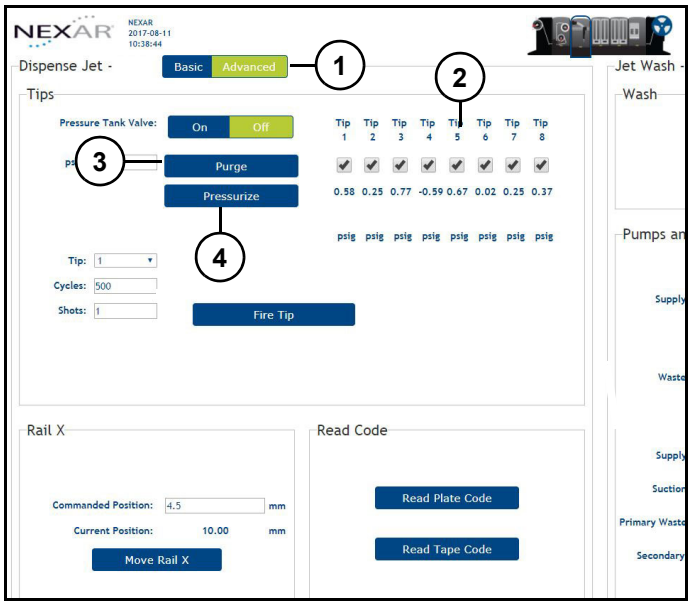


Figure 7

Refer to *(Figure 7)*.

1. Click "Advanced" (1).
2. Select tips to purge (2).
3. Click "Purge" (3). Metering pump will remove water from pressure tube then expel through all four tips. Cycle is repeated five times.
4. Repeat process, if needed, until pressure reservoir is completely purged of water.
5. Click "Pressurize" (4) to return system to proper function.

Ethanol washing tips

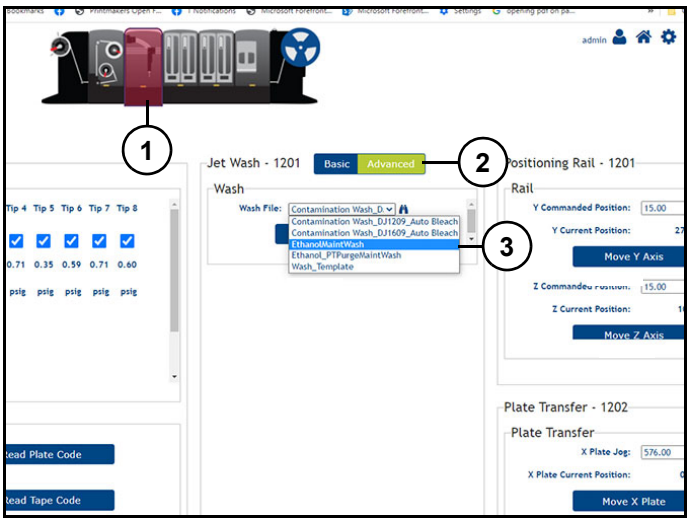


Figure 8

Refer to *(Figure 8)*.

1. Select "DJ Attachment" (1)
2. Click "Advanced" (2).
3. Select "EthanolMaintWash" (3) from drop-down.

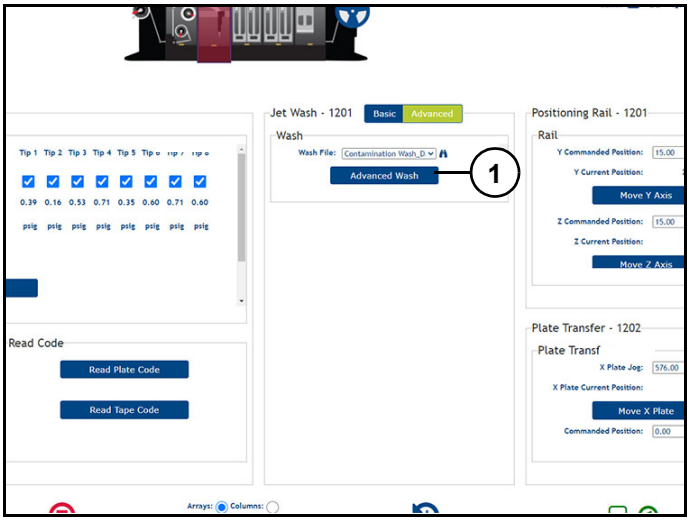


Figure 9

Refer to *(Figure 9)*.

4. Click "Advanced Wash" (1).

Creating new Dispense Jet settings

Users with administrator privileges can create new Dispense Pipette settings file.

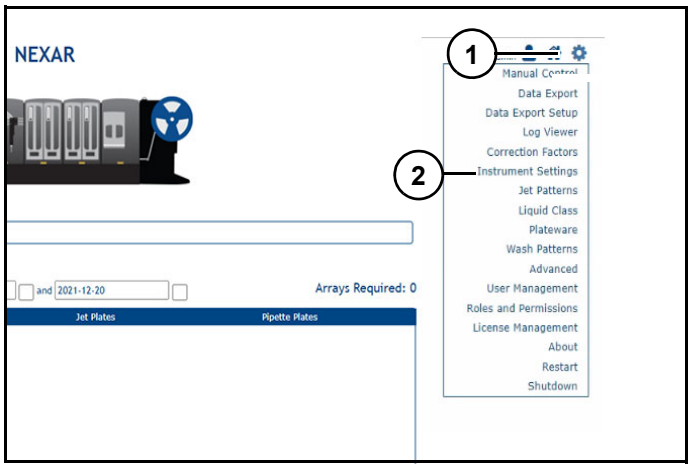


Figure 10

Refer to *(Figure 10)*.

1. Click "Settings" icon (1).
2. Click "Instrument Settings" (2).

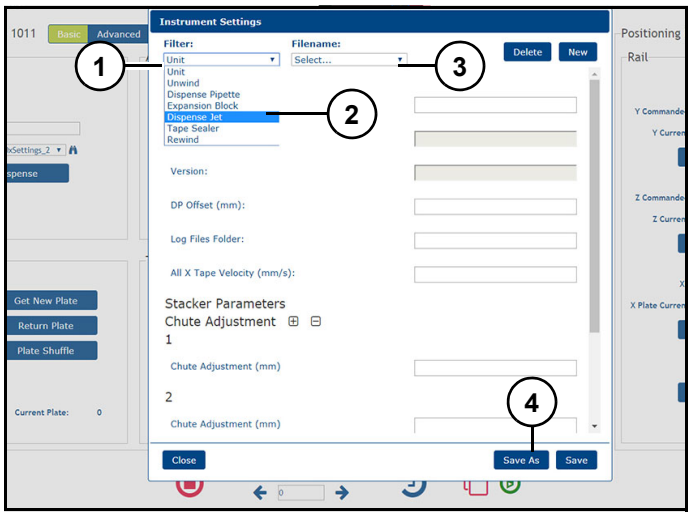


Figure 11

Refer to *(Figure 11)*.

3. Click "Filter" drop-down (1).
4. Select "Dispense Jet" (2).
5. Click "New" (3).
6. Enter desired settings on setting screen.
7. Click "Save As" (4).

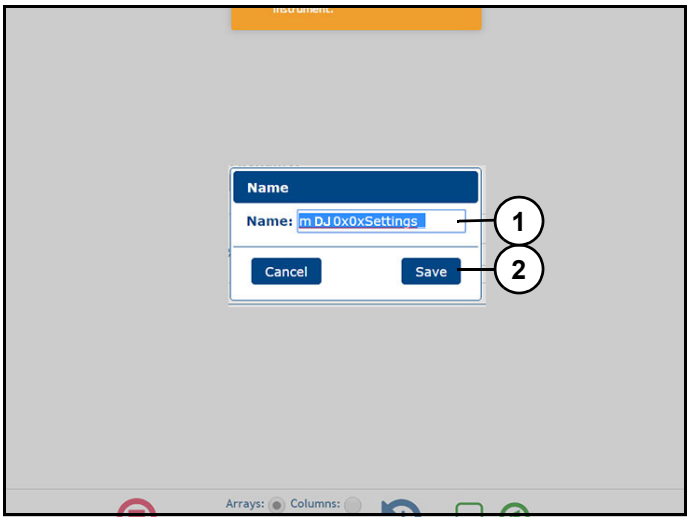


Figure 12

Refer to *(Figure 12)*

8. Enter "Name" (1) of new setting.
9. Click "Save" (2).

Note: Click "Cancel" to exit without saving new file.

Adjusting Dispense Jet settings

Users with administrator privileges can change Dispense Jet parameters using Settings file.

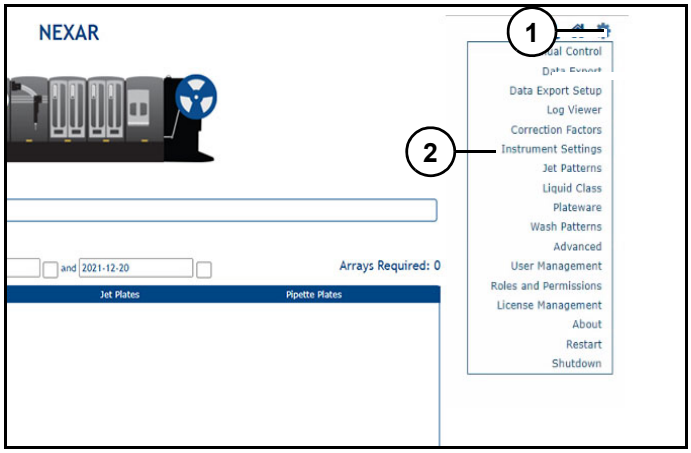


Figure 13

Refer to *(Figure 13)*.

1. Click "Settings" icon (1).
2. Click "Instrument Settings" (2).

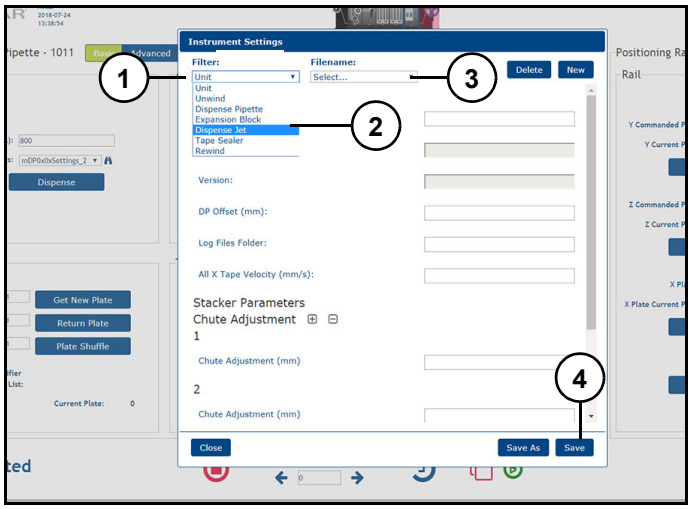


Figure 14

Refer to *(Figure 14)*.

3. Click "Filter" drop-down (1).
4. Select "Dispense Jet" (2).
5. Select "Filename" drop-down (3) and select file to edit.
6. Adjust desired settings on setting screen.
7. Click "Save" (4) to save changes.

Deleting Dispense Jet settings

Users with administrator privileges can change Dispense Jet parameters using Settings file.

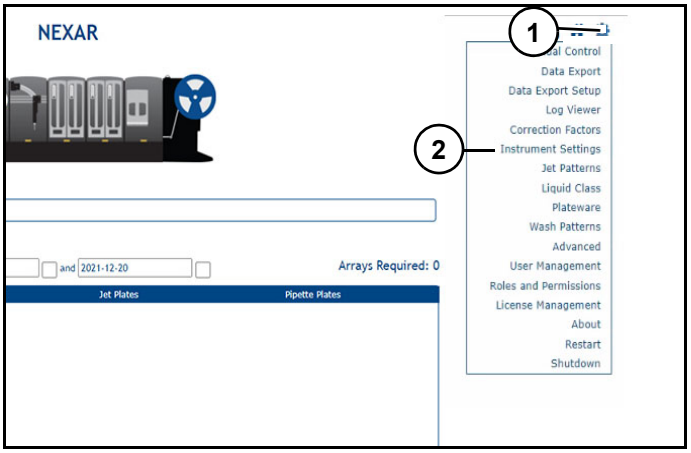


Figure 15

Refer to *(Figure 15)*.

1. Click "Settings" icon (1).
2. Click "Instrument Settings" (2).

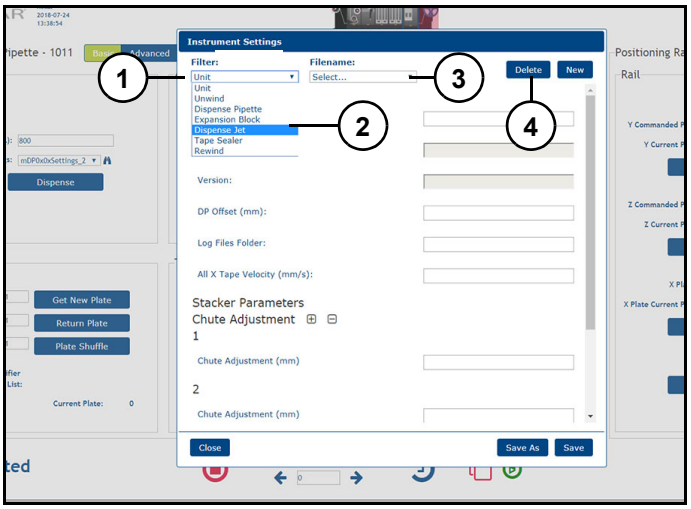


Figure 16

Refer to *(Figure 16)*.

3. Click "Filter" drop-down (1).
4. Select "Dispense Jet" (2).
5. Select "Filename" drop-down (3) and select file to delete.
6. Click "Delete" (4).
7. Click "Yes" (NS) to delete settings file.

Setting descriptions

Dispense Tip 1 Y Offset: Offset in Y direction for tip 1 to start its dispense operation. Units: mm.

Rail X Dispense Offset: Offset in X direction for start of dispense operation (if DPOffset from UnitSettings.xml is zero). Units: mm.

RailX Wash Offset: Offset position head over wash station in X direction. Units: mm.

Y Dispense Velocity: Y direction speed of head during a dispense operation. Units: mm/s.

Y Wash Offset: Offset to position head over wash station in Y direction. Units: mm.

Y Torque Limit: Torque limit for Y rail units: Measured Drive amperage in counts.

Code Y Position: Position in Y direction to read Array Tape code. Units: mm.

Code Z Position: Position in Z direction to read Array Tape code. Units: mm.

ZTipOffset: Offset used for compensating for Z positions based on dispense tip length. Used in Dispense, Aspirate, and Wash Units: mm.

ZWash Offset: Offset defining Z where positions combined with ZTipOffset. Units: mm.

ZTorque Limit: Torque limit for Z rail units: Measured drive amperage in counts.

Run Continuous Bit: Define if sequential basic mode recipes should use new plates or continue to use current plate.

Continuous Pressurize: Define if pressurise function should run during dispensing or only before and after dispense action.

In Chute ID: Define chute where manager should pull plates from.

Out Chute ID: Defines chute where manager should return plates to.

Plate Dump: Define direction that plate dump chute is from the manager +1 is down stream -1 is upstream.

Error Mode: Define error that should display if an Array Tape code does not match expected recipe Array Tape code "CheckRecipe" or previous managers stored Array Tapebar code "CheckArray".

Slot Sense: Define if Array Tape slot sensor is present in this module, for use with heated path only.

Plate Reposition: Define if plate should be repositioned each time an aspiration action occurs.

Restrictor Plate Operation: Define if automated restrictor plate will be used in aspiration action will move restrictor plate into position during aspiration sequence.

Pump Parameters: Torque limit for X rail Units: Measured drive amperage in counts.

Sampling Rate: Define number of task cycles to sample while scanning in time mode.

Tips 1-8.

- Volume Factor: Sets tip dispense volume.
- Forward Position Offset: Sets tip forward position.
- Backward Position Offset: Sets tip backward position.

Faults

Settable priority

PlateCodeMatch: Plate code does not match code identified in recipe.

PlateCodeRead: Plate barcode was not captured.

CodeArrayMatch: Upstream barcode reader scanned doesn't match barcode scanned.

CodeCheckPrevious: code out of sequence.

CodeRead: code was not captured.

Code3NoReads: Reader missed more than three barcodes in a row, check camera or barcodes.

CodeRecipeMatch: Recipe barcode doesn't match scanned.

CodeOrientation: Orientation of does not match what is expected.

Pause faults

CheckDispenseVolumeFactorsFile: Dispense Volume Factor file is missing or incorrect.

CheckLiquidClassFile: Liquid class file is missing or incorrect.

CheckPatternFile: Required jet pattern is missing.

CheckPlatewareFile: Required plate ware is missing.

CheckRecipeFile: Recipe file is incorrect.

CheckSettingsFile: Settings file may be missing or incorrect.

CheckUsageFile: Usage file is may be missing or incorrect.

ArrayFault: User added fault to Array Tapemode recipe.

Plate faults

PlateInFault: Plate was not successfully delivered from chute.

PlateTransfer: Plate failed to transfer from plate stacker on chute.

Stop: Plate failed to stop.

CheckPlateSize: Plate size does not match expected length.

MearsurementPosition: Plate failed to position.

NoClearedPlate: No plate from clear position.

ClearedPlateTransfer: Plate failed to transfer from plate stacker.

ClearedPlateStop: Plate failed to stop.

ClearedPlatePosition: Plate was not cleared successfully from conveyor.

PlateClear: Plate was not cleared successfully from conveyor.

PlateInShuffleCycle: Plate in shuffle failed on cycle of cycle(s) in chute.

PlateInShuffleCycle: Plate out shuffle failed on cycle of cycle(s) in chute.

PlateReturn: Plate failed to return to chute.

PlateNoDump: No plate on deck to dump.

Abort faults

YTorqueLimitFault: y-axis at position reached torque value.

ZTorqueLimitFault: z-axis at position reached torque value.

Calibrating a given dispense volume

Procedure is needed to account for different liquid properties. Volume dispensed into Array Tape depends on two system parameters - **<DispensePressure>** and **<DispenseValveOpenWidth>**. Same set of parameters will not work for every liquid encountered; therefore, calibration is necessary when changing liquids.

The **<DispensePressure>** and **<DispenseValveOpenWidth>** parameters work together and must be adjusted together to achieve desired result.

<DispensePressure> - Pressure propels liquid out of dispense tips. A higher pressure means a greater liquid velocity through tips. If liquid clinging at tips is observed, it is typically a sign of pressure that is too low. If pressure is too high, liquid will splash out of wells.

<DispenseValveOpenWidth> – Pressure Parameter changes time dispense valve stays open. Longer open time results in more volume dispesnsed at adjusted pressure. Maximum amount of time that valve can stay open is limited by speed of y-axis and amount of dispense pressure.

1. Ensure all utilities are connected.
2. Ensure Array Tape is loaded.
3. Synchronise drive and ensure Array Tape is advanced to dispense position.

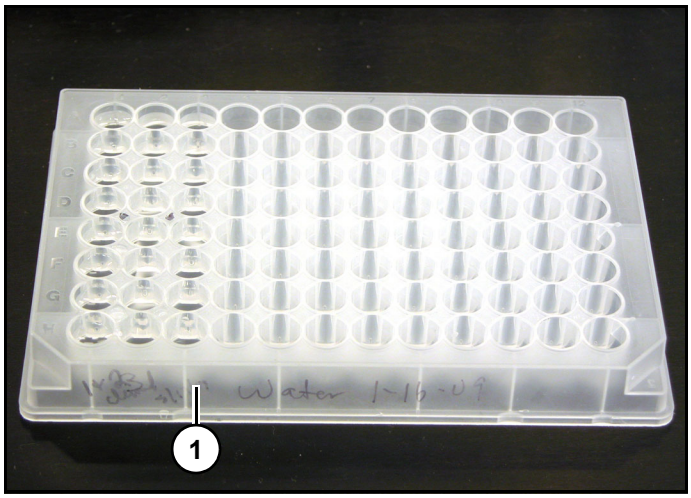


Figure 17

4. Prepare source plate (1) *(Figure 17)* with desired liquid at required volumes.
5. Load source plate in chute identified.
6. Ensure instrument is in Idle state.

Figure 18

Refer to *(Figure 18)*.

7. Click "Get New Plate" (1) to receive prepared source plate.
8. Click "Wash Tips" (2) to wash tips multiple times.

Note: Ensure there are no air bubbles in dispense tubes. If bubbles are present wash again.

9. In "Liquid Class File Settings", choose a suitable setting for <AirGapVolume> parameter. See "Note: Click "Cancel" to exit without saving new file." on page 126.

Note: This setting will depend on liquid and air gap size needed to separate liquids. Excessive air gaps will negatively effect dispense accuracy.

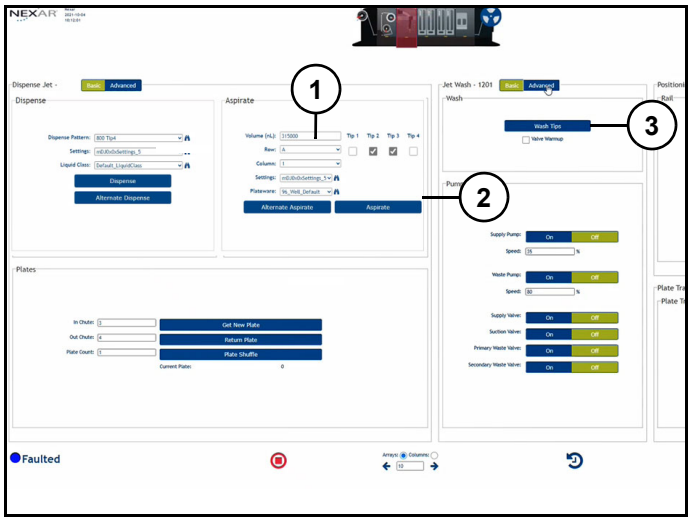


Figure 19

Refer to *(Figure 19)*.

10. In "Volume" (1) enter a small volume.

Note: Only enough liquid is needed so air gap is visible in beginning of tube. This will be final ending point for air gap.

11. Click "Aspirate" (2) and check air gap location when operation is finished.

12. If incorrect, repeat steps 8 through 11 until correct. Once correct, click "Wash Tips" (3) to empty dispense tips and tubes.

13. Add previous volume amount to volume amount needed to dispense.

14. Enter this new number into "Volume" (1).

15. Click "Aspirate" (2), air gap will rise farther up into tube.

Example: Volume is 65,000 nL. Reagent volume per well is 800 nL. Desired total dispense volume would be the volume per well multiplied by number of wells, which is 800 x 384 = 307,200 nL. Therefore, volume to enter for Step 14 would be 307,200 nL + (Predispense Volume x 2 x PrimaryPreDispenseCount)+Predispence Volume x SecondaryPreDispenseCount+ 65,000 nL (for maintaining the air gap above the valve) = 372,200 nL.

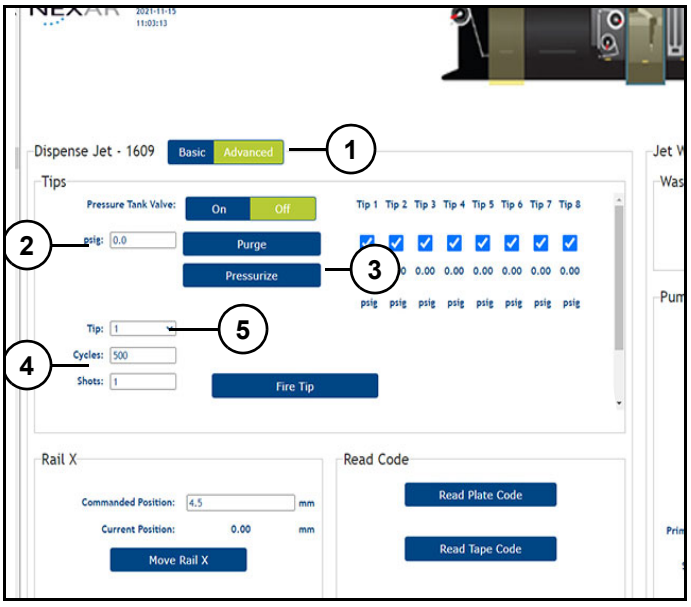


Figure 20

Refer to *(Figure 20)*.

16. Click "Advanced" (1).

17. Enter desired amount into "psig" (1).

18. Click "Pressurize" (3).

19. Set "Cycles" (4) to a suitable setting.

Note: Example for distilled water: A suitable pressure setting would be 1.2-1.8 psig and a suitable number of cycle settings would be 850.

20. Choose desired tip (5), if manual dispense.

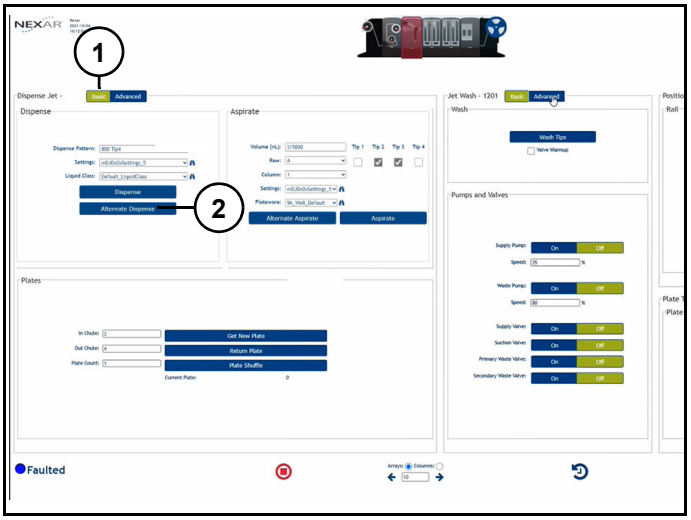


Figure 21

Refer to *(Figure 21)*.

21. Click "Basic" (1).

22. Click "Dispense" (2).

23. Check location of air gap in tube of tip selected. If air gap is not at correct ending point (as it was in Step 8), change value in "Cycles" (4) *(Figure 20)*.

24. Repeat steps 5 through 8, choosing next available tip. Repeat these steps until correct volumes are achieved. This process may require multiple wash and aspirate operations before results are successful.

25. Once correct, enter final setting into <DispensePressure> and <DispenseValveOpenWidth> parameters of Liquid Class File Settings.

Note: Volumes will be approximate.

Maintenance

Notice

When replacing tips of different lengths, change <ZTipOffset> parameter in _MGR_DJ1212 settings to avoid accidents. Refer to Handling Faults section.

- Replace tips when damaged.
- Refer to Microscan user's OEM manual for 2D/ Bar Code Reader maintenance.
- Perform an 70% ethanol wash when not running instrument for a period of time.

Replacing Dispense Jet tips

Tools required:

- Jet tip torque wrench (Provide by Biosearch Technologies).

Notice

The plastic valve nut (1) *(Figure 22)* that holds tip is very delicate. Use caution when engaging or disengaging torque wrench to avoid damage.

When removing tips, always start with front tip (2) *(Figure 22)* to avoid damaging tips.

When installing new tips, always start with back tip (3) *(Figure 22)* to avoid damaging tips.

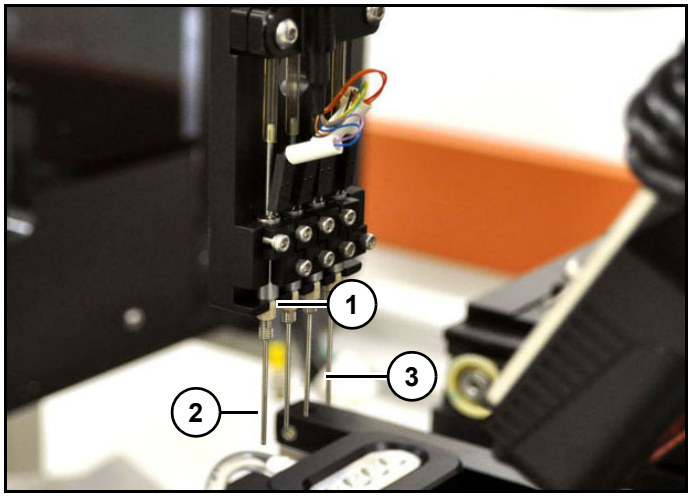


Figure 22

1. Gently loosen tip 4 (2) *(Figure 22)* by hand, turning counter-clockwise. If tip is screwed in too tight use provided torque wrench to loosen and then un-thread and remove by hand.
2. Loosen tip 3, tip 2, and then tip 1, using same procedure.

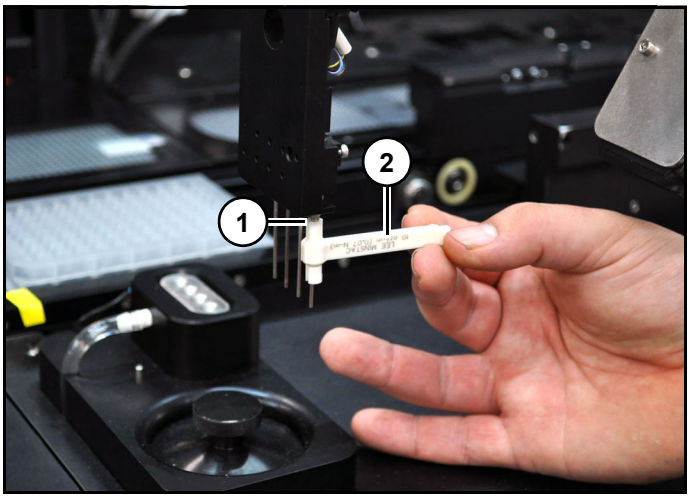


Figure 23

Refer to *(Figure 23)*.

3. By hand, gently start to thread tip 1 into plastic nut on dispense head.
4. Carefully place torque wrench (2) onto tip and tighten.

Note: Make sure tips are not crooked, this will damage tips.

5. Place and tighten tip 2, tip 3, and tip 4 using same procedure.

Dispense Jet Attachment_DJ1212 troubleshooting

Notice
Before attempting any fault solution, refer to Handling Faults section. Colours Red: Safety fault Yellow: Uncontrolled fault other than safety Blinking blue: Faulted (controlled) Blue: Recovering Green: Running Black: Initialising

Manager fault messages

Settable priority	Cause	Solution
PlateCodeMatch:	Plate code doesn't match expected platecode.	Ensure plates are loaded in correct order. Verify that Array Tape wasn't advanced manually during protocol, adjust forward or backwards 1 Array Tapeand try to resume.
PlateCodeRead:	Plate barcode was unable to be captured.	Camera read position may need to be optimised. Camera setting may need to be adjusted. Ensure there is no glare on area of interest.
CodeArrayMatch:	Upstream barcode reader scanned doesn't match barcode scanned.	Verify that Array Tape wasn't advanced manually during protocol, adjust forward or backwards and try to resume.
CodeCheckPrevious:	Code out of sequence.	Verify that Array Tape wasn't advanced manually during protocol, adjust forward or backwards and try to resume.
CodeRead:	Code was unable to be captured.	Camera read position may need to be optimised. Camera setting may need to be adjusted using "ESP" software. Ensure there is no glare on area of interest.
Code3NoReads:	Reader missed more than three barcodes in a row, check camera or barcodes.	Camera read position may need to be optimised. Camera setting may need to be adjusted using "ESP" software. Camera may need to be replaced.
CodeRecipeMatch:	Recipe barcode doesn't match scanned.	Ensure is aligned to the correct array. May have incorrect spool of Array Tape loaded on instrument.
CodeOrientation:	Orientation of does not match what is expected.	May need to be reversed and then resume protocol. Check protocol logic under "<Orientation>XXX</Orientation>" 0 is forward, 180 is backwards.

Pause faults	Cause	Solution
CheckDispenseVolumeFactorsFile:	Dispense Volume Factor file is missing or incorrect.	Verify file exists and that it is not corrupted.
CheckLiquidClassFile:	Liquid class file is missing or incorrect.	Verify file exists and that it is not corrupted.
CheckPatternFile:	Required jet pattern is missing.	Verify file exists and that it is not corrupted.
CheckPlatewareFile:	Required plate ware is missing.	Verify file exists and that it is not corrupted.
CheckRecipeFile:	Recipe file is incorrect, please check file for incorrect structure.	Verify file exists and that it is not corrupted.
CheckSettingsFile:	Settings file may be missing or incorrect.	Verify file exists and that it is not corrupted.
CheckUsageFile:	Usage file is may be missing or incorrect.	Verify file exists and that it is not corrupted.
ArrayFault:		User added fault to Array Tapemode recipe.

Plate faults	Cause	Solution
PlateInFault:	Plate was not successfully delivered from chute.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.
PlateTransfer:	Plate failed to transfer from plate stacker on chute.	Check transfer path.
Stop:	Plate failed to stop.	Check photo eye.
CheckPlateSize:	Plate size does not match expected length.	Check photo eye and transfer deck.
MearsurementPosition:	Plate failed to position.	Verify plate is not caught on transfer deck.
NoClearedPlate:	No plate from Clear Position.	Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path and verify Plate is present.
ClearedPlateTransfer:	Plate failed to transfer from the plate stacker.	Check transfer path.
ClearedPlateStop:	Plate failed to stop.	Check photo eye.
ClearedPlatePosition:	Plate was not cleared successfully from conveyor.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.

Plate faults	Cause	Solution
PlateClear:	Plate was not cleared successfully from conveyor.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.
PlateInShuffleCycle:	Plate in shuffle failed on cycle of cycle(s) in chute.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.
PlateInShuffleCycle:	Plate out shuffle failed on cycle of cycle(s) in chute.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.
PlateReturn:	Plate failed to return to chute.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.
PlateNoDump:	No plate on deck to dump.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.

Abort faults	Cause	Solution
YTorqueLimitFault:	y-axis at position reached torque value.	Check for obstructions in the "front to back" path way of head. Ensure rail is properly lubricated. May need to adjust torque settings.
ZTorqueLimitFault:	z-axis at position reached torque value.	Check for obstructions in the "up and down" path way of head. Ensure rail is properly lubricated. May need to adjust torque settings.

Module fault messages

Abort faults	Cause	Solution
RAILXDRIVE	Possible problem with Rail X drive system.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.
RAILXHOMEFAULT	Rail X is unable to home.	Ensure drive can move, check drive for obstructions, clear as necessary. Check proximity sensor for damage and ensure it has power.
_BK1120_COUPLER_STATE	Error on BK1120 Beckhoff card.	Run diagnostics and look for CRC errors and for cards not in OP mode, check card for power, try and reseat card.
_BK1120_STATE	State change on BK1120 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_BK1120_WCSTATE	Working counter error on BK1120 Beckhoff card.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_EK1100_STATE	State change on EK1100 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_EK1100_STATE	State change on EK1100 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_EK1100_WCSTATE	Working counter error on EK1100 Beckhoff card.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_420_EL2262_STATE	State change on EL2262 Beckhoff card at terminal 42.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_420_EL2262_WCSTATE	Working counter error on EL2262 Beckhoff card at terminal 42.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_430_EL2262_STATE	State change on EL2262 Beckhoff card at terminal 43.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_430_EL2262_WCSTATE	Working counter error on EL2262 Beckhoff card at terminal 43.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_420_EL2004_STATE	State change on EL2004 Beckhoff card at terminal 42.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_420_EL2004_WCSTATE	Working counter error on EL2004 Beckhoff card at terminal 42.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_430_EL2004_STATE	State chance on EL2004 Beckhoff card at terminal 43.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.

Abort faults	Cause	Solution
_430_EL2004_WCSTATE	Working counter error on EL2004 Beckhoff card at terminal 43.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

DJ1212 fault	Cause	Solution
_512_PWS_1235_FUSE_CHECK	Fuse on FlexJet power supply may be blown.	Check fuse inside Flexjet to see if indicator light is on, replace fuse.

4 channel fault	Cause	Solution
_220_EK1100_STATE	State change on EK1100 Beckhoff card at terminal 22.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_310_EL2262_STATE	State change on EL2262 Beckhoff card at terminal 31.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_310_EL2262_WCSTATE	Working counter error on EL2262 Beckhoff card at terminal 31.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_320_EL2262_STATE	State change on EL2262 Beckhoff card at terminal 32.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_320_EL2262_WCSTATE	Working counter error on EL2262 Beckhoff card at terminal 32.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_330_EL2024_STATE	State change on EL2024 Beckhoff card at terminal 33.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_330_EL2024_WCSTATE	Working counter error on EL2024 Beckhoff card at terminal 33.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_340_EL2024_STATE	State change on EL2024 Beckhoff card at terminal 34.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_340_EL2024_WCSTATE	Working counter error on EL2024 Beckhoff card at terminal 34.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_410_EL3104_STATE	State change on EL3104 Beckhoff card at terminal 41.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_410_EL3104_WCSTATE	Working counter error on EL3104 Beckhoff card at terminal 41.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

4 channel fault	Cause	Solution
_420_EL6001_STATE	State change on EL6001 Beckhoff card at terminal 42.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.v
_420_EL6001_WCSTATE	Working counter error on EL6001 Beckhoff card at terminal 42.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_430_EL7041_STATE	State change on EL7041 Beckhoff card at terminal 43.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_430_EL7041_WCSTATE	Working counter error on EL7041 Beckhoff card at terminal 43.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

8 channel fault	Cause	Solution
_610_EK1100_STATE	State change on EK1100 Beckhoff card at terminal 61.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_620_EL2262_STATE	State change on EL2262 Beckhoff card at terminal 62.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_620_EL2262_WCSTATE	Working counter error on EL2262 Beckhoff card at terminal 62.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_630_EL2262_STATE	State change on EL2262 Beckhoff card at terminal 63.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_630_EL2262_WCSTATE	Working counter error on EL2262 Beckhoff card at terminal 63.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_640_EL2024_STATE	State change on EL2024 Beckhoff card at terminal 64.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_640_EL2024_WCSTATE	Working counter error on EL2024 Beckhoff card at terminal 64.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_710_EL2024_STATE	State change on EL2024 Beckhoff card at terminal 71.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_710_EL2024_WCSTATE	Working counter error on EL2024 Beckhoff card at terminal 71.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_720_EL3104_STATE	State change on EL3104 Beckhoff card at terminal 72.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.

8 channel fault	Cause	Solution
_720_EL3104_WCSTATE	Working counter error on EL3104 Beckhoff card at terminal 72.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

Pumpnumber in string	Cause	Solution
EL7031_STATE_PUMP	State change on EL7031 Beckhoff card pump(s).	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
EL7031_WCSTATE_PUMP	Working counter error on EL7031 Beckhoff card pump(s).	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
MeteringDrive	Possible problem with metering pump drive(s).	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.
PressureLimitPump	Pressure is reading too high on DJ pump(s).	Try to PT Purge system. Ensure pressure reading is within normal reading range on HMI. Ensure pressure reading moves during pressurisation. Ensure electrical connections are good.
MeteringPumpHomeFault	Metering pump was unable to home.	Ensure drive can move, check drive for obstructions, clear as necessary. Check prox sensor for damage and ensure it has power.
WashPressureLimitPump	Pressure limit was reached during wash on tip.	Ensure pressure reading is within normal reading range on HMI. Wash speed may be too fast. Dispense Jet tip may be plugged.
PressurizeTimeOutPump	Failed to reach pressure on pump(s).	Try to PT Purge system. Ensure pressure reading is within normal reading range on HMI. Ensure pressure reading moves during pressurisation. Ensure electrical connections are good.

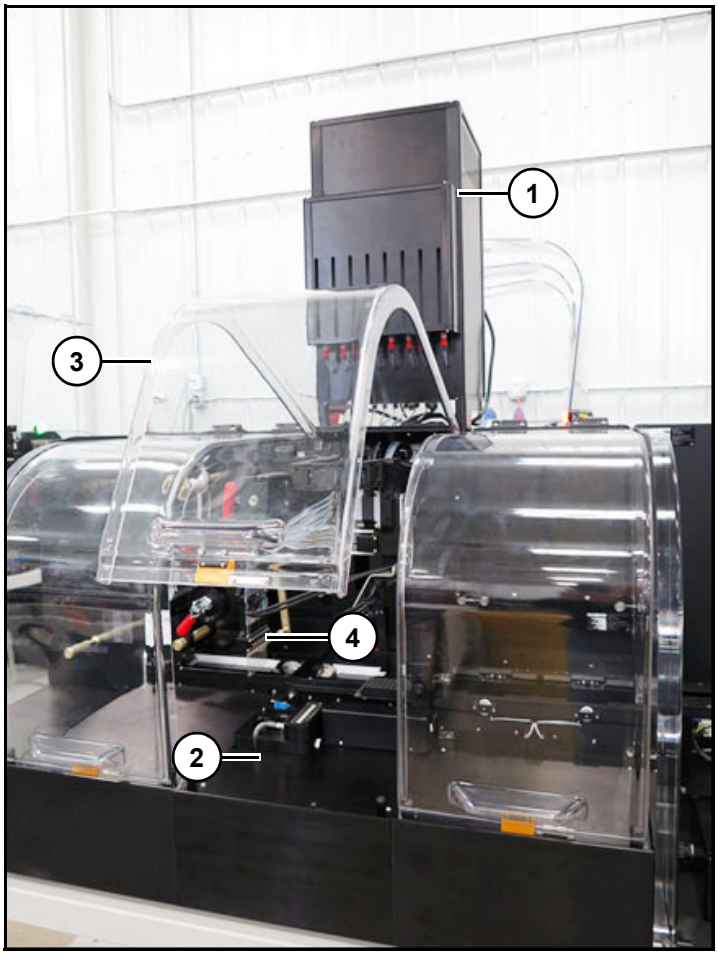
Dispense Jet_DJ1609

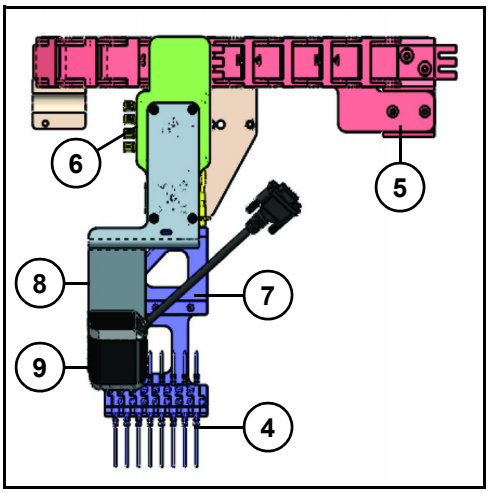
⚠WARNING

Read and understand equipment operators manual before operating or performing maintenance. Failure to do so could result in serious injury or death.

Component identification

FlexJet Attachment





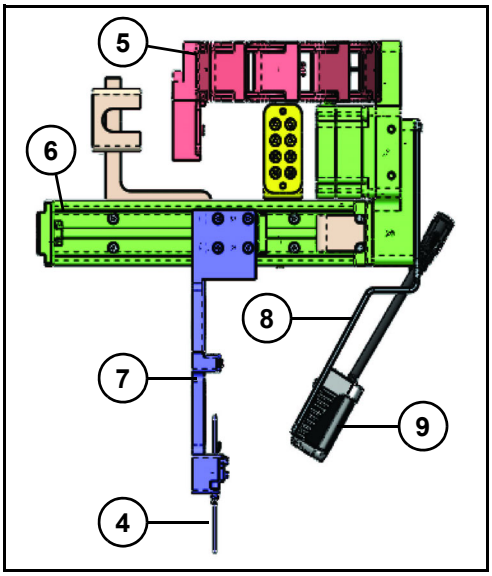


Figure 24

REF #	DESCRIPTION	REF #	DESCRIPTION
1	Pump Housing	7	FlexJet Mount
2	FlexJet Manager	8	Microscan Mount
3	Guard Door	9	Microscan
4	Eight Tip FlexJet Assembly		
5	E-Chain Assembly		
6	X-Axis Rail Assembly		

Dispense Jet_DJ1609 manager controls

Notice

Controls on Auto Screen can only be activated when instrument is in an idle state.

If a change is made to Manager Settings file (See Manager Settings section) it only takes effect after a pause and idle action is performed (See Getting Started section).

Dispense Jet screen - Basic

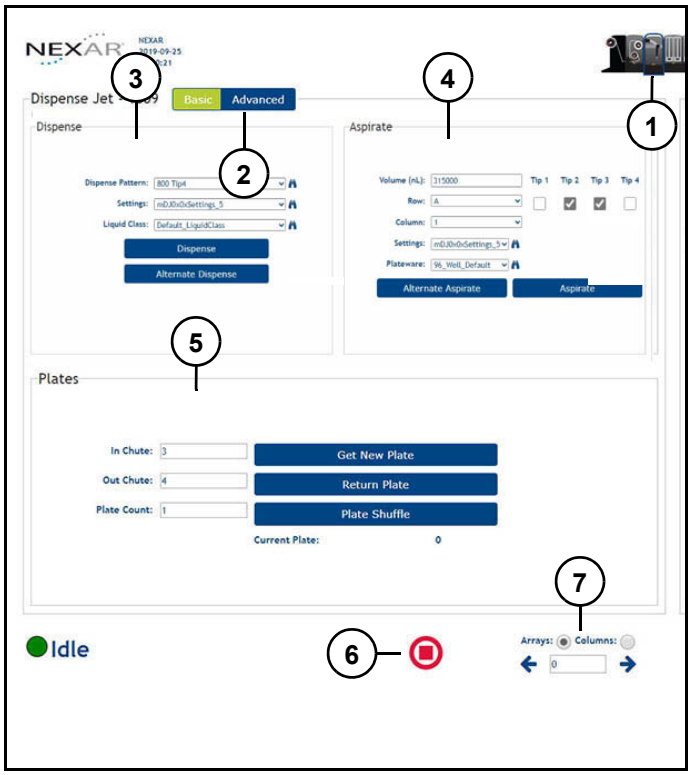


Figure 25

Refer to *(Figure 25)*.

Overview of controls

Dispense Jet (1): Displays module status.

- Default status indicator.
- Highlighted status indicator.
- Faulted status indicator.
- Faulted highlighted status indicator.
- Highlighted blue: Module is active.
- Highlighted red: Module is faulted.

Basic/Advanced (2): Switches between basic and advanced operations pages.

Dispense (3): Displays dispense settings.

Aspirate (4): Displays aspirate settings.

Plates (5): Displays plate settings.

Abort (6): Aborts all running actions.

Arrays/Columns (7): Displays Arrays, Columns, and number of arrays in protocol.

Dispense.

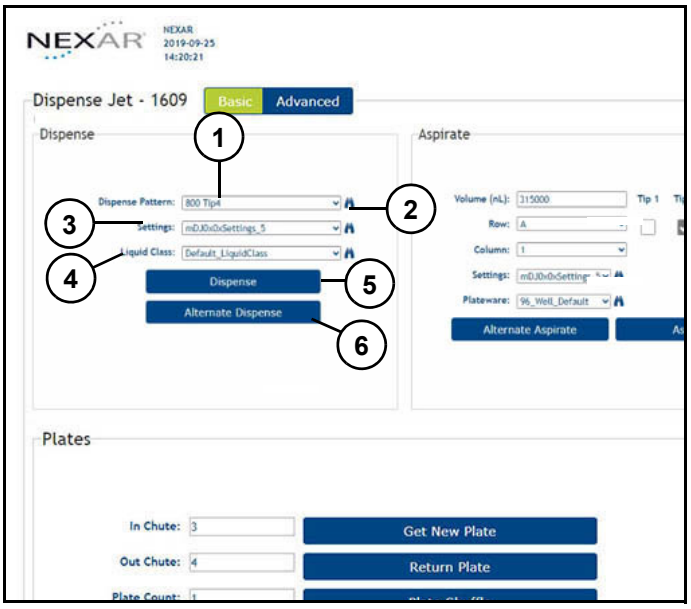


Figure 26

Refer to *(Figure 26)*.

Dispense Pattern (1): Selects dispense pattern.

Binocular icon (2): Displays settings for selected drop-down.

Settings (3): Displays and adjusts dispense pressure settings.

Liquid Class (4): Displays and adjusts liquid class settings.

Dispense (5): Initiates dispense sequence.

Alternate Dispense (6): Initiates alternate dispense sequence.

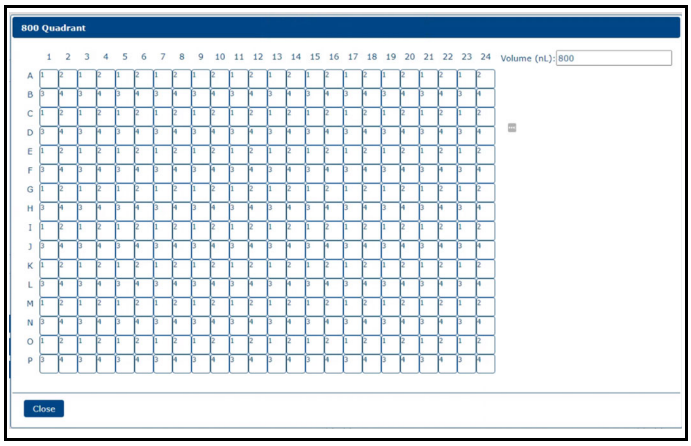


Figure 27

Array Tape Quadrant Diagram *(Figure 27)*.

Pattern text box (5): Dispenses 384-well Array Tape according to a given pattern, defined in pattern file list in .xml format.

When Pattern mode is selected, Pattern text box pops up, showing available pattern files. User can double-click any available pattern file.

Aspirate.

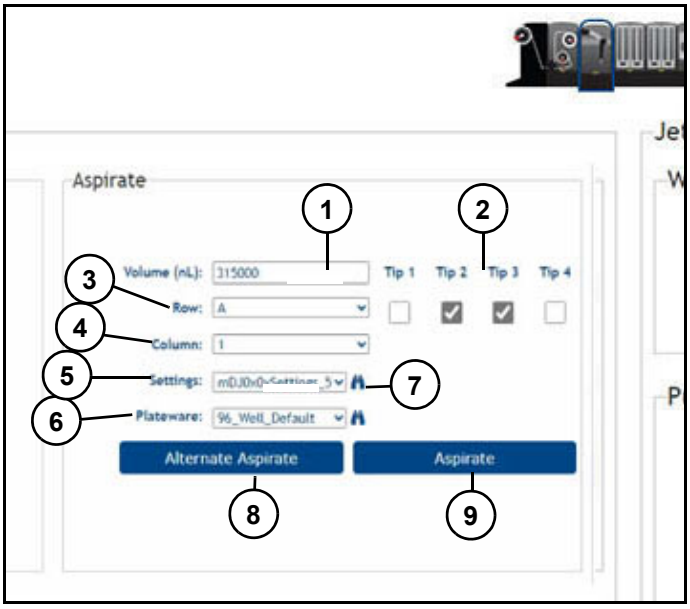


Figure 28

Refer to *(Figure 28)*.

Volume (nL) (1): Sets and displays volume aspirated from source plate.

Units	Nanoliters
Minimum	0
Default	78,800
Maximum	500,000

Tips Check Boxes (2): Selects which tip(s) should aspirate.

Row (3): Sets and displays source plate well to location from which tip 1 will aspirate.

Column (4): Sets and displays source plate column tow location from which tip 1 will aspirate.

Settings (5): Sets and displays aspiration settings.

Plateware (6): Selects plateware setting.

Binocular icon (7): Displays settings for selected drop-down.

Alternate Aspirate (8): Initiates alternate aspirate sequence.

Aspirate (9): Initiates aspirate sequence.

Plates.

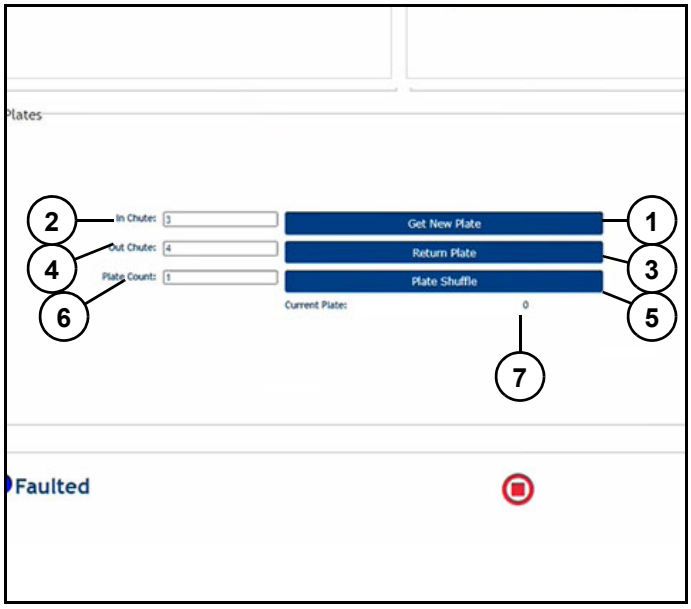


Figure 29

Refer to *(Figure 29)*.

Get New Plate (1): Initiates operation to retrieve a new plate from stack.

New plate is brought in from chute specified in In Chute (2). Plate will come down conveyor until it blocks photoeye sensor and stops at correct location.

In Chute (2): Sets and displays which chute will supply new plate. Chutes are numbered from right to left. Default setting can be specified in Dispense Jet settings.

Units	Number
Minimum	1
Default	1
Maximum	Number of chute on Instrument

Return Plate (3): Initiates operation to return plate to stack.

Plate goes down conveyor and is stacked in chute specified in Out Chute (4).

Out Chute Destination (4): Sets and displays which chute will receive plate. Chutes are numbered from right to left.

Units	Number
Minimum	1
Default	1
Maximum	Number of chute on Instrument

Plate Shuffle (5): Initiates (on/off) operation to transfer plates between stacks.

New plate is downstacked from chute specified in Plate Count (6). Plate is transferred and upstacked to chute specified in Out Chute (4).

Plate Count (6): Displays number of plates being used.

Current Plate (7): Displays plate currently being used.

Dispense Pipette screen advanced

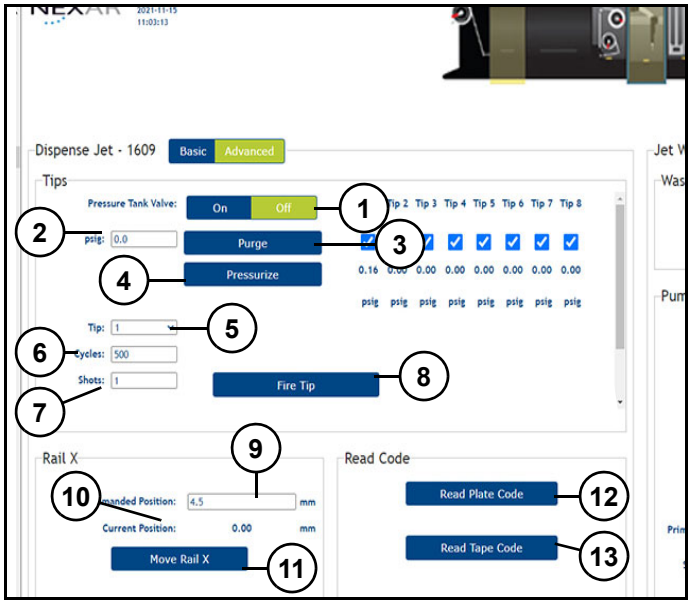


Figure 30

Refer to *(Figure 30)*.

Overview of controls

Pressure Tank Valve (1): Turns pressure tank valves on and off.

psig (2): Sets and displays purge pressure.

Purge (3): Purges water from pressure tank.

Pressurize (4): Pressurises DJ system to set point.

Units	PSIG
Minimum	0
Default	8
Maximum	12

Tips (5): Selects tip(s) to purge.

Cycles (6): Selects open time of valves.

Shots (7): Number of times valve turns on/off.

Tips, cycles, shots text boxes

Tips		Cycles		Shots	
Units	#	Units	#	Units	#
Min.	1	Min.	1	Min.	1
Default	1	Default	40	Default	1
Max.	5-Fires all tips at once	Max.	65,535	Max.	32,000

Fire Tip (8): Fires selected tips.

Command Position (9): Inputs position for X-Rail.

Current Position (10): Displays X-Rail's current position.

Move Rail X (11): Moves X-Rail to displayed command position.

Read Plate Code (12): Moves Dispense Jet to read plate code.

Read Code (13): Moves Dispense Jet to read Array Tape code.

Fault screen

Notice
Before resetting a fault be sure condition is corrected.

For fault list See “Manager fault messages” on page 155.

For fault descriptions See “Manager fault messages” on page 155.

For handling faults See “General fault recovery procedure” on page 25.

Purging pressure tank

Pressure tank is an air reservoir. Over time, water will creep in and air will leak out, causing a loss in reservoir capacity.

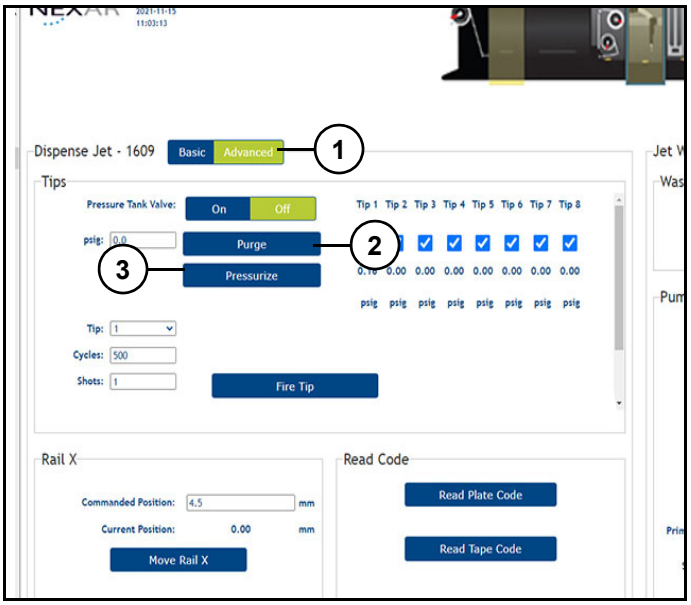


Figure 31

Refer to *(Figure 31)*.

1. Click "Advanced" (1).
2. Click "Purge" (2). Metering pump will remove water from pressure tube then expel through all four tips 1. Cycle is repeated five times.
3. Repeat process, if needed, until pressure reservoir is completely purged of water.
4. Click “Pressurize" (3) to return system to proper function.

Ethanol washing tips

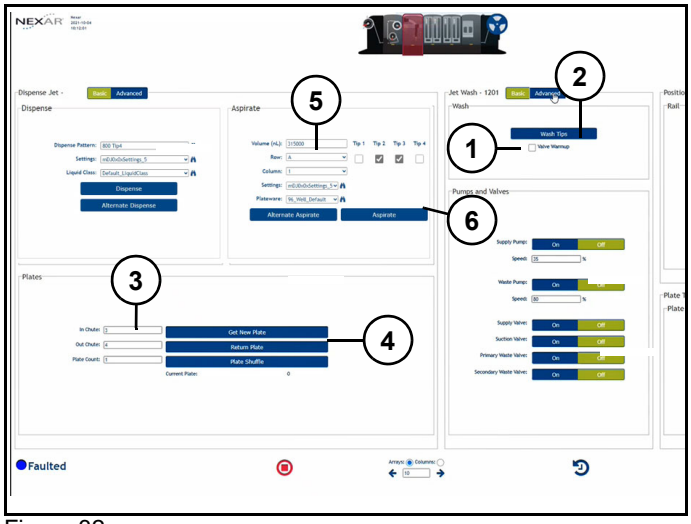


Figure 32

Refer to *(Figure 32)*.

1. Prepare a plate with 70% ethanol and place it into one of chutes.
2. Check "Valve Warmup" (1).
3. Click "Wash Tips" (2).
4. Identify "In-Chute" (3) where plate is located.
5. Click "Get New Plate" (4).
6. Enter aspiration amount in "Volume" (5).
7. Click "Aspirate" (6).
8. Click "Wash Tips" (2) with "Valve Warmup" (1) checked to remove 70% ethanol solution. Dispense jet is now ready for operation.

Creating new Dispense Jet settings

Users with administrator privileges can create new Dispense Pipette settings file.

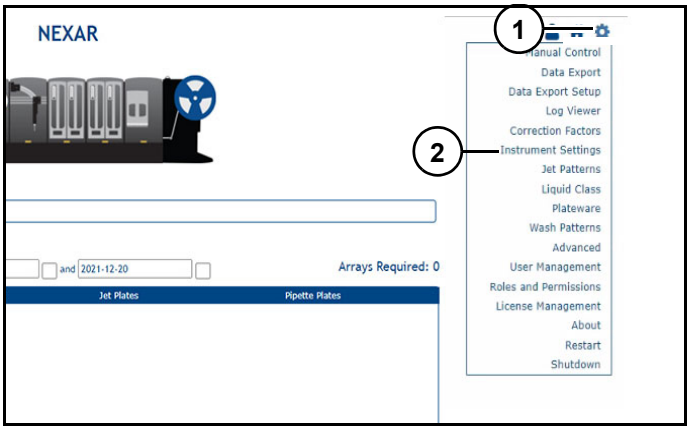


Figure 33

Refer to *(Figure 33)*.

1. Click "Settings" icon (1).
2. Click "Instrument Settings" (2).

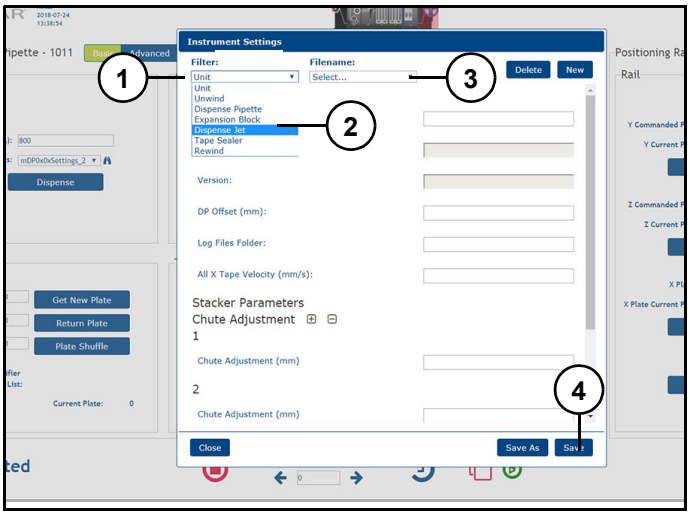


Figure 34

Refer to *(Figure 34)*.

3. Click "Filter" drop-down (1).
4. Select "DJ0X0X" (2).
5. Click "New" (3).
6. Enter desired settings on setting screen.
7. Click "Save" (4) to save changes.

Note: Click "Close" to exit without saving new file.

Adjusting Dispense Jet settings

Users with administrator privileges can change Dispense Jet parameters using Settings file.

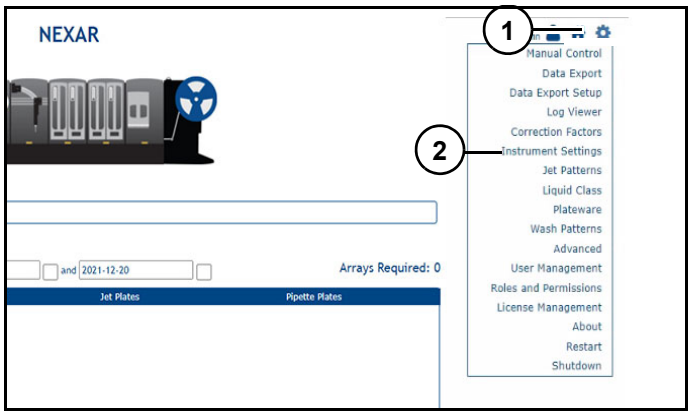


Figure 35

Refer to *(Figure 35)*.

1. Click "Settings" icon (1).
2. Click "Instrument Settings" (2).

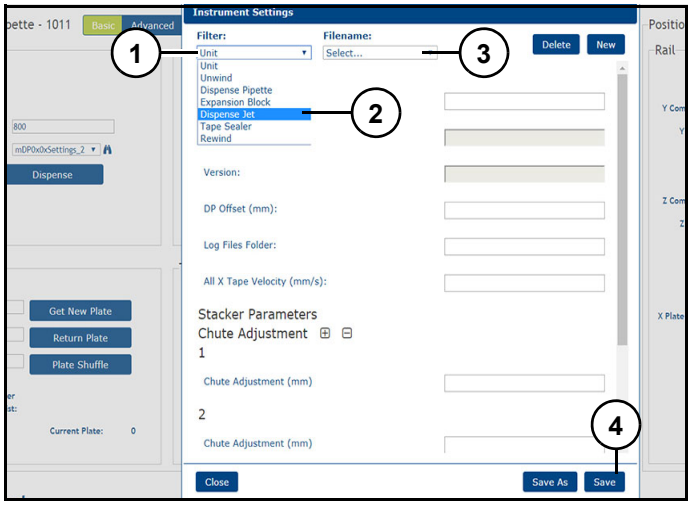


Figure 36

Refer to *(Figure 36)*.

3. Click "Filter" drop-down (1).
4. Select "Dispense Jet" (2).
5. Select "Filename" drop-down (3) and select file to edit.
6. Adjust desired settings on setting screen.
7. Click "Save" (4) to save changes.

Note: Click "Close" to exit without saving changes.

Setting descriptions

Dispense Tip 1 Y Offset: Offset in Y direction for tip 1 to start its dispense operation. Units: mm.

Rail X Dispense Offset: Offset in X direction for start of dispense operation (if DPOffset from UnitSettings.xml is zero). Units: mm.

RailX Wash Offset: Offset position head over wash station in X direction. Units: mm.

Y Dispense Velocity: Y direction speed of head during a dispense operation. Units: mm/s.

Y Wash Offset: Offset to position head over wash station in Y direction. Units: mm.

Y Torque Limit: Torque limit for Y rail units: Measured Drive amperage in counts.

Code Y Position: Position in Y direction to read Array Tape code. Units: mm.

Code Z Position: Position in Z direction to read Array Tape code. Units: mm.

ZTipOffset: Offset used for compensating for Z positions based on dispense tip length. Used in Dispense, Aspirate, and Wash Units: mm.

ZWash Offset: Offset defining Z where positions combined with ZTipOffset. Units: mm.

ZTorque Limit: Torque limit for Z rail units: Measured drive amperage in counts.

Run Continuous Bit: Define if sequential basic mode recipes should use new plates or continue to use current plate.

Continuous Pressurize: Define if pressurise function should run during dispensing or only before and after dispense action.

In Chute ID: Define chute where manager should pull plates from.

Out Chute ID: Defines chute where manager should return plates to.

Plate Dump: Define direction that plate dump chute is from the manager +1 is down stream -1 is upstream.

Error Mode: Define error that should display if an Array Tape code does not match expected recipe

Array Tape code "CheckRecipe" or previous managers stored Array Tapebar code "CheckArray".

Slot Sense: Define if Array Tape slot sensor is present in this module, for use with heated path only.

Plate Reposition: Define if plate should be repositioned each time an aspiration action occurs.

Restrictor Plate Operation: Define if automated restrictor plate will be used in aspiration action will move restrictor plate into position during aspiration sequence.

Pump Parameters: Torque limit for X rail Units: Measured drive amperage in counts.

Sampling Rate: Define number of task cycles to sample while scanning in time mode.

Tips 1-8.

- Volume Factor: Sets tip dispense volume.
- Forward Position Offset: Sets tip forward position.
- Backward Position Offset: Sets tip backward position.

Faults:

Priority 1 - Pause recipe and write fault to log file.

Priority 2 - Do not stop recipe and write fault to log file.

Priority 0 - Ignore fault and do not write to log file or stop recipe.

PlateCodeMatchFaultPriority: Triggered if plate code does not match code identified in recipe.

PlateCodeReadFaultPriority: Triggered if plate code read operation fails.

CodeArrayMatchFaultPriority: Triggered if Array Tapebarcode does not match previous manager and ErrorMode above is set to CheckArray.

CodeRecipeMatchFaultPriority: Triggered if Array Tapebarcode does not match recipe file and ErrorMode above is set to CheckRecipe.

TestFaultPriority: Triggered if ThrowFault operation is true and ThrowFault string is not blank in Array TapeMode recipe(for message faults in a recipe).

YTorqueLimitFaultPriority: Triggered if Y feedback amperage count reads a value higher than YTorqueLimit setting.

ZTorqueLimitFaultPriority: Triggered if Z feedback amperage count reads a value higher than ZTorqueLimit setting.

Calibrating a given dispense volume

Procedure is needed to account for different liquid properties. Volume dispensed into Array Tape depends on two system parameters - **<DispensePressure>** and **<DispenseValveOpenWidth>**. Same set of parameters will not work for every liquid encountered; therefore, calibration is necessary when changing liquids.

The **<DispensePressure>** and **<DispenseValveOpenWidth>** parameters work together and must be adjusted together to achieve desired result.

<DispensePressure> - Pressure propels liquid out of dispense tips. A higher pressure means a greater liquid velocity through tips. If liquid clinging at tips is observed, it is typically a sign of pressure that is too low. If pressure is too high, liquid will splash out of wells.

<DispenseValveOpenWidth> – Pressure Parameter changes time dispense valve stays open. Longer open time results in more volume dispesnsed at adjusted pressure. Maximum amount of time that valve can stay open is limited by speed of y-axis and amount of dispense pressure.

1. Ensure all utilities are connected.
2. Ensure Array Tape is loaded.
3. Synchronise drive and ensure Array Tape is advanced to dispense position.

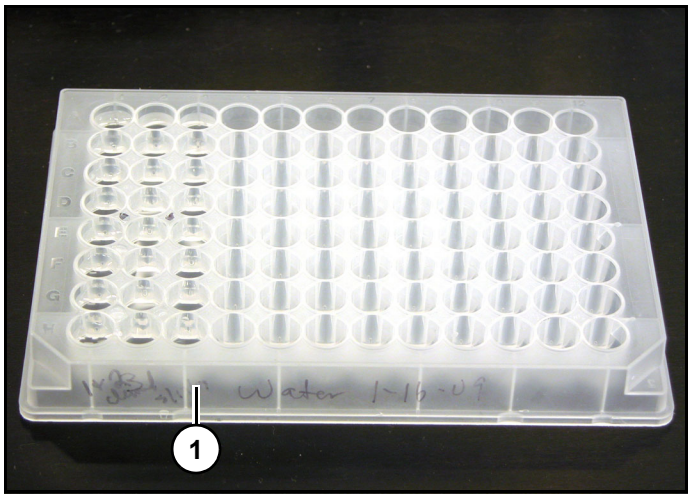


Figure 37

4. Prepare source plate (1) *(Figure 37)* with desired liquid at required volumes.
5. Load source plate in chute identified.
6. Ensure instrument is in idle state.

Figure 38

Refer to *(Figure 38)*.

7. Click "Get New Plate" (1) to receive prepared source plate.
8. Click "Wash Tips" (2) to wash tips multiple times.

Note: Ensure there are no air bubbles in dispense tubes. If bubbles are present wash again.

In "Liquid Class File Settings", choose a suitable setting for <AirGapVolume> parameter.

Note: This setting will depend on liquid and air gap size needed to separate liquids. Excessive air gaps will negatively affect dispense accuracy.

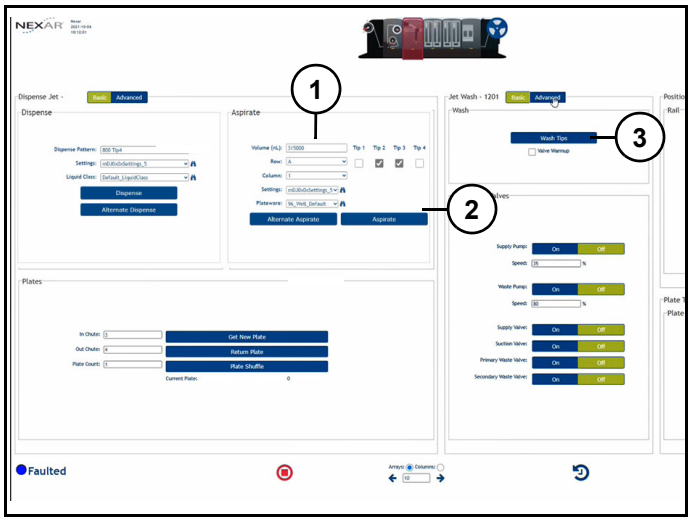


Figure 39

Refer to *(Figure 39)*.

9. In "Volume" (1) enter a small volume.

Note: Only enough liquid is needed so air gap is visible in beginning of tube. This will be final ending point for air gap.

10. Click "Aspirate" (2) and check air gap location when operation is finished.

11. If incorrect, repeat steps 8 through 11 until correct. Once correct, click "Wash Tips" (3) to empty dispense tips and tubes.

12. Add previous volume amount to volume amount needed to dispense.

13. Enter this new number into "Volume" (1).

14. Click "Aspirate" (2), air gap will rise farther up into tube.

Example: Volume is 65,000 nL. Reagent volume per well is 800 nL. Desired total dispense volume would be the volume per well multiplied by number of wells, which is 800 x 384 = 307,200 nL. Therefore, volume to enter for Step 14 would be 307,200 nL + (Predispense Volume x 2 x PrimaryPreDispenseCount)+Predispense Volume x SecondaryPreDispenseCount+ 65,000 nL (for maintaining the air gap above the valve) = 372,200 nL.

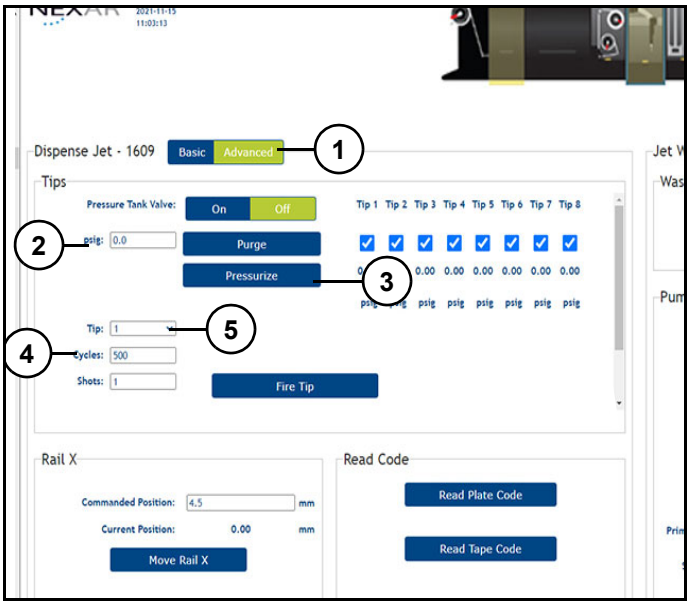


Figure 40

Refer to *(Figure 40)*.

1. Click "Advanced" (1).

2. Enter desired amount into "psig" (1).

3. Click "Pressurize" (3).

4. Set "Cycles" (4) to a suitable setting.

Note: Example for distilled water: A suitable pressure setting would be 1.2 - 1.8 psig and a suitable number of cycle settings would be 850.

5. Choose desired tip (5).

Figure 41

Refer to *(Figure 41)*.

6. Click "Basic" (1).
7. Click "Dispense" (2).
8. Check location of air gap in tube of tip selected. If air gap is not at correct ending point (as it was in Step 8), change value in "Cycles" (4) *(Figure 40)*.
9. Repeat steps 5 through 8, choosing next available tip. Repeat these steps until correct volumes are achieved. This process may require multiple wash and aspirate operations before results are successful.

Once correct, enter final setting into **<DispensePressure>** and **<DispenseValveOpenWidth>** parameters of Liquid Class File Settings.

Note: Volumes will be approximate.

Maintenance

Notice

When replacing tips of different lengths, change **<ZTipOffset>** parameter in _MGR_DJ1209 settings to avoid accidents. Refer to Handling Faults section.

- Replace tips when damaged.
- Refer to Microscan User's OEM manual for 2D/ Bar Code Reader maintenance.
- Perform an 70% ethanol wash when not running instrument for a period of time.

Replacing Dispense Jet tips

Tools required:

- Jet tip torque wrench (Provided by Biosearch Technologies).

Notice

The plastic valve nut (1) *(Figure 42)* that holds tip is very delicate. Use caution when engaging or disengaging torque wrench to avoid damage.

When removing tips, always start with front tip (2) *(Figure 42)* to avoid damaging tips.

When installing new tips, always start with back tip (3) *(Figure 42)* to avoid damaging tips.

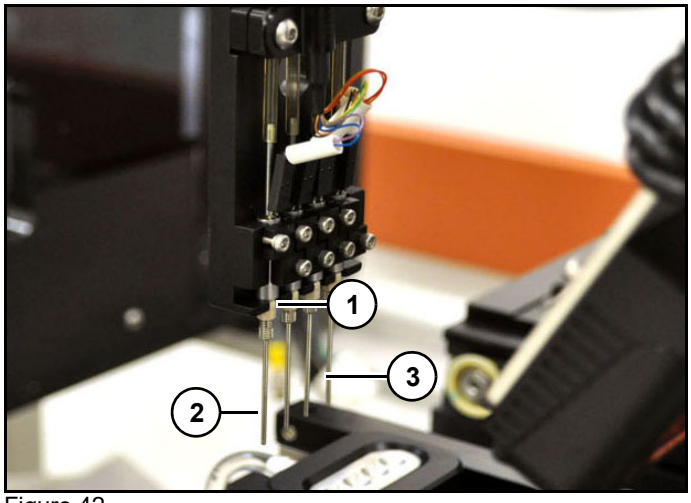


Figure 42

1. Gently loosen tip 4 (2) *(Figure 42)* by hand, turning counter-clockwise. If tip is screwed in too tight use provided torque wrench to loosen and then un-thread and remove by hand.
2. Loosen tip 3, tip 2, and then tip 1, using same procedure.

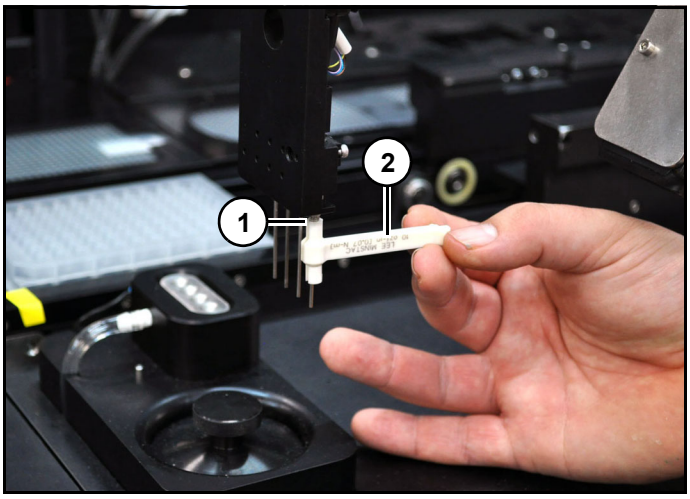


Figure 43.

Refer to *(Figure 43)*.

3. By hand, gently start to thread tip 1 into plastic nut on dispense head.
4. Carefully place torque wrench (2) onto tip and tighten.

Note: Make sure tips are not crooked, this will damage tips.

5. Place and tighten tip 2, tip 3, and tip 4 using same procedure.

Dispense Jet Attachment_DJ1609 troubleshooting

Notice
Before attempting any fault solution, refer to Handling Faults section. Colours Red: Safety fault Yellow: Uncontrolled fault other than safety Blinking blue: Faulted (controlled) Blue: Recovering Green: Running Black: Initialising

Manager fault messages

Settable priority	Cause	Solution
PlateCodeMatch:	Plate code doesn't match expected platecode.	Ensure plates are loaded in correct order. Verify that Array Tape wasn't advanced manually during protocol, adjust forward or backwards one array and try to resume.
PlateCodeRead:	Plate barcode was unable to be captured.	Camera read position may need to be optimised. Camera setting may need to be adjusted using "ESP" software. Ensure there is no glare on area of interest.
CodeArrayMatch:	Upstream barcode reader scanned doesn't match barcode scanned.	Verify that Array Tape wasn't advanced manually during protocol, adjust forward or backwards and try to resume.
CodeCheckPrevious:	Code out of sequence.	Verify that Array Tape wasn't advanced manually during protocol, adjust forward or backwards and try to resume.
CodeRead:	Code was unable to be captured.	Camera read position may need to be optimised. Camera setting may need to be adjusted. Ensure there is no glare on area of interest.
Code3NoReads:	Reader missed more than three barcodes in a row, check camera or barcodes.	Camera read position may need to be optimised. Camera setting may need to be adjusted using "ESP" software. Camera may need to be replaced.
CodeRecipeMatch:	Recipe barcode doesn't match scanned.	Ensure is aligned to the correct array. May have incorrect spool of Array Tape loaded on instrument.
CodeOrientation:	Orientation of does not match what is expected.	May need to be reversed and then resume protocol. Check protocol logic under "<Orientation>XXX</Orientation>" 0 is forward, 180 is backwards.

Pause faults	Cause	Solution
CheckDispenseVolumeFactorsFile:	Dispense Volume Factor file is missing or incorrect.	Verify file exists and that it is not corrupted.
CheckLiquidClassFile:	Liquid class file is missing or incorrect.	Verify file exists and that it is not corrupted.
CheckPatternFile:	Required jet pattern is missing.	Verify file exists and that it is not corrupted.
CheckPlatewareFile:	Required plate ware is missing.	Verify file exists and that it is not corrupted.
CheckRecipeFile:	Recipe file is incorrect, please check file for incorrect structure.	Verify file exists and that it is not corrupted.
CheckSettingsFile:	Settings file may be missing or incorrect.	Verify file exists and that it is not corrupted.
CheckUsageFile:	Usage file is may be missing or incorrect.	Verify file exists and that it is not corrupted.
ArrayFault:	User added fault to Array Tape mode recipe.	Verify file exists and that it is not corrupted.

Plate faults	Cause	Solution
PlateInFault:	Plate was not successfully delivered from chute.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.
PlateTransfer:	Plate failed to transfer from plate stacker on chute.	Check transfer path.
Stop:	Plate failed to stop.	Check photo eye.
CheckPlateSize:	Plate size does not match expected length.	Check photo eye and transfer deck.
MearsurementPosition:	Plate failed to position.	Verify plate is not caught on transfer deck.
NoClearedPlate:	No plate from Clear Position.	Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path and verify Plate is present.
ClearedPlateTransfer:	Plate failed to transfer from the plate stacker.	Check transfer path.
ClearedPlateStop:	Plate failed to stop.	Check photo eye.
ClearedPlatePosition:	Plate was not cleared successfully from conveyor.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.

Plate faults	Cause	Solution
PlateClear:	Plate was not cleared successfully from conveyor.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.
PlateInShuffleCycle:	Plate in shuffle failed on cycle of cycle(s) in chute.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.
PlateInShuffleCycle:	Plate out shuffle failed on cycle of cycle(s) in chute.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.
PlateReturn:	Plate failed to return to chute.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.
PlateNoDump:	No plate on deck to dump.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.

Abort faults	Cause	Solution
YTorqueLimitFault:	y-axis at position reached torque value.	Check for obstructions in the "front to back" path way of head. Ensure rail is properly lubricated. May need to adjust torque settings.
ZTorqueLimitFault:	z-axis at position reached torque value.	Check for obstructions in the "up and down" path way of head. Ensure rail is properly lubricated. May need to adjust torque settings.

Module fault messages

Abort faults	Cause	Solution
RAILXDRIVE	Possible problem with Rail X drive system.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.
RAILXHOMEFAULT	Rail X in unable to home.	Ensure drive can move, check drive for obstructions, clear as necessary. Check proximity sensor for damage and ensure it has power.
_BK1120_COUPLER_STATE	Error on BK1120 Beckhoff card.	Run diagnostics and look for CRC errors and for cards not in OP mode, check card for power, try and reseat card.
_BK1120_STATE	State change on BK1120 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_BK1120_WCSTATE	Working counter error on BK1120 Beckhoff card.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_EK1100_STATE	State change on EK1100 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_EK1100_STATE	State change on EK1100 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_EK1100_WCSTATE	Working counter error on EK1100 Beckhoff card.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_420_EL2262_STATE	State change on EL2262 Beckhoff card at terminal 42.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_420_EL2262_WCSTATE	Working counter error on EL2262 Beckhoff card at terminal 42.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_430_EL2262_STATE	State change on EL2262 Beckhoff card at terminal 43.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_430_EL2262_WCSTATE	Working counter error on EL2262 Beckhoff card at terminal 43.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_420_EL2004_STATE	State change on EL2004 Beckhoff card at terminal 42.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_420_EL2004_WCSTATE	Working counter error on EL2004 Beckhoff card at terminal 42.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_430_EL2004_STATE	State chance on EL2004 Beckhoff card at terminal 43.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.

Abort faults	Cause	Solution
_430_EL2004_WCSTATE	Working counter error on EL2004 Beckhoff card at terminal 43.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

DJ1212 fault	Cause	Solution
_512_PWS_1235_FUSE_CHECK	Fuse on FlexJet power supply may be blown.	Check fuse inside FlexJet to see if indicator light is on, replace fuse.

4 channel fault	Cause	Solution
_220_EK1100_STATE	State change on EK1100 Beckhoff card at terminal 22.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_310_EL2262_STATE	State change on EL2262 Beckhoff card at terminal 31.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_310_EL2262_WCSTATE	Working counter error on EL2262 Beckhoff card at terminal 31.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_320_EL2262_STATE	State change on EL2262 Beckhoff card at terminal 32.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_320_EL2262_WCSTATE	Working counter error on EL2262 Beckhoff card at terminal 32.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_330_EL2024_STATE	State change on EL2024 Beckhoff card at terminal 33.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_330_EL2024_WCSTATE	Working counter error on EL2024 Beckhoff card at terminal 33.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_340_EL2024_STATE	State change on EL2024 Beckhoff card at terminal 34.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_340_EL2024_WCSTATE	Working counter error on EL2024 Beckhoff card at terminal 34.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_410_EL3104_STATE	State change on EL3104 Beckhoff card at terminal 41.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_410_EL3104_WCSTATE	Working counter error on EL3104 Beckhoff card at terminal 41.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

4 channel fault	Cause	Solution
_420_EL6001_STATE	State change on EL6001 Beckhoff card at terminal 42.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_420_EL6001_WCSTATE	Working counter error on EL6001 Beckhoff card at terminal 42.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_430_EL7041_STATE	State change on EL7041 Beckhoff card at terminal 43.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_430_EL7041_WCSTATE	Working counter error on EL7041 Beckhoff card at terminal 43.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

8 channel fault	Cause	Solution
_610_EK1100_STATE	State change on EK1100 Beckhoff card at terminal 61.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_620_EL2262_STATE	State change on EL2262 Beckhoff card at terminal 62.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_620_EL2262_WCSTATE	Working counter error on EL2262 Beckhoff card at terminal 62.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_630_EL2262_STATE	State change on EL2262 Beckhoff card at terminal 63.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_630_EL2262_WCSTATE	Working counter error on EL2262 Beckhoff card at terminal 63.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_640_EL2024_STATE	State change on EL2024 Beckhoff card at terminal 64.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_640_EL2024_WCSTATE	Working counter error on EL2024 Beckhoff card at terminal 64.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_710_EL2024_STATE	State change on EL2024 Beckhoff card at terminal 71.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_710_EL2024_WCSTATE	Working counter error on EL2024 Beckhoff card at terminal 71.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_720_EL3104_STATE	State change on EL3104 Beckhoff card at terminal 72.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.

8 channel fault	Cause	Solution
_720_EL3104_WCSTATE	Working counter error on EL3104 Beckhoff card at terminal 72.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

Pumpnumber in string	Cause	Solution
EL7031_STATE_PUMP	State change on EL7031 Beckhoff card pump(s).	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
EL7031_WCSTATE_PUMP	Working counter error on EL7031 Beckhoff card pump(s).	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
MeteringDrive	Possible problem with metering pump drive(s).	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.
PressureLimitPump	Pressure is reading too high on DJ pump(s).	Try to PT Purge system. Ensure pressure reading is within normal reading range on HMI. Ensure pressure reading moves during pressurisation. Ensure electrical connections are good.
MeteringPumpHomeFault	Metering pump was unable to home.	Ensure drive can move, check drive for obstructions, clear as necessary. Check prox sensor for damage and ensure it has power.
WashPressureLimitPump	Pressure limit was reached during wash on tip.	Ensure pressure reading is within normal reading range on HMI. Wash speed may be too fast. DJ tip may be plugged.
PressurizeTimeOutPump	Failed to reach pressure on pump(s).	Try to PT Purge system. Ensure pressure reading is within normal reading range on HMI. Ensure pressure reading moves during pressurisation. Ensure electrical connections are good.

Specifications

Description	Parameters (8-Tip and 4-Tip FlexJet)
Model dimensions	
Width Height Depth	28.7 cm (11.3 inches) 122.0 cm (48.0 inches) 89.2 cm (35.1 inches)
Recommended air gap	
20,000 µL	
Dispense range (250-2500 nL)	
CV at 250-500 nL CV at 500-2500 nL	<7% <5%
Electrical requirements	
Four-tip FlexJet	Electrical needs are supplied by Nexar.
Eight-tip FlexJet	Requires a second source of power. Supply:115/230 V, 50/60 Hz auto-select Power rating: 400 W typical, 1200 W max. Fuse rating: 15 A at 115 V
Air requirements	
5 scfm at 80 psi	
Per-channel dead volume	
20 mm tip	˜27 µL
30 mm tip	˜28 µL
40 mm tip	˜29 µL
Operating sound level	
<70 dBA	

Dispense Pipette_DP1011

⚠WARNING

Read and understand equipment operators manual before operating or performing maintenance. Failure to do so could result in serious injury or death.

Component/decal identification

Dispense Pipette_DP1011

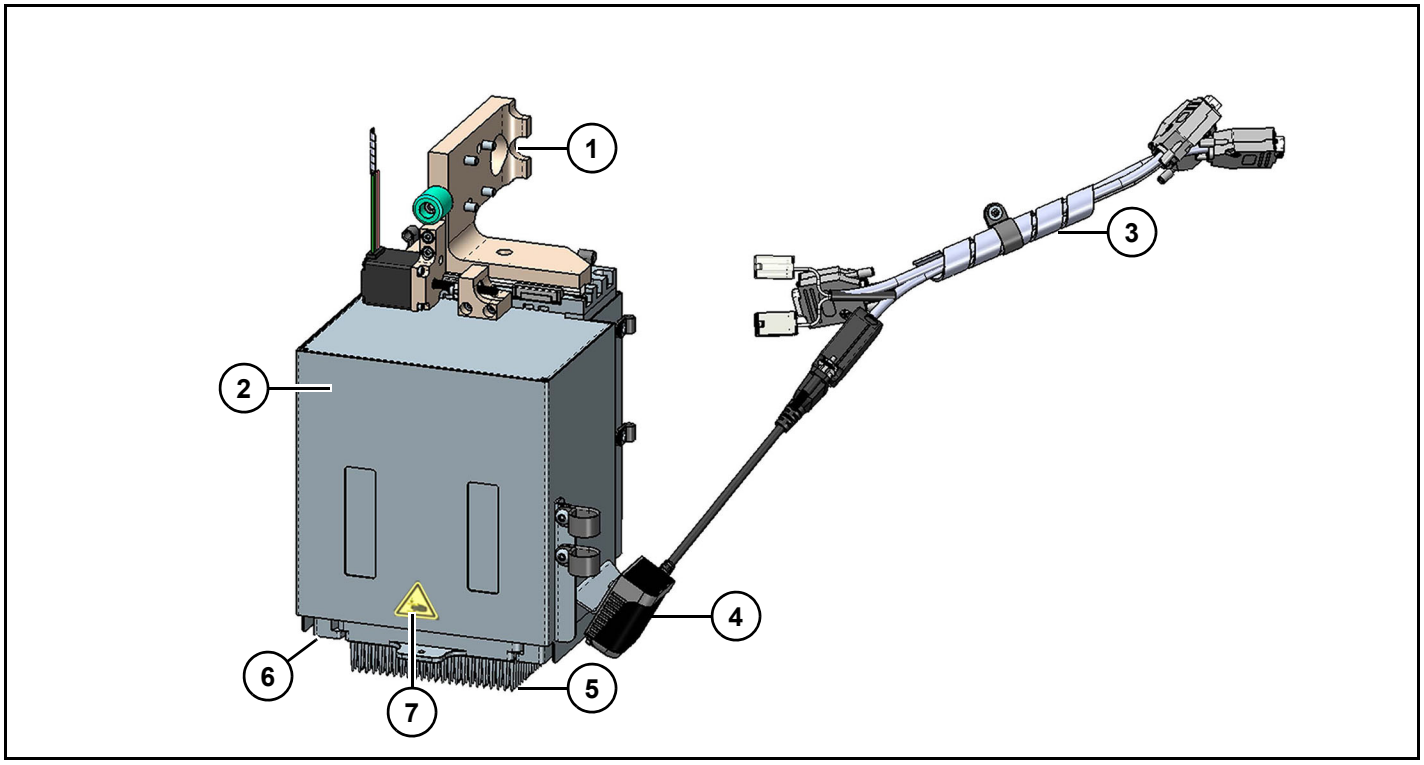


Figure 1

REF#	DESCRIPTION	REF#	DESCRIPTION
1	Pipettor Mounting Bracket	5	Disposable Tip Tray
2	Electrical Enclosure	6	Pipettor Clamp
3	Cable Harness	7	Pinch Point Decal
4	2D Bar Code Reader		

Dispense Pipette Manager_MGR_1011 controls

Notice

Controls on auto screen can only be activated when instrument is in idle state.

If a change is made to Manager Settings file, it will take effect after a pause, start or enable.

Dispense Pipette screen - Basic

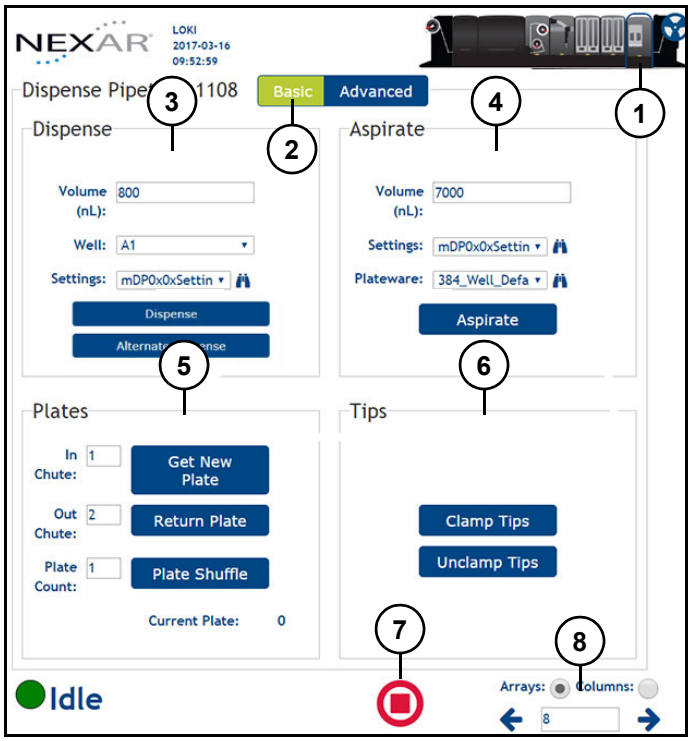


Figure 2

Refer to *(Figure 2)*.

Overview of controls

Dispense Pipette Module (1): Displays module status.

- Default status indicator.
- Highlighted status indicator.
- Faulted status indicator.
- Faulted-Highlighted status indicator.
- Highlighted blue: Module is active.
- Highlighted red: Module is faulted.

Basic/Advanced (2): Switches between basic and advanced operations pages.

Dispense (3): Displays dispense settings.

Aspirate (4): Displays aspirate settings.

Plates (5): Displays plate settings.

Tips (6): Displays tip settings.

Abort (7): Aborts all running actions.

Arrays/Columns Information (8): Displays Arrays, Columns, and number of arrays in protocol.

Note: For advancing Array Tape by arrays or columns.

Dispense settings

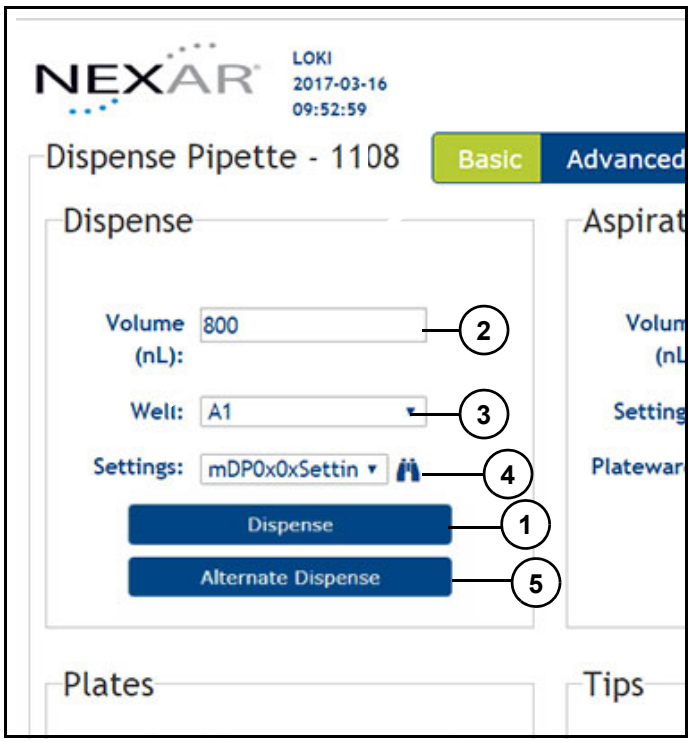


Figure 3

Refer to *(Figure 3)*.

Dispense (1): Initiates dispense operation.

Pipettor positions dispense tips above Array Tape and dispenses volume of fluid specified in Volume (nL) (2) into specified Well quadrant (3).

Volume (nL) (2): Sets and displays volume to dispense in nL.

Units	Nanoliters
Minimum	10
Default	800
Maximum	Limited by hmi 27000 pending on tip capacity maybe less.

Well (3): Indicates into which quadrant pipette dispenses. Four quadrants A1, A2, B1, B2.

Settings Binocular Icon (4): Opens dispense settings for displayed dispense file.

Alternate Dispense (5): Initiates alternate dispense operation.

Aspirate settings

Figure 4

Refer to *(Figure 4)*.

Aspirate (1): Initiates aspirate operation.

Pipettor moves to aspiration position, then positions tips into source plate, and aspirates volume of fluid from plate specified in Volume text box (nL) (2).

Volume Text Box (nL) (2): Displays volume aspirated from source plate in nL.

Units	Nanoliters
Minimum	10
Default	7,000
Maximum	Limited by hmi 27000 pending on tip capacity maybe less.

Settings Binocular icon (3): Opens aspirate settings for display aspirate file.

Plateware Binocular icon (4): Opens plateware settings for display plateware file.

Plate settings

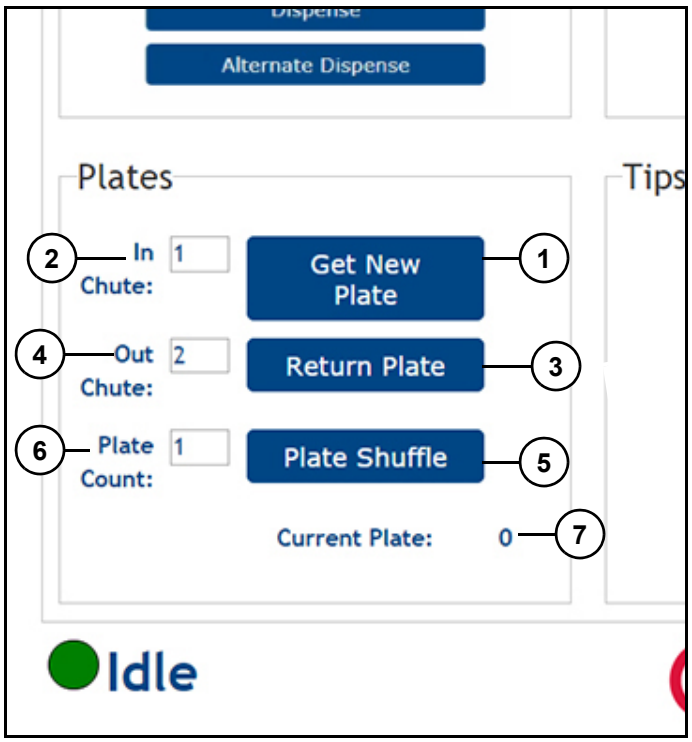


Figure 5

Refer to *(Figure 5)*.

Get New Plate (1): Initiates operation to retrieve a new plate from stack.

New plate is brought in from chute specified in In Chute (2). Plate will come down conveyor until it blocks photoeye sensor and stops at correct location.

In Chute Text Box (2): Sets and displays which chute will supply new plate. Chutes are numbered from right to left. Default setting can be specified in DP settings.

Units	Number
Minimum	1
Default	1
Maximum	Number of chute on Instrument

Return Plate (3): Initiates operation to return plate to stack.

Plate goes down conveyor and is stacked in chute specified in Out Chute (4).

Out Chute (4): Sets and displays which chute will receive plate. Chutes are numbered from right to left.

Units	Number
Minimum	1
Default	1
Maximum	Number of chutes on Instrument

Plate Shuffle on/off (5): Initiates operation to transfer plates between stacks.

New plate is downstacked from chute specified in Plate Count (6). Plate is transferred and upstacked to chute specified in Out Chute (4).

Current Plate (7): Displays plate currently being used.

Tip settings

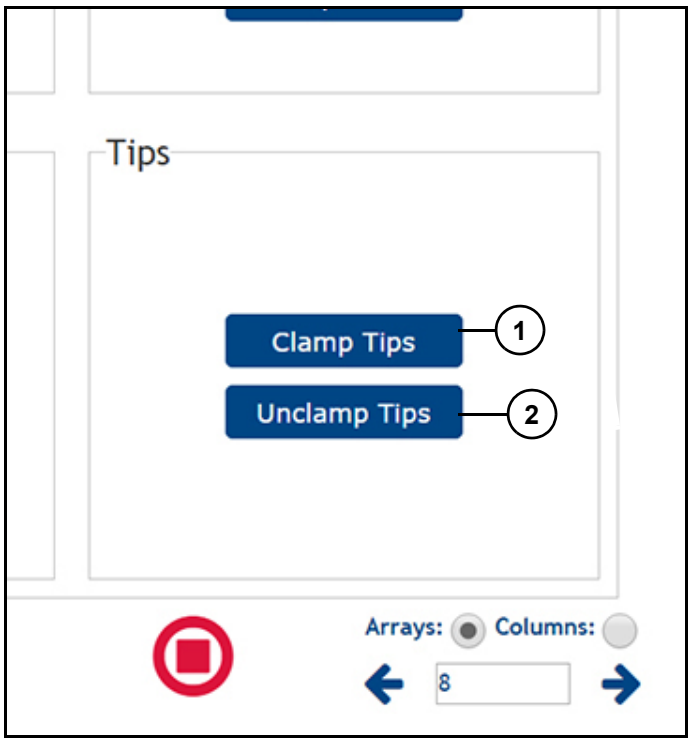


Figure 6

Refer to *(Figure 6)*.

Clamp Tips (1): Clamps tips to dispense head.

Unclamp Tips (2): Unclamps tips from dispense head.

Dispense Pipette screen - Advanced

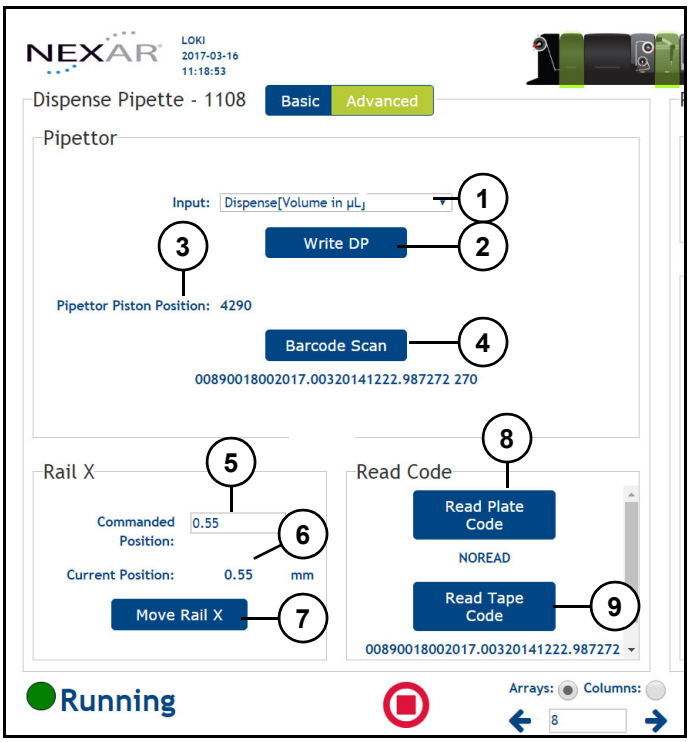


Figure 7

Refer to *(Figure 7)*.

Overview of controls

Input (1): Displays/selects desired input.

Write DP (2): Writes selected input command to pipette head.

Pipettor Pistion Position (3): Displays pipettor position in nL.

Barcode Scan (4): Triggers barcode scaner at displayed position.

Command Position (4): Inputs position for X-Rail.

Current Position (5): Displays X-Rail's current position.

Move Rail X (7): Moves X-Rail to displayed command position.

Read Plate Code (8): Moves pipette to read plate code.

Read Tape Code (9): Moves pipette to read Array Tape code.

Manually dispensing into Array Tape

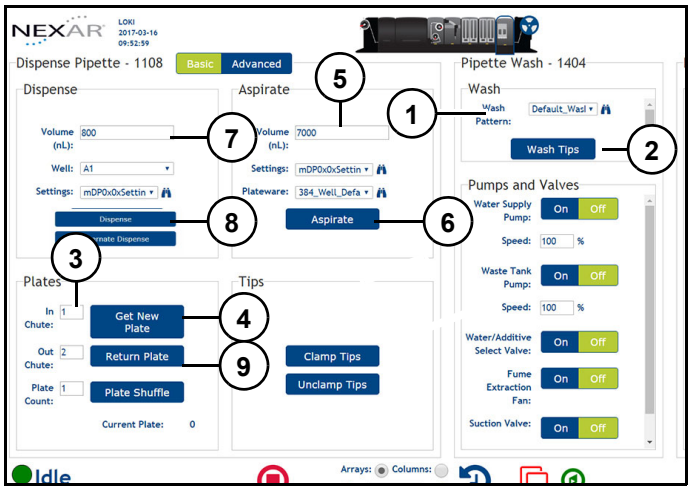


Figure 8

Refer to *(Figure 8)*.

1. Set "Wash Pattern" (1).
2. Click "Wash Tips" (2).
3. Specifying chute from "In Chute" (3).
4. Click "Get New Plate" (4).
5. Specify volume to aspirate in "Volume" (5).
6. Click "Aspirate" (6).
7. Specify volume to dispense in "Volume" (7).
8. Click "Dispense" (8) to dispense into Array Tape.
9. Click "Return Plate" (9) to return plate to specified chute.

Creating new dispense pipette setting

Users with administrator privileges can create new Dispense Pipette settings file.

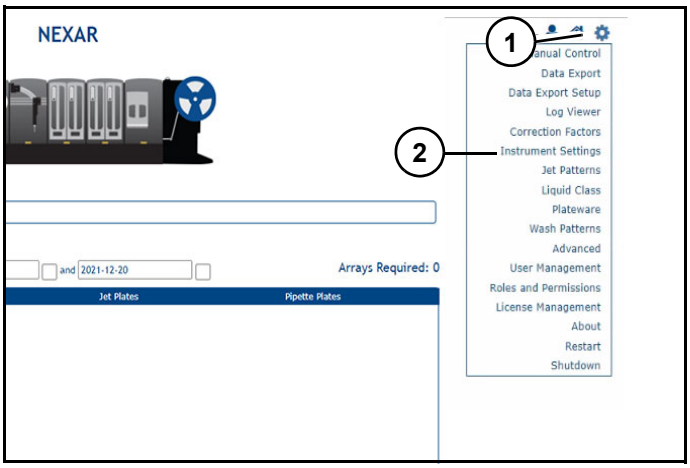


Figure 9

Refer to *(Figure 9)*.

1. Click "Settings" (1).
2. Click "Instrument Settings" (2).

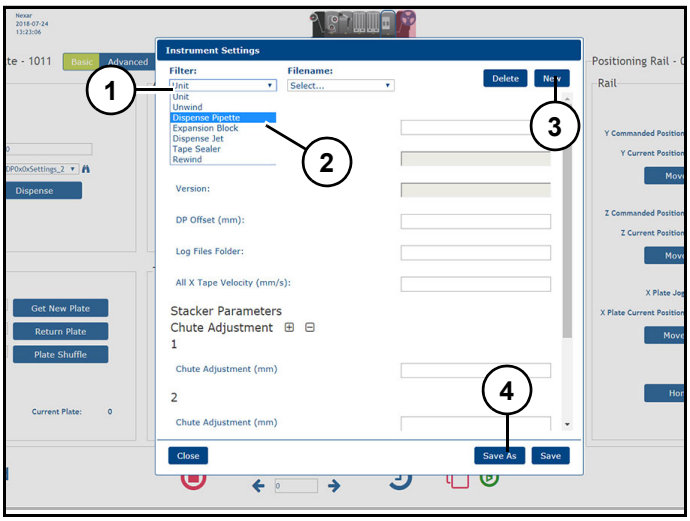


Figure 10

Refer to *(Figure 10)*.

3. Click "Filter" drop-down (1).
4. Select "Dispense Pipette" (2).
5. Click "New" (3).
6. Enter desired settings on setting screen.
7. Click "Save As" (4) to save changes.

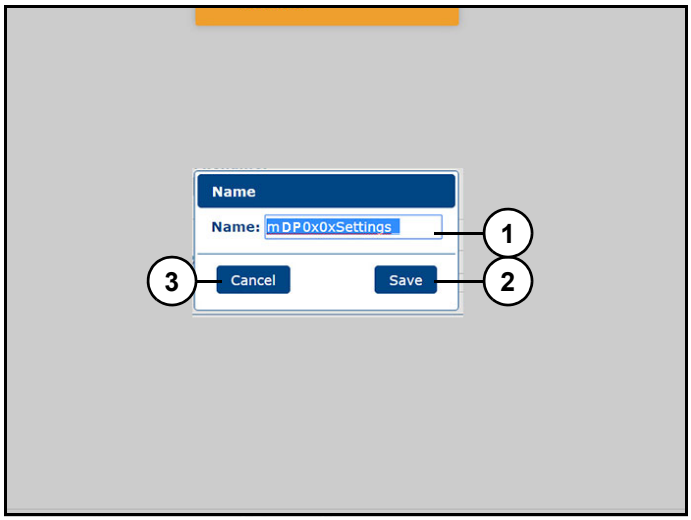


Figure 11

Refer to *(Figure 11)*.

8. Enter "Name" (1) of new setting.
9. Click "Save" (2).

Note: Click "Cancel" (3) to exit without saving new file.

Adjusting Dispense Pipette settings

Users with administrator privileges can change dispense pipette parameters using Settings file.

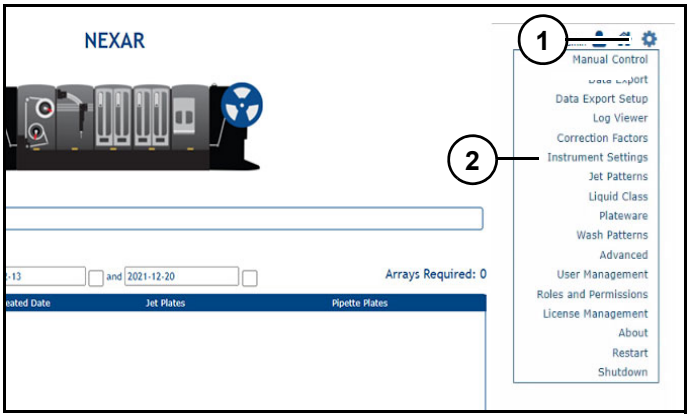


Figure 12

Refer to *(Figure 12)*.

1. Click "Settings" (1).
2. Click "Instrument Settings" (2).

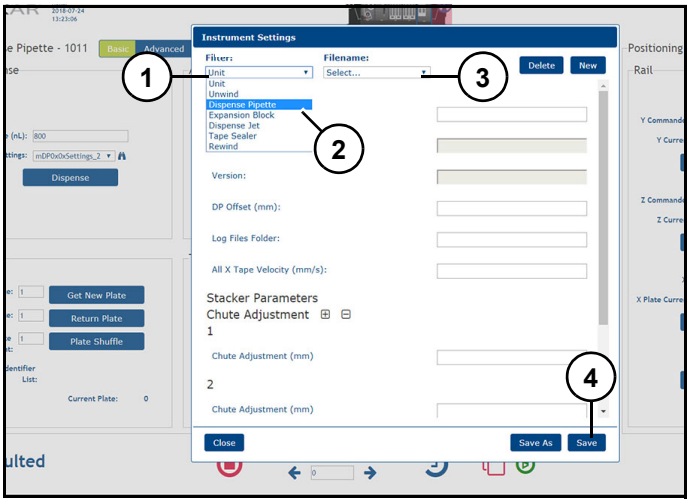


Figure 13

Refer to *(Figure 13)*.

3. Click "Filters" drop-down (1).
4. Select "Dispense Pipette" (2).
5. Select "Filename" drop-down (3) and select file to edit.
6. Adjust desired settings on setting screen.
7. Click "Save" (4) to save changes.

Deleting Dispense Pipette settings

Users with administrator privileges can change dispense pipette parameters using Settings file.

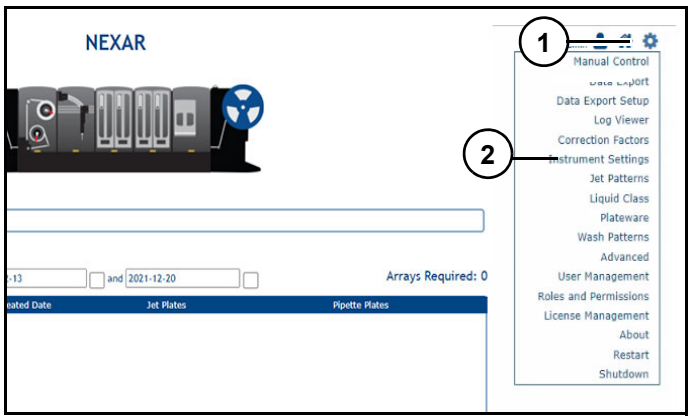


Figure 14

Refer to *(Figure 14)*.

1. Click "Settings" (1).
2. Click "Instrument Settings" (2).

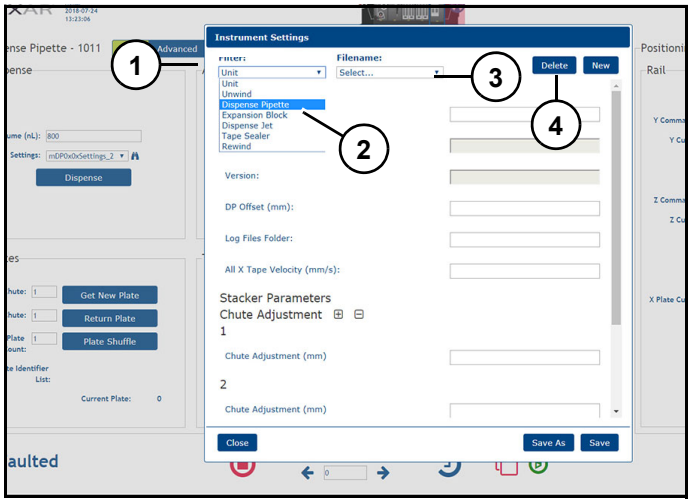


Figure 15

Refer to *(Figure 15)*.

3. Click "Filter" drop-down (1).
4. Select "Dispense Pipette" (2).
5. Select "Filename" drop-down (3) and select file to delete.
6. Click "Delete" (4) to delete settings file.
7. Click "Yes" (NS) to delete.

Setting Descriptions

Setting limits are listed in XML setting file.

Plateware:
Define plateware setting 384 default.

Liquid Class:
Define Liquid class setting.

Disable Liquid Class Overage:
Sets Dispense Pipette aspiration overage during manual and automatic operation (true/false). False is default.
False: Aspiration volume = recipe or HMI volume + extra volume + pre-dispense volume.
True: Aspiration volume = recipe or HMI volume.

Tip Capacity (µL):
Define Pipette Tip Capacity 10 or 25 µL only.

Rail X Dispense Offset:
Defines X-Rail's Offset for dispense operation.

Rail X Wash Offset:
Specifies position DP X-Rail should be in during wash operation.

Y Dispense Offset:
Defines Y offset for dispense operation.

Y Touch Off:
Defines Y touch off move distance for dispense operation.

Y Torque Limit:
Torque limit for Y rail units: Measured drive amperage in counts.

Y Wash Position Offset:
Defines Y offset for wash operation.

Y Wash Touch Off:
Defines Y touch off move distance for wash operation.

Z Clear Position:
Defines Z position that will clear all on module obstacles.

Z Wash Offset:
Defines Z position offset for wash operation.

Z Wash Suction Position:
Defines Z suction position for wash operation.

Z Wash Outside Of Tips Position:
Defines Z in station position for wash operation.

Z Dispense Position:
Defines Z position to start dispense sequence.

Z Tip Offset:
Defines Z offset to compensate for pipette tip length 10 µL =12.6 mm 20 µL = 21.6 mm.

Z Hover Position:
Defines Z position to create dispense bubble at.

Z In Position:
Defines Z position where tips are at bottom of Array Tape wells Z touchoff mode.

Z Touchoff Torque:
Defines stop torque if DP is set to torque mode dispensing.

Z Retract Acceleration:
Defines Z acceleration used when retracting tips after a dispense event.

Z Torque Limit:
Torque limit for Z rail Units: Measured Drive amperage in counts.

Verify Z Torque Position:
Defines if ZInPosition should be verified when dispensing in torque mode.

Z Torque Position Error:
Defines allowable error if ZInPosition is being verified in torque mode.

Code Y Position:
Defines Y position for Array Tape code reads.

Code Z Position:
Defines Z position for Array Tape code reads.

Error Mode:
Defines error that should display if a Array Tape code does not match expected recipe Array Tape code "CheckRecipe" or previous managers stored tape code "CheckArray".

Tape Slot Sense:
Defines if a tape slot sensor is present in this module - For use with heated tape path only.

Run Continuous Bit:
Defines if pressurise function should run during dispensing or only before and after dispense action.

In Chute ID Operation:
Defines chute that manager should fetch plates from.

Out Chute ID Operation:
Defines chute that manager should return plates to.

Plate Dump:
Defines direction that plate dump chute is from manager +1 is down stream -1 is upstream.

Plate Reposition:
Defines if plate should be repositioned during aspiration operation.

External Stacker Start:
Defines starting stacker and chute to fetch a plate from if using an external plate stacker.

Waste Pump Off Delay (min):
Defines whether or not to use waste pump.

Fume Extractor Fan Select:
Defines number of minutes Fume Extractor Fan continues to run after wash process is complete.

Waste Pump Select:
Defines whether or not to use waste pump.

Prime & Rinse Watchdog Time:
Defines number of milliseconds supply pump will fill from Additive reservoir during prime and rinse function.

Basic Mode Plate Scan:
Defines if DP should reverify plate code on a plate that is fetched from external plate.

Faults

Settable priority

PlateCodeMatch:
Plate code doesn't match expected platecode.

PlateCodeRead:
Plate barcode was unable to be captured.

CodeArrayMatch:
Upstream barcode reader scanned doesn't match barcode scanned.

CodeCheckPrevious:
Array Tape code out of sequence.

CodeRead:
Array Tape code was not captured.

Code3NoReads:
Reader missed more than three barcodes in a row, check camera or barcodes.

CodeRecipeMatch:
Recipe barcode doesn't match scanned.

CodeOrientation:
Orientation of does not match what is expected.

VerifyZTorquePosition:
DP reached torque position before expected position.

ArrayFault:
User added fault to Array Tape mode recipe.

File faults

CheckCorrectionFactorsFile:
Correction factor file is missing or incorrect.

CheckLiquidClassFile:
Liquid class file is missing or incorrect.

CheckPipetteVolumeOffsetsFile:
Pipette volume offset file is missing or incorrect.

CheckPlateIdentifierFile:
Plate identifier list is missing or incorrect.

CheckRecipeFile:
Recipe file is incorrect, please check file for incorrect structure.

CheckSettingsFile:
Settings file may be missing or incorrect.

CheckWashPatternFile:
Dispense Pipette reached torque before expected in Array Tape well.

CheckPlatewareFile:
Required plateware is missing.

CheckUsageFile:
Usage file is may be missing or incorrect.

Plate faults

PlateInFault:
Plate was not successfully delivered from chute.

PlateReposition:
Plate failed to reposition at Dispense Pipette.

PlateTransfer:
Plate failed to transfer from the plate stacker on chute.

RepositionMeasurement:
Plate failed to reposition.

CheckPlateSize:
Plate size does not match expected length.

MeasurementPosition:
Plate failed to position.

ShufflePlateNotFound:
Plate shuffle failed on cycle of cycle(s) in chute.

PlateInShuffleCycle:
Plate in shuffle failed on cycle of cycle(s) in chute.

PlateOutShuffleCycle:
Plate out shuffle failed on cycle of cycle(s) in chute.

PlateReturn:
Plate failed to return to chute.

PlateNoDump:
No plate on deck to dump.

Abort faults

YTorqueLimitFault:
y-axis at position reached torque value.

ZTorqueLimitFault:
z-axis at position reached torque value.

Maintenance

Notice

There are two pipettor motors, piston and clamp. During normal operation, pistons are inserted into disposable tip tray and need to be homed. If not homed module will cause an error. Usually user does not have to home motor as it is homed during a process. If an error message "Ex" appears in the Write DP Response field, motors must be homed.

⚠CAUTION

Pipettor must be over a wash station during homing procedure so liquid does not spill onto instrument.

Homing pipettor motors

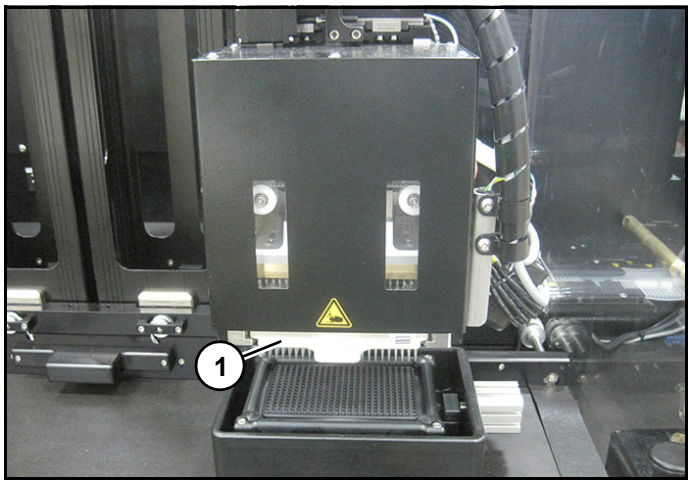


Figure 16

1. Ensure disposable tip tray (1) *(Figure 16)* is correctly inserted in clamp.

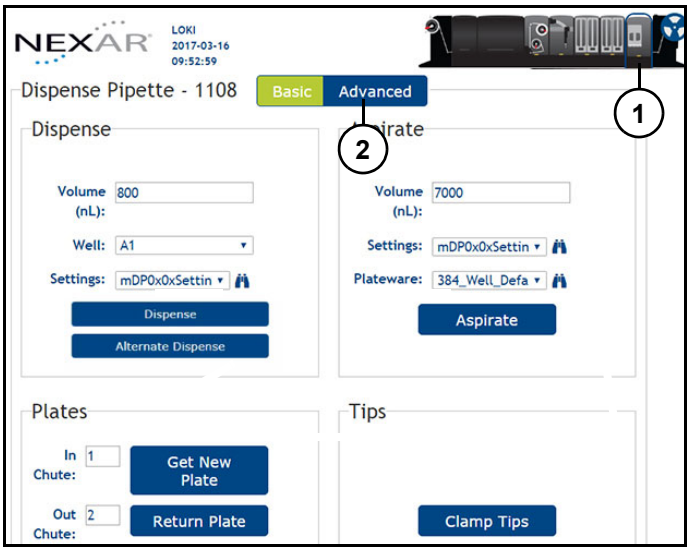


Figure 17

Refer to *(Figure 17)*.

1. Select "Dispense Pipette" (1).
2. Click "Advanced" (2).

Figure 18

Refer to *(Figure 18)*.

3. Set "Input" pump calibration command to motor: k (1).
4. Click on "Write DP" (2). Pistons will descend to their lowest position.

Note: "Write DP Response" will return with "!". indicating pipette is homed and "Write DP" (2) will turn green.

Replacing pipette tips

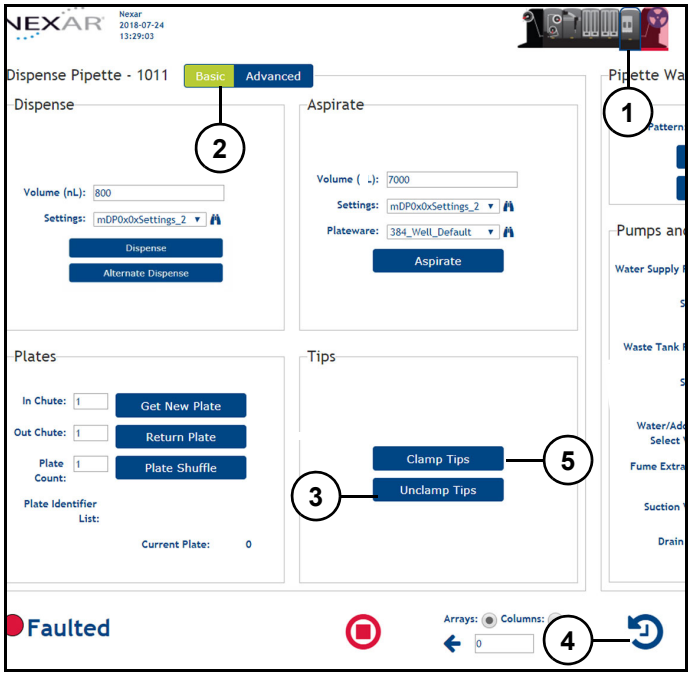


Figure 19

Refer to *(Figure 19)*.

1. Select "Dispense Pipette" (1).
2. Click "Basic" (2).
3. Click "Unclamp Tips" (3). Wait for clamp motor to release tip tray.

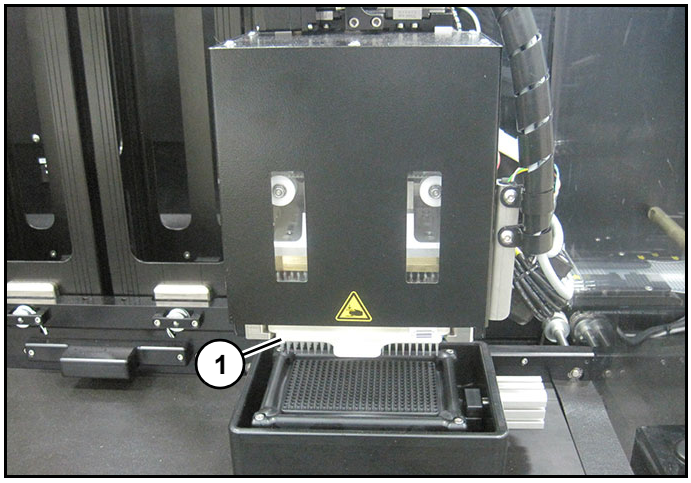


Figure 20

4. Lift guard door and remove tip tray (1) *(Figure 20)*.
5. Insert new tip tray.
6. Close guard door.
7. Click "Reset" (4) *(Figure 19)*.
8. Press "Clamp Tips" (5) *(Figure 19)* and wait until tip tray is clamped.

Cleaning CyBio seal

Tools Needed:

- Lint-free cloth and alcohol.
- Non-residual tacky surface (PCR plate seal).

1. Remove tips and pull CyBio head forward.
2. Shut down instrument to avoid damage.

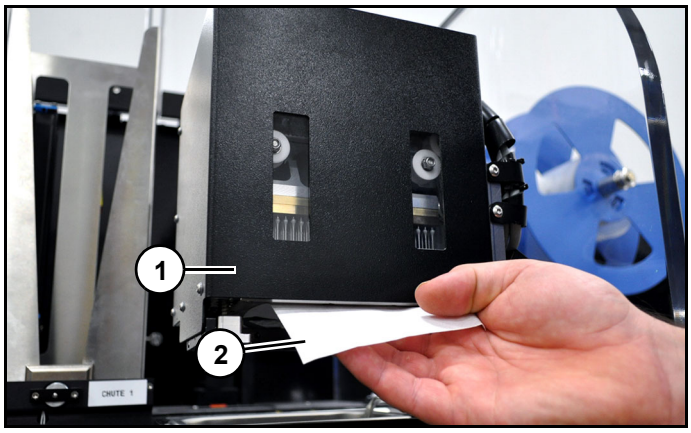


Figure 21

3. Dab seal, located on bottom of head (1), with a lint-free cloth moistened with alcohol (2). *(Figure 21)*
4. Allow to dry.

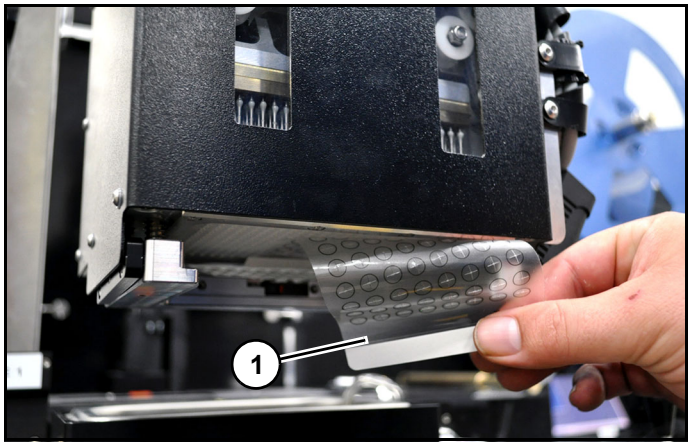


Figure 22

5. Cover bottom of head with a tacky surface (1) *(Figure 22)* that does not leave any residue.

Note: Two PCR plate seals side-by-side work well.

6. Peel tacky surface back gently at a sharp angle.
7. Replace tips and restart instrument.

Dispense Pipette Manager_MGR_DP1011 troubleshooting

Notice
Before attempting any fault solution, refer to Handling Faults section. Colours Red: Safety fault. Yellow: Uncontrolled fault other than safety. Blinking Blue: Faulted (controlled). Blue: Recovering Green: Running Black: Initialising

Manager fault messages

Settable priority	Cause	Solution
PlateCodeMatch:	Plate code doesn't match expected platecode.	Ensure plates are loaded in correct order. Verify that Array Tape wasn't advanced manually during protocol, adjust forward or backwards one Array Tape and try to resume.
PlateCodeRead:	Plate barcode was unable to be captured.	Camera read position may need to be optimised. Camera setting may need to be adjusted using "ESP" software. Ensure there is no glare on area of interest.
CodeArrayMatch:	Upstream barcode reader scanned doesn't match barcode scanned {0}.	Verify that Array Tape wasn't advanced manually during protocol, adjust forward or backwards and try to resume.
CodeCheckPrevious:	Array Tape code out of sequence.	Verify that Array Tape wasn't advanced manually during protocol, adjust forward or backwards and try to resume.
CodeRead:	Array Tape code was unable to be captured.	Camera read position may need to be optimised. Camera setting may need to be adjusted using "ESP" software. Ensure there is no glare on area of interest.
Code3NoReads:	Reader missed more than three barcodes in a row, check camera or barcodes.	Camera read position may need to be optimised. Camera setting may need to be adjusted using "ESP" software. Camera may need to be replaced.

Settable priority	Cause	Solution
CodeRecipeMatch:	Recipe barcode doesn't match scanned.	Ensure Array Tape is aligned to the correct array. May have incorrect spool of Array Tape loaded on instrument.
CodeOrientation:	Orientation of Array Tape does not match what is expected.	Array Tape may need to be reversed and then resume protocol. Check protocol logic under "<Orientation>XXX</Orientation>" 0 is forward, 180 is backwards.
VerifyZTorquePosition:	DP reached torque position before expected position {1}.	Ensure is aligned correctly and is not a column off. May need to optimise DP dispense position.
ArrayFault:	User added fault to Array Tape mode recipe.	

File faults	Cause	Solution
CheckCorrectionFactorsFile:	Correction factor file is missing or incorrect.	Verify file exists and that it is not corrupted.
CheckLiquidClassFile:	Liquid class file is missing or incorrect.	Verify file exists and that it is not corrupted.
CheckPipetteVolumeOffsetsFile:	Pipette volume offset file is missing or incorrect.	Verify file exists and that it is not corrupted.
CheckPlateIdentifierFile:	Plate identifier list is missing or incorrect.	Verify file exists and that it is not corrupted.
CheckRecipeFile:	Recipe file is incorrect, please check file for incorrect structure.	Verify file exists and that it is not corrupted.
CheckSettingsFile:	Settings file may be missing or incorrect.	Verify file exists and that it is not corrupted.
CheckWashPatternFile:	DP reached torque before expected in Array Tape well.	Verify file exists and that it is not corrupted.
CheckPlatewareFile:	Required plateware is missing.	Verify file exists and that it is not corrupted.
CheckUsageFile:	Usage file is may be missing or incorrect.	Verify file exists and that it is not corrupted.

Plate faults	Cause	Solution
PlateInFault:	Plate was not successfully delivered from chute.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.

Plate faults	Cause	Solution
PlateReposition:	Plate failed to reposition at DP.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.
PlateTransfer:	Plate failed to transfer from the plate stacker on chute.	Check transfer path.
RepositionMeasurement:	Plate failed to reposition.	Verify plate is not caught on transfer deck.
CheckPlateSize:	Plate size does not match expected length.	Check photo eye and transfer deck.
MeasurementPosition:	Plate failed to position.	Verify plate is not caught on transfer deck.
ShufflePlateNotFound:	Plate Shuffle failed on cycle of cycle(s) in chute. Plate code.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.
PlateInShuffleCycle:	Plate in shuffle failed on cycle of cycle(s) in chute.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.
PlateOutShuffleCycle:	Plate out shuffle failed on cycle of cycle(s) in chute.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.
PlateReturn:	Plate failed to return to chute.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.
PlateNoDump:	No plate on deck to dump.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.

Abort faults	Cause	Solution
YTorqueLimitFault:	y-axis at position reached torque value.	Check for obstructions in the "front to back" path way of head. Ensure rail is properly lubricated. May need to adjust torque settings.
ZTorqueLimitFault:	z-axis at position reached torque value.	Check for obstructions in the "up and down" path way of head. Ensure rail is properly lubricated. May need to adjust torque settings.

Module faults

Abort faults	Cause	Solution
_BK1120_COUPLER_STATE:	Error on BK1120 Beckhoff card.	Run diagnostics and look for CRC errors and for cards not in OP mode, check card for power, try and reseat card.
_BK1120_STATE:	State change on BK1120 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_BK1120_WCSTATE:	Working counter error on BK1120 Beckhoff card.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_EK1100_STATE:	State change on EK1100 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_220_EL6001_STATE:	State change on EL6001 Beckhoff card at terminal 22.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_220_EL6001_WCSTATE:	Working counter error on EL6001 Beckhoff card at terminal 22.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_310_EL6001_STATE:	State change on EL6001 Beckhoff card at terminal 31.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_310_EL6001_WCSTATE:	Working counter error on EL6001 Beckhoff card at terminal 31.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_320_EL7031_WCSTATE:	Working counter error on EL7031 Beckhoff card at terminal 32.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_320_EL7031_STATE:	State change on EL7031 Beckhoff card at terminal 32.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
RAILXDRIVE:	Possible problem with Rail X drive system.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.
RAILXHOMEFAULT:	Rail X in unable to home.	Ensure drive can move, check drive for obstructions, clear as necessary. Check prox sensor for damage and ensure it has power.

Pause faults	Cause	Solution
PIPETTOR:	Error on pipettor.	Contact Biosearch Technologies.

Dispense Pipette_DP1011

⚠WARNING

Read and understand equipment operators manual before operating or performing maintenance. Failure to do so could result in serious injury or death.

Component/decal identification

Dispense Pipette_DP1011

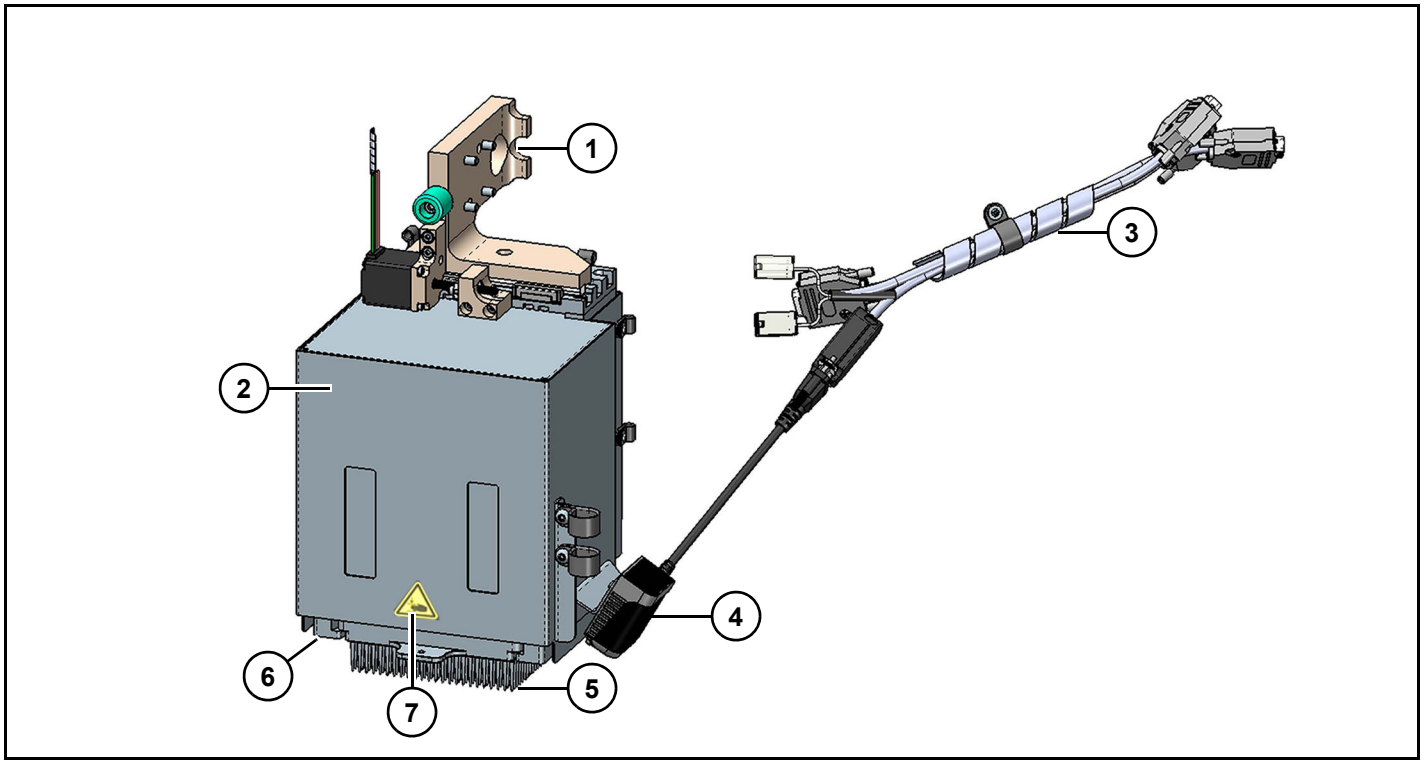


Figure 1

REF#	DESCRIPTION	REF#	DESCRIPTION
1	Pipettor Mounting Bracket	5	Disposable Tip Tray
2	Electrical Enclosure	6	Pipettor Clamp
3	Cable Harness	7	Pinch Point Decal
4	2D Bar Code Reader		

Dispense Pipette Manager_MGR_1011 controls

Notice

Controls on auto screen can only be activated when instrument is in idle state.

If a change is made to Manager Settings file, it will take effect after a pause, start or enable.

Dispense Pipette screen - Basic

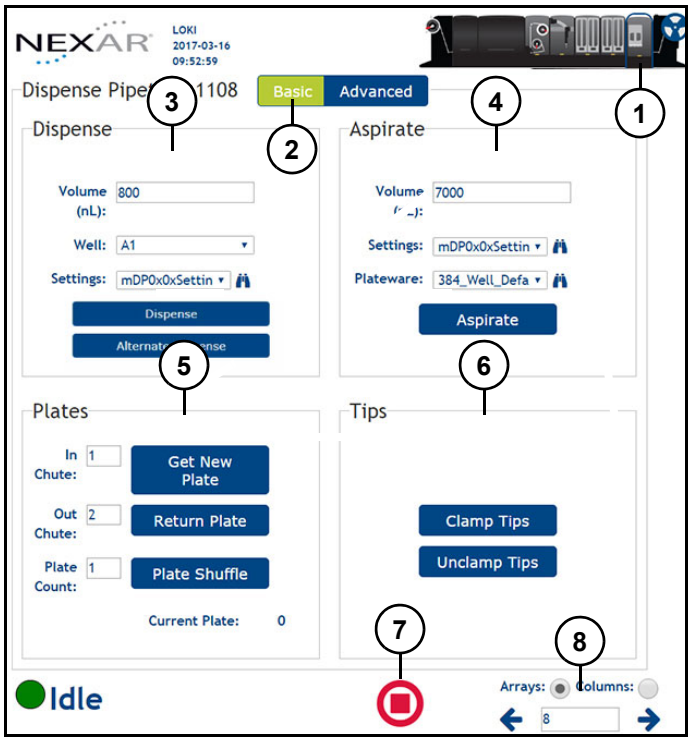


Figure 2

Refer to *(Figure 2)*.

Overview of controls

Dispense Pipette Module (1): Displays module status.

- Default status indicator.
- Highlighted status indicator.
- Faulted status indicator.
- Faulted-Highlighted status indicator.
- Highlighted blue: Module is active.
- Highlighted red: Module is faulted.

Basic/Advanced (2): Switches between basic and advanced operations pages.

Dispense (3): Displays dispense settings.

Aspirate (4): Displays aspirate settings.

Plates (5): Displays plate settings.

Tips (6): Displays tip settings.

Abort (7): Aborts all running actions.

Arrays/Columns Information (8): Displays Arrays, Columns, and number of arrays in protocol.

Note: For advancing Array Tape by arrays or columns.

Dispense settings

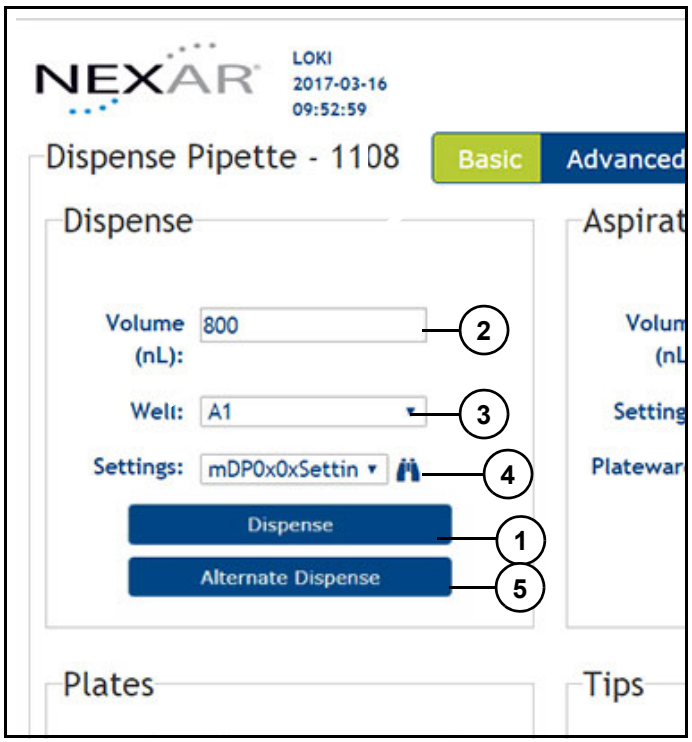


Figure 3

Refer to *(Figure 3)*.

Dispense (1): Initiates dispense operation.

Pipettor positions dispense tips above Array Tape and dispenses volume of fluid specified in Volume (nL) (2) into specified Well quadrant (3).

Volume (nL) (2): Sets and displays volume to dispense in nL.

Units	Nanoliters
Minimum	10
Default	800
Maximum	Limited by hmi 27000 pending on tip capacity maybe less.

Well (3): Indicates into which quadrant pipette dispenses. Four quadrants A1, A2, B1, B2.

Settings Binocular Icon (4): Opens dispense settings for displayed dispense file.

Alternate Dispense (1): Initiates alternate dispense operation.

Aspirate settings

Figure 4

Refer to *(Figure 4)*.

Aspirate (1): Initiates aspirate operation.

Pipettor moves to aspiration position, then positions tips into source plate, and aspirates volume of fluid from plate specified in Volume text box (nL) (2).

Volume Text Box (nL) (2): Displays volume aspirated from source plate in nL.

Units	Nanoliters
Minimum	10
Default	7,000
Maximum	Limited by hmi 27000 pending on tip capacity maybe less.

Settings Binocular icon (3): Opens aspirate settings for display aspirate file.

Plateware Binocular icon (4): Opens plateware settings for display plateware file.

Plate settings

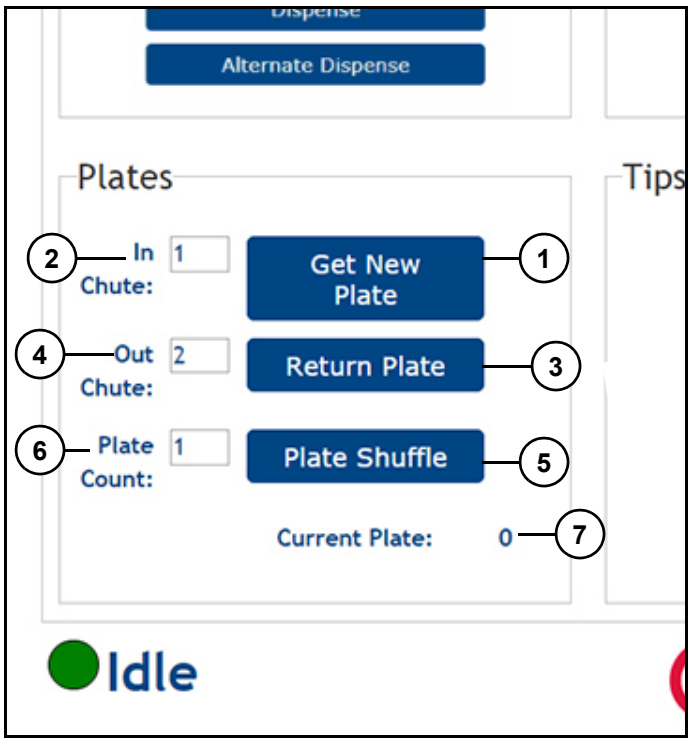


Figure 5

Refer to *(Figure 5)*.

Get New Plate (1): Initiates operation to retrieve a new plate from stack.

New plate is brought in from chute specified in In Chute (2). Plate will come down conveyor until it blocks photoeye sensor and stops at correct location.

In Chute Text Box (2): Sets and displays which chute will supply new plate. Chutes are numbered from right to left. Default setting can be specified in DP settings.

Units	Number
Minimum	1
Default	1
Maximum	Number of chute on Instrument

Return Plate (3): Initiates operation to return plate to stack.

Plate goes down conveyor and is stacked in chute specified in Out Chute (4).

Out Chute (4): Sets and displays which chute will receive plate. Chutes are numbered from right to left.

Units	Number
Minimum	1
Default	1
Maximum	Number of chutes on Instrument

Plate Shuffle on/off (5): Initiates operation to transfer plates between stacks.

New plate is downstacked from chute specified in Plate Count (6). Plate is transferred and upstacked to chute specified in Out Chute (4).

Current Plate (7): Displays plate currently being used.

Tip settings

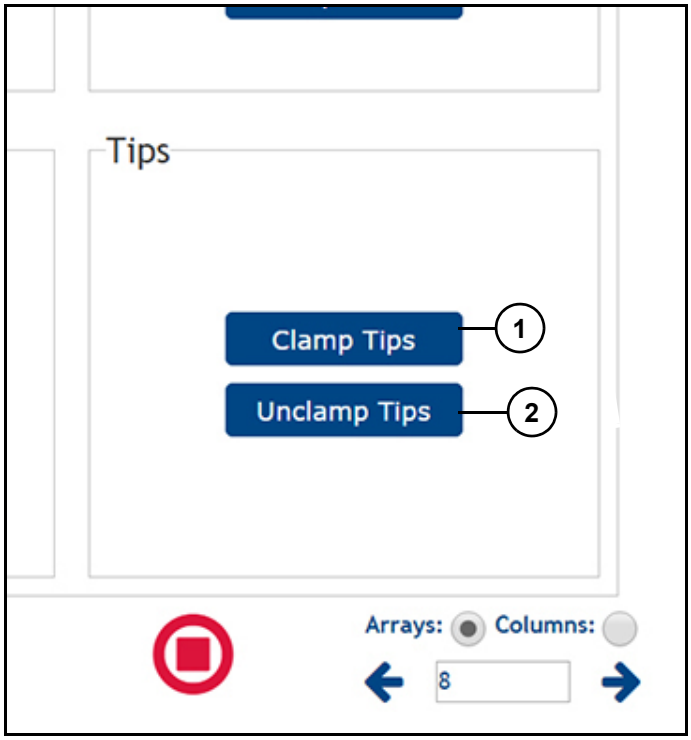


Figure 6

Refer to *(Figure 6)*.

Clamp Tips (1): Clamps tips to dispense head.

Unclamp Tips (2): Unclamps tips from dispense head.

Dispense Pipette screen - Advanced

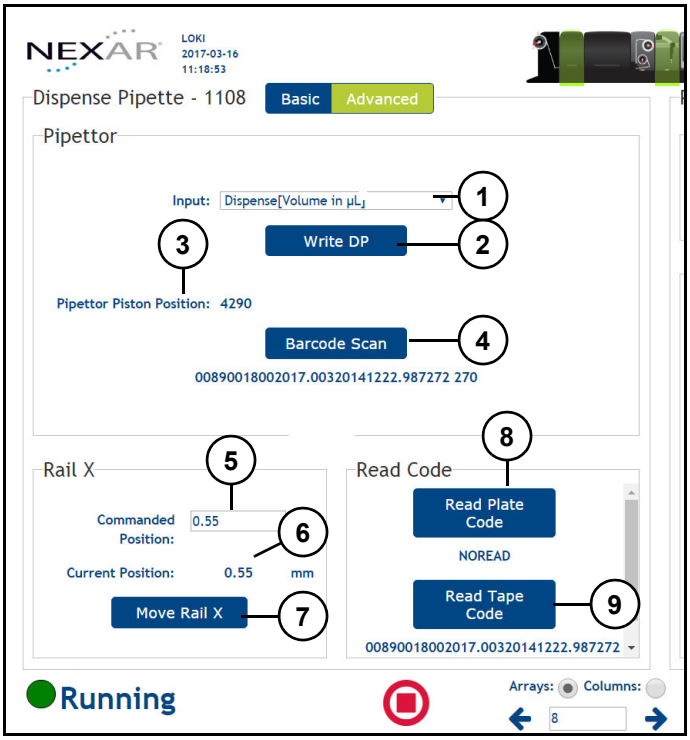


Figure 7

Refer to *(Figure 7)*.

Overview of controls

Input (1): Displays/selects desired input.

Write DP (2): Writes selected input command to pipette head.

Pipettor Pistion Position (3): Displays pipettor position in nL.

Barcode Scan (4): Triggers barcode scaner at displayed position.

Command Position (4): Inputs position for X-Rail.

Current Position (5): Displays X-Rail's current position.

Move Rail X (7): Moves X-Rail to displayed command position.

Read Plate Code (8): Moves pipette to read plate code.

Read Tape Code (9): Moves pipette to read Array Tape code.

Manually dispensing into Array Tape

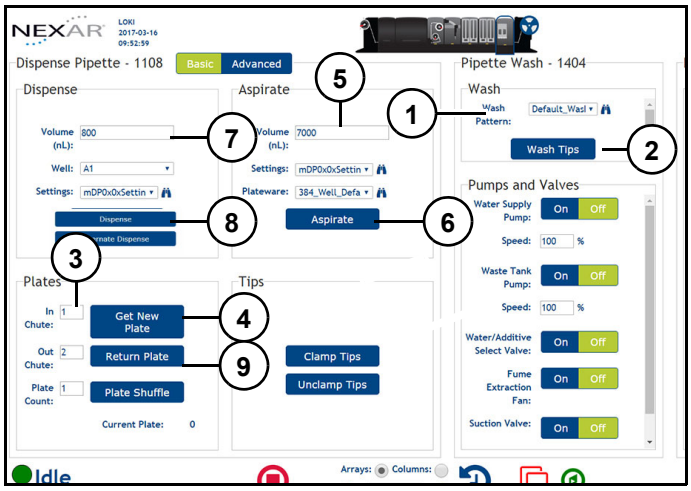


Figure 8

Refer to *(Figure 8)*.

1. Set "Wash Pattern" (1).
2. Click "Wash Tips" (2).
3. Specifying chute from "In Chute" (3).
4. Click "Get New Plate" (4).
5. Specify volume to aspirate in "Volume" (5).
6. Click "Aspirate" (6).
7. Specify volume to dispense in "Volume" (7).
8. Click "Dispense" (8) to dispense into Array Tape.
9. Click "Return Plate" (9) to return plate to specified chute.

Creating new dispense pipette setting

Users with administrator privileges can create new Dispense Pipette settings file.

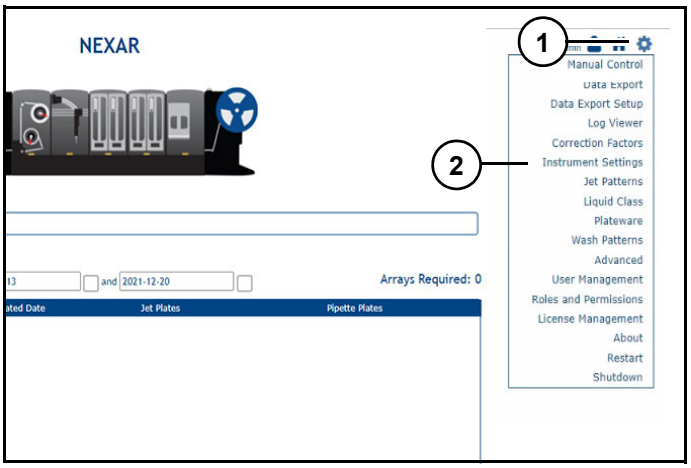


Figure 9

Refer to *(Figure 9)*.

1. Click "Settings" (1).
2. Click "Instrument Settings" (2).

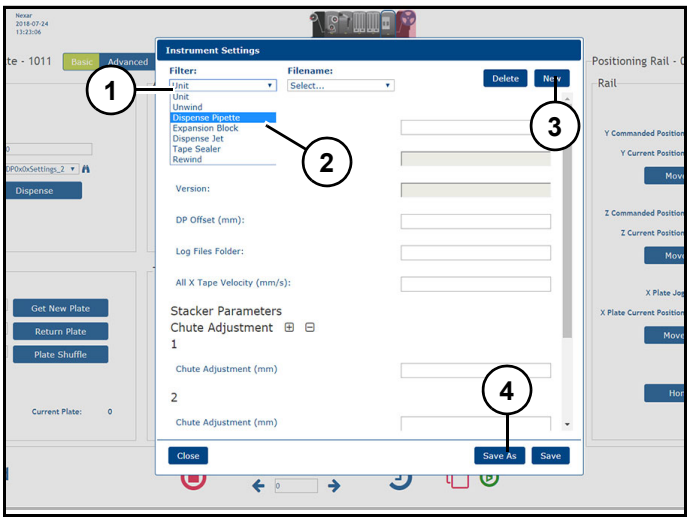


Figure 10

Refer to *(Figure 10)*.

3. Click "Filter" drop-down (1).
4. Select "Dispense Pipette" (2).
5. Click "New" (3).
6. Enter desired settings on setting screen.
7. Click "Save As" (4) to save changes.

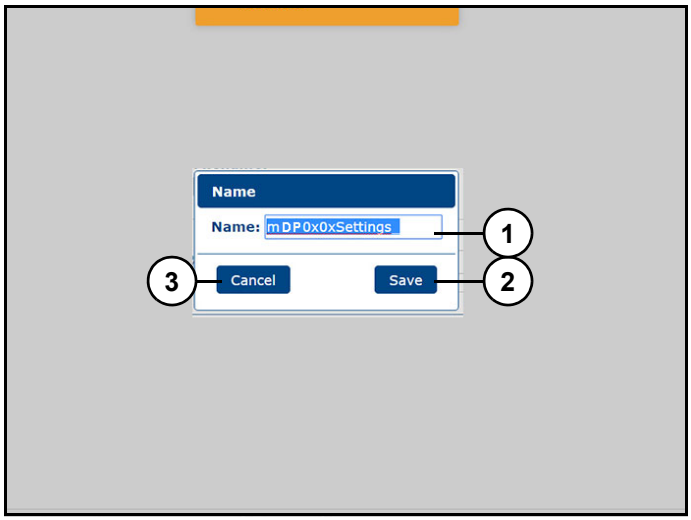


Figure 11

Refer to *(Figure 11)*.

8. Enter "Name" (1) of new setting.
9. Click "Save" (2).

Note: Click "Cancel" (3) to exit without saving new file.

Adjusting Dispense Pipette settings

Users with administrator privileges can change dispense pipette parameters using Settings file.

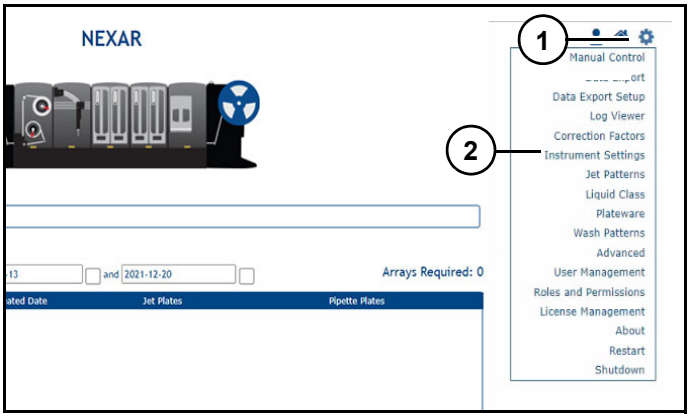


Figure 12

Refer to *(Figure 12)*.

1. Click "Settings" (1).
2. Click "Instrument Settings" (2).

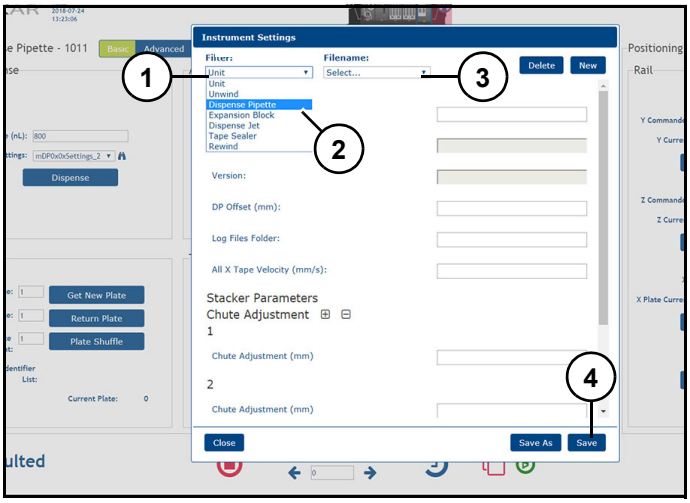


Figure 13

Refer to *(Figure 13)*.

3. Click "Filters" drop-down (1).
4. Select "Dispense Pipette" (2).
5. Select "Filename" drop-down (3) and select file to edit.
6. Adjust desired settings on setting screen.
7. Click "Save" (4) to save changes.

Deleting Dispense Pipette settings

Users with administrator privileges can change dispense pipette parameters using Settings file.

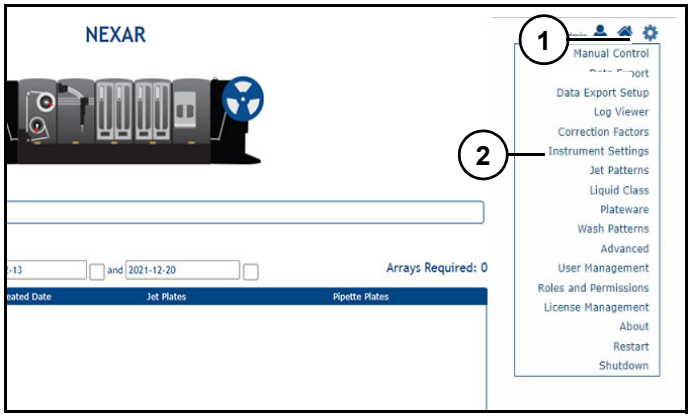


Figure 14

Refer to *(Figure 14)*.

1. Click "Settings" (1).
2. Click "Instrument Settings" (2).

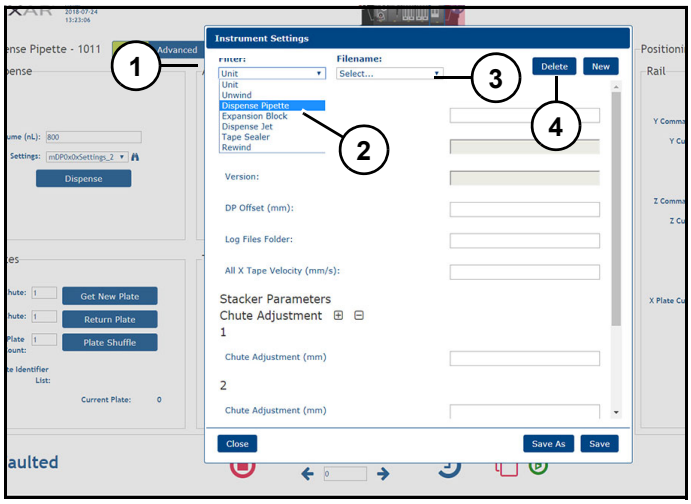


Figure 15

Refer to *(Figure 15)*.

3. Click "Filter" drop-down (1).
4. Select "Dispense Pipette" (2).
5. Select "Filename" drop-down (3) and select file to delete.
6. Click "Delete" (4) to delete settings file.
7. Click "Yes" (NS) to delete.

Setting Descriptions

Setting limits are listed in XML setting file.

Plateware:
Define plateware setting 384 default.

Liquid Class:
Define Liquid class setting.

Disable Liquid Class Overage:
Sets Dispense Pipette aspiration overage during manual and automatic operation (true/false). False is default.
False: Aspiration volume = recipe or HMI volume + extra volume + pre-dispense volume.
True: Aspiration volume = recipe or HMI volume.

Tip Capacity (µL):
Define Pipette Tip Capacity 10 or 25 µL only.

Rail X Dispense Offset:
Defines X-Rail's Offset for dispense operation.

Rail X Wash Offset:
Specifies position DP X-Rail should be in during wash operation.

Y Dispense Offset:
Defines Y offset for dispense operation.

Y Touch Off:
Defines Y touch off move distance for dispense operation.

Y Torque Limit:
Torque limit for Y rail units: Measured drive amperage in counts.

Y Wash Position Offset:
Defines Y offset for wash operation.

Y Wash Touch Off:
Defines Y touch off move distance for wash operation.

Z Clear Position:
Defines Z position that will clear all on module obstacles.

Z Wash Offset:
Defines Z position offset for wash operation.

Z Wash Suction Position:
Defines Z suction position for wash operation.

Z Wash Outside Of Tips Position:
Defines Z in station position for wash operation.

Z Dispense Position:
Defines Z position to start dispense sequence.

Z Tip Offset:
Defines Z offset to compensate for pipette tip length; 10 µL =12.6 mm 20 µL = 21.6 mm.

Z Hover Position:
Defines Z position to create dispense bubble at.

Z In Position:
Defines Z position where tips are at bottom of Array Tape wells Z touchoff mode.

Z Touchoff Torque:
Defines stop torque if DP is set to torque mode dispensing.

Z Retract Acceleration:
Defines Z acceleration used when retracting tips after a dispense event.

Z Torque Limit:
Torque limit for Z rail Units: Measured Drive amperage in counts.

Verify Z Torque Position:
Defines if ZInPosition should be verified when dispensing in torque mode.

Z Torque Position Error:
Defines allowable error if ZInPosition is being verified in torque mode.

Code Y Position:
Defines Y position for Array Tape code reads.

Code Z Position:
Defines Z position for Array Tape code reads.

Error Mode:
Defines error that should display if a Array Tape code does not match expected recipe Array Tape code "CheckRecipe" or previous managers stored tape code "CheckArray".

Tape Slot Sense:
Defines if a tape slot sensor is present in this module - For use with heated tape path only.

Run Continuous Bit:
Defines if pressurise function should run during dispensing or only before and after dispense action.

In Chute ID Operation:
Defines chute that manager should fetch plates from.

Out Chute ID Operation:
Defines chute that manager should return plates to.

Plate Dump:
Defines direction that plate dump chute is from manager +1 is down stream -1 is upstream.

Plate Reposition:
Defines if plate should be repositioned during aspiration operation.

External Stacker Start:
Defines starting stacker and chute to fetch a plate from if using an external plate stacker.

Waste Pump Off Delay (min):
Defines whether or not to use waste pump.

Fume Extractor Fan Select:
Defines number of minutes Fume Extractor Fan continues to run after wash process is complete.

Waste Pump Select:
Defines whether or not to use waste pump.

Prime & Rinse Watchdog Time:
Defines number of milliseconds supply pump will fill from Additive reservoir during prime and rinse function.

Basic Mode Plate Scan:
Defines if DP should reverify plate code on a plate that is fetched from external plate.

Faults

Settable priority

PlateCodeMatch:
Plate code doesn't match expected platecode.

PlateCodeRead:
Plate barcode was unable to be captured.

CodeArrayMatch:
Upstream barcode reader scanned doesn't match barcode scanned.

CodeCheckPrevious:
Array Tape code out of sequence.

CodeRead:
Array Tape code was not captured.

Code3NoReads:
Reader missed more than three barcodes in a row, check camera or barcodes.

CodeRecipeMatch:
Recipe barcode doesn't match scanned.

CodeOrientation:
Orientation of does not match what is expected.

VerifyZTorquePosition:
DP reached torque position before expected position.

ArrayFault:
User added fault to Array Tape mode recipe.

File faults

CheckCorrectionFactorsFile:
Correction factor file is missing or incorrect.

CheckLiquidClassFile:
Liquid class file is missing or incorrect.

CheckPipetteVolumeOffsetsFile:
Pipette volume offset file is missing or incorrect.

CheckPlateIdentifierFile:
Plate identifier list is missing or incorrect.

CheckRecipeFile:
Recipe file is incorrect, please check file for incorrect structure.

CheckSettingsFile:
Settings file may be missing or incorrect.

CheckWashPatternFile:
Dispense Pipette reached torque before expected in Array Tape well.

CheckPlatewareFile:
Required plateware is missing.

CheckUsageFile:
Usage file is may be missing or incorrect.

Plate faults

PlateInFault:
Plate was not successfully delivered from chute.

PlateReposition:
Plate failed to reposition at Dispense Pipette.

PlateTransfer:
Plate failed to transfer from the plate stacker on chute.

RepositionMeasurement:
Plate failed to reposition.

CheckPlateSize:
Plate size does not match expected length.

MeasurementPosition:
Plate failed to position.

ShufflePlateNotFound:
Plate shuffle failed on cycle of cycle(s) in chute.

PlateInShuffleCycle:
Plate in shuffle failed on cycle of cycle(s) in chute.

PlateOutShuffleCycle:
Plate out shuffle failed on cycle of cycle(s) in chute.

PlateReturn:
Plate failed to return to chute.

PlateNoDump:
No plate on deck to dump.

Abort faults

YTorqueLimitFault:
y-axis at position reached torque value.

ZTorqueLimitFault:
z-axis at position reached torque value.

Maintenance

Notice

There are two pipettor motors, piston and clamp. During normal operation, pistons are inserted into disposable tip tray and need to be homed. If not homed module will cause an error. Usually user does not have to home motor as it is homed during a process. If an error message "Ex" appears in the Write DP Response field, motors must be homed.

⚠CAUTION

Pipettor must be over a wash station during homing procedure so liquid does not spill onto instrument.

Homing pipettor motors

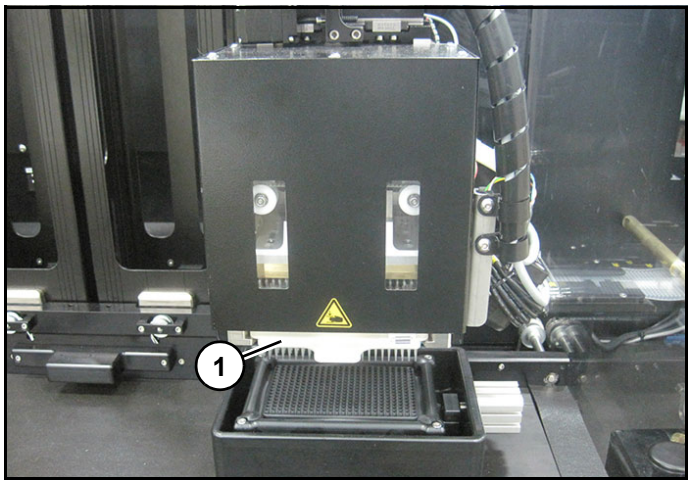


Figure 16

1. Ensure disposable tip tray (1) *(Figure 16)* is correctly inserted in clamp.

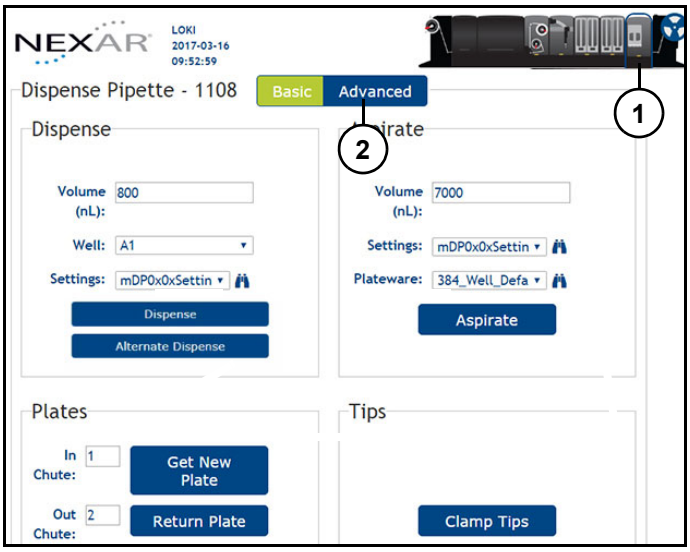


Figure 17

Refer to *(Figure 17)*.

1. Select "Dispense Pipette" (1).
2. Click "Advanced" (2).

Figure 18

Refer to *(Figure 18)*.

3. Set "Input" pump calibration command to motor: k (1).
4. Click on "Write DP" (2). Pistons will descend to their lowest position.

Note: "Write DP Response" will return with "!". indicating pipette is homed and "Write DP" (2) will turn green.

Replacing pipettor tips

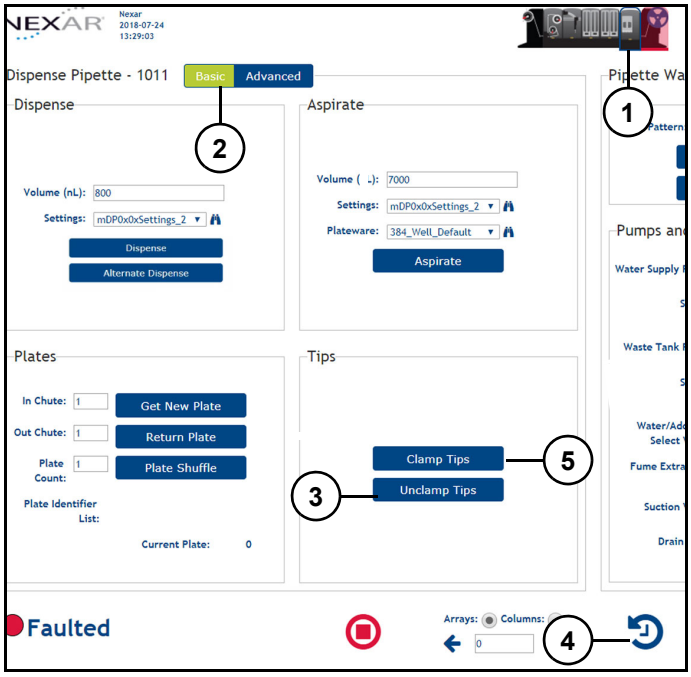


Figure 19

Refer to *(Figure 19)*.

1. Select "Dispense Pipette" (1).
2. Click "Basic" (2).
3. Click "Unclamp Tips" (3). Wait for clamp motor to release tip tray.

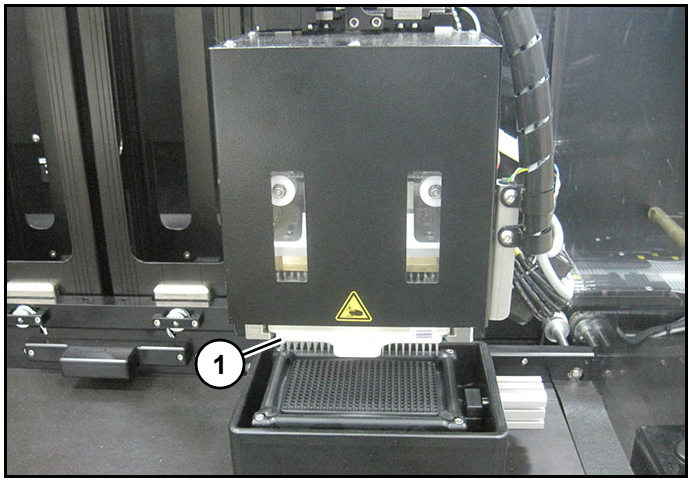


Figure 20

4. Lift guard door and remove tip tray (1) *(Figure 20)*.
5. Insert new tip tray.
6. Close guard door.
7. Click "Reset" (4) *(Figure 19)*.
8. Press "Clamp Tips" (5) *(Figure 19)* and wait until tip tray is clamped.

Cleaning CyBio seal

Tools Needed:

- Lint-free cloth and alcohol.
- Non-residual tacky surface (PCR plate seal).

1. Remove tips and pull CyBio head forward.
2. Shut down instrument to avoid damage.

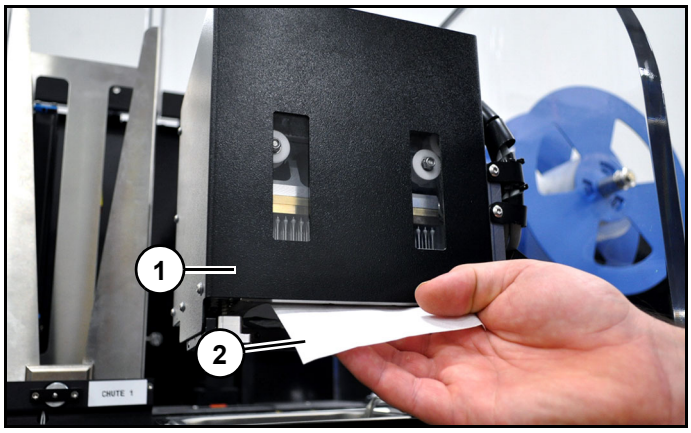


Figure 21

3. Dab seal, located on bottom of head (1), with a lint-free cloth moistened with alcohol (2). *(Figure 21)*
4. Allow to dry.

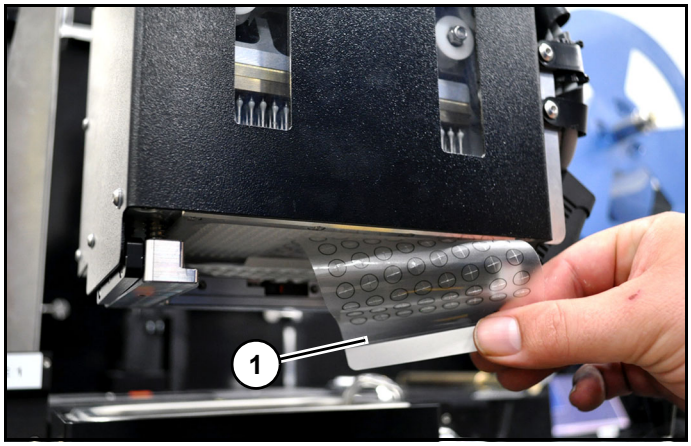


Figure 22

5. Cover bottom of head with a tacky surface (1) *(Figure 22)* that does not leave any residue.

Note: Two PCR plate seals side-by-side work well.

6. Peel tacky surface back gently at a sharp angle.
7. Replace tips and restart instrument.

Dispense Pipette Manager_MGR_DP1011 troubleshooting

Notice
Before attempting any fault solution, refer to Handling Faults section. Colours Red: Safety fault. Yellow: Uncontrolled fault other than safety. Blinking Blue: Faulted (controlled). Blue: Recovering Green: Running Black: Initialising

Manager fault messages

Settable priority	Cause	Solution
PlateCodeMatch:	Plate code doesn't match expected platecode.	Ensure plates are loaded in correct order. Verify that Array Tape wasn't advanced manually during protocol, adjust forward or backwards one Array Tape and try to resume.
PlateCodeRead:	Plate barcode was unable to be captured.	Camera read position may need to be optimised. Camera setting may need to be adjusted using "ESP" software. Ensure there is no glare on area of interest.
CodeArrayMatch:	Upstream barcode reader scanned doesn't match barcode scanned {0}.	Verify that Array Tape wasn't advanced manually during protocol, adjust forward or backwards and try to resume.
CodeCheckPrevious:	Array Tape code out of sequence.	Verify that Array Tape wasn't advanced manually during protocol, adjust forward or backwards and try to resume.
CodeRead:	Array Tape code was unable to be captured.	Camera read position may need to be optimised. Camera setting may need to be adjusted using "ESP" software. Ensure there is no glare on area of interest.
Code3NoReads:	Reader missed more than three barcodes in a row, check camera or barcodes.	Camera read position may need to be optimised. Camera setting may need to be adjusted using "ESP" software. Camera may need to be replaced.

Settable priority	Cause	Solution
CodeRecipeMatch:	Recipe barcode doesn't match scanned.	Ensure Array Tape is aligned to the correct array. May have incorrect spool of Array Tape loaded on instrument.
CodeOrientation:	Orientation of Array Tape does not match what is expected.	Array Tape may need to be reversed and then resume protocol. Check protocol logic under "<Orientation>XXX</Orientation>" 0 is forward, 180 is backwards.
VerifyZTorquePosition:	DP reached torque position before expected position {1}.	Ensure is aligned correctly and is not a column off. May need to optimise DP dispense position.
ArrayFault:	User added fault to Array Tape mode recipe.	

File faults	Cause	Solution
CheckCorrectionFactorsFile:	Correction factor file is missing or incorrect.	Verify file exists and that it is not corrupted.
CheckLiquidClassFile:	Liquid class file is missing or incorrect.	Verify file exists and that it is not corrupted.
CheckPipetteVolumeOffsetsFile:	Pipette volume offset file is missing or incorrect.	Verify file exists and that it is not corrupted.
CheckPlateIdentifierFile:	Plate identifier list is missing or incorrect.	Verify file exists and that it is not corrupted.
CheckRecipeFile:	Recipe file is incorrect, please check file for incorrect structure.	Verify file exists and that it is not corrupted.
CheckSettingsFile:	Settings file may be missing or incorrect.	Verify file exists and that it is not corrupted.
CheckWashPatternFile:	DP reached torque before expected in Array Tape well.	Verify file exists and that it is not corrupted.
CheckPlatewareFile:	Required plateware is missing.	Verify file exists and that it is not corrupted.
CheckUsageFile:	Usage file is may be missing or incorrect.	Verify file exists and that it is not corrupted.

Plate faults	Cause	Solution
PlateInFault:	Plate was not successfully delivered from chute.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.

Plate faults	Cause	Solution
PlateReposition:	Plate failed to reposition at DP.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.
PlateTransfer:	Plate failed to transfer from the plate stacker on chute.	Check transfer path.
RepositionMeasurement:	Plate failed to reposition.	Verify plate is not caught on transfer deck.
CheckPlateSize:	Plate size does not match expected length.	Check photo eye and transfer deck.
MeasurementPosition:	Plate failed to position.	Verify plate is not caught on transfer deck.
ShufflePlateNotFound:	Plate Shuffle failed on cycle of cycle(s) in chute. Plate code.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.
PlateInShuffleCycle:	Plate in shuffle failed on cycle of cycle(s) in chute.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.
PlateOutShuffleCycle:	Plate out shuffle failed on cycle of cycle(s) in chute.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.
PlateReturn:	Plate failed to return to chute.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.
PlateNoDump:	No plate on deck to dump.	Ensure plate chutes are seated properly. Verify all conveyor belts are in correct position and aren't slipping. Clear any obstructions on plate path.

Abort faults	Cause	Solution
YTorqueLimitFault:	y-axis at position reached torque value.	Check for obstructions in the "front to back" path way of head. Ensure rail is properly lubricated. May need to adjust torque settings.
ZTorqueLimitFault:	z-axis at position reached torque value.	Check for obstructions in the "up and down" path way of head. Ensure rail is properly lubricated. May need to adjust torque settings.

Module faults

Abort faults	Cause	Solution
_BK1120_COUPLER_STATE:	Error on BK1120 Beckhoff card.	Run diagnostics and look for CRC errors and for cards not in OP mode, check card for power, try and reseat card.
_BK1120_STATE:	State change on BK1120 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_BK1120_WCSTATE:	Working counter error on BK1120 Beckhoff card.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_EK1100_STATE:	State change on EK1100 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_220_EL6001_STATE:	State change on EL6001 Beckhoff card at terminal 22.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_220_EL6001_WCSTATE:	Working counter error on EL6001 Beckhoff card at terminal 22.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_310_EL6001_STATE:	State change on EL6001 Beckhoff card at terminal 31.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_310_EL6001_WCSTATE:	Working counter error on EL6001 Beckhoff card at terminal 31.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_320_EL7031_WCSTATE:	Working counter error on EL7031 Beckhoff card at terminal 32.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_320_EL7031_STATE:	State change on EL7031 Beckhoff card at terminal 32.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
RAILXDRIVE:	Possible problem with Rail X drive system.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.
RAILXHOMEFAULT:	Rail X in unable to home.	Ensure drive can move, check drive for obstructions, clear as necessary. Check prox sensor for damage and ensure it has power.

Pause faults	Cause	Solution
PIPETTOR:	Error on pipettor.	Contact Biosearch Technologies.

Positioning Rail_PR0904

⚠WARNING

Read and understand equipment operators manual before operating or performing maintenance. Failure to do so could result in serious injury or death.

Component identification

Positioning Rail_PR0904

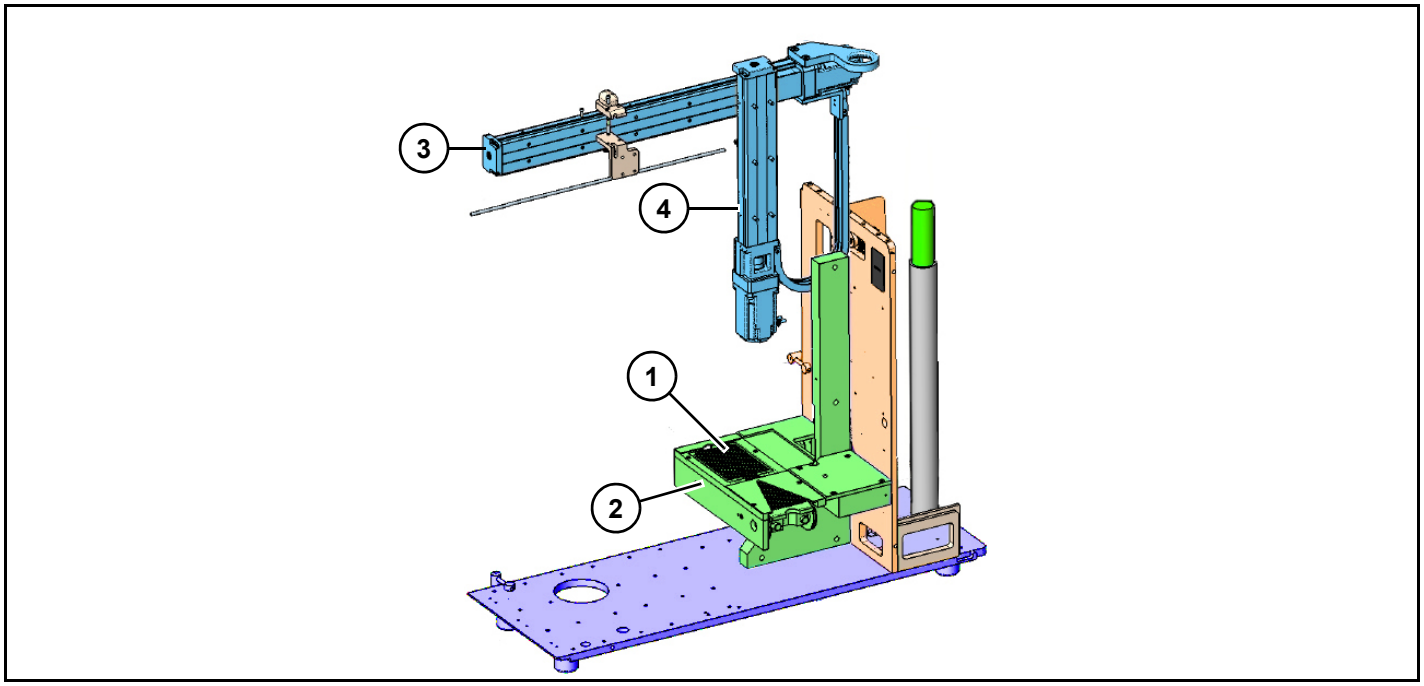


Figure 1

REF#	DESCRIPTION	REF#	DESCRIPTION
1	Drive	4	Z-Axis Rail
2	Photoeye (underneath deck)		Plate Conveyor (not shown)
3	Y-Axis Rail		

Explanation of components

3) Y-Axis Rail. : Provides y-direction motion for positioning rail.

4) Z-Axis Rail. : Provides z-direction motion for positioning rail.

(NS) Plate Conveyor: Shuttles plates back and forth from plate stacker chutes.

Positioning Rail Module_PR0904 controls

Notice

Controls on auto screen can only be activated when instrument is in an idle state.

⚠CAUTION

Although manual operation is limited, user can manually run dispense head into objects. Use caution to avoid damage.

Positioning Rail screen

Figure 2

Refer to *(Figure 2)*.

Overview of controls

Dispense Pipette Module (1): Displays module status.

- Default status indicator.
- Highlighted status indicator.
- Faulted status indicator.
- Faulted-Highlighted status indicator.
- Highlighted blue: Module is active.

Y Command Position (2): Displays/selects desired y-axis position in mm.

Y Current Position (2): Displays current y-axis position in mm.

Move Y Axis (4): Moves head in y-direction.

Units	Millimeters
Minimum	HMI limit
Default	Current position
Maximum	Rail limit

Note: A larger number indicates a position closer to front of module.

Z Command Position (5): Displays/selects desired z-axis position in mm.

Z Current Position (6): Displays current z-axis position in mm.

Move Z Axis (7): Moves head in z-direction.

Units	Millimeters
Minimum	Rail limit
Default	Current position
Maximum	Nozzle limit on carriage

Note: A larger number indicates a position closer to front of module.

X Plate Jog (8): Sets and displays distance plate moves. A positive number moves plate to left, a negative number moves plate to right

X Plate Current Position (9): Displays current x-plate position in mm.

Move X Plate (10): Moves head in x-plate direction.

Units	Millimeters
Minimum	-
Default	Current position
Maximum	-

Home Rail (11): Homes rail independently from rest of instrument.

Faults

Fault List	
XDrive	_400_EL1014_State
PlateXDrive	_400_EL1014_WCState
XJam	Rail_Z_Axis_Drive_Fault
_EK1100a_State	Rail_Y_Axis_Drive_Fault
_230_EL4132_State	_420_EL2004_State
_230_EL4132_WCState	_420_EL2004_WCState
_EK1110a_State	_430_EL5101_State
_EK1100b_State	_430_EL5101_WCState
_330_EL1014_State	_440_EL5101_State
_330_EL1014_WCState	_440_EL5101_WCState
Safety_Contactor_Status	_EK1110b_State
Bus_B_Fuse_Check	_BK1120c_Coupler_State
Bus_C_Fuse_Check	_BK1120c_State
Bus_D_Fuse_Check	_BK1120c_WCState

For fault information See “Positioning Rail_PR0904 troubleshooting” on page 201.

For handling faults See “General fault recovery procedure” on page 25.

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How to recover from a Array Tape jam

1. Remove jam by clearing path of Array Tape.
2. Reset instrument to clear Array Tape jam fault.
3. Press "Sync ".
4. Enable instrument.
5. Resume operations. While in recipe mode, process will resume where it was interrupted.

Note: Array Tape jams may result in lost data. Align Array Tape to dispense head prior to restarting operations.

Replacing fuses

Tools Needed:

- M3 hex wrench

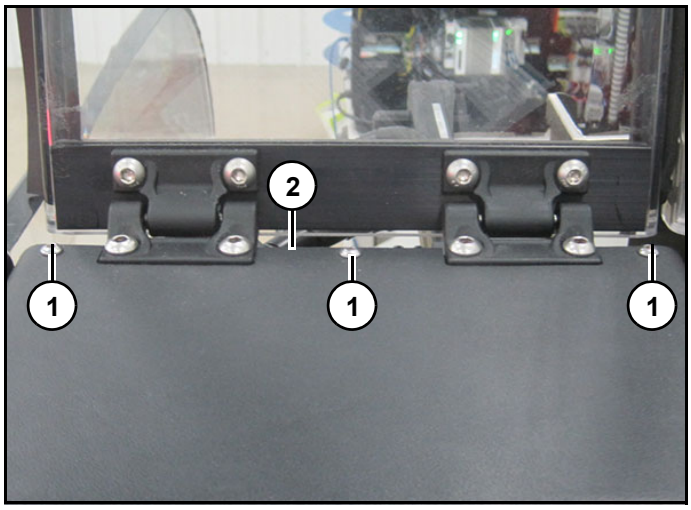

Figure 3

1. Using M3 hex wrench loosen three bolts (1) on top of back cover (2). *(Figure 3)*
2. Tilt cover back and lift up to remove.

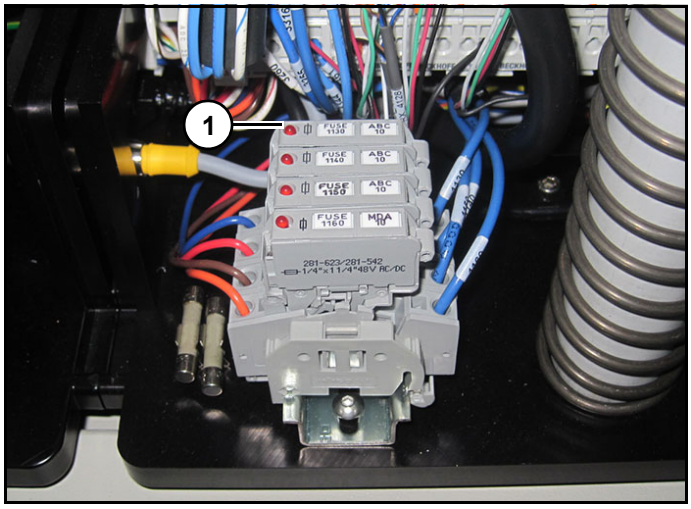

Figure 4

3. Check Bus B, Bus C, and Bus D fuses, light (1) *(Figure 4)* will be red on a blown fuse.

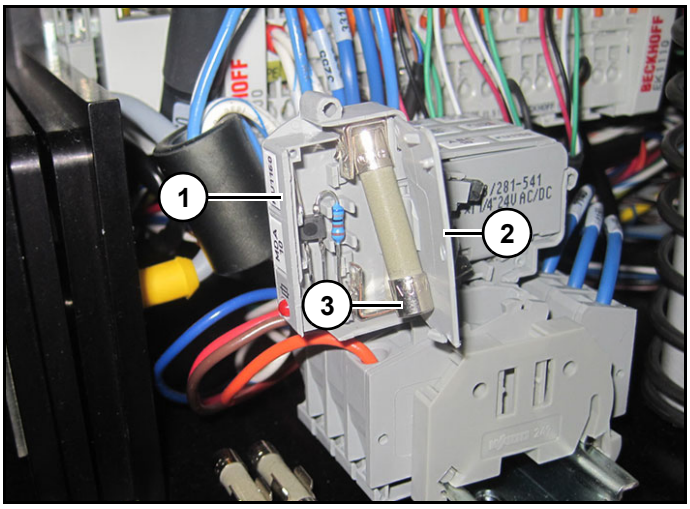

Figure 5

Refer to *(Figure 5)*.

4. Tip up blown fuse cover (1).
5. Pry fuse lid (2) open.
6. Remove fuse (3) and replace with a new fuse.

Note: Verify correct fuse ratings before installing.

7. Close fuse lid (2), fuse will lock into correct sockets.
8. Flip cover (1) down so it locks securely.
9. Replace back cover.
10. Replace and tighten bolts to secure.

Positioning Rail_PR0904 troubleshooting

Notice
Before attempting any fault solution, refer to Handling Faults section. Colours Red: Safety fault. Yellow: Uncontrolled fault other than safety. Blinking blue: Faulted (controlled). Blue: Recovering. Green: Running. Black: Initialising.

Fault messages

Blue error message	Cause	Solution
_XJAM	X-Drive was obstructed, most likely a jam.	Remove jam by clearing path of Array Tape. Reset instrument to clear fault. Enable instrument. Press Sync button on Unwind Manager Auto Screen and resume operation.

Yellow error message	Cause	Solution
_SAFETY_CONTACTOR_STATUS	Safety Contactor is faulty.	Cycle power to instrument. If problem persists, contact Biosearch Technologies.
_YHOMEFAULT	Rail failed to locate its initial (home) position.	Contact Biosearch Technologies.
_ZHOMEFAULT	Rail failed to locate its initial (home) position.	Contact Biosearch Technologies.
_XDRIVE	Terminal may be faulty.	Cycle power to instrument. If problem persists, contact Biosearch Technologies.
_PLATEXDRIVE	Same as above	Same as above
_EK1110a_STATE	Same as above	Same as above
_230_EL4132_STATE	Same as above	Same as above
_230_EL4132_WCSTATE	Same as above	Same as above
_EK1110b_STATE	Same as above	Same as above
_330_EL1014_STATE	Same as above	Same as above
_330_EL1014_WCSTATE	Same as above	Same as above
_400_EL1014_STATE	Same as above	Same as above
_400_EL1014_WCSTATE	Same as above	Same as above

Yellow error message	Cause	Solution
_RAIL_Z_AXIS_DRIVE_FAULT	Same as above	Same as above
_RAIL_Y_AXIS_DRIVE_FAULT	Same as above	Same as above
_420_EL2004_STATE	Same as above	Same as above
_430_EL5101_STATE	Same as above	Same as above
_430_EL5101_WCSTATE	Same as above	Same as above
_440_EL5101_STATE	Same as above	Same as above
_440_EL5101_WCSTATE	Same as above	Same as above
_EK1110b_STATE	Same as above	Same as above
_BK1120c_COUPLER_STATE	Same as above	Same as above
_BK1120c_STATE	Same as above	Same as above
_BK1120c_WCSTATE	Same as above	Same as above
BUS_B_FUSE_CHECK	Fuse is blown.	Replace fuse. See "Replacing fuses" on page 200.
BUS_C_FUSE_CHECK	Same as above	Same as above
BUS_D_FUSE_CHECK	Same as above	Same as above

Blue Error Message	Cause	Solution
Plate_In_fault	Plate stuck in plate stacker on conveyor.	Clear obstruction for plate.

Scanning Rail_SR1209

⚠WARNING

Read and understand equipment operators manual before operating or performing maintenance. Failure to do so could result in serious injury or death.

Component identification

Scanning Rail_SR1209

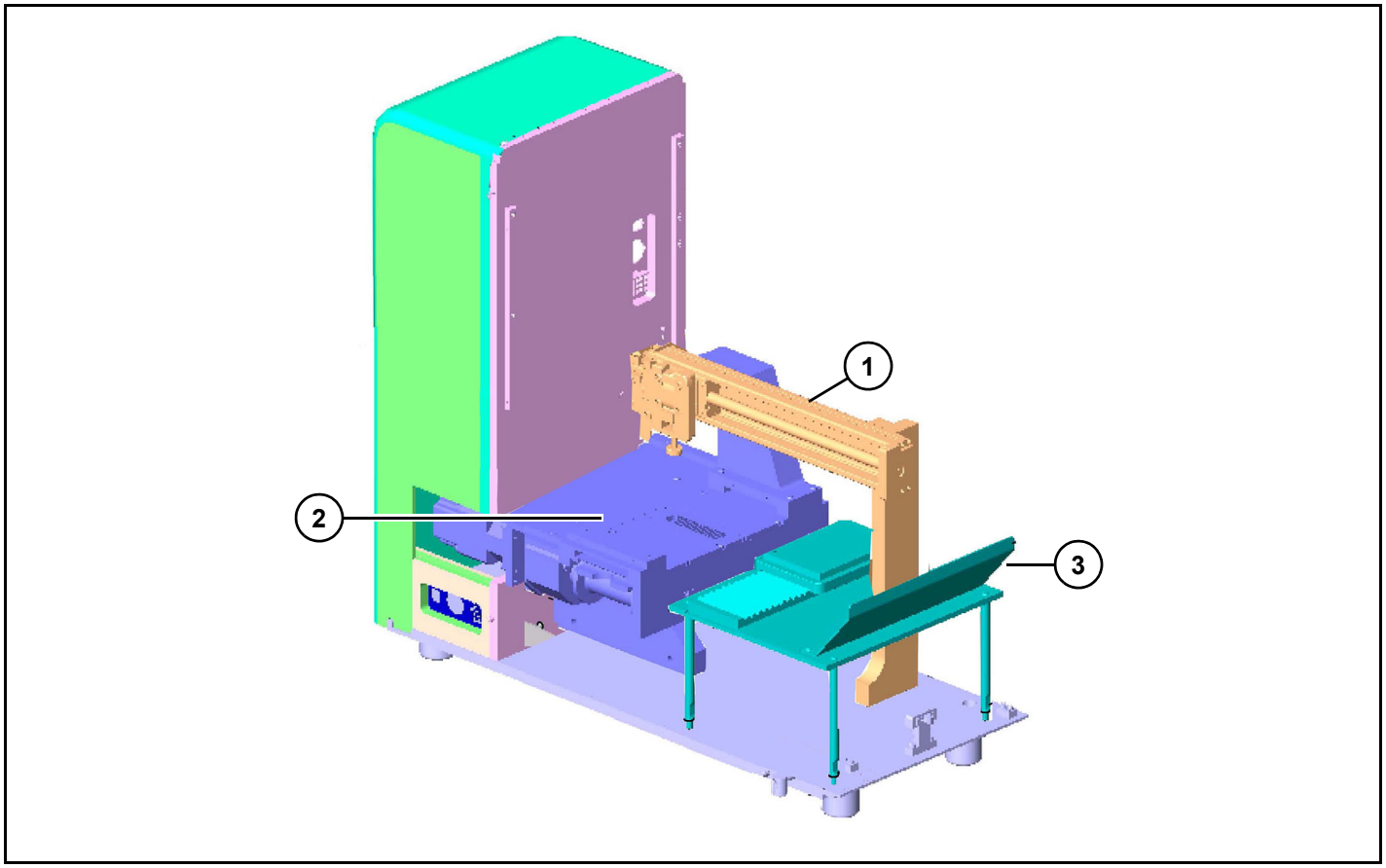

Figure 1

REF#	DESCRIPTION	REF#	DESCRIPTION
1	Y-Axis Scanning Rail	3	Calibration Tray Assembly
2	Scanning Deck		

Scanning Rail_SR1209

Notice
Controls on Auto screen can only be activated when instrument is in an idle state. If a change is made to Manager Settings file (See Manager Settings section) it only takes effect after a pause and idle action is performed.

⚠ CAUTION

Although manual operation is limited, user can manually run head into objects. Use caution to avoid damage.

Scanning Rail screen - basic

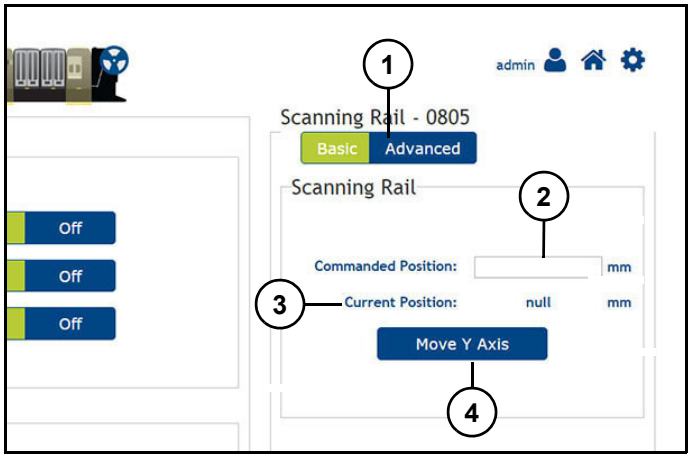

Figure 2

Refer to *(Figure 2)*.

Overview of controls

Basic/Advanced (1): Switches between basic and advanced operations pages.

Command Position (mm) (2): Sets and displays command position of y-axis in mm.

Units	Millimeters
Minimum	Rail limit
Default	Current position
Maximum	Rail limit

Current Position (mm) (3): Displays current position of y-axis in mm.

Move Y Axis (4): Moves y-axis to command position (2).

Faults

Notice
Before resetting a fault, be sure condition is corrected.

For fault list See “Scanning Rail Sealer_SR1209 troubleshooting” on page 206.

For fault information See “Scanning Rail Sealer_SR1209 troubleshooting” on page 206.

How to recover from a fault

To reset a fault, user can use one of two methods:

- Press "Reset" button on Unwind Manager Auto screen.

OR

- Pull and release joystick at STOP/RESET position.

After resetting, wait a few seconds to see if fault condition clears from navigation panel. If it clears, instrument is ready.

How to recover from Array Tape jam

1. Remove jam by clearing path of Array Tape.
2. Reset instrument to clear Array Tape jam fault.
3. Press "Sync Tape".
4. Home.
5. Resume operations.

Scanning Rail Sealer_SR1209 troubleshooting

Notice
Before attempting any fault solution, refer to Handling Faults section. Fault Colours Red: Safety fault. Yellow: Uncontrolled fault other than safety. Blue: Controlled fault. Green: Quality control fault.

Module fault messages

Abort faults	Cause	Solution
XDRIVE:	Possible problem with Array Tape drive system.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.
_EK1100_STATE:	State change on EK1100 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_310_EL1014_STATE:	State change on EL1014 Beckhoff card at terminal 31.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_310_EL1014_WCSTATE:	Working counter error on EL1014 Beckhoff card at terminal 31.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
SAFETY_CONTACTOR_STATUS:	Safety contactors may be faulty.	Contactors may be sticking, lightly tap and check. Ensure wires are properly terminated.
BUS_B_FUSE_CHECK:	Bus B fuse may be blown.	Check indicator light on fuse, replace fuse if necessary.
BUS_C_FUSE_CHECK:	Bus C fuse may be blown.	Check indicator light on fuse, replace fuse if necessary.
BUS_D_FUSE_CHECK:	Bus D fuse may be blown.	Check indicator light on fuse, replace fuse if necessary.
_320_EL1014_STATE:	State change on EL1014 Beckhoff card at terminal 32.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_320_EL1014_WCSTATE:	Working counter error on EL1014 Beckhoff card at terminal 32.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
RAIL_Y_AXIS_DRIVE_FAULT:	Possible problem with y-axis drive system.	Feedback loop may be faulty, check light for steady blinking on back of Positioning Rail (means it's good). Check power wires to ensure not damaged and terminated properly. Ensure drives have power.

Abort faults	Cause	Solution
_330_EL2004_STATE:	State change on EL2004 Beckhoff card at terminal 33.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_330_EL2004_WCSTATE:	Working counter error on EL2004 Beckhoff card at terminal 33.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_340_EL4132_STATE:	State change on EL4132 Beckhoff card at terminal 34.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_340_EL4132_WCSTATE:	Working counter error on EL4132 Beckhoff card at terminal 34.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_410_EL5101_STATE:	State change on EL5101 Beckhoff card at terminal 41.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_410_EL5101_WCSTATE:	Working counter error on EL5101 Beckhoff card at terminal 41.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_420_EL6001_STATE:	State change on EL6001 Beckhoff card at terminal 42.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_420_EL6001_WCSTATE:	Working counter error on EL6001 Beckhoff card at terminal 42.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_EK1122_STATE:	State change on EK1122 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_BK1250ex_COUPLER_STATE:	Error on BK1250 Beckhoff card.	Run diagnostics and look for CRC errors and for cards not in OP mode, check card for power, try and reseat card.
_BK1250ex_STATE:	State change on EL1250 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_BK1250ex_WCSTATE:	Working Counter error on BK1250 Beckhoff card.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_YHOMEFAULT:	y-axis wasn't able to home.	Ensure drive can move, check drive for obstructions, clear as necessary. Check prox sensor for damage and ensure it has power.

SR1607 faults	Cause	Solution
_310_EL1114_WCSTATE:	Working counter error on EL1114 Beckhoff card at terminal 31.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

SR1607 faults	Cause	Solution
_310_EL1114_STATE:	State change on EL1114 Beckhoff card at terminal 31.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_320_EL6001_STATE:	State change on EL6001 Beckhoff card at terminal 32.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_320_EL6001_WCSTATE:	Working counter error on EL6001 Beckhoff card at terminal 32.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_330_EL7031_WCSTATE:	Working counter error on EL7031 Beckhoff card at terminal 33.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_330_EL7031_STATE:	State change on EL7031 Beckhoff card at terminal 33.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_430_EL7031_WCSTATE:	Working counter error on EL7031 Beckhoff card at terminal 43.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_430_EL7031_STATE:	State change on EL7031 Beckhoff card at terminal 43.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_EK1110_STATE:	State change on EK1110 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
Z_DRIVE:	Possible problem with z drive.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.
Z_HOME:	Z was unable to home.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.
Z_MOVE_UP:	Lift was unable to raise.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.
Z_MOVE_DOWN:	Lift was unable to lower.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.

Pause faults	Cause	Solution
DriveProx:	Tape drive proximity has unexpectedly been triggered.	Check for tape jam. Verify proximity.
XJAM:	Something has caused tape drive to become out of sync.	Figure 1Check tape path for obstructions and clear as necessary. Homing proximity may be bad, ensure it has power and is reading drive holes.

Pipette Wash Attachment_PW1404

Overview

Biosearch Technologies Pipette Wash hardware and enhanced wash procedures are the first line of defense against cross-contamination. They significantly reduce DNA carryover between plates. The Pipette Wash attachment minimises DNA cross-contamination between plates as follows:

- When pipettes have finished dispensing to Array Tape, any overage inside pipettes and any droplets adhering to outside of tips are removed by air vacuum.
- Tips are dipped in a bleach/water mix (if used) that inactivates any DNA residues, and tips are subjected to a repetitive aspirate/dispense cycle (default is five iterations) that thoroughly wash both internal and external surfaces. Any remaining bleach droplets are then wicked away (by touching the tips against surface of basin) and all residual traces of bleach removed by air vacuum.
- Tips are washed three times with water, again using a repetitive aspirate dispense cycle followed by a vacuum-assisted flush.

This three-step procedure removes virtually all traces of DNA and other extraneous material from pipette tips, significantly reducing chances of cross-contamination between samples. During normal analytical runs, entire wash procedure is controlled by Nexar Settings file. Settings can be customised, if needed. Pipette wash procedure should be ran whenever you change from analysing one sample to another. Ethanol wash should be performed when changing from one type of DNA sample to another.

Routine maintenance for Pipette Wash attachment includes:

- Ethanol wash every week (or as needed), to prevent oils and other components in sample preparations from accumulating in Nexar System.
- When needed wipe down Pipette Wash head and surrounding components with warm water to remove any bleach crystallisation, followed by Isopropyl alcohol wipe down.
- Inspect all pumps, valves, tubes and fittings (and replace as necessary) every six months.

Expected levels of cross-contaminant control

For a typical DNA-analysis procedure, where pipette tips are washed at start-up, between plates, at shut-down, and whenever the analytical procedure is changed, expected level of DNA cross-contamination should be <=0.01% for most applications.

Bleach solution

The only wash additive that is approved for use with Nexar is up to 8.25% solution of sodium hypochlorite (household bleach).

Note: It is best not to leave any bleach in Nexar when it is not in use, bleach may crystalise and damage Nexar's internal parts. Wash basin should always be rinsed with water when Nexar is shut down overnight.

It is recommended that additive solution bottle be labeled with chemical used per user's company safety policies.

Notice

The following chemicals should never be used in wash basin, they will damage or corrode internal working parts of the Nexar.

- Acetic acid
- Ammonium hydroxide
- Acetone
- Ketones
- Lacquers

If in doubt about chemicals used for washing pipette tips, contact Biosearch Technologies.

Component identification

Pipette Wash upper assembly

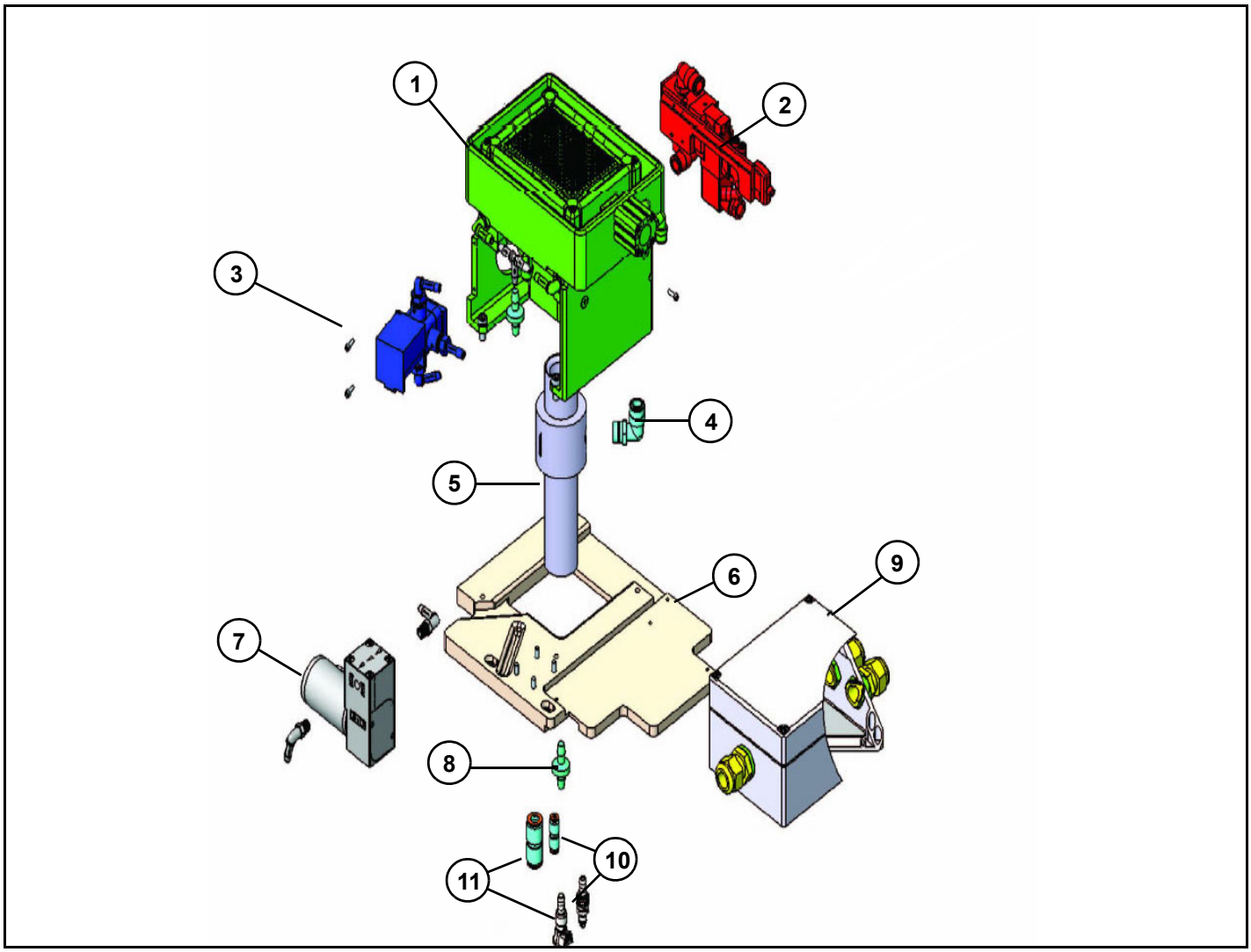

Figure 1

REF#	DESCRIPTION	REF#	DESCRIPTION
1	Wash Sub Assembly	7	Supply Pump
2	Pneumatic Assembly	8	Check Valve
3	Fill Valve Assembly	9	Electrical Enclosure
4	Pneumatic Elbow	10	Water Supply Quick Disconnects
5	Vacuum Generator	11	Bleach Quick Disconnects
6	Wash Mounting Plate		

Pipette Wash lower assembly

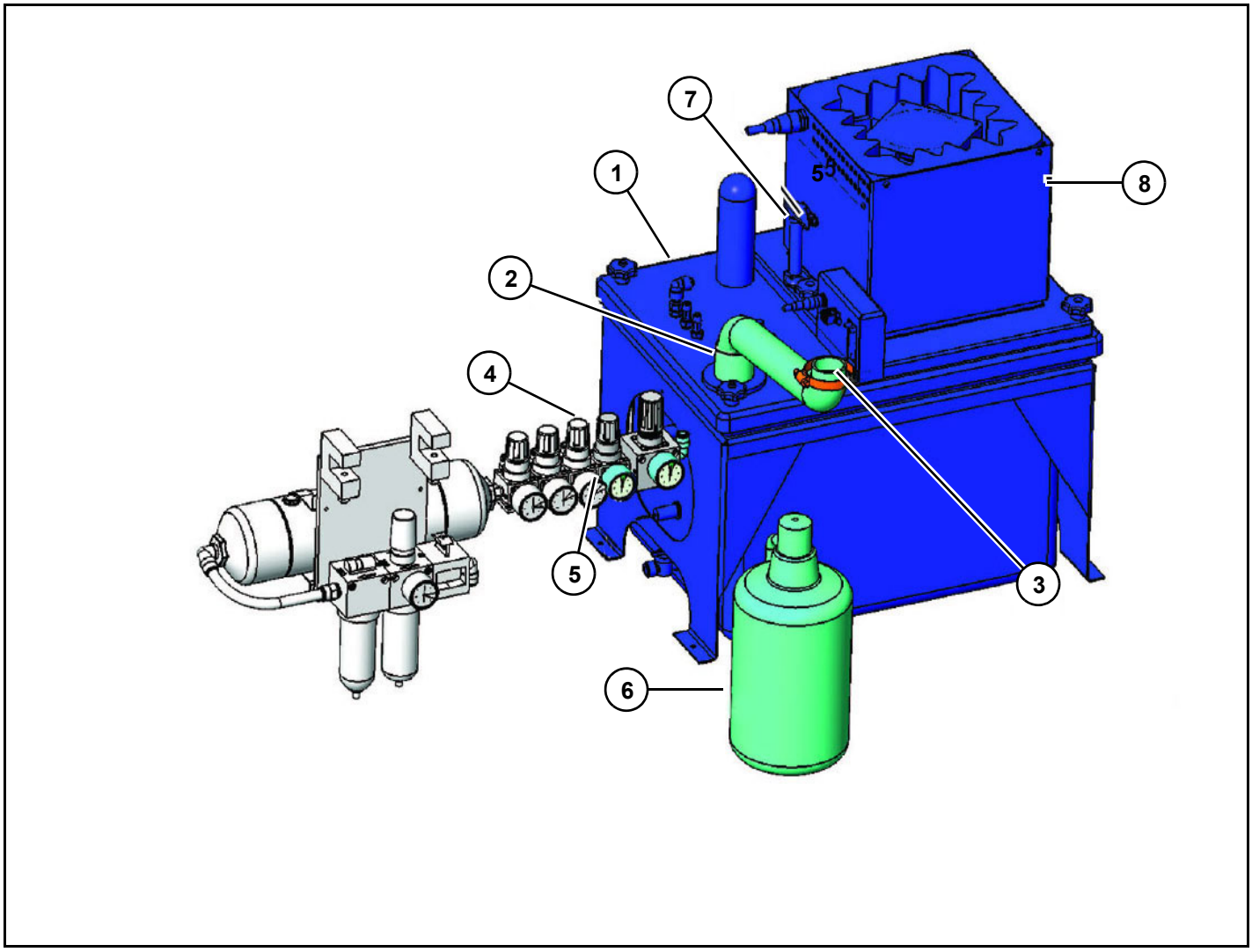

Figure 2

REF#	DESCRIPTION	REF#	DESCRIPTION
1	Waste Tank Assembly	7	Filter Box Clip
2	Duct Hose/Main Drain Line	8	Filter Box
3	Hose Clamp		
4	Regulator Manifold		
5	Air Pressure Indicator Gauge		
6	1 Gallon Bleach Jug		

Pipette Wash_1404 screen

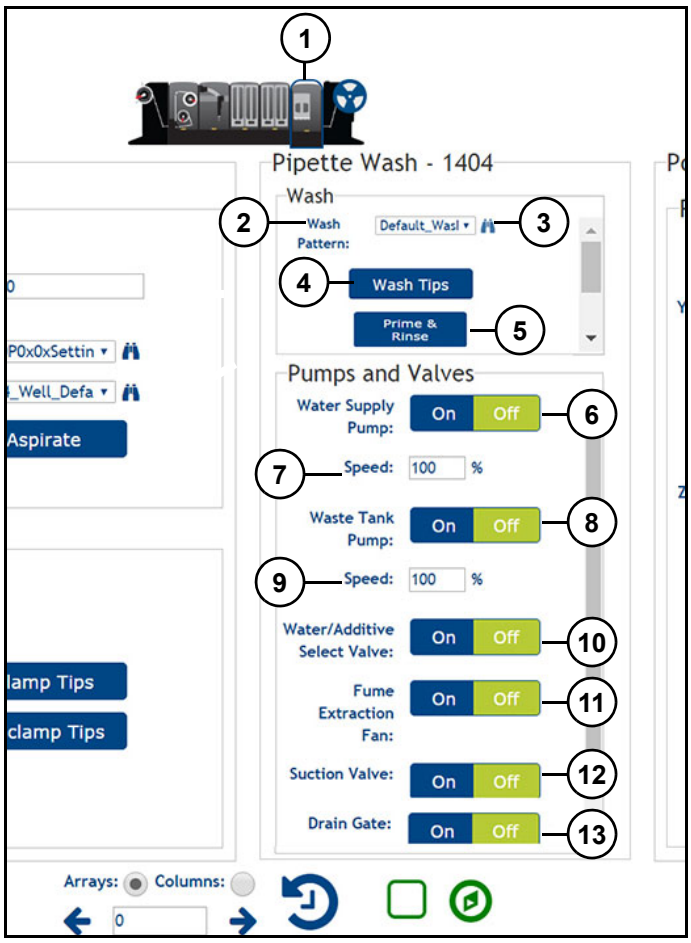

Figure 3

Refer to *(Figure 3)*.

Overview of controls

Dispense Pipette Module (1): Displays module status.

- Default status indicator.
- Highlighted status indicator.
- Faulted status indicator.
- Faulted highlighted status indicator.
- Highlighted blue: Module is active.
- Highlighted red: Module is faulted.

Wash Pattern (2): Displays and selects wash pattern.

Binocular Icon (3): Opens settings for displayed wash pattern file.

Wash Tips (4): Initiates washing tips.

Prime and Rinse (5): Primes and rinses system.

Water Supply Pump (6): Turns water supply pump on/off.

Speed (7): Displays and sets speed of water supply pump.

Waste Tank Pump (8): Turns waste water tank pump on/off.

Speed (9): Displays and sets speed of waste water tank pump.

Water/Additive Select Valve (10): Turns water additive valve on/off.

Fume Extraction Fan (11): Turns fume extraction fan on/off.

Suction Valve (12): Turns suction valve on/off.

Drain Gates (13): Turns drain gate on/off.

Daily start-up routine

Notice

Nexar and wash basin must be level (in both x and y directions) to ensure that all pipettes are washed evenly. If Nexar is moved to a new location, ensure wash basin is level.

Performing a prime and rinse before each run confirms that Pipette Wash attachment is working properly and that water and bleach (not air) are being drawn from reservoirs. A prime and rinse removes any air that may have accumulated in water/bleach supply lines during shut-down.

Note: Air in water or additive lines may result in excess splashing of bleach solution near Pippette Wash.

Prime and rinse is a three-step automated procedure taking less than one minute.

- Step one: Purges system with bleach.
- Step two: Purges system with water.
- Step three: Final water rinse and vacuum to ensure that all traces of bleach (if used) and other contaminants are removed.

Purge system with water and bleach

1. Locate air gauges below Nexar.

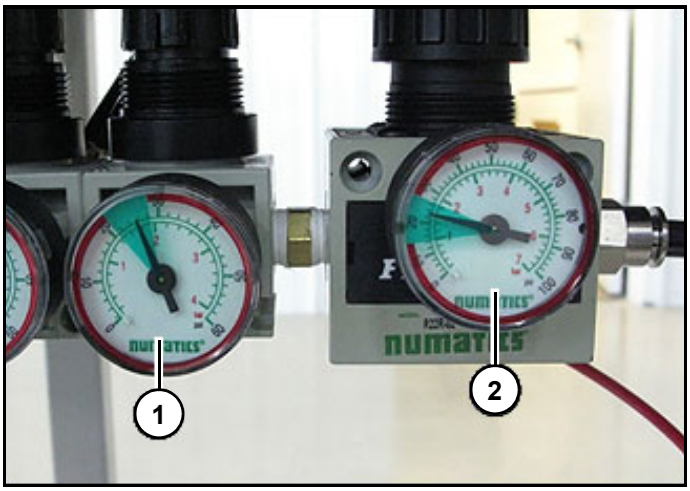

Figure 4

2. Verify drain gate regulator (1) is set to 25 psi and Venturi vacuum regulator (2) to 18 psi (this is an approximate, setting will vary per unit). *(Figure 4)*

Figure 5

Refer to *(Figure 5)*.

3. Ensure water reservoir (1) is full.
4. Ensure waste bucket (2) is empty.
5. Ensure bleach reservoir (3) is full.

Note: Reservoir and waste bucket are usually located below Nexar.

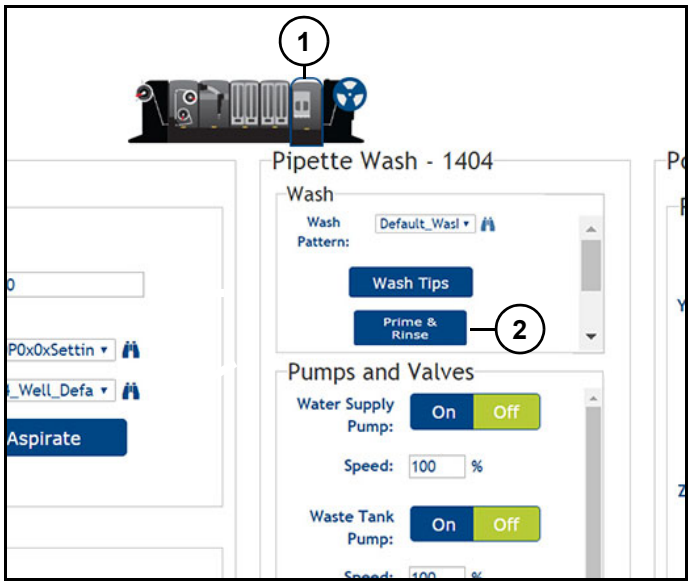

Figure 6

Refer to *(Figure 6)*.

6. Click Dispense Pipette icon (1).
7. Click "Prime and Rinse Pipette Wash" (2).

Note: If no bubbles come up on last rinse, system is ready to run. If bubbles are present repeat steps 6 and 7.

Shut-down prime and rinse

Notice

When shutting down Nexar overnight, a shut-down prime and rinse should be performed so all components are bathed in water, not bleach. If bleach is left in system for several days, it may start to crystalise and cause flow problems.

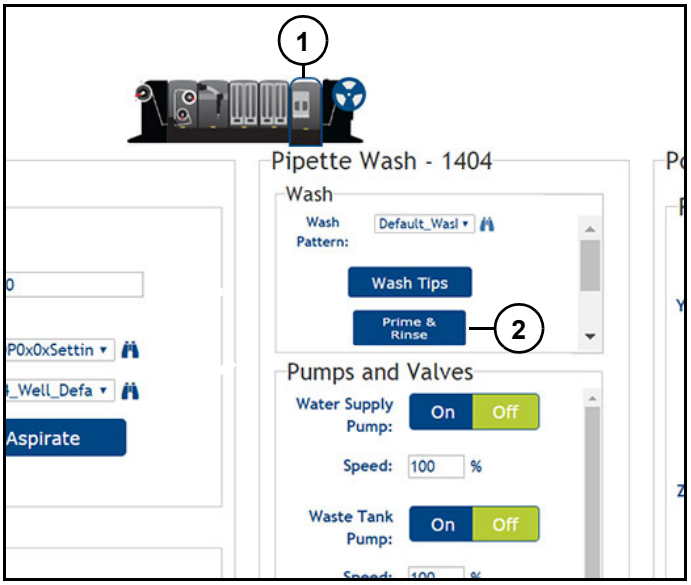

Figure 7

Refer to *(Figure 7)*.

1. Click Dispense Pipette (1).
2. Click "Prime and Rinse Pipette Wash" (2).
3. Refill water and bleach reservoirs and empty waste bucket.

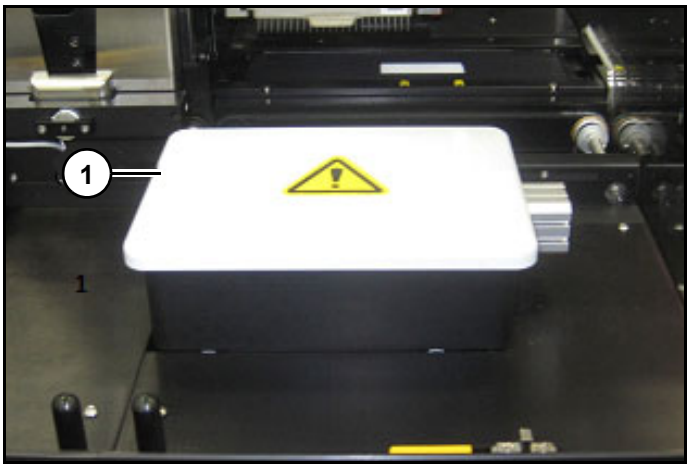

Figure 8

4. Place cover (1) *(Figure 8)* over pipette wash basin.
5. Shut down Nexar.

Pipette Wash settings

After pipettes have dispensed from each sample plate (and before dispensing from the next one), Nexar will do following wash steps.

- Dispense remaining DNA from tips into dry wash basin, followed by vacuum purge.
- Fill basin with water/bleach solution and wash tips, followed by vacuum purge.
- Fill basin with water and wash tips, followed by vacuum purge.

Note: Each step listed above (beside vacuum) goes through a three stroke cycle where tips are flushed five times.

Adjustments that may need to be made to Pipette Wash settings file:

- Eliminate bleach/water and wash, do a single water wash between sample plates.
- Change "Water Fill Time", because Nexar has moved to a new location where wash basin takes longer/shorter to fill, or overflows.

Changing Pipette Wash settings - Intellics

1. Connect computer to one of following:

- Nexar.
- Company intranet.
- Internet.

2. Open Chrome browser on computer and type in appropriate Intellics™ internet address for Nexar.

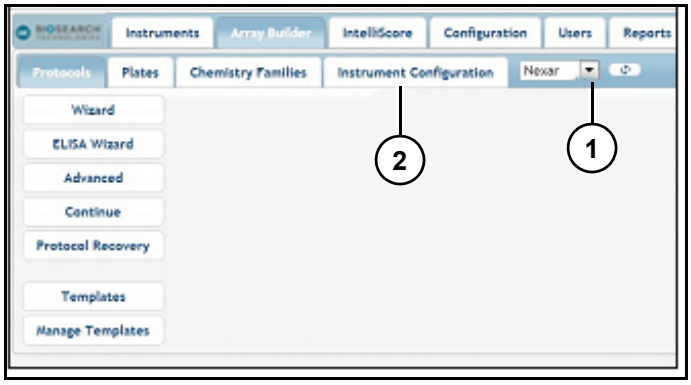

Figure 9

3. Click down-arrow (1) *(Figure 9)* and select Nexar to be controlled in software.

Note: If multiple Nexars are being used they will be listed in drop down menu.

4. Click "Instrument Configuration" (2) *(Figure 9)*.

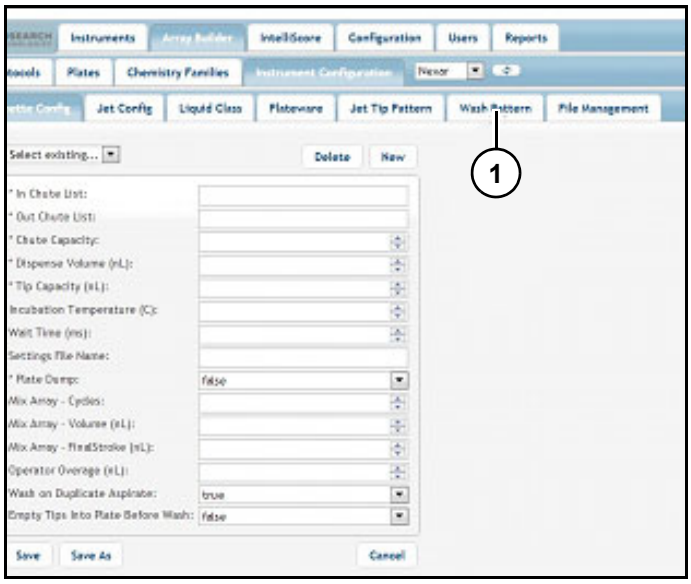

Figure 10

5. Click "Wash Pattern" (1) *(Figure 10)*.

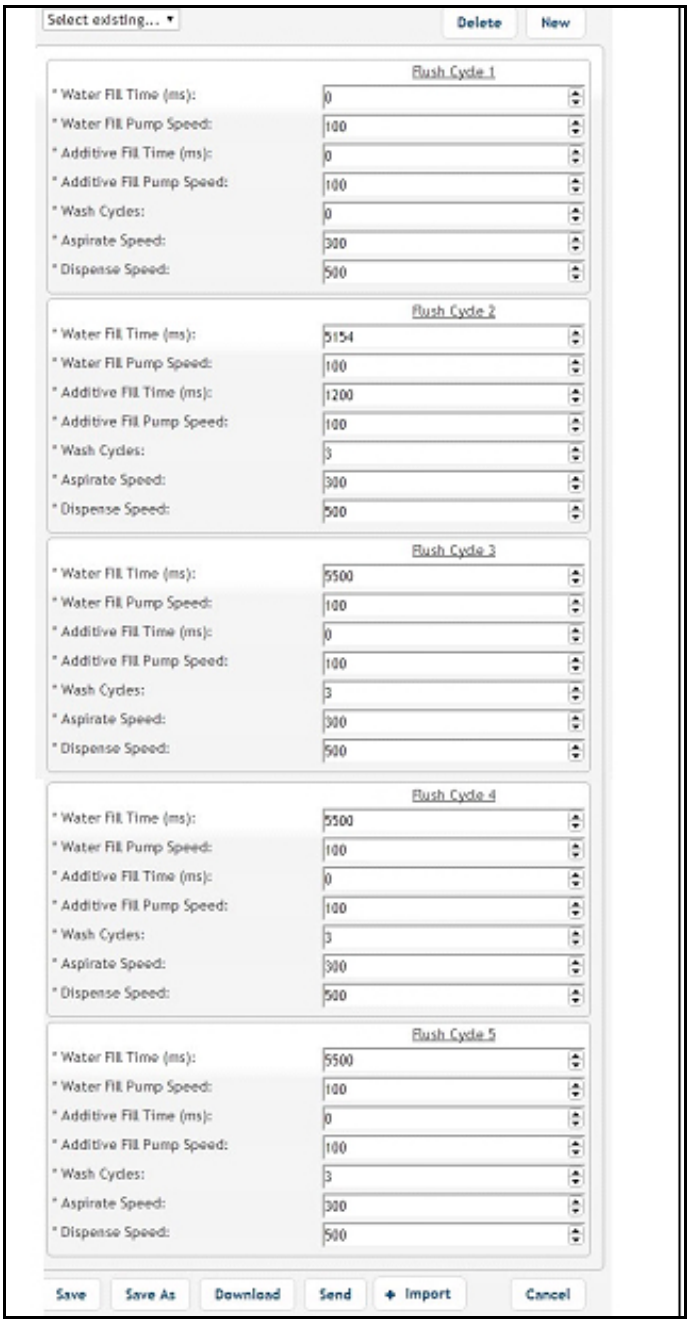

Figure 11

Default settings

- Water Fill Time: 5154 ms with bleach; 5500 ms without bleach . Times will vary based on install setup. Number of milliseconds water supply pump runs during fill portion of wash sequence. All values must be integers.
- Water Fill Pump Speed: 100%
  Speed at which water pump runs during fill portion of wash sequence. Values must be integers between 1 and 100%.

- Additive Fill Time: 1200 ms with bleach on second cycle only; 0 ms without bleach. Times will vary based on install setup. Number of milliseconds additive supply pump runs during fill portion of wash sequence. All values must be integers.
  Note: Additive fill time is dependent on additive concentration. Fill time may need to be adjusted to achieve desired final concentration in basin.
- Additive Fill Pump Speed: 100% Speed at which additive supply pump runs during fill portion of wash sequence. Values must be integers between 1 and 100%.
- Wash Cycles: 3 Number of aspiration/dispense cycles during each flush cycle used to clean tips. All values must be integers.
- Aspirate Speed: 300
  Speed at which pipette head aspirates wash fluid during wash sequence. Must be an integer between 100 and 800.
- Dispense Speed: 500
  Speed at which pipette head dispenses wash fluid during wash sequence. Must be an integer between 100 and 800.

Flush cycles

Note: Default number of flush cycles is five.

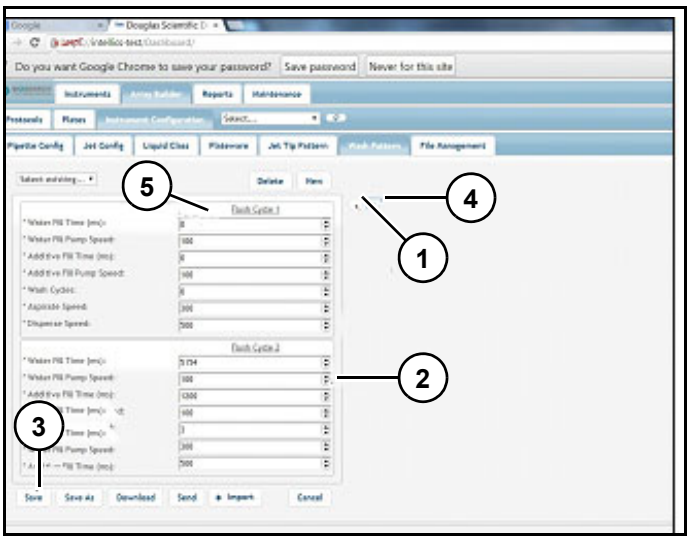

Figure 12

Refer to *(Figure 12)*.

1. To increase number of flush cycles, click "(+)" (1), a new flush cycle (2) is added to bottom of screen.
2. Click "Save" (3) to save changes.
3. To remove flush cycles, click "-" (4), highest numbered flush cycle is removed first.
4. Click "Save" (3) to save changes.

Changing water fill time

If Nexar is moved to a new location where water conditions change, Water Fill Time may need to be increased/decreased to ensure wash basin fills properly or does not overflow.

1. Enter new value in Water Fill Time box (5), use up and down arrows to change current value.

Note: Value must be an integer.

2. Click "Save" (3) *(Figure 12)* to save changes.

Maintenance

Performing ethanol wash

Notice

Ethanol wash prevents oils and other contaminants from accumulating in the Nexar system. An ethanol wash should be done:

- Weekly as routine maintenance.

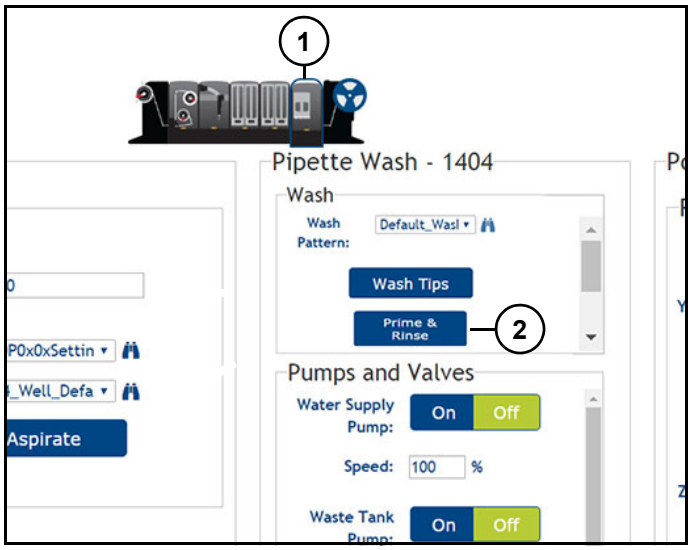

Figure 13

Refer to *(Figure 13)*.

1. Click Dispense Pipette icon (1).
2. Click "Prime and Rinse Pipette Wash" (2).
3. Wait for Prime and Rinse to complete.

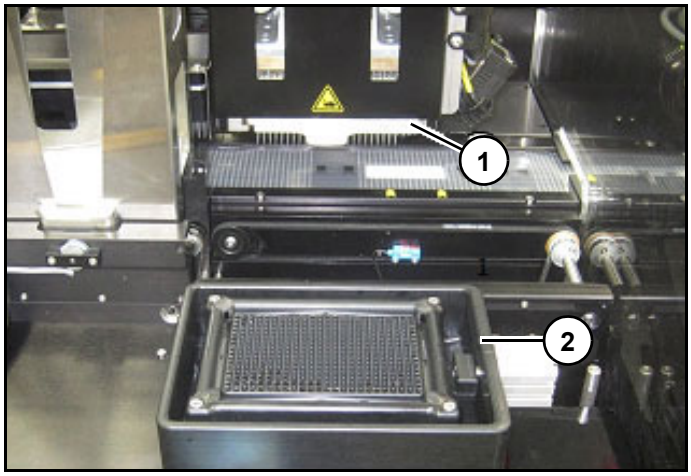

Figure 14

Refer to *(Figure 14)*.

4. Open Dispense Pipette guard door and manually push pipette head (1) back so area above pipette wash basin (2) is clear.
5. Manually fill wash basin (2) with ethanol and soak for five minutes.
6. Close all guard doors.
7. Reset and enable instrument.
8. Repeat steps 2 and 3.

Note: Nexar can resume normal operation.

Changing filter

Notice

Filter should be changed every six months or when Filter Full Fault light appears. Recommend spare filter (to avoid down time).

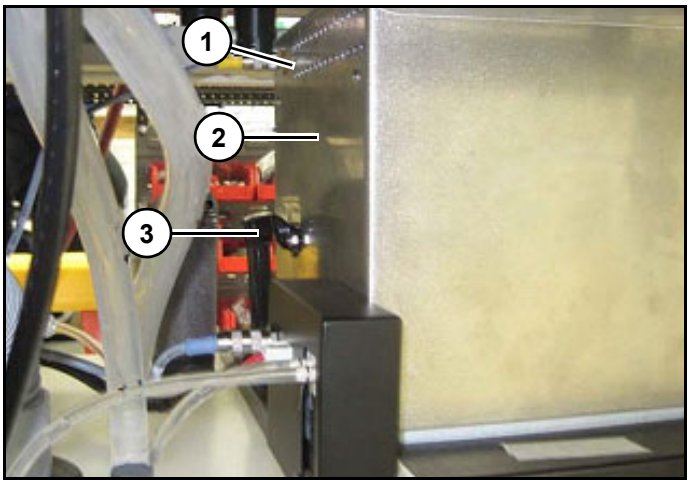

Figure 15

Refer to *(Figure 15)*.

1. Remove cable (1) from filter box (2).
2. Unlock clips (3) on both sides of filter box.

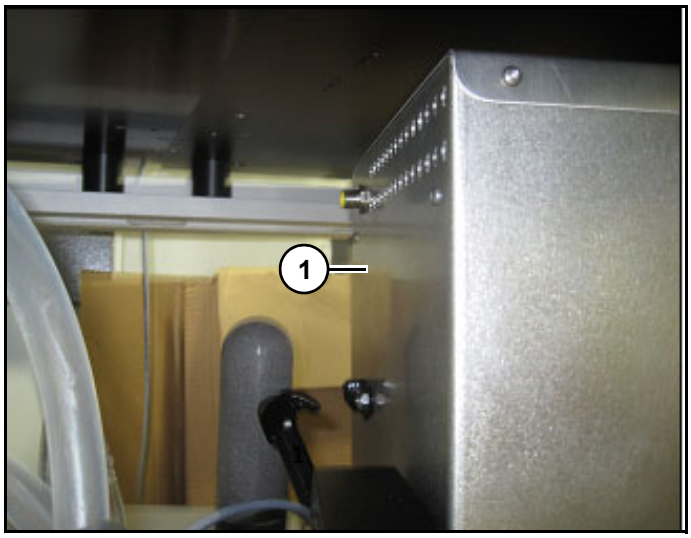

Figure 16

3. Lift and slide filter box (1) *(Figure 16)* forward away from tank.

4. Lift filter and cover off waste tank.

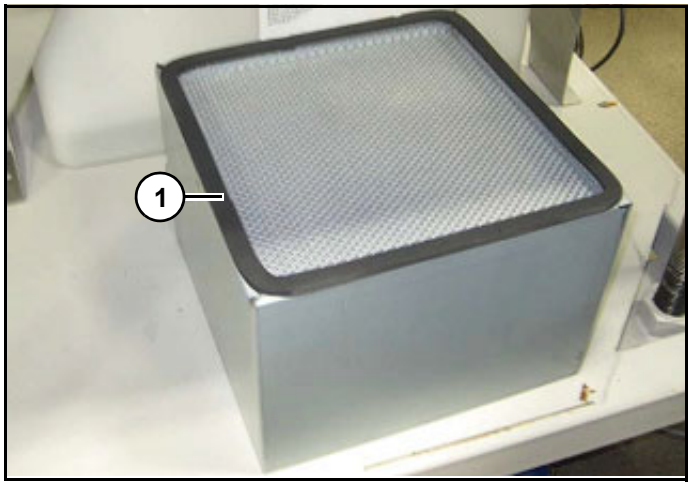

Figure 17

5. Remove and replace filter (1) *(Figure 17)*.

Note: Care should be taken to prevent damage to gasket during filter removal.

6. Replace cover and slide filter box back into position on top of waste tank.

7. Reattach clips and cable to filter box.

Preventative maintenance

- When needed wipe down Pipette Wash head and surrounding components with warm water to remove any bleach crystallisation, followed by IPA wipe down.

Every 6-12 months a Biosearch Technologies Certified Technician should perform following:

- Inspect all pumps and valves in Pipette Wash attachment and replace as necessary.
- Inspect all fittings and tubing and replace as necessary.

For more information about inspecting and replacing parts in Pipette Wash attachment, see Certified Technician Training Manual.

Trouble Shooting

Problem	Solution
Filter Full Fault Screen	Change Filter: See "Changing filter" on page 219.
Waste Tanks Won't Empty	Check pump and float switches for proper operation.
Float Switch Setup Fault	Check that float switches are in correct orientation (normally closed).
Tank Full Fault	Drain tank by pump or drain manually.

Pipette Wash_PW1404 troubleshooting

Notice
Before attempting any fault solution, refer to Handling Faults section. Colo.rs Red: Safety fault. Yellow: Uncontrolled fault other than safety. Blinking blue: Faulted (controlled). Blue: Recovering. Green: Running. Black: Initialising.

Module fault messages

Abort faults	Cause	Solution
_EK1100_STATE:	State change on EK1100 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_220_EL2024_STATE:	State change on EL2024 Beckhoff card at terminal 22.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_220_EL2024_WCSTATE:	Working counter error on EL2024 Beckhoff card at terminal 22.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_230_EL2004_STATE:	State change on EL2004 Beckhoff card at terminal 23.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_230_EL2004_WCSTATE:	Working counter error on EL2004 Beckhoff card at terminal 23.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_240_EL2004_STATE:	State change on EL2004 Beckhoff card at terminal 24.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_240_EL2004_WCSTATE:	Working counter error on EL2004 Beckhoff card at terminal 24.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_240_EL1114_STATE:	State change on EL1114 Beckhoff card at terminal 24.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_240_EL1114_WCSTATE:	Working counter error on EL1114 Beckhoff card at terminal 24.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

Jet Wash abort faults	Cause	Solution
_230_EL2024_STATE:	State change on EL2024 Beckhoff card at terminal 23.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_230_EL2024_WCSTATE:	Working counter error on EL2024 Beckhoff card at terminal 23.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

Sonic Wash abort faults	Cause	Solution
_120_EL3202_STATE:	State change on EL3202 Beckhoff card at terminal 12.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_120_EL3202_WCSTATE:	Working counter error on EL3202 Beckhoff card at terminal 12.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_220_EL1014_STATE:	State change on EL1014 Beckhoff card at terminal 22.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_220_EL1014_WCSTATE:	Working counter error on EL1014 Beckhoff card at terminal 22.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
TRANSDUCER_DRIVE:	Sonicator circuit or transducer may be faulty.	Open cover of SW and ensure transducer is still securily mounted to wash basin. Check wires for proper connection. Ensure there is no leak into SW electrical enclosure.
_310_EL4132_STATE:	State change on EL4132 Beckhoff card at terminal 31.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_310_EL4132_WCSTATE:	Working counter error on EL4132 Beckhoff card at terminal 31.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

Pipette Wash pause faults	Cause	Solution
FumeExtractorFanNotRunningFault:	Fan isn't running, when it should be on.	Check power going to fan. Ensure there are no obstructions in fan blade path.
FumeExtractorFilterFull:	Filter is full and needs to be replaced.	Remove filter housing on waste tank and replace filter with new one.
WasteTankFloatSetupFault:	Issue with floats in waste tank detected.	Check for damage to floats. Ensure plug for floats is secure. Ensure there is nothing obstructing the float path.

Pipette Wash pause faults	Cause	Solution
WasteTankFullFault:	Waste tank is full and needs to be drained.	Drain pump setting may not be checked so it auto drains. Drain pump may be vapor locked. Drain line may be clogged. Manually drain out valve on bottom of tank.
WasteTankPumpOrLowFloatFault:	Waste pump or low float isn't working.	Drain pump may be vapor locked. Drain line may be clogged. Manually drain out valve on bottom of tank. Low float may need to be replaced, check connections.

Jet Wash_JW0905

⚠WARNING

Read and understand equipment operators manual before operating or performing maintenance. Failure to do so could result in serious injury or death.

Component identification

Jet Wash_JW0905

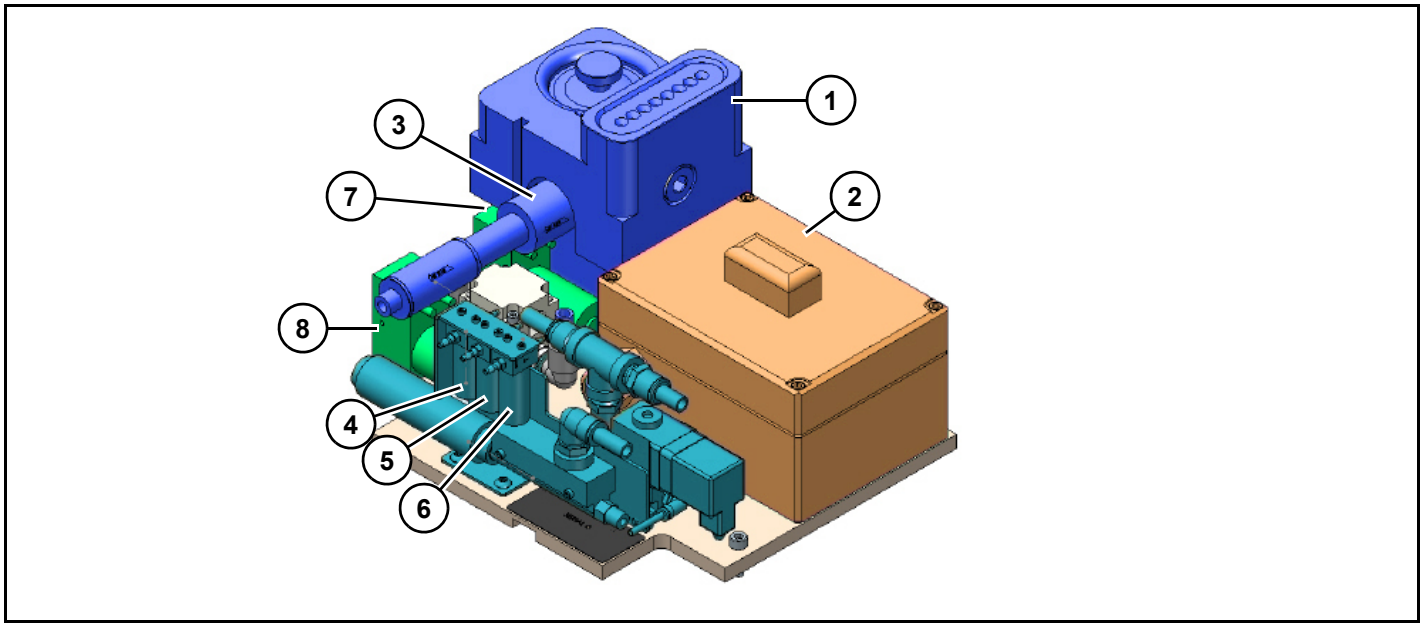

Figure 1

REF#	DESCRIPTION	REF#	DESCRIPTION
1	Jet Wash Body Assembly	5	Supply Valve
2	Electrical Enclosure	6	Secondary Waste Valve
3	Suction Venturi	7	Waste Pump
4	Primary Waste Valve	8	Supply Pump

Overview of components

Jet Wash Basin (1): Receptacle for washing tips. Jet nozzles spray water onto tips.

Filter (2): Collects mist created by jet wash basin. Mist is returned to droplet form and coalesces into secondary tank.

Suction Venturi (3): Creates a vacuum on jet wash assembly.

Primary Waste Valve (4): When open, water is drained from tank by waste pump.

Supply Valve (5): Isolates supply pump from supply line.

Secondary Waste Valve (6): When open, water is drained from secondary tank by waste pump.

Waste Pump (7): Pumps waste water from primary tank when primary waste valve is opened and pump waste water from secondary tank when secondary waste valve is opened.

Supply Pump (8): Pumps water into primary tank from supply line.

Jet Wash_JW0905 controls

Notice

Controls on Auto Screen can only be activated when instrument is in an idle state.

If a change is made to Manager Settings file (See Manager Settings section) it only takes effect after a pause and idle action is performed (See Getting Started section).

⚠CAUTION

Do not run supply pump with supply valve off.

Do not run supply pump with drain valve and pump off. This could cause a primary tank overflow.

Jet Wash screen

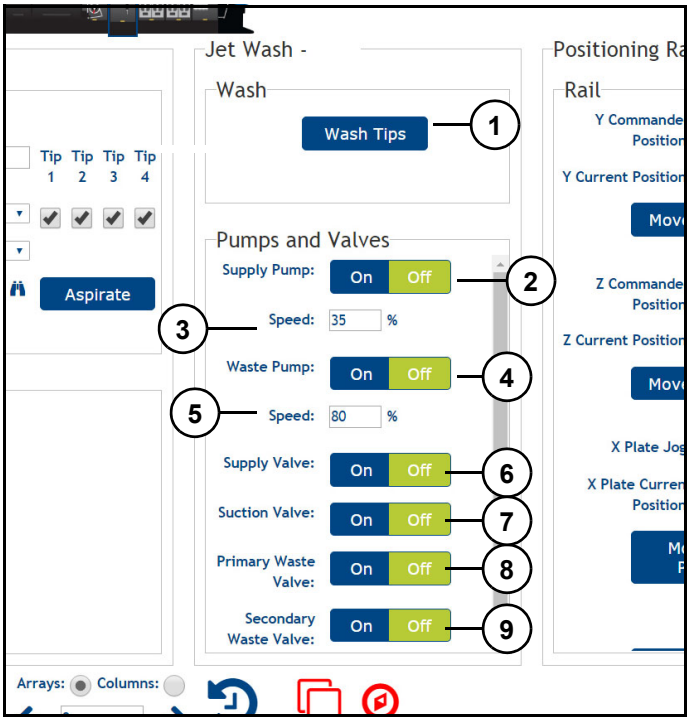

Figure 2

Refer to *(Figure 2)*.

Wash Tips (1): Wash Dispense Jet tips.

Supply Pump On/Off (2): Turns supply pump on or off.

When on supply pump is activated and water flows into supply line and into jet wash venturi for cleaning tips.

Speed (3): Displays speed of fill pump.

Units	Percent
Minimum	15
Default	50
Maximum	100

Waste Pump On/Off (4): Turns waste pump on or off.

When on with primary valve opened and secondary valve closed, overflow waste water is drained from primary tank. When primary valve is closed and secondary valve is opened, waste water is drained from secondary tank.

Speed (5): Displays speed of waste pump.

Units	Percent
Minimum	15
Default	50
Maximum	100

Supply Valve On/Off (6): Opens or closes supply valve.

When on, supply valve is opened. When running supply pump allows water to flow through valve into primary tank.

Suction Valve On/Off (7): Opens or closes suction air valve.

When on, supply air flows through suction venturi and creates a vacuum in jet wash basin.

Primary Waste Valve On/Off (8): Opens or closes primary waste valve.

When on with waste pump on, primary tank will drain to waste.

Secondary Waste Valve On/Off (9): Opens or closes secondary waste valve.

When on with waste pump on, secondary tank will drain to waste.

Maintenance

Replace tubing every three months or 1000 cycles.

Faults screen

Notice
Before resetting a fault, be sure condition is corrected.

Faults

For fault list See "Jet Wash_JW0905 troubleshooting" on page 227.

For fault descriptions See "Jet Wash_JW0905 troubleshooting" on page 227.

How to recover from a fault

For handling faults See "General fault recovery procedure" on page 25.

Jet Wash_JW0905 troubleshooting

Notice
Before attempting any fault solution, refer to Handling Faults section. Colours Red: Safety fault. Yellow: Uncontrolled fault other than safety. Blinking blue: Faulted (controlled). Blue: Recovering. Green: Running. Black: Initialising.

Fault messages

Yellow error message	Cause	Solution
_EK1100_STATE	Terminal may be faulty.	Cycle power to instrument. If problem persists, contact Biosearch Technologies.
_220_EL2024_STATE	Same as above	Same as above
_220_EL2024_WCSTATE	Same as above	Same as above
_230_EL2024_STATE	Same as above	Same as above
_230_EL2024_WCSTATE	Same as above	Same as above
_240_EL1114_STATE	Same as above	Same as above
_240_EL1114_WCSTATE	Same as above	Same as above

Jet Wash Attachment_JW1209

⚠WARNING

Read and understand equipment operators manual before operating or performing maintenance. Failure to do so could result in serious injury or death.

Component identification

Jet Wash_JW1209

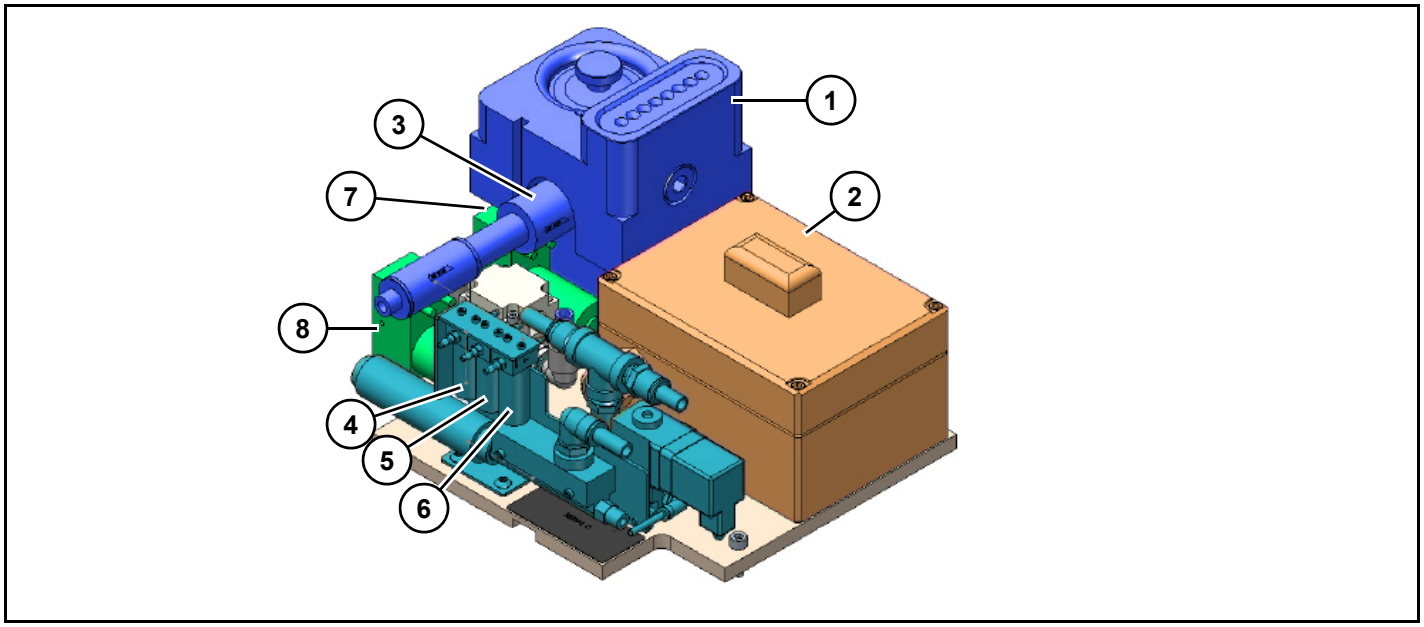

Figure 1

REF#	DESCRIPTION	REF#	DESCRIPTION
1	Jet Wash Body Assembly	5	Supply Valve
2	Electrical Enclosure	6	Secondary Waste Valve
3	Suction Venturi	7	Waste Pump
4	Primary Waste Valve	8	Supply Pump

Overview of components

Jet Wash Basin (1): Receptacle for washing tips. Jet nozzles spray water onto tips.

Filter (2): Collects mist created by jet wash basin. Mist is returned to droplet form and coalesces into secondary tank.

Suction Venturi (3): Creates a vacuum on jet wash assembly.

Primary Waste Valve (4): When open, water is drained from tank by waste pump.

Supply Valve (5): Isolates supply pump from supply line.

Secondary Waste Valve (6): When open, water is drained from secondary tank by waste pump.

Waste Pump (7): Pumps waste water from primary tank when primary waste valve is opened and pump waste water from secondary tank when secondary waste valve is opened.

Supply Pump (8): Pumps water into primary tank from supply line.

Jet Wash_JW1209 controls

Notice

Controls on Auto Screen can only be activated when instrument is in an idle state.

If a change is made to Manager Settings file (See Manager Settings section) it only takes effect after a pause and idle action is performed (See Getting Started section).

⚠CAUTION

Do not run supply pump with supply valve off.

Do not run supply pump with drain valve and pump off. This could cause a primary tank overflow.

Jet Wash screen

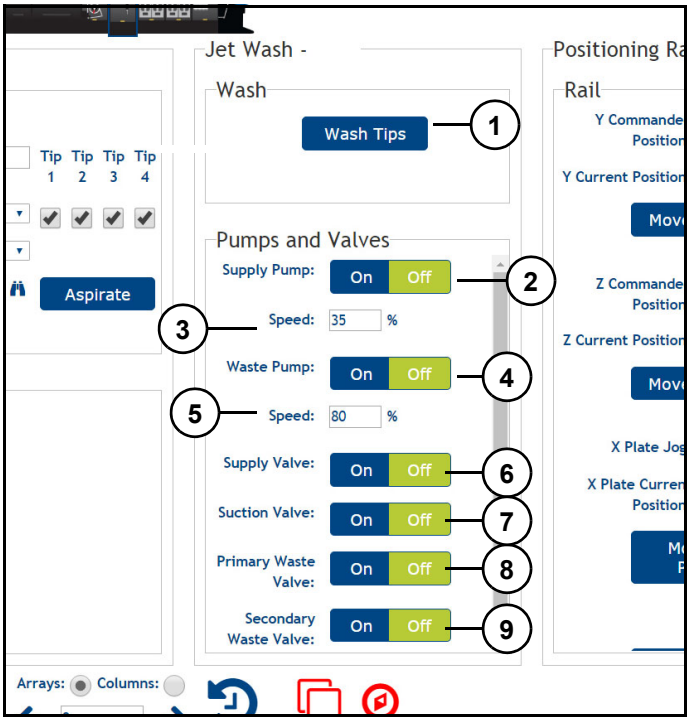

Figure 2

Refer to *(Figure 2)*.

Wash Tips (1): Wash Dispense Jet tips.

Supply Pump On/Off (2): Turns supply pump on or off.

When on supply pump is activated and water flows into supply line and into jet wash venturi for cleaning tips.

Speed (3): Displays speed of fill pump.

Units	Percent
Minimum	15
Default	50
Maximum	100

Waste Pump On/Off (4): Turns waste pump on or off.

When on with primary valve opened and secondary valve closed, overflow waste water is drained from primary tank. When primary valve is closed and secondary valve is opened, waste water is drained from secondary tank.

Speed (5): Displays speed of waste pump.

Units	Percent
Minimum	15
Default	50
Maximum	100

Supply Valve On/Off (6): Opens or closes supply valve.

When on, supply valve is opened. When running supply pump allows water to flow through valve into primary tank.

Suction Valve On/Off (7): Opens or closes suction air valve.

When on, supply air flows through suction venturi and creates a vacuum in jet wash basin.

Primary Waste Valve On/Off (8): Opens or closes primary waste valve.

When on with waste pump on, primary tank will drain to waste.

Secondary Waste Valve On/Off (9): Opens or closes secondary waste valve.

When on with waste pump on, secondary tank will drain to waste.

Maintenance

Replace tubing every three months or 1000 cycles.

Faults screen

Notice
Before resetting a fault, be sure condition is corrected.

Faults

For fault list See "Jet Wash_JW1209 troubleshooting" on page 231.

For fault descriptions See "Jet Wash_JW1209 troubleshooting" on page 231.

How to recover from a Fault

For handling faults See "General fault recovery procedure" on page 25.

Jet Wash_JW1209 troubleshooting

Notice
Before attempting any fault solution, refer to Handling Faults section. Colours Red: Safety fault. Yellow: Uncontrolled fault other than safety. Blinking blue: Faulted (controlled). Blue: Recovering. Green: Running. Black: Initialising.

Fault messages

Yellow error message	Cause	Solution
_EK1100_STATE	Terminal may be faulty.	Cycle power to instrument. If problem persists, contact Biosearch Technologies.
_220_EL2024_STATE	Same as above	Same as above
_220_EL2024_WCSTATE	Same as above	Same as above
_230_EL2024_STATE	Same as above	Same as above
_230_EL2024_WCSTATE	Same as above	Same as above
_240_EL1114_STATE	Same as above	Same as above
_240_EL1114_WCSTATE	Same as above	Same as above

Tape Sealer Attachment_TS0902

⚠WARNING

Read and understand equipment operators manual before operating or performing maintenance. Failure to do so could result in serious injury or death.

Component identification

Tape Sealer_TS0902 Assembly/Threading diagram

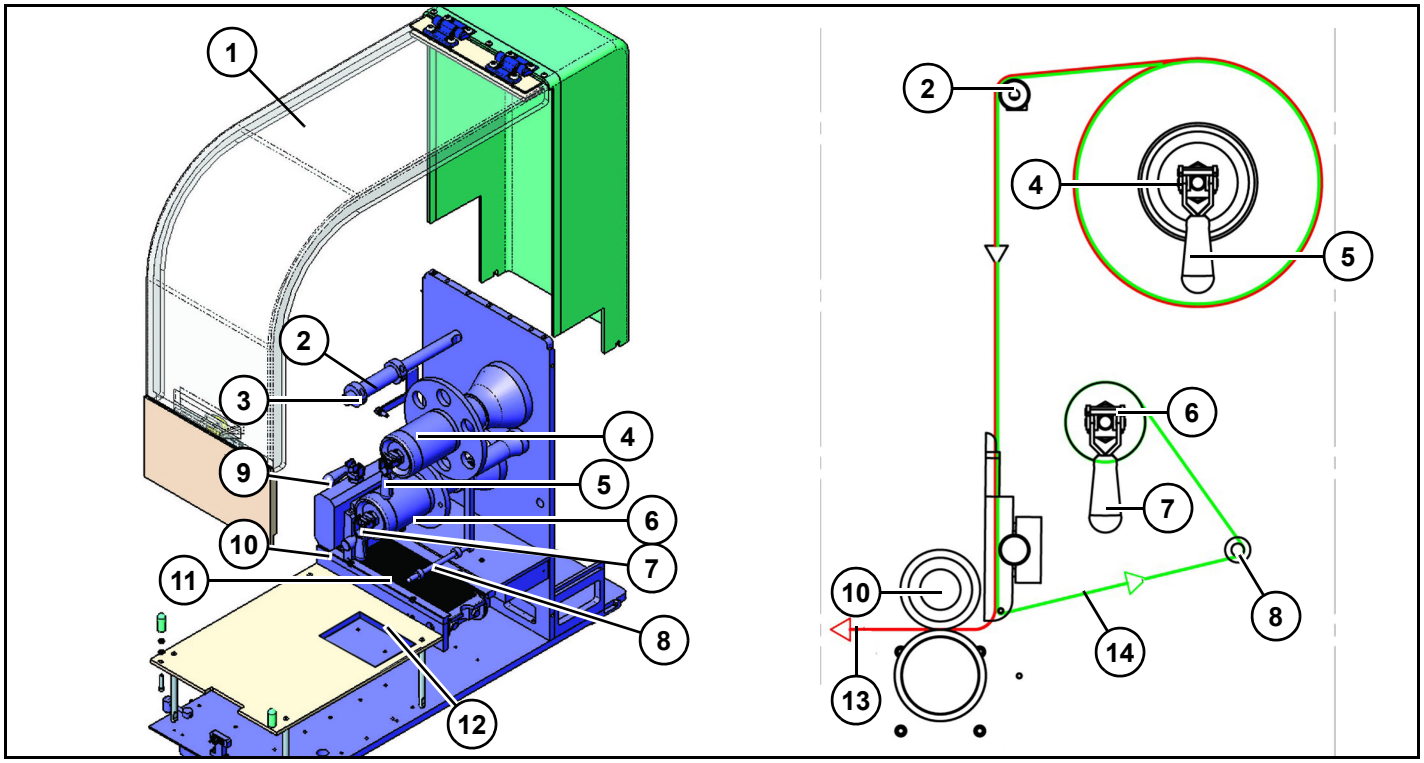

Figure 1

REF#	DESCRIPTION	REF#	DESCRIPTION
1	Guard Assembly	8	Dancer Bar
2	Seal Tape Guide Spindle	9	Nip Roller Handle
3	Seal Tape Guide Collars	10	Nip Roller
4	Tape Spindle	11	Seal Tape Drive Assembly
5	Tape Spindle Handle	12	Plate Dump
6	Tape Backing Spindle	13	Seal Tape
7	Tape Backing Spindle Handle	14	Seal Tape Backer

Loading Seal Tape

Notice

Load seal tape before loading Array Tape to avoid tapes sticking together.

Required tools

- Scissors
- Adhesive Tape

Seal Tape threading diagram

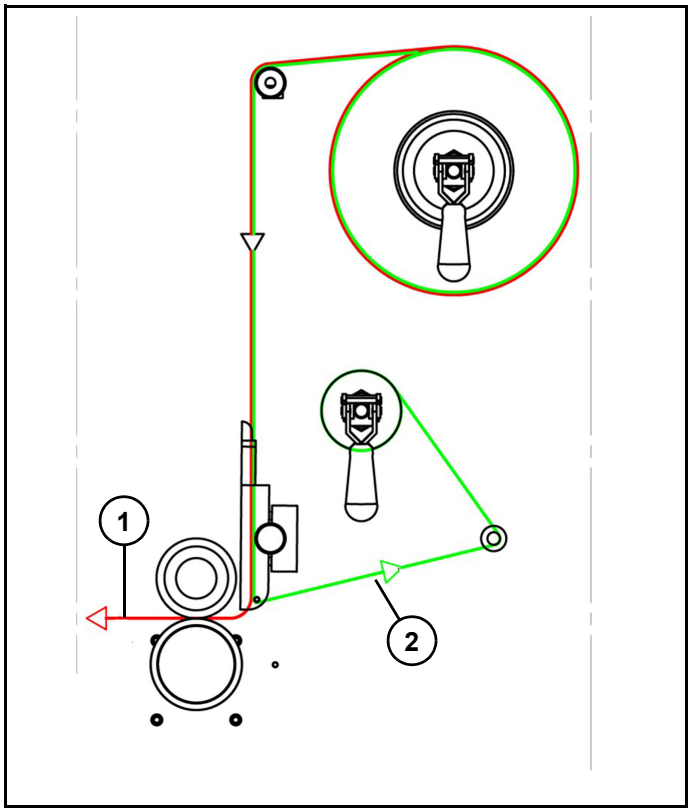

Figure 2

Seal Tape (1) *(Figure 2)*

Backer (2) *(Figure 2)*.

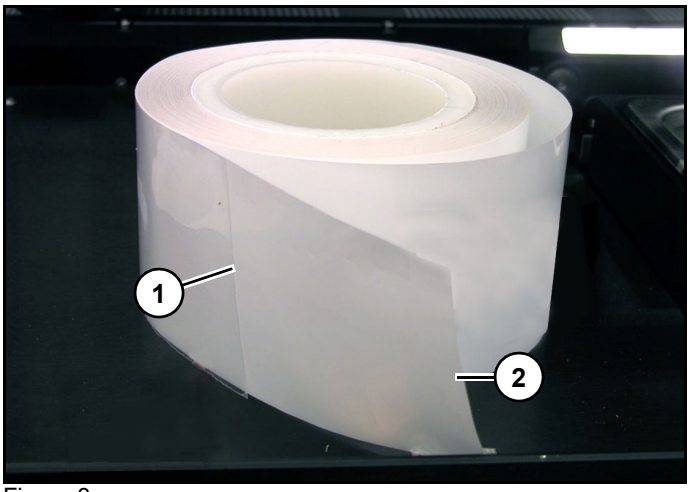

Figure 3

1. Using scissors, cut clear side 3-4 inches of clear tape (1) shorter than backing tape (2). *(Figure 3)*

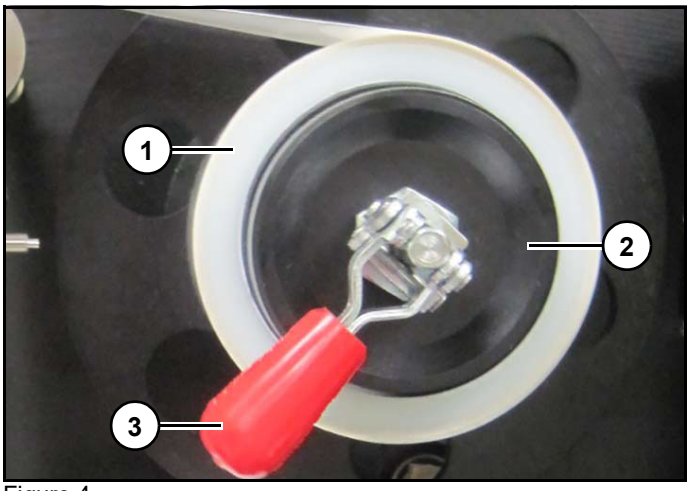

Figure 4

2. Load tape spool (1) on tape spindle (2). *(Figure 4)*
3. Push handle (3) *(Figure 4)* down to clamp spool to spindle.

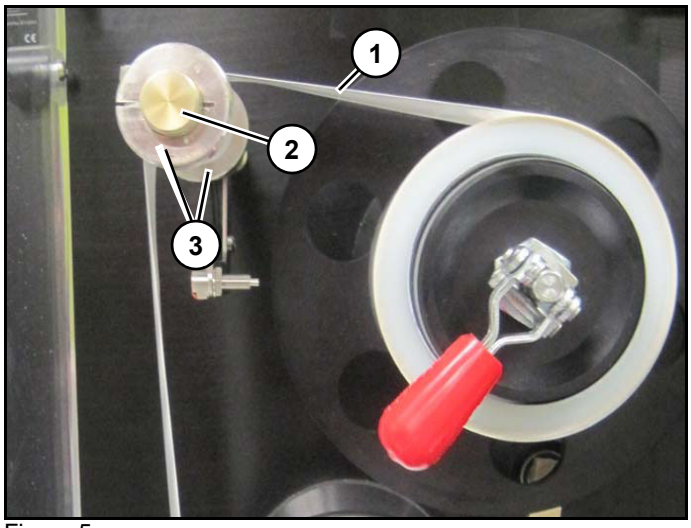

Figure 5

4. Thread tape (1) over seal tape guide spindle (2). Ensure tape is between collars (3). *(Figure 5)*

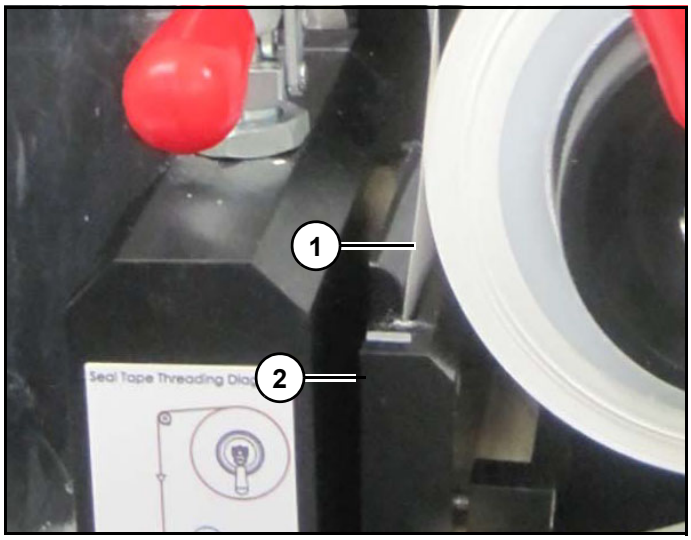

Figure 6

5. Thread tape (1) into tape seal guide (2). *(Figure 6)*

Note: Ensure tape is fit into grooves of tape seal guide.

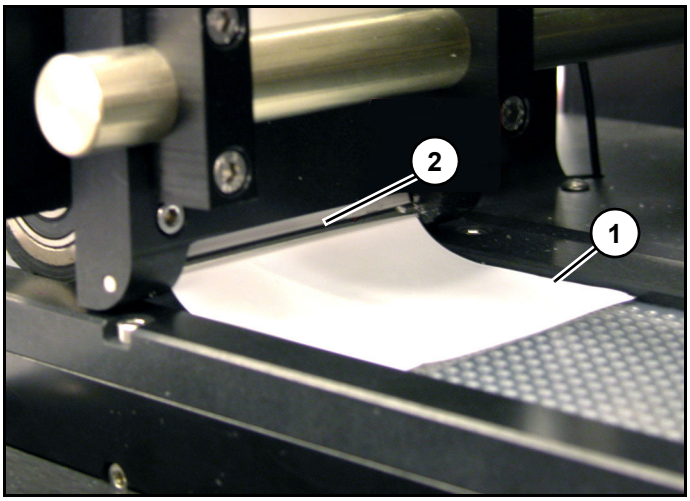

Figure 7

6. Pull tape (1) through seal guide. Ensure tape is positioned on left side of silver rod (2). *(Figure 7)*

7. Pull approximately 12" (30 cm) of tape through seal guide and separate seal tape from backing tape.

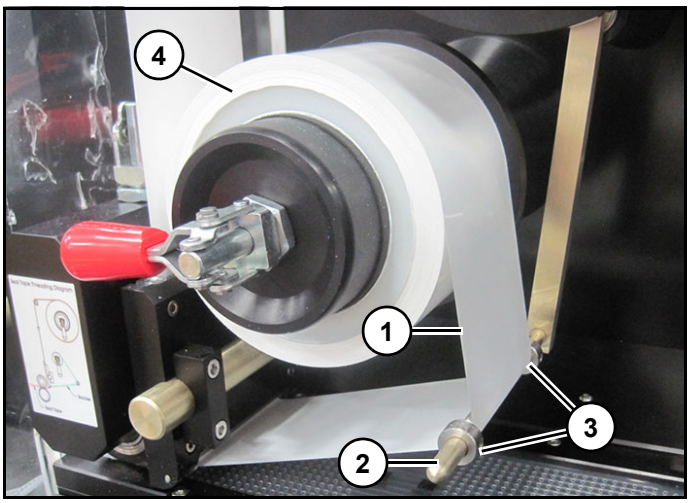

Figure 8

8. Position white backing tape (1) around dancer bar (2) between collars (3). *(Figure 8)*

9. Attach backing tape (1) to backer rewind reel (4) with adhesive tape. *(Figure 8)*

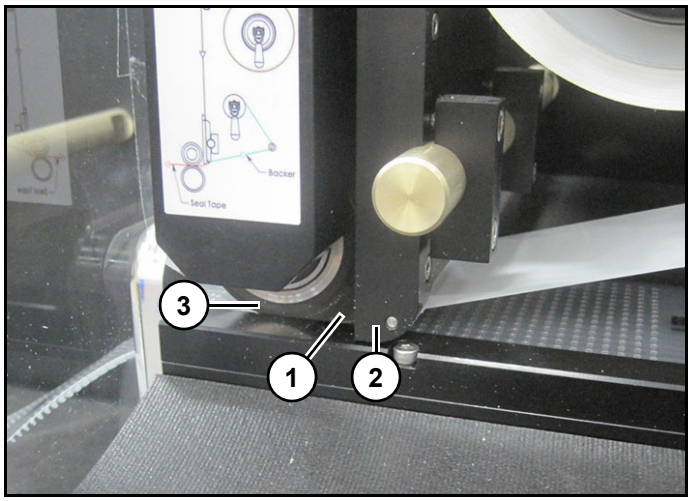

Figure 9

10. Feed clear seal tape (1) under seal tape guide (2) and Nip Roller (3). *(Figure 9)*

11. Feed seal tape out tape sealer module. Pull additional seal tape through module until seal tape and backer tape separate automatically below tape seal guide.

Notice

Do not clamp nip roller down unless Array Tape is positioned under nip roller. Clamping seal tape to Array Tape path without tape present will result in seal tape jam.

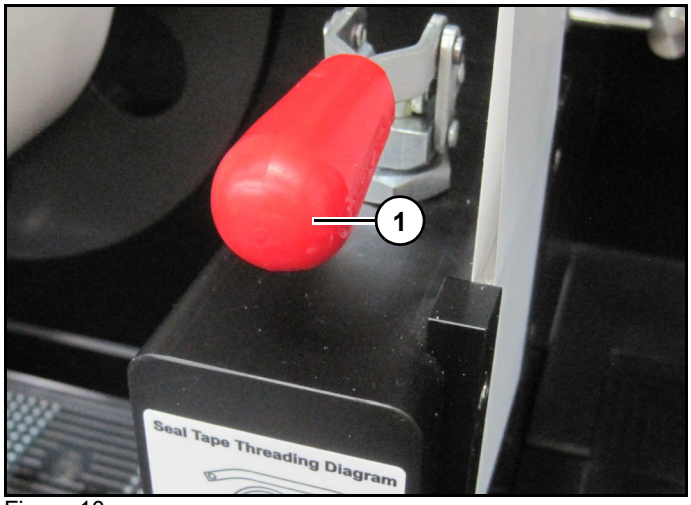

Figure 10

12. When seal tape is needed, push nip roller lever (1) *(Figure 10)* to clamped position.

Adjusting Tape Sealer settings

Users with administrator privileges can change tape sealer parameters using HMI settings file.

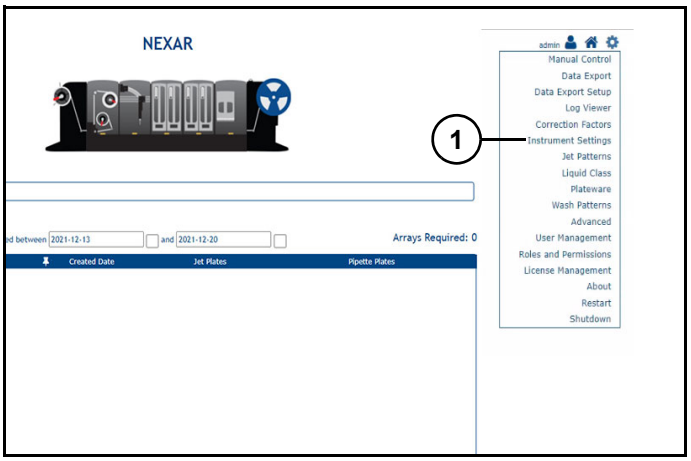

Figure 11

1. Click "Instrument Settings" (1) *(Figure 11)*.

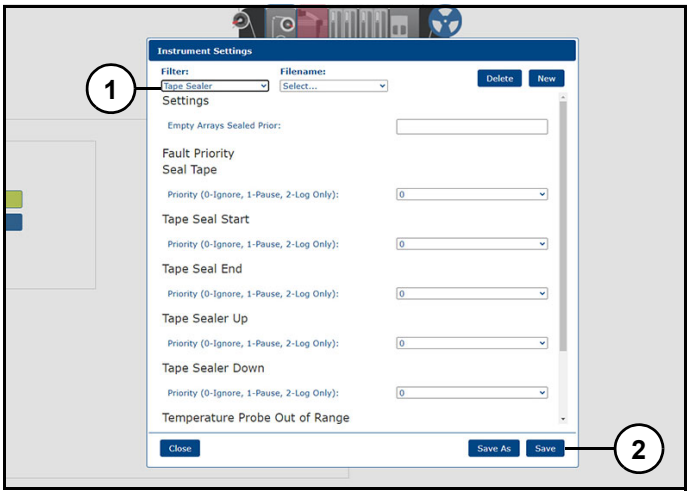

Figure 12

Refer to *(Figure 12)*.

2. Select "Tape Sealer" (1) from drop-down.

3. Adjust desired settings.

4. Click "Save" (2).

Setting descriptions

Dead Arrays Sealed Prior - . Define number of blank arrays sealed prior to first array in the recipe playlist (min = 0, max = 2).

Thermoelectric Operation - . Define control of tape path chiller.

Temperature Setpoint - . Define temperature set point of chiller.

Temperature Error Limit Faults - . Define allowable temperature error of chiller.

Seal Tape Fault Priority - . .
Priority 1 - Pause Recipe and write fault to log file

Priority 2 - Do not stop Recipe but write fault to log file.

Priority 0 - Ignore fault, continue recipe, and do not publish to log file or stop recipe.

Seal Tape Start Fault Priority - . . Triggered when first array in a playlist reaches tape sealer and nip roller is in up position.

Seal Tape End Fault Priority - . . Triggered when last array in a playlist reaches tape sealer and nip roller is in down position.

Tape Sealer Up Fault Priority - . Triggered when nip roller remains in up position when it has been commanded to go down.

Temperature Fault Priority - . Triggered when temperature of chiller is more than errror limit away from set point and a recipe is active.

Maintenance

- Adjust sealing guide.
- Adjust Nip Roller pressure.

Adjusting sealing guide

Notice
Only adjust sealing guide if seal tape misapplication is consistent. Wrinkling is common in first two arrays after loading.

Tools needed:

- M4 hex wrench.

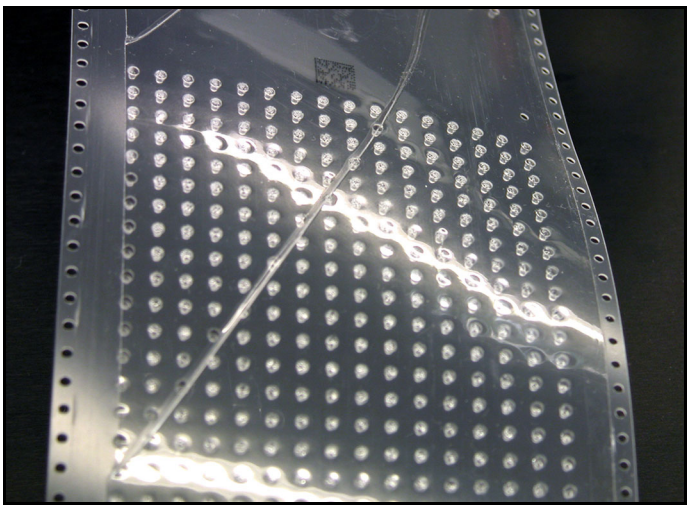

Figure 13

Seal tape wrinkled and not covering all wells *(Figure 13)*.

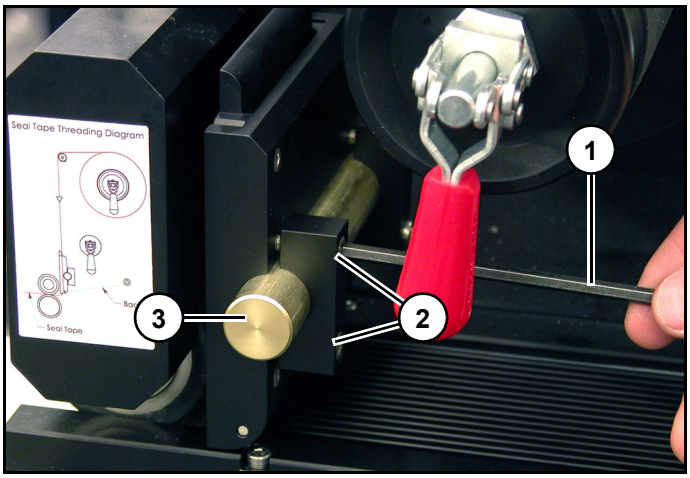

Figure 14

1. Using an M4 hex wrench (1), loosen four bolts (2) to loosen two clamps on seal guide (3). *(Figure 14)*
2. Ensure seal guide is flush with belt cover and that seal guide is straight up and down.
3. Tighten four clamp bolts to secure.

Adjusting Nip Roller pressure

Tools needed:

- Crescent Wrench.
- 19 mm Wrench.

If nip roller pressure is too high, tape will jam. If nip roller pressure is too low, tape will not seal properly and seal will either pull off easily or will contain air bubbles. Properly applied seal tape should peel off with moderate force.

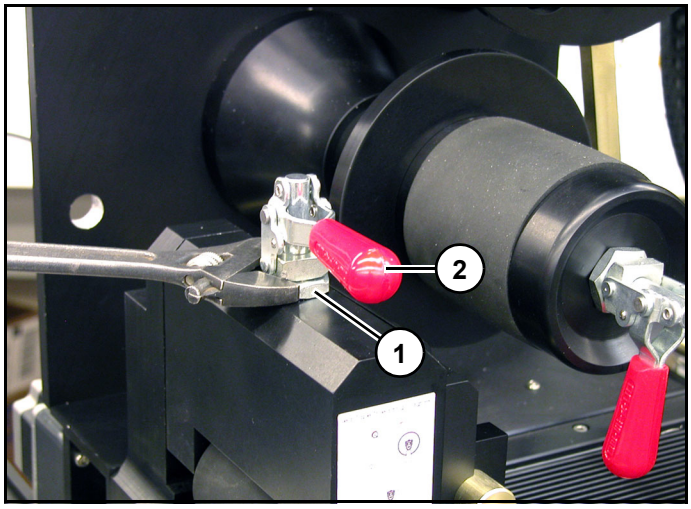

Figure 15

1. Place a crescent wrench on jam nut (1) below nip roller clamp handle (2) and loosen. *(Figure 15)*
2. Lift nip roller clamp handle (2) *(Figure 15)* and turn clockwise to increase pressure or counter-clockwise to decrease pressure.
3. Push nip roller clamp handle (2) *(Figure 15)* down towards front of machine.

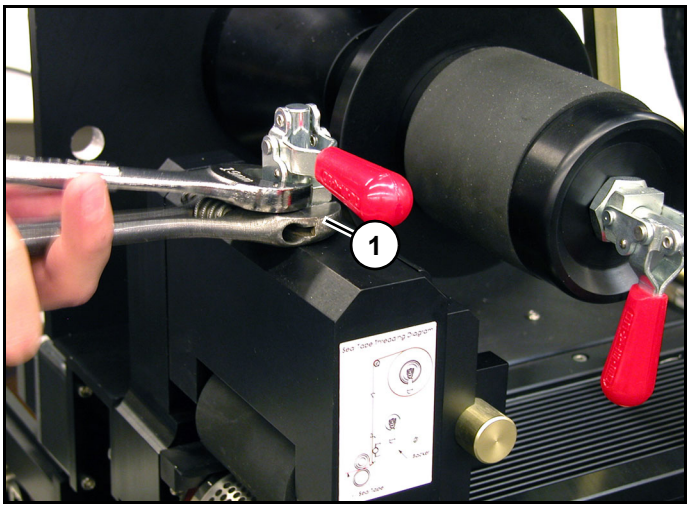

Figure 16

4. Using a 19mm wrench and crescent wrench, tighten jam nut (1) *(Figure 16)*.

Creating new Tape Sealer setting

Users with administrator privileges can create new Dispense Pipette settings file.

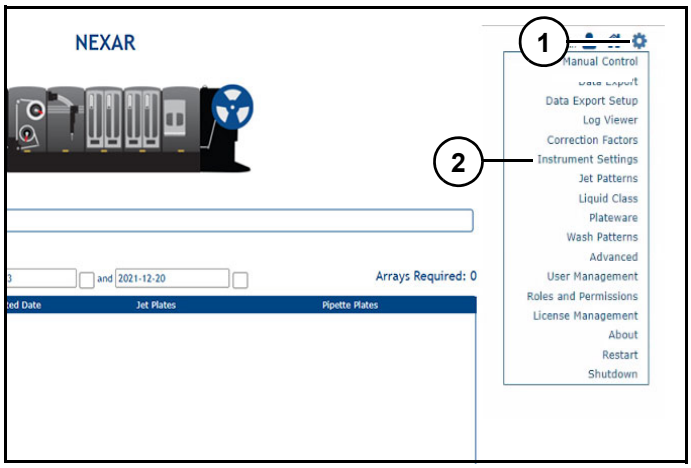

Figure 17

Refer to *(Figure 17)*.

1. Click "Settings" icon (1).
2. Click "Instrument Settings" (2).

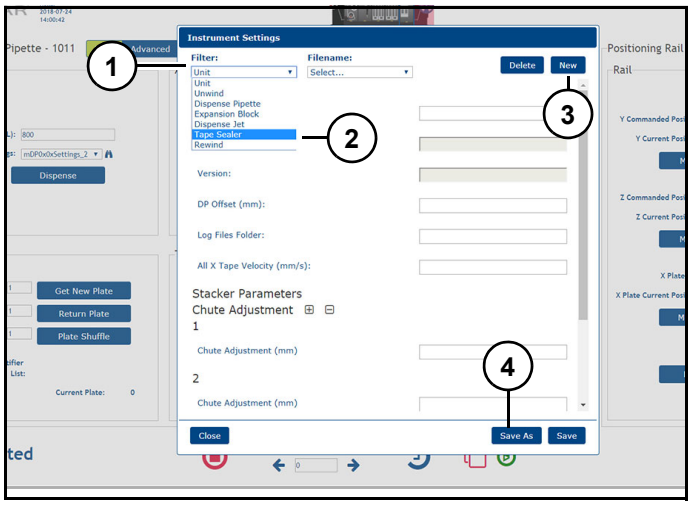

Figure 18

Refer to *(Figure 18)*.

3. Click "Filter" drop-down (1).
4. Select " Sealer" (2).
5. Click "New" (3).
6. Enter desired settings on setting screen.
7. Click "Save As" (4).

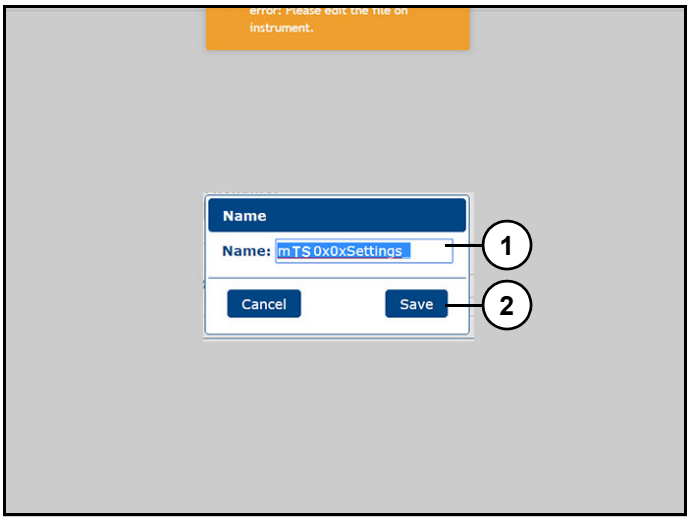

Figure 19

Refer to *(Figure 19)*.

8. Enter "Name" (1) of new setting.
9. Click "Save" (2).

Note: Click "Cancel" to exit without saving new file.

Adjusting Tape Sealer settings

Users with administrator privileges can change parameters using Settings file.

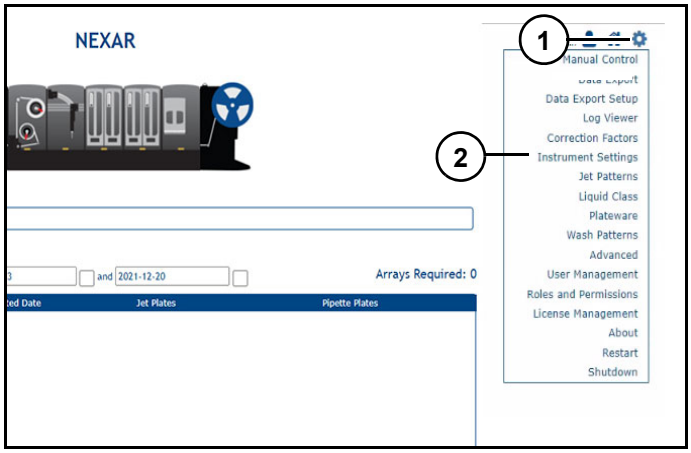

Figure 20

Refer to *(Figure 20)*.

1. Click "Settings" icon (1).
2. Click "Instrument Settings" (2).

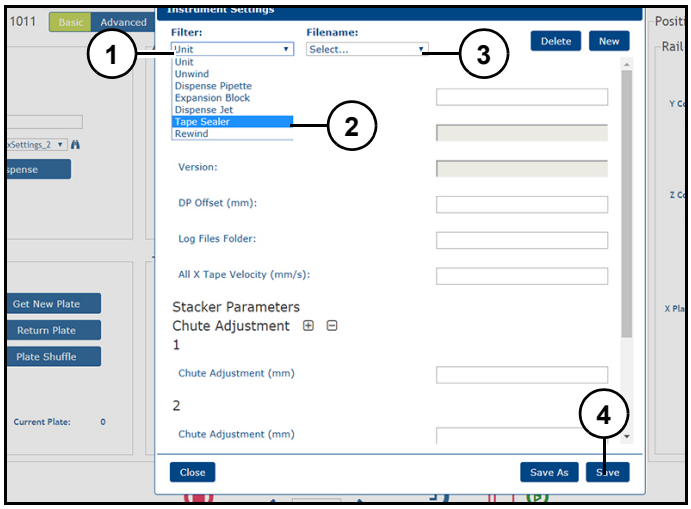

Figure 21

Refer to *(Figure 21)*.

3. Click "Filter" drop-down (1).
4. Select " Sealer" (2).
5. Select "Filename" drop-down (3) and select file to edit.
6. Adjust desired settings on setting screen.
7. Click "Save" (4) to save changes.

Deleting Tape Sealer settings

Users with administrator privileges can change parameters using Settings file.

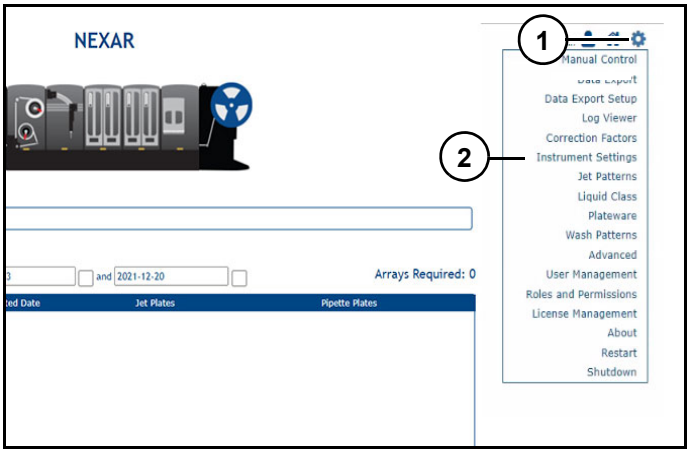

Figure 22

Refer to *(Figure 22)*.

1. Click "Settings" icon (1).
2. Click "Instrument Settings" (2).

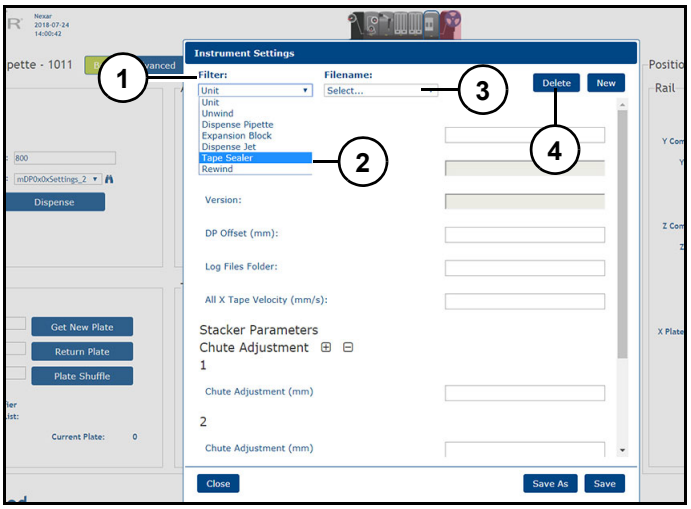

Figure 23

Refer to *(Figure 23)*.

3. Click "Filter" drop-down (1).
4. Select " Sealer" (2).
5. Select "Filename" drop-down (3) and select file to delete.
6. Click "Delete" (4).
7. Click "Yes" (NS) to delete settings file.

Setting descriptions

Dead Arrays Sealed Prior: Define number of blank arrays sealed prior to first Array Tape in the recipe playlist (min = 0, max = 2).

Thermo Electric Operation: Define control of path chiller.

Temperature Setpoint: Define temperature set point of chiller.

Temperature Error Limit Faults: Define allowable temperature error of chiller.

Seal Tape Fault Priority:

Priority 1 - Pause recipe and write fault to log file

Priority 2 - Do not stop recipe but write fault to log file.

Priority 0 - Ignore fault and do not publish to log file or stop recipe.

Seal Tape Start Fault Priority: Triggered when first Array Tape in a playlist reaches sealer and the nip roller is up.

Seal Tape End Fault Priority: Triggered when last Array Tape in a playlist reaches sealer and nip roller is down.

Tape Sealer Up Fault Priority: Triggered when nip roller remains up when it has been commanded to go down.

Temperature Fault Priority: Triggered when temperature of chiller is more than Error limit away from set point and a recipe is active.

Maintenance

Adjusting sealing guide

Notice
Only adjust sealing guide if seal misapplication is consistent. Wrinkling is common in first two arrays after loading.

Tools needed:

- M4 hex wrench.

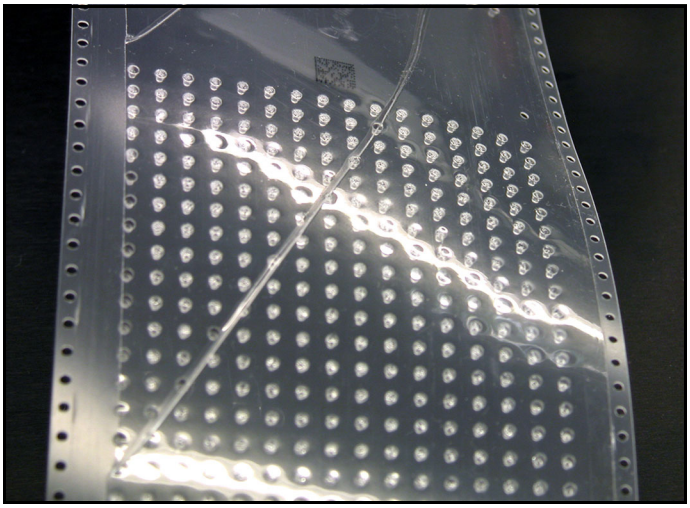

Figure 24

Seal tape wrinkled and not covering all wells *(Figure 13)*.

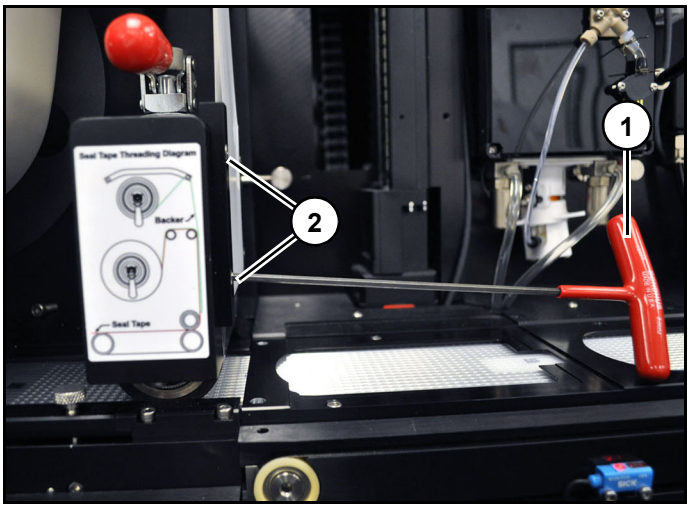

Figure 25

1. Using an M4 hex wrench (1), loosen four bolts (2) to loosen two clamps on seal guide. *(Figure 14)*

2. Ensure seal guide is flush with belt cover and that seal guide is straight up and down.

3. Tighten four clamp bolts to secure.

Adjusting Nip Roller pressure

Tools needed:

- Crescent wrench.
- 19 mm wrench.

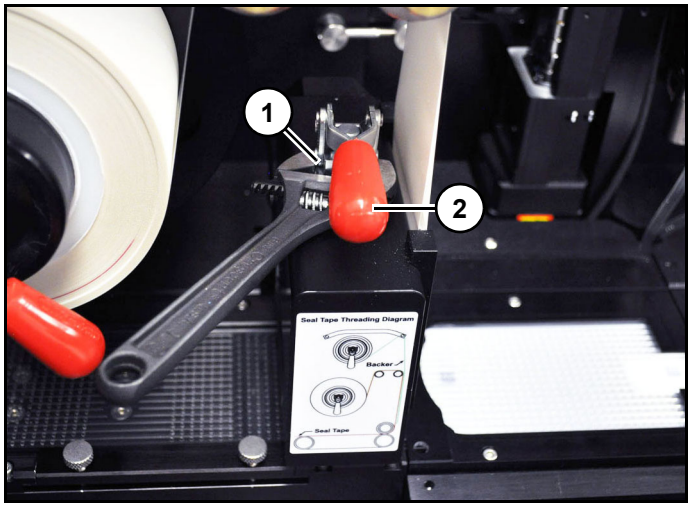

Figure 26

Refer to *(Figure 26)*.

If nip roller pressure is too high, seal tape will jam. If nip roller pressure is too low, seal tape will not seal properly and will either pull off easily or will have air bubbles.

1. Place a crescent wrench on jam nut (1) below Nip Roller clamp handle (2) and loosen.

2. Lift Nip Roller clamp handle (2) and turn clockwise to increase pressure or counter-clockwise to decrease pressure.

3. Push Nip Roller clamp handle (2) down towards front of machine.

4. Using a 19 mm wrench and crescent wrench, tighten jam nut.

Faults

Notice
Before resetting a fault, be sure condition is corrected.

For fault list See "Tape Sealer_TS0902 Troubleshooting" on page 243.

For fault descriptions See "Tape Sealer_TS0902 Troubleshooting" on page 243.

How to recover from a fault

To reset a fault, user can use one of two methods:

- Press "Reset" button on Unwind Manager Auto screen.

OR

- Pull and release joystick at STOP/RESET position.

After resetting, wait a few seconds to see if fault condition clears from navigation panel. If it clears, instrument is ready for use.

How to recover from Array Tape jam

1. Remove jam by clearing path of Array Tape.
2. Reset instrument to clear Array Tape jam fault.
3. Press "Sync Array Tape".
4. Enable instrument.
5. Resume operations.

Note: While in Recipe mode, process will resume where it was interrupted.

Tape Sealer_TS0902 Troubleshooting

Notice
Before attempting any fault solution, refer to Handling Faults in Getting Started section. Fault Colours. Red: Safety Fault. Yellow: Uncontrolled fault other than safety. Blue: Controlled fault. Green: Nexar enabled.

Fault messages

Yellow error message	Cause	Solution
TAPEXDRIVE	Terminal may be faulty.	Cycle power to instrument. If problem persists, contact Biosearch Technologies.
BACKERREWINDDRIVE	Same as above	Same as above
_BK1120_COUPLER_STATE	Same as above	Same as above
_BK1120_STATE	Same as above	Same as above
_BK1120_WCSTATE	Same as above	Same as above
_EK1120_STATE	Same as above	Same as above

Blue error message	Cause	Solution
_TAPEXJAM	Tape XDrive was obstructed, likely due to a tape jam.	1. Remove jam by clearing path of tape. 2. Reset instrument to clear fault. 3. Enable instrument. 4. Press Sync Tape button on Unwind Manager Auto Screen and resume operation.
_CHECKRECIPEFILE	Settings file was not created properly.	Debug file using Internet Explorer 6.0 or higher.
_LIFTNIP_CUTSEALTAPE	Recipe is done with seal tape.	Cut seal tape, restart instrument for one index, then pause and lift nip roller.
_SEALTAPEOUT	Photoeye does not sense seal tape.	Replace seal tape. See “Loading Seal Tape” on page 233.
_STARTSEALTAPE	Recipe declares it is ready for seal tape to be applied.	Be sure seal tape is fed through nip roller, then lower nip roller.

Tape Sealer_TS1209

⚠WARNING

Read and understand equipment operators manual before operating or performing maintenance. Failure to do so could result in serious injury or death.

Component identification

Tape Sealer_TS1209/ Thermoelectric Attachment -TE1209

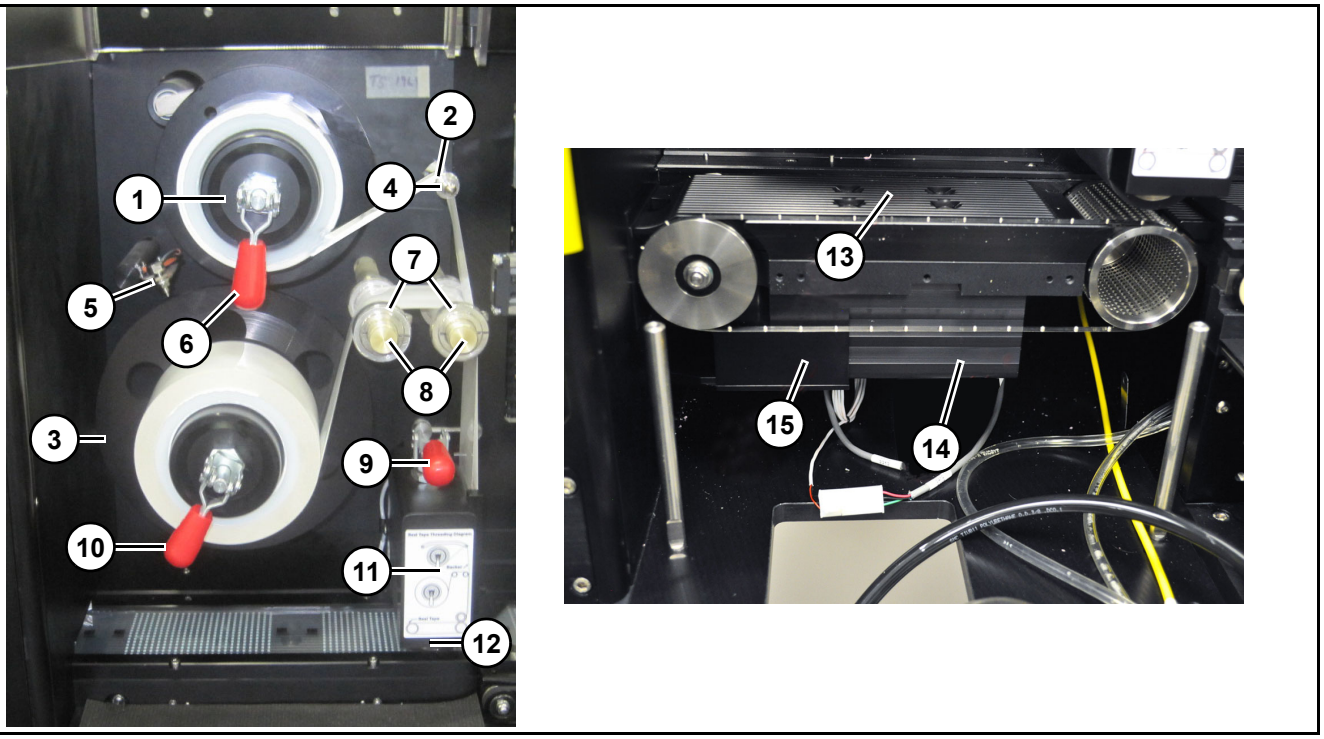

Figure 1

REF#	DESCRIPTION	REF#	DESCRIPTION
1	Backer Rewind Reel	9	Nip Roller Clamp Handle
2	Dancer Bar	10	Spindle Handle
3	Spindle	11	Seal Guide
4	Dancer Bar Collar	12	Seal Nip Roller
5	Seal Photoeye	13	Groove Plate
6	Backer Rewind Handle	14	Thermoelectric Cooler
7	Seal Guide Spindle Collars	15	Fan
8	Seal Guide Spindles		

Loading seal tape

Notice

Load seal tape before loading Array Tape to avoid tape sticking together.

Required tools

- Scissors
- Adhesive

Seal threading diagram

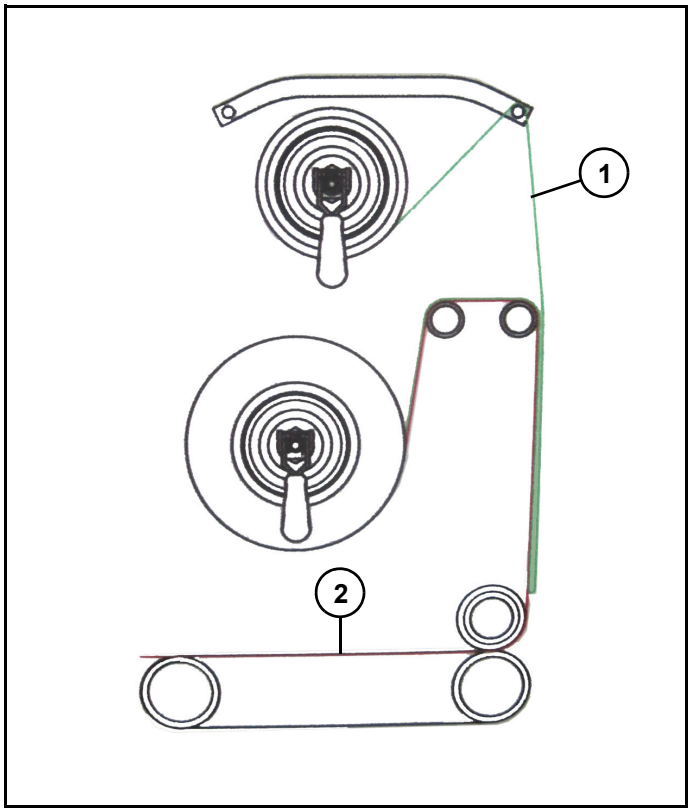

Figure 2

Refer to *(Figure 2)*.

Backer (1).

Seal Tape (2).

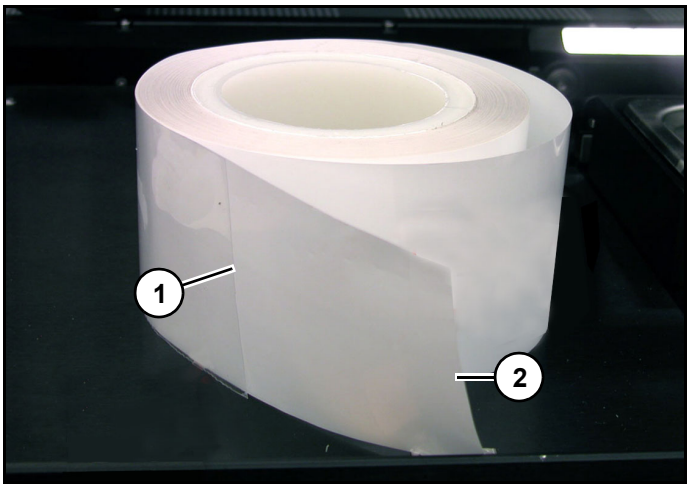

Figure 3

1. Using scissors, cut a few inches of seal tape (1) shorter than backing (2). *(Figure 3)*

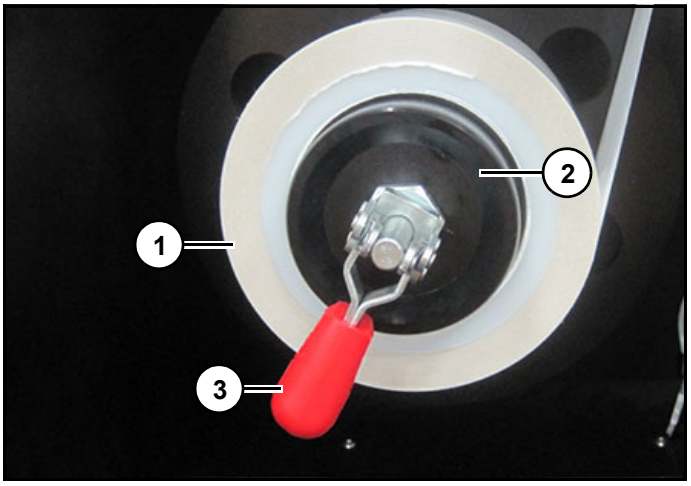

Figure 4

Refer to *(Figure 4)*.

2. Load spool (1) on spindle (2) with transparent side up.
3. Push handle (3) down to clamp spool to spindle.

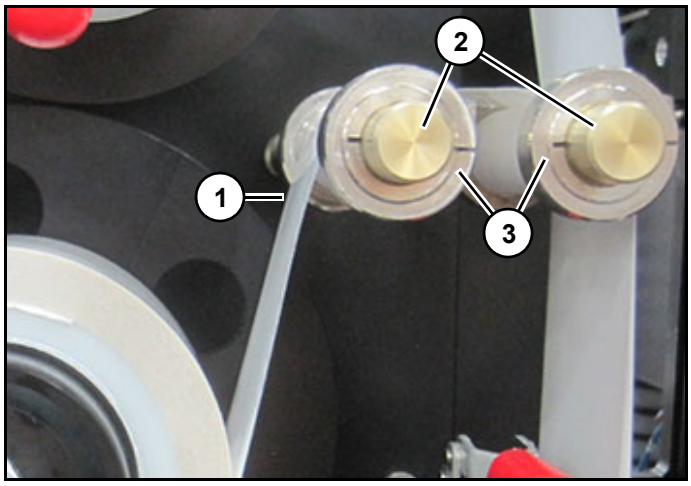

Figure 5

4. Thread seal tape (1) over seal guide spindle (2), ensure tape is between collars (3). *(Figure 5)*

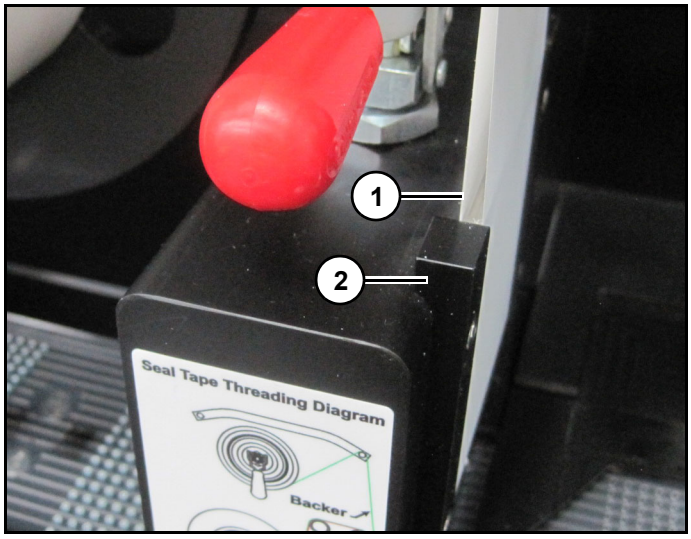

Figure 6

5. Thread seal tape (1) into seal guide (2). *(Figure 6)*

Note: Ensure fits into grooves of seal guide.

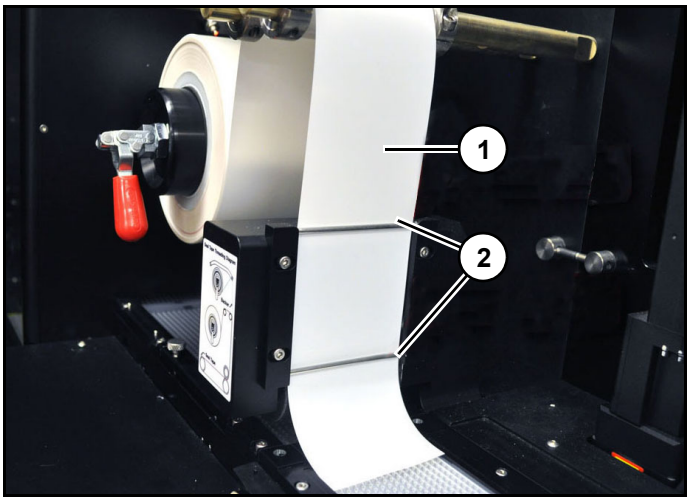

Figure 7

6. Pull (1) through and ensure seal tape is between Nip Roller block and silver rods (2). *(Figure 7)*

7. Pull seal tape through about one foot and separate seal tape from backing.

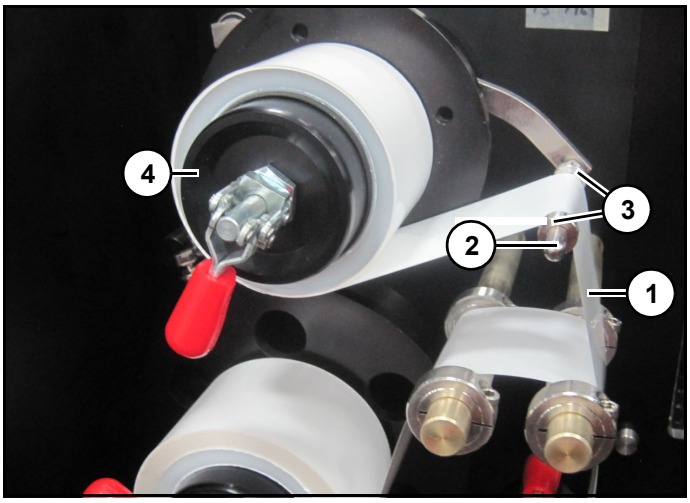

Figure 8

Refer to *(Figure 8)*.

8. Pull backing (1) around dancer bar (2) between collars (3).

9. Attach backing (1) to backer rewind reel (4) with adhesive tape.

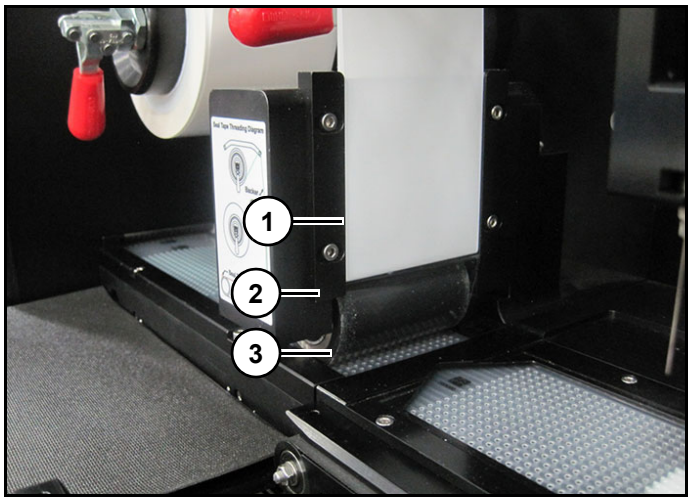

Figure 9

10. Feed seal tape (1) under seal tape guide (2) and Nip Roller (3). *(Figure 9)*

11. Feed seal tape out tape sealer module and pull until seal tape and backer split below seal tape guide.

Notice

Do not clamp nip roller down unless Array Tape is under nip roller. Clamping seal tape to sealing drum with nip roller will result in a seal tape jam.

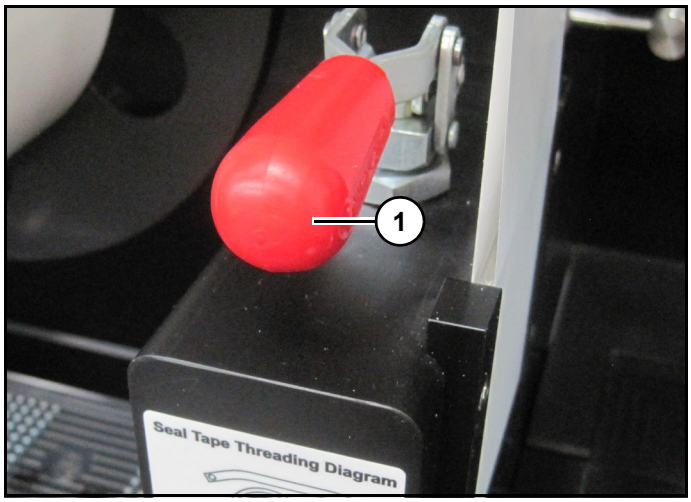

Figure 10

12. When seal tape is needed immediately, push Nip Roller lever (1) *(Figure 10)* to clamped position.

Creating new Tape Sealer setting

Users with administrator privileges can create new Dispense Pipette settings file.

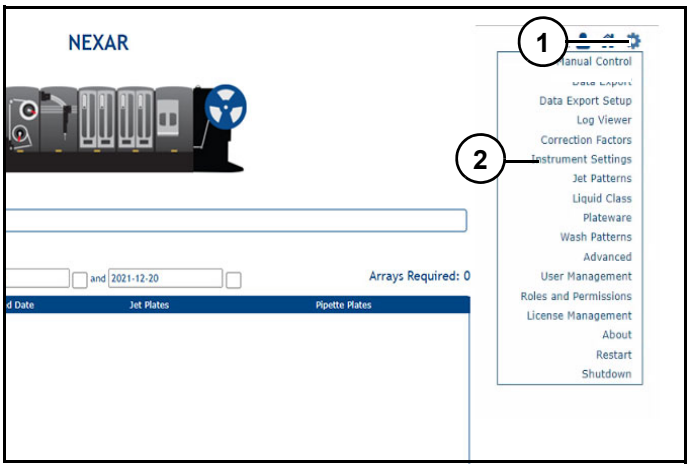

Figure 11

Refer to *(Figure 11)*.

1. Click "Settings" icon (1).

2. Click "Instrument Settings" (2).

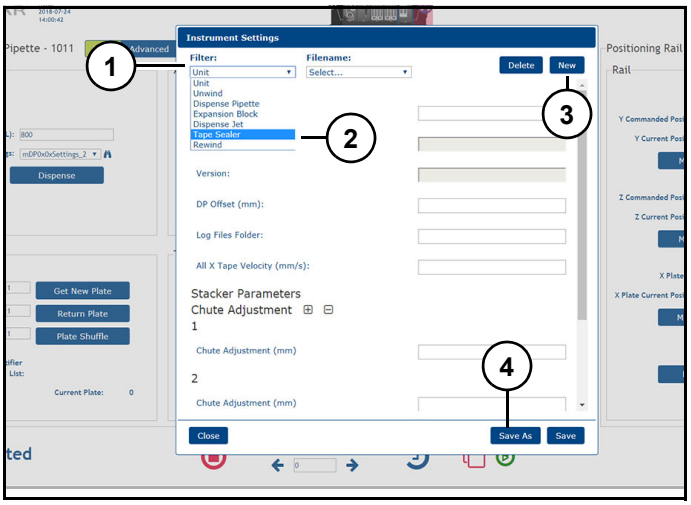

Figure 12

Refer to *(Figure 12)*.

3. Click "Filter" drop-down (1).

4. Select " Sealer" (2).

5. Click "New" (3).

6. Enter desired settings on setting screen.

7. Click "Save As" (4).

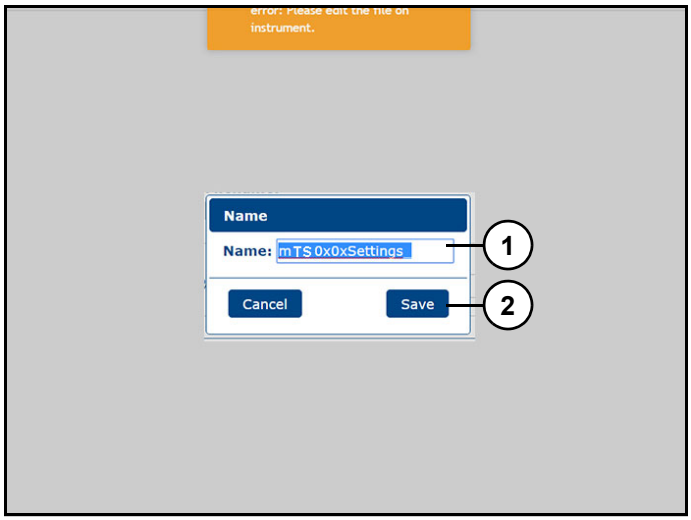

Figure 13

Refer to *(Figure 13)*.

8. Enter "Name" (1) of new setting.
9. Click "Save" (2).

Note: Click "Cancel" to exit without saving new file.

Adjusting Tape Sealer settings

Users with administrator privileges can change parameters using Settings file.

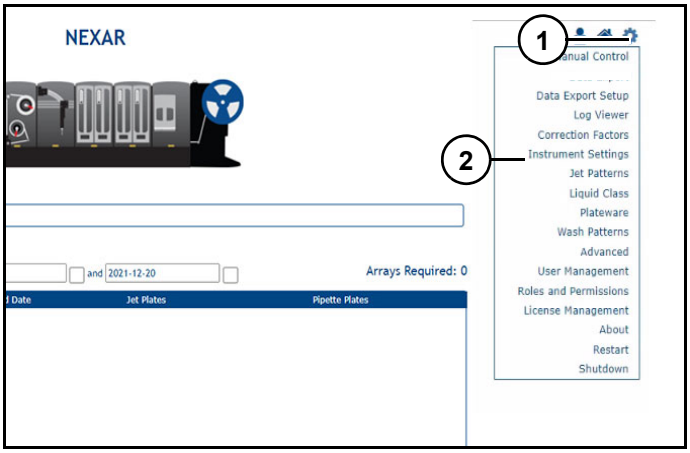

Figure 14

Refer to *(Figure 14)*.

1. Click "Settings" icon (1).
2. Click "Instrument Settings" (2).

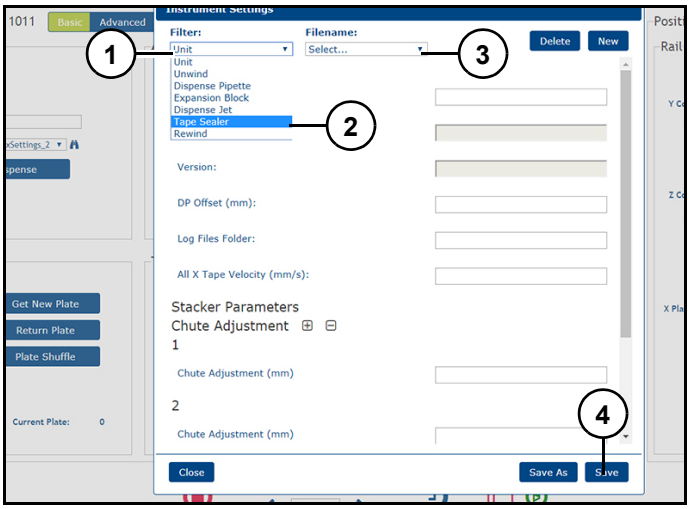

Figure 15

Refer to *(Figure 15)*.

3. Click "Filter" drop-down (1).
4. Select " Sealer" (2).
5. Select "Filename" drop-down (3) and select file to edit.
6. Adjust desired settings on setting screen.
7. Click "Save" (4) to save changes.

Deleting Tape Sealer settings

Users with administrator privileges can change parameters using Settings file.

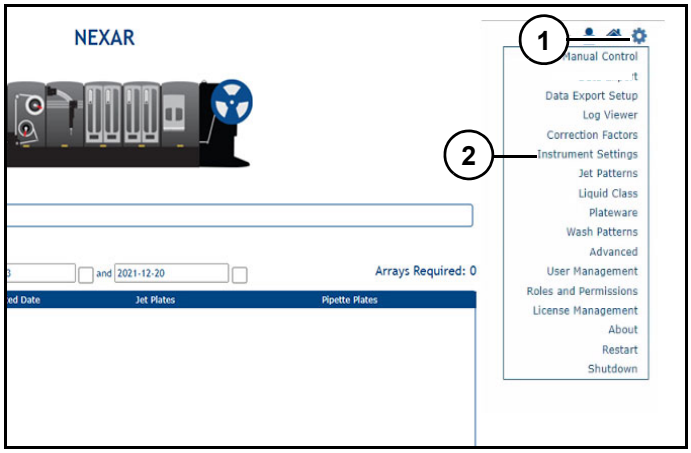

Figure 16

Refer to *(Figure 16)*.

1. Click "Settings" icon (1).
2. Click "Instrument Settings" (2).

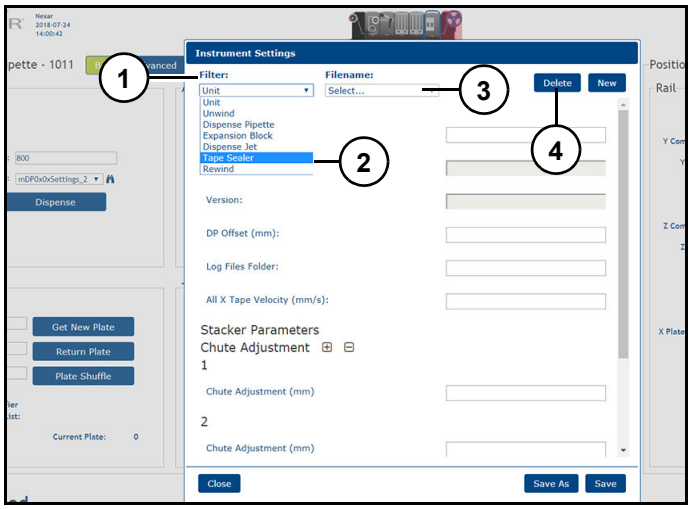

Figure 17

Refer to *(Figure 17)*.

3. Click "Filter" drop-down (1).
4. Select " Sealer" (2).
5. Select "Filename" drop-down (3) and select file to delete.
6. Click "Delete" (4).
7. Click "Yes" (NS) to delete settings file.

Setting descriptions

Dead Arrays Sealed Prior: Define number of blank arrays sealed prior to first Array Tape in the recipe playlist (min = 0, max = 2).

Thermo Electric Operation: Define control of path chiller.

Temperature Setpoint: Define temperature set point of chiller.

Temperature Error Limit Faults: Define allowable temperature error of chiller.

Seal Tape Fault Priority:

Priority 1 - Pause Recipe and write fault to log file

Priority 2 - Do not stop Recipe but write fault to log file.

Priority 0 - Ignore fault and do not publish to log file or stop recipe.

Seal Tape Start Fault Priority: Triggered when first Array Tape in a playlist reaches sealer and the nip roller is up.

Seal Tape End Fault Priority: Triggered when last Array Tape in a playlist reaches sealer and nip roller is down.

Tape Sealer Up Fault Priority: Triggered when nip roller remains up when it has been commanded to go down.

Temperature Fault Priority: Triggered when temperature of chiller is more than Error limit away from set point and a recipe is active.

Maintenance

Adjusting sealing guide

Notice
Only adjust sealing guide if seal misapplication is consistent. Wrinkling is common in first two arrays after loading.

Tools Needed.

- M4 hex wrench.

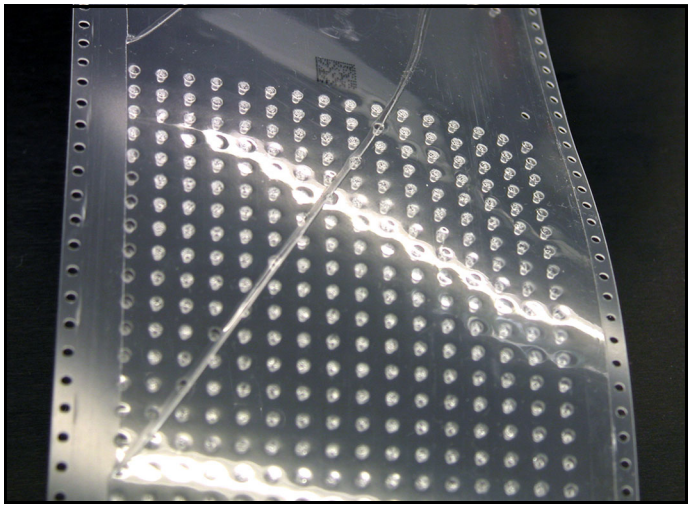

Figure 18

Seal tape wrinkled and not covering all wells *(Figure 18)*.

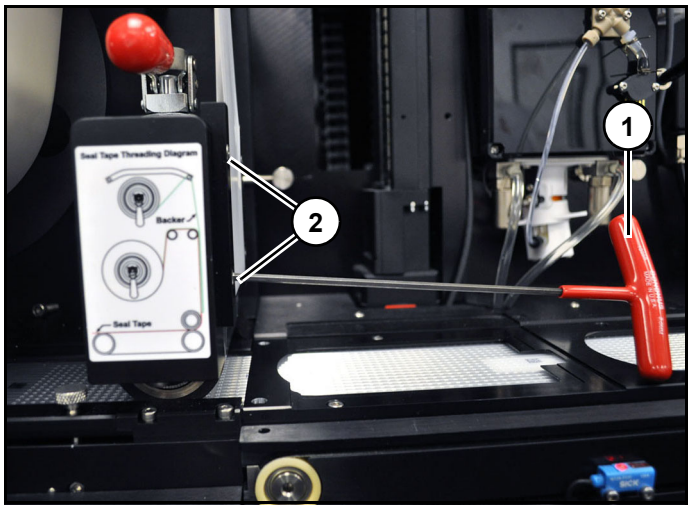

Figure 19

1. Using an M4 hex wrench (1), loosen four bolts (2) to loosen two clamps on seal guide. *(Figure 19)*
2. Ensure seal guide is flush with belt cover and that seal guide is straight up and down.
3. Tighten four clamp bolts to secure.

Adjusting nip roller pressure

Tools Needed:

- Crescent wrench.
- 19 mm wrench.

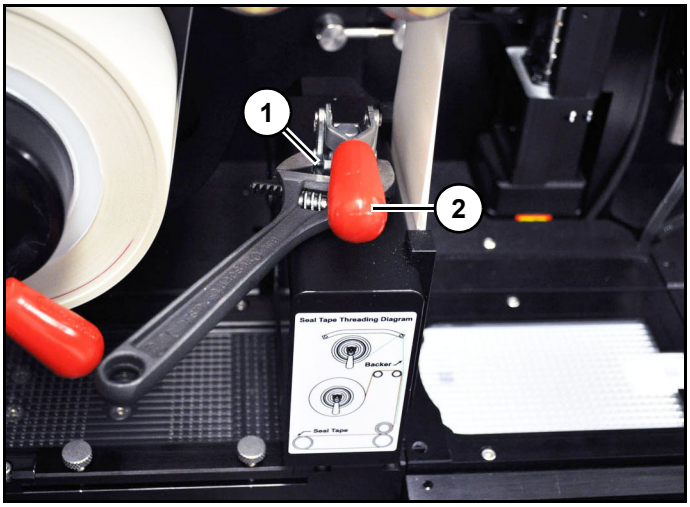

Figure 20

Refer to *(Figure 20)*.

If nip roller pressure is too high, seal tape will jam. If nip roller pressure is too low, seal tape will not seal properly and will either pull off easily or will have air bubbles.

1. Place a crescent wrench on jam nut (1) below nip roller clamp handle (2) and loosen.
2. Lift nip roller clamp handle (2) and turn clockwise to increase pressure or counter-clockwise to decrease pressure.
3. Push nip roller clamp handle (2) down towards front of machine.
4. Using a 19 mm wrench and crescent wrench, tighten jam nut.

Faults

Notice
Before resetting a fault, be sure condition is corrected.

For fault list See "Sealer_TS1209 troubleshooting" on page 253.

For fault descriptions See "Sealer_TS1209 troubleshooting" on page 253.

How to recover from a fault

To reset a fault, user can use one of two methods:

- Press "Reset" button on Unwind Manager Auto screen.

OR

- Pull and release joystick at STOP/RESET position.

After resetting, wait a few seconds to see if fault condition clears from navigation panel. If it clears, instrument is ready for use.

How to recover from Array Tape jam

1. Remove jam by clearing path of Array Tape.
2. Reset instrument to clear Array Tape jam fault.
3. Press "Sync Array Tape".
4. Enable instrument.
5. Resume operations.

Note: While in Recipe mode, process will resume where it was interrupted.

Thermal Electric Attachment _TE1209 controls

Notice

Controls on Auto Screen can only be activated when instrument is in an idle state.

If a change is made to Manager Settings file (See Manager Settings section) it only takes effect after a pause and idle action is performed (See Getting Started section).

Thermal Electric screen

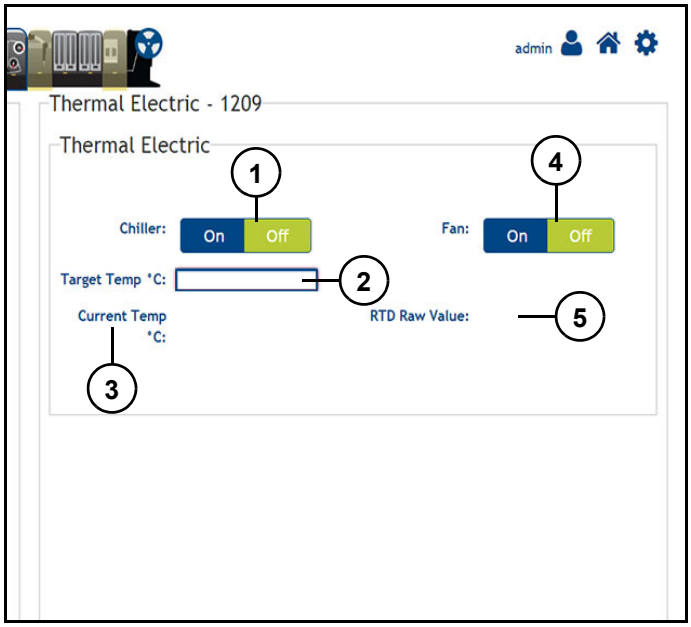

Figure 21

Refer to *(Figure 21)*.

Overview of controls

Chiller On/Off (1): Turns thermal electric chiller on and off.

Target Temp °C (2): Displays and adjusts target temperature of chiller in degrees C. Always set at 15 °C.

Current Temp °C (3): Displays current temperature of chiller in degrees C.

Fan On/Off (4): Turns thermal electric fan on and off.

RTD Raw Value (5): Displays RTD temperature.

Faults

Notice

Before resetting a fault, be sure condition is corrected.

For fault descriptions See "Sealer_TS1209 troubleshooting" on page 253.

Sealer_TS1209 troubleshooting

Notice
Before attempting any fault solution, refer to Handling Faults section. Colours Red: Safety fault Yellow: Uncontrolled fault other than safety Blinking blue: Faulted (controlled) Blue: Recovering Green: Running Black: Initialising

Manager fault messages

Pause faults	Cause	Solution
SealOut:	Seal out sensor has been triggered. Current Array Tape count.	Load new seal spool onto Sealer.
StartSeal:	Put nip roller down to seal Array Tape.	Put tape sealer down to start sealing Array Tape.
SealEndFault:	Cut seal tape.	Protocol is almost finished, lift up nip roller and cut seal.
SealerUp:	Nip Roller is still up.	Verify file exists and that it is not corrupted.
SealerDown:	Put nip roller down to seal Array Tape.	Put tape sealer down to start sealing Array Tape.
TempProbeFault:	Temperature probe may be faulty.	Check leads coming from temperature probe to ensure they are connected properly. If temperature is over 200 °C check probe.
TemperatureFault:	Temperature set point has not been reached.	Ensure that preheat is done prior to running protocol. Ensure there is power up to heating element.
CheckSettingsFile:	Settings file may be missing or incorrect.	Verify file exists and that it is not corrupted.
CheckRecipeFile:	Recipe file is incorrect, please check file for incorrect structure.	Verify file exists and that it is not corrupted.

Module fault messages

Abort faults	Cause	Solution
BACKERREWINDDRIVE:	Possible issue with backer rewind drive system.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.

Abort faults	Cause	Solution
XDRIVE:	Possible problem with Array Tape drive system.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.
_BK1120_COUPLER_STATE:	Error on BK1120 Beckhoff card.	Run diagnostics and look for CRC errors and for cards not in OP mode, check card for power, try and reseat card.
_BK1120_STATE:	State change on BK1120 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_BK1120_WCSTATE:	Working counter error on BK1120 Beckhoff card.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_EK1100_STATE:	State change on EK1100 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_230_EL7041_WCSTATE:	State change on EL7041 Beckhoff card at terminal 23.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_230_EL7041_STATE:	Working counter error on EL7041 Beckhoff card at terminal 23.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_310_EL7041_WCSTATE:	State change on EL7041 Beckhoff card at terminal 31.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_310_EL7041_STATE:	Working counter error on EL7041 Beckhoff card at terminal 31.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_330_EL2004_STATE:	State change on EL2004 Beckhoff card at terminal 33.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_330_EL2004_WCSTATE:	Working counter error on EL2004 Beckhoff card at terminal 33.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

Pause faults	Cause	Solution
NIP_ROLLER_RAISED:	Nip Roller is currently up.	Open guard door and manually engage tape sealer and continue run. Turn off in faults if not wanted. Reset and enable past
DriveProx:	Drive Proximity has unexpectedly been triggered.	Check for tape jam. Verify proximity.
XJAM:	Something has caused the drive to become out of sync.	Check tape path for obstructions and clear as necessary. Homing proximity may be bad, ensure it has power and is reading drive holes.

Accumulator faults

Abort faults	Cause	Solution
_EK1100_STATE:	State change on EK1100 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
SAFETY_CONTACTOR_STATE:	Safety contactors may be faulty.	Contactors may be sticking, lightly tap and check. Ensure wires are properly terminated.
BUS_B_FUSE_CHECK:	Bus B fuse may be blown.	Check indicator light on fuse, replace fuse if necessary.
BUS_C_FUSE_CHECK:	Bus C fuse may be blown.	Check indicator light on fuse, replace fuse if necessary.
BUS_D_FUSE_CHECK:	Bus D fuse may be blown.	Check indicator light on fuse, replace fuse if necessary.
_310_EL1114_STATE:	State change on EL1114 Beckhoff card at terminal 31.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_310_EL1114_WCSTATE:	Working counter error on EL1114 Beckhoff card at terminal 31.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_320_EL7041_STATE:	State change on EL7041 Beckhoff card at terminal 32.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_320_EL7041_WCSTATE:	Working counter error on EL7041 Beckhoff card at terminal 32.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
TAPEIN_XDRIVE:	Possible issue with Array Tape in drive system.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.
_330_EL7041_STATE:	State change on EL7041 Beckhoff card at terminal 33.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_330_EL7041_WCSTATE:	Working counter error on EL7041 Beckhoff card at terminal 33.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
TAPEOUT_XDRIVE:	Possible issue with Array Tape out drive system.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power
_340_EL2024_STATE:	State change on EL2024 Beckhoff card at terminal 34.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_340_EL2024_WCSTATE:	Working counter error on EL2024 Beckhoff card at terminal 34.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_410_EL5001_STATE:	State change on EL5001 Beckhoff card at terminal 41.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.

Abort faults	Cause	Solution
_410_EL5001_WCSTATE:	Working counter error on EL5001 Beckhoff card at terminal 41.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_420_EL7041_STATE:	State change on EL7041 Beckhoff card at terminal 42.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_420_EL7041_WCSTATE:	Working counter error on EL7041 Beckhoff card at terminal 42.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
ZDRIVE:	Possible issue with z-axis drive system.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.
_430_EL3351_STATE:	State change on EL3351 Beckhoff card at terminal 43.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_430_EL3351_WCSTATE:	Working counter error on EL3351 Beckhoff card at terminal 43.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
ZHOMEFAULT:	z-axis on TA wasn't able to reach home.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.
_440_EL3202_STATE:	State change on EL3202 Beckhoff card at terminal 44.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_440_EL3202_WCSTATE:	Working counter error on EL3202 Beckhoff card at terminal 44.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_510_EL4132_STATE:	State change on EL4132 Beckhoff card at terminal 51.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_510_EL4132_WCSTATE:	Working counter error on EL4132 Beckhoff card at terminal 51.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
OVERHEATFAULT:	Temperture has exceeded safe limit.	RTD may be reading incorrectly, check HMI for temp reading. Ensure circulation fan is working.

Pause faults	Cause	Solution
IN_XJAM:	May be jammed on infeed of Tape Accumulator.	Check tape path for obstructions on infeed and clear as necessary. Homing prox may be bad, ensure it has power and is reading drive holes.
OUT_XJAM:	May be jammed on outfeed of Tape Accumulator.	Check path for obstructions on infeed and clear as necessary. Homing prox may be bad, ensure it has power and is reading drive holes.

Pause faults	Cause	Solution
ZJAM:	Obstruction on z-axis.	Check z-axis path for obstructions, clear as necessary.

Pause faults	Cause	Solution
TemperatureFault:	Temperature set point has not been reached.	Ensure that preheat is done prior to running protocol. Ensure there is power up to heating element.
ArrayCountFault:	Estimated Array Tape count doesn't match arrays in accumulator.	Please see Tape Accumulator troubleshooting in User Manual.
CheckRecipeFile:	Recipe file is incorrect, please check file for incorrect structure.	Verify file exists and that it is not corrupted.
CheckSettingsFile:	Settings file may be missing or incorrect.	Verify file exists and that it is not corrupted.
CheckXVsZLengthFactorsFile:	Failed to read file.	Verify file exists and that it is not corrupted.

Thermal Electric faults

Abort faults	Cause	Solution
_EK1100_STATE:	State change on EK1100 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_110_EL2004_STATE:	State change on EL2024 Beckhoff card at terminal 11.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_110_EL2004_WCSTATE:	Working counter error on EL2024 Beckhoff card at terminal 11.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_110_EL2024_STATE:	State change on EL2024 Beckhoff card at terminal 11.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_110_EL2024_WCSTATE:	Working counter error on EL2024 Beckhoff card at terminal 11.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_120_EL3202_STATE:	State change on EL3202 Beckhoff card at terminal 12.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_120_EL3202_WCSTATE:	Working counter error on EL3202 Beckhoff card at terminal 12.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_710_EL2024_STATE:	State change on EL2024 Beckhoff card at terminal 71.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_710_EL2024_WCSTATE:	Working counter error on EL2024 Beckhoff card at terminal 71.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_720_EL3202_STATE:	State change on EL3202 Beckhoff card at terminal 72.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_720_EL3202_WCSTATE:	Working counter error on EL3202 Beckhoff card at terminal 72.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_EL7201_STATE:	State change on EL7201 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_EL7201_WCSTATE:	Working counter error on EL7201 Beckhoff card.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_BK1250_COUPLER_STATE:	Error on BK1250 Beckhoff card.	Run diagnostics and look for CRC errors and for cards not in OP mode, check card for power, try and reseat card.
_BK1250_STATE:	State change on BK1250 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.

Abort faults	Cause	Solution
_BK1250_WCSTATE:	Working counter error on BK1250 Beckhoff card.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
TIPSZDRIVE:	Possible issue with tip Z drive system.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.
TIPSZHOMEFAULT:	z-axis for tips wasn't able to home.	Ensure drive can move, check drive for obstructions, clear as necessary. Check proximity sensor for damage and ensure it has power.

Sealer_TS1402

⚠WARNING

Read and understand equipment operators manual before operating or performing maintenance. Failure to do so could result in serious injury or death.

Component identification

Sealer_TS1402 Assembly/Threading diagram

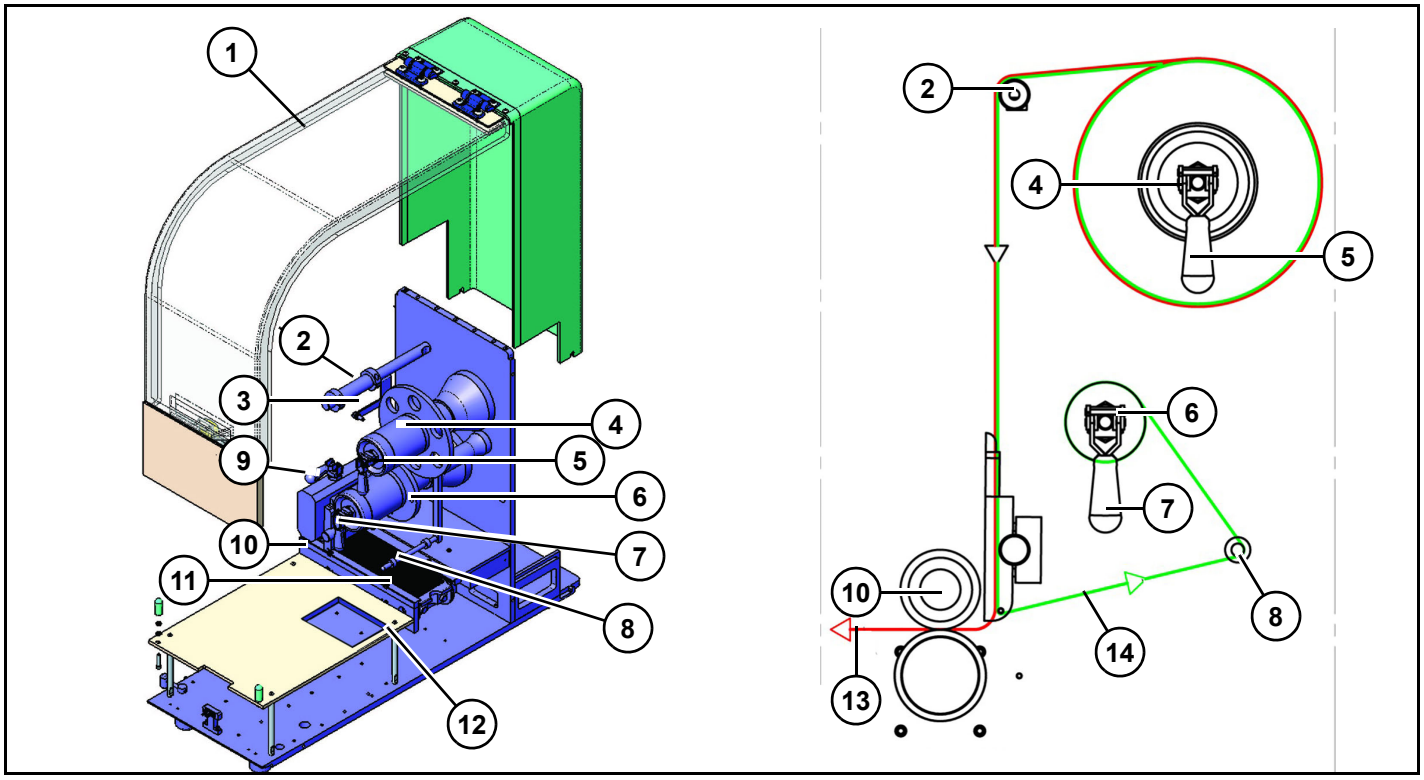

Figure 1

REF#	DESCRIPTION	REF#	DESCRIPTION
1	Guard Assembly	8	Dancer Bar
2	Seal Tape Guide Spindle	9	Nip Roller Handle
3	Seal Tape Guide Collars	10	Nip Roller
4	Tape Spindle	11	Seal Tape Drive Assembly
5	Tape Spindle Handle	12	Plate Dump
6	Tape Backing Spindle	13	Seal Tape
7	Tape Backing Spindle Handle	14	Seal Tape Backer

Loading seal

Notice
Load seal tape before loading Array Tape to avoid s sticking together.

Required tools

- Scissors
- Adhesive

Seal tape threading diagram

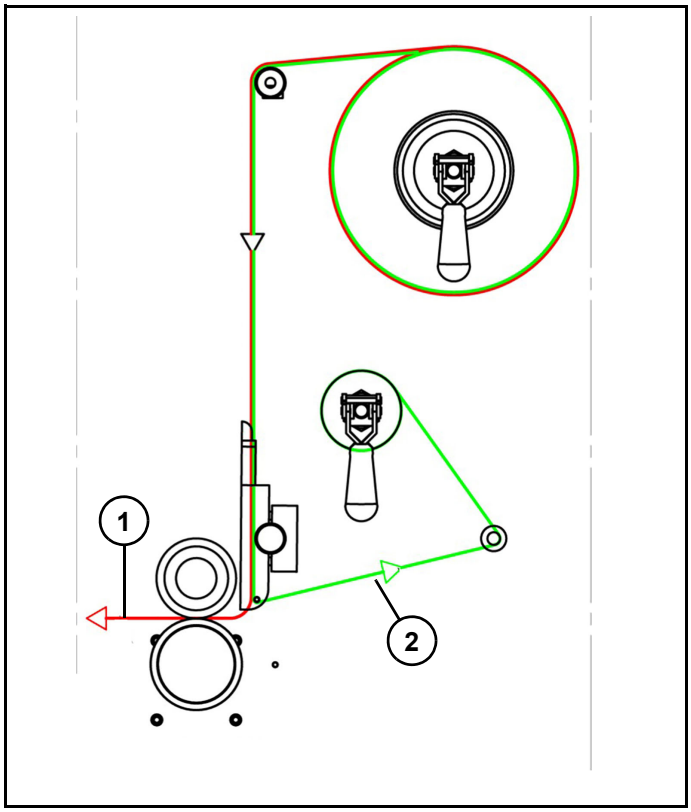

Figure 2

Refer to *(Figure 2)*.

Seal tape (1).

Backer (2).

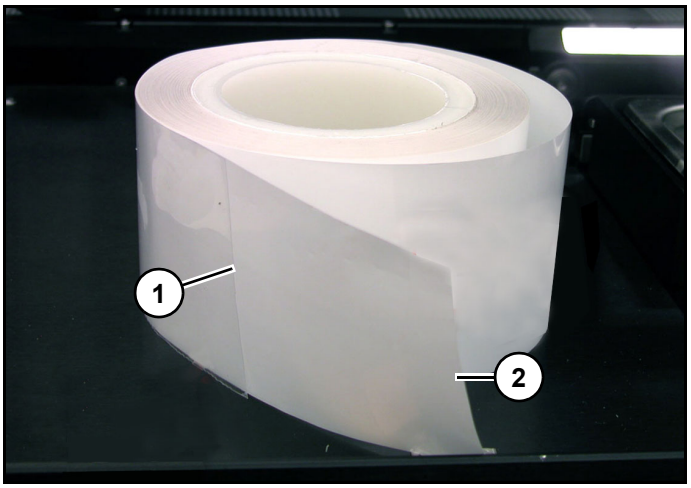

Figure 3

1. Using scissors, cut clear side 3-4 inches of clear tape (1) shorter than backing (2). *(Figure 3)*

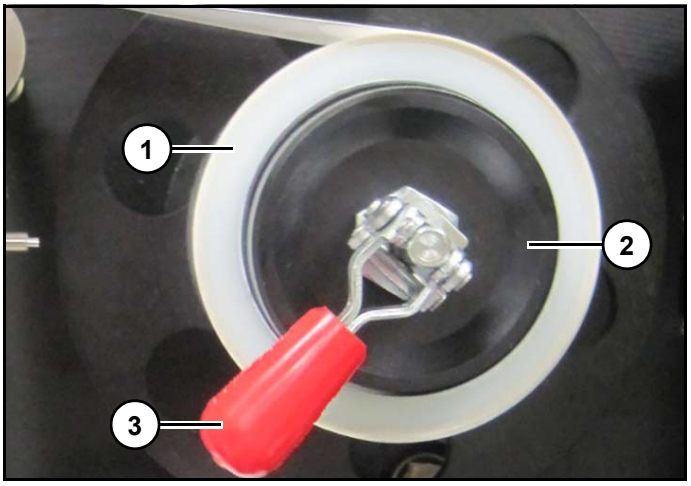

Figure 4

Refer to *(Figure 4)*.

2. Load tape spool (1) on tape spindle (2).
3. Push handle (3) down to clamp spool to spindle.

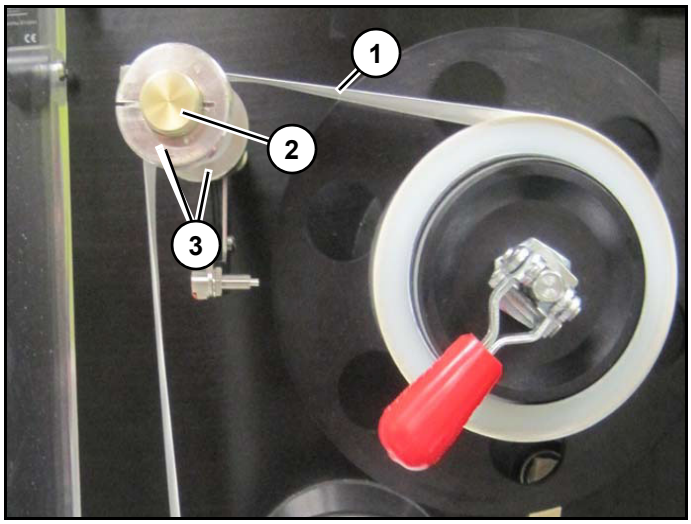

Figure 5

4. Thread tape (1) over seal tape guide spindle (2). Ensure tape is between collars (3). *(Figure 5)*

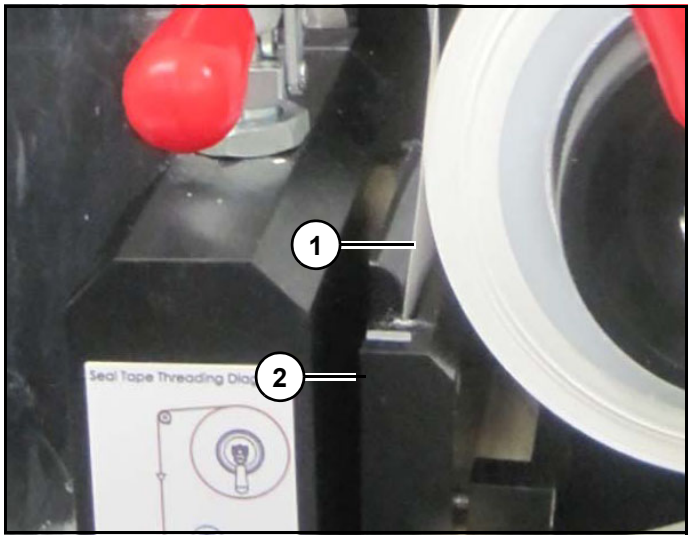

Figure 6

5. Thread tape (1) into tape seal guide (2). *(Figure 6)*

Note: Ensure tape is fit into grooves of tape seal guide.

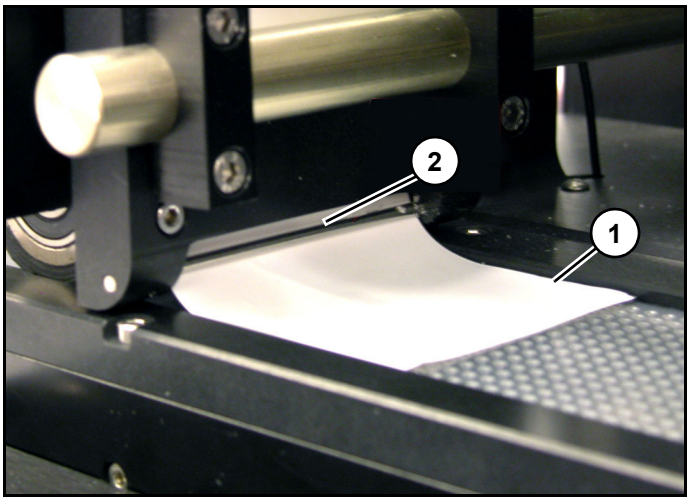

Figure 7

6. Pull tape (1) through seal guide. Ensure tape is positioned on left side of silver rod (2). *(Figure 7)*

7. Pull approximately 30 cm (12") of tape through seal guide and separate seal tape from backing.

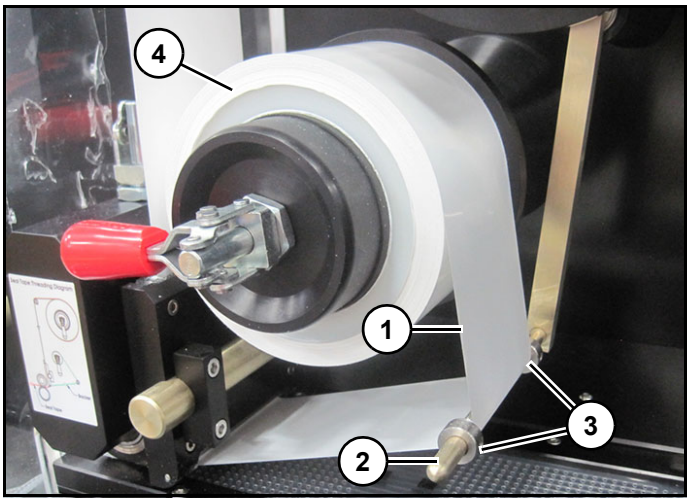

Figure 8

Refer to *(Figure 8)*.

8. Position white backing tape (1) around dancer bar (2) between collars (3).

9. Attach backing (1) to backer rewind reel (4) with adhesive tape.

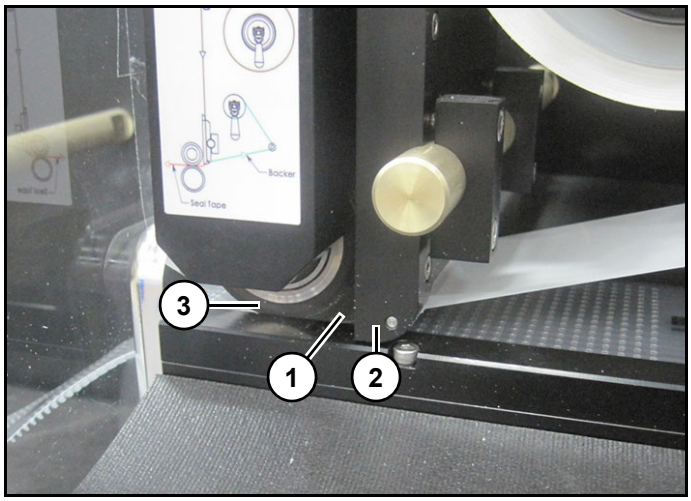

Figure 9

10. Feed clear seal tape (1) under seal guide (2) and nip roller (3). *(Figure 9)*

11. Feed seal out sealer module. Pull additional seal through module until seal and backer separate automatically below seal guide.

Notice

Do not clamp nip roller down unless Array Tape is positioned under nip roller. Clamping seal to Array Tape path without present will result in seal jam.

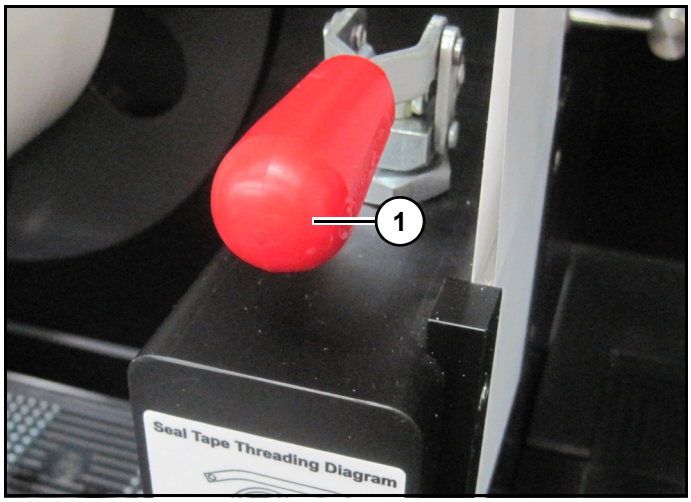

Figure 10

12. When seal is needed, push nip roller lever (1) *(Figure 10)* to clamped position.

Creating new Tape Sealer setting

Users with administrator privileges can create new Dispense Pipette settings file.

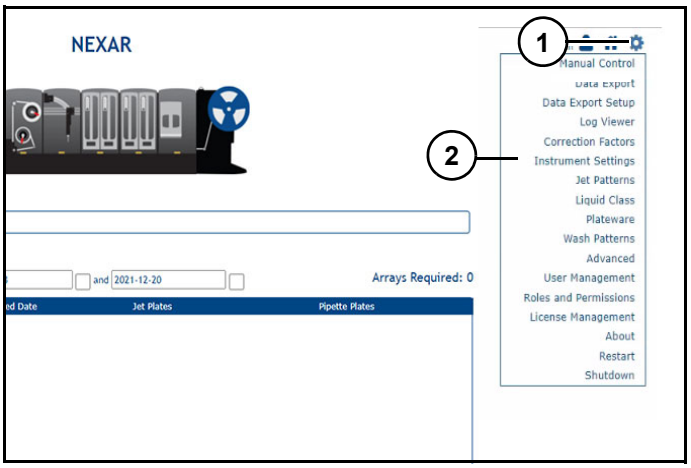

Figure 11

Refer to *(Figure 11)*.

1. Click "Settings" icon (1).

2. Click "Instrument Settings" (2).

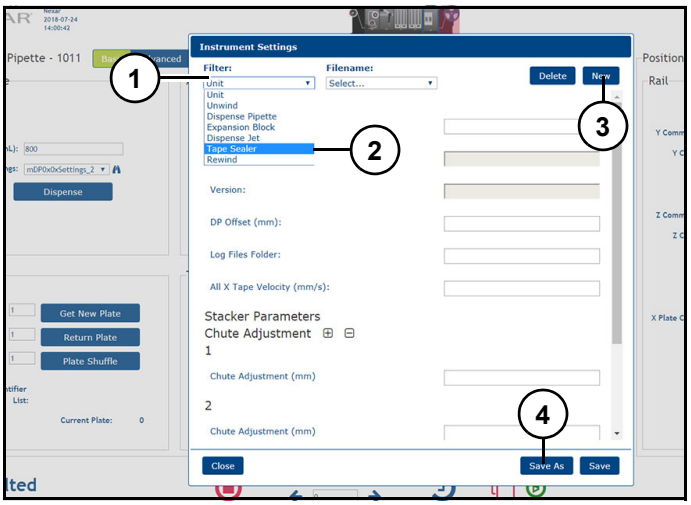

Figure 12

Refer to *(Figure 12)*.

3. Click "Filter" drop-down (1).

4. Select "Sealer" (2).

5. Click "New" (3).

6. Enter desired settings on setting screen.

7. Click "Save As" (4).

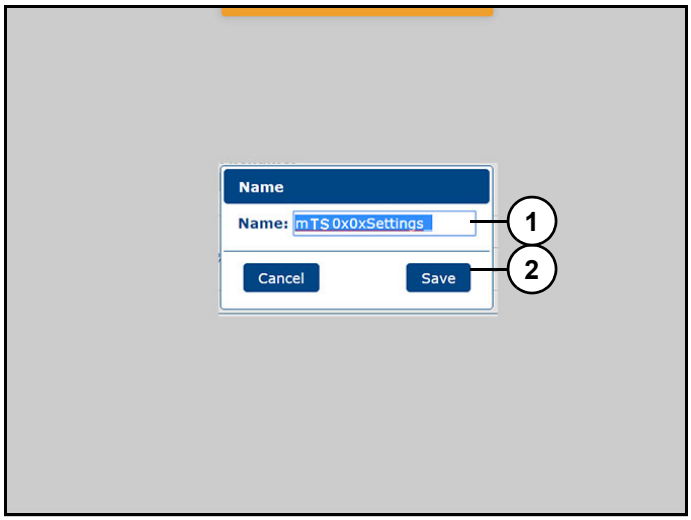

Figure 13

Refer to *(Figure 13)*.

8. Enter "Name" (1) of new setting.
9. Click "Save" (2).

Note: Click "Cancel" to exit without saving new file.

Adjusting Sealer settings

Users with administrator privileges can change Dispense Jet parameters using Settings file.

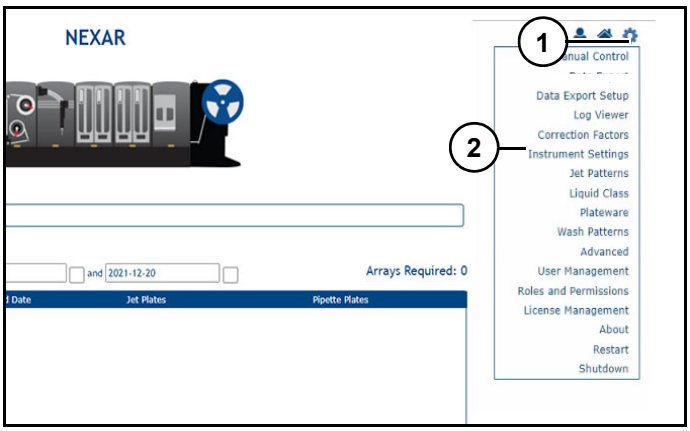

Figure 14

Refer to *(Figure 14)*.

1. Click "Settings" icon (1).
2. Click "Instrument Settings" (2).

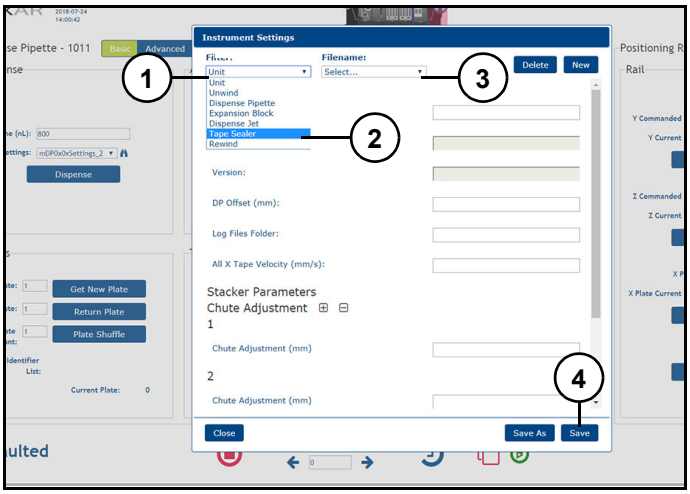

Figure 15

Refer to *(Figure 15)*.

3. Click "Filter" drop-down (1).
4. Select "Tape Sealer" (2).
5. Select "Filename" drop-down (3) and select file to edit.
6. Adjust desired settings on setting screen.
7. Click "Save" (4) to save changes.

Deleting Sealer settings

Users with administrator privileges can change Dispense Jet parameters using Settings file.

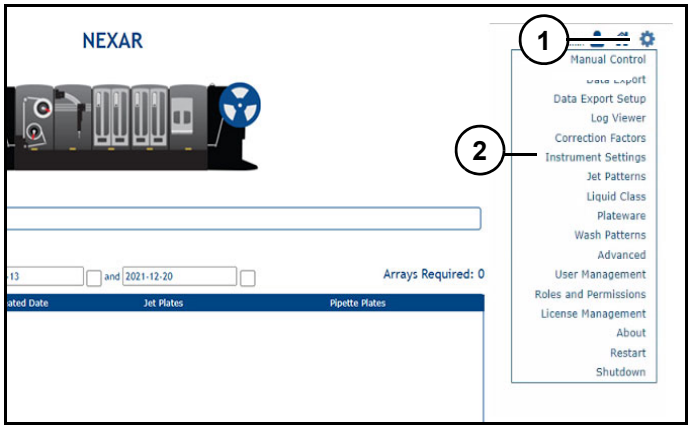

Figure 16

Refer to *(Figure 16)*.

1. Click "Settings" icon (1).
2. Click "Instrument Settings" (2).

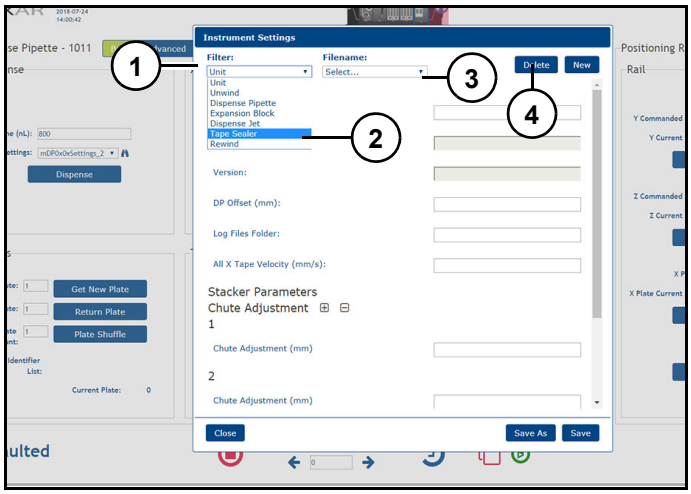

Figure 17

Refer to *(Figure 17)*.

3. Click "Filter" drop-down (1).
4. Select " Sealer" (2).
5. Select "Filename" drop-down (3) and select file to delete.
6. Click "Delete" (4).
7. Click "Yes" (NS) to delete settings file.

Setting descriptions

Dead Arrays Sealed Prior: Define number of blank arrays sealed prior to first Array Tapein the recipe playlist (min = 0, max = 2).

Thermoelectric Operation: Define control of path chiller.

Temperature Setpoint: Define temperature set point of chiller.

Temperature Error Limit Faults: Define allowable temperature error of chiller.

Faults

SealOut: Seal tape out sensor has been triggered. Current Array Tape count.

StartSeal: Put nip roller down to seal Array Tape.

SealEndFault: Cut seal tape.

SealerUp: Nip roller is still up.

SealerDown: Put nip roller down to seal Array Tape.

TempProbeFault: Temperature probe may be faulty.

TemperatureFault: Temperature set point has not been reached.

CheckSettingsFile: Settings file may be missing or incorrect.

CheckRecipeFile: Recipe file is incorrect, please check file for incorrect structure.

Maintenance

Adjusting tape sealing guide

Notice
Only adjust sealing guide if seal tape is application is consistent. Wrinkling is common in first two arrays after loading.

Tools needed.

- M4 hex wrench.

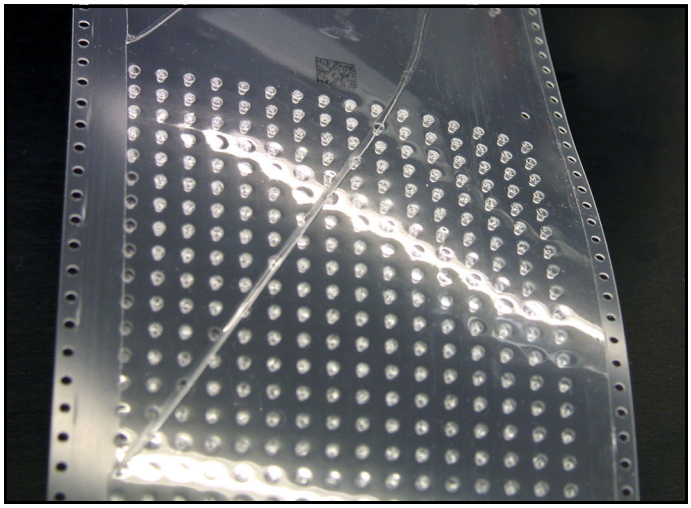

Figure 18

Seal tape wrinkled and not covering all wells *(Figure 18)*.

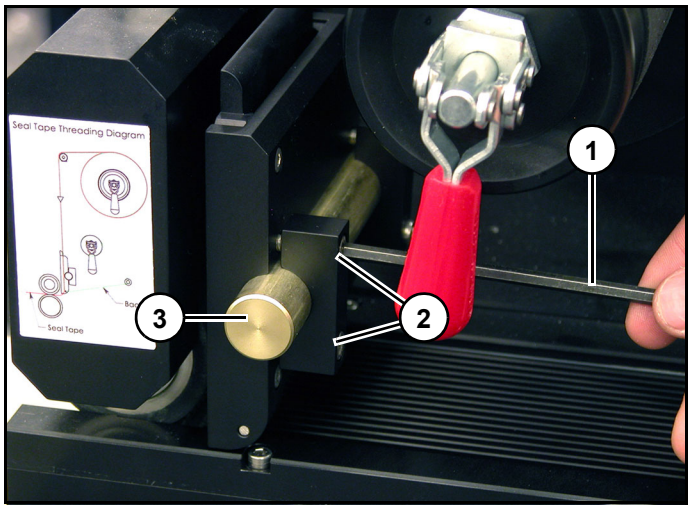

Figure 19

1. Using an M4 hex wrench (1), loosen four bolts (2) to loosen two clamps on seal guide (3). *(Figure 19)*
2. Ensure seal guide is flush with belt cover and that seal guide is straight up and down.
3. Tighten four clamp bolts to secure.

Adjusting nip roller pressure

Tools needed:

- Crescent wrench.
- 19 mm wrench.

If nip roller pressure is too high, tape will jam. If nip roller pressure is too low, tape will not seal properly and seal will either pull off easily or will contain air bubbles. Properly applied seal tape should peel off with moderate force.

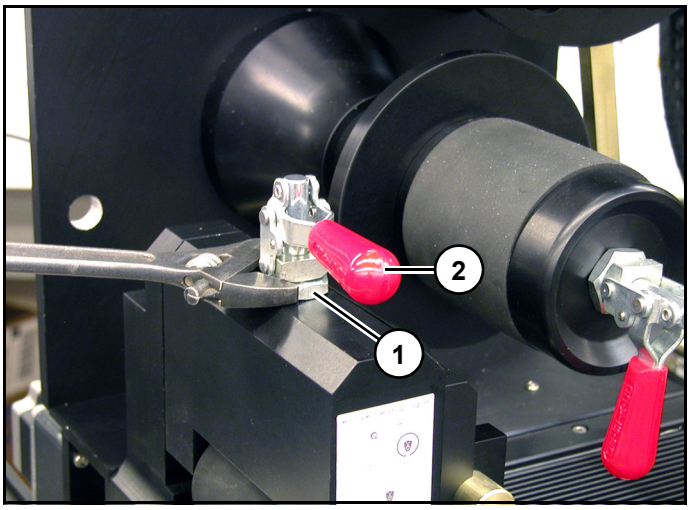

Figure 20

Refer to *(Figure 20)*.

1. Place a crescent wrench on jam nut (1) below nip roller clamp handle (2) and loosen.
2. Lift nip roller clamp handle (2) and turn clockwise to increase pressure or counter-clockwise to decrease pressure.
3. Push nip roller clamp handle (2) down towards front of machine.

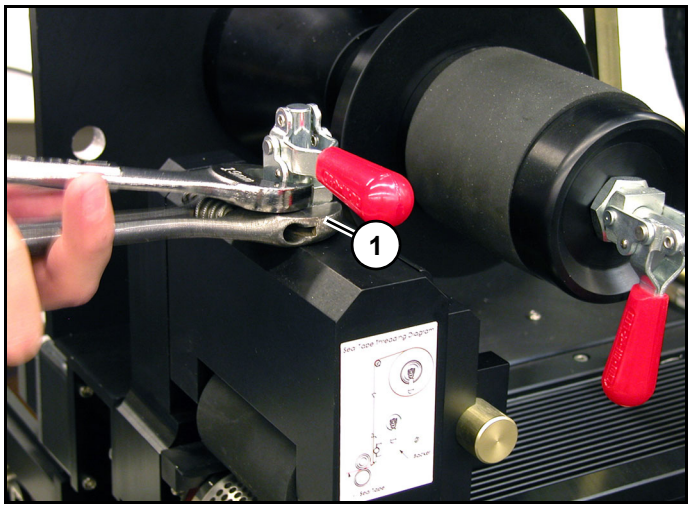

Figure 21

4. Using a 19 mm wrench and crescent wrench, tighten jam nut (1) *(Figure 21)*.

Faults

Notice
Before resetting a fault, be sure condition is corrected.

For fault list See “Sealer_TS1402 troubleshooting” on page 269.

For fault descriptions See “Sealer_TS1402 troubleshooting” on page 269.

How to recover from a fault

To reset a fault: user can use one of two methods:

- Press "Reset" button.

OR

- Pull and release joystick at STOP/RESET position.

After resetting, wait a few seconds to see if fault condition clears from navigation panel. If it clears, instrument is ready for use.

How to recover from Array Tape jam

1. Remove jam by clearing path of Array Tape.
2. Reset instrument to clear Array Tape jam fault.
3. Press "Sync".
4. Enable instrument.
5. Resume operations.

Note: While in Recipe mode, process will resume where it was interrupted.

Sealer_TS1402 troubleshooting

Notice
Before attempting any fault solution, refer to Handling Faults section. Colours Red: Safety fault. Yellow: Uncontrolled fault other than safety. Blinking Blue: Faulted (controlled). Blue: Recovering. Green: Running. Black: Initialising.

Manager fault messages

Pause faults	Cause	Solution
SealOut:	Seal out sensor has been triggered. Current Array Tape count.	Load new seal spool onto Sealer.
StartSeal:	Put nip roller down to seal Array Tape.	Put sealer down to start sealing tape.
SealEndFault:	Cut seal tape.	Protocol is almost finished, lift up nip roller and cut seal tape.
SealerUp:	Nip Roller is still up.	Verify file exists and that it is not corrupted.
SealerDown:	Put nip roller down to seal Array Tape.	Put sealer down to start sealing tape.
TempProbeFault:	Temperature probe may be faulty.	Check leads coming from temperature probe to ensure they are connected properly. If temperature is over 200 °C check probe.
TemperatureFault:	Temperature set point has not been reached.	Ensure that preheat is done prior to running protocol. Ensure there is power up to heating element.
CheckSettingsFile:	Settings file may be missing or incorrect.	Verify file exists and that it is not corrupted.
CheckRecipeFile:	Recipe file is incorrect, please check file for incorrect structure.	Verify file exists and that it is not corrupted.

Module fault messages

Abort faults	Cause	Solution
BACKERREWINDDRIVE:	Possible issue with backer rewind drive system.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.

Abort faults	Cause	Solution
XDRIVE:	Possible problem with Array Tape drive system.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.
_BK1120_COUPLER_STATE:	Error on BK1120 Beckhoff card.	Run diagnostics and look for CRC errors and for cards not in OP mode, check card for power, try and reseat card.
_BK1120_STATE:	State change on BK1120 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_BK1120_WCSTATE:	Working counter error on BK1120 Beckhoff card.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_EK1100_STATE:	State change on EK1100 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_230_EL7041_WCSTATE:	State change on EL7041 Beckhoff card at terminal 23.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_230_EL7041_STATE:	Working counter error on EL7041 Beckhoff card at terminal 23.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_310_EL7041_WCSTATE:	State change on EL7041 Beckhoff card at terminal 31.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_310_EL7041_STATE:	Working counter error on EL7041 Beckhoff card at terminal 31.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_330_EL2004_STATE:	State change on EL2004 Beckhoff card at terminal 33.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_330_EL2004_WCSTATE:	Working counter error on EL2004 Beckhoff card at terminal 33.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

Pause faults	Cause	Solution
NIP_ROLLER_RAISED:	Nip Roller is currently up.	Open guard door and manually engage tape sealer and continue run. Turn off in faults if not wanted. Reset and enable past tape.
DriveProx:	Drive Proximity has unexpectedly been triggered.	Check for tape jam. Verify proximity.
XJAM:	Something has caused tape drive to become out of sync.	Check tape path for obstructions and clear as necessary. Homing proximity may be bad, ensure it has power and is reading drive holes.

Tape Sealer Attachment_TS1706

⚠WARNING

Read and understand equipment operators manual before operating or performing maintenance. Failure to do so could result in serious injury or death.

Component Identification

Tape Sealer_TS1706 Assembly/Threading Diagram

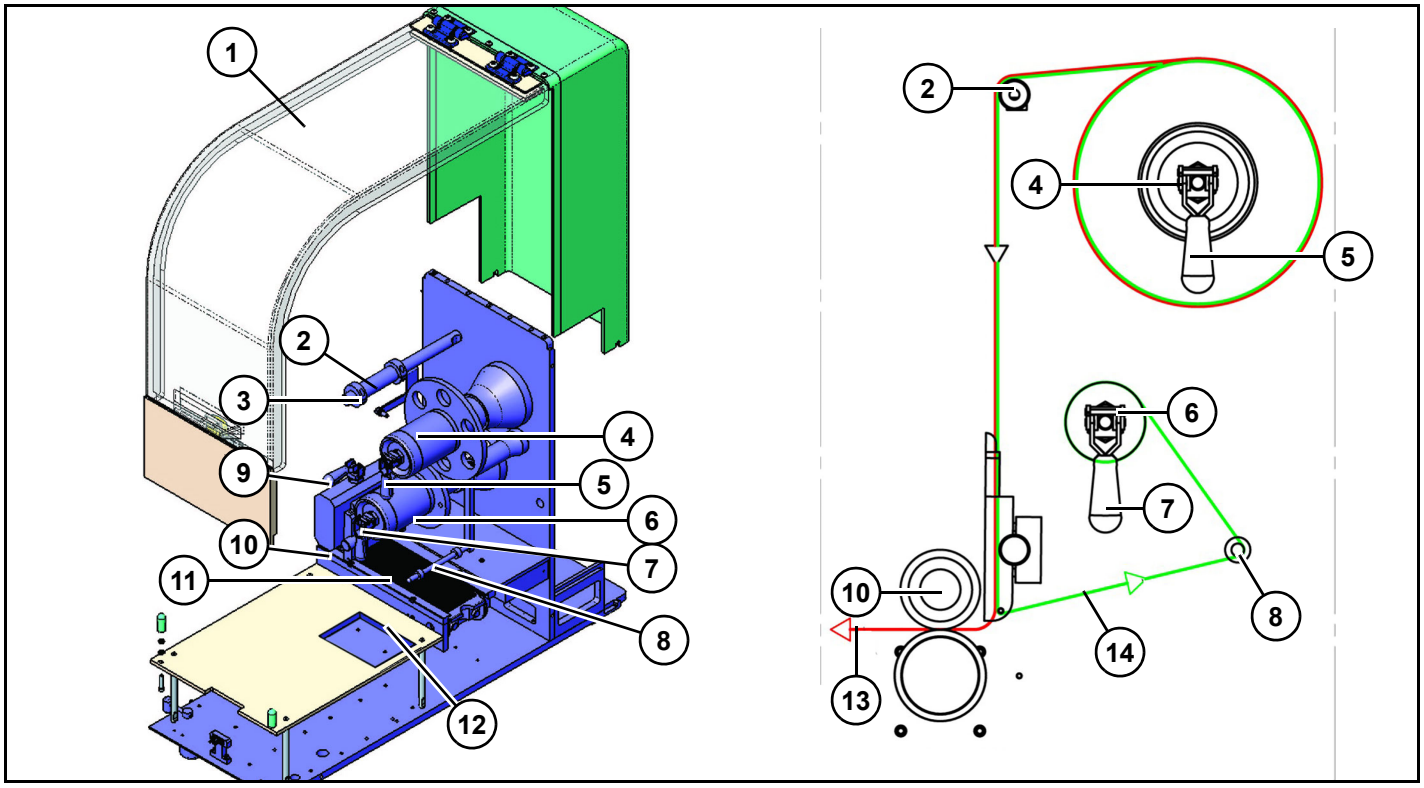

Figure 1

REF#	DESCRIPTION	REF#	DESCRIPTION
1	Guard Assembly	8	Dancer Bar
2	Seal Tape Guide Spindle	9	Nip Roller Handle
3	Seal Tape Guide Collars	10	Nip Roller
4	Tape Spindle	11	Seal Tape Drive Assembly
5	Tape Spindle Handle	12	Plate Dump
6	Tape Backing Spindle	13	Seal Tape
7	Tape Backing Spindle Handle	14	Seal Tape Backer

Loading Seal Tape

Notice

Load seal tape before loading Array Tape to avoid tapes sticking together.

Required Tools

- Scissors
- Adhesive Tape

Seal Tape Threading Diagram

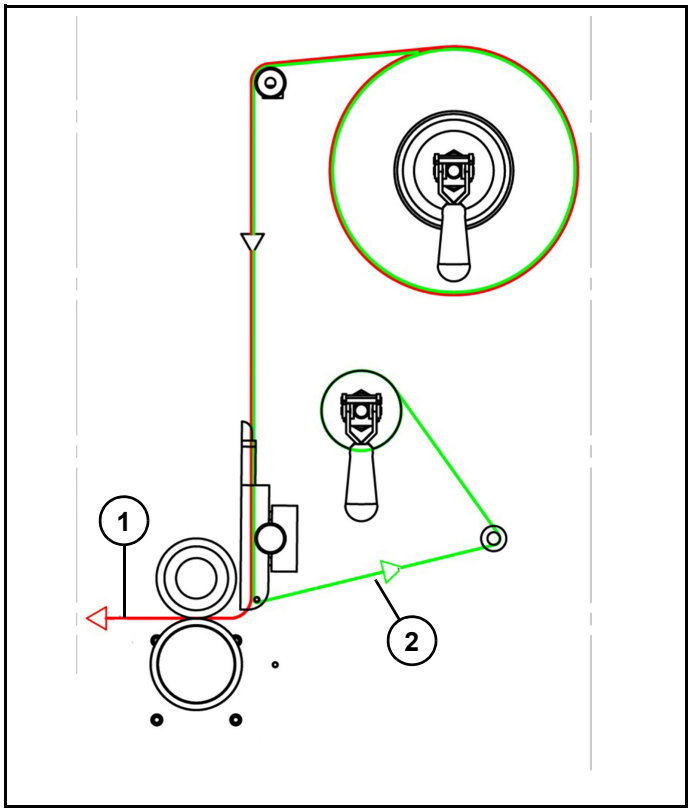

Figure 2

Seal Tape (1) *(Figure 2)*

Backer (2) *(Figure 2)*.

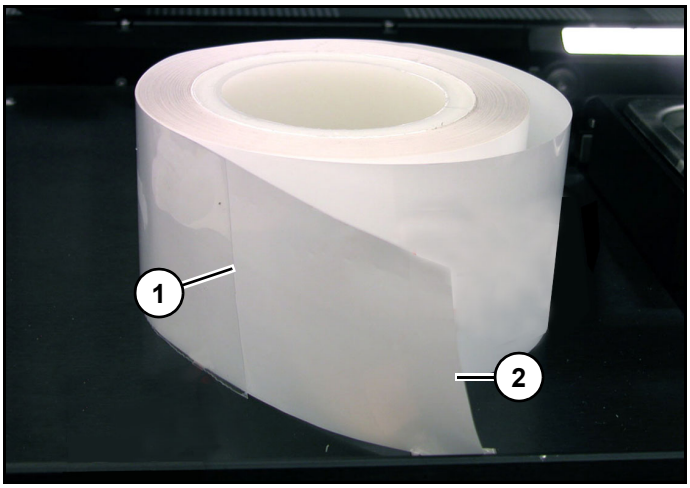

Figure 3

1. Using scissors, cut clear side 3-4 inches of clear tape (1) shorter than backing tape (2). *(Figure 3)*

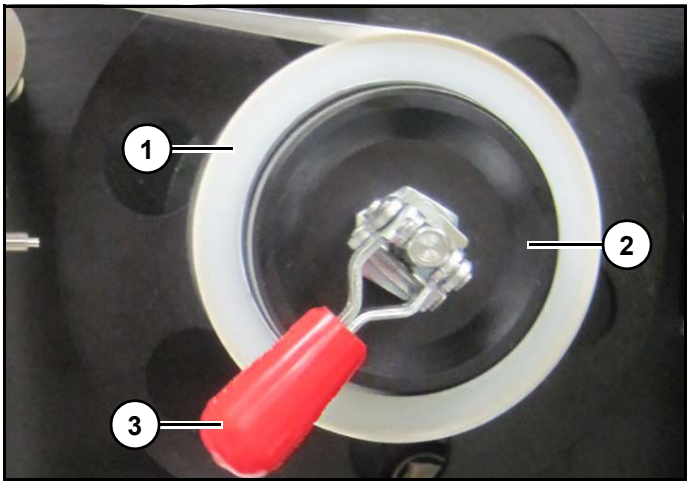

Figure 4

2. Load tape spool (1) on tape spindle (2). *(Figure 4)*
3. Push handle (3) *(Figure 4)* down to clamp spool to spindle.

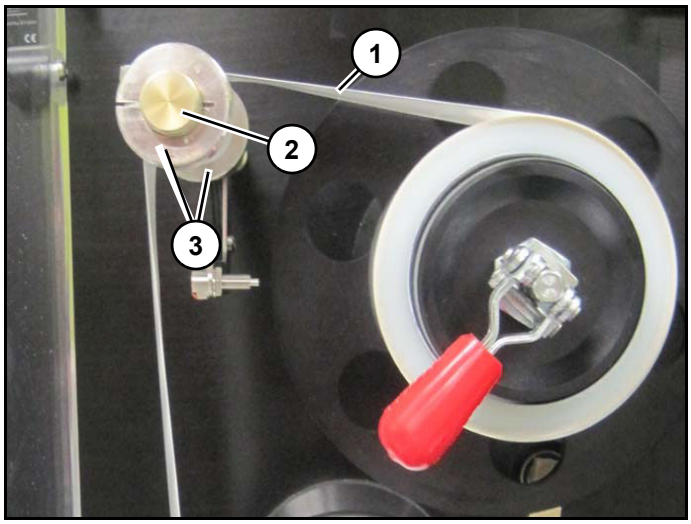

Figure 5

4. Thread tape (1) over seal tape guide spindle (2). Ensure tape is between collars (3). *(Figure 5)*

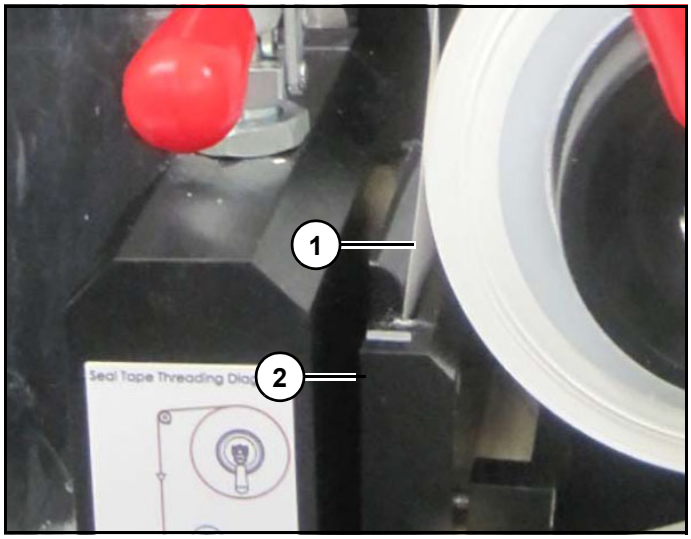

Figure 6

5. Thread tape (1) into tape seal guide (2). *(Figure 6)*

Note: Ensure tape is fit into grooves of tape seal guide.

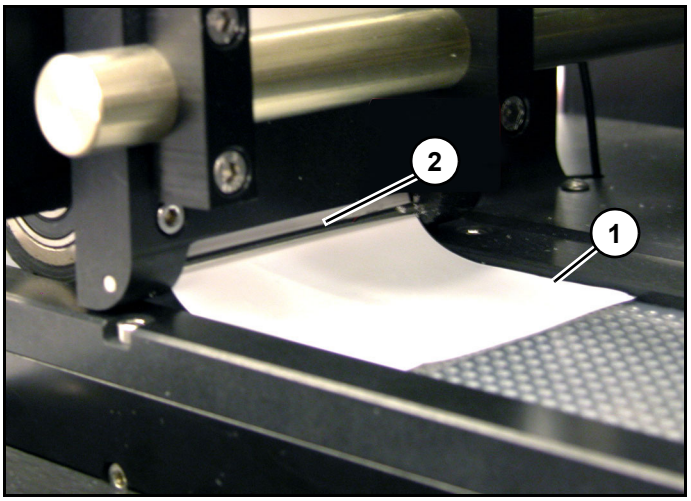

Figure 7

6. Pull tape (1) through seal guide. Ensure tape is positioned on left side of silver rod (2). *(Figure 7)*

7. Pull approximately 12" (30 cm) of tape throug seal guide and separate seal tape from backing tape.

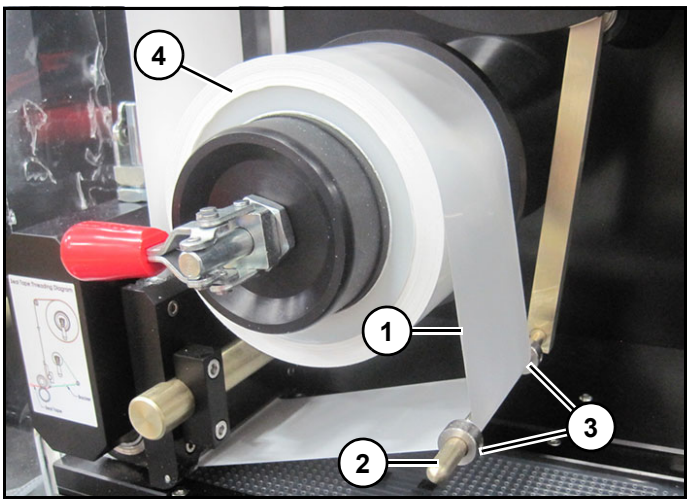

Figure 8

8. Position white backing tape (1) around dancer bar (2) between collars (3). *(Figure 8)*

9. Attach backing tape (1) to backer rewind reel (4) with adhesive tape. *(Figure 8)*

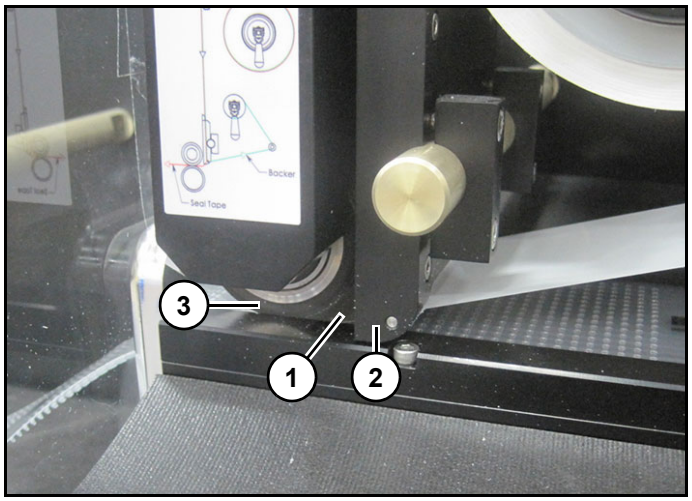

Figure 9

10. Feed clear seal tape (1) under seal tape guide (2) and nip roller (3). *(Figure 9)*

11. Feed seal tape out tape sealer module . Pull additional seal tape through module until seal tape and backer tape separate automatically below tape seal guide.

Notice

Do not clamp nip roller down unless Array Tape is positioned under nip roller. Clamping seal tape to Array Tape path without tape present will result in seal tape jam.

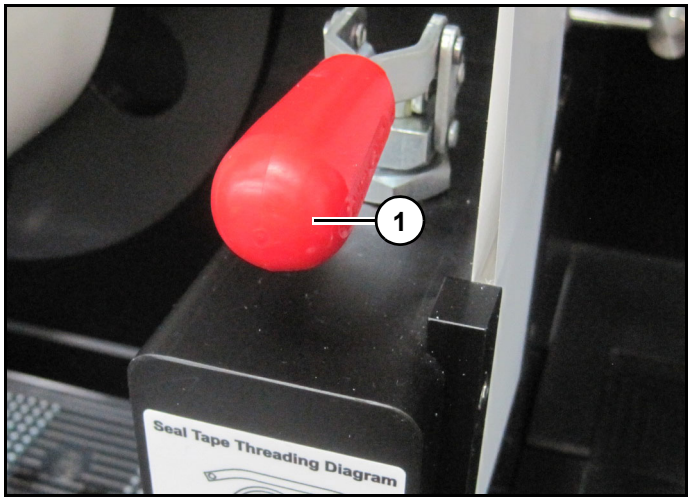

Figure 10

12. When seal tape is needed, push nip roller lever (1) *(Figure 10)* to clamped position.

Creating new Tape Sealer setting

Users with administrator privileges can create new Dispense Pipette settings file.

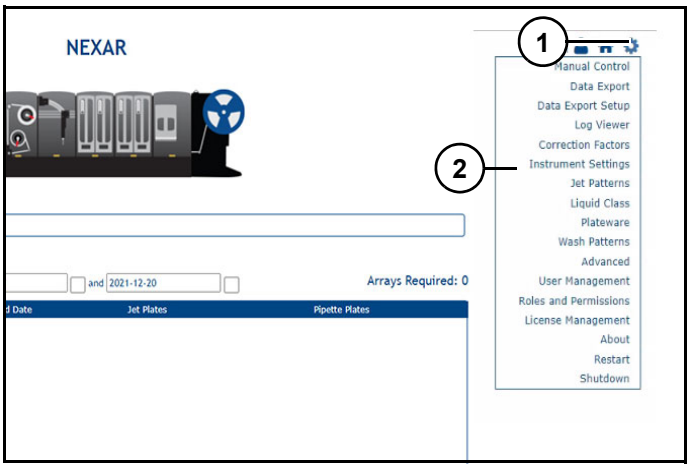

Figure 11

Refer to *(Figure 11)*.

1. Click "Settings" icon (1).

2. Click "Instrument Settings" (2).

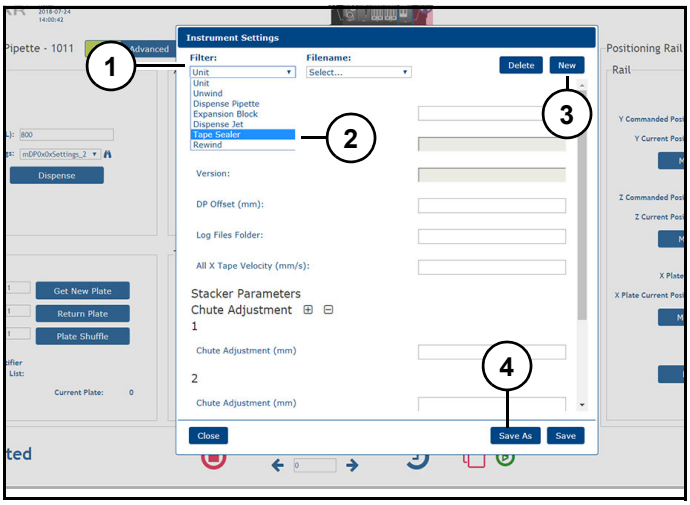

Figure 12

Refer to *(Figure 12)*.

3. Click "Filter" drop-down (1).

4. Select " Sealer" (2).

5. Click "New" (3).

6. Enter desired settings on setting screen.

7. Click "Save As" (4).

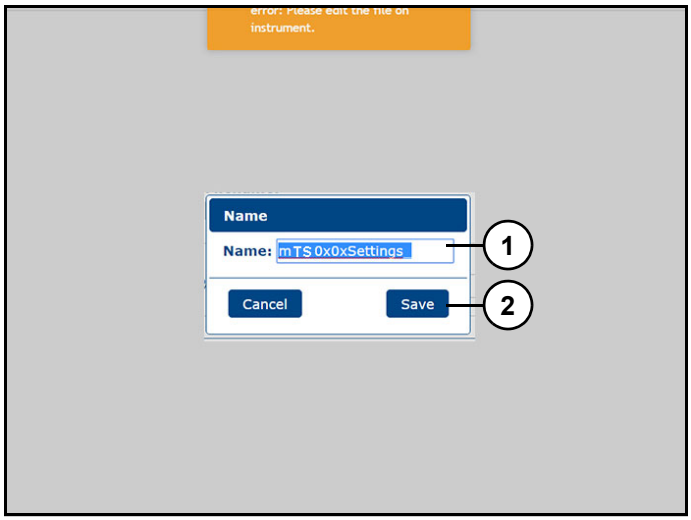

Figure 13

Refer to *(Figure 13)*.

8. Enter "Name" (1) of new setting.
9. Click "Save" (2).

Note: Click "Cancel" to exit without saving new file.

Adjusting Tape Sealer settings

Users with administrator privileges can change parameters using Settings file.

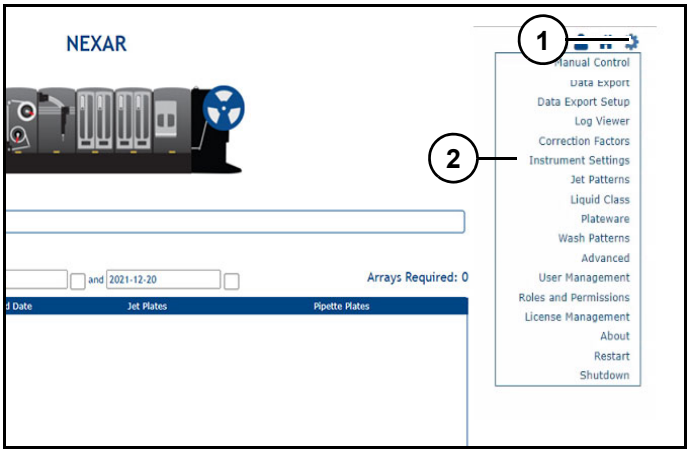

Figure 14

Refer to *(Figure 14)*.

1. Click "Settings" icon (1).
2. Click "Instrument Settings" (2).

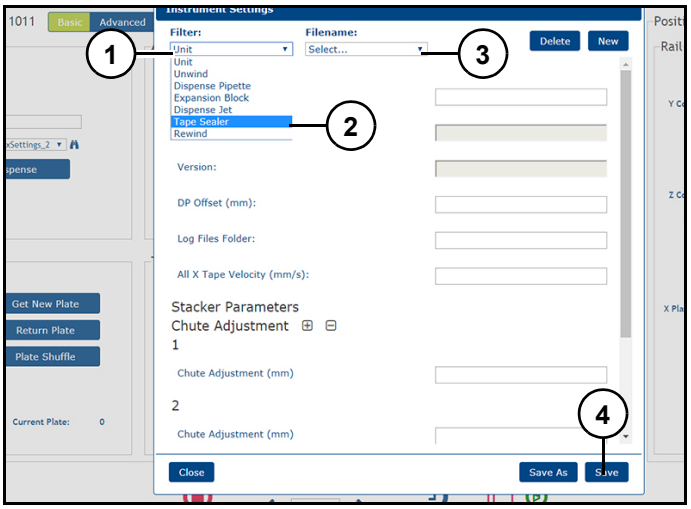

Figure 15

Refer to *(Figure 15)*.

3. Click "Filter" drop-down (1).
4. Select " Sealer" (2).
5. Select "Filename" drop-down (3) and select file to edit.
6. Adjust desired settings on setting screen.
7. Click "Save" (4) to save changes.

Deleting Tape Sealer settings

Users with administrator privileges can change parameters using Settings file.

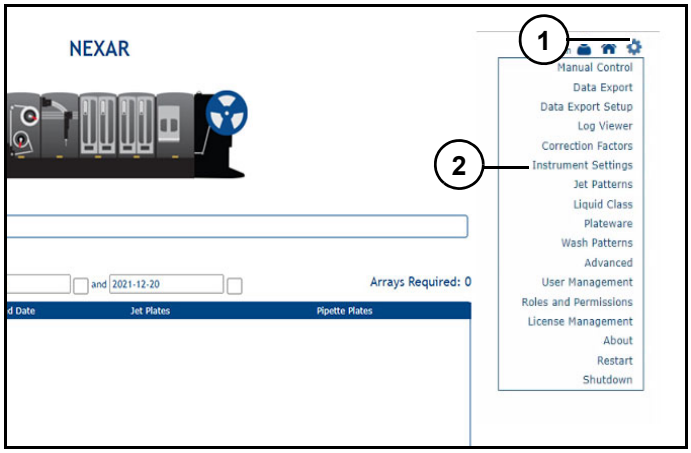

Figure 16

Refer to *(Figure 16)*.

1. Click "Settings" icon (1).
2. Click "Instrument Settings" (2).

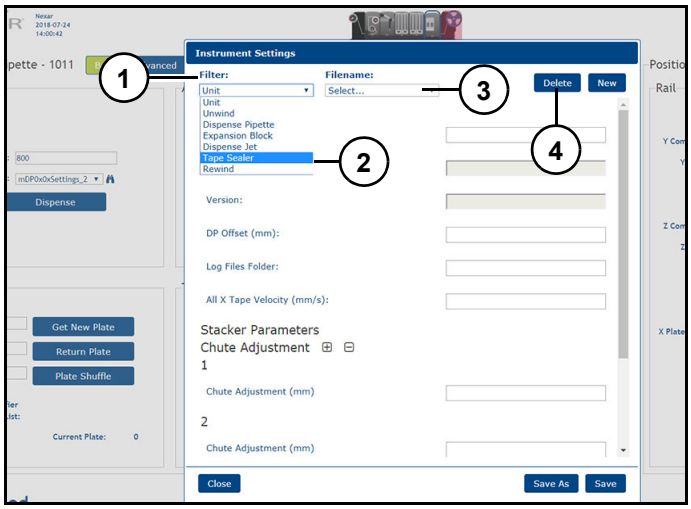

Figure 17

Refer to *(Figure 17)*.

3. Click "Filter" drop-down (1).
4. Select " Sealer" (2).
5. Select "Filename" drop-down (3) and select file to delete.
6. Click "Delete" (4).
7. Click "Yes" (NS) to delete settings file.

Setting descriptions

Dead Arrays Sealed Prior: Define number of blank arrays sealed prior to first Array Tapein the recipe playlist (min = 0, max = 2).

Thermo Electric Operation: Define control of path chiller.

Temperature Setpoint: Define temperature set point of chiller.

Temperature Error Limit Faults: Define allowable temperature error of chiller.

Seal Tape Fault Priority:

Priority 1 - Pause Recipe and write fault to log file

Priority 2 - Do not stop Recipe but write fault to log file.

Priority 0 - Ignore fault and do not publish to log file or stop recipe.

Seal Tape Start Fault Priority: Triggered when first Array Tapein a playlist reaches sealer and the nip roller is up.

Seal Tape End Fault Priority: Triggered when last Array Tapein a playlist reaches sealer and nip roller is down.

Tape Sealer Up Fault Priority: Triggered when nip roller remains up when it has been commanded to go down.

Temperature Fault Priority: Triggered when temperature of chiller is more than Error limit away from set point and a recipe is active.

Maintenance

Adjusting sealing guide

Notice
Only adjust sealing guide if seal misapplication is consistent. Wrinkling is common in first two arrays after loading.

Tools Needed.

- M4 hex wrench.

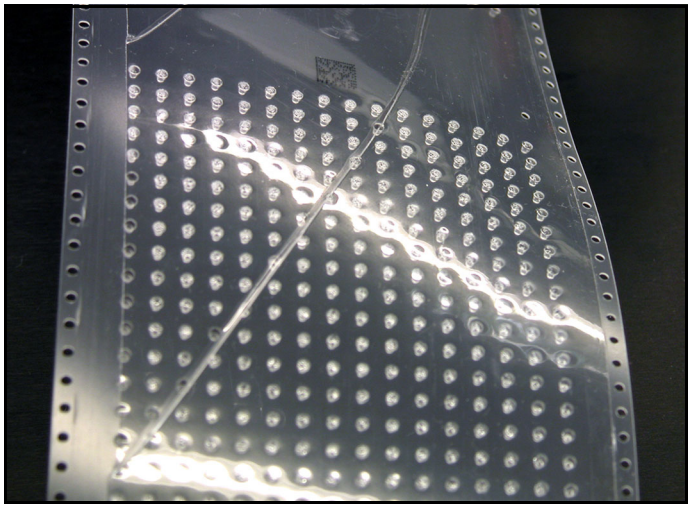

Figure 18

Seal tape wrinkled and not covering all wells *(Figure 18)*.

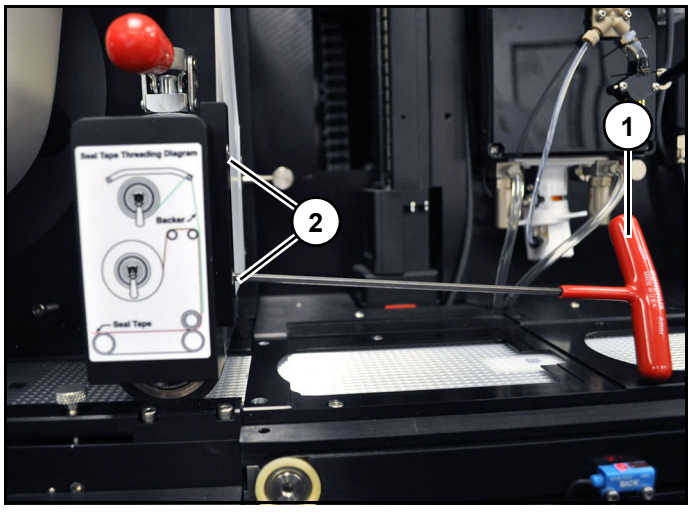

Figure 19

1. Using an M4 hex wrench (1), loosen four bolts (2) to loosen two clamps on seal guide. *(Figure 19)*
2. Ensure seal guide is flush with belt cover and that seal guide is straight up and down.
3. Tighten four clamp bolts to secure.

Adjusting nip roller pressure

Tools Needed:

- Crescent wrench.
- 19 mm wrench.

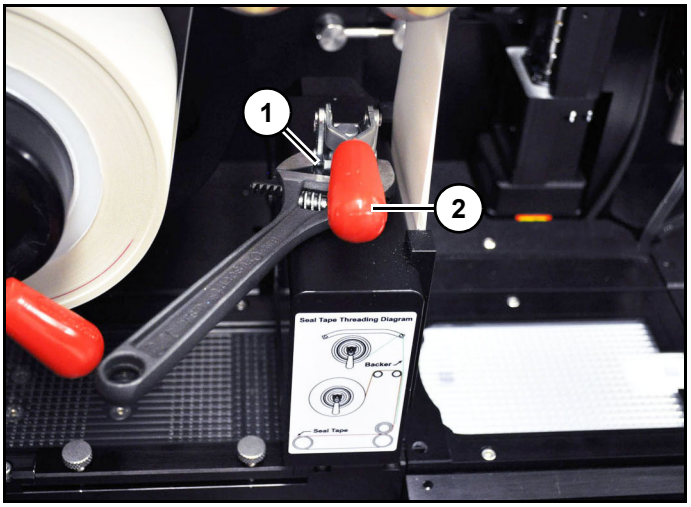

Figure 20

Refer to *(Figure 20)*.

If nip roller pressure is too high, seal tape will jam. If nip roller pressure is too low, seal tape will not seal properly and will either pull off easily or will have air bubbles.

1. Place a crescent wrench on jam nut (1) below nip roller clamp handle (2) and loosen.
2. Lift nip roller clamp handle (2) and turn clockwise to increase pressure or counter-clockwise to decrease pressure.
3. Push nip roller clamp handle (2) down towards front of machine.
4. Using a 19 mm wrench and crescent wrench, tighten jam nut.

Faults

Notice
Before resetting a fault, be sure condition is corrected.

For fault list See “Sealer_TS1706 troubleshooting” on page 279.

For fault descriptions See “Sealer_TS1706 troubleshooting” on page 279.

How to recover from a fault

To reset a fault: user can use one of two methods:

- Press "Reset" button on Unwind Manager Auto screen.

OR

- Pull and release joystick at STOP/RESET position.

After resetting, wait a few seconds to see if fault condition clears from navigation panel. If it clears, instrument is ready for use.

How to recover from Array Tape jam

1. Remove jam by clearing path of Array Tape.
2. Reset instrument to clear Array Tape jam fault.
3. Press "Sync Array Tape".
4. Enable instrument.
5. Resume operations.

Note: While in Recipe mode, process will resume where it was interrupted.

Sealer_TS1706 troubleshooting

Notice
Before attempting any fault solution, refer to Handling Faults section. Colours Red: Safety fault. Yellow: Uncontrolled fault other than safety. Blinking blue: Faulted (controlled). Blue: Recovering. Green: Running. Black: Initialising.

Manager fault messages

Pause faults	Cause	Solution
SealOut:	Seal out sensor has been triggered. Current Array Tape count.	Load new seal spool onto Sealer.
StartSeal:	Put nip roller down to seal Array Tape.	Put tape sealer down to start sealing Array Tape.
SealEndFault:	Cut seal tape.	Protocol is almost finished, lift up nip roller and cut seal.
SealerUp:	Nip Roller is still up.	Verify file exists and that it is not corrupted.
SealerDown:	Put nip roller down to seal Array Tape.	Put tape sealer down to start sealing Array Tape.
TempProbeFault:	Temperature probe may be faulty.	Check leads coming from temperature probe to ensure they are connected properly. If temperature is over 200 °C check probe.
TemperatureFault:	Temperature set point has not been reached.	Ensure that preheat is done prior to running protocol. Ensure there is power up to heating element.
CheckSettingsFile:	Settings file may be missing or incorrect.	Verify file exists and that it is not corrupted.
CheckRecipeFile:	Recipe file is incorrect, please check file for incorrect structure.	Verify file exists and that it is not corrupted.

Module fault messages

Abort faults	Cause	Solution
BACKERREWINDDRIVE:	Possible issue with backer rewind drive system.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.

Abort faults	Cause	Solution
XDRIVE:	Possible problem with Array Tape drive system.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.
_BK1120_COUPLER_STATE:	Error on BK1120 Beckhoff card.	Run diagnostics and look for CRC errors and for cards not in OP mode, check card for power, try and reseat card.
_BK1120_STATE:	State change on BK1120 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_BK1120_WCSTATE:	Working counter error on BK1120 Beckhoff card.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_EK1100_STATE:	State change on EK1100 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_230_EL7041_WCSTATE:	State change on EL7041 Beckhoff card at terminal 23.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_230_EL7041_STATE:	Working counter error on EL7041 Beckhoff card at terminal 23.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_310_EL7041_WCSTATE:	State change on EL7041 Beckhoff card at terminal 31.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_310_EL7041_STATE:	Working counter error on EL7041 Beckhoff card at terminal 31.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_330_EL2004_STATE:	State change on EL2004 Beckhoff card at terminal 33.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_330_EL2004_WCSTATE:	Working counter error on EL2004 Beckhoff card at terminal 33.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

Pause faults	Cause	Solution
NIP_ROLLER_RAISED:	Nip Roller is currently up.	Open guard door and manually engage tape sealer and continue run. Turn off in faults if not wanted. Reset and enable past
DriveProx:	Drive Proximity has unexpectedly been triggered.	Check for tape jam. Verify proximity.
XJAM:	Something has caused the drive to become out of sync.	Check tape path for obstructions and clear as necessary. Homing proximity may be bad, ensure it has power and is reading drive holes.

Optical Reader_OR0904

⚠WARNING

Read and understand equipment operators manual before operating or performing maintenance. Failure to do so could result in serious injury or death.

Component identification

Optical Reader_OR0904

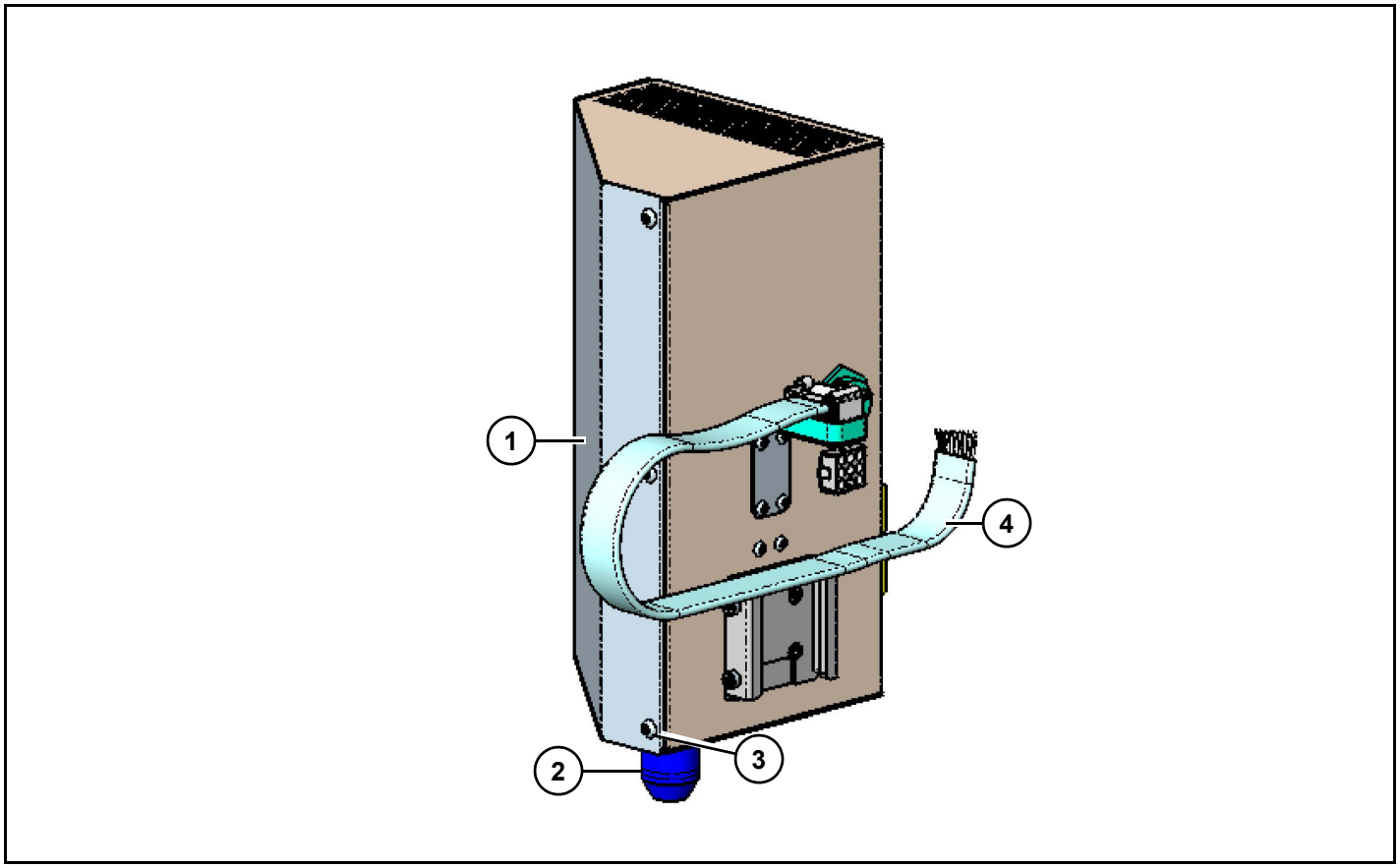

Figure 1

REF#	DESCRIPTION	REF#	DESCRIPTION
1	Reader Head	3	Z Lock Screw
2	Objective Lens	4	Network Cables

Optical Reader

Notice

Controls on auto screen can only be activated when instrument is in an idle state.

If a change is made to Manager Settings file (See Manager Settings section) it only takes effect after a pause and idle action is performed (See Getting Started section).

Optical Reader attachment screen - basic

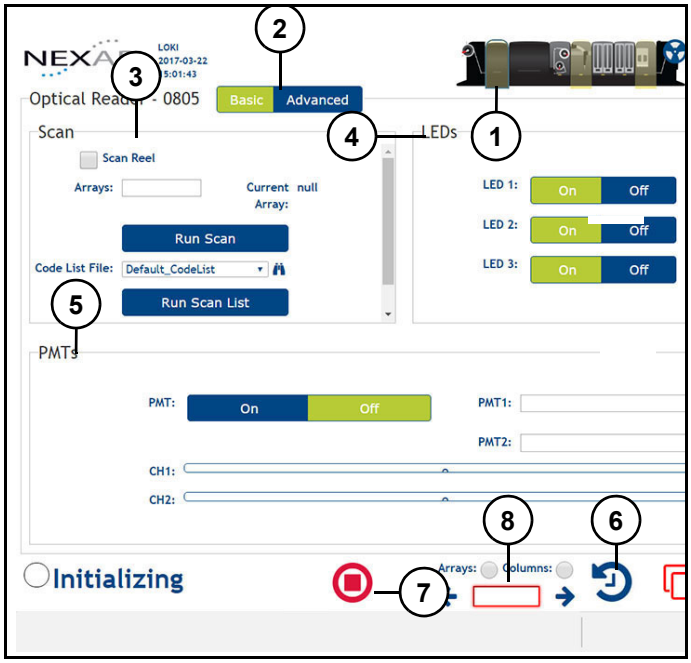

Figure 2

Refer to *(Figure 2)*.

Overview of controls

Optical Reader attachment (1): Displays module status.

- Default status indicator.
- Highlighted status indicator.
- Faulted status indicator.
- Faulted highlighted status indicator.
- Highlighted blue: Module is active.
- Highlighted red: Module is faulted.

Basic/Advanced (2): Switches between basic and advanced operations pages.

Scan (3): Displays scan settings.

LEDs (4): Displays LED settings.

PMTs (5): Displays PMT settings.

Reset (6): Resets all faults for instrument. If instrument is running an operation or ready to run, a pause is commanded.

Reset indicator states:

Solid green

- Running, scanning.

Blinking green

- Idle (paused or not synced).

Solid blue

- Resetting, recovering, waiting.

Blinking blue

- Faulted (controlled).

Amber

- Faulted (uncontrolled).

Red

- Faulted (safety).

Black

- Initialising.

Abort (7): Aborts all running actions.

Arrays/Columns (8): Displays Arrays, Columns, and number of arrays in protocol.

Scan.

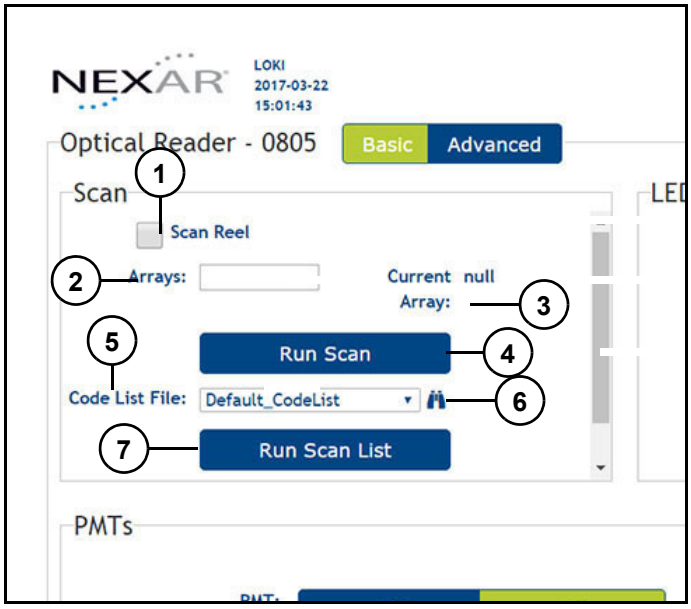

Figure 3

Refer to *(Figure 3)*.

Scan Reel Checkbox (1): Scans entire Array Tape reel when checked.

When checked, instrument will scan until last Array Tape passes sensor. When unchecked, instrument will scan number of arrays specified in "Arrays" (2).

Arrays (2): Displays and adjusts number of arrays to scan.

Current Array Tape(3): Displays number of Array Tape currently being scanned.

Run Scan (4): Initiates scan operation. Array Tape is advanced to scan position. 2D code is read and optical reader attachment moves back and forth to scan fluorescence from wells. Array Tape advances column by column while reader scans. Process repeats on next array. After each array is scanned, a Reading file is generated. Refer to system Log Files to access these files.

Code List File (5): Displays and selects a predefined code list file.

Binocular icon (6): Displays settings for selected code list file.

Run Scan List (7): Runs scan list bases on Array Tape number on code list.

LEDs.

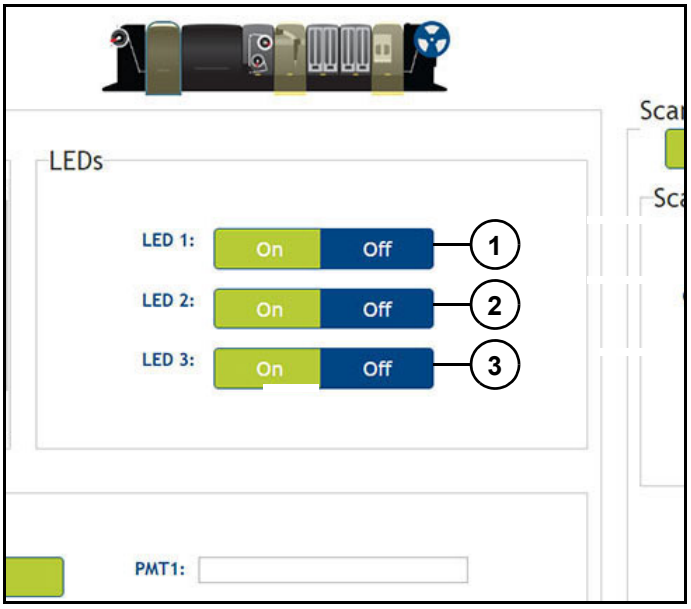

Figure 4

Refer to *(Figure 4)*.

Led 1 (1): Turns LED 1 on/off.

Led 2 (2): Turns LED 2 on/off.

Led 3 (3): Turns LED 3 on/off.

PMT.

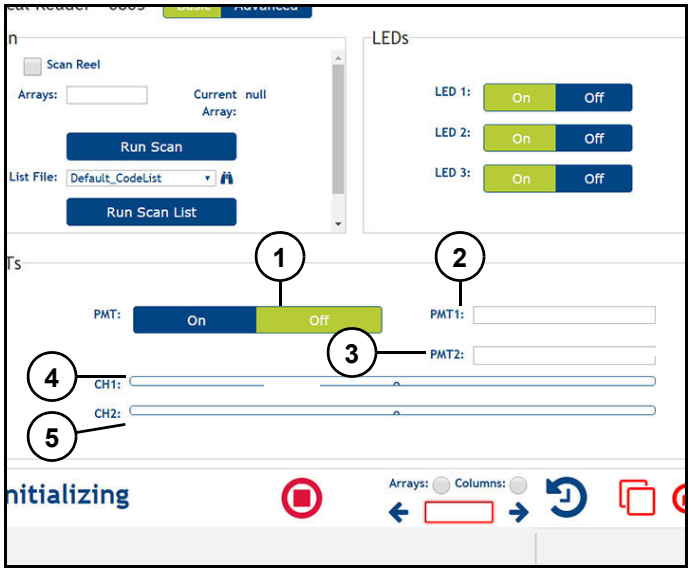

Figure 5

Refer to *(Figure 5)*.

PMT: (1): Turns PMT on/off.

PMT: 1 (2): Displays and sets gain values for PMT 1.

PMT: 2 (3): Displays and sets gain values for PMT 2.

CH1: (4): Graphically displays level of rough fluorescence units (RFUs) for PMT1.

CH2: (5): Graphically displays level of RFUs for PMT2.

Faults

Notice
Before resetting a fault, be sure condition is corrected.

For fault list See "Optical Reader_OR0904 troubleshooting" on page 291.

For fault descriptions See "Optical Reader_OR0904 troubleshooting" on page 291.

Recovering from a fault

See "General fault recovery procedure" on page 25.

Creating new Optical Reader setting

Users with administrator privileges can create new Accumulator settings file.

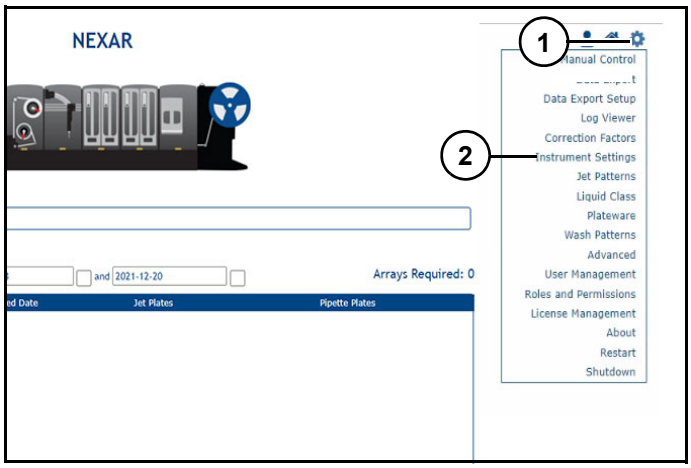

Figure 6

Refer to *(Figure 6)*.

1. Click "Settings" icon (1).
2. Click "Instrument Settings" (2).

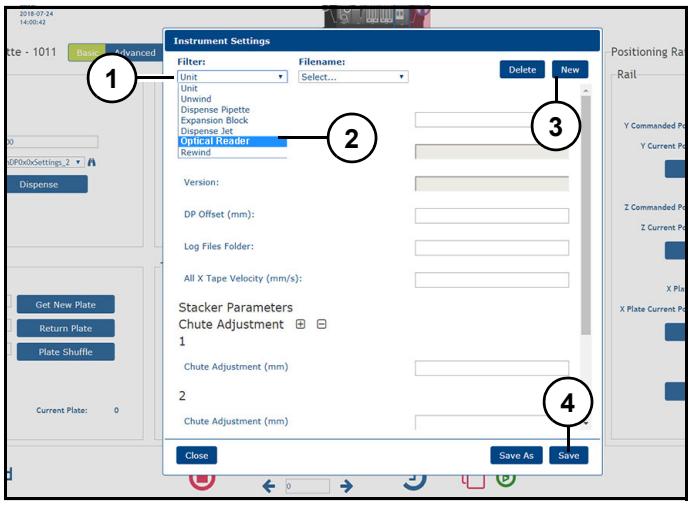

Figure 7

Refer to *(Figure 7)*.

3. Click "Filter" drop-down (1).
4. Select "Optical Reader" (2).
5. Click "New" (3).
6. Enter desired settings on setting screen.
7. Click "Save" (4) to save changes.

Note: Click "Close" to exit without saving new file.

Adjusting Tape Accumulator settings

Users with administrator privileges can change Dispense Jet parameters using Settings file.

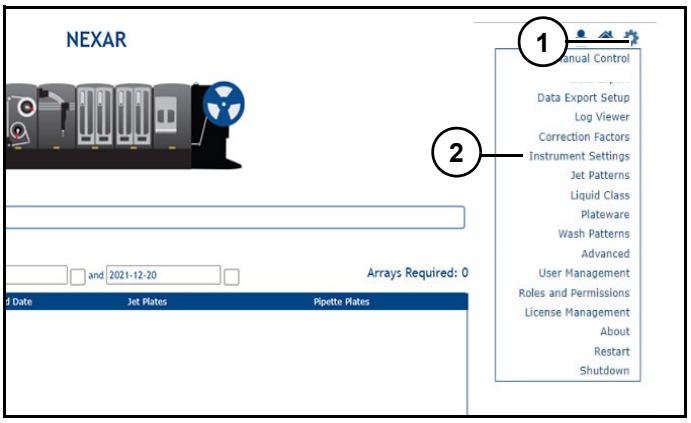

Figure 8

Refer to *(Figure 8)*.

1. Click "Settings" icon (1).
2. Click "Instrument Settings" (2).

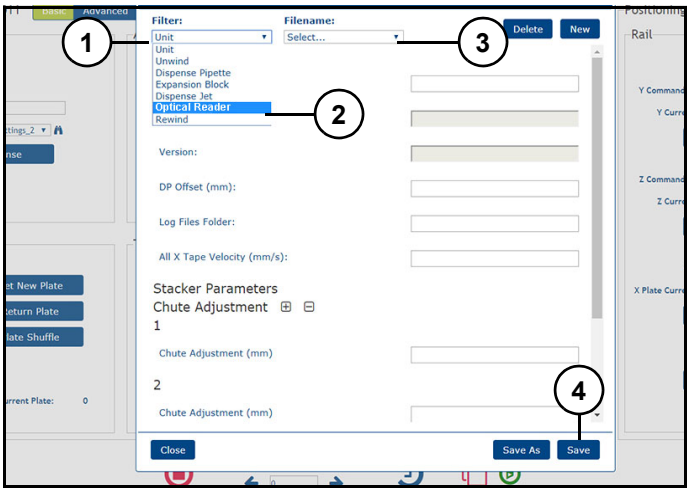

Figure 9

Refer to *(Figure 9)*.

3. Click "Filter" drop-down (1).
4. Select "Optical Reader" (2).
5. Select "Filename" drop-down (3) and select file to edit.
6. Adjust desired settings on setting screen.
7. Click "Save" (4) to save changes.

Note: Click "Save As" to save setting as new file, click "Close" to exit without saving changes.

Setting descriptions

Output: Defines output file format tab separated (txt) or comma separated.

Log Files Folder: Override directory readings files will be sent to (for scanner Inline) with Nexar.

Y Barcode Position: Defines Y Rail Position for tape code on XY Scanner.

Y Calibration Disk Position: Defines Y Rail Position for Calibration Disk on XY Scanner.

Y Start: Defines Y Rail Position to start scan action from.

Y Distance: Defines Y Rail distance from start position to travel to during scan action.

Y Velocity: Defines Y Rail speed during scan action.

Y Acceleration: Defines Y Rail acceleration during scan action.

Y Torque Limit: Torque limit for Y rail Units: Measured Drive amperage in counts.

X Interval: Defines X Spacing between Array Tape columns.

X Velocity: Defines speed during tape moves between Array Tape columns.

X Acceleration: Defines tape motion acceleration during moves between Array Tape columns.

X Resolution: Defines spacing increment to take readings at while in between data start and data end.

X Displacement: Defines initial distance first move will be when starting a new scan operation.

X Barcode Position: Defines X location of tape code during scanning.

X Calibration Disk Position: Defines X location of Calibration Disk Code during scanning.

X Position to Start a Scan Operation: Defines X location of Scanning Rail to start a scan operation.

X Torque Limit: Torque limit for X rail Units: Measured Drive amperage in counts.

Sampling Rate: Defines number of task cycles to sample at while scanning in time mode.

Gain PMT1: Gain multiplier used for inputs read by PMT1.

Gain PMT2: Gain multiplier used for inputs read by PMT2.

Columns: Number of Columns in Array.

Label 1: Text Label to use for Channel 1 in Readings File.

Label 2: Text Label to use for Channel 2 in Readings File.

Label 3: Text Label to use for Channel 3 in Readings File.

Label 1 Column Min: Minimum Sum of scan result of Channel 1 that indicate it was a valid column and not blank tape.

Label 2 Column Min: Minimum Sum of scan result of Channel 2 that indicate it was a valid column and not blank tape.

Label 3 Column Min: Minimum Sum of scan result of Channel 3 that indicate it was a valid column and not blank tape.

Data Start Position: Defines starting position for data acquisition in Y direction.

Data End Position: Defines ending position for data acquisition in Y direction.

Extracted Values: Defines number of scan events to use in sum of scan data.

Data Orientation: Defines tape orientation so that data in logfile is saved in proper position.

F11: Defines scaling factors to adjust cross talk between channels in scan data.

F12: Defines scaling factors to adjust cross talk between channels in scan data.

F13: Defines scaling factors to adjust cross talk between channels in scan data.

F21: Defines scaling factors to adjust cross talk between channels in scan data.

F22: Defines scaling factors to adjust cross talk between channels in scan data.

F23: Define scaling factors to adjust cross talk between channels in scan data.

F31: Define scaling factors to adjust cross talk between channels in scan data.

F32: Define scaling factors to adjust cross talk between channels in scan data.

F33: Define scaling factors to adjust cross talk between channels in scan data.

Faults:

CodeCheckPrevious: Tape code out of sequence.

CodeRead: Tape code was unable to be captured.

Code3NoReads: Reader missed more than three barcodes in a row, check camera or barcodes.

YTorqueLimitFault: Reader missed more than three barcodes in a row, check camera or barcodes.

YTorqueLimitFault: y-axis at position reached torque value.

ColumnAlignmentFault: Signal for column with sum does not meet threshold.

CodeListHasDuplicates: Duplicate barcode(s) detected in code list.

CodeListFileEmpty: Code list file may be missing or incorrect.

CodesOutOfOrder: Tape barcodes are not in sequential order.

CodeIndexTooHigh: Distance between target arrays is equal to or greater than 250.

IncorrectSpool: Due to distance between arrays, Array Tape targeted is likely on a different spool.

CheckCodeListFile: Code list file may be missing or incorrect.

CheckRecipeFile: Recipe file is incorrect, please check file for incorrect structure.

CheckSettingsFile: Settings file may be missing or incorrect.

CheckUsageFile: Usage file is may be missing or incorrect.

FileOutputType: Readings file type is incorrect.

LogFolderFault: Path called is missing.

XNotSynced: Tape drive needs to be synchronised.

CheckThermalProtocolFile: Thermal Protocol file may be missing or incorrect.

DetectionCamera: Camera is unresponsive.

LogFileCopy: Failed to copy log file.

ReadingsFileCopy: Failed to copy readings file.

Optical Reader Manager _MGR_OR0805 settings

Optical Reader (_MGR_OR0904) manager controls Scanning Rail (_SR1207) module and Optical Reader (_OR0904) attachment. Main task is to set scan locations and dye parameters for operations to account for variations in scanner optics and position.

File name: mOR0805Settings_x.xml.

The parameter x represents manager position within unit. Full path of this file is:

C:\HTSI\HTSI_Modules|HTSI_Settings\mOR0805 Settings_x.xml.

Example: **mOR0805Settings_2.xml** is second manager in unit arrangement. Modules are arranged from right to left on instrument.

Element descriptions

<settings> - Root element.

<ORSerialNo>- Unique identifier for optical reader attachment associated with manager. This identifier is used in log files.

<OutPut> - Format of log file. For details of log files, see System Log Files section.

There are currently two formats supported:

- txt: log file generated is a text (*.txt) file.
- csv: log file generated is a comma-separated values (*.csv) file.

<YStart> - Position of y-axis at start of scan. Parameter is a legacy value left for backward compatibility. (Unit: millimeters) (Default: 18.4)

<YDistance> - Distance traveled by y-axis in one scanning stroke. (Unit: millimeters) (Default: 72.0)

<YVelocity> - Steady scanning velocity of y-axis.
(Unit: millimeters/second) (Default: 200.0)

<YAcceleration> - Acceleration and deceleration of y-axis while scanning.
(Unit: millimeters/second^2) (Default: 2000.0)

<TorqueLimit> - Torque limit for y-axis which, if exceeded, asserts _YOBSTRUCTION error on _SR1207 module. Range is 0-32767. A value of 0 disables torque limit detection.
(Default: 5000)

<XInterval> - Distance advanced by drive after each Y axis scanning stroke.
(Unit: millimeters) (Default: 4.5)

<XVelocity> -Speed of drive when it advances a distance in an X interval.
(Default: 70.0)

<XAcceleration> - Acceleration on drive while it advances given distance. (Units: millimetres/second^2) (Default: 10000.0)

<XResolution> - Resolution of scan data for each Array Tape column. One data point is generated for every X resolution mm for each label.
(Unit: millimetres) (Default: 0.1)

<XDisplacement> - Parameter allows adjustment of initial Array Tape move at start of a scan.
(Default: 99.0)

<SamplingRate> - A legacy parameter not in current use.

<YGainPMT1> - Gain value for first PMT (photo multiplier tube). Value changes gain of PMT in a logarithmic fashion; therefore, it should be increased or decreased in small increments (For example, 01).
(Minimum: 0, Maximum: 1)

<YGainPMT2> - Gain value for second PMT (photo multiplier tube).Value changes gain of PMT in a logarithmic fashion; therefore, it should be increased or decreased in small increments (For example,.01).
(Minimum: 0, Maximum: 1)

<Columns> - Number of columns to scan.

<Label1> - Name of labels as reported in log file. If this tag is left empty, data for this label is not reported.

<Label2> - Name of labels as reported in log file. If this tag is left empty, data for this label is not reported.

<Label13> - Name of labels as reported in log file. If this tag is left empty, data for this label is not reported.

<DataStartPosition> - Position of y-axis where data collection starts.
(Units: millimetres)

<DataEndPosition> - Position of y-axis where data collection stops. (Units: millimetres)

<ExtractedValues> - Number of data values collected per well of array. (Default: 26)

<DataOrientation> - Orientation of data reported in log file. There are two possible values: (Default: 0)

- **0:** Row and column data is reported in same orientation as array. Tape well A1 is assumed to be in top left corner.
- **180:** Row and column data is reported as 180 degrees from orientation of array. This is useful if is loaded in reverse orientation. Tape well A1 is assumed to be in bottom right corner.

<Deconvolution> - Structure describes inverse matrix used for calculating correction factors for label crosstalk.

<Fxy> - Inverse matrix entry. x describes row number of 3x3 inverse matrix, y describes column number of 3x3 inverse matrix.

<Faults> - Contents of the <Faults> element allows user to change priority level of certain faults. Using priority level "0" disables fault. A priority level "1" fault will cause unit to pause or abort, depending on a controlled or uncontrolled fault. A priority level "2" will not interrupt unit operation, but fault will record in error log. For details of individual fault messages, See "Optical Reader_OR0904 troubleshooting" on page 291.

Example Optical Reader Manager Settings File

mOR0802Settings_x.xml

```
<?xml version="1.0" encoding="UTF-8"?>
- <Settings>
    <ORSerialNo>1070905001</ORSerialNo>
     <Output>txt</Output>
    <YStart>18.4</YStart>
    <YDistance>72.0</YDistance>
    <YVelocity>200.0</YVelocity>
    <YAcceleration>2000.0</YAcceleration>
    <YTorqueLimit>5000</YTorqueLimit>
    <XInterval>4.5</XInterval>
    <XAcceleration>10000.0</XAcceleration>
    <XResolution>0.1</XResolution>
    <XDisplacement>99.0</XDisplacement>
    <SamplingRate>2.0</SamplingRate>
    <GainPMT1>0.5</GainPMT1>
    <GainPMT2>0.45</GainPMT2>
    <Columns>24</Columns>
    <Label1>FAM</Label1>
    <Label2>VIC</Label2>
    <Label2>ROX</Label3>
    <DataStartPosition>25.7</
DataStartPosition>
    <DataEndPosition>97.7</DataEndPosition>
    <ExtractedValues>26</ExtractedValues>
    <DataOrientation>0</DataOrientation>
   - <Deconvolution>
        <F11>1.0</F11>
        <F12>0.0</F12>
        <F13>0.0</F13>
        <F21>0.0</F21>
        <F22>1.0</F22>
        <F23>0.0</F23>
        <F31>0.0</F31>
        <F32>0.0</F32>
        <F33>1.0</F33>
    </Deconvolution>
    -<Faults>
    </Faults>
 </Settings>
```

Maintenance

Tools needed:

- M5 hex wrench.
- Can of pure compressed air.
- 10 mm box wrench.

Tightening top screw

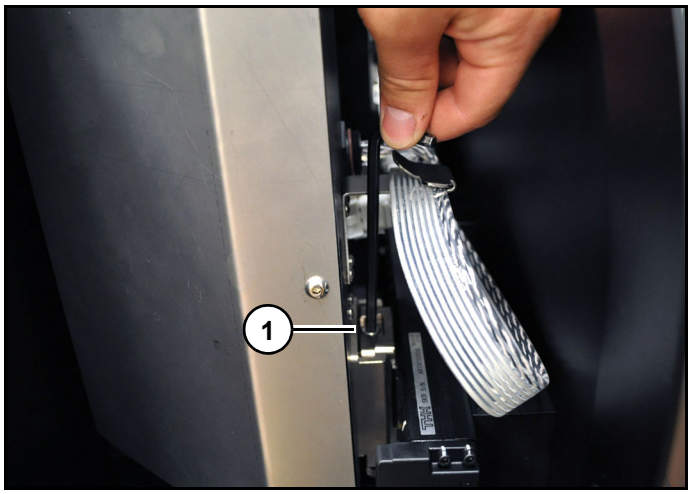

Figure 10

Ensure top screw (1) *(Figure 10)* on optical reader is tight by using an M5 hex wrench.

Tightening jam nut

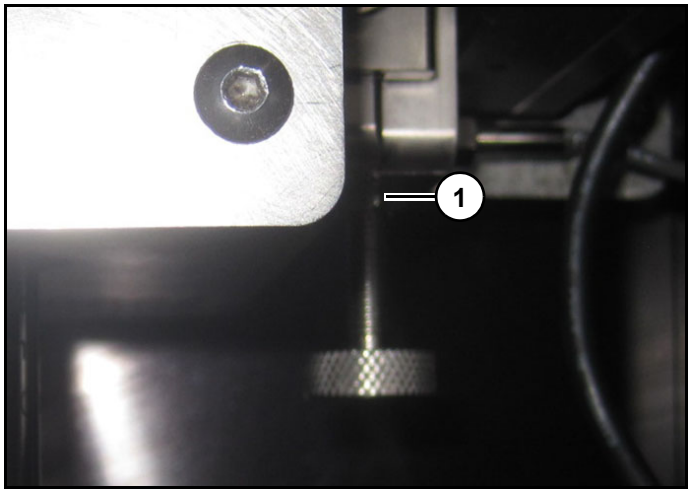

Figure 11

Ensure jam nut (1) *(Figure 11)* is tight, using a 10 mm box wrench.

Tightening objective lens

⚠CAUTION

Touching objective lens will result in instrument damage.

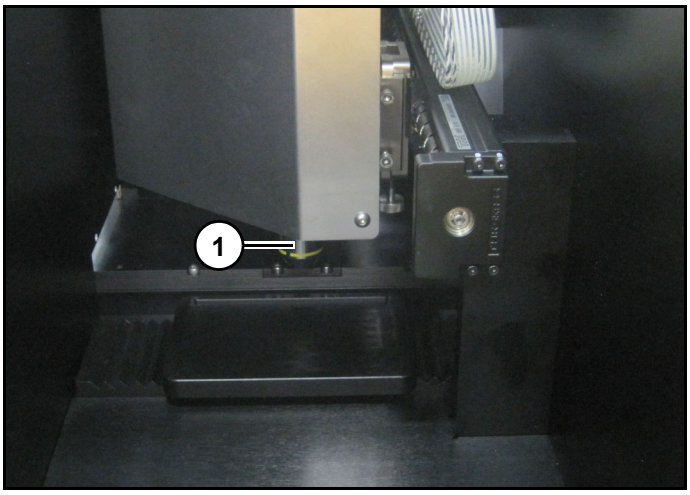

Figure 12

1. Ensure objective (1) *(Figure 12)* is tight by hand tightening.
2. Blow off entire optical reader using a can of pure compressed air.

Note: Be sure no coolant is sprayed at Optical Reader by first spraying a few blows away from module. Never turning can upside down while spraying towards instrument.

Optical Reader_OR0904 troubleshooting

Notice
Before attempting any fault solution, refer to Handling Faults section. Fault Colours Red: Safety fault. Yellow: Uncontrolled fault other than safety. Blue: Controlled fault. Green: Nexar enabled.

Manager faults

Settable priority faults	Cause	Solution
CodeCheckPrevious:	Tape code out of sequence.	Verify that Array Tape wasn't advanced manually during protocol, adjust forward or backwards 1 Array Tape and try to resume.
CodeRead:	Tape code was unable to be captured.	Camera read position may need to be optimised. Camera setting may need to be adjusted using "ESP" software. Ensure there is no glare on area of interest.
Code3NoReads:	Reader missed more than three barcodes in a row, check camera or barcodes.	Camera read position may need to be optimised. Camera setting may need to be adjusted using "ESP" software. Camera may need to be replaced.
YTorqueLimitFault:	y-axis at position {0} reached torque value.	Check for obstructions in the "front to back" path way of head. Ensure rail is properly lubricated. May need to adjust torque settings.
ColumnAlignmentFault:	Signal for column with sum does not meet threshold.	Verify alignment.
CodeListHasDuplicates:	Duplicate barcode(s) detected in code list.	Remove duplicate barcode(s) from code list file.

Pause faults	Cause	Solution
CodeListFileEmpty:	Code list file may be missing or incorrect.	Verify file exists and that it is not corrupted.
CodesOutOfOrder:	Barcodes are not in sequential order.	Check code list file to ensure barcodes are ascending or descending depending on direction Array Tape is fed in.
CodeIndexTooHigh:	Distance between target arrays is equal to or greater than 250.	Segment tape to smaller Array Tape counts.

Pause faults	Cause	Solution
IncorrectSpool:	Due to distance between arrays, Array Tape targeted is likely on a different spool.	Verify that you have the correct spool.
CheckCodeListFile:	Code list file may be missing or incorrect.	Check corresponding parent folder to see if file exists. Check specific file to ensure it isn't corrupt by opening it.
CheckRecipeFile:	Recipe file is incorrect, please check file for incorrect structure.	Verify file exists and that it is not corrupted.
CheckSettingsFile:	Settings file may be missing or incorrect.	Verify file exists and that it is not corrupted.
CheckUsageFile:	Usage file is may be missing or incorrect.	Verify file exists and that it is not corrupted.
FileOutputType:	Readings file type is incorrect.	Verify file type is .csv or txt.
LogFolderFault:	Path called is missing.	Verify file path.
XNotSynced:	Tape drive needs to be Sync'd.	Move left.
CheckThermalProtocolFile	Thermal Protocol file may be missing or incorrect.	Verify file exists and that it is not corrupted.
DetectionCamera:	Camera is unresponsive.	Ensure camera is plugged in.
LogFileCopy:	Failed to copy log file.	Error ID.
ReadingsFileCopy:	Failed to copy readings file.	Error ID.

Module faults

Abort faults	Cause	Solution
_EK1100_STATE:	State change on EK1100 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_1_EL2024_STATE:	State change on EL2024 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_1_EL2024_WCSTATE:	Working counter error on EL2024 Beckhoff card.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_2_EL2024_STATE:	State change on EL2024 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_2_EL2024_WCSTATE:	Working counter error on EL2024 Beckhoff card.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_EL2535_STATE:	State change on EL2535 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_EL2535_WCSTATE:	Working counter error on el2535 Beckhoff card.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_EL4132_STATE:	State change on EL4132 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_EL4132_WCSTATE:	Working counter error on EL4132 Beckhoff card.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_EL3702_STATE:	State change on EL3702 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_EL3702_WCSTATE:	Working counter error on EL3702 Beckhoff card.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_EL5101_STATE:	State change on EL5101 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_EL5101_WCSTATE:	Working counter error on EL5101 Beckhoff card.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_EL1124_STATE:	State change on EL1124 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_EL1124_WCSTATE:	Working counter error on EL1124 Beckhoff card.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

OR1607 faults	Cause	Solution
_310_EL2798_STATE:	State change on EL2798 Beckhoff card at terminal 31.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_310_EL2798_WCSTATE:	Working counter error on EL2798 Beckhoff card at terminal 31.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

OR1607 faults	Cause	Solution
_320_EL2535_STATE:	State change on EL2535 Beckhoff card at terminal 32.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_320_EL2535_WCSTATE:	Working counter error on EL2535 Beckhoff card at terminal 32.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_410_EL7031_STATE:	State change on EL7031 Beckhoff card at terminal 41.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_410_EL7031_WCSTATE:	Working counter error on EL7031 Beckhoff card at terminal 41.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
FilterWheelDrive:	Possible problem with filter wheel drive.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.
FilterWheelHome:	Filter wheel was unable to home.	Ensure drive can move, check drive for obstructions, clear as necessary. Check proximity sensor for damage and ensure it has power.
DetectionCamera:	Camera is unresponsive.	Ensure camera is plugged in.

Dehydrator_DH0904

⚠WARNING

Read and understand equipment operators manual before operating or performing maintenance. Failure to do so could result in serious injury or death.

Component identification

Dehydrator_DH0904

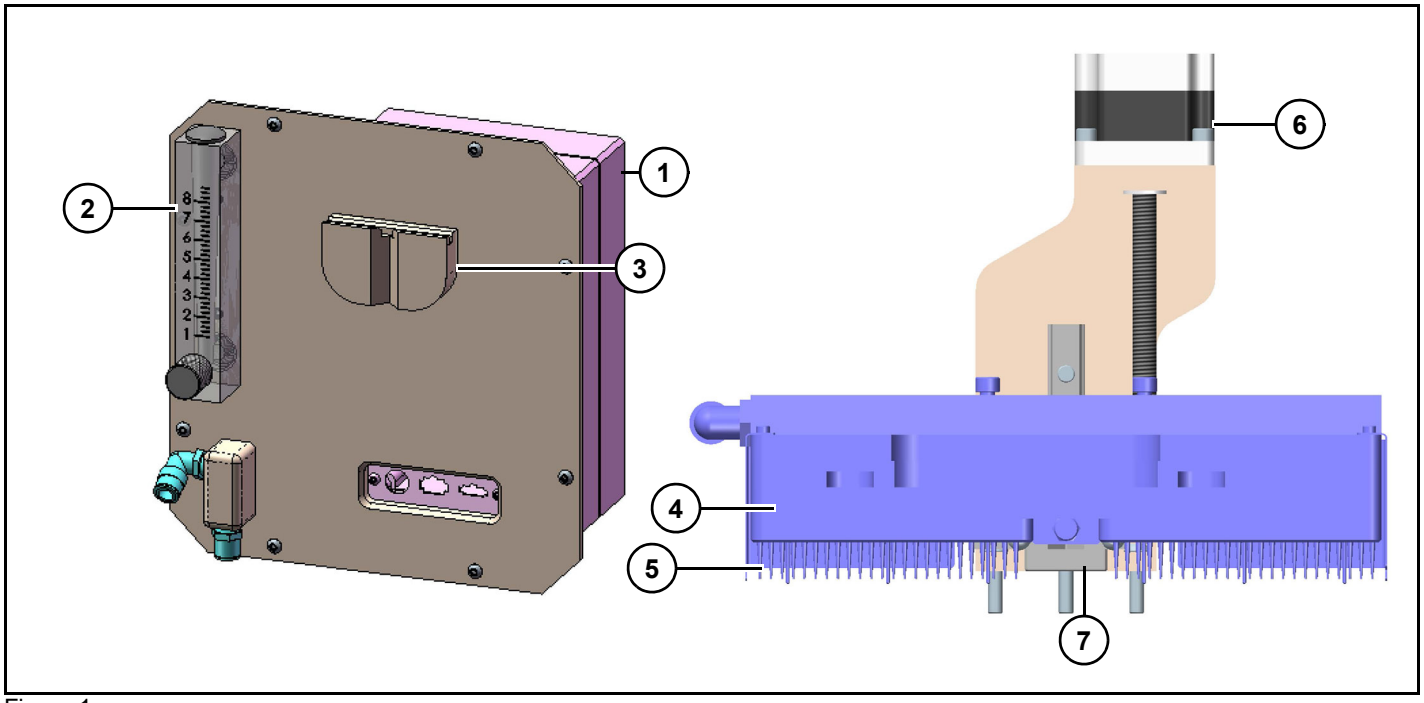

Figure 1

REF#	DESCRIPTION	REF#	DESCRIPTION
1	Electrical Enclosure	5	Drying Tips
2	Flow Regulator	6	Dryer Z Motor
3	Dryer Perch	7	Dryer Head
4	Heater Block		

Dehydrator_DH0905 controls

Notice

Controls on Auto Screen can only be activated when instrument is in an idle state.

If a change is made to Manager Settings file (See Manager Settings section) it only takes effect after a pause and idle action is performed (See Getting Started section).

⚠ CAUTION

Although manual operation is limited, user can manually run head into objects. Use caution to avoid damage.

Dehydrator screen

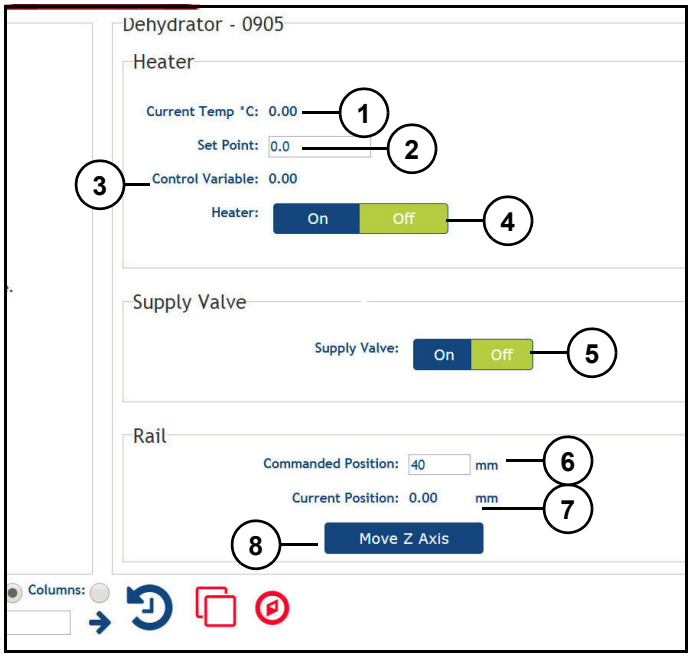

Figure 2

Refer to *(Figure 2)*.

Current Temp °C (1): Displays current temperature.

Set Point (2): Sets temperature.

Control Variable (3): Displays control variable.

Heater On/Off (4): Turns heater on/off.

Supply Valve On/Off (5): Turns air supply on/off.

Command Position (mm) (6): Enters z-axis rail position.

Current Position (mm) (7): Displays current position of z-axis rail.

Move Z-Axis (8): Moves axis in z direction specified in Move z-axis text box. A bigger number indicates a lower z position.

Units	Millimeter
Minimum	Rail Limit
Default	Current Position
Maximum	Limit on Carriage

Faults

Notice

Before resetting a fault, be sure condition is corrected.

For fault descriptions Refer to the Positioning Rail Troubleshooting section for more fault information.

Refer to *Handling the Faults* section.

Dehydrator Attachement_DH0904 troubleshooting

Notice
Before attempting any fault solution, refer to Handling Faults section. Colours Red: Safety fault Yellow: Uncontrolled fault other than safety Blinking blue: Faulted (controlled) Blue: Recovering Green: Running Black: Initialising

Module fault messages

Abort faults	Cause	Solution
_EK1100_STATE:	State change on EK1100 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_110_EL2004_STATE:	State change on EL2024 Beckhoff card at terminal 11.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_110_EL2004_WCSTATE:	Working counter error on EL2024 Beckhoff card at terminal 11.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_110_EL2024_STATE:	State change on EL2024 Beckhoff card at terminal 11.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_110_EL2024_WCSTATE:	Working counter error on EL2024 Beckhoff card at terminal 11.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_120_EL3202_STATE:	State change on EL3202 Beckhoff card at terminal 12.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_120_EL3202_WCSTATE:	Working counter error on EL3202 Beckhoff card at terminal 12.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_710_EL2024_STATE:	State change on EL2024 Beckhoff card at terminal 71.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_710_EL2024_WCSTATE:	Working counter error on EL2024 Beckhoff card at terminal 71.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_720_EL3202_STATE:	State change on EL3202 Beckhoff card at terminal 72.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.

Abort faults	Cause	Solution
_720_EL3202_WCSTATE:	Working counter error on EL3202 Beckhoff card at terminal 72.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_EL7201_STATE:	State change on EL7201 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_EL7201_WCSTATE:	Working counter error on EL7201 Beckhoff card.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
_BK1250_COUPLER_STATE:	Error on BK1250 Beckhoff card.	Run diagnostics and look for CRC errors and for cards not in OP mode, check card for power, try and reseat card.
_BK1250_STATE:	State change on BK1250 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_BK1250_WCSTATE:	Working counter error on BK1250 Beckhoff card.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.
TIPSZDRIVE:	Possible issue with tip Z drive system.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.
TIPSZHOMEFAULT:	z-axis for tips wasn't able to home.	Ensure drive can move, check drive for obstructions, clear as nessessary. Check prox sensor for damage and ensure it has power.

Air Dryer_AD0904

⚠WARNING

Read and understand equipment operators manual before operating or performing maintenance. Failure to do so could result in serious injury or death.

Component identification

Air Dryer_AD0904

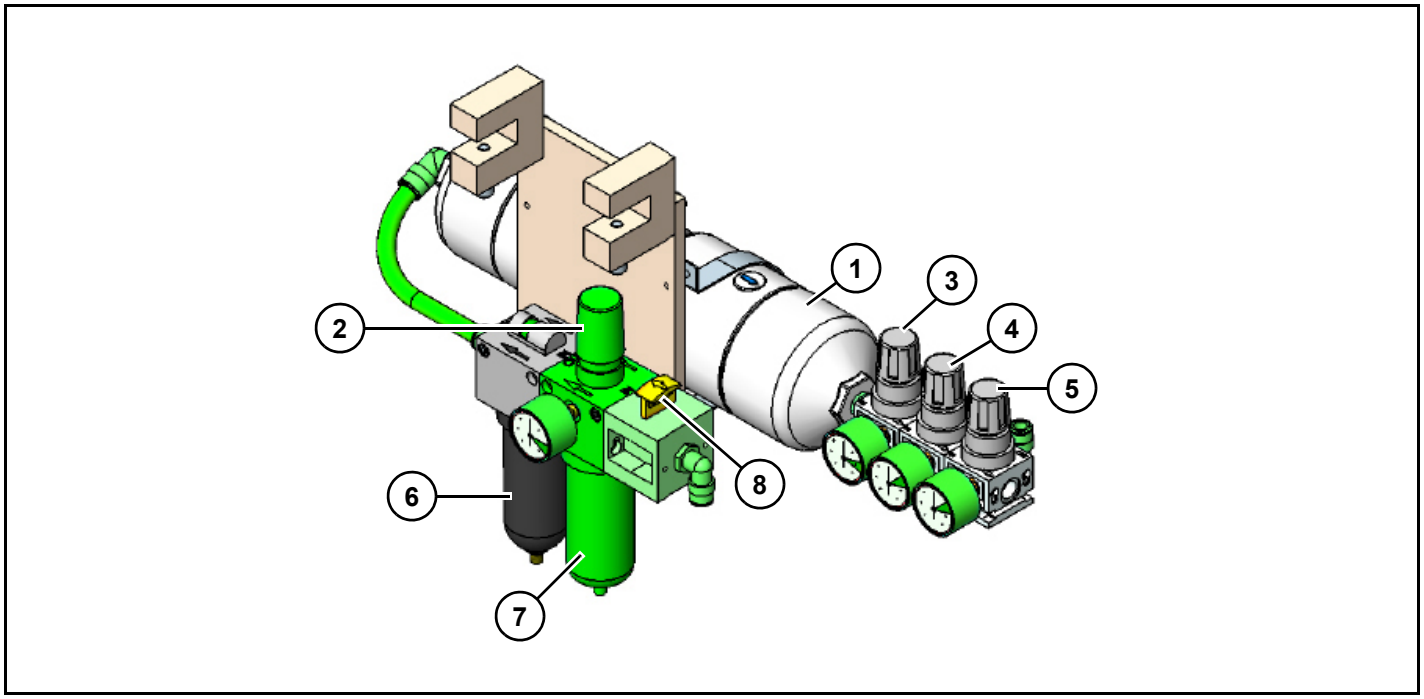

Figure 1

REF#	DESCRIPTION	REF#	DESCRIPTION
1	Cactus Air Dryer	5	EB #1 Air Dryer Regulator
2	Main Regulator	6	Water Filter
3	Jet Wash Regulator	7	Oil Filter
4	EB #2 Air Dryer Regulator	8	Air Disconnect Lever

Air Dryer_AD0904 components

Refer to *(Figure 1)*.

Cactus Air Dryer (1): Receives air from inlet, removes water and oil and inputs dry clean air.

Main Regulator (2): Controls main system pressure, should be set at 90 psi.

Jet Wash Regulator (3): Controls jet wash pressure, should be set at 50 psi.

Air Dryer EB#2 Regulator (4): Controls EB#2 air dryer pressure, should be set at 35 psi.

Air Dryer EB#1 Regulator (5): Controls EB#1 air dryer pressure, should be set at 35 psi.

Water Filter (6): Filters water from input air.

Water Filter (7): Filters oil from input air.

Air Disconnect Lever (8): When down, relieves system air pressure. When up engages air flow.

Maintenance

- Check filter covers for water and oil build up every six months.

Note: If fluids are present check more frequently.

- If filters as discoloured, replace.

Cleaning filter covers

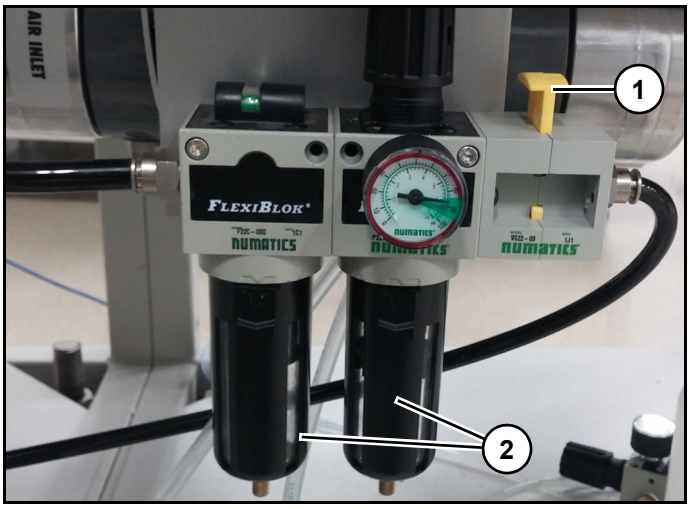

Figure 2

Refer to *(Figure 2)*.

1. Press disconnect lever (1) down to relieve air pressure.
2. Twist covers (2) off.
3. Clean out and dry covers (2).
4. Replace covers.

Filter replacement

1. Press disconnect lever (1) down to relieve air pressure.
2. Twist covers (2) off.
3. Twist filter off.
4. Install new filter.
5. Replace covers (2).

Rewind Module_RW0904

⚠WARNING

Read and understand equipment operators manual before operating or performing maintenance. Failure to do so could result in serious injury or death.

Component identification

Rewind Module_RW0904

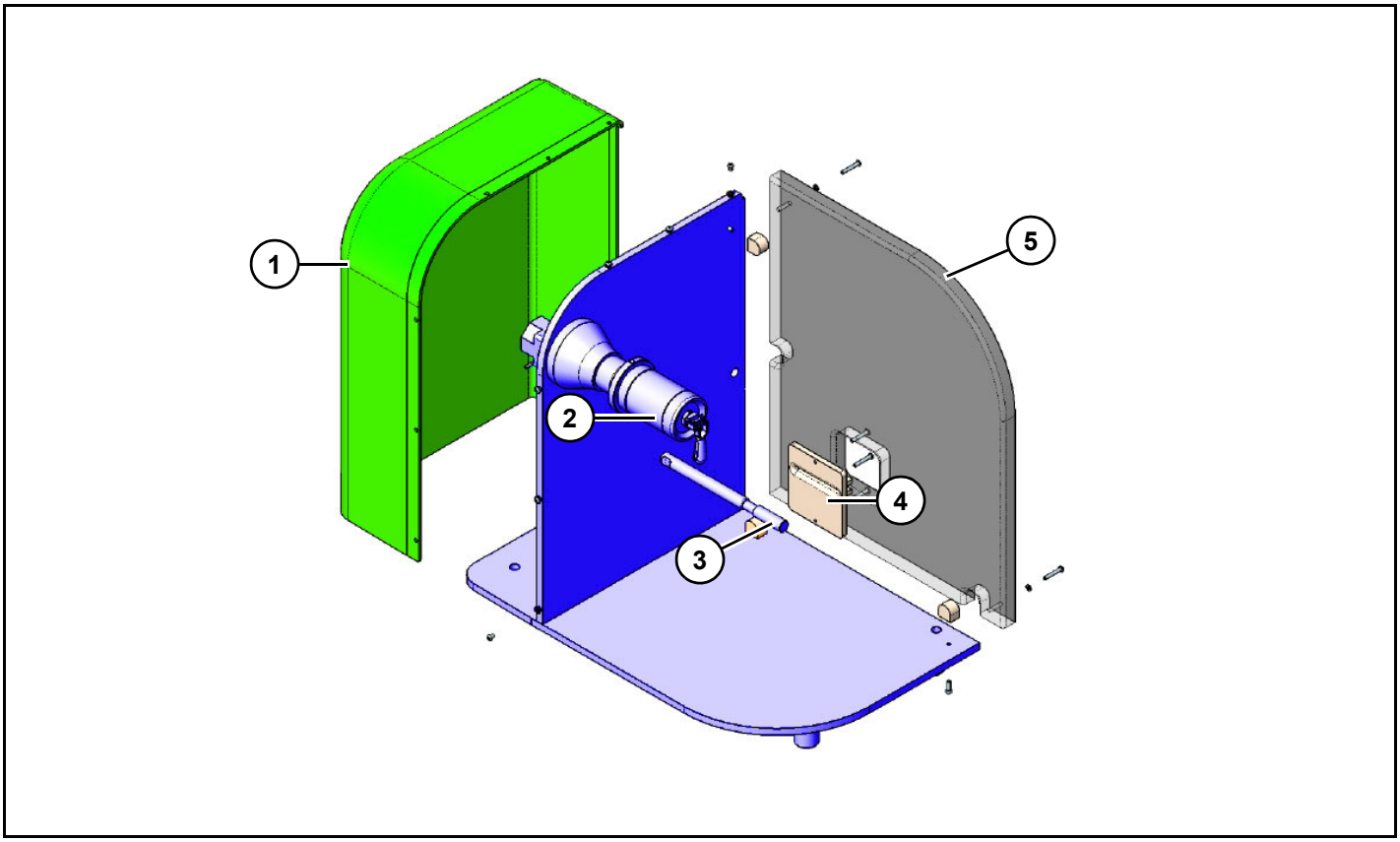

Figure 1

REF#	DESCRIPTION	REF#	DESCRIPTION
1	Electrical Enclosure	4	Tape Guide
2	Rewind Spindle	5	Rewind Guard
3	Guide Pin		

Rewind Module_RW0904 controls

Notice

Controls on Auto screen can only be activated when instrument is in an idle state.

If a change is made to Manager Settings file (See Manager Settings section) it only takes effect after a pause and idle action is performed (See Getting Started section).

Manual screen

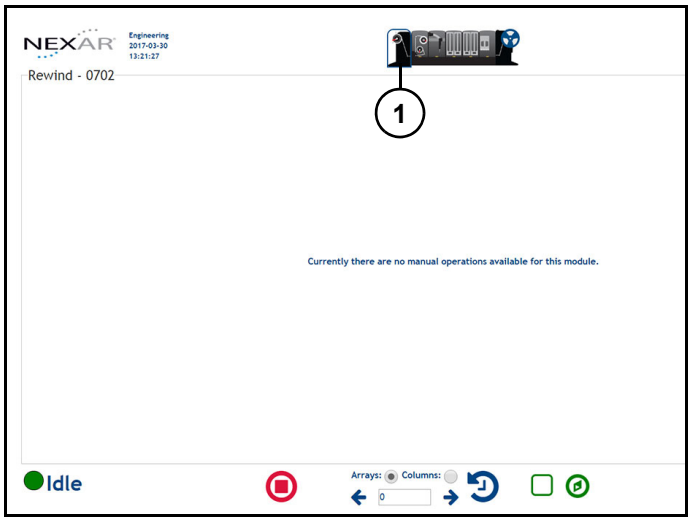

Figure 2

Refer to *(Figure 2)*.

Overview of controls

Rewind Module (1): Displays module status.

- Default status indicator.
- Highlighted status indicator.
- Faulted status indicator.
- Faulted highlighted status indicator.
- Highlighted blue: Module is active.
- Highlighted red: Module is faulted.

There are currently no controls on Manual screen.

Creating new Rewind setting

Users with administrator privileges can create new Dispense Pipette settings file.

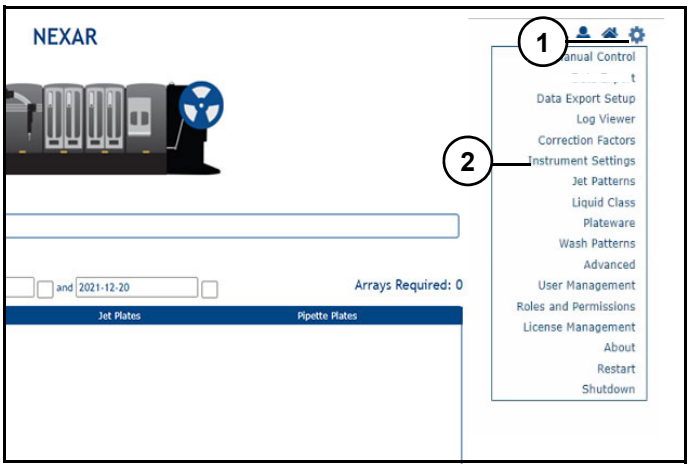

Figure 3

Refer to *(Figure 3)*.

1. Click "Settings" icon (1).
2. Click "Instrument Settings" (2).

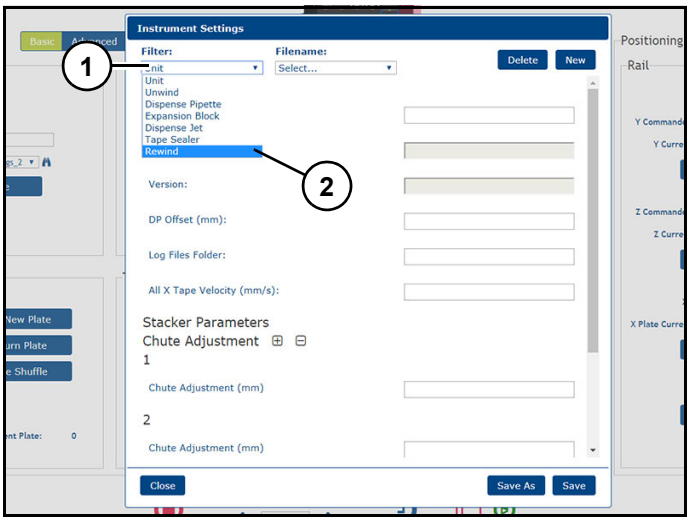

Figure 4

Refer to *(Figure 4)*.

3. Click "Filter" drop-down (1).
4. Select "Rewind" (2).

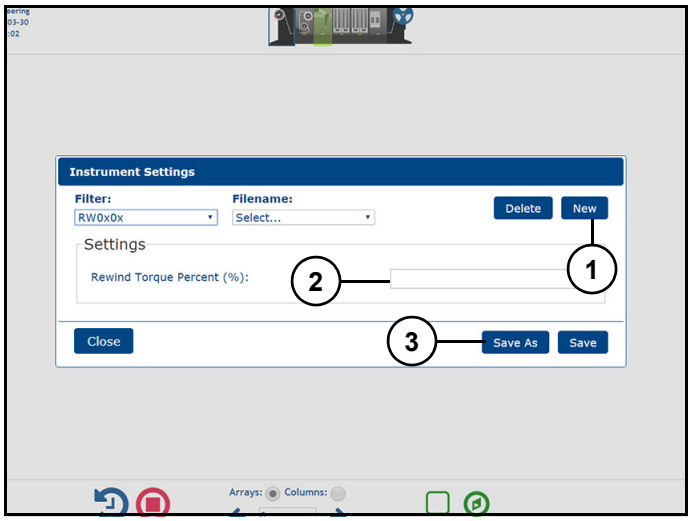

Figure 5

Refer to *(Figure 5)*

5. Click "New" (3).
6. Enter desired settings on Instrument Setting screen (2).
7. Click "Save As" (3).

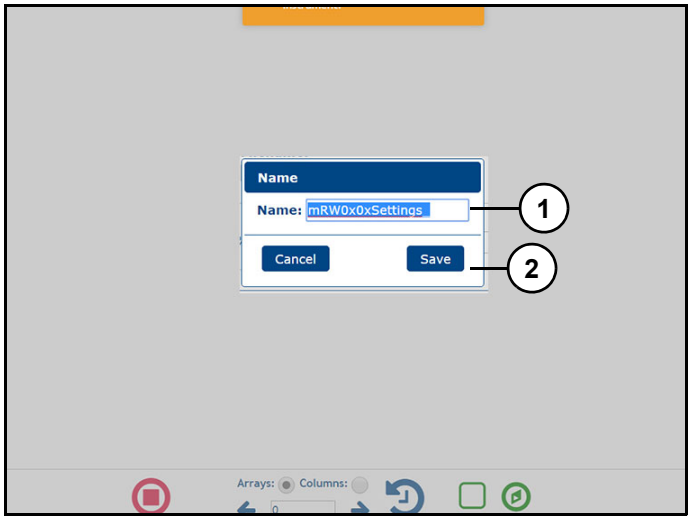

Figure 6

Refer to *(Figure 6)*

8. Enter "Name" (1) of new setting.
9. Click "Save" (2).

Note: Click "Cancel" to exit without saving new file.

Adjusting Rewind settings

Users with administrator privileges can change parameters using settings file.

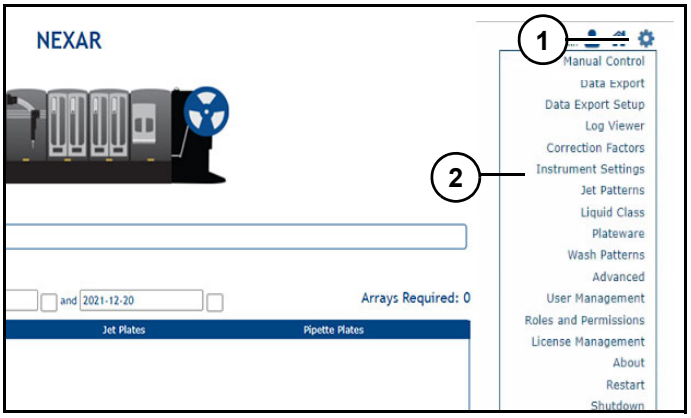

Figure 7

Refer to *(Figure 7)*.

1. Click "Settings" icon (1).
2. Click "Instrument Settings" (2).

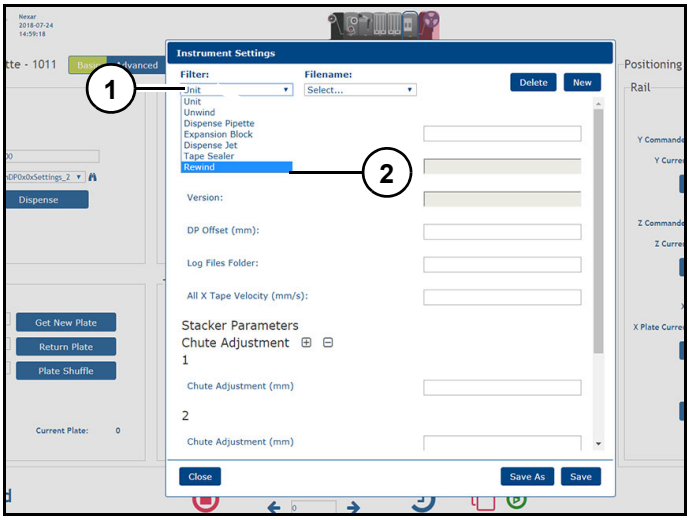

Figure 8

Refer to *(Figure 8)*.

3. Click "Filter" drop-down (1).
4. Select "Rewind" (2).

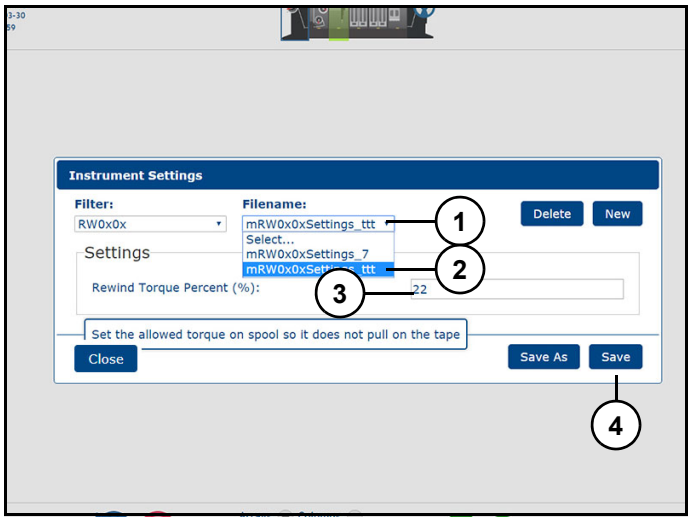

Figure 9

Refer to *(Figure 9)*

5. Click "Filename" drop-down (1).
6. Select "Filename" drop-down (3) and select file to edit.
7. Adjust setting (3) on setting screen.
8. Click "Save" (4) to save changes.

Note: Click "Close" to exit without saving changes.

Deleting Rewind settings

Users with administrator privileges can change parameters using settings file.

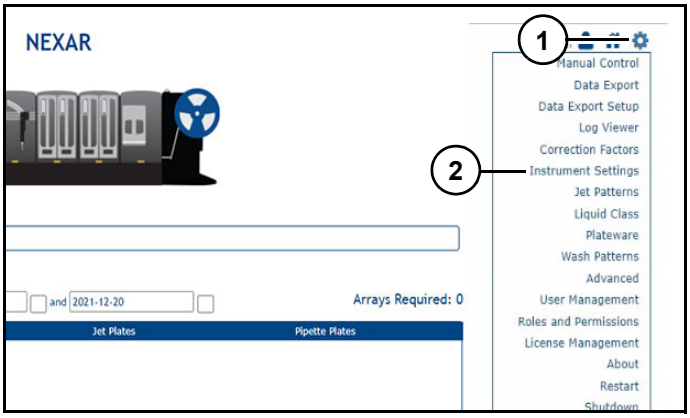

Figure 10

Refer to *(Figure 10)*.

1. Click "Settings" icon (1).
2. Click "Instrument Settings" (2).

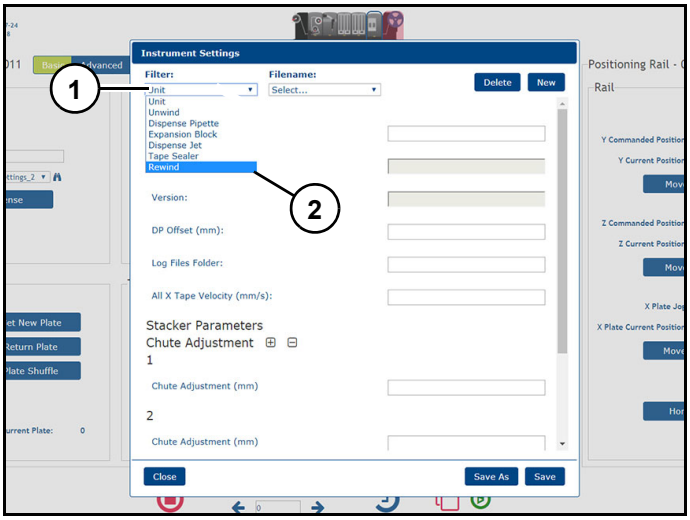

Figure 11

Refer to *(Figure 11)*.

3. Click "Filter" drop-down (1).
4. Select "Rewind" (2).

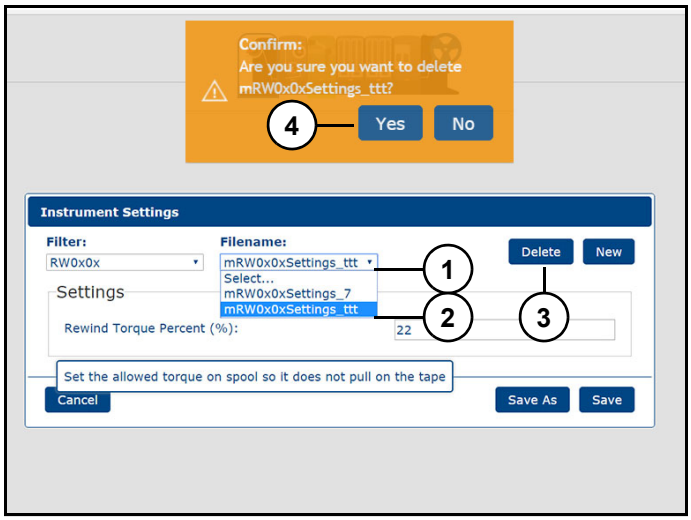

Figure 12

Refer to *(Figure 12)*

5. Click "Filename" drop-down (1).
6. Select "Filename" drop-down (2) and select file to delete.
7. Click "Delete" (3) to delete settings file.
8. Click "Yes" (4) to delete.

Faults

Notice
Before resetting a fault, be sure condition is corrected.

For fault list See "Rewind_RW0904 troubleshooting" on page 307.

For fault descriptions See "Rewind_RW0904 troubleshooting" on page 307.

How to recover from fault

See "General fault recovery procedure" on page 25.

Rewind_MGR_RW0904 Manager Settings

Rewind (_MGR_RW0904) manager controls Rewind (_RW0904) module. Settings files main task is to control operations for Rewind.

File Name: mRW0702Settings_x.xml

Parameter x represents manager position within unit. Full path of this file is:

C:\HTSI\HTSI_Modules\HTSI_Settings\mRW0904Settings_x.xml.

Example, mRW0904Settings_5.xml is fifth manager in unit arrangement.

Note: Modules are arranged from right to left on instrument.

Element descriptions

<Settings> - Root element

<RewindGearRatio> - This value dictates rotation of rewind motor. There are two possible values:
(Default: +1)

+1: Rewind motor rotates in a counter-clockwise direction ↺.

-1: Rewind motor rotates in a clockwise direction ↻.

<Faults> - Contents of <Faults> element allows user to change priority level of certain faults. Using priority level "0" disables fault. A priority level "1" fault will cause unit to pause or abort, depending on a controlled or uncontrolled fault. A priority level "2" will not interrupt unit operation, but fault will record in error log.

For individual fault messages, refer to the Unit Troubleshooting section.

Example Rewind Manager settings file

mRW0702Settings_x. .xml

<?xml version="1.0" encoding="UTF-8"?>

- <Settings>

<RewindGearRatio>**+1**</RewindGearRatio>

-<Faults>

- <TestFault>

<Priority>**0**</Priority>

</TestFault>

-<TriggerFault>

<Priority>**1**</Priority>

</TriggerFault>

</Faults>

</Settings>

Rewind_RW0904 troubleshooting

Notice
Before attempting any fault solution, refer to Handling Faults section. Fault Colours Red: Safety fault Yellow: Uncontrolled fault other than safety Blue: Controlled fault Green: Nexar enabled

Manager faults

Pause faults	Cause	Solution
CheckSettingsFile:	Settings file may be missing or incorrect.	Verify file exists and that it is not corrupted.

Module faults

Abort faults	Cause	Solution
REWINDDRIVE:	Possible issue with Rewind drive system.	Ensure drive can move, check drive for obstructions, clear as necessary. Check corresponding drive card for power.
_BK1120_COUPLER_STATE:	Error on BK1120 Beckhoff card.	Run diagnostics and look for CRC errors and for cards not in OP mode, check card for power, try and reseat card.
_BK1120_STATE:	State change on BK1120 Beckhoff card.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_BK1120_WCSTATE:	Working counter error on BK1120 Beckhoff card.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

RW1212	Cause	Solution
_230_EL7031_STATE:	State change on EL7031 Beckhoff card at terminal 23.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_230_EL7031_WCSTATE:	Working Counter error on EL7031 Beckhoff card at terminal 23.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

RW1607	Cause	Solution
_310_EL7031_STATE:	State change on EL7031 Beckhoff card at terminal 31.	Run diagnostics and look for cards not in OP mode, check card for power, try and reseat card.
_310_EL7031_WCSTATE:	Working counter error on EL7031 Beckhoff card at terminal 31.	Run diagnostics and look for CRC errors, check card for power, try and reseat card.

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Customer support

Customer support

Biosearch Technologies customer support provides unparalleled in-house, field, and remote customer support. Please refer to the Instrument Service Programme and associated Terms and Conditions for support availability.

Technicians are cross-trained in mechanical, electrical, and programming competencies. They are equipped with latest portable computers and remote software and are available for preventive maintenance, instrument surveys, instrument modifications, and routine or emergency service work. Biosearch Technologies customer support can be contacted at:

Biosearch Technologies customer support	
Customer support	+ 1 888.300.9529
Parts and Array Tape reorder	orders.alx@lgcgroup.com
Address:	LGC Biosearch Technologies 3600 Minnesota Street Alexandria, MN 56308
Website:	www.biosearchtech.com

Customer Support Portal

Customer Support Portal will be accessible through following website:

https://lgcgenomics.force.com/community/s/

Logging in

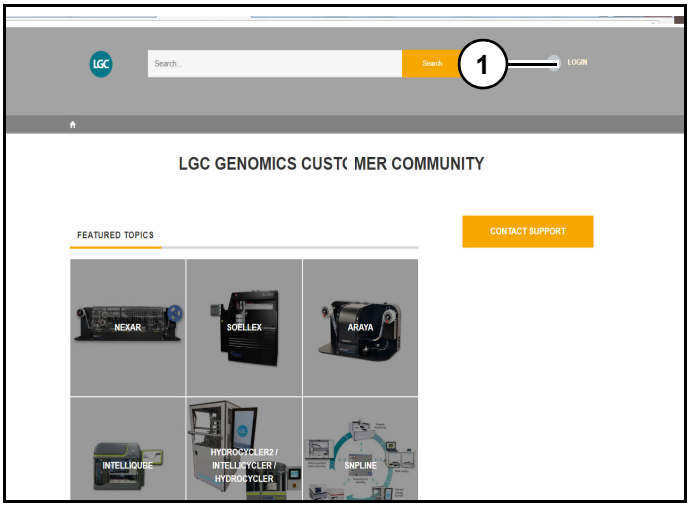

Figure 1

Refer to *(Figure 1)*.

1. Within an Internet browser, navigate to https://lgcgenomics.force.com/community/s/
2. Click "Login" (1).

Figure 2

Refer to *(Figure 2)*.

3. Enter "Username" (1) and "Password" (2).

4. Click "Login" (3).

Note: If password has been forgotten, click "Forgot your password?" (4) and a password reset email will be sent to you.

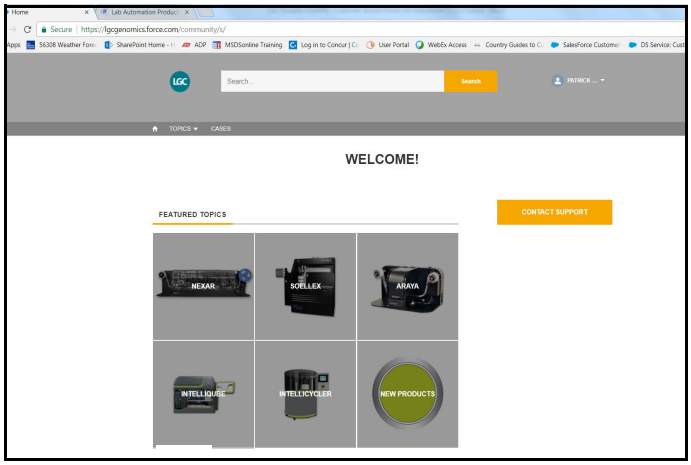

Figure 3

Following successful login completion, Biosearch Technologies Customer Service Portal will be displayed. *(Figure 3)*

Case creation

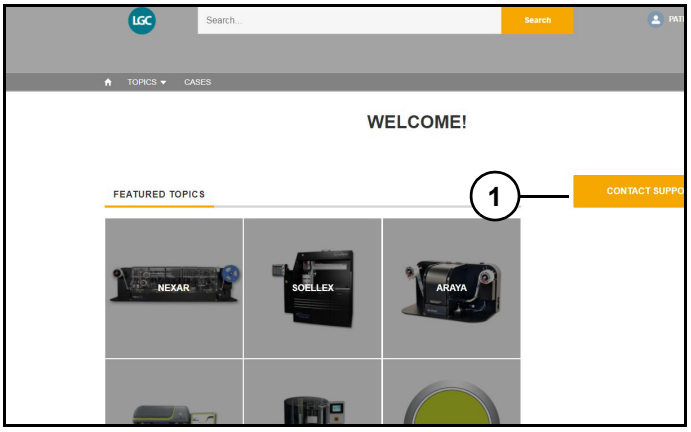

Figure 4

1. Click "Contact Support" (1) *(Figure 4)*.

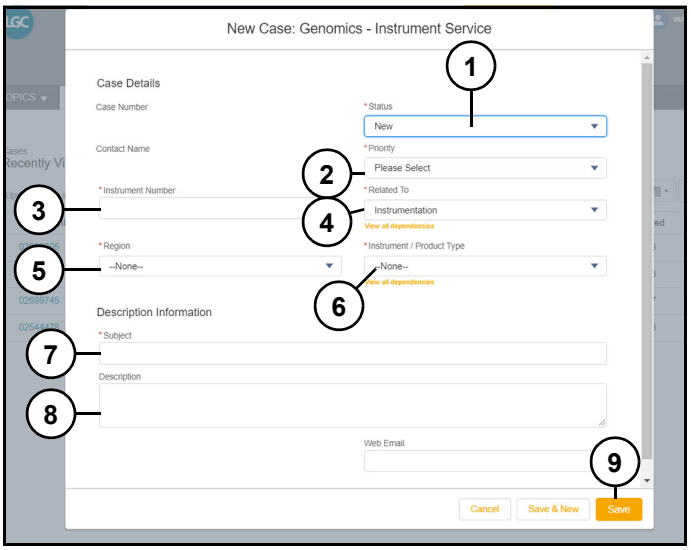

Figure 5

Refer to *(Figure 5)*.

2. Enter "Status" (1), "Priority" (2), "Instrument Number" (3), "Related To" (4), "Region" (5), "Instrument / Product Type" (6), "Subject" (7), and "Description" (8) of issue.

3. Click "Submit" (9).

Note: All fields must be filled before case can be submitted. When information has been entered into "Subject" field (1) and cursor has been moved to another field, "Need Answers Fast" field on right side of screen will automatically search Customer Service Portal for information that may be of assistance with case. These links can also be accessed prior to submitting case.

Case access and commenting

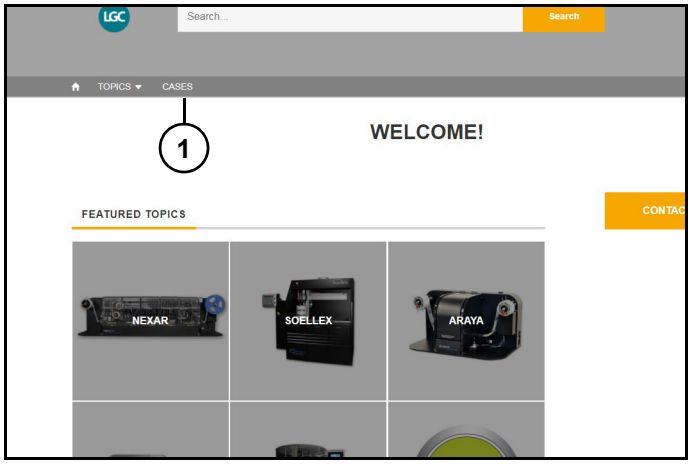

Figure 6

1. Click "Cases" (1) *(Figure 6)*.

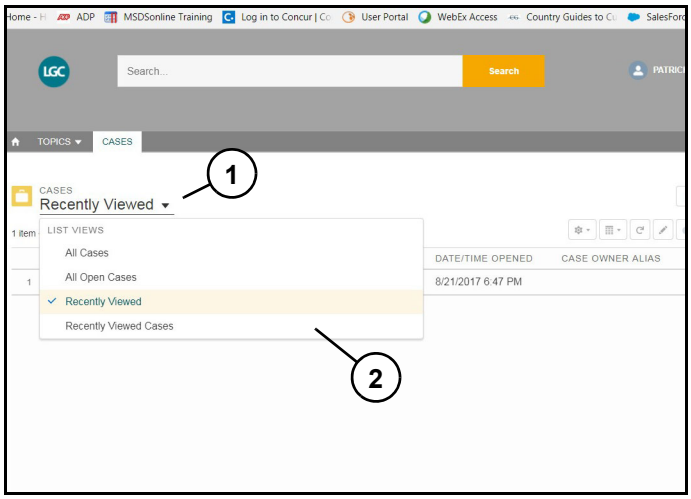

Figure 7

2. Click "Cases" dropdown (1). A number of case viewing options will be displayed (2). *(Figure 7)*

Note: Default case viewing option will be "Recently Viewed" cases, which provides a list of recently accessed cases.

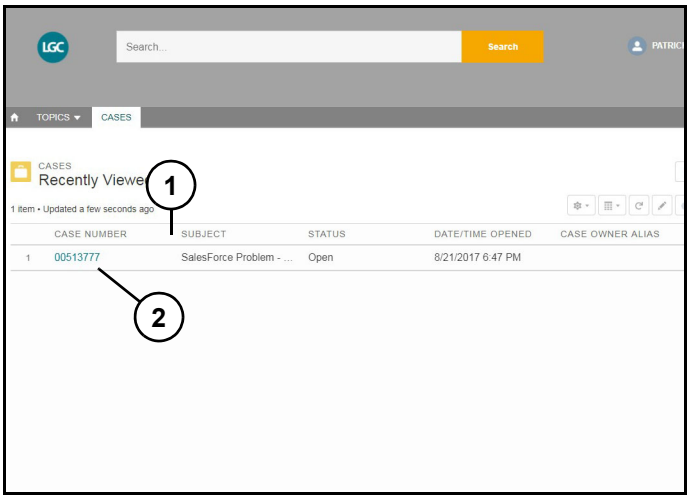

Figure 8

3. Cases can be sorted by clicking on column headers. Cases can be accessed by clicking on case number (2). *(Figure 8)*

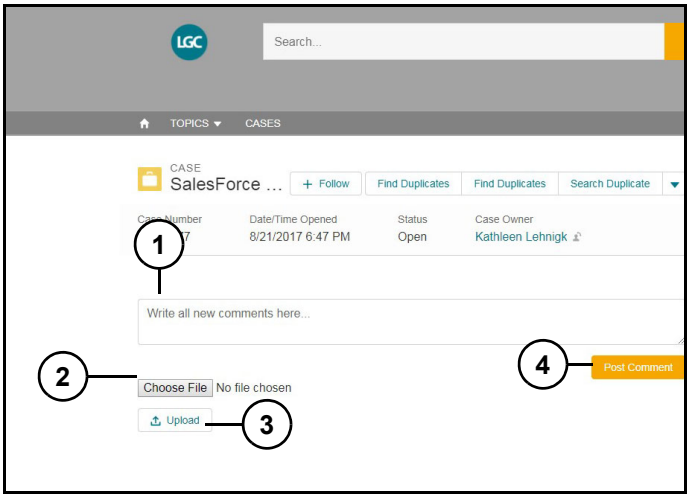

Figure 9

Refer to *(Figure 9)*.

4. To add a comment, type into box (1).

Note: To add an attachment file to case, click on choose file and click "Upload" (3).

5. Click "Post Comment" (4).

Caution

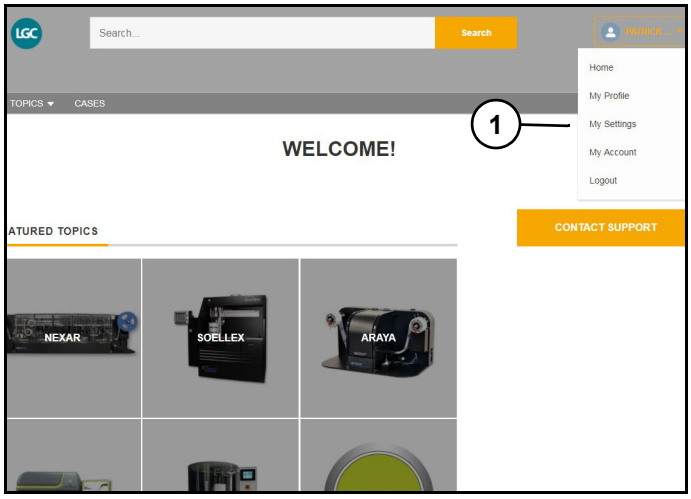

Figure 10

Refer to *(Figure 10)*.

Within profile drop-down there is a "My Settings" (1) page. User can make changes to setting options that are presented, which may result in the loss of email communication with Biosearch Technologies Service.

Unless user no longer wants to receive case comment notification emails, it is strongly recommended that presented settings do not change.

Customer community ticket logging

Within an Internet browser, navigate to : http://community.lgcgenomics.com/

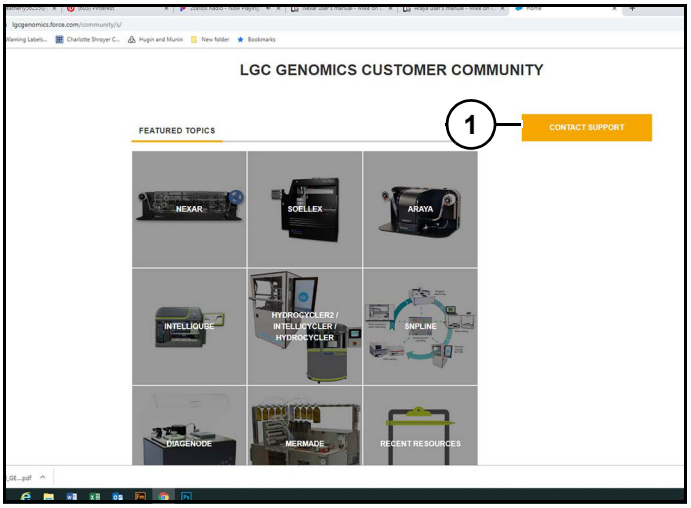

Figure 11

6. Click "Customer Support" (1)*(Figure 11)*.

Figure 12

Refer to *(Figure 12)*.

7. Fill in required fields (1) and attach any related files (2).

8. Check "I'm not a robot" (3).

Click "Submit" (4).

Mobile device case creation

Creating new case

1. Using mobile browser, go to: https://lgcgenomics.force.com/community/s/

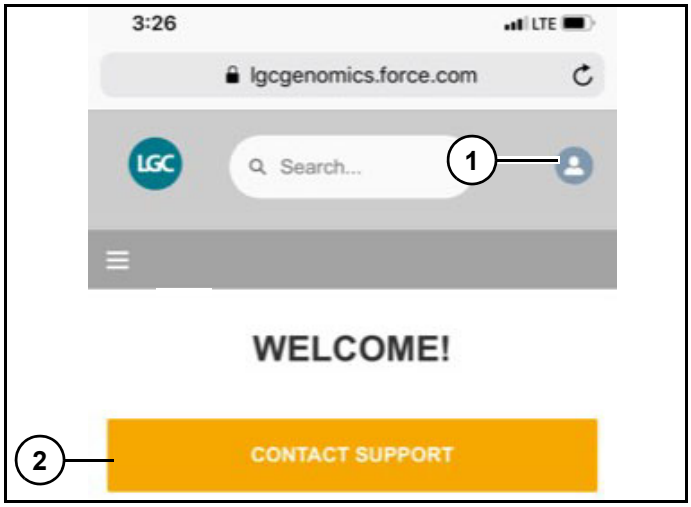

Figure 13

Refer to *(Figure 13)*.

2. Click "Login Icon" (1) and enter credentials.

Note: If login credentials have not been supplied click "Contact Support" (2).

Note: Allowing your mobile device to remember your credentials will make adding comments and attachments very easy. If not a registered user, then you will proceed via email after the case creation.

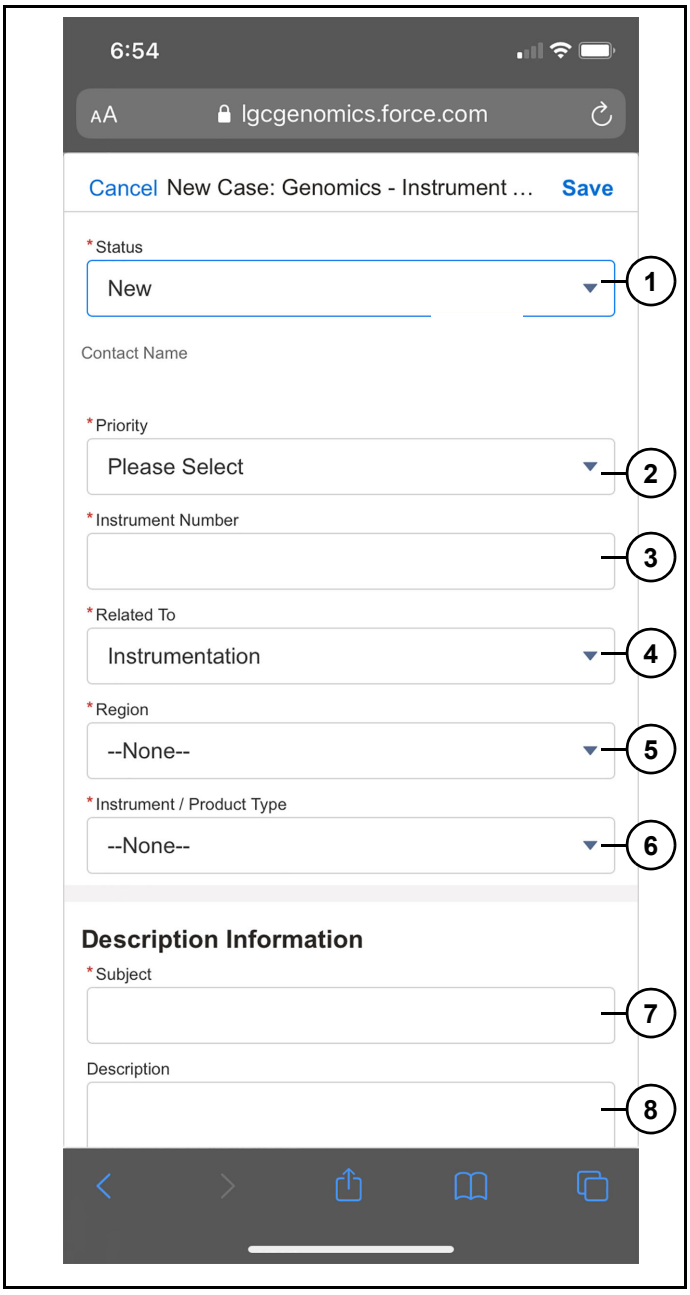

Figure 14

Refer to *(Figure 14)*.

3. Fill out "Status" (1), "Priority" (2), "Instrument Number" (3), "Related To" (4), "Region" (5), "Instrument / Product Type" (6), "Subject" (7) and Description (8) with as much detail as possible to ensure quicker resolution.

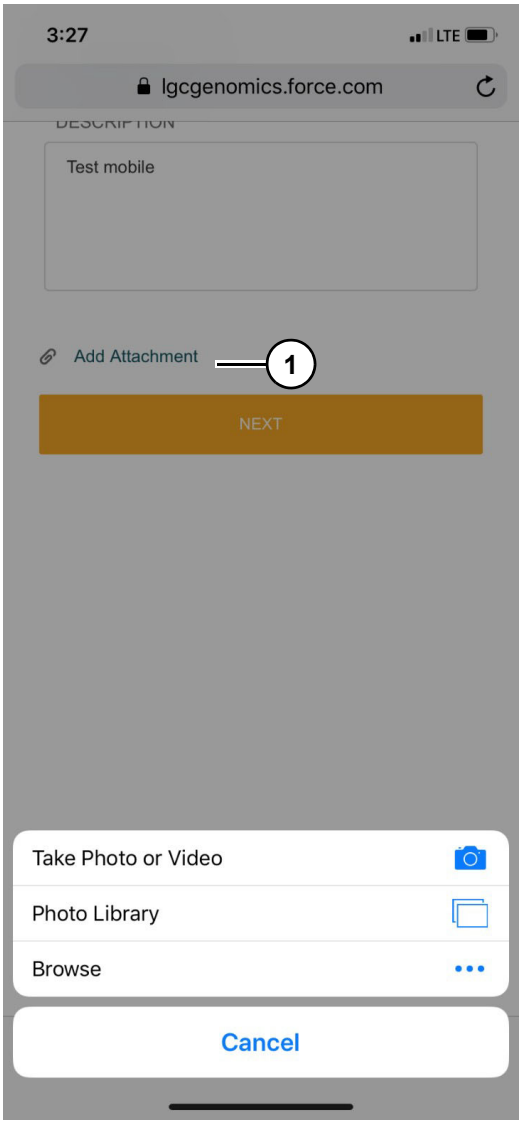

Figure 15

Refer to *(Figure 15)*.

4. Click "Add Attachment" (1) if needed and take photo or add one from library.

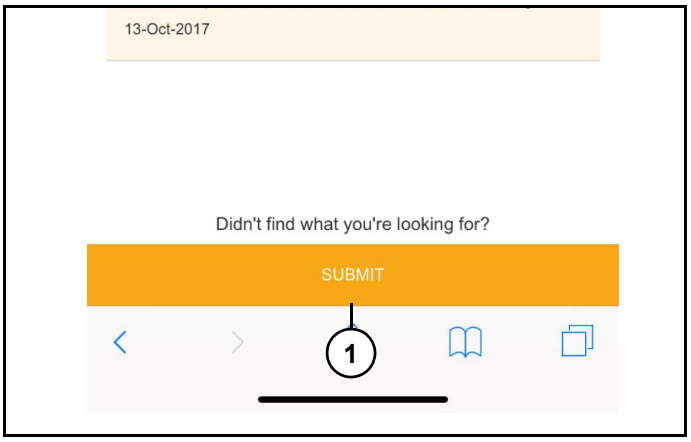

Figure 16

5. Click "Submit" (1) *(Figure 16)*.

Creating shortcut on mobile device

1. Using mobile browser, go to: https://lgcgenomics.force.com/community/s/
2. Login.

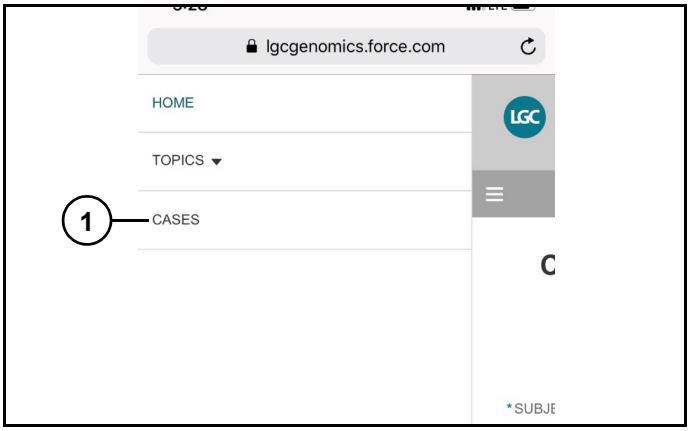

Figure 17

1. Select "Cases" (1) *(Figure 17)*.
2. Depending device, select save and then "Add to Home Screen" and a shortcut will be created.

Updating cases using mobile device

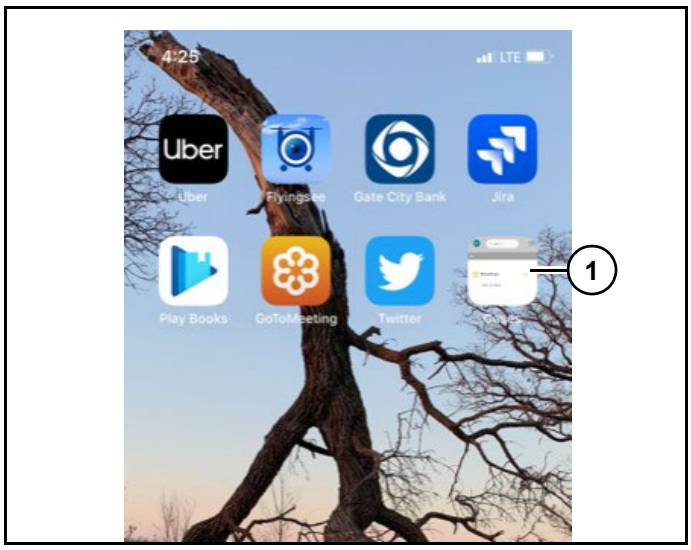

Figure 18

1. Click "Case shortcut" (1) *(Figure 18)*.

Note: If credentials are remembered, it will go to case list.

From case list, click case and add comments and attachments by clicking in proper locations on screen and click submit.

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