User Guide

Echo Array Maker Application

BECKMAN COULTER

Echo Array Maker Application
User Guide
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Original Instructions

Revision Status

This document applies to the latest software listed and higher versions. When a subsequent software version changes the information in this document, a new issue will be released to the Beckman Coulter website. For labeling updates, go to www.beckman.com/techdocs and download the most recent manual or system help for your instrument.

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Revision Status

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Preface

This section provides information about who the intended audience is, the software requirements, technical support resources, and documentation conventions used. It includes the following sections.

- About this Guide
- Intended Audience
- Software Requirements
- Technical Support Resources
- Documentation Conventions

About this Guide

This guide describes the key features of the Echo Array Maker Application.

Intended Audience

The intended audience for this guide is laboratory personnel. Researchers can use this guide to design arrays with custom patterns and create transfer protocols for transfers from microplates to a variety of substrates with the Echo Liquid handler.

Software Requirements

To use the Echo Array Maker Application, the following items are required:

- Echo Liquid Handler instrument using server version 2.4.x or later and Echo.Net Framework version 1.8.0
- Software license key from Beckman Coulter.
- Computer system meeting the following requirements:
    - **Operating system**: Microsoft Windows 10 64-bit, (must be run in Windows 7 Compatibility Mode); Microsoft .Net Framework

      NOTE Echo Array Maker Application will run in 32-bit mode on Windows 10 64-bit Operating System.

    - **CPU**: Intel® Core™ i5 or later
    - **Memory**: 4 GB or greater

- — **Network connection:** 2 x 10/100/1000 BaseT
- — **Network protocol:** TCP/IP
- — **Hard drive:** 4 GB Free Space Available
- — **Video:** Minimum 1600 x 1200 resolution

The Echo Array Maker Application works closely with the Echo Liquid Handler Software for Client Computers and should be installed on the same client PC.

The Echo Software Compatibility Matrix table below documents the versions of software supported by this guide and their compatibility.

Table 1.1 Echo Software Version Compatibility Matrix

Echo Client Software	Echo Application Software	Tempo Automation Control Software	Echo.Net Framework
2.4.5 - 2.5.x	1.5.4 or later	1.5.2 or later	1.5.4 or later
2.4.5 - 2.6.x	1.6.0 or later	1.6.0 or later	1.6.0 or later
2.4.5 - 2.6.x	1.7.0 or later	2.1.x[a] or later	1.7.0 or later
3.1.x	1.7.2 or later	2.1.x[a] or later	1.7.2 or later
2.4.5-2.6.x	1.8.0 or later	2.2.0 or later	1.8.0 or later
3.1.x	1.8.0 or later	2.2.0 or later	1.8.0 or later

a. Check with your Beckman Coulter Sales Representative for availability.

NOTE For information on the compatibility of a specific software version, please contact us.

Customer Responsibilities

The customer is responsible for installing, configuring, and securing the Windows 10 operating system on their computer, including the creation of any user accounts and password complexity rules that may apply, and the application of any software patches and security updates that are necessary to keep the system secure. The customer is also responsible for installing anti-virus and anti-malware software and keeping the virus definitions from the vendor up to date so as to keep the computer safe.

The Echo application software accepts certain inputs, such as Sample ID and Sample Name, which the user might populate with personally identifiable information. Furthermore, the Echo application software uses those inputs to generate reports that are stored unencrypted on the disk. Accordingly, it is the responsibility of the customer to ensure that the information provided to the Echo application, and subsequent reports that are stored on the disk, do not contain any personally identifiable information, or that the information is obfuscated or encrypted when stored on the disk to comply with any applicable regulations related to data privacy and security.

Technical Support Resources

For technical support issues, contact Customer Service www.beckman.com/support/technical.

For telephone support, call (877) 742-6548.

Documentation Conventions

Table 1.2 Documentation Conventions

Style	Purpose
blue italicized text (PDF, Web only)	Cross references, link, Web addresses
`courier std`	Commands, filenames, directories, paths, user input
bold text	Interactive interface objects, keys, buttons
italicized text	Book titles, glossary terms

CHAPTER 2

Introduction

Introduction

The Echo Array Maker application provides a variety of plate transfer functions to the Echo Liquid Handler and works with all Echo Liquid Handlers. With an interactive graphical editor, researchers can design custom spotting patterns to build custom arrays. In a similar fashion, researchers can create and edit protocols that map the transfer of fluids from microplates to the custom arrays using the Echo Liquid Handler. A variety of spotting patterns can be created for microarrays, MALDI-chips, and more.

The steps to creating a typical transfer protocol for Echo Array Maker Application are shown below.

1 Define a new destination plate type or verify that the required plate type exists. For more information, see Labware Definitions For Array Making.

2 Create an array or arrays within a new destination plate type (slide holder or microplate). For more information, see Adding a New Destination Array.

3 Create, add, or edit the pattern of spots within the array. For more information, seeAdding a Pattern to the Pattern Library, Editing a Pattern in the Pattern Library, and Adding Patterns to a Destination Array.

4 Create a transfer protocol to transfer samples from microplate to arrays on the new destination plate. For more information, see Creating a Transfer Protocol.

5 Run the protocol. For more information, see Running a Protocol.

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Getting Started

This chapter describes the basic tasks to start, set up, and exit the Echo Plate Reformat application. It includes the following topics.

- Starting the Software
- Activating the Instrument
- Importing the Labware
- Understanding the Main Window
- Setting Up the Software
- Shutting Down the Software

Starting the Software

To start the Echo Array Maker application:

1 Open the **Start** menu.

2 Select **All Programs (or Programs) > BeckmanCoulter > Echo Array Maker**.

3 Select the **Echo Array Maker** application.

Figure 3.1 Location of Echo Array Maker application
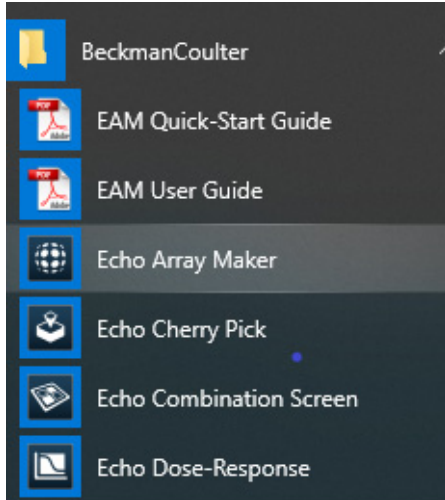
NOTE To create a shortcut to the **Echo Array Maker** application on the computer desktop, right-click on the **Echo Array Maker** icon and select **Send** to and **Desktop**.

After launching the application, the **Connect to Instrument** prompt is displayed.

Figure 3.2 Connect to instrument dialog box
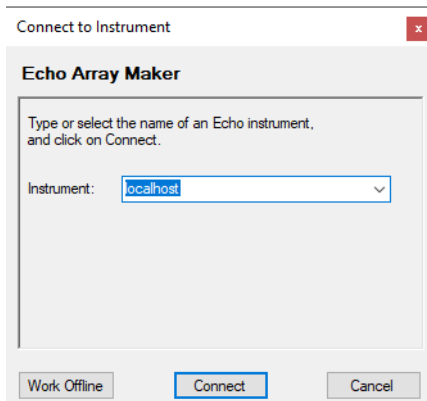
The **Connect to Instrument** dialog box connects the Echo Array Maker application to a specific Echo instrument, if there are multiple instruments. If there are no instruments listed for **Instrument**, it means that the application has never connected to an instrument. After the first time a user connects to the instrument from the application, that Echo instrument will be added to the dropdown list in the application.

NOTE Activating an instrument allows the user to run an actual protocol on a licensed Echo instrument. The user can still connect to the Echo instrument and create a protocol even if the licensing requirements have not been completed, but must click the **Work Offline** button to work offline. The protocol can be created but cannot be run until the licensing requirements have been met. If the user recently installed or upgraded the software, the instrument will need to be activated. See Activating the Instrument for more information.

4 Choose one of the following start options:

- **Connect**: Select an Echo Liquid Handler from the **Instrument** menu and click **Connect**. The Main Window opens with the connection status and instrument information at the bottom of the screen. This option enables the user to execute the sample or reagent survey as soon as the transfer protocol is ready.

  Figure 3.3 Echo Array Maker application connected to an Echo Liquid Handler
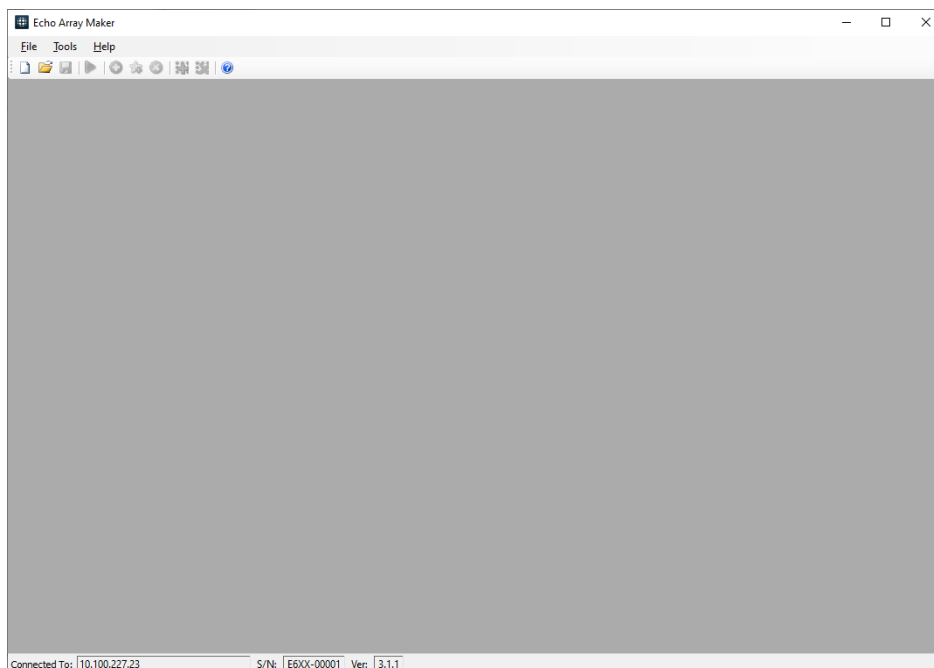
- **Work Offline:** Click **Work Offline.** The Echo Array Maker application opens with the connection status set to *offline* the bottom of the screen. This option enables the user to create a transfer protocol and run a simulation without connecting to the Echo Liquid Handler.

Figure 3.4 Echo Array Maker application offline
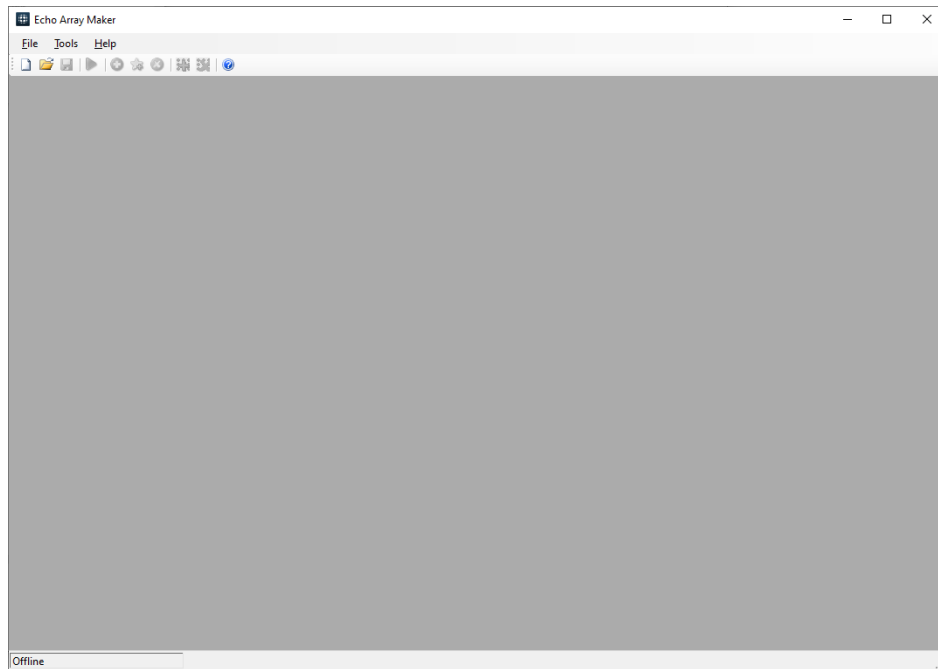
Activating the Instrument

To run a protocol created from the Echo Array Maker application on an Echo Liquid Handler, the user must activate this application for each Echo Liquid Handler. Each application has to be activated for the instrument connected.

- The Echo Array Maker application must be activated with the software license key provided by Beckman Coulter.
- If the Echo Array Maker application was installed with the Echo Liquid Handler by a Beckman Coulter support engineer, the activation step should not be necessary.

1 Start the Echo Array Maker application. See Starting the Software for more information.

2 In the **Connect to Instrument** dialog box, type the name or IP address of the Echo server to connect to and click **Connect**.

Figure 3.5 Connect to instrument dialog box
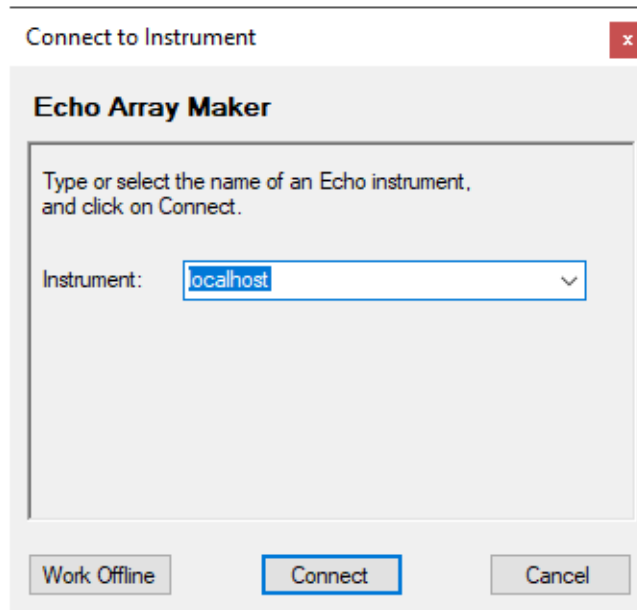
3 Click the **Tools** tab in the **Toolbar** and select the **Activate Instrument** option.

4 Enter the license key. The license key is an encrypted block of text that authorizes the user to run the Echo Array Maker application with a specific Echo Liquid Handler

The license key can be entered in either of the following ways:

- Copy the license key from the file received from Beckman Coulter and paste it into the **License Key** text box.

- Click the **Open License Key File** button and browse for the license key file.

Figure 3.6 Activate instrument screen
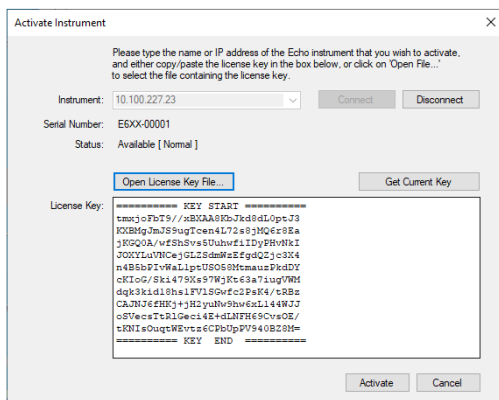
NOTE The **Get Current Key** function is a useful troubleshooting tool used to verify that the key is written correctly to the instrument. When the **Get Current Key** button is clicked, the application searches for the license key and inserts it into the **License Key** text box. In case of an error, send the encrypted key to Beckman Coulter to determine if the license key is corrupted or if it applies to a different instrument.

5 Click the **Activate** button.

The Echo Liquid Handler should be activated now. This procedure is not required again unless a different instrument is activated or the application needs to be upgraded.

Importing the Labware

When connecting to an Echo instrument for the first time, the associated Labware files must be imported. This is required each time the Echo Array Maker application is connected to a new Echo instrument or if the Labware for a previously connected Echo changes. If the user skips this step, they may find that an error occur when loading plate types.

To import Labware:

1 Select the **Tools > Labware Definitions** menu option. The **Plate Type List** dialog box is displayed.

Figure 3.7 Labware Definitions dialog box

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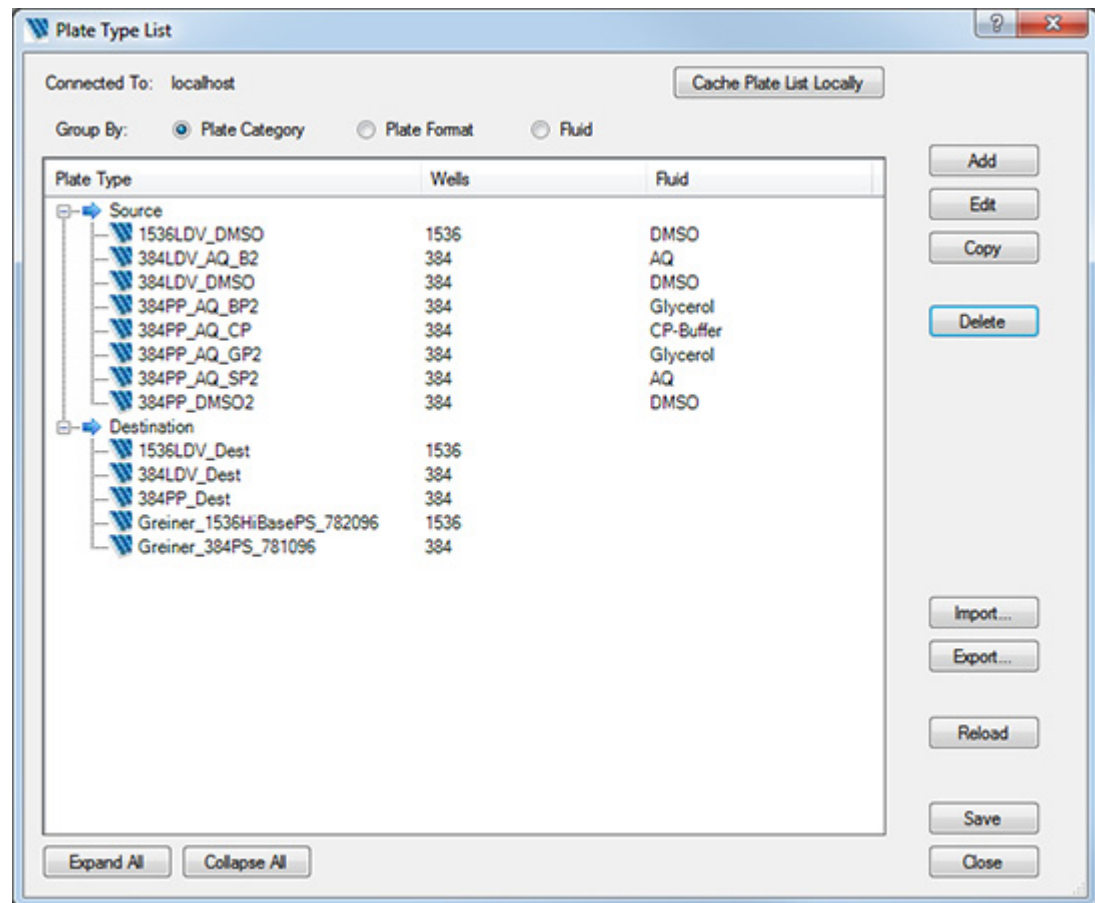
2 Click **Import** to load the Labware files. The **Open Labware File** dialog box is shown.

---

3 Navigate to and select `C:\Labcyte\Echo\Protocols\EAMDestinationLabware.elwx`.

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4 Click **Open** to load the Labware file. The following Labware Destination plates types are added:

- 4-Slide-Holder
- Greiner_CrystalQuick_96
- Intelliplate_96x3well_LP
- Intelliplate_96x3well_LVR
- SwissCI_96x3well

Figure 3.8 Labware Definitions dialog box after EAMDestinationLabware.elwx file is imported
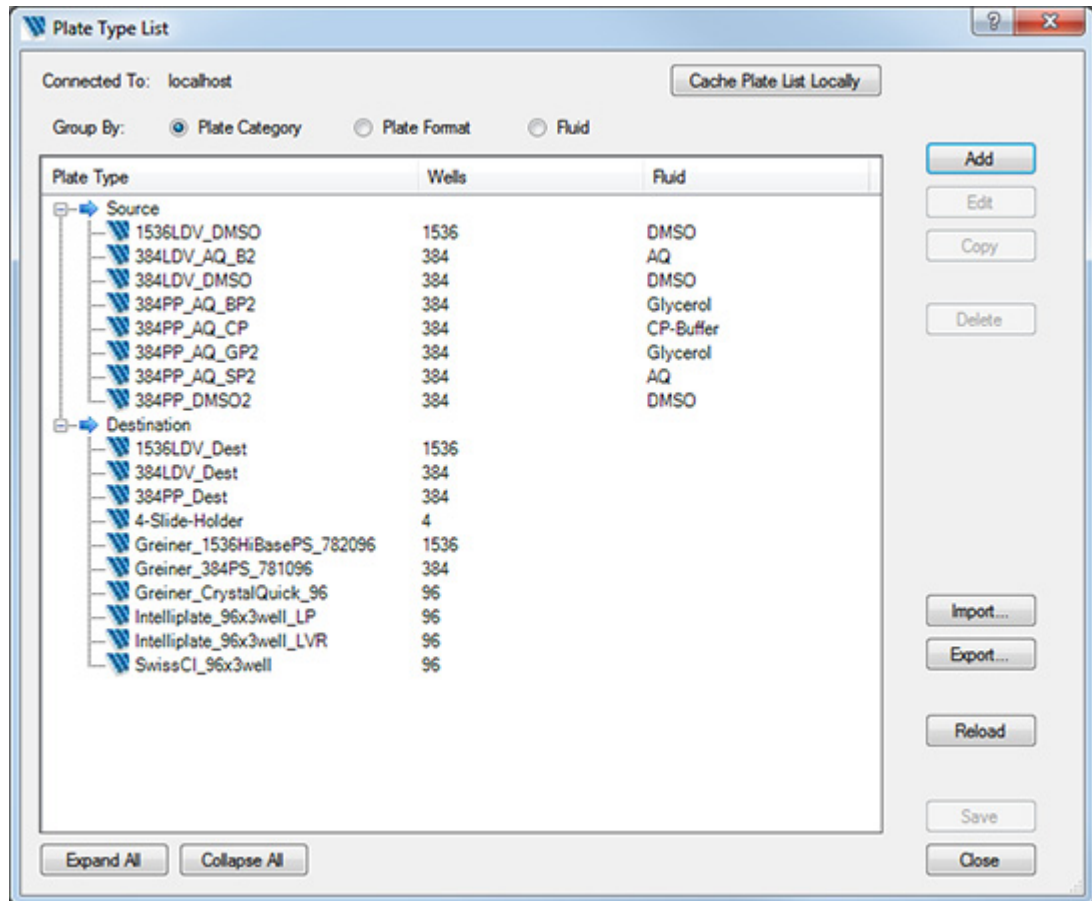
5   Click **Save** to save the imported Labware.

6   Click **Close** to exit the **Plate Type List** dialog box.

Understanding the Main Window

When an existing protocol is opened, the **main Window** displays the **Protocol** window. If a new protocol is created, the **Protocol Setup** window is shown before the **main Window**. For more information on the **Protocol Setup** window, see Starting a New Protocol.

Figure 3.9 Main Window
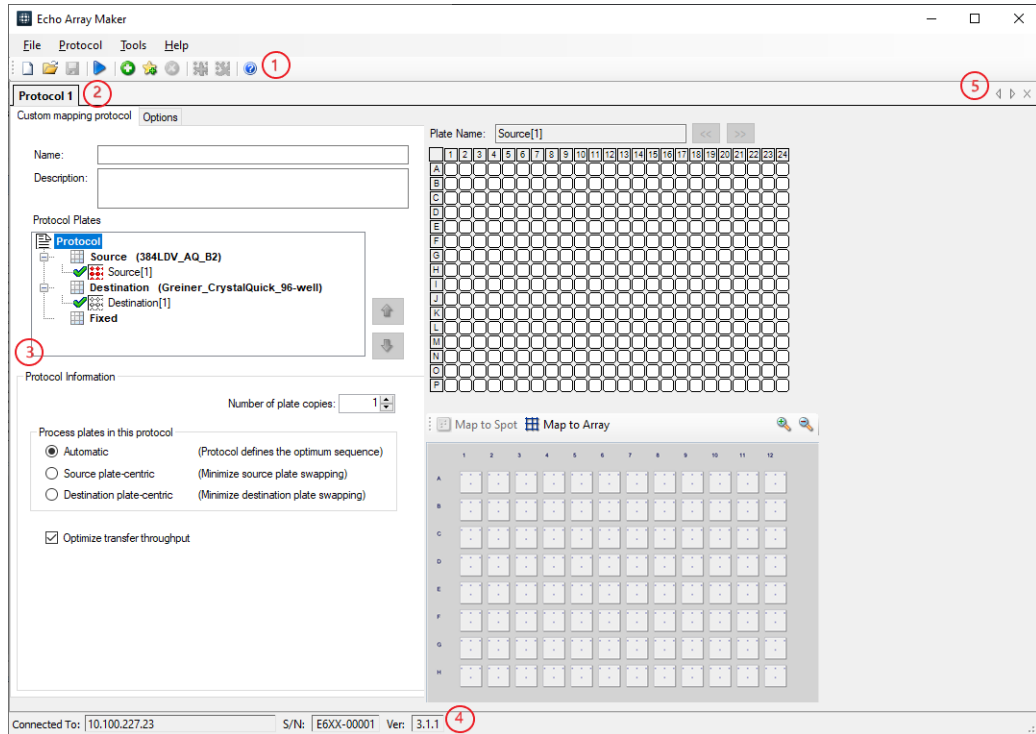
The table below describes the buttons/fields or sections in the **Main Window** and their functionality.

Table 3.1 Callout table for Main Window

Callout Number	Name	Description
1	Toolbar	The toolbar contains software menus that provide options to open and save transfer protocols, set up the software, define Labware, run the protocol, customize protocol options, and display the online Help. The icons in the toolbar provide shortcuts to the most frequently selected options, such as the Run Protocol function. For a detailed description, see Toolbar.
2	Protocol window	The protocol window is labeled with the protocol file name. The software uses an `.eam` file extension and stores the file in the default directory: `C:\Labcyte\Echo\Protocols`. The default directory can be changed to a user specified directory.
3	Protocol window tabs	The window tabs open the following software windows: • **Main Protocol window** — The main Protocol window is the first window that is displayed when a new or existing protocol is opened. It contains all of the default protocol data necessary to perform the transfer. For a detailed description, see Protocol Tab. • **Options window** — The Options window displays protocol-specific options, such as survey history, output file type, and report formats. For a detailed description, see Options Tab.
5	Status bar	The status bar displays Echo connection information, such as instrument name, serial number, and the version of Echo client software that is running.
6	Navigation and Exit buttons	The left and right arrows become active when there are too many protocols open to view all of the file names. The arrows shift the protocol tabs left or right to display the file names. The **Exit** icon closes the displayed protocol.

Setting Up the Software

The Echo Array Maker application is simple to set up. Default settings, such as output file type and report format, can be modified here. The Echo Array Maker application provides transfer data in three file formats (csv, xml, and txt) with reporting options that can be customized to meet protocol-specific needs.

To change the default settings, and set up preferences:

1 Open the **Tools** menu and select **Preferences**.

Figure 3.10 Preferences/Options dialog box
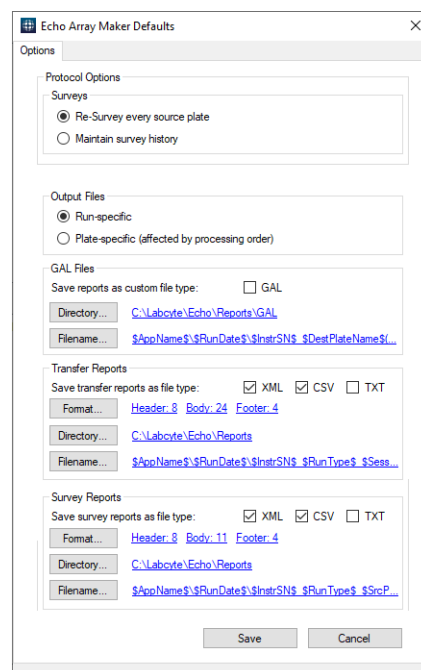
2 Select **Maintain survey history** to re-use the current plate survey for more than one transfer operation for a specified period of time. For more information, see Surveys.

3 Select **Run-specific** or **Plate-specific** for the output files.

- **Run-specific** — Stores all of the transfer results in a file.
- **Plate-specific** — Stores all of the transfer results in separate files.

4 Select GAL files to generate reports in the custom GAL file type.

- **Directory** — Change the directory location for the GAL report.
- **Filename** — Change the file name for the GAL report.

5 Customize the transfer and survey reports:

- **File type** — Select XML, CSV, and/or TXT file formats.
- **Format** — Customize the transfer/survey report header, body, and footer.
- **Directory** — Change the directory location for the transfer/survey report.
- **Filename** — Change the file name for the transfer/survey report.

These options are used as default settings for all transfer protocols. To change the options for an individual protocol, use the **Options** tab. For more information, see Options Tab.

Shutting Down the Software

There are two ways to exit the Echo Array Maker application:

- Open the **File** menu and select **Exit**.

Figure 3.11 Exit function in the File menu
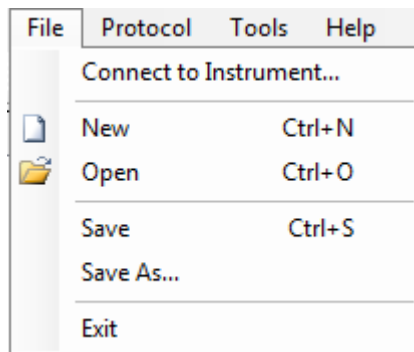
- Click the **Close** icon in the application.

Figure 3.12 Close window icon
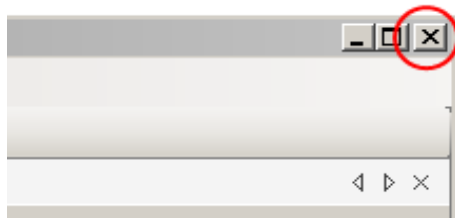
Software Operations

This chapter describes how to use the Echo Array Maker application. It includes the following topics.

Understanding Destination Arrays

A destination array incorporates a Labware definition and custom spotting patterns into a single object for creating transfer protocols. A *Destination Array* can be composed of several arrays each with their own unique spotting pattern.

There are five destination array examples that are available when Echo Array Maker is installed. As mentioned in the previous section, the supporting Labware for these default Destination Arrays may need be imported before using these.

The default Destination Arrays and corresponding Labware and patterns are listed below:

Labware	Default Destination Array	Pattern(s)
4-Slide-Holder	4-Slide-12x384-well_Array	384-well pattern
Greiner_CrystalQuick_96	Greiner_CrystalQuick_96-well	3x1 pattern
Intelliplate_96x3well_LP	Intelliplate_96x3well_LP	3x1-well pattern Reservoir
Intelliplate_96x3well_LVR	Intelliplate_96X3well_LVR	3well_pattern
SwissCI_96x3well	SwissCI_96x3well	Reservoir 3-spot_pattern

Additional destination array types can be added by editing the destination array types listed above.

Destination arrays also have patterns defined within them. For more information about patterns referenced above, see Managing Patterns.

Labware Definitions For Array Making

Labware for Array Making incorporates several additional attributes in comparison to standard microplate definitions. The details associated with each parameter and their relationship to one another are defined here. Creating and using each attribute is described in the upcoming sections, Creating Patterns for Array Making and Managing Patterns.

Labware

To properly define a destination array, the user must first define the physical substrate the array will be created on. This is achieved through the creation of a new Labware definition. The Labware, depending on its configuration, is capable of holding any number of different arrays.

A Labware definition specifies physical characteristics required by the Echo Liquid Handler for proper positioning. The dimensions include information such as plate height and the offsets that indicate to the device where the wells are defined. When transferring fluids to the bottom of a microplate well, the Labware definition corresponds to the physical characteristics of the microplate. Each individual well can serve as the foundation of a destination array. When transferring fluids to microarrays in a slide holder, the Labware definition corresponds to the physical characteristics of the slide holder. Each well of the slide holder represents the location of a slide and serves as the foundation to create destination arrays. An example of this is provided in the sections below. For more information about defining Labware, see Labware Definitions.

Labware is a shared resource across all Echo Software Applications. Labware definitions are stored within the Echo Liquid Handling software. Upon first installing the Echo Array Maker software, the corresponding Labware definitions for the default arrays and patterns will need to be imported if not previously done. This should be performed by a Service Engineer upon installation.

The default Labware file for the Echo Array Maker software is located at:
C:/Labcyte/Echo/Protocols/EAMDestinationLabware.elwx

New Labware definitions can be created directly from within the Echo Array Maker software, and these definitions are stored within the Echo Liquid Handling software. These definitions may require reloading if the software is upgraded or if the computer is connected to a different device. This process is different than defining Labware for array making. For more information, see Importing the Labware.

The Destination Arrays and Patterns are specific to the Echo Array Maker software and are accessed and stored only in the Echo Array Maker software.

4-Slide-Holder

In a typical slide holder, all microarrays are in a single row. Each microarray resides in a separate column.

In the example below, four microarrays would require 4 columns on the slide holder in a single row (Columns: 4, Rows: 1).

Figure 4.1 Example 4-Slide microarray holder
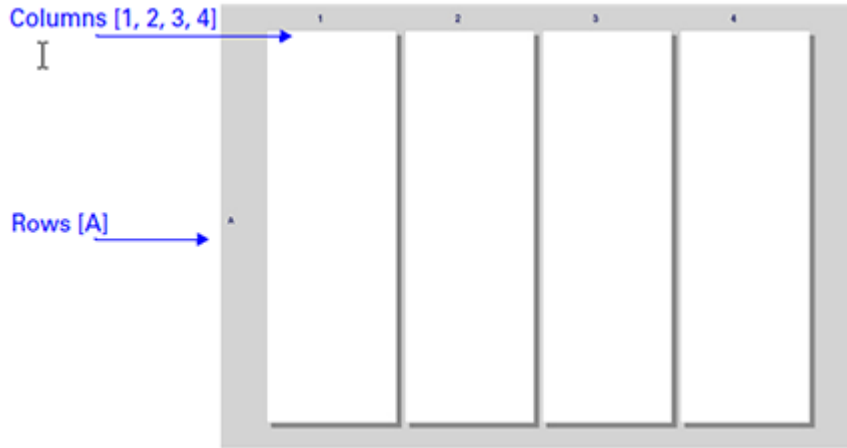
The Labware definition for the 4-Slide-Holder is created using the **Plate Type Editor** dialog box. The parameters and values are shown below. To load the **Plate Type Editor**, select **Labware Definitions** from the **Tools** menu and click **Add.** For more information on the **Plate Type Editor**, see Plate Type Editor.

Figure 4.2 Labware values for a 4-Slide-Holder
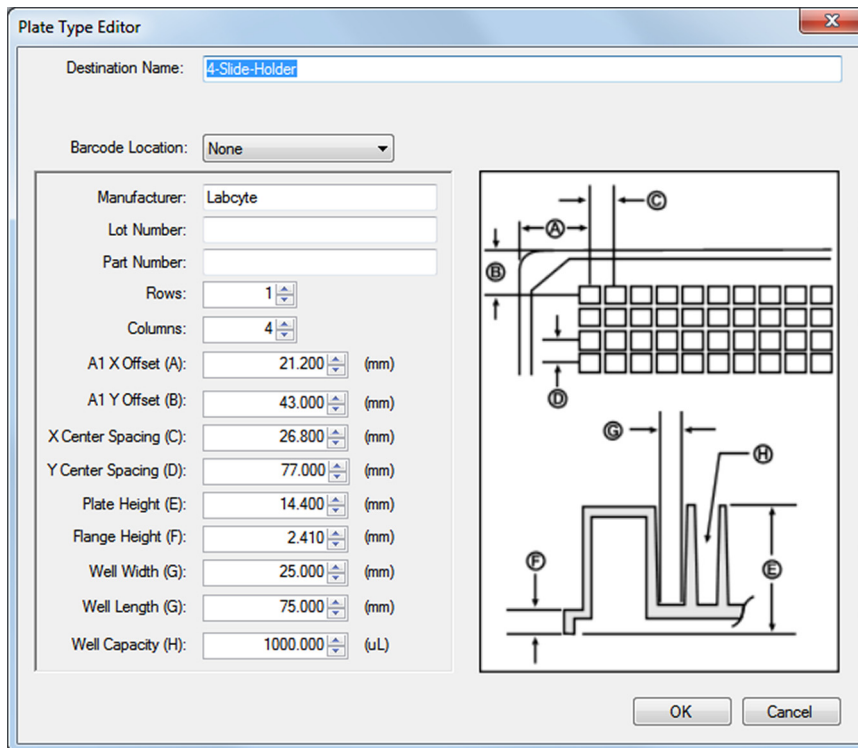
The **Echo Destination Array Editor** allows the user to define the destination arrays and patterns for the selected **Labware.** To load the **Echo Destination Array Editor**, select **Destination Arrays** from the **Tools** menu. For more information on the **Echo Destination Array Editor**, see Destination Arrays.

Figure 4.3 Defining the destination array and patterns for a 4-Slide-Holder
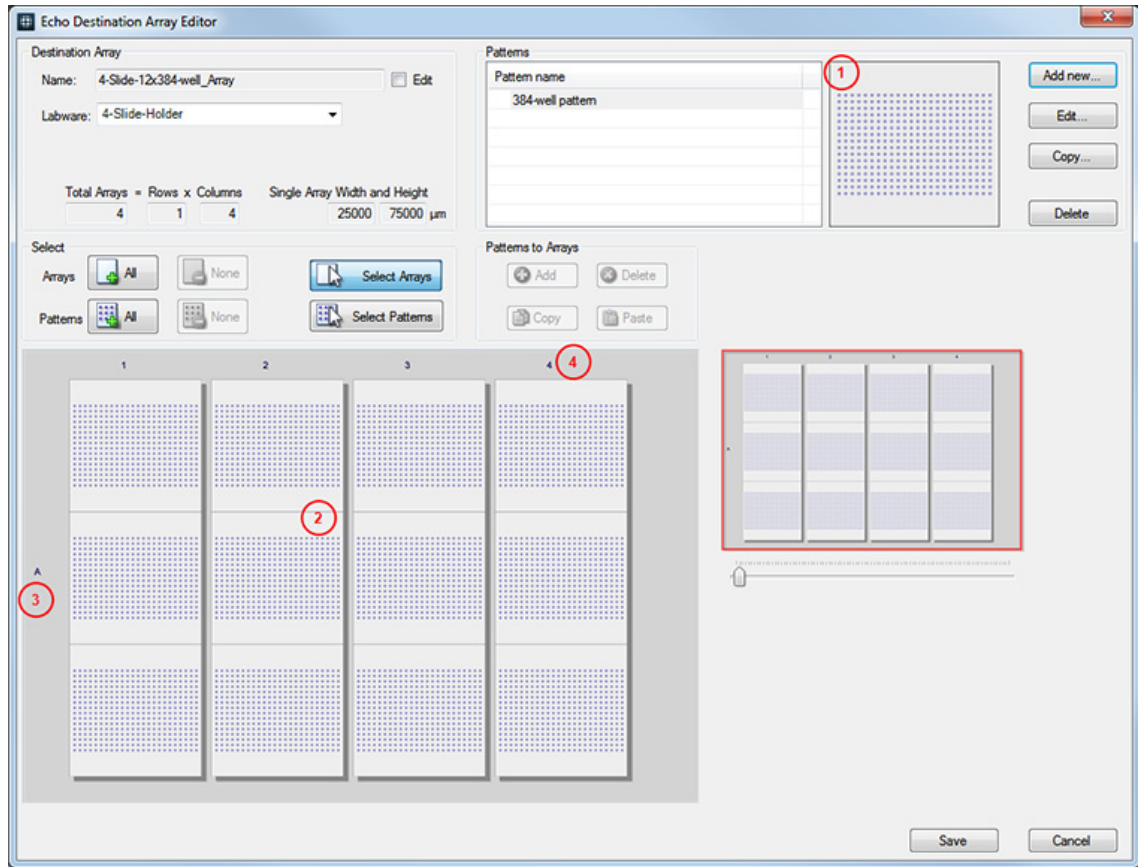
The table below describes the buttons/fields or sections in the **Echo Destination Array Editor** dialog box and their functionality.

Table 4.1 Callout table for Echo Destination Array Editor dialog box

Callout Number	Name	Description
1	Pattern	Visual representation for the pattern.
2	Destination Array	Visual representation of the destination array.
3	Rows	Visual representation of the number of rows in the destination array. In this example, there is one row.
4	Columns	Visual representation of the number of columns in the destination array. In this example, there are four columns.

NOTE For information on possible error icons when using the **Destination Array Editor** dialog box, see Understanding Destination Array Errors.

Crystallography Plate

In a typical crystallography plate, there are 96 wells that can be used to create 96 arrays. These wells or arrays are separated into eight rows (Rows: 8) and twelve columns (Columns: 12).

Figure 4.4 Greiner_CrystalQuick_96-well microplate
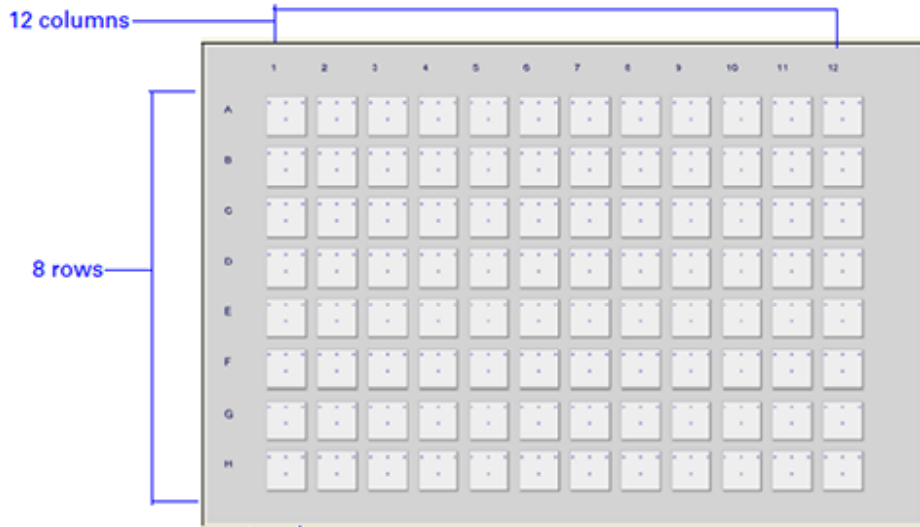
The Labware for the Greiner_CrystalQuick_96-well array type is defined using the **Plate Type Editor** dialog box. The parameters and values are shown below.

Figure 4.5 Labware values for Grenier_CrystalQuick_96
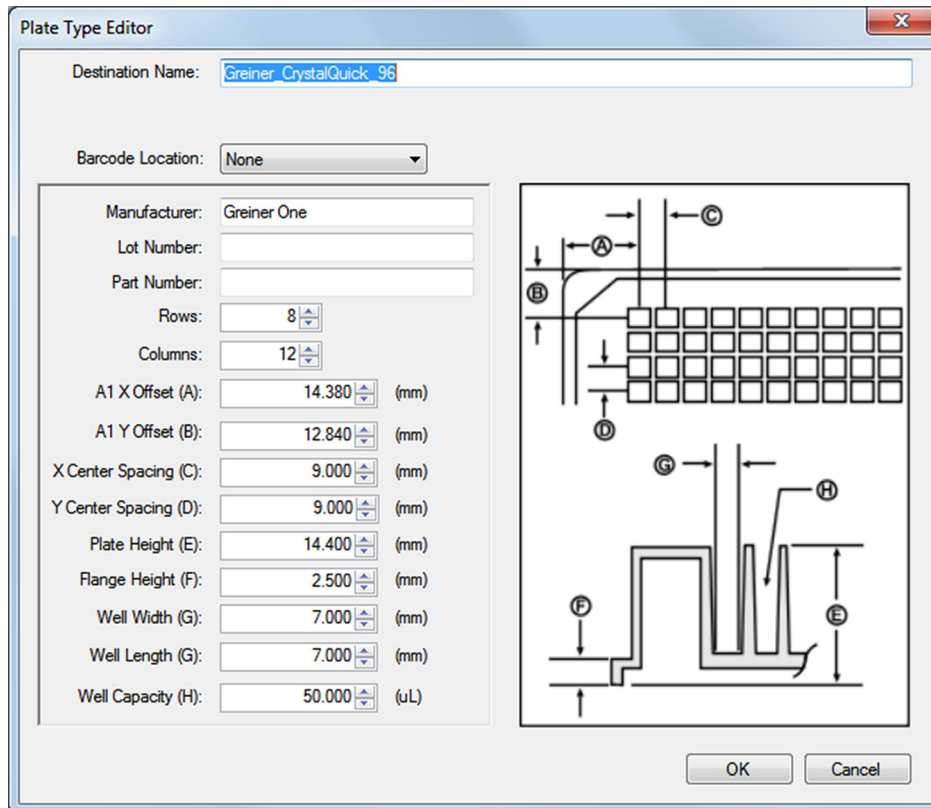
The Echo **Destination Array Editor** allows the user to define the destination arrays and patterns for the selected Labware.

Figure 4.6 Defining the destination array and patterns for a Grenier_CrystalQuick_96-well microplate
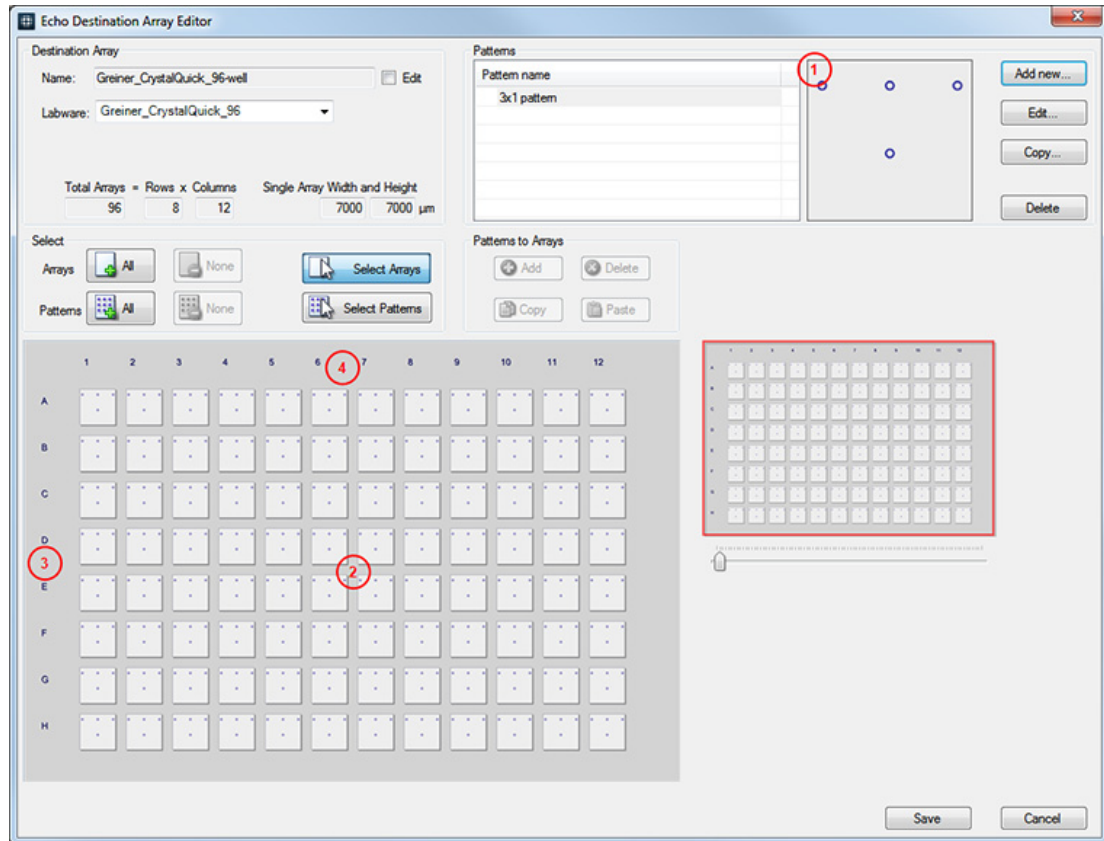
The table below describes the buttons/fields or sections in the **Echo Destination Array Editor** dialog box and their functionality.

Table 4.2 Callout table for Echo Destination Array Editor dialog box

Callout Number	Name	Description
1	Pattern	Visual representation for the pattern.
2	Destination Array	Visual representation of the destination array.
3	Rows	Visual representation of the number of rows in the destination array. In this example, there is eight rows.
4	Columns	Visual representation of the number of columnsin the destination array. In this example, there are twelve columns.

NOTE For information on possible error icons when using the Destination Array Editor dialog box, see Understanding Destination Array Errors.

Creating Patterns for Array Making

Patterns are the series of spots that can be assigned to one or more arrays within a Destination array. Each array can contain one or more unique patterns and each Destination array can contain one or more arrays.

For more information on patterns, see the following topics:

- Adding a Pattern to the Pattern Library
- Editing a Pattern in the Pattern Library
- Copying a Pattern in the Pattern Library
- Deleting a Pattern in the Pattern Library
- Manipulating Patterns

Figure 4.7 Destination Array Editor dialog box
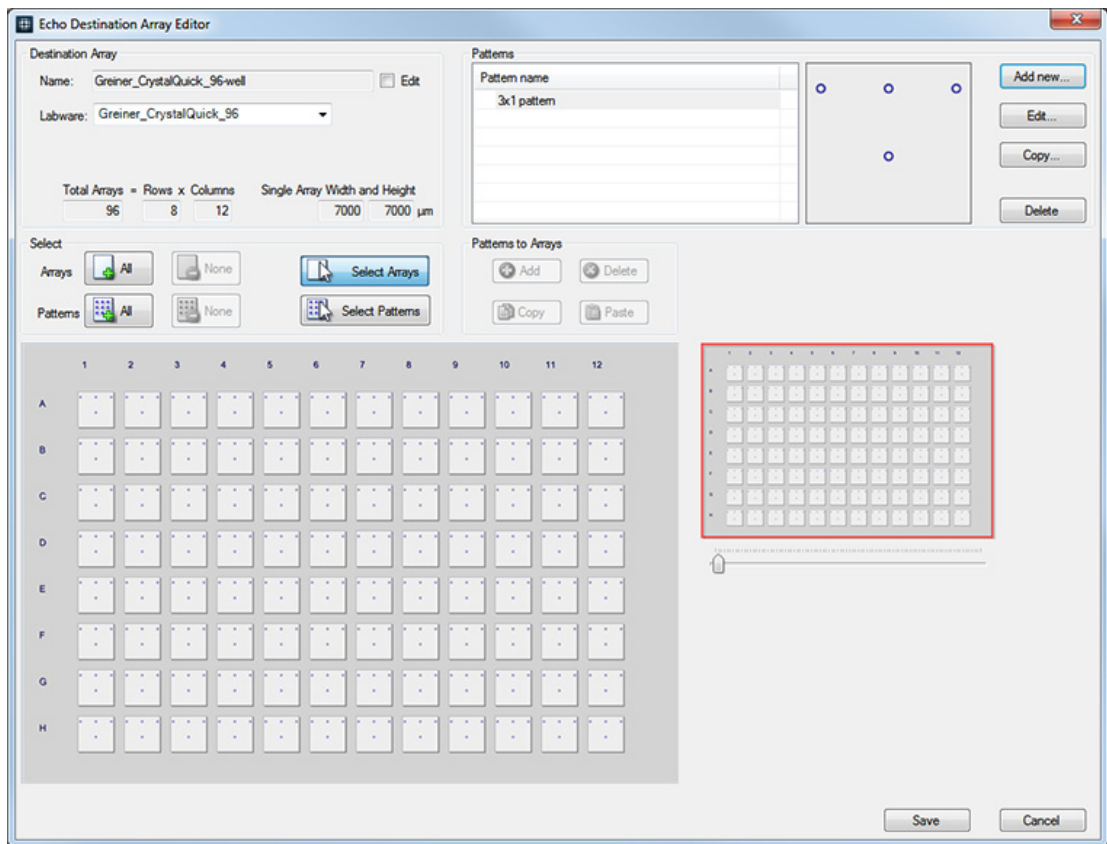
Viewing the Destination Array Library

To view existing destination arrays:

1 Select the **Tools > Destinations Arrays** menu option. The **Destination Arrays** dialog box is displayed.

Figure 4.8 Destination Arrays dialog box

2 Select an **Array Type** to view a graphical representation of the array.

Adding a New Destination Array

To add a new destination array:

1 Select the **Tools > Destinations Arrays** menu option. The **Destination Arrays** dialog box is displayed. See Destination Arrays dialog box.

2 Click the **Add new** button. The **Destination Array Editor** dialog box is displayed.

Figure 4.9 Destination Array Editor dialog box
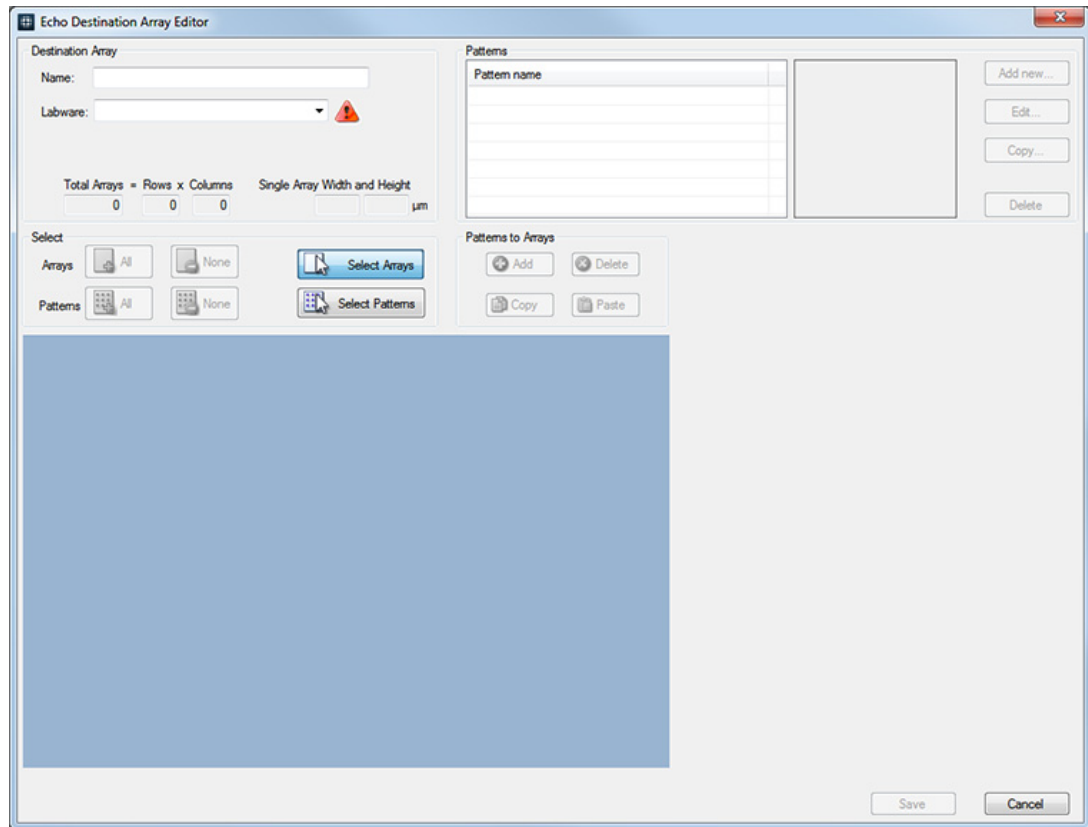
3 Enter the **Name** of the array.

4 Select **Labware** from the drop-down menu. Based on the Labware selected, the **Number of Arrays**, **Rows of Arrays**, and **Columns of Arrays** fields will be automatically filled in with the corresponding values.

For example, if the Labware selected is the 4-Slide-Holder, the fields will automatically be filled in to reflect the Labware definition for Rows and Columns. In this case, that is 1 Row and 4 Columns.

> **NOTE** The red exclamation icon indicates that no Labware has been set. Once the user selects valid Labware, the red exclamation icon will be removed. For more information on possible error icons, see Understanding Destination Array Errors.

Figure 4.10 4-Slide-Holder selected for the Labware
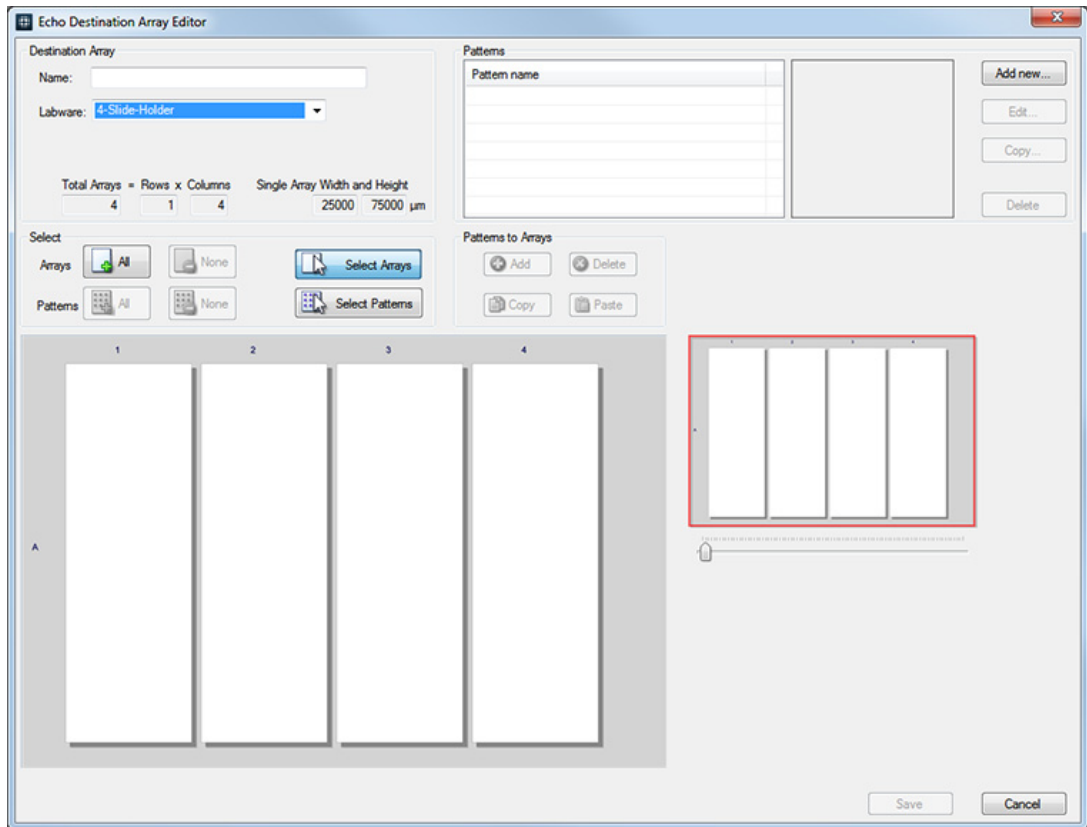
If the Labware selected is the SwissCI_96x3well plate, the fields will automatically be filled in to reflect that Labware definition. In this case, that is 8 Rows and 12 Columns.

Figure 4.11 SwissCI_96x3well selected for the Labware
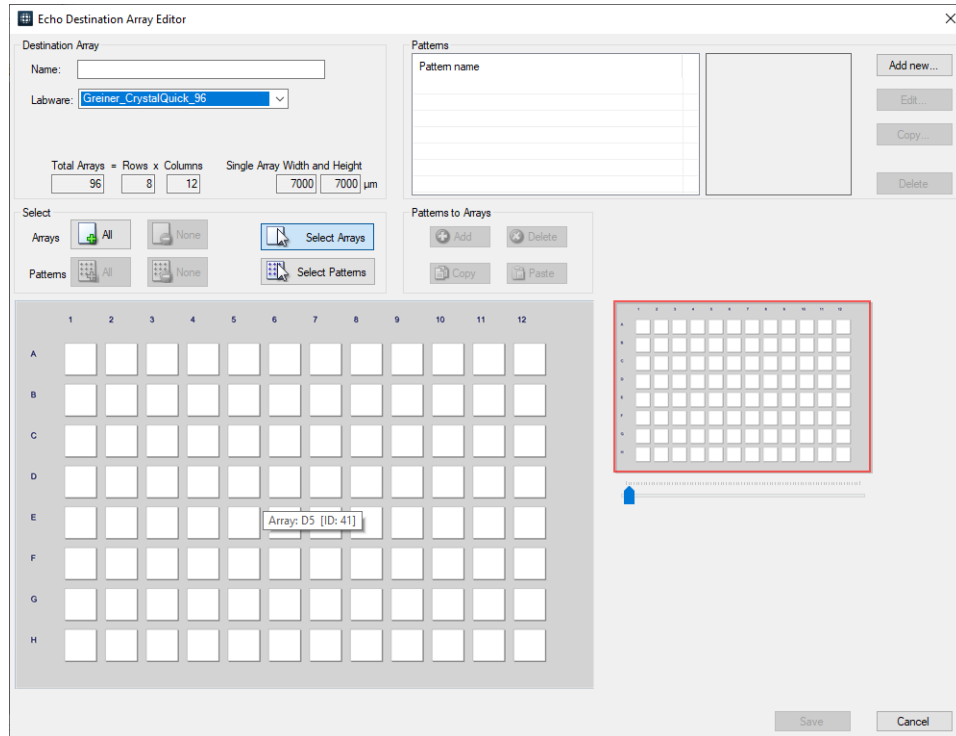
5 Create or select a pattern to add to an array. For more information on how to create or add a new pattern, see Adding a Pattern to the Pattern Library and Editing a Pattern in the Pattern Library.

6 Highlight one or more arrays and click **Add** to add the selected pattern. For more information on how to add a pattern to an array, see Adding Patterns to a Destination Array.

7 Click **Save** to save the new array.
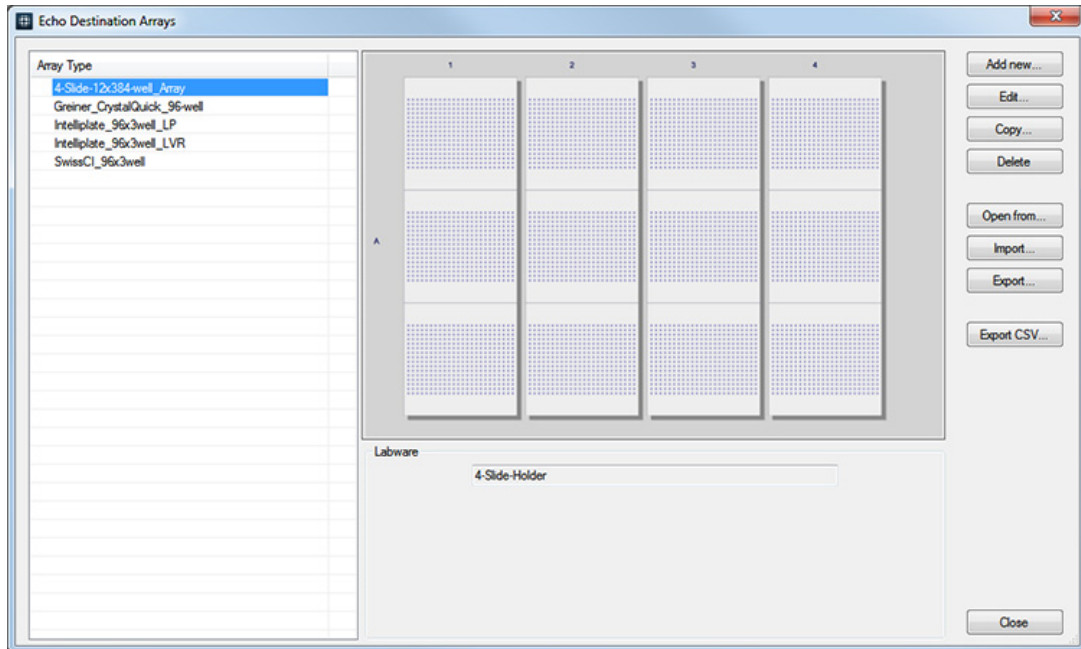
Editing a Destination Array

To edit an existing destination array:

1 Select the **Tools > Destinations Arrays** menu option. The Destination Arrays dialog box is displayed. See Viewing the Destination Array Library.

2 Select the **Array Type** and click **Edit** to modify the destination array properties. The Destination Array Editor dialog box is displayed. See Destination Array Editor dialog box.

3 To create or add a pattern to add to the destination array, see Adding a Pattern to the Pattern Library and Editing a Pattern in the Pattern Library.

4 To add the pattern to the destination array, see Adding Patterns to a Destination Array.

5 Complete any other desired changes to the patterns and destination array.

6 Click **Save** to save the array.

Copying a Destination Array

Copying an existing Destination Array can be used to associate an array with a new type of Labware without having to recreate the array or the patterns associated with it.

To copy an existing destination array into a new one (duplicate):

1 Select the **Tools > Destinations Arrays** menu option. The Destination Arrays dialog box is displayed. See Destination Arrays dialog box.

2 Select the **Array Type** and click **Copy** to copy the destination array. The Destination Array Editor dialog box is displayed. See Destination Array Editor dialog box.

3 The software automatically appends **"- Copy-01"** to the name for the copied destination array. The user can keep this new name or change the **Name** for the destination array.

4 Complete any other desired changes to the patterns and destination array.

5 Click **Save** to save the destination array.

Deleting a Destination Array

To delete an existing destination array:

1 Select the **Tools > Destinations Arrays** menu option. The Destination Arrays dialog box is displayed. See Destination Arrays dialog box.

2 Select one or more **Array Type** and click **Delete** to delete the destination array. The **Confirm Delete** dialog box is displayed.

3 Click **Yes** in the **Confirm Delete** dialog box to delete the destination array.

   NOTE Click **No** in the **Confirm Delete** dialog box to cancel deleting the destination array.

⚠ **CAUTION**

   Use the Delete destination array option with caution, as there is *no undo*.

Open From an Existing Destination Array

The **Open From** option allows the user to view a destination array, but does not import the destination array to the list of destination arrays. To import the array that was opened using the **Open From** function, the user must save the array.

NOTE A destination array *must* be imported before it can be used in a protocol. Using the **Open From** option does not import the destination array. The user must save the array after opening it in order to use it.

To open an existing destination array:

1 Select the **Tools > Destinations Arrays** menu option. The Destination Arrays dialog box is displayed. See Destination Arrays dialog box.

2 Click **Open From** to open an existing array. The **Import Destination Arrays** dialog box is displayed.

Figure 4.12 Import Destination Arrays dialog box

3 Select the destination array (`.holder`) to be opened and click **Open**. The **Destination Array Editor** dialog box is displayed with the selected destination array. See Destination Array Editor dialog box.

4 Complete any desired changes to the patterns and destination array.

5 Click **Save** to save the destination array.

Importing an Array

The **Import** option allows the user to import one or more arrays to the list of Destination Arrays.

To import an existing destination array:

1 Select the **Tools > Destinations Arrays** menu option. The **Destination Arrays** dialog box is displayed. See Destination Arrays dialog box.

2 Click **Import** to import an existing array. The **Import Destination Arrays** dialog box is displayed. See Import Destination Arrays dialog box.

3 Select the destination array (`.holder`) to be imported and click **Open**. The selected destination array is added to the list of array types. To view details for the imported destination array, open the **Destination Array Editor**.

NOTE If the user attempts to import a destination array with the same name as an existing destination array, a warning dialog box is displayed, asking the user if the destination array should be overwritten or not.

Exporting a Destination Array

Use the **Export** option to export destination arrays developed on one Echo Liquid Handler to another Echo Liquid Handler.
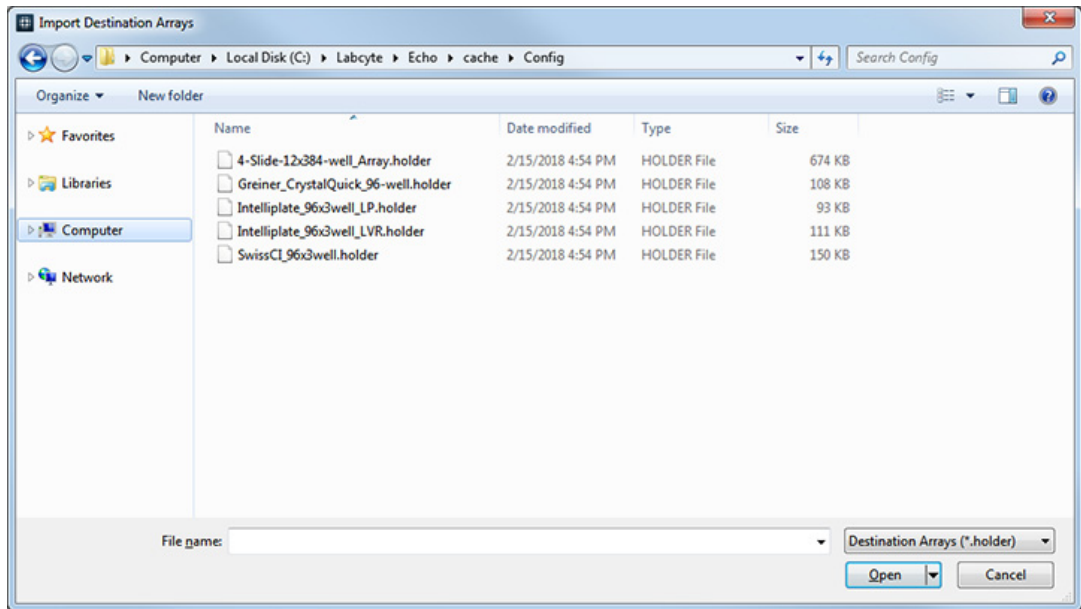
To export an existing destination array:

1 Select the **Tools > Destinations Arrays** menu option. The **Destination Arrays** dialog box is displayed. See Destination Arrays dialog box.

2 Select the **Array Type** and click Export to export the array type. The **Browse For Folder** dialog box is displayed.

Figure 4.13 Browse For Folder dialog box
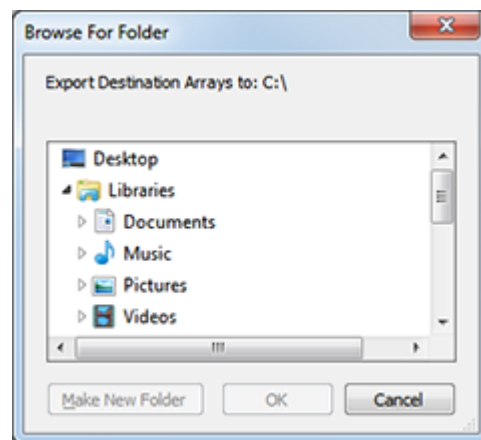
3 Select the location to export the array to and click **OK**.

Click **Cancel** in the **Browse For Folder** dialog box to cancel exporting the destination array.

Exporting a CSV

Exporting a .csv file after creating a Destination Array allows the user to create a .csv file that will contain the specifications of the pattern(s) transferred to the destination array. This should include the exact position of individual spots on the array for use with downstream analysis devices.

To export as a CSV file:

1 Select the **Tools > Destinations Arrays** menu option. The **Destination Arrays** dialog box is displayed. See Destination Arrays dialog box.

2 Select the **Array Type** and click **Export CSV** to export the array type as a CSV. The **Save As** dialog box is displayed.

Figure 4.14 Save As dialog box

3 Select the location to export the array to and click **Save**.

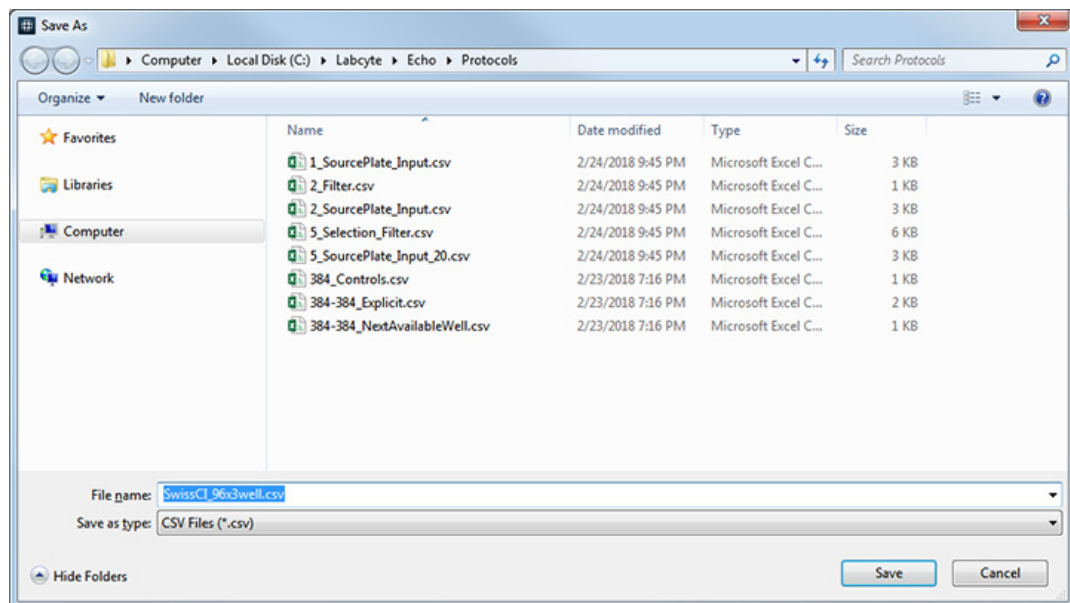**4** Click **Cancel** in the **Save As** dialog box to cancel exporting the array.

Understanding Destination Array Errors

Various warning and error icons are used to indicate if there is a problem with the destination array. Information such as plate type name, plate type definition, labware, and dimensions must all be correct to successfully use a destination array.

The table below describes the icons displayed for missing or incorrect information, possible error messages, and some possible solutions the user should try to fix the error(s).

NOTE The possible solutions listed below are only applicable for the Echo Destination Arrays dialog box. These messages are displayed in the Labware section at the bottom of the dialog box. In addition to the messages, solution buttons are available that allow the user to fix the errors.

If error icons are displayed in dialog boxes other that the Echo Destination Arrays dialog box, the user should use the tooltips to get information about the error.

Icon	Destination Array has Destination Plate Type Name	Destination Array has Destination Plate Type Definition	Destination Plate Type is defined in the Labware	Destination Plate Type is in the Destination Array and the Labware have the same dimensions	Message displayed	Possible solutions
No icon	Yes	Yes	Yes	Yes	None. Labware name is displayed.	Not applicable
⚠	Yes	No	Yes	Yes	*Labware is not included in the Destination Array.*	Click **Add to Destination Array** to add this Plate Type from Labware to the Destination Array.
⚠	Yes	Yes	Yes	Yes	*Labware and Destination Array refer to same Plate Type of different dimensions.*	1. Click **Update Labware** to copy this Plate Type from the Destination Array to the Labware Definitions. 2. Click **Update Destination Array** to copy this Plate Type from Labware to the Destination Array.

Icon	Destination Array has Destination Plate Type Name	Destination Array has Destination Plate Type Definition	Destination Plate Type is defined in the Labware	Destination Plate Type is in the Destination Array and the Labware have the same dimensions	Message displayed	Possible solutions
	Yes	No	Yes	No	*Labware is not included in the Destination Array, and Labware and Destination Array refer to same Plate Type of different dimensions.*	Click **Update Destination Array** to copy this Plate Type from Labware to the Destination Array.
	Yes	No	No	Not Applicable	*Labware is not defined in the Echo.*	None
	Yes	Yes	No	Not Applicable	*Labware is not defined in the Echo.*	Click **Add to Labware** to add this Plate Type from Destination Array to the Labware Definitions.

Managing Patterns

A spotting pattern indicates the geographical location for fluid transfers to a destination array. A pattern can consist of one or more spots in a custom arrangement. One or more patterns can be defined on one or more arrays when creating a destination array.

The topics below show different ways to manage patterns:

- Adding a Pattern to the Pattern Library
- Editing a Pattern in the Pattern Library
- Manipulating Spots in a Pattern
- Copying a Pattern in the Pattern Library
- Deleting a Pattern in the Pattern Library

Adding a Pattern to the Pattern Library

Patterns are created for specific array types. Pattern dimensions are limited by the array dimensions for which they were created.

To create a pattern:

1   Create or open an array. See Adding a New Destination Array or Editing a Destination Array.

2   In the **Destination Array Editor** dialog box, click **Add New** next to the **Patterns** library. The **Pattern Editor** dialog box is displayed.

Figure 4.15 Pattern Editor dialog box
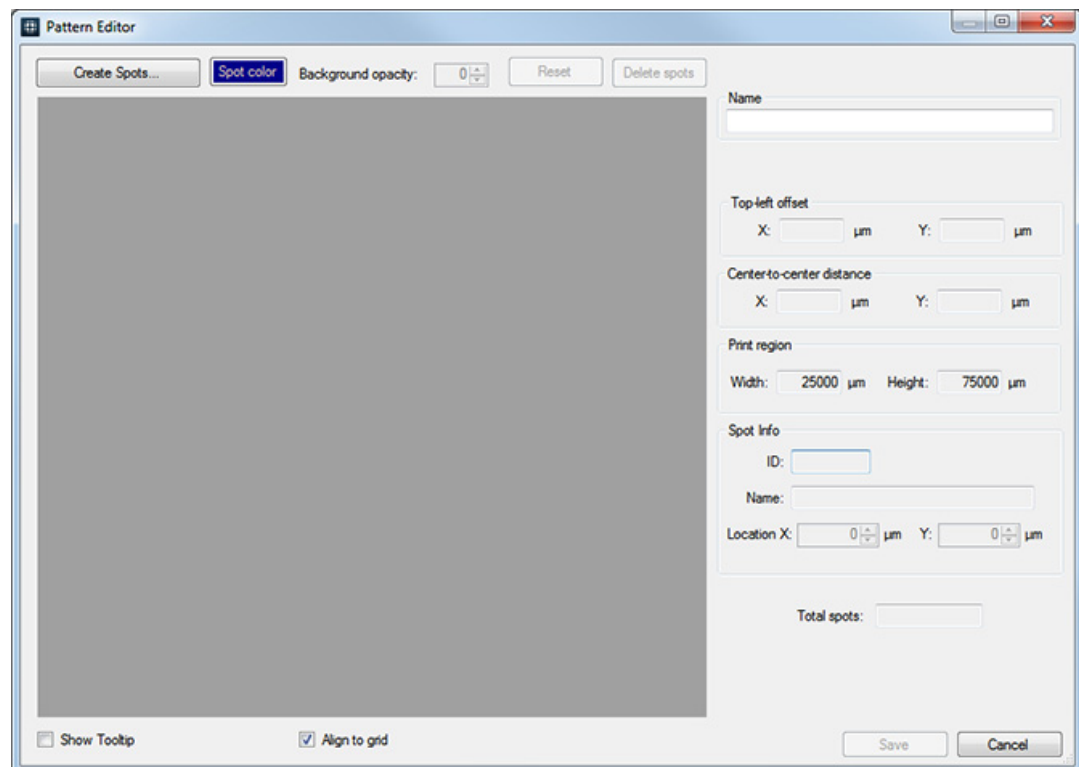
3   Enter the **Name** for the pattern.

4   Click **Create Spots**. The **Create Pattern** dialog box is displayed.

Figure 4.16 Create Pattern dialog box
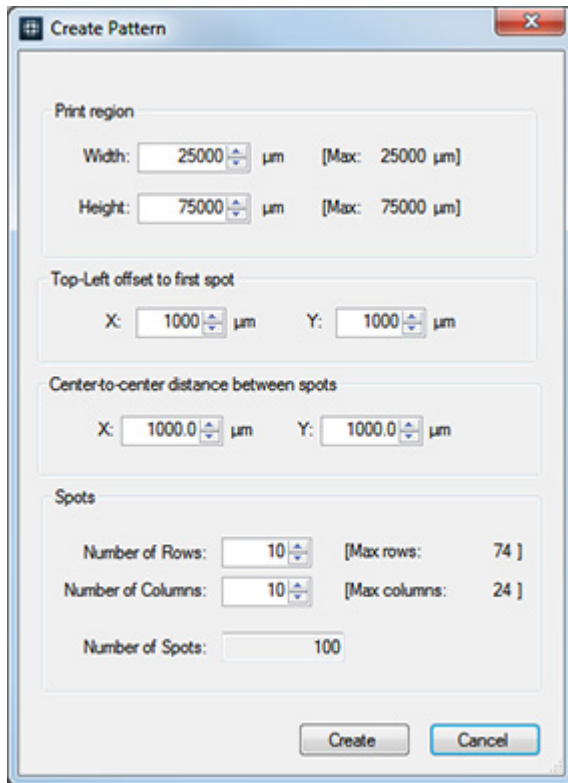
5   Set the **Top-left offset to the first spot** dimensions: **X** and **Y** in microns.

6   Set the **Center-to-center distance between spots** dimensions: **X** and **Y** in microns.

7   Set the **Number of Spots** implicitly by setting **Number of Rows** and **Number of Columns**. The maximum number of rows and columns are defined by the pattern Center-to-center distance between spots. As the distance between spots increases, the number of possible rows and columns will decrease. Alternatively, as the distance between spots decreases, the number of possible rows and columns increases.

8   Set the **Print region** dimensions. The **Print region** is defined as the **Width** and **Height** of the area within which the spots will be contained. The **Print region** is constrained by the dimensions of a single array. For example, in a 4-Slide-12x384-well_ Array, if a new pattern was created for use on the array, the **Print region** would default to the size of a single array, or slide in this case. In the example shown above, the **Width** is 25000 μm and the **Height** is 75000 μm.

If the default pattern that is defined for use in this array is used, the **Print region** is constrained to a size that is smaller than the actual height of a single array. When constrained, the **Width** would be 25000 μm and the **Height** would be 25000 μm. This allows the pattern to be duplicated to fit three times onto a single array as shown in the figures below.

Figure 4.17 384-well pattern duplicated onto the 4-slide-12x384-well_Array
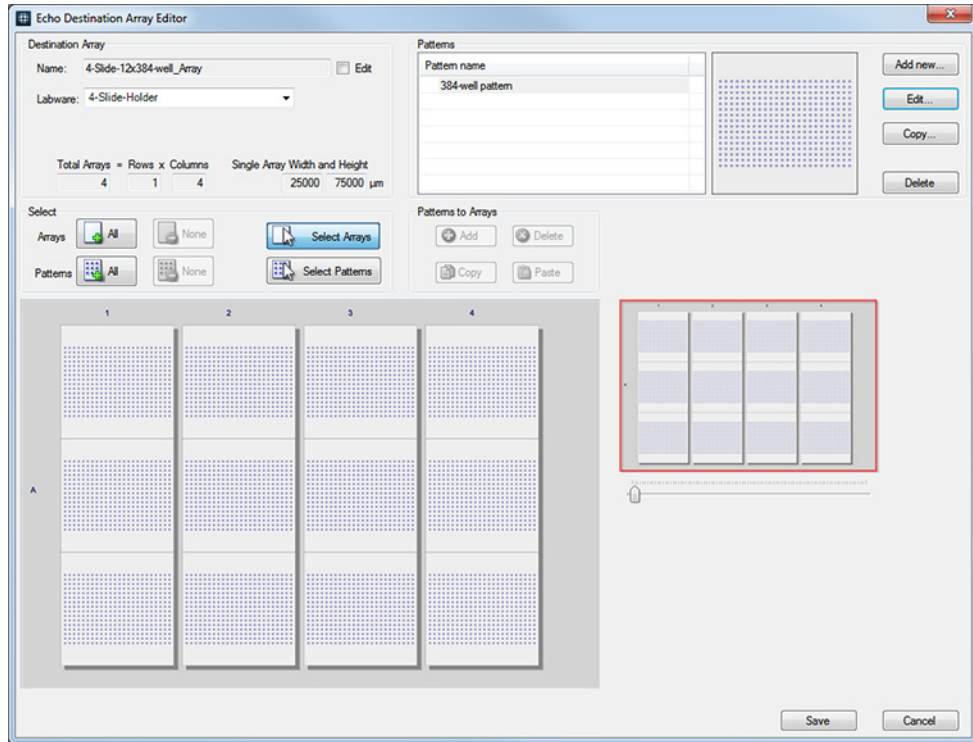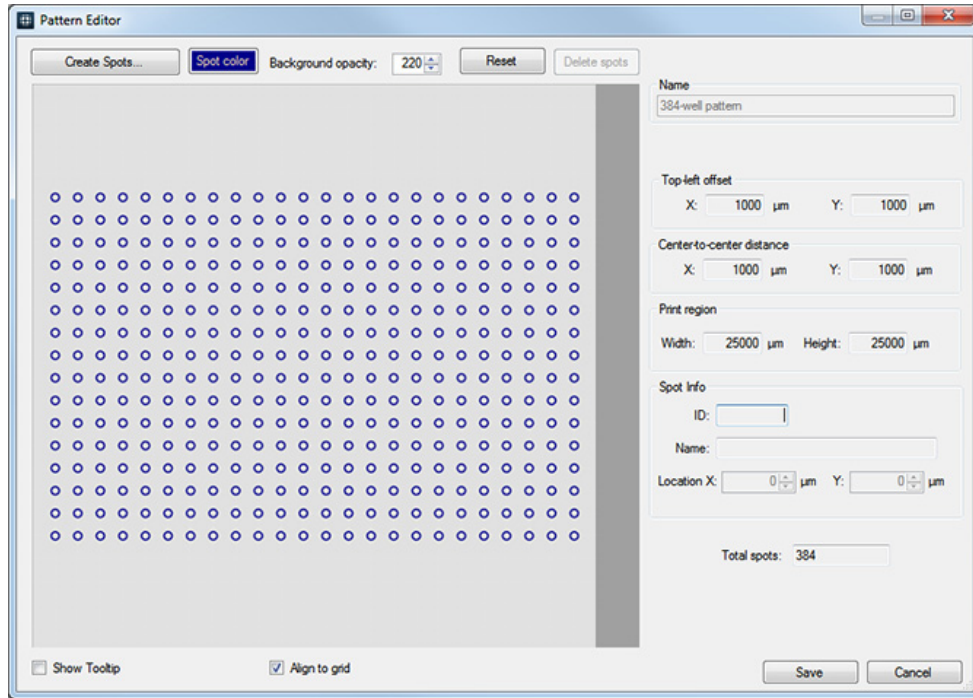
9 Click **Create** to create the pattern specified by the previous steps. The **Create Pattern** dialog box is closed and the user is returned to the **Pattern Editor** dialog box. See Pattern Editor dialog box.

NOTE Once the pattern is created and saved, the user is returned to the **Pattern Editor** dialog box. If the user hovers the mouse over one of the spots, information is shown in the **Spot Info** fields on the lower right side of the dialog box. If the user clicks on a spot, the editable fields are activated. **Spot Info** is automatically generated and is not editable by the user. Other fields such as **Name**, **Location X** and **Location Y** can be edited and can be used when the need arises to move an individual spot within a pattern. For more information, see Manipulating Spots in a Pattern.

Editing a Pattern in the Pattern Library

To edit a pattern:

1 Select and open an existing destination array. See Editing a Destination Array.

2 In the **Destination Array Editor** dialog box, select a pattern and click **Edit** in the **Patterns** section. The **Pattern Editor** dialog box is displayed.

Figure 4.18 Pattern editor dialog box
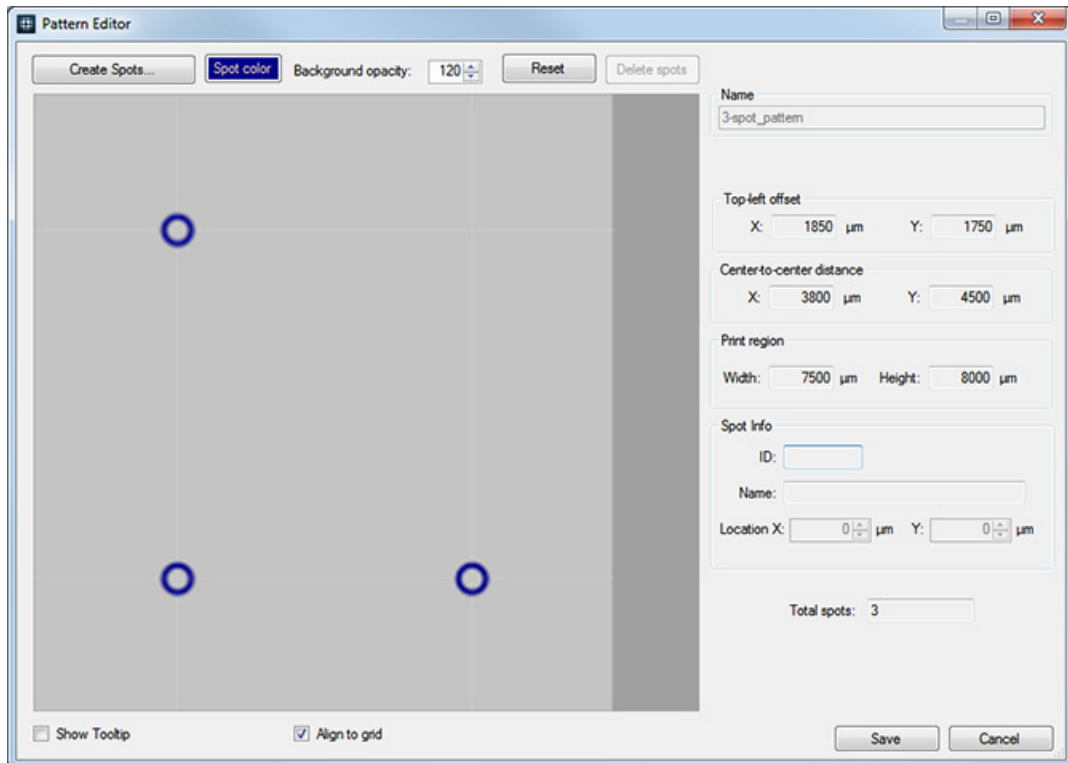
3 Click on the **Create Spots** button. The **Create Pattern** dialog box is displayed. Use this dialog box to edit and make changes to the desired fields.

Figure 4.19 Create Pattern dialog box

4 Click **Save** to save changes to the pattern. Click **Cancel** to discard any changes made and close the dialog box.

> **NOTE** If the user clicks the Cancel button in the **Pattern Editor** dialog box, the changes made in the **Create Pattern** dialog box will not be saved to the pattern.
>
> If the **Cancel** button was clicked after making changes to the pattern in the **Create Pattern** dialog box, these changes will not be saved to the pattern.

Figure 4.20 Pattern Editor dialog box
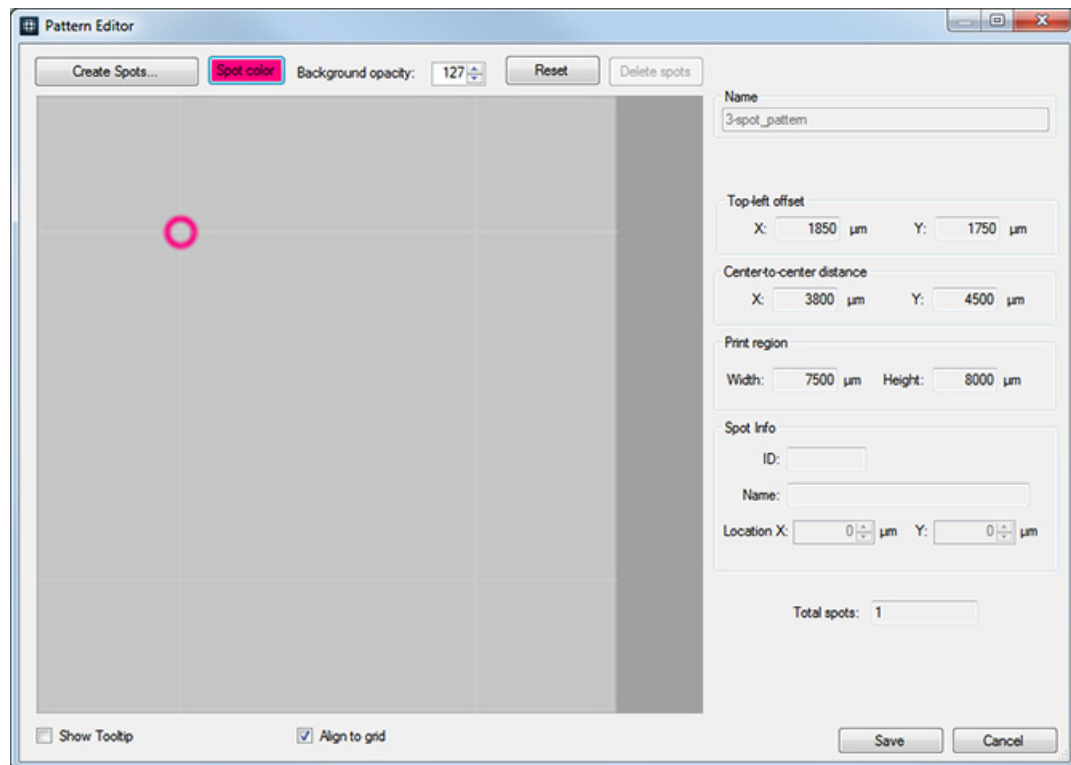
Manipulating Spots in a Pattern

The tasks below can all be completed in the **Pattern Editor** dialog box. See Pattern Editor dialog box.

> **NOTE** When referring to coordinates for spots, the coordinates are relative to the center of the pattern.

To select a spot

- Click on a spot to select a single spot.
- Hold the Shift or Ctrl key to select multiple spots.

> **NOTE** The user can also drag and select multiple spots however care should be taken when using this technique as spots can inadvertently be moved when selecting the spots if the beginning of the selection is not made outside of the spot area.

- Press the left mouse button and drag a rectangle around the desired spots to select multiple spots.
- Set the pivotal spot. (Optional)
  — The pivotal spot is used to reposition the spot selection precisely by changing location coordinates.
  — The pivotal spot is initially the top-left spot within a group of spots.
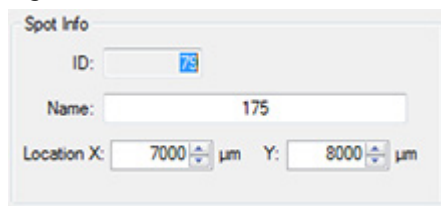 — If the user selects multiple spots, one of the spots is highlighted with a lighter color. This is known as the pivotal spot. The coordinates for this pivotal spot are shown in the Spot Info section.
  — The user can reposition the pivotal spot selection as a whole group by changing the values for the **Location X,Y** text boxes. This allows the user to specify a new location for the pivotal spot, and the rest of the selected spots are moved accordingly by the same position delta.
  — User can press Ctrl+click on any spot to make it a pivotal spot.

To change spot locations for single or multiple spots

- Restricted — Selecting **Align to Grid** will force the placement of any spot to the alignment grid.
- Unrestricted — When **Align to Grid** is not selected, spots can be positioned freely within the print region using one of the following methods:
  — Using a mouse to *click-and-drag* a spot to any location.
  — Selecting a spot, then using arrow keys to incrementally move the spot to any location.
  — Selecting a spot, then changing the X and Y offsets parameters of the **Spot Info** section.

Figure 4.21 Spot info section

To change the spot name

Edit the spot name text box.

To change the spot color

Click **Spot Color** and select the new spot color.

To change the background opacity

Change the **Background** opacity value. Values range from 0 (fully transparent) to 255 (fully opaque).

To reset the spots

Click **Reset** to auto regenerate all the spots.

To delete the spots

Select the spots to be deleted and click **Delete spots**, or click the **Delete** button on the keyboard.

Copying a Pattern in the Pattern Library

To copy a pattern:

1 Open an array. See Editing a Destination Array.

2 In the **Destination Array Editor** dialog box, select a pattern and click **Copy** in the **Patterns** section. The **Pattern Editor** dialog box is displayed. See Pattern Editor dialog box.

3 Change the **Name** for the pattern.

4 Complete any desired changes to the pattern.

5 Click **Save** to save the pattern.

NOTE Click **Cancel** in the **Pattern Editor** dialog box to cancel saving the changes to the pattern.

Deleting a Pattern in the Pattern Library

To delete a pattern:

1 Open an array. See Editing a Destination Array.

2 In the **Destination Array Editor** dialog box, select a pattern and click **Delete** in the **Patterns** section.

NOTE The pattern is deleted without a warning if the pattern is not being used. If the pattern is being used, a warning message is displayed, prompting the user if it is okay to delete the pattern. If the user selects **Yes** to delete the pattern, the pattern is deleted from the pattern library and from the arrays.

Adding Patterns to a Destination Array

To add a pattern to a destination array:

1   Open an array. See Editing a Destination Array.

2   In the **Patterns** section on the upper right side of the **Array Editor** dialog box, select the pattern to be added to the array.

3   In the **Select** section, select the array in which to add the pattern to.

- To select a single destination array, click on the array to be selected.
- To select more than one destination array, use Ctrl+click to select or deselect multiple arrays. Dragging the mouse over the desired destination arrays to select multiple arrays can also be used to select multiple destination arrays.
- To select all of the available destination arrays, click the **Arrays All** button.
- To deselect all of the selected destination arrays, click the **Arrays None** button.

Figure 4.22 All of the destination arrays selected in the Destination Array Editor
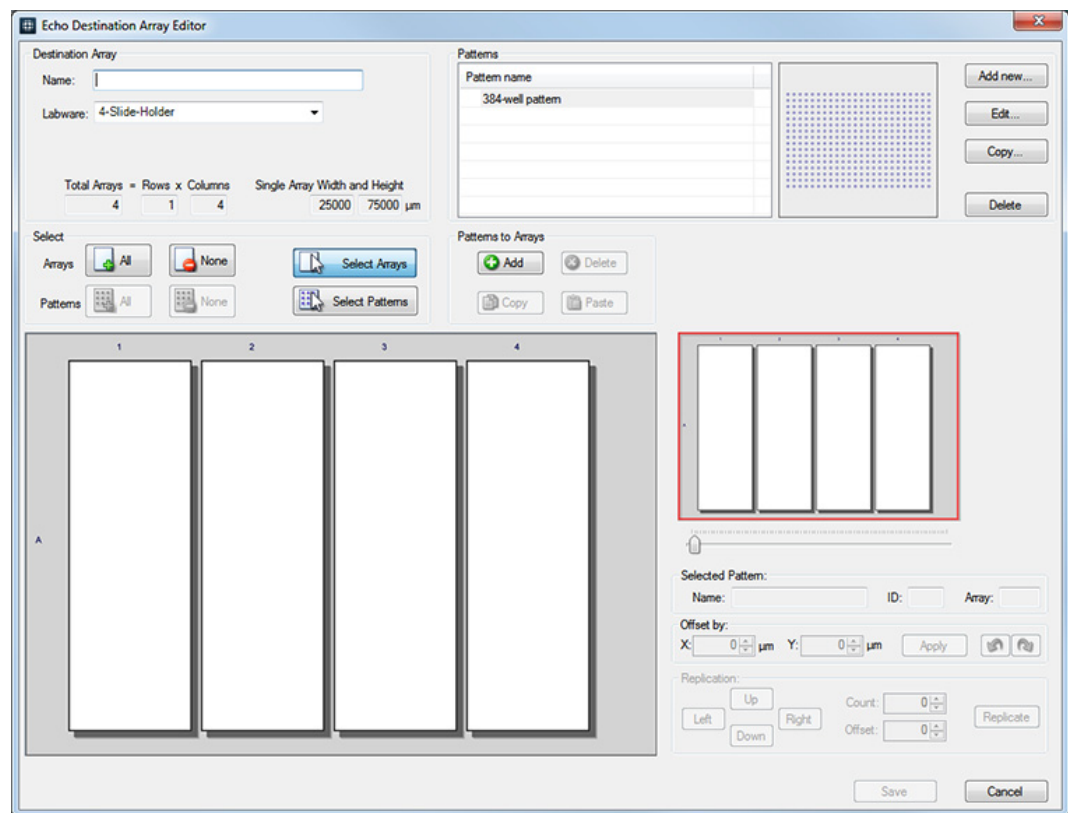
4 In the **Patterns to Arrays** section on the lower middle section of the **Array Editor** dialog box, click **Add** to add the selected pattern from step 2 to the array(s) selected in step 3.

This adds the selected pattern to the first available region on the destination array(s) according to the **Print Region** specified in the **Pattern**. The figure below shows that a pattern was added to each of the selected destination arrays. In the event that only a single destination array was selected, the pattern would be only added to that destination array.

Figure 4.23 Adding a pattern to each of the selected destination arrays in the Destination Array Editor
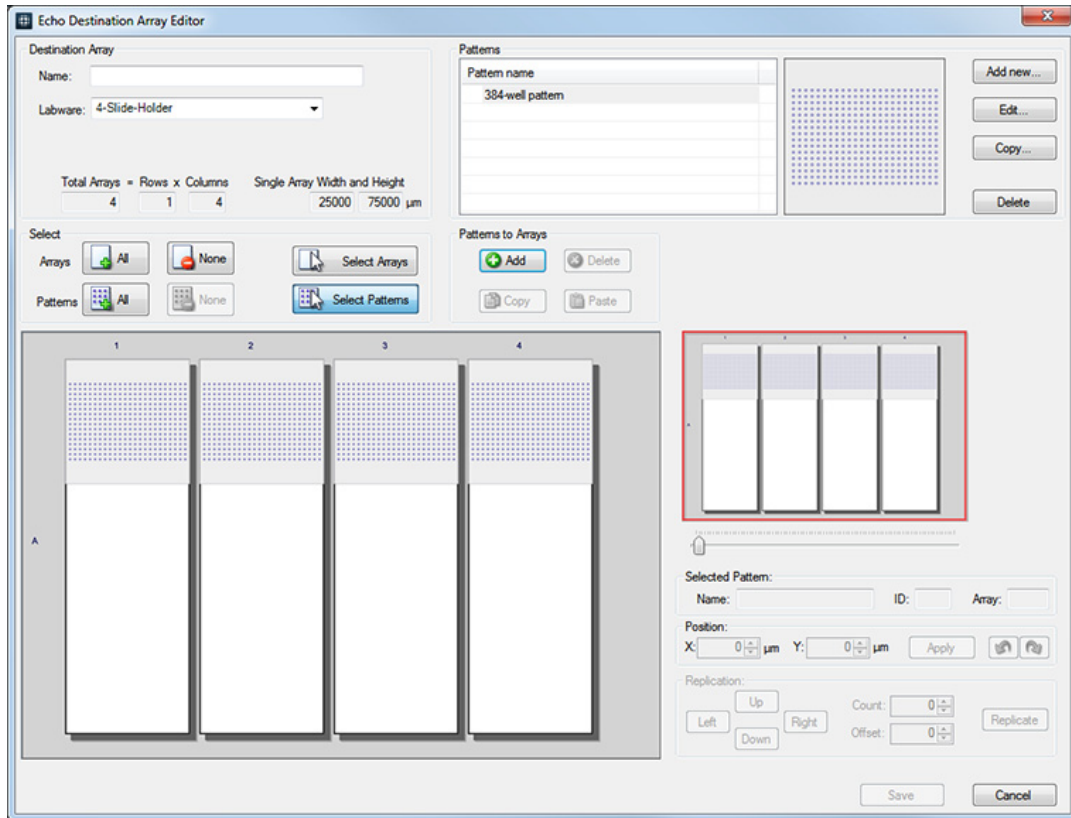
5 To copy the selected pattern(s) in the array, click **Copy**.

Figure 4.24 Selecting and copying a pattern to be pasted in the Destination Array Editor
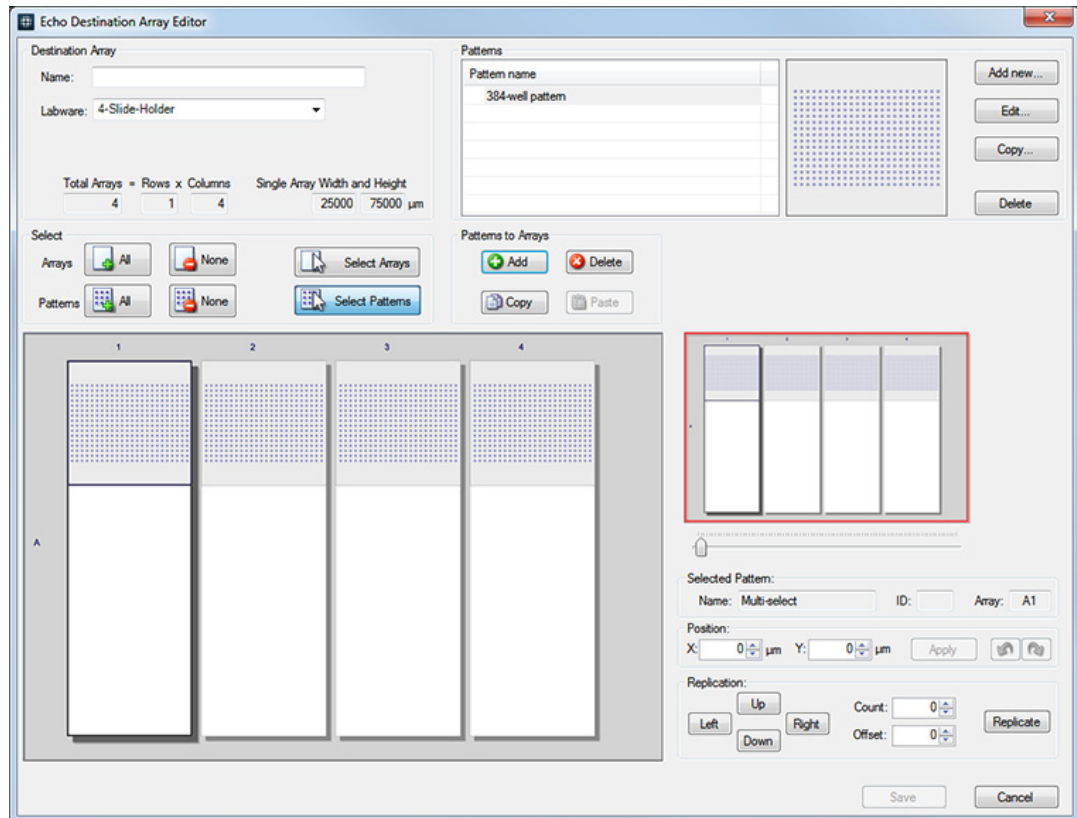
6 To paste the pattern copied in the previous step, select the desired array(s) and click **Paste**.

Figure 4.25 Pasting the copied pattern in the Destination Array Editor
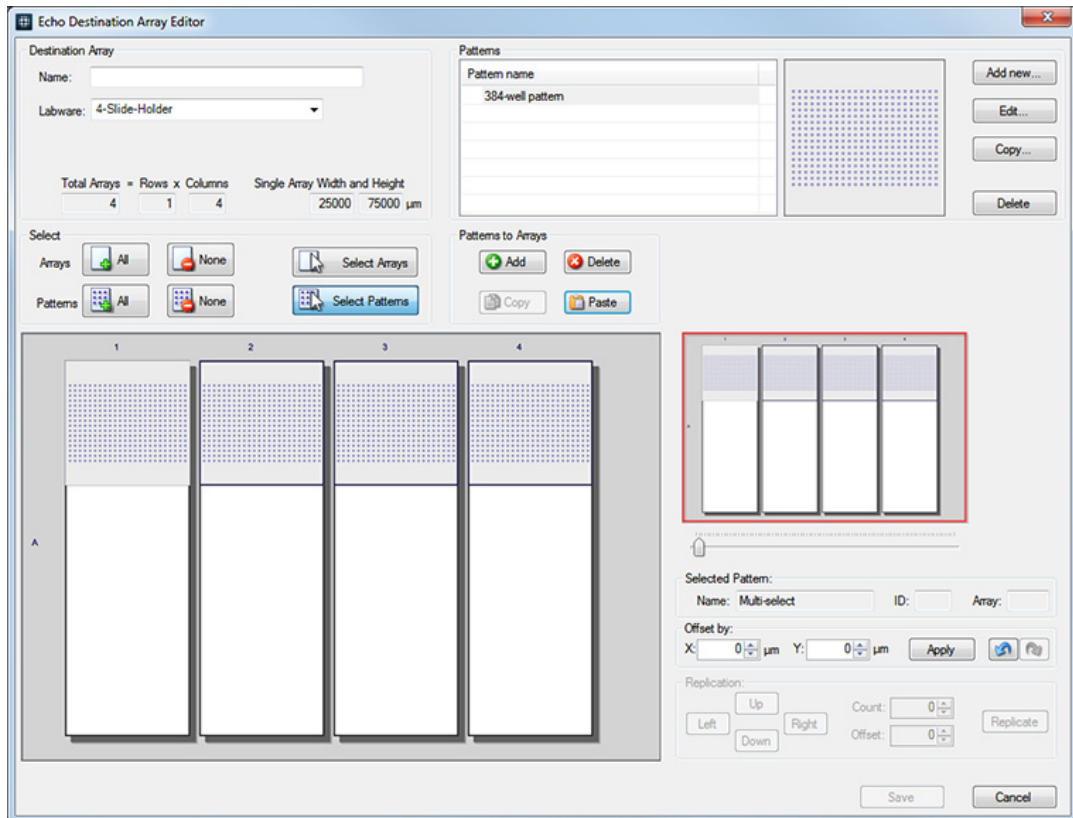
NOTE When using the Copy and Paste functions, ensure that duplicate patterns are not inadvertently added into the same region of the Destination Array. To check this, hold the mouse over one of the patterns and a list of the current patterns that were placed in that region are shown.

Figure 4.26 Mouse over pattern showing list of current patterns in that region in the Destination Array Editor
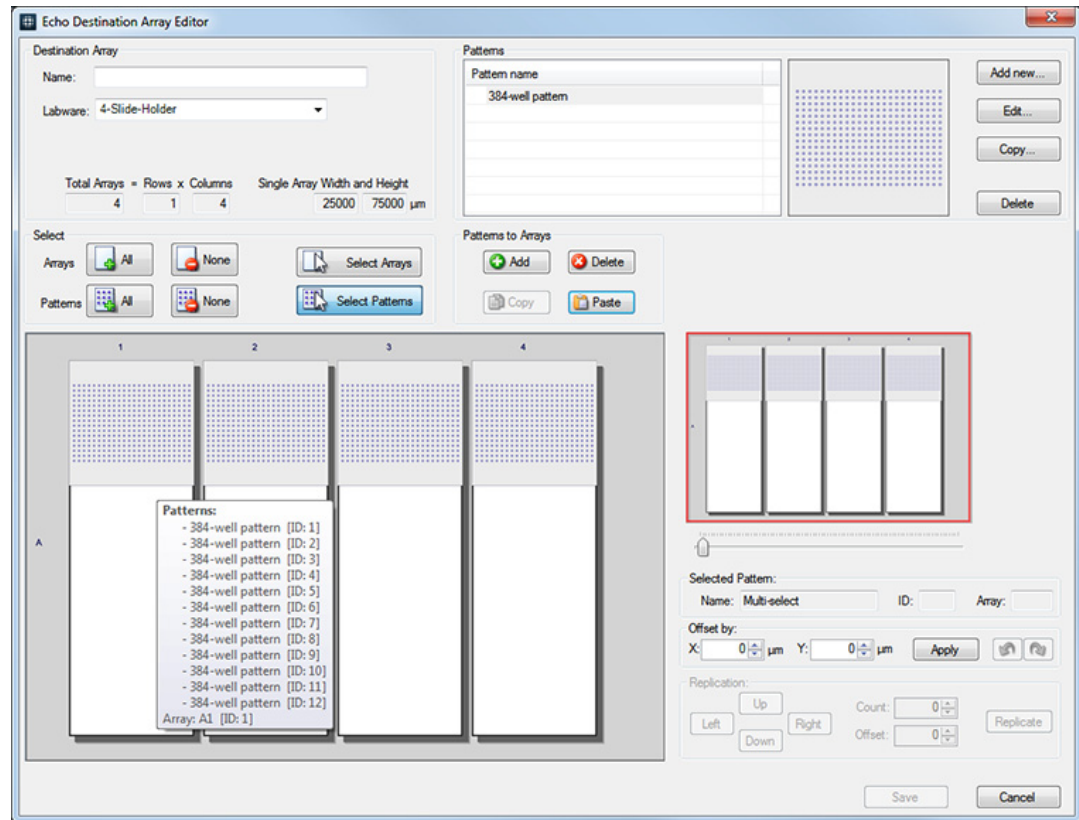
If duplicate patterns were added, remove the undesired patterns by right clicking on the pattern. A list of the patterns that were replicated is shown. Left click on the extra pattern to select only that pattern and click on the **Delete** button in the **Patterns** section. These steps may have to repeated multiple times if multiple patterns were replicated to the same region of the array.

Figure 4.27 Left click selecting pattern to be deleted in the Destination Array Editor
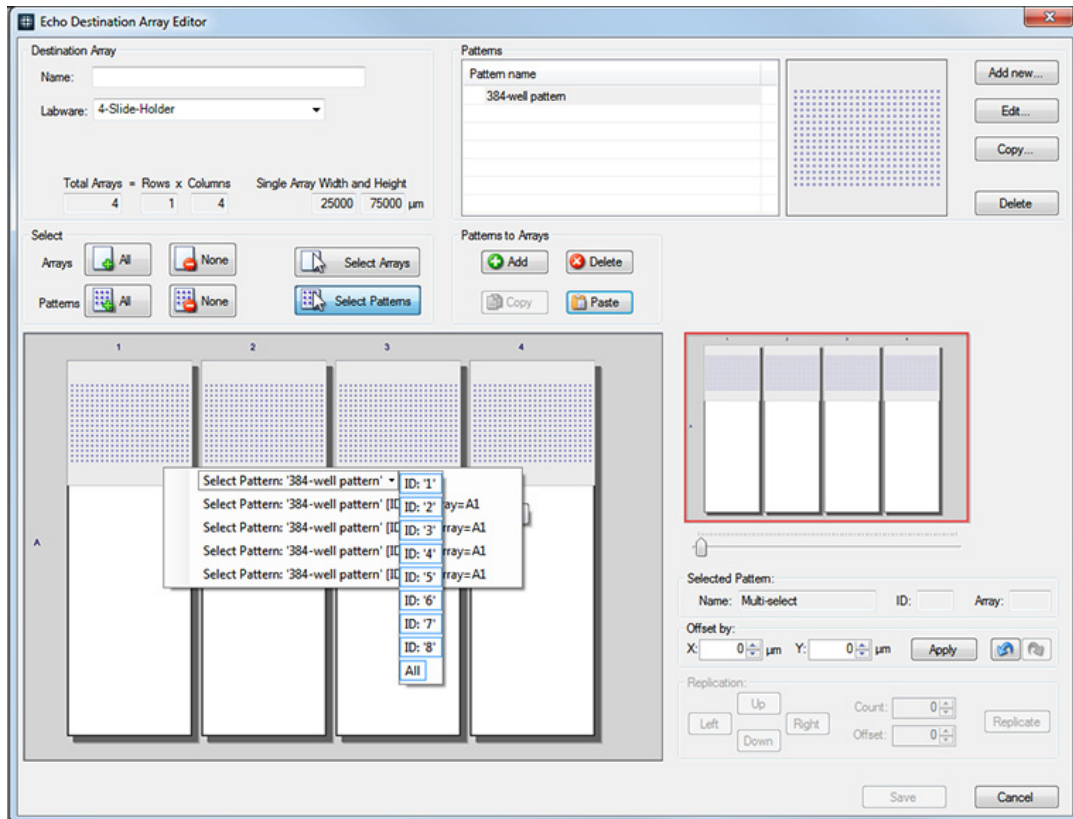
7 To further manipulate the patterns added to the array, see the Manipulating Patterns topic.

Manipulating Patterns

For lower level adjustments of the pattern placement on an array, use the **Selected Pattern**, **Position**, and **Replication** sections on the bottom right corner in the **Destination Array Editor** dialog box.

Figure 4.28 Selected Pattern, Position, and Replication sections of the Array Editor dialog box
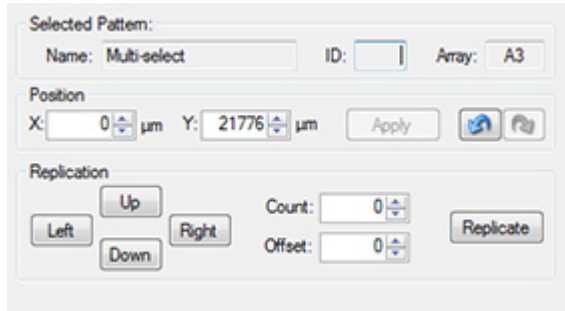
NOTE The values for **Name**, **ID**, and **Array** in the **Selected Pattern** section are automatically filled based on the pattern selected by the user. These fields cannot be manually changed by the user. When patterns overlap, a mouse click on a single pattern selects all the patterns under the mouse cursor.

A cursor tool-tip shows all the content under the cursor: spot(s), pattern(s), and the parent array.

Figure 4.29 Cursor tool-tip showing stops, patterns, arrays
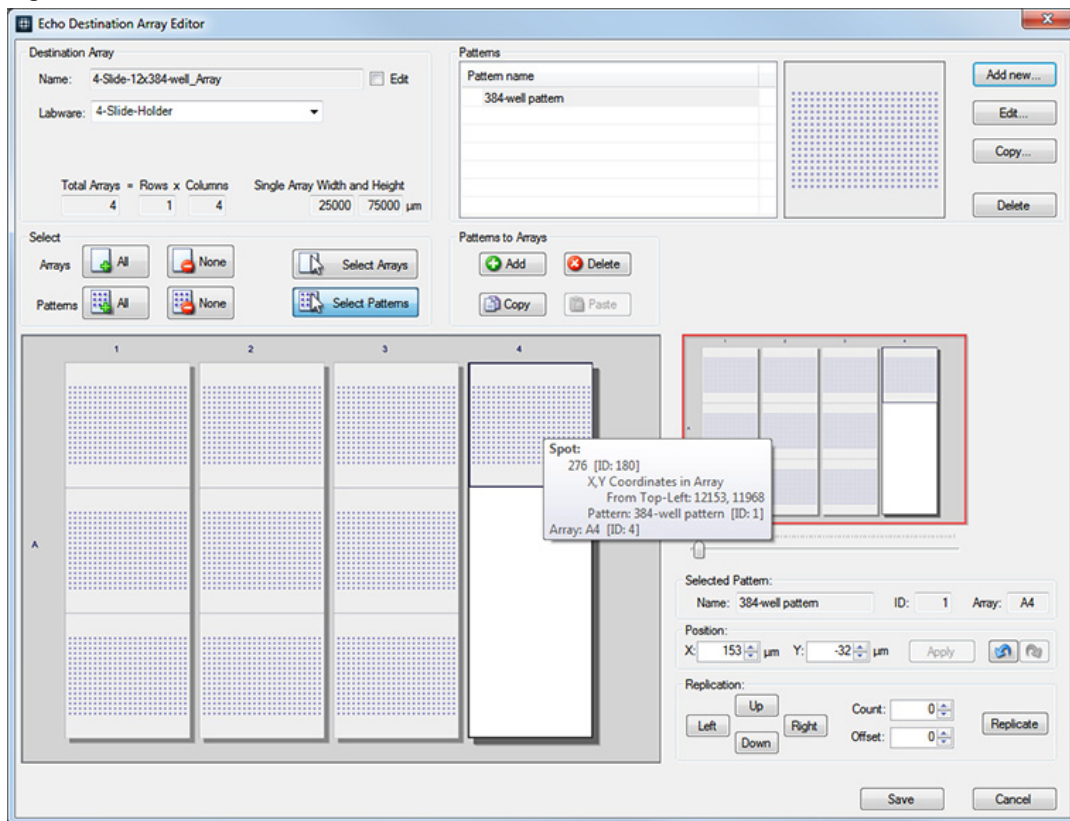
To adjust pattern locations

- To select a single pattern when multiple patterns overlap in an array, right-click on the patterns. A context menu shows the list of all the patterns under the cursor: name, ID, and parent array name. Click on the item in the list that should be selected.

- In the **Position** section, set the values for **X** and **Y** and click **Apply**.

  NOTE The **Apply** button does not become enabled until clicking outside of the **Y** field.

To undo/redo a pattern location change

In the **Position** section, click on the blue left arrow to undo and the blue right arrow to redo the previous position set, respectively.

To replicate patterns in an array

- Select the pattern(s) to be replicated.

  Figure 4.30 Pattern selected with Replicate button highlighted in the Destination Array Editor
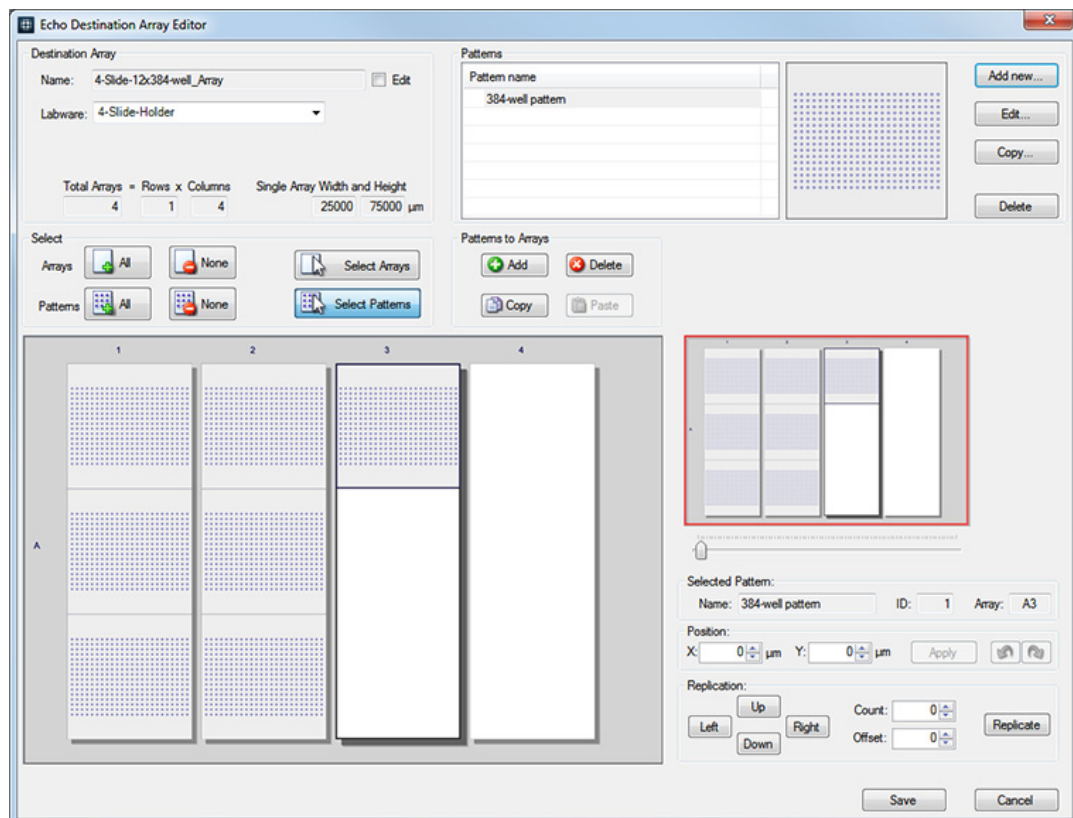
- In the **Replication** section, click **Up**, **Down**, **Left**, or **Right** depending on the desired direction to replicate the pattern.
- Green preview boxes are displayed to illustrate the number of times the pattern can be replicated in the selected direction. The Count and the Offset are programmatically changed to

reflect the maximum number of times the pattern can be replicated. See Selected Pattern, Position, and Replication sections of the Array Editor dialog box.

- To accept the number of replicates as indicated by the green boxes, click **Replicate**.

- To decrease or change the number of times the pattern is replicated, change the value for **Count**, and then click **Replicate**

  NOTE If the **Count** value entered exceeds the capacity of the array, the application ignores the value entered, and uses the maximum value possible.

Figure 4.31 Single replicate pattern being created in the Destination Array Editor
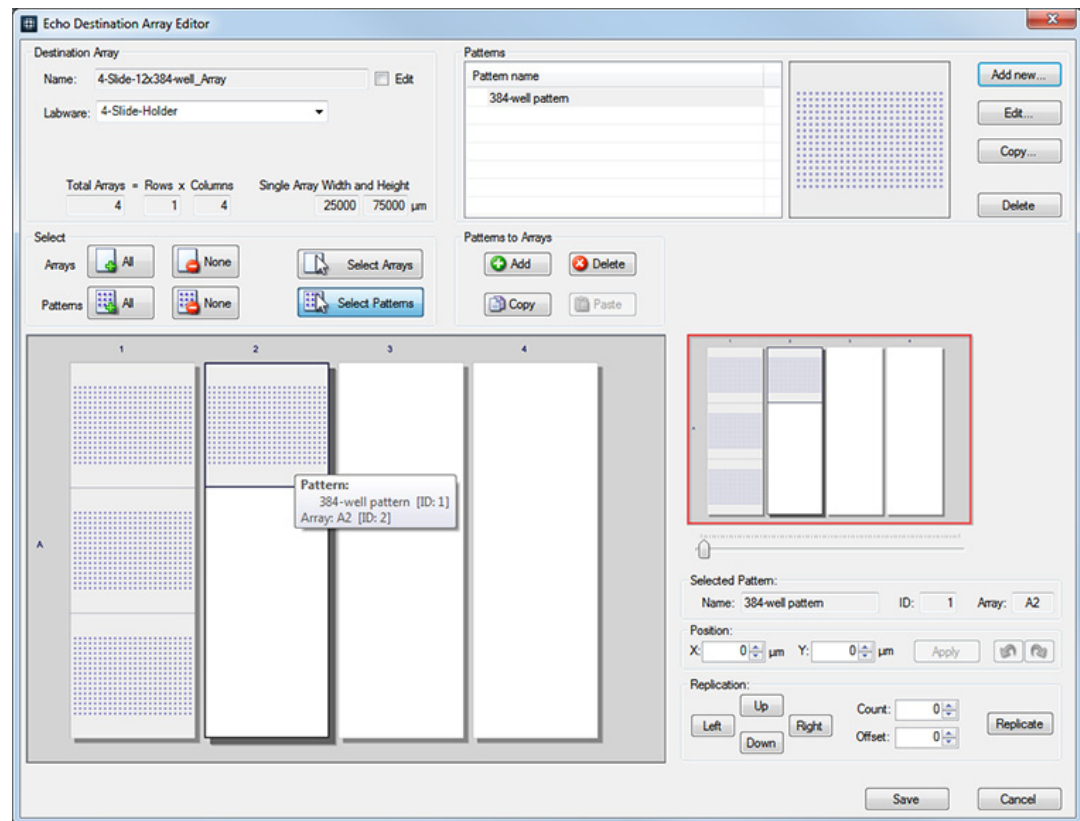
- To change the offset between each pattern being replicated, change the **Offset** value, and then click **Replicate**.

  NOTE Programmatically, the application prevents the user from replicating patterns beyond the size of the array, but the user is allowed to overlap patterns.

To zoom in/out and navigate the array

Figure 4.32 Main array view and preview screen

- Use the slider below the preview screen above the **Selected Pattern** section to zoom in and out of the destination array.
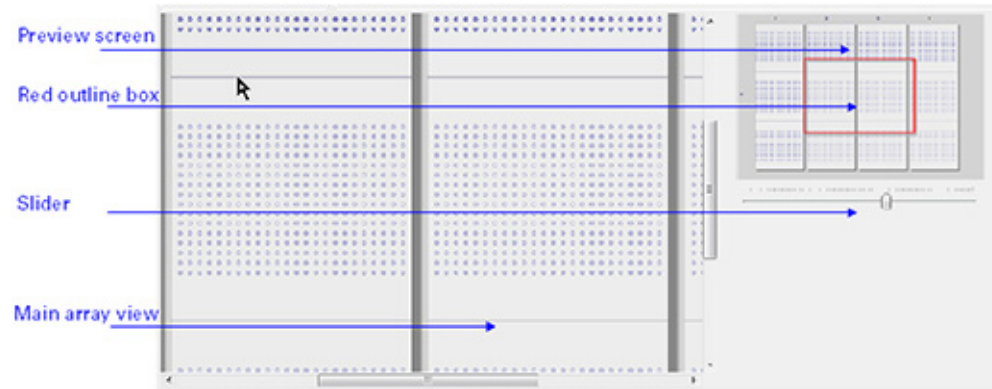
- Click in the preview screen above the **Selected Pattern** section to navigate a specific location in the destination array.

- Double-click in the preview screen to zoom in for the patterns being shown in the main array view.

- Right double-click in the preview screen to zoom in for the patterns being shown in the main array view.

- The red outline box in the preview screen represents the patterns being shown in the main array view.

- In the main array view:
  - Double-click while pressing the space bar to zoom-in.
  - When zoomed-in, press the space bar and press the left mouse key to move the array view.

NOTE When referring to coordinates for patterns, the coordinates are relative to the top-left corner of the array.

Starting a New Protocol

There are multiple ways to start a new protocol.

1. Select **New** from the **File** menu.

2. Click the **New** icon in the **Toolbar**.

3. Press **CTRL+N** from the keyboard.

Figure 4.33 Protocol Setup window

- All new protocols start with the Protocol Setup window. This window defines the plate names, plate types, and array types for source to destination plate transfers.

- Plate type information is used to build appropriate graphics in the protocol creation window.

NOTE For information on possible error icons when using the Protocol Setup window, see Understanding Destination Array Errors.
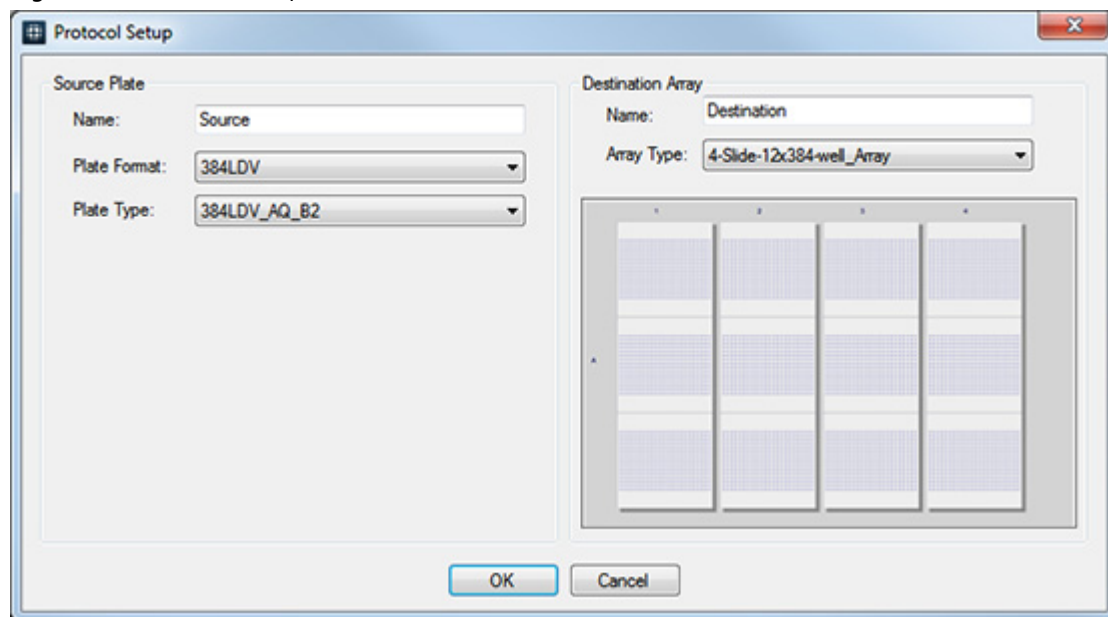
Selecting the Source Plate Type and Destination Array Type

The Echo Liquid Handler dynamically adjusts to different changes in fluid characteristics within a broad fluid class (Dynamic Fluid Analysis). Choosing the plate format determines the physical plate parameters that the Echo Array Maker application uses. Choosing the plate type determines the transfer method that the Echo Liquid Handler uses; taking the plate format and fluid properties into account. These settings enable the Echo system to transfer multiple fluid types from the same source plate. For example, using the plate format 384PP and plate type MyBuffer_AQ_GP instructs the Liquid Handler to transfer samples from a 384PP format plate with a transfer method suited for the Glycerol with Protein fluid class.

These steps are critical when creating the application protocol.

1 In the **Protocol Setup** window, select the **Plate Format** to be 384PP, 384LDV, or 1536LDV. Based on the plate format chosen, the compatible plate types appear for **Plate Type**.

2 Select the **Plate Type** to set the transfer properties for the **Source Plate**.

3 Select the **Array Type** to set the transfer properties for the **Destination Array**.

4 Click **OK** to create the protocol with the specified source plate and destination array type.

NOTE Not all plate formats and plate types are available on all instruments. The specific plate requirements per user environment are specified in the purchase agreement and programmed into the instrument prior to shipping.

Understanding Mapping Mode

There are three different mapping modes available. For information on each of these mapping modes, see the topics below:

- Map to Destination
- Map to Spot
- Map to Array

Map to Destination

Map to Destination is the default mapping mode. In this mode, source wells are mapped to spots within a selected array 1:1. If there are not enough spots in the array to accommodate the number of transfers mapped, the source region will be cropped. This mode does not require the user to select specific spots within a pattern and is automatically used if one of the other mapping modes is not used. For an example using **Map to Destination**, see Using Map to Destination.

Map to Spot

The **Map to Spot** view allows the user to map transfers to specific spots or a group of spots within a pattern. For example, spotting siRNA samples to a microarray.

The functionality of **Map to Spot** is intended for use with transfers onto a set of slides containing a series of patterns. **Map to Spot** uses a series of source wells – designated as a source region and transfers these onto a series of spots within a pattern on the destination array. **Map to Spot** does not support choosing multiple patterns. To choose multiple patterns, use the default mapping mode, **Map to Destination**.

When using **Map to Spot**, the user must select an existing pattern and assign it as the destination region. For an example using **Map to Spot**, see Using Map to Spot - Mapping Source Wells to Patterns on Chips or Microarrays.

Map to Array

The **Map to Array** view allows the user to map transfers to specific spots within the same pattern repeated across multiple arrays within a destination array. For example, transferring the reagent to the upper left shelf of every array (well) in a crystallography plate.

The functionality of **Map to Array** is intended for use with transfers onto a microplate, such as a crystallography plate, where a series of patterns have been defined to represent the various wells to which different fluids might be transferred. Map to Array uses a series of source wells, designated as a source region, and will transfer these onto the same spot in a pattern repeated across multiple arrays on the destination array.

When using **Map to Array**, the destination arrays are treated as a destination plate and the user must select an existing pattern and a spot that gets assigned to the destination region. For an example using Map to Array, see Using Map to Array - Mapping Source Wells to Patterns in Microplate Wells (Crystallography).

Creating a Transfer Protocol

For the examples below, it is assumed that the required destination arrays have been created.

- Add Region - Map to Destination
- Replicate Region - Map to Destination
- Add Region - Map to Spot
- Replicate Region - Map to Spot
- Add Region - Map to Array
- Replicate Region - Map to Array

Using Map to Destination

The topics below explain the different ways to map to destination:

- Add Region - Map to Destination
- Replicate Region - Map to Destination

Add Region - Map to Destination

NOTE It is assumed that the required destination arrays have been created.

To add transfers from a source region to patterns:

1 Start a new protocol as explained in topic Starting a New Protocol.

2 Select the source plate types and the destination array types as explained in Selecting the Source Plate Type and Destination Array Type.

3 In the **main Protocol** window, select the desired wells as the region in the source plate map from which the transfers will occur. This becomes the Source Region. The information box for that region is automatically populated.

In the lower left corner of the **main Protocol** window in the **Region Information** section, the user can select the **Add Region** and **Replicate Region** buttons. These allow the user to determine the way in which the source region is mapped onto the selected destination.

NOTE If the user selects the **Treat as identical well** content checkbox, the **Replicate Region** button is removed. The **Treat as identical well** content option is only available with the **Add Region** command.

Figure 4.34 Main Protocol window highlighting Add Region and Replicate Region buttons
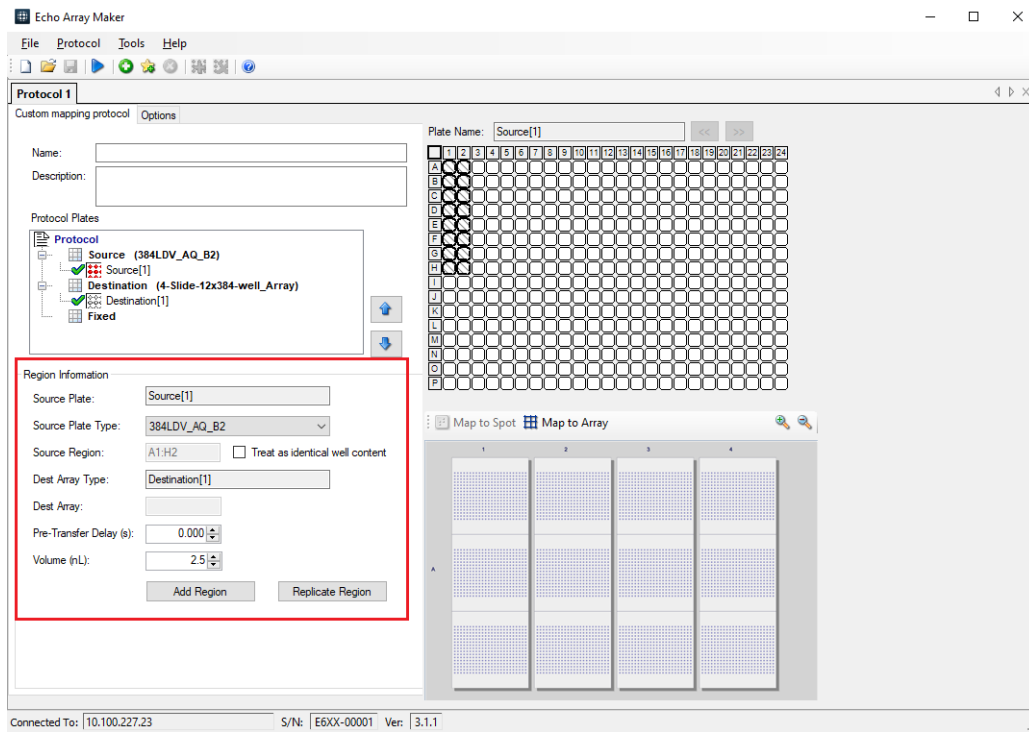
4 In the **main Protocol** window, select the destination pattern or patterns to which the source region will be transferred. To select multiple patterns, use Ctrl + click or click and drag.

The figures below show screen shots where no patterns are selected and where all patterns are selected.

Figure 4.35 All patterns selected
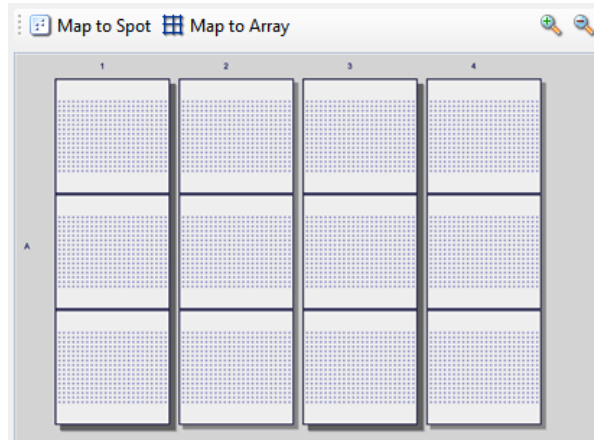
Figure 4.36 No patterns selected
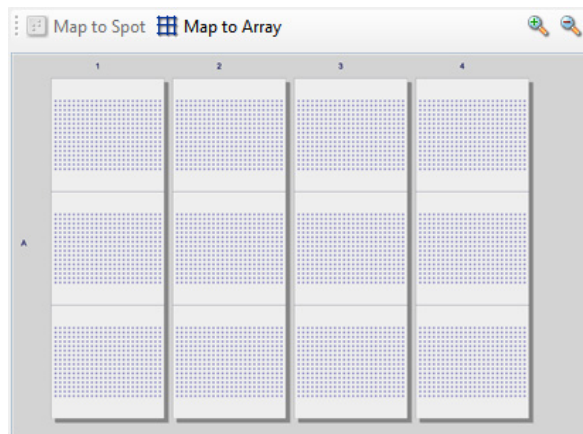
5 Click the **Add Region** button to duplicate the selected source region into the selected destination region in a one to one manner.

Figure 4.37 Adding a region using Map to Destination

6 Select another source pattern and destination pattern, check **Treat as identical** well pattern, and click **Add Region**.
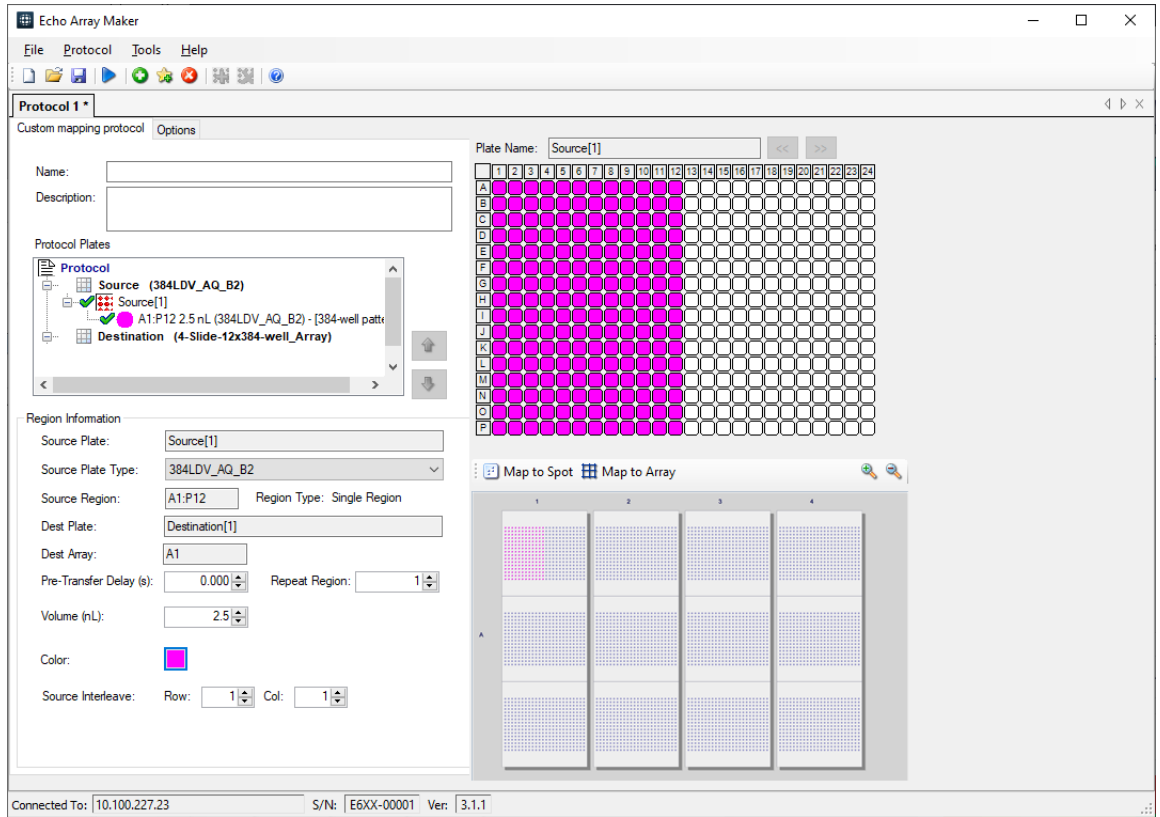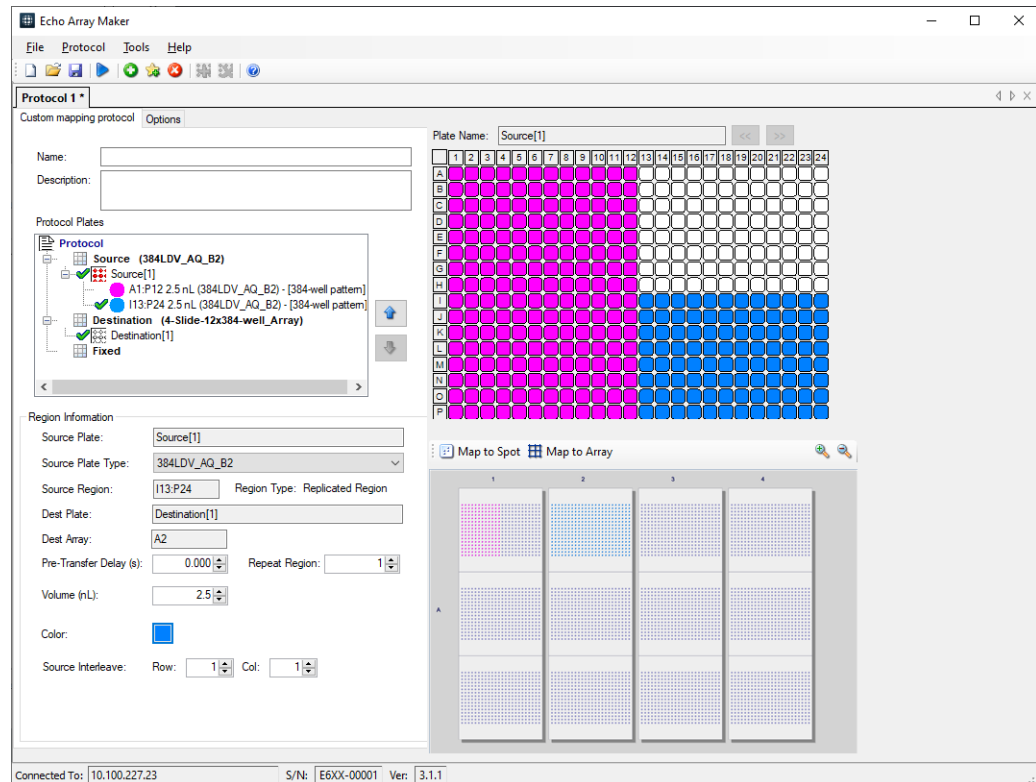
Figure 4.38 Selecting Treat as identical well and Add Region

Replicate Region - Map to Destination

NOTE It is assumed that the required destination arrays have been created.

To replication transfers from a source plate region to patterns:

1 Start a new protocol as explained in topic Starting a New Protocol.

2 Select the source plate types and the destination array types as explained in topic Selecting the Source Plate Type and Destination Array Type.

3 In the **main Protocol** window, select the desired wells as the region in the source plate map from which the transfers will occur. This becomes the Source Region. The information box for that region is automatically populated.

In the lower left corner of the **main Protocol** window in the **Region Information** section, the user can select the **Add Region** and **Replicate Region** buttons. These allow the user to determine the way in which the source region is mapped onto the selected destination.

NOTE If the user selects the **Treat as identical well** content checkbox, the **Replicate Region** button is removed. The **Treat as identical well** content option is only available with the **Add Region** command.

Figure 4.39 Main Protocol window highlighting Add Region and Replicate Region buttons
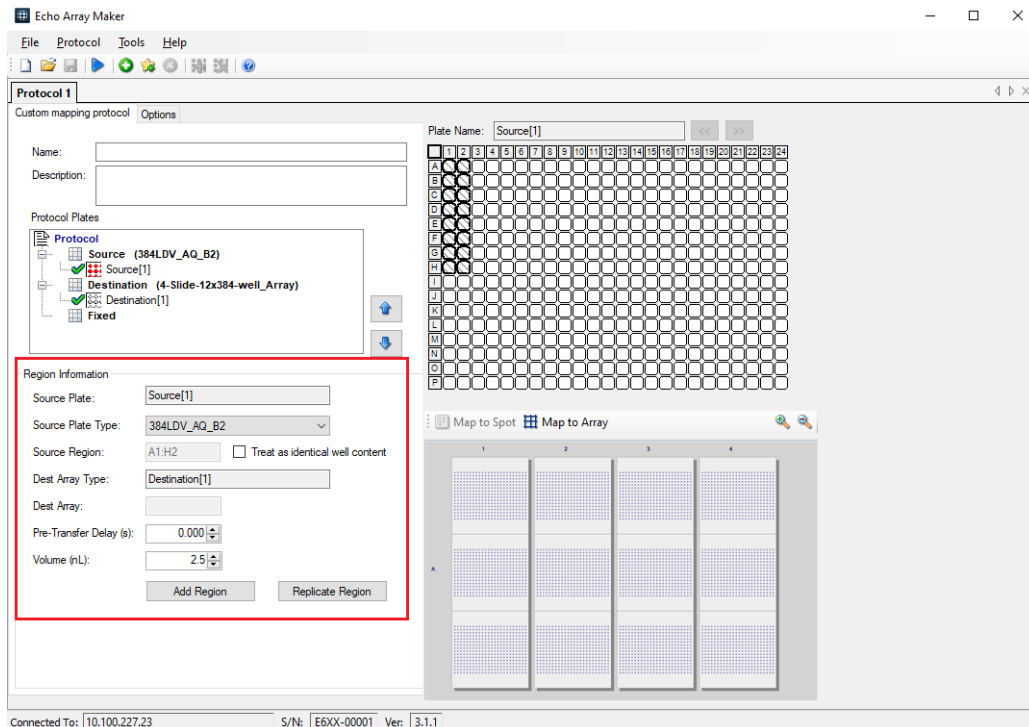
4 In the **main Protocol** window, select the destination pattern or patterns to which the source region will be transferred. To select multiple patterns, use Ctrl + click or click and drag.

The figures below show screen shots where no patterns are selected and where all patterns are selected.

Figure 4.40 All patterns selected
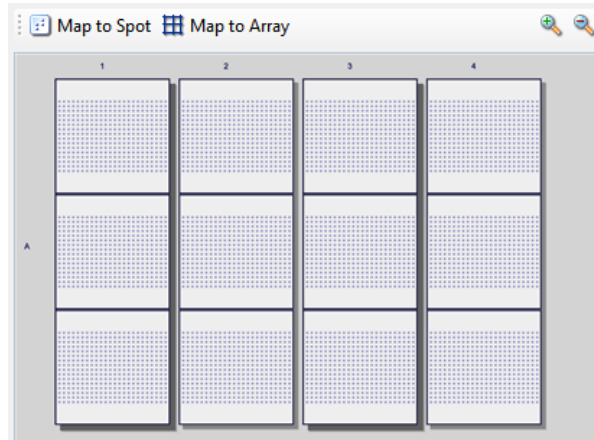
Figure 4.41 No patterns selected
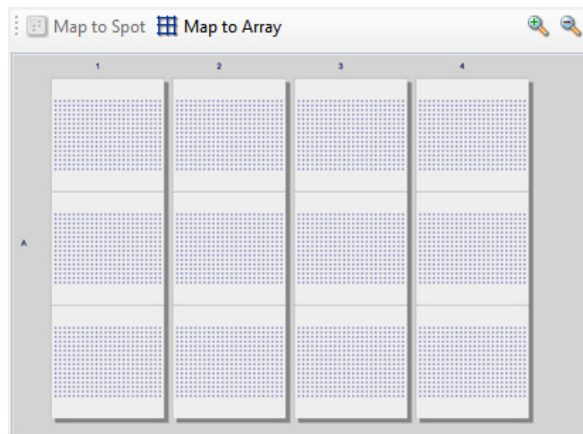
5 Click the **Replicate Region** button to translate the selected source region and replicate that into the selected destination region as many times as allowed by the destination pattern selected.

If the destination region is too small to fit a single replicate of the source region, an error occurs. In the event that the destination region is not an exact multiple of the source region, it will only replicate a complete set of the source region wells.

NOTE In the example below, the pattern contains two replicate patterns of the source region.

Figure 4.42 Replicating a region using Map to Destination
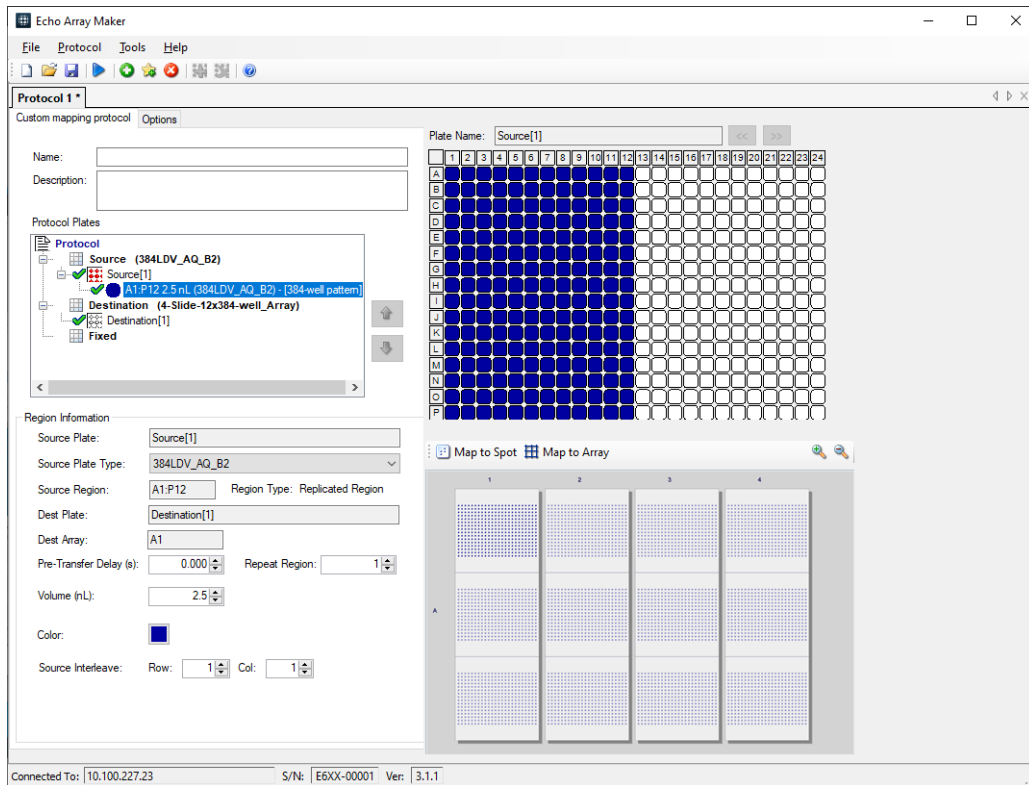
Using Map to Spot - Mapping Source Wells to Patterns on Chips or Microarrays

The topics below explain the different ways to map to spot:

- Add Region - Map to Spot
- Replicate Region - Map to Spot

Add Region - Map to Spot

In this example, a **4-Slide-12x384-well_Array** is used for the destination array and a **384PP** is used for the source plate format. **Map to Spot** is used to map transfers from the source plate to the destination array.

NOTE It is assumed that the required destination arrays have been created.

To add a region to patterns:

1 Start a new protocol as explained in topic Starting a New Protocol.

2 Select the source plate types and the destination array types as explained in topic Selecting the Source Plate Type and Destination Array Type.

3 In the **main Protocol** window, select the desired wells as the region in the source plate map from which the transfers will occur. This becomes the Source Region. The information box for that region is automatically populated.

**4** In the **main Protocol** window, select the destination pattern to which the source region will be transferred. To select multiple patterns, use **Ctrl + click** or click and drag.

> **NOTE** **Map to Spot** is designed to have a one to one relationship with the patterns in a destination array. Therefore, if multiple patterns are selected, only the first pattern will be mapped for transfer.

Figure 4.43 Source region with single destination pattern selected
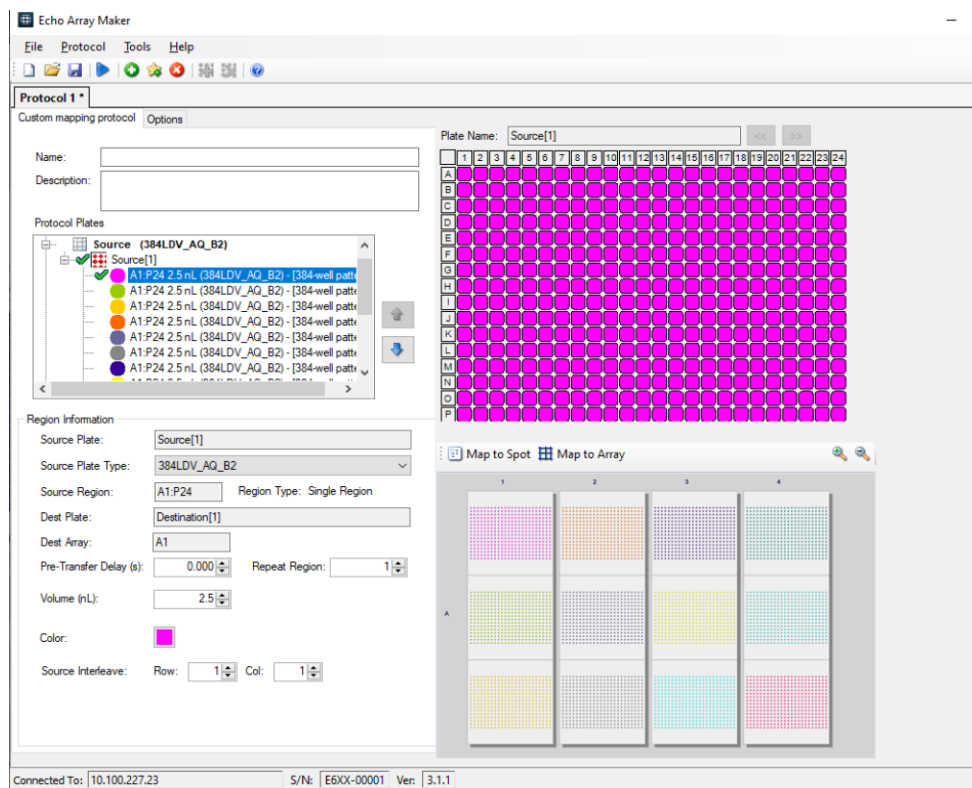
5 Click **Map to Spot**. This launches the pattern view of the pattern selected in a **Pattern** dialog box.

Figure 4.44 Pattern dialog box
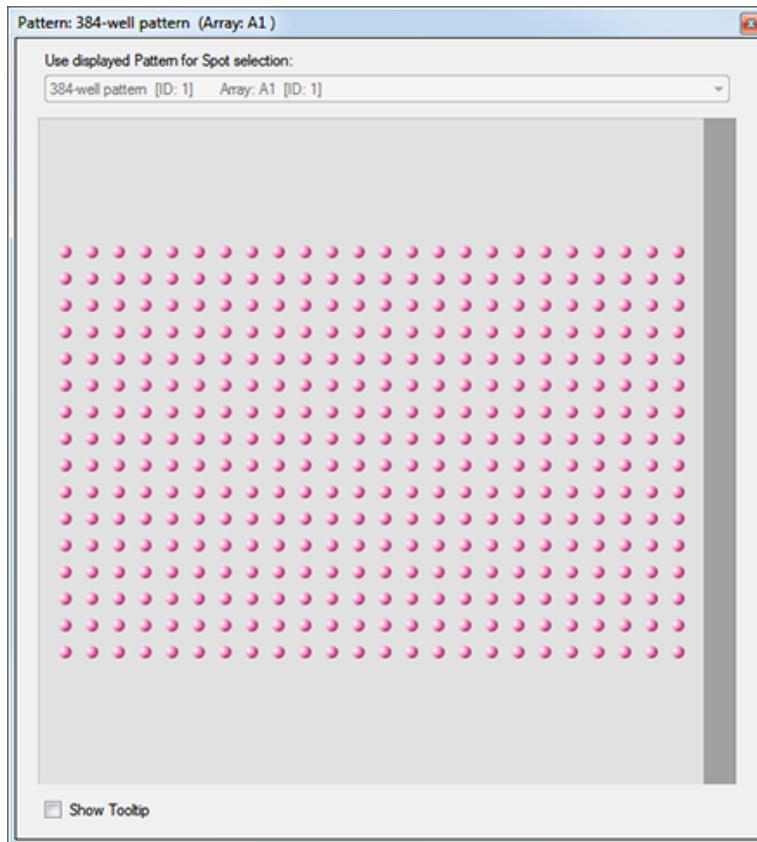
6 Select the top-left, or starting spot for the source region to be transferred. The region will be created according to the dimensions of the source region, if possible or until the edges of the pattern are reached.

7 Click the **Add Region** button or select the **Add Region** [icon] icon in the **Toolbar** to add the region to the selected destination pattern region. The **Add Region** command translates the selected source region in a one to one manner.

Figure 4.45 Adding a region to patterns
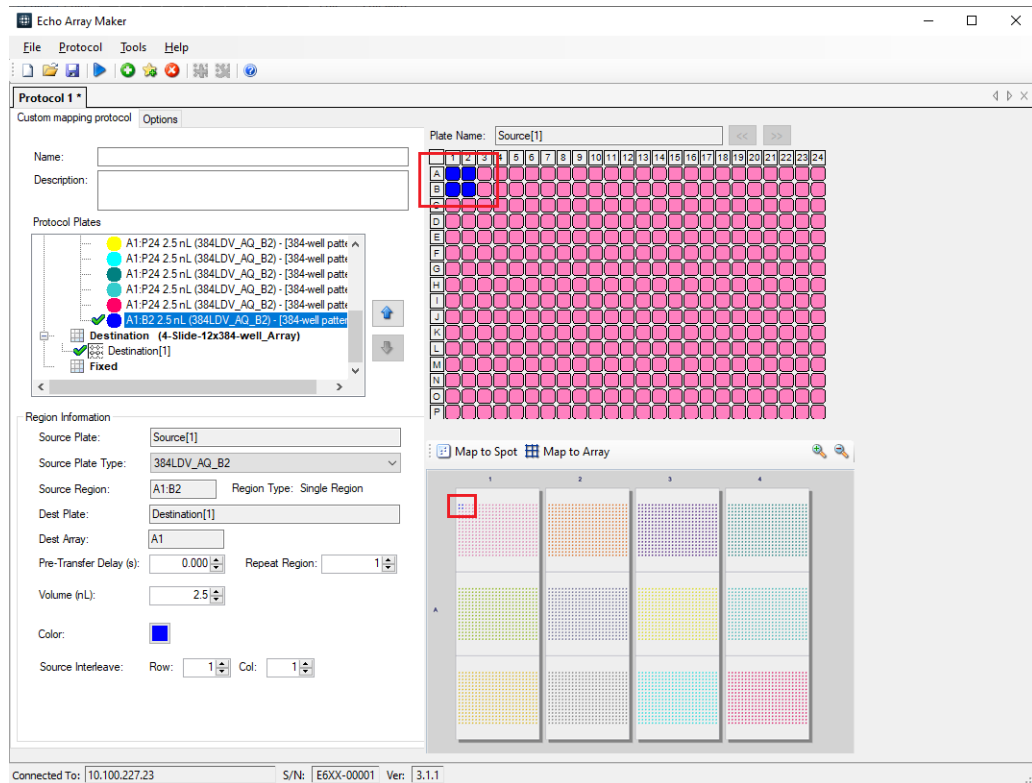
Replicate Region - Map to Spot

In this example, a **4-Slide-12x384-well_Array** is used for the destination array and a **384PP** is used for the source plate format. **Map to Spot** is used to map transfers from the source plate to the destination array.

NOTE It is assumed that the required destination arrays have been created.

To replicate a region in patterns:

1 Start a new protocol as explained in topic Starting a New Protocol.

2 Select the source plate types and the destination array types as explained in topic Selecting the Source Plate Type and Destination Array Type.

3 In the **main Protocol** window, select the desired wells as the region in the source plate map from which the transfers will occur. This becomes the Source Region. The information box for that region is automatically populated.

4 In the **main Protocol** window, select the destination pattern to which the source region will be transferred. To select multiple patterns, use **Ctrl + click** or click and drag.

NOTE **Map to Spot** is designed to have a one to one relationship with the patterns in a destination array. Therefore, if multiple patterns are selected, only the first pattern will be mapped for transfer.

Figure 4.46 Source region with single destination pattern selected
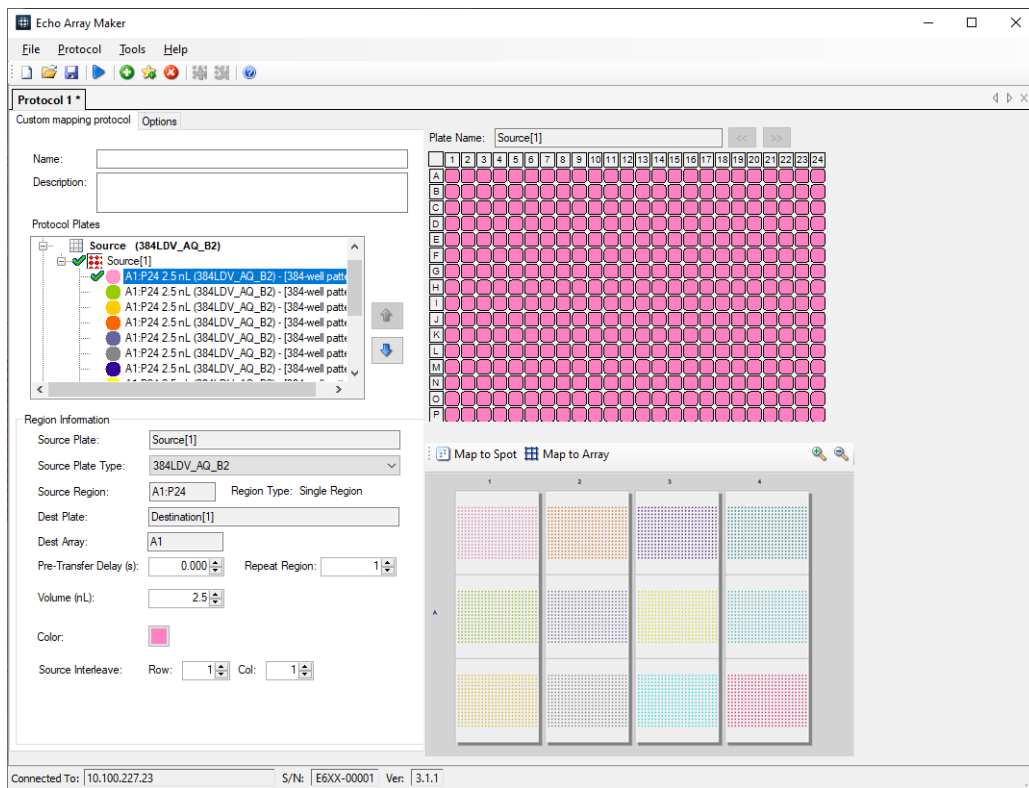
5 Click **Map to Spot**. This launches the pattern view of the pattern selected in a **Pattern** dialog box.

Figure 4.47 Pattern dialog box
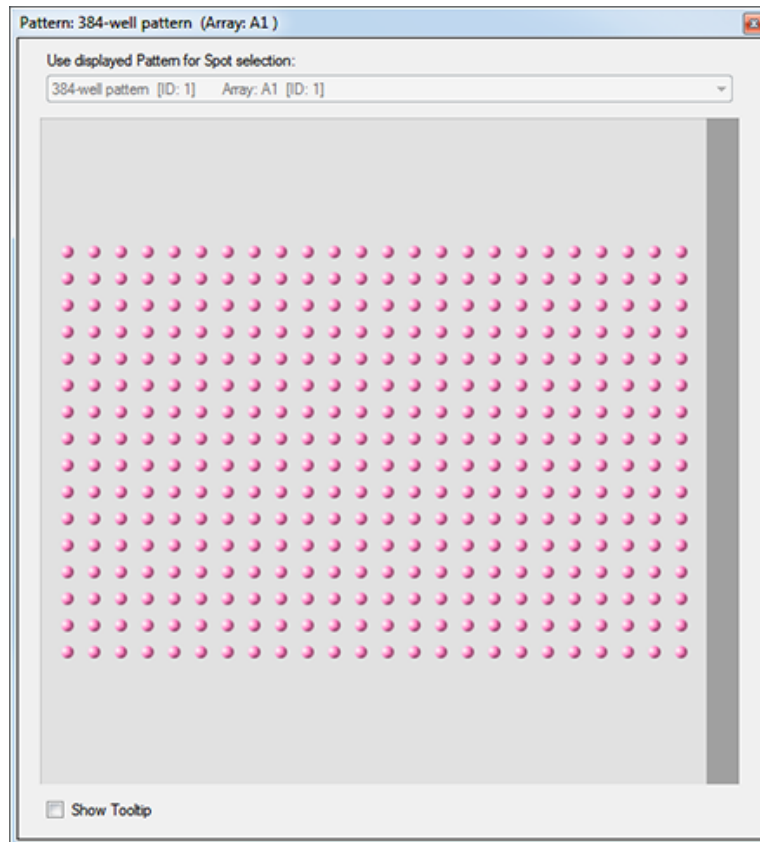
6 Select the top-left, or starting spot for the source region to be transferred. The region will be created according to the dimensions of the source region, if possible or until the edges of the pattern are reached.

7 Click the **Replicate Region** button or select the **Replicate Region** icon in the **Toolbar** to add the region to the selected destination pattern region. The **Replicate Region** command translates the selected source region and replicates that into the selected destination region as many times as allowed by the destination pattern selected.

Source region with single destination pattern selected shows the four source wells selected in the source region replicated across the destination region that correspond to exact multiples of the source region.

Figure 4.48 Replicating a region
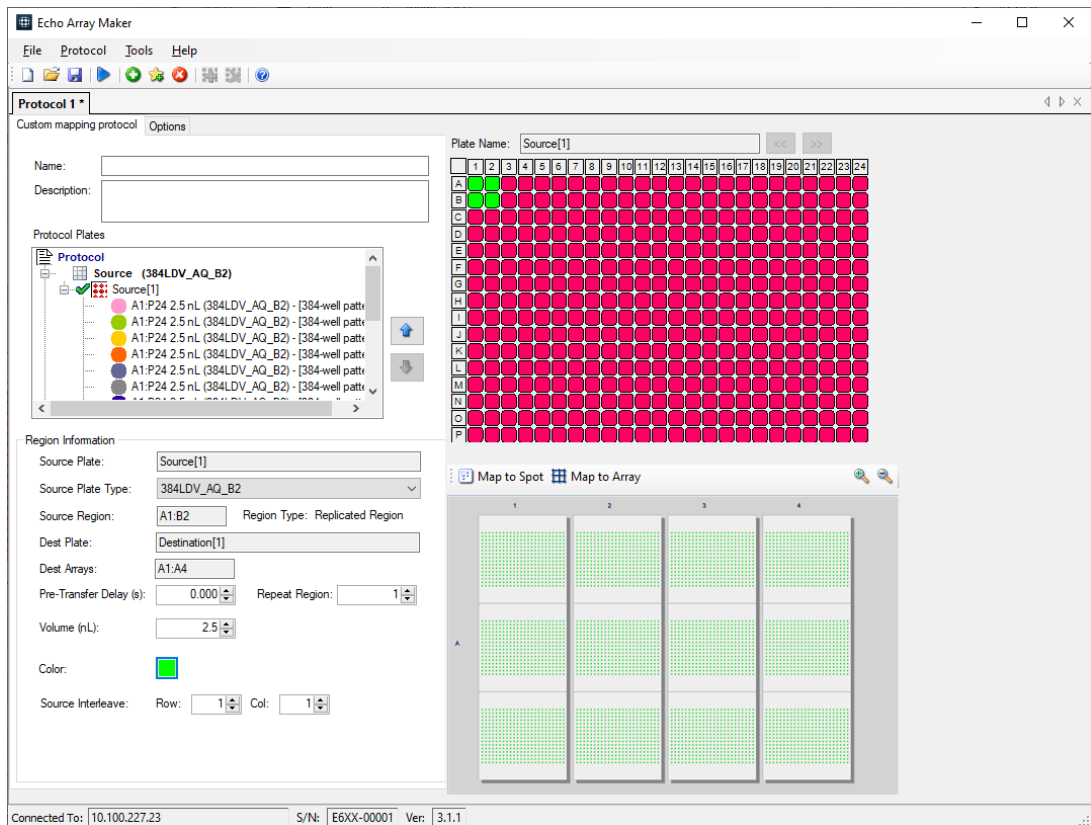
NOTE If the destination region is too small to fit a single replicate of the source region, an error message is generated. In the event that the destination region is not an exact multiple of the source region, it will replicate as many complete sets of the source region wells as possible.

8 Select any optional steps as needed.

The following section provides detailed information on the optional steps that can occur mapping transfers to an array.

Optional steps after adding or replicating a region

To change the volume:

- In the **Region Information** box, enter the required volume value. The default value is 2.5 nL.

To set a source interleave pattern:

- To quickly transfer contents from or to wells in an interleaved pattern, select the Source Interleave option. This allows a user to set the row-wise or column-wise spacing for interleaved transfers.

  The default value for the Source Interleave option is 1, 1, or no interleave. For more information on interleave, see Using Interleaving.

To set a Pre-Transfer Delay:

- To use advanced features such as **Pre-Transfer Delay**, see Using Pre-Transfer Delay.

To change the color for the source region:

- Click **Color** and choose a different color.

To treat all the wells identical (only applicable for replicate):

- To use advanced features such as Treat as Identical Well Content, see Transferring Identical Well Content.

Using Map to Array - Mapping Source Wells to Patterns in Microplate Wells (Crystallography)

The topics below explain the different ways to map to array:

- Add Region - Map to Array
- Replicate Region - Map to Array

Add Region - Map to Array

In this example, a **SwissCI_96x3well** array is used for the destination array and a 384PP is used for the source plate format. **Map to Array** is used to map the source plate to the destination plate.

NOTE It is assumed that the required destination arrays have been created.

To add a region:

1 Start a new protocol as explained in topic Starting a New Protocol.

2   Select the source plate types and the destination array types as explained in topic Selecting the Source Plate Type and Destination Array Type.

3   In the **main Protocol** window, select the desired wells as the region in the source plate map from which the transfers will occur. This becomes the Source Region. The information box for that region is automatically populated.

4   For the **Map to Array** command, selection of the destination array(s) to which the source region will be transferred occurs after the user clicks on **Map to Spot**. Designating the destination arrays in the **main Protocol** window is not required.

Destination Arrays are represented by the wells of a crystallography plate.

Figure 4.49   Before map to array is executed
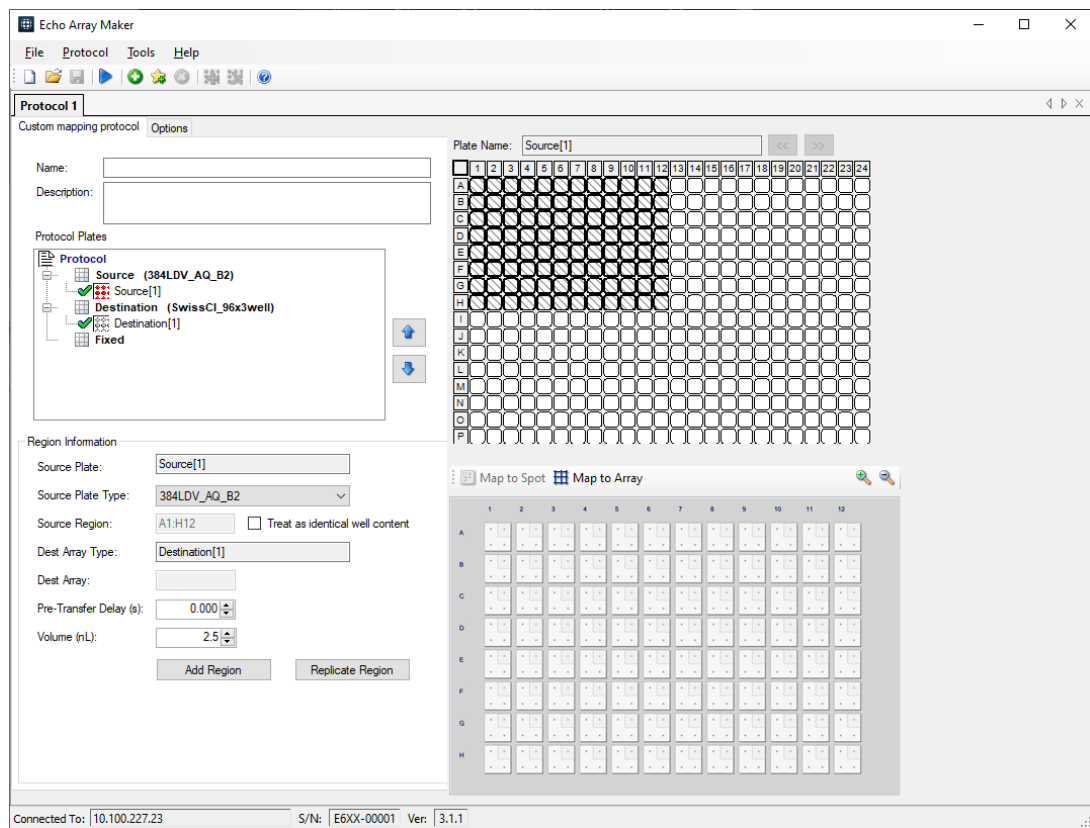
5   Click **Map to Array**. This launches the array view of the Destination Array in the **main Protocol** window.

6 Select the destination arrays (wells) containing the spots to which the source region will be transferred to. If more than one pattern exists in the destination array(s), select the desired pattern using the **Pattern** drop-down menu.

The destination array below contains 2 patterns: **3-spot_pattern** and **Reservoir**. For this example, the **Reservoir** pattern is selected which maps the contents of each well of the source region into the corresponding reservoir wells on the crystallography plate.

Figure 4.50 Selecting the Reservoir pattern
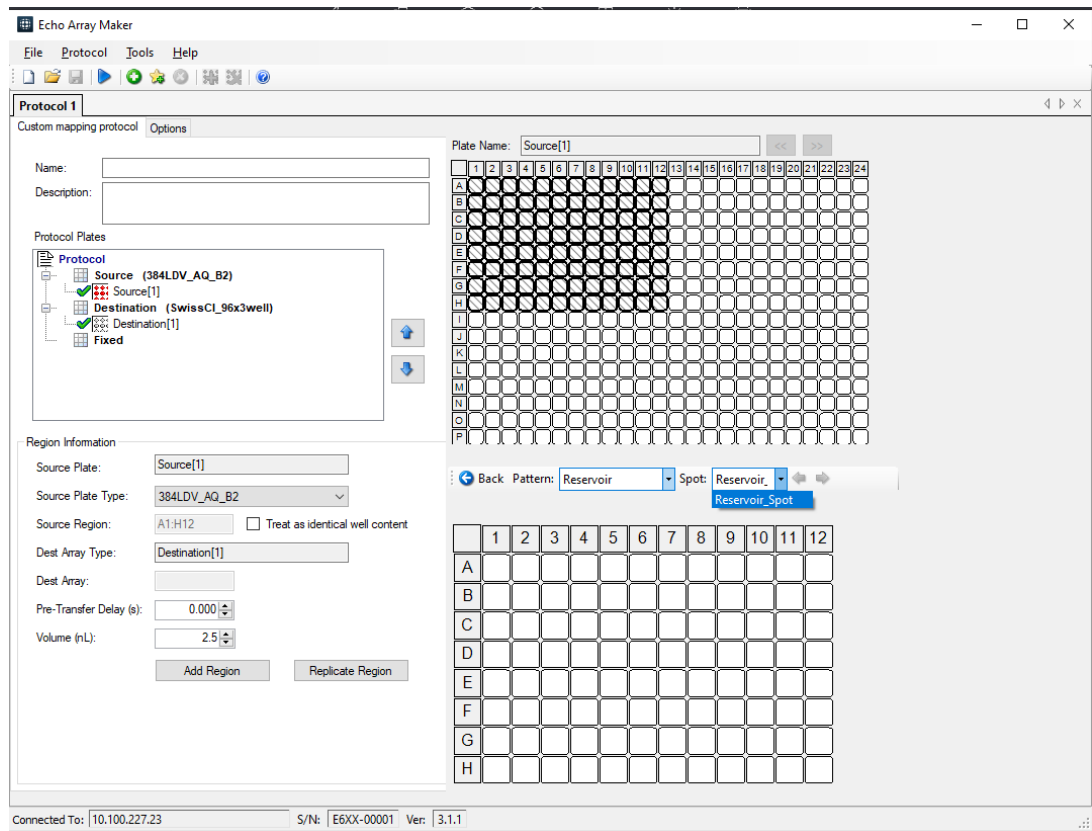
7 Using the **Spot** drop-down menu, select the specific spot to be used for all of the destination arrays selected.

Figure 4.51 Selecting the spot
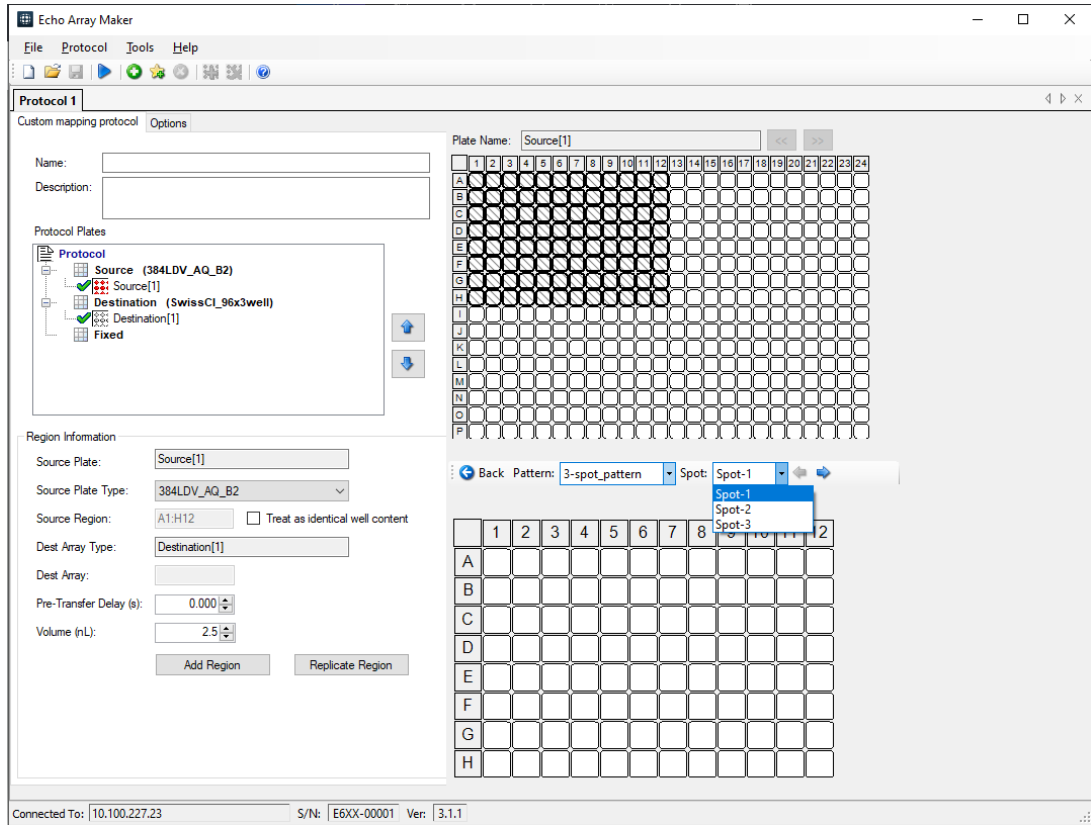
NOTE Map to Array is designed to function in a one to one relationship with selected spots in the destination arrays. If the 3-spot_pattern were chosen, the user would specify to which of the 3 spots the source region wells should be transferred.

NOTE The blue right and left arrows can be used to select the previous or next spot in the pattern.

8 Click the **Add Region** button or select the **Add Region** icon in the **Toolbar** to add the region to the selected destination pattern region. The **Add Region** command translates the selected source region in a one to one manner.

Figure 4.52 Add region executed

9 Select any optional steps as needed. For more information on the optional steps available, see Optional steps after adding or replicating a region.

Replicate Region - Map to Array

In this example, a **SwissCI_96x3well** array is used for the destination array and a 384PP is used for the source plate format. **Map to Array** is used to map the source plate to the destination plate.
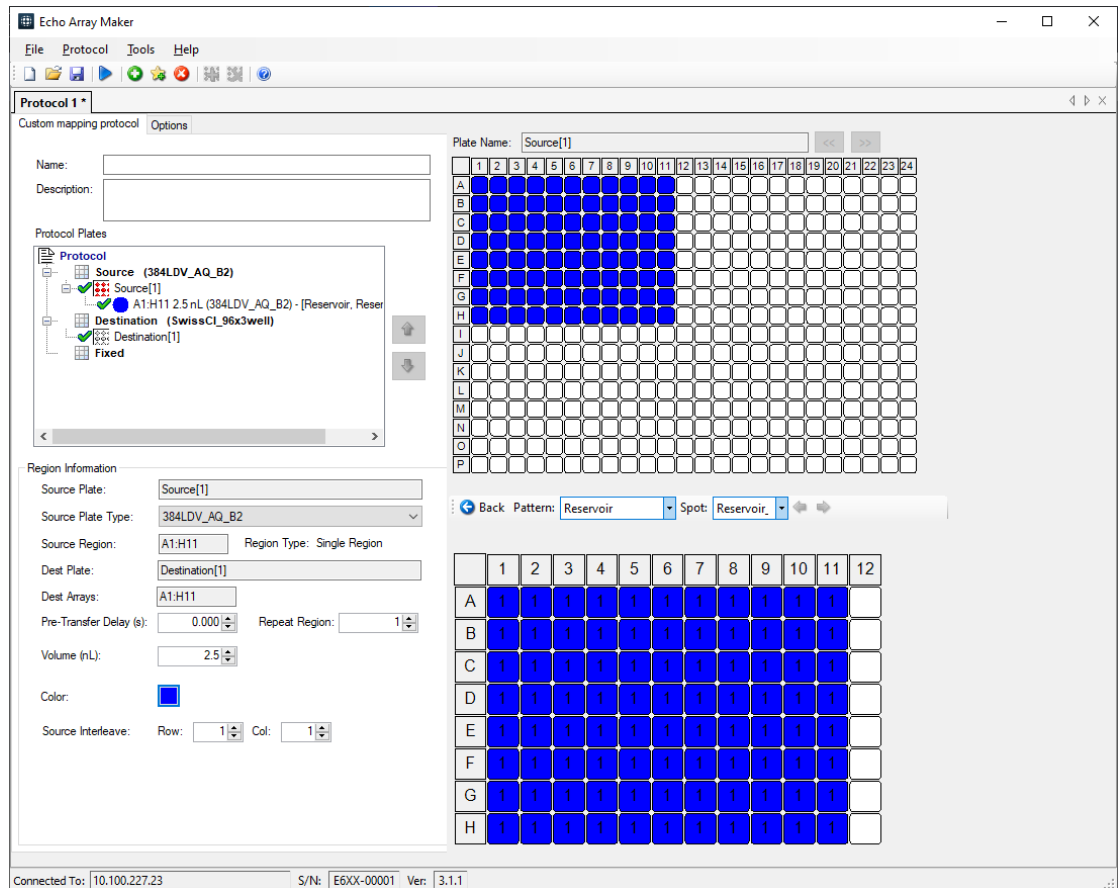
NOTE It is assumed that the required destination arrays have been created.

To replicate a region:

1 Start a new protocol as explained in topic Starting a New Protocol.

2   Select the source plate types and the destination array types as explained in topic Selecting the Source Plate Type and Destination Array Type.

3   In the **main Protocol** window, select the desired wells as the region in the source plate map from which the transfers will occur. This becomes the Source Region. The information box for that region is automatically populated.

4   For the **Map to Array** command, selection of the destination array(s) to which the source region will be transferred occurs after the user clicks on **Map to Spot.** Designating the destination arrays in the **main Protocol** window is not required.

NOTE   Destination Arrays are represented by the wells of a crystallography plate.

Figure 4.53   Before map to array is executed
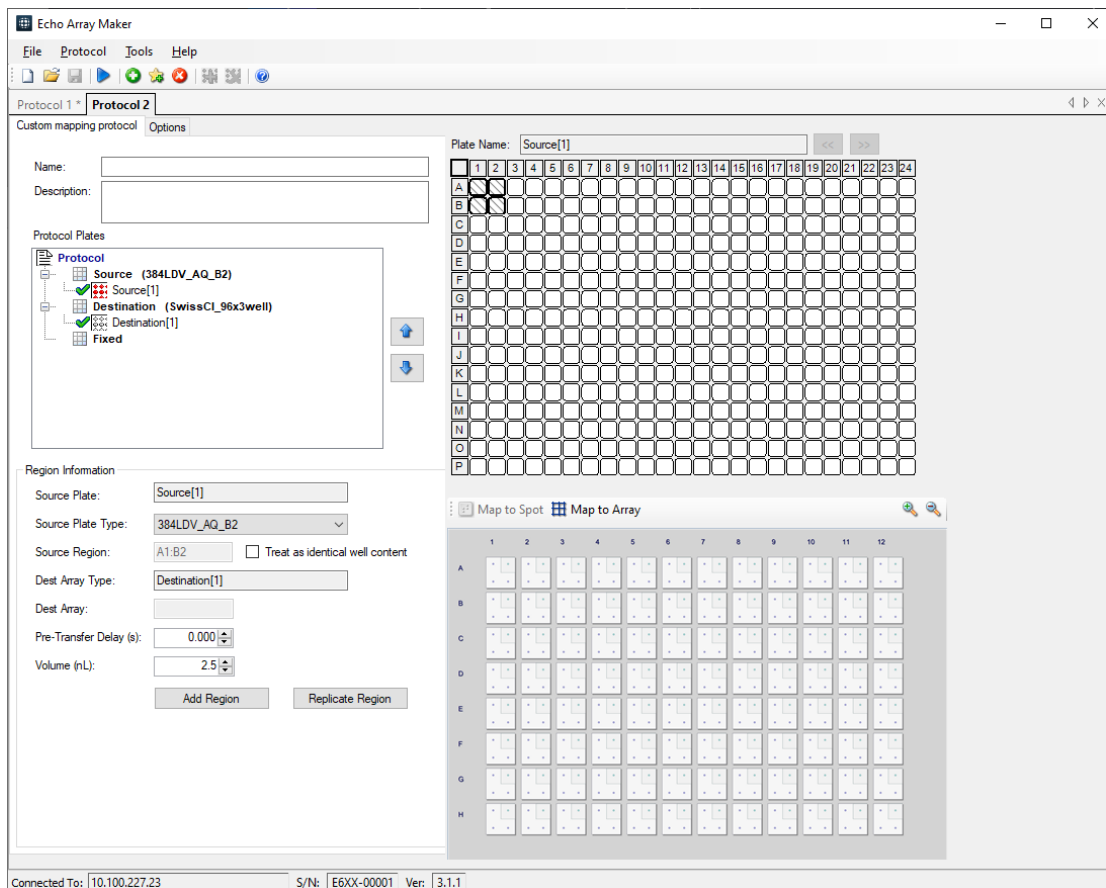
5   Click **Map to Array.** This launches the array view of the Destination Array in the **main Protocol** window.

6 Select the destination arrays (wells) containing the spots to which the source region will be transferred to. If more than one pattern exists in the destination array(s), select the desired pattern using the **Pattern** drop-down menu.

The destination array below contains 2 patterns: **3-spot_pattern** and **Reservoir**. For this example, the **Reservoir** pattern is selected which maps the contents of each well of the source region into the corresponding reservoir wells on the crystallography plate.

Figure 4.54 Selecting the Reservoir pattern
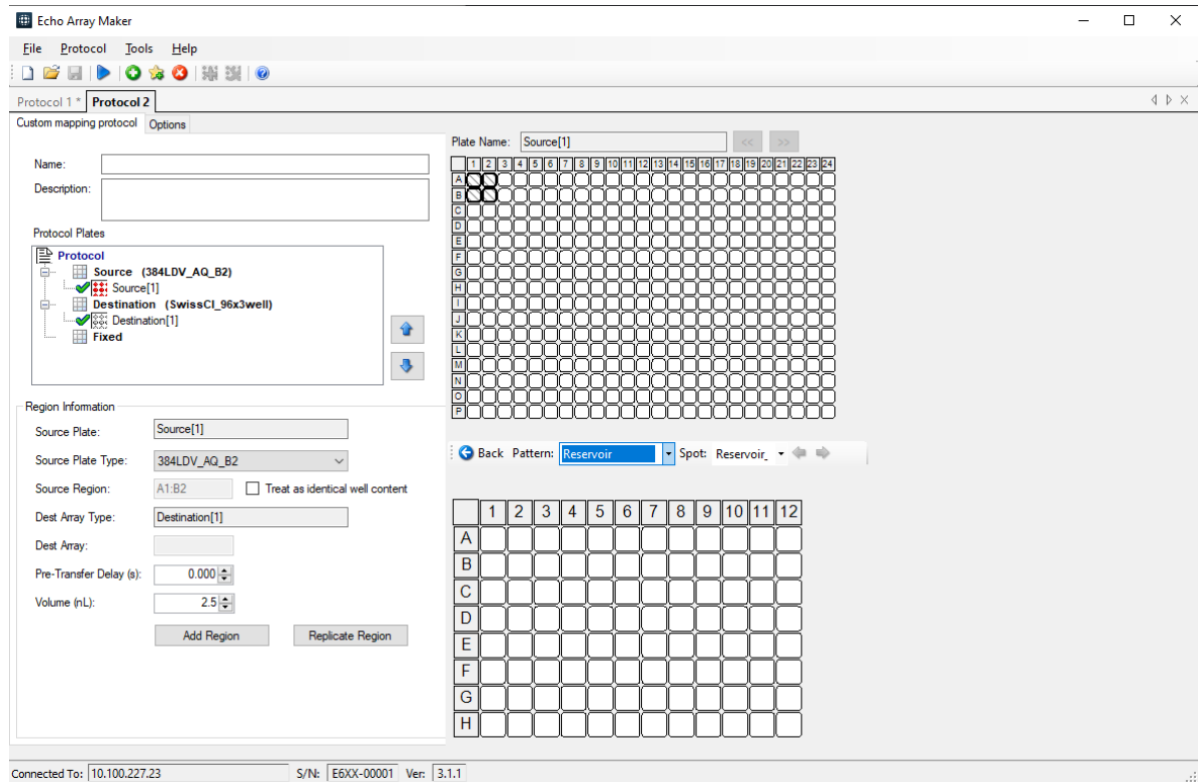
7 Using the **Spot** drop-down menu, select the specific spot to be used for all of the destination arrays selected.

Figure 4.55 Selecting the spot
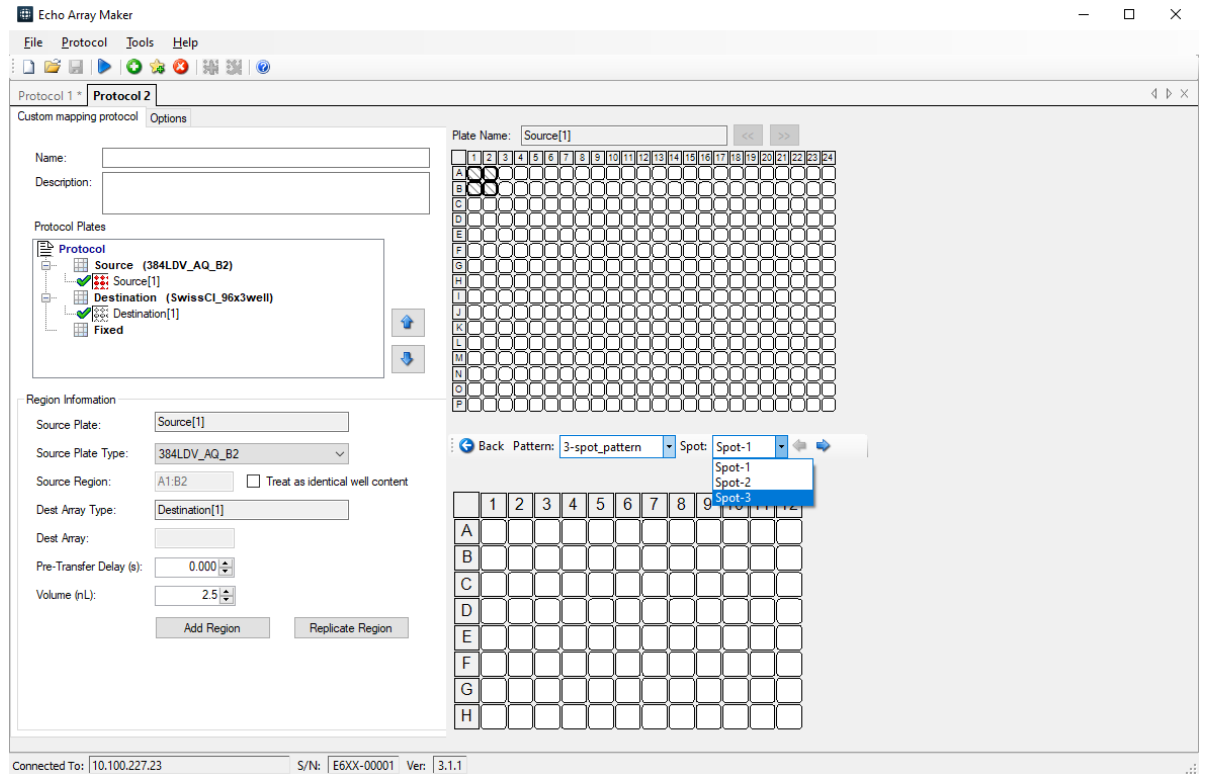
NOTE **Map to Array** is designed to function in a one to one relationship with selected spots in the destination arrays. If the 3-spot_pattern were chosen, the user would specify to which of the 3 spots the source region wells should be transferred.

NOTE The blue right and left arrows can be used to select the previous or next spot in the pattern.

8 Click the **Replicate Region** button or select the **Replicate Region** in the **Toolbar** to add the source region to the selected destination spot across the selected destination arrays. Replicate region translates the selected source region and replicates that into the selected destination spots across the destination array as many times as allowed by the number of destination arrays selected.

> **NOTE** If the number of destination arrays is too small to fit a single replicate of the source region, an error message is generated. In the event that the destination arrays is not an exact multiple of the source region, it will replicate as many complete sets of the source region wells as possible.

Figure 4.56 Add region executed
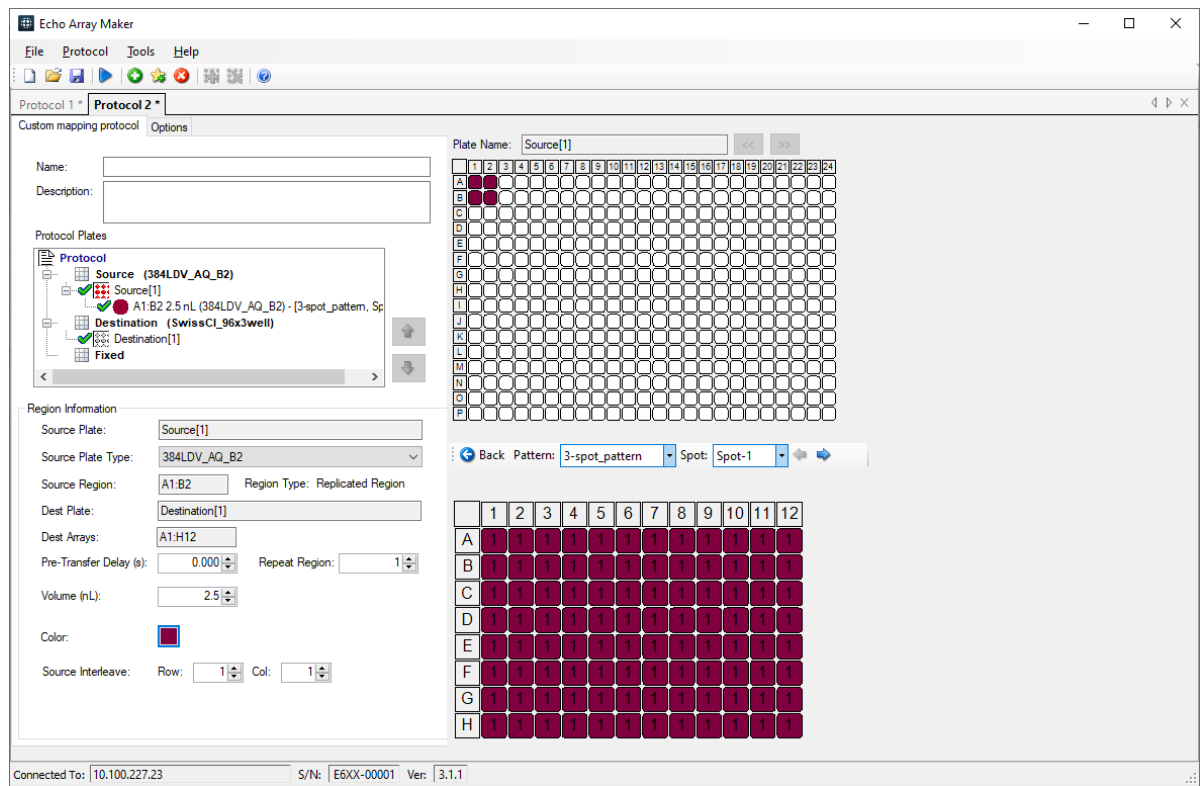
9 Select any optional steps as needed. For more information on the optional steps available, see Optional steps after adding or replicating a region.

Running a Protocol

To begin a protocol simulation or live run:

Figure 4.57 Run Options Dialog Box
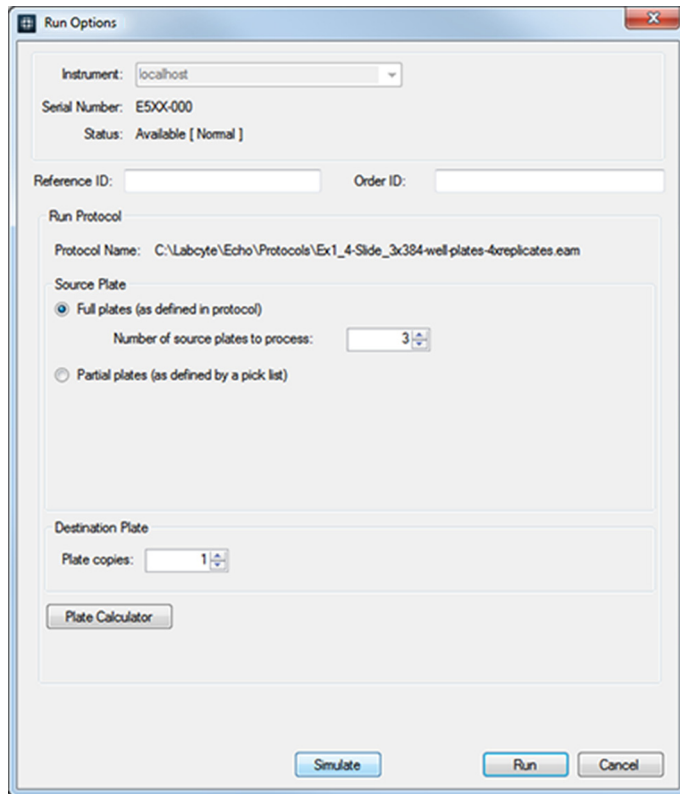
---

1 Select **Run** from the **Protocol** menu or click the **Run** ▶ icon in the **Toolbar**.

---

2 Select the **Instrument** if it is not already selected.

---

3 Optionally, enter a **Reference ID** and/or **Order ID** to be used to reference the run in the output report files.

---

4 For the **Full Plates** option defined by the protocol, specify the number of source plates to process. The number of source plates are defined in the protocol and cannot be overridden in the **Run Options** dialog box.

---

5 Click **Partial Plates** to pick specific plates. When the **Partial Plates** option is selected, an **Import** button is displayed to import a .csv pick list indicating the wells to be transferred. For more information on how to define a pick list, see Importing a Pick List.

6 In the **Destination Plate** section, change the value for **Plate copies** to override the number of plate copies for the protocol.

7 Click the **Plate Calculator** button to view the number of plates needed to run the protocol.

Figure 4.58 Plates Used dialog box
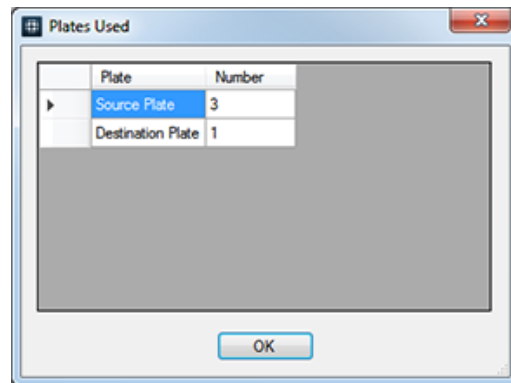
8 Optionally, click **Simulate** to test the run.

> **NOTE** Running a simulation is recommended to verify the transfers defined in the protocol before a live run.

9 Click **Run** to execute the protocol

Advanced Features

There are many advanced features that a user can use when creating protocols. The topics below describe what these features are and how to use them.

- Using Pre-Transfer Delay
- Using Repeat Region
- Adding a Fixed Plate
- Using Interleaving
- Transferring Identical Well Content
- Importing a Pick List

Using Pre-Transfer Delay

The Pre-Transfer Delay sets the time delay before starting the transfer for a given region. It is used in cases where there may be a requirement to pause shortly between transfers.

The Pre-Transfer Delay should be set before adding a region.

Figure 4.59 Pre-Transfer Delay in Main Protocol Window
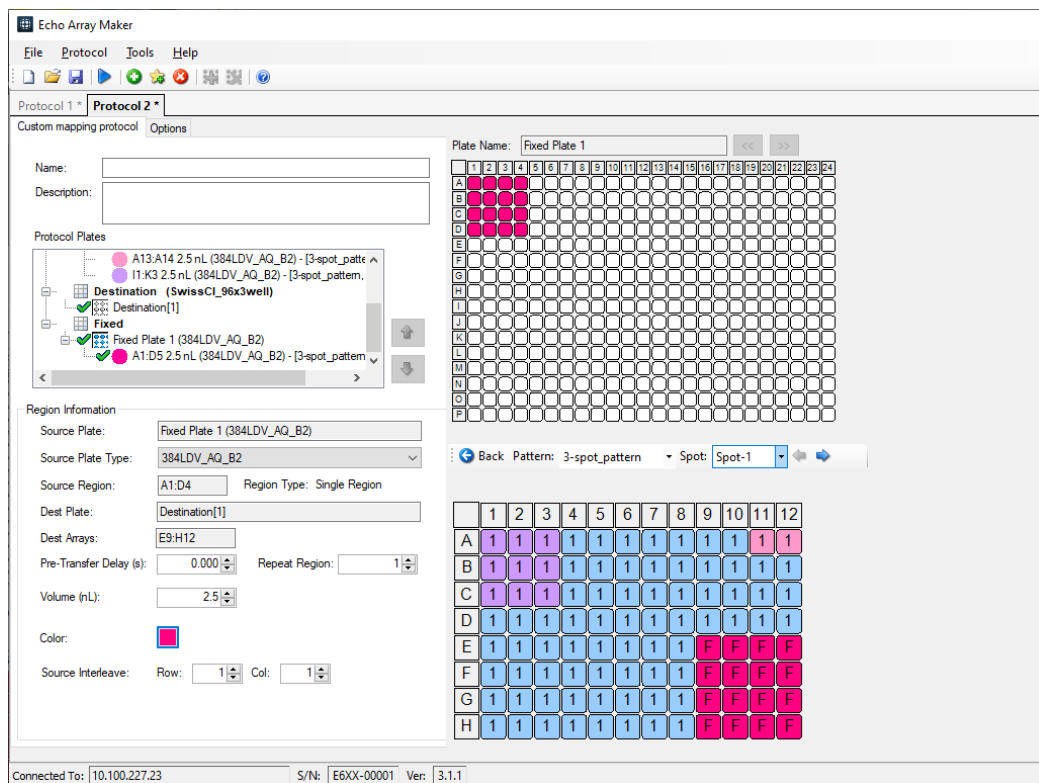

Using Repeat Region

The Repeat Region sets the number of times the selected region is repeatedly transferred. it is recommended to use this option with Pre-Transfer Delay.

Adding a Fixed Plate

To add controls to the plates, use the fixed plate option:

Figure 4.60 Fixed Plate Selected in Main Protocol Window

1   Start a new protocol as explained in topic .

2   Select the source plate types and the destination array types as explained in topic Selecting the Source Plate Type and Destination Array Type.

3   Select **Fixed** in the **Protocol Plates** tree in the **main Protocol** window.

4   Select the **Before Source Plate** or **After Source Plate** option.

5   Click the **Add Plate** button or click the **Add Plate** [icon] icon in the **Toolbar**.

Figure 4.61 Fixed Plate Setup Dialog Box
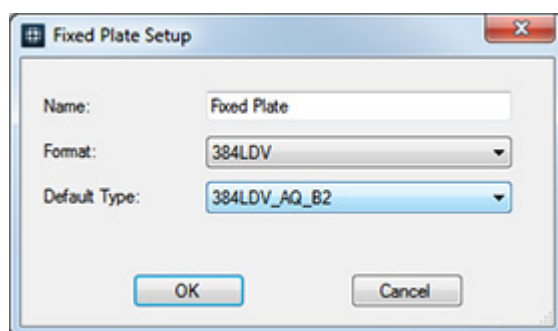
6   In the **Fixed Plate Setup** dialog box, select the **Format** and the **Default Type** and click **OK**.

7   Select the new **Fixed Plate** in the **Protocol Plates** tree in the main **Protocol** window.

8   In the **main Protocol** window, select the desired wells as the region in the source plate map. The information box for that region automatically opens.

9   Click on a pattern or use the mouse to select the pattern directly. To select multiple patterns, use **Ctrl+click**. See Source region with single destination pattern selected.

10   Enter the **Fixed Plate** settings in the **Region Information** box.

   NOTE   The fixed plate determines the uniform fill volume for the entire plate. The volume ranges are limited by the plate type.

11   Select any optional steps as needed. For more information on the optional steps available, see Optional steps after adding or replicating a region.

Using Interleaving

Interleaving is only applicable for source plates in Echo Array Maker. To map transfers from interleaved wells of a source plate to a destination array, the user must select interleave to highlight the source wells in an interleaved fashion, and then use the map to spot or map to array similar to what would be performed for a non-interleaved transfer.

To interleave wells in source plate:

1 Add or replicate a region as explained in topic Add Region - Map to Spot or Replicate Region - Map to Spot.

2 To quickly transfer contents from or to wells in an interleaved pattern, select the **Source Interleave** option. This allows a user to set the row-wise or column-wise spacing for interleaved transfers.

The default value for the **Source Interleave** option is 1, 1, or no interleave.

In the example below, the **Source Interleave** was set for **Row 2** and **Col 3**.This instructs the application to transfer from neighboring source wells separated by 3 columns to destination spots that are direct neighbors in X direction. The transfer from neighboring source wells should be separated by 2 rows to destination spots that are direct neighbors in Y direction.

3 Select any optional steps as needed. For more information on the optional steps available, see
Optional steps after adding or replicating a region.

Figure 4.62 Interleave wells in source plate to wells in destination plates
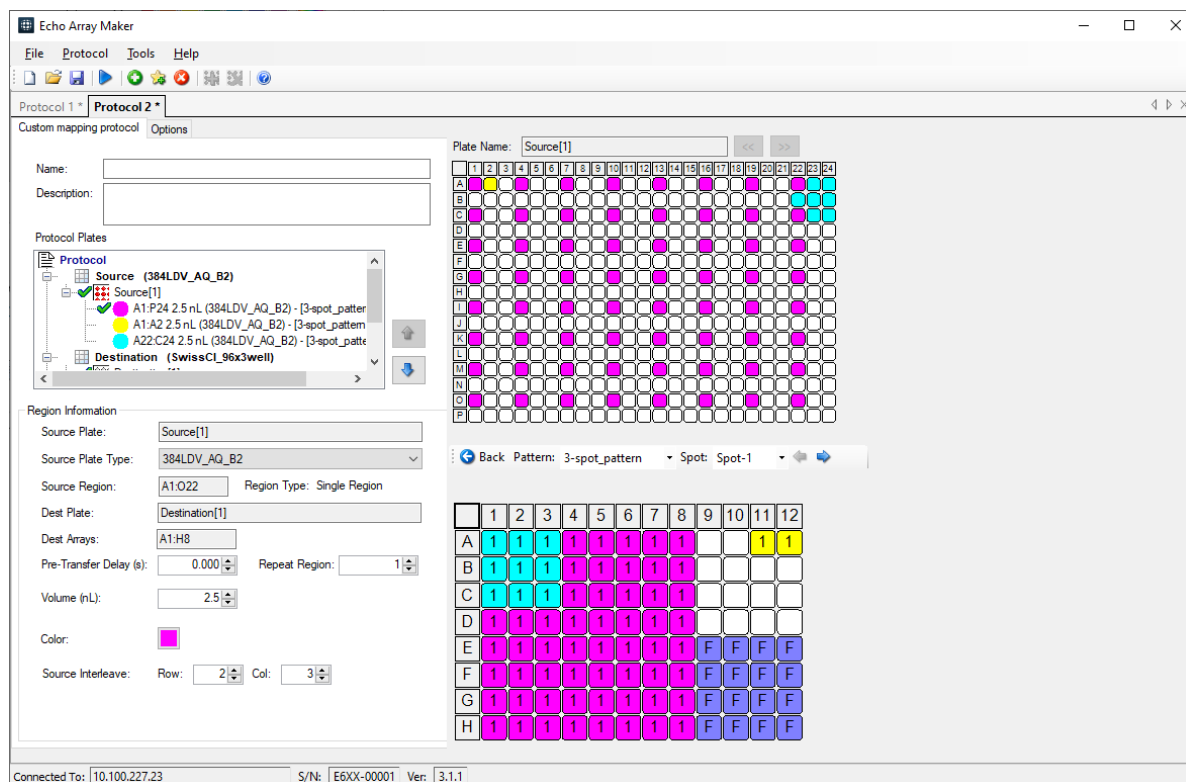
NOTE The Interleave option is not available until a region is created. It is available if an existing region
is selected and if the region is not an Identical well content region.

Transferring Identical Well Content

Selecting **Treat as identical well content** indicates that the contents of wells in a selected source plate
are identical. These wells can be used interchangeably to fill wells of a destination plate. Wells
containing the largest volume in the group will be depleted until all wells have an equal volume.
Once all wells are equal, contents will be transferred in a round-robin fashion. This option is
commonly used for repeated transfers from a group of wells across multiple protocol runs. This
option is available when adding a region.

To treat wells within a region as having "identical well content":

For example, to transfer an identical reagent from a group of wells in a source plate to one or more assay plates.

1 Add a region as explained in topic Add Region - Map to Spot and check **Treat as identical well content** before clicking the **Add Region** button. This action overwrites the pattern by treating all the source wells identically.

NOTE If an identical well type region is created, the Interleave option is not available.

2 Select any optional steps as needed. For more information on the optional steps available, see Optional steps after adding or replicating a region.

Figure 4.63 Treat as identical wells selected for region 4
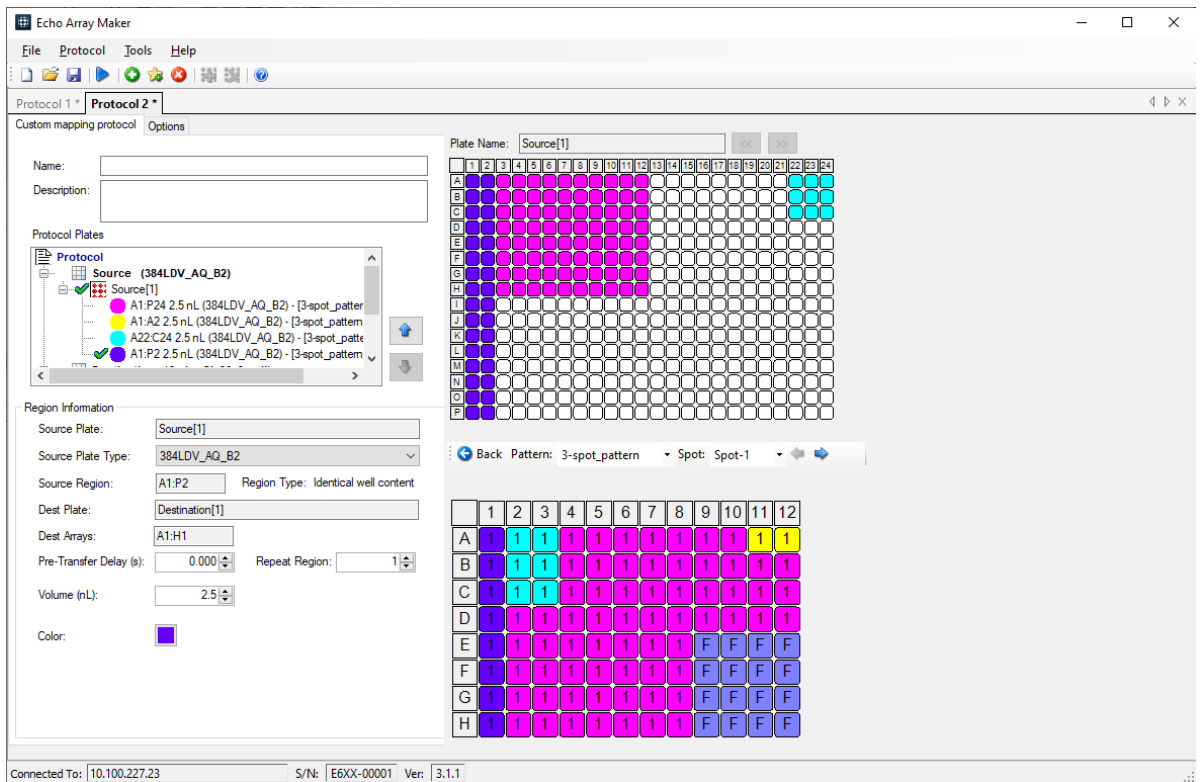
Importing a Pick List

Importing a pick list from the **Run Options** dialog box is a quick way to run existing Echo Array Maker protocols with partial source plates as defined by an input file. Using a pick list eliminates the need to create a unique protocol.

When importing a pick list via the **Run Options** dialog box, the pick list parameters override any plate parameters in the protocol for the run, with the exception of fixed plates. This is typically used for creating exact copies of a pick list plate.

NOTE The pick list cannot be saved in the protocol.

The pick list is a table of specific wells that have been selected from a group of wells for analysis. The pick list is typically created in a text or spreadsheet file.

Guidelines for defining pick list:
- Pick lists using row and column location must use the one-based coordinate system, which means that the first well in the upper left corner of the microplate is labeled row 1, column 1, or (1,1).
- Pick lists must be saved in .csv file format to be used by the Echo Array Maker application.

The pick list must provide a minimum set of information in columns that map to functional parameters in the Echo Array Maker application. The minimum set required depends on which parameters are used. The table below shows four examples of minimum column selections required for a pick list to be processed.

Columns Selected	CSV Example File
Source Well, Transfer Volume, Destination Array ID, Destination Pattern ID, Destination Spot ID	EAM Pick List - Greiner_CrystalQuick_96-well.csv
Source Row, Source Col, Transfer Volume, Destination Array ID, Destination Pattern ID, Destination Spot ID	EAM Pick List - 4-Slide-12x384-well_Array.csv
Source Well, Transfer Volume, Array Name, Destination Pattern ID, Destination Spot ID	EAM Pick List - Intelliplate_96x3well_LP.csv
Source Row, Source Col, Transfer Volume, Array Name, Destination Pattern ID, Destination Spot ID	EAM Pick List - SwissCI_96x3well.csv

In addition to the columns listed above, **Source Plate Name** and **Destination Plate Name** columns can be selected to specify unique plates for each transfer. If these values are not mapped to the pick list, the application assumes the same source and destination plates are used for every transfer in the pick list.

Using existing files to create a pick list:
- Transfer Reports — Transfer Reports from completed protocol runs are saved as .CSV, .XML, or .TXT files depending on what the user selected for **Save transfer reports as file type** in the **Options** tab. These files can be imported as pick lists for new protocols. Transfer Reports contain columns that can be mapped to all source and destination parameters in an Echo application. For more information, see Transfer and Survey Reports.
- Exported Destination Array — Complete Destination Arrays can be exported to .CSV files via the **Export CSV** button in the **Destination Arrays** dialog box. See Destination Arrays dialog box.

Columns containing Source Well and Transfer Volume information must be manually added to the exported .CSV file. Once the information is added, the new file can be imported as a pick list in an Echo application.

NOTE If an error is encountered when importing a pick list, the error message will show the column data that is needed.

To import a pick list:

1 To open the **Import Pick List** dialog box, select **Run** from the **Protocol** menu or click the **Run** icon in the **Toolbar**. See Run Options Dialog Box.

2 Click **Partial Plates** to pick specific plates. When the **Partial Plates** option is selected, an **Import** button is displayed to import a .csv pick list indicating the wells to be transferred.

3 Click **Import** to import the pick list.

Figure 4.64 Import Pick List dialog box
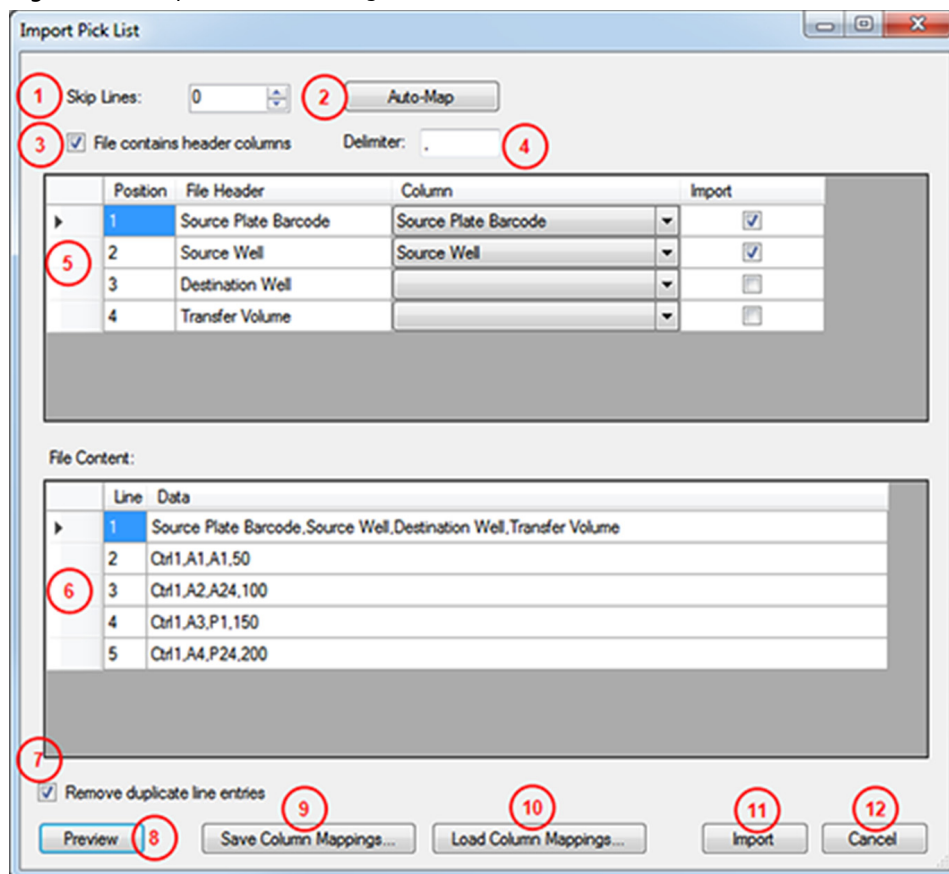
The table below describes the buttons/fields or sections in the **Import Pick List** dialog box and their functionality.

Table 4.3 Callout table for Import Pick List dialog box

Callout Number	Name	Description
1	Skip Lines	The pick list can contain heading information (for example, assay information, date, etc.), but it should be skipped when importing. Select a numerical value for Skip Lines to skip the number of specified heading lines for the column headings (header line).
2	Auto-Map button	Maps the column headings and data automatically.
3	File contains header columns	If the pick list contains a header line (column headings), select this option.
4	Delimiter	The delimiter used to separate data in the pick list file.
5	Column Details	• **Position** — Specifies the position in the file. • **File Header** — Specifies the header for the column. • **Column** — Specifies the column name. This drop-down list defines the columns that can be added to the pick list. • **Import** — Specifies if the data for the associated column should be imported or not.
6	Preview Result or File Content table	The results for this table are toggled based on if the user clicks the **Preview** or the **File content** button.
7	Remove duplicate line entries checkbox	Check this to remove duplicate entries in the source file when creating the pick list.
8	Preview or File content button	Toggles between the preview result showing the IDs, corresponding source wells, and other data available and the file content result showing the line number and corresponding data.
9	Save Column Mapping to File button	Exports the column mappings to a text file.
10	Load Column Mapping from File button	Imports the column mappings to be viewed.
11	Import button	Imports the source wells, destination wells, and transfer volume into the current protocol. **NOTE** By clicking **Import**, the existing protocol data is overwritten and cannot be undone unless the protocol was previously saved.
12	Cancel button	Closes the **Import Pick List** dialog box without saving any changes.

Software Reference

This chapter describes all of the Echo Plate Audit application screens. It includes the following topics.

- Toolbar
- Protocol Tab
- Options Tab
- Preferences
- Labware Definitions
- Destination Arrays
- Run Protocol
- Simulator Window
- Run Status Window

Toolbar

The **Toolbar** contains the **File**, **Protocol**, **Tools**, and **Help** menus, and individual icons for frequently used functions.
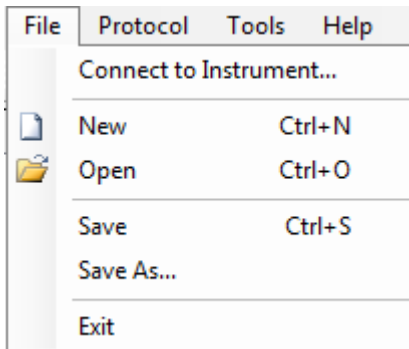
Figure 5.1 Toolbar

The topics below describe the functions that can be performed using the **Toolbar**.

- File Menu
- Protocol Menu
- Tools Menu
- Help Menu

File Menu

Figure 5.2 File menu

- **Connect to instrument** — Selects an Echo instrument to connect to the software.
- **New** — Creates a new transfer protocol.
- **Open** — Opens an existing transfer protocol.
- **Save** — Saves the current transfer protocol.
- **Save As** — Copies the current transfer protocol to a different file name.
- **Exit** — Closes the Echo Array Maker software.

## Protocol Menu

Figure 5.3 Protocol menu
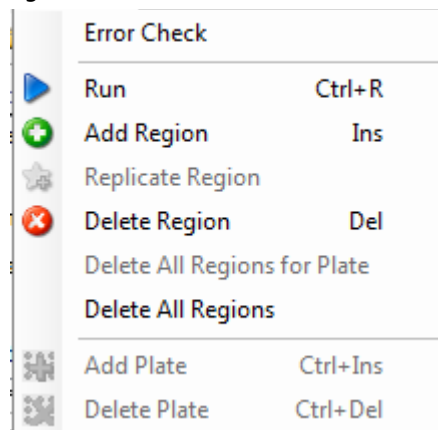
- **Error Check** — Checks the protocol for inconsistent information.
- **Run** — Executes the transfer protocol that is displayed.
- **Add Region** — Adds the selected region.
- **Replicate Region** — Replicates the selected region within the highlighted destination region as many times as possible.
- **Delete Region** — Deletes the selected region.
- **Delete All Regions for Plate** — Deletes all the regions for the selected plate.

- **Delete All Regions** — Deletes all the selected regions.
- **Add Plate** — Adds a new plate to the protocol.
- **Delete Plate** — Deletes a plate from the protocol.

Tools Menu

Figure 5.4 Tools menu
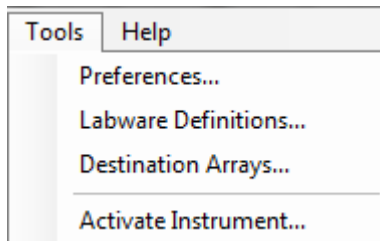
- **Preferences** — Used to set survey, output, and report options for all protocols.
- **Labware Definitions** — Manages existing Labware definitions or adds new definitions.
- **Destination Arrays** — Manages existing arrays and patterns or creates new arrays and patterns.
- **Activate Instrument** — Used to enter the software license key to use the Echo Array Maker software.
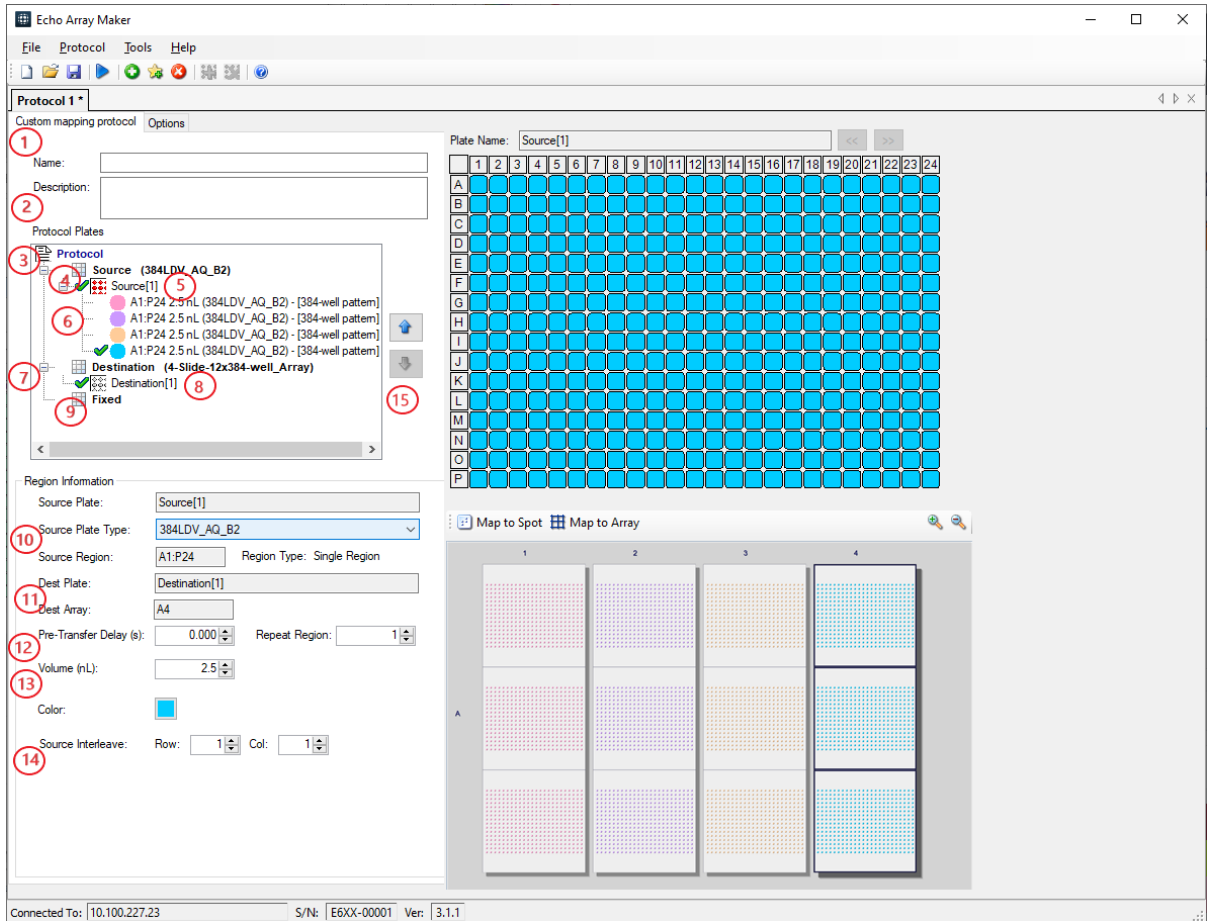
Help Menu

Figure 5.5 Help menu
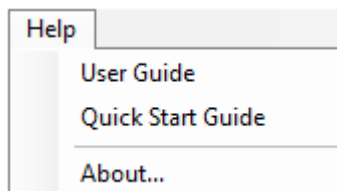
- **User Guide** — Launches the application User Guide in PDF format.
- **Quick Start Guide** — Launches the application Quick Start Guide in PDF format.
- **About...** — Display the version number of the Echo Array Maker software.

Protocol Tab

The **Protocol** tab displays the following information:

Figure 5.6 Protocol tab

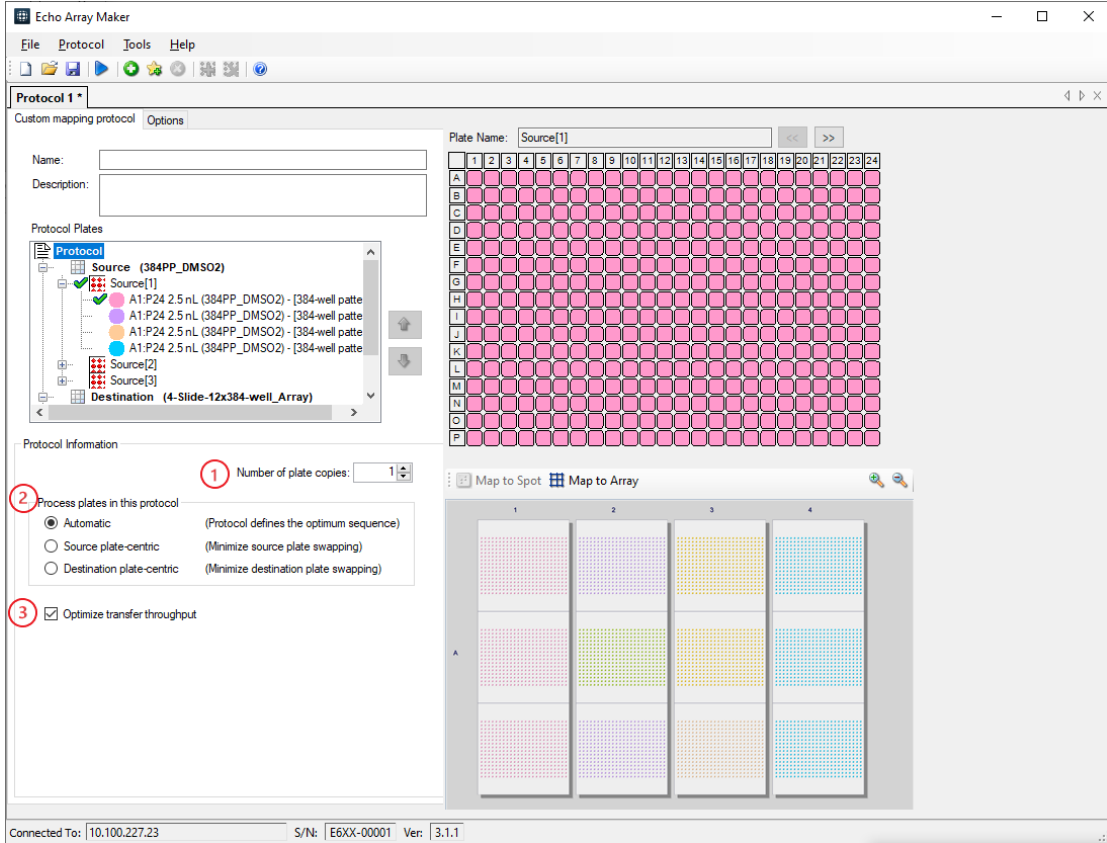The table below describes the buttons/fields or sections in the **Protocol** tab and their functionality.

Table 5.1 Callout table for Protocol tab

Callout Number	Name	Description
1	Name	Defines the name of the protocol.
2	Description	Sets a brief description for the protocol.
3	Protocol	Selecting the protocol in protocol tree is used to set protocol specific features.
4	Source Plate Type	Defines the source plate type used in the protocol.
5	Source Plate(s)	Defines the source plate(s) used in the protocol.
6	Region(s)	Defines the region(s) in a source plate.
7	Destination Plate Type	Defines the destination plate type and plate format for the protocol.
8	Destination Plate	Defines the destination plate name(s) receiving transfers for the protocol.
9	Fixed Plate	Defines a fixed plate for the protocol.
10	Selected source plate, source plate type, source region information, and destination array type	The fields displayed in this Region Information section change based on the type of protocols being used.
11	Dest Array	Read-only field that indicates the location for the destination array.
12	Pre-Transfer Delay	Defines the time delay before the starting the transfer for this region. This can be used in cases where there is a requirement to incubate shortly between transfers.
13	Volume	Defines the volume transferred from the selected region.
14	Source Interleave	The row or column that is selected from the source plate is interleaved before it is transferred.
15	Region Order	These arrows are used to change the order (up and down) of the regions in a plate. This is important if the regions have Pre-Transfer Delay set.

The **Protocol** tab has many fields that change depending on what is selected. Furthermore, depending on what is selected in the **Protocol Plates** tree, the bottom left information box can change. The examples below illustrate the different fields that appear depending on what is selected in the **Protocol Plates** tree.

In the Protocol Plates tree of the Plate Design tab, if Protocol is selected, the following settings become available:

Figure 5.7 Protocol selected

The table below describes the buttons/fields in the **Protocol Information** section and their functionality.
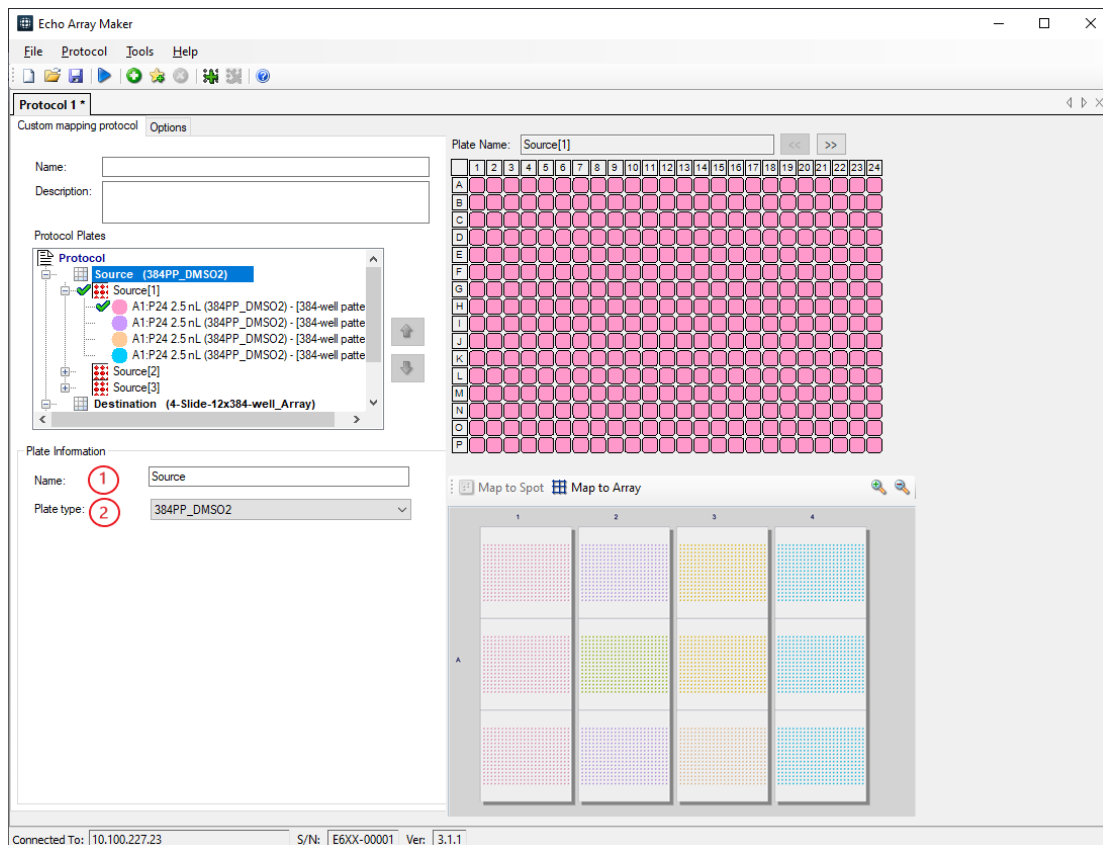
Table 5.2 Callout table for Protocol Information section

Callout Number	Name	Description
1	Number of plate copies	Number of times the plate should be copied.
2	Process plates in this protocol	Defines the order in which to process the plates. • **Automatic** — Protocol defines the optimum sequence. • **Source plate-centric** — Minimizes source plate swapping. • **Destination plate-centric** — Minimizes destination plate swapping.
3	Optimize transfer throughput	Echo overrides the order of operation specified in the protocol and reorder transfers to minimize stage and transducer movements.

In the Protocol Plates tree of the Plate Design tab, if Source or Destination plate type is selected, the following settings become available:

Figure 5.8 Source plate type selected

The table below describes the buttons/fields in the **Protocol Information** section and their functionality.

Table 5.3 Callout table for Protocol Information section

Callout Number	Name	Description
1	Name	Name of the source plate.
2	Plate Type	Defines the plate type.

NOTE Changes are applied once cursor is removed from the field modified.

In the Protocol Plates tree of the Plate Design tab, if a specific Source or Destination plate is selected, the following settings become available:

Figure 5.9 Source plate selected
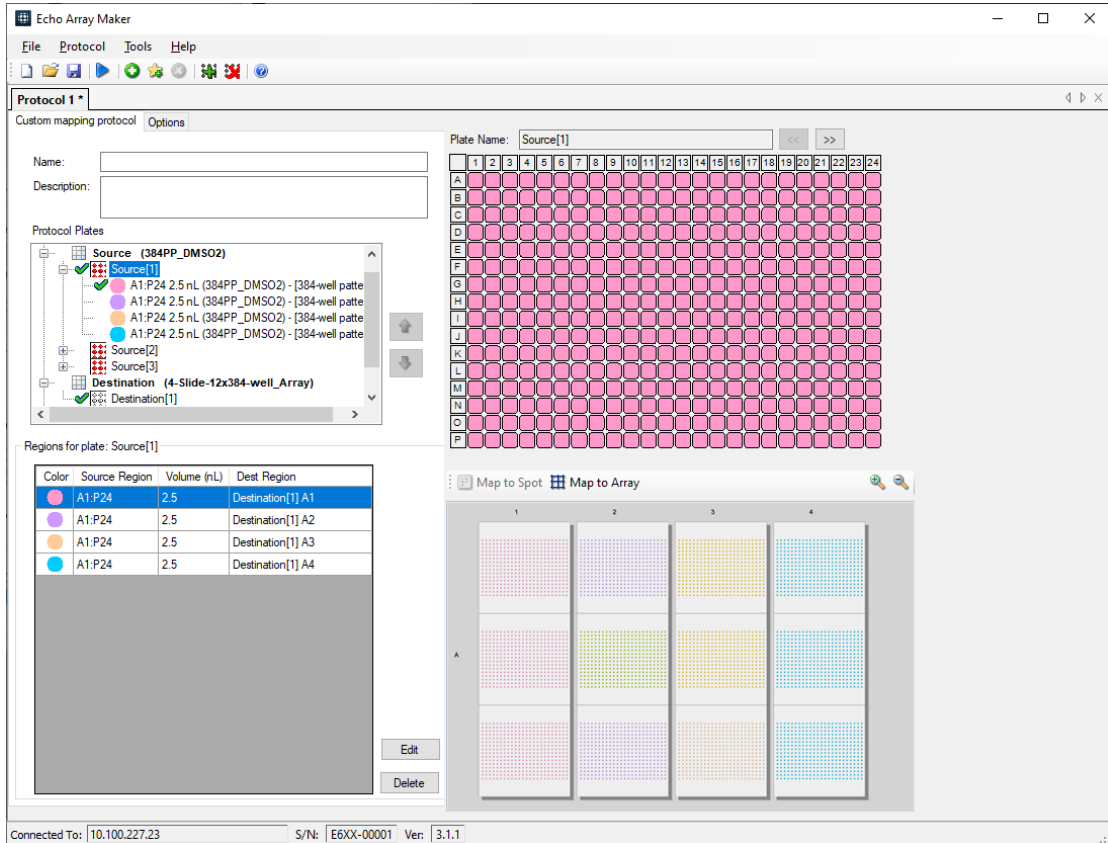
In the **Regions for Plate** box, the regions for the selected plate are listed. The user can click **Edit** to modify a region or **Delete** to remove a region from the plate.

The following fields can be modified for a region:

- Pre-Transfer Delay
- Repeat Region
- Volume
- Source Interleave or Treat as Identical (Treat as identical is only available if the region is not an identical well type region)
- Color

NOTE If there are no regions for the plate, this list will be empty.

In the Protocol Plates tree of the Plate Design tab, if a specific Region is selected, the following settings become available:
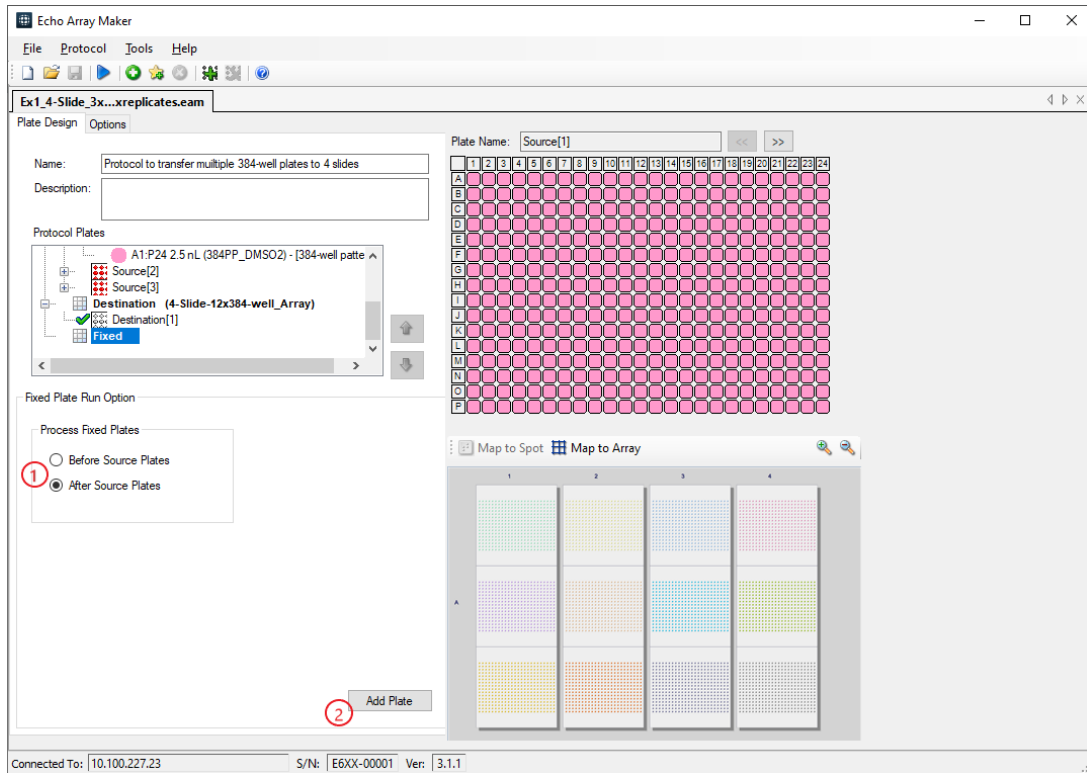
Figure 5.10 Region selected
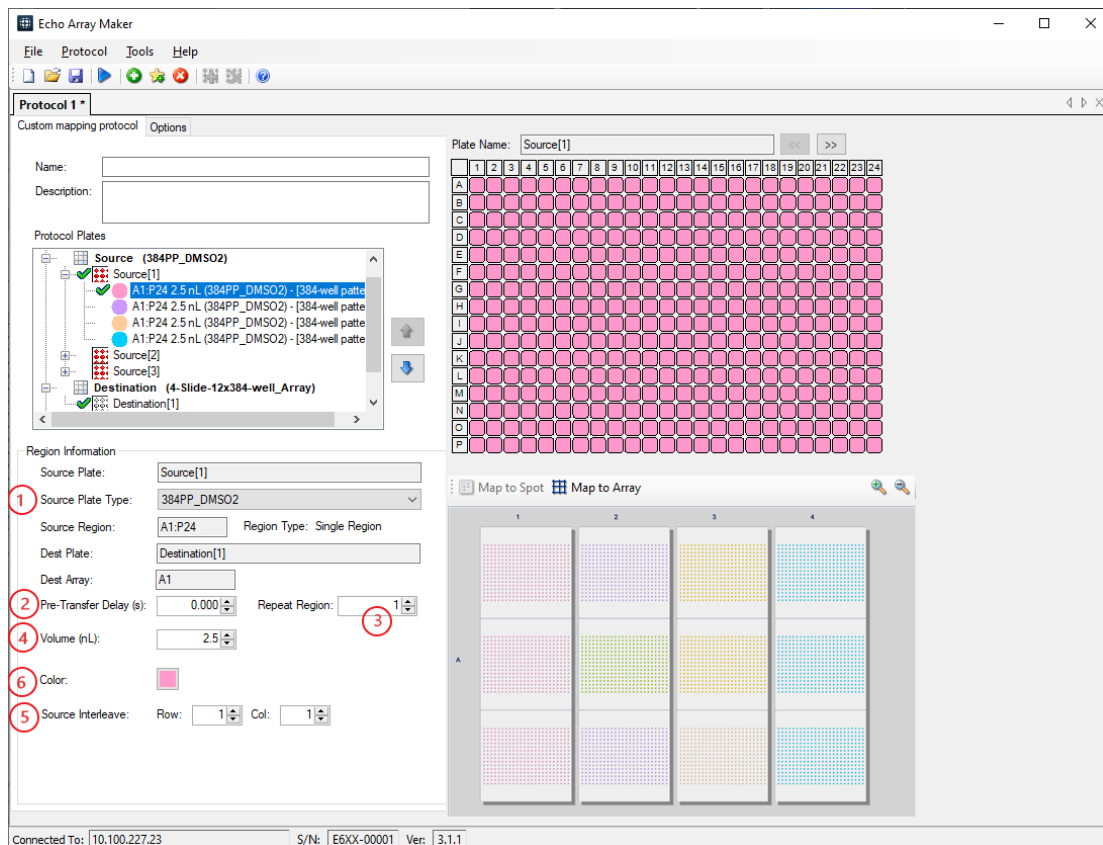
The table below describes the buttons/fields in the **Region Information** section and their functionality.

Table 5.4 Callout table for Region Information section

Callout Number	Name	Description
1	Source Plate Type	Defines a combination of a physical plate and a fluid type for a plate.
2	Pre-Transfer Delay	Pre-Transfer Delay sets the time delay before starting the transfer for a given region.
3	Repeat Region	Repeat Region sets the number of times the selected region is repeatedly transferred.
4	Volume	The volume in nL in the region.
5	Source Interleave or Treat as Identical	Treat as identical is only available if the region is not an identical well type region. Select Treat as identical well content to indicate that the contents of wells in a selected source plate are identical.
6	Color	Color that identifies the region on the plate map.

In the Protocol Plates tree of the Plate Design tab, if Fixed Plate is selected, the following settings become available:

Figure 5.11 Fixed plate selected

The table below describes the buttons/fields in the **Fixed Plate Run Option** section and their functionality.

Table 5.5 Callout table for Region Information section

Callout Number	Name	Description
1	Process Fixed Plates	Defines the order in which to process the fixed plate. • **Before Source Plates** — Process the fixed plate before the source plates. • **After Source Plates** — Process the fixed plate after the source plates.
2	Add Plate button	The user can click Add Plate to add the fixed plate. For more information on adding a fixed plate, see Adding a Fixed Plate

Add Plate

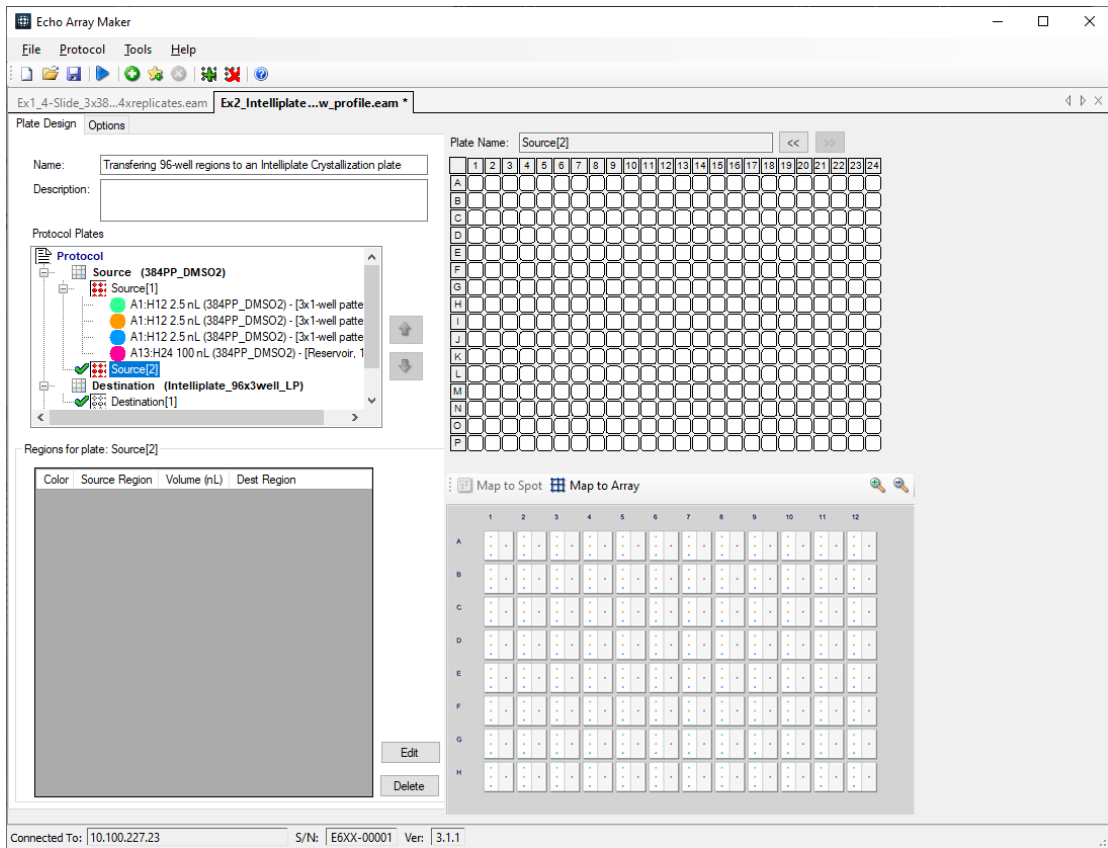The **Add Plate** command allows a user to add a new plate to the protocol.

Figure 5.12 Main Protocol Window Before Add Plate Executed
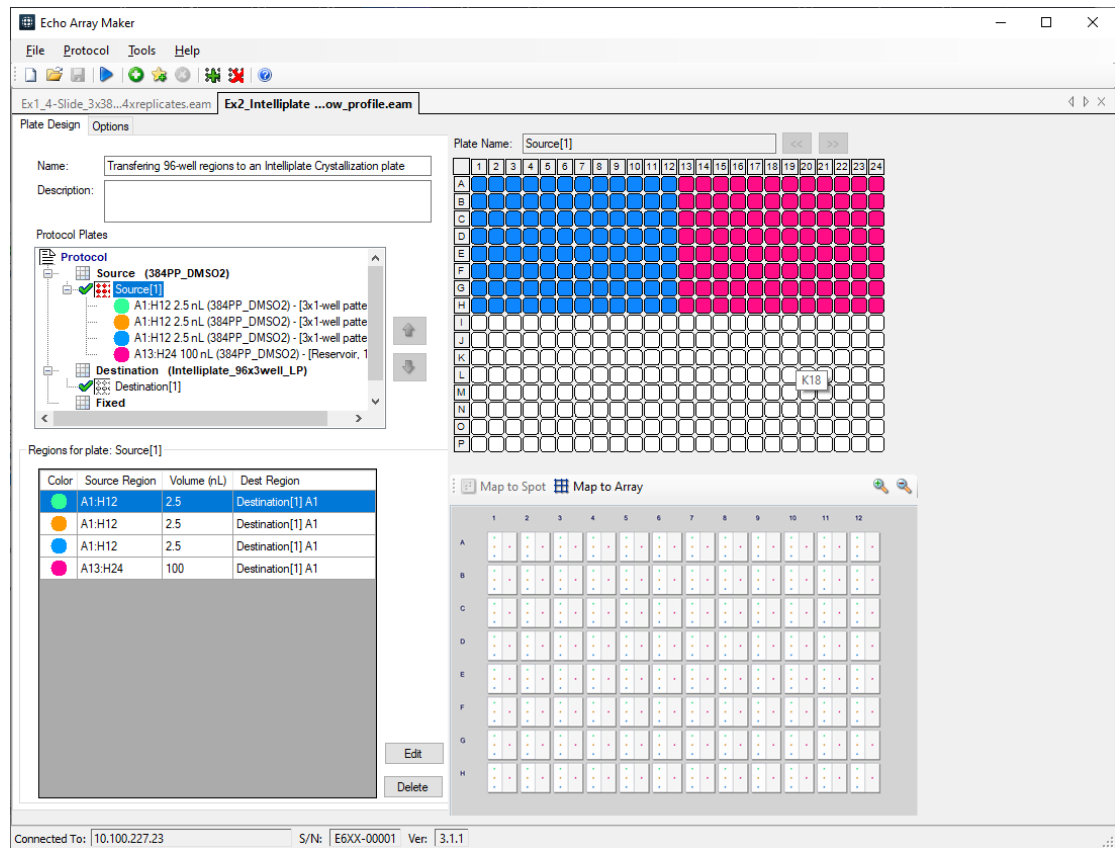
To add a new plate, in the **main Protocol** window, select **Source** or **Destination** and click the **Add Source Plate** or select the **Protocol > Add Plate** menu option.
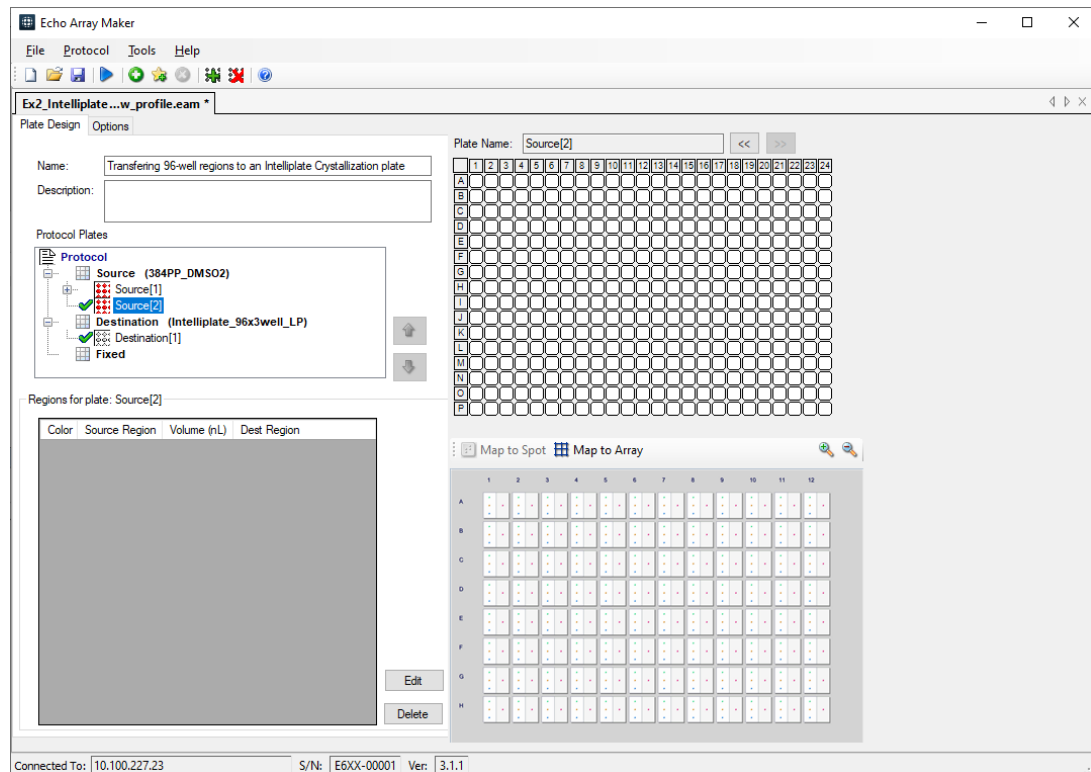
Figure 5.13 Main Protocol Window After Add Plate executed

Delete Plate

The **Delete Plate** command allows a user to delete a plate from the protocol.

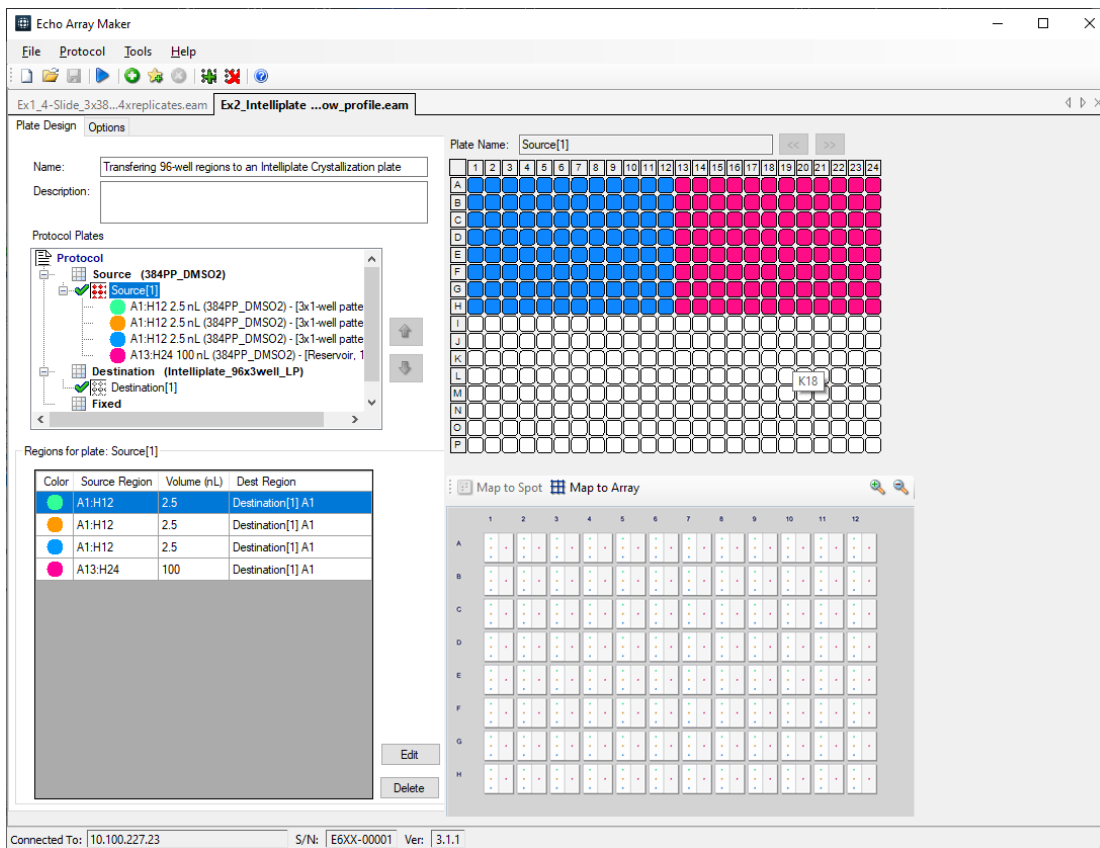**Figure 5.14** Main Protocol Window Before Delete Plate Executed

To delete a plate, in the **main Protocol** window, select the **Source** or **Destination plate** to be deleted

and click the **Delete Source Plate** icon or select the **Protocol > Delete Plate** menu option.

Figure 5.15 Main Protocol Window After Delete Plate Executed

Select Region

A region must be selected before it can be added or replicated. There are different ways to select wells:

- Click top-left corner to select all the wells in the plate.
- Click on a number (1-24) to select all the wells in that column.
- Click on a letter (A-P) to select all the wells in that row.
- Click and drag to select specific wells.

NOTE Wells must be selected on the source plates.

There are different ways to select regions depending on the type of destination plates being used.

- **Microarray**
  - A single pattern or multiple patterns can be selected. For more information, see Add Region - Map to Spot.

- **Crystallography**
  - A single well or multiple wells can be selected on a single pattern and a single spot can be selected using the **Map To Array** option. For more information, see Add Region - Map to Array.

Add Region

The **Add Region** command allows the user to add a region to a source or destination plate.

Figure 5.16 Main Protocol Window Before Add Region Executed
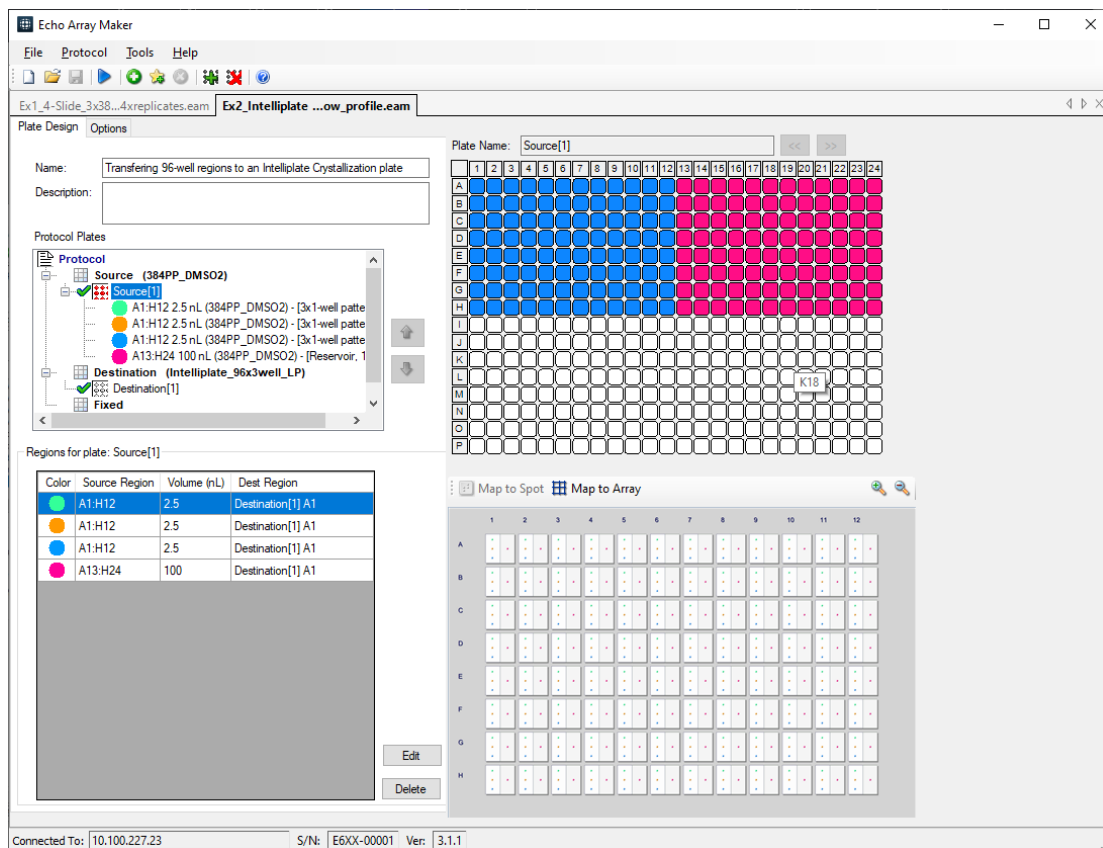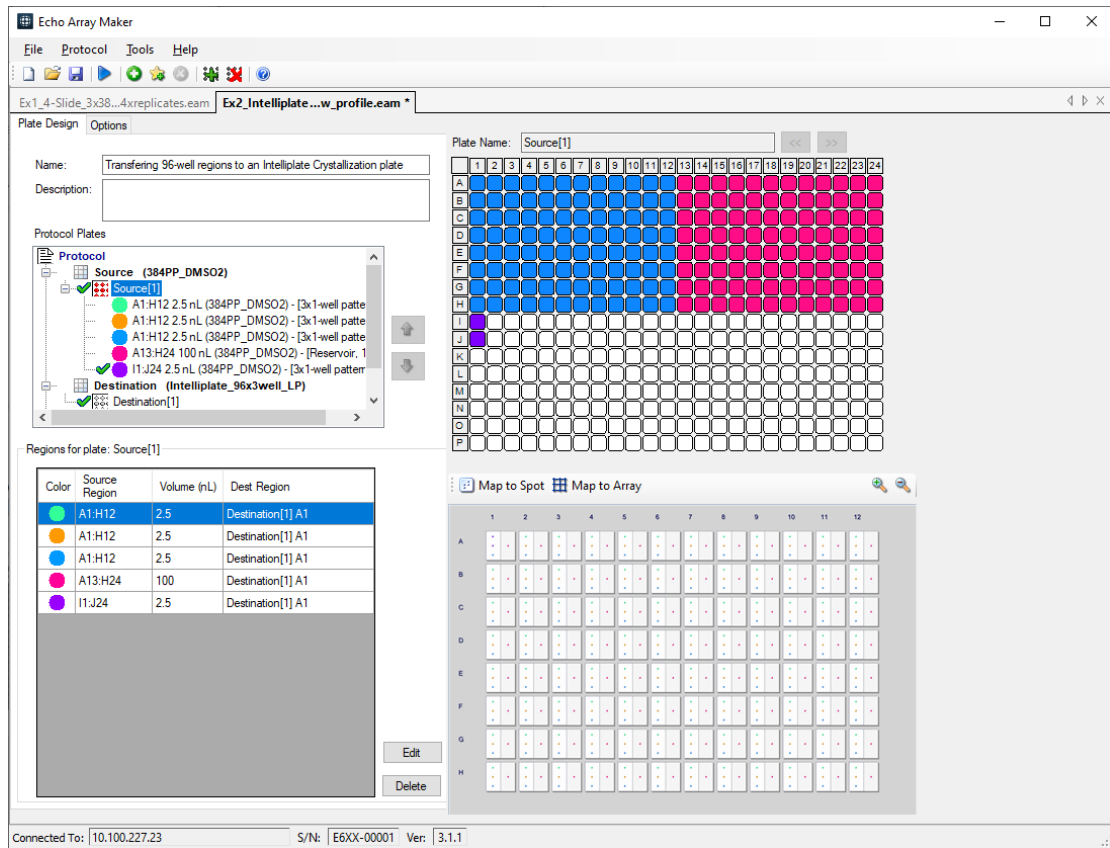

To add a region to a plate, in the **main Protocol** window, select the **Source** or **Destination plate** to add

the region to, and click the **Add region** icon or select the **Protocol > Add Region** menu option.

**Figure 5.17** Main Protocol Window After Add Region Executed

NOTE When adding a region, the **Treat as identical well option** becomes available. For more information, see Transferring Identical Well Content.

Replicate Region

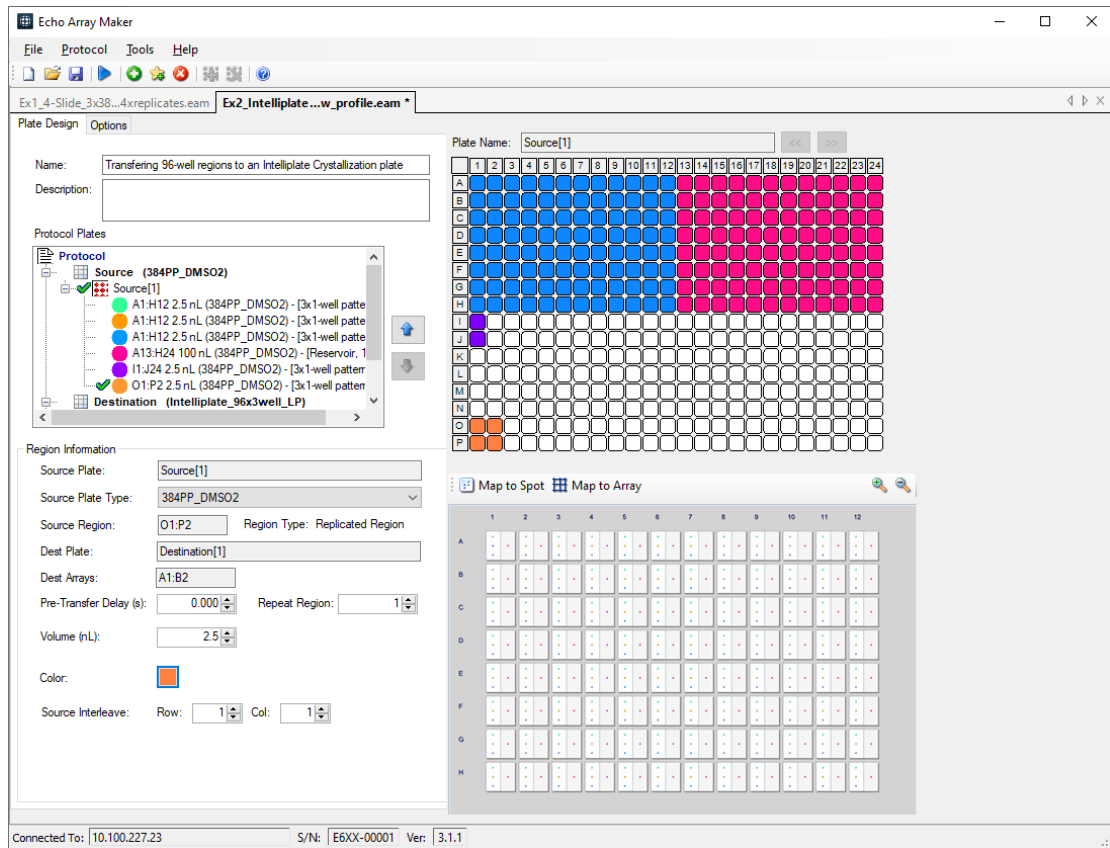The **Replicate Region** command allows the user to replicate a selected region.

Figure 5.18 Main Protocol Window Before Replicate Region Executed
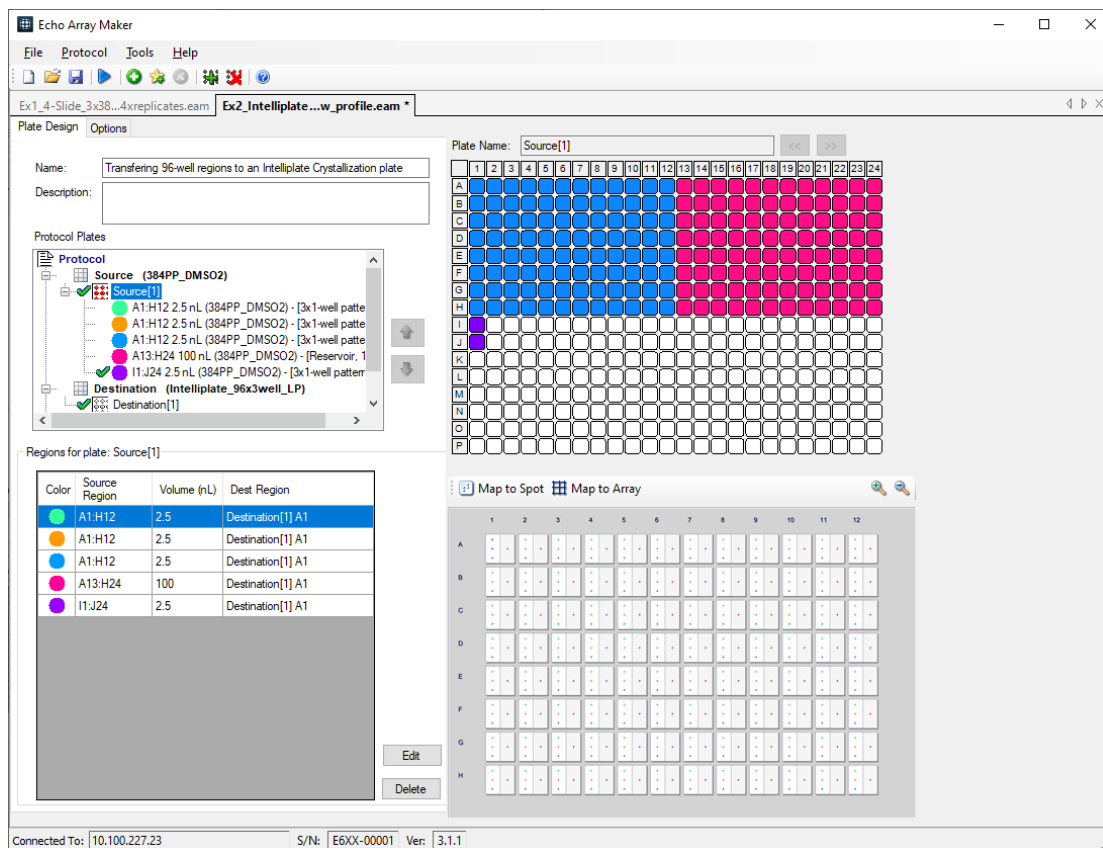
To replicate a region, in the **main Protocol** window, select the region in the **Source** and **Destination**

plate to be replicated and click the **Replicate Region** icon or select the **Protocol > Replicate Region** menu option.

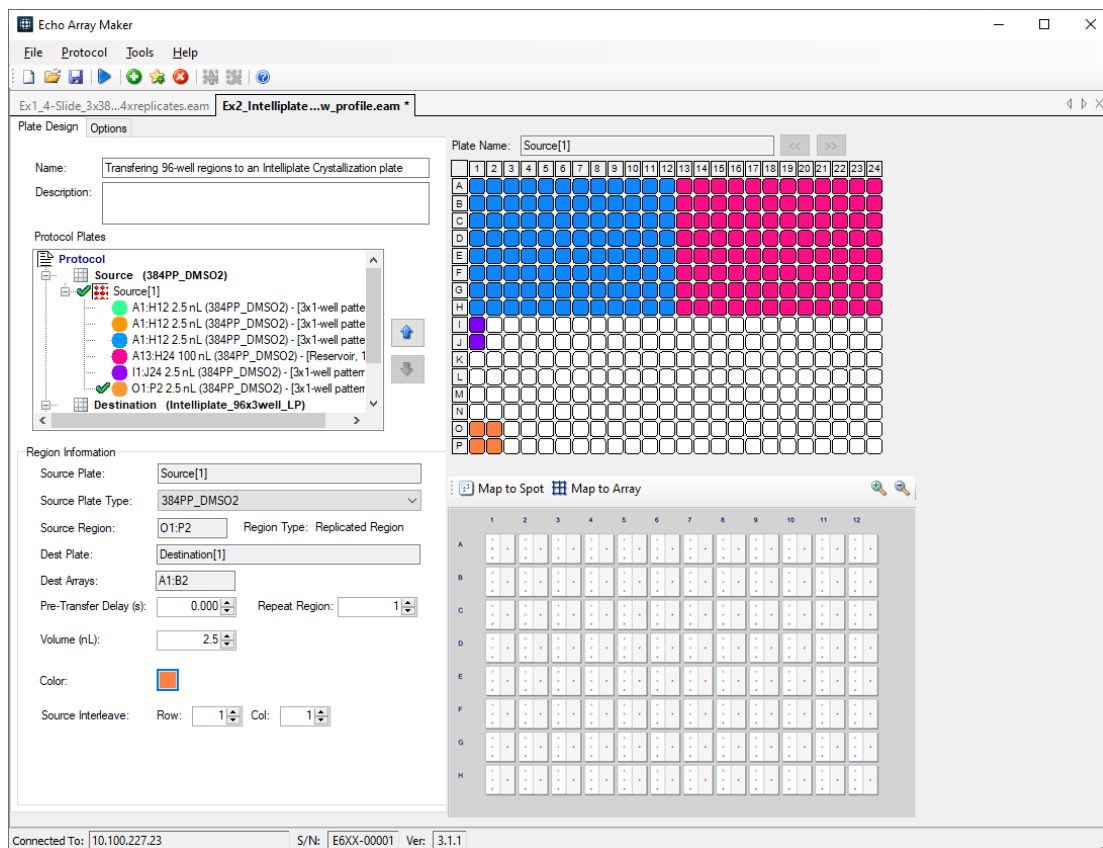**Figure 5.19** Main Protocol Window After Replicate Region Executed

NOTE For a replicate region the source region must be smaller than the destination region, otherwise the user receives an error message.

Delete Region

The **Delete Region** command allows the user to delete a selected region.

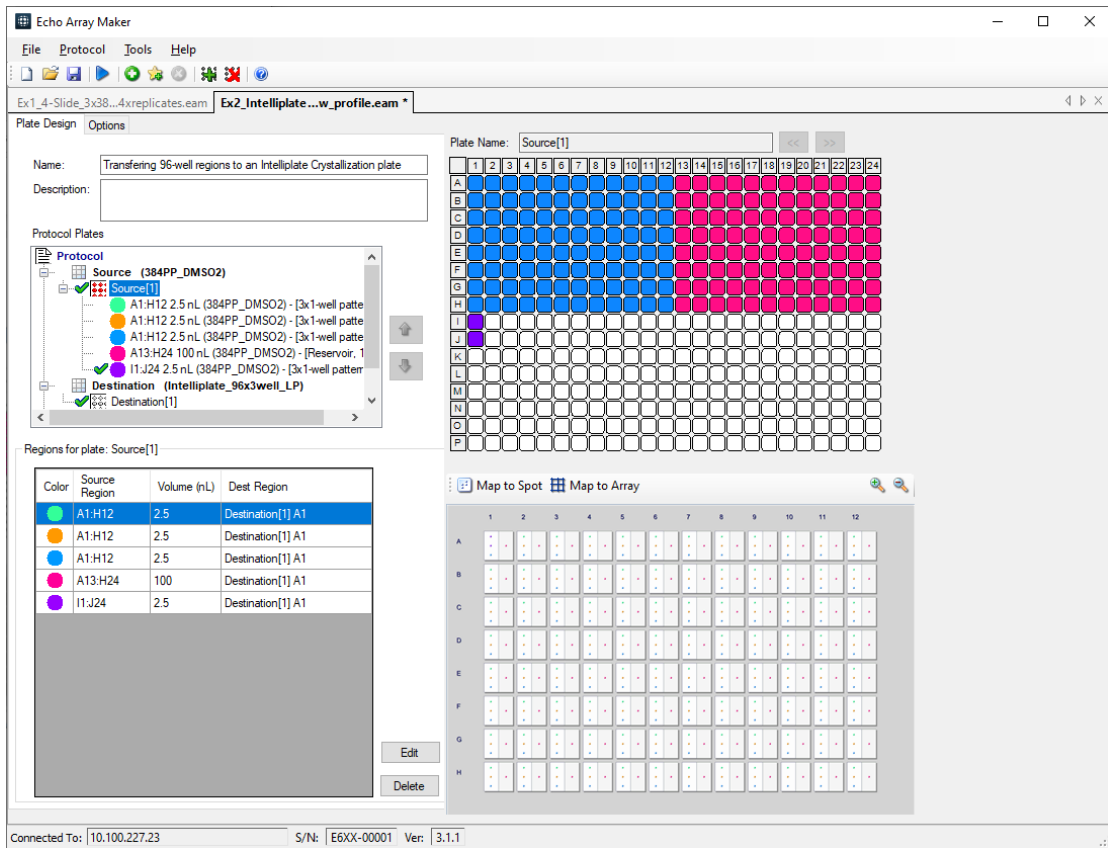**Figure 5.20** Main Protocol Window Before Delete Region Executed

To delete a region, in the **main Protocol** window, select the region in the **Source** or **Destination plate**

to be deleted and click the **Delete Region** icon or select the **Protocol > Delete Region** menu option.

Figure 5.21 Main Protocol Window After Delete Region Executed

Delete All Regions for Plate

The **Delete All Regions for Plate** command allows the user to delete all the regions for the selected plate.

Figure 5.22 Main Protocol Window Before Delete All Regions for Plate Executed

To delete all the regions in a plate, in the **main Protocol** window, select the **Source** or **Destination plate** whose regions should be deleted and select the **Protocol > Delete All Regions for Plate** menu option, or right-click on a plate and select **Delete All Regions for Plate**.
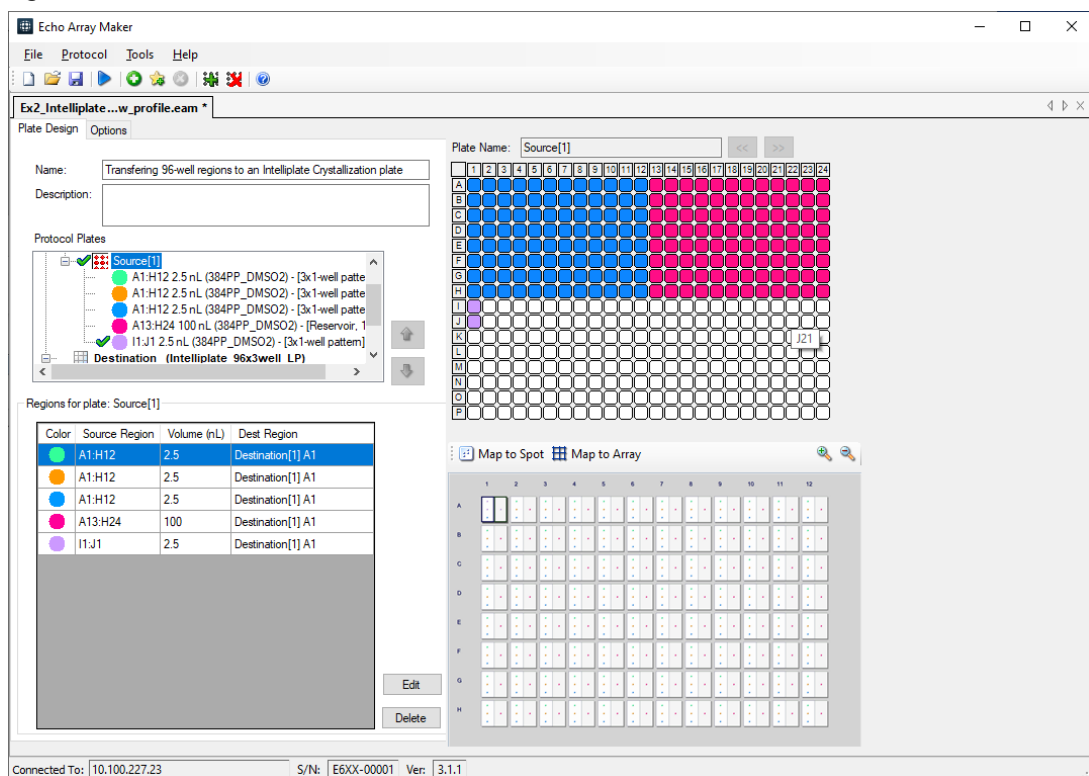
Figure 5.23 Main Protocol Window After Delete All Regions for Plate Executed
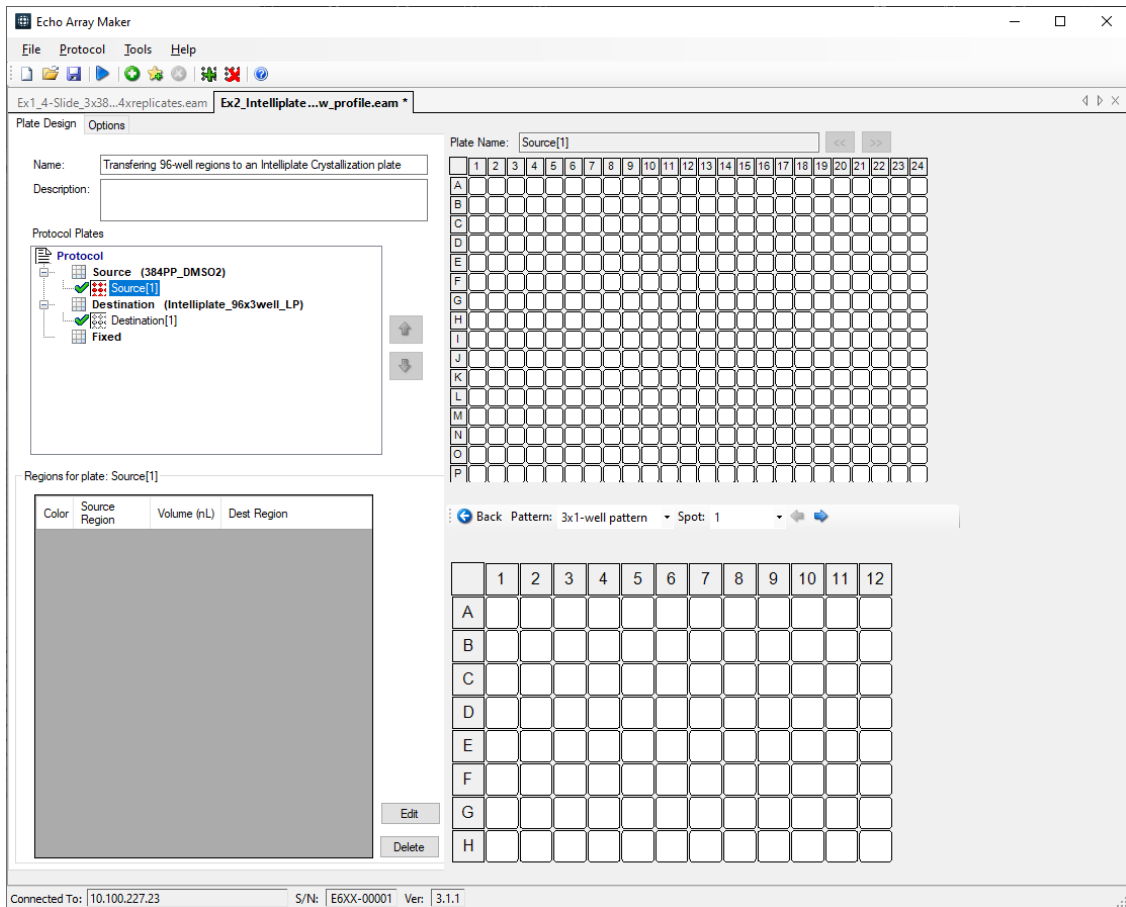
Delete All Regions

The **Delete All Regions** command allows the user to delete all the regions for all the plates with one command.

Figure 5.24 Before Delete All Regions executed
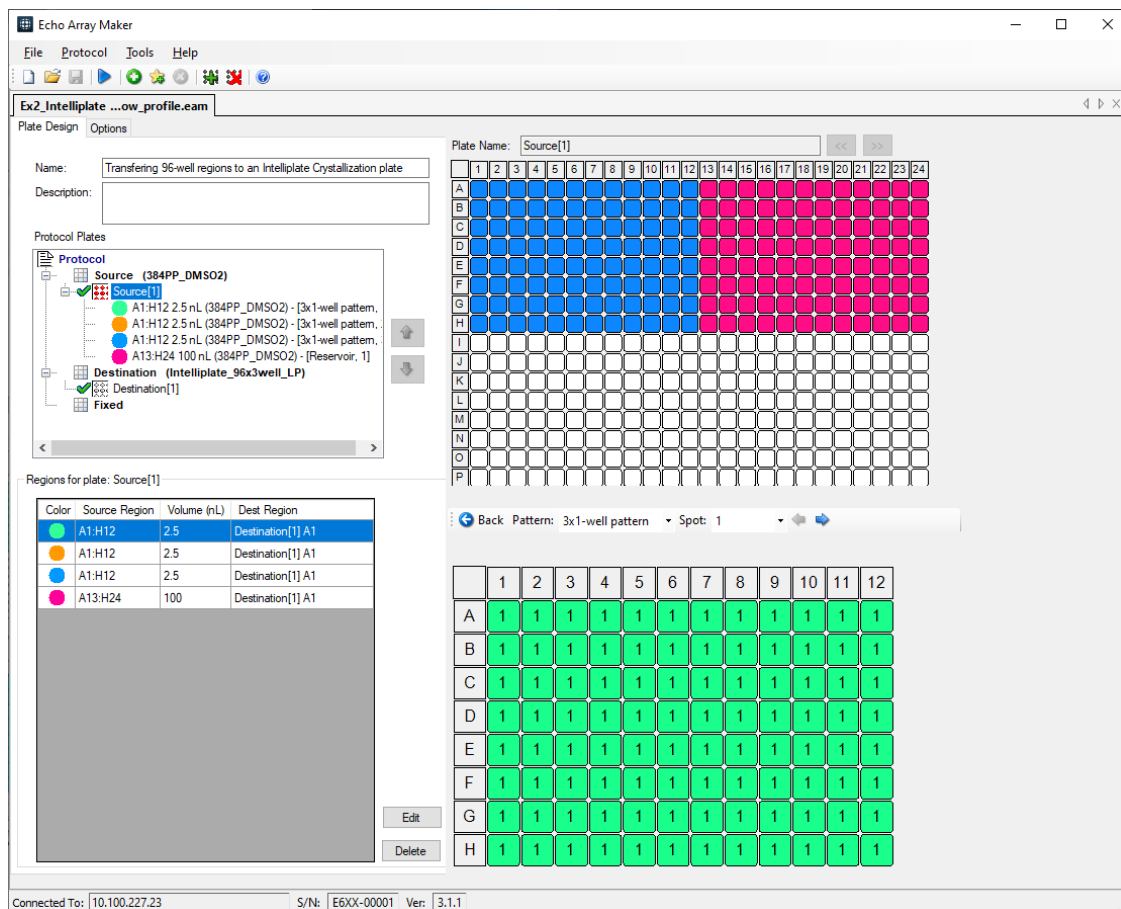
To delete all the regions for all the plates, in the **main Protocol** window, select the **Protocol > Delete All Regions** menu option or right-click on a main source, or fixed tree item and click on **Delete All Regions** to delete all the regions in all the source or all the fixed plates, respectively.

Figure 5.25 Main Protocol Window After Delete All Regions Executed
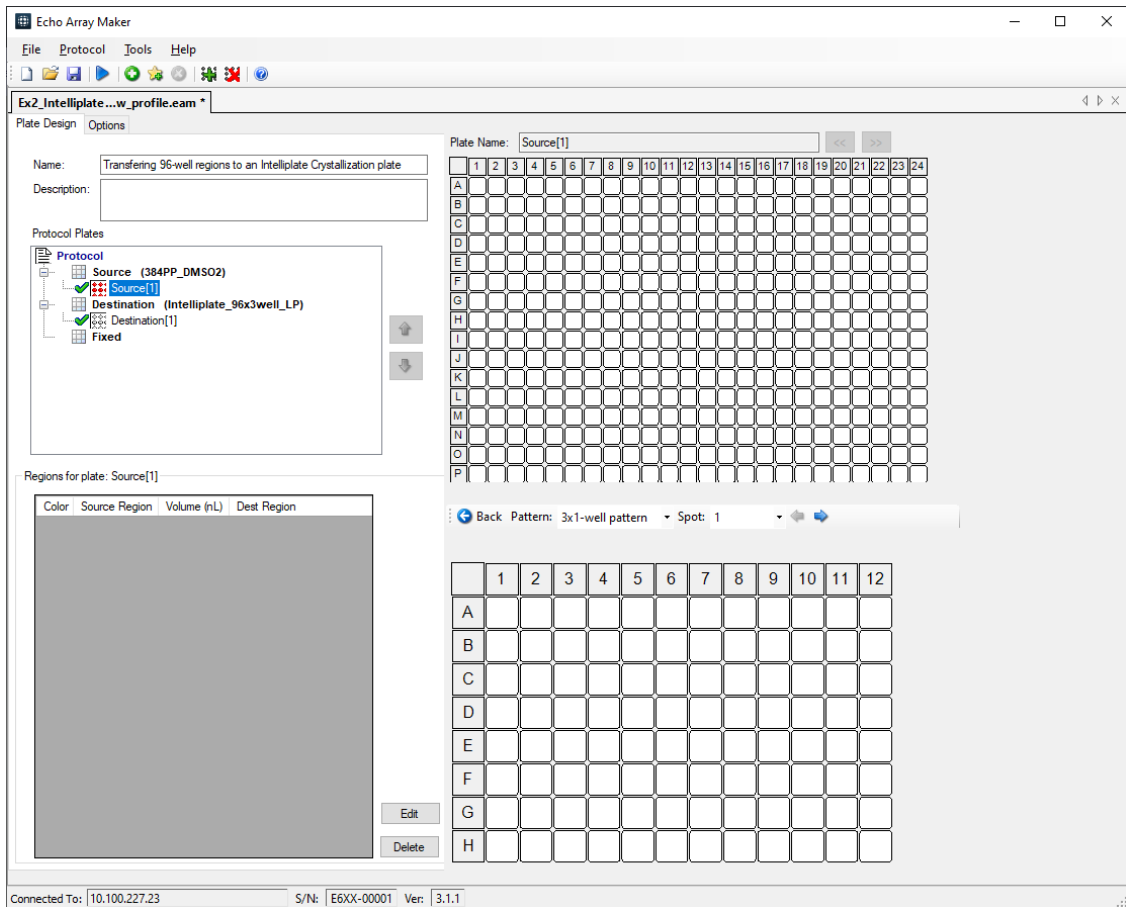
Error Check

The **Error Check** command allows the user to check the protocol for inconsistent information.

To check the current protocol for errors, in the **main Protocol** window, select the **Error Check** menu option.

Run

The **Run** command initiates the transfer protocol that is displayed.

To run the current transfer protocol, in the **main Protocol** window, click the **Run** [icon] icon or select the **Protocol > Run** menu option. For more information, see Run Protocol.

Options Tab

The **Options** tab is accessible by clicking the **Options** tab behind the **Protocol** tab. This window enables the user to customize the survey, output, and reporting options for the Echo Array Maker application. These settings are automatically used for the protocol created.

Each of the sections in the **Options Tab** is explained in the following topics.

- Understanding Protocol Options
- Understanding Output Options

Understanding Protocol Options

The **Options** tab displays the following protocol and output options.

Figure 5.26 Options tab

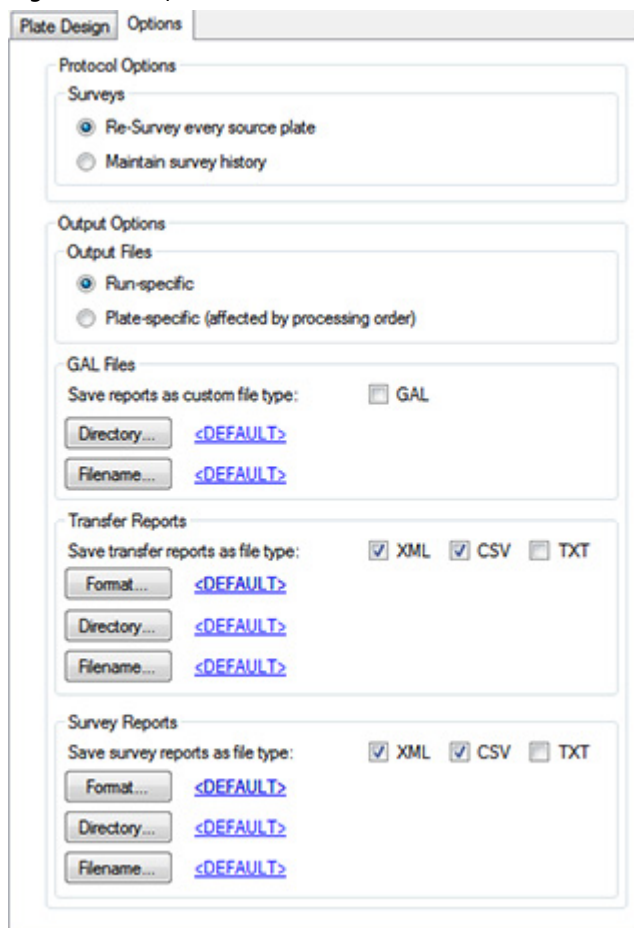**NOTE** The options settings are similar to the **Preferences**/**Options** window, but apply only to the protocol displayed.

Surveys

There are two ways to manage survey history:

- **Re-Survey every source plate** — Default setting that automatically surveys the source plate every time the protocol is run. Survey history is saved, but not referenced each time.

- **Maintain survey history** — Used to store survey data for source plates.

  With **Maintain survey history** chosen, information from the initial survey is referenced for subsequent transfers — eliminating the requirement to resurvey.

  This feature can reduce processing time during a protocol run — particularly if the source plate is swapped several times during a protocol run. The user can specify the length of time that the survey data is retained, from a few minutes to never resurvey.

  The software stores the survey data by plate barcode; therefore, the data is independent of the protocol and can be used across different protocols until the expiration time.

  NOTE Various factors can affect the content of the source wells, such as DMSO concentration, humidity, and exposure time during the transfer run; therefore, consider these factors when selecting an expiration time. For additional information, read the user note "*How Long Will A Survey Last When Performing Acoustic Droplet Ejections?*" on contact us.
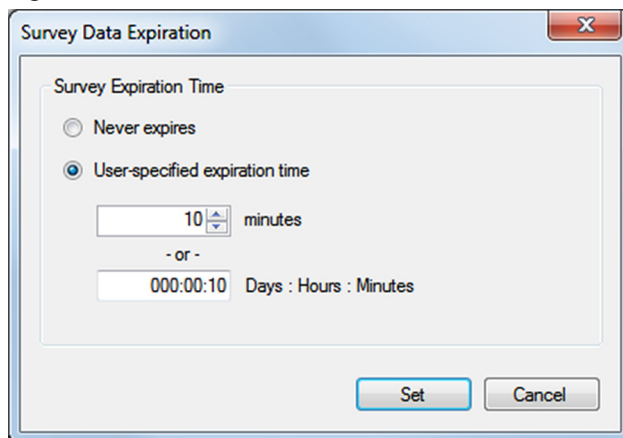
The **Maintain survey history** function is located in the **Options** tab. If the user selects **Maintain survey history**, an **Expiration** button appears.

Figure 5.27 Surveys box

Click **Expiration** to open the **Survey Data Expiration** dialog box and set the expiration values.

Figure 5.28 Survey Data Expiration dialog box

The following parameters can be set in the **Survey Data Expiration** dialog box:

- **Never expires** — Existing survey data is always re-used.
- **User-specified expiration time** — Existing survey data is re-used for the time that is specified in **minutes** or **Days:Hours:Minutes**.

NOTE If a stored survey does not cover the plate area that is required by the protocol (for example, some of the wells were empty when the plate was originally surveyed, but then filled later on), the software will survey the new wells and add this data to the stored survey data.

The stored survey data is instrument-specific. For example, if a source plate is surveyed in instrument A, the stored survey data cannot be used in instrument B.

Although survey history can be used indefinitely, it is not recommended.

Understanding Output Options

The output options are explained in the following topics:

- Output Files
- GAL Files
- Transfer and Survey Reports

Output Files

The **Output Files** box in the **Options** window organizes the survey and transfer results according to the following criteria:

Figure 5.29 Output Files options
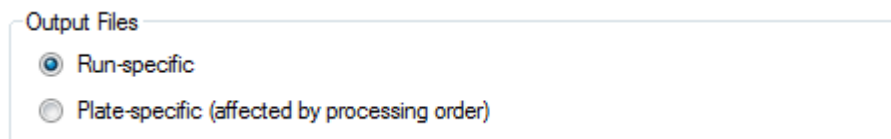
The following parameters can be set for output files:

- **Run-specific** — All protocol data is stored in one file, in the order that the results are generated.
- **Plate-specific** — Protocol data is stored in separate files, based on source or destination plates, depending on the process order specified in the **main Protocol** window.

GAL Files

Reports can be generated in the custom GAL file type. The results are saved in the GAL format, and stored in the directory specified in the **Directory** option with the **Filename** specified. A GAL file is created for each array. For example, if arrays A1, A2, and C5 are used, the generated GAL files will be named:

- Filename_A1.GAL
- Filename_A2.GAL
- Filename_C5.GAL

NOTE The **Filename** specified by the user is appended with `_arrayname.GAL` to create the final filename for each GAL file.

Transfer and Survey Reports

File Type
Survey and transfer results can be saved to the following file formats that are compatible with most laboratory information systems:

- **XML** (extensible markup language)
- **CSV** (comma separated values)
- **TXT** (text file)

The results are saved in the formats selected, and stored in the directory specified in the **Directory** option with the **Filename** specified.

Report Format

The survey and transfer reports can be customized by clicking the **Format** button in the **Protocol Options** tab.

NOTE. The *DEFAULT* settings in the **Transfer** and **Survey Reports** are from the **Preferences/Options** window.

Figure 5.30 Report Format Options

The **Output Format Builder** dialog box shows all the report variables (left selection box) that can be added to the report format (right selection boxes). The list of variables changes with the report area selected.

Figure 5.31 Transfer Output Format Builder
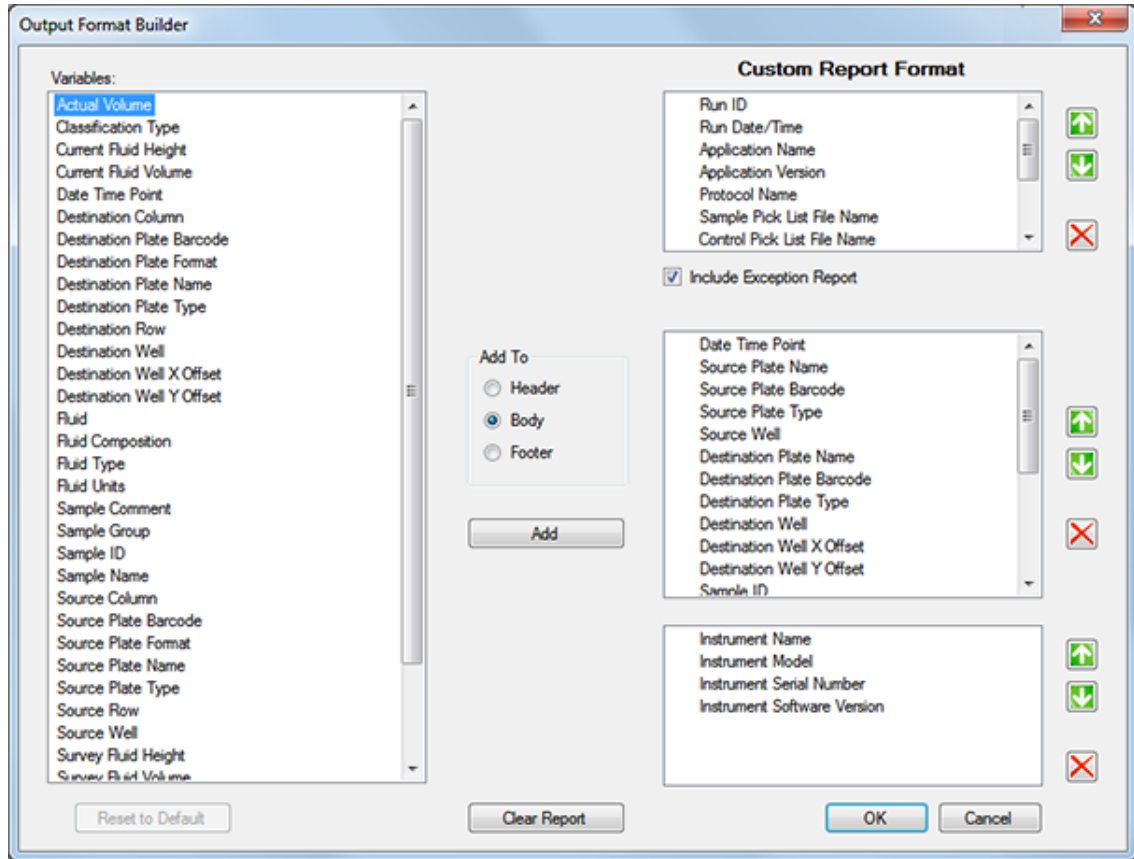
Figure 5.32 Survey Output Format Builder
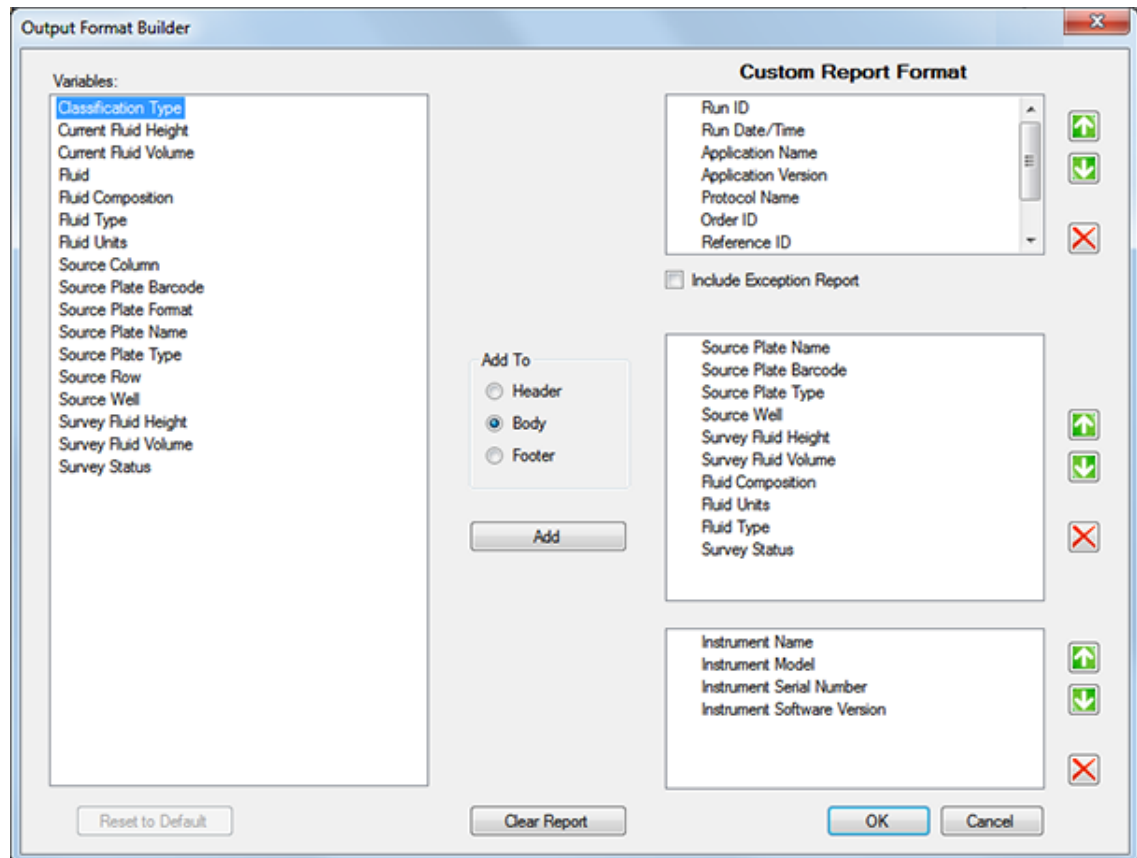
NOTE The **Include Exception Report** option parses out any transfers that were not initiated because of a failed survey and promotes them to the top of the output file.

Report Directory

The default report directory for both surveys and transfers is `C:\Labcyte\Echo\Reports`. The default report directory for GAL files is `C:\Labcyte\Echo\Reports\GAL`. A different directory can be specified by clicking the **Directory** button and entering a new location. Use the **Select Folder** button to browse to a different directory.

Figure 5.33 Folder Name dialog box
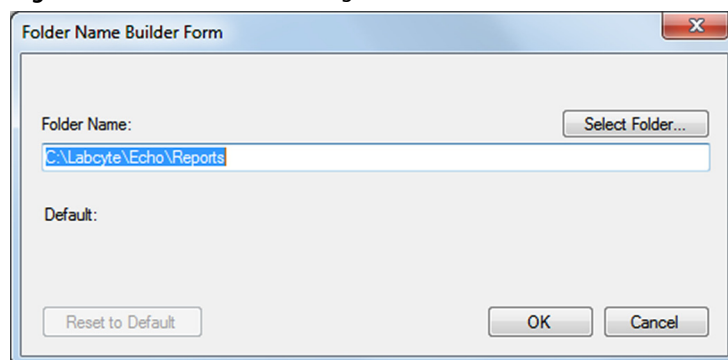
Report Filename
The Echo Array Maker application uses the following default formats to report the survey, transfer, and GAL results:

Survey results file name —

$AppName$\$RunDate$\$InstrSN$_$RunType$_$SrcPlateName$($SrcPlateBarcode$)

For example:

Echo Software\2018-02-22\E5XX-0001_Transfer_Plate1(1-989992-0)

Transfer results file name —

$AppName$\$RunDate$\$InstrSN$_$RunType$_$SessionID$

For example:

Echo Software\2018-02-22\E5XX-0001_Transfer_123

GAL results file name —

$AppName$\$RunDate$\$InstrSN$_$DestPlateName$($DestPlateBarcode$)

For example:

Echo Software\2018-02-22\E5XX-0001_Plate 2(5-989998-3)

The survey and transfer formats can be changed by clicking the **Format** button in the **Protocol Options** tab.

Figure 5.34 Transfer Filename Builder
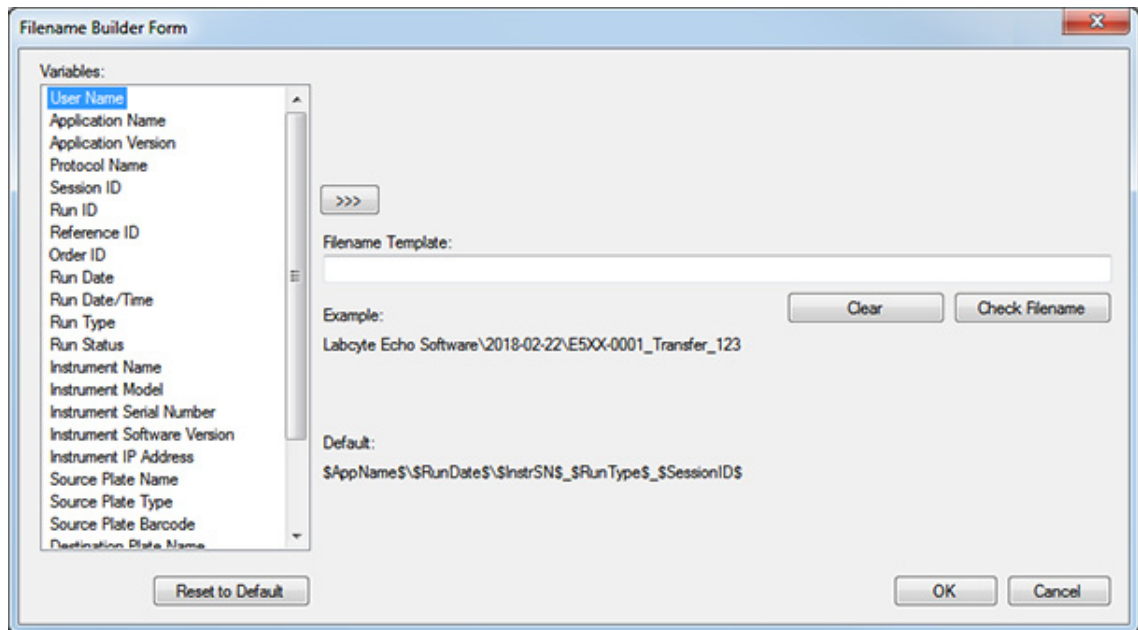
Figure 5.35 Survey Filename Builder
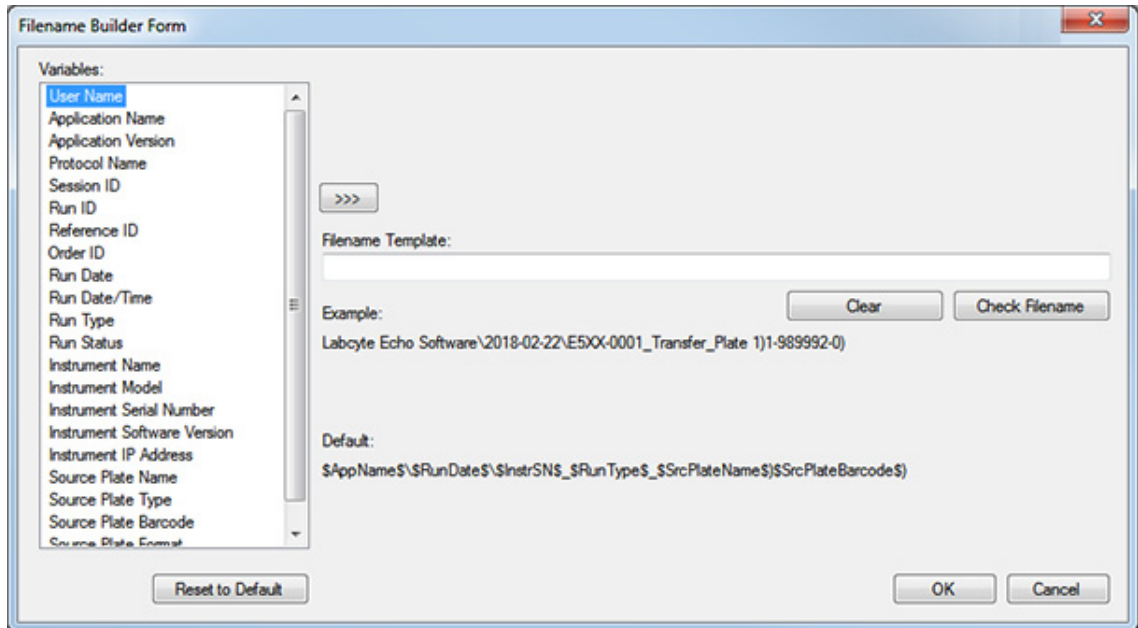
Figure 5.36 GAL Filename Builder
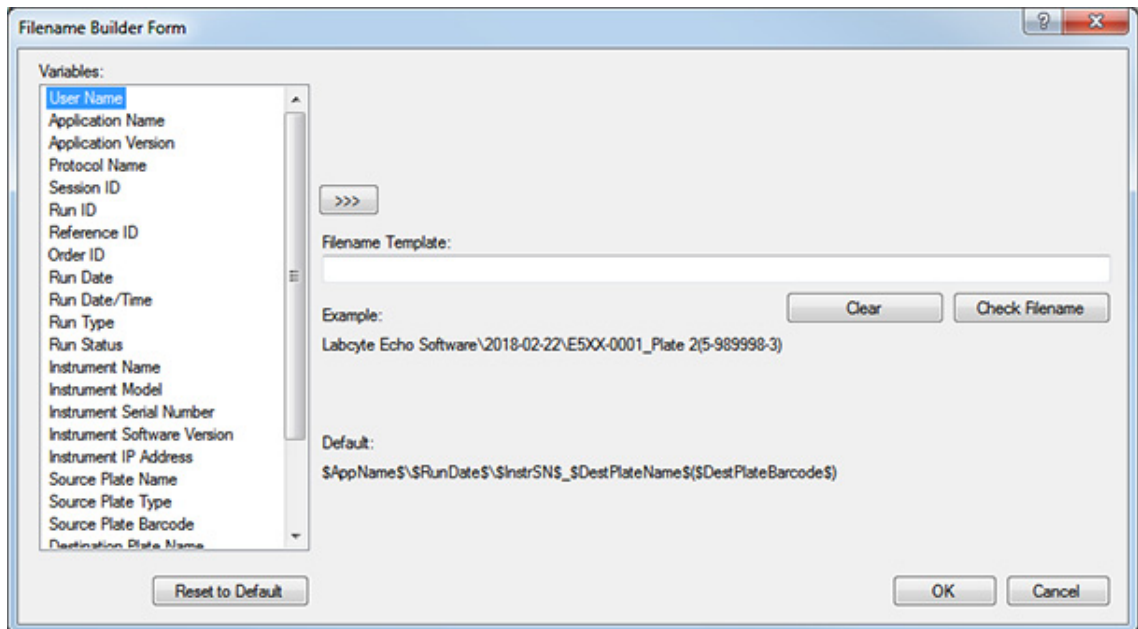
Preferences

The **Preferences**/**Options** window is accessible from the **Tools** menu. This window is very similar to the **Protocol Options** tab, but with the following differences:

- Settings are automatically applied to all protocols created unless changes were made in the **Protocol Options** window (report formats shown as "default").

- Accessible from the **Toolbar.**

  When the user clicks **Preferences**, the **Options** window opens to display the following protocol and output options:

Figure 5.37 Preferences/Options Window
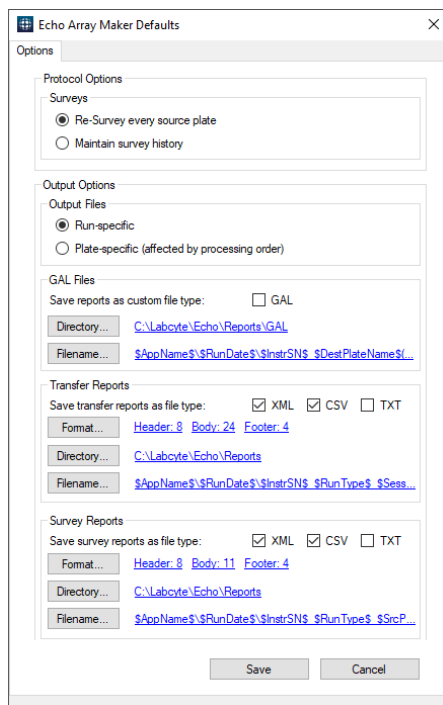
Labware Definitions

The Echo Array Maker application relies on the Labware definitions resident in the Echo Liquid Handler database. New plate definitions can be added or existing plate definitions can be managed by selecting **Labware Definitions** from the **Tools** menu.

Each of the Labware topics are explained in the following topics.

- Plate Type List
- Plate Type Editor
- Plate Export

Plate Type List

The **Plate Type List** dialog box enables the user to add new plate definitions or manage existing ones.

Figure 5.38 Plate Type List dialog box
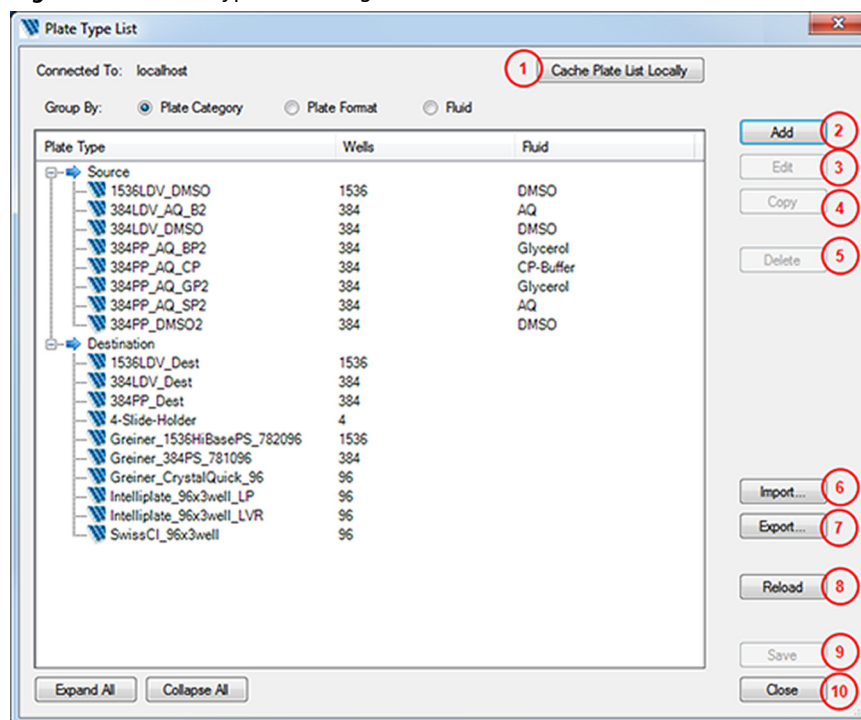
NOTE In case of an error message followed by a blank Plate Type List, connect to an Echo Liquid Handler or import the Labware file from the Echo Liquid Handler directory.

The table below describes the buttons/fields or sections in the **Plate Type List** dialog box and their functionality.

Table 5.6 Callout table for Plate Type List

| Callout Number	Name	Description
1	Cache Plate List Locally	Click this button to save the plate list from the Echo Liquid Handler to the Echo® Array Maker Application.
2	Add	Adds a plate definition. Only a destination plate can be added. Refer to one of the following options: • Add a Labware definition from the Echo® Array Maker Application. • Add a plate definition from the Echo Liquid Handler software and reload the updated Labware definition to the Echo® Array Maker Application.
3	Edit	Edit a plate definition. Select a plate definition and click the Edit button. • Source plate definition: Only the barcode location of the source plate can be edited. • Destination plate definition: Edit any setting in the definition.
4	Copy	Copy a plate definition. Select a plate definition and click the Copy button. The user can copy a source or destination plate definition. For a source plate definition, an alias or child plate is created with exact parameters as the parent plate except the user-defined fluid name. For a destination plate, a destination plate definition is created. Alternate source or destination plate names can be created by copying existing plate types.
5	Delete	Delete a plate definition. Select a plate definition and click the Delete button. The user can delete a destination plate definition or an alias or child plate definition previously created for a source plate but not a source plate definition.
6	Import	Import a single plate definition or group of definitions from a specific file location. The file must have an .elwx extension to be imported.
7	Export	Export a single plate definition or group of definitions. This includes any user created alias or child plate definitions for source plates and destination plate definitions that were created.
8	Reload	Reload the plate types that have been edited or deleted since the plate type list was last saved.
9	Save	Save any changes made to the plate type list, such as adding a new plate definition.
10	Close	Close the Plate Type List dialog box.

NOTE In case of an error message followed by a blank Plate Type List, connect to an Echo Liquid Handler or import the Labware file from the Echo Liquid Handler directory.

Plate Type Editor

The **Plate Type Editor** dialog box is similar to the **Plate Specification** window in the Echo Liquid Handler software.

Figure 5.39 Plate Type Editor dialog box
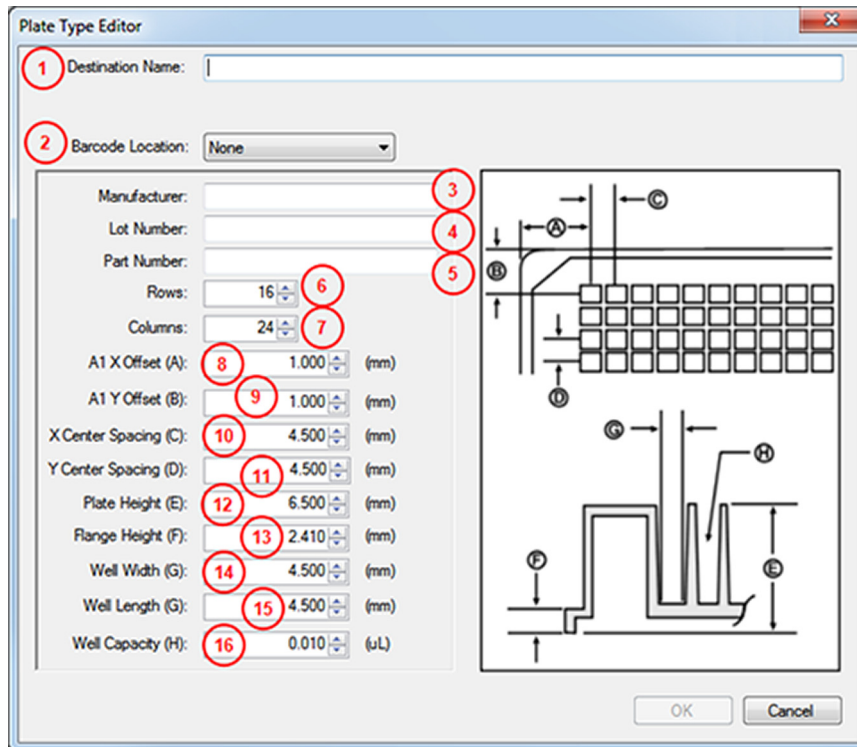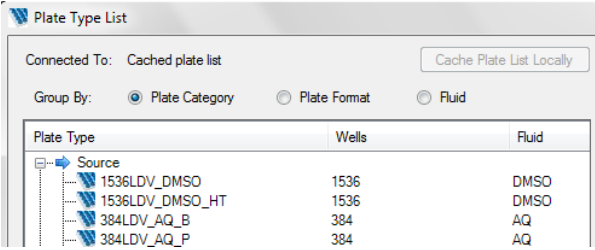
Source plate definitions — Source plate definitions require exact specifications to accurately transfer nanoliter volumes; therefore, they are defined specifically for the Echo Liquid Handlers and tested at Beckman Coulter (Echo-qualified). For this reason, source plates cannot be defined by the user. For existing source plates, only the barcode location can be edited. Contact Beckman Coulter to add more source plates.

Destination plate definitions — The Echo Liquid Handler is programmed with several compatible destination plates; however, the user can add destination plates through the Echo® Array Maker Application or the Echo Liquid Handler software.
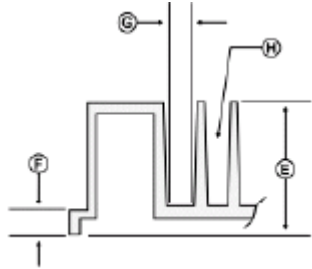
The table below describes the buttons/fields or sections in the **Plate Type Editor** dialog box and their functionality.

Table 5.7 Callout table for Plate Type Editor

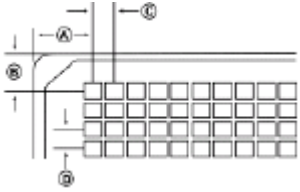| Callout Number	Name	Description
1	Name	User-defined name to identify the plate. This name will be listed in the Plate Type List dialog box.
2	Barcode Location	Location of barcode label on the destination plate: • None • Left • Right • Long
3	Manufacturer	Name of the plate manufacturer.
4	Lot Number	Lot number assigned by the plate manufacturer.
5	Part Number	Part number assigned by the plate manufacturer.
6	Rows	Number of rows in the microplate.
7	Columns	Number of columns in the microplate.
8	A1 X Offset	(A)* Distance from left outside edge to center of first column where the left edge of the part will be defined as the two 12.7 mm areas (as measured from the corners) as specified in ANSI SLAS 1-2004 (R2012). Valid range: 0.0 to 128.0 mm.
9	A1 Y Offset	(B) Distance from top outside edge to center of first row where the top edge of the part will be defined as the two 12.7 mm areas (as measured from the corners) as specified in ANSI SLAS 1-2004 (R2012). Valid range: 0.0 to 86.0 mm.
10	X Center Spacing (C)	Column spacing: Each following row/column shall be an additional X.Y mm in distance from the top/left outside edge of the plate as specified in ANSI SLAS 4-2004 (R2012). Valid range: 0.05 to 9.0 mm.

Table 5.7 Callout table for Plate Type Editor *(Continued)*

Callout Number	Name	Description
11	Y Center Spacing (D)	Row spacing: Each following row/column shall be an additional X.Y mm in distance from the top/left outside edge of the plate as specified in ANSI SLAS 4-2004 (R2012). Valid range: 0.05 to 9.0 mm.
12	Plate Height (E)	The overall height of the plate as specified in ANSI SLAS 2-2004 (R2012). Valid range: 6.5 to 14.5 mm.
13	Flange Height (F)**	The height of the flange (skirt) as specified in ANSI SLAS 3-2004 (R2012). Valid choices: 2.41 mm, 6.10 mm, and 7.62 mm.
14	Well Width (G)	The width of the well opening at the bottom (not an SLAS specified dimension. Valid range: 0.0 to 86.0 mm.
15	Well Length (G)	The length of the well opening (not an SLAS specified dimension. Valid range: 0.0 to 128.0 mm.
16	Well Capacity (H)	The overall capacity of the well in microliters. Valid range: greater than 0.0 uL.

NOTE * The items marked A-G are measurements that need to be taken by hand or filled in from the manufacturer's specifications. These dimensions and further details on their definitions can be found at https://www.slas.org/resources/information/industry-standards/.

** Currently, the Echo Liquid Handler does not use dimensions F (flange height) and H (well capacity). Any value entered for flange height or well capacity is ignored.

Plate Export

The **Export Plates** dialog box displays the plates currently available in the Echo® Array Maker Application. The user can select and export one or more plates to a file (`.elwx` file extension) for use in another application.

Figure 5.40 Export Plates dialog box
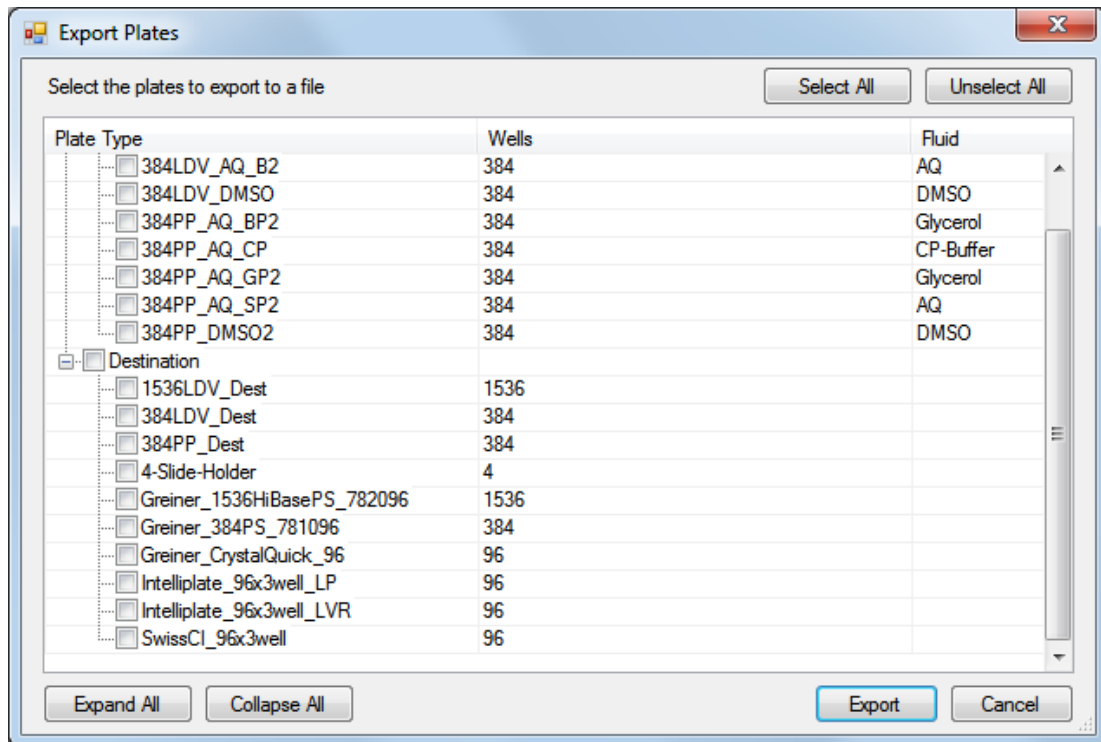
Destination Arrays

The **Destination Arrays** dialog box enables the user to add new arrays or manage existing ones.

Figure 5.41 Destination Arrays dialog box
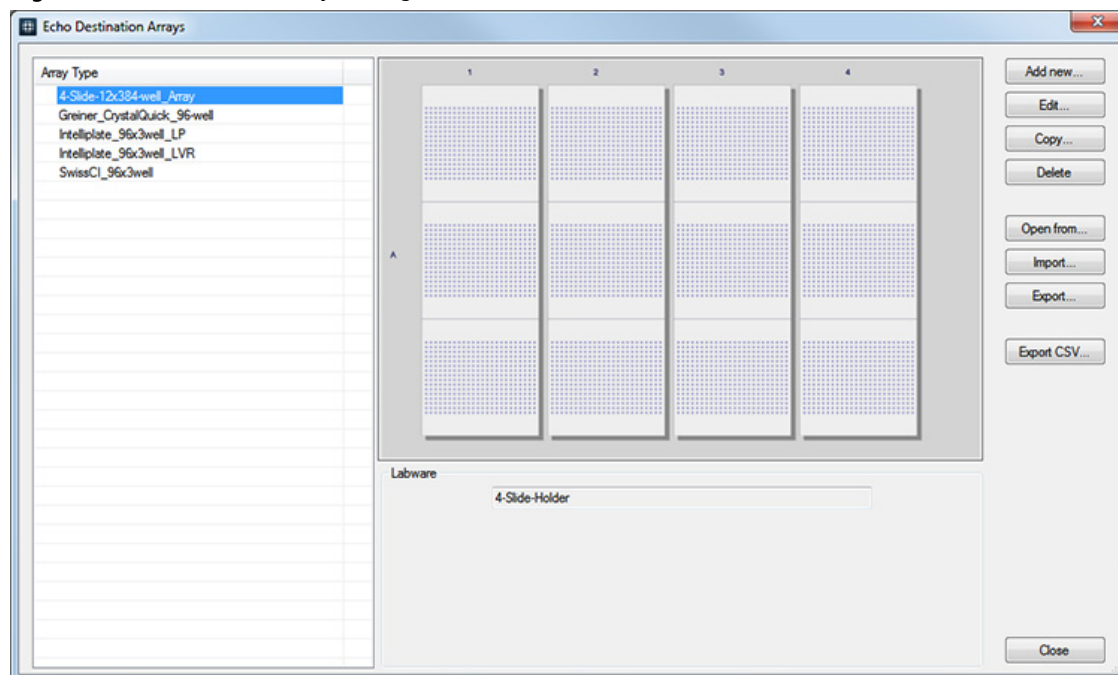
The table below describes the buttons/fields or sections in the **Destination Arrays** dialog box and their functionality.

Table 5.8 Callout table for Destination Arrays dialog box

Callout Number	Name	Description
1	Add new	Add a new destination array to a collection of all the destination arrays available to the application.
2	Edit	Edit an existing destination array.
		Select a destination array and click the Edit button.
		The user can add new, modify, or remove patterns or change patterns in the array.
3	Copy	Copy or duplicate an existing destination array.
		Select a destination array and click the Copy button.
		The user can:
		• Change Labware
		• Add new, modify, or remove patterns
		• Change patterns in the arrays
		The destination array copy should be named such that it does not match any of the existing destination arrays in the collection.

Table 5.8 Callout table for Destination Arrays dialog box *(Continued)*

| Callout Number	Name	Description
4	Delete	Delete one or many of the destination arrays from the collection. Select a destination array and click the Delete button. **NOTE** There is no undo for this operation.
5	Import	Import a single destination array type definition or group of destination array type definitions from a specific file location on a local or network drive. The file must have an `.holder` extension to be imported. This option imports the chosen destination array(s) directly to the local collection of destination arrays available to the application. If any of new names match the name of an existing destination array, the user will be warned that the existing destination array will be overwritten. **NOTE** There is no undo if a destination array is overwritten.
6	Export	Export a single destination array type definition or group of destination array type definitions from the current collection to a location on a local or network drive. The exported file will be a `.holder` extension. **NOTE** If the file being exported has the same name as a file that already exists at the chosen location, the user will be warned that the existing file will be overwritten.
7	Open from	Open an existing destination array file from a location on a local or network drive in the Echo Destination Array editor dialog box. The file must have an `.holder` extension to be imported. The user can edit this destination array, change name and save it in the local collection. If the new name matches the name of an existing destination array, the user will be warned that the existing destination array will be overwritten. **NOTE** There is no undo if a destination array is overwritten.
8	Export csv	Export a single destination array from the current collection to a Comma-separated Value (`.CSV`) file format. **NOTE** If a `.CSV` file with the destination array name already exists at the specified location, the user will be warned that the existing file will be overwritten.
9	Close	Close the Destination Arrays dialog box.

For information on possible error icons when using the Destination Arrays dialog box, see .

Run Protocol

The **Run Options** dialog box enables the user to run a simulation of the transfer protocol or run the transfer protocol on the Echo instrument. If the application is not connected to an Echo instrument, this window also provides a connection dialog box.
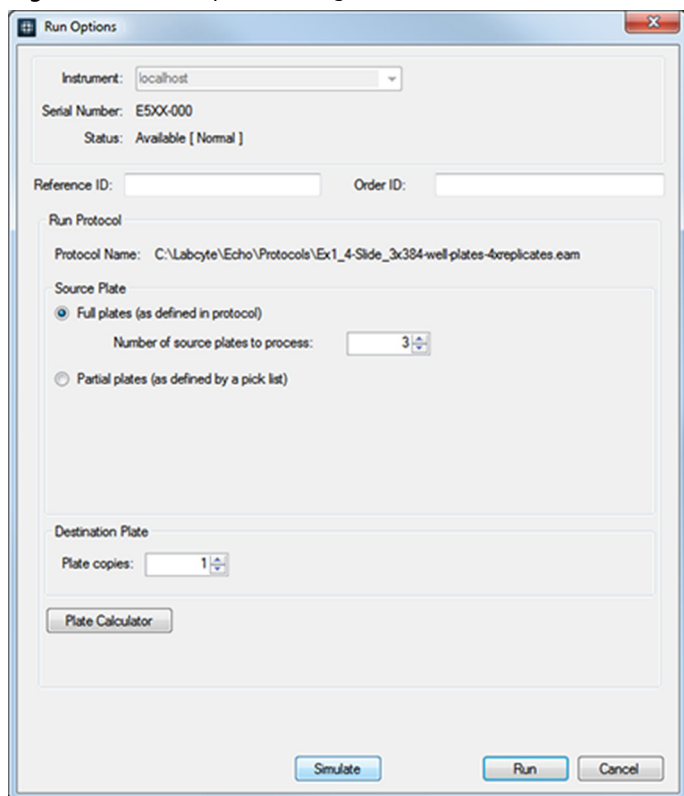
To run a protocol:

1 Select **Run** from the **Protocol** menu or click the **Run** icon in the **Toolbar**.

2 Select the **Instrument** if it is not already selected.

3 Optionally, enter a **Reference ID** and/or **Order ID** to be used to reference the run in the output report files.

4 For the **Full Plates** option defined by the protocol, specify the number of source plates to process. Click the **Plate Definitions** button to view the plates to be used.

5 Click **Partial Plates** to pick specific plates. When the **Partial Plates** option is selected, an **Import** button is displayed to import a .csv pick list indicating the wells to be transferred. For more information on how to define a pick list, see Importing a Pick List.

6 In the **Destination Plate** section, change the value for **Plate copies** to override the number of plate copies for the protocol.

7 Click the **Plate Calculator** button to view the number of plates needed to run the protocol.

Figure 5.43 Plates Used dialog box
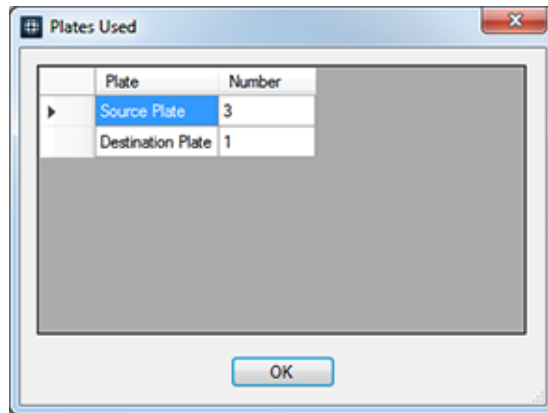
8 Optionally, click **Simulate** to test the transfer protocol.

NOTE Running a simulation is recommended to verify the transfers defined in the protocol before a live run.

9 Click **Run** to execute the protocol.

Simulator Window

The simulator is an animation of fluid transfer for the selected protocol. The simulation is interactive and allows the user to respond to a prompt box to insert and remove plates. Since this is a simulation, the prompt box appears for only 5 seconds, then the software automatically responds to the prompt and continues to the next step.

The protocol example that is described in this help page uses a pick list of compounds in five source plates and a control plate transferring to a single destination plate. The components of the simulator window are described below.

Figure 5.44 Simulator Window
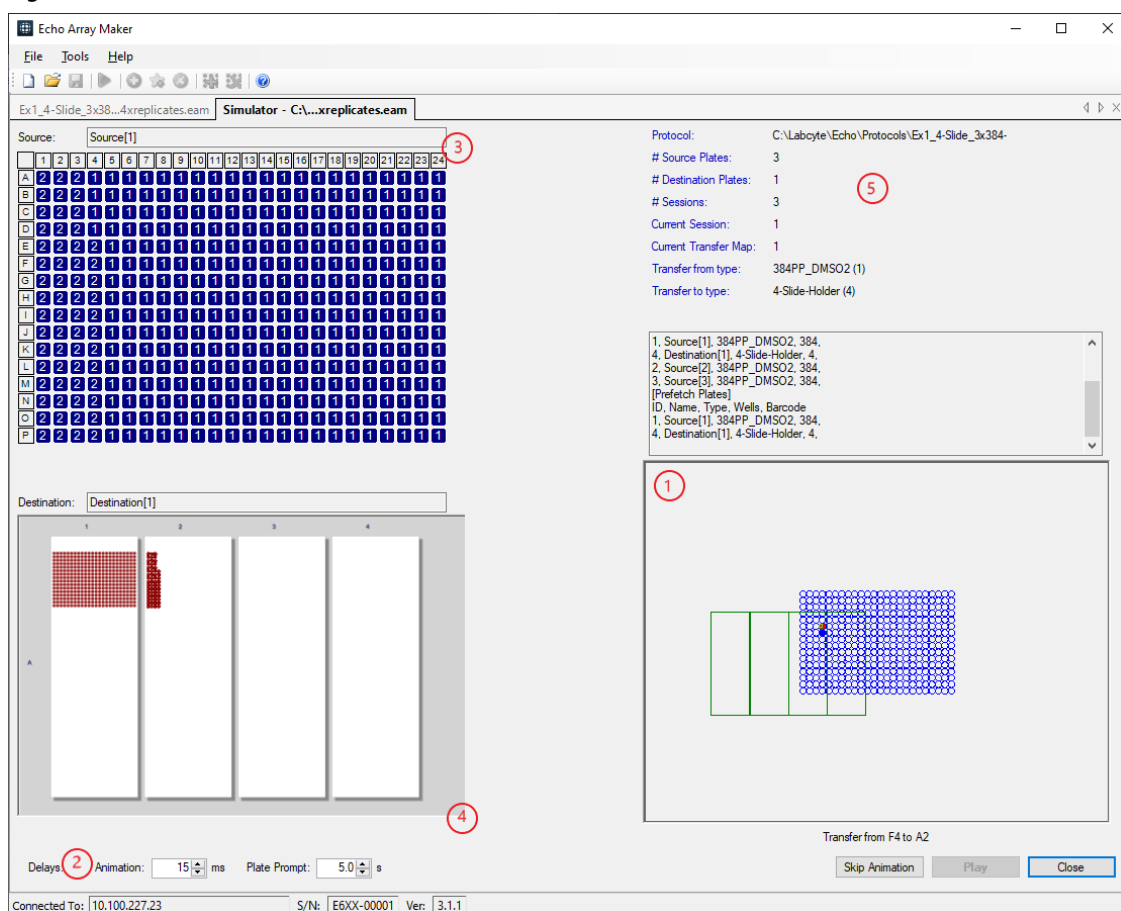
The table below describes the buttons/fields or sections in the **Simulator Window** and their functionality.

Table 5.9 Callout table for Simulator Window

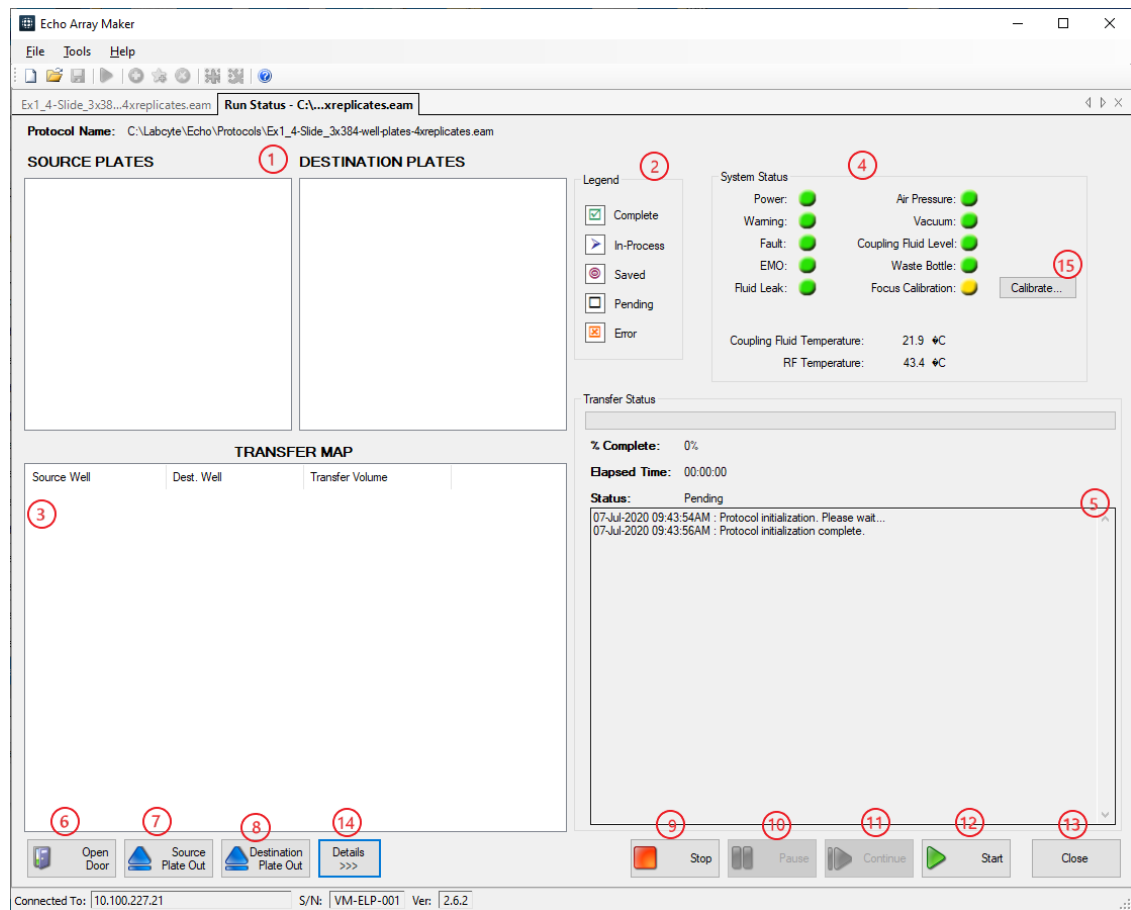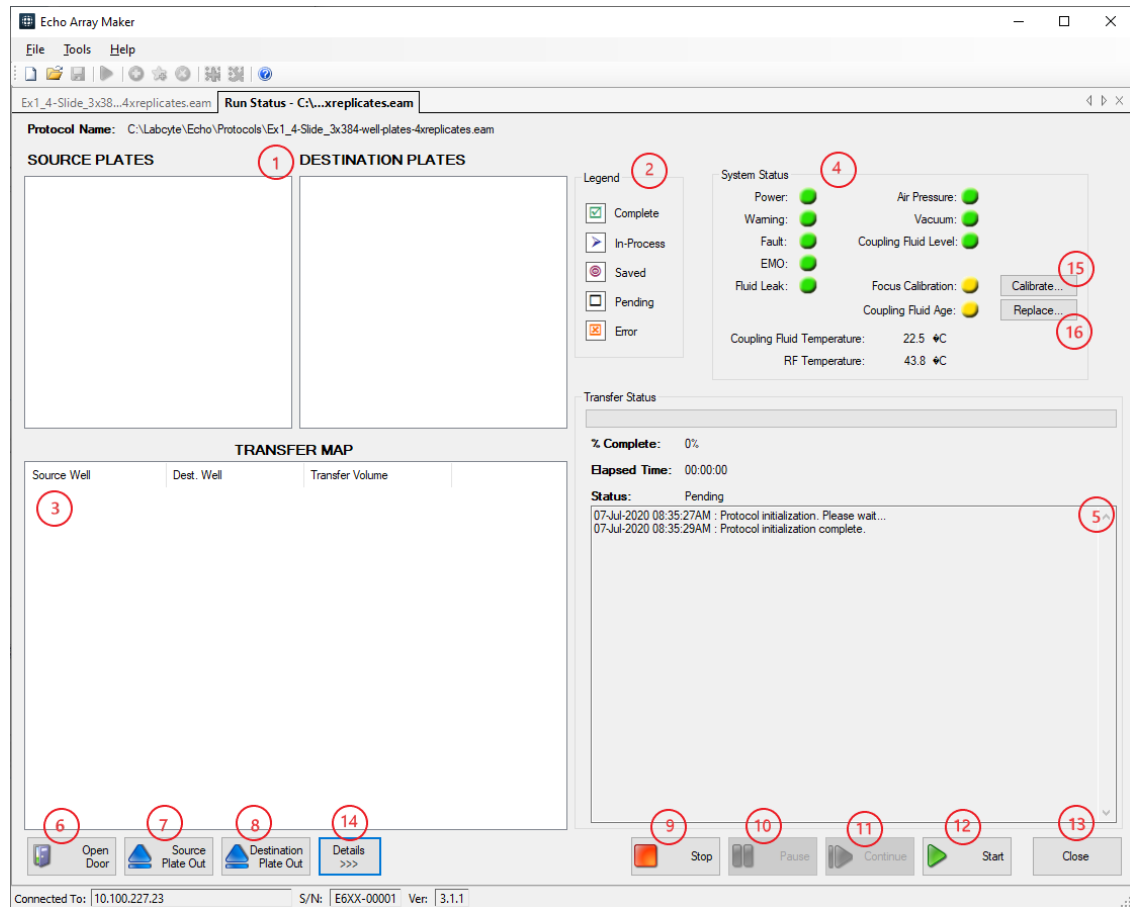| Callout Number	Name	Description
1	Transfer Animation Box	Simulates the movement of the destination plate (green) as it receives liquid from the source plate. Each source-to destination well transfer is documented below the plates.
2	Delays	The following Delays commands are available to manage the transfer animation. • **Animation (milliseconds)** — Controls the speed of the simulated well-by-well transfer. Speed ranges from 500 ms to 0; default is 15 ms. Higher speeds are useful to slow down the animation when transfers jump around the plate. For example, during backfills. • **Plate Prompt (seconds)** — Controls the time interval that the plate prompt box is displayed, from 30 s to 0. Zero setting is useful to bypass the prompt box entirely and view the animation only. • **Skip Animation** — Bypasses the animation step and shows only the transfer results for that step. This control enables the user to quickly review the plate mapping after each transfer step. **NOTE** This control does not bypass plate prompts or bulk fill displays. • **Play** — Begins the simulated fluid transfer. • **Close** — Closes the simulation window. If a simulation is in progress, it will need to be canceled before the window can be closed.
3	Source Plate Type Map Box	Shows the source plate that is selected for transfer. As the simulation runs, each source well shows the number of times a transfer is made from that well.
4	Destination Plate Type Map Box	Shows each well that receives transfers and the number of transfers that are received.
5	Protocol Information Box	Provides details about the transfer protocol, such as the number of plates that will be needed. As the simulation proceeds, this box is updated to show which plates are currently in use.

Run Status Window

The **Run Status** window is a dynamic window that provides control buttons to run the protocol, and various status windows to show the progress of the compound transfer, the state of the Echo instrument, and the final well positions and volume of the transferred fluid.

Figure 5.45 Run status window (Echo 55X Series Liquid Handler)

Figure 5.46 Run status window (Echo 650 Series Liquid Handler)

The table below describes the buttons/fields or sections in the **Run Status** window and their functionality.

Table 5.10 Callout table for Run Status window

Callout Number	Name	Description
1	Source and Destination Plate windows	Shows the status of each plate as it progresses through the transfer protocol. The Legend interprets the symbols used in the status windows.
2	Legend	Identifies each of the states (Complete, InProcess, Saved, Pending, Error) possible for a source and destination plate during a run.
3	Transfer Map window	Shows the details of each well-to-well transfer.
4	System Status window	Shows the status of the Echo instrument during the transfer run. If a problem occurs, an alert is indicated by the colors turning from green to yellow to red. If it is red, the user needs to do something to fix it.
5	Transfer Status window	Shows a progress bar of the transfer protocol, as well as percent completion and elapsed time. This section also provides a text window that displays all the actions that occur during the run.

Callout Number	Name	Description
6	Open Door button	Opens the process door of the connected Echo Liquid Handler.
7	Source Plate button	Extends the source plate gripper.
8	Destination Plate Out button	Extend the destination plate gripper.
9	Stop button	Stops the transfer protocol that is in progress.
10	Pause button	Pauses the transfer protocol that is in progress.
11	Continue button	Continues the transfer protocol that is in progress.
12	Start button	Begins the transfer protocol.
13	Close button	Closes the Run Status window.
14	Details button	Shows the debugging information for the protocol run.
15	Calibrate button	Starts the focus calibration procedure.
16	Replace button	Starts the coupling fluid replacement procedure (only applies to the Echo 650 Series Liquid Handler).

Plate Prompt

The **Plate Prompt** boxes instruct the user to insert or remove a plate. Depending on the protocol, there may be multiple source and destination plate prompts displayed and the order in which they are shown is also dependent on the protocol.

The plate prompt steps are described below:

1 Insert the source plate into the source plate gripper stage and click **OK**.

Figure 5.47 Insert source plate prompt box
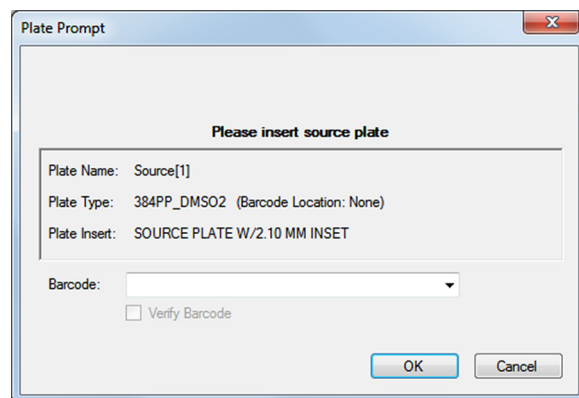
NOTE For Echo 650 Series Liquid Handler instruments, the **Plate Insert** will always be **Universal Insert**.

Identify the source plate in one of the following ways:

- **Plate ID** — Select the **Source Plate ID** from the drop-down menu.

- **Barcode** — Select the **Barcode** field and ensure the **Verify Barcode** option is selected. The Echo instrument automatically scans the barcode label on the plate and inserts it into the **Barcode** field.

  NOTE If the **Barcode** field was skipped and **Verify Barcode** was not selected, the software displays a plate read error.

After the source plate is processed, the software removes it from the drop-down menu.

2 Insert destination plate and click **OK**.

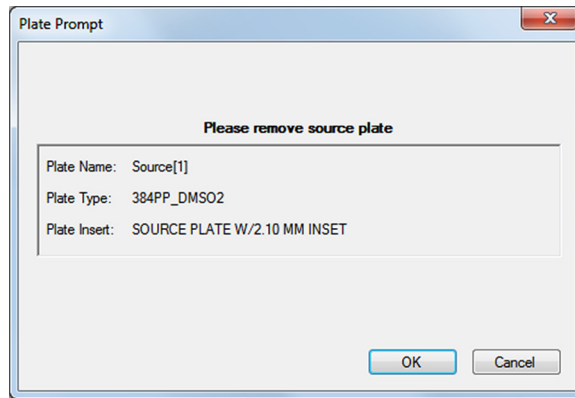**Figure 5.48** Insert destination plate prompt box
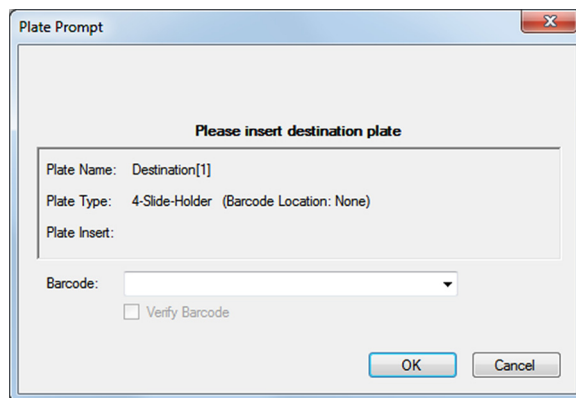
- Select the **Source Plate Barcode** (or plate ID) from the drop-down menu. If there is only one destination plate, the software automatically selects it and disables the **Verify Barcode** option.

- Select **Verify Barcode** (optional) and click **OK**.

After the destination plate is processed, the software removes it from the drop-down menu.
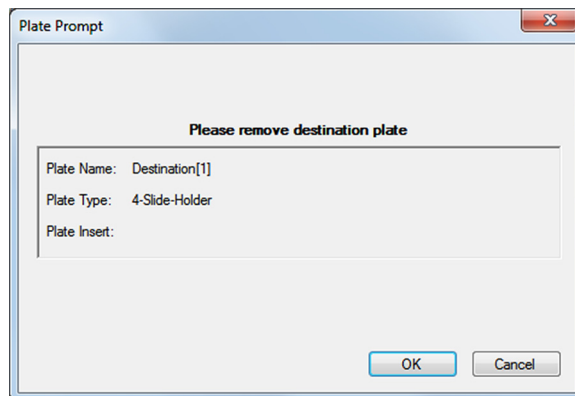
3 Remove the source plate and click **OK**.

Figure 5.49 Remove source plate prompt box


4 Remove the destination plate and click **OK**.

Figure 5.50 Remove destination plate prompt box

Focus Calibration

The **Focus Calibration** dialog box is automatically displayed when the user selects **Run** in the **Run Options** dialog box if the Echo Liquid Handler requires acoustic transducer calibration. This is also indicated by the yellow warning status indicator for **Focus Calibration** in the **System Status** section.

Figure 5.51 Focus Calibration Dialog Box
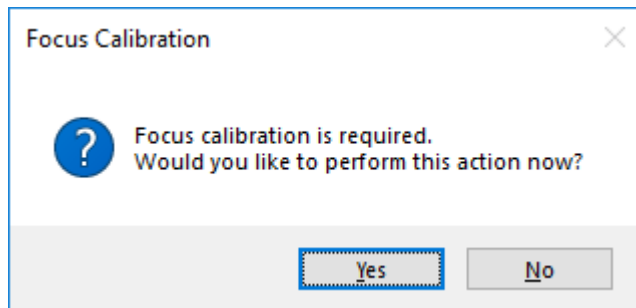
The Focus calibration procedure measures the focal length of the acoustic transducer and compares it to the previous measurement. If the difference between these measurements is minimal, then the system updates its calibration database with the new focal length and the procedure is finished. If the difference is larger than a preset threshold, users should call Beckman Coulter Service and Support to ensure the system is running properly before accepting the focal length new value.

It is recommended to select **Yes** and follow the focus calibration steps. If you choose to delay the focus calibration, you can click the **Calibrate** button next to the **Focus Calibration** status indicator in the **System Status** section in the **Run Status** window to start the focus calibration steps.

To run the Focus Calibration procedure:

1   Click **Yes** to begin the **Focus Calibration** procedure. The **Focus Calibration** dialog box is displayed.

2 In the **Focus Calibration** dialog box, click **Run.**

Figure 5.52 Focus Calibration Dialog Box
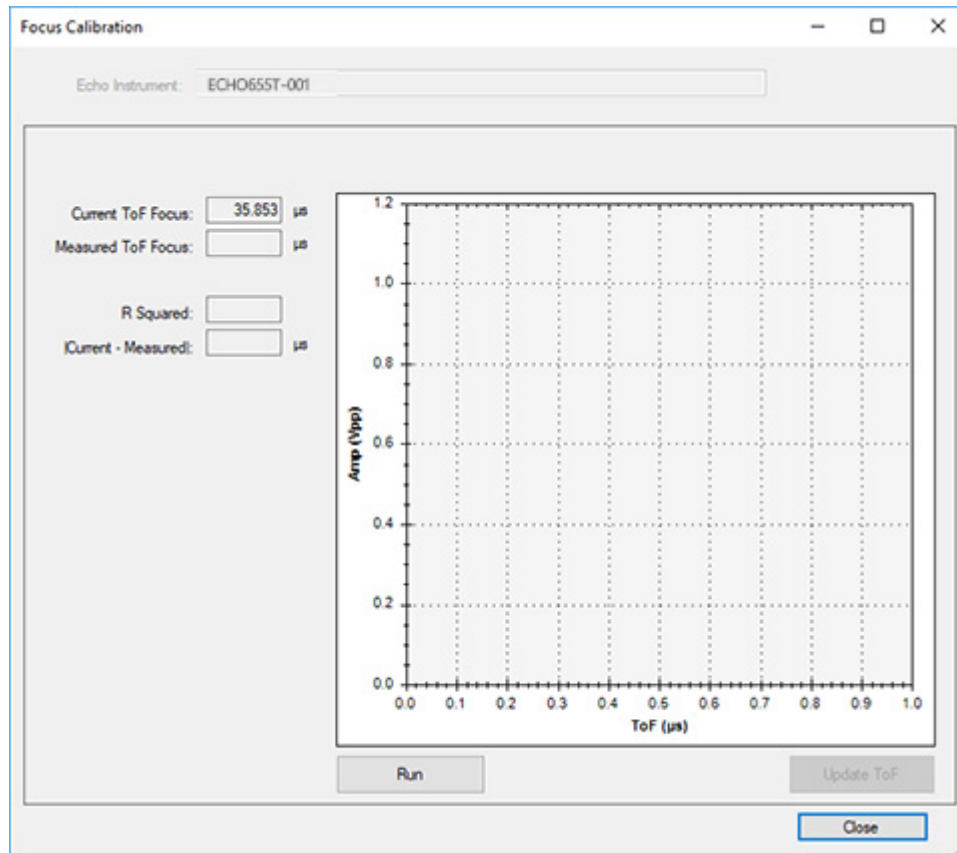
**3** The new focus calibration values are displayed. If there are no errors, click **Update ToF** to update the focus calibration values. If the focus calibration values are outside the normal range, a red warning box is displayed indicating the focus calibration values are out of range. If the user clicks **Update ToF**, a confirmation dialog box is displayed to ensure the user is aware of committing calibration values that are out of range. Out of range focus calibration values should not be committed unless instructed by Beckman Coulter Service and Support.

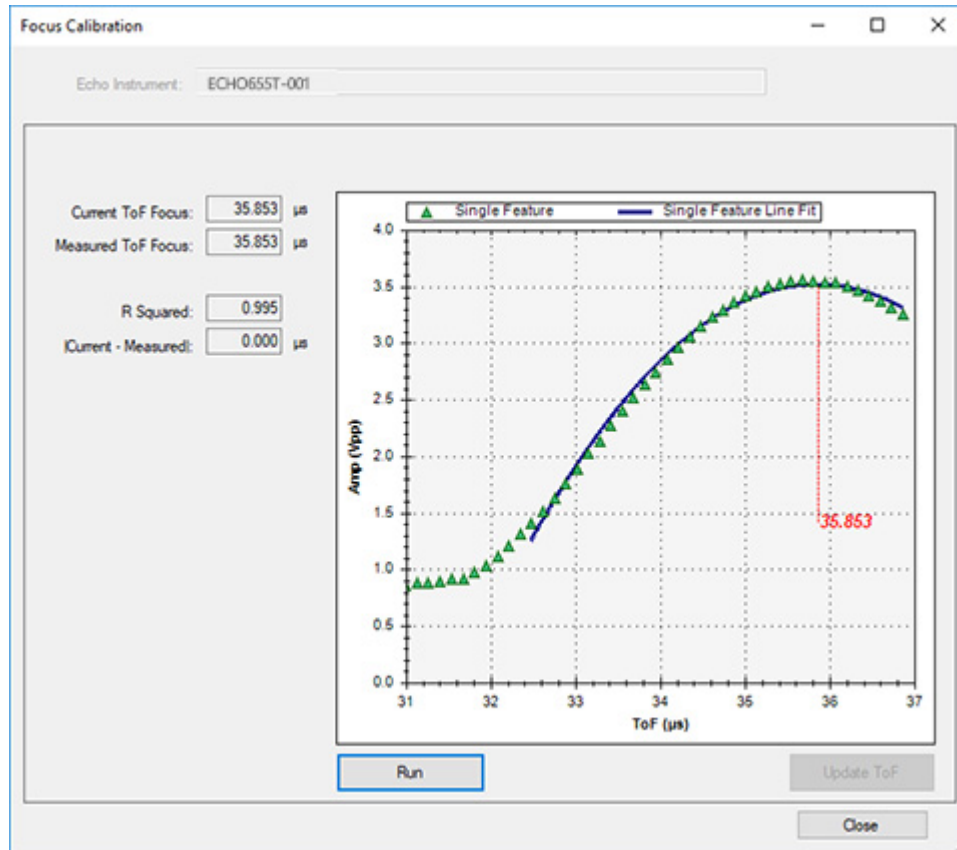**Figure 5.53** Focus Calibration Dialog Box
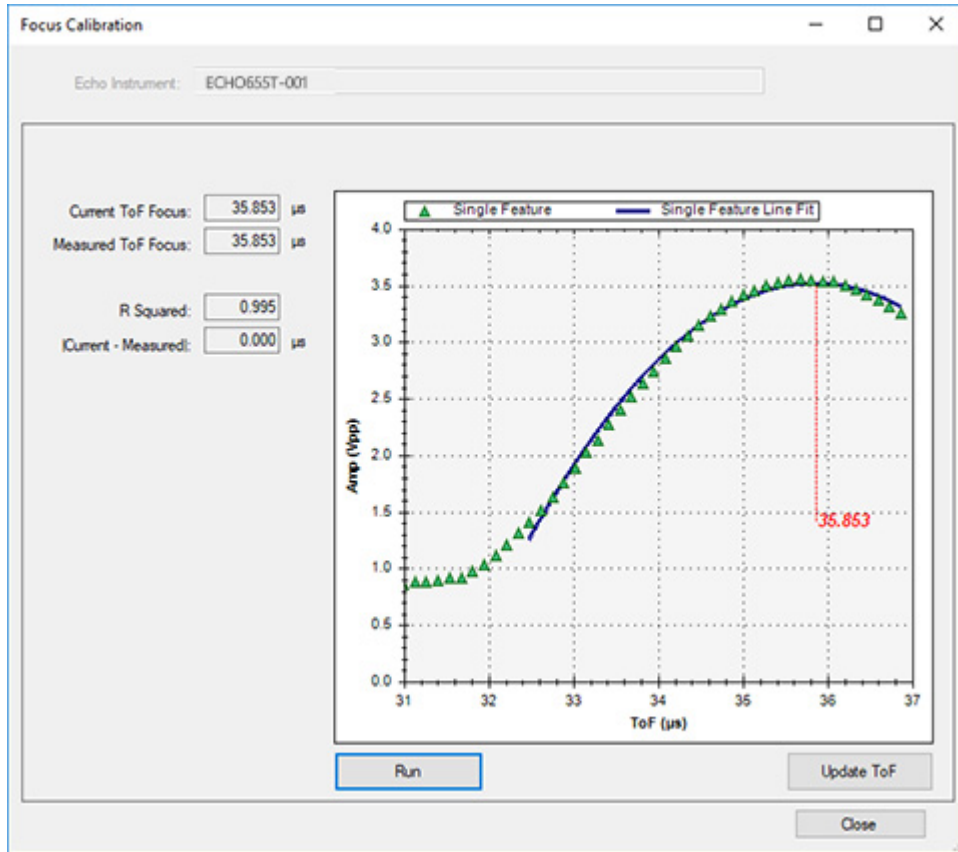
4 Once the focus calibration values have been committed, the **Update ToF** button is disabled. Click **Close** to exit the **Focus Calibration** dialog box.

**Figure 5.54** Focus Calibration Dialog Box

Coupling Fluid Replacement

NOTE The coupling fluid replacement procedure is only required for the Echo 650 Series Liquid Handler.

The **Coupling Fluid Replacement** dialog box is automatically displayed when the user selects **Run** in the **Run Options** dialog box a if the Echo Liquid Handler needs coupling fluid replacement. This is also indicated by the yellow warning status indicator for **Coupling Fluid Age** in the **System Status** section.

Figure 5.55 Coupling Fluid Replacement dialog box
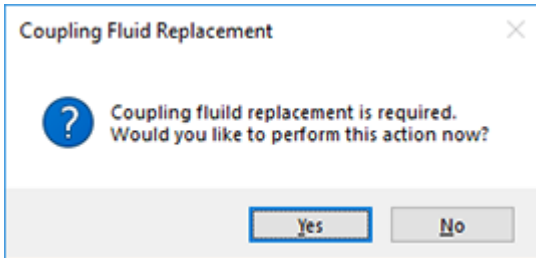
It is recommended to select **Yes** and follow the coupling fluid replacement steps. If you choose to delay coupling fluid replacement, you can click the **Replace** button next to the **Coupling Fluid Age** status indicator in the **System Status** section in the **Run Status** window to start the fluid replacement steps.

To start the fluid replacement process:

1 Click **Start** to begin the coupling fluid replacement process.

Figure 5.56 Coupling Fluid Replacement Start dialog box
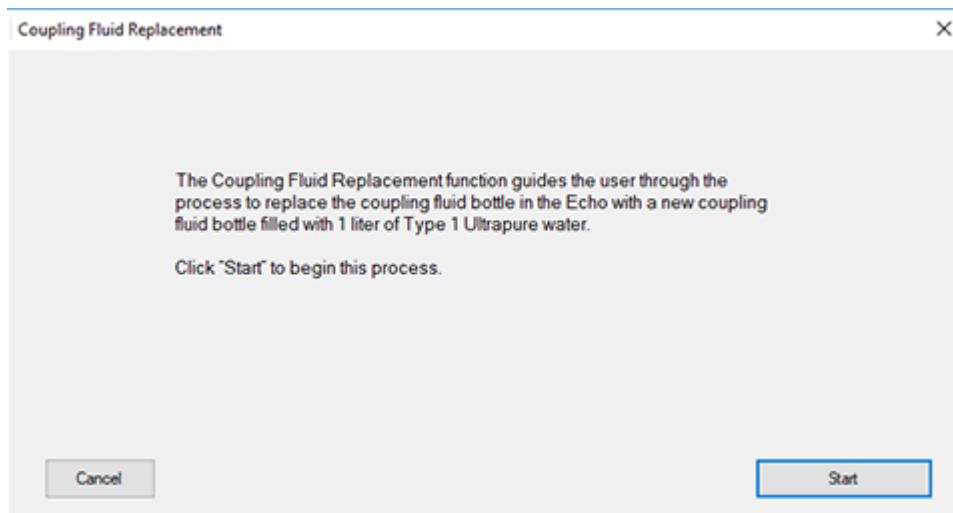
2 The **Fluid Replacement Workflow** is displayed and step 1 in the workflow is enabled. Go to the back of the Echo Liquid Handler and remove the coupling fluid bottle. Unscrew the bottle cap with the attached tubing and then dispose of the used coupling fluid.

Figure 5.57 Coupling Fluid Replacement Workflow displayed
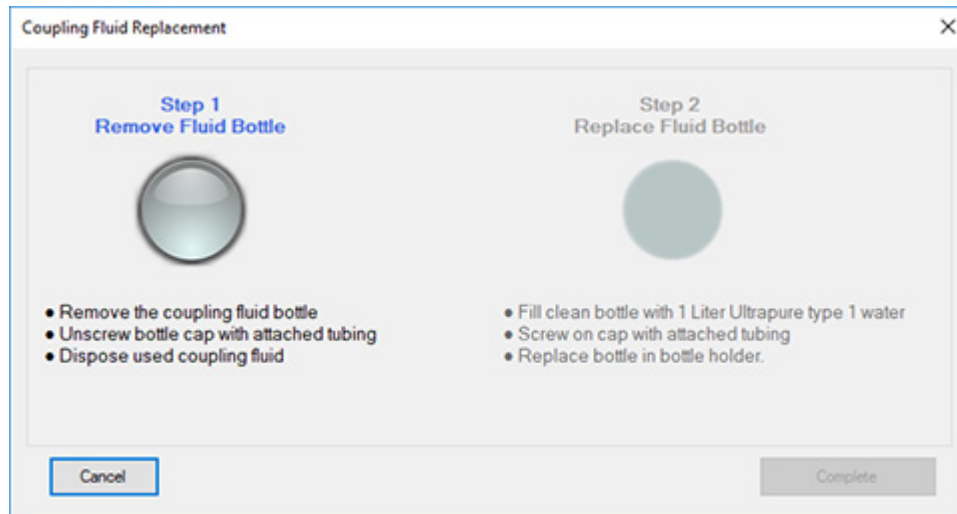
3 After the coupling fluid bottle has been removed, step 2 in the workflow is enabled.

Figure 5.58 Coupling Fluid Replacement Step 1
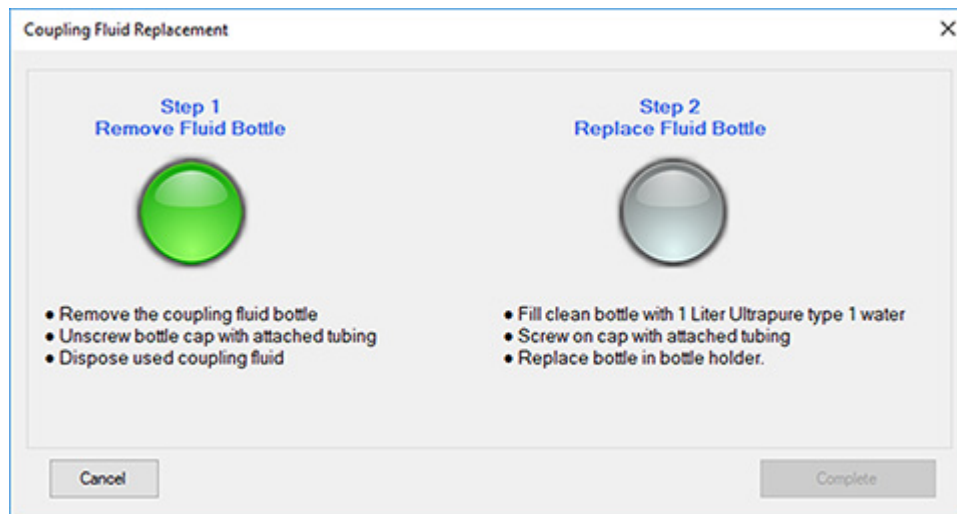
4 Fill a clean coupling fluid bottle with 1 Liter Ultrapure Type 1 water and screw on the bottle cap with the attached tubing. Then replace the coupling fluid bottle in the bottle holder.

Figure 5.59 Coupling Fluid Replacement Step 2
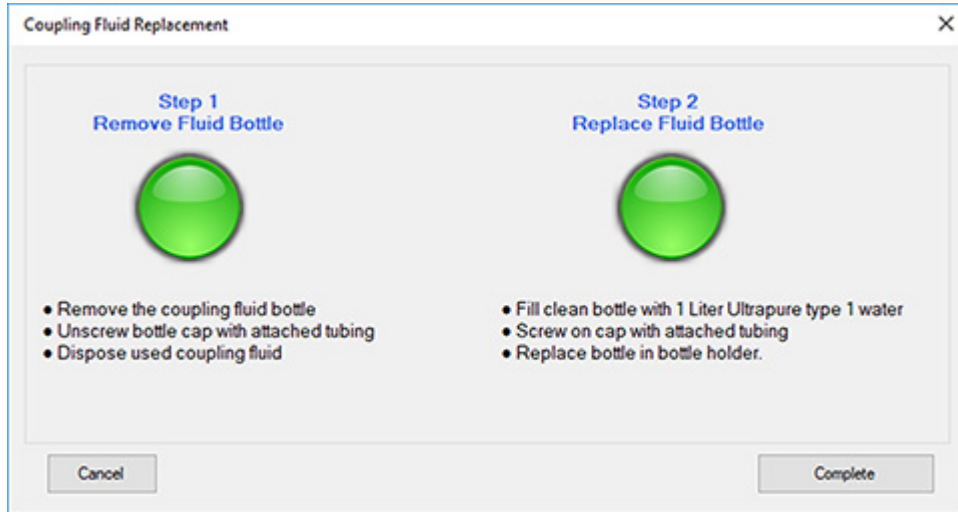
Once the fluid replacement process is started, if the user clicks the **Cancel** button and the coupling fluid level is sufficient, the following message box is displayed.

Figure 5.60 Canceling Fluid Replacement dialog box
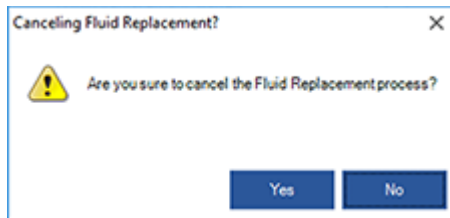
Once the fluid replacement process is started, if the user clicks the **Cancel** button and the sensor indicates that either the coupling fluid bottle is empty or not present, the following messages are displayed.

Figure 5.61 Canceling Fluid Replacement dialog box
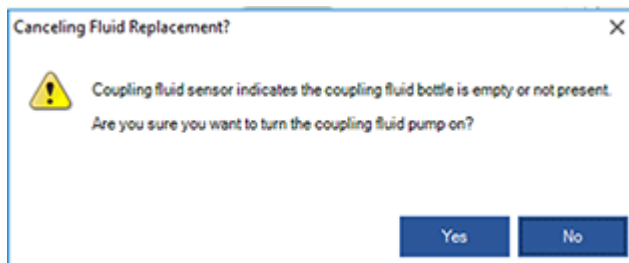
A second dialog box is displayed to confirm if the user wants to end the fluid replacement process.

Figure 5.62 Canceling Fluid Replacement dialog box
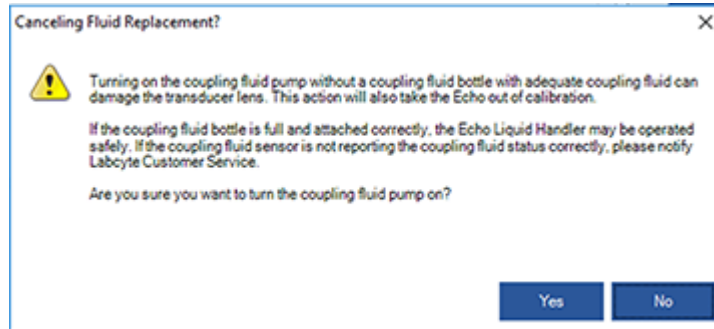
5 If the user did not cancel the fluid replacement process, they can click the **Complete** button to finish the fluid replacement process and exit the **Coupling Fluid Replacement** dialog box.

Glossary

There are many terms used throughout this guide that refer to parts of the Echo Array Maker application. It is useful to know and understand these terms before using the application.

Across — Indicates the ordering of transfers to occur in a row-wise manner.

Array — Specifies a region on a destination microplate or microarray that contains a pattern of spots. There can be one or more arrays in a Destination array.

Crystallography plate — A 96-well microplate typically containing subdivisions within each well (shelves).

Dest array or region — Indicates the array within a destination plate (or slide holder) that has been selected for transfer from a source plate.

Destination array — The combination of a Labware definition, one or more arrays, and spotting patterns into a single object for developing transfer protocols.

Destination plate — Microplate receiving the transfer contents from one or more source plates.

Down — Indicates the ordering of transfers to occur in a column-wise manner.

Echo qualified microplates — Microplates manufactured for Beckman Coulter and calibrated for using Echo Liquid Handlers.

Interleave pattern — A pattern consisting of source or destination wells separated by one or more wells in a column-wise or row-wise direction.

Microarray — Supporting material (as a glass or plastic slide) onto which numerous molecules or fragments usually of DNA or protein are attached in a regular pattern for use in biochemical or genetic analysis.

Microplate — A multi-well plate (96, 384, 1536, 3456 wells per plate) complying with the SLAS standard footprint.

Patterns — Custom arrangement of spots that can be named, saved, and mapped onto a substrate to create a destination array.

Plate Format — Defines the physical plate based on the number of wells, plate material (for example, PP, PS), and fluid capacity (for example, LDV).

Plate Type — Defines a combination of a physical plate and a fluid type. For example, 384PP_DMSO2 designates a DMSO transfer from a 384 polypropylene plate.

Pre-Transfer Delay — Sets the time delay before starting the transfer line. It is used in cases where there may be a requirement to incubate shortly between transfers.

Quadrant — One quarter of the total wells available in a microplate.

Pre-Transfer Delay — Mapping of transfers from source wells to destination wells according to pre-defined mapping modes. The pre-defined modes include full plate replication, compression, and decompression.

Quadrant — One quarter of the total wells available in a microplate.

Slide holder — A physical device that holds one or more microarray slides in position during a sample transfer.

Source plate — Echo qualified microplate containing samples or reagents for transfer to another microplate serving as a destination plate.

Source Plate Regions — Sub-groups of wells within a source plate that have been selected for transfer to a destination array.

Spot — A graphical representation of a specific location within a pattern to which a fluid transfer will be mapped to.

Well — A single division of a microplate designed to contain fluid. The central location of a well is typically determined by the X and Y offset from the upper-left corner of the microplate (A1).

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Related Documents

Beckman Coulter documentation consists of the following publications:

- *Echo Array Maker Quick Start Guide*
- *Echo Combination Screen User Guide*
- *Echo Combination Screen Quick Start Guide*
- *Echo Cherry Pick User Guide*
- *Echo Cherry Pick Quick Start Guide*
- *Echo Plate Reformat User Guide*
- *Echo Plate Reformat Quick Start Guide*
- *Echo Plate Audit User Guide*
- *Echo Plate Audit Quick Start Guide*
- *Echo Dose-Response User Guide*
- *Echo Dose-Response Quick Start Guide*
- *Echo 21CFR11 Compliance Manager User Guide*
- *Echo 21CFR11 Compliance Manager Quick Start Guide*
- *Echo 21CFR11 Compliance Manager Admin User Guide*
- *Echo 21CFR11 Compliance Manager Admin Quick Start Guide*
- *Echo 500 Series Liquid Handler User Guide*
- *Echo 525 Series Liquid Handler User Guide*
- *Echo 650 Series Liquid Handler User Guide*
- *Echo Software Applications Integration Guide*
- *Echo Liquid Handler Software Integration Guide*
- *Tempo Automation Control Software User Guide*
- *Access Dual Robot System User Guide*