Flow Conductor

User Guide
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About This User Guide

This user guide describes how to use Flow Conductor™, including the system software (v3.0.2). For complete instrument specifications and unpacking/installation instructions, see the Flow Conductor Site Requirements Guide (FLDM-00141).

**IMPORTANT** Before using Flow Conductor, read and understand the detailed instructions and safety guidelines in this document. For complete safety information, see Appendix E.

Safety Alert Conventions

Fluidigm documentation uses specific conventions for presenting information that may require your attention. Refer to the following safety alert conventions.

**Safety Alerts for Chemicals**

For hazards associated with chemicals, this document follows the United Nations Globally Harmonized System of Classification and Labelling of Chemicals (GHS) and uses indicators that include a pictogram and a signal word that indicates the severity level:

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>!</td>
<td>Pictogram (see example) consisting of a symbol on a white background within a red diamond-shaped frame. Refer to the individual safety data sheet (SDS) for the applicable pictograms and hazards pertaining to the chemicals being used.</td>
</tr>
</tbody>
</table>

**DANGER** Signal word that indicates more severe hazards.

**WARNING** Signal word that indicates less severe hazards.

**Safety Alerts for Instruments**

For hazards associated with instruments, this document uses indicators that include a pictogram and signal words that indicate the severity level:

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>!</td>
<td>Pictogram (see example) consisting of a symbol on a white background within a black triangle-shaped frame. Refer to the instrument user guide for the applicable pictograms and hazards pertaining to instrument usage.</td>
</tr>
</tbody>
</table>

**DANGER** Signal word that indicates an imminent hazard that will result in severe injury or death if not avoided.

**WARNING** Signal word that indicates a potentially hazardous situation that could result in serious injury or death if not avoided.

**CAUTION** Signal word that indicates a potentially hazardous situation that could result in minor or moderate personal injury if not avoided.

**IMPORTANT** Signal word that indicates information necessary for proper use of products or successful outcome of experiments.
Safety Data Sheets

Read and understand the SDSs before handling chemicals. To obtain SDSs for chemicals ordered from Fluidigm, either alone or as part of this system, go to fluidigm.com/sds and search for the SDS using either the product name or the part number.

Some chemicals referred to in this user guide may not have been provided with your system. Obtain the SDSs for chemicals provided by other manufacturers from those manufacturers.

Use Limitations

Flow Conductor is a lab automation instrument designed to support a variety of protocols (also standard operating procedures) and cell types. In all cases, protocol validation should be performed by the practicing lab using cell types of interest.

Flow Conductor is compatible with the labware and buffers described in this user guide. Use of alternative labware or buffers should be validated by the practicing lab.

Flow Conductor should only be operated by a competent lab technician or scientist who has received training by Fluidigm and has read this user guide.

For calibration and other technical questions, contact Fluidigm at techsupport.fluidigm.com.

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Chapter 1: Product Overview

About Flow Conductor

Flow Conductor™ is an innovative, fully automated sample preparation system that performs complete sample preparation workflows for flow or mass cytometry. Its ability to mimic benchwork allows for easy adaptation of existing assay workflows, reduction in hands-on time, and minimization of human error and variability, resulting in more consistent results.

Flow Conductor is intended to be used in laboratories performing sample processing for flow cytometry and mass cytometry applications. The system processes suspension samples prior to flow and mass cytometry analysis. Processes that can be automated include antibody cocktail preparation, specimen aliquoting, cell staining, red blood cell lysis, fixation, and wash steps that involve centrifuging and aspirating supernatants. The system has the capacity for up to 28 cocktails and up to 72 different stock antibodies. Flow Conductor allows users to load antibodies, reagents, and specimens and walk away, then return to retrieve samples ready for analysis by a flow cytometer or a CyTOF® system. The Delayed Start mode provides an option to start an operation at a preset time. It can be used for overnight cocktail preparation in advance of a day’s work or full sample preparation such that samples are ready to be acquired early in the day.

Flow Conductor is designed to run batches of samples. Up to 18 specimens and up to 28 specimen target tubes (secondary tubes) can be loaded for every run. Throughput varies based on user-programmed protocols.

Flow Conductor is compatible with many standard flow and mass cytometry staining reagents and labware. Low Dead Volume (LDV) Reagent Tubes (PN 500116), uniquely designed to minimize the dead volume of precious antibodies and reagents, are required.
Flow Conductor Stations and Modules

For a glossary of terms, see Appendix B.

Figure 1. Flow Conductor stations and modules

Figure 2. Inside of the instrument (top view, robot arm not shown)
Safety Door

CAUTION Use caution when safety door is open and avoid placing hands or fingers near the movable parts. Familiarize yourself with these parts of the instrument to avoid injury.

The safety door contains an interlock that prevents opening when the system is running. The safety door interlock is also active when the system is placed in Night Mode. When aborting a run, there is a 1 min delay before the door can be opened.

Cooling Chamber (A–D Stations)

The cooling chamber maintains antibodies and other reagents in LDV tubes at a temperature between 3 and 8 °C. The cooled antibody holder inside the chamber is divided into 3 removable antibody racks (left, right, and center) that hold a total of 100 LDV tubes. Of these tubes, 72 are allocated to stock antibodies or other reagents and 28 to cocktails. Each tube can hold up to 4 mL of liquid. The cooling chamber contains sensors to detect the types of antibody racks (left and right) that are placed in the instrument.

NOTE Flow Conductor is provided with 1 set of antibody racks.

The cooling chamber has a perforated dark cover that limits light in the cooling chamber while allowing the small probe to access tubes for pipetting.

Specimen Racks (E–F Stations)

Flow Conductor has 2 joint specimen racks labeled with the letters E and F. Combined, the specimen racks can hold up to 18 specimen tubes. The specimen racks consist of:

- E station: 9 positions compatible with standard 5 mL 12 x 75 mm tubes.
  
  NOTE The instrument is compatible with both polystyrene and polypropylene tubes.

- F station: 9 positions compatible with 12 x 75 mm, 13 x 100 mm, and 17 x 120 mm tubes.

Fluidics Systems (G1–G9 Stations)

The Flow Conductor fluidics systems consist of the reagent and waste stations inside the instrument (internal fluidics system) and the reagent bottle rack outside the instrument (external fluidics system). A distilled water tank is also provided.

NOTE Deionized water (DIW 18.2 MΩ) is strongly recommended for mass cytometry applications.

Internal Fluidics System

The Flow Conductor internal fluidics system consists of a reagents and waste station module with 5 reagent wells (G1–G5 wells) directly connected to the G1–G5 bottles in the external fluidics system, 2 wash wells for the probes, a waste well, and 4 tube holders for positions G6–G9. The 5 reagent wells connect to the external bottle rack and the waste tank via fluid lines on the lower part of the module. The waste well collects overflow from
the 5 reagent wells and the 2 wash wells, as well as any excess waste liquids from the pipetting probes.

Positions G6–G9, located next to the reagents and waste station, can be used for lower-volume reagents. These positions are compatible with 90 x 25 mm polypropylene tubes, which hold up to 25 mL of reagents (see Equipment and Consumables Used with Flow Conductor on page 13). Flow Conductor has a volume tracking feature that informs the user when reagent levels in the internal fluidics system run low.

External Fluidics System

The reagent bottle rack holds five 2 L bottles (G1–G5 bottles). Each bottle is connected to the respective reagent well of the internal fluidics system (G1–G5 wells). There is a separate 5 L DIW tank (G0) that should be placed on the lab bench close to the instrument.

**TIP** Before a run, visually inspect the reagent bottles and DIW tank to ensure that there are sufficient volumes of reagents to run the desired protocols.

**TIP** Your system is delivered with 5 dust covers that are used to cover the bottle rack when not in use. When reagent bottles are not in place, it is recommended to cover exposed positions with dust covers to minimize the chance of particles entering the fluidics system. Simply place the bottle rack dust covers on the bottle rack open positions. Note that for ease of use the covers are not secured to the system. When not in use, store dust covers in a safe and clean location.

**NOTE**
- The maximum capacity of the reagent tanks in positions G1–G5 is 2 L. An aspiration step from these positions picks up an additional 1.6 mL to prime the fluidics line in order to avoid cross-contamination with previously used reagents.
- Positions G6–G9 are located inside the instrument and are compatible with 25 x 90 mm polypropylene tubes (without caps) (see Other Equipment on page 13).
- The maximum capacity of 25 x 90 mm tubes in positions G6–G9 is 25 mL. An aspiration step from these positions picks up an additional 1 mL to prime the fluidics line in order to avoid cross-contamination with previously used reagents. This additional volume is discarded. The recommended overfill in these tubes is 10% but no less than 300 μL.

For more information, see Replace Reagents in the Fluidics Systems on page 73.

Centrifuge (H Station)

Flow Conductor features an integrated centrifuge that holds up to 28 sample tubes for staining and washing. The centrifuge is used to hold samples for incubation, for reagent addition (for example, staining), and to centrifuge samples for washes. Wash steps are performed by addition of user-defined reagents and user-defined centrifugation steps at up to 800 x g. The centrifuge swinging tube holders are compatible with standard 12 x 75 mm tubes with a maximum fill volume of 4 mL each. An automated lid with pipetting-access orifices protects samples from light throughout protocol runs.
Robot Arm and Probes

**DANGER** Always keep body parts away from the Flow Conductor probes. Probes may cause bodily harm. Do not expose probes by removing the protective case surrounding the pipetting module.

Flow Conductor uses 2 probes to transfer and prepare reagents and samples. The probes are mounted on the robot arm behind a protective case to prevent damage to the pipetting module and possible user injury. The robot arm moves to pipet specimens from specimen tubes to secondary tubes in the centrifuge, to pipet reagents in the cooling chamber, and to pipet reagents to secondary tubes in the centrifuge.

Specimens are pipetted with a large probe. The default usable volume for the large-probe fluidics system is 8 mL.

Reagents in the cooling chamber are pipetted with a small probe. The default usable capacity for the small-probe fluidics system is 200 µL.

Waste Tank

Flow Conductor disposes of excess liquids containing residual specimens, samples and reagents into a waste tank (Figure 1). The waste tank is placed on the floor and can contain up to 25 L of liquid waste. The waste tank is connected to the instrument with a waste line.

**WARNING** BIOHAZARD. When handling biohazardous material, use appropriate personal protective equipment and adhere to Biosafety in Microbiological and Biomedical Laboratories (BMBL), a publication from the Centers for Disease Control and Prevention, and to your lab’s safety protocol to limit biohazard risks. If biohazardous materials are used, properly label the equipment as a biohazard. For more information, see the BMBL guidelines online at cdc.gov/biosafety/publications/index.htm.

Onboard Computer

Flow Conductor is equipped with an integrated computer with an LCD touchscreen that controls instrument operation and monitors its performance. The onboard computer is used to create and edit protocols and templates and manage antibody as well as reagent lists. The onboard computer is controlled only through the touchscreen. A keyboard is not provided.

Barcode Reader (Optional)

A barcode is a label with a coded unique identifier applied to a specimen or sample tube. Flow Conductor is designed to work with an optional barcode reader. The barcode reader provides 2 default levels of chain of custody (CoC) control. These levels of control determine whether tubes must be scanned for a barcode prior to loading. The settings are called CoC level 1 for the more stringent default and CoC level 2 for the less stringent level. A Fluidigm field service engineer installs and sets up the barcode reader.

**NOTE** Additional CoC settings are available. Ask your Fluidigm field applications scientist (FAS) or contact Fluidigm Support.
CoC level 1

By default, each specimen tube and secondary tube must have a barcode label and must be scanned during tube loading.

CoC level 2

By default, each specimen tube must have a barcode label and must be scanned during tube loading. Secondary tubes are not required to have barcode labels.
Equipment and Consumables Used with Flow Conductor

Standard Equipment

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Manufacturer</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow Conductor</td>
<td>Fluidigm</td>
<td>500102</td>
</tr>
<tr>
<td>Barcode Reader Module (optional)</td>
<td>Fluidigm</td>
<td>500115</td>
</tr>
<tr>
<td>Water Tank, 5 L with Cap</td>
<td>Fluidigm</td>
<td>500158</td>
</tr>
<tr>
<td>Reagent Bottle, 2 L with Cap</td>
<td>Fluidigm</td>
<td>500112</td>
</tr>
<tr>
<td>Waste tank, 25 L</td>
<td>Fluidigm</td>
<td>500113</td>
</tr>
<tr>
<td>Station G6–G9 Tube, 90 x 25 mm, pack of 20</td>
<td>Fluidigm</td>
<td>500114</td>
</tr>
<tr>
<td>Antibody Rack Cover</td>
<td>Fluidigm</td>
<td>500107</td>
</tr>
</tbody>
</table>

Standard Consumables

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Manufacturer</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Dead Volume (LDV) Reagent Tubes, pack of 1,000</td>
<td>Fluidigm</td>
<td>500116</td>
</tr>
</tbody>
</table>

Other Equipment

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Manufacturer</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 x 25 mm skirted conical tubes</td>
<td>Sarstedt</td>
<td>60.9922.241</td>
</tr>
<tr>
<td>12 x 75 mm tubes, polystyrene or polypropylene</td>
<td>Various</td>
<td></td>
</tr>
<tr>
<td>17 x 120 mm tubes, conical</td>
<td>Various</td>
<td></td>
</tr>
<tr>
<td>13 x 100 mm tubes, round bottom</td>
<td>Various</td>
<td></td>
</tr>
</tbody>
</table>

Regulatory Compliance

The following directives and harmonized standards were used to evaluate the safety and performance of the Flow Conductor system:

General Regulations and Requirements

- 2014/35/EU European Parliament Low Voltage Directive
Harmonized Standards

- IEC/EN 61326-1
- IEC/EN 61010-1
- IEC 61010-2-101
- IEC 61010-2-020
- FCC CFR 47 subpart 15b
- CISPR 16-2-1
- CISPR 16-2-3
- EN IEC 61000-3-2
- EN 61000-3-3
- EN 61000-4-2
- EN 61000-4-3
- EN 61000-4-4
- EN 61000-4-5
- EN 61000-4-6
- EN 61000-4-8
- EN 61000-4-11

Conformity Symbols on the Instrument

The instrument is labeled with the following conformity markings:

<table>
<thead>
<tr>
<th>Conformity Mark</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nemko US</td>
<td>Indicates conformity with safety requirements for Canada and the United States.</td>
</tr>
<tr>
<td>CE</td>
<td>Indicates conformity with European Union requirements for safety and electromagnetic compatibility.</td>
</tr>
</tbody>
</table>

Refer to the Flow Conductor Site Requirements Guide (FLDM-00141) for more detailed information on the recommended environmental conditions.
Chapter 2: Flow Conductor Software

This chapter describes the Flow Conductor™ workflow and explains software modules including reagent cards, cocktail cards, reagent layout, templates, protocols, and worklists.

Flow Conductor Workflow

1. Create a reagent card.
2. Create a cocktail card.
3. Assign the reagent and cocktail cards to positions in the reagent layout.
4. Load or refill reagents and antibodies.
5. Create templates and protocols.
6. Run a protocol.
7. Load and unload the specimens.
8. Select the type of specimen tube to load.
9. Select the protocols to run.
Access Levels

Flow Conductor software can be run in 1 of 2 modes to control for use access level: User mode and Administrator mode.

- In User mode, users can set up cases, load or refill reagents and antibodies, and run protocols.
- In Administrator mode, administrators can create and edit templates, change protocols, change parameters, and access service screens.
- To log in to the Main Menu a user or administrator must enter a pin code in the login screen. This pin is linked to a pre-defined user ID.

Reagent Card

A reagent is defined as a buffer, lysing solution, antibody, or other substance used to prepare cells for flow cytometry or mass cytometry analysis. Reagent cards identify each reagent and antibody that is used in protocols and templates. To add a reagent to a protocol or template, or to prepare a cocktail, each reagent must have an associated reagent card.

For each reagent card the first 4 fields—Name, Label, Clone, and Supplier—are required, and these fields are combined to create a unique identifier for the antibody or reagent. Additional optional information fields, including Catalog/Order Number, Lot Number, Regulatory Status, Bottle Volume, Price, and Sales Rep Contact Information, are also available. After a reagent card is saved, the reagent can be linked to a cooling chamber position (A–D) or to the fluidics system (G1–G9) in the reagent layout.

NOTE When refilling a reagent such as an antibody, update the expiry date, lot number, and volume in the reagent card. To load or refill reagents, see Refill Antibodies and Reagents on page 31.

Figure 3. Reagent card

To create a reagent card, see Create a Reagent Card on page 25.
Reagent Layout

Reagents are loaded in the fluidics system (G1–G5 external bottles and G6–G9 tubes) or in the cooling chamber (A–D). Antibodies should only be loaded in the cooling chamber. The 5 G1–G5 2 L bottles are used for buffers such as PBS, distilled water, and lysing reagent.

Figure 4 shows the Reagent Layout screen in the software for cooling chamber positions A–D, 1–25 and the list of reagents that are loaded in positions G1–G9.

Figure 4. Reagent layout for cooling chamber positions and reagents

Command Buttons

This section describes buttons that control reagents positions in the cooling chamber and the fluidics system in the Reagent Layout screen.

Figure 5. Reagent layout showing the command buttons for G1–G9 positions
Chapter 2: Flow Conductor Software

Templates

Figure 6. Reagent layout for the cooling chamber showing 4 command buttons: MOVE, DELETE, ADD and VIEW

Add
To link a reagent card to a position in the reagent layout, tap ADD.

View
To view more information about a reagent, tap the reagent to select it and then tap VIEW.

Move
To change the position of a reagent, tap MOVE.

Delete
To delete a reagent card from its assigned position in the reagent layout, tap the reagent to select it and then tap DELETE.

IMPORTANT Be sure to remove the reagent tube from the instrument when it is deleted from the reagent layout. After its position is deleted in the layout, the tube may be linked to an alternative position in the layout. See the section on the Add button, above.

Templates

A template is a user-defined set of instructions for protocols (see Protocols below). It contains the reagent and antibody volumes, the parameters for staining, incubation, centrifugation, and vortexing, and the sequence of steps that Flow Conductor performs during a run. The template is used to generate protocols. Tests can be processed only from protocols and not directly from templates.

IMPORTANT When making changes to a template, the software prompts to save the changes as a new template. Changing an existing template file does not update the protocols based on the template. Make sure to change in the protocols if a template change is needed.
Protocols

A protocol is the sequence of steps that Flow Conductor follows to process samples.

NOTE To change the steps in the protocol, first create a new template.

A protocol linked to a template allows Flow Conductor to prepare multiple specimens and secondary tubes in the same run. A linked protocol allows edits to settings for specific staining steps, but edits to the number and order of steps and settings for incubations and centrifugations are limited (see Create a Linked Protocol from an Existing Template on page 51). Linked protocols are color-coded to match the template to which they are linked (Figure 7).

Worklists

A worklist consists of 2 or more linked protocols that are designed to be run simultaneously on the instrument.

Example

This example illustrates a template, protocol, and worklist using 3 sample tubes with 3 different antibody cocktails based on the same template. The run can be set up as follows:

- **Template**: FDM-T is a template that contains the step-by-step procedure similar to a bench workflow.

- **Protocol**: FDM 1, FDM 2, and FDM 3 are 3 different protocols based on the FDM-T template but with different antibody cocktails in each tube.

- **Worklist**: FDM-Worklist consists of the FDM 1, FDM 2, and FDM 3 protocols, which can be processed on the instrument simultaneously on 1 or more specimen tubes.
Operating Menu

The Operating Menu is the Flow Conductor software home screen. It contains a list of the available protocols and worklists. After powering on, wait for the Operating Menu screen to appear (Figure 8). Flow Conductor is now ready to run.

Figure 8. Operating Menu

Worklists and Protocol Lists

The worklist box and the protocol box show worklists and protocols that are available and their status. In the lists, an empty red circle ( ) indicates 1 or more reagent card is not linked to the reagent layout. A half-empty red circle ( ) indicates that all reagent cards are linked to the reagent layout, but some ingredients do not have the required volume to run the protocol. A green circle ( ) indicates that the ingredients (reagents or antibodies) needed are onboard and filled. Tap one of the protocols to open the Protocol screen and review protocol steps, protocol details, and notices for low-volume reagents.

Shortcut Buttons

The 4 shortcut buttons on the top right side of the screen allow quick access to commonly used setups for specimens and their associated secondary tubes. Available shortcuts are: 2 specimen and 2 secondary tubes, 5 specimen and 2 secondary tubes, 9 specimen and 2 secondary tubes, and 1 specimen and 10 secondary tubes. For example, tap the shortcut 2 specimen x 2 secondary tubes to go directly to the specimen setup for running 2 specimen tubes with 2 secondary tubes each. See Appendix C: Parameters for shortcut button options.

Load Specimen

Load Specimen opens the Specimen setup screen.
Create Cocktail

Create Cocktail opens the Create Cocktail screen.

Night Mode

Night Mode performs a cleaning procedure and turns off all systems except the cooling chamber. For more information, see Night Mode on page 68.

Settings

Tap SETTINGS to open the Main Menu (Figure 9). In the Main Menu screen users can change and create protocols, assign positions in the reagent layout, and load or refill reagents in the instrument, depending on the user’s access level. For example, in User mode a user can only run tests and load or refill reagents. In Administrator mode a user can change a protocol or create a template, change parameters, or access the service screens.

![Figure 9. Main Menu with the Administrator login (left), User login (right)](image-url)
## Flow Conductor Sample Processing Workflow

<table>
<thead>
<tr>
<th>Hands-On Step</th>
<th>Automated Step</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Create the reagent and cocktail cards and assign them in the reagent layout.</td>
<td>8  The instrument probes dispense the specimen from the specimen tubes into secondary tubes in the centrifuge.</td>
</tr>
<tr>
<td>2  Load or refill the reagents and antibodies into Flow Conductor.</td>
<td>9  Between each step in the protocol the probe is washed in the wash wells.</td>
</tr>
<tr>
<td>3  Create a template and create the protocols you want to run.</td>
<td>10  Stock antibodies and reagents are used to prepare a cocktail.</td>
</tr>
<tr>
<td>4  Select the number of secondary tubes for each specimen to set up and choose protocols.</td>
<td>11  Cocktails (and optionally stock reagents) are pipetted to the tubes.</td>
</tr>
<tr>
<td>5  Load the specimen tubes into the E and F stations.</td>
<td>12  Additional steps in the staining procedure are performed according to the protocol, including centrifuging, aspiration, washes, addition of reagents, and incubations.</td>
</tr>
<tr>
<td>6  Load the secondary tubes into the H station.</td>
<td>13  When the automated sample processing procedure is complete, Flow Conductor provides an audible signal and presents an operation-completed message.</td>
</tr>
<tr>
<td>7  Start sample processing.</td>
<td>✓  The secondary tubes can now be removed from Flow Conductor and further processed or loaded into the mass or flow cytometer for acquisition.</td>
</tr>
</tbody>
</table>
Chapter 3: Flow Conductor Operation

Start Flow Conductor from Night Mode

Flow Conductor™ is designed to remain in operation for extended periods. Reagents can be refilled for convenient operation on consecutive days. For daily operation, use Night Mode instead of powering the instrument on and off every day. See Night Mode on page 68.

Start Flow Conductor

NOTE  The startup process takes a few minutes.

1  Before starting the instrument, check that:
   •  The waste line is not bent.
      
      NOTE  A bend in the waste line could cause waste to flow into the internal fluidics system and overflow.
   •  The cooling chamber cover is in place.

2  Turn on Flow Conductor by toggling the power switch, accessible on the right side of the back panel.

   Figure 10. Power switch location on the back of the instrument

NOTE  
   •  The instrument does not perform a new reagent-level check when brought out of Night Mode.
   •  A connection error may occur, resulting in the error message There is an error during the operation. No connection with the MCU board. This indicates that the connection between the MCU (master controller processor unit) and the PC is not established or has been lost. Power off Flow Conductor using the power switch. Unplug the USB cable from the PC. Power on Flow Conductor using the power switch. When the Windows operating system starts up and before the Flow Conductor software automatically starts, immediately connect the USB cable to the PC.
The Startup Screen appears (Figure 11) and the instrument performs a functionality check.

![STARTUP SCREEN](image)

Figure 11. Startup Screen

The software then prompts with an instrument inspection checklist.

3 Perform the instrument checks as instructed on the screen. When completed, select the checkboxes, and then tap **DONE**.

![INSPECT INSTRUMENT](image)

Figure 12. Completed instrument inspection checklist

The startup process continues with an automatic reagent level check. If any of the reagent volumes are low, the software prompts the user to refill.

**NOTE** If you do not want to refill at this time, tap **NEXT**.
4 Tap the keypad in the User ID screen to log into the software. Use the user code provided by your Fluidigm field service engineer during installation.

Figure 13. User ID entry screen

Create a Reagent Card

There are 2 types of uses for reagent cards based on the same template, one for reagents cards and one for antibody cocktails cards. To create a Cocktail card, see Create a Cocktail Card on page 27. To create a reagent card:

1 In the Main Menu, tap REAGENT LIST to open the Reagent List screen, shown in Figure 14.

Figure 14. Reagent list, accessed from the Main Menu

The reagent list shows a list of reagent cards that have already been created.
2 Tap **NEW CARD** to open an empty reagent card.

![Example antibody reagent card](image1)

**Figure 15. Example antibody reagent card**

3 If the reagent is an antibody, enter the information for the antibody and tap **DONE**.

**NOTE** Name, Label, Clone, and Supplier are required fields. The contents of these fields are combined to create a unique identifier for the reagent.

4 From the Reagent Layout screen, link the reagent card for the antibody to a specific position in the reagent layout (Figure 16).

   a In the Operating Menu, tap **SETTINGS > REAGENT LAYOUT** to open the Reagent Layout screen.

   b Tap an available position in the Reagent Layout to select the position, then tap **ADD**.

![Reagent layout with empty position selected](image2)

**Figure 16. Reagent layout with empty position selected**
c Tap the reagent card you want to assign to the selected position in the reagent layout, and then tap CONFIRM to continue creating reagent cards.

Figure 17. Confirm the reagent position.

5 When you have finished creating reagent cards and linking them to the reagent layout, tap BACK to return to the Main Menu (remember to tap YES to save changes), or continue to the refill procedure (see Refill Antibodies and Reagents on page 31).

NOTE Aliquot all antibodies into Low Dead Volume (LDV) Reagent Tubes (PN 500116). These tubes are specially designed to minimize dead volume and allow more accurate volume measurement. Ensure that if the antibody cooling rack tube is put into the cooling chamber, it is placed correctly so that LDV tubes reach the bottom of the rack and are held firmly in place.

Create a Cocktail Card

To use Flow Conductor to create cocktails of antibodies, first create a cocktail card.

IMPORTANT Make sure reagent cards for antibodies and reagents used in the cocktail are completed before creating the cocktail card. See Create a Reagent Card on page 25.

1 In the Main Menu tap REAGENT LIST to open the Reagent List screen.

2 Tap NEW CARD to open an empty reagent card.

3 In the Reagent Card screen (Figure 18), tap SET COCKTAIL to open the Select reagent(s) screen (Figure 19).
Create the cocktail card:

a. Select single antibodies by tapping an antibody shown in the list without the label (cocktail mix) (Figure 19).

   **TIP** A non-antibody reagent can also be a cocktail ingredient when you add it to a position in A–D 8–25. Provide unique names to all reagents.

b. Enter the volume ratio of each ingredient needed for the cocktail. The actual volumes of the antibodies needed are calculated as a proportion of the total volume of the cocktail during cocktail creation. See Create and Prepare Cocktails on page 37.

c. Tapﷺ to add the antibody to the cocktail.
5 Tap **DONE**.

![Example of a completed cocktail card](image)

**Figure 20. Example of a completed cocktail card**

6 After the cocktail card is complete, link it to a position in the reagent layout (**Figure 21**).

**NOTE** All cocktail tubes should be placed in antibody rack positions A 1–7, B 1–7, C 1–7, and D 1–7. In the Reagent Layout the header for these positions is labeled Cocktail, as shown in **Figure 21**.

![Reagent layout](image)

**Figure 21. Reagent layout**
a  In the Main Menu, tap **REAGENT LAYOUT** to open the Reagent Layout screen.

b  Tap an available position in the Cocktail section to select it, then tap **ADD**.

c  Tap the cocktail card you want to link to that position in the screen and tap **CONFIRM** to return to the reagent layout screen.

d  Repeat Steps b and c to link all the cocktail cards for the run.

When done, in the Reagent Layout screen tap **BACK** to return to the Main Menu to proceed with the Create Cocktail procedure (see Create and Prepare Cocktails on page 37).
Add a New Antibody, Reagent, or Cocktail

Before placing a new antibody, reagent, or prepared cocktail in the antibody rack, complete the following steps:

1. Create a reagent card for the antibody, reagent, or prepared cocktail.
   - **NOTE** To open the Reagent Layout screen, tap REAGENT LAYOUT in the Main Menu.
     - a. Select an empty position and tap ADD to select the reagent card you want to link to the position.
     - b. Place the LDV tube containing the correct reagent with sufficient volume in the selected position.

2. Repeat Step 1 to link another reagent card and load additional reagents.
   - **IMPORTANT** Ensure that LDV tubes are placed in the appropriate positions before starting a run. Flow Conductor does not check the presence of cocktail LDV tubes in the cooling chamber.

Refill Antibodies and Reagents

- **IMPORTANT** Label each antibody tube with its contents.
- **NOTE** To replace any reagents or buffers in the external fluidics system (G1–G5 bottles), see Replace Reagents in the Fluidics Systems on page 73.

The instrument performs an antibody level check when the instrument is powered on. Stock antibody positions are designated in antibody rack positions A–D 8–25.

Antibodies and reagents must be refilled if volumes are insufficient before a run or before preparing a cocktail. You can perform this refill in advance by following the steps below, or follow the software prompts when the volume check indicates low volumes of reagents (Figure 25).

1. Open the Refill Reagents screen:
   - a. In the Operating Menu screen, tap SETTINGS
   - b. Log in, then tap MAINTENANCE > REFILL REAGENTS to open the Access to Refill screen.

   ![Figure 24. Refill Reagents in the Maintenance screen](image)
2 In the Access to Refill screen (Figure 25), identify reagents that need to be refilled.

3 Open the safety door and use a pipet to refill the antibody or reagent. Pipet the desired volumes into existing or new LDV tubes. Place tubes back into the appropriate positions in the cooling chamber afterwards.

**NOTE**
- The maximum volume in the LDV tube is 4,000 µL.
- Consider overfilling by 10% reagents that are pipetted manually into LDV tubes.

**CAUTION** Use caution when the safety door is open. Avoid placing hands or fingers near the movable parts. Familiarize yourself with these parts of the system to avoid injury.

4 Tap the name of the reagent you refilled to select it, then tap **SELECT**.

![](Figure_25.png)

**Figure 25.** Select a reagent to refill.

**IMPORTANT** Flow Conductor only shows reagents and antibodies that have cards linked to a position in the reagent layout.

5 In the upper box, confirm the position and source of the refilled reagent:

![](Figure_26.png)

**Figure 26.** Confirm the position of the refilled tube.
a. In the source list, select the line starting with Manual, then tap **SET SOURCE** to open the reagent card associated with this reagent.

![Refill screen with source list.](image)

b. Confirm that the reagent shown in the reagent card is the one refilled, then tap **DONE** to return to the Refill screen.

![Confirm refilled reagent is correct.](image)

**NOTE** You can update lot numbers and expiry dates on the reagent card after tapping **DONE**. Depending on your setting in Traceability_Level (see Appendix C: Parameters), the refill procedure may ask several verification questions to reduce errors.
6 In the Refill screen, confirm that the green checkboxes for both refill and source are checked, then tap **NEXT**.

![Confirm checkboxes](image)

**Figure 29. Confirm checkboxes.**

The Manual Refill screen opens:

![Manual Refill screen](image)

**Figure 30. Manual Refill screen**

7 (Optional) Tap **UPDATE REAGENT CARD** to update a lot number and expiry date in the Reagent card (**Figure 31**).

8 Choose the refill method under **Select level detection type**:
   - Select **AUTODETECT VOLUME** to have Flow Conductor automatically perform a level check.

   **NOTE** A minimum volume of 100 µL is required in the tube for this refill method. When Flow Conductor autodetects the volume, it uses the built-in liquid level detection system to determine the volume in the reagent tube.
**IMPORTANT**

- The liquid level detection system uses liquid surface sensing. Avoid bubbles when pipetting to LDV tubes. If needed, perform a quick spin-down with a lab centrifuge to resolve bubbles in LDV tubes.
- The software prompts you to refill the reagent if there is insufficient volume for the run. Follow the sequence on the refill procedure screens to refill the reagent.
- The liquid level detection system’s operating range for LDV tubes is 60–4,000 μL.

- Select **USER DEFINED VOLUME** to set a refill volume. Tap **SET VOLUME** and enter the volume in the antibody tube placed in the cooling chamber using the keyboard screen.

![Manual Refill Screen](image)

**Figure 31. Set the user-defined volume.**

9 Tap **CONFIRM REFILL**. A confirmation message appears.

10 To continue, tap **YES**.

**NOTE** If you have different lot numbers and do not want to mix the lots, tap **NO** and find a different source.

![Confirmation Screen](image)

**Figure 32. Refill screen**
11 Continue to confirm refill of another reagent, or to check volumes in other tubes.

12 In the Access to Refill screen, tap **VERIFY LEVELS**. When the message **Some stations have been refilled** appears, tap **OK** to start the level check for the reagents that were refilled using Autodetect Volume.

![Verify levels image](image)

**Figure 33. Verify levels**

**NOTE**
- If a reagent is selected to be autodetected, a question mark (?) appears in the volume column.
- If User Defined Volume is selected, the volume appears in the volume column. **Manual refill** appears in the Refill column.

13 Close the Safety Door. When the message **Some sources have unknown levels** appears, tap **YES** to start the level check for the reagents that were refilled using Autodetect Volume.

![Liquid level verification message](image)

**Figure 34. Liquid level verification message for refill**
The Level check screen with progress bar appears.

![Level Check screen with progress bar](image)

Figure 35. Level Check screen with progress bar

Create and Prepare Cocktails

1. Once you create a cocktail card and link it to a position in the reagent layout, go to the Operating Menu and tap **CREATE COCKTAIL** to view the cocktails available for creation. The list of cocktails shown (Figure 36) reflects the cocktails with allocated positions in the reagent layout.

![Operating Menu](image)

Figure 36. Tap **CREATE COCKTAIL**.
2 Tap to select the cocktail to create, then tap SELECT and then START PREPARING to access the Create Cocktails screen (Figure 38).

**TIP** You can select more than one cocktail to create. Once all selected cocktails are properly created, they will appear in a cocktail job list to be prepared in the same run.

In the Create Cocktail screen (Figure 39), the selected cocktail name is shown at the top and the upper table contains the information regarding position in the reagent layout, expiry date, and lot number (if entered in the card). The lower table lists the ingredients with name, position, lot number (if entered), available volume, and volume necessary to make the desired volume of cocktail.
In the Desired volume field of the Create Cocktail screen, enter the volume of cocktail to prepare.

In bottom table, the Use volume for each ingredient is determined by the Desired volume entered and the volume ratio of each ingredient from the cocktail card for this cocktail (see Create a Cocktail Card on page 27). In this example, the cocktail consists of equal volumes of 3 antibodies since the Use volumes are the same. A Desired volume of 100 µL would mean that at least 33.33 µL from each of the 3 ingredients would be used.

The Available volume and Use volume together determine whether a reagent used as a cocktail ingredient needs to be refilled before the cocktail can be prepared. If a reagent appears in red text, the available volume of the reagent is insufficient and must be refilled. To refill cocktail ingredients, see Refill Antibodies and Manually Prepared Cocktails During Cocktail Creation on page 43.

Remove any tubes that are not applicable by selecting the cocktail name in the upper table and tapping DISCARD. The software provides a prompt to put a new empty tube in the appropriate position.

Tap NEXT to create the next selected cocktail, or to start preparing cocktails.
6 In the lot number option confirmation window that appears, tap **YES** to enter a lot number manually or tap **NO** to use an automatically generated lot number.

![Lot number option confirmation window](image)

Figure 40. Lot number option confirmation window

7 In the confirmation window that appears, tap **YES** to confirm that a tube is placed in the specified position in the cooling chamber.

![Confirm cocktail preparation and position](image)

Figure 41. Confirm cocktail preparation and position.
Prepare the cocktail:

- Tap **START** to start preparing the cocktails in the Cocktail Job List immediately.
- To set a specific date and time to prepare the cocktail, tap **DELAYED START** to access the Time Start screen. Use the drop-down menus to select the time zone, date, and time to start (Figure 43). Tap **START** to start cocktail preparation at the specified date and time.

**IMPORTANT** Check the system current date and time display under the Start date and Start time menu before selecting **DELAYED START**. If the current date and time presented are incorrect, tap **BACK** to abort the task. Set the correct date and time in **Main Menu > Service > Instrument Service > Date and time**.

**IMPORTANT** Ensure that LDV tubes are placed in the appropriate positions before starting the cocktail preparation procedure. Flow Conductor does not check the presence of cocktail LDV tubes in the cooling chamber.
NOTE  If the cocktail ingredients have insufficient volumes, you will be prompted with the Access to Refill screen to refill any ingredients when you tap START in either the Create Cocktail screen with Cocktail Job list (Figure 42) or the Timer Start screen (Figure 43).

During cocktail preparation, the Create Cocktail screen shows the cocktail job list and a progress bar with time remaining displayed below.

9  When the preparation is finished, as shown below the progress bar at the bottom of the screen, tap NEXT. The Create Cocktail screen displays the updated volume information for the cocktail.

The prepared cocktail is now ready to be used.

After the cocktail preparation job is completed, a cocktail report is automatically generated. The report includes information about the cocktail and the preparation procedure. The
Refill Antibodies and Manually Prepared Cocktails During Cocktail Creation

**IMPORTANT** Validate antibody and cocktail storage for the desired period of time.

**Refill Antibodies for Automatic Cocktail Preparation**

1. **Determine whether refilling is necessary:**
   - **TIP** Cocktail ingredients must have a volume of 10 µL or more. The recommended minimal dispensing volume for the small probe is 10 µL.
     - If there is sufficient volume of antibody for the desired volume of cocktail (Figure 39), tap NEXT to skip refilling.
     - If an antibody volume is insufficient for the cocktail (as indicated in red text with a lower Use volume than Available volume), tap the name of the antibody to select it, then tap REFILL. The Access to Refill screen (Figure 25) opens.
     - **NOTE** You are also prompted to refill when you start the cocktail preparation if the volumes of the cocktail ingredients are insufficient.

2. **Follow instructions in Refill Antibodies and Reagents on page 31 to refill any cocktail ingredients if required.**

**Refill Manually Prepared cocktails**

1. **Tap MANUAL REFILL** if you have a manually prepared a cocktail in an LDV tube ready to be placed in one of the cocktail positions in the cooling chamber. The Manual Refill screen (Figure 30 on page 34) opens.

   ![Create Cocktail screen with updated volume information](image.png)

   **Figure 46. Create Cocktail screen with updated volume information**

2. **Open the safety door and place the LDV tube with the cocktail into the appropriate position in the cooling chamber. In this example, place the tube in A1.**
CAUTION Use caution when the safety door is open. Avoid placing hands or fingers near the movable parts. Familiarize yourself with these parts of the system to avoid injury.

3 Follow instructions in Refill Antibodies and Reagents on page 31 to complete manually refilling cocktails. The volume of the manually prepared cocktail will be updated.

IMPORTANT Refill or prepare a cocktail (using a cocktail card) in the Create Cocktail screen. Refill a reagent (using a reagent card) in the Refill Reagents screen.

NOTE For mass cytometry applications, in order to minimize reagent cross-contamination between LDV tubes, it is recommended to load newly prepared antibodies in new LDV tubes and use new LDV tubes for target cocktails for each run.

Create Templates and Protocols

A protocol is the sequence of steps that controls how Flow Conductor processes samples.

To create a protocol, first create a new template or copy from an existing template. A template is a user-defined set of instructions for protocols. Protocols are typically linked to templates and are created to be used for sample runs. Only protocols linked to templates are applicable to multiple sample tubes.

NOTE A sample cannot be run directly from a template. A protocol must be created from a template to run a sample. Before creating a protocol or a template ensure that reagent cards are available. To create reagent cards, see Create a Reagent Card on page 25.

Create a New Template

NOTE Administrator permissions are required to create protocols and templates.

1 In the Operating Menu, tap SETTINGS > PROTOCOL/WORKLIST.

2 In the Protocol/Worklist screen, tap CREATE PROTOCOL (Figure 47) and then enter a template name (for example, with a "-T" suffix) in the top left field of the Create Protocol screen (Figure 48). This protocol is to be saved as a template for subsequent protocol creation.
Figure 47. Tap the Create Protocol button in the Protocol/Worklist screen.

Figure 48. Enter a protocol name.

3 Tap **ADD STEP** to open the Choose step screen (Figure 49, left) and choose steps to perform in the template. The instrument can perform 7 different actions that simulate manual sample preparation steps on the bench.

**TIP** Reach out to your Fluidigm field applications scientist for advice on protocol optimization.

**Protocol steps:**

- **Aliquot specimen**

  Enter the volume (in µL) of specimen to deliver to each secondary tube/test tube from the specimen rack for the protocol. This can be blood, bone marrow, or other cell suspensions.
Figure 49. Choose to add the Aliquot specimen step.

- **Incubate**
  Enter incubation time in minutes. The incubation timer starts when the last tube has received reagent. Incubation happens in the centrifuge at ambient temperature.

- **Vortex**
  Select 1 of the following 3 vortex types:
  - **Hard vortex**: designed to vortex a pellet of fixed cells after centrifuging. This vortex type is the longest of the 3. This vortex type is used to vortex all sample tubes in sequence after reagent addition.
  - **Medium vortex**: designed to vortex a live cell pellet after centrifugation. This vortex type is medium duration. This vortex type is used to vortex all sample tubes in sequence after reagent addition.
  - **Soft Immediate vortex**: designed to vortex a reagent into another liquid. This is the shortest vortex. The soft immediate vortex is used between dispensing steps. This vortex type can be used to vortex each of the sample tubes directly after a reagent is added.

  Vortexing starts as soon as an antibody or reagent is added to the secondary tube. Hard vortex or medium vortex starts when all tubes in a setup have completed the step before the vortex.

  **NOTE** If secondary tubes must be labeled with a tape or sticker, consult Fluidigm technical support for proper label placement.

  **IMPORTANT** The maximum recommended sample volume to vortex is 600 μL. Vortexing larger volumes may result in sample aerosolization and spillage.

- **Probe-mix**
  Select 1 of the following 2 probe-mix types:
  - **Type 1 - Hard**: The syringe performs 10 cycles of aspirating 150 μL of the liquid in the secondary tube and dispensing the volume back without adding any liquid.
  - **Type 2 - Soft**: The syringe performs 5 cycles of aspirating 500 μL of the liquid in the secondary tube and dispensing the volume back without adding any liquid.

  **NOTE** In the field under **Repeats**, enter a value equal to or higher than 1. This determines the number of times Type 1 or Type 2 Probe-mix is performed.
• Full end probe-mix: If checked, the syringe aspirates the entire volume in the secondary tube and dispenses the full volume back without adding liquid after Type 1 or Type 2 Probe-mix and their repeats have been performed.

• Centrifuge
  Select 1 of the following 2 presets or enter custom setting:
  • Preset 1: 500G, 5 min
  • Preset 2: 300G, 5 min
  • Custom Profile: Enter the force (in G) and time (in minutes) for the desired centrifugation setting for the step. The maximum force is 800 x g.

![Centrifuge settings](image)

Figure 50. Centrifuge settings

**NOTE** Validate the appropriate centrifugation force and time for your application. For example, forming a firm pellet with fixed cells requires a high centrifugal force.

• Stain/Lyse/Wash

  Choose this step to add a reagent to a sample, for example, antibody, lysis buffer, or any other reagent.

To add the Stain/Lyse/Wash step:

a In the options window that appears after you choose Stain/Lyse/Wash, choose either **ANTIBODY** or **OTHER REAGENTS** to access the Reagent Card list. Tap **ANTIBODY** if you are selecting a reagent from the A–D station (cooling chamber) or **OTHER REAGENTS** if you are selecting a reagent from any of the G1–G9 stations.

**NOTE** If you tap **ANTIBODY** and then choose a reagent from a G1–G9 station, the software displays an error message.

Reagents that are assigned to a position in the layout are displayed in green text. Check the checkbox **Only in layout** (Figure 51, bottom) to show reagents with assigned positions only.
Figure 51. Add the Stain/Lyse/Wash step.

- Select the reagent to add and enter the volume in the field next to µL. Tap \( \rightarrow \) to add the selected reagent with the specified volume in the right box as part of the staining solution (Figure 52).
Create Templates and Protocols

Chapter 3: Flow Conductor Operation

Figure 52. Add volume in Stain/Lyse/Wash step.

- **Remove supernatant**
  
Enter the volume in microliters (µL) to remain in the secondary tube (residual volume) after excess volume is gently aspirated.

  **NOTE** To minimize disruption to the cell pellet, it is recommended to use a residual volume of at least 150 µL.

- **Subroutine** (if available)
  
Select a subroutine to add a previously saved list of protocol steps as a collection.

4 Add steps until the protocol is complete.

  **TIP** You can choose to save any part of the protocol as a sub-routine before saving the protocol as a whole. A sub-routine consists of the protocol steps in the specified order as a collection that you may choose to insert into other new protocols. The sub-routine can be selected from the Choose step screen after you tap **ADD STEP** when creating a protocol/template.

5 Tap **SAVE PROTOCOL** to save this protocol as a template. Select **YES** when the confirmation window appears (Figure 53). Saving the protocol as a template allows protocols to be created from this template.

Figure 53. Confirmation window to save a protocol as a template
Create a New Template from an Existing Protocol or Template

1. In the **PROTOCOL/WORKLIST** screen, select the protocol or template that you want to create a new template from and tap **NEW FROM COPY**.

2. Tap **NO** to create a new template from an existing protocol or template (Figure 54).

![Figure 54. Choose to create non-linked protocol](image)

3. In the Create Protocol screen, rename the template by changing the text in the top left field, using the keyboard screen.

![Figure 55. Rename the template in the top left field](image)

**TIP**  Tap to select one of the following options for each step you want to modify: to saving the protocol.

4. Select **YES** when the confirmation window appears (Figure 53). This allows protocols to be created from this template.
5 Tap to select one of the following options for each step you want to modify:
   • **INSERT STEP** to add a protocol step before the selected step
   • **ADD STEP** to add a protocol step after the last step
   • **EDIT** to change the details of the step, for example, to change volume or to select another reagent
   • **REMOVE STEP** to remove the selected step

6 When you are finished editing the steps, tap **SAVE PROTOCOL**.

**TIP** You can save the steps as a sub-routine or as a new template. A sub-routine can then be used as a shortcut when adding steps in new Protocols.

**TIP** A linked protocol is linked to an existing template. For more information, see Protocols on page 19.

### Create a Linked Protocol from an Existing Template

1 In the Protocol/Worklist screen, select an existing template you want to link your protocol to and tap **NEW FROM COPY**.

![Figure 56. Select from list of templates to link your protocol to.](image)

2 In the confirmation window (Figure 57), tap **YES** to create a linked protocol.

**IMPORTANT** In a linked protocol, settings for stain/lyse/wash, vortex, and remove supernatant can be changed. Steps cannot be added or removed, and the order of steps cannot be changed. Settings for incubations and centrifugations also cannot be changed. The lock symbol next to the steps (Figure 58) indicates unchangeable steps.
3. Rename the protocol by changing the text in the top left field.

   **NOTE** Protocol and template names have to be unique.

4. Select the steps you want to change and tap **EDIT**.

   **NOTE** A single Flow Conductor run can utilize 1 template up to 28 linked protocols. To create a variation in the number of steps in a linked protocol while retaining its link to the template, use the **SKIP STEPS** feature. For further information using this advanced feature contact Fluidigm technical support.
When you are finished editing the steps, tap SAVE PROTOCOL. The new protocol that appears in the Operating Menu is ready for use.

Delete a Protocol

1 In the PROTOCOL/WORKLIST screen, select the protocol you want to delete and tap OPEN to open the Create Protocol screen.

2 Tap DELETE PROTOCOL when the Create Protocol list screen appears. Tap YES to confirm.

![Confirmation message to delete a protocol](image)

Figure 59. Confirmation message to delete a protocol

NOTE

• If a protocol is unintentionally deleted, return to the template and create a new protocol based on that template.
• To delete a template, all protocols linked to the template have to be deleted first.

Create a Worklist

IMPORTANT A worklist consists of at least 2 protocols from the same template.

1 In the Operating Menu screen, tap SETTINGS > PROTOCOL/WORKLIST.

NOTE

• Reagent cards are required to create a protocol.
• If no protocols or worklists are pre-programmed, the worklist and protocol selection boxes appear empty.
2 Tap **CREATE WORKLIST**.

![Figure 60. Create a worklist.](image)

3 In the Worklist name field, enter a name for your worklist.

![Figure 61. Name the worklist.](image)

4 Tap **ENTER** on the keyboard screen and add protocols to your worklist.

5 Select a protocol and tap **>>** to add it to the Chosen protocols list.
Figure 62. Choose protocols to include in the worklist.

After you select a protocol, only other protocols linked to the same template are available.

6 Repeat Step 5 to select additional protocols to include in the worklist.

7 Tap SAVE WORKLIST in the Worklist screen (Figure 62).

Figure 63. Completed Protocol/Worklist screen

The new worklist is now available in the Operating Menu.

Run a Protocol

IMPORTANT It is recommended to establish and validate protocols using traditional manual processes before implementing them on Flow Conductor. This practice establishes a performance baseline and can help troubleshooting if needed.
NOTE  Before starting a run, check the buffer volumes in the fluidics systems and refill them if the volumes are low (see Replace Reagents in the Fluidics Systems on page 73).

**WARNING** BIOHAZARD. When using biohazardous material on the instrument, use appropriate personal protective equipment and adhere to Biosafety in Microbiological and Biomedical Laboratories (BMBL), a publication from the Centers for Disease Control and Prevention, and to your lab's safety protocol to limit biohazard risks. If biohazardous materials are used, properly label the equipment as a biohazard. For more information, see the BMBL guidelines online at cdc.gov/biosafety/publications/index.htm.

**Load and Unload Specimens**

**IMPORTANT** Before running a protocol, link the reagents in the reagent layout.

When setting up a run, the Flow Conductor software provides guidance about placing specimen tubes in the specimen rack and/or secondary tubes in the centrifuge based on the protocol and number of tests.

Flow Conductor uses a light scattering detector to confirm that secondary tubes are placed in centrifuge positions before starting a procedure.

When the run is complete the software displays a report that traces the secondary tubes back to the specimen tube and indicates which protocol was run on each tube. This report is available under Reports and can be downloaded to a USB portable media.

In the centrifuge, secondary tubes are grouped by specimen to simplify sample tracking and balance the centrifuge. Flow Conductor may include empty positions between tubes.

**NOTE** In the Specimen Setup screen, you can choose to load secondary tubes pre-filled with specimen into the centrifuge.

**NOTE** If running an odd number of secondary tubes, the software asks you to add an empty tube for balancing. Flow Conductor adds water during the run to balance against the volume in the tube in the opposite position. Ensure that you load an **empty** tube for balancing.

**NOTE** When running multiple protocols, make sure to consider sample volumes throughout the run in all protocols to allow for centrifuge balancing.

**NOTE** It is recommended to perform a system flush between runs to minimize potential reagent carryover. See Flush the Fluidics System on page 75.

**IMPORTANT** Make sure specimens are prepared as single-cell suspensions before loading them to Flow Conductor. Use best practices to remove excess debris and cell aggregates.
1. In the Operating Menu, tap **LOAD SPECIMEN**.

![Operating Menu Screen](image_url)

Figure 64. Load Specimen button in the Operating Menu screen

2. Select the number of secondary tubes needed per specimen using the scroll-down menu.

![Specimen Setup Screen](image_url)

Figure 65. Select the number of secondary tubes for each specimen.

3. Tap **ADD SPECIMEN**.

   **NOTE** To remove a specimen, select the list item from the right box and tap **REMOVE SPECIMEN**.
4 Repeat Steps 2 and 3 for each specimen.

The specimens with their associated number of secondary tubes appear in the right box. In the example (Figure 66) there is 1 specimen with 2 secondary tubes (Specimen 1: 2).

![Figure 66. Specimen setup with 1 specimen and 2 secondary tubes](image)

5 Tap CONTINUE after adding all the specimens. A specimen ID is automatically assigned. To learn more, see Generate Specimen ID on page 70.

6 (Optional) To load the centrifuge with secondary tubes with prefilled specimens and disable the E and F stations, check the Use only secondary tubes checkbox before tapping CONTINUE, and then follow the instructions on the screen to load the centrifuge.

![Figure 67. Checkbox for Use only secondary tubes in Specimen Setup screen](image)
NOTE Check the Use only secondary tubes checkbox to run protocols that do not contain the Aliquot specimen step. When that checkbox is checked, Flow Conductor assumes that the protocols used are programmed with accurate volume in secondary tubes and does not detect volumes in secondary tubes before performing protocol steps.

7 In the Specimen Setup screen tap the top specimen button for the first sample, and then tap **Tap to setup** to begin loading the instrument.

![Specimen Setup Screen](image)

**Figure 68. Tap to setup button**

**NOTE** To correct errors in the specimen setup, tap **ABORT**, and then set up the sample tubes again.

8 Select the type of specimen tube in the Load Specimen screen (**Figure 69**).

![Load Specimen Screen](image)

**Figure 69. Load Specimen screen**

Select the type of labware for this sample. The software indicates where to place the tube in the specimen rack.
For example, if Standard tube is selected, the confirmation window (Figure 70) appears. A specimen ID is assigned to the test run (sample tube and secondary tubes).

**NOTE**
- For specimen tube compatibility see Specimen Racks (E–F Stations) on page 9.
- If you checked the *Use only secondary tubes* checkbox during specimen setup (Figure 66), this step is not shown.
- To learn about managing specimen ID, see Generate Specimen IDs on page 70.
- Flow Conductor does not have cap-piercing capabilities. To avoid system damage always remove all tube caps before loading.

![Figure 70. Confirm that the specimen is in place.](image)

**NOTE** To load the centrifuge with secondary tubes with prefilled specimens and disable the E and F stations, tap the button **Specimen is preloaded** on the Load Specimen screen. This is similar to the Use only secondary tubes feature available in the Specimen Setup screen (Figure 67). By selecting Specimen is preloaded, you load the specific sample with the specimen ID indicated on the screen. This allows you to have a specimen ID assigned to the secondary tube without a loading specimen tubes in the E or F stations. When Specimen is preloaded is selected, the user is prompted to enter specimen volume in secondary tubes and Flow Conductor does not check these volumes.

9. Follow the instructions on the screen, place the tube in the appropriate position, then tap **CONFIRM**. The screen to choose protocols or worklists appears.

**NOTE** When you are choosing another labware type, the software prompts you to manually remove the tube cap before loading it into position (Figure 71).
WARNING BIOHAZARD. When using biohazardous material on the instrument, use appropriate personal protective equipment and adhere to Biosafety in Microbiological and Biomedical Laboratories (BMBL), a publication from the Centers for Disease Control and Prevention, and to your lab’s safety protocol to limit biohazard risks. If biohazardous materials are used, properly label the equipment as a biohazard. For more information, see the BMBL guidelines online at cdc.gov/biosafety/publications/index.htm.

Select the Protocols to Run

1. In the Choose Protocols for Secondary Tube screen, select the protocols to run for the secondary tubes.

   IMPORTANT Create protocols or worklists before setting up a run.

   NOTE Figure 73 shows an example of a few different protocols and one worklist. Required reagents must be linked to the reagent layout and added before a run can be started. The green color indicates that the reagents are filled, and the protocol or worklist can be run.

2. Select the protocol or worklist you want to run, and then tap ADD. To run the sample protocol for all secondary tubes for the selected specimen tap ADD TO ALL.
NOTE  You can remove a protocol or worklist from the run by selecting it in the Chosen protocols box and tapping **REMOVE**.

![Figure 73. Example screen after protocols have been chosen. The specimen ID is shown in the upper left corner. The specimen tube label identifies the specimen location in the E or F station.](image)

3  (Optional) Check the checkbox for **Apply to all specimens** to apply the same protocol/worklist setup from the first specimen to all the specimens in the same run.

4  (Optional) Select a specimen volume multiplier.  

**TIP** The specimen volume multiplier drop-down menu provides an option to change the volume aliquoted from specific specimens to all linked secondary tubes. Use this feature to adjust for known or expected differences in specimen cellularity (number of cells per unit volume). For example, certain blood and bone marrow specimens may exhibit variable cellularity. Measure cellularity using a cell counter (not included with Flow Conductor). The default value, 1X, results in dispensing the volume as specified in the protocol. The 0.5X option results in dispensing half (0.5X) the volume specified in the protocol. The 2X option results in dispensing twice (2X) volume specified in the protocol.

5  After selecting all the desired protocols to include in a run, tap **CONFIRM** and follow the instructions on the screen.

6  Load the secondary tubes connected with the selected protocols or worklists in the centrifuge. The software displays the centrifuge position for each secondary tube.
7. After loading all the secondary tubes for specimen 1, return to the Specimen Setup menu to load additional specimens.

![Specimen Setup screen with 1 specimen remaining to be loaded (orange)](image)

Figure 74. Specimen Setup screen with 1 specimen remaining to be loaded (orange)

8. Tap **View Setup** to view your setup. The Specimen Setup Overview screen appears (Figure 75).

![Specimen Setup Overview provides a list of specimens and secondary tubes loaded.](image)

Figure 75. Specimen Setup Overview provides a list of specimens and secondary tubes loaded.
9 Confirm that samples are assigned correctly and tap **Return** to go back to the Specimen Setup screen to load the next specimen.

**NOTE** Tap **Back** to return to the Specimen Setup screen.

![Specimen Setup Screen](image)

Figure 76. The run is ready to start when all specimen buttons are green with green checkmarks.

The Sample Setup screen provides 4 options:

- **VIEW SETUP** opens the Specimen Setup Overview screen.
- **ABORT** aborts the run. The instrument prompts to remove tubes and start over.
  
  **NOTE** A confirmation window appears after you tap **ABORT**.
- **START** starts the run.
- **DELAYED START** allows the start of the run to be delayed until a set date and time.
  
  See **Delayed Start** on page 66.

10 Tap **START** to start the run.

**NOTE**

- If there is insufficient volume for the run, Flow Conductor prompts you to refill (Figure 77).
  
  See section 2 in **Refill Antibodies and Reagents** on page 31. Flow Conductor rechecks reagent levels and, if sufficient volumes are confirmed, immediately starts sample preparation.
- During a Flow Conductor run the software displays information about the estimated remaining time, the current step and, in gray, the previous and next steps (Figure 78).
Chapter 3: Flow Conductor Operation
Run a Protocol

Figure 77. Refill prompt

Figure 78. Flow Conductor Running Screen

**IMPORTANT** To stop during a run, press **STOP** for 2 sec. Flow Conductor aborts the run and keeps the safety door closed for 1 min before allowing it to be opened.

**NOTE** A long press aborts the run. There is no confirmation window.

When the run is finished, the instrument makes a low beeping tone and the Operation completed confirmation window appears.
Chapter 3: Flow Conductor Operation
Delayed Start

Figure 79. Operation completed confirmation window

11 In the Operation completed confirmation window tap **OK** to confirm that the test run is completed. The interlock unlocks the safety door, the centrifuge lid opens, the sensor light turns on, and the beeping stops.

12 When the positions of secondary tubes in the centrifuge appear on the screen, carefully remove sample tubes from the centrifuge.

13 Carefully remove specimen tubes from the specimen rack E–F.

**WARNING** BIOHAZARD. Dispose of biohazardous waste in accordance with all national, state/provincial, and local health and safety regulations and laws.

14 If desired, remove LDV tubes from the cooling chamber.

**WARNING** Dispose of reagents in accordance with all national, state/provincial, and local health and safety regulations and laws. Refer to the reagent Safety Data Sheet for more information.

**Delayed Start**

The Delayed Start feature allows you to choose a worklist or protocol to run at a later time. You can optimize your daily workload by performing full sample preparation overnight or preparing a cocktail for an early morning start to the day.

**Sample Processing Delayed Start**

To delay a run for sample processing, follow the instructions in this manual to load Flow Conductor with reagents (antibodies, cocktails, other stains and buffers), specimens, and secondary tubes and tap **DELAYED START** in the Specimen Setup screen (see Figure 76 on page 64). Then follow these steps.
In the Timer Start screen, confirm that the system time (shown below the Start time field) is correct.

Enter the Start date and Start time in the fields.

Tap **START**. Flow Conductor enters into a standby mode until the start time.

**NOTE** In standby mode, the cooling chamber retains the preset temperature and the computer shows a countdown screen.

**IMPORTANT** Before using Delayed Start, validate the time for storing and processing specimens (in racks E–F) and reagents (in positions G1–9) at room temperature and for storing and using reagents (in the A–D cooling chamber) at 3–8 °C.

### Antibody Cocktail Preparation Delayed Start

To delay a run of antibody cocktail preparation, follow the instructions in this manual and choose Delayed Start in the Create Cocktail screen.

Parameters that control the Delayed Start feature are listed in Appendix C: Parameters.
Always validate a delayed start cocktail job list by validating the time for storing and using reagents (in the A–D cooling chamber) at 3–8 °C.

## Night Mode

**IMPORTANT** Validate antibody and cocktail storage in Night Mode for the desired period of time.

The Flow Conductor Night Mode function maintains the preset temperature in the cooling chamber.

1. Remove any secondary tubes from the centrifuge and remove any specimens from the specimen racks.
2. Close the safety door.
3. In the Operating Menu window, tap **NIGHT MODE** (Figure 82) to start Night Mode (Figure 83).

In a few seconds, the instrument starts the shutdown procedure, including automatically cleaning the probes, and shuts down all functions except the cooling chamber. The
temperature in the cooling chamber is maintained at 3–8 °C. After a few minutes, the instrument begins a cleaning program. The safety door remains locked until you tap **START INSTRUMENT**.

**Advanced Features**

**Check the Reagent and Antibody Levels in the Cooling Chamber**

Reagents used in Flow Conductor runs are called sources. The liquid level check function simplifies checking and refilling reagents. Refilling reagents in fixed positions negates the need to track lot numbers and expiration dates for these sources. Allocated positions for frequently used reagents provide added convenience. The level check is done directly in the Layout screen.

The Level Check in Cooling Chamber screen provides an overview. The software allows automated volume checks for selected reagents in the cooling chamber, either for individual racks or the entire chamber. Flow Conductor only updates volumes. If other information is changed (such as lot numbers), update the information in reagent cards before starting the level check.

1. In the Operating Menu screen, tap **SETTINGS > MAINTENANCE > LEVEL CHECK** to open the Level Check in Cooling Chamber screen.

2. Select one of the antibody racks: **LEFT RACK**, **CENTER RACK**, **RIGHT RACK**, or **ALL**.

3. In the confirmation window that appears, tap **YES** to continue. Flow Conductor checks volumes and updates reagent and cocktail cards.
Generate Specimen IDs

Each specimen used in Flow Conductor is assigned a specimen ID. A specimen ID is assigned in the specimen setup process.

There are 3 methods to generate or use a specimen ID: system generation, barcode reader generation [see Barcode Reader (Optional) on page 11], and manual generation.

System-Generated Specimen ID

If tube labels are not scanned into the system, you can manually enter a specimen ID, or Flow Conductor automatically generates a number.

Barcode Reader-Generated Specimen ID

The barcode reader is active when the icon in screen headers is blinking.

First determine which CoC level of the barcode reader you are using.
For CoC level 1, follow these steps:

1. Open the Specimen Setup screen by tapping the **Load Specimen** button in the Operating Menu.

   ![Specimen Setup screen](image)

   Figure 86. Specimen Setup screen

2. Scan the barcode on the specimen tube. The specimen ID and number of secondary tubes are read from the barcode and populated in the Specimen Setup screen.

3. Follow the instructions on the screen to load the specimen. Once a specimen is loaded you are prompted to scan and load secondary tubes.

4. Scan and load secondary tubes.

5. Repeat scanning and loading to set up all specimens.

   **NOTE** If the barcode on a secondary tube does not match the specimen ID, an error message appears.

   ![Secondary tube barcode error message](image)

   Figure 87. Secondary tube barcode error message

   Rescan with the tube that has the correct ID and load it into the appropriate position.
For CoC level 2, follow these steps:

1. Follow the steps to set up specimens and secondary tubes in the Specimen Setup screen (see Step 6 in the Load and Unload section on page 58). After you tap a button, the Load Specimen screen appears (Figure 69 on page 59).

2. Scan the specimen ID using the barcode reader.

3. Follow the instructions on the screen to choose protocols and load Flow Conductor.

4. Depending on the settings set up during installation, you may be prompted to scan secondary tubes prior to loading them.

### Manual Setup

You can override system-generated specimen IDs with your choice of a descriptive string. To manually enter a specimen ID:

1. Follow the steps to set up specimens and secondary tubes in the Specimen Setup screen (see Step 6 in the Load and Unload section on page 58). After you tap a specimen button, the Load Specimen screen appears (Figure 69 on page 59).

2. Tap **ENTER SPECIMEN ID**. A keyboard screen appears.

3. Enter a specimen string. Tap **ENTER** to continue. The specimen ID has been updated.

4. To manually enter additional specimen IDs, repeat Steps 1 through 4.

### Shut Down Flow Conductor

To shut down Flow Conductor, toggle the switch on the back of the instrument to the OFF position. When the instrument is shut down it is not suitable for storage of antibodies or other reagents.

**IMPORTANT** Remove all antibodies and reagents and store them in the recommended storage conditions. Some reagents that contain proteins such as BSA (bovine serum albumin) of FCS (fetal calf serum) may degrade or become contaminated with biological material such as bacteria and fungi when left at room temperature for extended periods of time. These buffers should be removed and stored under the manufacturer’s recommended conditions.

Empty the G1–G5 wells in the internal fluidics system. Flush the G1–G5 bottle holders with distilled water and leave the water in the lines to ensure that they do not dry out. See Appendix A: Maintenance, Decontamination, and Disposal for more details.
Appendix A: Maintenance, Decontamination, and Disposal

Instrument Maintenance

Replace Reagents in the Fluidics Systems

Before refilling or changing content or bottles in the bottle rack check the reagent layout position and reagent card in the software. For more information, see Reagent Layout on page 17.

Fill fluidics system as follows:

- Position G0: Up to 5 L distilled water
- Position G1: Up to 2 L distilled water
  **NOTE** Use position G1 for distilled water only.
- Position G3: Up to 2 L PBS or similar buffer
  **NOTE** Use position G3 for PBS only.
- Positions G2, G4–G9: Reagents of choice
  **NOTE** Validate stability of reagents in bottles for the expected period of time between refills and between cleanings. Some reagents that contain proteins such as BSA (bovine serum albumin) or FCS (fetal calf serum) may degrade or become contaminated with biological material such as bacteria and fungi when left at room temperature for extended periods of time. These buffers should be removed and stored under the manufacturer’s recommended conditions.

![Reagent Layout screen](image)

Figure 88. Reagent Layout screen
To remove a reagent bottle:

1. Gently pull the bottle out and lift it up and then straight out.

2. If the bottle contains liquid, keep the metal seal in the out position when pressing the bottle gently down in position. Hold the bottle down while pushing the metal seal back in position.
   **IMPORTANT** Ensure that the cap is firmly fitted on the bottle to avoid leakage.

3. Label the bottle and the respective bottle holder with its contents.
   **IMPORTANT** Ensure that the labels on the bottle and the reservoir in the external fluidics system match.

### Preventive Maintenance

**IMPORTANT** Before using a cleaning or decontamination method other than those recommended by Fluidigm, verify with Fluidigm technical support that the proposed method will not damage the equipment.

This section describes how to clean and maintain Flow Conductor™ for optimal performance. All preventive maintenance can be performed by the operator.

#### Maintenance Schedule

<table>
<thead>
<tr>
<th>Component</th>
<th>Action</th>
<th>Frequency</th>
<th>Agent/Equipment</th>
<th>Supplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal and external fluidics</td>
<td>Cleaning</td>
<td>Weekly</td>
<td>Plastic syringe*, lint-free wipes, deionized water</td>
<td>Major laboratory supplier (MLS)</td>
</tr>
<tr>
<td>systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Centrifuge</td>
<td>Check for cracks or damage</td>
<td>Weekly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waste tank</td>
<td>Empty and clean</td>
<td>As needed</td>
<td>Lint-free wipes, bleach</td>
<td>MLS</td>
</tr>
<tr>
<td>Instrument surfaces</td>
<td>Clean</td>
<td>Weekly</td>
<td>Lint-free wipes, deionized water</td>
<td>MLS</td>
</tr>
<tr>
<td></td>
<td>Check for cracks or damage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vent filters</td>
<td>Clean</td>
<td>Weekly</td>
<td>Lint-free wipes</td>
<td>MLS</td>
</tr>
<tr>
<td>Touchscreen</td>
<td>Clean</td>
<td>Weekly</td>
<td>Lint-free wipes, deionized water</td>
<td>MLS</td>
</tr>
</tbody>
</table>

* 1 plastic syringe is supplied with Flow Conductor.

**WARNING** Do not attempt to use the Flow Conductor instrument if any abnormal conditions occur, such as a broken test probe or cracked instrument cover or door.
Flush the Fluidics System

The Flow Conductor fluidics system can be cleaned by flushing water through the external and internal fluidics systems. Use the Flow Conductor software to perform a system flush for the small and large syringes and connected fluidics lines.

1. Close the safety door

2. From the OPERATING MENU screen, tap SETTINGS.

3. Enter your User ID and tap LOG IN to access the MAIN MENU.

4. In the MAIN MENU screen, tap MAINTENANCE.

5. Wash the small syringe and connected fluidics by tapping SERVICE SYRINGE S FLUSH on the MAINTENANCE screen.
Flush the Fluidics System

6 Tap **YES** to reset the robot arm.

The system resets the robot arm in preparation for flushing the syringes and then begins flushing the fluidics lines.
When the flush is completed the MAINTENANCE screen appears.

7. Perform the syringe flush several times, as needed.

8. Wash the large syringe and connected fluidics by tapping **SERVICE SYRINGE L FLUSH** on the MAINTENANCE screen.

9. Perform the syringe flush several times, as needed.

10. After completing both the small and the large syringe flushes, use the **BACK** button to navigate to the OPERATING MENU screen.
Flow Conductor Weekly Cleaning Procedures

**IMPORTANT** Use only cleaning procedures and materials described in this manual.

To limit the build-up of excess debris in the instrument, we recommend cleaning Flow Conductor weekly as described in this section.

**Fluidics Systems**

1. Open the Flow Conductor safety door.

2. With your right hand, gently press left on the mid-lower right side of the robot arm to slide the module to the left until the internal fluidics system is exposed and accessible (Figure 89).

3. Inspect the reagents and waste station and use a lint-free wipe moistened with deionized water to clean off any sediments that may have accumulated on the surface of the internal fluidics system.

4. Use a cotton swab or lint-free wipe to gently remove any deposits and sediments from the internal fluidics system.

5. Remove the bottles on the outside of the instrument from the bottle rack.

---

**Figure 89.** Reagents and waste station (part of the internal fluidics system)

**Figure 90.** Bottles

**Figure 91.** Removing bottles from the bottle rack
Use the provided plastic syringe to completely remove the reagents positions G1–5 outside the instrument and G1–9 inside the instrument.

Figure 92. Inside instrument G-station  
Figure 93. Outside bottle rack

Use distilled water to flush the fluidics in the internal fluidics system.

a. Pour distilled water into the empty positions in the outside bottle rack.

b. Use the plastic syringe to remove the water from internal fluidics system and waste wells inside the instrument.

c. Repeat Steps a and b 2–3 times.

If the lines contain buffer, flush the G1–5 lines with the same buffer once before replacing the bottle in the rack. This prevents the distilled water used for cleaning from contaminating the buffers present in the fluidics lines.

Clean the bottles and caps with distilled water. Let the bottles air-dry upside down on a clean surface before replacing them.

TIP Check bottles and caps for buildup of biological contaminants such as fungi and bacteria. If suspected biological contaminants cannot be resolved with the recommended washing steps, contact Fluidigm technical support.

IMPORTANT Do not use bleach to clean the fluidics system. Bleach can corrode metal components.

Wipe the internal fluidics system with a lint-free wipe.

Refill the G1–G5 bottles with reagents as follows:

- G1: DIW
- G2: Reagent of choice. Use DIW if other is not applicable.
- G3: PBS

NOTE Use Maxpar® PBS (PN 201058 for use in mass cytometry applications).

- G4: Reagent of choice. Use DIW if other is not applicable.
- G5: Reagent of choice. Use DIW if other is not applicable.

Refill the DIW tank G0 as needed.

Remove air from the tubes between the external and internal fluidics systems using the plastic syringe to prime the tubes with the reagent that will be used in this position.

Empty the waste tank.
WARNING BIOHAZARD. When handling biohazardous material, use appropriate personal protective equipment and adhere to Biosafety in Microbiological and Biomedical Laboratories (BMBL), a publication from the Centers for Disease Control and Prevention, and to your lab’s safety protocol to limit biohazard risks. If biohazardous materials are used, properly label the equipment as a biohazard. For more information, see the BMBL guidelines online at cdc.gov/biosafety/publications/index.htm.

WARNING PHYSICAL INJURY HAZARD. Use proper lifting techniques to lift or move the Flow Conductor waste tank.

15 Rinse the waste tank with tap water.

16 Add enough bleach so that the final volume is 10% bleach when the container is full.

17 Use a lint-free wipe with mild detergent to clean all surfaces on the inside and outside of the instrument. Use another lint-free wipe with deionized water to wipe away residual detergent.

WARNING Make sure the Flow Conductor waste tank is properly installed to prevent leakage of liquid waste.

Vent Filters

Use a lint-free wipe to wipe the dust from the 2 black vent filters below the bottle rack. The vent covers can easily be removed and replaced for better access.

![Flow Conductor vents](image)

Figure 94. Flow Conductor vents

Touchscreen

Clean the surface of the touchscreen using a lint-free wipe and recommended detergent or cleaning solutions.
Decontamination and Disposal

**WARNING** BIOHAZARD. When using biohazardous material on the instrument, use appropriate personal protective equipment and adhere to Biosafety in Microbiological and Biomedical Laboratories (BMBL), a publication from the Centers for Disease Control and Prevention, and to your lab’s safety protocol to limit biohazard risks. If biohazardous materials are used, properly label the equipment as a biohazard. For more information, see the BMBL guidelines online at cdc.gov/biosafety/publications/index.htm.

Ensure that Flow Conductor, laboratory centrifuges, rotors, and any accessories are cleaned and/or decontaminated prior to servicing the equipment, removing it from use, or transporting it for disposal. Refer to the instructions contained in this document and use only those materials specified.

**Biological Agents**

1. Using a soft cloth, apply 70% ethyl alcohol or 70% isopropyl alcohol to all accessible surfaces.

2. Keep surfaces wet for at least 5 min, then wipe dry.

3. Repeat Steps 1 and 2 once.

4. Clean all treated surfaces with a wet cloth to remove residual alcohol and wipe dry.

**Disposal of Products**

Used consumables and reagents should be handled and disposed of in accordance with federal, state, regional, and local laws for hazardous waste management and disposal.

Do not dispose of this product in unsorted municipal waste. This equipment may contain hazardous substances that could affect health and the environment. Use appropriate take-back systems when disposing of materials and equipment.

Learn more at fluidigm.com/compliance.
# Appendix B: Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cocktail</td>
<td>A combination of stock antibodies or other staining reagents. Placed in positions (A–D; 1–7) in the cooling chamber.</td>
</tr>
<tr>
<td>Cocktail card</td>
<td>A software record that contains the list of reagents (including stock antibodies and other reagents) and the volumes needed for preparing a specific cocktail using Flow Conductor™.</td>
</tr>
<tr>
<td>Destination</td>
<td>A position in the cooling chamber (A–D) into which an existing cocktail or stock antibody can be dispensed.</td>
</tr>
<tr>
<td>Ingredient</td>
<td>A reagent that is added to a cocktail. Ingredients can be from the cooling chamber (A–D stations).</td>
</tr>
<tr>
<td>LDV tubes</td>
<td>Low Dead Volume Reagent Tubes (PN 500116). Flow Conductor uses 4 mL conical tubes to hold antibodies and other reagents in the cooling chamber.</td>
</tr>
<tr>
<td>Linked protocol</td>
<td>A protocol that is linked to a template.</td>
</tr>
<tr>
<td>Position</td>
<td>A physical space in Flow Conductor used to store a specimen (E–F), reagent (A–D and G), or secondary tube in the centrifuge (H).</td>
</tr>
<tr>
<td>Protocol</td>
<td>Instructions for a staining procedure for a single tube. A protocol is based on a template, and it contains the different staining steps for the test. The template is copied and saved as a protocol in order to run the samples on the instrument.</td>
</tr>
<tr>
<td>Reagent</td>
<td>Buffer, lysing solution, antibody, or other substance used to prepare cells for flow cytometry or mass cytometry analysis.</td>
</tr>
<tr>
<td>Reagent card</td>
<td>A record in the software that identifies a reagent, pre-prepared cocktail, or stock antibody used by Flow Conductor.</td>
</tr>
<tr>
<td>Reagent layout</td>
<td>The software display screen that shows links between reagents and position.</td>
</tr>
<tr>
<td>Sample</td>
<td>A cell suspension to be processed on Flow Conductor. Samples are aliquoted from specimens to the centrifuge (H) or loaded directly to the centrifuge in secondary tubes.</td>
</tr>
<tr>
<td>Secondary tube</td>
<td>A 12 x 75 mm tube placed in the centrifuge (H) where the sample is processed.</td>
</tr>
<tr>
<td>Source</td>
<td>Reagents used in Flow Conductor are called sources. Reagents may be stored in the positions in the cooling chamber (A–D) or the internal or external fluidics system (G1–9).</td>
</tr>
<tr>
<td>Specimen</td>
<td>A collection of cells such as blood, PBMC, or bone marrow to be processed in Flow Conductor. Specimens can be loaded into the specimen rack (E–F) or the centrifuge (H).</td>
</tr>
<tr>
<td>Stock antibody</td>
<td>A single antibody pipetted into an LDV tube either undiluted from the vendor or diluted to fit the assay. Placed in positions (A–D; 8–25) in the cooling chamber.</td>
</tr>
<tr>
<td>Template</td>
<td>A user-defined set of instructions for protocols. It contains the reagent and antibody volumes; the parameters for staining, incubation, centrifugation, and vortexing; and the sequence of steps that Flow Conductor performs during a run.</td>
</tr>
<tr>
<td>Test</td>
<td>An experiment or assay.</td>
</tr>
<tr>
<td>Worklist</td>
<td>Two or more protocols that are based on the same template and executed in the same Flow Conductor run.</td>
</tr>
</tbody>
</table>
Users can adjust certain parameters in the software in Administrator mode. See the table below for details.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ReagentWarningLevel1</td>
<td>The liquid level in µL that triggers a software warning for low reagent level. When triggered, the status symbol color turns from green to red.</td>
</tr>
<tr>
<td>ReagentWarningLevel2</td>
<td>The liquid level in µL that triggers a halt to Flow Conductor™ operation and prompts the user to refill. Recommended value: zero (0).</td>
</tr>
<tr>
<td>Language</td>
<td>Default setting is 1. English is the only option.</td>
</tr>
<tr>
<td>CentrifugeHighProfileForce</td>
<td>Default preset centrifuge force for High profile button</td>
</tr>
<tr>
<td>CentrifugeHighProfileTime</td>
<td>Default preset centrifuge time for High profile button</td>
</tr>
<tr>
<td>CentrifugeLowProfileForce</td>
<td>Default preset centrifuge force for Low profile button</td>
</tr>
<tr>
<td>CentrifugeLowProfileTime</td>
<td>Default preset centrifuge time for Low profile button</td>
</tr>
<tr>
<td>BeeperHighVolume</td>
<td>The beeper volume level that indicates when the instrument has completed a run</td>
</tr>
<tr>
<td>MixAntibodiesOnMondays</td>
<td>Automated weekly antibody mix</td>
</tr>
<tr>
<td></td>
<td>Default value: 1, Mondays</td>
</tr>
<tr>
<td>CoolerLowestTemperature</td>
<td>The low-point temperature in the cooling chamber. When this temperature is reached, the cooling apparatus temporarily stops until the CoolerHighestTemperature is reached.</td>
</tr>
<tr>
<td>CoolerHighestTemperature</td>
<td>The high-point temperature in the cooling chamber. When this temperature is exceeded, the cooling apparatus resumes cooling.</td>
</tr>
<tr>
<td>DelayedStart-DefaultDays</td>
<td>The default value for number of days for the Delayed Start function</td>
</tr>
<tr>
<td>DelayedStart-DefaultHours</td>
<td>The default value for time of day for the Delayed Start function</td>
</tr>
<tr>
<td>Traceability_Level</td>
<td>Settings to control the amount of confirmation prompts for reagent refill. Allowed values: 0, basic traceability; 1 advanced traceability</td>
</tr>
<tr>
<td>CaseLoadingShortcuts</td>
<td>Changes the 4 shortcut buttons in the Operating Menu</td>
</tr>
<tr>
<td>DisplayTemperatureOffset</td>
<td>Reduces the cooling chamber temperature display value by the parameter value °C</td>
</tr>
<tr>
<td>IMPORTANT</td>
<td>This parameter does not affect temperature control, only temperature display.</td>
</tr>
<tr>
<td>NOTE</td>
<td>The ambient temperature in the cooling chamber is approximately 2 °C higher than the air temperature in the chamber.</td>
</tr>
</tbody>
</table>
Appendix D: Related Documents

Go to fluidigm.com to download these related documents.

<table>
<thead>
<tr>
<th>Title</th>
<th>Document Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow Conductor™ Site Requirements Guide</td>
<td>FLDM-00141</td>
</tr>
</tbody>
</table>
Appendix E: Safety

General Safety

In addition to your site-specific safety requirements, Fluidigm recommends the following general safety guidelines in all laboratory and manufacturing areas:

- Use the appropriate personal protective equipment (PPE): safety glasses, fully enclosed shoes, lab coats, and gloves, according to your laboratory safety practices.
- Know the locations of all safety equipment (fire extinguishers, spill kits, eyewashes/showers, first-aid kits, safety data sheets, etc.), emergency exit locations, and emergency/injury reporting procedures.
- Do not eat, drink, or smoke in lab areas.
- Maintain clean work areas.
- Wash hands before leaving the lab.

Instrument Safety

The system should be serviced by authorized personnel only.

**WARNING** Do not modify this instrument or system. Unauthorized modifications may create a safety hazard.

**WARNING** BIOHAZARD. When handling biohazardous material or when using biohazardous material on the instrument, use appropriate personal protective equipment and adhere to Biosafety in Microbiological and Biomedical Laboratories (BMBL), a publication from the Centers for Disease Control and Prevention, and to your lab’s safety protocol to limit biohazard risks. If biohazardous materials are used, properly label the equipment as a biohazard. For more information, see the BMBL guidelines online at cdc.gov/biosafety/publications/index.htm.

**WARNING** BIOHAZARD. Dispose of biohazardous waste in accordance with all national, state/provincial, and local health and safety regulations and laws.

**WARNING** Dispose of reagents in accordance with all national, state/provincial, and local health and safety regulations and laws. Refer to the reagent Safety Data Sheet for more information.

**DANGER** Always keep body parts away from the Flow Conductor™ probes. Probes may cause bodily harm. Do not expose probes by removing the protective case surrounding the pipetting module.

**WARNING** Do not attempt to use Flow Conductor if any abnormal conditions occur, such as a broken test probe or cracked instrument cover or door.
WARNING PHYSICAL INJURY HAZARD. Use proper lifting techniques to lift or move the Flow Conductor waste tank.

WARNING Make sure the Flow Conductor waste tank is properly installed to prevent leakage of liquid waste.

WARNING PHYSICAL INJURY HAZARD. Do not attempt to lift or move the instrument unless you use proper lifting techniques. The weight of the instrument is 99 kg (218 lb).

If you choose to lift or move the instrument after it has been installed, do not attempt to do so without the assistance of others. Use appropriate moving equipment and proper lifting techniques to minimize the chance of physical injury.

CAUTION Use caution when safety door is open and avoid placing hands or fingers near the movable parts. Familiarize yourself with these parts of the system to avoid injury.

Symbols on the Instrument

The following table describes the hazard symbols that may be used in this document or on labels on the system.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Hazard" /></td>
<td>Hazard. Consult the user guide for further information.</td>
</tr>
<tr>
<td><img src="image" alt="Biohazard" /></td>
<td>Biohazard.</td>
</tr>
<tr>
<td><img src="image" alt="Electricity hazard" /></td>
<td>Electricity hazard. Indicates high electricity levels and a threat of electric shock from machines and/or equipment in the vicinity. You may suffer severe injuries or death.</td>
</tr>
<tr>
<td><img src="image" alt="Lifting hazard" /></td>
<td>Lifting hazard.</td>
</tr>
<tr>
<td><img src="image" alt="Specific chemical harm" /></td>
<td>Indicates specific chemical harm.</td>
</tr>
<tr>
<td><img src="image" alt="Hazardous, toxic, or very toxic materials" /></td>
<td>Indicates hazardous, toxic, or very toxic materials that are very hazardous to health or potentially fatal when inhaled, swallowed, or in contact with the skin.</td>
</tr>
<tr>
<td><img src="image" alt="Caustic and acid materials" /></td>
<td>Indicates caustic and acid materials that can destroy the skin and eat through metals.</td>
</tr>
<tr>
<td><img src="image" alt="Material contained under pressure" /></td>
<td>Indicates the presence of material contained under pressure, including compressed gas, dissolved gas, or gas liquefied by compression or refrigeration.</td>
</tr>
<tr>
<td><img src="image" alt="Compressed gas cylinder" /></td>
<td>A compressed gas cylinder can become a projectile when ruptured, with the potential to cause significant damage.</td>
</tr>
<tr>
<td><img src="image" alt="Health hazard" /></td>
<td>Indicates a health hazard.</td>
</tr>
</tbody>
</table>
# Appendix E: Safety

## Electrical Safety

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Power and standby symbol.</td>
</tr>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Power switch is in the Off position.</td>
</tr>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Power switch is in the On position.</td>
</tr>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Protective conductor terminal (main ground). It must be connected to earth ground before any other electrical connections are made to the instrument or system.</td>
</tr>
</tbody>
</table>

To minimize negative environmental impact from disposal of electronic waste, do not dispose of electronic waste in unsorted municipal waste. Follow local municipal waste ordinances for proper disposal provision. Contact customer service for information about responsible disposal options.

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[Image of safety symbols on the Flow Conductor system]

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**Figure 95. Safety symbols on the Flow Conductor system**

**Electrical Safety**

**WARNING** ELECTRICAL HAZARD. DO NOT REMOVE THE COVERS. Electrical shock can result if the system is operated without its protective covers. No internal components under the covers are serviceable by the user.

**WARNING** ELECTRICAL HAZARD. Plug the system into a properly grounded receptacle with adequate current capacity.

**WARNING** Any interruption of the protective conductor (earth ground) inside or outside the system or disconnection of the protective conductor terminal is likely to make the system dangerous.

- Do not operate the system with any covers or internal parts removed.
- Do not attempt to perform internal adjustments or replacements except as directed in this user guide.
Chemical Safety

The responsible individuals must take the necessary precautions to ensure that the surrounding workplace is safe and that system operators are not exposed to hazardous levels of toxic substances. When working with any chemicals, refer to the applicable safety data sheets (SDSs) provided by the manufacturer or supplier. When handling any chemical, the following safe-handling guidelines should be strictly observed:

- Do not inhale fumes from chemicals. Use adequate ventilation and return caps to bottles immediately after use.
- Use, store, and dispose of chemicals according to manufacturer recommendations and to regulations applicable to the locality, state, province, and/or country.
- When preparing chemical solutions, always work in a fume hood that is suitable for those chemicals.
- Conduct sample preparation away from the system to minimize corrosion and contamination.
- Store solvents in an approved cabinet (with the appropriate ventilation) away from the system.

Waste Tank Safety

A waste tank is supplied with Flow Conductor. The tank is made of high-density polyethylene (HDPE) and is used to gather the effluent from the system. For safe operation of your system, properly install and maintain the waste tank and waste line. Waste disposal procedures must be in accordance with all national, state/provincial, and local health and safety regulations and laws. Waste tanks may contain flammable, acidic, caustic, or organic solutions; cell debris; and small amounts of the elements analyzed.

**WARNING** It is necessary to follow appropriate waste segregation guidelines in order to prevent effluents from reacting in the waste tank.

- Never place the tank in an enclosed cabinet. Doing so may result in a build-up of hazardous gases.
- Do not use a glass waste tank. A glass waste tank may break and spill toxic or corrosive liquids. Use only the Fluidigm provided waste tank (Waste tank, 25 L; Part Number 500113).
- Place the waste tank in an area that is visible to the operator, who can observe the level of collected effluent and empty the tank when necessary.
- Check the condition of the waste lines regularly to monitor deterioration. Organic solvents deteriorate the lines more quickly than aqueous solutions. When the lines become brittle or cracked, replace them.
- Empty the waste tank regularly. Dispose of waste in accordance with all national, state/provincial, and local health and safety regulations and laws.