# Purpose

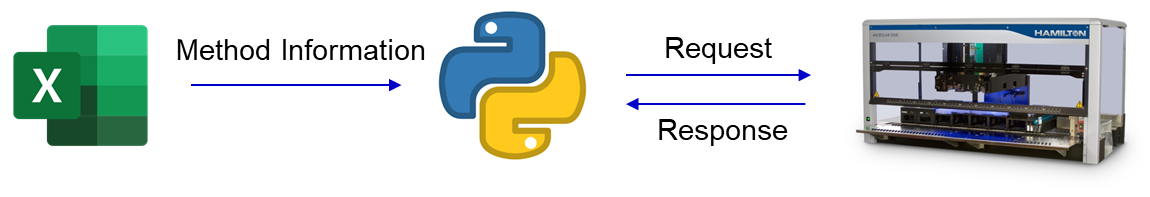
This protocol serves as the guidance to use the Automation Bare Necessities (ABN) Excel based method editor on Hamilton automated liquid handlers. This document covers method creation and testing, includes information about each available Building Block, and details new instrument installation and configuration. This document should be updated as soon as new actions are made available to ABN users.

# Scope

ABN support is limited to Hamilton automated liquid handlers only. ABN will theoretically capture all programming and runtime errors before a sample run and prevent an error prone run from occurring. One important caveat is that ABN cannot capture all logic errors during method creation. If errors are experienced, it is important to report the errors as soon as possible so corrections can be implemented. This correction will prevent the error from accidently occurring during a run, which means that error reporting is the single most important responsibility for all ABN users.

# principle

ABN functions as a python-based method translator between Excel and Hamilton. During translation, ABN will request information from the Hamilton then use this as follow-up input information to create advanced functionality that is generally not possible on Hamilton systems.



ABN is a full-service bad mamma-jamma lol.

# Definitions

ABN – Automation Bare Necessities

SME – Subject Matter Expert(s)

Building Blocks (Blocks) –

Parent Plate – The plate block that comes immediately before all other blocks

# Method Creation

## Building Blocks

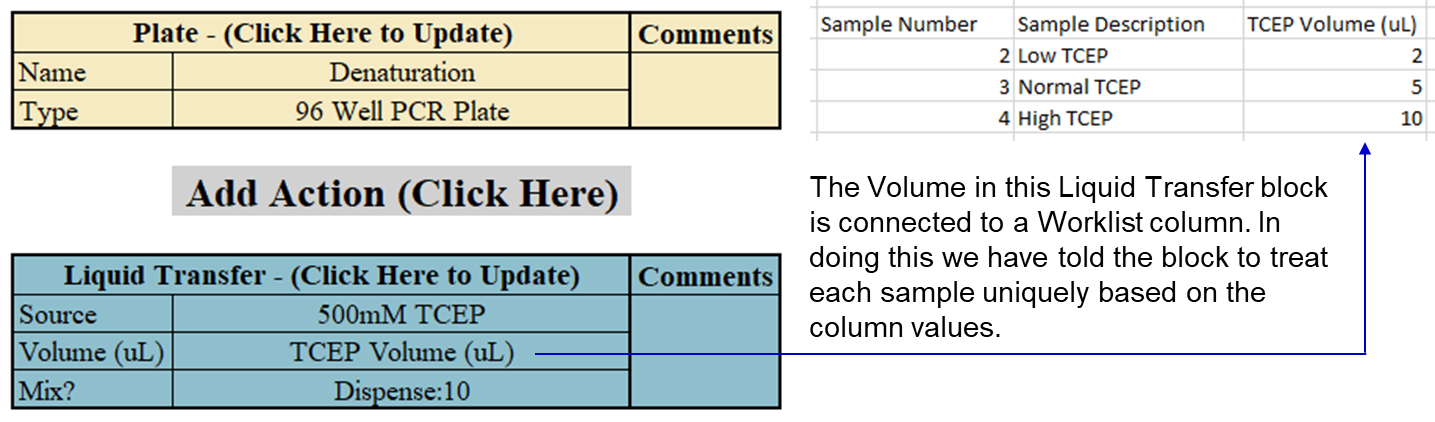
### High Level Description

Blocks is the term to describe all Pathways, Actions, and Modifiers. They are designed to convey information in a linear, human readable sequence of events. Manual sample preparation can, similarly, be described as a linear sequence of events. Thus, blocks should theoretically be able to mimic all possible sample preparations in a lab setting. Blocks are made of 3 sections: Parameter Titles (left) which describe the information required; Parameters (middle) which is information provided by the user; and Comments (right) which is optional, but recommended, information to convey what is being accomplished to other users who may run your method.



### Worklist Interface

Blocks can interface directly to a sample worklist, which allows blocks to treat samples uniquely during processing. The primary use of the worklist interface is to enable development type workflows on automated systems. This goes against the thought process of automation where automation does a single method and does it consistently. ABN makes all the guarantees of a typical automation method but unlocks the full potential for development.



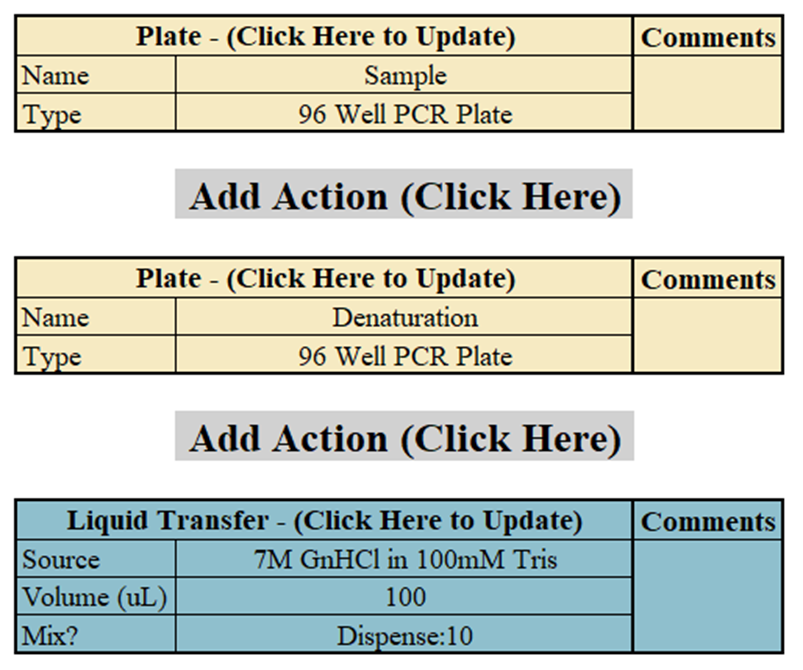
We can see above that each sample will receive the following volumes: Low TCEP -> 2uL, Normal TCEP -> 5uL, High TCEP -> 10uL. This functionality is not limited to volume because all parameters support the Worklist Interface. This will be confirmed in the Building Block Descriptions.

### Pathways

Pathway blocks are used to create or terminate a sequence of logical events. A pathway is defined with one block only: Plate.

### Actions

Actions act on plates that are defined in pathways. An action will always act on the Plate block immediately before it (most recent).



We can see above that Denaturation is the most recent Plate block. Thus, the Liquid Transfer block will dispense the liquid into the Denaturation plate. All following steps will continue to act on the Denaturation plate until a new Plate block is defined.

### Modifiers

Modifiers are used to significantly change the way Action blocks act in a Pathway. Modifiers are advanced blocks and, as such, the desired functionality should be confirmed in the log when creating a new method. Once desired functionality is confirmed, the method is suitable for use by all users.

## Thought Process

## Method Testing

# Building block Descriptions

## Notes

### Building Blocks Availability

Not all blocks may be available on your system. Available blocks are configuration dependent. If you would like a block implemented, please reach out to a Hamilton SME to discuss feasibility.

### Building Block Changes

Blocks are subject to change (this means color as well). You should be notified before changes are pushed to your system. If you notice a block has changed and do not understand the change, you should reference this document. If information has not been updated for that block. Please reach out to a SME immediately.

### Section Goals

Input options which are configuration dependent and will not be discussed here. Instead, this section will cover the meaning behind each input and potential block limitations.

## Pathways

### Plate



**Block Description:** This creates a new pathway for blocks to be executed. All blocks that follow this step will act on a virtual plate with the **Name** argument.

**Name:** Can be any text. This names the new pathway you are creating.

**Type:** Can be any value from the dropdown. This argument controls what type of labware can be used for deck loading. This does not limit the volume of the labware.

### Split Plate



**Block Description:** This splits a pathway into two new pathways. These pathways are processed together, meaning no delay is expected for actions across pathways.

**Plate Choice:** This chooses the path for each sample. There are always 5 available options: Split, Concurrent, the 2 names you choose for the new pathways or a Worklist Column. The **Split** choice means that the sample will be processed on both pathways, but the volume will be halved. The **Concurrent** choice means that the sample will be processed on both pathways, but the volume will not be halved. If you choose the name for **Pathway 1** or **Pathway 2**, that means that the sample will be processed on only that pathway and the volume will not be halved.

**Plate Name 1:** Can be any text. This names the new pathway you are creating.

**Plate Name 2:** Can be any text. This names the new pathway you are creating.

### Merge Plates



**Block Description:** This merges 2 pathways into a single pathway. A merge block is required on each pathway you would like to merge.

**Plate Name:** Is the name of the parent plate on the other merging pathway.

**Continue Here?:** The available options are always **Yes** or **No**. If both Merge blocks are Yes, then this step acts only as a synchronization tool. If one of two blocks are Yes, then this will merge both pathways together. If the volumes were halved by a Split Plate block then they will stay halved once merged.

### Finish



**Block Description:** This block terminates flow on a pathway. This block should always be the last block in a pathway.

## Actions

### Dilute



**Block Description:** This block performs a dilution from a **Source** and uses **Diluent** to dilute the **Source** from the **Starting Concentration (mg/mL)** to the **Target Concentration (mg/mL)**. Behind the scenes, this block is made from two Liquid Transfer blocks. This block will always pipette the largest volume first, which ensures complete transfer down to 1uL. The formula C1V1 = C2V2 is used to determine the volume of **Source** and **Diluent**.

**Source:** Can be any text, plate name, or a worklist column

**Diluent:** Can be any text, plate name, or a worklist column

**Starting Concentration (mg/mL):** Can be any number or a worklist column

**Target Concentration (mg/mL):** Can be any number or a worklist column

**Target Volume (uL):** Can be any number or a worklist column

**Max Source Volume (uL):** Can be any number or a worklist column. This parameter limits how much volume can be taken from the **Source**. Example: If the dilution requires 100uL of **Source** but this parameter is 80uL, then only 80uL will be taken from **Source**. The remaining 20uL will be taken from **Diluent.**

### IMCS SizeX Desalt



**Block Description:** This block uses IMCS Size Exclusion (SizeX) tips to desalt intact protein sample. Sample must be denatured, reduced, and alkylated prior to desalting. Only SizeX100 is supported.

**Source Plate:** Can be any plate name

**Waste Plate:** Can be any plate name

**Equilibration Buffer:** Can be any text or any plate name

**Load Volume:** This is the load volume. The typical yield for IMCS tips is 80% of the **Load Volume**. It is important to consider this in following Liquid Transfer or Dilute blocks.

**Elution Method:** The IMCS tips are not as robust as the Nap5 columns. As a work around, various **Elution Methods** are available to ensure the desalted sample meets your analytical needs.

### Incubate



**Block Description:** This block can heat, cool, or perform an on deck ambient incubation.

**Temp (C):** Can be Ambient or a number.

**Time (min):** Can be a number.

**Shake (rpm):** Can be a number.

### Liquid Transfer



**Block Description:** This block performs a simple liquid transfer from **Source** into the parent plate.

**Source:** Can be text, a plate name, or a worklist column

**Volume (uL):** Can be a number or a worklist column

**Mix?:** This option gives users the ability to select to mix before aspiration, after dispensing, or both. Additionally, the user can choose the number of mixing cycles. A single mixing cycle is both an aspirate and dispense event.

### Magnetic Beads



### Notify



### Vacuum



## Modifiers

### Aliquot



### Pool



### Preload Liquid



# Log sheets

Work in Progress

# Troubleshooting

Work in Progress

# Run a method

Work in Progress

# Advanced Information

Work in Progress