NGC Chromatography Systems Multidimensional (Multi-D) Plumbing Guide

Version 2.0

BIO-RAD

Introduction

This guide is designed to help plumb your NGC System for multidimensional (Multi-D) chromatography applications. These techniques can help enhance sample recovery and improve productivity by minimizing the steps and time required for protein purification. In addition, it shows the optimal locations for module placement to minimize tubing length and swept volume.

Traditionally, multistep purifications have been labor intensive and time consuming, as fractions from a run are collected, pooled, and often dialyzed before being injected onto the next column. With the NGC System, well-characterized single-step purifications are combined to create tandem or automated multicolumn protocols, significantly decreasing sample loss and the time spent on the protein purification process. Typically, the columns in the combined methods have different chemistries or binding characteristics, enhancing selectivity, peak separation, and resolution.

In tandem chromatography, proteins of interest can be eluted from the first column and loaded directly onto a second column plumbed in series followed by analysis using the ultraviolet (UV) detector. For a tandem chromatography run to be successful, certain considerations must be taken into account, including the binding capacity of both columns, the optimal buffer composition (including pH and salt concentration), and the pressure ratings for both columns.

In two-step automated multicolumn (2-D) chromatography, proteins of interest are eluted from the first column (often an affinity column) and held in a sample loop before being injected directly onto a second column. With this technique, column pressure ratings and buffer conditions are not critical factors for a successful separation.

Using this plumbing guide in conjunction with the numerous tandem and 2-D templates in ChromLab Software should help you successfully set up and run your methods and achieve your protein purification goals more quickly and efficiently. Refer to the Multidimensional Chromatography Success Guide (bulletin 6701) for more information about Multi-D.

Table of Contents

Similarly named systems differ in the additional modules present. The illustrations on the respective pages show the optimal positions of these additional and blank modules to minimize tubing length and overall swept volume.

The 4-tier NGC System configurations shown here are built from the NGC Discover Pro with additional modules added.

The NGC Discover Pro System includes 1 column switching valve (CSV), 1 sample pump, 1 sample inlet valve, 2 buffer inlet valves, 1 outlet valve, 1 pH valve, and 1 buffer blending valve.

2-TIER + 2 CSV
for Tandem Chromatography Applications

Simple system configuration for tandem affinity and desalting columns. Proteins are eluted from the affinity column directly onto the desalting column.

Example Templates

Affinity 1 ml — Desalting

Affinity 5 ml — Desalting

Tubing

1 Tube #2 — Length: 17 cm
Inject Valve Column to Column Switching Valve 1 In

2 Tube #2 — Length: 17 cm
Column Switching Valve 1 Out to Column Switching Valve 2 In

3 MWD:
Tube #1 — Length: 24.5 cm
Column Switching Valve 2 Out to Multi-Wavelength Detector In

3-TIER + 2 CSV
for Tandem Chromatography Applications

3-tier system for tandem affinity and desalting columns. Proteins are eluted from the affinity column directly onto the desalting column.
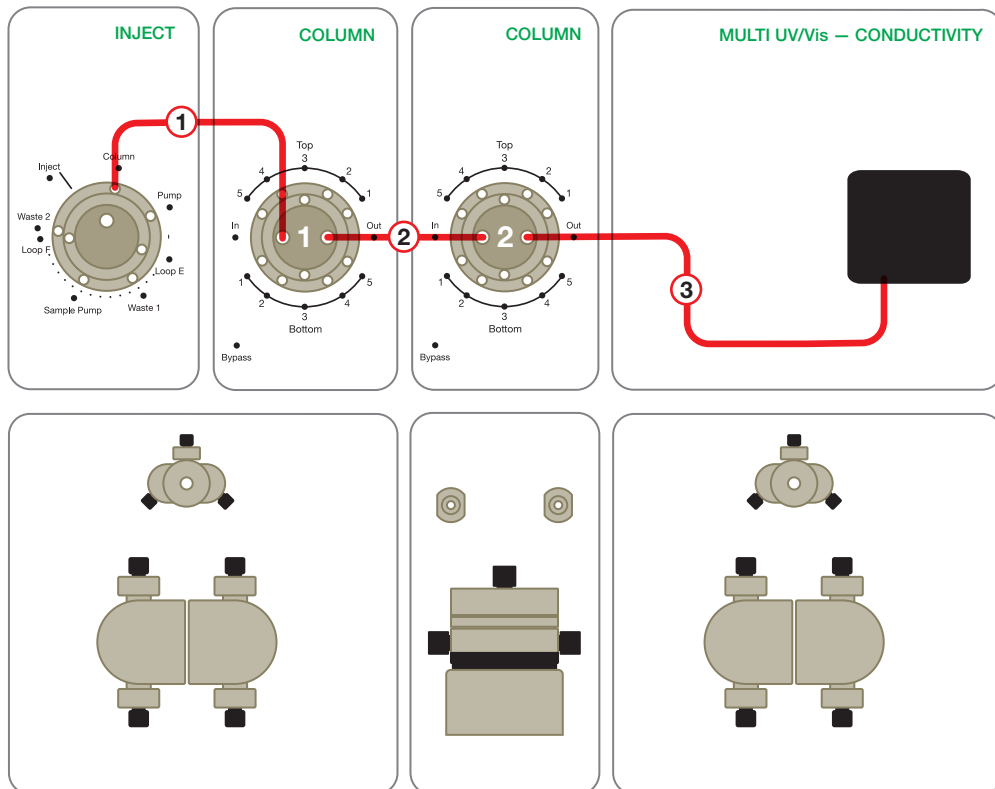

MULTI UV/Vis — CONDUCTIVITY

INJECT   COLUMN   COLUMN

Example Templates

Affinity 1 ml — Desalting
Affinity 5 ml — Desalting
Affinity 1 ml — Linear Gradient
Affinity 1 ml — Step Gradient
Affinity 5 ml — Linear Gradient
Affinity 5 ml — Step Gradient
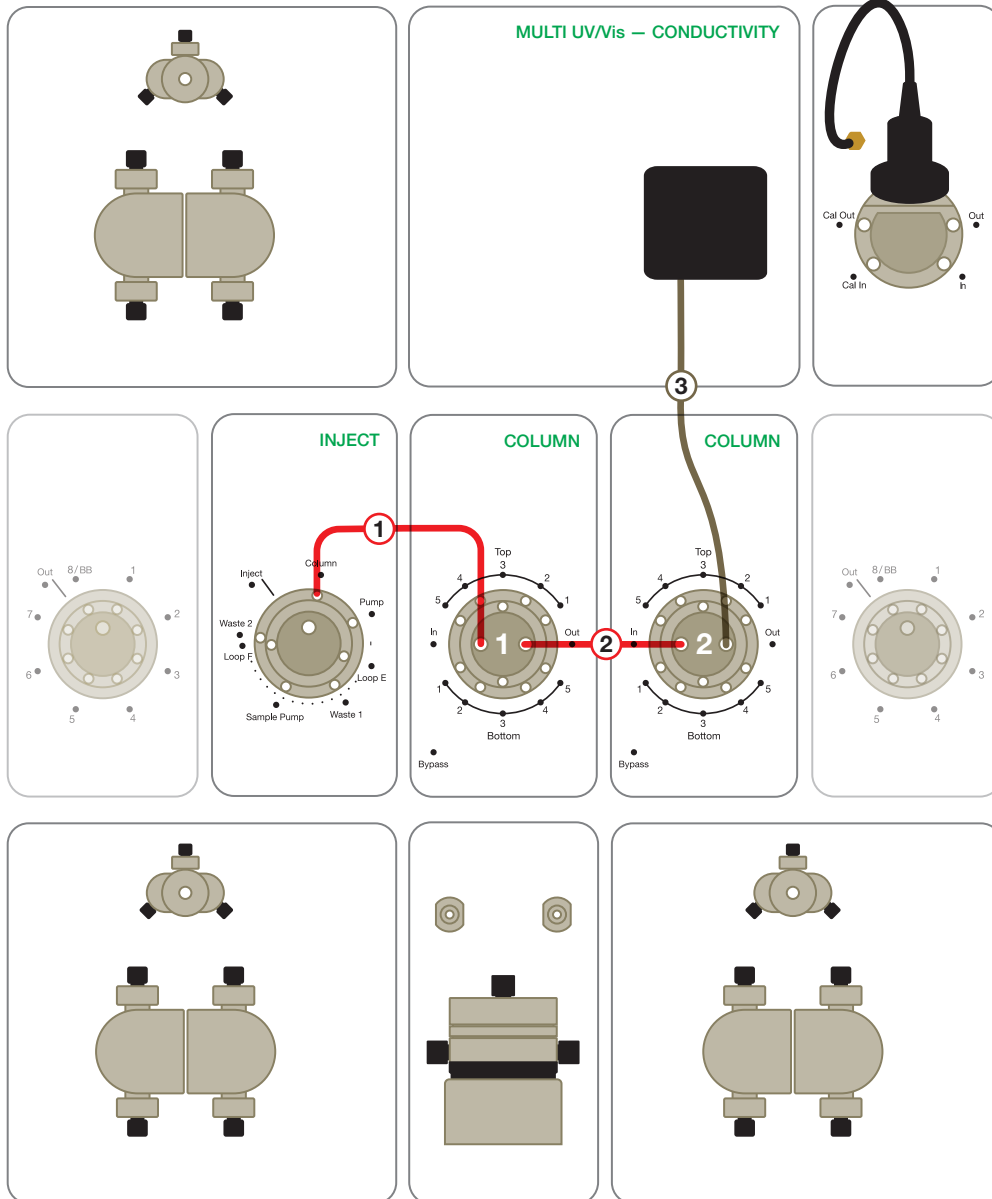
Tubing

① Tube #2 — Length: 17 cm
Inject Valve Column to
Column Switching Valve 1 In

② Tube #2 — Length: 17 cm
Column Switching Valve 1 Out
to Column Switching Valve 2 In

③ MWD:
Tube #1 — Length: 24.5 cm
Column Switching Valve 2 Out
to Multi-Wavelength Detector In

Additional modules (grayed out) are shown in the optimal positions to minimize tubing length and swept volume.

3-TIER + 2 CSV + 1 OUTLET
for 2-D Chromatography Applications

3-tier system for 2-D chromatography. The outlet valve is used to direct proteins to either the fraction collector or a static loop on the CSV before loading onto the second column.

Example Templates

2-D Affinity 1 ml — SEC

2-D Affinity 5 ml — Desalting

Tubing

1   **Tube #1 — Length: 24.5 cm**
Inject Valve Loop F to
Column Switching Valve 2 In

2   **Tube #2 — Length: 17 cm**
Column Switching Valve 2 Out
to Inject Valve Loop E

3   **Tube #1 — Length: 24.5 cm**
Inject Valve Column to
Column Switching Valve 1 In

4   **MWD:**
Tube #1 — Length: 24.5 cm
Column Switching Valve 1 Out
to Multi-Wavelength Detector In

5   **Medium Pressure:**
Tube #3 — Length: 10 cm →
20 psi Backpressure Fitting →
Tube #3 — Length: 10 cm or
Low Pressure (not shown):
Tube #2 — Length: 17 cm
Conductivity Sensor Out
to Outlet Valve In

6   **Tube #4 — Length: 50 cm**
Outlet Valve Port 2 to
Inject Valve Injection Port

Blank modules are shown in the optimal positions to minimize tubing length and swept volume.

3-TIER + 2 CSV + 1 OUTLET
for 2-D Chromatography Applications (with additional buffer selection)

3-tier system for 2-D chromatography. The outlet valve is used to direct proteins to either the fraction collector or a static loop on the CSV before loading on to the second column.
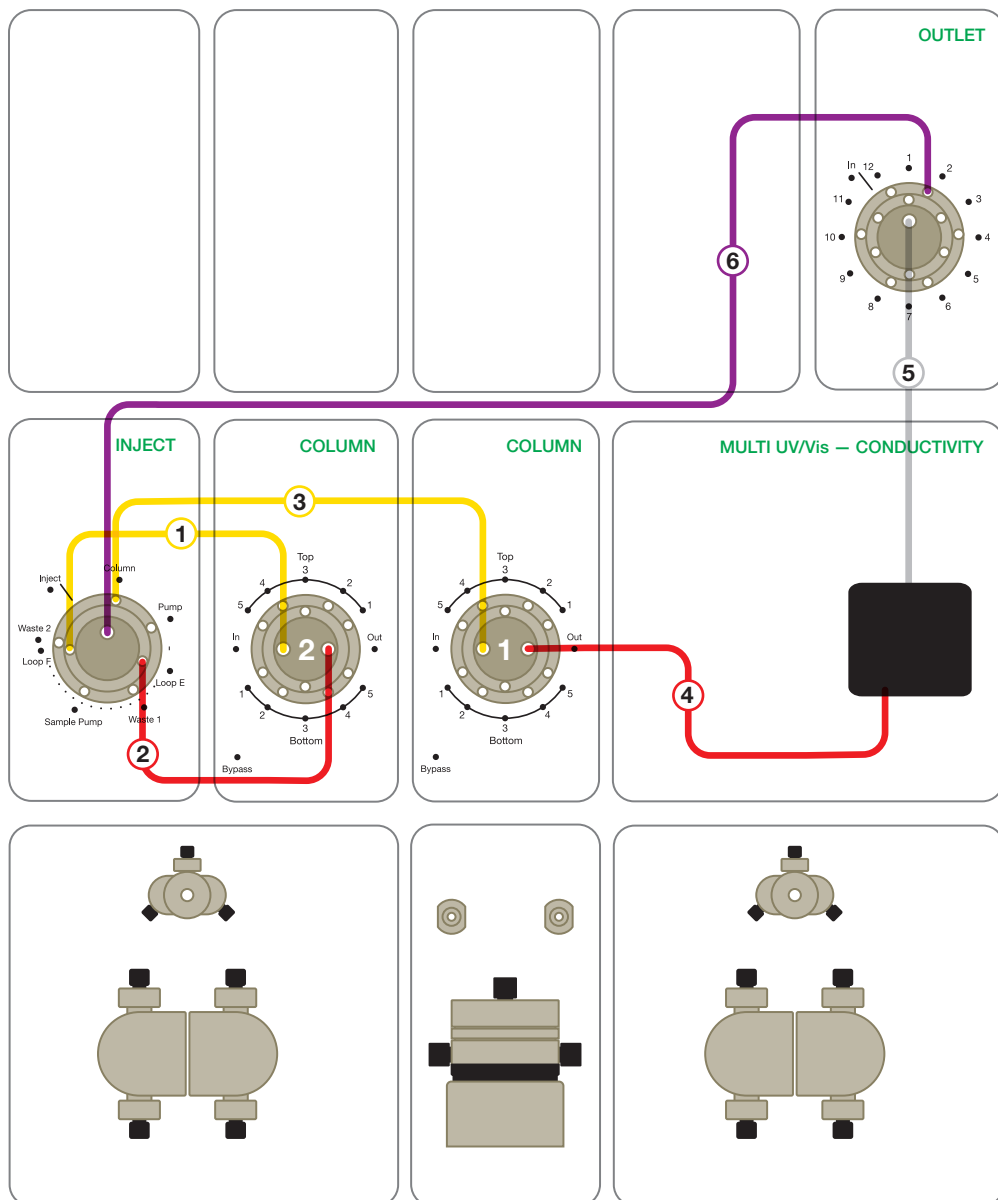

COLUMN

MULTI UV/Vis — CONDUCTIVITY

INJECT

COLUMN

OUTLET

Example Templates

2-D Affinity 1 ml — SEC
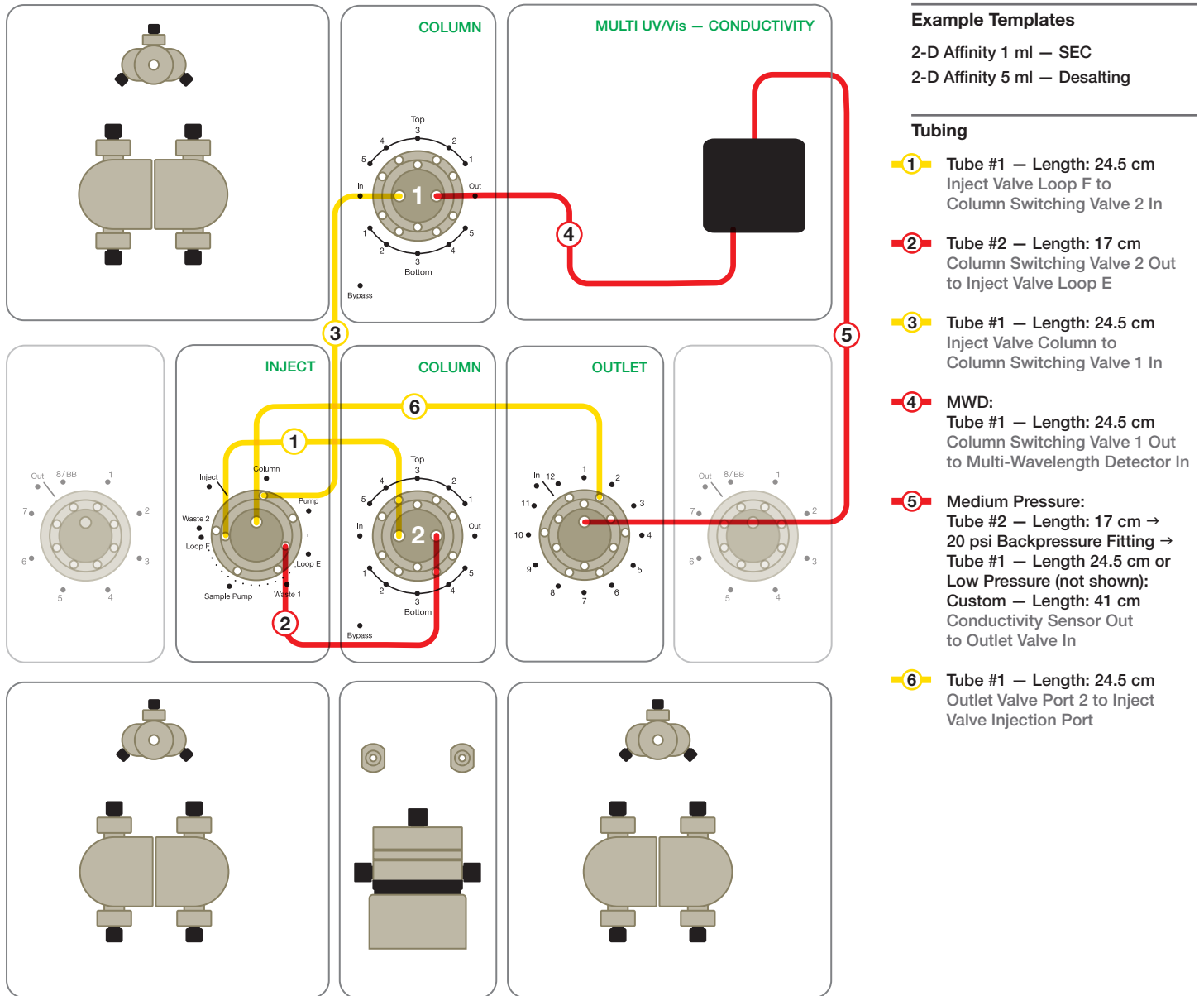2-D Affinity 5 ml — Desalting

Tubing

1   **Tube #1 — Length: 24.5 cm**
Inject Valve Loop F to
Column Switching Valve 2 In

2   **Tube #2 — Length: 17 cm**
Column Switching Valve 2 Out
to Inject Valve Loop E

3   **Tube #1 — Length: 24.5 cm**
Inject Valve Column to
Column Switching Valve 1 In

4   **MWD:**
Tube #1 — Length: 24.5 cm
Column Switching Valve 1 Out
to Multi-Wavelength Detector In

5   **Medium Pressure:**
Tube #2 — Length: 17 cm →
20 psi Backpressure Fitting →
Tube #1 — Length 24.5 cm or
Low Pressure (not shown):
Custom — Length: 41 cm
Conductivity Sensor Out
to Outlet Valve In

6   **Tube #1 — Length: 24.5 cm**
Outlet Valve Port 2 to Inject
Valve Injection Port

Additional modules (grayed out) are shown in the optimal positions to minimize tubing length and swept volume.

3-TIER + 2 CSV + SAMPLE PUMP + 1 SAMPLE INLET
for Tandem Chromatography Applications

3-tier system that can be used for tandem applications. The inclusion of a sample pump and sample inlet valve means multiple samples can be processed in an automated sequential manner.

Example Templates

Affinity 1 ml — Desalting

Affinity 5 ml — Desalting

Affinity 1 ml — Linear Gradient

Affinity 1 ml — Step Gradient

Affinity 5 ml — Linear Gradient

Affinity 5 ml — Step Gradient

Tubing

① Tube #2 — Length: 17 cm
Inject Valve Column to
Column Switching Valve 1 In

② Tube #2 — Length: 17 cm
Column Switching Valve 1 Out
to Column Switching Valve 2 In

③ MWD:
Tube #1 — Length: 24.5 cm
Column Switching Valve 2 Out
to Multi-Wavelength Detector In

④ Tube #1 — Length: 24.5 cm
(1/16" green PEEK if <5 ml/min
or 1/8" FEP if >5 ml/min)
Sample Inlet Valve Out
to Sample Pump In

Blank modules are shown in the optimal positions to minimize tubing length and swept volume.

3-TIER + 2 CSV + SAMPLE PUMP + 1 SAMPLE INLET
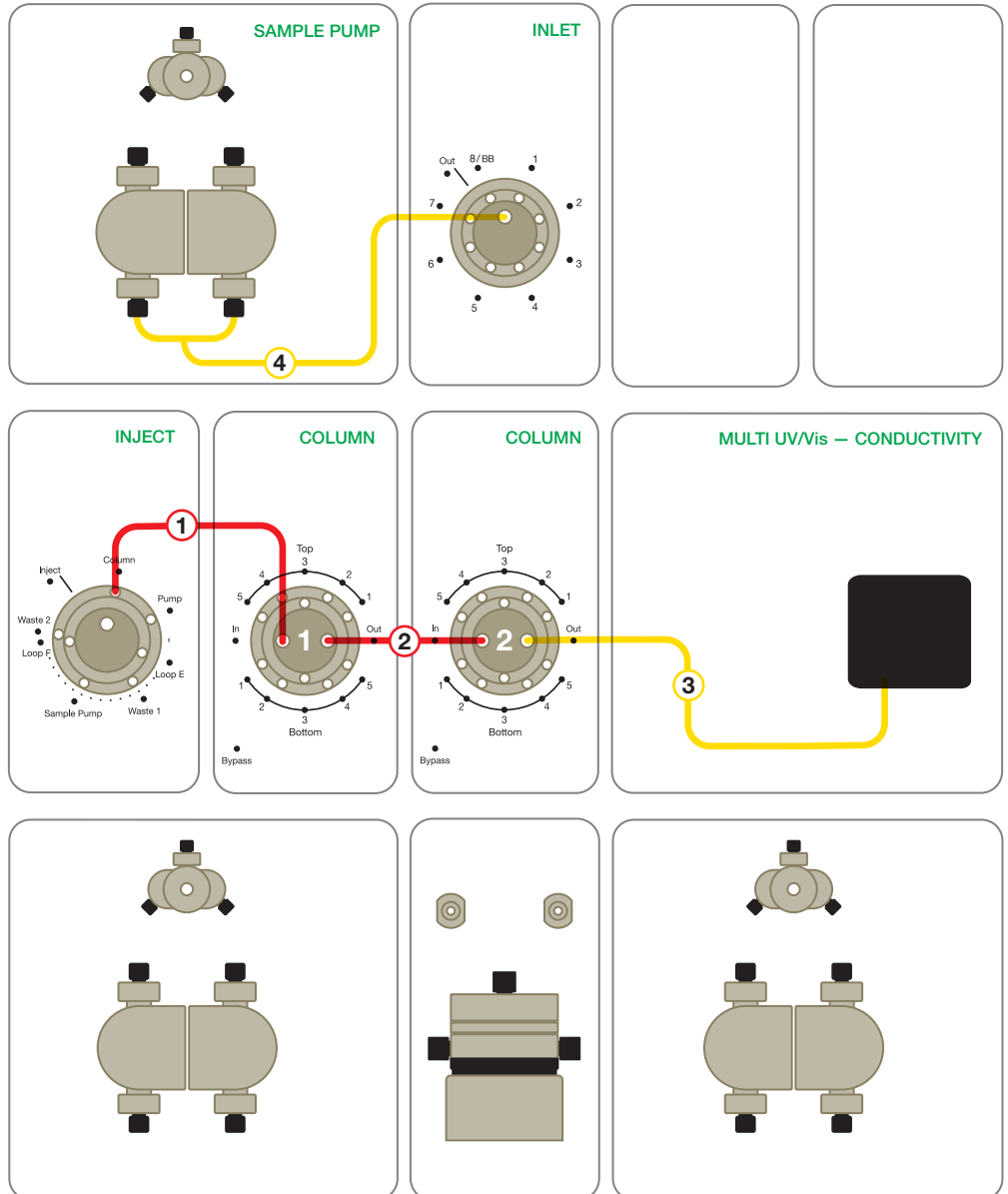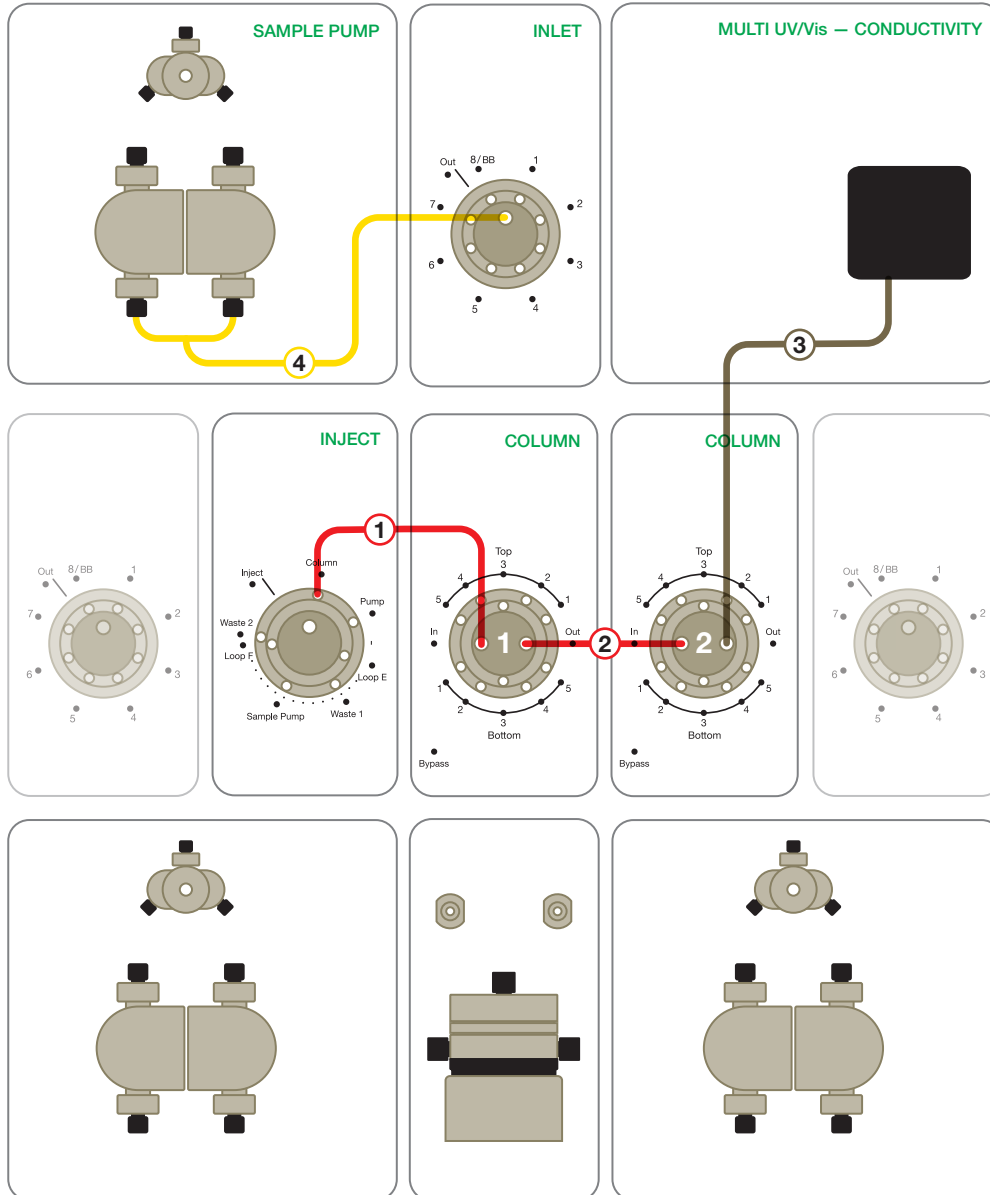# for Tandem Chromatography Applications (with additional buffer selection)

3-tier system with sample pump and sample inlet valve for multiple samples on tandem applications.

Example Templates

Affinity 1 ml — Desalting

Affinity 5 ml — Desalting

Affinity 1 ml — Linear Gradient

Affinity 1 ml — Step Gradient

Affinity 5 ml — Linear Gradient

Affinity 5 ml — Step Gradient

Tubing

① Tube #2 — Length: 17 cm
Inject Valve Column to
Column Switching Valve 1 In

② Tube #2 — Length: 17 cm
Column Switching Valve 1 Out
to Column Switching Valve 2 In

③ MWD:
Tube #10 — Length: 33.5 cm
or Custom — Length: 26 cm
Column Switching Valve 2 Out
to Multi-Wavelength Detector In

④ Tube #1 — Length: 24.5 cm
(1/16" green PEEK if <5 ml/min
or 1/8" FEP if >5 ml/min)
Sample Inlet Valve Out to
Sample Pump In

Additional modules (grayed out) are shown in the optimal positions to minimize tubing length and swept volume.

3-TIER + 2 CSV + SAMPLE PUMP + 1 SAMPLE INLET
for Tandem Chromatography Applications (with additional buffer selection and pH monitoring)

3-tier system with sample pump and sample inlet valve for multiple samples on tandem applications.

Example Templates

Affinity 1 ml — Desalting
Affinity 5 ml — Desalting
Affinity 1 ml — Linear Gradient
Affinity 1 ml — Step Gradient
Affinity 5 ml — Linear Gradient
Affinity 5 ml — Step Gradient

Tubing

1 Tube #2 — Length: 17 cm
Inject Valve Column to
Column Switching Valve 1 In

2 Tube #2 — Length: 17 cm
Column Switching Valve 1 Out
to Column Switching Valve 2 In

3 MWD:
Tube #10 — Length: 33.5 cm
Column Switching Valve 2 Out
to Multi-Wavelength Detector In

4 Tube #2 — Length: 17 cm
(1/16" green PEEK if <5 ml/min
or 1/8" FEP if >5 ml/min)
Sample Inlet Valve Out
to Sample Pump In

Additional module (grayed out) is shown in the optimal position to minimize tubing length and swept volume.

3-TIER + 2 CSV + SAMPLE PUMP + 1 SAMPLE INLET + 1 OUTLET
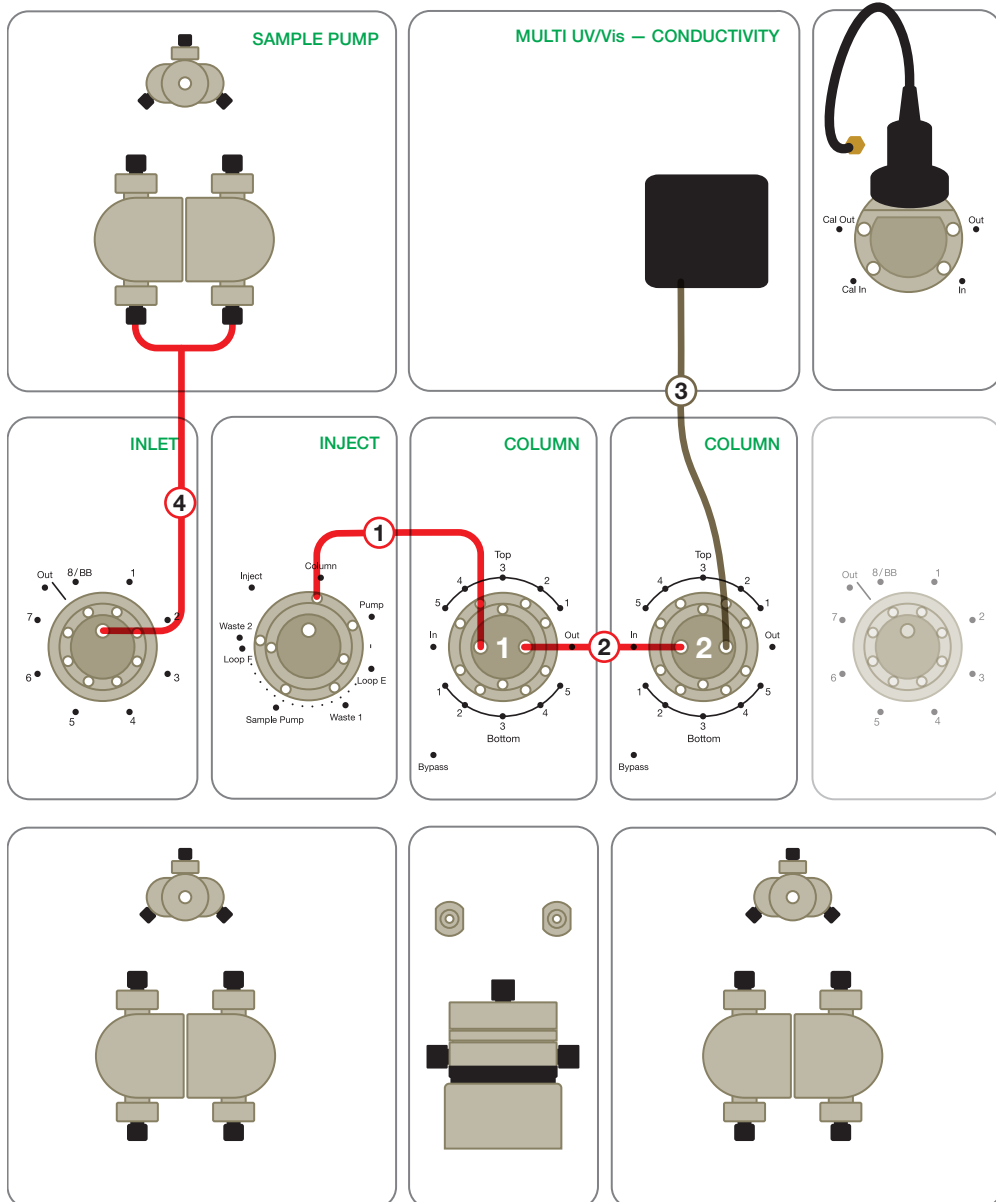## for 2-D and Tandem Chromatography Applications

3-tier system with sample pump and sample inlet valve for multiple samples on 2-D and tandem applications.

Example Templates

2-D Affinity 1 ml — SEC
2-D Affinity 5 ml — Desalting
Affinity 1 ml — Linear Gradient
Affinity 1 ml — Step Gradient
Affinity 5 ml — Linear Gradient
Affinity 5 ml — Step Gradient

Tubing

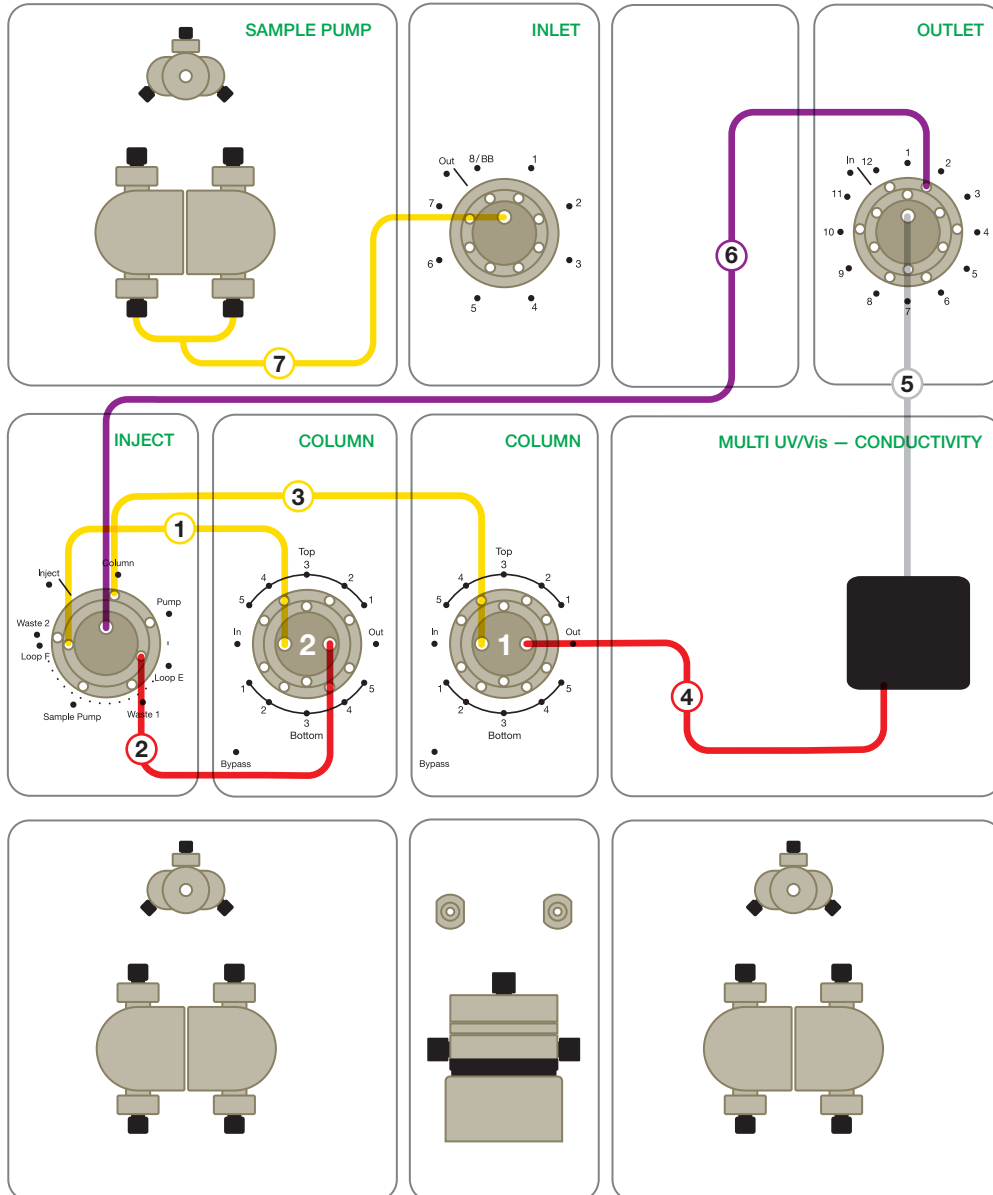**1** Tube #1 — Length: 24.5 cm
Inject Valve Loop F to
Column Switching Valve 2 In

2 Tube #2 — Length: 17 cm
Column Switching Valve 2 Out
to Inject Valve Loop E

3 Tube #1 — Length: 24.5 cm
Inject Valve Column to
Column Switching Valve 1 In

4 MWD:
Tube #1 — Length: 24.5 cm
Column Switching Valve 1 Out
to Multi-Wavelength Detector In

5 Medium Pressure:
Tube #3 — Length: 10 cm →
20 psi Backpressure Fitting →
Tube #3 — Length: 10 cm or
Low Pressure (not shown):
Tube #2 — Length: 17 cm
Conductivity Sensor Out
to Outlet Valve In

6 Tube #4 — Length: 50 cm
Outlet Valve Port 2 to
Inject Valve Injection Port

7 Tube #1 — Length: 24.5 cm
(1/16" green PEEK if <5 ml/min
or 1/8" FEP if >5 ml/min)
Sample Inlet Valve Out to
Sample Pump In

Blank module is shown in the optimal position to minimize tubing length and swept volume.

3-TIER + 2 CSV + SAMPLE PUMP + 1 SAMPLE INLET + 1 OUTLET
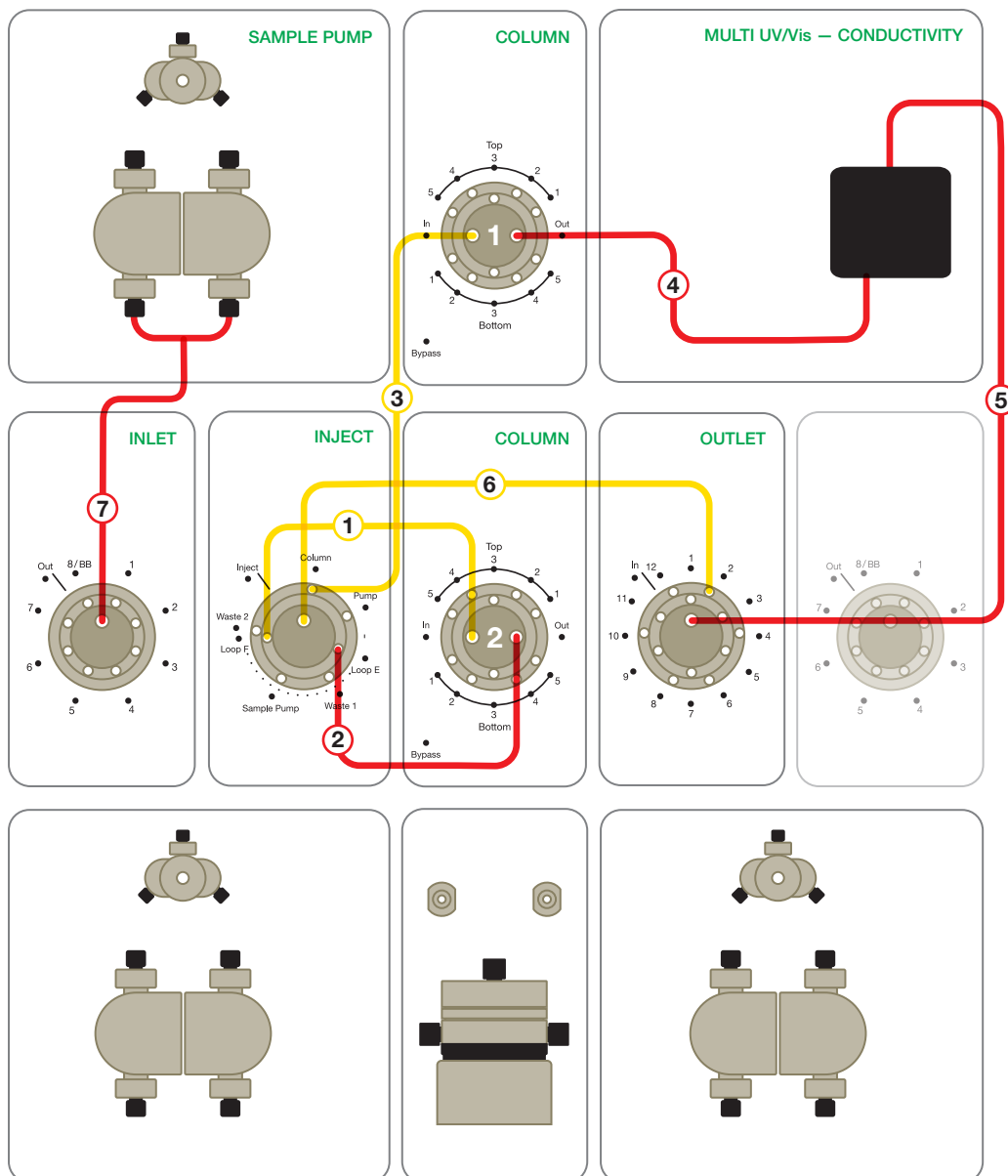## for 2-D and Tandem Chromatography Applications (with additional buffer selection)

3-tier system with sample pump and sample inlet valve for multiple samples on 2-D and tandem applications.

Example Templates

2-D Affinity 1 ml — SEC
2-D Affinity 5 ml — Desalting
Affinity 1 ml — Linear Gradient
Affinity 1 ml — Step Gradient
Affinity 5 ml — Linear Gradient
Affinity 5 ml — Step Gradient

Tubing

1 Tube #1 — Length: 24.5 cm
Inject Valve Loop F to
Column Switching Valve 2 In

2 Tube #2 — Length: 17 cm
Column Switching Valve 2 Out
to Inject Valve Loop E

3 Tube #1 — Length: 24.5 cm
Inject Valve Column to
Column Switching Valve 1 In

4 MWD:
Tube #1 — Length: 24.5 cm
Column Switching Valve 1 Out
to Multi-Wavelength Detector In

5 Medium Pressure:
Tube #2 — Length: 17 cm →
20 psi Backpressure Fitting →
Tube #1 — Length 24.5 cm or
Low Pressure (not shown):
Custom — Length: 41 cm
Conductivity Sensor Out to
Outlet Valve In

6 Tube #1 — Length: 24.5 cm
Outlet Valve Port 2 to
Inject Valve Injection Port

7 Tube #2 — Length: 17 cm
(1/16" green PEEK if <5 ml/min
or 1/8" FEP if >5 ml/min)
Sample Inlet Valve Out to
Sample Pump In

Additional module (grayed out) is shown in the optimal position to minimize tubing length and swept volume.

3-TIER + 2 CSV + 2 BUFFER INLETS + BUFFER BLENDING VALVE
for Tandem Chromatography Applications

3-tier system for tandem affinity and desalting columns. Proteins are eluted from the affinity column directly onto the desalting column.

Example Templates

Affinity 1 ml — Desalting
Affinity 5 ml — Desalting
Affinity 1 ml — Linear Gradient
Affinity 1 ml — Step Gradient
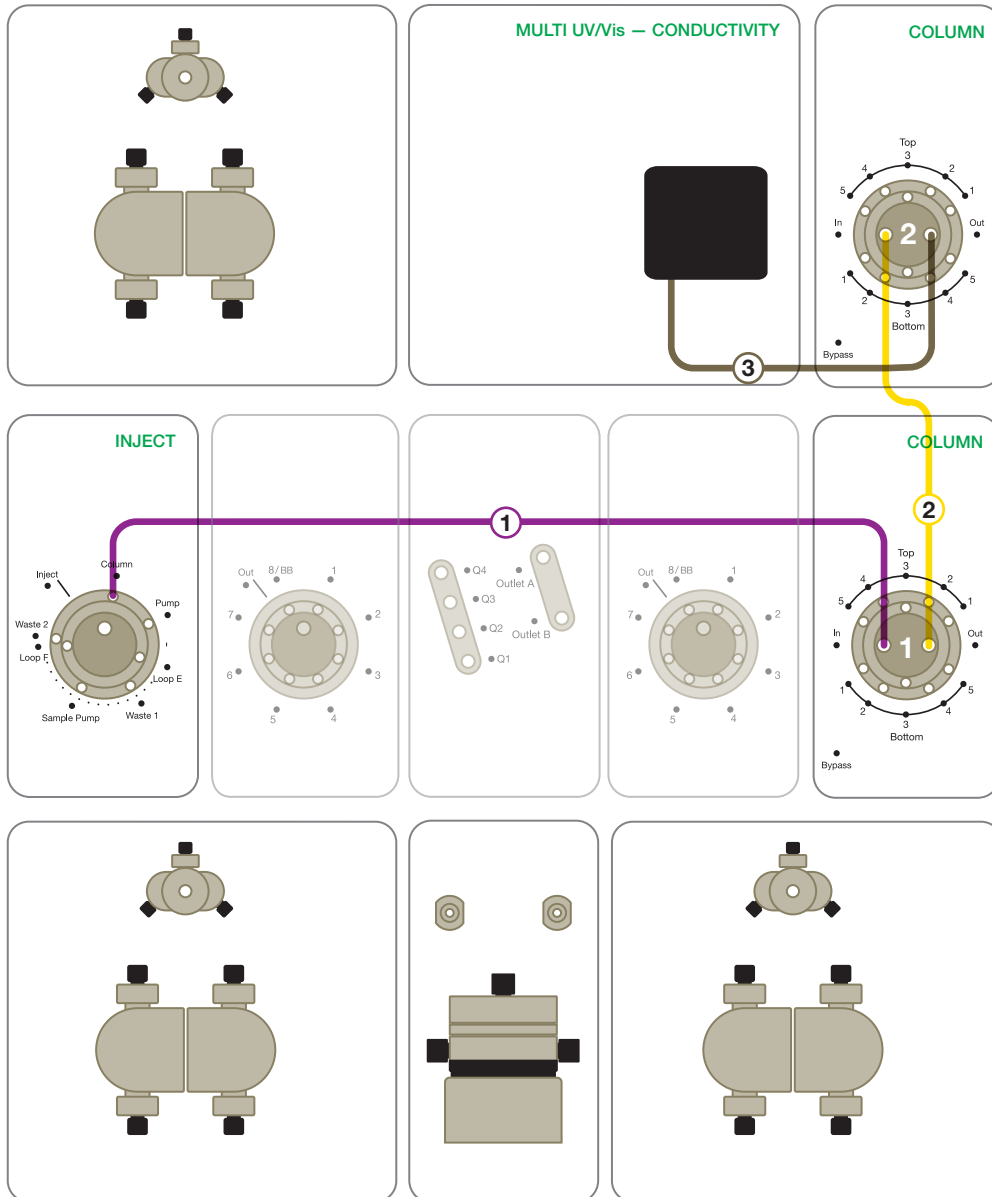Affinity 5 ml — Linear Gradient
Affinity 5 ml — Step Gradient

Tubing

① Tube #4 — Length: 50 cm
Inject Valve Column to
Column Switching Valve 1 In

② Tube #1 — Length: 24.5 cm
Column Switching Valve 1 Out
to Column Switching Valve 2 In

③ MWD:
Tube #10 — Length: 33.5 cm
Column Switching Valve 2 Out
to Multi-Wavelength Detector In

Additional modules (grayed out) are shown in the optimal positions to minimize tubing length and swept volume.

3-TIER + 3 CSV + SAMPLE PUMP + 1 SAMPLE INLET + 1 OUTLET
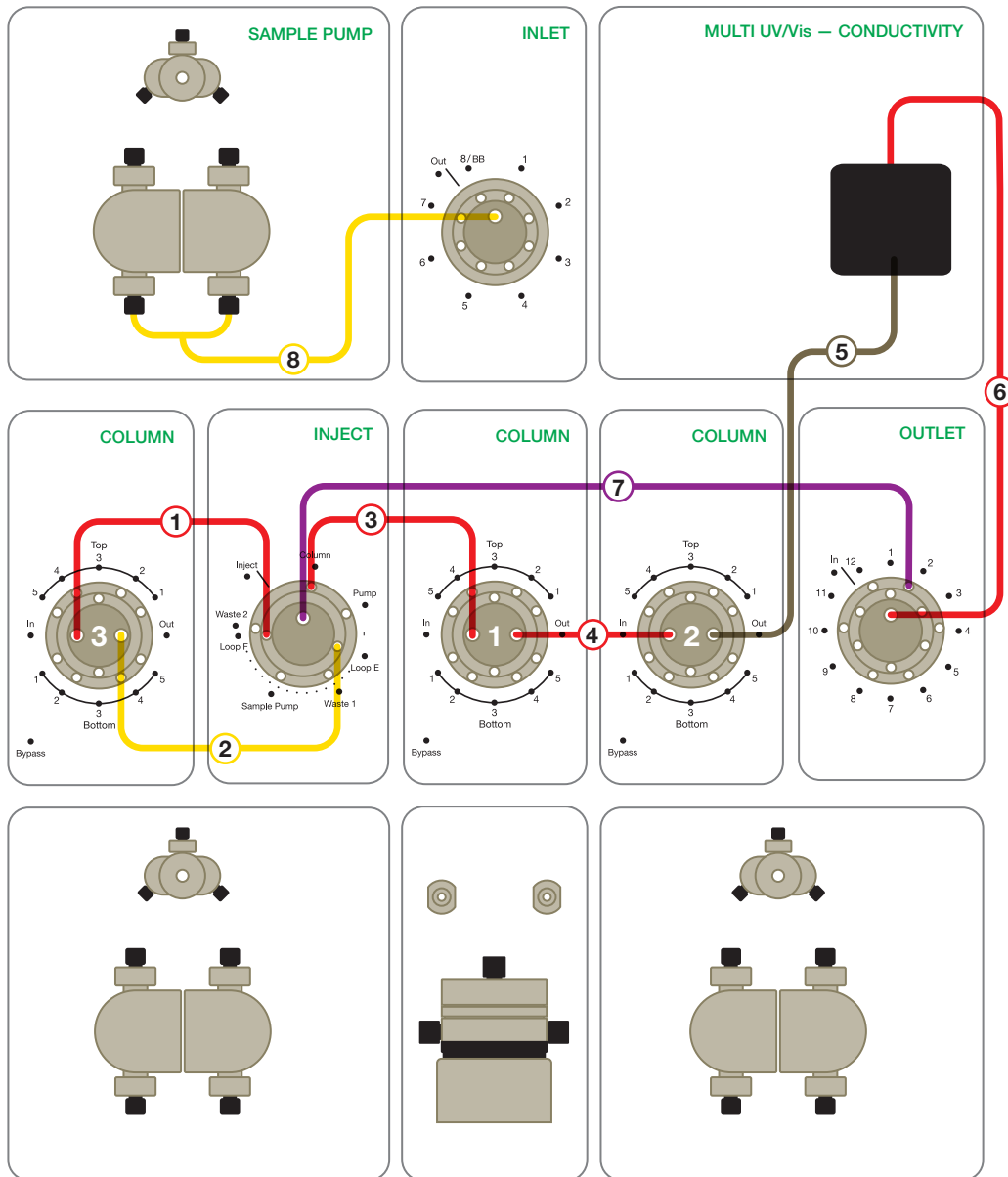# for 2-D and Tandem Chromatography Applications

3-tier system with sample pump and sample inlet valve for multiple samples on 2-D and tandem applications.

Example Templates

2-D Affinity 1 ml — SEC

2-D Affinity 5 ml — Desalting

Affinity 1 ml — Linear Gradient

Affinity 1 ml — Step Gradient

Affinity 1 ml —
Step Gradient (manual)

Affinity 5 ml — Linear Gradient

Affinity 5 ml — Step Gradient

Affinity 1 ml — Desalting

Affinity 5 ml — Desalting

Tubing

1 Tube #2 — Length: 17 cm
Inject Valve Loop F to
Column Switching Valve 3 In

2 Tube #1 — Length: 24.5 cm
Column Switching Valve 3 Out
to Inject Valve Loop E

3 Tube #2 — Length: 17 cm
Inject Valve Column to
Column Switching Valve 1 In

4 Tube #2 — Length: 17 cm
Column Switching Valve 1 Out
to Column Switching Valve 2 In

5 MWD:
Tube #10 — Length: 33.5 cm
or Custom — Length: 26 cm
Column Switching Valve 2 Out
to Multi-Wavelength Detector In

6 Medium Pressure:
Tube #2 — Length: 17 cm →
20 psi Backpressure Fitting →
Tube #1 — Length 24.5 cm or
Low Pressure (not shown):
Custom — Length: 41 cm
Conductivity Sensor Out
to Outlet Valve In

7 Tube #4 — Length 50 cm
or Custom — Length: 45 cm
Outlet Valve Port 2 to
Inject Valve Injection Port

8 Tube #1 — Length 24.5 cm
(1/16" green PEEK <5 ml/min
or 1/8" FEP >5 ml/min)
Sample Inlet Valve Out
to Sample Pump In

4-TIER (DISCOVER PRO) + 1 CSV
for 2-D Chromatography Applications

4-tier system with sample pump and sample inlet valve for multiple samples on 2-D applications.

Example Templates

2-D Affinity 1 ml — SEC

2-D Affinity 5 ml — Desalting

Affinity 1 ml — Linear Gradient

Affinity 1 ml — Step Gradient

Affinity 1 ml —
Step Gradient (manual)

Affinity 5 ml — Linear Gradient

Affinity 5 ml — Step Gradient

Tubing

1 **Tube #1 — Length: 24.5 cm**
Inject Valve Loop F to
Column Switching Valve 2 In

2 **Tube #1 — Length: 24.5 cm**
Column Switching Valve 2 Out
to Inject Valve Loop E

3 **Tube #2 — Length: 17 cm**
Inject Valve Column to
Column Switching Valve 1 In

4 **MWD:**
Tube #1 — Length: 24.5 cm
Column Switching Valve 1 Out
to Multi-Wavelength Detector In

5 **Tube #1 — Length: 24.5 cm**
pH Valve Out to Outlet Valve In

6 **Tube #4 — Length: 50 cm**
Outlet Valve Port 2 to
Inject Valve Injection Port

7 **Tube #1 — Length 24.5 cm**
(1/16" green PEEK <5 ml/min
or 1/8" FEP >5 ml/min)
Sample Inlet Valve Out to
Sample Pump In

The NGC Discover Pro System includes
1 CSV, 1 sample pump, 1 sample inlet
valve, 2 buffer inlet valves, 1 outlet valve,
1 pH valve, and 1 buffer blending valve.

Blank modules are shown in the optimal positions to minimize tubing length and swept volume.

4-TIER (DISCOVER PRO) + 1 CSV
for Tandem Chromatography Applications

4-tier system with sample pump and sample inlet valve for multiple samples on tandem applications.

Example Templates

Affinity 1 ml — Linear Gradient

Affinity 1 ml — Step Gradient

Affinity 1 ml —
Step Gradient (manual)

Affinity 5 ml — Linear Gradient

Affinity 5 ml — Step Gradient
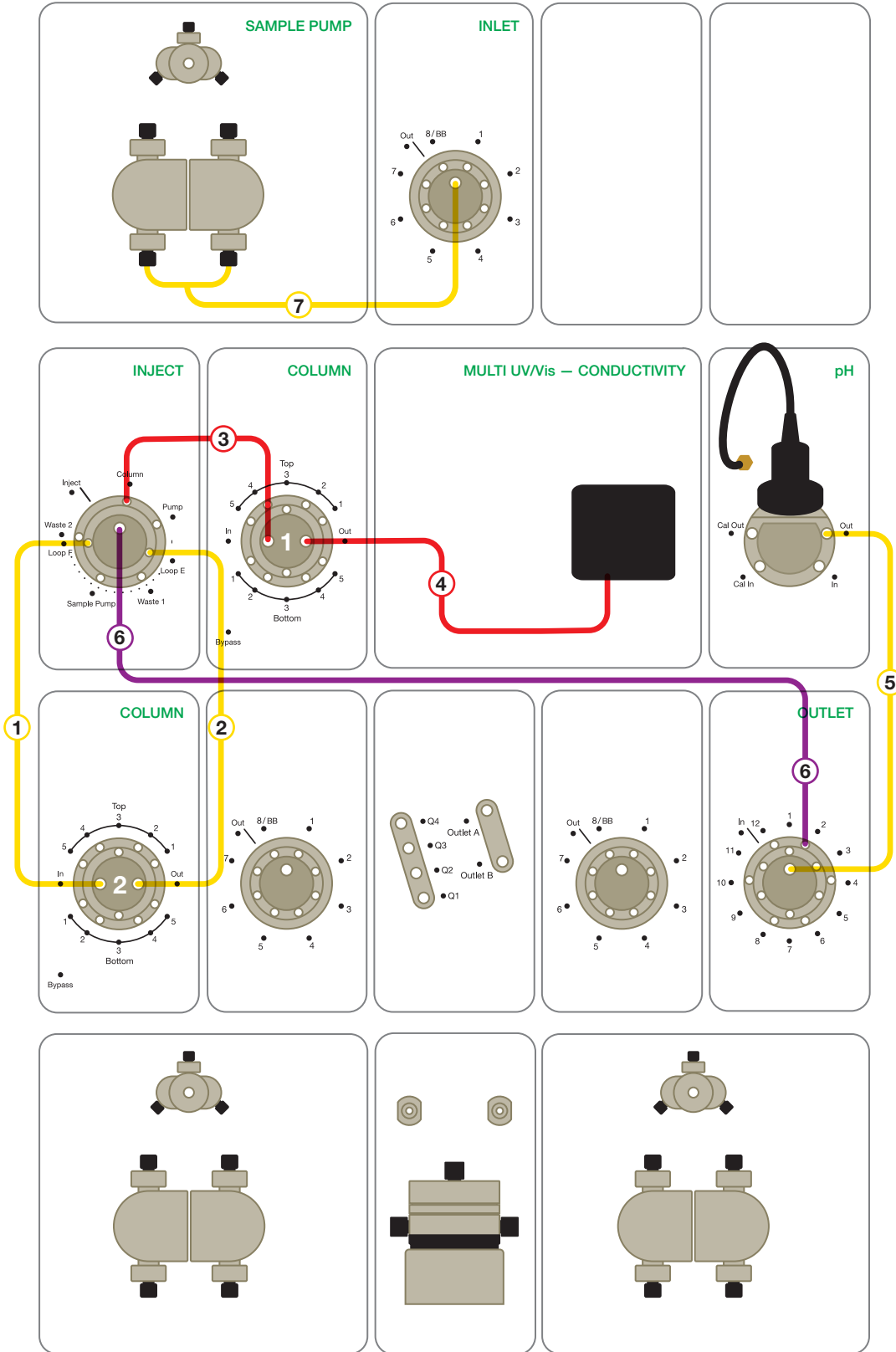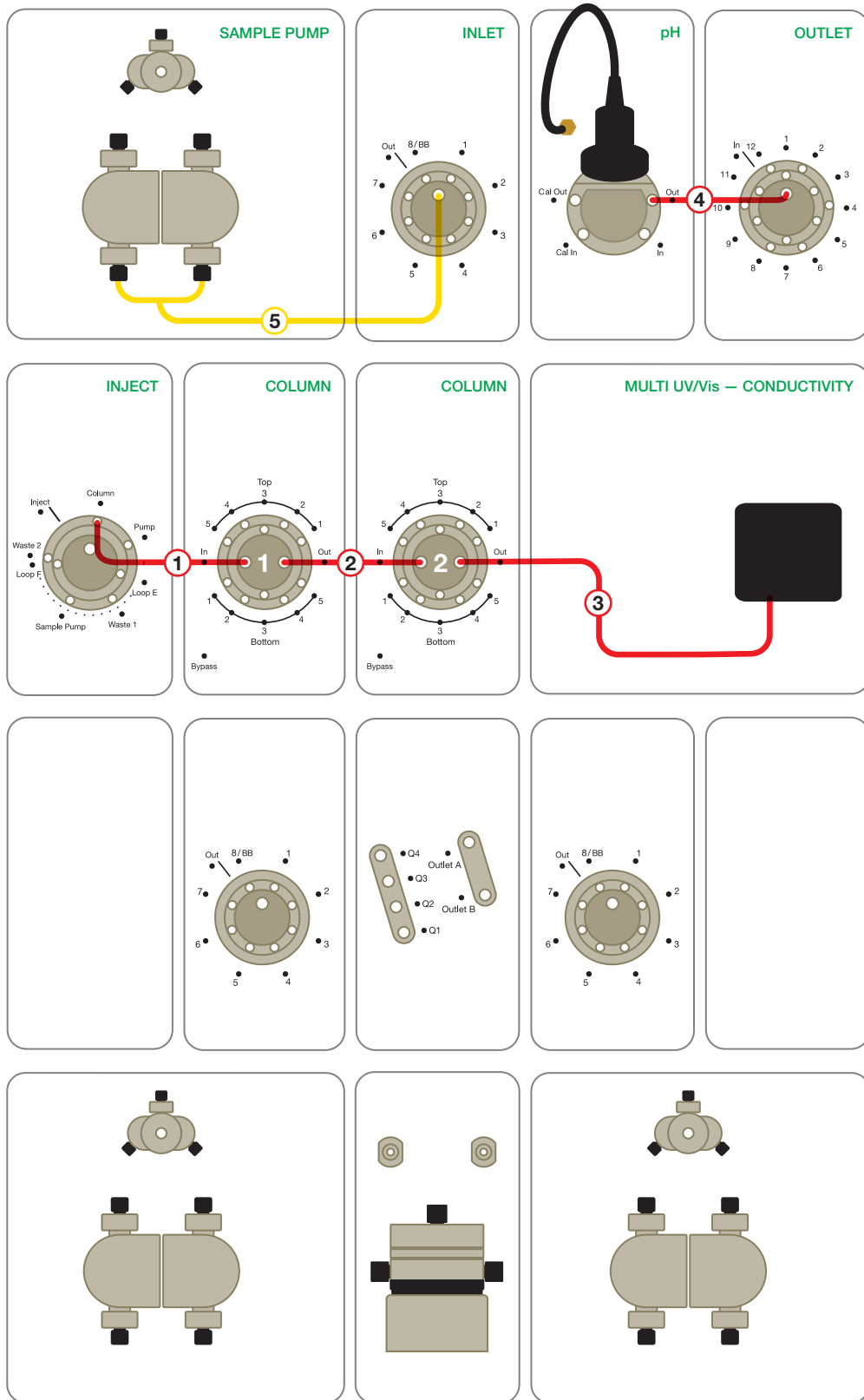
Affinity 1 ml — Desalting

Affinity 5 ml — Desalting

Tubing

1   **Tube #2 — Length: 17 cm**
Inject Valve Column to
Column Switching Valve 1 In

2   **Tube #2 — Length: 17 cm**
Column Switching Valve 1 Out
to Column Switching Valve 2 In

3   **MWD:**
Tube #1 — Length: 24.5 cm
Column Switching Valve 2 Out
to Multi-Wavelength Detector In

4   **Tube #2 — Length: 17 cm**
pH Valve Out to Outlet Valve In

5   **Tube #1 — Length 24.5 cm**
(1/16" green PEEK if <5 ml/min
or 1/8" FEP if >5 ml/min)
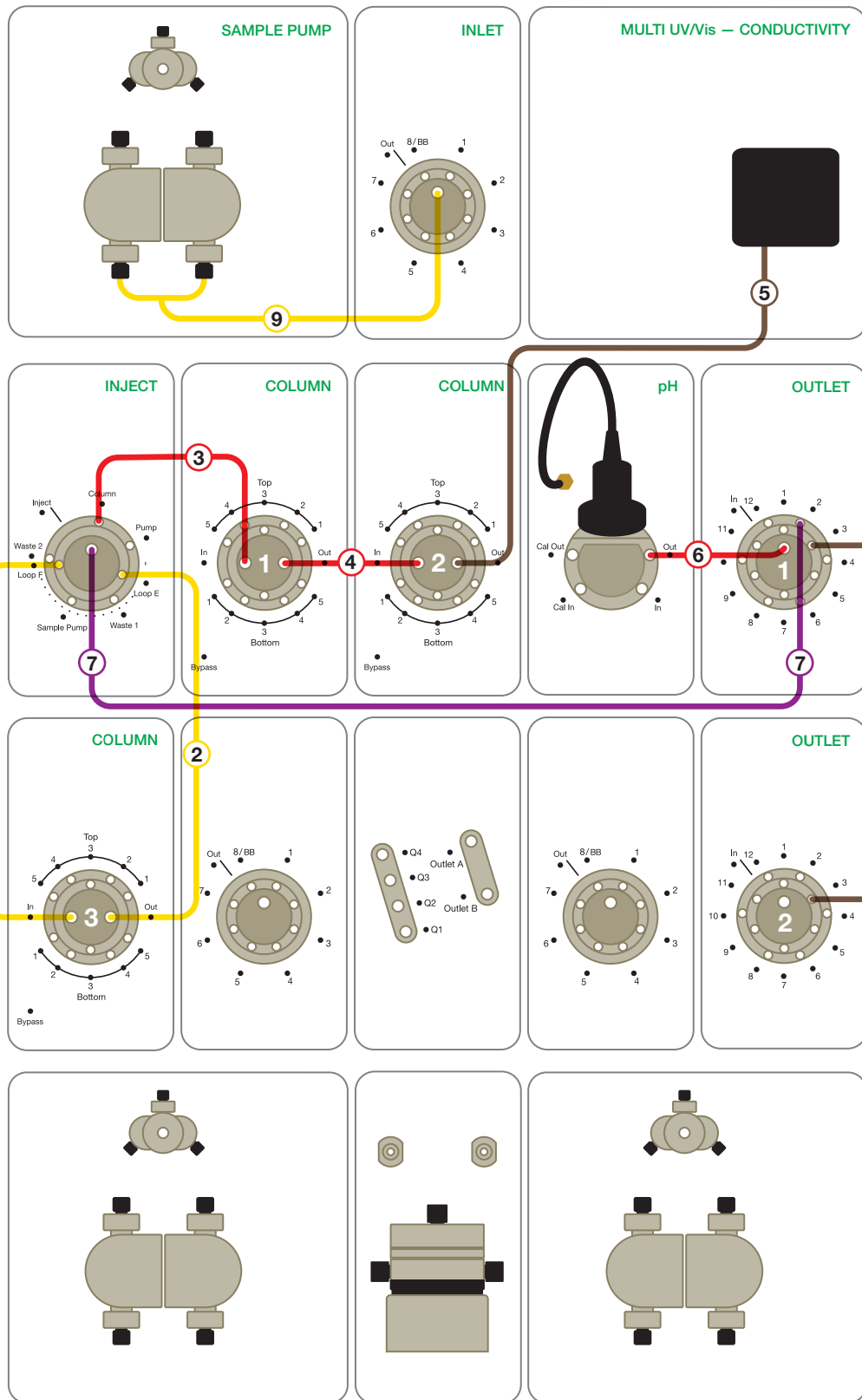Sample Inlet Valve Out to
Sample Pump In

The NGC Discover Pro System includes
1 CSV, 1 sample pump, 1 sample inlet
valve, 2 buffer inlet valves, 1 outlet valve,
1 pH valve, and 1 buffer blending valve.

Blank modules are shown in the optimal positions to minimize tubing length and swept volume.

4-TIER (DISCOVER PRO) + 2 CSV + 1 OUTLET
for 2-D and Tandem Chromatography Applications

4-tier system with sample pump and sample inlet valve for multiple samples on 2-D and tandem applications.

Example Templates

2-D Affinity 1 ml — SEC

2-D Affinity 5 ml — Desalting

Affinity 1 ml — Linear Gradient

Affinity 1 ml — Step Gradient

Affinity 1 ml —
Step Gradient (manual)

Affinity 5 ml — Linear Gradient

Affinity 5 ml — Step Gradient

Affinity 1 ml — Desalting

Affinity 5 ml — Desalting

Tubing

1 — Tube #1 — Length: 24.5 cm
Inject Valve Loop F to
Column Switching Valve 3 In

2 — Tube #1 — Length: 24.5 cm
Column Switching Valve 3 Out
to Inject Valve Loop E

3 — Tube #2 — Length: 17 cm
Inject Valve Column to
Column Switching Valve 1 In

4 — Tube #2 — Length: 17 cm
Column Switching Valve 1 Out
to Column Switching Valve 2 In

5 — MWD:
Tube #10 — Length: 33.5 cm
Column Switching Valve 2 Out
to Multi-Wavelength Detector In

6 — Tube #2 — Length: 17 cm
pH Valve Out to
Outlet Valve 1 In

7 — Tube #4 — Length: 50 cm
Outlet Valve 1 Port 2 to
Inject Valve Injection Port

8 — Tube #10 — Length: 33.5 cm
Outlet Valve 1 Port 3 to
Outlet Valve 2 In

9 — Tube #1 — Length 24.5 cm
(1/16" green PEEK if <5 ml/min
or 1/8" FEP if >5 ml/min)
Sample Inlet Valve Out to
Sample Pump In

The NGC Discover Pro System includes
1 CSV, 1 sample pump, 1 sample inlet
valve, 2 buffer inlet valves, 1 outlet valve,
1 pH valve, and 1 buffer blending valve.

4-TIER (DISCOVER PRO) + 2 CSV + 1 SAMPLE INLET
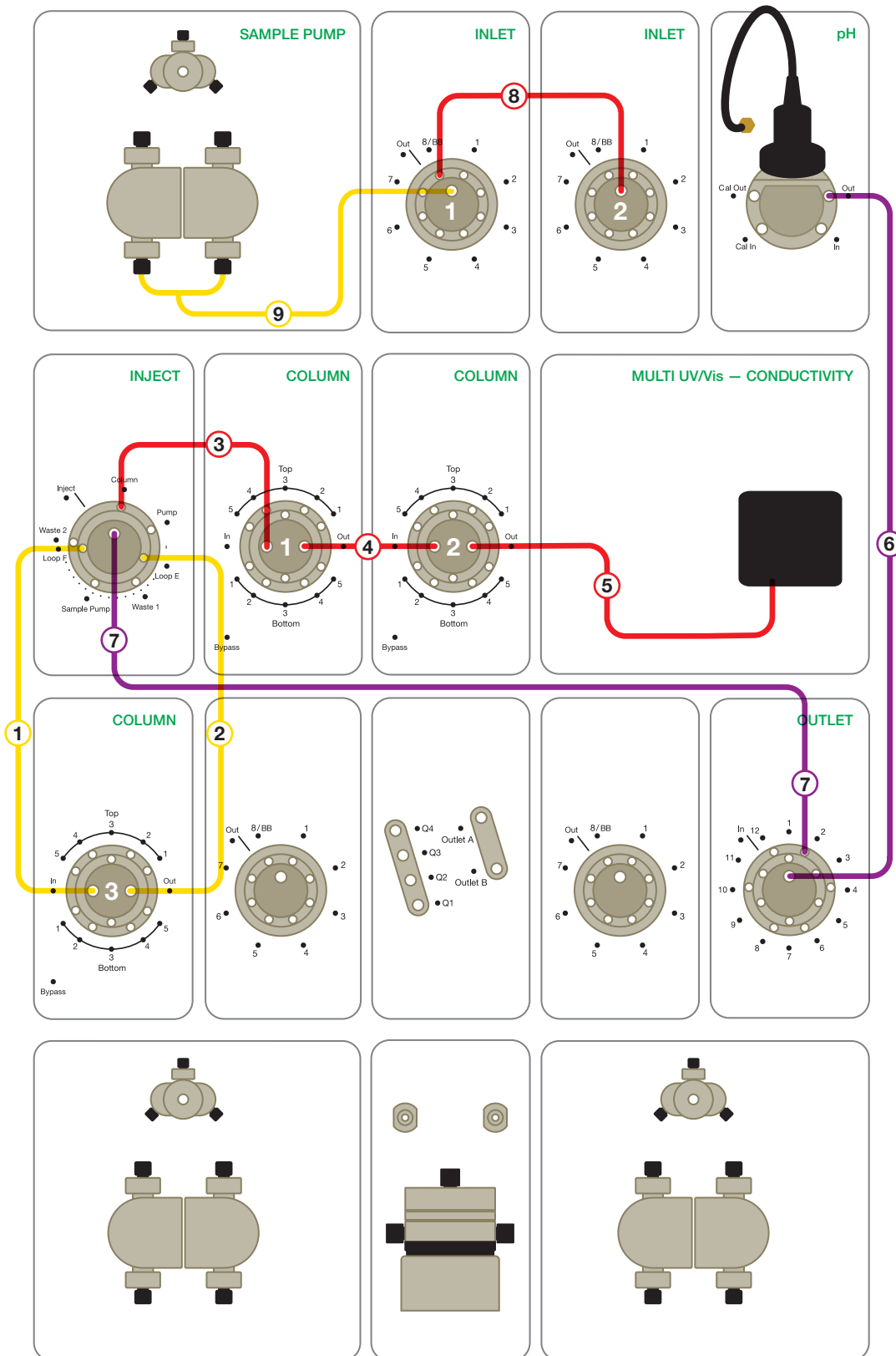# for 2-D and Tandem Chromatography Applications

4-tier system with sample pump and sample inlet valves for multiple samples on 2-D and tandem applications.

Example Templates

2-D Affinity 1 ml — SEC

2-D Affinity 5 ml — Desalting

Affinity 1 ml — Linear Gradient

Affinity 1 ml — Step Gradient

Affinity 1 ml —
Step Gradient (manual)

Affinity 5 ml — Linear Gradient

Affinity 5 ml — Step Gradient

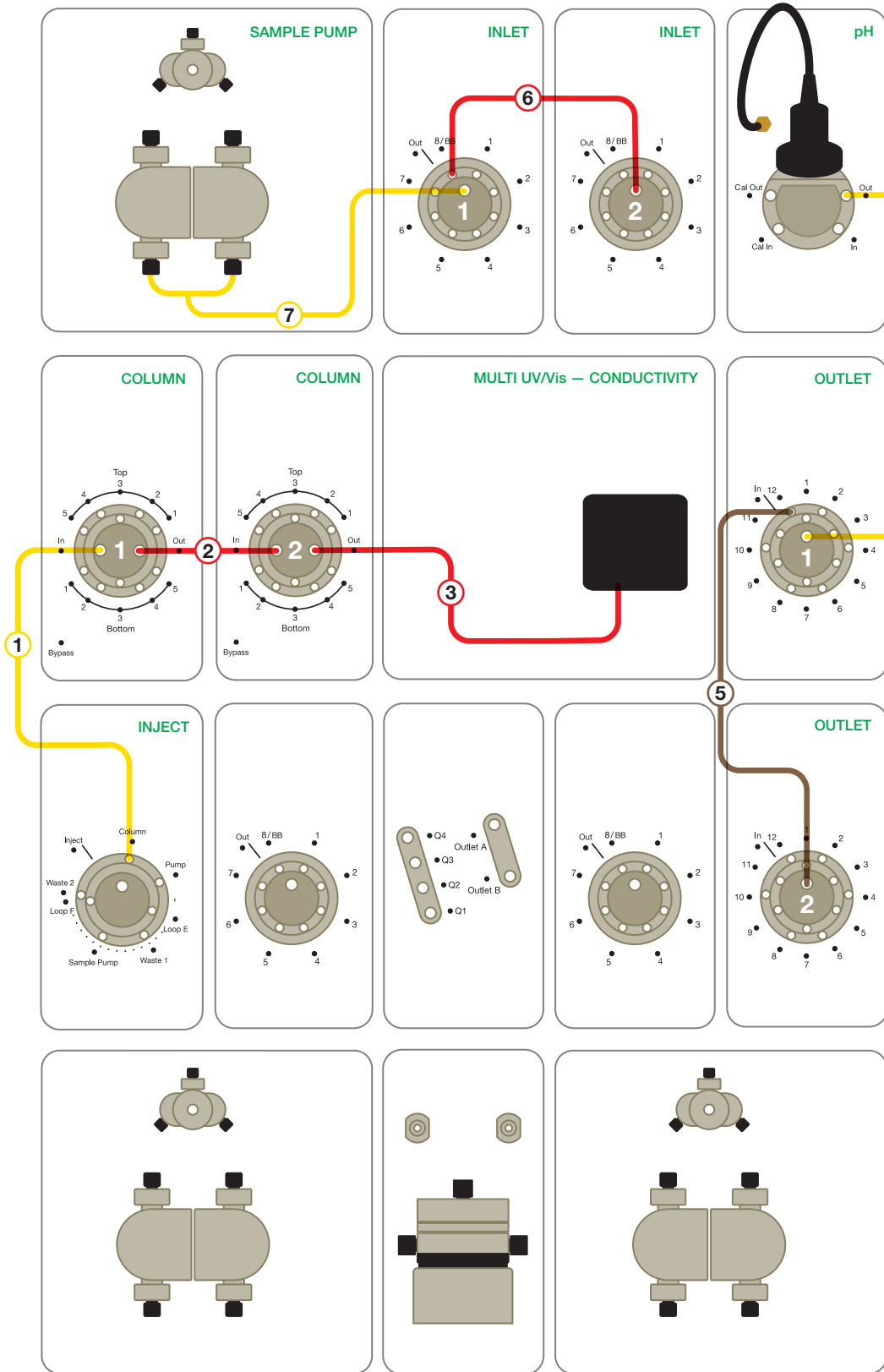Affinity 1 ml — Desalting

Affinity 5 ml — Desalting

Tubing

① Tube #1 — Length: 24.5 cm
Inject Valve Loop F to
Column Switching Valve 3 In

② Tube #1 — Length: 24.5 cm
Column Switching Valve 3 Out
to Inject Valve Loop E

③ Tube #2 — Length: 17 cm
Inject Valve Column to
Column Switching Valve 1 In

④ Tube #2 — Length: 17 cm
Column Switching Valve 1 Out
to Column Switching Valve 2 In

⑤ MWD:
Tube #1 — Length: 24.5 cm
Column Switching Valve 2 Out
to Multi-Wavelength Detector In

⑥ Tube #4 — Length: 50 cm or
Custom — Length: 45 cm
pH Valve Out to Outlet Valve In

⑦ Tube #4 — Length: 50 cm
Outlet Valve Port 2 to
Inject Valve Injection Port

⑧ Tube #2 — Length: 17 cm
(1/16" green PEEK if <5 ml/min
or 1/8" FEP if >5 ml/min)
Sample Inlet Valve 2 Out to
Sample Inlet Valve 1 Port 8

⑨ Tube #1 — Length: 24.5 cm
(1/16" green PEEK if <5 ml/min
or 1/8" FEP if >5 ml/min)
Sample Inlet Valve 1 Out to
Sample Pump In

The NGC Discover Pro System includes
1 CSV, 1 sample pump, 1 sample inlet
valve, 2 buffer inlet valves, 1 outlet valve,
1 pH valve, and 1 buffer blending valve.

4-TIER (DISCOVER PRO) + 1 CSV + 1 SAMPLE INLET + 1 OUTLET
for Tandem Chromatography Applications

4-tier system with sample pump and sample inlet valves for multiple samples on tandem applications. Two outlet valves provide enhanced fraction collection flexibility.

Example Templates

Affinity 1 ml — Linear Gradient

Affinity 1 ml — Step Gradient

Affinity 1 ml —
Step Gradient (manual)

Affinity 5 ml — Linear Gradient

Affinity 5 ml — Step Gradient

Affinity 1 ml — Desalting

Affinity 5 ml — Desalting

Tubing

1 — Tube #1 — Length: 24.5 cm
Inject Valve Column to Column
Switching Valve 1 In

2 — Tube #2 — Length: 17 cm
Column Switching Valve 1 Out
to Column Switching Valve 2 In

3 — MWD:
Tube #1 — Length: 24.5 cm
Column Switching Valve 2 Out
to Multi-Wavelength Detector In

4 — Tube #1 — Length: 24.5 cm
pH Valve Out to
Outlet Valve 1 In

5 — Tube #10 — Length: 33.5 cm
Outlet Valve 1 Port 12 to
Outlet Valve 2 In

6 — Tube #2 — Length: 17 cm
(1/16" green PEEK if <5 ml/min
or 1/8" FEP if >5 ml/min)
Sample Inlet Valve 2 Out to
Sample Inlet Valve 1 Port 8

7 — Tube #1 — Length: 24.5 cm
(1/16" green PEEK if <5 ml/min
or 1/8" FEP if >5 ml/min)
Sample Inlet Valve 1 Out
to Sample Pump In

The NGC Discover Pro System includes
1 CSV, 1 sample pump, 1 sample inlet
valve, 2 buffer inlet valves, 1 outlet valve,
1 pH valve, and 1 buffer blending valve.

4-TIER (DISCOVER PRO) + 1 CSV + 1 SAMPLE INLET + 1 OUTLET
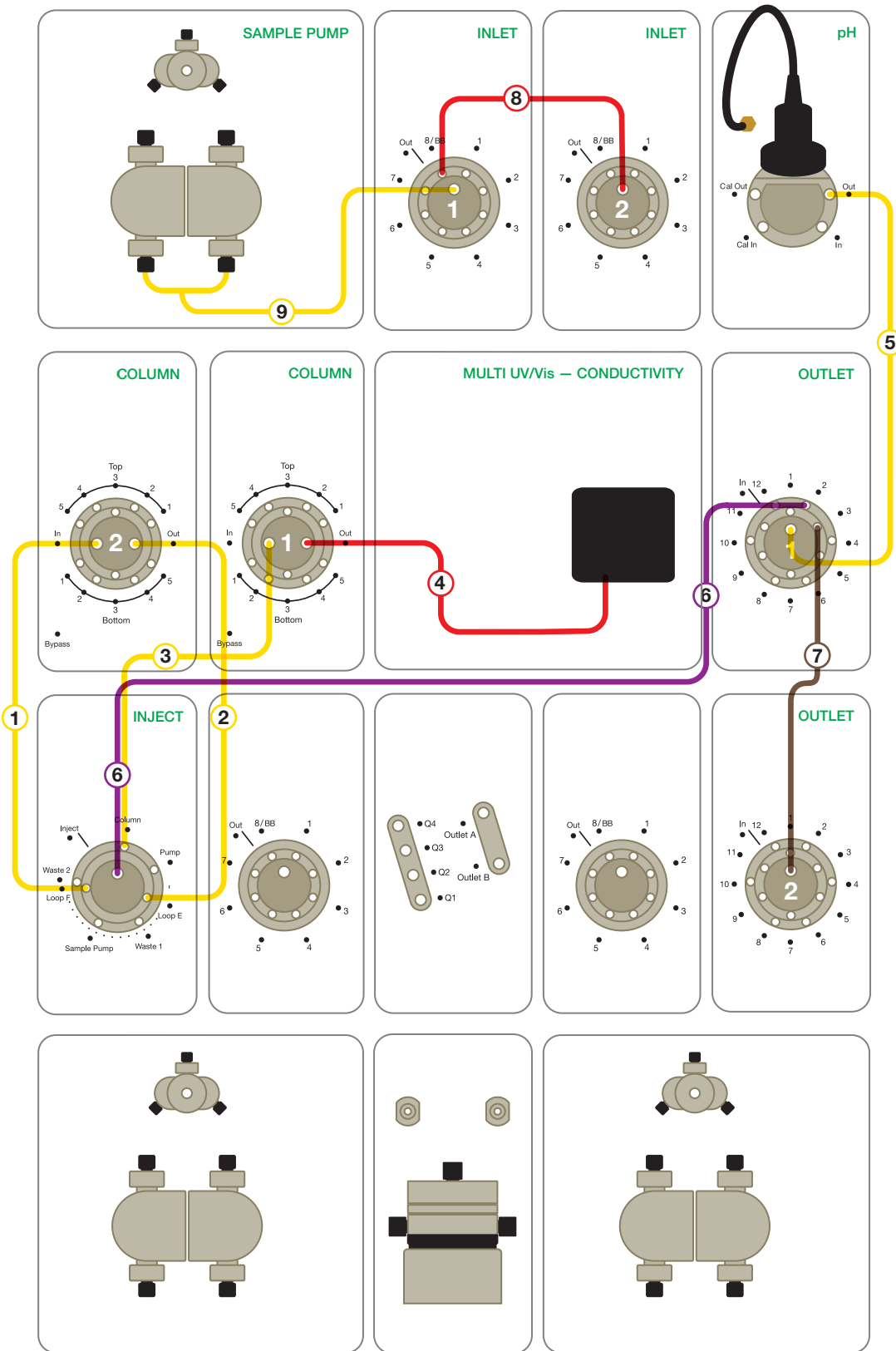## for 2-D and Tandem Chromatography Applications

4-tier system with sample pump and sample inlet valves for multiple samples on 2-D and tandem applications. Two outlet valves provide enhanced fraction collection flexibility.

Example Templates

2-D Affinity 1 ml — SEC

2-D Affinity 5 ml — Desalting

Affinity 1 ml — Linear Gradient

Affinity 1 ml — Step Gradient

Affinity 1 ml —
Step Gradient (manual)

Affinity 5 ml — Linear Gradient

Affinity 5 ml — Step Gradient

Tubing

1 — Tube #1 — Length: 24.5 cm
Inject Valve Loop F to
Column Switching Valve 2 In

2 — Tube #1 — Length: 24.5 cm
Column Switching Valve 2 Out
to Inject Valve Loop E

3 — Tube #1 — Length: 24.5 cm
Inject Valve Column to
Column Switching Valve 1 In

4 — MWD:
Tube #1 — Length: 24.5 cm
Column Switching Valve 1 Out
to Multi-Wavelength Detector In

5 — Tube #1 — Length: 24.5 cm
pH Valve Out to
Outlet Valve 1 In

6 — Tube #4 — Length: 50 cm
Outlet Valve 1 Port 2 to
Inject Valve Injection Port

7 — Tube #10 — Length: 33.5 cm
Outlet Valve 1 Port 3 to
Outlet Valve 2 In

8 — Tube #2 — Length: 17 cm
(1/16" green PEEK if <5 ml/min
or 1/8" FEP if >5 ml/min)
Sample Inlet Valve 2 Out to
Sample Inlet Valve 1 Port 8

9 — Tube #1 — Length: 24.5 cm
(1/16" green PEEK if <5 ml/min
or 1/8" FEP if >5 ml/min)
Sample Inlet Valve 1 Out to
Sample Pump In

The NGC Discover Pro System includes
1 CSV, 1 sample pump, 1 sample inlet
valve, 2 buffer inlet valves, 1 outlet valve,
1 pH valve, and 1 buffer blending valve.

Ordering Information

Catalog #	Description

NGC Medium-Pressure Chromatography Systems

NGC Quest Plus Chromatography Systems
For all-purpose purification of biomolecules:

7880003	**NGC Quest 10 Plus System**
7880004	**NGC Quest 100 Plus System**

NGC Scout Plus Chromatography Systems
For rapid scouting of proteins, peptides, and nucleic acids:

7880007	**NGC Scout 10 Plus System**
7880008	**NGC Scout 100 Plus System**

NGC Discover Chromatography Systems
For method development:

7880009	**NGC Discover 10 System**
7880011	**NGC Discover 10 Pro System**
7880010	**NGC Discover 100 System**
7880012	**NGC Discover 100 Pro System**

ChromLab Software

12009390	**ChromLab Software**
17000099	**ChromLab Software, User Management Edition**, allows networking of all NGC Systems to a centralized database, 1 license
17000098	**ChromLab Software, User Management Edition**, 3 licenses
17000097	**ChromLab Software, User Management Edition**, 5 licenses
7886001	**ChromLab Software, Security Edition**, U.S. FDA 21 CFR Part 11 module for ChromLab Software, maintains security logs and allows networking of all NGC Systems to a centralized database, 1 license
7886003	**ChromLab Software, Security Edition**, 3 licenses
7886005	**ChromLab Software, Security Edition**, 5 licenses

NGC System Modules and Accessories
All NGC modules and accessories include necessary tubing and fittings.

System Pumps

7884002	**NGC F10 Pump Module**, pkg of 1, 10 ml/min system pump kit for creating buffer gradients; for use with the buffer blending valve to generate flow rates of up to 20 ml/min
7884003	**NGC F100 Pump Module**, pkg of 1, 100 ml/min system pump kit for creating buffer gradients; for use with the buffer blending valve to generate flow rates of up to 200 ml/min

Sample Pump

7884004	**NGC Sample Pump Module**, pkg of 1, 100 ml/min sample pump kit, for automated large-volume sample application via sample inject valve

Detector

12010343	**NGC Multi-Wavelength Detector II Module**, pkg of 1, UV/Vis and conductivity detector kit for simultaneous 4-wavelength monitoring of elution fractions between 190 and 800 nm and salt gradient generation
7884011	**NGC pH Valve Module**, pkg of 1, kit includes the pH valve kit, pH probe, tubing, and fittings, for accurate inline pH measurement

Mixers

7884018	**NGC Mixer Module**, pkg of 1, includes a mixer motor assembly and an integrated system pressure sensor; can be extended with mixing barrels of various sizes; does not include mixer base or barrels
7884019	**NGC F100 Mixer**, pkg of 1, 750 µl base and top assembly, included with all 100 ml/min NGC Systems
7884020	**NGC F10 Mixer**, pkg of 1, 263 µl base and top assembly, included with all 10 ml/min NGC Systems
7884021	**NGC F10 Mixer Barrel Kit**, pkg of 1, 750 µl extension barrel for F10 263 µl mixer, part of NGC Scout 10 Plus and NGC Discover 10 Systems
7884022	**NGC F10 Mixer Barrel Kit**, pkg of 1, 2 ml extension barrel for F10 263 µl mixer, optional part
7884028	**NGC F100 Mixer Barrel Kit**, pkg of 1, 2 ml extension barrel for F100 750 µl mixer, part of NGC Scout 100 Plus and NGC Discover 100 Systems
7884023	**NGC F100 Mixer Barrel Kit**, pkg of 1, 5 ml extension barrel for F100 750 µl mixer, optional part
7884024	**NGC F100 Mixer Barrel Kit**, pkg of 1, 12 ml extension barrel for 750 µl mixer, optional part
7885171	**NGC High Flow Tubing Kit**, pkg of 1, for operating NGC Systems >80 ml/min

Catalog #	Description

Valves

7884010	**NGC Buffer Blending Valve Module**, pkg of 1, for inline buffer preparation and generating pH gradients for quick pH scouting and flow rate doubling
7884006	**NGC Inlet Valve Module**, pkg of 1, for automated switching between multiple buffers and samples during method development
7884012	**NGC Column Switching Valve Module (10 ml)**, holds 5 columns or sample loops; for use with F10 systems for quick column scouting, automated multicolumn, and reverse flow applications
7884026	**NGC Column Switching Valve Module (100 ml)**, holds 5 columns or sample loops; for use with F100 systems for quick column scouting, automated multicolumn, and reverse flow applications
7884013	**NGC Outlet Valve Module**, pkg of 1, for automated fraction collection of large-volume fractions with up to 12 vessels
7884016	**NGC Signal Import Module**, pkg of 1, enables analog to digital signal conversion and connection to third-party autosamplers and detectors

Air Sensors

7885017	**NGC Air Sensor Module**, pkg of 1, kit includes 2 large-bore air sensors to detect end of buffer and sample to protect against air entering pumps and columns; supports up to 4 large- and small-bore air sensors
7885018	**NGC Air Sensor Extension Module**, pkg of 1, connects to the base air sensor module to support 4 additional air sensors, does not include any air sensors, optional part
7885020	**NGC Small Air Sensor**, pkg of 1 air sensor to exclude air from system and columns; detects air in small-diameter PEEK Tubing
7885021	**NGC Large Air Sensor**, pkg of 1 air sensor to exclude air from system and columns; detects air in large-diameter PTFE tubing

Fraction Collectors
Compatible with all NGC Systems:

17002070	**NGC Fraction Collector with Racks**, 100/240 V, includes power cord, rack set (two 13 mm tube racks), tubing, union
7410002	**BioFrac Fraction Collector**, 100/240 V, includes power cord, rack set F1 (2 x flatpack, 13 mm), BioFrac Diverter Valve, PEEK Tubing, standard dropper head

Visit **bio-rad.com/NGC** for more information.

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