DIONEX

AS40 AUTOMATED SAMPLER
OPERATOR'S MANUAL

DISCLAIMER OF WARRANTY AND LIMITED WARRANTY

TRADEMARKS

PRINTING HISTORY

Contents

1 • Introduction

2 • Description

3 • Operation and Maintenance

4 • Troubleshooting

5 • Service

A • Specifications

B • Installation

C • Setting the AS40 Defaults

D • Relay Control of the AS40

E • Parallel Remote Control of the AS40

F • Reordering Information

1 • Introduction

1.1 Overview

The AS40 Automated Sampler is a versatile, fully automated sampler capable of delivering between 0.2 mL and 5.0 mL of sample (in set increments) to the sample loop or concentrator column in a chromatography module, such as an LC10 Chromatography Enclosure, LC20 Chromatography Enclosure, LC30 Chromatography Oven, or a DX-100 Ion Chromatograph. The AS40 holds between 66 and 88 vials, depending upon the size of vials used (either the 0.5 mL, the 5.0 mL, or a combination of the two sizes). Up to three samples can be taken from each vial.

The unique PolyVial™ sample vial eliminates the need for an external sampling pump. The vial incorporates a cap that acts as a simple piston to force sample out of the vial and deliver it to an injection loop, or to a concentrator column with backpressures up to 690 KPa (100 psi). Caps with a 20-micron filter are available to remove solid materials from the sample before injection.

The AS40 can be operated manually from the front panel or under relay control from a device capable of executing timed events, such as an integrator or a DX 500 module.

The AS40 is shipped with vial and cassette kits for 0.5 mL vials (P/N 046028) or for 5.0 mL vials (P/N 046029).

1.2 About This Manual

Chapter 1, **Introduction**, introduces the product and conventions used in the manual, and provides safety information.

Chapter 2, **Description**, is a description of the physical aspects of the AS40, followed by a functional description of its operating features.

Chapter 3, **Operation and Maintenance**, discusses the operating features of the AS40. Routine preventive maintenance requirements are included in this chapter.

Chapter 4, **Troubleshooting**, lists possible causes of problems and provides step-by-step procedures to isolate and eliminate their sources.

Chapter 5, **Service**, presents step-by-step instructions for service procedures and parts replacement.

Appendix A, **Specifications**, contains the AS40 specifications and facility requirements.

Appendix B, **Installation**, describes the installation and interface necessary to place the AS40 Automated Sampler into operation.

Appendix C, **Setting the AS40 Defaults**, describes how to change the default operation parameters.

Appendix D, **Relay Control of the AS40**, provides details about setting up the AS40 for remote operation.

Appendix E, **Parallel Remote Control the AS40**, describes the AS40 parallel interface.

Appendix F, **Reordering Information**, lists part numbers of sample vials, cassettes, and other supplies for convenience when reordering.

1.3 Conventions

The following typographical conventions are used in this manual:

- Front panel keys are in bold print when reference is made to the key itself rather than its function, such as in the following example which references the *Load* key:

    Press **Load** to start the sampling cycle.

- References to a key's function are in normal typeface and lowercase, such as in the following example:

    You are now ready to load samples.

1.4 Product Safety Information

This instrument is designed to comply with the requirements for safety set forth in IEC 1010, *Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use.*

Sections of this manual are flagged with key words and symbols to denote the nature of any hazard. These safety directives apply to all operators and service personnel.

IMPORTANT — **Indicates that the function or process of the instrument may be impaired. Operation will not damage the instrument. Example: A cap must be installed in each vial in order for the AS40 to operate correctly.**

CAUTION — **Indicates a potential hazard to the operator, or damage to the instrument or other property. Example: Overtightening valve bolts may break them off.**

2 • Description

2.1 Physical Description

Figure 2-1 illustrates the AS40 Automated Sampler main features.
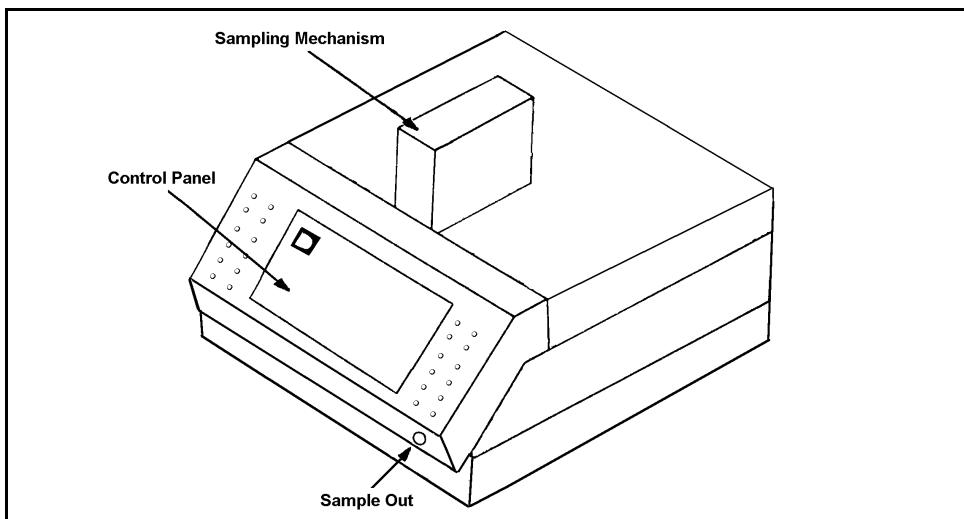
Figure 2-1.   AS40 Automated Sampler Features

2.1.1 Sampling Mechanism

The sampling mechanism consists of the sampling head tower, and the sample input and output trays (beneath the gray polycarbonate cover). The cover protects light-sensitive samples and the interior of the AS40. To remove the cover, tilt it back and then lift it straight off.

⚠ **To avoid trapping dust particles in the vial caps, always operate the AS40 with the cover on.**
IMPORTANT

The input tray holds sample cassettes loaded with filled sample vials. The sampling head delivers sample from the sample vials to the **Sample Out** port. The output tray holds the cassettes after sampling is complete. See Section 2.2.1 for a description of how the sampling mechanism operates.

> ⚠ **CAUTION**
>
> **The tower which houses the sampling head is NOT intended for use as a handle. Using this tower to lift the AS40 may damage the sampling mechanism.**

2.1.2 Control Panel

The control panel contains switches for controlling AS40 operation and indicators for displaying AS40 status (see Figure 2-2).

Operation Switches

The **Operation** switches in the right section of the control panel control the sampling mechanism.
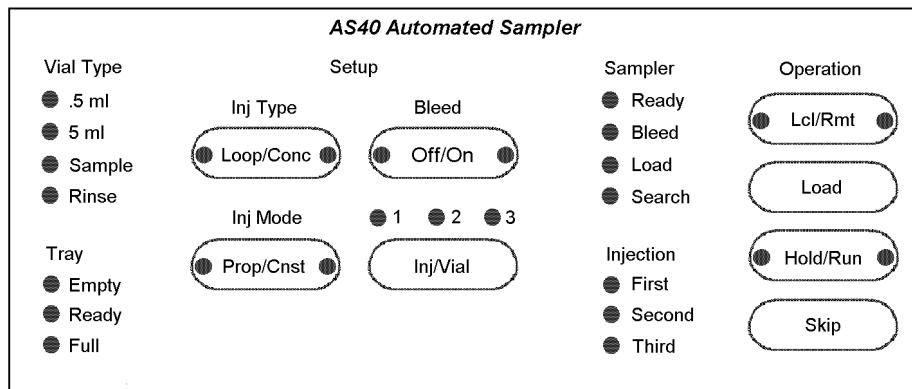
Figure 2-2. AS40 Control Panel

Lcl/Rmt

Selects whether the AS40 functions are controlled locally (**Lcl**) using control panel switches or relay control, or remotely (**Rmt**) using the parallel interface. LEDs on each side of the switch indicate the current selection.

In Local mode, all control panel switches are active and you control the AS40 using these switches. **Relay control is also active when the AS40 is in Local mode.** Relay control uses simple TTL logic levels or relay contact-closures to control the AS40 Load function (see Appendix D for details). When relay control is active, the Load function can be controlled either from the control panel or with relay control.

In Remote mode, all of the control panel switches are disabled with the exception of **Lcl/Rmt** and **Hold/Run** and the AS40 can be operated using a 50-line parallel interface to control and monitor all of the AS40 functions (see Appendix E).

> **NOTE**
> **Dionex controllers do not provide parallel remote control of the AS40 Automated Sampler.**

Load

Triggers the sample loading sequence, forcing a predetermined volume of sample from a sample vial through the **Sample Out** port into either a sample loop or a concentrator column.

Hold/Run

Provides a means of interrupting the AS40 at any point during operation (**Hold**) and then resuming operation at the point of interruption (**Run**). LEDs on each side of the switch indicate the current selection.

Skip

Allows you to skip one or more vials by advancing the cassette to the next vial. The cassette advances one vial each time you press the switch. **Skip** operates only when the AS40 is in **Hold**.

Setup Switches

The **Setup** switches in the center of the panel determine how samples are taken from the PolyVials. LEDs indicate the current selections.

Inj Type

Loop/Conc

Determines whether the sample is delivered to a sample loop or to a concentrator column.

- **Loop** specifies a sample loop or other sample holder with less than 345 KPa (50 psi) backpressure. Sample is loaded at approximately 4.0 mL/min from a 5.0 mL vial.

- **Conc** selects a concentrator or other sample holder with backpressure between 345 and 690 KPa (50 and 100 psi). Sample is loaded at approximately 1.0 mL/min from a 5.0 mL vial.

Inj Mode

Prop/Cnst

Selects either Proportional or Constant sampling mode.

• Proportional mode delivers sample aliquots equal to the fill volume of the vial (5.0 mL or 0.5 mL) divided by the number of samples per vial. For example, if two samples per vial are requested from a 5.0 mL vial, the AS40 delivers two aliquots of 2.5 mL each.

• Constant mode delivers a constant sample volume, equal to one-third of the volume of the vial, regardless of the number of samples requested per vial. If 0.5 mL vials are used, then the sample volume will be 0.17 mL per aliquot. If the 5.0 mL vials are used, then the sample volume will be 1.7 mL per aliquot.

Constant mode permits small sample volumes to be delivered from the larger vials or allows you to rinse the sample injection valve and loop thoroughly with sample before an injection is made. Because the first sample is taken from the top of the vial, supernatant from an extraction can be sampled directly.

Figure 2-3 illustrates the differences between the Proportional and Constant sampling modes.
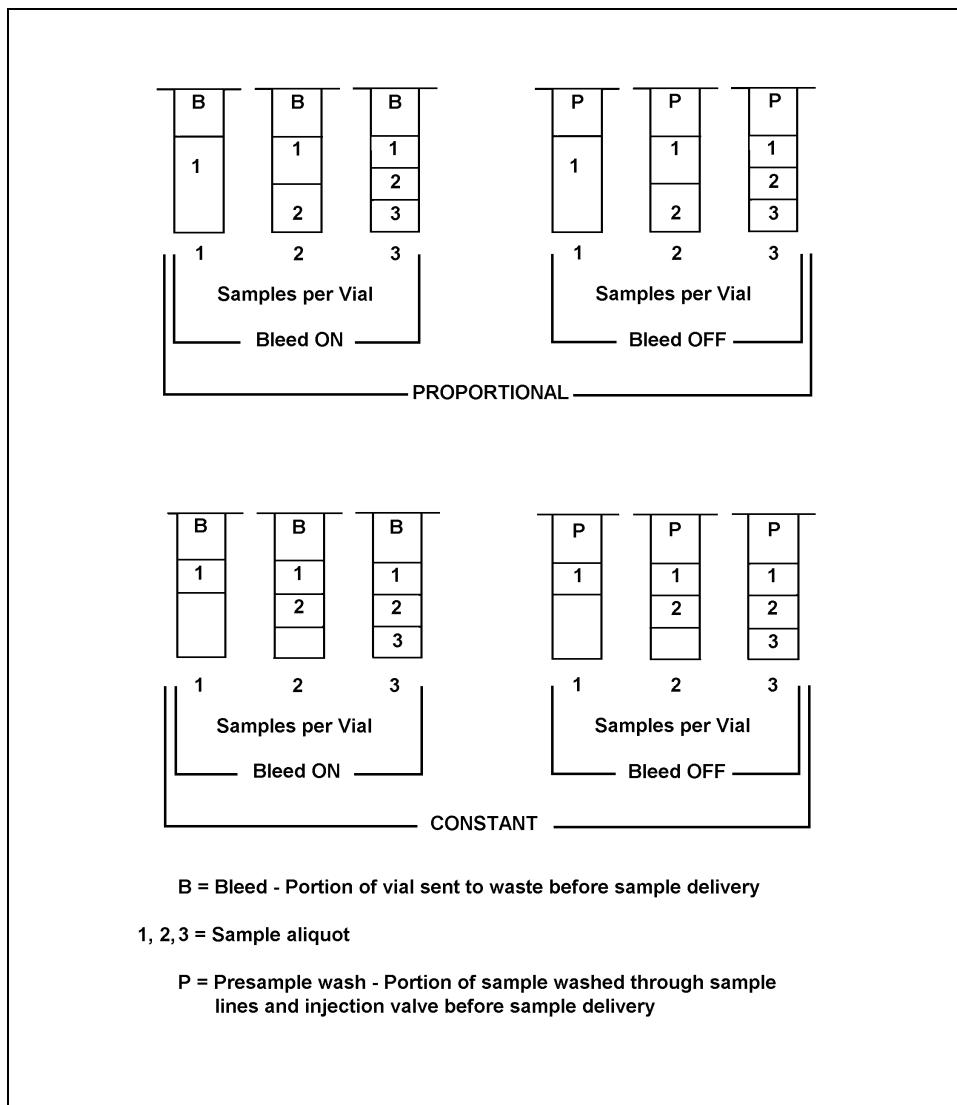
Figure 2-3.   Proportional vs. Constant Sampling

Bleed

Off/On

Bleed Off/On determines whether the trapped air and excess liquid above the fill line are directed to waste (**Bleed On**) or flushed through the sample loop as a presample wash (**Bleed Off**). **Bleed On** is selected automatically when **Inj Type** is set to **Conc**. Select **Bleed On** when loading a concentrator column to prevent air from being accidentally forced through the column and ensure that an accurate, reproducible volume is loaded for each injection.

In Proportional mode sampling, the bleed function works in the following manner:

- **Bleed On**: Any excess sample above the fill line is expelled to waste before the sample is delivered.

- **Bleed Off**: Any excess sample is delivered to the injection valve as a presample wash along with the volume of the first sample aliquot.

In Constant mode sampling, the bleed function works in the following manner:

- **Bleed On**: Any excess sample above the volume required to deliver the requested number of aliquots per vial is expelled to waste before the first sample is delivered.

- **Bleed Off**: Any excess sample above the volume required to deliver the requested number of aliquots is delivered to the injection valve along with the volume of the first sample aliquot.

Inj/Vial

Selects the number of injections (1, 2, or 3) to be made from each sample vial. Press the button repeatedly to cycle through the choices.

Vial Type Indicators

- **.5 ml** and **5 ml** indicate the size sample vial currently under the sampling head. Cassettes holding 0.5 mL vials and those holding 5 mL vials can be intermixed in the input tray and reliably recognized.

- **Sample** and **Rinse** indicate the type of vial currently under the sample head. The AS40 recognizes a vial as a sample vial if its cap is flush with the top of the vial, or as a rinse vial if its cap extends above the vial (see Section 2.2.1).

Tray Indicators

- **Empty** indicates there are no more sample cassettes in the input tray and sampling of the vials in the current cassette (the one under the sampling head) is complete.

- **Ready** indicates there are sample cassettes in the input tray and the AS40 is ready to begin a sampling cycle.

- **Full** indicates that the AS40 output tray is full and sampling of the vials in the current cassette is complete. No additional cassettes can be run until you remove one or more sample cassettes from the output tray.

Sampler Indicators

- **Ready** indicates that the AS40 is ready to load a sample.

- **Bleed** indicates that the portion of the vial currently being sampled is going to waste.

- **Load** indicates that a sample is currently being loaded from the sample vial or that a rinse cycle is in progress.

- **Search** indicates the AS40 is searching for the next vial.

Injection Indicators

First, **Second**, and **Third** indicate the number of the injection being taken from the sample vial. The count is updated when the Load cycle is complete.

2.1.3 Sample Out

The **Sample Out** port at the lower right corner of the AS40 (see Figure 2-1) provides a connection to the liquid line that carries sample from the AS40 to the injection valve. The injection valve can have either a sample loop or a concentrator column attached.

2.1.4 Rear Panel

The rear panel of the AS40 Automated Sampler contains the following connections and controls (see Figure 2-4):

- **POWER:** Controls the AC power to the AS40.

- **WASTE:** Waste from the bleed process exits the AS40 enclosure via the tubing connected to this grommet. Place the free end of the waste line into either a waste container or an appropriate drain.

!\
CAUTION

Neutralize acidic and caustic waste before disposal. Dispose of wastes containing organic solvents and all wastes in accordance with local regulations.
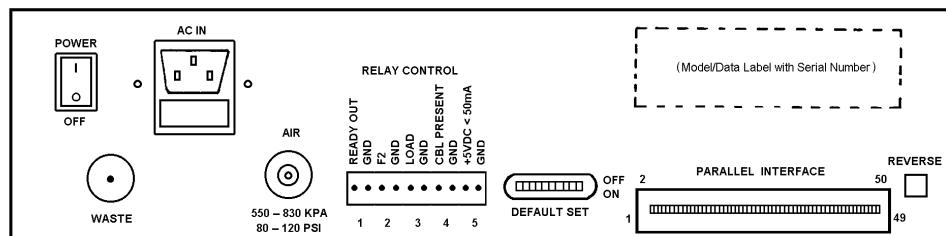
Figure 2-4.   Rear Panel

- **AC IN:** Contains two AC fuses and the power cord connection. Operating voltages from 90 to 265 Vac, 47 to 63 Hz are automatically accommodated.

- **AIR:** Pressurized air to operate the bleed valve enters the AS40 enclosure via this barbed fitting. Use a regulated source of nitrogen or air pressure to provide the required 550 to 830 KPa (80 to 120 psi) pressure.

⚠ **CAUTION**

To avoid contamination and possible deterioration of the pneumatic system, make sure that laboratory compressed air is oil-free, clean, and dry.

- **RELAY CONTROL:** Provides a connection to a controlling device equipped with TTL or contact-closure relays for remote control of the AS40. A Relay Control cable (P/N 047946) is provided in the Ship Kit (see Section D.3).

- **DEFAULT SET:** These switches select the AS40 operating functions in effect at power-up (see Appendix C).

- **PARALLEL INTERFACE:** Provides a connection to controllers equipped with a parallel interface for remote control of the AS40.

NOTE
Dionex controllers do not provide parallel remote control of the AS40. See Appendix E for information about connecting other devices to the PARALLEL INTERFACE.

- **REVERSE:** This button is used only during trouble-shooting, to reverse the motion of sample cassettes under the sampling head when the AS40 is jammed. Read the instructions and cautions in Section 4.7 before using the **REVERSE** button.

2.2 Functional Description

2.2.1 Sampling Mechanism Operating Principles

The AS40 sampling mechanism consists of an input tray, an output tray, and a sampling head (see Figure 2-5). The input tray holds sample cassettes that have been loaded with PolyVials containing sample or rinse. The sampling head delivers sample from the vials to the **Sample Out** port. The output tray holds the cassettes after sampling is complete.
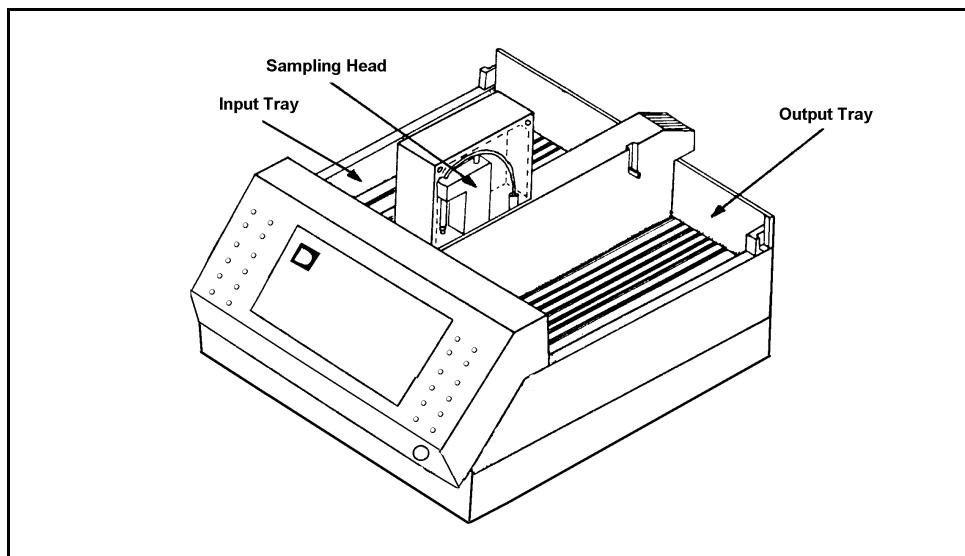
Figure 2-5.   Sampling Mechanism

PolyVials

Disposable plastic PolyVials and caps are available in two sizes: 0.5 mL (P/N 038142) and 5.0 mL (P/N 038141). The socket for the sampling tip is identical on both sizes of caps to allow mating with the tip of the sampler head (see Figure 2-6).

Vial caps perform an important function in sample loading (see "Sampling" on page 2-16) and they also prevent evaporation, contamination, or spills of sample while awaiting use. The optional 20 μm filter traps particulates which might contaminate the analytical system. The PolyVials and caps can be used to load either a sample loop or a concentrator column.
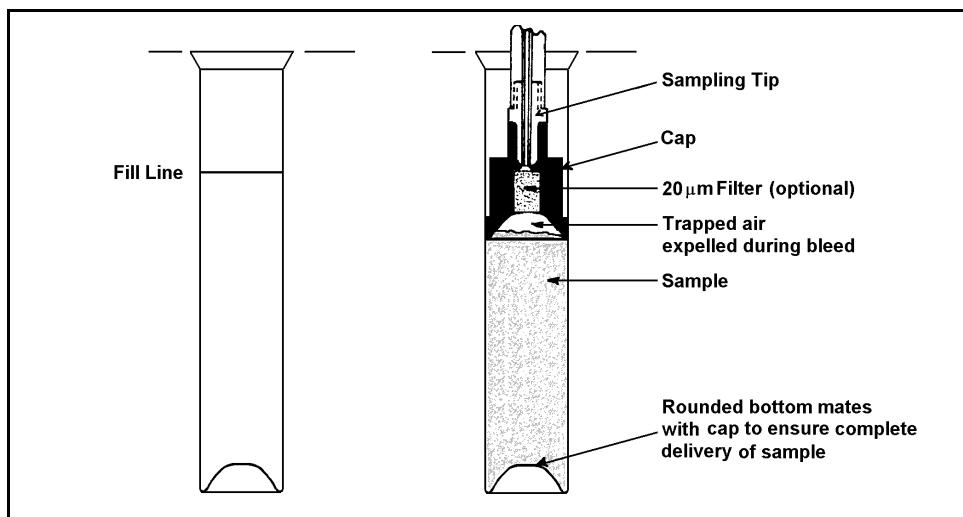
Figure 2-6.   PolyVial Features

Sample and Rinse Vials

PolyVials serve both rinse and sample functions.

- To designate a rinse vial, leave the top one-quarter inch of the cap extended above the lip of the vial.

- To designate a sample, push the cap into the vial until the top is flush with the lip of the vial.

A special tool (P/N 037987), included in the Ship Kit, simplifies inserting the caps. One end of the tool inserts the cap to the proper depth for a rinse, and the other end inserts the cap to the proper depth for a sample.

Sample Cassettes

Two sample cassette models are available: One model (P/N 046031) holds up to eight 0.5 mL PolyVials. The other model (P/N 046032) holds up to six 5.0 mL PolyVials. You can place a total of 11 cassettes, in any combination of the two models, in the input tray.

To remove vials from the cassette, slide them up and out with a thumb or finger placed against the exposed half of the vial.

Vial Positioning for Sampling

Cassettes containing vials are placed in the input tray ahead of a spring-loaded pusher. Molded teeth on the front of the cassette (see Figure 2-7) mesh with the toothed belt on the cassette drive to move the front-most cassette to the right, positioning a vial under the sampling head. In addition, a set of ramps molded into the cassette mates with the sampler mechanism to ensure that the vial stops directly under the sampler tip. Because there is no connection between cassettes and the mechanism, any cassette not under the sampling head can be removed or replaced without interrupting operation.

Vial numbers molded into the top of the cassettes indicate the order in which the vials are sampled. The black dot on one end of each cassette indicates the end of the cassette which feeds into the sampling mechanism first.
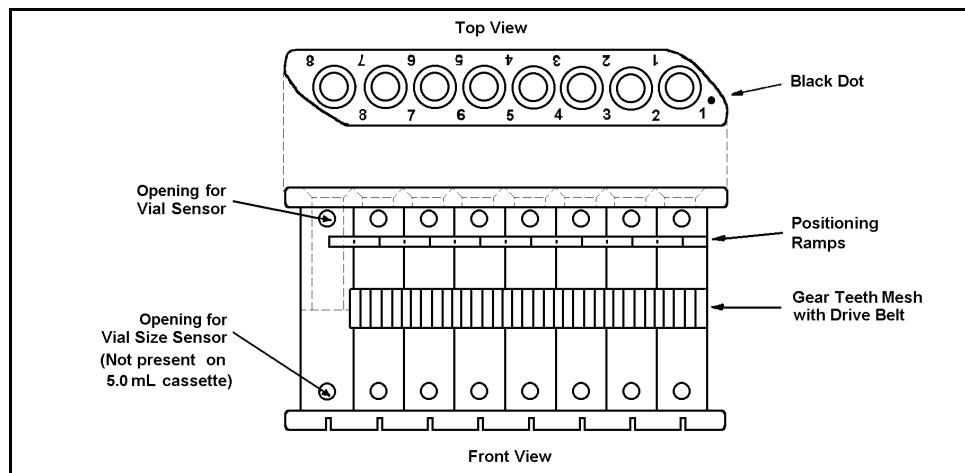
Figure 2-7.   Sample Cassette Features (0.5 mL Model)

Vial Detection

Sensors in the sampling mechanism detect the presence of a vial, the size of the vial, and whether it is a sample or a rinse vial (see Figure 2-8).

To detect the presence of a sample vial under the sampling tip, an infrared light beam shines through the opening in the top of the cassette. When a vial is present, the beam is blocked and a vial is detected. When there is no vial, the beam shines through the opening and strikes the sensor, indicating that no vial is present. The sampler then advances the cassette until a vial is detected.

⚠ IMPORTANT

A cap must be installed in each vial in order for the sampler to operate correctly. A vial with no cap in place will be sensed as an empty position and the sampler will continue searching for a vial.
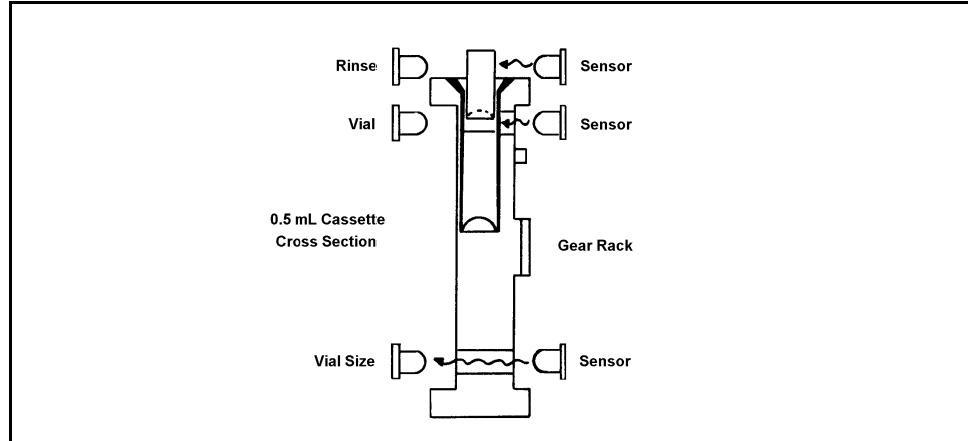
Figure 2-8.   Detecting the Sample Vial

When a vial is detected, a second beam shines through the opening in the bottom of the 0.5 mL cassette and strikes a sensor to indicate the vial size. This opening is not present in the 5.0 mL cassettes. Thus, when no light is detected, the sampler assumes that a 5.0 mL vial is present.

Finally, a third sensor detects whether the vial is a rinse or a sample. If the cap extends above the top of the vial it blocks the beam, indicating a rinse vial. When the cap is flush with the top of the vial the beam is detected by a sensor, indicating a sample vial.

Sampling

The sampling head consists of a motor-driven shaft which moves down to engage the top of the vial cap. As the shaft moves downward, the cap is gradually pushed into the vial, forcing the liquid through the filter (if present) and into the tubing connecting the AS40 to the injection valve. The moving cap acts as a piston to force the liquid from the vial. This allows samples to be loaded without the use of an external sampling pump. The concave bottom of the vial cap traps air, so that it can be expelled with any excess sample above the fill line (see Figure 2-6). In addition, the shape exactly matches the convex bottom of the sample vial so that when the cap is pushed completely into the vial, virtually all of the sample is expelled.

The sampling head speed depends on the setting of the **Loop/Conc** switch on the control panel.

•   When **Loop** is selected, the sampling head moves more quickly. The high speed is used for bleed and rinse operations, as well as for filling sample loops. When loading a sample loop, the flow rate from the vial is approximately 4.0 mL/min (with 5.0 mL vials).

- When **Conc** is selected, the head moves more slowly. The slower speed is used for loading a concentrator column. The sampling head moves more slowly to decrease the amount of backpressure developed when pushing the liquid into the concentrator column, and to increase the concentrating efficiency of the column. The flow rate from the vial to the concentrator is approximately 1.0 mL/min (with 5.0 mL vials).

NOTE
Use the Conc setting to load highly viscous samples through a loop. The slower speed provides more time for viscous material to move through the system.

After the last sample is taken from a vial, the sampling tip retracts from the spent vial. To prevent sample from being pulled back into the vial as the sampling tip is withdrawn, there is a 1.5-minute (90-second) delay between the time the tip stops moving downward and the time it begins to retract to allow the sample to be injected. During this time the **Sampler Load** LED flashes. It takes approximately 15 seconds for the sampling tip to withdraw.

Spent vials, in their cassettes, move into the output tray. When the tray is full, the **Tray Full** LED flashes, and the AS40 stops until additional space is made by removing cassettes.

2.2.2 Bleed Valve Operating Principles

The bleed valve is controlled by the **Bleed On/Off** switch. The valve is isolated in its own compartment and is accessible only from the bottom of the AS40. The air-actuated valve controls the flow path of sample from the vial (see Figure 2-9). When **Bleed Off** is selected, the valve directs sample from the sample vial directly to the **Sample Out** port on the front panel and from there to the injection valve.

When **Bleed On** is selected, the valve automatically directs the excess sample and any air trapped in the sample vial to waste. This ensures the delivery of uniform, reproducible volumes for each injection regardless of the accuracy with which the sample vials are filled (provided that they are filled at least to the fill line). After any excess volume bleeds off, the valve automatically switches to direct the remaining volume to the **Sample Out** port.
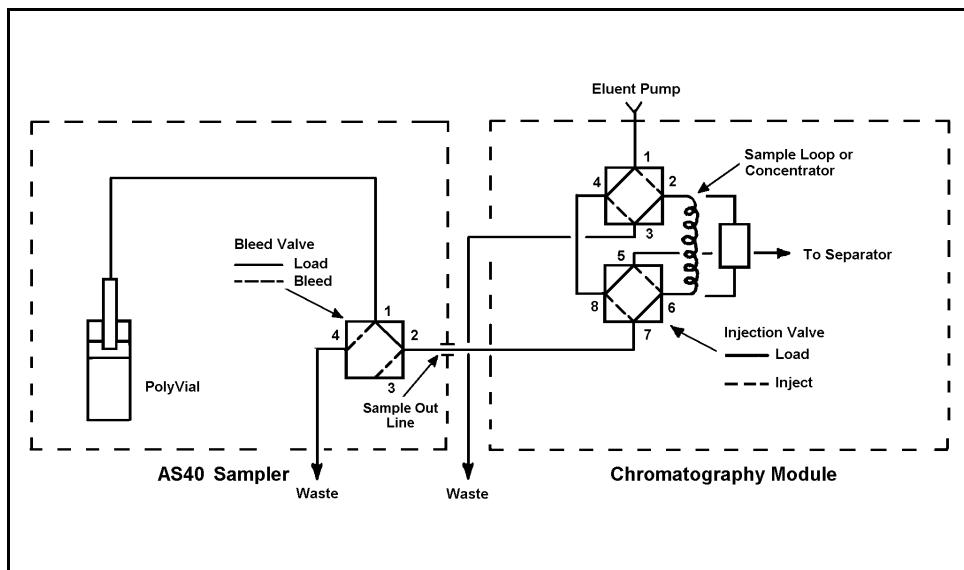
Figure 2-9.   Bleed Valve Flow Schematic

2.2.3 Rinse Cycle Modes

You can intermix sample vials and rinse vials in any order in the cassettes and the AS40 will detect which vial type is currently under the sampling head. There are two modes for running rinse cycles with sample cycles: Rinse After mode (the default), and Rinse Before mode.

- **Rinse After:** If the AS40 detects a rinse vial after loading a sample vial, it automatically runs the rinse. If there are multiple rinse vials, they are run as well. When the next sample vial is detected, the AS40 stops and waits for another Load command (either from the **Load** switch on the front panel or from a Load input relay signal).

- **Rinse Before:** After loading a sample vial, the AS40 waits for another Load command before running the next sample or rinse cycle. When a new Load command occurs and the next vial is a rinse, the AS40 runs the rinse, and any subsequent rinses, before automatically loading the next sample.

Use DIP switch #7 on the **DEFAULT SET** switches to select the rinse mode (see Appendix C). The following sections describe the operating sequence for each mode in more detail.

Rinse After Mode

1. After the last load from a sample vial is complete, the AS40 waits for approximately 90 seconds, the sampling head withdraws, and the cassette advances to the next vial.

2. If this is a rinse vial (i.e., the top of the cap extends above the top of the vial), the sampler automatically performs the rinse and advances to the next vial.

3. If the next vial is a rinse, the sampler performs the rinse and advances to the next vial. This continues until the AS40 detects a sample vial.

4. When the AS40 detects a sample vial, it stops and waits for the next Load command.

See Figure 2-10 for a typical example sampling sequence in the Rinse After mode.

Rinse Before Mode

1. After the last load from a sample vial is complete, the AS40 waits for approximately 90 seconds, the sampling head withdraws, and the cassette advances to the next vial.

2. Regardless of whether the vial is a rinse or a sample vial, the sampler stops and waits for the next Load command.

3. After the Load command, if the next vial is a rinse, the sampler performs the rinse and advances to the next vial. If it is a rinse vial, the rinse is performed. This continues until the AS40 detects a sample vial.

4. When the AS40 detects a sample vial, it performs the sample load and then waits for the next Load command.

See Figure 2-11 for a typical example sampling sequence in the Rinse Before mode.

Sampler Sequence (One Sample per Vial, Bleed ON, Proportional, Rinse After)

(1)

Sampler
● Ready
○ Bleed
○ Load
○ Search

Load command starts
Bleed function.
Ready Out relay toggles
to Not Ready.

(2)

Sampler
○ Ready
● Bleed
○ Load
○ Search

Bleed function completed -
10-second pause.

(3)

Sampler
○ Ready
○ Bleed
● Load
○ Search

Sample delivered to
injection valve.

(4)

Sampler
○ Ready
○ Bleed
● Load (blinking)
○ Search

Sample loading completed -
Ready Out relay toggles to Ready.
Sampler pauses 90-seconds
to allow injection valve to be
switched from load to inject.

(5)

Sampler
○ Ready
○ Bleed
○ Load
● Search

After 90-second pause,
probe withdraws and cassette
moves next vial under sample
probe.

(6)

Sampler
○ Ready
○ Bleed
● Load
○ Search

Rinse vial detected and
rinse delivered.
Note: Ready Out relay
does NOT toggle.

(7)

Sampler
○ Ready
○ Bleed
○ Load
● Search

Rinse completed - probe
withdraws and next vial
moves under sample probe.

(8)

Sampler
● Ready
○ Bleed
○ Load
○ Search

Sample vial detected - Sampler
waits for Load command to
start sequence again.

Key

S R S 〈○○○○○○〉 = Top view of cassette
↑ = Sample probe position
S = Sample Vial
R = Rinse Vial

Figure 2-10.   Sampling Sequence: Rinse After Mode

Sampler Sequence (Two Samples per Vial, Bleed ON, Constant, Rinse Before, Concentrator)

(1)
Sampler
● Ready
○ Bleed
○ Load
○ Search

Rinse vial detected - Load
command starts rinse.
Ready Out relay toggles
to Not Ready.

(2)
Sampler
○ Ready
○ Bleed
● Load
○ Search

Rinse delivered.

(3)
Sampler
○ Ready
○ Bleed
○ Load
● Search

Next vial moves
under sample probe.
Sample vial detected.

(4)
Sampler
○ Ready
● Bleed
○ Load
○ Search

Bleed function completed -
10-second pause.

(5)
Sampler
○ Ready
○ Bleed
● Load
○ Search

Sample delivered to
concentrator column.

(6)
Sampler
● Ready
○ Bleed
○ Load
○ Search

Sample loading completed -
Ready Out relay toggles to
Ready. Sampler waits
for next Load command.

(7)
Sampler
○ Ready
○ Bleed
● Load
○ Search

Load command starts load
cycle. Ready Out relay
toggles to Not Ready.
Sample delivered to
concentrator column.

(8)
Sampler
○ Ready
○ Bleed
● Load (blinking)
○ Search

Sample loading completed -
Ready Out relay toggles to
Ready. Sampler pauses
90-seconds to allow
switching of injection valve
from load to inject.

(9)
Sampler
○ Ready
○ Bleed
○ Load
● Search

After 90-second pause,
probe withdraws and
cassette moves next vial
under sample probe.

(10)
Sampler
● Ready
○ Bleed
○ Load
○ Search

Sample vial detected - Sampler
waits for Load command to
start sequence again.

Key

S R S 〈○○○○○○〉 = Top view of
cassette

↑ = Sample probe
position

S = Sample Vial

R = Rinse Vial

Figure 2-11.   Sampling Sequence: Rinse Before Mode

3 • Operation and Maintenance

3.1 Preparing the Sample Vials

Although the sample vials and caps are washed before packaging, Dionex recommends thoroughly rinsing all PolyVials and caps with deionized water before filling to remove any traces of dust. Dionex DOES NOT recommend reusing vials or caps and does not guarantee their cleanness or proper operation if reused.

When performing trace-level analyses, use the procedure in Section 3.1.1 to clean the vials. To clean the caps, use either the procedure in Section 3.1.2 (for caps without filters), or Section 3.1.3 (for caps with filters).

Extreme care must be used in cleaning to prevent the introduction of contaminants onto the vials and filter caps. Use only ultra-pure (18 megaohm conductance), deionized water for the following cleaning procedures.

IMPORTANT

3.1.1 Clean the Vials

1. Rinse the vials 10 times with a jet of deionized water.

2. Place the rinsed vials in a sample cassette and fill them to the top with deionized water. Do not touch the tops or interiors of the vials with your fingers.

3. Allow the vials to soak for a minimum of 24 hours (48 hours if possible).

4. When you are ready to use a vial, empty it, and then rinse it 10 times with a jet of deionized water. Shake out any excess water and then rinse the vial twice with aliquots of sample.

3.1.2 Clean the Caps

Use the following procedure to clean caps without filters.

⚠️ **IMPORTANT**

For trace analyses, use caps without filters to avoid introducing contaminants from the filter.

1. Place a large number of caps into a clean 4-liter polyethylene container. Fill the container three-quarter full with deionized water and cap.

2. For trace analyses, allow the vials to soak for a minimum of 24 hours in deionized water. This allows time for contaminants to leach out.

3. Vigorously agitate the container for 30 seconds. Drain off the water. Repeat four times.

4. Refill the container to the top with deionized water and cap.

5. When you are ready to use a cap, use forceps to remove one from the container. Shake off any excess water and install the cap in the vial.

3.1.3 Clean the Filter Caps

Use the following procedure to clean caps with filters.

1. Place a large number of caps into a clean 4-liter polyethylene container. Fill the container three-quarter full with deionized water and cap.

2. Vigorously agitate the container for 30 seconds; drain off the water.

3. Empty the caps onto a clean surface.

4. Using a clean syringe, force 50 cc of deionized water through the filter frit from the top of the cap. Be sure not to dislodge the filter frit.

5. Place the rinsed caps into a clean 4-liter polyethylene container. Fill the container three-quarter full with deionized water and cap.

6. Vigorously agitate the container for 30 seconds. Drain off the water. Repeat four times.

7. Refill the container to the top with deionized water and cap.

8. When you are ready to use a cap, use forceps to remove a cap from the container. Shake off any excess water and install the cap in the vial.

3.1.4 Fill the Vials

A cap must be installed in each vial in order for the sampler to operate correctly. A vial without a cap will be sensed as an empty position and the sampler will continue searching for a vial.

IMPORTANT

1. After rinsing, place the empty vials into a sample cassette. If you are doing trace-level analyses, use forceps to handle the vials and avoid touching any surface that will be wetted with sample.

2. Fill the vials with either sample or rinse solution to the fill line marked on the vial body (see Figure 2-6). (Using a pipette simplifies filling the 0.5 mL vials.) After filling, inspect the vials to make sure no air bubbles are trapped at the bottom.

NOTE
Do not underfill the vials. This may result in insufficient sample being loaded for the first injection.

3. Inspect each cap for damage (nicks, scratches, etc.). Install the caps in the vials. Again, if doing trace-level analyses, use forceps when handling the caps to prevent contamination and avoid touching any surface that will be wetted by sample.

   An insertion tool (P/N 037987) provided in the Ship Kit helps prevent contamination of the cap socket and ensures that the cap is inserted to the proper depth. One end of the tool inserts the cap to the proper depth for a sample (i.e., the top of the cap is flush with the lip of the vial); the other end inserts the cap to the proper depth for a rinse (i.e., the top of the cap extends one-quarter inch above the lip of the vial).

4. After pushing the cap into the vial, shake off any liquid that has been forced into the cap socket.

NOTE
Do not use laboratory wipes to blot liquid from the cap sockets; wipes leave fibers which can accumulate in the liquid flow path and cause increased backpressure.

3.2 Load the Sample Cassettes

1. Press the **Hold/Run** switch to set the sampler to **Hold**.

2. Slide the spring-loaded cassette pusher back and hold it. Place the filled cassettes into the tray, with the **black dots to the right**. The tray holds up to 11 sample cassettes in any combination of the two models (0.5 mL size or 5.0 mL size).

> **NOTE**
> **Vials move under the sample head from right to left. When cassettes are placed correctly in the input tray, vial number 1 (labeled on the top of the cassette) is closest to the sample head.**

3. After all the cassettes are in place, allow the pusher to slide forward into place against the last cassette.

> **NOTE**
> **If the sampler is not in Hold when you release the pusher, the first sample cassette will automatically feed into the sampling mechanism, positioning the first vial under the sampling head.**

3.3 Select the Operating Parameters

When you power-up the AS40, the **Setup** switches on the front panel indicate the default operating parameters (see Section B.3). If necessary, use the **Setup** switches to select new operating parameters.

If you change the operating parameters after pressing **Run**, the new settings will take effect only after sampling from the current vial (using the old settings) is complete. If sampling from the current vial has not yet started, the changes take effect immediately.

The following list summarizes the functions of the **Setup** switches. See Section 2.1.2 for details about each switch.

- **Inj Type (Loop/Conc):** Determines whether the sample will be delivered to a sample loop or to a concentrator column.

- **Inj Mode (Prop/Cnst)**: Selects either proportional or constant sample delivery.

- **Bleed (Off/On)**: Determines whether trapped air and excess liquid is sent to waste (On) or pushed through the sample loop (Off).

- **Inj/Vial**: Selects 1, 2, or 3 injections per vial.

When loading a concentrator in constant mode, make sure that Bleed is On. Operating with Bleed Off will result in the volume of the first sample being larger than the volume of subsequent samples from the vial.

IMPORTANT

If you typically run with operating parameters that are different from the default settings, you can change the default parameters with the **DEFAULT SET** switches on the rear panel. See Appendix C for details.

3.4 Manual Operation

After selecting the operating parameters, you are ready to begin using the AS40 to load samples into your chromatography system for analysis.

NOTE
See Appendix D for information about remote operation of the AS40 using relay control.

⚠ **IMPORTANT**

To avoid trapping dust particles in the vial caps, always operate the AS40 with the cover on.

3.4.1 Start Sampling Cycle

1. Before beginning manual operation (i.e., pressing **Run**), make sure that the injection valve connected to the AS40 **Sample Out** port is set to **Load**. If the injection valve is set to **Inject**, sample from the AS40 will not fill the sample loop or concentrator column.

⚠ **IMPORTANT**

Attempting to load sample when the injection valve is set to Inject can dead-head the AS40, causing it to stop and go to Hold (see Section 4.4). This is more likely to occur with the 3-way valve used in the DX-100 and 4500 i Series, than with the Rheodyne injection valve used in DX-300 and DX 500 modules.

2. Select **Local** operation and verify that the sampler status indicates **Ready**.

3. Set the **Hold/Run** switch to **Run**. The sampler will automatically advance the first cassette until it detects a vial under the sampling head. The next response depends upon the selected rinse mode. See Section 2.2.3 for a description of the rinse modes.

In the Rinse After mode, if the first vial is a sample, the sampling head remains poised above the vial until you press **Load**. If the first vial is a rinse, the AS40 performs the rinse and any subsequent rinses until it detects a sample vial. It then waits for you to press **Load**.

In the Rinse Before mode, the sampling head remains poised above the vial until you press **Load**, regardless of the type of vial detected.

4. Press **Load** to start the sampling cycle. Sample is delivered through the **Sample Out** port to the injection valve in accordance with the selected operating parameters. If **Bleed On** is selected, the sampler executes the bleed upon receipt of a Load command, then, after a short pause, loads the sample.

   When delivering sample to a concentrator column, especially against high backpressures, the stepper motor that drives the sampling head will produce a ''whining'' sound. This is normal.

⚠ **IMPORTANT**

Do not attempt to load sample against backpressure greater than 690 KPa (100 psi). Sampling accuracy is not guaranteed when the pressure through the concentrator (or other sample-holding device) exceeds 690 KPa.

5. If another sample is being delivered from the vial, press **Load** again. Repeat if a third sample is being delivered.

6. After the last sample in a vial is delivered, the sampler pauses for 90-seconds to allow the sample to be injected. It then retracts the sampling tip from the vial and advances to the next vial. The pause after the last sample in the vial prevents sample from being drawn back into the vial as the sampling tip is withdrawn. During the pause, the **Load** LED blinks on and off, indicating the last injection in the vial. **To assure accurate sample delivery, you MUST inject the sample during this pause**.

3.4.2 Interrupting Operation

You can press the **Hold/Run** button at any time during the
operation sequence to activate **Hold** and immediately ''freeze''
sampler operation. Pressing the switch again returns to **Run**
and causes the sampler to resume operation from the point of
interruption.

If you change any of the **Setup** switch settings while in **Hold**,
the sampler will complete the entire vial currently being
sampled, using the old settings, and begin using the new
settings with the next vial. If sampling from the current vial
had not yet started when the changes were made, the new
settings go into effect immediately. The new settings are
displayed on the front panel.

3.4.3 Skipping a Vial

The **Skip** button allows you to omit one or more vials. It
operates only when the sampler is in **Hold**. When **Skip** is
pressed, the sampler head automatically retracts from the vial
and advances to the next vial. Each time you press **Skip**, the
cassette advances one vial.

3.5 Routine Maintenance

- Periodically check the input and output trays and wipe up any spills.

- Periodically rinse off any dried spills.

- Periodically perform the following cleaning procedure:

⚠ **CAUTION** **Turn off the power on the AS40 before performing the following procedure. This prevents the sampling mechanism from being accidentally triggered and possibly injuring your hands.**

1. Turn off the AS40 power.

2. Clean the ''throat'' (the cassette passage under the sampling head) with a damp cloth and then dry it.

4 • Troubleshooting

The chapter is intended to help you isolate and solve minor problems that may arise while operating the sampler. To use the guide, refer to the section that discusses the problem you are having and consider the possible causes. If you are unable to solve the problem on your own, call the nearest Dionex Regional Service Office for assistance.

4.1 Poor Peak Reproducibility

- **Insufficient sample in the sample vial**

  Always be sure to fill each vial with enough sample to reach the fill line (see Figure 2-6). Underfilling a vial will result in a smaller than normal volume for the first injection and increase the risk of injecting air.

  If the problem continues, overfill the vial slightly. After pushing the cap into the vial, shake out any excess liquid from the fill cap socket.

- **Bleed function not turned on when loading a concentrator**

  When loading concentrator columns, always be sure **Bleed On** is selected. This ensures that a uniform sample volume is delivered to the concentrator, regardless of how accurately the vials are filled, and also prevents introducing air onto the concentrator column. It does not, however, compensate for underfilling a sample vial.

- **Injection not made during the 90-second pause before the sample tip is retracted from the sample**

  1. Always switch the injection valve to **Inject** before the end of the pause following the last sample in the vial. If you do not, the probe may create a vacuum when it withdraws from the vial and remove some or all of the sample from the sample loop.

2. Make sure that the injection valve is in **Load** whenever a Load or Rinse cycle is in progress.

3. During remote operation, use the Ready Out relay to trigger your Timed Events method and switch the injection valve to **Inject**. The Ready Out relay toggles when the load is completed and injection should occur (see Section D.1.2), or use the time sequences in Section D.2 when setting up your timed events. If necessary, use separate timed events tables for sample vials and rinse vials.

- **Liquid leak**

  1. Do not reuse caps or sample vials.

  2. Inspect the lip and socket of each new cap for irregularities, nicks, scratches, or other damage that might interfere with sealing as the cap is pushed into the vial.

  3. Make sure that the sampling tip is not damaged. Replace the tip if it is scratched, damaged, plugged, or restricted in any way (see Section 5.2).

  4. Inspect the connections to the **Sample Out** port and the bleed valve (see Section 4.8). Make sure that all fittings are securely tightened.

4.2 Unexpected or Extraneous Peaks Detected

- **Sample contaminated**

  1. Never reuse sample vials and caps.

  2. Always rinse new PolyVials and caps with deionized water before filling, especially when doing trace-level analyses (see Section 3.1).

  3. Include a rinse vial between samples, especially if samples are very different from each other.

4. During remote operation, use either the Ready Out relay to trigger your Timed Events method and switch the injection valve to **Inject** (see Section D.1.2), or use the time sequences in Section D.2 when setting up your timed events. If necessary, use separate timed events tables for sample vials and rinse vials.

4.3 Sample Not Loaded

- **Load not triggered**

  1. Make sure the AS40 is in **Run**, not **Hold**.

  2. During remote operation, use either the Ready Out relay to trigger your Timed Events method and switch the injection valve to **Inject** (see Section D.1.2), or use the time sequences in Section D.2 when setting up your timed events. If necessary, use separate timed events tables for sample vials and rinse vials.

- **Vial type incorrectly sensed**

  1. Make sure that a cap is installed in each PolyVial. Vials without caps are sensed as empty positions (see Section 2.2.1).

  2. Make sure that no liquid is inside the cap socket after inserting the cap into the vial.

  3. For a rinse, make sure that the top of the cap extends one-quarter inch above the top of the vial. For a sample, push the cap into the vial until it is flush with the top of the vial. Use the insertion tool provided in the Ship Kit to install the caps correctly. One end of the tool inserts the cap to the proper depth for a sample; the other end inserts the cap to the proper depth for a rinse.

  4. The vial detection sensors (see Section 2.2.1) are blocked, dirty, or faulty. Inspect and clean.

4.4 Sampler Stops Operating, Goes to Hold

- **Cassette output tray is full**

  1. Remove spent cassettes. The output tray will only hold 11 cassettes.

  2. Press **Run** to resume operation.

  3. Make sure that no cassettes are pushed to the back of the output tray, thus tripping the TRAY/FULL sensor (the lever on the left rear side of the output tray).

- **Cassette input tray is empty**

  1. Place additional cassettes in the input tray.

  2. Press **Run** to resume operation.

- **Sampler is "dead-headed" (i.e., attempting to load against a dead end in the injection valve)**

  1. Make sure that the injection valve is in the **Load** position whenever a Load or Rinse cycle is in progress (see Section 3.4).

  2. During remote operation, use the Ready Out relay to trigger your Timed Events method and switch the injection valve to **Inject** (see Section D.1.2). Another method is to use the time sequences in Section D.2 when setting up your timed events. If necessary, use separate timed events tables for sample vials and rinse vials.

  3. If you are using a concentrator column, replace the slider in a three-way injection valve with a four-way slider (P/N 030338) (see Section 5.3). Use of this 4-way slider provides an alternate flow path through the valve when it is in the inject position, thus preventing dead-heading of the sampler during a rinse.

  4. After eliminating the dead-head, press **Run** to resume operation.

- **Sample loading backpressure exceeds 690 KPa (100 psi)**

    1. If you are using a concentrator column, be sure that you set **Inj Type** to **Conc**.

    2. If you selected the correct **Inj Type**, refer to Section 4.5 to isolate and eliminate the source of backpressure.

- **Sampler is jammed**

    In the event of a jam, the sampler will automatically go to the **Hold** state and wait until the jam is eliminated (see Section 4.7).

4.5 Excessive Backpressure

Backpressure greater than 690 KPa (100 psi) automatically causes the sampler to go to the Hold state and wait.

- **Injection valve in wrong position**

    1. Make sure the injection valve is set to **Load** before beginning either a rinse cycle or a load cycle. If you attempt a rinse or a load when the valve is in **Inject**, the sampler may be loading against a dead-end (if it is a three-way valve). This will result in excessive backpressure on the sampler tip, causing the sampler to stop.

    2. Press the **Hold/Run** switch to resume operation.

- **Wrong injection type selected**

  1. If you are using a concentrator column, be sure that you set **Inj Type** to **Conc**. This causes the sampling head to move at a slower rate, thus preventing the build-up of excessive backpressure and improving the sample concentrating efficiency.

  2. After eliminating the source of the backpressure, press the **Hold/Run** switch to resume operation.

- **Sampler dead-heading during rinse**

  1. Use the Rinse Before mode (see Section 2.2.3).

  2. If you are using a concentrator column and you cannot return the injection valve to the load position before a rinse cycle begins, replace the slider in the three-way injection valve with a four-way slider (P/N 030338) (see Section 5.3). Use of this four-way slider provides an alternate flow path through the valve when it is in the inject position, thus preventing dead-heading of the sampler during a rinse.

  3. After eliminating the source of the backpressure, press the **Hold/Run** switch to resume operation.

- **Restriction in the liquid flow path**

  1. If the high backpressure persists, follow the liquid flow path backward from the injection valve, through the sampler bleed valve, loosening fittings and reconnecting them until you locate the restriction.

     If the restriction is in the bleed valve, disassemble the valve and clean the slider (see Section 5.3). Inspect the port faces and replace them if necessary (see Section 5.4).

     If the restriction is in the sampling tip (or the tubing between the bleed valve and the sampling tip), replace the sampling tip (Section 5.2).

2. After eliminating the source of the backpressure, press the **Hold/Run** switch to resume operation.

- **Sample is viscous**

  Use **Conc** mode to load at a slower rate (see Section 2.2.1).

4.6 Sample Cassettes Do Not Advance

- **Sample cassettes improperly loaded into sampler input tray**

  Place cassettes in the input tray, with their black dots to the right.

- **Obstruction in the sample cassette**

  1. Make sure that the caps on rinse vials do not extend more than ¼-inch above the top of the vial. Caps that extend too far above the edge of the vial may not clear the opening into the cassette guide, causing the sample cassettes to jam. Use the insertion tool to insert caps to the proper depth in the vials.

  2. Make sure that the vials are pushed completely into the sample cassettes. If a vial (not the cap) extends above the top edge of the cassette, it may not clear the entrance to the cassette guide, causing the cassette to jam.

- **The TRAY-FULL sensor is triggered**

  1. Make sure that no cassettes are pushed to the back of the output tray, thus tripping the TRAY/FULL sensor (the lever on the left rear side of the output tray).

  2. Remove spent cassettes from the output tray.

  3. Power the AS40 off and then on to reset the sensor.

- **Sample cassette is damaged**

  Inspect the sample cassettes to make sure that the gear teeth that mate with the cassette drive belt are not damaged. Discard damaged cassettes.

- **Sample cassette fails to advance when performing a skip function**

  1. The sampler must be in **Hold** to perform a skip operation.

  2. The cassette pusher moves to the forward-most position, causing the EMPTY sensor to stop sampler operation.

  3. Move the cassette pusher back to remove the EMPTY condition, then press **Skip**.

4.7 Sampler Jammed

In the event of a jam, the sampler will automatically go to the Hold state and wait.

- **Sample cassette is jammed**

  1. Remove all sample cassettes from the input tray. Failure to do so will cause the cassettes to jam during the next step.

!\
CAUTION

The sample cassettes are shaped to move easily in the forward direction. It is important to remove all sample cassettes from the input tray before using reverse, to prevent jamming.

  2. Make sure the sampler is in **Hold**.

3. Reach around the left side of the sampler and locate the Reverse button on the rear panel, near the **PARALLEL INTERFACE** connector. Press the button and hold it down. The sampler will raise the head if it is down, and then move the jammed cassette backward until it clears the cassette guide. **BE PATIENT!** The unjamming routine operates slowly, to avoid damaging the sampling mechanism.

4. Release the button.

5. Eliminate the cause of the jam, then press the **Hold/Run** switch to resume operation.

6. Make sure that the caps on rinse vials do not extend more than 1/4-inch above the top of the vial. Caps that extend too far above the edge of the vial may not clear the opening into the cassette guide, causing the sample cassettes to jam. Use the insertion tool to insert caps to the proper depth in the vials.

7. Make sure that the PolyVials are pushed completely into the sample cassettes. If a vial (not the cap) extends above the top edge of the cassette, it may not clear the entrance to the cassette guide, causing the cassette to jam.

8. Make sure the teeth on the cassette drive belt engage the sample cassette. A small spring at the entrance to the cassette guide normally retards the cassettes enough that they slip backward on the drive belt and engage the teeth. If this fails to happen, the cassette will continue moving under the sampling head and may jam.

- **Sample vial fails to stop directly under the sampling head, causing the sampling tip to jam as it enters the socket on the cap or to strike the sample cassette instead of engaging the socket on the cap.**

    1. Press **Hold**, then use **Skip** to raise the sampling tip directly under the sampling head and advance to the next vial. Inspect the sampling tip for damage and replace it if necessary (see Section 5.2).

    2. Return to **Run** and resume operation.

    3. If the problem persists, call your Dionex Customer Satisfaction Representative.

- **The sampling tip jams as it is being withdrawn**

    1. Remove all sample cassettes from the input tray. Failure to do so will cause the cassettes to jam during the next step.

![CAUTION triangle symbol] **The sample cassettes are shaped to move easily in the forward direction. It is important to remove all sample cassettes from the input tray before using reverse, to prevent jamming.**

CAUTION

    2. Make sure the sampler is in **Hold**.

    3. Reach around the left side of the sampler and locate the Reverse button near the **PARALLEL INTERFACE** connector on the rear panel. Press the button and hold it down. The sampler will attempt to raise the head. If it fails, the cassette drive will begin a series of reverse/forward motions to free the tip, then again attempt to raise the head. When the tip is free, the cassette drive will reverse until the jammed cassette moves backward away from the cassette guide. **BE PATIENT!** The unjamming routine operates slowly to avoid damaging the mechanism.

    4. Release the button.

5. Eliminate the cause of the jam, then press the **Hold/Run** switch to resume operation.

6. If the sampler continues to jam, call your Dionex Customer Satisfaction Representative.

4.8 Liquid Leaks

• **Old, previously-used caps or sample vials**

Do not reuse caps or sample vials.

• **Loose or damaged fitting connection(s) to the bleed valve**

1. The bleed valve is located on the front right corner of the sampler chassis. It is accessible only from the bottom of the AS40. To reach the valve, place the AS40 on its left side, exposing the valve compartment. Remove the valve from its mounting clips and inspect the valve for loose fittings. Tighten any loose fittings fingertight, then an additional one-eighth turn. **Do not overtighten!**

2. If tightening a fitting does not stop the leak, disconnect the fitting from the valve and then reconnect it. Occasionally, fittings stop leaking if simply disconnected and reconnected. If the leak persists, replace the fitting (see Section 5.1).

3. If the leak persists after replacing the fitting, ensure that the valve pressure bolts (see Figure 5-3) are evenly tight (80 to 100 in-oz). See Section 5.4 if tightening the pressure bolts does not stop the leak.

⚠
CAUTION

Overtightening may break the pressure bolt off in the valve body.

4.9 Air Leaks

Air leaks are normally audible. A short burst of air is normal when the valve actuates. A continuous air leak may cause the bleed valve to operate sluggishly and frequently results in excessive air consumption. Use a very dilute soap solution to help locate air leaks.

- **Loose air connection to the bleed valve**

    1. Remove all cassettes from the input and output trays.

    2. Locate the **DEFAULT SET** switches on the rear panel and set switch #10 to the Test position (see Figure C-1). This allows the bleed valve to be activated manually, using the **Bleed Off/On** switch on the front panel.

    3. Place the sampler on its left side, exposing the bleed valve in the right front corner of the sampler chassis. The bleed valve is accessible only from the bottom of the sampler.

    4. Remove the valve from its mounting clip.

    5. Make sure that the air tubing is pushed completely over the barbed fitting on the valve cap on each end of the valve.

    6. Make sure that the barbed fittings on each end of the valve (see Figure 5-3) are tight. If they are not, carefully tighten them with an open end wrench. **Do not overtighten; overtightening may damage the threads on the valve cap or barb.**

    7. If a fitting is tight and still leaks, replace the fitting (P/N 038649).

    8. Reset **DEFAULT SET** switch #10 to the Run position. The sampler is ready to use.

- **Bleed valve air operator improperly seated**

  1. Make sure that the air operators on each end of the valve are seated by activating the **Bleed Off/On** switch several times. If the leak persists, remake the seal (see Section 5.5).

  2. Reset **DEFAULT SET** switch #10 to the Run position. The sampler is ready to use.

- **Internal air leak**

  If the bleed valve itself is not the source of the air leak, contact your Dionex Customer Satisfaction Representative for assistance. The internal components of the AS40, including the solenoid valves used to control the bleed valve, are not customer-serviceable.

⚠
CAUTION
High voltage circuitry and static sensitive components inside chassis. DO NOT open the chassis.

5 • Service

This section describes service procedures for the AS40 Automated Sampler. These are not required very often, but some wear of the fittings and tubing is to be expected during the life of the sampler. When ordering replacement parts, please include the model and serial number of your sampler along with the part numbers and, where applicable, the revision number of the items you are ordering.

None of the electronic components, including the solenoid valves that control the bleed valve, are customer-serviceable. Any repairs involving the electronic components must be done at a Dionex Regional Office, as directed in the Standard Warranty Statement.

5.1 Replacing Fittings

A damaged fitting may result in a leak which cannot be stopped by tightening the fitting. Sample volume reproducibility may be poor. Two types of fitting are used on the AS40:

- A gripper fitting is used to connect the 1.55-mm (1/16-in) OD sample tip tube to the bleed valve. See Section 5.1.1 for installation instructions.

- Ferrule fittings are used for all other connections. Instructions for installing ferrule fittings are found in *Installation of Dionex Ferrule Fittings* (Document No. 034213).

5.1.1 Installation for 1.55-mm (1/16-in) OD Tubing

Install the gripper fitting used to connect the sample tip tube to the bleed valve as follows:

1. Disconnect the fitting and slide it up the tube, away from the gripper. Use a sharp razor blade to cut the old gripper off the tubing. If cutting off the flare makes the tubing too short to reach the destination, prepare a new piece of tubing.

2. Inspect the fitting and replace it if damage makes it unusable (P/N 037626).

3. Use the razor blade to taper the tubing to a long narrow point.

4. Slide a new gripper (P/N 030509), stainless steel side first, over the tapered end of the tubing. Grasp the emerging end of the tubing with pliers and pull the fitting and gripper onto the full diameter of the tubing (Figure 5-1).

5. Rotate the gripper several turns on the tubing to seat the internal barbs.

6. Use a sharp razor blade to carefully trim the excess tubing flush with the face of gripper. **Be careful not to nick the sealing surface.**

7. The fitting is ready for use. Tighten fittings fingertight, then make an additional one-eighth turn. Tighten further only if leaks are observed. **DO NOT OVERTIGHTEN!**
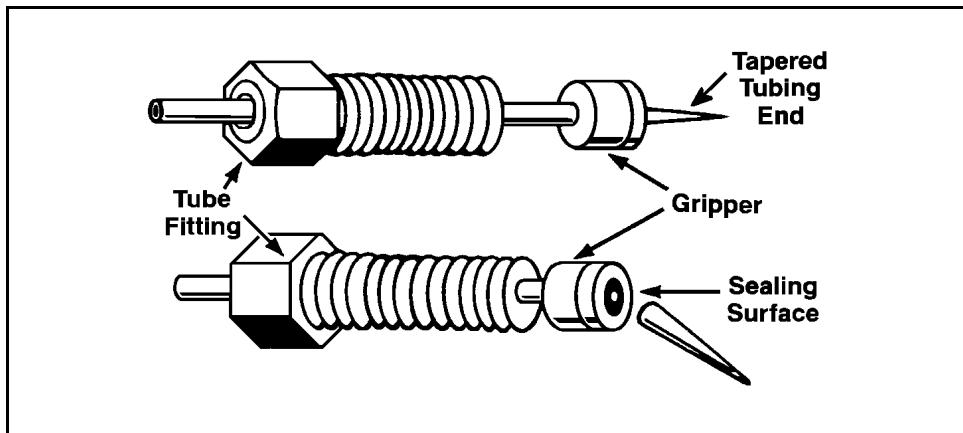

Figure 5-1.   Installing a Tube Fitting

5.2 Replacing the Sampling Tip

A scratched or otherwise damaged sampling tip may result in poor transfer of liquid from the sample vial to the injection valve. Damage to the tubing between the tip and the bleed valve may result in liquid leaks. If you replace the sampling tip, you must also replace the tubing between the tip and the bleed valve.

The ASM/AS40 Sample Tip Replacement Kit (P/N 040835), available from Dionex, provides all of the components required to replace the sampling tip and the tubing between the tip and the injection valve.

1. With the AS40 in **Hold**, press **Skip** to retract the sampling tip to its fully up position.

2. Turn off the AS40 Power and remove all cassettes from the input and output trays.

3. Place the sampler on its left side, exposing the bleed valve in the right front corner of the sampler chassis. The bleed valve is accessible only from the bottom of sampler. Remove the valve from its mounting clip for easier access to the fittings.

4. Disconnect the sample tube from port 1 of the bleed valve (see Figure 5-3).

5. Remove the tube gripper and fitting from the tube. Save the fitting, but discard the gripper.

6. Return the sampler to its upright position.

7. Remove the two screws from the plastic cover on the right side of the sample head cover (as seen from the front of the sampler) and remove the cover. Locate the set screw in the sampling head mechanism (see Figure 5-2) and loosen it until you can slide the shaft down and to the right, out of the mechanism.

8. Unscrew the plastic tip from the shaft. Pull the tubing that connects the sampling tip to the bleed valve through the shaft and out. Discard the plastic tip and the tubing.
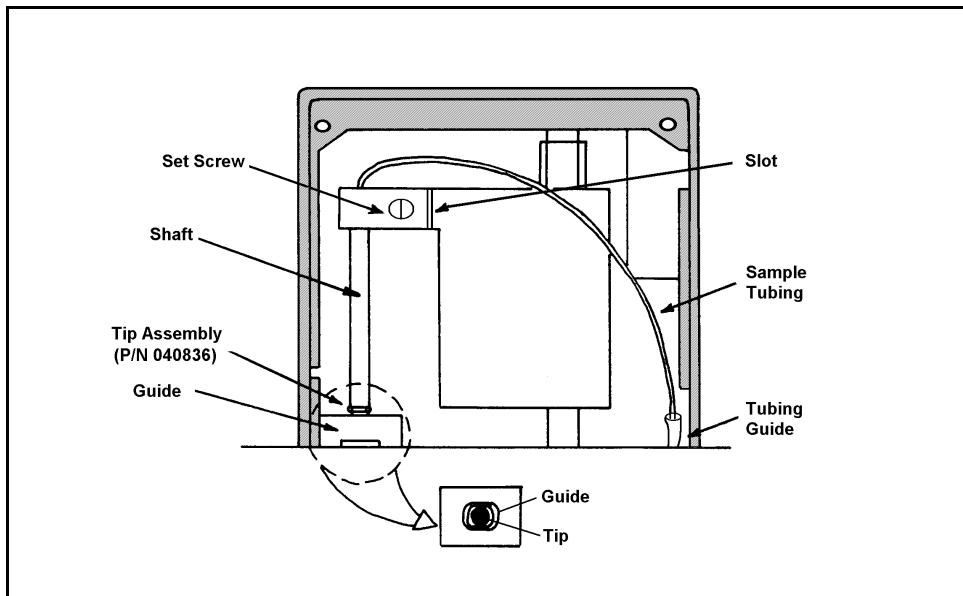
Figure 5-2. Replacing the Sampling Tip Assembly

9. Locate the sampling tip assembly (P/N 040836) in the kit. This assembly consists of a length of tubing with a new sampling tip installed on one end. Use an indelible pen to mark the tubing approximately 60 cm (24 inches) from the end of the sampling tip. The installed length of the tube between the end of the sampling tip and the bleed valve must be approximately 60 cm (24 inches).

10. Thread the free end of the tubing up through the sampling shaft and screw the tip into place on the shaft.

11. Continue threading the free end of the tubing up through the sampling head mechanism and slide the sampling shaft into place. Align the flat sides of the sampling tip so that they fit through the oval hole in the guide (see Figure 5-2 inset). Make sure that the shaft is pushed as far as it will go up into the sampling head mechanism and then tighten the set screw firmly.

12. Slide the tubing through the red plastic tubing guide at the base of the sampling mechanism, down into the compartment where the bleed valve is located.

13. Once again, turn the sampler on its left side. Install the fitting and a new gripper (P/N 030509) on the free end of the tubing so that the finished length is 60 cm (24 inches) (as indicated by the mark made in step 9). See Section 5.1.1 for gripper fitting installation instructions.

14. Screw the fitting into port 1 of the bleed valve. Tighten the fitting fingertight, then an additional one-eighth turn.

15. Press the valve back into its mounting clip and return the sampler to its upright position.

16. Reinstall the sampling head cover panel.

17. The AS40 is ready to use.

5.3 Cleaning a Valve Slider

A dirty or plugged bleed valve slider will cause excessive back-pressure in the sample vial and may cause the sampler to go to the Hold state and stop.

1. Locate the **Default Set** switches on the rear panel and set switch 10 to the Test position (see Figure C-1). This allows the bleed valve to be operated manually using the **Bleed Off/On** switch on the front panel.

2. Place the sampler on its left side, exposing the bleed valve in its compartment in the right front corner of the AS40 chassis. The bleed valve is accessible only from the bottom of the AS40. Remove the valve from its mounting clips for access to the valve components.

3. Disconnect the air line from one end of the valve.

4. Unscrew one cap from the valve body. Be careful not to lose the cap O-ring.

5. Press the disconnected air line against the vent hole below port 1 (see Figure 5-3). If necessary, activate the **Bleed Off/On** switch to direct a blast of air pressure against the slider. The air pressure thus applied will cause the piston to pop out of the valve body.

6. Turn off the air supply.

7. Carefully loosen each of the pressure bolts **one-eighth turn** to disengage the port faces from the slider. It is not necessary to loosen the pressure bolts any further.

8. Remove the other cap. Use a blunt rod against the slider to push the other piston out of the valve body, then push the slider out of the body.
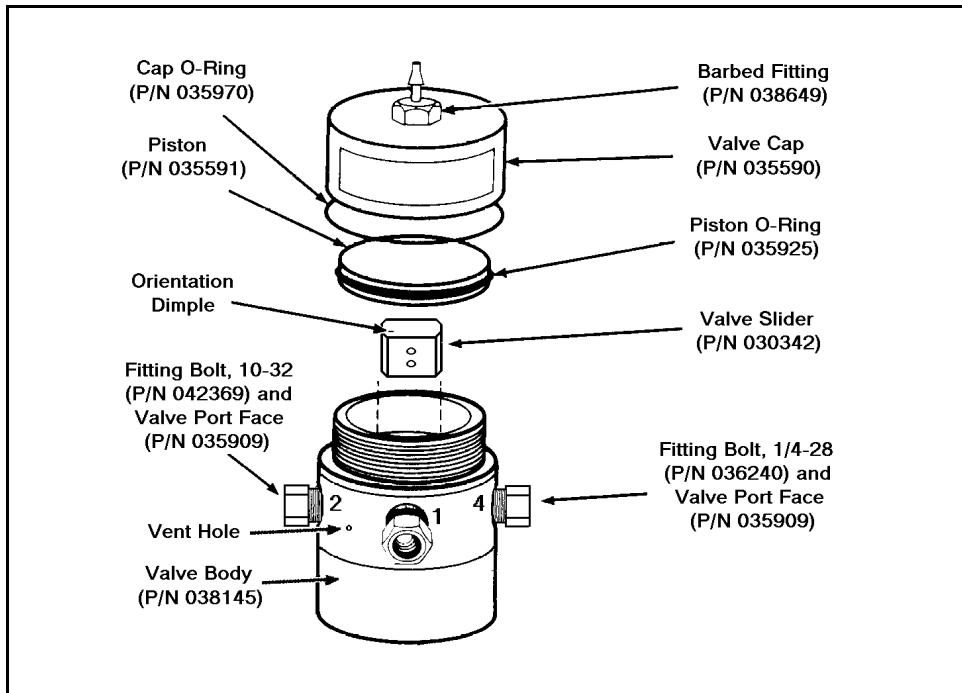

Figure 5-3.   Bleed Valve Assembly Detail

9. Inspect the slider surface. If there are scratches in the surface, replace the slider (P/N 030338).

10. Place the slider in a small container of deionized water or methanol. Sonicate or agitate vigorously for several minutes.

11. Rinse the slider with deionized water. Blow any water out of the holes and inspect them for blockage. Use a fine piece of wire to dislodge any remaining blockage. Be careful not to scratch the slider surface. If the blockage cannot be removed, replace with a new slider.

12. Push the slider back into the valve body. Orient the dimple on the top of the slider between ports 1 and 2 of the valve body (see Figure 5-3). The valve operates properly only if the slider is correctly oriented in the valve body. The groove around the valve body indicates the top of the valve body. The small vent hole is under port 1. The ports are numbered clockwise from the top around the valve body. The slider connects the ports as follows:

    Bleed Off (Slider down): $1 \rightarrow 4$ and $2 \rightarrow 3$
    Bleed On (Slider up): $1 \rightarrow 2$ and $3 \rightarrow 4$

13. Inspect the piston O-rings (P/N 035925) and replace them if necessary.

14. Carefully wipe a **very thin film** of silicone grease over the surface of the piston O-rings.

⚠️ **CAUTION** Use the grease very sparingly. Excess grease may contaminate the liquid flowing through the valve.

15. Press the piston back into the valve body.

16. Make sure that the cap O-rings are inside the caps. Screw the caps back onto the valve body. Tighten them only fingertight. Reconnect the air line to the cap.

17. Tighten each pressure bolt fingertight, then use an open end wrench to tighten an additional one-eighth turn.

> **NOTE**
> **For optimum operation, all eight pressure bolts must be evenly tightened against the slider. For optimum leak-free operation, a torque wrench may be used to evenly tighten the pressure bolts to the recommended 0.56 to 0.71 N-m (80 to 100 in-oz).**

⚠
CAUTION   **Overtightening may break off the bolt in the valve body.**

18. Reset **Default Set** switch #10 to the Run position.

19. See Section 5.4 if cleaning the valve slider does not eliminate the backpressure problem.

5.4 Replacing a Damaged Port Face

A scratched port face may cause a leak around the pressure bolt of the bleed valve. A plugged port face will cause excessive backpressure.

1. Place the sampler on its left side, exposing the bleed valve in its compartment in the right front corner of the AS40 chassis. The bleed valve is accessible only from the bottom of the AS40. Remove the valve from its mounting clips for access to the valve components.

2. Remove the bleed valve from its clip mount for easy access to all of the ports.

3. Disconnect the tube fitting from the suspect pressure bolt (see Figure 5-3), then unscrew the pressure bolt from the valve body.

4. Inspect the port face. If it is scratched or plugged, carefully pry it out of the pressure bolt. Press a new port face (P/N 035909) into the pressure bolt. **Do Not Scratch The Sealing Surfaces!**

5. Screw the pressure bolt into the valve body. Tighten each pressure bolt fingertight, then use an open end wrench to tighten an additional one-eighth turn.

> **NOTE**
> **For optimum operation, all eight pressure bolts must be evenly tightened against the slider. For optimum leak-free operation, a torque wrench may be used to evenly tighten the pressure bolts to the recommended 0.56 to 0.71 N-m (80 to 100 in-oz).**

⚠ **Overtightening may break off the bolt in the valve body.**
CAUTION

6. Reconnect the tube fitting to the pressure bolt. Use a wrench to prevent the pressure bolt from turning while tightening the fitting. Tighten the fitting fingertight, then an additional one-eighth turn. Tighten further only if leaks appear.

5.5 Eliminating Bleed Valve Air Leaks

An air leak around the bleed valve piston or cap may cause the valve to operate sluggishly or not at all and may also cause excessive air consumption.

1. Follow the Steps in Section 4.9 to verify that the valve air operator is the source of the air leak.

2. Place the sampler on its left side, exposing the bleed valve in its compartment in the right front corner of the AS40 chassis. The bleed valve is accessible only from the bottom of the AS40.

3. Remove the valve from its clip mount.

4. Make sure that the top and bottom caps are tight. If necessary, tighten fingertight.

5. If the leak persists, go on to step 6 to determine which end of the valve leaks.

6. Locate the **DEFAULT SET** switches on the rear panel and set switch #10 to the Test position (Figure C-1). This allows the bleed valve to be operated manually using the **Bleed On/Off** switch on the front panel.

7. Activate the **Bleed On/Off** switch. Air will escape through the vent hole below port #1 (see Figure 5-3) when the leaking end is pressurized.

8. Disconnect the air line from the leaking cap. If necessary, press **Bleed On/Off** to turn off the air flow from the disconnected line.

9. Unscrew the leaking cap from the valve body. Be careful not to lose the cap O-ring. Inspect the O-ring for cracks and replace it if necessary (P/N 035970).

10. Press the disconnected air line against the vent hole below port #1. If necessary, activate the **Bleed On/Off** switch to direct a blast of air pressure against the slider. The air pressure thus applied will cause the piston to pop out of the valve body. Turn off the air supply.

11. Inspect the piston O-ring and replace it if necessary (P/N 035925).

12. Carefully wipe a very thin film of silicon grease on the piston O-ring.

⚠ **CAUTION** **Use the grease very sparingly. Excess grease may contaminate the liquid flowing through the valve.**

13. Press the piston back into the valve body.

14. Make sure that the cap O-rings are inside the caps, then screw the caps onto the valve body. Tighten them only fingertight.

15. Reconnect the air line to the valve.

16. Reset **DEFAULT SET** switch 10 to the Run position. The sampler is ready to use.

17. If the leak persists, and you have eliminated the bleed valve as the source of the air leak, call your Dionex Customer Satisfaction Representative. The internal components of the sampler, including the solenoid valves used to control the bleed valve, are not customer-serviceable.

5.6 Replacing the AC Fuses

1. Turn off the main power switch on the AS40. Disconnect the main power cord at its source and also from the main power receptacle on the rear panel of the AS40.

2. The fuse holder is part of the main power receptacle on the rear panel (see Figure 5-4). A recessed lock is located on each side of the fuse holder. Use a small screwdriver or your fingernail to push each lock toward the center to release it. The fuse holder will pop out approximately $\frac{1}{16}$-inch when the lock releases. When both locks are released, pull the fuse holder straight out of its compartment.
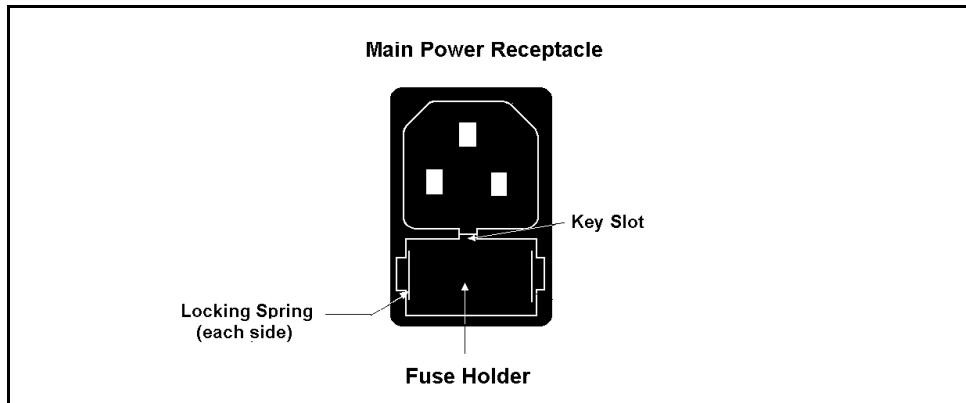

Figure 5-4.   Replacing the AC Fuses

3. The holder contains two fuses. Remove both fuses and replace them with identical 3.15 amp IEC127 fast-blow fuses (P/N 954745) from the AS40 Ship Kit. Dionex recommends replacing both fuses even though only one has failed. The other fuse has been stressed and could fail even under normal operation.

⚠ **To avoid the risk of fire, use only replacement fuses of the recommended model.**
CAUTION

4. Insert the fuse holder into its compartment. Note the orientation of the slot on the receptacle and the key in the holder. Apply sufficient pressure evenly against the holder to engage the two locks. The holder will be flush against the panel when both locks are engaged.

A • Specifications

A.1 Electrical

AC Power Requirements   90 to 265 Vac, 47/63 Hz, 60W
The power supply is auto-ranging and does not require any voltage adjustment.

Fuse Requirements   Dual 3.15A fast-blow IEC127 fuses (P/N 954745)

A.2 Environmental

Operating Temperature   10 °C to 40 °C (50 °F to 104°F), ambient

Operating Humidity   5 to 95% relative humidity, non-condensing

Pneumatic Pressure   550 to 830 KPa (80 to 120 psi) regulated, clean, dry, oil-free air supply (required to operate bleed valve)

A.3 Physical

Dimensions   36.8 cm W x 44.5 cm D x 30.2 cm H (14.5 in x 17.5 in x 11.9 in)

Weight   8.9 kg (19.6 lbs)

A.4 Sampling Mechanism

Sample Capacity   Eleven sample cassettes. Each cassette holds either six 5.0 mL PolyVials, or eight 0.5 mL PolyVials. Any combination of the cassette models can be used.

Materials   All wetted surfaces are chemically inert plastic (polypropylene, polyethylene, PEEK, Tefzel, Kel-f, or Teflon).

Sample Delivery	Sample loaded against up to 690 KPa (100 psi) using displacement of a proprietary vial cap in the Dionex PolyVial. No sampling pump is required.
Delivery Type	Sample loop (4.0 mL/min with 5.0 mL vial, 1.6 mL/min with 0.5 mL vial), or concentrator column (1.0 mL/min with 5.0 mL vial, 0.4 mL/min with 0.5 mL vial)
Delivery Mode	Proportional (delivery volume is the ratio of the number of injections per vial), or Constant (delivery volume is fixed at the minimum)
Number of Samples	Up to three per vial with a maximum of 66 (5.0 mL), or 88 (0.5 mL) vials
Minimum Volume Delivered	0.17 mL from 0.5 mL vial, 1.7 mL from 5.0 mL vial
Bleed Valve	Directs the output to the remote injection valve or to waste.

A.5 Sample Vials

Volume	0.5 mL and 5.0 mL, nominal
Filter	20 μm, nominal (optional)
Material	Pharmaceutical grade polypropylene vial and polyethylene cap, sintered polyethylene filter.
Contamination Levels	Less than 3.0 ppb fluoride, chloride, nitrate, and phosphate; 8.0 ppb sulphate.
Special Features	Concave cap directs air out of the vial, convex vial bottom mates with the cap to allow maximum delivery of sample.

B • Installation

B.1 Facilities Required

B.1.1 Bench Space

Refer to the dimension specifications in Appendix A to determine the amount of bench space required for the AS40 Automated Sampler. For optimum operation, place the AS40 as near as possible to the left side of the Chromatography module or DX-100. Be sure that there is sufficient clearance above the AS40 to allow easy access to the sample cassettes under the top cover.

CAUTION

The tower which houses the sampling head is NOT intended for use as a handle. Using this tower to lift the AS40 may damage the sampling mechanism.

B.1.2 Power

The sampler requires a **grounded**, single-phase power source. The three-conductor power cord assures a safety ground. The power supply is auto-adjusting over the range of operating voltage and line frequency (90 to 265 Vac and 47/63 Hz). No manual adjustment is required.

B.1.3 Air

An air-actuated bleed valve controls the liquid flow path from the sampler to waste or to the injection valve. Use a regulated source of nitrogen or air pressure to provide the 550 to 830 KPa (80 to 120 psi) pressure required to operate this valve.

⚠
CAUTION

To avoid contamination and possible deterioration of the pneumatic system, make sure that laboratory compressed air is oil-free, clean, and dry. Install an in-line filter if in doubt.

B.2 Installation Instructions

NOTE
Refer to Section D.3 for relay control installation instructions.

B.2.1 Sample Out Connection

1. Locate the 0.2-mm (0.010-inch) ID PEEK tubing exiting the **Sample Out** port on the front of the AS40.

2. Route the tubing to the injection valve sample port.

3. Check the tubing length. The length should be as short as practical. If it is unnecessarily long, cut it with a razor blade.

4. Connect the tubing to the sample port, using a Dionex fitting bolt (P/N 043275) and a double-cone ferrule fitting (P/N 043276). Detailed instructions for installing ferrule fittings are found in the manual *Installation of Dionex Ferrule Fittings* (Document No. 034213). The bolt, ferrule, and manual are included in the AS40 Ship Kit (P/N 047873).

   If you are connecting the tubing to a system that uses 1/4-28 fittings, an adapter (P/N 042295) is required. Contact your Dionex Customer Satisfaction Representative.

B.2.2 Air Pressure Connection

1. Verify that the air is regulated to between 550 and 830 KPa (80 and 120 psi).

2. Locate the pipe adapter (P/N 030087) and the barbed air adapter fitting (P/N 030077) in the Ship Kit.

3. If the outlet to the air supply regulator is incompatible with the #10-32 thread on the barbed fitting, screw the pipe adapter into the outlet, then screw the barbed air adapter into the pipe adapter.

4. Locate the coil of red 3-mm (1/8-in) OD air tubing (P/N 030089). Push one end over the barbed fitting labeled **AIR** on the AS40 rear panel. Push the other end over the barbed adapter on the air supply.

5. If this is the same air supply used to operate the valves in your chromatography system, use barbed tees (P/N 030538) to split the line as necessary.

6. Turn on the air supply and adjust the pressure to the required level.

B.2.3 Waste Line Connection

1. Locate the waste line exiting the **WASTE** port on the AS40 rear panel.

2. Place the free end of the waste line into either a waste container or an appropriate drain. Make sure that the outlet of the waste line is below the level of the AS40 and is not elevated at any point.

B.3 Select Power-up Configuration

When the AS40 power is turned on, the microprocessor reads the position of the **DEFAULT SET** switches on the rear panel to determine the power-up status of each of the operating parameters. These parameters are factory-set as follows:

Operating Parameter	Factory Setting
Injection Type	Loop
Injection Mode	Proportional
Bleed	Off
Injections per Vial	1
Rinse Mode	Rinse After Last Load

If you intend to operate the AS40 consistently in a configuration different from the one set at the factory, you can change the default operating parameters (see Appendix C).

C • Setting the AS40 Defaults

The 10-position **DEFAULT SET** switch on the rear panel controls the AS40 Automated Sampler default operating parameters. Figure C-1 shows the factory settings for the switches; SW 1 is on, all other switches are off. To change a setting, first **turn off the power**; then, push the switch down to turn it on, up to turn it off.
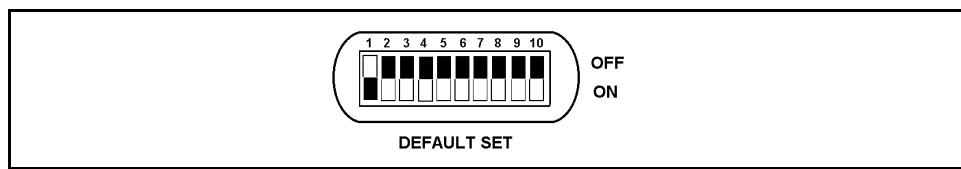

Figure C-1.   Default Switch Settings

The table below shows the parameters each switch controls.

SW #	On	Off	Default
1	Deliver 1 sample per vial	Other (see note)	On
2	Deliver 2 samples per vial	Other (see note)	Off
3	Deliver 3 samples per vial	Other (see note)	Off
4	Bleed function on	Bleed function off	Off
5	Constant sample size	Proportional sample size	Off
6	Use a concentrator column	Use a sample loop	Off
7	Rinse before first load in vial	Rinse after last load in vial	Off
8	Reserved for auxiliary communication	Reserved for auxiliary communication (must be off for normal AS40 operation)	Off
9	Not used	Not used	Off
10	Test	Run	Off

Note   **Turn on only one of the first three switches (1, 2, and 3) to select the default number of samples per vial to deliver. If more than one is selected, the switch with the highest value takes precedence.**

The AS40 microprocessor reads the switch positions only at power-up. Changing the switch positions after power-up will have no effect until you recycle the power. You can override the default settings after power-up by using the front panel switches.

D • Relay Control of the AS40

The AS40 can be operated remotely by connecting the **RELAY CONTROL** connector on the rear panel of the AS40 to an integrator or other controller equipped with TTL or contact-closure relay control outputs. This appendix provides the following information:

- A description of the AS40 relay control functions

- General instructions on how to set up the AS40 for remote operation

- Examples for connecting the AS40 to various system configurations

- Examples for setting up controller timed events in the various systems

D.1 Relay Control Functions

The AS40 has two relay control functions:

- The Load input relay starts the AS40 Load cycle.

- The Ready Out relay signals when the Load cycle is complete.

D.1.1 Load Input Relay

The Load input relay allows you to start the Load cycle using a contact-closure relay output or TTL output signal from a connected controlling device.

Turning on the Load input relay causes different AS40 responses, depending on which Rinse cycle mode is selected (see Section 2.2.3 for a description of rinse modes):

• In the default mode, Rinse After, turning on the Load relay starts the Load cycle. After the last load from a sample vial, Rinse cycles are performed automatically if rinse vials are encountered. When the AS40 detects a sample vial, it stops and waits for another Load command.

• In the Rinse Before mode, turning on the Load relay triggers a Rinse cycle if a new vial is under the sampling head and it is a rinse vial. Any subsequent rinse vials are run as well. When the AS40 detects a sample vial, it performs the first load from the vial and then stops and waits for another Load command.

The example in Figure D-1 shows the Load cycle sequence for each rinse mode.

D.1.2 Ready Out Relay

The Ready Out relay allows you to enable sample injection using the timed event function of an integrator or other controller equipped with TTL or contact-closure relay control outputs.

When a Load command occurs, the Load cycle starts and the Ready Out relay toggles off (Not Ready). When the Load cycle is complete, the Ready Out relay toggles on (Ready). You can set up the controller to switch the injection valve to **Inject** when Ready Out toggles to Ready.

At power-up, Ready Out is off until the first Load is complete. If a fault occurs, Ready Out turns off and remains off until the fault is cleared. There are three faults: input tray empty, output tray full, and mechanical jam.

The start and end of a Load cycle are different for the Rinse After and Rinse Before modes:

*   In the Rinse After mode, the Load cycle includes only the sample cycle. It does not include any Rinse cycles that occur after sample loading.

*   In the Rinse Before mode, the Load cycle includes the Rinse cycles that are run before sample loading as well as the sample cycle.

The example in Figure D-1 shows when Ready Out toggles for each rinse mode. Also see the loading sequence examples in Figures 2-10 and 2-11.
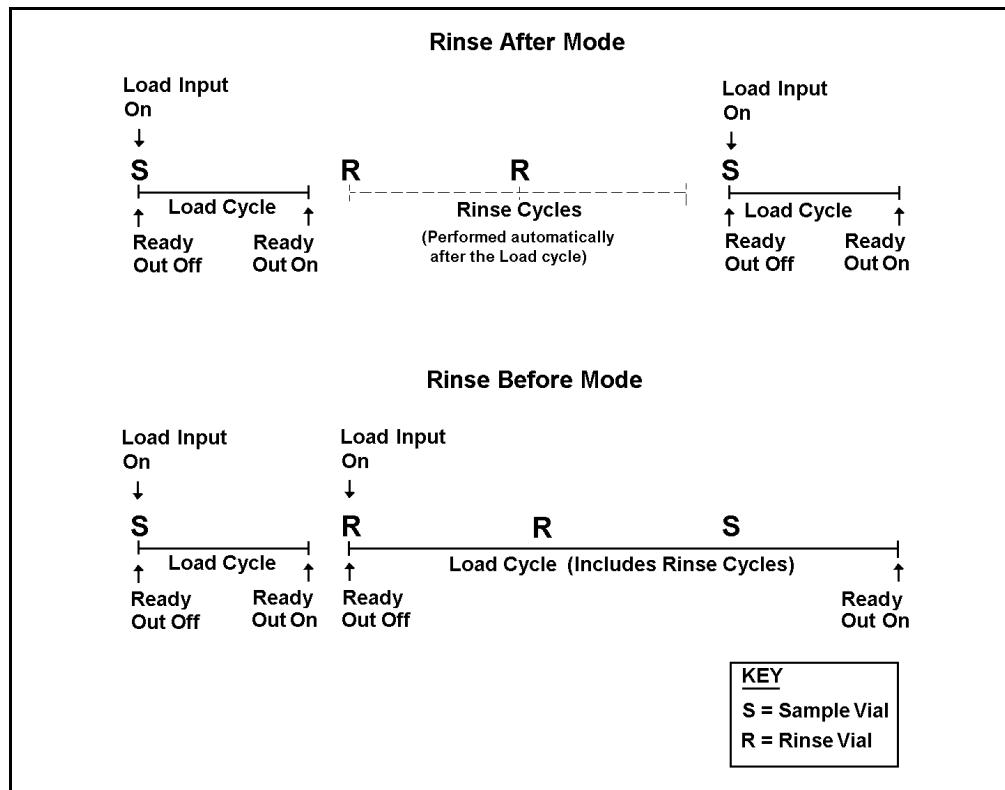
Figure D-1.   Relay Sequence for each Rinse Mode

D.2 Load Cycle Timing

D.2.1 Sample Cycle Timing

For remote control options, the most critical part of setting up a timed events table is determining the interval between the start of the sampler load cycle and the actual injection of the sample (i.e., when you switch the injection valve to **Inject**). The remaining sampler functions are typically set once at the beginning of a series of analyses and then left unchanged.

Several factors affect the time interval between the AS40 Load command and injection of the sample, including the vial size, the number of samples per vial, the sampling type (Loop or Concentrator), and the sampling mode (Constant or Proportional). Theoretically, if you were using three samples per vial you would need a minimum of three separate timed events tables, one for each sample from the vial, plus an additional timed event table for a rinse, if used. This would make setting up the timed events required for remote control very cumbersome.

To simplify setting up remote control, the Ready Out relay toggles when the Load is complete and injection should occur. If you do not use the Ready Out relay, you can use Table D-1 to set up timed events. All of the possible combinations of timed events are shown. To use the table, choose an option in each column as you move from left to right. The value in the far right column is the time you should allow in your timed events table between the AS40 Load command and the injection valve Inject command. (Each time value listed allows a margin of error of approximately ± 0.2 minutes.)

Vial Size	Type	Bleed Status	Sampling Mode	Injection per Vial	Time (min.) per Sample Load
Large (5 mL)	Loop	Either Case	Constant	All cases	1.5
			Proportional	1	2.4
				2	1.8
				3	1.5
	Concentrator	On	Constant	All cases	2.4
			Proportional	1	6.0
				2	3.3
				3	2.4
		Off	Constant	All cases	4.9
			Proportional	1	8.4
				2	5.8
				3	4.9
Small (0.5 mL)	Loop	Either Case	Constant	All cases	0.9
			Proportional	1	1.1
				2	1.0
				3	0.9
	Concentrator	On	Constant	All cases	0.9
			Proportional	1	1.6
				2	1.1
				3	0.9
		Off	Constant	All cases	2.6
			Proportional	1	3.3
				2	2.8
				3	2.6

Table D-1. AS40 Sample Load Times

D.2.2 Rinse Cycle Timing

The Rinse cycle requires the same amount of time as a sample of the corresponding type and size. Typically, the Rinse cycle is complete before the analysis of the preceding sample, leaving the AS40 ready for the next Load command. If, however, the Rinse cycle time exceeds the analysis time, you must allow for this extra time in your timed events by using one of the following methods:

- Use Rinse Before mode to group the Rinse cycles with the Load cycle (see Section D.1.2).

- Increase the run time for each analysis.

- Periodically switch to a separate table of ''Rinse'' timed events.

If you are using a concentrator column and want the interconnecting tubing rinsed, but not the column, or if you are in Loop mode and you want the tubing rinsed, but not the sample loop, you may replace the slider in a three-way injection valve with a four-way slider (P/N 030338). A three-way valve is used in the DX-100 and the DX-300 systems. The four-way slider provides an alternate flow path through the valve when it is in the inject position, thus preventing dead-heading. When dead-heading occurs, the AS40 stops and the remaining timed events are aborted. See Section 5.3 for instructions on replacing the slider.

A four-way Rheodyne injection valve is used in the LC10 Chromatography Enclosure, LC20 Chromatography Enclosure, and LC30 Chromatography Oven. Therefore, you can perform rinses at any time without encountering dead-heading. If the valve is set to the inject position during the rinse, the sample loop or concentrator column will not be rinsed.

D.3 Overview of Relay Control Connections

The **RELAY CONTROL** connector on the AS40 Automated Sampler rear panel allows you to connect the AS40 to a controller equipped with TTL or contact-closure relay control outputs. The 10-pin connector is divided into five pairs. Each pair includes an active pin and a ground pin. Each relay control function is operated by a separate contact-closure relay or TTL logic level. When an output relay function is off, the relay contacts are open and the lines are ''pulled'' high to +5 volts. Turning on the output function closes the relay contacts, grounding the corresponding line and dropping it to zero volts (low). The following table lists the functions of the **RELAY CONTROL CONNECTOR** pins.

Relay #	Name	Type	Function
1	**READY OUT**	Output	Toggles on when the AS40 begins a Load cycle; toggles off when the Load cycle is complete.
2	**F2**		Unused.
3	**LOAD**	Input	Starts the Load cycle when turned on.
4	**CBL PRESENT**		Used by the AS40 to detect whether the cable is connected. This must be connected for the relays to work.
5	**+5 VDC**		Supplies power to an external load (maximum 50 mA).

The Relay Control connector cable (P/N/ 047946) provided in the Ship Kit is prewired for use with DX 500 modules, but it can be adapted for use with other Dionex or non-Dionex devices equipped with TTL or relay outputs.

The following steps outline the basic procedure for setting up the AS40 for relay control. The remaining sections of this appendix provide detailed examples for connecting to specific systems and for creating timed events Methods.

1. Connect the Relay Control cable's 10-pin connector to the **RELAY CONTROL** connector on the AS40 rear panel (see Figure D-2).

2. Connect the two-pin connector attached to the violet wire labeled **READY** to a TTL input connector on the controlling device.

NOTE
Check the polarity when connecting the Relays and TTLs. Connect the signal wires (READY and LOAD) from the AS40 to signal (+) pins on the controlling device and connect the ground wires to ground (-) pins. If necessary, remove the wires from the two-pin connectors and reinsert them in the correct positions.
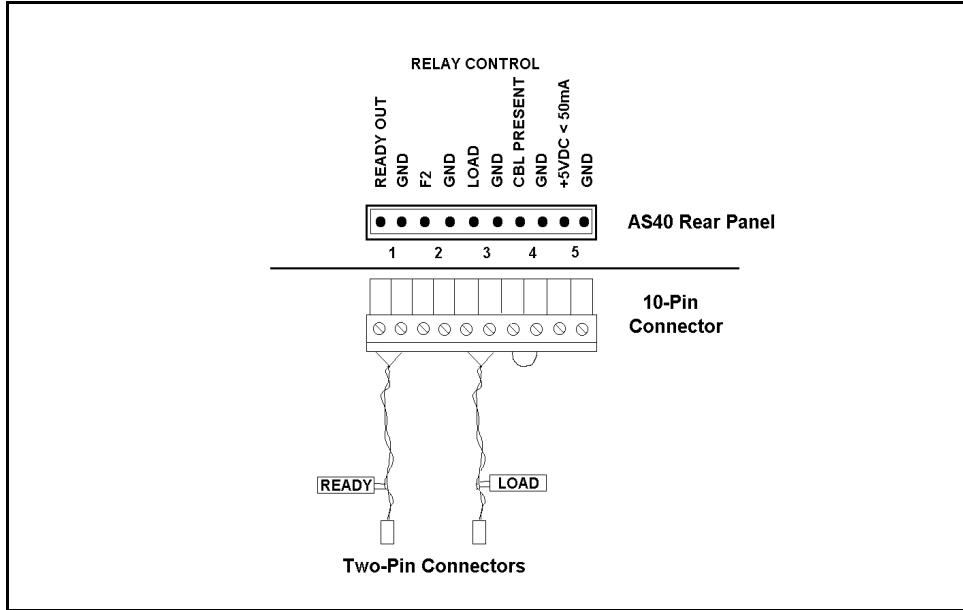
Figure D-2.   Relay Control Cable Connections

.

3. Connect the two-pin connector attached to the red wire labeled **LOAD** to a Relay or TTL output connector on the controlling device.

4. Use the controller software or integrator timed events function to set up a Method that includes timed events for operation of the AS40 and the injection valve.

5. Set the **Lcl/Rmt** switch on the AS40 front panel to **Lcl** (local). All front panel switches remain active and the AS40 will respond to either relay or front panel input.

6. Run the Method.

Refer to the list below for the section that contains the installation and example method(s) for your system.

D.4   Relay Control with a DX 500 System

D.4.1   Using PeakNet

Connections

Figure D-3 is an example of wire connections for a DX 500 system connected to a PeakNet Chromatography Workstation.

1. Connect the Relay Control cable's (P/N 047946) 10-pin connector to the **RELAY CONTROL** connector on the AS40 rear panel.

2. Insert an additional ground wire and signal wire into the two-pin connector attached to the violet wire labeled **READY**. Connect the two-pin connector (which now has four wires attached) to **TTL-2 IN** on the pump module.
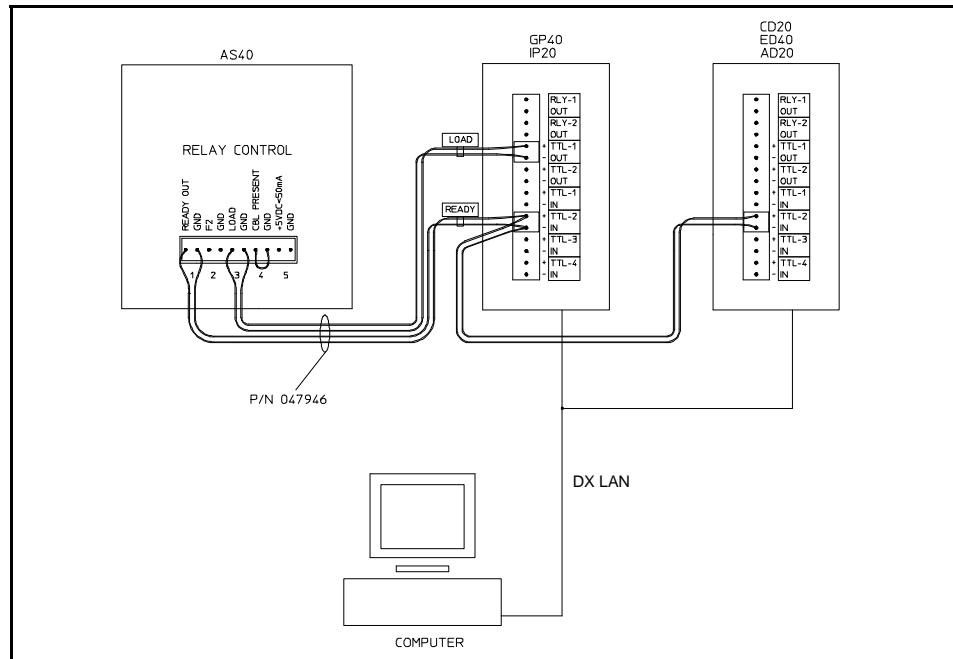
*Figure D-3.   Example Relay Connections:
DX 500 and PeakNet*

NOTE
Check the polarity of the connections. Connect signal wires between (+) pins and ground wires between (-) pins. If necessary, remove wires from the two-pin connectors and reinsert them in the correct positions.

3. Insert the two unattached wires into a two-pin connector (P/N 921185) and connect it to **TTL-2 IN** on the detector.

4. Connect the two-pin connector attached to the red wire labeled **LOAD** from the AS40 to **TTL-1 OUT** on the pump.

5. Open the pump and detector **TIME FUNCTION IN** screens and verify that the input control mode is set to **NORMAL EDGE**, and the **TTL-2** inputs are assigned to **HOLD/RUN**. See the pump and detector operator's manuals for details.

Example Methods: DX 500 with PeakNet

The following examples describe how to use PeakNet Timed Events to control the AS40. The examples assume you are familiar with using PeakNet. If needed, refer to the *PeakNet Software User's Guide* (Document No. 034914) for additional information.

- Example 1 describes how to create a Method that starts the AS40 Load cycle in the Method's initial conditions (INIT) step. At the end of a Schedule, Example 1 requires that an ''end'' Method be downloaded to turn off the Load cycle in the initial conditions step. Because you do not need to enter the total sample run time into the timed event steps, you can use Example 1 to run samples that have different run times, or samples with unknown run times. Example 1 starts on the next page.

- Example 2 describes how to set up a Method that starts the AS40 Load cycle at the end of the Method. With Example 2, you must enter the sample run time in the Method. The Method will run continually and stop automatically when there are no more samples to load. A separate ''end'' Method is not required. Example 2 starts on page D-16.

DX 500 and PeakNet Example Method 1:

Figure D-4 illustrates the timed events for Example 1.
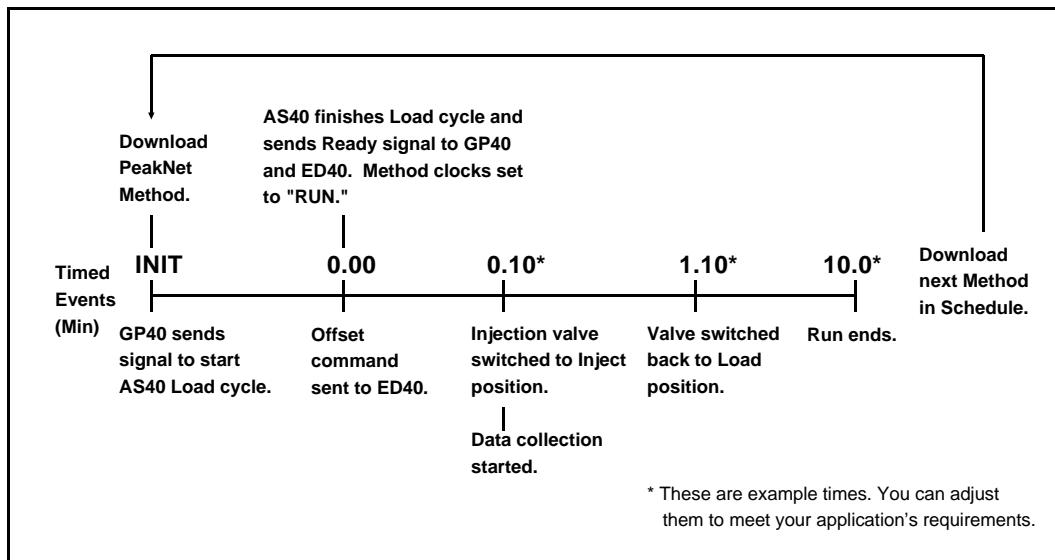
D-4. DX 500 and PeakNet Timed Events Example 1

Use the following steps to set up the events.

1. Use the Method Editor to create a Method that includes the modules connected to the AS40. In this example, the GP40 Gradient Pump and ED40 Electrochemical Detector are connected. A data collection time of 10.0 minutes is used.

2. In the GP40 Editor dialog box, enter the timed events for the Method. The times used for this example are shown below. This example includes a 1.0 minute flush of the sample loop.

NOTE
It is important to trigger the AS40 Load cycle at time INIT, not at time 0.00.

Time	Inject	Column	RLY1	RLY2	TTL1	TTL2	Comment
INIT	0	0	0	0	1	0	Start AS40 Load cycle.
0.00	0	0	0	0	0	0	
0.10	1	0	0	0	0	0	Valve switched to Inject position.
1.10	0	0	0	0	0	0	Valve switched back to load.

3. In the ED40 Editor dialog box, enter the time to begin data collection. The time used for this example is shown below:

Time	Range (μS)	Offset	Mark	RLY		TTL		Collect
INIT	10.000			0	0	0	0	
0.00	10.000	*		0	0	0	0	
0.10	10.000			0	0	0	0	Begin

4. With PeakNet Method Editor, create an ''end'' Method that turns off the AS40 Load cycle in the initial conditions (INIT) step of the Method. The GP40 timed events used for this example are shown below:

| Time	Inject	Column	TTL/RLY				Comment
INIT	0	0	0	0	0	0	AS40 Load cycle off.
0.00	0	0	0	0	0	0	

5. Use the Schedule Editor to create a Schedule for running the Methods. Include the ''end'' method on the last line. The example Schedule is shown below:

Inj#	Sample Name	Method	Data File	Vol.	Dil.	Int. Std.
1	SAMPLE1	..\AS40TEST	..\TEST001	1	1	1
2	SAMPLE2	..\AS40TEST	..\TEST001	1	1	1
3	SAMPLE3	..\AS40TEST	..\TEST001	1	1	1
		..\ENDTEST				

6. Make sure that the samples are ready in the AS40 input tray.

7. Press the AS40 **HOLD/RUN** switch to put the AS40 in hold.

8. Use the Run program to load the Schedule. In the Load Schedule dialog box, select the following conditions:

> Number of loops for the Schedule: **-1**
> Start Successive Runs: **Upon receiving signal at module**

The **-1** option causes the Schedule to restart and run continually. The **Upon receiving signal at module** option defers the start of the next Method until the AS40 sends the Ready signal indicating the sample has been loaded.

9. Select the Start... command to start the Schedule and begin data collection.

10. Press the AS40 **HOLD/RUN** switch to take the AS40 out of hold. The first load cycle will begin immediately and sample runs will then continue according to the Schedule until the ENDTEST Method is downloaded.

DX 500 and PeakNet Example Method 2:

Figure D-5 illustrates the timed events for Example 2.

Download PeakNet Method.

GP40 receives Ready signal from AS40. Method clock set to "RUN."

Timed Events (Min)

| INIT | 0.00 | 1.00* | 10.00* |

AS40 finishes Load cycle and sends Ready signal to GP40 and ED40.

Injection valve switched to Inject position.

Injection valve switched back to Load position.

GP40 sends signal to AS40. Load cycle started.

Data collection started.

Note: Press the AS40 Load switch to start the first Load cycle.

* These are example times. You can adjust them to meet your application's requirements.

D-5. DX 500 and PeakNet Timed Events Example 2

Use the following steps to set up the events.

1. Use the Method Editor to create a Method that includes the modules connected to the AS40. In this example, the GP40 Gradient Pump and ED40 Electrochemical Detector are connected. A data collection time of 10.0 minutes is used.

2. In the GP40 Editor dialog box, enter the timed events for the Method. The times used for this example are shown below. The example allows 1.0 minute for injection and 10.00 minutes for the run.

Time	Inject	Column	RLY1	RLY2	TTL1	TTL2	Comment
INIT	0	0	0	0	0	0	
0.00	1	0	0	0	0	0	Valve switched to Inject position.
1.00	0	0	0	0	0	0	Valve switched back to Load position.
10.00	0	0	0	0	1	0	AS40 Load cycle triggered.

3. In the ED40 Editor dialog box, enter the time to begin data collection. The time used for this example is shown below:

Time	Range (μS)	Offset	Mark	TTL/RLY				Collect
INIT	10.000			0	0	0	0	
0.00	10.000	*		0	0	0	0	Begin
10.00	10.000			0	0	0	0	

4. Use the Schedule Editor to create a Schedule for running the Method. The Schedule used for this example is shown below:

Inj#	Sample Name	Method	Data File	Vol.	Dil.	Int. Std.
1	SAMPLE	..\AS40TEST	..\TEST001	1	1	1

5. Use the Run program to load the Schedule and start the Method. In the Load Schedule dialog box, select the following conditions:

>   Number of loops for the Schedule: **-1**
>   Start Successive Runs: **Upon receiving signal at module**

    The **-1** option causes the Schedule to restart and run continually. The **Upon receiving signal at module** option defers the start of the next run of the Schedule until the AS40 sends the Ready signal indicating the sample has been loaded.

6. Select the Start... command to start the Method.

7. Press the **Load** switch on the AS40 to start the first sample load. Thereafter, the Method will run automatically. When the AS40 runs out of samples, it does not send the Ready signal and the Method ends.

D.4.2 Using an Integrator

Connections

Figure D-6 is an example of the wire connections for a DX 500 system connected to an integrator.

1. Connect the AS40 Relay Control cable's 10-pin connector to the **RELAY CONTROL** connector on the AS40 rear panel.

2. Insert an additional ground wire and signal wire in the two-pin connector attached to the violet wire labeled **READY**. Connect this two-pin connector (which now has four wires attached) to **TTL-2 IN** on the pump.
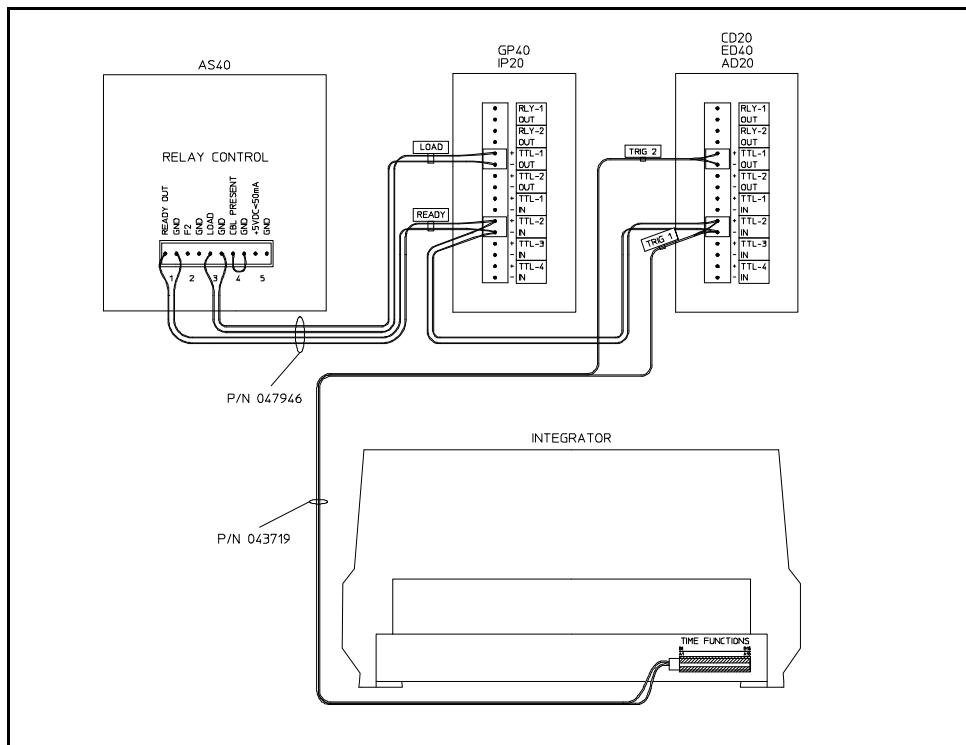
*Figure D-6. Example Relay Connections:*
DX 500 and Integrator

NOTE
**Check the polarity of the connections. Connect signal
wires between (+) pins and ground wires between (-) pins.
If necessary, remove wires from the two-pin connectors
and reinsert them in the correct positions.**

3. Connect the two-pin connector attached to the red wire
   labeled **LOAD** from the AS40 to **TTL-1 OUT** on the pump.

4. Connect the integrator cable (P/N 043719) to the **TIME
   FUNCTIONS** connector on the integrator.

5. Insert the two unattached wires extending from the **TTL-2
   IN** on the pump module into the two-pin connector
   attached to the wires labeled **TRIG 1** on the integrator
   cable. Connect this two-pin connector (which now has
   four wires attached) to **TTL-2 IN** on the detector.

6. Connect the two-pin connector attached to the wires
   labeled **TRIG 2** from the integrator cable to **TTL-1 OUT** on
   the detector.

7. Open the pump and detector **TIME FUNCTION IN** screens
   and verify that the input control mode is set to **NORMAL
   EDGE**, and the TTL-2 inputs are assigned to **HOLD/RUN**.
   See the pump and detector operator's manuals for details.

Example Method: DX 500 with an Integrator

The following example describes how to use a Dionex 4400 Integrator or 4600 Integrator with DX 500 modules to control the AS40 Automated Sampler. For additional information, refer to the *4400 Integrator User's Guide* (Document No. 034200) or the *4600 Integrator User's Guide* (Document No. 034408), and the operator's manuals for the DX 500 modules.

Figure D-7 illustrates the timed events for the example.
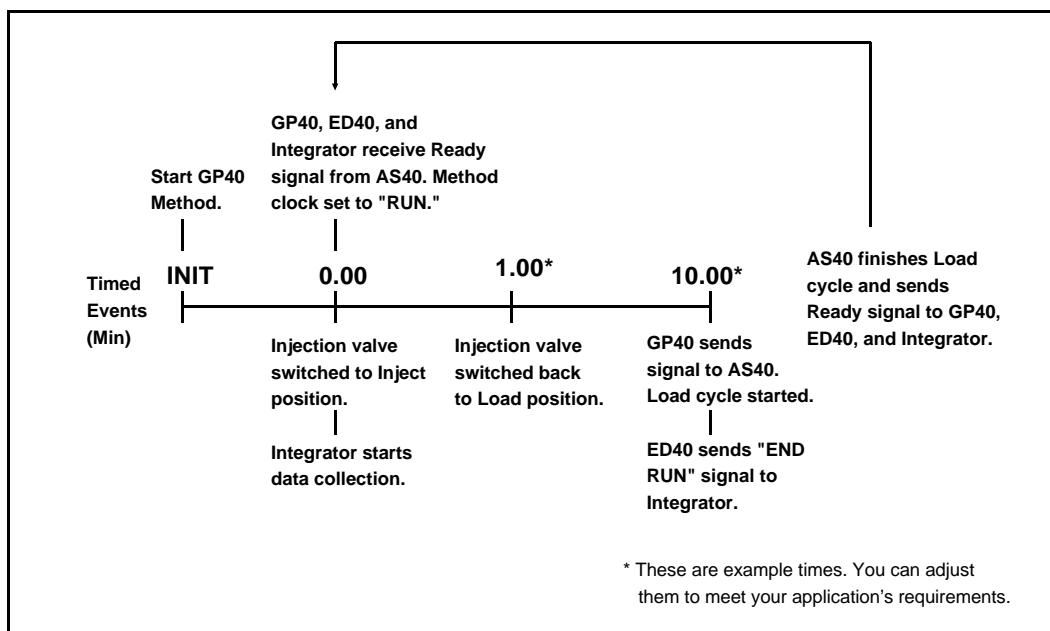
D-7. DX 500 and Integrator Timed Events Example

Use the following steps to set up the events.

1. Create a method using the GP40 **METHOD** screen and enter the timed events. The example timed events are shown below:

NOTE
Only the timed events that pertain to AS40 operation are shown in the following examples.

Time	V	TTL1	TTL2	RLY1	RLY2	Comment
INIT	L	0	0	0	0	Injection valve in Load position.
0.0	I	0	0	0	0	Injection valve switched to Inject.
1.0	L	0	0	0	0	Injection valve switched back to Load position.
10.00	L	1	0	0	0	Load cycle triggered.

2. Create a method using the ED40 **METHOD** screen and enter the time for sending the end of run signal to the integrator. The example time is shown below:

Time	TTL1	TTL2	RLY1	RLY2	Comment
INIT	0	0	0	0	
0.0	0	0	0	0	
10.00	1	0	0	0	End-of-run signal sent to integrator.

3. Before starting the GP40 method, make sure the correct method number is selected in the ED40 **METHOD** or **MAIN** screen.

4. In the GP40 **METHOD** screen, enter the method number and then press **Enter** to start the run. The first sample run will be a blank, because the timed events inject the sample at the beginning of the run, before the first AS40 Load cycle occurs. Thereafter, the method will continue automatically until there are no more samples to run.

D.5 Relay Control with a DX-300 System

D.5.1 Using a UI20 and PeakNet

Connections

Figure D-8 is an example of wire connections for a DX-300
system connected to a UI20 Universal Interface and a
PeakNet Chromatography Workstation.

1. Connect the AS40 Relay Control cable's (P/N 047946)
    10-pin connector to the **RELAY CONTROL** connector on
    the AS40 rear panel.

2. Connect the two-pin connector attached to the violet wire
    labeled **READY** from the AS40 to the **TTL IN R** connector
    on the UI20.
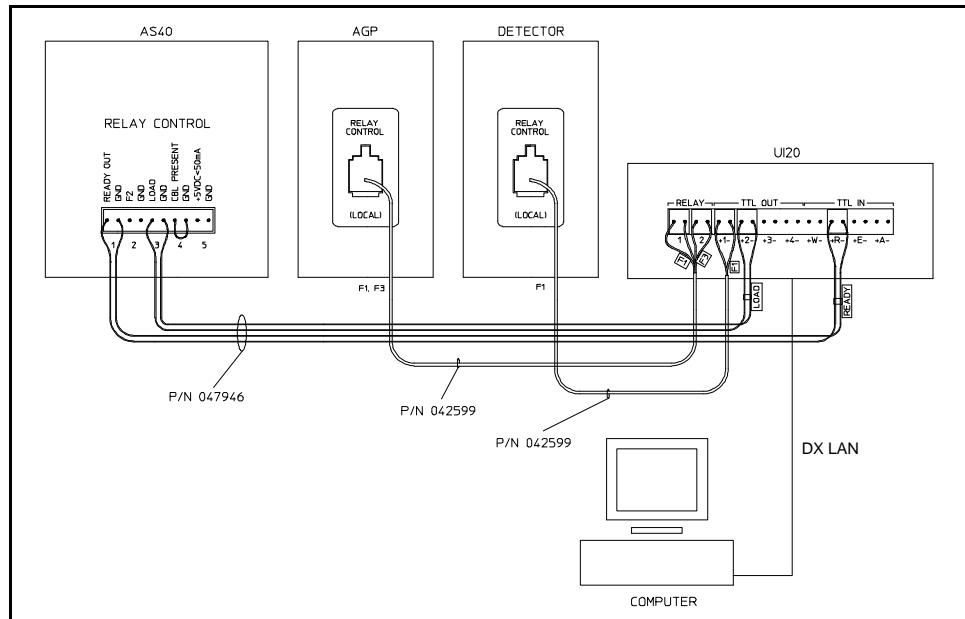
*Figure D-8. Example Relay Connections:
DX-300, UI20, and PeakNet*

NOTE
Be sure to check the polarity of the connections. Connect signal wires between (+) pins and ground wires between (-) pins. If necessary, remove wires from the two-pin connectors and reinsert them in the correct positions.

3. Connect the two-pin connector attached to the red wire labeled **LOAD** from the AS40 to **TTL OUT 2** on the UI20.

4. For the remaining connections, use the three-function relay/TTL cables (P/N 042599) that are provided with the DX-300 pump and detector modules. These cables have a telephone-style connector on one end and three pairs of wires on the other end for connecting up to three relay/TTL functions. For additional information, see *Installing the Three-Function Relay/TTL Cable with the ACI/UI20* (Document No. 034175).

5. Connect the telephone-style connector on one of the three-function cables to the **RELAY** connector on the detector. Attach a two-pin connector (P/N 921370) to the pair of wires labeled **F1** and connect it to **TTL OUT 1** on the UI20. Check the polarity of the connection; the blue wire is the ground wire. (Relay/TTL functions **F2** and **F3** are not used in this example.)

6. Connect the telephone-style connector on the other three-function cable to the **RELAY** connector on the pump. Attach a two-pin connector to the pair of wires labeled **F1** and connect it to **RELAY 1** on the UI20. Attach a two-pin connector to the pair of wires labeled **F3** and connect it to **RELAY 2** on the UI20. Check the polarity of the connections; the blue wires are the ground wires. (Relay/TTL function **F2** is not used in this example.)

Example Methods: DX-300, UI20, and PeakNet

The following examples describe how to use PeakNet Timed Events to control the AS40. The examples assume you are familiar with using PeakNet. If needed, refer to the *PeakNet Software User's Guide* (Document No. 034914) for additional information.

- Example 1 describes how to create a Method that starts the AS40 Load cycle in the Method's initial conditions (INIT) step. At the end of a Schedule, Example 1 requires that an ''end'' Method be downloaded to turn off the Load cycle in the initial conditions step. Because you do not need to enter the total sample run time into the timed event steps, you can use Example 1 to run samples that have different run times, or samples with unknown run times. Example 1 starts on the next page.

- Example 2 describes how to create a Method that starts the AS40 Load cycle at the end of the Method. With Example 2, you must enter the sample run time in the Method. The Method will run continually and stop automatically when there are no more samples to load. A separate ''end'' Method is not required. Example 2 starts on page D-30.

DX-300 and PeakNet Example Method 1:

Figure D-9 illustrates the timed events for Example 1.

D-9. DX-300, UI20, and PeakNet Timed Events Example 1

Use the following steps to set up the events.

1. Use the Method Editor to create a Method that includes the UI20. For this example, a data collection time of 10 minutes is entered.

2. In the UI20 Editor dialog box, click on the Setup... command button to open the UI20 Setup dialog box. Select the following parameters:

TTL/Relay Output	Labels
Relay 1	RLY 1 Run/Hold
Relay 2	RLY 2 Pump On/Off
TTL 1	TTL 1 Autozero
TTL 2	TTL 2 Load AS40

TTL Input	Trigger Type
WAIT	Normal Edge
RUN	Normal Edge
END	Normal Edge
ABORT	Normal Edge

3. In the UI20 Editor dialog box, enter the timed events for the Method. The times used for this example are shown below:

NOTE
It is important to trigger the AS40 Load cycle at time INIT, not at time 0.00.

Time	RLY 1	RLY 2	TTL 1	TTL 2	TTL 3	TTL 4	Collect	Comment
INIT	0	1	0	1	0	0		Pump on. Start Load cycle.
0.00	1	1	0	0	0	0		Pump clock set to Run.
0.10	1	1	1	0	0	0	Begin	Offset on. Begin data collection.

4. Program the pump using the pump module's front panel controls. Enter the times for switching the injection valve into the program. For this example, the following program steps are entered for controlling the injection valve:

Pump Program Step	Description
TIME 0.10 %/#5 1	Injection valve (valve 5) switched to Inject position.
TIME 1.10 %/#5 0	Injection valve switched to Load position.

5. Use the Method Editor to create an ''end'' Method that turns off the AS40 Load cycle in the initial conditions (INIT) step of the Method. The example UI20 timed events are shown below:

Time	TTL 1	TTL 2	TTL 3	TTL 4	RLY 1	RLY 2	Collect	Comment
INIT	0	0	0	0	0	0		AS40 Load cycle off.
0.00	0	0	0	0	0	0		

6. Use the Schedule Editor to create a Schedule for running the Methods. The example Schedule is shown below:

Inj#	Sample Name	Method	Data File	Vol.	Dil.	Int. Std.
1	SAMPLE1	..\AS40TEST	..\TEST001	1	1	1
2	SAMPLE2	..\AS40TEST	..\TEST001	1	1	1
3	SAMPLE3	..\AS40TEST ..\ENDTEST	..\TEST001	1	1	1

7. Make sure that the samples are ready in the AS40 input tray. Press the **HOLD/RUN** switch to put the AS40 in hold.

8. Use the Run program to load the Schedule. In the Load Schedule dialog box, select the following conditions:

    Number of loops for the Schedule: **-1**
    Start Successive Runs: **Upon receiving signal at module**

    The **-1** option causes the Schedule to restart and run continually. The **Upon receiving signal at module** option defers the start of the next Method until the AS40 sends the Ready signal indicating the sample has been loaded.

9. Select the Start... command to start the Schedule and begin data collection.

10. Press the AS40 **HOLD/RUN** switch to take the AS40 out of hold. The first load cycle starts immediately, and then sample runs will continue according to the Schedule until the ENDTEST Method is downloaded.

DX-300 and PeakNet Example Method 2:

Figure D-10 illustrates the timed events for Example 2.
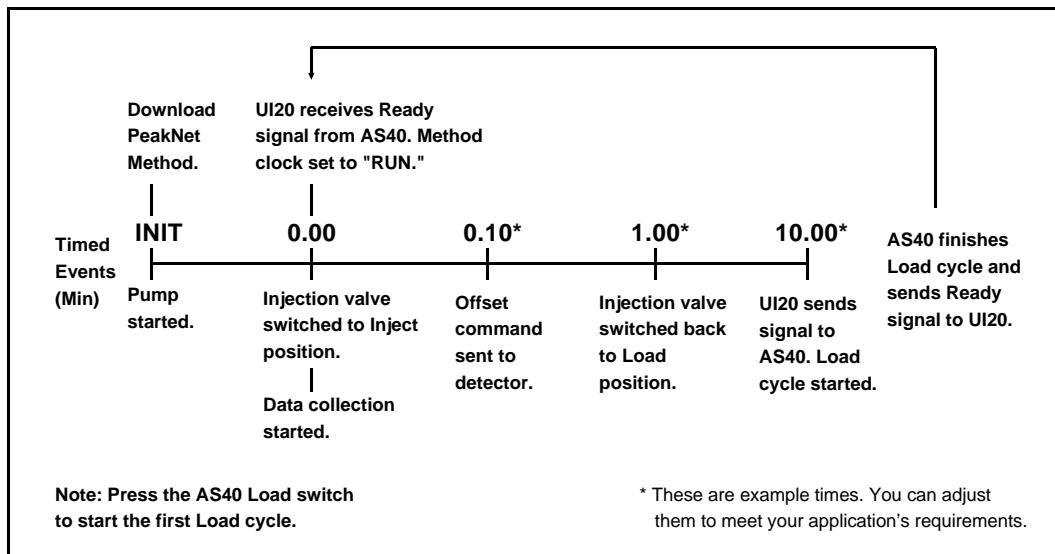
D-10. DX-300, UI20, and PeakNet Timed Events Example 2

1. Use the Method Editor to create a Method that includes the UI20. For this example, a data collection time of 10 minutes is entered.

2. In the UI20 Editor dialog box, click on the Setup... command button to open the UI20 Setup dialog box. Select the following parameters:

TTL/Relay Output	Labels
Relay 1	RLY 1 Run/Hold
Relay 2	RLY 2 Pump On/Off
TTL 1	TTL 1 Autozero
TTL 2	TTL 2 Load AS40

TTL Input	Trigger Type
WAIT	Normal Edge
RUN	Normal Edge
END	Normal Edge
ABORT	Normal Edge

3. In the UI20 Editor dialog box, enter the timed events for the Method. The times used for this example are shown below:

Time	RLY 1	RLY 2	TTL 1	TTL 2	TTL 3	TTL 4	Collect	Comment
INIT	0	1	0	0	0	0		Turn pump on.
0.00	1	1	0	0	0	0	Begin	Pump clock set to Run. Begin data collection.
0.10	1	1	1	0	0	0		Offset on.
10.00	1	1	0	1	0	0		Trigger AS40 Load cycle.

4. Program the pump using the pump module's front panel controls. Enter the times for switching the injection valve into the program. For this example the following program steps were entered for controlling the injection valve:

Pump Program Step	Description
TIME 0 %/# 5 1	Injection valve (valve 5) switched to Inject position.
TIME 1.0 %/# 5 0	Injection valve switched to Load position.

5. Use the Schedule Editor to create a Schedule for running the Method. The Schedule used for this example is shown below:

Inj#	Sample Name	Method	Data File	Vol.	Dil.	Int. Std.
1	SAMPLE	..\AS40TEST	..\TEST001	1	1	1

6. Use the Run program to load the Schedule and start the Method. In the Load Schedule dialog box, select the following conditions:

> Number of loops for the Schedule: **-1**
> Start Successive Runs: **Upon receiving signal at module**

The **-1** option causes the Schedule to restart and run continually. The **Upon receiving signal at module** option defers the start of the next run of the Schedule until the AS40 sends the Ready signal indicating the sample has been loaded.

7. Select the Start... command to start the Method.

8. Press the **Load** switch on the AS40 to start the first sample load. Thereafter, the Method will run automatically. When the AS40 runs out of samples, it does not send the Ready signal and the Method ends.

D.5.2 Using an ACI and AI-450

Connections

Figure D-11 illustrates an example of wire connections for a
DX-300 system connected to an Advanced Computer
Interface (ACI) and an AI-450 Chromatography Workstation.

1. Connect the Relay Control cable's (P/N 047946) 10-pin
    connector to the **RELAY CONTROL** connector on the AS40
    rear panel.

2. Connect the two-pin connector attached to the violet wire
    labeled **READY** from the AS40 to the **SYS 1 RUN**
    connector on the ACI.
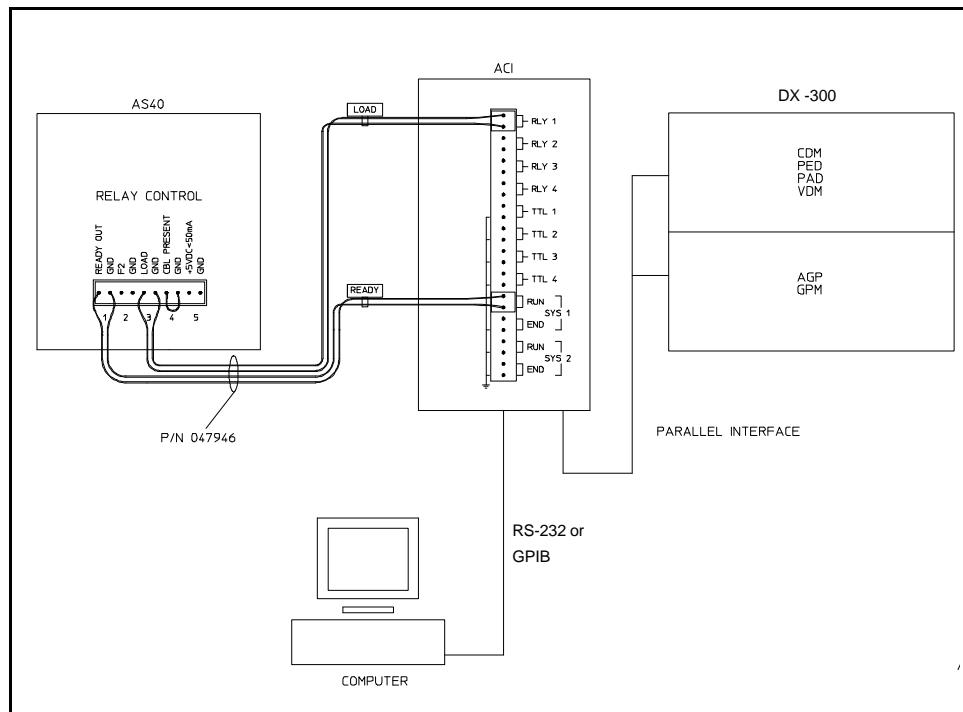
Figure D-11. Example Relay Connections:
DX-300, ACI, and AI-450

NOTE
**Check the polarity of the connections. Connect signal
wires between (+) pins and ground wires between (-) pins.
If necessary, remove wires from the two-pin connectors
and reinsert them in the correct positions.**

3. Connect the two-pin connector attached to the red wire
   labeled **LOAD** to **RLY 1** on the ACI.

4. Connect one of the ACI's parallel interface ribbon cables
   to the DX-300. Refer to the *Dionex Advanced Computer
   Interface Module Installation and Operation* manual
   (Document No. 034011) for details.

5. Connect either the RS-232 or GPIB cable from the ACI to
   the computer.

Example Methods: DX-300, ACI, and AI-450

The following examples describe how to use AI-450 Timed Events to control the AS40. The examples assume you are familiar with using AI-450. If needed, refer to the *AI-450 Chromatography Software User's Guide* (Document No. 034039) for additional information.

- Example 1 describes how to create a Method that starts the AS40 Load cycle in the Method's initial conditions (INIT) step. At the end of a Schedule, Example 1 requires that an ''end'' Method be downloaded to turn off the Load cycle in the initial conditions step. Because you do not need to enter the total sample run time into the timed event steps, you can use Example 1 to run samples that have different run times, or samples with unknown run times. Example 1 starts on the next page.

- Example 2 describes how to set up a Method that starts the AS40 Load cycle at the end of the Method. With Example 2, you must enter the sample run time in the Method. The Method will run continually and stop automatically when there are no more samples to load. A separate ''end'' Method is not required. Example 2 starts on page D-39.

DX-300, ACI, and AI-450 Example Method 1:

Figure D-12 illustrates the timed events for Example 1.
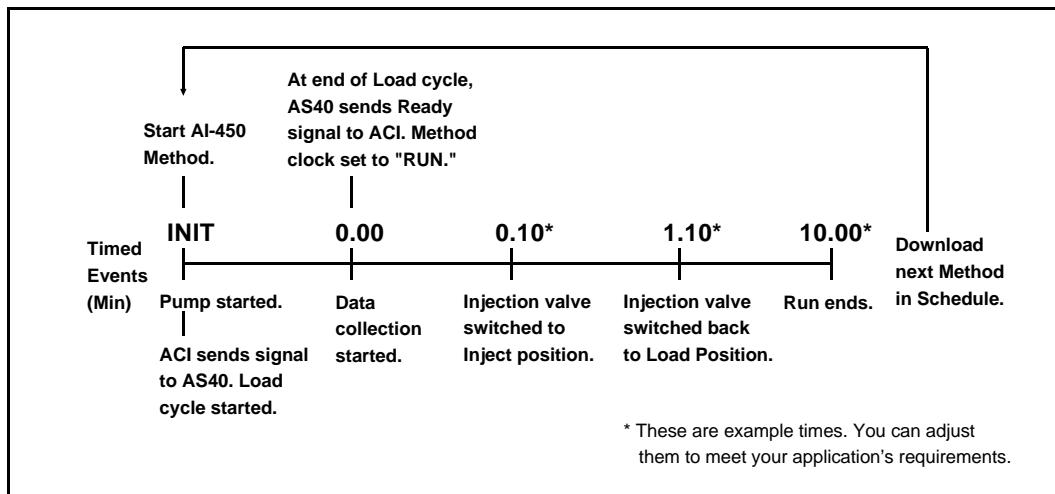
D-12. DX-300, ACI, and AI-450 Timed Events Example 1

1. Use the AI-450 Configuration Editor to set the ACI configuration. The example configuration is shown below:

    Configuration for ACI 1 on COM 1:
    System 1: AS40 Test
    System 2: NONE

    Control Cable Assignments:
    Cable 1: AGP-I Adv. Gradient Pump Assigned to System 1
    Cables 2 - 8: None

    AC/Relay Assignments:
    RLY1: (Autosmp) Assigned to System 1
    RLY2: Assigned to System 1
    TTL1: Assigned to System 1
    TTL2: Assigned to System 1
    AC1: (Regen) Assigned to System 1
    Other relays and TTLs assigned to System 2.

2. Use the AI-450 Method Editor to create a Method and enter a sample Run Time. This example uses a Run Time of 10.0 minutes. Default values are used for all other Method parameters.

3. With the AI-450 Gradient Editor, create a gradient file and include the timing for switching the injection valve position. The example file is shown below:

Time	Flow	%1	%2	%3	%4	Curve	V5*	V6	Comment
0.0	1.00	100	0	0	0	5	0	0	Injection valve in Load position.
0.1	1.00	100	0	0	0	5	1	0	Injection valve switched to Inject.
1.1	1.00	100	0	0	0	5	0	0	Injection valve switched back to Load.

* V5= injection valve

4. Use the AI-450 Timed Events Editor to create a timed events file for the Method. The example file is shown below:

Step	Time	Description		Notes
INIT		ACI	Autosmp ON	AS40 Load relay on.
INIT		ACI	RLY 2 OFF	
INIT		ACI	TTL 1 OFF	
INIT		ACI	TTL 2 OFF	
INIT		GPM	Start	Start the GPM.
INIT		GPM	Hold Gradient Clock	
INIT		GPM	Reset ON	
1	0.0	ACI	Autosmp OFF	AS40 Load relay off.
1	0.0	Start Sampling		Begin data collection.
1	0.0	GPM	Run Gradient Clock	Start timed events clock.
1	0.0	GPM	Reset OFF	

5. With the AI-450 Method Editor, create an ''end'' Method that turns off the AS40 Load cycle in the initial step of the Method. The example timed events are shown below:

Step	Time	Description		Notes
INIT		ACI	Autosmp OFF	AS40 Load relay off.
INIT		ACI	RLY 2 OFF	
INIT		ACI	TTL 1 OFF	
INIT		ACI	TTL 2 OFF	
INIT		GPM	Stop	Stop the pump.
INIT		GPM	Hold Gradient Clock	
INIT		GPM	Reset OFF	
1	0.0	ACI	Autosmp OFF	
1	0.0	ACI	RLY 2 OFF	
1	0.0	GPM	Hold Gradient Clock	
1	0.0	GPM	Reset OFF	

6. Use the AI-450 Schedule Editor to create a Schedule. The example Schedule is shown below:

Inj#	Sample Name	Method	Data File	Vol.	Dil.	Int. Std.
1	SAMPLE	..\AS40INIT	..\TEST001	1	1	1
2	SAMPLE2	..\AS40TEST	..\TEST001	1	1	1
3	SAMPLE3	..\AS40TEST	..\TEST001	1	1	1
		..\ENDTEST				

7. Use the AI-450 Run program to load the Schedule. In the Load Schedule dialog box, enter the name of the Schedule and select the following settings:

> Number of loops for the Schedule: **-1**
> Start Successive Runs: **Upon receiving signal at interface**

The -**1** option causes the Schedule to restart run continually. The **Upon receiving signal at module** option defers the start of the next run of the Schedule until the AS40 sends the Ready signal indicating the sample has been loaded.

8. Make sure that the samples are ready in the AS40 input tray and then start the Schedule by selecting the Start... command in the Run program, or by pressing the **RUN** button on the ACI front panel. The first sample Load cycle begins immediately after you start the Schedule. Thereafter, sample runs will continue according to the schedule until the ENDTEST Method is downloaded.

DX-300, ACI, and AI-450 Example Method 2:

Figure D-13 illustrates the timed events for Example 2.

D-13. DX-300, ACI, and AI-450 Timed Events Example 2

Use the following steps to set up the events.

1. Use the AI-450 Configuration Editor to set the ACI configuration. The example configuration is shown below:

   Configuration for ACI 1 on COM 1:
       System 1: AS40 Test
       System 2: NONE

   Control Cable Assignments:
       Cable 1: AGP-I Adv. Gradient Pump Assigned to System 1
       Cables 2 - 8: None

   AC/Relay Assignments:
       RLY1: (Autosmp) Assigned to System 1
       RLY2: Assigned to System 1
       TTL1: Assigned to System 1
       TTL2: Assigned to System 1
       AC1: (Regen) Assigned to System 1

Other relays and TTLs assigned to System 2.

2. Use the AI-450 Method Editor to create a Method. For this example a Run Time of 10.0 minutes is used. Default values are used for all other parameters in the Method.

3. Use the AI-450 Gradient Editor to create a gradient file, which will include the timing for switching the injection valve position. The file created for this example is shown below:

Time	Flow	%1	%2	%3	%4	Curve	V5*	V6	Comment
0.0	0.00	100	0	0	0	5	0	0	
0.1	0.00	100	0	0	0	5	1	0	Injection valve switched to Inject.
1.1	0.00	100	0	0	0	5	0	0	Injection valve switched back to Load.

* V5= injection valve

4. Use the AI-450 Timed Events Editor to create a timed events file for the Method. The example file is shown below:

Step	Time	Description		Notes
INIT		ACI	Autosmp OFF	AS40 Load relay off.
INIT		ACI	RLY 2 OFF	
INIT		ACI	TTL 1 OFF	
INIT		ACI	TTL 2 OFF	
INIT		GPM	Start	Start the pump.
INIT		GPM	Hold Gradient Clock	
INIT		GPM	Reset OFF	
1	0.0	Start Sampling		Begin data collection.
1	0.0	GPM	Run Gradient Clock	Start timed events clock.
2	10.0	ACI	Autosmp ON	AS40 Load relay on (sampler Load cycle starts).
2	10.0	GPM	Hold Gradient Clock	Pause timed events clock.
2	10.0	GPM	Reset ON	Reset timed events clock.

NOTE
The time for the last step in the Method and the Method
Run Time must be the same.

5. Use the AI-450 Schedule Editor to create a Schedule. The example Schedule is shown below:

Inj#	Sample Name	Method	Data File	Vol.	Dil.	Int. Std.
1	TEST	..\AS40TEST	..\TEST001	1	1	1

6. Use the AI-450 Run program to load the Schedule. In the Load Schedule dialog box enter the Schedule filename and select the following settings:

    Number of loops for the Schedule: **-1**
    Start Successive Runs: **Upon receiving signal at interface**

    The **-1** option causes the Schedule to restart and run continually. The **Upon receiving signal at module** option defers the start of the next run of the Schedule until the AS40 sends the Ready signal indicating the sample has been loaded.

7. Start the Schedule by selecting the Start... command in the Run program, or by pressing the **RUN** button on the ACI front panel.

8. Press the **Load** switch on the AS40 to start the first sample load. Thereafter, the Method will run automatically. When the AS40 runs out of samples, it does not send the Ready signal and the Method ends.

D.5.3 Using an Integrator

Connections

Figure D-14 is an example of wire connections for a DX-300 system connected to an integrator. These connections require one of the following integrator cables:

- Use the single-channel cable (P/N 048634) for systems with one sampler, one DX-300 system, and one integrator.

- Use the dual-channel cable (P/N 048635) for systems with two samplers, two DX-300 systems, and one integrator.

1. Connect the integrator cable's 36-pin connector to the **TIME FUNCTION** connector on the rear of the integrator.
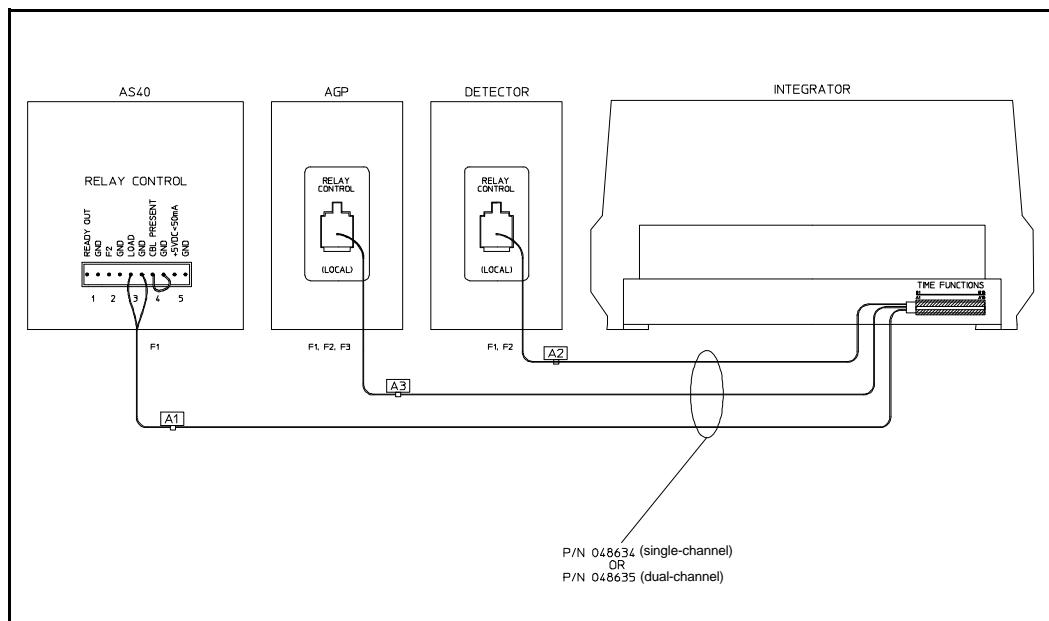
*Figure D-14.   Example Relay Connections:
DX 300 and Integrator*

2. Remove the pair of wires labeled **LOAD** from the AS40 Relay Control cable's 10-pin connector and replace them with the pair of wires labeled **A1** from the integrator cable. **Check the polarity of the connections**; connect the signal wire to the **+** pin and the blue ground wire to the **-** pin. (The pair of wires labeled **READY** can also be removed from the Relay Control cable. The Ready Out function is not used in this system configuration.)

3. Connect the modified Relay Control cable's 10-pin connector to the **RELAY CONTROL** connector on the AS40 rear panel.

4. Plug the telephone-style connector labeled **A2** on the integrator cable into the **RELAY CONTROL** connector on the detector.

5. Plug the telephone-style connector labeled **A3** on the integrator cable into the **RELAY CONTROL** connector on the pump.

Example Method: DX-300 and an Integrator

The following example describes how to use the External Event option on the Dionex 4400 Integrator or 4600 Integrator to control the AS40 Automated Sampler. See *Getting Started with Your Dionex Integrator* (Document No. 032299) for additional information.

The integrator timed functions used to control the sampler, pump, and detector are shown in the following table:

Timed Event Code	Module	Function ON (=1)	OFF (=0)
T3	AS40	Start Load cycle	Ready
T4	CDM	10X Range	Selected Range
T5	CDM	Auto Offset on	Offset off
T6	AGP	Run	Hold
T7	AGP	Pgm+1	Selected Pgm
T8	AGP	Start	Stop

Figure D-15 illustrates the timed events for the example.
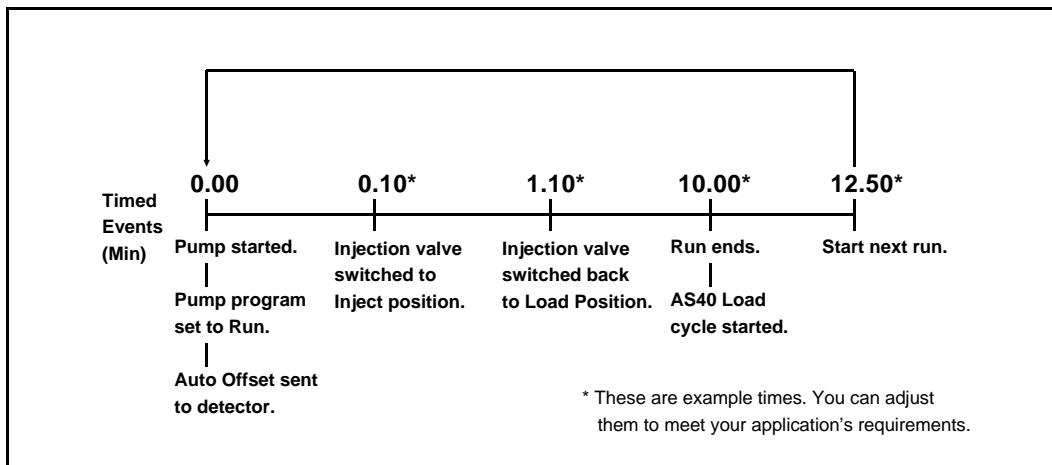
D-15. DX-300 and Integrator Timed Events Example

1. Use Dialog to create a Method that controls the AS40
   Load cycle, the pump, and the integrator. The Method
   must also include the Method number, a component table,
   and a sample table, which are not shown here. See
   Getting Started with Your Dionex Integrator (Document
   No. 032299) for details.

   The timed functions for the Method will be similar to the
   following sample file, which is based on loading a sample
   loop in Proportional mode, using a single sample from a
   5 mL sample vial.

Time	Function	Value	Comment
TT= 0	TF=" T8	TV= 1	Start AGP.
TT= 0	TF=" T6	TV= 1	Set AGP program clock to Run.
TT= 0	TF=" T5	TV= 1	CDM Auto Offset.
TT= 10.0	TF=" T6	TV= 0	Set AGP program clock to Hold.
TT= 10.0	TF=" ER	TV= 1	End integrator Run.
TT= 10.0	TF=" T5	TV= 0	Auto Offset Off.

Time	Function	Value	Comment
TT= 10.0	TF=" T3	TV= 1	Start AS40 Load cycle.
TT= 12.5	TF=" SR	TV= 1	Start Run (start the next integrator run).

2. Set up an AGP program for timing switching of the injection valve in the chromatography module. In the following example, the pump is operating isocratically using eluent 1. Valve 5 is used to operate the injection valve.

Time	Flow	Eluent Conditions	Valve 5
0.0	2.0	100% Eluent 1	Off
0.10	2.0	100% Eluent 1	On
1.10		100% Eluent 1	Off

After programming the integrator and pump, you are ready to begin automated operation.

3. Select the desired operating parameters (samples per vial, type, etc.) on the front panel of the AS40 Automated Sampler.

4. Set the AS40 to **Lcl**.

5. Start the first run by pressing the integrator **INJ/END A** key. The first sample run will be a blank, because the timed events inject the sample at the beginning of the run, before the first AS40 Load cycle occurs. Thereafter, the method will continue automatically until you stop the integrator by again pressing the **INJ/END A** key.

<div align="center">

NOTE

</div>

Refer to *Getting Started with Your Dionex Integrator* **(Document No. 032299) for information about using a BASIC program to fully automate the process (e.g., to initialize the integrator, run samples, and automatically stop the system).**

D.6 Relay Control with a DX-100 System

D.6.1 Using a UI20 and PeakNet

Connections

Figure D-16 is an example of wire connections for a DX-100 system connected to a UI20 Universal Interface and a PeakNet Chromatography Workstation.

NOTE
Check the polarity of the connections. Connect signal wires between (+) pins and ground wires between (-) pins. If necessary, remove wires from their two-pin connectors and reinsert them in the correct positions.

1. Connect the Relay Control cable's (P/N 047946) 10-pin connector to the **RELAY CONTROL** connector on the AS40.
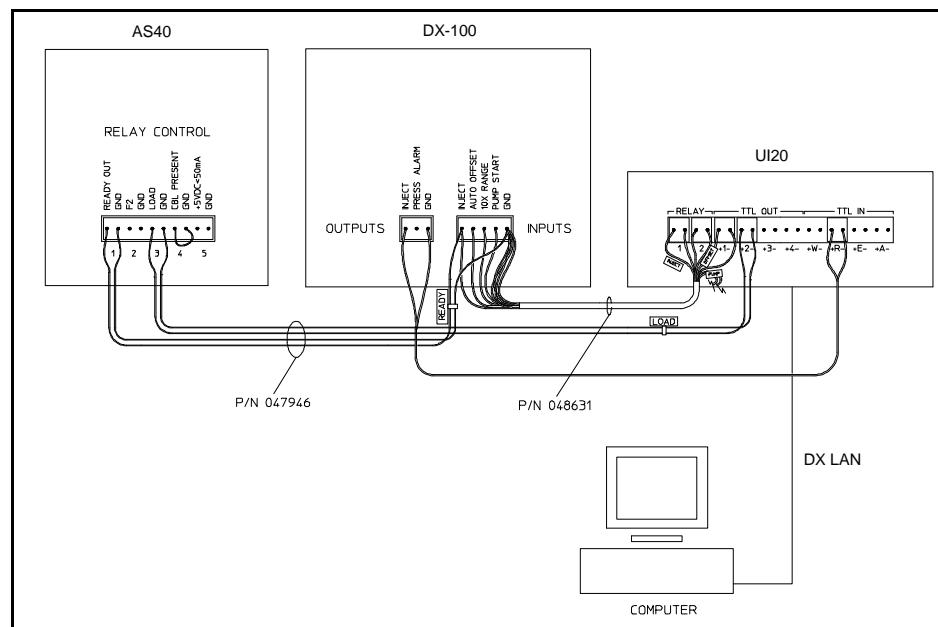
Figure D-16.   Example Relay Connections:
DX-100, UI20, and PeakNet

2. Connect the cable's two-pin connector labeled **LOAD** to **TTL OUT 2** on the UI20.

3. Remove the two-pin connector from the pair of wires labeled **READY** on the AS40 Relay Control cable. Insert the violet signal wire into the left-most position of the five-pin connector on the DX-100 Automation cable (P/N 048631). This will connect the AS40 **READY OUT** (**+**) pin to the DX-100 **INJECT INPUTS** pin. (This pin will have two wire connections.) Insert the ground wire into the right-most position on the Automation cable five-pin connector. This will connect the AS40 **READY OUT GND** (**-**) pin to the DX-100 **INPUTS GND** pin.

4. Plug the modified five-pin connector into the **INPUTS** connector on the rear of the the DX-100.

5. Connect the two-pin connector labeled **INJECT** from the DX-100 Automation cable to **RELAY 1** on the UI20.

6. Connect the two-pin connector labeled **OFFSET** from the Automation cable to **RELAY 2** on the UI20.

7. Connect the two-pin connector labeled **PUMP** from the Automation cable to **TTL OUT 1** on the UI20.

NOTE
The DX-100 10X Range Inputs pin is not connected in this installation.

8. Connect the **INJECT OUTPUTS** pin on the DX-100 to the TTL IN **+R** pin on the UI20 and connect the **-R** pin to the DX-100 **OUTPUTS GND** pin. To do this, create a ''jumper'' cable by attaching two-pin connectors (P/N 921370) to both ends of a pair of wires. Use a red wire (P/N 216158) for the signal wire and a black wire (P/N 010451) for the ground wire.

9. Set the AS40 to Rinse Before mode by setting **DEFAULT SET** switch #7 to the On position (see Appendix C).

Example Methods: DX-100, UI20, and PeakNet

The following examples describe how to use PeakNet Timed Events to control the AS40. The examples assume you are familiar with using PeakNet. If needed, refer to the *PeakNet Software User's Guide* (Document No. 034914) for additional information.

- Example 1 describes how to create a Method that starts the AS40 Load cycle in the Method's initial conditions (INIT) step. At the end of a Schedule, Example 1 requires that an ''end'' Method be downloaded to turn off the Load cycle in the initial conditions step. Because you do not need to enter the total sample run time into the timed event steps, you can use Example 1 to run samples that have different run times, or samples with unknown run times. Example 1 starts on the next page.

- Example 2 describes how to set up a Method that starts the AS40 Load cycle at the end of the Method. With Example 2, you must enter the sample run time in the Method. The Method will run continually and stop automatically when there are no more samples to load. A separate ''end'' Method is not required. Example 2 starts on page D-53.

DX-**100, UI20, and PeakNet Example 1:**

Figure D-17 illustrates the timed events for Example 1.
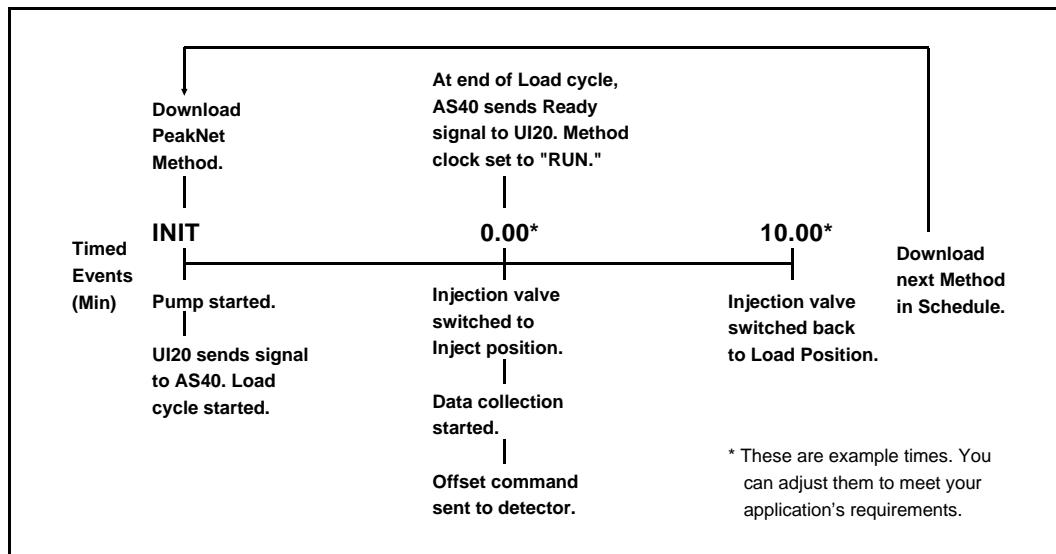
D-17. DX-100, UI20, and PeakNet Timed Events Example 1

Use the following steps to set up the events.

1. Use the Method Editor to create a Method that includes the UI20 module.

2. In the UI20 Editor dialog box, click on the Setup... command button to open the UI20 Setup dialog box. Select the following parameters:

TTL/Relay Output	Labels
Relay 1	Inject
Relay 2	Pump On
TTL 1	Offset
TTL 2	Load AS40

TTL Input	Trigger Type
WAIT	Normal Edge
RUN	Normal Edge
END	Normal Edge
ABORT	Normal Edge

3. In the UI20 Editor dialog box, enter the timed events for the Method. The times used for this example are shown below:

Time	RLY 1	RLY 2	TTL 1	TTL 2	TTL 3	TTL 4	Collect	Comment
INIT	0	1	0	1	0	0		Turn pump on. Trigger AS40 Load cycle.
0.00	1	1	1	0	0	0	Begin	Offset on. Switch valve to Inject. Begin data collection.
10.00	0	1	0	0	0	0		Valve switched back to Load.

4. Use the Method Editor to create an ''end'' Method that turns off the AS40 Load cycle in the initial conditions (INIT) step of the Method. The UI20 timed events used for this example are shown below:

Time	TTL 1	TTL 2	TTL 3	TTL 4	RLY 1	RLY 2	Collect	Comment
INIT	0	0	0	0	0	0		AS40 Load cycle off.
0.00	0	0	0	0	0	0		

5. Use the Schedule Editor to create a Schedule for running the Methods. The example Schedule is shown below:

Inj#	Sample Name	Method	Data File	Vol.	Dil.	Int. Std.
1	SAMPLE1	..\AS40TEST	..\TEST001	1	1	1
2	SAMPLE2	..\AS40TEST	..\TEST001	1	1	1
3	SAMPLE3	..\AS40TEST ..\ENDTEST	..\TEST001	1	1	1

6. Set the AS40 to **Lcl**.

7. Set the AS40 to Rinse Before mode by setting **DEFAULT SET** switch #7 to the On position (see Appendix C).

8. Make sure that the samples are ready in the AS40 input tray. Press the **HOLD/RUN** switch to put the AS40 in hold.

9. Use the Run program to load the Schedule. In the Load Schedule dialog box, select the following conditions:

    Number of loops for the Schedule: **-1**
    Start Successive Runs: **Upon receiving signal at module**

    The **-1** option causes the Schedule to restart and run continually. The **Upon receiving signal at module** option defers the start of the next Method until the AS40 sends the Ready signal indicating the sample has been loaded.

10. Select the Start... command to start the Schedule and begin data collection.

11. Press the **HOLD/RUN** switch to take the AS40 out of hold. The first sample Load cycle begins immediately, and sample runs will then continue according to the Schedule until the ENDTEST Method is downloaded.

DX-100, UI20, and PeakNet Example 2:

Figure D-18 illustrates the timed events for Example 2.
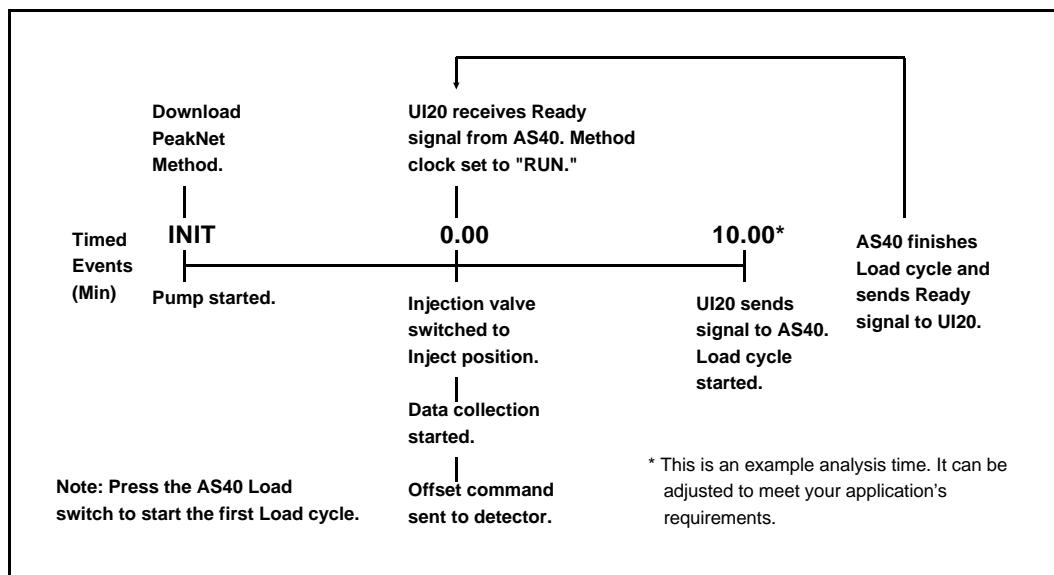
D-18. DX-100, UI20, and PeakNet Timed Events Example 2

Use the following steps to set up the events.

1. Use the Method Editor to create a Method that includes the UI20.

2. In the UI20 Editor dialog box, click on the Setup... command button to open the UI20 Setup dialog box. Select the following parameters:

TTL/Relay Output	Labels
Relay 1	Inject
Relay 2	Pump On
TTL 1	Offset
TTL 2	Load AS40

TTL Input	Trigger Type
WAIT	Normal Edge
RUN	Normal Edge
END	Normal Edge
ABORT	Normal Edge

3. In the UI20 Editor dialog box, enter the timed events for the Method. The times used for this example are shown below:

Time	RLY 1	RLY 2	TTL 1	TTL 2	TTL 3	TTL 4	Collect	Comment
INIT	0	1	0	0	0	0		Turn pump on.
0.00	1	1	1	0	0	0	Begin	Offset on. Switch valve to Inject and begin data collection.
10.00	0	1	0	1	0	0		Trigger AS40 Load cycle.

4. Use the Schedule Editor to create a Schedule for running the Method. The Schedule used for this example is shown below:

Inj#	Sample Name	Method	Data File	Vol.	Dil.	Int. Std.
1	SAMPLE	..\AS40TEST	..\TEST001	1	1	1

5. Use the Run program to load the Schedule and start the Method. In the Load Schedule dialog box, select the following conditions:

    Number of loops for the Schedule: **-1**
    Start Successive Runs: **Upon receiving signal at module**

    The **-1** option causes the Schedule to restart and run continually and the **Upon receiving signal at module** option defers the start of the next run of the Schedule until the AS40 sends the Ready signal indicating the sample has been loaded.

6. Select the Start... command to start the Schedule.

7. Press the **Load** switch on the AS40 to start the first sample load. Thereafter, the Schedule will run automatically. When the AS40 runs out of samples, it does not send the Ready signal and the Schedule ends.

D.6.2 Using an ACI and AI-450

Connections

Figure D-19 is an example of wire connections for a DX-100 system connected to an Advanced Computer interface (ACI) and an AI-450 Chromatography Workstation.

NOTE
Check the polarity of the connections. Connect signal wires between (+) pins and ground wires between (-) pins. If necessary, remove wires from their two-pin connectors and reinsert them in the correct positions.

1. Connect the AS40 Relay Control cable's (P/N 047946) 10-pin connector to the **RELAY CONTROL** connector on the AS40 rear panel.
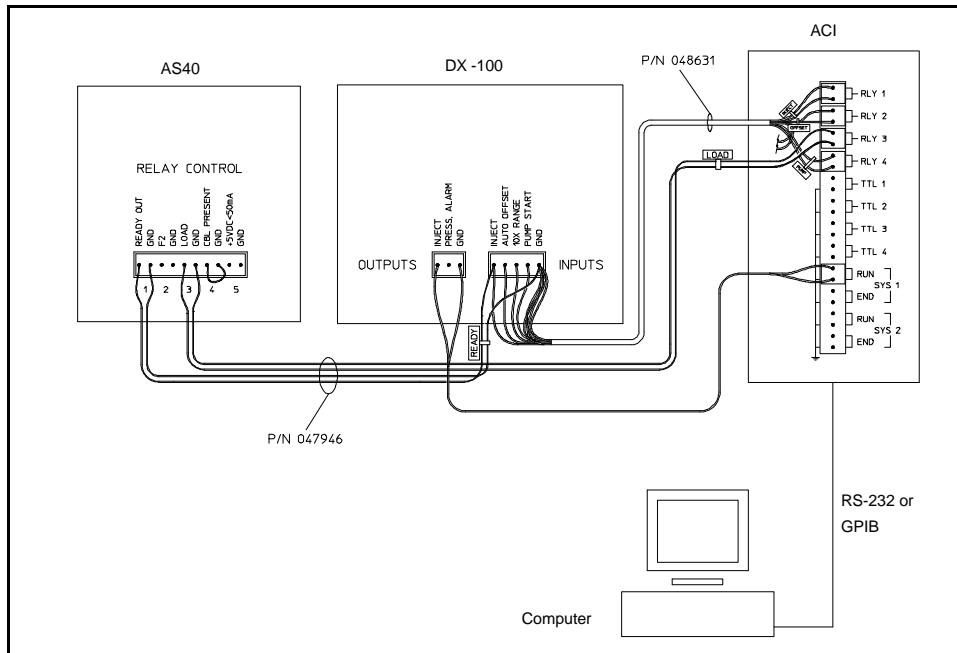
*Figure D-19. Example Relay Connections:
DX-100, ACI, and AI-450*

2. Connect the two-pin connector labeled **LOAD** to **RLY 3** on the ACI.

3. Remove the two-pin connector from the pair of wires labeled **READY** on the AS40 Relay Control cable. Insert the violet signal wire into the left-most position of the five-pin connector on the DX-100 Automation cable (P/N 048631). This will connect the AS40 **READY OUT** (**+**) pin to the DX-100 **INJECT INPUTS** pin. (This pin will have two wire connections.) Insert the ground wire into the right-most position on the Automation cable's five-pin connector. This will connect the AS40 **READY OUT GND** (**-**) pin to the DX-100 **INPUTS GND** pin.

4. Plug the modified five-pin connector into the **INPUTS** connector on the rear of the the DX-100.

5. Connect the two-pin connector labeled **INJECT** from the DX-100 Automation cable to **RLY 1** on the ACI.

6. Connect the two-pin connector labeled **OFFSET** from the Automation cable to **RLY 2** on the ACI.

7. Connect the two-pin connector labeled **PUMP** from the Automation cable to **RLY 4** on the ACI.

NOTE
The DX-100 10X Range Inputs pin is not connected in this installation.

8. Connect the **INJECT OUTPUTS** pin on the DX-100 to the **SYS RUN** (**+**) pin on the ACI and connect the **SYS RUN** (**-**) pin to the DX-100 **OUTPUTS GND** pin. To do this, create a ''jumper'' cable by attaching two-pin connectors (P/N 921185) to both ends of a pair of wires (P/N 043598). Use a red wire for the signal and a black wire for the ground.

9. Set the AS40 to Rinse Before mode by setting **DEFAULT SET** switch #7 to the On position (see Appendix C).

DX-100, ACI, and AI-450 Example Method

The following example describes how to use AI-450 Timed Events to control the AS40. See the *AI-450 Chromatography Software User's Guide* (Document No. 034039) for additional information.

Figure D-17 illustrates the timed events for the example.
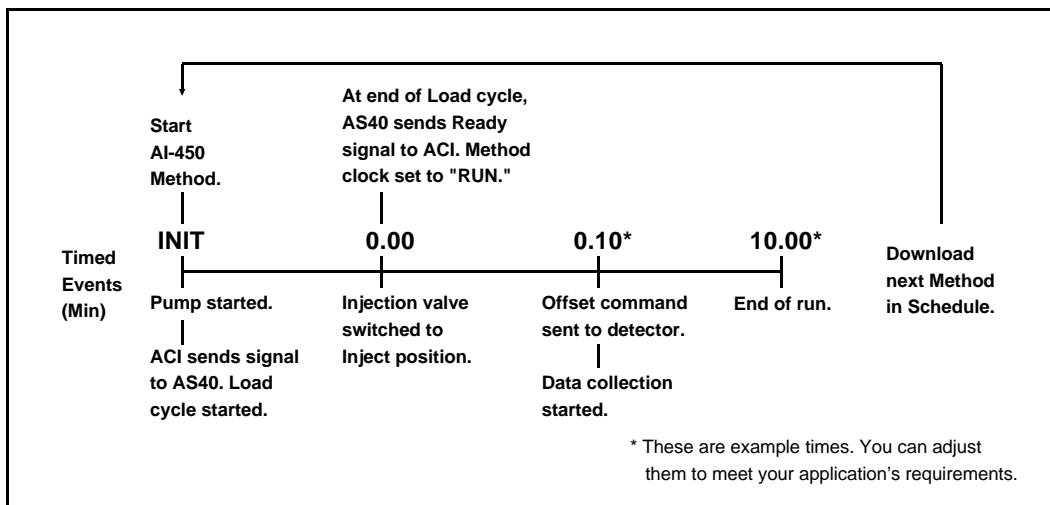
D-20. DX-100, ACI, and AI-450 Timed Events Example

Use the following steps to set up the events.

1. Use the AI-450 Configuration Editor to set the ACI configuration. The configuration used for this example is shown below:

   Configuration for ACI 1 on COM 1:
       System 1: NONE
       System 2: AS40 Test

   Control Cable Assignments:
       Cables 1 - 8: None Assigned

AC/Relay Assignments:

    RLY1 = Inject Assigned to System 1

    RLY2 = A Offset Assigned to System 1

    RLY3 = Pump Start Assigned to System 1

    RLY4 = Load AS40 Assigned to System 1

    All other relays and TTLs assigned to System 2

2. Use the AI-450 Method Editor to set up two Method files. Each of these Methods will include a timed function file that controls the operation of the AS40, the injection valve, and the ACI. For this example, the two Method files are named TEST.MET and ENDTEST.MET. A Run Time of 10.0 minutes is entered for each Method. Default values are used for all other Method parameters.

3. Use the AI-450 Timed Events Editor to create the timed events file for the first Method. The file created for this example, TEST.TE, is shown below:

Step	Time	Description		Notes
INIT		ACI	AS40 ON	AS40 Load relay on (Load cycle starts).
INIT		ACI	OFFSET OFF	
INIT		ACI	AC 2 OFF	
INIT		ACI	PUMP START ON	Start the pump.
1	0.0	ACI	AS40 OFF	
1	0.0	ACI	OFFSET OFF	
1	0.0	ACI	RUN	Start timed events clock.
1	0.0	ACI	INJECT ON	Switch injection valve to Inject position.
2	0.1	ACI	OFFSET ON	
2	0.1	Start Sampling		Begin data collection.
3	10.0	ACI	INJECT OFF	Switch injection valve back to Load position.

The timed events file for the second Method ends the looping of the first Method by turning off the AS40 Load relay in the initialization step. The file created for this example, ENDTEST.TE, is shown below:

Step	Time	Description	
INIT		ACI	AS40 OFF
INIT		ACI	INJECT OFF
INIT		ACI	OFFSET OFF
INIT		ACI	PUMP START ON
1	0.0	ACI	PUMP START OFF

4. Use the AI-450 Schedule Editor to create a Schedule for the Methods. For each sample injection, include a line which references the first Method file. At the end of the Schedule include a line which references the second Method file. The Schedule created for this example is shown below:

Inj#	Sample Name	Method	Data File	Vol.	Dil.	Int. Std.
1	SAMPLE1	..\TEST	..\TEST001	1	1	1
2	SAMPLE2	..\TEST	..\TEST001	1	1	1
3	SAMPLE2	..\TEST	..\TEST001	1	1	1
		..\ENDTEST				

5. Use the AI-450 Run program to load the Schedule. In the Load Schedule dialog box, select the following settings:

> Number of loops for the Schedule: **-1**
> Start Successive Runs: **Upon receiving signal at interface**

The **-1** option causes the Schedule to restart and run continually. The **Upon receiving signal at module** option defers the start of the next run of the Schedule until the AS40 sends the Relay signal indicating the sample has been loaded.

6. Set the AS40 to **Lcl**.

7. Set the AS40 to Rinse Before mode by setting **DEFAULT SET** switch #7 to the On position (see Appendix C).

8. Make sure that the samples are ready in the AS40 input tray and then start the Schedule by selecting the Start... command in the Run program or by pressing the **RUN** button on the ACI front panel. The first sample Load cycle begins immediately after you start the Schedule. Thereafter, sample runs will continue according to the Schedule until the ENDTEST Method is downloaded.

D.6.3 Using an Integrator

Connections

Figure D-21 illustrates the wire connections for a DX-100 system connected to a Dionex 4400 Integrator or 4600 Integrator. These connections require one of the following cables:

•   Use the single-channel cable (P/N 048634) for systems with one sampler, one DX-100 system, and one integrator.

•   Use the dual-channel cable (P/N 048635) for systems with two samplers, two DX-100 systems, and one integrator.
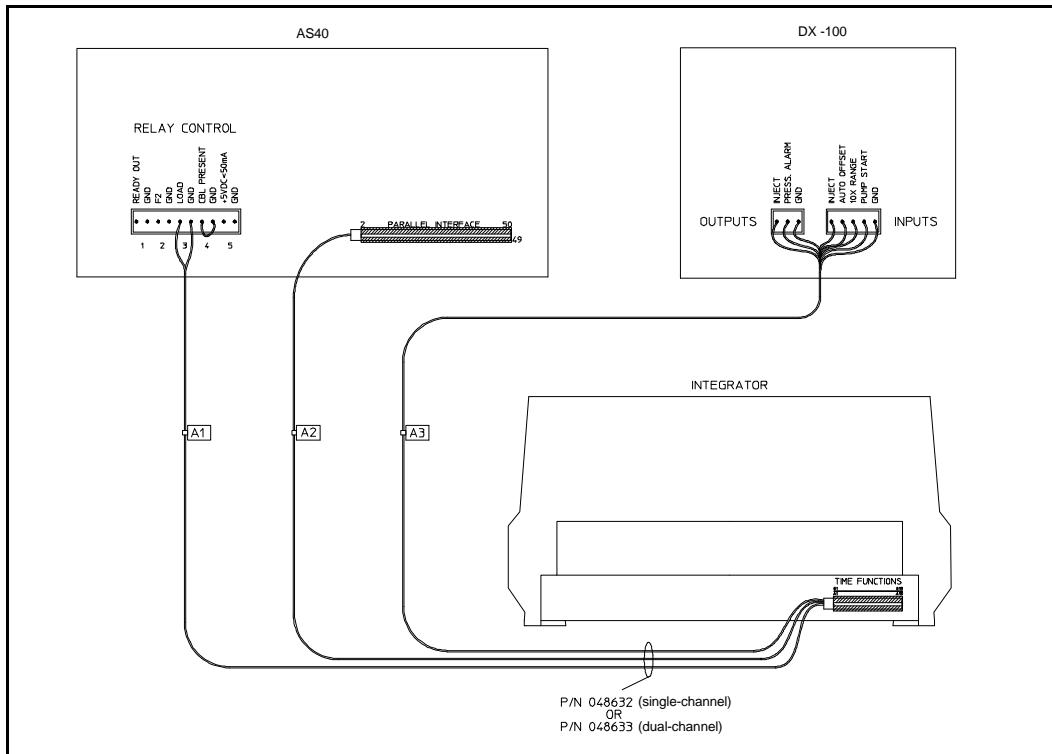
Figure D-21.   Example Relay Connections:
DX-100 and Integrator

1. Set the DX-100 to Local control.

2. Connect the cable's 36-pin connector to the **TIME FUNCTION** connector on the rear of the integrator. Connect the cable's 10-pin green connector, labeled **A1**, to the AS40 **RELAY CONTROL** connector.

3. Connect the cable's three-pin connector to the DX-100 **OUTPUTS** connector.

4. Connect the cable's five-pin connector to the DX-100 **INPUTS** connector.

5. Connect the cable's 50-pin parallel connector to the AS40 **PARALLEL INTERFACE** connector.

6. Connect the cable's 10-pin connector to the AS40 **RELAY CONTROL** connector.

DX-100 and Integrator Example Method

The following example describes how to use a Dionex 4400 Integrator or 4600 Integrator with a DX-100 to control the AS40 Automated Sampler. For additional information, refer to the *4440 Integrator User's Guide* (Document No. 034200) or *4600 Integrator User's Guide* (Document No. 034408), and the *DX-100 Ion Chromatograph Operator's Manual* (Document No. 034731).

Figure D-22 illustrates the timed events for the example.
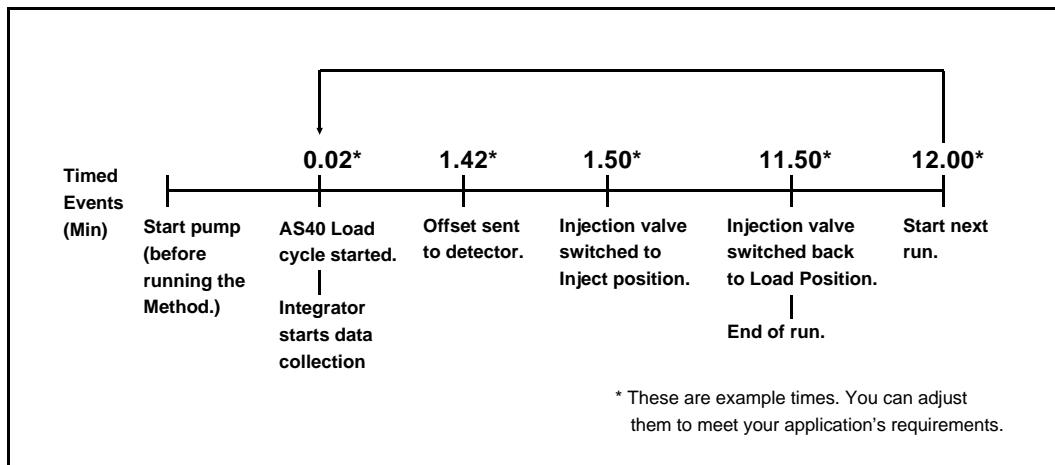
D-22. DX-100 and Integrator Timed Events Example

The integrator Time Function (TFN) commands are assigned to the following DX-100/AS40 functions:

Time	Function ON (=1)	OFF (=0)
T3 (AS40)	Start Load cycle	No Action
T4 (Detector)	Range 10X	Range normal
T5 (Auto Offset)	Auto Offset on	Auto Offset off
T6 (Injection Valve)	Inject	Load
T7 (Pump)	Pump on	Pump off

Use the following steps to set up the events:

1. Use Dialog to create a Method file that includes a timed function file for controlling the operation of the AS40, the injection valve, and the integrator. The Method must also include the Method number, a component table, and a sample table, which are not shown here (see the *DX-100 Ion Chromatograph Operator's Manual*). The timed function file for this example is shown below:

Time	Function	Value	Comment
TT= 0.02	TF=" T3	TV= 1	Start AS40 Load cycle.
TT= 0.04	TF=" T3	TV= 0	Toggle the Load relay off.
TT= 1.40	TF=" T5	TV= 0	Turn off Auto Offset.
TT= 1.42	TF=" T5	TV= 1	Reset Auto Offset.
TT= 1.50	TF=" T6	TV= 1	Injection valve set to Inject position.
TT= 11.50	TF=" T6	TV= 0	Injection valve set to Load position.
TT= 11.50	TF=" ER	TV= 1	End run.
TT= 12.00	TF=" SR	TV= 1	Start next run.

2. Before running the Method, the T7 Time Function, which controls the pump, must be set to 1 to turn on the pump. Press the **TFN** key on the integrator and enter **T7=1**.

3. Set the AS40 to **Lcl** control.

4. Set the DX-100 to **Relay** control.

5. Start the the first run by pressing the **INJ/END A** key on the integrator. Thereafter, the method will continue automatically until you stop the integrator by again pressing the **INJ/END A** key.

NOTE
Refer to the *DX-100 Ion Chromatograph Operator's Manual* **for information about using a BASIC program to fully automate the process (e.g., to initialize the integrator, run samples, and automatically stop the system).**

E • Parallel Remote Control of the AS40

NOTE
Dionex controllers do not provide Parallel Remote control of the AS40 Automated Sampler. The following information is provided to allow you to program non-Dionex devices to control the AS40.

E.1 Basic Control Structure

The parallel interface is standardized to have five I/O ports of eight bits (one byte) each, plus an additional 10 bits of miscellaneous I/O control. Data to and from the AS40 is received and sent in parallel bytes of eight bits.

E.2 Parallel Interface Organization

Each of the 50 parallel I/O lines is wired to a pin on the printed circuit board edge connector. The cable between the controller and AS40 is a 50-wire ribbon cable. Although all 50 lines are available, not all are required for the complete control and monitoring of the sampler (see Section E.4).

E.3 Electrical Characteristics

The input lines from the controller to the sampler may be driven by a variety of logic families, including TTL, CMOS, and computer I/O. The output lines from the sampler to the controller operate with a 0 volt logic low to 5 volt logic high capable of driving low power Shottky loads, CMOS loads, and a variety of computer I/O. The monitor (Mon) lines **will not** drive standard TTL loads.

E.4 Pin Assignments

The monitor functions are active in both Local and Remote mode.
The AS40 accepts the command functions only when in Remote
mode. The functions listed in the table are asserted (true) by a logic
''HI''.

Pin No.	Port No.	Data Bit	Function
1	2	7	Not Used
2	2	6	Not Used
3	2	5	Not Used
4	2	4	Not Used
5	2	3	Not Used
6	2	2	Not Used
7	2	1	Not Used
8	2	0	Not Used
9	2		Mon - Data Ready (Not used)
10	SPARE		Spare
11	1	7	Cassette Jammed
12	1	6	Head Jammed
13	1	5	Remote/Local
14	1	4	Run/Hold
15	1	3	In Queue Empty
16	1	2	Out Queue Full
17	1	1	Head Up
18	1	0	Tray Ready
19	1		Mon - Data Ready (Not Required)
20	SPARE		Spare
21	0	7	Inj. in progress: 1, 2, or 3
22	0	6	Inj. in progress: 1, 2, or 3
23	0	5	Type: Sample/Rinse
24	0	4	Size 5/.5
25	0	3	Search

Pin No.	Port No.	Data Bit	Function
26	0	2	Load
27	0	1	Bleed
28	0	0	Ready
29	0		Mon - Data Ready (Not Required)
30	SPARE		Spare
31			No Module (Sampler will ground)
32			No Remote Control (Controller must ground)
33	1	7	Spare
34	1	6	Spare
35	1	5	Spare
36	1	4	Spare
37	1	3	Head Up
38	1	2	Skip
39	1	1	Run/Hold
40	1	0	Not Load
41	0	7	Spare
42	0	6	Spare
43	0	5	3 Injections per Vial
44	0	4	2 Injections per Vial
45	0	3	1 Injection per Vial
46	0	2	Bleed (On/Off)
47	0	1	Mode (Proportional/Constant)
48		0	Type (Loop/Concentrator)
49			GROUND (module signal common)
50			GROUND (module signal common)

F • Reordering Information

Reorder P/N	Description	Quantity
038141	5.0 mL Vials with Filter Caps	250 Each
038142	0.5 mL Vials with Filter Caps	250 Each
038008	5.0 mL Vials	250/Box
038010	0.5 mL Vials	250/Box
038009	Filter Caps for 5.0 mL Vials	250/Box
039528	Plain Caps for 5.0 mL Vials	250/Box
038011	Filter Caps for 0.5 mL Vials	250/Box
042154	Plain Caps for 0.5 mL Vials	250/Box
046032	5.0 mL Cassettes	6/Box
046031	0.5 mL Cassettes	6/Box
040835	Sample Tip Replacement Kit	1 Each

Index