



# **REAGENT-FREE™ CONTROLLER OPERATOR'S MANUAL**

Document No. 031880  
Revision 03  
March 2004

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## **PRINTING HISTORY**

Revision 01, February 2003

Revision 02, May 2003

Revision 03, March 2004

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# Reagent-Free Controller Operator's Manual

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## 1. Introduction

The Reagent-Free Controller (RFC) is an external power supply, available in two versions:

- The RFC-10 controls an AES<sup>®</sup> Atlas Electrolytic Suppressor or an SRS<sup>®</sup> Self-Regenerating Suppressor.
- The RFC-30 controls an AES or SRS, as well as an EluGen<sup>®</sup> eluent generator cartridge (EGC) and a CR-TC Continuously Regenerated Trap Column.

The RFC controls these devices by supplying current (to the suppressor and eluent generator) and voltage (to the CR-TC).

This manual provides instructions for operating and installing the RFC-10 and RFC-30 with the following Dionex products:

- DX-320/320J Ion Chromatography System
- DX-500 or DX-600 Ion Chromatography System
- DX-120 Ion Chromatograph

## 1.1 Safety Messages and Notes

This manual contains warnings and precautionary statements that can prevent personal injury and/or damage to the RFC when properly followed. Safety messages appear in bold type and are accompanied by icons, as shown below.



**Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.**



**Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.**



**Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. Also used to identify a situation or practice that may seriously damage the instrument, but will not cause injury.**



**Indicates that the function or process of the instrument may be impaired. Operation does not constitute a hazard.**

### Messages d'avertissement en français



**Signale une situation de danger immédiat qui, si elle n'est pas évitée, entraînera des blessures graves à mortelles.**



**Signale une situation de danger potentiel qui, si elle n'est pas évitée, pourrait entraîner des blessures graves à mortelles.**



**Signale une situation de danger potentiel qui, si elle n'est pas évitée, pourrait entraîner des blessures mineures à modérées. Également utilisé pour signaler une situation ou une pratique qui pourrait gravement endommager l'instrument mais qui n'entraînera pas de blessures.**

### Warnhinweise in Deutsch



Bedeutet unmittelbare Gefahr. Mißachtung kann zum Tod oder schwerwiegenden Verletzungen führen.



Bedeutet eine mögliche Gefährdung. Mißachtung kann zum Tod oder schwerwiegenden Verletzungen führen.



Bedeutet eine mögliche Gefährdung. Mißachtung kann zu kleineren oder mittelschweren Verletzungen führen. Wird auch verwendet, wenn eine Situation zu schweren Schäden am Gerät führen kann, jedoch keine Verletzungsgefahr besteht.

### Notes

Informational messages also appear throughout this manual. These are labeled NOTE and are in bold type:

**NOTE** NOTES call attention to certain information. They alert you to an unexpected result of an action, suggest how to optimize instrument performance, etc.

## 1.2 Safety Labels

The TUV GS, C, US Mark safety label and the CE Mark label on the RFC indicate that the RFC is in compliance with the following standards: EN 61010-1:2001 (safety), CAN/CSA-C22.2 No. 1010.1-92+A2:97 (safety), UL 61010C-1:2002 R8.02 (safety), and EN 61326:1997+A1:1998 (susceptibility and immunity).

The symbols below appear on the RFC or on RFC labels.



Alternating current



Protective conductor terminal (earth ground)



Power supply is on



Power supply is off



Indicates a potential hazard. Refer to the operator's manual for an explanation of the hazard and how to proceed.

## 2. RFC Features

### 2.1 Overview of Device Control

The RFC can provide power to a device (suppressor, EGC, or CR-TC) only when the pump flow is on. A TTL or AC connection between the RFC and the pump or DX-120 signals the RFC when the pump flow is on. When this occurs, the **RFC ENABLED** LED on the front panel (see Figure 2) turns on, indicating the RFC is ready to control devices.

The **DEVICE SELECT** buttons turn on or off control of individual devices. Power is supplied to a device only when **RFC ENABLED** is on and the **DEVICE SELECT** LED for the device is on. Figure 1 illustrates the relationship between the Device Select and RFC Enabled functions.

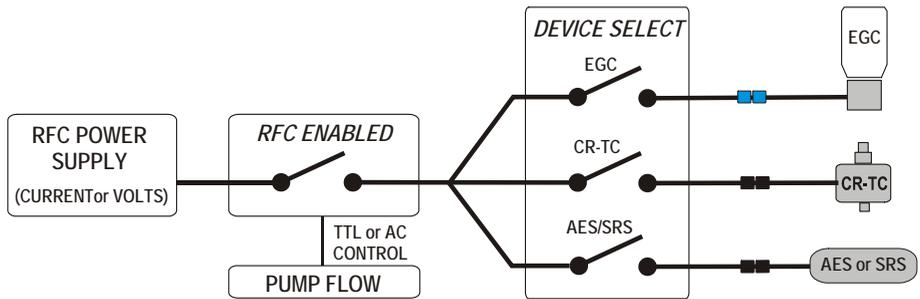
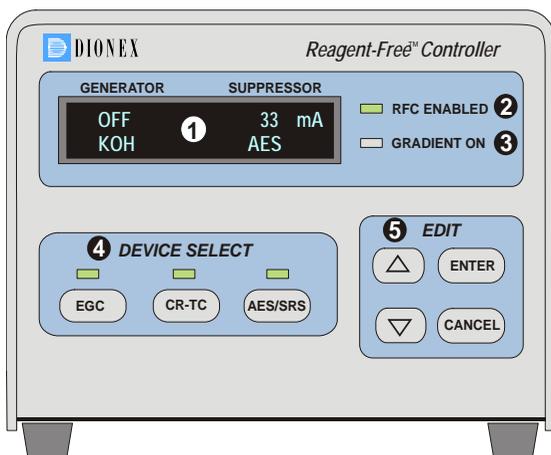


Figure 1. Summary of RFC Enabled and Device Select Functions

**IMPORTANT**

When priming the pump, turn off all devices (suppressor, EGC, and CR-TC). During priming, the pump is on and the RFC is enabled, but there is no flow to the devices.

## 2.2 Front Panel



### 1 Display Screen

- Displays eluent generator and suppressor status information.
- Provides control of eluent generator and suppressor functions.
- Displays error messages.

### 2 RFC ENABLED LED

(On)—Indicates the RFC is ready to supply power to the installed devices.

Figure 2. RFC Front Panel

### 3 GRADIENT ON LED (RFC-30 only)

(On)—Indicates a gradient is in progress.

### 4 DEVICE SELECT (EGC, CR-TC, AES/SRS)

Buttons turn on or off control of an installed device.

LEDs indicate when control of a device is selected.

(On)—Device is selected and pump flow is on. The RFC is supplying power.

(Flashing)—Device is selected, but there is no pump flow. The RFC is not supplying power to the device.

(Off)—Device is not selected. The RFC will not supply power to the device when the pump flow is on.

### 5 EDIT Buttons

**ENTER** initiates edit mode. In edit mode, pressing **ENTER** selects the edited value and exits edit mode.

**CANCEL** cancels the value currently being edited, restores the original value, and exits edit mode.

**▲** and **▼** scroll up or down through a list of display screens (see Figure 3). In edit mode, the up arrow increases the value being edited and the down arrow decreases the value. Press and release the button to change the value by one unit. Press and hold the button to rapidly change the value.

## 2.3 Display Screens

The display screens enable you to view status information and to select control parameters for the device(s). Use the arrow buttons to scroll up or down through the screens. The list wraps around if you scroll down from the last screen or up from the first screen. Figure 3 lists the available screens for the RFC-10 and the RFC-30.

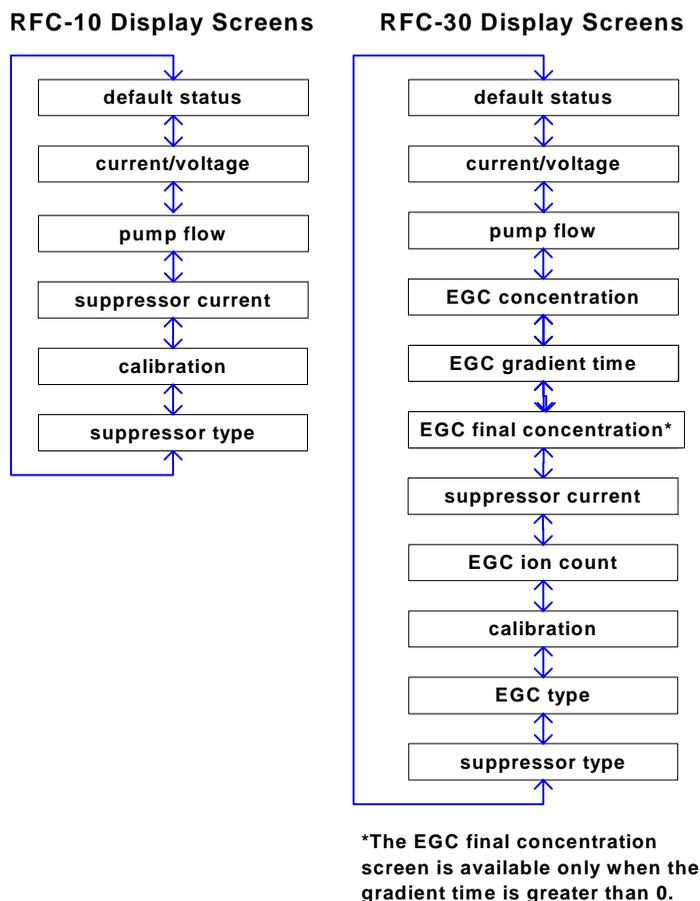


Figure 3. RFC-10 and RFC-30 Display Screens

## 2.4 Rear Panel

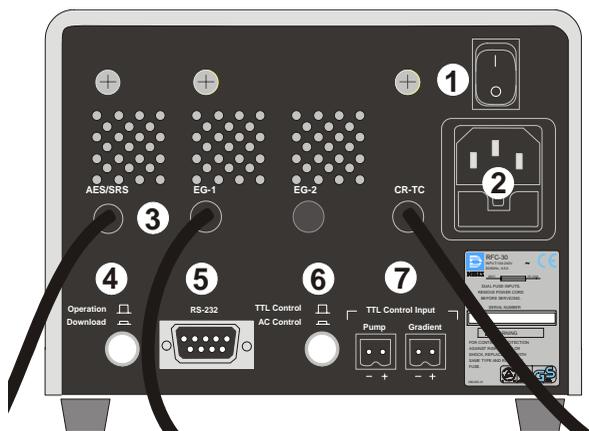


Figure 4. RFC Rear Panel

- 1 Main Power Switch**  
Provides on/off control of the RFC.
- 2 Main Power Receptacle and Fuse Holder**  
The RFC power cord connects here. Two fuses are located in the holder under the receptacle. See Section 6.3 for how to change fuses.

### 3 Cable(s) to Controlled Device(s)

An electrical cable for each controlled device extends from the rear panel and connects to the device. The RFC-10 includes only the suppressor (AES/SRS) cable. The RFC-30 (pictured) includes cables for a suppressor (AES/SRS), an eluent generator (EG-1), and a CR-TC.

### 4 Operation/Download Button

When the **Download** position (in) is selected, new Moduleware can be downloaded to the RFC (see Section 6.1). The **Operation** position (out) must be used for all other functions.

### 5 RS-232 Port

This port is used when downloading new Moduleware to the RFC (see Section 6.1).

### 6 TTL Control/AC Control Button

When the **TTL Control** position (out) is selected, the **Pump** TTL input connector is enabled. When the **AC Control** position (in) is selected, the RFC bypasses the **Pump** TTL input. AC control can be used with a DX-120 system. Contact Dionex for details.

### 7 TTL Control Input Connectors

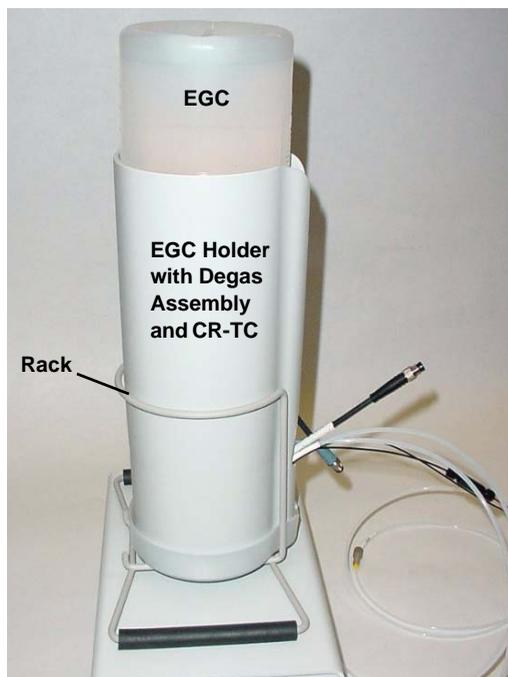
The **Pump** input connects to a TTL output on the pump or to a DX-120 adapter cable. The pump or DX-120 then signals the RFC when the pump flow is on. The **Gradient** connector is used only with RFC-30 eluent generator control. It

connects to a TTL (or relay) output and is used to signal the RFC-30 to run a gradient. See Section 3.7 for how to set up and run gradients.

### 2.5 Eluent Generator (RFC-30 Only)

The eluent generator produces high-purity eluents online, using only deionized water as the carrier. The eluent generator consists of an eluent generator cartridge (EGC) that generates the eluent, a Continuously Regenerated Trap Column (CR-TC) that removes contaminants from eluent, and a high-pressure degas tubing assembly that removes electrolysis gases created during eluent generation.

#### Eluent Generator Cartridge (EGC) Holder



The EGC is installed in a cartridge holder, which mounts on a rack on top of the RFC top cover (see Figure 5).

The cartridge holder also houses the high-pressure degas tubing assembly and the CR-TC.

Tubing and fittings for plumbing the cartridge, degas assembly, and CR-TC are included with the holder.

Figure 5. EGC, Holder, and Rack

#### Continuously Regenerated Trap Column (CR-TC)

The CR-TC Continuously Regenerated Trap Column is a high-pressure electrically-regenerated device that removes anionic or cationic contaminants from eluent. The CR-TC is designed for use with an eluent



- Deionized water flows from the pump **①** into the EluGen cartridge (EGC) **②**, which generates the programmed concentration of eluent.
- Eluent exits the cartridge and flows through the CR-TC **③**, through the EGC degas tubing assembly **④**, and on to the injection valve **⑤** in the chromatography compartment or DX-120.
- The eluent (and sample, when injection occurs) then flows through the chromatography components (columns, suppressor, cell, and back to the suppressor).
- Regenerant waste from the suppressor **⑥** is directed back to the CR-TC **⑦**, and then to the EGC degas tubing **⑧**, where any released hydrogen or oxygen gas is removed before it is sent to waste **⑨**.

## 3. Operation

### 3.1 Turning On the Power

Press the power switch on the RFC rear panel (see Figure 4) to turn on the power. These are the conditions at startup:

- The RFC briefly displays the RFC model and version numbers and then the default status screen appears.
- All settings that were in effect when the RFC power was turned off are restored.
- The RFC begins ramping the power to each selected device at the maximum rate possible until the set point is reached. The maximum rate at which the suppressor current can increase is 100 mA in 10 seconds; the maximum rate at which the EGC concentration can increase is 100 mM in 10 seconds. The default status screen (see Section 3.2) displays the suppressor current and EGC concentration values as they count up.

In some cases, the RFC is not able to ramp up to the set point at the maximum rate. This occurs because the fast increase in current causes the RFC to reach its maximum voltage limits. Ramping then slows to allow the voltage to decrease. A new suppressor may take longer to reach its set point than an older one. Conversely, a new EGC may reach its set point more quickly than an older one.

### 3.2 Viewing Eluent Generator and Suppressor Status

The default status screen (see Figure 7) displays after the power is turned on. It also displays automatically if there is no input from the front panel for 2 minutes (and the RFC is not in edit mode). The default screen provides status information for an eluent generator and/or a suppressor.



Figure 7. Example Default Status Screen (RFC-30 Shown)

## Viewing Eluent Generator and Suppressor Status

If control for the eluent generator is not installed (as in the RFC-10), the **GENERATOR** side of the screen is blank (see Figure 8). If control for a device is installed but the **DEVICE SELECT** button for the device is off, or if the **RFC ENABLED** LED is off, that area of the screen displays **OFF**.



Figure 8. Default Status Screen (RFC-10 Shown)

To view the current and voltage being applied to the eluent generator and/or suppressor, press ▼ to display the current/voltage screen (see Figure 9).

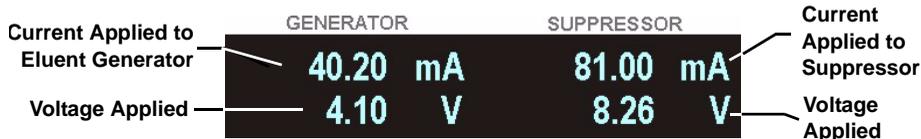


Figure 9. Current/Voltage Screen

If there is no input from the front panel for one hour, a “screen saver” appears (see Figure 10). Press any key to display the default status screen.



Figure 10. Screen Saver

### 3.3 RFC-10 Operation

The RFC-10 controls the suppressor by supplying current to the device. The front panel LEDs indicate when the suppressor is on (current is being supplied):

- **RFC ENABLED** (on)
- **AES/SRS** (solid light on, not flashing)

If either of these LEDs is off, current is not being supplied to the device and the suppressor is off.

**NOTE** A flashing AES/SRS LED indicates the AES/SRS is selected, but the pump flow is off.

#### Turning On the Suppressor

1. Start the pump flow. This turns on the **RFC ENABLED** LED.
  - **For a DX-320, DX-500, or DX-600 system**, turn on the pump flow from the module's front panel or from the chromatography software.
  - **For a DX-120 system**, press the **Pump** button on the DX-120 front panel to turn on the pump flow and then press the **SRS** button to turn on the suppressor.
2. If the **AES/SRS** LED is off, press the **AES/SRS** button to select the device. The RFC is now supplying current to the suppressor.

#### Turning Off the Suppressor

To turn off the suppressor, press the **AES/SRS** button or turn off the pump. Turning off the pump automatically turns off the suppressor.

**IMPORTANT**

**When priming the pump, turn off the suppressor. During priming, the pump is on and the RFC is enabled, but there is no flow to the device.**

### 3.4 RFC-10 Setup

Before using the RFC-10 for the first time or after installing a different suppressor type, follow the steps on page 15 to set the suppressor type.

The RFC then sets the upper limit for suppressor current. After setting the type, set the flow rate (see page 16) and the suppressor current (see page 17).

### Setting the RFC-10 Suppressor Type

1. Press **▲** to display the suppressor type screen (see Figure 11).

```

GENERATOR          SUPPRESSOR
SUPP TYPE= NONE
(NONE, A&C SRS, AES)
  
```

Figure 11. Suppressor Type Screen

**NOTE** The **NONE** suppressor type indicates that a type is not selected.

2. Press **ENTER**.

The **SUPP TYPE =** entry field on the screen is highlighted (see Figure 12).

```

GENERATOR          SUPPRESSOR
SUPP TYPE= NONE
(NONE, A&C SRS, AES)
  
```

Figure 12. Setting the Suppressor Type

3. Press **▲** or **▼** to select the installed suppressor type. Figure 13 shows a 2-mm ASRS suppressor selected.

```

GENERATOR          SUPPRESSOR
SUPP TYPE= ASRS 2MM
(NONE, A&C SRS, AES)
  
```

Figure 13. Example Suppressor Type Selected

**NOTE** The **SRSXCALC** and **AESXCALC** types are not used with the RFC-10.

4. Press **ENTER** to save the entry.

## Setting the RFC-10 Flow Rate

The flow rate screen lets you enter the flow rate used in your application.

1. Press ▲ or ▼ until the pump flow rate screen (see Figure 14) is displayed.



Figure 14. Pump Flow Rate Screen

**NOTE** The flow rate range varies, depending on the type of suppressor selected (see Table 1).

2. Press **ENTER**.
3. Press ▲ or ▼ until the pump flow rate for your application is displayed.
4. Press **ENTER** to save the value.

SRS Type	Flow Rate Range
ASRS_2MM	0.10 – 1.00 mL/min
ASRS_4MM	0.10 – 3.00 mL/min
CSRS_2MM	0.10 – 0.75 mL/min
CSRS_4MM	0.10 – 3.00 mL/min
AAES	0.10 – 3.00 mL/min
CAES	0.10 – 3.00 mL/min

Table 1. Flow Rate Ranges per Suppressor Type

## Setting the RFC-10 Current

For optimal suppressor performance, use the suppressor current recommended for your target application. The setting to use depends on several variables: the suppressor type, the column, the eluent type and concentration, and the flow rate. Refer to the suppressor manual for the recommended current setting for your application. Suppressor manuals are included on the Dionex Reference Library CD-ROM (P/N 053891).

Before setting the current, verify that the correct suppressor type and flow rate are selected. The maximum current allowed for the suppressor depends on its type, and for the Atlas suppressors, the flow rate (see Table 2).

Suppressor Type	Current Range
ASRS_2MM	0 – 150 mA
ASRS_4MM	0 – 500 mA
CSRS_2MM	0 – 110 mA
CSRS_4MM	0 – 300 mA
AAES	0 – $100 \times (\text{Flow})^{0.6}$ mA <sup>a</sup>
CAES	0 – $100 \times (\text{Flow})^{0.6}$ mA <sup>a</sup>

Table 2. Current Range Allowed for Each Suppressor Type

a. The maximum current cannot be greater than 150 mA.

- To set the suppressor current, press ▲ or ▼ to display the suppressor current screen (see Figure 15).



Figure 15. Example Suppressor Current Screen

- Press **ENTER**. The **SUPP CURR =** value on the screen is highlighted.
- Press ▲ or ▼ to increase or decrease the value, until the desired current is displayed.
- Press **ENTER** to save the value. If the suppressor is on (i.e., the **RFC ENABLED** and the **AES/SRS** LEDs are both on), the current is applied immediately.

### 3.5 RFC-30 Operation

The RFC-30 can control a suppressor, an eluent generator, and a CR-TC. The RFC-30 controls these devices by supplying current (to the suppressor and eluent generator) and voltage (to the CR-TC).

The front panel LEDs indicate when a device is on (current or voltage is being supplied):

- **RFC ENABLED** (on)
- **DEVICE SELECT (AES/SRS, EGC, CR-TC)** (solid light on, not flashing)

If either the **RFC ENABLED** or the **DEVICE SELECT** LED is off, current or voltage is not being supplied and the device is off.

**NOTE** A flashing **DEVICE SELECT** LED indicates the device is selected, but the pump flow is off.

#### Turning On a Device (Suppressor, Eluent Generator, or CR-TC)

1. Start the pump flow. This turns on the **RFC ENABLED** LED.
  - **For a DX-320, DX-500, or DX-600 system**, turn on the pump flow from the module's front panel or from the chromatography software.
  - **For a DX-120 system**, press the **Pump** button on the DX-120 front panel to turn on the pump flow and then press the **SRS** button to turn on the suppressor.
2. If the **DEVICE SELECT** LED is off, press the button for the device (**AES/SRS, EGC, CR-TC**) to select the device. The RFC is now supplying current to the selected device(s).

#### Turning Off a Device

To turn off a device, press the **DEVICE SELECT** button or turn off the pump.

**IMPORTANT**

When priming the pump, turn off all devices (suppressor, EGC, and CR-TC). During priming, the pump is on and the RFC is enabled, but there is no flow to the devices.

### 3.6 RFC-30 Setup

For optimal suppressor performance, use the suppressor current recommended for your target application. The setting to use depends on several variables: the suppressor type, the column, the eluent type and concentration, and the flow rate. The RFC-30 provides two methods for setting the suppressor current:

- **Automatic calculation:**  
With this method, you enter system information (EGC type, suppressor type, flow rate, and eluent concentration) on the display screens. The RFC-30 sets operating limits appropriate for the system, and automatically calculates and sets the suppressor current. See “Setting Up the RFC-30 for Automatic Current Calculation” on page 23 for details.
- **Manual entry:**  
With this method, you disable automatic calculation and manually enter operating parameters. To disable automatic calculation, select one of the following suppressor types: **AESXCALC**, **SRSXCALC**. See “Setting Up the RFC-30 for Manual Current Entry” on page 27 for details.

Table 3 summarizes the two setup methods.

RFC-30 Setup Method	Suppressor Types	Operating Limits	Suppressor Current
Automatic current calculation	<b>AAES</b> <b>ASRS_2MM</b> <b>ASRS_4MM</b> <b>CAES</b> <b>CSRS_2MM</b> <b>CSRS_4MM</b>	RFC-30 sets limits appropriate for the selected EGC type, suppressor type, flow rate, and concentration.	RFC-30 calculates the current range and sets the current to the recommended value. A different value can be entered, provided it is within the calculated range.
Manual current entry	<b>AESXCALC</b> <b>SRSXCALC</b>	RFC-30 sets limits to the absolute minimum and maximum allowed for the type of EGC and suppressor (AES or SRS).	Current must be set manually.

*Table 3. Summary of RFC-30 Setup Methods*

### Note Regarding the “NONE” EGC and Suppressor Types

Before initial setup, the RFC-30 sets the EGC and suppressor types to **NONE** to designate that the types have not yet been selected. After initial setup, the RFC-30 sets the suppressor type to **NONE** if a new EGC type is selected and the type is incompatible with the current suppressor (for example, changing from a **KOH** to an **MSA** EGC when the suppressor type is **AAES**). When the type is **NONE**, the device is disabled. If either the EGC or the suppressor type is **NONE**, automatic calculation is disabled.

### Operating Ranges and Formulas Used in Automatic Calculations

The suppressor type determines the maximum flow rate.

SRS Type	Flow Rate Range
ASRS_2MM	0.10 – 1.00 mL/min
ASRS_4MM	0.10 – 3.00 mL/min
CSRS_2MM	0.10 – 0.75 mL/min
CSRS_4MM	0.10 – 3.00 mL/min
AAES	0.10 – 3.00 mL/min
CAES	0.10 – 3.00 mL/min

*Table 4. Flow Rate Ranges per Suppressor Types*

The suppressor type, EGC type, and flow rate determine the maximum eluent concentration. However, the maximum never exceeds 100 mM.

Suppressor Type	EGC type	Pump Flow Rate	Maximum Eluent Concentration
ASRS_2MM	KOH	0.1 – 0.25 mL/min	<i>Max Conc = 30/Flow</i>
		0.26 – 0.75 mL/min	<i>Max Conc = 50/Flow</i>
		0.76 – 1.00 mL/min	60 mM
	CO3	0.1 – 1.00 mL/min	12.5 mM
ASRS_4MM	KOH	0.1 – 3.00 mL/min	<i>Max Conc = 200/Flow</i>
	CO3	0.10 – 1.00 mL/min	12.5 mM
		1.01 – 3.00 mL/min	<i>Max Conc = 12.5/Flow</i>
CSRS_2MM	MSA	0.1 – 0.24 mL/min	<i>Max Conc = 20/Flow</i>
		0.25 – 0.75 mL/min	<i>Max Conc = 35/Flow</i>
CSRS_4MM	MSA	0.1 – 3.00 mL/min	<i>Max Conc = 100/Flow</i>
AAES	KOH	0.1 – 1.00 mL/min	25 mM
		1.01 – 3.00 mL/min	<i>Max Conc = 25/Flow</i>
	CO3	0.1 – 1.00 mL/min	12.5 mM
		1.01 – 3.00 mL/min	<i>Max Conc = 12.5/Flow</i>
CAES	MSA	0.10 – 1.00 mL/min	12.5 mM
		1.01 – 3.00 mL/min	<i>Max Conc = 12.5/Flow</i>

Where: *Max Conc* = Maximum eluent concentration in mM and  
*Flow* = Pump flow rate in mL/min

Table 5. Maximum Eluent Concentrations per Suppressor Type, EGC Type, and Flow Rate

## Reagent-Free Controller

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The RFC-30 uses the formulas shown in Table 6 to calculate current ranges. The RFC-30 sets the current to the minimum value. You can select a different value, provided it is within the range. If the calculated maximum current exceeds the absolute maximum allowed for the suppressor type (see Table 7), the absolute value is used for the upper limit of the range.

Suppressor Type	EGC Type	Minimum Current	Maximum Current
AAES	KOH	$Conc \times Flow \times 3.22$	$100 \times (Flow)^{0.6}$
	CO3	$Conc \times Flow \times 3.22 \times 2$	$100 \times (Flow)^{0.6}$
ASRS_2MM ASRS_4MM	KOH	$Conc \times Flow \times 2.474$	$Conc \times Flow \times 4$
	CO3	$Conc \times Flow \times 2.474 \times 2$	$Conc \times Flow \times 4 \times 2$
CAES	MSA	$Conc \times Flow \times 3.22$	$100 \times (Flow)^{0.6}$
CSRS_2MM CSRS_4MM	MSA	$Conc \times Flow \times 2.924$	$Conc \times Flow \times 4$

Where: *Conc* = Eluent concentration in mM; *Flow* = Pump flow rate in mL/min

Table 6. Formulas for Calculating Suppressor Current Ranges

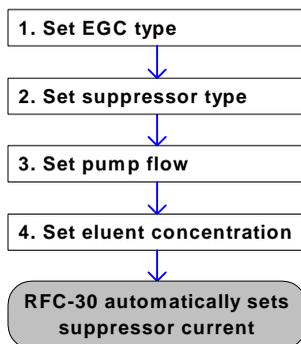
Suppressor Type	Absolute Maximum Current
ASRS_2MM	150 mA
ASRS_4MM	500 mA
CSRS_2MM	110 mA
CSRS_4MM	300 mA
AAES	150 mA
CAES	150 mA

Table 7. Maximum Current Allowed per Suppressor Type

**NOTE** If the RFC-30 is in gradient mode (see Section 3.7) the RFC-30 uses the highest concentration entered to calculate the suppressor current. This is normally the final concentration.

## Setting Up the RFC-30 for Automatic Current Calculation

Follow the steps below to set up the RFC-30 to automatically calculate and set the suppressor current.



### Notes:

- Enter information in the order shown here; parameter choices and operating limits are based on the settings already entered.  
  
For example, if you set the EGC type to **KOH**, the available suppressor types are **AAES**, **ASRS\_2MM**, and **ASRS\_4MM**. The selected suppressor type then determines the upper limit for flow rate (see Table 4) and the three parameters (EGC type, suppressor type, and flow) determine the upper limit for eluent concentration (see Table 5).
- The suppressor current set by the RFC-30 is the lower limit of the calculated current range (see Table 6).
- You can enter a higher suppressor current, provided it is within the range.
- Because the RFC-30 does not automatically detect the pump flow rate or the type of installed EGC or suppressor, always update this information on the RFC-30 screens, if you make any changes in the system or application settings.
- If you change the flow rate or EGC concentration, the RFC-30 recalculates and sets a new current amount.
- If you change the suppressor or EGC type, the RFC-30 turns off the current to the changed device, if it is on. Check the settings for the

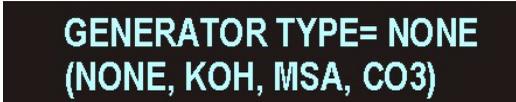
remaining parameters and enter new settings as needed before turning on the device again.

### Example RFC-30 Setup for Automatic Calculation

This example shows how to set up an RFC-30 for use with a system with the following operating conditions: AS18 column, 2-mm ASRS suppressor, 1.0 mL/min flow rate, and a KOH EGC.

#### To set the EGC type:

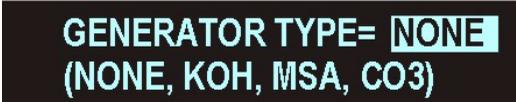
1. From the default screen, press **▲** twice to display the generator type screen.



GENERATOR TYPE= NONE  
(NONE, KOH, MSA, CO3)

Figure 16. EGC Type Screen

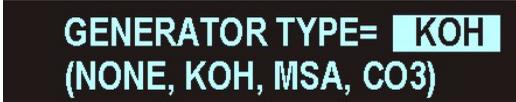
2. Press **ENTER**. The **GENERATOR TYPE =** entry field on the screen is highlighted.



GENERATOR TYPE= NONE  
(NONE, KOH, MSA, CO3)

Figure 17. Selecting the EGC Type

3. Press **▲** to select type, for example KOH.



GENERATOR TYPE= KOH  
(NONE, KOH, MSA, CO3)

Figure 18. Example EGC Type Selected

4. Press **ENTER** to save the entry.

**To set the suppressor type:**

1. Press ▼ to display the suppressor type screen.



SUPP TYPE= NONE  
(NONE, A&C SRS, AES)

Figure 19. Suppressor Type Screen

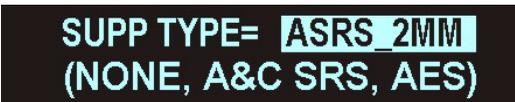
2. Press ENTER. The SUPP TYPE = entry field is highlighted.



SUPP TYPE= NONE  
(NONE, A&C SRS, AES)

Figure 20. Selecting the Suppressor Type

3. Press ▲ twice to select the suppressor type, for example 2-mm ASRS.



SUPP TYPE= ASRS\_2MM  
(NONE, A&C SRS, AES)

Figure 21. Example Suppressor Type Selected

4. Press ENTER.

**To set the flow rate:**

1. Press ▼ three times to display the pump flow screen.



Pump Flow Rate — FLOW= 0.10 mL/min  
Range of Flow Rates Allowed — (0.10 TO 1.00)

Figure 22. Pump Flow Screen

2. Press ENTER.
3. Press ▲ to select flow rate, for example, 1.00 mL/min.



FLOW= 1.00 mL/min  
(0.10 TO 1.00)

Figure 23. Example Flow Selected

4. Press ENTER.

## To set the eluent concentration and check the calculated current:

1. Press ▼ to display the EGC concentration screen.

Concentration limits  
for the selected  
EGC type, suppressor  
type, and flow rate



EGC CONC= 0.10 mM  
(0.10 TO 60.00) KOH

Figure 24. EGC Concentration Screen

2. Press ENTER.
3. Press ▲ to select the concentration, for example, 47 mM.



EGC CONC= 47.00 mM  
(0.10 TO 60.00) KOH

Figure 25. Example Concentration Selected

4. Press ENTER.
5. Press ▼ twice to go to the suppressor current screen.

Current limits for  
this application



SUPP CURR= 117 mA  
(117 TO 150) ASRS\_2MM

Calculated current  
recommended for  
this application

Figure 26. Suppressor Current Screen with Calculated Current Set

### Setting Up the RFC-30 for Manual Current Entry

If you do not want the RFC-30 to automatically calculate and set the suppressor current as described in the previous section, you can turn off automatic calculation. To do this, select one of the following suppressor types, depending on the type installed: **SRSXCALC** (for an AES suppressor—no calculation) or **AESXCALC** (for an SRS suppressor—no calculation). See the example below.

1. Set the EGC type, flow rate, and eluent concentration as described in the previous example for automatic calculation.
2. Then, go to the suppressor type screen.

A screenshot of the 'SUPP TYPE=' screen. The text 'SUPP TYPE= NONE' is displayed in large white letters on a black background. Below it, in smaller white letters, are the options '(NONE, A&C SRS, AES)'. The word 'NONE' is highlighted with a white rectangular box.

Figure 27. Suppressor Type Screen

3. Press **ENTER**. The **SUPP TYPE =** entry field is highlighted.

A screenshot of the 'SUPP TYPE=' screen, similar to Figure 27. The text 'SUPP TYPE= NONE' is displayed. The word 'NONE' is highlighted with a white rectangular box.

Figure 28. Selecting the Suppressor Type

4. Press **▼** and select either **SRSXCALC** or **AESXCALC**.

A screenshot of the 'SUPP TYPE=' screen. The text 'SUPP TYPE= AESXCALC' is displayed. The word 'AESXCALC' is highlighted with a white rectangular box.

Figure 29. AESXCALC Type Selected

5. Press **ENTER**.
6. Press **▼** three times to go to the suppressor current screen.

Current limits  
for the AES  
suppressor

A screenshot of the 'SUPP CURR=' screen. The text 'SUPP CURR= 0 mA' is displayed in large white letters on a black background. Below it, in smaller white letters, are the options '(0 TO 150) AESXCALC'. A white line points from the text 'Current limits for the AES suppressor' to the '0 mA' value.

Figure 30. Suppressor Current Screen

7. Press **ENTER**.
8. Press **▲** to select the desired suppressor current and then press **ENTER**.

### 3.7 Gradient Operation (RFC-30 Only)

A change in the eluent concentration during an analysis is referred to as a *gradient*. The RFC can run a linear ramp gradient, which is a uniform change in eluent concentration over a specified time.

To set up a gradient, specify a starting concentration, a gradient time, and a final concentration. The gradient time is the number of minutes it takes to reach the final concentration. The final concentration can be either higher or lower than the starting concentration.

A TTL input connection to a controlling device (such as the pump, combination pump/detector, or DX-120) is used to start and stop the gradient. See Section B.2 for DX-320, DX-500, and DX-600 connection instructions. See Section B.3 for DX-120 instructions.

Figure 31 shows an example linear ramp gradient with a starting concentration of 30 mM, a gradient time of 10 minutes, and a final concentration of 60 mM. In the example, the gradient TTL input is kept active beyond the gradient time and the final concentration is maintained until the TTL is turned off. The eluent concentration then returns to the starting value.

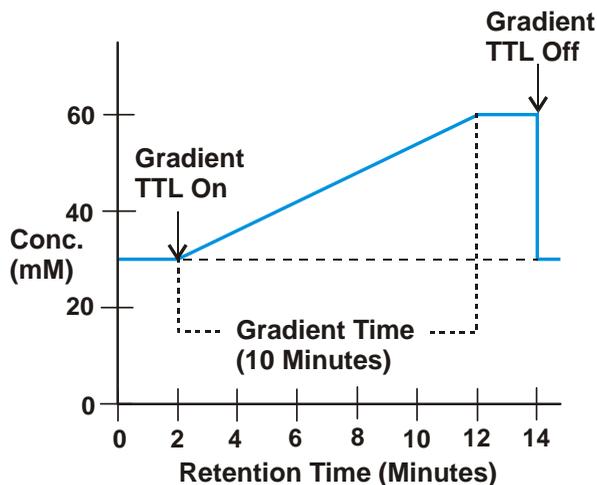
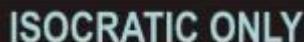


Figure 31. Gradient Example

### Note Regarding CO3 Cartridges

If **CO3** is the selected EGC type, gradient operation is not available and the EGC gradient time screen displays **ISOCRATIC ONLY** (see Figure 32).



ISOCRATIC ONLY

Figure 32. EGC Gradient Time Screen: CO3 Cartridge Installed

### Setting Up a Gradient

1. Set the starting concentration for the gradient by selecting the value in the EGC concentration screen. In the example in Figure 33, the starting concentration is 30.00 mM.

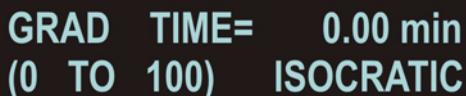


EGC CONC= 30.00 mM  
(0.10 TO 60.00) KOH

Starting Gradient Concentration

Figure 33. Gradient Starting Concentration

2. To set the gradient time, press ▼ to display the EGC gradient time screen (see Figure 34).



GRAD TIME= 0.00 min  
(0 TO 100) ISOCRATIC

Figure 34. EGC Gradient Time Screen

**NOTE** When the gradient time is 0 minutes, the RFC-30 is in isocratic mode. A gradient time greater than 0 selects gradient mode.

3. Press **ENTER**.

- Press ▲ or ▼ to select the gradient time (the number of minutes to reach the final concentration). In the example in Figure 35, a gradient time of 10.00 minutes is selected.



Figure 35. Gradient Time Selected

- Press ENTER.
- To set the final concentration, press the ▼ button to display the EGC final concentration screen.

**NOTE** The final concentration screen is available only if the gradient time is greater than 0.

- Press ENTER.
- Press ▲ or ▼ to select the desired final concentration and press ENTER. In the example in Figure 36, the final concentration is 60.00 mM.



Figure 36. EGC Final Concentration Screen

**NOTE** If the RFC-30 is set up for automatic calculation (see “Setting Up the RFC-30 for Automatic Current Calculation” on page 23) the RFC-30 uses the highest concentration entered to calculate the suppressor current. This is normally the final concentration.

### Running a Gradient

- Verify that the **Gradient** TTL on the rear panel is connected to a TTL output on a controlling device such as the pump, combination pump/detector, or DX-120. See Section B.2 for DX-320, DX-500, and DX-600 connection instructions. See Section B.3 for DX-120 instructions.

2. Verify that the **RFC ENABLED** and the **EGC** LEDs are on.
3. Turn on (activate) the **Gradient** TTL. This signals the RFC to start the gradient. See “Controlling the Gradient TTL” on page 31 for how to turn on and off the TTL.
4. Keep the **Gradient** TTL on for the time defined for the gradient, plus any additional time that you want to continue running at the final concentration.

The **GRADIENT ON** LED is on while the gradient is running. During this time, the EGC concentration values cannot be edited.

5. To end the gradient, turn off the **Gradient** TTL. The eluent concentration returns to the starting value.

### Controlling the Gradient TTL

For DX-320, DX-500, and DX-600 systems, the **Gradient** TTL can be controlled from the front panel of the controlling module or from a software command, if the module is controlled with software.

For DX-120 systems, the **Gradient** TTL can only be controlled with software.

Below are examples for controlling the TTL using PeakNet® 5.2 software, PeakNet 6 software, and the front panel of the pump.

### PeakNet 5.2 Gradient Method Example

This example shows how to set up a Method in PeakNet 5.2 for controlling the RFC **Gradient** TTL. This example is for a DX-120 system. Method setup is similar for DX-320, DX-500, and DX-600 systems.

1. Open the Method to which you will be adding the gradient TTL commands, or create a new Method.
2. Click  to open the DX-120 Timed Events Editor.

- (Optional) Click **Setup** and enter a label for the TTL output connected to the RFC **Gradient** input. See the example in Figure 37.

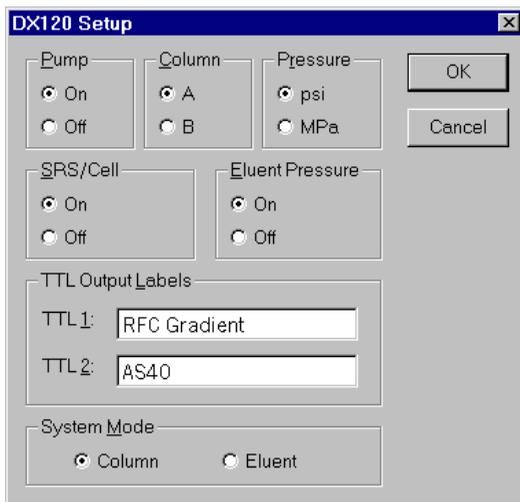


Figure 37. DX-120 Method Setup Example

- In the Editor, enter two timed events (or edit existing events). In the first event, select the **RFC Gradient** output check box to turn on the **Gradient** TTL. In the second event, clear the check box to turn off the **Gradient** TTL.

In the example in Figure 38, the **RFC Gradient** output is turned on at 2.00 minutes and turned off at 14.00 minutes.

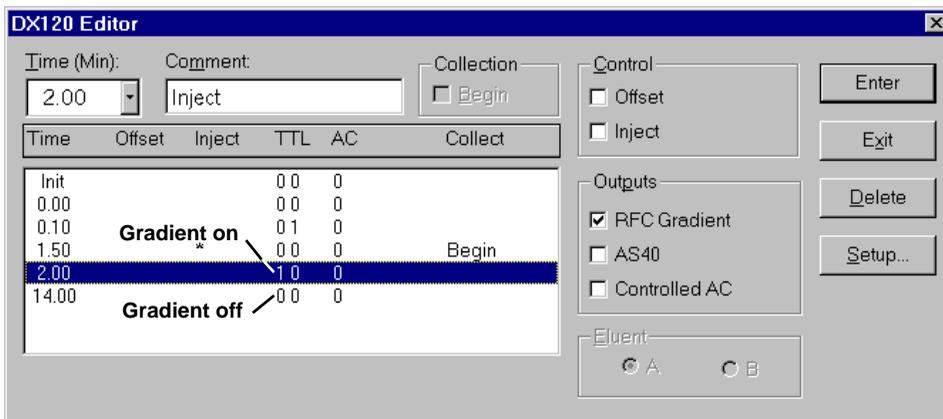


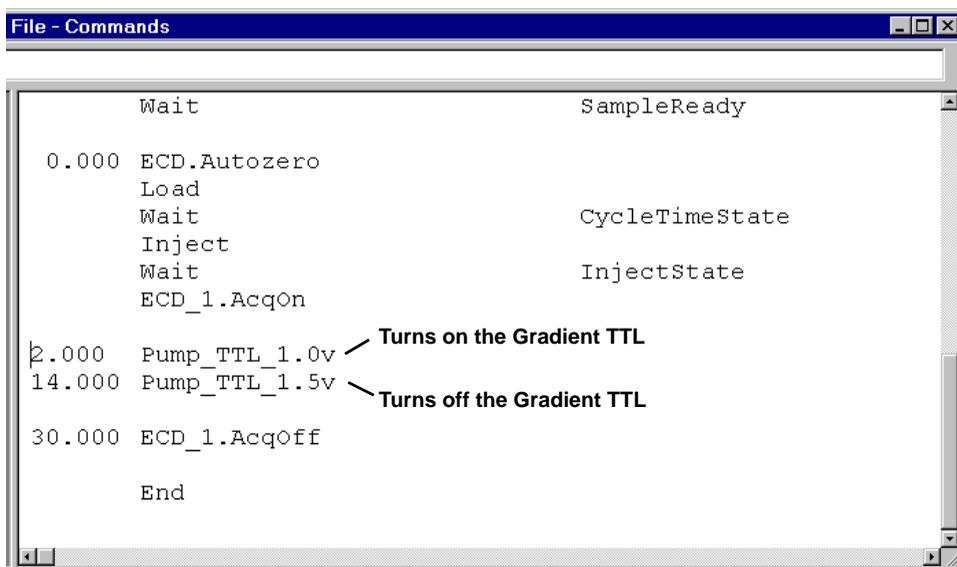
Figure 38. DX-120 Timed Events Editor Example for Gradient Control

### PeakNet 6 Gradient Program Example

This example shows how to add commands for controlling the RFC **Gradient TTL** input to a PeakNet 6 program.

1. In PeakNet 6, open the program (PGM) file that will be used for controlling the RFC, or create a new program.
2. Add two commands to the program. The first command turns on the TTL (or relay) output that is connected to the RFC **Gradient TTL** input. The second command turns off the TTL (or relay) output.

In the example program shown in Figure 39, TTL 1 output on the pump (which is connected to the RFC **Gradient TTL** input) is turned on at 2.00 minutes and turned off at 14.00 minutes.



```
File - Commands
Wait                               SampleReady
0.000 ECD.Autozero
Load
Wait                               CycleTimeState
Inject
Wait                               InjectState
ECD_1.AcqOn
2.000 Pump_TTL_1.0v  Turns on the Gradient TTL
14.000 Pump_TTL_1.5v Turns off the Gradient TTL
30.000 ECD_1.AcqOff
End
```

Figure 39. PeakNet 6 Example Program for Gradient Control

## Front Panel Method Gradient Example

**NOTE** Front panel control is not available for the DX-120 TTL outputs.

This example shows how to edit or create a front panel Method that includes timed events for controlling the RFC **Gradient** TTL input. In this example, the RFC Gradient TTL input is connected to the TTL1 output on an IS25 pump.

1. From the front panel of the pump, go to the **METHOD** screen.
2. Open a Method that you want to edit, or start a new Method.

**NOTE** For a gradient pump or combination pump/detector module, press the right arrow button to display the extension to the **METHOD** screen, which includes the fields for controlling TTL and Relay outputs.

3. Enter two timed events (or edit existing events). In the first event, turn on the TTL1 output. In the second event, turn off the TTL1 output.

In the example in Figure 38, a 1 is entered in the TTL1 output field at 2.00 minutes to turn on the TTL, and a 0 is entered at 14.00 minutes to turn off the TTL.

METHOD EDIT 1		SAVE TO		LIMITS 200 3000 PSI			
TIME	V	COL	TTL1	TTL2	RLY1	RLY2	FLOW
INIT	L	A	0	0	0	0	1.00
0.00	I						
2.00			1				
14.00			0				

Help Message

Figure 40. Example Front Panel Method for Gradient TTL Control (IS25 Pump Method Screen Shown)

### 3.8 Monitoring Eluent Generator Cartridge Use (RFC-30 Only)

The Reagent-Free Controller monitors eluent generator cartridge use and displays warning messages when the cartridge ion count nears depletion. A warning first appear when the percentage of ions left reaches 10%. Warnings are repeated at each 1% decrease in count. To set up this feature:

- When you install a new cartridge, set the cartridge ion count to 100%. As the cartridge is used, the RFC decrements the percentage.
- If you remove a partially used cartridge, note the percentage of ions remaining. Then, if you later reinstall the cartridge, re-enter the percentage.

#### Setting the Ion Count Percentage

1. Press ▲ or ▼ to display the EGC ion count screen (see Figure 41).

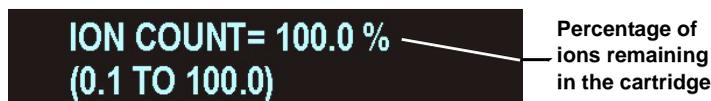


Figure 41. EGC Ion Count Screen

2. Press **ENTER**.  
The **ION COUNT =** value on the screen is highlighted.
3. Press ▲ or ▼ until the desired count is displayed. If this is a new cartridge, select 100%. If you are reinstalling a used cartridge, select the value that was displayed before the cartridge was removed.
4. Press **ENTER**.

### 4. Shutting Down the RFC

#### DX-120 Shutdown

Front panel control	Turn off the pump.
Software control	Turn off the pump from the software.

#### DX-320/DX-320J Shutdown

Front panel control	Set flow to 0 <i>or</i> Turn off the pump motor.
Software control	Write a program or method to set the flow to 0. This disables the TTL and shuts off current to the suppressor.

#### DX-500/DX-600 Shutdown

Front panel control	Set the flow to 0 <i>or</i> Turn off the pump motor.
Software control	Write a program or method to set the flow to 0. This disables the TTL and shuts off current to the suppressor.

#### RFC Manual Shutdown

- Turn off the pump motor.
- Turn off the power to the RFC.

### **5. Troubleshooting**

This section is a guide to troubleshooting problems that may occur while operating the Reagent-Free Controller.

- Section 5.1 describes the error messages displayed on the screen.
- Section 5.2 describes other operating problems and how to resolve them.

If you are unable to eliminate a problem, contact Dionex for help. In the U.S., call Dionex Technical Support at 1-800-346-6390. Outside the U.S., call the nearest Dionex office.

#### **5.1 Error and Warning Messages**

When an error occurs, the error message is displayed on the screen. For most errors, the message remains until you clear it by pressing a key. Other messages remain for three seconds only, and then the display reverts to the previous screen. For some errors, the RFC displays a relevant screen as a prompt to enter needed information (see error 105 for an example).

- **Select EGC type [104]**

This message appears if you try to edit any parameters related to the eluent generator (EGC concentration, gradient time, final concentration, or ion count ) and the EGC type is set to “none.” After the error appears, the EGC type screen is displayed.

**To troubleshoot:**

- Select the type of cartridge installed and then retry editing the eluent generator parameter.

- **Select suppressor type [105]**

This message appears if you try to edit the suppressor current when the suppressor type is set to “none.” After the error appears, the suppressor type screen is displayed.

**To troubleshoot:**

- Select the type of suppressor installed and then retry editing the suppressor current.

- **Feature not installed [106]**

This message appears if you press a **DEVICE SELECT** button for a device that is not installed.

- **Gradient in progress [107]**

This error appears if you try to edit the flow rate, EGC concentration, gradient time, final concentration, or EGC type while a gradient is running.

**To troubleshoot:**

- Wait for the gradient to complete, or stop the gradient by pressing the **EGC** button on the front panel. When you restart, the concentration selected on the EGC concentration screen (i.e., the starting gradient concentration) is in effect.

- **ERR:OVER VOLTAGE SUPP [120]**

This error appears if you press the **AES/SRS DEVICE SELECT** button and the RFC cannot establish a connection with the suppressor.

**To troubleshoot:**

- Check the suppressor cable connections.
- If the error persists, replace the suppressor. Refer to the suppressor manual for instructions. Suppressor manuals are included on the Dionex Reference Library CD-ROM (P/N 053891).

- **ERR:OVER CURRENT SUPP [121]**

This error may be caused by a malfunction in the suppressor controller electronics.

**To troubleshoot:**

- Call Dionex for assistance. The RFC electronics components cannot be serviced by the user.

- **ERR:OVER POWER SUPP [122]**

This error appears when, in order to maintain the selected current, the RFC is required to apply a higher voltage than the suppressor can support.

**To troubleshoot:**

- Reduce the flow rate.
- Rehydrate the suppressor. Refer to the suppressor manual for instructions. Suppressor manuals are included on the Dionex Reference Library CD-ROM (P/N 053891).
- If the error persists, replace the suppressor. Refer to the suppressor manual for instructions.

- **ERR:SUPPR NOT FOUND [123]**

This error appears when you press the **AES/SRS DEVICE SELECT** button and the RFC cannot establish a connection with the suppressor.

**To troubleshoot:**

- Check the suppressor cable connections.
- If the error persists, replace the suppressor. Refer to the suppressor manual for instructions.

- **ERR:SUPPRESSOR SHORT [124]**

This error may be caused by a malfunction in the suppressor.

**To troubleshoot:**

- After closing the error message, press the **AES/SRS DEVICE SELECT** button to restart the suppressor. If the error reappears, replace the suppressor. Refer to the suppressor manual for instructions.

- **ERR:OVER CURRENT CR-TC [130]**

This error may be caused by a malfunction in the CR-TC.

**To troubleshoot:**

- Replace the CR-TC (see Section 6.5).

- **ERR:OVER CURRENT EGC1 [140]**

This error may be caused by a malfunction in the EGC controller electronics.

**To troubleshoot:**

- Call Dionex for assistance. The RFC electronics components cannot be serviced by the user.

- **ERR:OVER VOLTAGE EGC1 [141]**

This error appears if you press the **AES/SRS DEVICE SELECT** button and the RFC cannot establish a connection with the suppressor.

**To troubleshoot:**

- Check the suppressor cable connections.
- If the error persists, replace the suppressor. Refer to the suppressor manual for instructions. Suppressor manuals are included on the Dionex Reference Library CD-ROM (P/N 053891).

- **WRN: ION PERCENT LOW [142]**

This warning occurs when the percentage of ions left in the EGC falls below 10%. The warning is repeated at each 1% decrease in count.

**To troubleshoot:**

This warning informs you when it is time to replace a cartridge that is nearing depletion. In order for the RFC to determine when the ion percentage is low, you must set the percentage to 100 when a new cartridge is installed. See “Monitoring Eluent Generator Cartridge Use (RFC-30 Only)” on page 35 for details.

- **ERR: EGC 1 INVALID CONCENTRATION [143]**

This error occurs if the concentration is outside of the absolute range allowed by the RFC (0.10 to 100.00 mM). This may indicate corrupted memory or a problem in the Moduleware (the instrument control firmware installed in the RFC).

**To troubleshoot:**

- Call Dionex for assistance. The RFC electronics components and Moduleware cannot be serviced by the user.

- **ERR: EGC 1 INVALID FLOW RATE [144]**

This error occurs when the flow rate is outside of the absolute range allowed by the RFC (0.01 to 3.00 mL/min). This may indicate corrupted memory or a problem in the Moduleware (the instrument control firmware installed in the RFC).

**To troubleshoot:**

- Call Dionex for assistance. The RFC electronics components and Moduleware cannot be serviced by the user.

- **ERR: EGC 1 INVALID FLOW RATE VS. CONCENTRATION [145]**

This error occurs if the flow rate is greater than 1.0 mL/min *and* the product of the flow rate times the concentration is greater than 100. This is an invalid operating condition, which may indicate a problem in the Moduleware (the instrument control firmware installed in the RFC).

**To troubleshoot:**

- Call Dionex for assistance. The RFC Moduleware cannot be serviced by the user.

- **ERR:EGC NOT FOUND [146]**

This error appears if you press the **EGC DEVICE SELECT** button and the RFC cannot establish a connection with the EGC.

**To troubleshoot:**

- Check the EGC cable connections.
- If the error persists, replace the EGC (see Section 6.4).

- **ERR:EGC SHORT [147]**

This error may be caused by a malfunction in the EGC.

**To troubleshoot:**

- After closing the error message, press the **EGC DEVICE SELECT** button to restart the EGC. If the error reappears, replace the EGC (see Section 6.4).
- If the error persists after replacing the EGC, call Dionex for assistance.

- **ERR: OVERPOWER EGC1 [148]**

This error appears when, in order to maintain the selected current, the RFC is required to apply a higher voltage than the EGC can support.

**To troubleshoot:**

- Replace the EGC (see Section 6.4).

- **ERR: NO BOARD PRESENT [150]**

The RFC does not recognize the installed electronics board(s) or no board is installed.

**To troubleshoot:**

- If this error appears, call Dionex for assistance. The RFC electronics components cannot be serviced by the user.

- **ERR: BOARD IS BAD—SUPPRESSOR [152]**

The suppressor controller electronics board is malfunctioning.

**To troubleshoot:**

- Call Dionex for assistance. The RFC electronics components cannot be serviced by the user.

- **ERR: BOARD IS BAD—EGC [153]**

The EGC controller electronics board is malfunctioning.

**To troubleshoot:**

- Call Dionex for assistance. The RFC electronics components cannot be serviced by the user.

- **WRN: NEW BOARD FOUND  
MUST CALIBRATE [160]**

This warning occurs when a new electronics board is installed.

**To troubleshoot:**

- If this warning occurs when a new board has not been installed, first try calibrating the RFC (see Section 6.2).
- If the warning persists, call Dionex for assistance. The RFC electronics components cannot be serviced by the user.

- **ERR: TTL/AC CONTROL CONFLICT [161]**

This error occurs when the TTL Control/AC Control button on the RFC rear panel is set to the **AC Control** (in) position and a **Pump TTL** signal occurs.

The **AC Control** button position bypasses the pump TTL control. This setting is used only when a DX-120 is operating under AC control. For all other operating configurations, select the **TTL Control** (out) position. This setting ensures that the installed devices (suppressor, EGC, CR-TC) are on only when the pump flow is on.

**To troubleshoot:**

Push the TTL Control/AC Control button to select the **TTL Control** (out) position.

## 5.2 Other Operating Problems

The table below lists some routine problems that may occur when installing or operating the RFC.

Problem	Solution
I can't set the suppressor current high enough.	<p>The selected suppressor type may be incorrect. Current requirements vary for the two types of suppressors. For the AES, the maximum current allowed is 150 mA. For the SRS, the maximum current is 500 mA.</p> <p>If you are using an RFC-30 that is set up for automatic current calculation, also check the settings for flow rate and EGC concentrations. These values affect the upper limit for current. For instructions on selecting the RFC-10 suppressor type, see page 14. For instructions on setting the RFC-30 current see "Setting Up the RFC-30 for Automatic Current Calculation" on page 23.</p>
The RFC is "not enabled" although the pump is on.	<p><b>For systems using TTL control:</b></p> <ul style="list-style-type: none"><li>• Check that the <b>Pump TTL Control Input</b> connector on the rear panel is connected correctly and there are no loose wires.</li><li>• Check that the <b>TTL Control</b> button position (out) on the rear panel is selected.</li></ul> <p>See Section B.2 for DX-320, DX-500, or DX-600 system TTL connections. See Section B.5 for DX-120 TTL connections.</p> <p><b>For DX-320, DX-500, or DX-600 systems:</b></p> <ul style="list-style-type: none"><li>• Check that the <b>TTL OUTPUT USAGE</b> is set to <b>0 FLOW</b> on the <b>PUMP OPTIONS</b> screen (see Section B.5).</li></ul> <p><b>For systems using AC control:</b></p> <ul style="list-style-type: none"><li>• Check that the <b>AC Control</b> button position (in) on the rear panel is selected.</li></ul>

Problem	Solution
The <b>RFC ENABLED</b> LED is on, but pressing the <b>DEVICE SELECT</b> button does not turn on the device.	Check to make sure the device type is selected. If <b>NONE</b> is displayed on the default screen for the generator or suppressor, a type is not selected. See Section 3.4 for RFC-10 setup or Section 3.6 for RFC-30 setup.
Leakage from the degas assembly in the EGC holder.	Replace the EGC holder (P/N 057931) (see Section 6.6).

## 6. Service Procedures

This chapter describes RFC service and repair procedures that the user can perform. All procedures not included here, including electronics-related repair procedures, must be performed by Dionex personnel. For assistance, contact Dionex Technical Support. In the U.S., call 1-800-346-6390. Outside the U.S., call the nearest Dionex office.

Before replacing any part, refer to the troubleshooting information in Chapter 5 to isolate the cause of the problem.

### IMPORTANT

**Substituting non-Dionex parts may impair RFC performance, thereby voiding the product warranty. Refer to the warranty statement in the Dionex Terms and Conditions for more information.**

### 6.1 Downloading New Moduleware

Moduleware is the instrument control firmware installed in the RFC. Moduleware is installed at the factory before shipping. Thereafter, Moduleware updates can be downloaded using the RS-232 port on the rear panel.

#### Items Required

- RS-232 computer cable (DB-9 male to DB-9 female), included in the RFC Ship Kit (RFC-10, P/N 060310; RFC-30, P/N 060299)
- Computer with a 9-pin serial port
- Moduleware download software and new Moduleware file (provided on a diskette from Dionex). The download software and Moduleware file are combined in an executable file with the following name: **RFC\_Vxxxx.EXE**, where **Vxxxx** is the version number of the Moduleware.

#### How to Download Moduleware

1. Turn off the RFC power.
2. Connect the RS-232 cable between the RS-232 port on the RFC rear panel and the computer's serial port.
3. Set the **Download/Operation** button on the RFC rear panel (see Figure 4) to the **Download** (in) position.

4. Turn on the RFC power.
5. Insert the diskette in the computer's drive. Display the diskette contents, using My Computer or Windows Explorer and double-click the RFC icon . A dialog box appears with a list of serial ports.
6. Select the computer serial port and click **OK**. A Moduleware download dialog box appears.
7. Click **OK** to start the download.  
When complete, the RFC screen displays the new Moduleware version number.
8. Set the **Download/Operation** button on the RFC rear panel to the **Operation** (out) position.

## 6.2 Calibrating the RFC

### When to Calibrate

Calibration is done at the factory before shipping. Thereafter, the RFC should be calibrated if a new electronics board is added or before a validation procedure.

### How to Calibrate

1. Press the ▲ or ▼ button to display the calibration screen (see Figure 42).



*Figure 42. Calibration Screen*

2. Press ▲ to select **YES**.
3. Press **ENTER**.

The message "Calibration in Progress" is displayed. When calibration is complete, the display returns to the default status screen.

## 6.3 Changing Main Power Fuses

1. Turn off the main power switch.



**HIGH VOLTAGE**—Disconnect the main power cord from its source and also from the rear panel of the RFC.



**HAUTE TENSION**—Débranchez le cordon d'alimentation principal de sa source et du panneau arrière du RFC.



**HOCHSPANNUNG**—Ziehen Sie das Netzkabel aus der Steckdose und der Netzbuchse auf der Rückseite des RFC.

2. The fuse holder is part of the main power receptacle (see Figure 43) on the RFC rear panel. To remove the fuse holder, squeeze the tab on the top of the holder to release it and pull the holder straight out of its compartment.
3. Replace the two fuses in the holder with new IEC 127 fast-blow fuses rated 3.15 amp (P/N 954745). Dionex recommends always replacing both fuses.
4. Reinsert the fuse holder into its compartment and push in until the tab clicks in place.
5. Reconnect the main power cord and turn on the power.

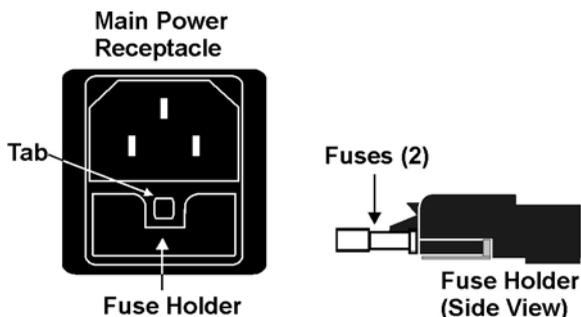


Figure 43. Main Power Fuse Holder

## 6.4 Replacing an EGC

1. If you are removing a partially used EGC, go to the ion count screen and note the percentage of ions remaining. If you reinstall the EGC later, re-enter this percentage on the screen. See Section 3.8 for details.
2. Turn off the power to the RFC-30.
3. Disconnect the RFC-30 **EG-1** cable from the EGC cable. Twist the locking ring to unlock the two cables and then pull them apart.



CAUTION

The EGC contains either KOH, a corrosive base, or MSA, a corrosive acid. Wear protective eye wear and gloves when handling the EGC.



AVERTISSEMENT

Insert French translation of the above caution here.

4. Remove the **EGC VENT** line (see Figure 44) from the EGC by unscrewing the luer lock from the luer adapter.

If necessary, use a wrench to hold the luer adapter in place while unscrewing the vent line.

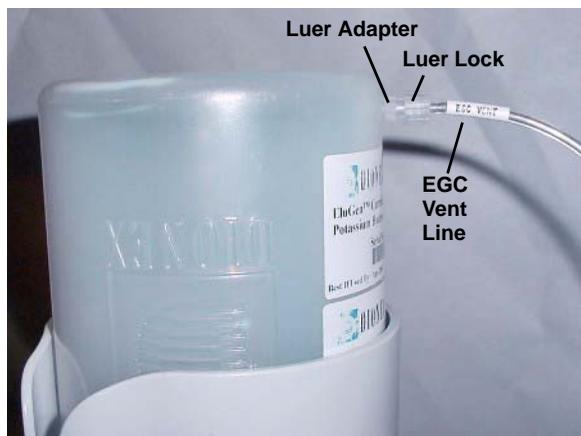


Figure 44. EGC Vent Line and Luer Fitting

5. Install the luer cap (P/N 053981), provided with the EGC, onto the luer adapter. This prevents leaks from the vent opening when you turn over the EGC (see Step 6).

6. Lift the EGC out of the holder (the inlet and outlet tubing is attached). Turn the EGC upside down and set it next to the holder (see Figure 45).

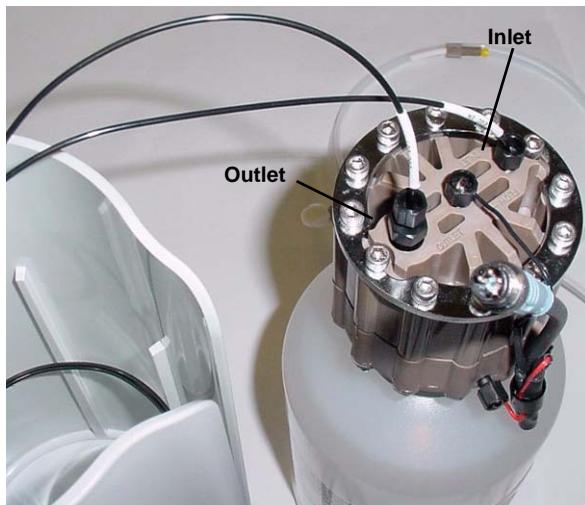


Figure 45. EGC Inlet and Outlet Connections

7. Disconnect the **EGC IN** and **EGC OUT** lines from the EGC inlet and outlet ports.
8. Follow the instructions in the EGC manual (Document No. 031908), on the Dionex Reference Library CD-ROM (P/N 053891), to prepare an expended EGC for disposal or to store a partially used EGC for later use.
9. Turn the new EGC upside down and set it next to the holder.
10. Remove the plugs from the EGC **INLET** and **OUTLET** fittings (see Figure 46).

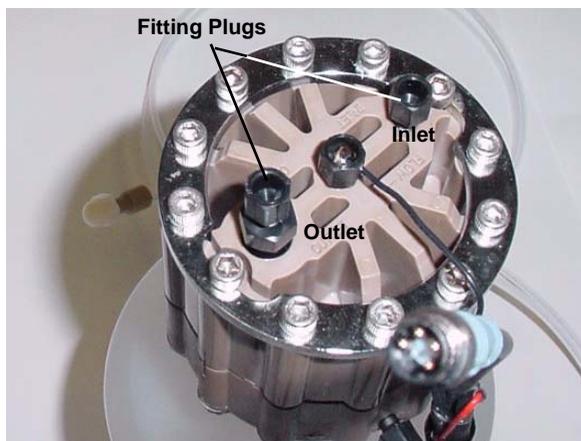


Figure 46. EGC Fitting Plugs

11. Connect **EGC IN** to the **EGC INLET** port (see Figure 12).

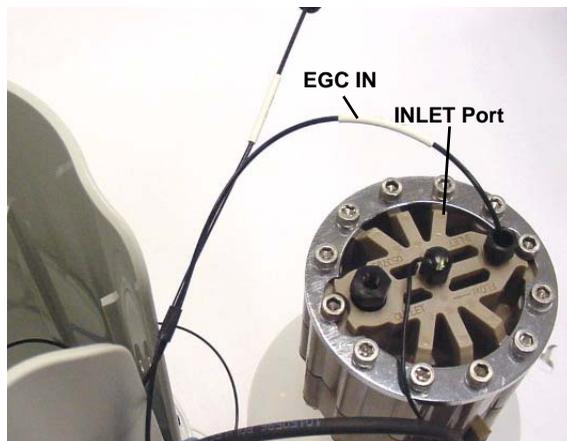


Figure 47. EGC Inlet Connection

12. Locate the yellow 0.5 mL/min, 1000 psi (7 MPa) pressure restrictor coil (P/N 053765) in the RFC-30 Ship Kit (P/N 060299). Connect this coil to the **EGC OUTLET** port (see Figure 48).

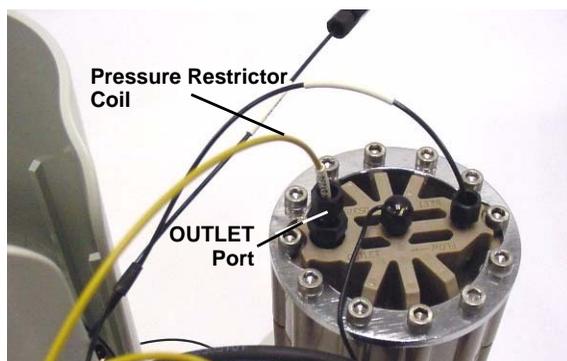


Figure 48. EGC Outlet Connection for Conditioning the EGC

**NOTE** This is a temporary connection, which is used only during the EGC conditioning procedure described in the next section.

13. Turn over the EGC (fittings facing down). **Shake the EGC vigorously, and tap it with the palm of your hand 10 to 15 times. Check that all trapped bubbles are dislodged.**

14. Orient the EGC with the cable aligned with the slot in the holder (see Figure 49) and then slide the EGC down into the holder until it stops.

**NOTE** To avoid crimping the lines inside the holder, do not twist the EGC as you turn it over.

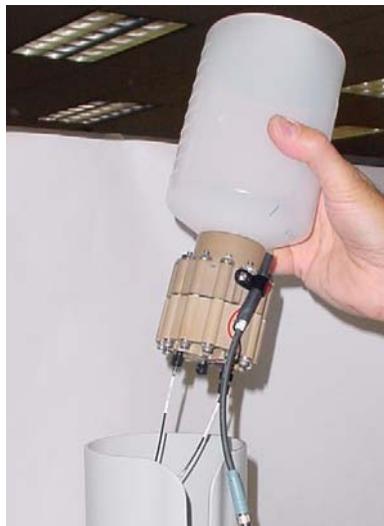


Figure 49. EGC Installation

### Conditioning the EGC

1. Unscrew and remove the plug from the vent opening on the side of the EGC (see Figure 50).



Figure 50. EGC Vent Plug

2. Direct the yellow backpressure coil from the EGC **OUTLET** port to a waste container. **Note:** This can be a temporary waste container, such as a beaker.
3. Connect the RFC-30 **EG-1** cable to the EGC cable. Push the two cables together and twist the locking ring to connect them.
4. Turn on the power to the RFC-30.
5. Go to the flow screen and set the flow rate to **1 mL/min**.

6. Go to the EGC concentration screen and set the concentration to **50 mM**.
7. Verify that the suppressor and CR-TC are off. (The **AES/SRS** and **CR-TC** LEDs are both off).

**IMPORTANT**

**Always turn off the suppressor and CR-TC before conditioning the EGC. The pump flow is on during conditioning, however, no flow reaches the suppressor or CR-TC.**

8. Turn on the pump.
9. Press the **EGC DEVICE SELECT** button on the RFC-30 front panel to turn on the EGC.
10. Run at the selected settings (1 mL/min at 50 mM) for 30 min.
11. Turn off the pump.
12. Remove the backpressure tubing from the waste container.
13. **Replace the vent plug in the EGC.**
14. Lift the EGC out of the holder, turn it over, and set it next to the holder.
15. Disconnect the backpressure coil from the EGC **OUTLET** port.
16. Connect the **EGC OUT** line from the holder to the **OUTLET** port (see Figure 51).

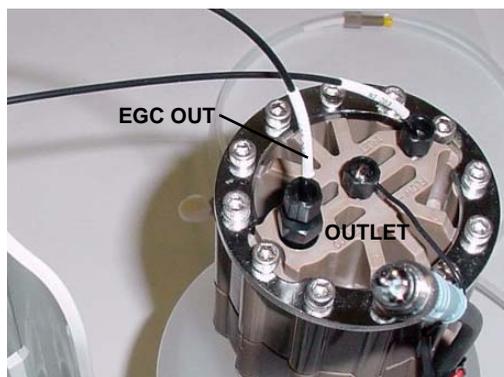
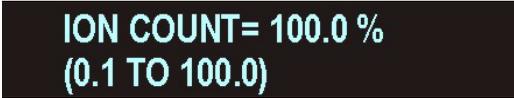


Figure 51. EGC Outlet Connection

17. Turn over the EGC, and again shake and tap it to remove air bubbles.
18. Reinstall the EGC in the holder.

19. Remove the plug from the EGC vent opening. Locate the luer adapter (P/N 053980) and cap (P/N 053981) supplied with the EGC.
20. Wipe off any liquid from the EGC and screw the luer adapter onto the vent opening. Remove the cap on the luer adapter by twisting. **Save the cap.**
21. Twist the luer lock and **EGC VENT** line into the luer adapter.
22. Go to the ion count screen and press **ENTER**.
23. Press ▲ to select 100% (see Figure 52) and press **ENTER**.



ION COUNT= 100.0 %  
(0.1 TO 100.0)

Figure 52. EGC Ion Count Screen

### 6.5 Replacing a CR-TC

1. Turn off the power to the RFC.
2. Follow the instructions in Section 6.4, Steps 3 through 7 to disconnect the EGC cable, cap the EGC vent opening, remove the EGC from the holder, and disconnect the inlet and outlet tubing. Set the EGC aside.
3. Disconnect the CR-TC cable from the RFC-30 **CR-TC** cable. Twist the locking ring to unlock the two cables and then pull them apart.
4. Disconnect the **TO INJ VALVE IN - P** line from the injection valve and disconnect the **SRS/AES REGEN OUT** line from the **REGEN OUT** port on the suppressor.
5. In order to remove the old CR-TC, you will need to lift the EGC holder out of its rack and turn it upside down. If there is not enough slack in the lines, disconnect the liquid line connections from the pump, and/or waste container.
6. Lift the holder out of the rack, turn it upside down, and set it on the workbench.
7. Grasp the top of the CR-TC and lift up to disconnect it from the holder.
8. Disconnect the liquid lines from the four ports on the CR-TC (see Figure 53).

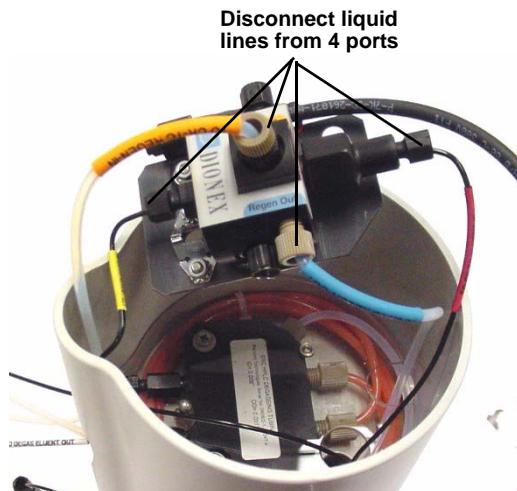


Figure 53. Disconnecting CR-TC Liquid Lines

9. Remove the CR-TC from the holder.
10. Remove the plugs from the ports on the new CR-TC. Reconnect the liquid lines that were disconnected in Step 8 to the corresponding ports on the new CR-TC.

## Reagent-Free Controller

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11. Check that none of the lines are caught under the CR-TC and then push the CR-TC onto the metal stud inside the EGC holder. Push down until the CR-TC snaps in place (see Figure 54).



Figure 54. CR-TC Installed in Holder

12. Feed the CR-TC cable through the slot on the side of the EGC holder (see Figure 55).
13. Turn the EGC holder right side up.



Figure 55. CR-TC Cable

14. Reconnect the **EGC IN** and **EGC OUT** lines to the EGC inlet and outlet ports.
15. Turn over the EGC (fittings facing down). **Shake the EGC vigorously, and tap it with the palm of your hand 10 to 15 times. Check that all trapped bubbles are dislodged.**

16. Reinstall the EGC in the holder.
17. Remove the cap on the luer adapter by twisting. **Save the cap.**
18. Twist the luer lock and **EGC VENT** line into the luer adapter.
19. Replace the holder in the rack.

### Hydrating the CR-TC

1. Locate the 10-32 to 1/4-28 coupler (P/N 042806) in the RFC-30 Ship Kit (P/N 060299).
2. Connect the coupler between the **TO INJ VALVE IN - P** line and the **SRS/AES REGEN OUT** line.
3. Verify that the EGC, CR-TC, and suppressor are off.
4. Reconnect the following EGC holder liquid lines, if they were disconnected:
  - Connect **TO PUMP/DAMPER** to the pump outlet.
  - Connect the **WASTE, GAS SEPARATOR** to the gas separator waste tube assembly installed on the waste container.
5. Turn on the pump and set the flow to the rate recommended for your application. Pump deionized water through the CR-TC, for at least 10 minutes.
6. Turn off the pump and disconnect the coupler.
7. After hydrating the CR-TC,
  - Reconnect **TO INJ VALVE IN - P** to port **2** on the injection valve.
  - Reconnect **TO SRS/AES REGEN OUT** to the **REGEN OUT** port on the suppressor.
8. Connect the cable from the CR-TC to the **CR-TC** cable from the RFC and connect the cable from the EGC to the RFC **EG-1** cable. Push two cables together and twist the locking ring to connect them.
9. Turn on the power to the RFC.

### 6.6 Replacing an EGC Holder

1. Turn off the power to the RFC.
2. Disconnect the holder liquid lines:
  - Disconnect **TO SRS/AES REGEN OUT** from the **REGEN OUT** port on the suppressor.
  - Disconnect **TO INJ VALVE IN - P** from port **2** on the injection valve.
  - Disconnect **TO PUMP/DAMPER** from the pump outlet.
  - Disconnect the **WASTE, GAS SEPARATOR** from the gas separator waste tube assembly installed on the waste container.
3. Follow the instructions in Section 6.4, Steps 3 through 7 to disconnect the EGC cable, cap the EGC vent opening, remove the EGC from the holder, and disconnect the inlet and outlet tubing. Set the EGC aside.
4. Disconnect the CR-TC cable from the RFC-30 **CR-TC** cable. Twist the locking ring to unlock the two cables and then pull them apart.
5. Lift the holder out of the rack, turn it upside down, and set it on the workbench.
6. Grasp the top of the CR-TC and lift up to disconnect it from the holder.
7. Disconnect the liquid lines from the four ports on the CR-TC (see Figure 53).
8. Remove the CR-TC from the holder.

9. Turn the new holder upside down (see Figure 56) and connect the liquid lines to the CR-TC.

**NOTE** To help retain the fittings and ferrules on the lines, remove the union from each line just before connecting the line to a port.



Figure 56. EGC Holder (upside down)

10. Check that none of the lines are caught under the CR-TC and then push the CR-TC onto the metal stud inside the EGC holder (see Figure 56). Push down until the CR-TC snaps in place.
11. Feed the CR-TC cable through the slot on the side of the EGC holder (see Figure 55).
12. Turn the EGC holder right side up.
13. Reconnect the **EGC IN** and **EGC OUT** lines to the EGC inlet and outlet ports.
14. Turn over the EGC (fittings facing down). **Shake the EGC vigorously, and tap it with the palm of your hand 10 to 15 times. Check that all trapped bubbles are dislodged.**
15. Reinstall the EGC in the holder.
16. Remove the cap on the luer adapter by twisting. **Save the cap.**
17. Locate the EGC vent line tubing, label, tubing clips, and barbed luer lock, supplied with the holder. Slide the label onto the tubing and push the tubing onto the luer lock.
18. Twist the luer lock and EGC vent line into the luer adapter

19. Remove the paper backing from the black tubing clips and press the clips onto the sides of the EGC holder (see Figure 57). Attach the vent line to the clips.

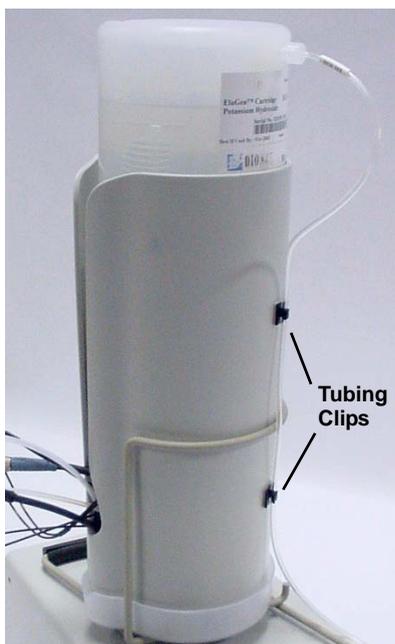


Figure 57. EGC Vent Line and Tubing Clips

20. Route the vent line to the waste container and insert it down into the gas separator waste tube about 4 to 6 inches.
21. Reconnect the CR-TC and EGC cables.
22. Connect the holder liquid lines to the pump, suppressor, injection valve, and gas separator waste tube assembly.
23. Turn on the power to the RFC.

## A. RFC Specifications

<b>Input Voltage Range</b>	90 – 264 Vac, 47 – 63 Hz
<b>Maximum AC Power Draw</b>	45 W
<b>Maximum AC Current Draw</b>	0.75 A
<b>Typical AC Current Draw</b>	<b>RFC-10:</b> 0.4 A <b>RFC-30:</b> 0.5 A
<b>Output Operating Range</b>	<b>AES:</b> CC <sup>a</sup> : 0 – 150 mA, 0 – 50 VDC <b>SRS:</b> CC: 0 – 500 mA, 0 – 10 VDC <b>EG-1/EG-2:</b> CC: 0 – 320 mA, 0 – 45 VDC <b>CR-TC:</b> CV <sup>b</sup> : 24 VDC, 0 – 170 mA
<b>Ripple and Noise</b>	<b>AES/SRS/EG:</b> CC: less than 0.01 mA rms and 0.020 mA peak-to-peak <b>CR-TC:</b> CV: less than 200 $\mu$ V rms and 2 mV peak-to-peak
<b>Output Drift</b>	<b>AES/SRS/EG:</b> CC: less than 0.1% total drift for 8 hours after an initial warm-up of 10 minutes <b>CR-TC:</b> CV: less than 0.1% total drift for 8 hours after an initial warm-up of 10 minutes
<b>Overload Protection</b>	A continuously acting constant current circuit protects the power supply for all overloads, including a direct short on its power output
<b>TTL Connectors</b>	TTL inputs operate from 0 to 5 VDC level. Inputs are active low (less than or equal to 0.5 VDC)
<b>Fuses</b>	Two IEC 127 fast-blow fuses rated 3.15 amp
<b>Temperature Range</b>	0 – 40 °C (32 – 104 °F); fan cooling is employed
<b>Weight (net)</b>	2.9 kg (6.5 lbs)

a. CC=constant current

b. CV=constant voltage

## B. Installation

**NOTE** These installation instructions are also shipped with the RFC as a printed manual, (Document No. 031895).

**NOTE** In this appendix, the **30** symbol indicates information that pertains to the RFC-30 only.

### B.1 RFC Cable Connections

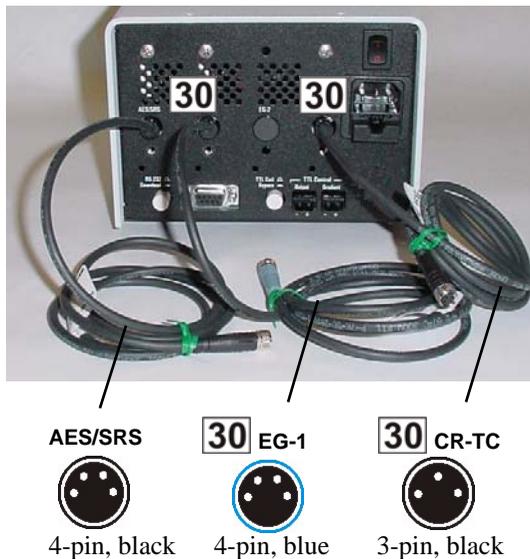


Figure 58. RFC Cables

1. Install the suppressor now, if it is not already installed (refer to the suppressor manual for installation instructions).
2. If a suppressor is already installed and connected to an existing power supply, disconnect the suppressor from the existing power supply. For detailed instructions, see Appendix D. Briefly:
  - **For DX-320, DX-500, and DX-600 systems:** Unplug the suppressor cable from the J3 connector on the detector electronics chassis and disconnect the power source cable from the suppressor cable.



1. Locate the two TTL cables in the RFC Ship Kit (see Figure 60).
2. Connect one end of the red-and-black TTL cable to the **Pump** TTL input on the RFC rear panel (see Figure 61).
3. **30** Connect one end of the yellow-and-black TTL cable to the **Gradient** TTL input (see Figure 61).

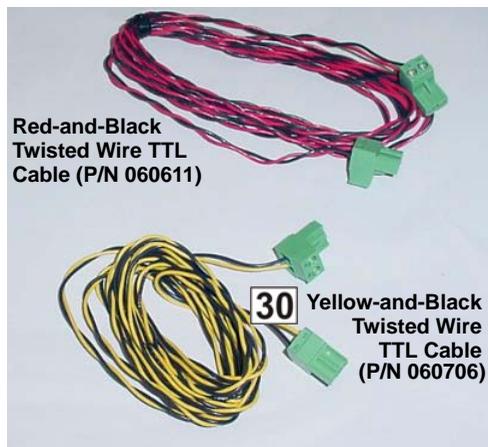


Figure 60. TTL Cables

**NOTE** TTL cables are color coded for easier identification, but are identical in all other respects.

4. Verify that the **TTL Control** button position (out) is selected.



Figure 61. RFC TTL Connections

**NOTE** The **TTL Control** button position (out) must be selected, in order for the pump to use **TTL-2 out** to enable and disable the RFC.

5. Route the TTL cable(s) from the RFC rear panel to the pump or combination pump/detector electronics chassis.
6. Connect the red-and-black cable to **TTL-2 OUT**. Refer to the label inside the door of the electronics chassis and to Figure 59 for the location of **TTL-2 OUT**.
7. **30** Connect the yellow-and-black cable to **TTL-1 OUT** (or to any available TTL or Relay output)(see Figure 59).
8. Go on to Section B.4, “Power Connection.”

### B.3 DX-120 TTL Connections

**NOTE** See Section B.2 for DX-320, DX-500, or DX-600 TTL connections.

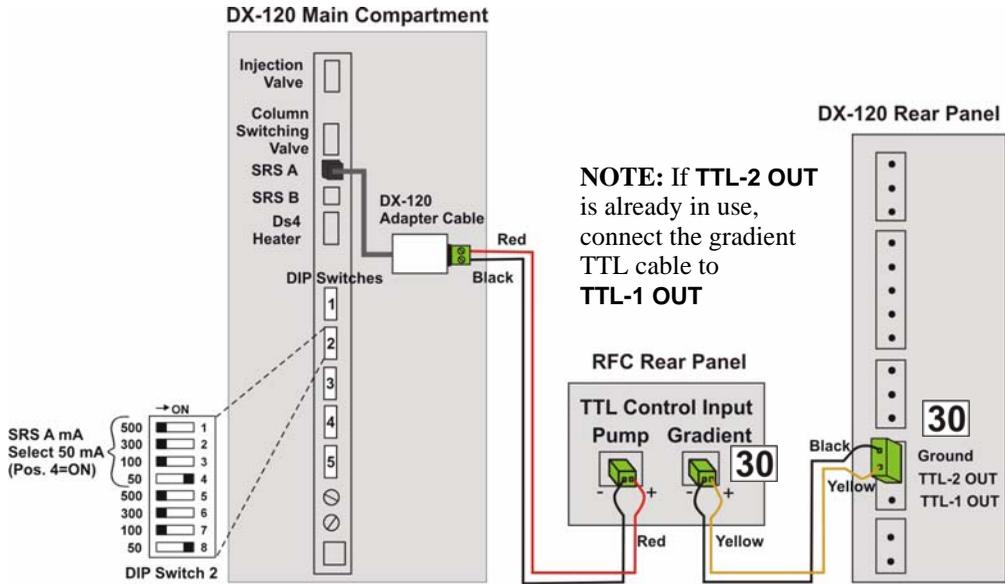


Figure 62. DX-120 TTL Connections Overview

1. Locate the two TTL cables in the Ship Kit (see Figure 63), and the DX-120 adapter cable and grommet (ordered separately).

**NOTE** The DX-120 adapter cable ensures that all current to the suppressor, EGC, and CR-TC stops if there is no flow to the pump.

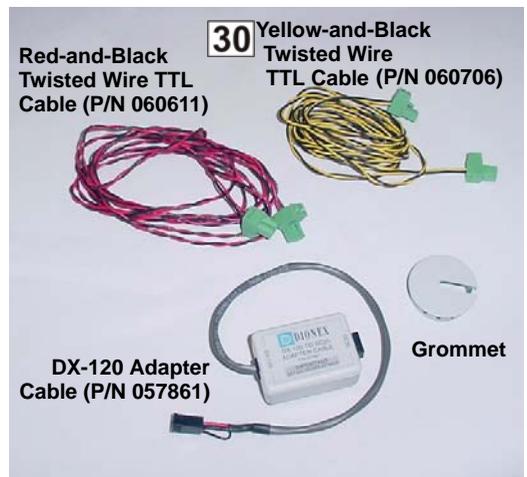


Figure 63. DX-120 TTL Cables

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2. Connect one end of the red-and-black TTL cable to the **Pump** TTL input on the RFC rear panel (see Figure 64).
3. **30** Connect one end of the yellow-and-black TTL cable to the **Gradient** TTL input (see Figure 64).

**NOTE** TTL cables are color coded for easier identification, but are identical in all other respects.

4. Verify that the **TTL Control** button position (out) is selected.



Figure 64. RFC TTL Connections

**NOTE** The **TTL Control** button position (out) must be selected in order for the DX-120 to control the power to the suppressor, CR-TC, and EGC.

5. Route the other end of the red-and-black TTL cable into the DX-120 compartment.

### Routing cables and tubing from the RFC to inside the DX-120

- Remove the grommet from the side of the DX-120 nearest the RFC and direct the tubing/cables through that opening.
- After completing all connections, install the new grommet supplied with the DX-120 adapter cable. The new grommet has a larger slot to accommodate more tubing/cables.



6. Connect the cable to the 2-pin connector on the DX-120 adapter cable (see Figure 65).
7. Connect the black 4-pin connector on the adapter cable to the DX-120 **SRS A** connector (see Figure 65).

**NOTE** To install the RFC-30 for Column B in a dual-column configuration, connect the adapter cable to **SRS B**.

8. Attach the adapter to the interior wall of the DX-120 using the VELCRO® on the back of the adapter.

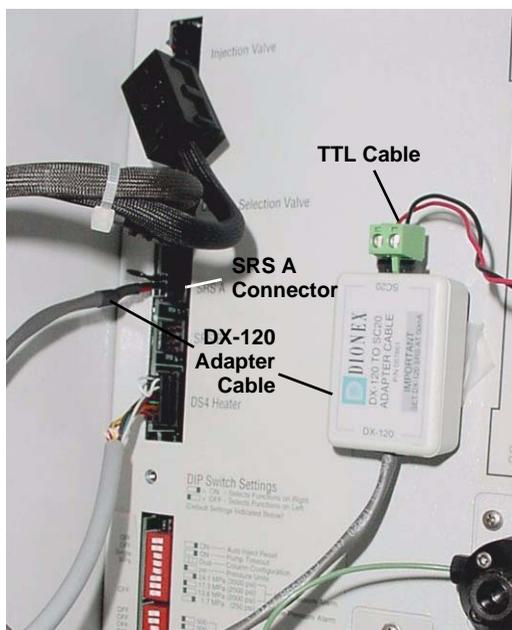


Figure 65. DX-120 Adapter Cable Connections

9. Using the DIP switch labeled switch 2 on Figure 62, set the SRS A current to 50 mA (position 4 = ON). For a Column B configuration, set the SRS B current to 50 mA (position 8=ON).

10. **30** Remove the 2-pin connector from the free end of the yellow-and-black TTL cable. Reverse the positions of the two wires and reattach them to the connector.

**NOTE** Use a screwdriver to loosen the locking screws and remove the wires. Insert the wires in the reversed position, and tighten the screws.



When attaching wires to the connector plug, be careful not to allow stray strands of wire to short to the adjoining position on the connector.

11. **30** Route the cable to the DX-120 rear panel and connect it to the **TTL-2 OUT** (see Figure 62). Double-check the connection: Make sure the yellow wire is connected to **TTL-2 OUT** and the black wire is connected to **Ground**.
12. Go on to Section B.4.

### B.4 Power Connection

1. Connect the power cord (IEC 320 C13) from the main power receptacle on the rear panel to a grounded power source.
2. Turn on the power to the RFC and to all other system modules.



**SHOCK HAZARD**—To avoid electrical shock, use a grounded receptacle. Do not operate the RFC or connect it to AC power mains without an earthed ground connection.



The power supply cord is used as the main disconnect device. Make sure the socket-outlet is located near the RFC and is easily accessible.



Operation at AC input levels outside the specified operating voltage range may damage the RFC.



**DANGER D'ÉLECTROCUTION**—Pour éviter toute électrocution, il faut utiliser une prise de courant avec prise de terre. Ne l'utilisez pas et ne le branchez pas au secteur C.A. sans utiliser de branchement mis à la terre.



Le cordon d'alimentation principal est utilisé comme dispositif principal de débranchement. Veillez à ce que la prise de base soit située/installée près du module et facilement accessible.



**STROMSCHLAGEFAHR**—Zur Vermeidung von elektrischen Schlägen ist eine geerdete Steckdose zu verwenden. Das Gerät darf nicht ohne Erdung betrieben bzw. an Wechselstrom angeschlossen werden.



Das Netzkabel ist das wichtigste Mittel zur Stromunterbrechung. Stellen Sie sicher, daß sich die Steckdose nahe am Gerät befindet und leicht zugänglich ist.

3. Go on to Section B.5.

## B.5 Pump Setup

### DX-320, DX-500, and DX-600 Systems

1. Go to the **PUMP OPTIONS** screen and set the **TTL2 OUTPUT USAGE** to **0 FLOW**. Figure 66 shows an example **PUMP OPTIONS** screen

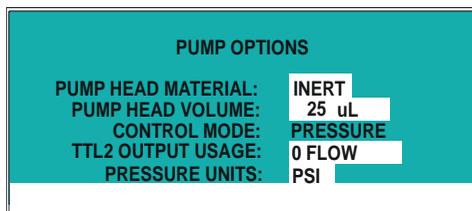


Figure 66. Example Pump Options Screen

**NOTE** When the **0 FLOW** setting is selected, the pump turns on **TTL2** when the flow is on. This enables the **RFC**. When the pump flow is off (**0 flow**), the pump turns off **TTL2** and the **RFC** is disabled.

2. Go to the **DETAIL** screen (see the examples in Figure 67 and Figure 68) and set the following pressure limits:  
 Low limit = 1.38 MPa (200 psi)  
 High limit = 20.6 MPa (3000 psi)

**NOTE** If you are installing an **RFC-30**, the pressure limits listed above must be set. These limits are recommended for an **RFC-10**, but not required.

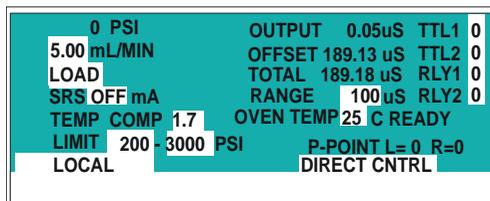


Figure 67. Example DX-320 Detail Screen

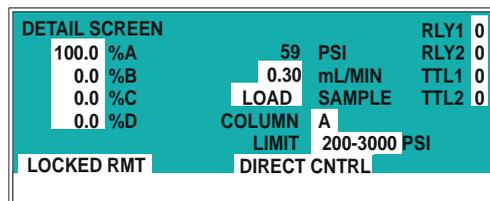


Figure 68. Example DX-500/DX-600 Pump Detail Screen

**NOTE** When pump operation is controlled by Dionex chromatography software, pressure limits can also be set from the software.

- If you are installing an RFC-10, go on to Section B.6. If you are installing an RFC-30, go on to Section B.7.

## DX-120 Pump Pressure Alarm Setup

Using the DIP switch labeled switch 1 on Figure 62, set the high pressure alarm to 24.1 MPa (3500 psi) (position 5 = ON) and set the low pressure alarm to 2.0 MPa (250 psi) (position 8 = ON).

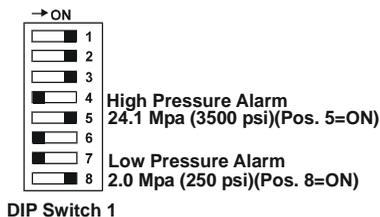


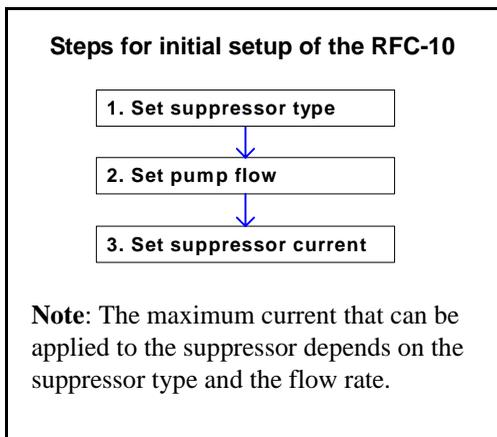
Figure 69. DX-120 High and Low Pressure Alarm DIP Switch Settings

If you are installing an RFC-10, go on to Section B.6. If you are installing an RFC-30, go on to Section B.7.

## B.6 RFC-10 Initial Setup

**NOTE** See Section B.7 for RFC-30 setup.

Before beginning operation of the RFC-10, refer to the suppressor manual for the recommended current setting for your application.



### Example Initial Setup for RFC-10

This example shows how to set up an RFC-10 for use with a system with the following operating conditions: AS18 column, 2-mm ASRS suppressor, 1.0 mL/min flow rate, and 47 mM KOH eluent.

1. From the default screen, press ▲ to display the suppressor type screen.

```
SUPP TYPE= NONE
(NONE, A&C SRS, AES)
```

Figure 70. Suppressor Type Screen

2. Press **ENTER**. The **SUPP TYPE=** entry field is highlighted, indicating that this parameter can be edited.
3. Press ▼ to select the suppressor type; for example, **ASRS\_2MM**.

```
SUPP TYPE= ASRS_2MM
(NONE, A&C SRS, AES)
```

Figure 71. Example Suppressor Type Selection

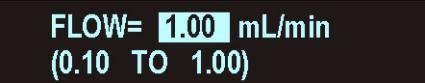
4. Press **ENTER**.
5. Press **▼** three times to display the pump flow screen.



FLOW= 0.10 mL/min  
(0.10 TO 1.00)

Figure 72. Pump Flow Screen

6. Press **ENTER**.
7. Press **▲** to select the application flow rate; for example, 1.00 mL/min. Press **ENTER**.



FLOW= 1.00 mL/min  
(0.10 TO 1.00)

Figure 73. Example Flow Rate Selection

8. Press **▼** to go to the suppressor current screen.



SUPP CURR= 0 mA  
(0 TO 150) ASRS\_2MM

Figure 74. Suppressor Current Screen

9. Press **ENTER**.
10. Press **▲** to select the current, for example, 117 mA. Press **ENTER**.



SUPP CURR= 117 mA  
(0 TO 150) ASRS\_2mm

Figure 75. Example Suppressor Current Selection

## B.7 **30** RFC-30 Initial Setup

### Set the EGC Type

1. From the default screen, press **▲** twice to display the generator type screen.



GENERATOR TYPE= NONE  
(NONE, KOH, MSA, CO3)

Figure 76. EGC Type Screen

2. Press **ENTER**. The **GENERATOR TYPE=** entry field on the screen is highlighted, indicating that this parameter can be edited.



GENERATOR TYPE= NONE  
(NONE, KOH, MSA, CO3)

Figure 77. Selecting the EGC Type

3. Press **▼** to select the type of EGC you will be installing; for example, KOH.



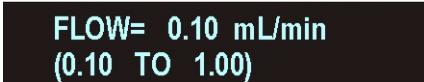
GENERATOR TYPE= KOH  
(NONE, KOH, MSA, CO3)

Figure 78. Example EGC Type Selection

4. Press **ENTER**.

### Set the Initial Flow Rate

1. Press **▼** three times to display the pump flow screen.

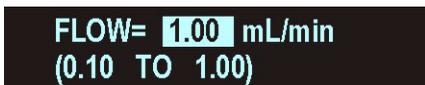


FLOW= 0.10 mL/min  
(0.10 TO 1.00)

Figure 79. Pump Flow Screen

2. Press **ENTER**.

3. Press ▲ to select a flow rate of 1.00 mL/min. **Note:** This is the flow rate required for initial set up of the EGC. You will set the application flow rate later.



FLOW= 1.00 mL/min  
(0.10 TO 1.00)

Figure 80. 1.0 mL Flow Rate Selected

4. Press ENTER.

### Set the Initial Eluent Concentration

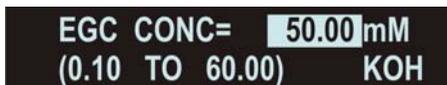
1. Press ▼ to display the EGC concentration screen.



EGC CONC= 0.10 mM  
(0.10 TO 60.00) KOH

Figure 81. EGC Concentration Screen

2. Press ENTER.
3. Press ▲ to select an eluent concentration of 50 mM. **Note:** This is the concentration required for initial set up of the EGC. You will set the application concentration later.



EGC CONC= 50.00 mM  
(0.10 TO 60.00) KOH

Figure 82. 50 mM Concentration Selected

4. Press ENTER.
5. Go on to Section B.8.

### B.8 30 RFC-30 Eluent Generator Installation

Figure 83 shows the controller and the components used for installing an eluent generator.

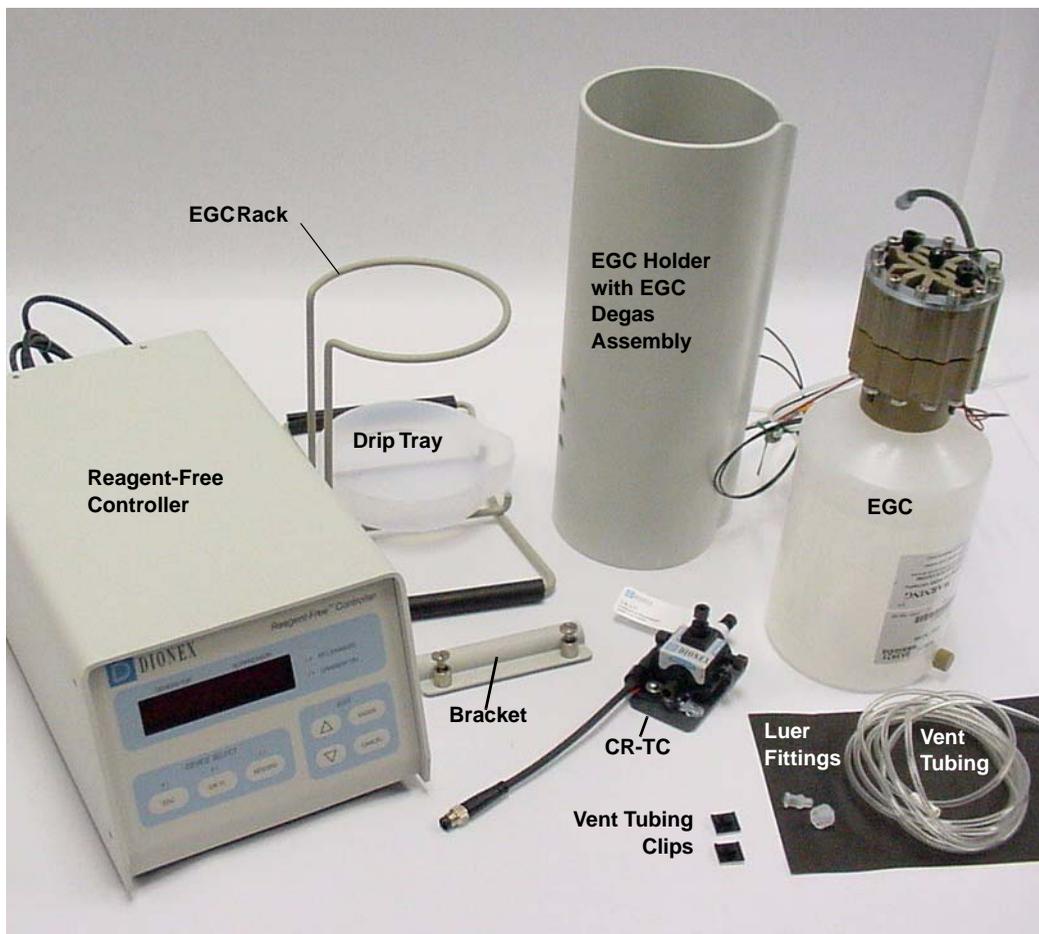


Figure 83. RFC-30 Components

Figure 84 illustrates the liquid flow path through the eluent generator components after all plumbing connections are complete. The EGC, CR-TC, and EGC holder are shipped in separate boxes. The EGC degas assembly is installed inside the EGC holder at the factory. When installation is complete, all components fit inside the EGC holder.



### Installing the CR-TC

1. Turn the EGC holder upside down to view the bottom of the holder (see Figure 85).



Figure 85. EGC Holder (upside down)

2. Before installing the CR-TC, notice the opening on the CR-TC mounting plate (see Figure 86). This corresponds to the metal stud inside the bottom of the EGC holder (see Figure 85). These are used to mount the CR-TC after it is plumbed.
3. Remove the plugs from the 4 ports on the CR-TC (see Figure 86).

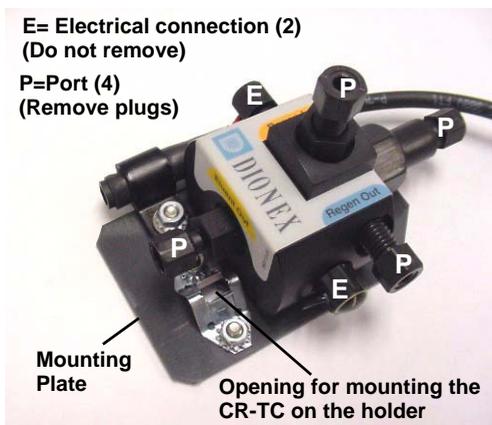


Figure 86. CR-TC

## Reagent-Free Controller

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4. With the CR-TC oriented as shown in Figure 87, connect the lines to the corresponding ports on the CR-TC. Match the color coded labels on the EGC holder lines to the color coded labels for the CR-TC ports.

**NOTE** To help retain the fittings and ferrules on the lines, remove the union from each line just before connecting the line to a port.



Figure 87. Plumbed CR-TC

5. Check that none of the lines are caught under the CR-TC and then push the CR-TC onto the metal stud inside the EGC holder (see Figure 88). Push down until the CR-TC snaps in place.

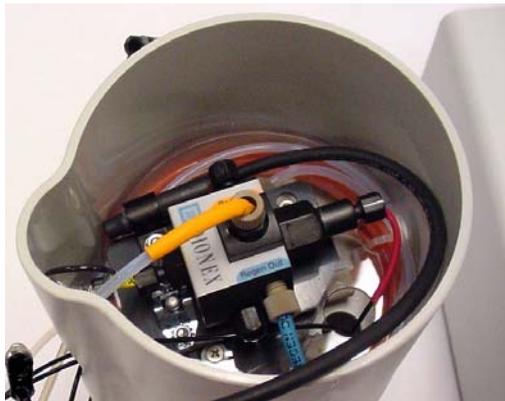


Figure 88. CR-TC Installed in Holder

6. Feed the CR-TC cable through the slot on the side of the EGC holder (see Figure 89).



Figure 89. Installing the CR-TC

7. Turn the EGC holder right side up.
8. Pull the bundled liquid lines from inside the holder to the outside.

### Installing the EGC

1. Turn the EGC upside down (fittings facing up) (see Figure 90) and set the EGC next to the holder. Remove the plugs from the EGC **INLET** and **OUTLET** fittings (see Figure 90).

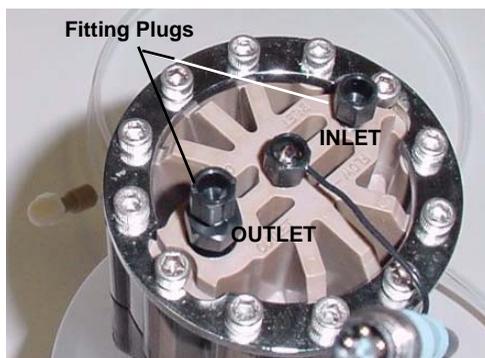


Figure 90. EGC Fitting Plugs

2. Disconnect the coiled black **EGC IN** line from the union that connects it to the **EGC OUT** line. Connect **EGC IN** to the **EGC INLET** port (see Figure 12).

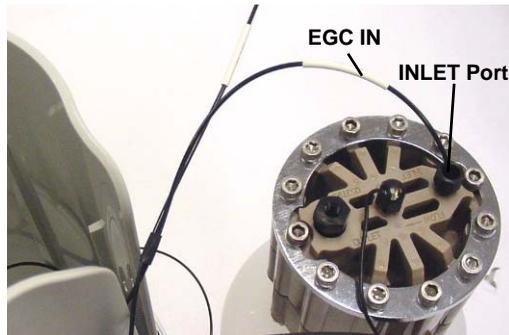


Figure 91. EGC Inlet Connection

3. Locate the yellow 0.5 mL/min, 1000 psi (7 MPa) pressure restrictor coil (P/N 053765) in the RFC-30 Ship Kit. Connect this coil to the **EGC OUTLET** port (see Figure 48). **Note:** This is a temporary connection, which is used only during the EGC conditioning procedure described on page 82.

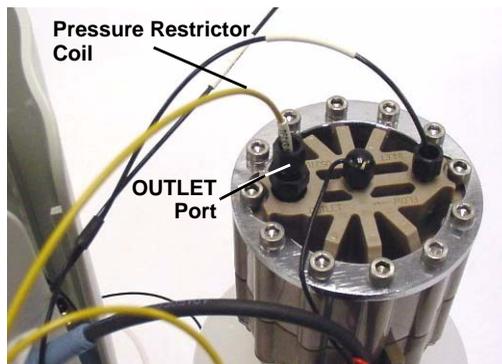


Figure 92. EGC Outlet Connection for Conditioning the EGC

4. Turn over the EGC (fittings facing down). **Shake the EGC vigorously, and tap it with the palm of your hand 10 to 15 times. Check that all trapped bubbles are dislodged.**
5. Orient the EGC with the cable aligned with the slot in the holder (see Figure 93) and then slide the EGC down into the holder until it stops.

**NOTE** To avoid crimping the lines inside the holder, do not twist the EGC as you turn it over.

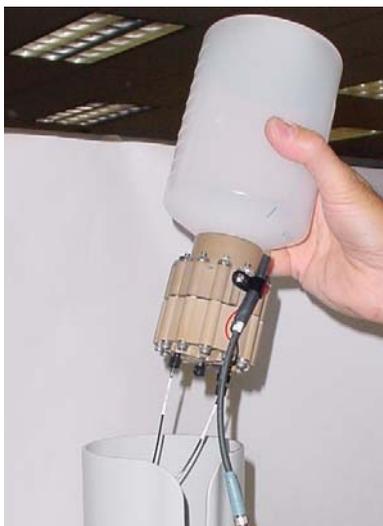


Figure 93. EGC Installation

6. Connect the **EG-1** cable from the RFC-30 rear panel to the EGC cable exiting the holder. To connect the cables, push them together and twist the locking ring.
7. Fill a reservoir with deionized water and connect the reservoir to the eluent inlet line from the pump. Use ASTM filtered, Type I (18-megohm) deionized water.
8. Connect the **TO PUMP/DAMPER** line from the EGC holder to the pump outlet.

### Conditioning the EGC



The EGC contains either KOH, a corrosive base, or MSA, a corrosive acid. Wear protective eye wear and gloves when handling the EGC.

1. Unscrew and remove the plug from the vent opening on the side of the EGC (see Figure 50).



Figure 94. EGC Vent Plug

2. Direct the yellow backpressure coil, which is connected to the EGC **OUTLET** port, to a waste container. **Note:** This can be a temporary waste container, such as a beaker.
3. Turn on the pump.
4. Press the **EGC DEVICE SELECT** button on the RFC-30 front panel to turn on the EGC.
5. Run the EGC at the initial flow rate and concentration settings (1 mL/min at 50 mM) for 30 min.
6. Turn off the pump.
7. Remove the backpressure tubing from the waste container.
8. **Replace the vent plug in the EGC.**
9. Lift the EGC out of the holder, turn it over, and set it next to the holder.

10. Disconnect the backpressure coil from the EGC **OUTLET** port and then connect the **EGC OUT** line from the holder to the **OUTLET** port (see Figure 51).

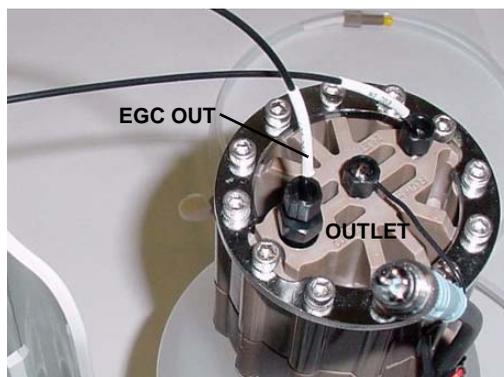


Figure 95. EGC Outlet Connection

11. Turn over the EGC, and again shake and tap it to remove air bubbles.
12. Reinstall the EGC in the holder.

### Installing the EGC Holder in the Rack

1. Set the EGC rack on top of the RFC with the vertical posts oriented toward the side nearest the chromatography module or DX-120 (see Figure 96). Secure the rack with the bracket.

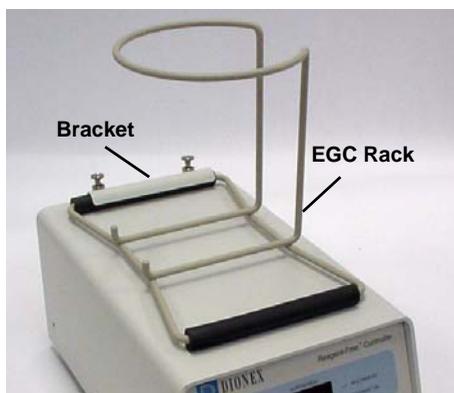


Figure 96. EGC Rack

2. Locate the corrugated drain tubing in the RFC Ship Kit. Push the tubing onto the fitting on the drip tray spout. Install the drip tray with the spout and drain line between the vertical posts in the rack (see Figure 97).

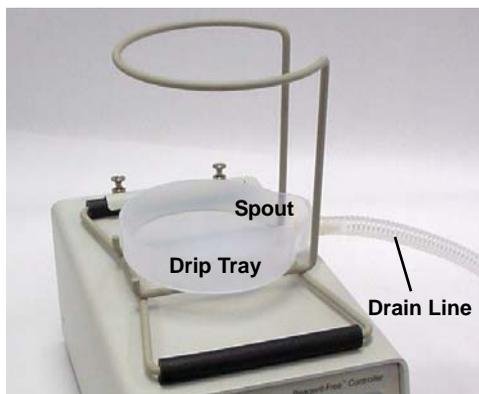


Figure 97. Drip Tray with Drain Line

3. Route the drain line to a waste container.
4. Slide the EGC holder, with the tubing and cables between the vertical posts, into the rack (see Figure 98).



Figure 98. EGC Installed on Rack

5. Locate the EGC vent line tubing, label, tubing clips, and barbed luer lock, supplied with the holder. Locate the luer adapter and cap, supplied with the EGC. Slide the label onto one end of the tubing and then push the barbed luer lock onto the tubing.
6. Remove the plug from the vent opening and wipe off any liquid from the EGC.
7. Screw the luer adapter onto the vent opening. Remove the cap on the luer adapter by twisting. **Save the cap.**

**NOTE** To prevent leaks from the EGC, always replace the luer adapter cap before moving the EGC.

8. Twist the luer lock and EGC vent line into the luer adapter (see Figure 99).

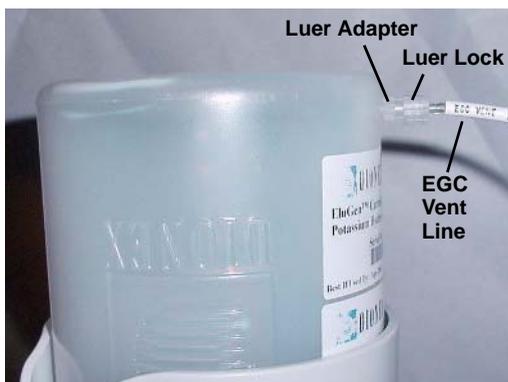


Figure 99. EGC Vent Line Installed

9. Remove the paper backing from the black tubing clips and press the clips onto the sides of the EGC holder (see Figure 100). Attach the vent line to the clips.

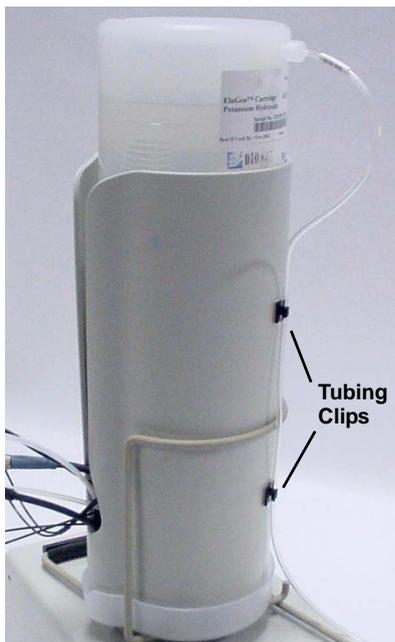


Figure 100. EGC Vent Line and Tubing Clips

10. Direct the **WASTE, GAS SEPARATOR** line from the holder to a waste container and connect the line to a gas separator waste tube assembly installed on the waste container. Refer to the suppressor manual for installation instructions.
11. Route the vent line from the EGC to the waste container and insert it down into the gas separator waste tube about 4 to 6 inches.



**DO NOT CAP THE WASTE CONTAINER:** The eluent generator uses an electrolytic process that results in the production of small amounts of oxygen or hydrogen gas. To ensure that the gas is not trapped in a closed container and allowed to concentrate, install a 1.3-cm (0.52-in) ID black gas separator waste tube (P/N 045460) to an uncapped waste container. Connect the system waste line to the waste tube.



Le eluent generator produit des éluants par électrolyse, résultant en la production de petites quantités de gaz d'oxygène et d'hydrogène. Pour veiller à ce que les gaz ne soient pas emprisonnés dans un contenant fermé où ils pourraient se concentrer, installez un tube d'évacuation du séparateur de gaz noir ID (réf. 045460) de 1,3 cm (0,52 po) dans un réservoir d'évacuation ouvert (non bouché). Consultez le manuel du dispositif de suppression pour obtenir des instructions d'installation. Orientez la conduite d'évacuation de l'ensemble de dégazage de l'eluent generator vers le tube d'évacuation.



Der Eluent Generator erzeugt Eluenten durch Elektrolyse. Dabei entstehen kleine Mengen von Sauerstoff- und Wasserstoffgas. Verbinden Sie einen Gasabscheiderschlauch (ID = 1,3 cm) Bestell-Nr. 045460) mit einem offenen (unverschlossenen) Abgasbehälter, damit sich kein Gas in einem geschlossenen Behälter sammelt und aufkonzentriert. Hinweise zur Installation finden Sie im Suppressor-Handbuch. Führen Sie die Abgasleitung von der Entgasungseinheit des Eluent Generator zum Abgasschlauch.

### Hydrating the CR-TC

1. Locate the 10-32 to 1/4-28 coupler (P/N 042806) in the Ship Kit.
2. Connect the coupler between the **TO INJ VALVE IN - P** line and the **SRS/AES REGEN OUT** line.
3. Verify that the EGC, CR-TC, and suppressor are off.
4. Turn on the pump and set the flow to the rate recommended for your application. Pump deionized water through the CR-TC, for at least 10 minutes.
5. Turn off the pump and disconnect the coupler.

### Completing the Plumbing

1. Connect **TO INJECT VALVE IN - P** to port **2** on the injection valve.  
**Note:** On some injection valves, port 2 is also labeled “P.”
2. Connect **TO SRS/AES REGEN OUT** to the **REGEN OUT** port on the suppressor.

**NOTE** If you need to extend the length of the **TO SRS/AES REGEN OUT** line, connect the 10-in Tefzel<sup>®</sup> tubing assembly (P/N 061336), provided in the Ship Kit.

3. Connect the **CR-TC** cable from the RFC-30 rear panel to the CR-TC cable exiting the EGC holder (see Figure 101). Push the cables together and twist the locking ring to connect them.

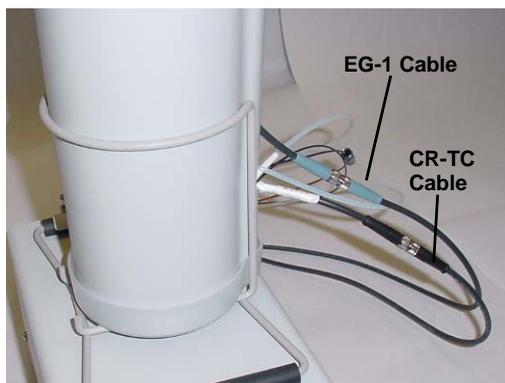


Figure 101. EGC and CR-TC Cable Connections

### Backpressure Note

For correct operation of the eluent generator, the system pressure must be maintained at between 14 and 21 MPa (2000 and 3000 psi). A system pressure of 16 MPa (2300 psi) is ideal. Check your system pressure first, and if necessary, install backpressure tubing to supply the required system pressure. Install the tubing between the injection valve inlet (port 2) and the EGC degas eluent outlet. The RFC-30 Ship Kit (P/N 060299) includes various sizes and lengths of backpressure tubing. The actual backpressure tubing to use will depend upon your system configuration.

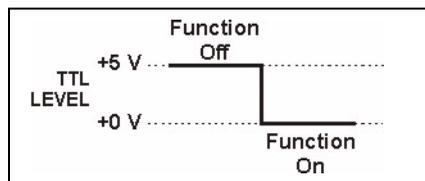
## C. TTL Control

The two TTL input connectors (**Pump** and **Gradient**) on the RFC rear panel can be connected to the TTL outputs of a controlling device (for example the pump, combination pump/detector, or DX-120). The controlling device activates the TTL to turn on the RFC function.

- Activating the **Pump** TTL enables the power output to the suppressor, eluent generator (RFC-30 only), and CR-TC (RFC-30 only). For DX-320, DX-500, or DX-600 systems, the **Pump** TTL must be connected to the TTL-2 output on the pump or combination pump/detector module. See Section B.2 for installation instructions. For a DX-120 system, the **Pump** TTL must be connected to a DX-120 adapter cable. See Section B.3 for installation instructions.
- Activating the **Gradient** TTL enables gradient control of the eluent generator.  
**Note:** This input is ignored if the **Pump** TTL is inactive.

Both TTL inputs are level sensitive. They are inactive at +5 V and active at 0 V.

- When the TTL is at +5 V, the controlled function is off.
- When the TTL is at 0 V, the controlled function is on.



The **Gradient** TTL can also be controlled via a relay from the pump, combination pump/detector, or detector module. For relay control, opening the relay turns on the function and closing the relay turns off the function.

The **TTL Control/AC Control** button on the RFC rear panel selects and deselects control of the **Pump** TTL.

- When the button is in the **TTL Control** position, TTL control is selected and the **Pump** input works as described above.
- When the button is in the **AC Control** position, TTL control is bypassed. The **AC Control** position is used when a DX-120 system is connected to the RFC via an AC cable. For additional information about AC control with a DX-120, contact Dionex.

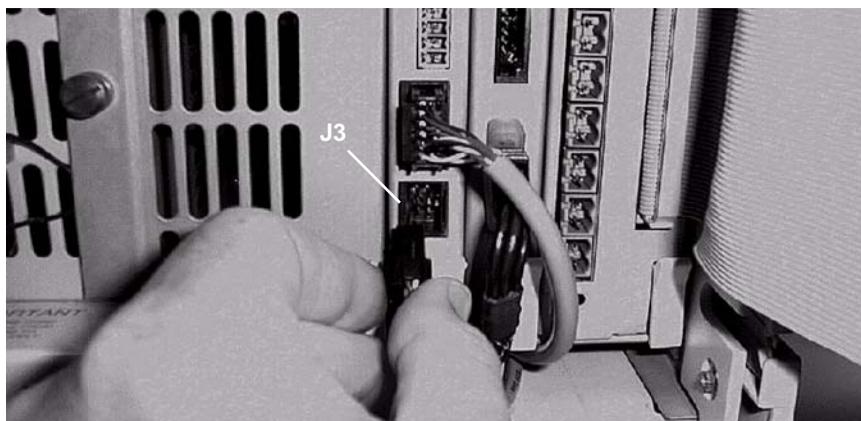
**NOTE** The **TTL Control/AC Control** button does not affect the **Gradient** TTL input.

## **D. Disconnecting a Suppressor from an Internal Power Supply**

If you want to use the RFC to control the suppressor, but the system currently includes a suppressor controlled by an internal power supply, follow the instructions in this section to disconnect the suppressor from the internal power supply. See Section D.1 for DX-320, DX-500, or DX-600 systems or Section D.2 for DX-120 systems. After disconnecting the existing power source, continue installing the RFC as described in Appendix B.

### **D.1 Disconnecting the Suppressor from a DX-320, DX-500, or DX-600 System**

1. Open the door of the detector or combination pump/detector and locate the suppressor cable connected to J3 (SRS) of the SCR card in slot 2. (The label on the inside of the door identifies the electronics cards.)
2. Unplug the suppressor cable from the J3 connector (see Figure 102).



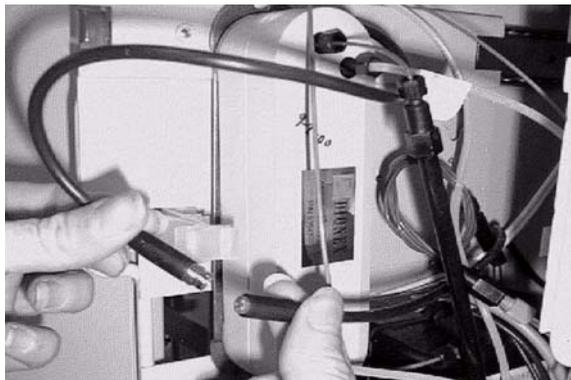
*Figure 102. Disconnecting the Suppressor Cable from the SCR Card*

3. Locate the suppressor in the chromatography compartment.

## ***Disconnecting the Suppressor from a DX-120 System***

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4. Disconnect the suppressor power source cable from the suppressor cable (see Figure 103).



*Figure 103. Disconnecting the SRS Power Source Cable from the SRS Cable*

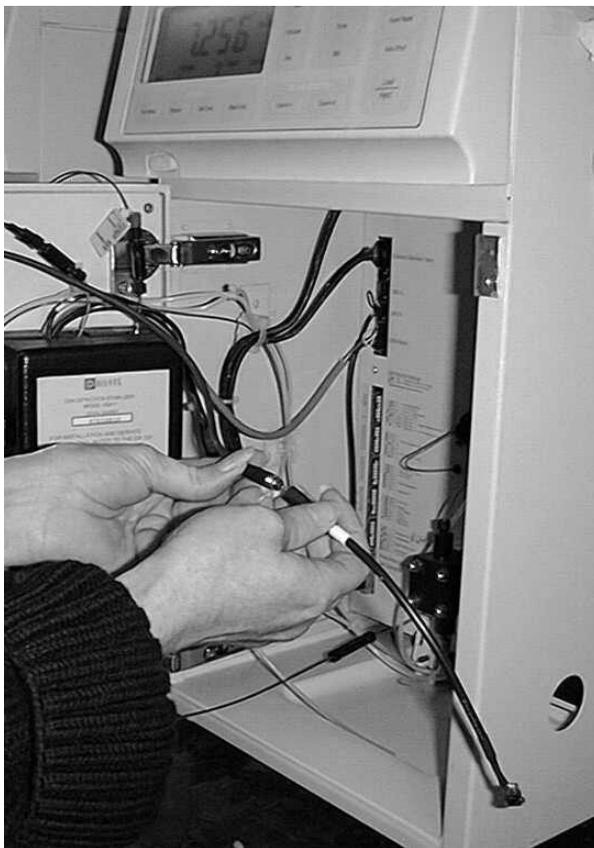
### **D.2 Disconnecting the Suppressor from a DX-120 System**

1. Open the front door of the DX-120.
2. Locate the SRS A Power Source cable in the main compartment (see Figure 104).



*Figure 104. The DX-120 SRS A Power Source Cable*

3. Firmly grip the SRS A power source cable at the connector and unplug it from the electronics card.
4. Disconnect the SRS A power source cable from the suppressor cable and remove it (see Figure 105). Store the cable for future use.



*Figure 105. Disconnecting the SRS A Power Source Cable from the Suppressor Cable*

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