



# **Agilent Electron Capture Detectors, Exempt**

**Information for ECD  
Owners**



**Agilent Technologies**

# Notices

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## Safety Notices

### CAUTION

A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

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### WARNING

A **WARNING** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a **WARNING** notice until the indicated conditions are fully understood and met.

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## **What can we do to assist you?**

Please call:

Radiation Safety Officer 302-636-8262

Technical Support 1-800-227-9770



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## Agilent Electron Capture Detectors

### Introduction

This publication describes proper installation, operation and maintenance of Agilent electron capture detectors (ECDs). It also discusses the regulations that govern their use and the safety precautions that must be observed to help avoid radiological hazards.

*For customers located outside of the United States*—The information contained in this booklet relates to the regulations in the U.S. Though following the safety precautions and many of the requirements in this booklet is a good practice, it is your responsibility to comply with your local regulations.



## Allowances of Exempt Status for Customers

- No wipe tests
- No inventory requirements
- No transfer requirements
- No NRC disposal requirements (may be local metal requirement)
- No reporting requirement

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## Description of the ECD

The ECD can be purchased as an option with the instrument, in which case it is installed in your GC at the factory, or as an add-on accessory to be installed by you or by Agilent Technologies.

The ECD consists of the detector cell, the thermal insulation that surrounds it, mounting hardware, the ECD cover and associated overheat protection circuitry, if appropriate. The two halves of the ECD body are joined by tamper-proof screws.

## Properties of an ECD

The radiation source used in the ECD is  $^{63}\text{Ni}$ . This material is plated onto the inner surface of the cell body. It is a solid at temperatures used in chromatography. Some of its properties are listed here.

- Half life: 101.1 years
- Emission: 65.87 keV maximum, beta radiation
- Melting point: 1453 °C
- Nominal dimensions of the active part of the ECD:
  - Inside diameter: 1.2 cm
  - Height: 1 cm
- Nominal dimensions of the active part of the  $\mu\text{ECD}$ :
  - Inside diameter: 6 mm
  - Height: 4.2 mm
- Activity: Refer to the Characteristics of the Sealed Source for the individual model number maximum activity.

## Regulatory Requirements

Agilent Technologies, Inc., is licensed under US NRC regulation 10 CFR 32.26 to transfer detectors manufactured for use pursuant to 10 CFR 30.20 (available through the NRC web site [www.nrc.gov](http://www.nrc.gov)) or equivalent regulations of an Agreement State. US Customers are exempt from nuclear regulatory requirements from a usage perspective but not from a transportation perspective if transferring ECD locations. Customers should also be cognizant of local environmental restrictions regarding the disposal of stainless steel and nickel. Non-US customers must comply with the local regulations.

Additionally:

- 1 You must remove the metal tag attached by wire to the ECD.
- 2 Comply with the instructions provided in this booklet and any other manuals or instructions provided that pertain to ECDs.
- 3 Disassembly of the ECD for modification by cutting, drilling, welding or any other destructive or damaging operation is prohibited. Only customers who have a specific license which allows them to do so are permitted to open their ECD.

## Safety precautions to follow when handling ECDs

- 1 Never eat, drink or smoke when handling ECDs.
- 2 Connect the ECD exhaust vent to a fume hood or vent to the outside in some other acceptable manner whenever the ECD is in use.
- 3 Cap the inlet and outlet fittings when the ECD is not in use.
- 4 Store removed ECDs in an inert gas environment such as Nitrogen or Helium.

## ECD warnings

Although beta particles at this energy level have little penetrating power (the surface layer of the skin or a few sheets of paper will stop most of them), they may be hazardous if the isotope is ingested or inhaled. For this reason, the cell must be handled with care, the inlet and outlet fittings must be capped when the ECD is not in use, corrosive chemicals must not be introduced into the ECD and the effluent from the ECD must be vented outside the laboratory environment.

**WARNING**

Materials that may react with the  $^{63}\text{Ni}$  source, either to form volatile products or to cause physical degradation of the plated film, must be avoided. These materials include oxidizing compounds, acids, wet halogens, wet nitric acid, ammonium hydroxide, hydrogen sulfide, PCPs and carbon monoxide. This list is not exhaustive but indicates the kinds of compounds that may cause damage to  $^{63}\text{Ni}$  detectors.

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**WARNING**

In the extremely unlikely event that both the oven and the ECD heated zone should go into thermal runaway (maximum, uncontrolled heating in excess of 400 °C) at the same time and that the ECD remains exposed to this condition for more than 12 hours, the following must be done:

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- After turning off the main power and allowing the instrument to cool, cap ECD inlet and exhaust vent openings. Wear disposable plastic gloves and observe normal safety precautions.
- Call the Technical Support number identified at the front of this booklet.

It is unlikely, even in this very unusual situation, that radioactive material will escape from the cell. However, permanent damage to the  $^{63}\text{Ni}$  plating within the cell is possible and, therefore, the cell must be disposed of.

**CAUTION**

Do not use solvents to clean the ECD.

---

**WARNING**

You may not open the ECD cell unless authorized to do so by your local nuclear regulatory agency. Do not disturb the four socket-head bolts. These hold the cell halves together. US customers, removing or disturbing them is a violation of the terms of the exemption and could create a safety hazard.

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## Capping your ECD

### **WARNING**

**Overheating or chemical damage could cause radioactive particles to drop from the inlet fitting.**

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The ECD inlet fitting must be capped whenever a column is not attached. In addition, the metal vent tube exiting from the side of the ECD must be capped whenever the vent line is disconnected. If the ECD is not going to be used or will be stored, see [“Storing your ECD”](#) on page 15.

## Temperature limitations

The maximum detector temperature limit is 400 °C (350 °C for 5790 and 5880 GCs), and the ECD must not be heated above these limits. This limit is built into the 5890, 6890, 7890A, and 7820A GCs' temperature control systems. If a malfunction should occur and the temperature of the ECD should rise to 425 °C, the instrument's main thermal control system will turn off all the thermal zones.

For the 5790 and the 5880 GCs, if the temperature should rise above 350 °C, whether due to an incorrect setpoint entry or because of an instrument malfunction, a safety circuit will turn the heater power off at  $370 \pm 10$  °C.

### **WARNING**

**If the ECD heater(s) should be deactivated, a hardware problem may exist in the instrument. Consult the instrument manual for information on diagnosing and correcting the problem.**

---

## Transferring an ECD

There are no restrictions or limitations to transferring exempt devices within the United States or its protectives. However, exports will be subject to the regulations of the recipient country and to DOT/IATA transportation regulations.

## Maintenance

Customer maintenance of the ECD is limited to installation, radioactivity leak testing, thermal cleaning and removal of the ECD.

One of the easiest ways to monitor the proper operation of the ECD is to monitor the signal baseline. See your Operators Manual for specific information.

Leaks can adversely affect the performance of your ECD. It is important to locate and fix any gas leaks. Complete instructions for performing leak tests can be found in the Maintenance and Troubleshooting Manual provided with your instrument.

Instructions for removal of the ECD can be found in this manual.

### Thermal cleaning

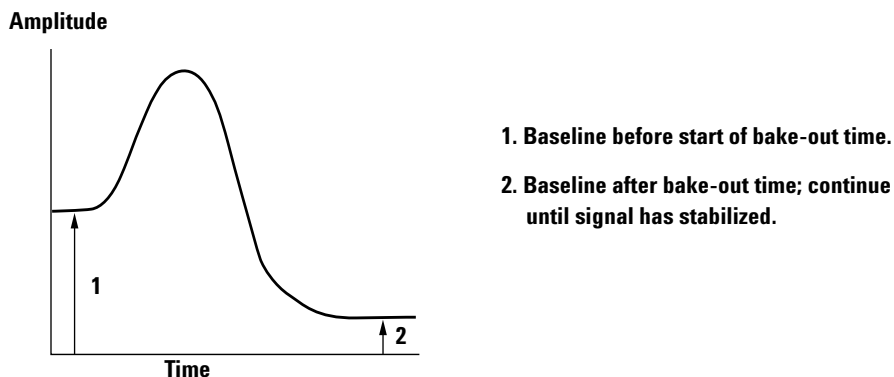
#### **WARNING**

**Thermal cleaning is the only cleaning procedure permitted by the customer. Do not introduce any liquid solvent into the ECD cell.**

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The ECD effluent must be vented properly during the thermal cleaning process.

Remove any existing column between the injection port and the ECD. Install an empty (unpacked), clean glass/metal column to maintain gas flow into and through the ECD. Set the oven temperature to 250 °C and the carrier flow to 30 to 90 mL/min. Raise the ECD temperature above your normal operating temperature but less than the maximum operating temperature allowed for your ECD. (For the 5880A GC, the maximum ECD temperature is 370 °C; for 5890, 6890, 7890A, and 7820A GC instruments, the maximum ECD temperature is 400 °C). Maintain this bakeout condition for several (3 to 24) hours or until the ECD baseline has stabilized. The total time necessary will depend on the type and degree of contamination as well as the normal operating temperature versus the bakeout temperature. Baking the ECD at higher temperatures (above the normal operating temperature) and at higher purge flow rates will shorten the time necessary. It is good practice to monitor the ECD signal/baseline during the bakeout to help determine the time necessary. A typical baseline trace might look similar to [Figure 1](#).



**Figure 1** Typical baseline trace

Cleaning the ECD thermally will most likely change its response characteristics, so you will probably be required to recalibrate your ECD depending on the actual method.

### Who can open their ECD for cleaning?

- Only customers holding a current Specific License issued by either the NRC or the applicable Agreement State, and
- The license must specify that they are qualified to clean ECDs.

### Installation

ECDs ordered as an option to an Agilent GC are installed at the factory. If the ECD is purchased as an add-on accessory, the ECD will be shipped with detailed installation instructions.

#### **WARNING**

**(5880 GCs Only): To prevent possible creation of a hazardous situation, the instructions must be followed exactly. Pay special attention to those sections concerning the overheat protection board and the thermal measurement board.**

The instructions include a procedure for verifying correct operation of the overheat protection circuitry. If this circuitry does not function correctly, turn the instrument off, notify your local Agilent service organization immediately and do not attempt to use the instrument.

When installing an ECD, always remember to vent the detector in accordance with the procedure specified in “[Venting your ECD](#)” (see below) and remember to install all labels as instructed.

## Venting your ECD

The instrument in which the ECD is mounted must be placed where the ECD effluent can be vented. The ECD shall not be vented into the laboratory environment. A vent line to a fume hood is a convenient way to accomplish this. This precaution is taken to avoid radioactive contamination of the laboratory if an abnormal condition should occur.

Agilent Technologies recommends a vent line running to a fume hood. The inside diameter should be 6 mm (1/4 inch) or greater to prevent back pressure which might cause noise in the ECD signal. With a line of this diameter, the length of the tubing is not critical.

## Storing your ECD

Depending on the needs of the laboratory, it may be good practice to have an extra ECD on site to provide rapid turnaround for a contaminated ECD. This would be particularly true in laboratories with a very high workload or sample throughput where instrument operation must be maintained. This “spare ECD cell” operation is quite possible with the Agilent design, but some precautions may be necessary for trouble-free operation when the spare ECD is put into service.

Due to the extremely chemically active atmosphere inside the ECD, it is advisable to keep air and moisture out of the cell. The carrier gas flow does this when the detector is in use, but storage for an extended period will result in an ECD that does not perform as desired when restored to service. This may be due to the formation of corrosive compounds (such as nitric acid) from the ionized components of air inside the cell. To our knowledge this has not been proven, but such components would likely be quite detrimental to the ECD if they were present. To prevent this occurrence, we suggest providing a slow purge gas through an ECD in storage or purging the ECD well and sealing an inert gas inside to prevent air (oxygen and water) from diffusing into the

active area of the cell. Nitrogen by itself is not a problem but, in combination with oxygen, very corrosive components could be formed. An inert gas, such as argon or helium, would probably be best for this purge gas.



## Removing your ECD

You will need to remove the ECD if you wish to reposition it on the GC or return it to Agilent Technologies. The ECD consists of two parts: the ECD cell and the heated block. ***Under no conditions is the ECD cell to be disassembled.***

Begin by turning the heated zone off and allowing the instrument to cool to room temperature. When the ECD has cooled, turn all gas flows off, remove the column to which the detector is connected and turn the main instrument power off. Disconnect the main power cord from the wall receptacle.

The instructions for removing the ECD from your chromatograph vary with the GC model. Determine which model ECD you have and follow the appropriate instructions. When removing the ECD, wear disposable gloves and wash your hands thoroughly with mild soap and water after handling the ECD. If you are returning the ECD to Agilent Technologies, refer to the shipping instructions in “[How to Package and Ship ECDs](#)” on page 24. If you should encounter any problems or complications when removing your ECD, call your local Agilent customer engineer or the Agilent Response Center at 1-800-424-9759.

### Instructions for removing G1533A (6890 GC), G2397A (6890 and 7890A GCs), and G2397AE (7820A GC) ECDs

#### Safety

##### **WARNING**

All versions of ECD cells contain radioactive material. Exposure to radioactive material may be hazardous to human health. Under no circumstances should an ECD cell be disassembled as this is in violation of the ECD exemption. Agilent will accept only ECDs manufactured by either Hewlett Packard or Agilent Technologies, Inc.

##### **CAUTION**

Always allow time for the oven and heated zones to cool before turning off the gas supplies. Failure to allow cooling may damage the ECD.

**WARNING**

Before proceeding, turn off the oven and any heated zones and let them cool down. When they have cooled, turn off any detector gases at their supply, then turn off the main power switch and unplug the power cord.

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**CAUTION**

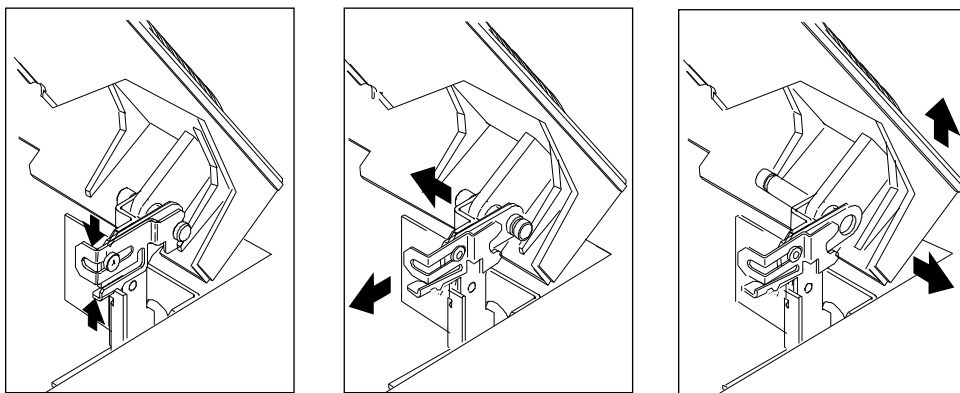
Make sure you are properly grounded with an ESD strap before continuing.

---

### Removing the detector cover (6890, 7890A, and 7820A)

Raise the GC's detector cover to the vertical position and lift off of instrument.

### Removing the old style detector cover (6890)



The top cover protects the detectors, valve box and valve assembly.

- 1 Tilt the front cover up.
- 2 Squeeze the clip on the right hinge, pull the clip toward you and pivot it up.
- 3 Push the metal pin behind the clip to the left.
- 4 Slide the detector cover to the right and lift it off.

- 5 To replace the top cover:
  - a Slide the plastic post on the left side of the cover into the hole on the injection port fan cover.
  - b Line up the hole in the tab on the right side of the cover with the metal pin and push the pin to the right through the hole.
  - c Pivot the clip back down and snap it back over the metal pin.

## Removing the right side cover

### WARNING

The electronics cover shields the high voltage components on the main board. Turn off the main power switch and unplug the power cord before removing this cover.

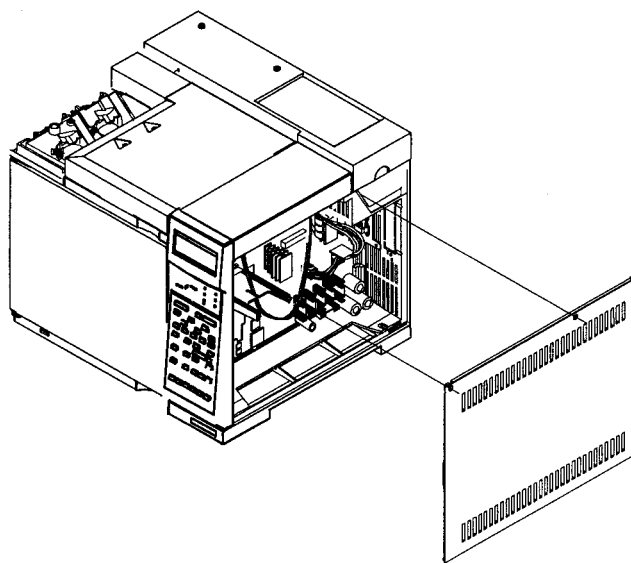
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### CAUTION

Be sure to wear an ESD strap grounded to the GC chassis while performing this procedure.

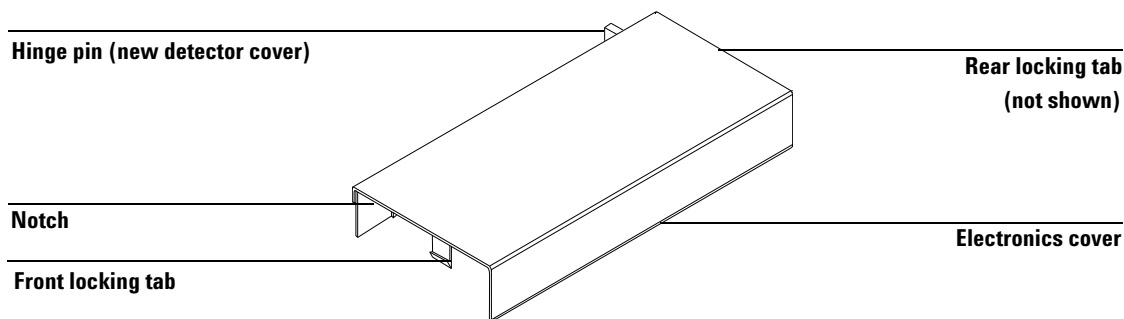
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- 1 Fully loosen the two captive screws (Torx T-20) in the top of the cover for the 6890 and 7890A GCs and on the right side of the cover for the 7820A GC.
- 2 Slide the side cover slightly to the rear of the GC and lift the cover out of the slot in the bottom of the chassis.



**Figure 2** Right side cover removal (6890 GC shown, 7890A GC similar)

**6890 GC cover removal**



- 1 Remove the GC right side cover.
- 2 Reach under the electronics cover and press the rear locking tab toward the front of the instrument.

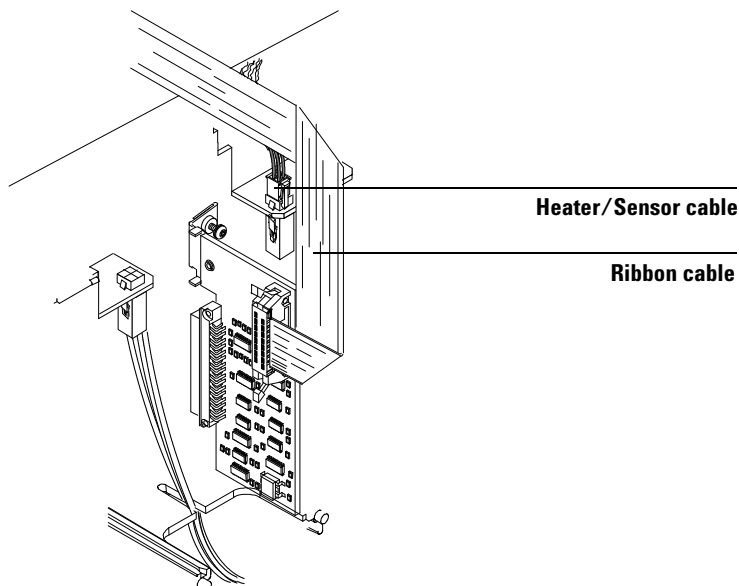
- 3 While pressing the tab, lift up the back of the electronics cover and slide the cover back, up, and out of the instrument.
- 4 To reinstall the cover, make sure that the notched edge of the cover faces the front left side of the instrument and snap it back into place.

### 7890A GC cover removal

- 1 Remove the screws from the left side and the rear of the top electronics cover.
- 2 Lift the electronics top cover up and away from the right side of the GC.

## Disconnecting the cables

- 1 Disconnect the heater/sensor cable from the connector on the right side of the GC.
- 2 Disconnect the ribbon cable from the detector board.



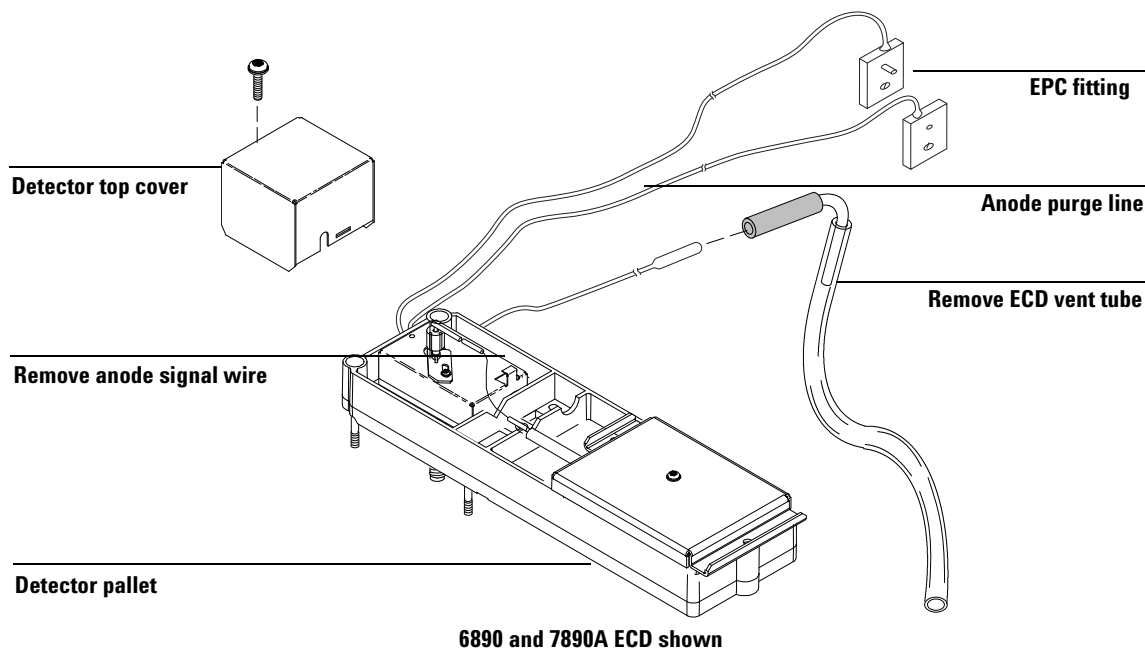
**Figure 3** Disconnect the cables (6890 GC shown, 7890A and 7820A GCs similar)

## Removing the makeup gas adapter

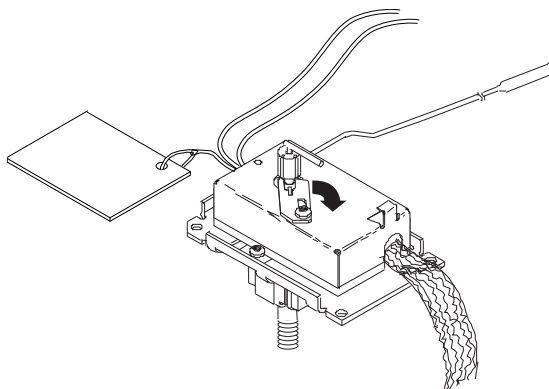
- 1 Inside the oven, remove the insulation cup and disconnect the column from the makeup gas adapter.
- 2 Use a 9/16-inch wrench to loosen the 1/4-inch Swagelok nut on the makeup gas adapter from the bottom of the detector. Slide the makeup gas adapter out of the bottom of the detector.

## Removing the ECD

- 1 Disconnect the ECD vent tube at the rubber sleeve.
- 2 Disconnect the anode purge line at the pneumatics manifold.
- 3 Remove the one Torx T-20 screw securing the ECD detector top cover to the detector pallet and remove the cover.
- 4 Disconnect the anode signal wire from the detector.
- 5 Fully loosen the four Torx T-20 screws (five screws for the 7820A GC) on the detector pallet, lift the pallet and turn on its right side.
- 6 Thread the heater/sensor leads out of the detector pallet and remove the rest of the detector from the pallet.
- 7 For shipping or storage purposes, cap the inlet, anode purge and exhaust vent tubing.



- 8 The ECD detector is now properly disassembled. Call the Technical Support number identified at the front of the booklet if you wish to return the ECD to Agilent for transfer or disposal.



## How to Package and Ship ECDs

Shipping radioactive materials in the U.S. (including exempt ECDs) is regulated by the U.S. Department of Transportation (DOT) for surface transport and by the International Air Transport Association (IATA) for air transport.

[Appendix A](#) on page 31 contains:

- “Instructions for Customer Return of ECDs per Compliance with IATA Regulations” for shipping ECDs via Air Transportation.
- “Instructions for Customer Return of ECDs per Compliance with U.S. DOT Regulations” for shipping ECDs via Surface Transportation.

Prior to shipping radioactive materials, you should contact your transportation officer and/ or your carrier to determine which regulations are pertinent to your shipment.

- 1 Using a clean dry cloth, remove any external chemicals or debris that may be on the ECD.
- 2 Insert the threaded plug in the entrance fitting and cap the vent tube. These measures keep foreign materials out of the ECD cavity and keep any loose fragments in.
- 3 Place the ECD in a strong plastic bag and seal the bag.
- 4 Pack the bag in a strong container (corrugated cardboard is satisfactory) with a shock-absorbing packing material (bubble-pack if available) and seal the box carefully. If possible, try to retain the original ECD box for return shipment.
- 5 Determine the carrier’s means of transportation to Agilent Technologies; 2850 Centerville Rd., Wilmington, DE 19808-1610. See [Appendix A](#) on page 31 for Procedures to package, label, and mark ECDs for return to Agilent Technologies by air or ground transportation (for shipment by Federal Express, use IATA instructions).
- 6 If available, affix the preprinted address label originally provided with the ECD. If you are using our address label, ensure that our current Wilmington, Delaware address is on the label. All ECDs should be sent to:

Agilent Technologies  
Attention: ECD Lab  
2850 Centerville Road  
Wilmington, DE 19808-1610



- 7** All ECDs must be shipped via a licensed common carrier with tracking capabilities; we recommend Federal Express. ECDs should not be shipped via regular mail (because regular mail is not traceable).
- 8** Regulations cited in this manual were valid at the time of this revision. Agilent Technologies accepts no liability for transportation compliance. For additional regulatory information regarding shipping ECDs, refer to the domestic and/or international regulatory requirements in [Appendix A](#) on page 31. Consult with your appropriate transportation officer for changes since the date of this revision.

## Radioactive Wipe Tests

In the US, wipe tests are not required on exempt ECDs. Non-US customers must comply with local regulations.

## Incidents

10 CFR Sections 20.2202 31.5(c)(5) and 20.2203 of the NRC Regulations, describe the reporting actions that must be taken if an incident occurs. In this section, an incident is any occurrence involving radioactive material that may have caused, or threatens to cause:

- Exposure to dangerous levels of radiation
- Release of dangerous amounts of radioactive materials

Please refer to the NRC regulations for further details.

### WARNING

**In the absence of radiation measuring equipment, all incidents or significant failures should be reported and the ECD should be taken out of service immediately.**

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Because the owner of an exempt device is not required to maintain radiation measurement capability and may not have access to one when needed, the following criteria are offered to aid in recognizing possible incidents and other failures:

- **Temperature runaway**—A failure in the temperature control circuits of the instrument, accompanied by failure of the overheat protection circuits, could cause the heating of the detectors to exceed their limits. This must be reported if it causes failure or damage to the ECD.
- **Physical damage**—If the ECD is involved in a fire, flood or any other event that may cause harm to the ECD, it must be reported, per 10 CFR 31.5.
- **Modification of the ECD**—Changes to the ECD, including drilling, welding, soldering, sawing or other operations, are prohibited. If this occurs, it must be reported per 10 CFR 31.5.
- **Breakage of the ECD**—If the inlet fitting or vent tube of the ECD should break off, take the ECD out of service immediately and contact the RSO identified in [“What can we do to assist you?”](#) on page 3.

This list is not exhaustive. It is intended to illustrate the range of occurrences that could be considered reportable incidents or failures. In dealing with radioactive isotopes, it is advisable to be overly cautious, particularly if you do not have the equipment to make an accurate assessment of the situation.

All incidents and failures should also be reported to:

Agilent Technologies  
Attn: Radiation Safety Officer  
2850 Centerville Road  
Wilmington, Delaware  
19808-1610

## Principle of Operation

The radioactive source in this ECD produces high-energy electrons called beta particles. These beta particles collide and interact with the carrier gas molecules causing a multiplication of the number of electrons and a decrease in their energy. Each beta particle produces approximately 100 of these low energy electrons, also known as free electrons.

When a sample molecule comes in contact with the free electrons, a free electron may be captured by a sample molecule to create a negatively charged ion. The voltage across the cell electrodes is pulsed to collect the surviving free electrons, while the heavier ions are relatively unaffected and swept out the vent with the carrier gas flow.

The measured cell current is compared to a reference current. The pulse rate is adjusted to keep the two currents equal. The more free electrons there are, the lower the pulse frequency required to match the reference current. When a component that captures electrons passes through the cell, it causes a decrease in the electron concentration and an increase in the pulse rate. This pulse rate is converted to a voltage and recorded.

### What types of samples do ECDs detect?

The ECD is used for low-level detection of electron-capturing substances. These include mono- and poly-halogenated compounds, nitro derivatives and anhydrides. The ECD produces little or no response to hydrocarbons, ethers, and esters or to aliphatic alcohols, ketones and amines. Hydrocarbons, ethers, and esters, in that order, are the preferred solvents for ECD analysis.

Because of the combination of very high sensitivity and selectivity provided by the ECD, it is widely used for trace level analysis of halogenated, particularly chlorinated, components. A major application is the detection and quantitation of pesticide residues, many of which are chlorinated.

### Sensitivity

The response of the ECD depends upon the molecular composition of the analyte and its concentration, your ECD, the cell cleanliness, the column, the inlet and the instrument setpoints (temperature, flow rates, and reference current).

It is important to create calibration curves on all compounds and evaluate ECD response on a regular basis. Even with frequent calibration, you can expect the ECD response to change when operating conditions change, for instance, when analyzing dirty samples that contaminate the ECD.





## Appendix A

### Instructions for Customer Return of ECDs per Compliance with IATA Regulations (Air Transportation)

**Exempt ECDs are exempt from NRC regulations but not from IATA or DOT regulations regarding transporting radioactive devices. Following are procedures for Packaging, Labeling and Marking ECD Packages for Return to Agilent Technologies by Air**

- 1 Plug the entrance fitting and cap the vent tube. Place the ECD in a strong plastic bag, seal it and pack it in a strong container with shock-absorbing packing material (a corrugated cardboard box in good condition and bubble wrap is a satisfactory combination).
- 2 This package must be marked with the appropriate Radioactive Material Excepted Packaging label. Contact your Agilent Field Repair Center for the required label.
- 3 The Air Bill/Air Waybill must list this as “Radioactive material, excepted package-articles, UN2911.”
- 4 Refer to [page 33](#) for a further explanation of shipping information and instructions.

### IATA Regulations

The following are references and excerpts from the International Air Transport Association (IATA), Dangerous Goods Regulations. This information is provided for your convenience. It is your responsibility to comply with all current regulations including requirements for training, packaging, labeling and documentation procedures. Most primary carriers use the IATA regulations; however, consult with your selected carrier for additional information.



**Definition of Excepted Quantities (Excerpted from IATA 2.7)**

Very small quantities of dangerous goods may be transported, . . . in such a manner that they may be excepted from the marking, loading and documentation of these Regulations. When they are transported under these provisions, such goods are called “Dangerous Goods in Excepted Quantities”.

In the case of radioactive material, the requirements for radioactive material in excepted packages is found in IATA 10.5.9.

**Excepted Package Activity Limits for ECD Returns (Calculated from Table 10.5.A)**

The activity of an ECD cell (an item in Table 10.5.A) is below the limit of 800 mCi for <sup>63</sup>Ni. (A2 = 800 Ci; therefore 800 Ci × 0.01 = 8 Ci or 8000 mCi). This qualifies all packages containing a single ECD (at 15 mCi or 555 MBq) as an excepted quantity.

**Table 10.5.A.** Excepted Package Activity Limits (10.5.9.4)

Nature of Contents	Materials	Instruments and articles	
	Package limits	Item limits	Package limits
Solids:			
Special form	$10^{-3}A_1$	$10^{-2}A_1$	$A_1$
Other form	$10^{-3}A_2$	$10^{-2}A_2$	$A_2$
Liquids:			
	$10^{-4}A_2$	$10^{-3}A_2$	$10^{-1}A_2$
Gases:			
Tritium	$2 \times 10^{-2}A_2$	$2 \times 10^{-2}A_2$	$2 \times 10^{-1}A_2$
Special form	$10^{-3}A_1$	$10^{-3}A_1$	$10^{-2}A_1$
Other form	$10^{-3}A_2$	$10^{-3}A_2$	$10^{-2}A_2$



## **Instructions for Customer Return of ECDs per Compliance with U.S. DOT Regulations (Surface Transportation other than Federal Express)**

**Exempt ECDs are exempt from NRC regulations but not from IATA or DOT regulations regarding transporting radioactive devices. Following are procedures for packaging, labeling and marking ECD packages for return to Agilent Technologies by common carrier**

- 1** Plug the entrance fitting and cap the vent tube. Place the ECD in a strong plastic bag, seal it, and pack it in a strong container with shock-absorbing packing material (a corrugated cardboard box in good condition and bubble wrap is a satisfactory combination).
- 2** Completely remove or mark out any previous labels if the container chosen has previous shipping labels on it.
- 3** This package must be marked with the appropriate Radioactive Material Excepted Packaging label.

Contact your Agilent Field Repair Center for the required label.

- 4** Refer to [page 24](#) and the regulations provided below for additional shipping information and instructions.

### **U.S. DOT Regulations**

The U.S. Department of Transportation (U.S. DOT) provides requirements for surface transportation of ECDs in 49 CFR Part 173.424 (Excepted packages for radioactive instruments and articles). Contact your qualified carrier or access the regulation on line at [www.dot.gov](http://www.dot.gov) for up-to-date instructions.



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