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U.S. Environmental Protection Agency
Science and Ecosystem Support Division
Athens, Georgia

GUIDANCE

Title: Chlorofluorocarbon Refrigerant Field Screening and Sampling

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Revision History

This table shows changes to this controlled document over time. The most recent version is presented in the top row of the table. Previous versions of the document are maintained by the SESD Document Control Coordinator.

History	Effective Date
SESDPROC-103-R2, Chlorofluorocarbon Refrigerant Field Screening and Sampling, Replaces SESDPROC-103-R1 **General:** Corrected any typographical, grammatical and/or editorial errors. **Title Page:** The Enforcement and Investigations Branch Chief, Danny France was changed to the Field Services Branch Chief, John Deatrick. Changed Field Quality Manager from Bobby Lewis to Hunter Johnson. **Section 2.2.1, Bullet 1:** Clarification language was added about sampling canisters but no technical changes were made.	June 28, 2017
SESDPROC-103-R1, Chlorofluorocarbon Refrigerant Field Screening and Sampling, Replaces SESDPROC-103-R0	**February 28, 2013**
SESDPROC-103-R0, Chlorofluorocarbon Refrigerant Field Screening and Sampling, Original Issue	**July 24, 2009**

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1 General Information

1.1 Purpose

This document describes general and specific procedures, methods and considerations to be used and observed when collecting chlorofluorocarbon (CFC) refrigerant samples for field screening or laboratory analysis

1.2 Scope/Application

The procedures contained in this document are to be used by field personnel when collecting and handling CFC refrigerant samples in the field. On the occasion that SESD field personnel determine that any of the procedures described in this section are inappropriate, inadequate or impractical and that another procedure must be used to field screen and collect (CFC) refrigerant samples, the variant procedure will be documented in the field log book, along with a description of the circumstances requiring its use. Mention of trade names or commercial products in this operating procedure does not constitute endorsement or recommendation for use.

1.3 Documentation/Verification

This procedure was prepared by persons deemed technically competent by SESD management, based on their knowledge, skills and abilities and have been tested in practice and reviewed in print by a subject matter expert. The official copy of this procedure resides on the SESD local area network (LAN). The Document control Coordinator (DCC) is responsible for ensuring the most recent version of the procedure is placed on the SESD LAN and for maintaining records of review conducted prior to its issuance.

1.4 Quality Control

Quality control for sampling associated with field screening and collecting (CFC) refrigerant samples is method specific. The sampling methods described in the sections that follow contain the quality control procedures appropriate for each method.

1.5 Records

Information generated or obtained by SESD personnel will be organized and accounted for in accordance with SESD records management procedures found in SESD Operating Procedure for Control of Records (SESDPROC-002). Field notes, recorded in a bound field logbook, will be generated, as well as chain-of-custody documentation in

accordance with SESD Operating Procedure for Logbooks (SESDPROC-010) and SESD Operating Procedure for Sample and Evidence Management (SESDPROC-005).

1.6 General Precautions

1.6.1 Safety

Proper safety precautions must be observed when field screening and collecting (CFC) refrigerant samples. Refer to the SESD Safety, Health and Environmental Management Program (SHEMP) Procedures and Policy Manual and any pertinent site-specific Health and Safety Plans (HASPs) for guidelines on safety precautions. These guidelines, however, should only be used to complement the judgment of an experienced professional. Address chemicals that pose specific toxicity or safety concerns and follow any other relevant requirements, as appropriate.

1.6.2 Procedural Precautions

The following precautions should be considered when collecting (CFC) refrigerant samples.

- Special care must be taken not to contaminate samples. This includes storing samples in a secure location to preclude conditions which could alter the properties of the sample. Samples shall be custody sealed during long-term storage or shipment.

- Collected samples are in the custody of the sampler or sample custodian until the samples are relinquished to another party.

- If samples are transported by the sampler, they will remain under his/her custody or be secured until they are relinquished.

- Shipped samples shall conform to all U.S. Department of Transportation (DOT) rules of shipment found in Title 49 of the Code of Federal Regulations (49 CFR parts 171 to 179), and/or International Air Transportation Association (IATA) hazardous materials shipping requirements found in the current edition of IATA's Dangerous Goods Regulations.

- Documentation of field sampling is done in a bound logbook.

- Chain-of-custody documents shall be filled out and remain with the samples until custody is relinquished.

- All shipping documents, such as bills of lading, etc., shall be retained by the project leader and stored in a secure place.

1.7 References

International Air Transport Authority (IATA). Dangerous Goods Regulations, Most Recent Version

Neutronics® Model RI-2002PA Portable Automotive Refrigerant Identifier Operation Instruction Manual

SESD Operating Procedure for Control of Records, SESDPROC-002, Most Recent Version

SESD Operating Procedure for Sample and Evidence Management, SESDPROC-005, Most Recent Version

SESD Operating Procedure for Logbooks, SESDPROC-010, Most Recent Version

SESD Operating Procedure for Field Sampling Quality Control, SESDPROC-011, Most Recent Version

SESD Operating Procedure for Equipment Inventory and Management, SESDPROC-108, Most Recent Version

SESD Operating Procedure for Field Equipment Cleaning and Decontamination, SESDPROC-205, Most Recent Version

SESD Operating Procedure for Packaging, Marking, Labeling and Shipping of Environmental and Waste Samples, SESDPROC-209, Most Recent Version

US EPA Safety, Health and Environmental Management Program Procedures and Policy Manual Region 4 SESD, Athens, GA, Most Recent Version

2 Chlorofluorocarbon Refrigerant Field Screening and Sample Collection

2.1 Guidance Procedure for Chlorofluorocarbon (CFC) Refrigerant Field Screening using the Neutronics® Model RI-2002PA Portable Automotive Refrigerant Identifier

2.1.1 General Information

The Neutronics® Model RI-2002PA is designed to identify vapor gas samples taken directly from CFC refrigerant storage cylinders. The Neutronics Model RI-2002PA 2537A uses Multiple Sensor, Non-Dispersive Infrared (NDIR) technology to perform the analysis.

The Neutronics® Model RI-2002PA 2537A identifies the percentage, by weight, of R12, R134a, R22 and hydrocarbons (HC) in a sample of refrigerant. The unit will flash the measured percentages of R12, R134a, R22 and HC on the display if their concentrations are greater than zero. Samples will be identified with air concentrations up to 90% by weight. This unit eliminates the effect of air when determining the concentration of a gas because air is not considered a contaminate and can be removed during the recycling process. The instrument detects and indicates either R12 or R134a if the sample is at least 98 % pure. This unit has an accuracy of ± 1 % the concentration of contaminates in the 0-5 % range and ± 2 % the concentration of air after a 30 minute warm-up period. If a hydrocarbon refrigerant is detected in a mixture sufficient to constitute a potential flammability problem, a horn will sound and a hydrocarbon LED will light.

The instrument is designed to sample gas concentrations. If the liquid phase is sampled by mistake and contains lubricating oil the pre-filter will turn red and the instrument may need to be returned to the manufacturer for repair.

2.1.2 Instrument Operating Procedure

The operator should be familiar with the detailed procedures as described in the Neutronics® Model RI-2002PA Portable Automotive Refrigerant Identifier Operation Instructions Manual. The following Quick Instructions are from page 9 of the manual and give a brief description of how to operate the instrument.

Read and follow the Safety Messages on pages 3 and 4 of the Neutronics Model RI-2002PA Portable Automotive Refrigerant Identifier Operation & Instructions Manual

1. Connect the correct hose (R12 or R134a) to the RI-2002PA Sample Inlet.

DO NOT connect the service end of the hose to the cylinder at this time.

2. Plug the power cord into a three prong standard wall outlet (110/220 vac 60/50 Hz.).

3. After warm and auto cal, connect the supplied calibrated sample hose to the vapor port of the cylinder.

4. 9-15 psig will register on the system pressure gauge. The unit is ready to take a sample as indicated by the flashing green LED. Push the *ENTER* button. Wait for the identification mode.

5. The RI-2002PA will indicate a *PASS* status with an R12 or R134a LED, or *FAIL* status with a fail LED and the detected refrigerant concentrations. The display will scroll through and indicate the percent by weight concentrations for R12, R134a, R22 and HC if their concentrations are not zero. If the gas is determined to be potentially flammable, the hydrocarbon LED will illuminate and the horn will sound. Press the Horn Mute button to silence the horn, and follow the safety messages.

6. After Identification, a flashing yellow LED will indicate that the unit is ready to purge. DISCONNECT THE SAMPLE HOSE FROM THE CYLINDER. Be sure the system pressure gauge registers 0 psig, and press the *ENTER* button. Allow the unit to purge then connect the hose to the next cylinder. Go to Quick Instructions Step 2.

2.1.3 Interferences

Due to the unique design of the Neutronics® Model RI-2002PA, there are no known chemical interferences. The only materials that enter the instrument are gases and vapors. The instrument will analyze and report the presence of hydrocarbons and water.

2.1.4 Required Equipment

- The Neutronics® Model RI-2002PA 2537A
- Calibration Standards
- Spare Disposable Filter Assembly (Neutronics® part # RI-2002PA1)
- Parallel Port Printer to record the data
- Appropriate fittings

2.1.5 Calibrations

The RI-2002 PA is factory tuned and does not require any further adjustments in the field. The instrument also features automatic self calibration. However, the

instrument's calibration is verified by analyzing R-12, R-22 and R-134a standards. Standards are run in the same fashion as a sample. The standard is followed by a room air purge to verify the system is cleaning itself after a high concentration of analyte. Standards for air and hydrocarbons are not analyzed.

2.1.6 Calculations

The instrument's on-board processor calculates the concentrations automatically. The user need not perform any calculations during routine sampling and analysis.

2.1.7 Records Management and Documentation

The instrument will only store data from the last analysis performed. Therefore, to maintain a hard-copy record of sampling runs the data will be sent to the printer and will immediately be printed out.

2.1.8 Safety

The instrument itself presents few health & safety concerns. However, the instrument is used to sample refrigerant containers that have internal pressures exceeding 150 psi. The refrigerants may cause skin or eye injury from low temperature, if allowed to vent. The individual responsible for sampling should use personal protective equipment (PPE) stipulated by the site safety officer.

2.2 Liquid CFC Sampling

2.2.1 General Information

The following is a synopsis of procedures which should be strictly adhered to for the cleanup and use of canisters for sampling refrigerants for analysis.

- Sampling canisters must be capable of withstanding the pressures and temperature extremes of refrigerant sampling. The canisters must also meet Department of Transportation (DOT) regulations for the shipping of refrigerant samples.

- All new canisters must be individually checked for contamination by the laboratory before use. One of each batch of 10 canisters that are subsequently cleaned must be analyzed to check for contamination.

- All sampler fittings, must be solvent washed in hexane and heated to >100^{o}C. These parts should then be assembled and flushed with nitrogen [1] for at least 8 hours prior to use in the sample train or in the canister cleanup apparatus.

- Each canister's inlet port fitting will be inspected for damage before cleaning. Any damaged fitting will be replaced with a previously cleaned (see procedure above) fitting. After replacing any fitting, the canister will be cleaned and analyzed to verify that it is free of contamination.

- Chain-of-custody must be maintained for all samples.

1. The nitrogen should be certified 99.999% pure by the manufacturer. A molecular sieve scrubber should be attached to the nitrogen line after the regulator to remove any trace impurities.

2.2.2 Sample Collection Procedure

The canister is connected to the liquid port of the refrigerant container. NOTE: Some refrigerant containers will need to be rolled or inverted to collect a liquid sample depending on their construction.

- Connect the pre-evacuated sampling canister to the refrigerant container using the appropriate tubing (e.g. 1/4 inch outside diameter, thick wall, Teflon® tubing) and fittings.

- Open the sampling canister valve.

- Slowly open the refrigerant valve. Verify liquid CFC flowing through the tubing. Fill the sampling canister approximately one-half full. Close the refrigerant container valve while the sampling canister is still filling. Then close the canister sampling valve. This will prevent CFCs venting during the sampling process.

- After the sample has been collected, the canister should be capped, an EPA pre-numbered tag should be completed and attached to the canister, and the canister valve sealed with EPA sample custody tape.

- A Chain-Of-Custody Record should be completed detailing time of sampling, refrigerant container identification and signed by the person collecting the sample.

- The samples are returned to the SESD laboratory for analysis.