

Fact Sheet

American Innovation and Manufacturing Act: Automatic Leak Detection Requirements for Appliances Containing Hydrofluorocarbons and Certain Substitutes

Background

The American Innovation and Manufacturing (AIM) Act, enacted on December 27, 2020, authorizes the U.S. Environmental Protection Agency (EPA) to address hydrofluorocarbons (HFCs) in three main ways:

- (1) Phasing down HFC production and consumption through an allowance allocation program;
- (2) Maximizing reclamation and minimizing releases of HFCs from equipment and ensuring the safety of technicians and consumers; and
- (3) Facilitating the transition to next-generation technologies by restricting the use of HFCs in the sector or subsectors in which they are used. This fact sheet concerns the second area – maximizing reclamation and minimizing releases of HFCs, and in particular, installation and use of automatic leak detection (ALD) systems for appliances containing HFCs and certain substitutes.

In this fact sheet, EPA is providing information on the ALD requirements established under the 2024 Emissions Reduction and Reclamation (ER&R) final rule published on October 11, 2024 ([89 FR 82682](#)). The rule establishes regulatory requirements to minimize the release of HFCs and certain substitutes from equipment (*e.g.*, air conditioning and refrigeration appliances) and to maximize the amount of HFCs reclaimed. Refrigerant-containing appliances used for commercial refrigeration and industrial process refrigeration (IPR) are required to have an ALD system installed and in use if they meet all the following criteria:

- Have a full charge size of 1,500 pounds or more;
- Use a refrigerant that contains an HFC or a substitute for an HFC with an exchange value or global warming potential¹ above 53; and
- The equipment is either installed on or after January 1, 2026, or is legacy equipment installed on or after January 1, 2017.

Types of ALD Systems

ALD systems are refrigerant leak detection technologies that continuously monitor refrigerant-containing appliances for leaks and alert owners or operators if the system detects a leak.²

- (1) **Direct systems** (Figure 1a) automatically detect refrigerant in the air and can identify the location and severity of a leak using fixed hardware sensors.
- (2) **Indirect systems** (Figure 1b) automatically analyze system operating conditions (*e.g.*, temperature, pressure) and can monitor outdoor components of an appliance more effectively than direct systems.

¹ The AIM Act assigns an exchange value to each regulated substance. The exchange values included in subsection (c) of the AIM Act are identical to the global warming potentials of these substances included in the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (2007). The lowest exchange value assigned to a regulated substance in the AIM Act is 53.

² Additional information on the two types of ALD systems is available in the [Automatic Leak Detection Systems Technical Support Document](#).

Both types of ALD systems are acceptable and may monitor more than one appliance.³ Owners or operators have discretion to choose which type of ALD system to use as long as the system meets the standards in the final rule.⁴

Figure 1: Examples of (a) direct and (b) indirect ALD systems

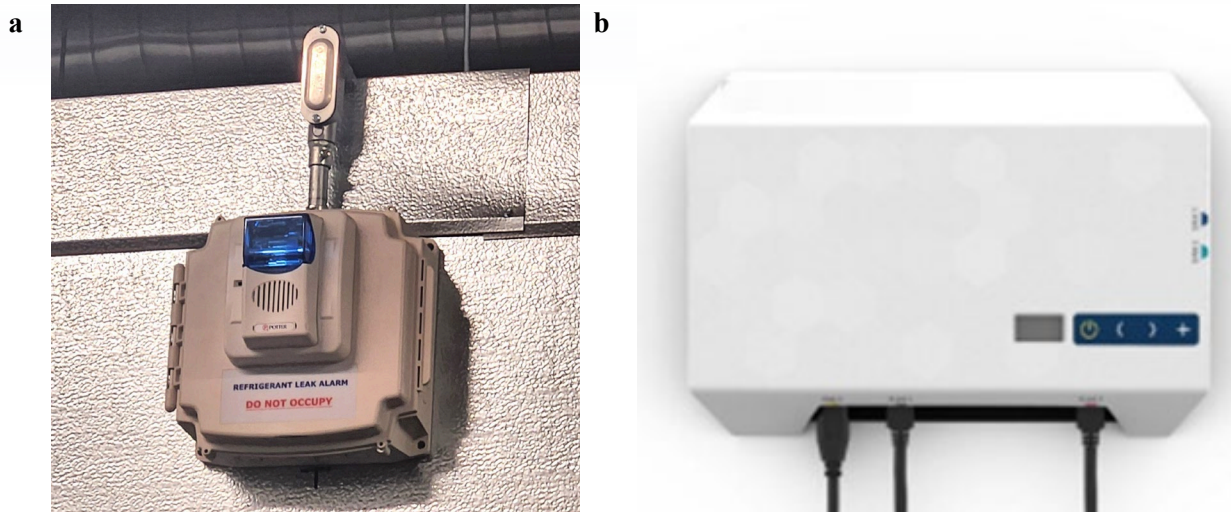


Table 1: Direct and Indirect ALD Systems

Direct ALD	Indirect ALD
<ul style="list-style-type: none"> • Hardware with sensors that continuously monitor refrigerant concentration in the air and are affixed to walls near an appliance(s) or on one or more appliances. • Alerts owners or operators when refrigerant concentration levels exceed a set threshold measured in parts per million (ppm). • Detects the location and severity of leaks based on sensor placement. • Most effective in enclosed spaces with controlled airflow; potentially less effective outdoors. <p>Available as:</p> <ul style="list-style-type: none"> • Active sensors that use a central system and tubing to sample multiple areas. • Passive sensors that use zone-specific infrared sensors that detect refrigerant presence locally. 	<ul style="list-style-type: none"> • Uses predictive software that analyzes data from existing control systems and appliance sensors to identify potential leaks. • Can monitor multiple appliances if appliances contain the necessary control systems. • Compares real-time operating data (e.g., liquid levels, pressure, temperature, ambient conditions) to historical trends. • Should monitor at least two operating parameters (e.g., temperature, pressure, liquid levels, flow rate) for accurate detection. • May indicate where a leak is likely, but owners or operators must inspect to determine the exact location. • Monitors the entire appliance, including outdoor components.

³ For example, a direct system may have sensors affixed to cover a number of zones (*i.e.*, areas of the appliance that are being monitored) and monitor more than one appliance with the data recorded and stored in one central monitoring station.

⁴ Refer to [40 CFR 84.108](#) and any relevant manufacturer instructions for additional details.

Requirements for Installation and Use⁵

For applicable commercial refrigeration and IPR appliances, the compliance date for installing and using an ALD system depends on the installation date of the appliance:

- For appliances installed on or after January 1, 2026, owners and operators must install and use an ALD system upon installation of the appliance, or within 30 days of installation.
- For appliances installed on or after January 1, 2017, and before January 1, 2026, owners and operators must install and use an ALD system by January 1, 2027.

Owners or operators must also meet specific requirements for the installation and use of ALD systems under [40 CFR 84.108](#), including:

- Installing ALD systems in accordance with manufacturer instructions;
- Performing annual auditing and calibration of the system; and
- Installing ALD systems to monitor components inside an enclosed building or structure.

ALD System Requirements

In addition to the requirements for installation and use, ALD systems must meet the requirements at [40 CFR 84.108 \(f\)](#) and [40 CFR 84.108\(g\)](#) (refer to Table 2). If an ALD system is used as a compliance option instead of leak inspection requirements at [40 CFR 84.106](#), also refer to those provisions for the relevant requirements.⁶

Table 2: Requirements for ALD Systems

Direct Systems	Requirement
Continuous Monitoring 40 CFR 84.108(f)(1)	Have sensors or intakes placed to continuously monitor the refrigerant concentrations in air in proximity to the compressor, evaporator, condenser, and other areas with a high potential for a refrigerant leak.
Detection Limit 40 CFR 84.108(f)(2)	Detect a concentration level of 10 ppm of vapor of the specific refrigerant(s) used in the refrigerant-containing appliance(s).
Leak Threshold 40 CFR 84.108(f)(3)	Alert the owner or operator when a refrigerant concentration of 100 ppm of vapor of the specific refrigerant(s) used in the appliance(s) is reached.
Indirect Systems	Requirement
Leak Threshold 40 CFR 84.108(g)	Automatically alert the owner or operator when measurements indicate a loss of 50 pounds of refrigerant or 10 percent of the full charge, whichever is less.

⁵ This information is provided for informational purposes only and should not be relied on for compliance.

⁶ For further information on the ER&R regulations refer to [40 CFR part 84, subpart C](#).

Addressing ALD System Alerts

When an ALD system alerts an owner or operator to a leak, they must comply with the requirements at [40 CFR 84.108\(h\)\(1\)](#) or [40 CFR 84.108\(h\)\(2\)](#), and [40 CFR 84.108\(h\)\(3\)](#) where applicable (refer to Table 3). Refer to [40 CFR 84.106](#) for the full leak repair requirements.

Table 3: Requirements for Addressing ALD System Alerts for Appliance Owners or Operators

Provision	Requirement
Calculate the Leak Rate 40 CFR 84.108(h)(1)	<ul style="list-style-type: none"> Calculate the leak rate as described in 40 CFR 84.102 within 30 days of an alert (or 120 days where an industrial process shutdown would be necessary). If the leak rate is above the applicable leak rate as described in 40 CFR 84.106(c)(2), comply with the leak repair provisions in 40 CFR 84.106.
Preemptive Repair 40 CFR 84.108(h)(2)	<ul style="list-style-type: none"> Preemptively repair the identified leak(s) before adding refrigerant to the appliance and then calculate the leak rate within 30 days of an alert (or 120 days where an industrial process shutdown would be necessary).
Conduct Leak Inspections 40 CFR 84.108(h)(3)	<ul style="list-style-type: none"> If a refrigerant-containing appliance leaks above the applicable leak rate described in 40 CFR 84.106(c)(2), and the ALD system is only monitoring portions of an appliance, the remainder of the appliance remains subject to any applicable leak inspection requirements, as described in 40 CFR 84.106(g).

Recordkeeping and Reporting Requirements

Where ALD systems are required, owners or operators must maintain records for at least three years (electronic or paper format) regarding:⁷

- The installation of the system;
- The annual calibration and audit of the system;
- Each date the system triggers an alert; and
- The location of the leak(s) which resulted in the alarm.



Additional Resources

Managing Use and Reuse of HFCs and Their Substitutes:
www.epa.gov/climate-hfcs-reduction/managing-use-and-reuse-hfcs-and-substitutes

ER&R Fact Sheets and Additional Resources:
www.epa.gov/climate-hfcs-reduction/resources-managing-hfc-use-and-reuse

Contact EPA: HFCEmissionsReductions@epa.gov

⁷ Refer to [40 CFR 84.108\(i\)](#) for additional information.