

Autofrost

Manufactured by

Monroe Air Tech

522 W. 2nd St.

Bloomington, IN 47403

Phone: 800-424-3836

Fax: 800-691-4996

Charging Instructions for Autofrost

Read all of this instruction sheet before beginning.

1. Diagnose system operation and repair leaks.
2. Change nitrile hoses to barrier hose. (developed for 134a.)
3. Install Autofrost unique fittings. (See instructions for installing Autofrost unique fittings.)
4. Vacuum system for at least 30 min. at 29.9 inches of mercury.
5. Determine amount of Autofrost to be used. (80% by weight, 100% by volume)
6. Before starting engine, charge up to 60% of determined amount through low side port as a liquid only.
DO NOT TURN CYLINDER UPSIDE DOWN! (Cyl. has a pickup tube, must remain right side up.)
7. Allow system to stabilize for 3 minutes then start engine. Turn A/C on Max.
8. Wait 3 more minutes then add up to 20% more Autofrost until performance is acceptable.
Total maximum charge is 80%! Some systems perform better with less than 80%.
DO NOT OVER CHARGE! TOO MUCH IS WORSE THAN TOO LITTLE!!!

TIPS:

- a. No two vehicles will have the same gauge readings.
- b. Always measure charge (A digital bathroom scale will be closer than guessing.)
- c. Air and moisture will not condense and will cause excessive high side pressure.
(Always vacuum system for at least 30 minutes at 29.9 inches of mercury.)
- d. Small debris can get through condenser fins, get caught in the smaller fins of the radiator, and is undetectable without removing top covers and visually inspecting. Dirty radiators, inside and out can cause heat to soak into the condenser and cause excessive pressure even after vehicle is parked.
- e. Initial charge can also be accomplished through the high side of the system and will aid in oil return but do this only if the vehicle is turned off!!

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Instructions for Installing & Using Autofrost Unique Fittings, Test Hose Adapters, & Labels

1. Attach one large Autofrost unique hex fitting to the low side of the system to be serviced and tighten.
2. Attach one small Autofrost unique hex fitting to the high side of the system to be serviced and tighten.
3. Attach large Autofrost test hose adapter to the unique fitting on the low side of the WC system.
4. Attach small Autofrost test hose adapter to the unique fitting on the high side of the A/C system.
5. Attach appropriate test hoses and equipment to Autofrost test hose adapters.
6. Service A/C system as needed.
7. After A/C system has been serviced, remove test hoses and equipment.
8. Remove Autofrost test hose adapters from unique fittings. (Test hose adapters remain with equipment.)
9. Install protective caps on both high and low side Autofrost unique fittings. (Fittings remain on vehicle.)
10. Fill out Autofrost unique label and place over existing R-12 label or find a suitable place elsewhere under vehicle hood and render original R-12 label unreadable.

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Autofrost™ / Autofrost X4™ R-12 Replacement Questions & Answers

Q. What is Autofrost refrigerant?

A. Autofrost is a blend of refrigerants R-22, R-142b, and a small amount (4%) of R-600a, that is a drop-in substitute for R-12 in stationary and automotive A/C systems. The 4% R-600a aids in returning the mineral oil to the compressor and is such a small amount, that Autofrost stays non-flammable. Even after worst case leaking and recharging Autofrost still has no "flash point" and will not sustain a flame. No oil change is needed. Autofrost was invented by George H. Goble (GHG) and is marketed by Monroe Air Tech (1-800-424-3836).

Q. What is Autofrost X4 and how is it different from Autofrost?

A. Autofrost X4 is very similar to Autofrost. It consists of R-22, R-142b, R-124 and a small amount of R-600a (to provide a good mineral oil return). Autofrost X4 is basically Autofrost with a small amount of R-124 added and is also non flammable. Suction pressures are the same as Autofrost and the head pressure will be slightly higher, about 5 PSI higher at 130 degrees F condensing temperature. This blend also carries a UL listing (Underwriters Laboratories).

Q. Are these products legal to use?

A. Yes. Autofrost and Autofrost X4 have been found "acceptable" by the E. P. A. and was printed in the Federal Register on October 16, 1996.

Q. Does this refrigerant have to be charged as a liquid?

A. Yes. This refrigerant and all other zeotropic blends (R-400 series) must be charged as a liquid to prevent change in composition. Autofrost/Autofrost X4 are supplied in 25 lb. cylinders which contain a "pickup tube" to withdraw the product as a liquid without inverting the cylinder.

Q. Should I always vacuum the system before charging?

A. **Air and moisture will not condense and will cause excessive high side pressures! This can cause damage to the system, especially the hoses.** Always pull a vacuum at 29.9 inches of mercury for at least 30 minutes before charging. 45 min. to 1 hr is better,

Q. How much Autofrost/Autofrost X4 do I need to charge in?

A. If you are using scales to weigh it, then use 80% of the R-12 weight amount. If you are using a liquid charging cylinder such as DIAL-A-CHARGE™, use the same liquid amount as you would R-12. Some systems will perform better with less than the recommended charge.

Q. Why do I use only 80%?

A. Autofrost is lighter in weight than R-12. (like antifreeze and water). The 25 lb cylinder of Autofrost is the same size as 30 lb of R- 12. The Autofrost 9.6 oz can is the same as the 12 oz can of R- 12. When comparing prices, always divide by 30 lbs.

Q. What is the best procedure for charging?

A. Before starting engine, charge up to 60% (2.5 lbs R-12 X .60 = 1.5 lbs Autofrost) of determined amount through the low or high side port as a liquid only. **DO NOT TURN CYLINDER UPSIDE DOWN!** (Cyl. has a pickup tube and must remain "valve up") Allow system to stabilize for 3 minutes, then start engine. Turn A/C on Max., wait 3 more minutes and then add up to 20% (2.5 lbs R-12 X .20 = .5 lbs) more Autofrost through low side port only. Performance maybe acceptable at less than 80%. Total maximum charge is 80%! (2.5 lbs R-12 X .80= 2.0 lbs Autofrost)

DO NOT OVER CHARGE!!! TOO MUCH IS WORSE 'THAN TOO LITTLE!!!

Q. How should the system perform?

A. If you did a performance check on the same system with R-12 and Autofrost you would see a 3 to 5 degree improvement with Autofrost. No two systems will perform exactly the same, but the readings will be very close on the suction side. High side pressures will be within 15% of R-12 pressures depending on condenser design, airflow and ambient temperature. If you experience excessive head pressure, check for a dirty radiator. Small debris can get through condenser fins, get caught in the smaller fins of the radiator, and is undetectable without removing top covers and visually inspecting. Dirty radiators, inside and out will cause heat to soak into the condenser and cause excessive pressure in the system even after the vehicle is parked! It is wise to always measure refrigerant charge. Something as simple as a digital bathroom scale will be closer than guessing. Remember too much can do damage!

Q. Can I use automatic charging equipment with Autofrost?

A. It depends. Older type automatic charging equipment, which uses a FLOW METER to meter in R-12 at a fixed rate should be checked with a scale. For example, pull a vacuum on an empty recovery tank and place it on a scale. Program 3 lbs on your charging station and note the weight added to the empty tank when the machine stops charging. The number scale on your machine can be altered to the correct amount. Newer type equipment, which contains a set of scales to weigh in a measured charge (remember to only use 80% as much Autofrost as you would R-12) to a holding tank before charging should work all right. Remember to use the same liquid (level or volume) here as you would for R-12.

Also, most R-12 automatic charging equipment withdraws the product (R-12) from a 30 lb. cylinder as a liquid, and the R-12 cylinder must be mounted upside down when attached to charging equipment. Autofrost 25 lb. refrigerant cylinders contain a "pickup-tube". Much like a can of spray paint, such that you get liquid out when the can is upright. Autofrost cylinders **MUST BE INSTALLED UPRIGHT** when used in charging equipment that is designed to have R-12 cylinders installed upside down. You may have to lengthen or splice in a small piece of hose if needed.

Also, use only automatic charging equipment that withdraws the product from the refrigerant supply as a liquid.

Q. What about the old "feel the evaporator outlet line" and charge "until it gets cold" method of charging?

A. Blends such as Autofrost sometimes need two or three minutes (at idle speed) to become thoroughly mixed throughout the system. Often, when the evaporator outlet line begins to get cold, the system will be overcharged. Solution: as you near the end of charging, stop charging for 2 or 3 minutes and let the system continue to run at idle before performing further charging or diagnosis. If a large part of the initial charge is dumped into a suction (low side) accumulator, such as on a typical GM CCOT system, the higher boiling components of the blend will hang around in the accumulator longer than R-12 would. Please take an extra 2 to 3 minutes to let the blend mix completely before proceeding.

Q. Does this refrigerant need to be recovered (captured)?

A. Yes. Under US EPA rules and regulations, all CFC, HCFC, HFC refrigerants and just about anything else needs to be recovered and not be vented into the atmosphere. Refrigerants which require recovery are R-12, R-22, R-134a, Autofrost, and all the other current "legal" R-12 replacements at the current time. The only refrigerants which may be vented are air (nitrogen), water, CO₂, ammonia, and pure hydrocarbons according to US EPA rules. You are not likely to encounter any of these, as they will not work and will damage the system.

Q. What are EPA retrofit fittings?

A. The US EPA is requiring special "uniquely threaded" fittings to be attached to all R-12 service ports. These fittings provide threads which are unique to each type of alternative refrigerant. These fittings are required by law (only for the automotive sector, does not apply to stationary equipment) for refrigerants which have completed the entire EPA approval process and are listed as "acceptable" for mobile A/C. Refrigerants **MUST** be properly labeled some where under the hood. These labels are packaged with Autofrost. All other refrigerant labels must be removed or rendered unreadable.

Retrofit fittings for Autofrost are available from suppliers of Autofrost and cost around \$5 each. Adapters to hook up R-12 equipment are also available.

Q. What about "topping off" systems low on charge?

A. Current EPA rules only permit "topping off" with the same type of refrigerant which is already installed in an automotive system. For systems charged with zeotropic refrigerants such as Autofrost or almost all other "blends", the recommended procedure is to first remove (recover) the charge and recharge with fresh virgin material. As zeotropic blends vapor leak, they change composition (pressures get lower), and a recharge will result in lower pressures, and some reduced capacity. However, many technicians have topped off Autofrost systems and report no problems. The property which makes Autofrost change composition (called fractionation) as it vapor leaks, is also responsible for a big performance gain over single component refrigerants such as R-12 or R-134a. Zeotropic refrigerants exhibit a temperature "glide" (about 16 degrees F for Autofrost), which causes the refrigerant to boil (evaporate) or condense over a range of temperatures instead of a single temperature, thus increasing the heat rejecting capacity of the condenser and increasing cooling performance over R-12 and R-134a.

Q. How will refrigerant identifiers read Autofrost?

A. All refrigerant identifiers currently available are designed to read R 12 and 134a. If virgin Autofrost is entered, it will show R 12, 134a, and hydrocarbons. Keep in mind that oil used in the system will also show as a hydrocarbon.

Robinair has purchased Autofrost, and is working on a new identifier that will give true readings on all GHG products.

Q. Do the hoses, driers, or the oil need changing?

A. In general, no. Most American built cars have used nylon lined "barrier" hoses for years. These are fine for Autofrost. Some real old cars, foreign cars, and cars with "port of entry" add - on A/C systems may have "nitrile" rubber hoses, which can leak R-134a and all currently legal alternative refrigerants at a higher rate. It is therefore recommended that nitrile rubber hoses be replaced. All current replacement hoses are now of the barrier type.

Unless the oil is contaminated by a system failure, it does not need to be changed. Autofrost works fine with the standard mineral oils (usually 525 viscosity) used in R- 12 systems and does not require any additives. If you change the oil, replace it with the same mineral oil as was in the R-12 system. Alkylbenzyne based (AB) oils also work fine.

Q. Compressor suppliers (automakers) are sometimes shipping compressors precharged with PAG oil, what do I do?

A. Do not put Autofrost into one of those or it will probably fail. Local technicians have had good luck by ordering compressors "dry" (no oil), and then charging mineral oil (on the bench, while turning by hand). Another alternative which local technicians have tried is to take the PAG oiled compressor and purge it with mineral oil on the bench while turning it over 30 or 40 times by hand to work almost all of the PAG oil out. Both dry and formerly PAG - charged compressors have been in the local area for over two years in service with R-12 and mineral oil.

Q. What do I do with used refrigerant?

A. The best approach is to "recover" (capture it) into a standard gray and yellow refrigerant recovery cylinder and send it to a reclaimer to be reclaimed to new refrigerant purity and composition. Some technicians may wish to "recycle" (clean it locally). If this is done, one must make a "pressure-temperature" check to insure the composition hasn't changed too much from leaking. Let a cylinder stabilize overnight to some known temperature, say, 70 degrees F. Connect up a gauge and measure the pressure. Look up the correct pressure on a pressure-temperature chart (on the bottom of the 25 lb. cylinder). If the pressure is within 2 or 3 PSI of the listed pressure, you should be all right. If the pressure is low, then the composition has changed from vapor leaking. The easiest thing to do with changed - composition refrigerant is to return it for reclaiming.

By far the SAFEST and least likely to cause problems method for dealing with USED refrigerant (from cars which come to your shop), is to RECOVER it into a cylinder and ship it to a reclaimer. You have no idea what is in the system without using expensive and not always accurate refrigerant identification equipment. The owner or other shops may have charged in a pound or two of R- 134a, R-22, propane, illegal blends (often propane/i sobutane/butane blends), smuggled - in refrigerant of questionable purity, or other legal blends and not properly labeled the system.

After doing an evacuation of the system, charge with only virgin (new) refrigerant or good refrigerant of known quality. If you have to then remove the charge to do more work on the system, you may then want to "recycle" and reuse this charge you just put in, provided there was no excessive loss of it due to vapor leaking.

Another legal, lower cost alternative to the high price of refrigerant recovery cylinders, is to use NEW BBQ grill propane tanks. These are DOT rated at 240 PSI and are legal for shipping R-12 and similar pressure alternatives. A 20 lb. BBQ grill propane tank typically may be purchased for about \$15 at places such as Sam's Club or other wholesale buyers clubs. Be sure you only use NEW tanks. If propane was ever in the tank, it will "stink" for eternity from the mercaptain odorant. The reclaimer will get extremely mad at you and you will have to pay upwards of \$ 10/lb. to have the refrigerant burned if you do not use a new tank. Adapters are available from Autofrost suppliers for adapting R-12 hoses to these tanks. The 20 lb. propane tank will hold 37 lbs. of Autofrost (the 80% fill level). Larger, 100 lb. propane tanks may be purchased new for around \$80, and the hold 185 lbs. of refrigerant. If you do use propane tanks, be sure to contact your reclaimer first to make sure it is all right. Contact your reclaimer or refrigerant supplier for proper shipping instructions on used refrigerant, A \$10 or so "hazmat" fee (all compressed gases are shipped as hazardous) will usually be charged in addition to the normal shipping charges. The tank will have to be properly marked for shipment and need "diamond" stickers, and other labels. For a \$15 tank, you can tell the reclaimer to just "keep it" or sell it or throw it away, since it is cheaper to buy a new tank than to ship the old one back.

Conversion Chart

R-12 (lbs.)	x 80%	Autofrost (lbs.)
1		0.8
1.25		1
1.5		1.2
1.75		1.4
2		1.6
2.25		1.8
2.5		2
2.75		2.2
3		2.4
3.25		2.6
3.5		2.8
3.75		3
4		3.2
4.25		3.4
4.5		3.6
4.75		3.8
5		4
5.25		4.2
5.5		4.4
5.75		4.6
6		4.8

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IDENTIFICATION

NAME

AUTOFROST/(GHG REFRIGERANT-X4) SUBSTITUTE (GHG-X4)

All four components are currently registered with the EPA on an individual basis.

Chemical Family

Halogenated Hydrocarbons+ Paraffhic Hydrocarbons.

Formula

Mixture of i-C₄H₁₀ / CH₃CClF₂ / CHClF₂ / CHClFCF₃

Synonyms

Methyl propane / R-142b or Isotron-142b or Chlorodifluoroethane or HCFC-142b /
R-22 or Freon-22 or Genetron-22 or HCFC-22 / R-600a / Chlorotetrafluoroethane /
R-124 / Suva- 124 or Genetron-124 / GHG-X4 / Chill-It / AutoFrost

CAS Name

Isobutane

1 -Chloro- 1, 1-difluoroethane

Chlorodifluoromethane

1-chloro-1, 2, 2, 2 tetrafluoroethane

CAS Registry No.

75-28-5

75-68-3

75-45-6

2837-89-0

PHYSICAL DATA

Boiling (bubble) Point: about -26°F

Boiling (dew) Point: about -9°F

Density (liquid 70°F): about 85 lb/fts

Vapor Density (Air = 1): @ 70°F about 1.4 lb/fts

pH Information: neutral

Appearance & Odor: colorless liquified gas with faint ethereal odor

Percent Volatile by Volume: 100

Mol. Wt.: about 95

Pressure: 95 PSIA @ 70°F

Volubility in H₂O: slight

HAZARDOUS COMPONENTS

Material(s)

Isobutane (R-600a)

Chlorodifluoroethane (R-142b)

Clorotetrafluoroethane (R- 124)

Chlorodifluoromethane (R-22)

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HAZARDOUS REACTIVITY

Stability

Material is stable; however, avoid open flame and high temperature.

Incompatibility (Materials to Avoid)

Strong oxidants, including oxygen. Freshly scraped aluminum, alkali metals, and alkali earth metals (sodium, magnesium, etc.) may cause exothermic reaction. Aluminum in refrigeration systems contains an oxide/chloride coating, so it does not react.

Hazardous Decomposition Products

May decompose at high temperatures (above 400°F – 500°F) and from contact with hot metal, heating elements, pilot lights, internal combustion engines, and open flame. Decomposition products may include hydrofluoric and hydro-chloric acids, chlorine, fluorine, possible phosgene and carbonyl halides, carbon dioxide, and carbon monoxide.

Polymerization

Will not occur

FIRE & EXPLOSION DATA

Flash Point

None

Autoignition Temperature

About 500°F

Autodecomposition Temperature

About 400°F

Fire & Explosion

Product is nonflammable, both as formulated and after worst case vapor leakage (fractionation). Cylinders of products recovered from refrigeration systems may contain mineral oil and may be flammable due to dissolved oils.

Cylinders may vent or rupture in fire conditions, leading to decomposition.

Extinguishing Media

Water spray

Special Fire Fighting Instructions

Use self-contained breathing apparatus, Water spray to cool cylinders and prevent bursting or venting in fire conditions.

Product may be flammable if mixed with large quantities of air at greater than atmospheric pressure. Cylinders of USED refrigerants may contain large amounts of refrigeration (mineral) oil. A liquid leak or cylinder venting in a fire will cause a cloud of oil mist. This oil mist can be very flammable (in the order of gasoline).

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HEALTH HAZARD INFORMATION

Principle Health Hazards

Inhalation: Vapor is heavier than air and can cause suffocation by displacing oxygen available for breathing. Contact with liquid may cause frostbite.

Breathing high concentrations of vapor may cause light-headedness, giddiness, shortness of breath, and may lead to narcosis, cardiac irregularities, unconsciousness, or death. May cause eye irritation.

Toxicity/Exposure Limits

OSHA and ACGIH Not established, but recommended-TWA 1000 ppm

Isobutane

Humans exposed to isobutane, 500 ppm, 8 hours per day, 5 days a week for 4 weeks showed no cardiac, pulmonary, or other functional abnormalities.

Chlorodifluoroethane

Inhalation-Rat - 4HR LC 50 = 128,000 ppm

Chlorodifluoromethane

Low in toxicity at concentrations as high as 4% (40,000 ppm). Narcotic effects have been seen at 200,000 ppm. Heart efficiency (animal studies) has been reported to be reduced at concentrations of over 25,000 ppm. Cardiac sensitization to epinephrine has been observed at concentrations of 50,000 ppm.

Chlorotetrafluoroethane

Immediate (Acute) Effects: Acute Inhalation 4HR LC50 (rat) = 360,000 ppm
Cardiac Sensitization Threshold = 25,000 ppm (dog)
Central Nervous System Depression-10 min EC50 = 140,000 ppm

Delayed (Subchronic & Chronic) Effects: Acute Inhalation-4HR LC50 (rat) = 360,000 ppm
Subchronic Inhalation-NOEL (rat & mouse) = 15,000 ppm

Other Data: Teratology (rat & mouse dams)-NOEL = 15,000 ppm

SHIPPING INFORMATION

proper Shipping Name Compressed Gas, N.O.S. UN1956

DOT Placard Nonflammable Gas

Do not heat above 125°F

REGULATORY INFORMATION

Toxic Substances Control Act (TSCAL)

ISCA Inventory Stature R-124 is on the TSCA inventory

Other TSCA Issues It is subject to SNUR public in the Federal Register of July 22,1992 at 57FR3241

* **WARNING: DO NOT VENT** to the atmosphere. To comply with provisions of the US Clean Air Act, any residual must b recovered. Contains HCFC-22 and HCFC- 142b and HCFC- 124, substances which harm public health and environment by destroying ozone in the upper atmosphere. Destruction of the ozone layer can lead to increased ultraviolet radiation which, with excess exposure to sunlight, may lead to an increase in skin cancer and eye cataracts.