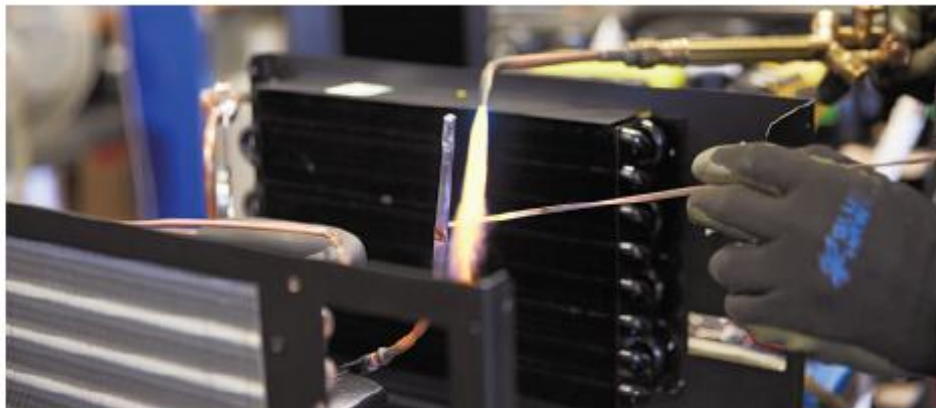




R-290 SERVICE MANUAL

Section 1 – Flammable Refrigerant Notice:



R-290

This manual provides safety guidelines in the maintenance, repair, retrofit, and decommissioning of CellarPro cooling units. This cooling unit contains highly flammable **R-290** refrigerant, as well as insulation which contains one or more of the following flammable blowing agents: **a)** trans-1,3,3,3-tetrafluoropropene, HFO-1234ze(E); **b)** Azodicarbonamide, ADC; **c)** 1,1 Difluoroethane, HFC-152a. Please read this manual carefully before servicing this equipment to prevent risk of fire or explosion in accordance with UL-60335-2-89. This manual applies to all CellarPro self-contained systems which contain R-290, as indicated on the unit serial plate. Note that R-290 is high-purity refrigeration grade propane, and does not contain odorizing agents, so refrigerant leaks are not detectable by smell.

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.

Section 2 – Safety Warning:

- **WARNING**
 - Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.
 - The appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater.)
 - Do not pierce or burn.
 - Be aware that refrigerants may not contain an odour.
- **MISE EN GARDE**
 - Ne pas utiliser de moyens autres que ceux recommandés par le fabricant pour accélérer le processus de degivrage ou pour nettoyer l'appareil.
 - L'appareil doit être entreposé dans un local ne contenant pas de sources d'inflammation permanentes (Hammes nues, appareil à gaz ou dispositif de chauffage électrique en fonctionnement, par exemple).
 - Ne pas percer ou
 - Attention, les fluides frigorigènes peuvent ne pas dégager d'odeur.
- **WARNING:** Keep clear of obstruction all ventilation openings in the appliance enclosure or in the structure for building-in.
- **WARNING:** Do not use mechanical devices or other means to accelerate the defrosting process, other than those recommended by the manufacturer.



- **WARNING:** Do not use electrical appliances inside the food/ice storage compartments unless they are of the type recommended by the manufacturer.
- **WARNING:** Do not damage the refrigerating circuit.

Section 3 – General Safety Precautions:

Keep required ventilation openings clear of obstructions. Refer to the product owner's manual for specific clearance requirements.

For outdoor rated models, the CellarPro Outdoor Hood must be installed on the condenser section of the unit. The outdoor hood is rated IPX4 for protection against outdoor elements.

If the product is connected to ducting, auxiliary devices which may be ignition sources shall not be installed in the ductwork, other than auxiliary inline duct fans approved for use with cooling unit by CellarPro.

Check that cabling will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges, or any other adverse environmental effects. The check shall also consider the effects of aging or continual vibration from sources such as compressors or fans.

Section 4 – Maintenance and Repair Categories:

- **Routine Maintenance**

Routine maintenance such as filter replacement, vent plate relocation, coil cleaning, and drain line installation and cleaning can be performed without specialized training. If the unit cover needs to be removed to access internal components for inspection or cleaning, all power must be disconnected from the unit, and the unit must be located in a well-ventilated area away from any ignition sources such as open flames, an operating gas appliance, or an operating electric heater.

- **Repair or Retrofit of Components Not Containing Refrigerant**

Examples of components in this repair and retrofit category are the unit controller, temperature probes, internal wiring, fan/motor assemblies, electric heaters and safety switches, control switches, receptacles, power cords, internal sheet metal components, internal insulation, and internal drain lines.

Servicing and retrofits shall be performed only as recommended by CellarPro. Use CellarPro parts only. Use of non-OEM parts will void the warranty and increase the risk of fire or explosion. These types of repairs and retrofits can be made without specialized training, however basic electrical service experience is recommended when working on electrical components. Except for when the unit is being tested, all power must be disconnected from the unit prior to re-installing the cooling unit. The unit must be located in a well-ventilated area away from any ignition sources such as open flames, an operating gas appliance, or an operating electric heater.



- **Repair of Components Containing Refrigerant**

Examples in this repair category include the repair of refrigerant leaks and replacement of refrigerant-containing components. Those components include the evaporator coil, condenser coil, refrigerant tubing, expansion valve, filter/drier, hot gas loop, high pressure control, low pressure control, and fan cycling control.

Servicing shall be performed only as recommended by CellarPro. Use CellarPro parts only, as the use of non-OEM parts will void the warranty and increase the risk of fire or explosion. All power must be disconnected from the unit prior to service.

The technician servicing the unit must be certified to work on refrigeration systems containing flammable refrigerants. **Section 5** outlines the specific technician qualifications and safety requirements for working on refrigerant containing components.

When servicing the unit, ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.

Section 5 – Refrigeration Technician Required Qualifications

Information of procedures additional to usual information for refrigerating appliance installation, repair, maintenance, and decommission procedures is required when an appliance with FLAMMABLE REFRIGERANTS is affected.

The training of these procedures is carried out by national training organizations that are accredited to teach the relevant national competency standards that may be set in legislation.

The achieved competence should be documented by a certificate.

The training should include the substance of the following:

- Information about the explosion potential of FLAMMABLE REFRIGERANTS to show that flammables can be dangerous when handled without care.
- Information about potential ignition sources, especially those that are not obvious, such as lighters, light switches, vacuum cleaners, electric heaters.
- Information about the different safety concepts:
 - Unventilated – Safety of the appliance does not depend on ventilation of the housing. Switching off the appliance or opening of the housing has no significant effect on safety. Nevertheless, it is possible that leaking refrigerant may accumulate inside the enclosure and flammable atmosphere will be released when the enclosure is opened.
 - Ventilated Enclosure – Safety of the appliance depends on ventilation of the housing. Switching off the appliance or opening of the enclosure has a significant effect on safety. Care should be taken to ensure sufficient ventilation before working on the appliance.

- Ventilated Room — Safety of the appliance depends on the ventilation of the room. Switching off the appliance or opening of the housing has no significant effect on safety. The ventilation of the room should not be switched off during repair procedures.
- Information about refrigerant detectors:
 - Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used.
 - The following leak detection methods are deemed acceptable for all refrigerant systems:
 - Electronic leak detectors may be used to detect refrigerant leaks but, in the case of FLAMMABLE REFRIGERANTS, the sensitivity might not be adequate or might need re-calibration (detection equipment shall be calibrated in a refrigerant-free area). Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed, and the appropriate percentage of gas (25% maximum) is confirmed.
 - Leak detection fluids are also suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine can react with the refrigerant and corrode the copper pipework.
- If a leak is suspected, all naked flames shall be removed/extinguished.
- If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system. Follow the procedures outlined in the **Refrigerant Removal and Evacuation** section.

Section 6 – General Information for Service Personnel

Prior to beginning work on systems containing flammable refrigerants, safety checks are necessary to ensure that the risk of ignition is minimized. For maintenance that requires the removal of the cooling unit housing cover or access panels, follow these safety instructions:

- **General work area**

All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out. Work in confined spaces shall be avoided.

- **Checking for presence of refrigerant**

The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially toxic or flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants, (i.e. nonsparking, adequately sealed, or intrinsically safe).

- **Presence of fire extinguisher**



If any hot work is to be conducted on the refrigerating equipment or any associated parts, appropriate fire extinguishing equipment shall be available on hand. A dry chemical or CO₂ fire extinguisher should be adjacent to the charging area.

- **No ignition sources**

No person carrying out work in relation to a refrigerating system which involves exposing any pipe work shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which refrigerant can possibly be released to the surrounding space. Prior to work taking place, the area around the equipment shall be surveyed to make sure that there are no flammable hazards or ignition risks. "No Smoking" signs shall be displayed.

- **Ventilated area**

Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.

Section 7 – Maintenance and Repair to Electrical Devices

Servicing shall be performed only as recommended by CellarPro. If replacing parts, use CellarPro parts only. Use of non-OEM parts will void the warranty and increase the risk of fire or explosion. Repair and maintenance of electrical components shall include initial safety checks and component inspection procedures. If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment, so all parties are advised.

- **Initial safety checks:**

- All capacitors must be discharged. This shall be done in a safe manner to avoid possibility of sparking (for example, using a bleed resistor).
- No live electrical components and wiring are exposed while charging, recovering or purging the system.
- Confirm continuity of earth bonding (ground).
- The actual refrigerant charge is in accordance with the room size within which the refrigerant containing parts are installed.
- The cooling unit vent and duct openings are operating adequately and are not obstructed.
- Markings on the equipment are visible and legible. Markings and signs that are illegible shall be corrected.
- Refrigerating pipe or components are installed in a position where they are unlikely to be exposed to any substance which may corrode refrigerant containing components,



unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being so corroded.

- **Repairs to sealed components**

During repairs to sealed components, all electrical supplies shall be disconnected from the equipment being worked upon prior to removing any sealed covers. However, if it is absolutely necessary to have an electrical supply to equipment during service, then a permanently operating form of leak detection shall be located at the most critical point to warn of a potentially hazardous situation.

Particular attention shall be paid to the following to ensure that by working on electrical components, the casing is not altered in such a way that the level of protection is affected. This shall include damage to cables, excessive number of connections, terminals not made to original specification, damage to seals, incorrect fitting of glands, etc.

Ensure that the apparatus is mounted securely.

Ensure that seals or sealing materials have not degraded to the point that they no longer serve the purpose of preventing the ingress of flammable atmospheres. Replacement parts must be approved by CellarPro.

- **Repair to intrinsically safe components**

There are no intrinsically safe components used on CellarPro systems, however this section is included in the event this type of component was added external to the cooling unit by the installer, for example a 3rd party intrinsically safe leak detection sensor.

Do not apply any permanent inductive or capacitance loads to the circuit without ensuring that this will not exceed the permissible voltage and current permitted for the equipment in use.

Intrinsically safe components are the only types that can be worked on while live in the presence of a flammable atmosphere. The test apparatus shall be at the correct rating.

Replace components only with parts specified by the manufacturer. Other parts can result in the ignition of refrigerant in the atmosphere from a leak.

NOTE The use of silicon sealant can inhibit effectiveness of some types of leak detection equipment. Intrinsically safe components do not have to be isolated prior to working on them.

Section 8– Maintenance and Repair of Refrigerant Containing Parts

Servicing shall be performed only as recommended by CellarPro. Use CellarPro parts only. Use of non-OEM parts will void the warranty and increase the risk of fire or explosion.

- **Detection of flammable refrigerants**

Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used.



The following leak detection methods are deemed acceptable for all refrigerant systems:

- Electronic leak detectors may be used to detect refrigerant leaks but, in the case of flammable refrigerants, the sensitivity might not be adequate or might need re-calibration (detection equipment shall be calibrated in a refrigerant-free area). Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed, and the appropriate percentage of gas (25% maximum) is confirmed.
- Leak detection fluids are also suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine can react with the refrigerant and corrode the copper pipework.

Examples of leak detection fluids:

- Bubble method
- Fluorescent leak detection method. Fluid must be compatible with R-290 and POE oil.

If a leak is suspected, all naked flames shall be removed/extinguished.

If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be removed from the system as detailed in the **Refrigerant Removal and Evacuation** section.

• Refrigerant Removal and Evacuation

When breaking into the refrigerant circuit to make repairs - or for any other purpose - conventional procedures shall be used. However, for flammable refrigerants it is important that best practice be followed, since flammability is a consideration. The cooling unit is to be repaired outside or in a workshop specially equipped for servicing units with flammable refrigerants.

Remove all duct adapters, unit covers, access panels, and vent louvers as necessary to access the internal components. Take careful notes of the locations of all internal insulation pieces and internal covers, including the taped seams securing them and covering air gaps. These parts must be re-installed, secured, and gaps covered in the same manner after servicing. CellarPro R-290 cooling units have two service ports, indicated by a red marking on the tubing inside the unit. One port is on the high side, and one port is on the low side. Both ports must be used for venting and purging of the refrigerant. Adhere to the following procedure:

- Ensure sufficient ventilation at the repair place.
- Be aware that malfunction of the equipment can be caused by refrigerant loss and a refrigerant leak is possible.
- Discharge capacitors in a way that won't cause any spark (for example, using a bleed resistor).
- The refrigerant charge shall be recovered into the correct recovery cylinders if venting is not allowed by local and national codes. Refer to the **Refrigerant Recovery** section for additional details.
- If venting R-290 to atmosphere, follow these safety procedures:



- Make sure there are no ignition sources within 10 feet of the discharge point.
- Let everyone in the area know that flammable gas is being vented.
- Comply with all local regulations for hazardous or flammable substances.
- R-290 is heavier than air and can accumulate, so don't vent into low-lying areas.
- Don't vent R-290 inside a building or public area.
- The system shall be purged with oxygen-free nitrogen to render the appliance safe for flammable refrigerants. This process might need to be repeated several times. Compressed air or oxygen shall not be used for purging refrigerant systems.
- Refrigerant purging shall be achieved by breaking the vacuum in the system with oxygen-free nitrogen and pressurizing to 300 PSIG, then venting to atmosphere, and finally pulling down to a vacuum. This process shall be repeated until no refrigerant is within the system.
 - Ensure that the outlet for the vacuum pump is not close to any potential ignition sources and that ventilation is available.
 - Purge the refrigerant circuit with oxygen free nitrogen first entering through the high side port, then exiting through the low side port.
 - Evacuate the refrigerant circuit by pulling a vacuum through both service ports.
 - Purge the refrigerant circuit once more with nitrogen for 5 minutes, with flow entering the low side and exiting the high side.
 - Evacuate again by pulling a vacuum through both service ports.
 - Break vacuum with a final oxygen-free nitrogen charge, then vent down to atmospheric pressure to enable work to take place.
 - Remove parts to be replaced by cutting or brazing. If removing a part by brazing, purge with nitrogen during the removal process.
 - Purge the braze point with nitrogen during the brazing procedure required for repair.
 - Carry out a leak test before charging with refrigerant. Pressurize the system to **300 PSIG** of dry nitrogen. It is important to add nitrogen through both the high and low side access valves on the condensing unit to make sure the system is fully pressurized. Mark the pressure and hold for a minimum of 1 hour. If the pressure holds, proceed to the next step, otherwise locate and repair the leak and repeat this step. Refer to the **Refrigerant Charging** section to charge the system with R-290.
 - Reassemble the cooling unit after servicing, including the replacement and/or taping of all internal insulation panels, access covers and air gaps. Re-install all access panels, vent plates, and duct adapters.
 - Check safety equipment before returning to service.

- **Refrigerant Charging**

In addition to conventional charging procedures, the following requirements shall be followed:

- Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimize the amount of refrigerant contained in them.
- Evacuate the system to a minimum of **500 microns**. It is important to pull a vacuum through both the high and low side service ports on the cooling unit to make sure the system is fully evacuated. If the vacuum is achieved, proceed to the next step,



otherwise locate and repair the leak and repeat the pressure holding test and vacuum process.

- While the system is still under vacuum, weigh in the refrigerant using a charging scale with a resolution of 0.1 oz, and an accuracy of 0.5% of reading +/- 1 least significant digit. CHARGE WITH LIQUID REFRIGERANT THROUGH HIGH SIDE ACCESS PORT ONLY.
- Ensure that the refrigerating system is earthed prior to charging the system with refrigerant.
- Charge with the exact amount indicated on the unit serial plate, +/- 0.2 oz.
- Label the system when charging is complete.
- Extreme care shall be taken not to overfill the refrigerating system. If the charge limit is exceeded, it will be necessary to repeat the refrigerant removal and evacuation process and introduce a new charge.
- The system shall be leak-tested on completion of charging but prior to commissioning. A follow-up leak test shall be carried out prior to leaving the site.

Section 9 – Decommissioning

If the cooling unit must be decommissioned, follow these safety procedures. It is essential that the technician is completely familiar with the equipment and all its detail. It is a recommended good practice that all refrigerants are recovered safely.

- The refrigerant charge and compressor oil are to be removed before disposal.
- Ensure sufficient ventilation at the equipment location.
- Be aware that malfunction of the equipment can be caused by refrigerant loss and a refrigerant leak is possible.
- Discharge capacitors in a way that will not cause any spark (for example: bleed resistor).
- Remove the refrigerant as described in the **Refrigerant Removal and Evacuation** procedure.
- Remove the compressor by cutting or brazing. If removing with brazing, purge with nitrogen during the removal process.
- Drain the compressor oil out of the compressor shell into a suitable oil disposal container.
- Foam insulation may release flammable vapor for an extended period of time. Do not store waste in areas or containers that have high heat or ignition sources. Ventilation may be required to prevent the accumulation of vapor in waste disposal areas.
- **Refrigerant Recovery**
 - When removing refrigerant from a system, either for servicing or decommissioning, it is recommended good practice that all refrigerants are removed safely.
 - If intending to re-use recovered refrigerant, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use. It is essential that electrical power is available before the task is commenced.
 - Become familiar with the equipment and its operation.
 - Isolate the system electrically.
 - Before attempting the procedure, ensure that:

- Mechanical handling equipment is available, if required, for handling refrigerant cylinders.
- All personal protective equipment is available and being used correctly.
- The recovery process is supervised at all times by a competent person.
- If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
- Make sure that cylinder is situated on the scales before recovery takes place.
- Start the recovery machine and operate in accordance with instructions.
 - Do not overfill cylinders (no more than 80% volume liquid charge). Do not exceed the maximum working pressure of the cylinder, even temporarily.
 - When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.
 - Recovered refrigerant shall not be charged into another refrigerating system unless it has been cleaned and checked.

When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed. Ensure that the correct number of cylinders for holding the total system charge is available. All cylinders to be used are designated for the recovered refrigerant and labelled for that refrigerant (i.e. special cylinders for the recovery of refrigerant). Cylinders shall be complete with a pressure-relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.

The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of all appropriate refrigerants, including flammable refrigerants. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition. Before using the recovery machine, check that it is in satisfactory working order, has been properly maintained and that any associated electrical components are sealed to prevent ignition in the event of a refrigerant release. Consult manufacturer if in doubt.

The recovered refrigerant shall be returned to the refrigerant supplier in the correct recovery cylinder. and the relevant waste transfer note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.

If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. The evacuation process shall be carried out prior to returning the compressor to the suppliers. Only electric heating to the compressor body shall be employed to accelerate this process. When oil is drained from a system, it shall be carried out safely.

- **Labelling**

Equipment shall be labelled stating that it has been de-commissioned and emptied of refrigerant and compressor oil. The label shall be dated and signed. For appliances containing flammable refrigerant, ensure that there are labels on the equipment stating the equipment contains flammable refrigerant.