

Capna
Fabrication

ETHOS

Ethanol Operating System

OPERATOR'S MANUAL

Table of Contents

Introduction	1
Key Terms.....	1
Safety:	2
Specs	3
System Components	3
Features	4
Installation	5
Pre Operation.....	6
Operation of the Extraction Apparatus:	8
Maintenance	10
Storage	11
Support	12

Introduction

This manual contains step-by-step procedures to extract the essential oil from plant material using the ETH-OS-04. The media used by this unit for safely removing essential oils from plant material is a solvent. This unit uses the method of liquid - liquid extraction to extract essential oils in a concentrated form. To establish the proper application of safety in handling the crude essential oil and the extraction solvent, the following operation procedures must be followed carefully.

Read and understand this manually completely before attempting to operate or service the ETHOS system.

Key Terms

The following key terms are defined below and are referred to throughout this manual:

1. **Plant material:** The raw plant mater use to extract essential oils from using this unit.
2. **Essential oil:** Un-processed oil extract in combination with the solvent, terpenoids and pigments from the plant material.
3. **Solvent:** 100% organic grain ethanol which will be used as the primary solvent in all extraction procedures herein.
4. **Extraction:** The removal process of desired constituents from a plant material.
5. **Solution:** The ethanol / essential oil tincture produced by the extraction process.
6. **Extraction Vessel:** The vessel which holds the plant material
7. **Collection Vessel:** The vessel located under the Filter Access Door.
8. **Evacuation:** The removal of a either plant material or Solution from the extraction system.
9. **Evacuation Tank:** A stainless steel vessel that connects to Valve E1. (Only applicable when rotary evaporator is not in-line)
10. **Rotary Evaporator:** A device which separates the solvent from the essential oils.

Safety:

WARNING

The solvent which is required for the processes contained in this manual, is dangerous if not handled with care. Follow the processes in this operator's manual to safely handle the solvent and operate this unit.

1. Do not allow any persons under the age of 18 to operate this unit.
2. Install and operate this unit in a safe location, away from persons under 18 years of age or pets.
3. The solvent required to operate this unit is flammable, be sure to handle the solvent with caution and store unused solvent in a proper fire-proof storage container.
4. Always install and keep an appropriate fire extinguisher near the device.
5. Check the fire extinguisher quarterly. Some extinguishers have a shelf life.
6. Do not use cigarette lighters, matches or any other open flame source near this device.
7. Install and operate this unit only in a well-ventilated area. Solvent vapors can accumulate in closed areas and ignite without warning.
8. Always wear long sleeved clothing, gloves and goggles when handling frozen liquid solvent.
9. Always wear gloves and long sleeved clothing when reaching inside the freezer compartment.
10. Only use the recommended solvent.
11. Clean up any solvent spills before refilling this unit. Flames may follow solvent that has been spilled.
12. Keep water away from the refrigeration control unit as it can cause electric sparks and fire when its internal components are exposed to direct contact with water.
13. Do not move the unit when the solvent storage cartridges are filled with solvent.
14. Never leave an operating unit unattended at any time.

In case of fire:

- Only use dry powder or foam based fire extinguishers.
- Never extinguish a solvent fire using water; this will cause the fire to spread.
- A fire blanket may also be used to smother the fire.
- Disconnect any electrical sources to the unit.
- Ensure all flames are put out and evacuate the fire area.
- Call your local fire department if emergency response is required.

Specs

- Dimensions: 33.8 L x 87.6 W x 40.5 H
- Extractor Power: 208 - 230 / 12A
- Vacuum Pump Power: 115 or 208 / 15A or 2.8A
- Maximum Plant Material Load Capacity: 3000 g / 6.61 lb
- Ethanol Capacity: 24 gal
- Solution Recovery Efficiency: 85%
- Extraction Efficiency: 98.6%

System Components

Refrigerating Unit	Thermo Fischer Cascade Type
Vacuum Pump	8 CFM Rotary Vane Vacuum Pump
Solvent	200 Proof Organic Grain Ethanol
Inline Filter Sleeve	FDA Nylon, PP, or PE 10 micron
Tank Liner	508 US Mesh FDA Nylon
Sanitary Gaskets	FDA PTFE, Viton, Silicone, EPDM
Butterfly Valves	304L SS / FDA Silicone
Compression Valves	304L SS / PCTFE
Vessels	304L SS
Plumbing	304L SS
Sight Glass	Borosilicate, 304L SS, Silicone
Flex Hose	Teflon inner, 316L SS outer
Extraction Vessel Lid Gaskets	EPDM

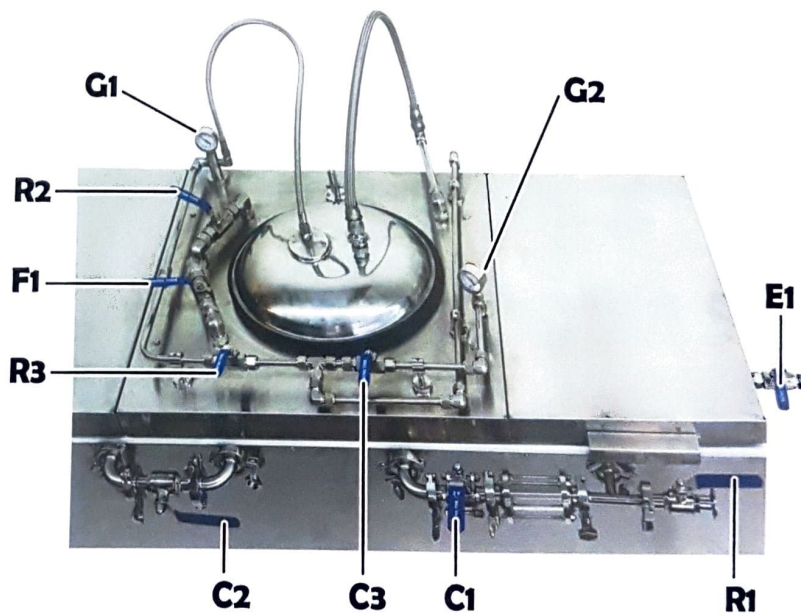
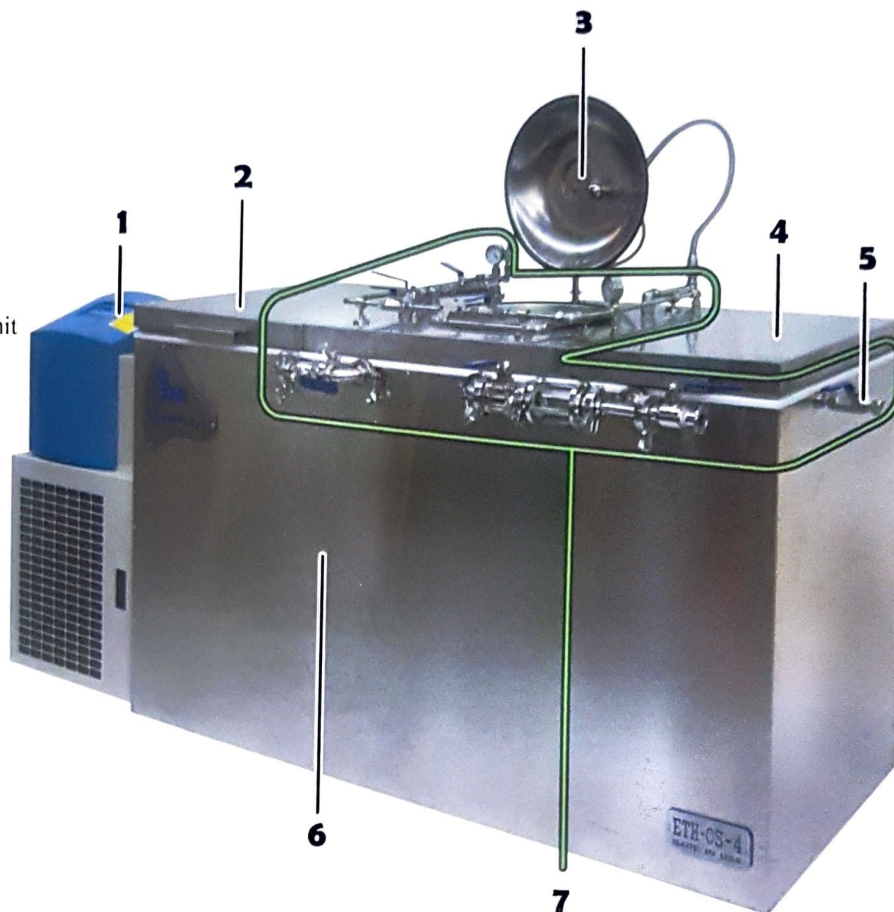
Featu

1. Refrig
2. Cartri
3. Extrac
4. Filter
5. Evacu
6. Cool
7. Cont

R1
R2
R3
C1
C2
dra
Fl
ca
C
E
F
G
G

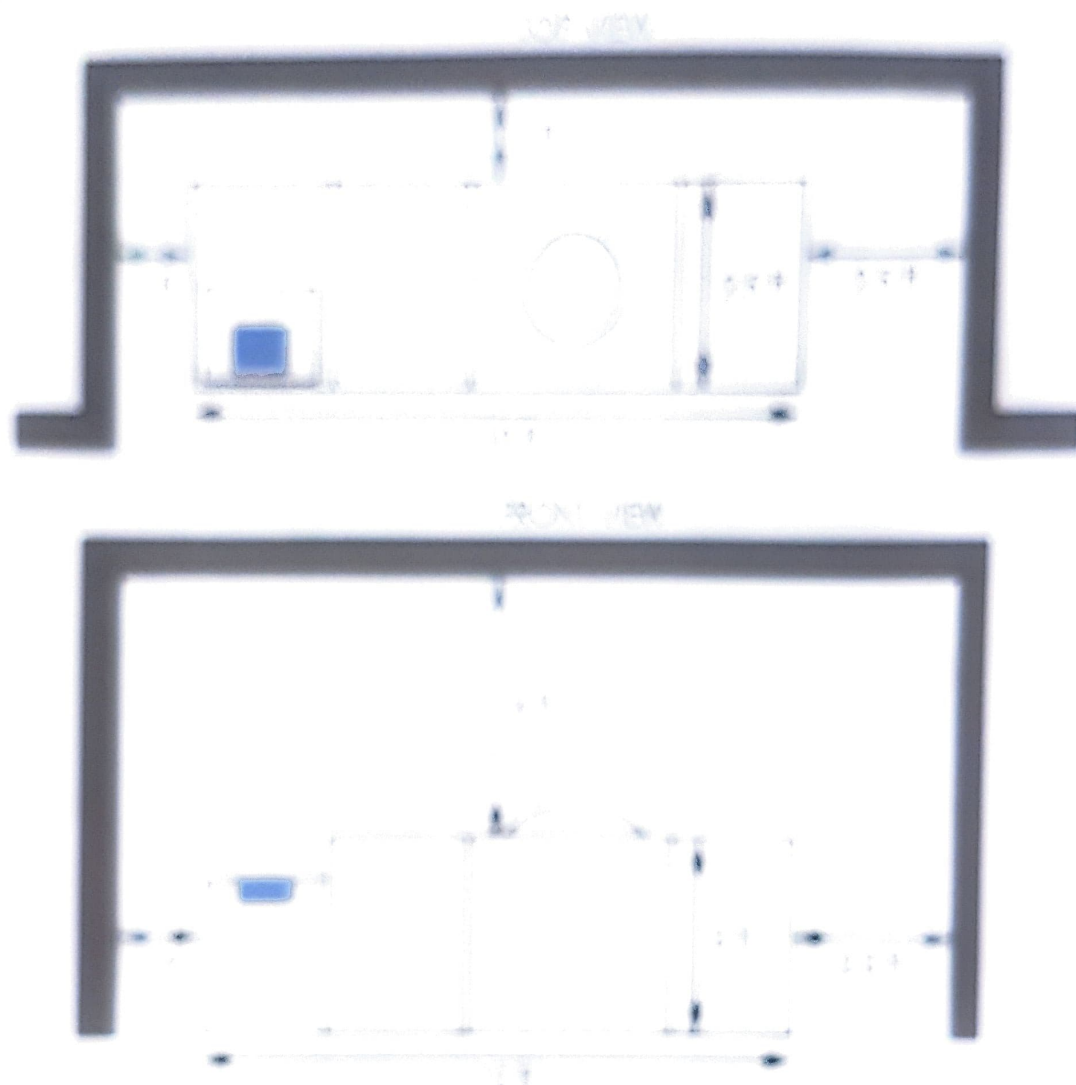
Features

1. Refrigeration Control Unit
2. Cartridge Access Door
3. Extraction Vessel Lid
4. Filter Access Door
5. Evacuation Valve E1
6. Cooler Unit
7. Control Valves



- R1 Air Intake Valve
 R2 Solution Circulation Valve
 R3 Extraction Vessel Vacuum Valve
 C1 Solution Collection Valve
 C2 Open position allows valve F1 to draw cold air. Closed position allows F1 to draw solvent from storage cartridge.
 C3 Collection vessel Vacuum Valve
 E1 Evacuation Valve
 F1 Ethanol Feed Valve / Air intake
 G1 Extraction Vessel Vacuum Gage
 G2 Collection vessel Vacuum Gage

Installation



- Remove the unit from its packaging and install it in flat level ground. Install the unit in a well-ventilated area - 3' far away from walls.
- Install the unit allowing a 2" minimum clearance to the right side of the unit to allow clearance to any external ventilation unit.
- If connecting other equipment directly to circulation valves (CV), allow at least 4.0 feet of clearance from wall to the CV/CVU system.**
- Disconnect all external supply connections and check that all lamps are tightened properly. Connect external lighting fixture as described/lightened as well as system design requires.
- Verify the vacuum tubing to the 5 inch vacuum connection on the back of the CV/CVU system.

6. Connect the vacuum tubing to the evacuation tank via barb Tee provided. The Tee should be installed into the vacuum tubing line, between the ETHOS and the vacuum pump.
7. Plug electrical cord from the ETHOS unit into 240V single phase electrical outlet.
8. Plug in electrical cord from the Edwards vacuum pump into 240V single phase electrical outlet.
9. Ensure refrigeration unit and its control interface is operating.
10. Check that the temperature on the control unit is set to -70C
11. Always ensure fire safety equipment such as a dry powder extinguisher and suitable fire blanket, is easily accessible in case of fire.

Pre Operation

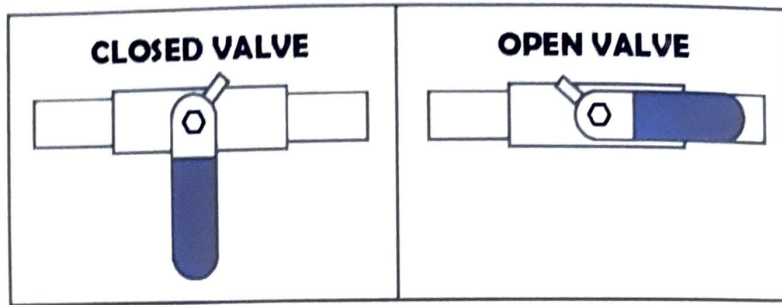
WARNING!

Do NOT force extraction vessel lid past a vertical position as it will break the solvent hose!

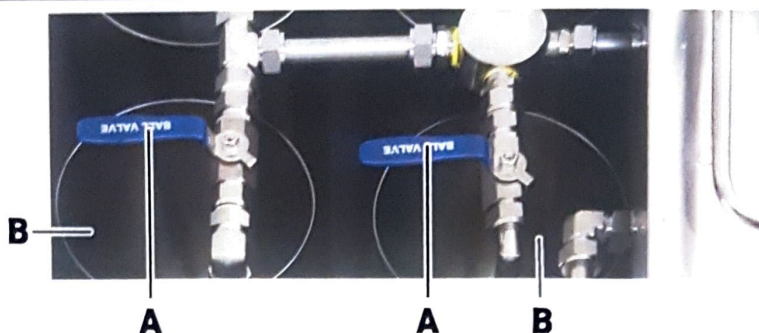
Cold surfaces can cause cold burn while operating the extraction system. Prior to operation, wear personal protective gear such as gloves, goggles, and organic vapor respirator to promote laboratory safety. In addition to gloves and goggles, wear a sleeved laboratory coat to protect your arms from touching the cold surface of the environment control compartment.

Note: Before starting the extraction, always check the temperature of the solvent in cartridges. Ideal temp for extraction is -50C. Temperatures above -35C will drastically affect the color of your extract.

1. Open the 'cartridge access' compartment cover and locate the solvent cartridges inside. (B)
2. Fill the solvent containers inside the refrigeration compartment with solvent up to 1.0 inches below the top of the container (6 gal / 24 L)
3. Ensure the valves above the containers are in the closed position as shown. (A)



A. Valve
B. Container



4. Close the compartment cover.
5. Check that the temperature on the refrigeration control display has reached the set point value -70 C. (Refrigeration controls are pre-set at the factory)
6. Allow the solvent to chill until it reaches a temperature of at least -50 C or below before starting an extraction. (approx. 5 hrs)
7. Install a filter sleeve into the filter housing. Secure the filter sleeve with the hose clamp provided.
8. Install the provided false bottom, into the extraction vessel.
9. Prior to commencing the extraction procedure, be sure that the sample is logged to assure proper sample identification.
10. Prior to each extraction, record the weight of plant material loaded. This will allow to track yields and maximize extraction efficiency.
11. Inspect that the vacuum pump has sufficient amount of clean motor oil (if the motor oil is dirty, drain the motor oil and fill the motor with fresh motor oil).

extraction check list:

Pre Extraction Check List

- Always check the solvent temperature prior to an extraction (-50C to -75C).
- Always check that the secondary filter has been cleaned and is free of visible debris. Check for tears.
- Always wear gloves and long sleeves when opening filter housing. You will get cold burns!
- Always run clean solvent through the system after extraction of inferior material.
- Check material housing bag for tears. Replace if necessary.

Operation of the Extraction Apparatus:

1. FLOODING PROCEDURE

- A. Load plant material into nylon filter bag provided. For maximum efficiency, we recommend 1000 - 2000 g. per extraction. Do not to exceed 3000 g / 6.61 lbs of plant material.
- B. Place filled bag inside extraction vessel.
- C. Close the collection vessel lid.
- D. Close ALL valves.
- E. Open Valve R3 to engage vacuum in the extraction vessel. De-compress Vacuum Gauge G1 to -20 inHG
- F. Open valve F1. This action will flood / saturate the plant matrix via solvent transfer from the holding cartridge into the extraction vessel. **NOTE: The flow rate at -20 inhg vacuum is typically 1 gal / 5 seconds.**
- G. OPEN valve C2 to STOP the flow of solvent, **NOTE: Valves C2 and F1 should remain open during Solution COLLECTION PROCEDURE.**
- H. Close valve R3 to disengage vacuum in extraction vessel.

2. COLLECTION PROCEDURE

Note: Valves C2 and F1 must be OPEN prior to starting collection procedure.

- A. Open valve C3. De-compress Vacuum Gauge G2 down to -25inHG.
- B. Close valve C3.
- C. Open valve C1 to engage the transfer of Solution from the extraction vessel into the collection vessel.
- D. Once the Solution has been transferred, Close valve C1
- E. Prepare for recirculation procedure by **CLOSING** VALVE F1
- F. Prepare for recirculation procedure by **OPENING** VALVE R1

3. RECIRCULATION PROCEDURE:

Note: Valve F1 must be CLOSED prior to recirculation procedure.

Note: Valve R1 must be OPEN prior to recirculation procedure.

- A. OPEN valve R3 to de-compress Vacuum Gauge G1 to -10inHG
- B. OPEN valve R2 to engage transfer of Solution into the extraction vessel.
- C. Upon the completion of transfer, CLOSE valve R2.
- D. Allow Gauge G2 to de-compress to 0 inhg. Close valve R1.
- E. Repeat step 2.A
- F. Repeat step 2.B
- G. Repeat step 2.C
- H. Repeat step 2.D
- I. Repeat step 2.E
- J. Repeat step 2.F
- K. Repeat the recirculation/collection procedures at least 5 times to maximize yield efficiency.

4. DRAINING PROCEDURE:

Note: COLLECTION PROCEDURE must be completed prior to DRAINING PROCEDURE.

Note: Valves C2 and F1 must be OPEN prior to starting COLLECTION PROCEDURE.

- A. De-compress Vacuum Gauge G2 to -25 inHG
- B. OPEN valve C1
- C. Repeat these steps up to 12 times

5. EVACUATION OF SOLUTION:

Note: DRAINING PROCEDURE must be completed prior to EVACUATION PROCEDURE.

- A. Open valves C1, C2, and F1 in preparation for evacuation.
- B. De-compress the evacuation tank or rotary evaporator. **NOTE: When using a rotary evaporator in-line with the ETHOS system, ensure that the Solution in the evaporatory flask has sufficiently reduced prior to evacuating the ETHOS. DO NOT over fill your evaporation flask!**
- C. Open valve E1, allow the Solution to evacuate into holding tank or rotary evaporator.

6. EVACUATION OF PLANT MATERIAL:

- A. Open extraction vessel lid. **DO NOT FORCE THE LID PAST A VERTICAL POSITION!**
- B. Remove the filled bag and dump the extracted plant material into an appropriate holding / draining vessel.

Maintenance

- Clean or change the filter daily. The filter housing is located under the filter access door on the right of the ETHOS.
- Shut down and de-frost the ETHOS system every 2 - 3 weeks. Failure to do so will reduce the life span of the refrigeration compressor.

- Clean the air filter on the front of the refrigeration control unit every 2-3 weeks or with every de-frost.
- After de-frosting, use a shop-vac to remove any accumulated water inside the freezer compartment.
- Wipe down any condensation on the extractor vessel gaskets and lid to prevent water from entering the system.
- Use a heat gun to remove any icing from the valves in the cartridge compartment at the end of every work shift, prior to refilling the cartridge with solvent.
- Keep collection vessel clean between different batches of plant material by running clean ethanol through the system.
- Wipe any water or ice that falls into cartridges or extraction vessel.

Storage

1. Unplug unit from incoming power.
2. Drain any solvent from the storage cartridges.
3. Ensure evacuation tank or rotary evaporator is detached.
4. Allow freezer compartments to defrost.
5. Vacuum out any residual fluids from the freezer compartment.
6. Allow the system to dry prior to storage. Any residual water or solvent can damage the internal components.
7. Close all compartments and all valves.
8. Store this product in a safe, dry, well-ventilated area,
9. Store solvents safely in an appropriate container with the lid tightly shut.
10. Always ensure fire safety equipment such as a dry powder extinguisher or suitable fire blanket, is easily accessible in case of fire.

Support

Email: Info@capnafabrication.com

Service Request URL: <http://capnafabrication.com/service-request>

Phone: 888-416-6777

