



## TURBO 500 DISTILLATION SYSTEM MANUAL

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The Turbo 500 Distillation System is designed to produce high purity Alcohol and give maximum Alcohol recovery. High quality alcohol made with the T500 can be used to make high quality, commercial grade, clear spirits such as Gin, White Rum and Vodka as well as any of the other spirits and liqueurs in the Still Spirits Essences range.

To complete a T500 Distillation System you will need both a T500 Distillation Column and a T500 Boiler.

To obtain the best performance from the Distillation System and to operate it safely it is important to read these instructions carefully.

Your T500 Distillation Column has a unique serial number. You are invited to visit [www.stillspirits.com](http://www.stillspirits.com) to register your Column. We do not need to know who you are or where you are, but would like to provide special offers, information and help in getting the best results from your Column.

**PLEASE READ ALL OF THESE INSTRUCTIONS CAREFULLY BEFORE USING YOUR STILL.**

## **SAFETY**

The high purity of the alcohol produced by the Turbo 500 Distillation System is far more flammable and potentially explosive than the lower purity alcohol produced from previous home distilling technologies. It should be regarded as being as flammable as gasoline and it is quite capable of forming an explosive mixture in the air at normal room temperature.

- The Still should always be run in a well ventilated area.
- It should never be left running unattended.
- Smoking, open flames or other possible ignition sources must be banned.
- If you spill any alcohol, dilute it with water, clean it up immediately and rinse any cloths or paper towels you use, to reduce the alcohol level before disposal.
- A fire extinguisher suitable for alcohol should be kept nearby.
- The Still is fitted with a user reset-able electrical cut-out to protect the element in the event that the Still is allowed to boil dry. This cut-out can be reset with the button under the base of the Still.

In the very unlikely event the electric cut out fails, a fusible link gives an added protection. This fuse will melt and cut the flow of power if the temperature exceeds a safe level. It cannot be reset by the user and the Boiler will need professional attention.

## FERMENTATION OF WASH

Careful attention to producing a clean and high quality wash will reward you with higher quality finished spirits and liqueurs. The Distillation process is where most of the impurities are removed, but care and effort to make a clean wash makes a very satisfying difference to the Alcohol produced.

To produce a wash most suited to the T500 Distillation System, we recommend you ferment 6kg (13¼ lb) white sugar in 21 litres (5½ US Gal) clean water using a Still Spirits Classic Turbo Yeast. Still Spirits Turbo Yeasts are carefully developed and premixed with the optimum nutrients to give high levels of Alcohol fermentation with minimal impurities.

Adding Still Spirits Liquid Carbon to the fermenting wash absorbs a significant portion of the undesirable flavours. The carbon makes the wash into a black liquid. The carbon does not harm the fermentation process, and is removed when the wash is cleared.

Ensure the fermentation is allowed to run until all sugar is converted to Alcohol. A specific gravity reading on a Hydrometer of 990, or less, indicates the fermentation is complete.

Clear the wash of yeast, and other fermentation by-products. These will contain undesirable flavours and odours. Use Still Spirits Turbo Clear following the instructions on the pack, and carefully siphon off the clear clean wash leaving the fermentation sediment in the fermenter vessel.

## Actual steps to produce the cleared wash ready for distilling:

1. Clean and sterilise your fermenter.
2. Add 21 litres (5 ½ US Gal) of water to your fermenter at 40°C (104°F)
3. Add 6kgs (13¼ lb) white sugar and stir well to dissolve.
4. Add Classic yeast and Turbo Carbon and stir well.
5. Leave fermenter at 20°C (68°F) room temperature to ferment
6. The wash has finished fermenting when SG reading is at 990 or below and wash has stopped fizzing,
7. Add Turbo Clear; first stir vigorously to remove all gas, then add part A and stir well. 1 hour later, evenly and gently mix part B in the top of the wash. Leave for 24 hours to clear.
8. Carefully siphon contents of wash into boiler, leaving behind as much sediment as possible.
9. Add 3ml (capful) of distilling conditioner and ceramic boil enhancers supplied, to help prevent frothing and surge boiling.

## HOW DISTILLATION IN THE T500 DISTILLATION SYSTEM WORKS

The wash is heated in the boiler to boiling point and kept at boiling point throughout the Distillation process. The vapour boiled off from the wash rises up the column, in which the vapours of the heavier liquids (water and heavier undesirable molecules) condense and fall back down. This cycle of evaporation, rising and condensing is continuous and is described as refluxing.

The temperature at the top of the Column will be lower than the base of the column, as the vapour becomes more concentrated with alcohol the temperature will drop. The higher the temperature at the top of the column, the lower the alcohol.

The ceramic saddles in the column provide a large surface area to maximise the contact between the liquid and vapour flows in the column and accelerate the refluxing action.

The Turbo 500 Still has been carefully engineered to provide a continuously compensating reflux rate. As the Distillation process progresses, the alcohol concentration in the wash reduces. To maintain high purity of Alcohol being produced, the refluxing ratio will increase to compensate and the alcohol production will slow.

Towards the end of the distillation the Alcohol purity remains high, but output will slow until it stops altogether. At this point the water vapour will keep rising and condensing part way up the column, but nothing will reach the top of the column to pass into the Condenser. The Alcohol extraction is finished at that point.

– Time to switch off and move onto making some high quality Spirits and Liqueurs with your Alcohol and your favourite essences.

## ALCOHOL PURITY AND YIELD

The Purity and Yield of the Alcohol will vary depending on factors such as;

The type of sugar you ferment

The choice of Yeast

How well the wash is cleared

Control of the water outlet temperature

“Purity” describes the strength of the Alcohol produced by the Distillation. In the development work, the T500 delivered 92 to 93% strength alcohol, using well prepared washes that were cleared.

“Yield” describes the effectiveness of Alcohol extraction from the wash. The higher the yield the less Alcohol is left behind in the boiler. With care and attention to wash clearing and the distillation process, you can expect to recover 95% or more of the Alcohol fermented in the wash.

## Producing the best spirit possible:

1. Use Triple Distilled Turbo with Turbo Carbon to produce your wash.
2. Clear the wash using Turbo Clear once it has finished fermenting,
3. Take special care to leave as much sediment as possible in the fermenter when you transfer the wash to the boiler.

Triple Distilled Turbo contains special absorbents that reduce congeners in the wash that could produce off flavours and aromas in your spirit. If you transfer these absorbents in the boiler, they will be released back into the wash during boiling.

## ASSEMBLY

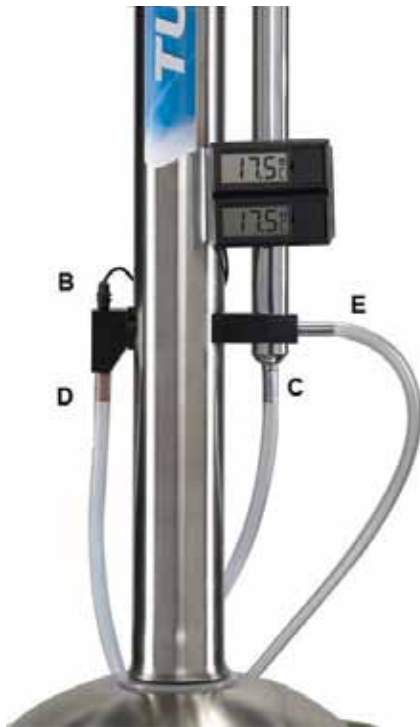
Your Turbo 500 Condenser comes with the following components.

- Column assembly with condenser water connections and alcohol take-off.
- Two digital temperature sensors (Thermometers).
- Water flow controller (and adaptor)
- Mounting Panel for Thermometers.
- Water and alcohol tubing.
- Copper saddles for column packing.
- Ceramic saddles for column packing.

You will need a T500 Boiler with lid to complete a T500 Distillation System.

## LEGEND

- A - Column Temperature Sensor (Different to shown)
- B - Water Outlet Temperature Sensor
- C - Cooling Water Inlet
- D - Water Outlet
- E - Spirit Outlet



## 1. DISASSEMBLE COLUMN BASE.

Unscrew the bottom flanged bush from the column.

## 2. INSTALL COPPER & CERAMIC SADDLES

Hold the column upside down and add the copper saddles. Gently shake these into place at the top of the column. Then add the ceramic saddles a small handful at a time. Shake the column gently between handfuls to settle the saddles in without gaps. The saddles should fill the column to within 50mm (2") from the bottom end.

Keep the column upside down while you move to the next step.

It is vital for optimum quality spirit that the Copper Saddles are at the very top of the column. Please add them first and shake into place before adding ceramic Berl saddles.

It is important that the saddles are not loose inside the column. Take time to settle the saddles in with gentle shaking between small handfuls.

Copper Saddles are most effective at the very top of the column.



## 3. FIT THE BOILER LID TO THE COLUMN

Fit the O-ring to the base of the column. Place the washer on the threaded bush and slide the bush through the hole in the lid from inside.

Screw the bush into the column firmly. You may need to shake the column to let the bush clear the saddles. Top up column with saddles by adding one at a time through the holes in the bottom flange.

To tighten the bush firmly a pair of long nose pliers can be used to grip and turn the inner grating.



#### 4. THERMOMETERS

The thermometers supplied need to have the LR44 batteries installed. The batteries should be included separately with the thermometer.

There are two different temperature probes supplied. Fit the one with the plastic probe into the water outlet block (B) halfway up the column and the metal probe into the hole at the very top of the column (A).

Check the thermometers are both working and set to Celsius. A switch on the back allows you to turn the thermometer on and off. A second switch allows you to set the thermometer to Celsius or Fahrenheit.

Place the column and lid on a bench.

Mount both thermometers in the mounting bracket provided. Clip the panel onto the Condenser near the bottom.

Use a wire tie to tidy up any loose wiring.

#### 5. FIT TUBES

Connect the 1,100mm (3'7") length of tubing onto the Water inlet. (C). This will connect to the faucet adaptor and supply cooling water.

Connect the 1,500mm (5') length of tubing onto the Water outlet (D). Water will flow from this to your outlet drain/sink.

Connect the 850mm (2'9") length of tubing onto the Spirit outlet. (E). The distilled alcohol will flow from here to your collecting jug.

**It is essential that the spirit outlet should not be sitting in alcohol at any time. Please note that this hose is a firmer, white tube which is rated for alcohol. To mould this to the best shape for your distilling arrangement, you can bend the hose after soaking in boiling water and it can be set to stay in this shape by cooling quickly.**

The short 200mm (8") length of tube links the two fittings at the top of the Still. (F)

Your T500 Column is now ready to fit on the Boiler.



## OPERATING INSTRUCTIONS

Distilling the recommended wash of 25 litres (6½ US Gal) made with 6kg (13 ¼ lb) white sugar, will take about 4 hours from start to finish. Please ensure you can give your full attention to operating the T500 Distilling System for this time period.

### You will need to have

- Clock or timer
- 1 litre calibrated jug
- 5L Jug or Vessel to collect Alcohol
- Cooling water supply. Under normal conditions the water supply will need to be about 500-600mls (1 - 1¼ pints) per minute. If the water temperature is 20°C (68°F) then the water supply will need to be about 450-500mls (13oz-1pint) per minute. If the tap water is cooler then it will need to be lower and if warmer it should be higher.

### STEP 1

Place the boiler body on a firm, level, bench where the waste can discharge into a drain or sink. It is important that the still is vertical and not tilted, otherwise the condensate will not reflux evenly.

### STEP 2

Add the wash to the T500 Boiler. The still is designed for a normal 25 litre (6½ US Gal) wash with 23 to 24 litres (6 to 6 ¼ US Gal) of cleared wash to be distilled. If you use a larger wash do not fill beyond the maximum level line on the boiler.

The wash can sometimes foam when boiling during the distilling process. If it foams it can enter the Column and disrupt the reflux action, reduce Alcohol quality and disrupt temperature control. To help prevent foaming we recommend adding 3ml (capful) of Still Spirits Distilling Conditioner. This reduces the chance of foaming in the boiler and promotes optimum distillation conditions. Also add the reusable Ceramic Boil Enhancers before distilling to avoid surge boiling.

### STEP 3

Place the Column and Boiler lid assembly onto the Boiler Base. Ensure you can clearly see the thermometers. Fasten the four clips that hold the lid onto the Boiler. Check the sealing gasket is sitting firmly onto the Boiler with no gaps.



### STEP 4

Fit the Water flow controller to your faucet/tap. Remove the aerator from your faucet/tap. Attach the water flow controller. You may need to use the enclosed adaptor depending on the thread on your faucet/tap.

If your faucet/tap does not have an aerator thread, your Still Spirits stockists will be able to supply a push on faucet connector.

Connect the water inlet tube to the flow controller.

Place the Water outlet tube into the sink or drain.

Place the Alcohol outlet tube into the collection jug or vessel.

Position the outlet of the tube so that it cannot become submerged under the Distillate.

### STEP 5

Connect the power supply and turn on the Boiler.

The wash will take 60 - 80 minutes to heat to boiling temperature.

### STEP 6

Before the wash begins to boil, turn on the cooling water. Use the clock or timer and the graduated 1 litre jug to adjust the flow to



approximately 550mls (1 pint 3 oz) per minute if cold water is over 25°C (77°F). If under this start with 450ml (15oz) per minute.

Once the wash starts boiling, heated vapours will rise into the column and the temperature on the Thermometers will increase quickly.

Alcohol will start to flow as the temperature at the top of the Column moves above 70°C (158°F).

### STEP 7

**VERY IMPORTANT** – Collect and discard the first 50mls of Alcohol that flows.

The first 50mls (2oz) of Alcohol must be collected separately and discarded. Your fermentation may have produced a very small amount of by-products that will evaporate at a much lower temperature than Ethanol (the alcohol we can consume).

### STEP 8

Adjust the water flow to give an outlet water temperature of 55–65°C (131-150°F). Monitor and adjust the water flow throughout the distillation process if needed.

Controlling the water outlet temperature is the key user control of the T500's distillation process. This differs substantially from older technologies in which the user controls cooling water flow to achieve an ideal temperature at the top of the Column.

The development work on the T500 showed an ideal water outlet range of 55-65°C (131-150°F). This can be lowered as low as 50°C (122°F), which will slow the Alcohol production rate. The outlet temperature can be raised to as high as 65°C (150°F), which will make the Alcohol flow faster, but at slightly lower strength and purity.

As a general rule, running the still between 60 and 65°C (140-150°F) will produce alcohol faster but at a slightly lower strength and quality and running the still between 55 and 60°C (131-140°F) will provide you with optimum quality but it will take a bit longer.

As the distillation process proceeds the alcohol remaining in the wash is reducing, so the reflux ratio automatically rises to compensate and the rate of alcohol flow slows. This slowing is most noticeable after 2 hours of alcohol production.

You can confidently keep the Distillation Process running until the Alcohol flow stops. There are no recognisable "tails" from the T500. All the Alcohol produced, except the 50mls (2oz) of heads, will be high quality.

Always ensure the spirit outlet is not below the level of the collected distillate.

### STEP 9

When the Distillation is finished, turn the Boiler power off and disconnect from the power outlet.

Turn off the cooling water supply.

The depleted wash left in the Boiler will be dangerously hot. Allow it to cool to a safe temperature before emptying it. Note: The spent wash is rich in nutrients and makes an ideal fertiliser for your garden.

### STEP 10

Remove the Column and Boiler lid assembly, and rinse the Boiler of all wash and debris, being careful to retain the Ceramic boil Enhancers for the next distillation run.

Rinse the Column by filling with clean water several times to remove any debris carried up by the rising vapours.

Be careful not to get any water on the thermometers during cleaning.

**Hint: The Alcohol produced is very high purity, but for complete confidence in the flavour of your finished spirits, filtering through an EZ Filter activated carbon filter will give the final "polish" to your product.**

### MAINTENANCE

If storing the Condenser for an extended period, the thermometers can be turned off by the on/off switch on the back of each.

## TROUBLESHOOTING

SYMPTOM: SPIRIT PRODUCED IS CLOUDY	
CAUSE	SOLUTION
Wash is foaming while boiling and carrying fermentation residues up the column.	Add 3ml of Still Spirits Distilling Conditioner to the wash. This stops excessive foaming in the boiler which can be caused by high concentrations of proteins and unfermented sugars.
SYMPTOM: IRREGULAR FLOW OF SPIRIT.	
CAUSE	SOLUTION
Wash is surge boiling caused by hot spot on base of integrated boiler.	Add Ceramic boil enhancers. In extreme cases try adding 1 – 2 Stainless steel Pot Scrubbers.
Spirit outlet is submerged in distillate causing alternating pressure and vacuum.	Trim outlet pipe so that it cannot be below the level of the collected distillate
SYMPTOM: THE WATER OUTLET TEMPERATURE IS HARD TO CONTROL	
CAUSE	SOLUTION
Steam and vapour pressure is leaking from lid seal.	Check lid gasket is sitting evenly inside lid before clipping onto the base.
Water supply is inconsistent.	Check your water supply does not vary significantly through the distillation process. The included Faucet adapter should help prevent this even with variable water supply.
SYMPTOM: THE SPIRIT PURITY (V/V%) SEEMS LOW	
CAUSE	SOLUTION
The Column temperature has been too hot. This can cause the spirit to flow at a higher but less concentrated rate.	Check the water out temperature is no more than 65°C (150°F).
SYMPTOM: THE YIELD IS LOW	
CAUSE	SOLUTION
The wash has not fermented out properly so the amount of alcohol available is reduced.	Use a beer, wine and wash hydrometer to ensure the wash has reached a specific gravity of 990 or below.

Steam and vapour pressure is leaking from lid seal.	Check lid gasket is sitting evenly inside lid before clipping onto the base.
<b>SYMPTOM: THE SPIRIT HAS A YELLOW/ORANGE TINT</b>	
<b>CAUSE</b>	<b>SOLUTION</b>
Build up of dead yeast cells passing through the column and building up on cooling coils inside the Column.	Be sure to use Turbo Clear on your wash before distilling to remove any unwanted yeast cells. If this does occur, empty the column and separate the copper saddles from the ceramic saddles. Soak the copper saddles and wash the inside of the column and the main condensor with white vinegar. Hold column upside down and fill with white vinegar, being careful to hold the end of the spirit outlet above the level of the white vinegar in the column. Shake gently, then run out through spirit outlet and discard vinegar. Repeat 3-4 times. Rinse column with water. Pack copper saddles into column first so they sit at the very top of the column.
High alcohol washes are more prone to this phenomena	Reduce sugar used in wash. Lower alcohol washes will always produce higher quality alcohol. The T500 still already produces higher yield than any other still on the market. You will likely find that using a 7 kg (15½ lb) wash with the T500 still will produce more alcohol than an 8kg (17lb 10oz) wash with another still type.

## TERMINOLOGY

**ALCOHOL** – Most commonly used to describe Ethanol, the type of alcohol in wine, beer, spirits and other alcoholic beverages. It is a chemical with the formula C<sub>2</sub>H<sub>5</sub>OH.

**DISTILLATE** - The concentrated component that condenses from a Distillation process.

**DISTILLATION** – Method of separating 2 or more substances by heating the mixture to a temperature that is higher than the boiling point of one component and lower than the boiling point of the other component. The

vapour of the lower boiling point component is captured and allowed to condense and is more concentrated compared to the original mixture.

**FERMENTATION** – Conversion of carbohydrates (sugars) into Alcohol and Carbon Dioxide by Yeast.

**SPIRIT** - An alcohol beverage containing at least 20% alcohol v/v and with no added sugar  
Wash - Liquid containing Alcohol which has been produced by yeast fermenting sugars.



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## ALCOHOL DISTILLATION

Please note that in certain countries alcohol distillation may be illegal and you may require a licence. Ask for advice or contact your local Customs & Excise Department.

In Australia it is illegal to use this unit to produce alcohol for consumption without a licence from the Customs & Excise Department.

In the USA it is illegal to use this unit to produce alcohol for consumption without a licence from the relevant authorities.

In the UK it is illegal to manufacture spirits without a distiller's licence which is required under the provisions.

## ALCOHOL FOR BI FUEL

On 30th June 2007 the UK Government made it legal for people to produce up to 2500 litres without the need to pay duty or to hold a permit. To make your own bio fuel you will need to double distil the alcohol you make. Always check with car manufacturers as to the level you can add.

The USA authorities have recently allowed distillation for fuel alcohol and you can get a permit from the Federal Government very cheaply.

Your local Still Spirits stockist