PROCEDURES FOR GAS VERIFICATION AND PARTS REPLACEMENT

GAS CIRCUIT INTEGRITY VERIFICATION PROCEDURE

- ***You will use the (water-faucet-like) valve on the Cylinder, turning it ON and OFF during these tests. You just have to 'crack' the valve open ¼ turn then close it…it's quick.***
- ***You will do this repeatedly during the check.***
- ***Use the (red-green) high-pressure contents gauge on the regulator as an indication of leaks.***
- ***If/when pressure drops, you have a leak and larger leaks drop the needle faster.***

Behind this procedure:

By turning the gas supply ON, then immediately OFF, a very small amount of high-pressure gas fills the brass cylinder nipple between the cylinder and the regulator assembly. With the cylinder valve OFF, the gauge is now reading only the pressure of that tiny amount of residual gas trapped in the nipple. A small, downstream leak at various points of isolation during the test will show rapidly as an exaggerated pressure drop on the contents gauge. This method offers quick, high-resolution leak detection - using, even, the rudimentary gauge on the regulator.

MAIN SUPPLY CIRCUIT CHECK – CYLINDER-TO-MASTER

⚠ **(PERFORM THIS CHECK ON INITIAL SETUP AND WITH EVERY CYLINDER CHANGE!)**

Turn the Master Gas Valves on all units OFF.
Open and close the cylinder valve and note the reading on the gauge for several minutes.
The pressure reading should remain stable during this time. IE the pressure needle should not move down.
n2Vin, can hold pressure so locked in this condition for days with no-to-negligible gauge needle movement.

If the pressure drops with the Masters OFF, the leak is most likely to be the o-ring on the cylinder nipple. This can be a fast leak! Replace the o-ring.

Cracked deformed cylinder nipple o-ring.

DISCRETE GAS DISTRIBUTION CIRCUIT CHECK – MASTERS-TO-BOTTLE HEAD VALVES
(Bottles do not need to be attached for this.)

One unit at a time will be checked for internal gas circuit integrity in this procedure.
Turn ALL Bottle Head Valves OFF on the module being checked.
Flip the Master Switch on that unit ON. (The Masters on all other interconnected units are OFF.)
Open/Close the cylinder valve and observe for pressure drop.
There may be a small, immediate drop in the first 5 sec as the gas manifold pressurizes and settles, but within 20 seconds observation the gauge should hold a stable reading.

If it does not, the following are possible problems:

- The gas inlet fitting or tube connection feeding one (or more) of the Bottle Valves may have become loosened or damaged. These are tightened with a small, ¼" open-end wrench.
- Inspect the tube-barb connection...it should be difficult to pull the tube off the barb. If it pulls off easily, cut ¼" from the end and reposition.
- A Bottle Head Valve may not be closing properly in the OFF (down) position.
- The valve could be broken.

(Above items are possible, but no real world history of it.)

- The internal piston in a valve could be stuck 'open' from wine having squirted into it.

(Rare, but we have seen this.)

If the gauge drops during this check, turn the cylinder valve ON and immerse each Bottle Head (valve closed) in a glass or bowl filled with water sufficient to cover over the Bottom Nut by at least ¼". You will see bubbling either at one of the Valve inlet connections (correct it) OR at the Bottom Nut. If bubbling at the Bottom Nut, the valve is stuck or (unprecedentedly) broken. A wine-stuck valve can be rinsed clear/restored to proper operation with a jet of hot tap water pushed through it using the Cleaning Pump toggling the valve open and closed in the process – call if this seems to be necessary.

...on to the same check of the next 5-bottle module.
It's Master ON.

It's Bottle Valves OFF.
All other Masters OFF.
Open/close the cylinder valve.
Look at the gauge.

Discrete, Master-ON, unit-by-unit, head-by-head testing as described above is not routine and rarely necessary. However, this protocol will verify and trace all hard-plumbing aspects of the system if leaking is suspected in the gas circuits.

A quick assessment of the need to perform discrete testing can be done system-wide – after having assured that the MAIN supply circuit described above is 100%.

- Turn ALL Bottle Head Valves OFF.
- Turn ALL Master Valves ON.
- Open/Close the Cylinder Valve.
- Observe the gauge.

As built, n2Vin will hold pressure in this condition for a long time. Your check need be only a minute or two. A rapid drop in pressure indicates a significant leak. If that happens, the protocol above should be followed to detect and correct the problem.

If the gauge moves down very slowly, while this does indicate correctable gas seepage, whether it is worthwhile to correct it is operator discretion. (See Recommendation below.) As commented earlier, this test offers high resolution detection due to the very small volume of pressurized gas trapped to indicate pressure losses. A rapid fall in pressure with the gauge needle moving immediately or around the same speed as a second hand on a clock will empty a cylinder overnight - maybe faster. The gauge dropping from full pressure to zero over a 10-15 minute timeframe will take weeks drain a cylinder.
A poorly secured Bottle Head, by contrast, can empty a full cylinder in 4 hours or less.

SYSTEMIC LEAK DETECTION

n2Vin can leak, but it doesn't have to and it shouldn't. While it is possible that fittings loosen or become damaged, the incidence of this is historically very rare.

High gas consumption, typically, is caused by poor bottle placements – at the Bottle Seal. Gas leaks can be traced using the pressure gauge on the regulator and the system's valves in various positions.

First look at the bottle seals.

If they have become scrunched up during use, get a warm moist towel and rotate them back and forth on the bottle head shaft to relax/reseat them. You should do this occasionally - during a random bottle change. Look at the condition of the seals when this is done. If one looks bad – ripped or impossibly mangled, it ought to be replaced. This is rare - except if used in a screw bottle

without an overseal. ScrewTop Adapters are, now, far preferable than use of the overseals for using screw bottles in the system.

INDIVIDUAL BOTTLE CHECKS
(Bottles need to be attached for this.)
Assuming the supply circuits check OK or were corrected:

- Turn all bottle valves OFF.
- Turn one unit's Master ON. The others stay OFF. You are going to check each bottle in the case.
- In that case, turn one Bottle Valve ON – the others remain OFF.
- Open then close the cylinder valve the ¼-turn, note pressure, and look for gas losses - IE: look for the pressure needle going down. 5-10 sec ought to cover it.
- Turn that bottle valve OFF.
- Do the same check with the next one, etc.
- Note: If your wine level is lower in a given bottle, you have more gas in the bottle so your test period should go a few seconds longer for low bottles.
- Each bottle position is isolated in this test and by this point is verifying Seal integrity.
- If one is found to be leaking, check the condition of the seal and the Bottle Head position in the bottle. This will usually be the cause – if not call – 616-494-0100 for further analysis.

REPLACING PARTS

REMOVE/REPLACE BOTTLE HEAD – FIXED VALVE
Wipe the existing wine tubing with a warm, moist towel.
While it is still moist, pull the wine tubing – from the top loop - up through the Bottle Head until it is free.

You should have a blue-handled, narrow 13mm bicycle 'cone wrench' at one of the stores.

Valve Wrench

With the wine tube out of the head, put the wrench on the nut at the base of the swivel gas valve and spin the Bottle Head off the threads with your other hand.
Clean the Teflon tape from the valve end.

A special narrow/heavy Teflon tape roll was included in the box.

Reapply 2 full winds of lightly-stretched Teflon tape onto the valve base thread – best to leave a couple end threads un-taped. *(When looking at the end of the valve threads, the correct direction of tape wind is clockwise.)*

The new Bottle Heads are 'skewered' onto a piece of tubing. DO NOT REMOVE THE TUBE AT THIS TIME.

Hold the Valve and fit the replacement Head up to the valve port – squarely – turning the valve carefully onto the first few threads to assure correct engagement.
This should be an easily turning engagement for the first several turns, if not, pull back to check orientation before stripping the female threads in the Bottle Head.
Once the taper threads begin to bind the valve base will start to swivel; you'll be back to the wrench on the base nut.
You can look at adjacent Bottle Heads to see how 'deep' the thread goes...it's pretty close to flush with the Body, but no need to overdo it if you feel substantial resistance getting there.
You can stop turning in any orientation – remember the valve base is designed to rotate.

The Bottle Heads are 'skewered' on a piece of tubing, a ***pilot tube***.

Bottle Head Assembly w/ScrewTop
(Thru-running Pilot Tube Shown)

The extended upper end of the pilot tube should be pressed down/in flush to the top of the bottle head.
Done with a finger, this will result in the pilot tube being very slightly recessed in the center bore. That's good.
Wipe the existing wine tubing clean with a warm, wet towel and leave it moist. (Yes...again...)
Grasp the existing wine tubing 1-1 ½" from its end.
Put the end of the wine tube in or up to the slight recess at the center bore and push the pilot tube through the Bottle Head with it.
Push the wine tube further until its end is exposed at the bottom sufficiently to grip/pull it slowly and fluidly into position up the tube.
You may notice a small 'hour glassing' in the wine tube where the original Bottle Head was positioned.
If so, leave the new head ½" below the detent for complete seal.
The pilot tube will have dropped away; it has no further use.

The prefit of the pilot uses an FDA/NSF-certified, food-safe no-taste/no-odor silicone lubricant. While it isn't soluble in wine or water, that warm, moist towel ought to be used again at this point just to wipe any residue off of the tube.

If you have any future Body changes, you can use a cooking spray – like PAM - on the lower end of the tubing and a spritz into the top, center bore of the Body, hitting the tandem o-rings. This is necessary to guard against damaging or displacing the internal, sealing o-rings machined into the center bore of the Bottle Head. It is best to use an angle-cut pilot tube as a starter, but you can also trim the end of the existing wine tube at a steep angle.

CONNECTION CHECK
CHECK THE GAS INLET ON THE BOTTLE HEAD VALVE to assure it has not been disturbed in the process of changing the Head.
If a leak is suspected here, with the Cylinder Valve ON, Master Gas Valve ON, and the Bottle Valve OFF, simply dunk the Head assembly in a water-filled glass or bowl to look for bubbling.
The base hex at the barb inlet takes a ¼" open-end wrench, small, but nothing unusual. These need to be air-tight.
We've not had any reports of these loosening, but it's not a bad idea to inspect them 6-12 months or if you experience unaccountable gas loss. *(This is covered again in detail under systemic procedures at LEAK DETECTION – mentioned here as part of the individual Bottle Head replacement.)*

STANDARD SEAL CHANGE
You need ordinary pliers for this.
Verify whether the Bottle Heads are fitted with standard right-hand Bottom Nuts or reverse, left-hand Bottom Nuts.

- Standard Bottom Nuts have smooth sidewalls.
- Reverse Bottom Nuts have a groove milled into the sidewall. The Bottle Head also has a blue band on it.

The Standard Nuts loosen and tighten in the same direction as a jar lid.
The Reverse ... is reverse!
Light grip around the Bottom Nut in the arc of the pliers and the nut will loosen in a turn or two to an easy hand turn off.
Slip it down the wine tube and off.
Spin the Compression Wheel down to move the seal down; they are usually clingy on the shaft.
Spin the Wheel back up and you have a place to grip to slip the seal off.
Don't lose the spacer – keep it on the wine tube for the moment.
Thread the new Seal onto the tube followed by the Bottom Nut.
Tighten the Bottom Nut firmly by hand then with the pliers - about another turn.

The end of the Body Shaft and the Nut have small, mating tapers. You don't need to 'bottom' the nut against the taper.
The turn of the nut becomes progressively resistive. It is a tactile judgment, but when it is clearly resistive with the pliers, test to see if you can back it off by hand.

➔ If you can't loosen the standard Bottom Nut by hand, any torsion from rational tightening of the silicone Seal isn't going to back it off either. Reverse bottom nuts tend to self-tighten.

(Though less susceptible to rotational drag, the same Bottom Nut tightening needs to be done when setting up the Bottle Head with a ScrewTop Adapter.)

⚠ The Bottom Nuts should be checked on occasion...hand-loosenable nuts need to be tightened.
The Bottom Nut is readily exposed for a check at every bottle change. That kind of frequency isn't necessary, but it is good practice to hand-check it once in a while.

AN OPERATIONAL RECOMMENDATION

All n2Vin modules are fitted with Master Valves. Following the above procedure, the main supply circuit will be entirely sound/leak-free. While many things can happen to equipment, as built, as tested, and as repeatedly proven, the supply from cylinder to Masters will hold locked gas for weeks without bleeding pressure off.

Secure, leak-free bottle placement is a simple process, but is also highly subjective - based on the user's experience and how rushed the service period is. One poor Bottle Head placement can drain a full nitrogen/argon cylinder in four hours – possibly less.

Though not necessary,

we recommend the operator requires ON/OFF use of the system's Master Valves at each dispensing cycle.

That is, the Master Gas Valves (Switch) should always be in the OFF position except when dispensing.
The switch is immediately accessible for split-second operation.
Flip up (ON), Dispense, then flip down (OFF).
Operating this way will eliminate accidental operator gas loss.

While there is no assurance that all staff will remember to turn the Master OFF, other, attentive staff will notice if a Master was left in the up position and they can simply flip it down.
If someone is unable to flip an obvious and instantaneous switch up and down, realistically, they are not going to be changing bottles particularly well, either. The resulting gas loss is a frustrating point of vulnerability.

This brief extra step of ALWAYS USING THE MASTER makes the system highly tolerant to rushed servers and those with limited experience. It will save a lot of managerial aggravation.

If there is a fuddle-point, it's probably the controller. I'll discuss that in some detail along with pointing out the reverse thread bottom nut and a thinly possible shipping issue.

CONTROLLER INFO
The controller shows on P-11 and more detail on P-21.
The Excel sheet attached is an internal document used during assembly in the shop – sort of an electrical assembly checklist.
Once the system is wired & functional, a gang of 6 units are plugged in and fired up at the same time.
Once 'hot', at the bottom of the sheet are the parametric settings we dial into the controller before the completed assemblies are tested/burned-in.
(I'm disappointed to see that this lower section of the Excel sheet is not incorporated into the Manual, but so be it. We received notice early last week that our UL spec is changing. We just had a UL line inspection on Friday and even the inspector doesn't know what the changes are! One thing for certain: It'll mean a change in the User Guide. I can update it then for their 'approval' and will include the shop programming at that time.)

Because we don't know how the system will be configured on client sites, all units are shipped with the temperature preset for Whites 46 or 47. This is where they are set for our post-assembly burn-in.

- You need to identify the Red cases.
- Temperature needs to be adjusted to 63-64 – but you can ask them their preference.
- Then the E-5 parameter needs to be set from -8 to -4 or -5 (negative numbers) for performance optimization. (I'll use the -4 as the book says.)

The controller is fast.
It offers only a 5-second window for changing parametric settings before falling out of programming mode.

I recommend that you identify the Red cases with the client, make the change in the temp setting and then "know' that you need to change another parameter and get me on the phone – just as a cover. But if you are comfortable with doing it, it isn't necessary to call; I'll explain what you do below.

Setting the Temp – assuming the system is on and running:

- It's a <u>quick one-touch</u> of the SET button.
- Regardless of case temp, the display will now show the current set-point - flashing.
- Arrow up or down to desired temp.

- Press SET again.
- Numbers stop flashing and you are done.

Setting the E5 parameter

- For this, you Push and Hold the SET button ~5 seconds and you hear a beep.
- It's in 'programming' mode.
- E1 pops up.
- Come off of the SET button briefly and push it again.
- E2 pops up.
- Off again. Push again - for E3.

You get to E5 in this sequence.

- Now – with E5 flashing – immediately touch the UP arrow.
- The current program value shows.
- It will read -8.
- Bounce on the UP arrow to -4.
- Immediately press the SET button to store the value.
- As you do, it goes to the next parameter - so the F1 parameter now flashes. But you are done.
- Let it time out (in that short 5-second programming window).

The display reverts to detected case temps at this point.
(However, if it had read 64 at the beginning, it will now display a reading that's 4 degrees warmer as a result of the new setting.)

This is easy and straight-forward, but can also be a disconcertingly fast sequence when you are doing it the first time.

If you go past the E5, you can either let it time out and start over or keep bouncing on the SET button until it comes back around in order following E4 showing up.
As long as you do not press the SET button a second time after accidentally changing any internal parameter, regardless of where you've gotten to, no accidentally changed parameter will be stored when the system times out.
So it is easy to just start over.

BOTTLE HEAD BOTTOM NUTS

Also note that this equipment is setup with a ***left-hand Bottom Nut on the Bottle Heads***.
If you put one of the STA's on for them, there's a good chance you'll need a simple pliers to loosen the Bottom Nut – BACKWARDS! – as if tightening a normal-handed nut.
Once the Bottom Nut is off, just spin the Compression Wheel down (then fully back up) to push the silicone seal down a bit so you can easily pull it off.

- O-ring on first
- STA (with the orange flat seal in side it)
- Bottom Nut.

At this point *firmly* finger tight should be sufficient. The space is tight once the Screw Adapter is in place. But the reverse thread nut is pretty-much self-tightening. We'll usually use a needle nose plier for an extra half-turn on the Bottom Nut, but it is not essential.

When using the ScrewTop Adapters –

- The Compression Wheel should be spun UP fully until the STA is secured to the bottle.
- Then bring the Compression Wheel down softly to seat/seal the O-ring on top.
- When changing bottles, first run the Compression Wheel back up to free the STA.
- Remove the STA from the wine bottle.
- Put a new bottle in.
- Snug down the Compression Wheel.

Whether you change to the STA or simply make them aware of them, we usually set the removed silicone seal or the unused STA in the inside, back/left corner of the case (behind the wine bottles) so they're available and we know where they are.

SHIPPING SHUFFLE

Before setting a bunch of bottles in place, once the gas is all setup – as it should be when you arrive:

- Turn the Master Valve (lower left leg) ON in each case one-by-one.
- Flip UP/ON one of the Bottle Head Valves in each case to confirm you hear the nitrogen hiss coming out of it.
- You can kind of cup your hand around the bottom of the head to amplify the sound – seashell style.

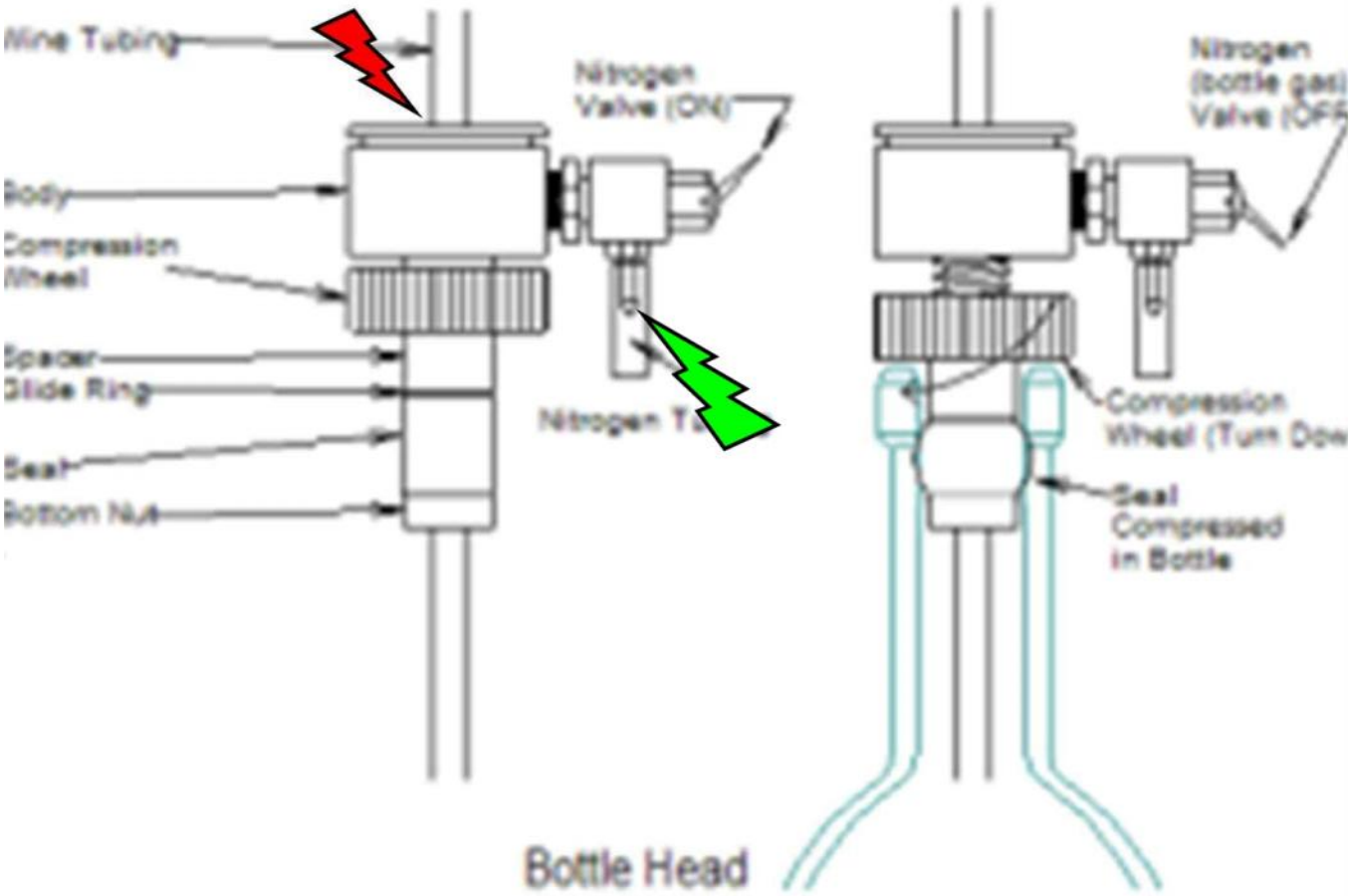
Why?

We've seen a couple instances in which the tube manifold must have shifted in transit to result in a kinked supply tube that feeds the rest of the manifold. It can pinch it off! Gas doesn't flow. (if it flows to one, it flows to all.)

I expect this verification to have been done by the equipment dealer who sets the system up – but I don't know that they will or that they will even phone. I'll try to get them on Mon/Tues before you arrive. Try.

If the gas isn't flowing in this quick check, lifting the bottle deck as if hinging up from the front edge will expose the main feed tube coming up from the left above the Master Switch through the front, interior wall of the case. You'll probably see that it is kinked. (As this is some kind of shipping thing, we've not actually seen it, but from trouble shooting a couple isolated reports, we know it can happen!)

- There is either an obvious, visible kink in the feed line – repositioning and squeezing the kink makes it go away.
- Or the tubing slipped back into the space above the Master and developed an unexposed kink – gently pulling the tube toward the back of the unit straightens this one out.


Mine Tubing
Nitrogen
Valve (ON)
Body
Compression
Wheel
Spacer
Slide Ring
Seal
Bottom Nut
Nitrogen
(bottle gas)
Valve (OFF
Compression
Wheel (Turn Dow
Seal
Compressed
in Bottle
Bottle Head