	VT-0014	005	12-17	CWH/BBK
CHART®	LNG Economizer Test Tool Procedure			

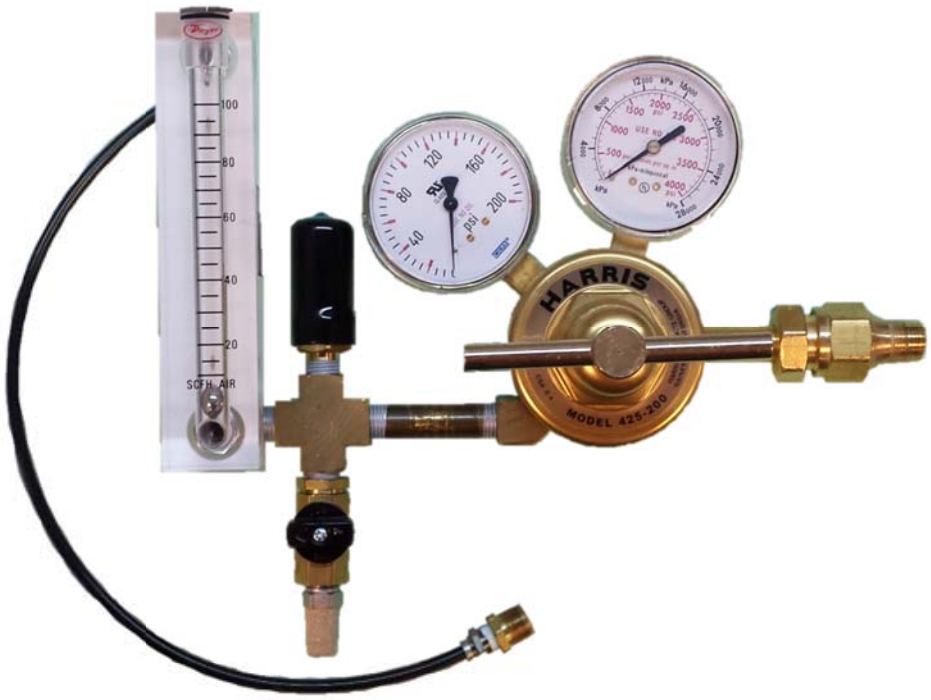
OVERVIEW

The LNG Economizer Test Tool allows a technician to more accurately and easily diagnose the operability of the pressure control regulator/economizer (referred to from here on as the economizer), and the 2psi/.014bar knuckle check valve if a low tank pressure condition is exhibited. The economizer is used to re-refrigerate the tanks, and the 2psi/0.14bar knuckle check valve in the tank knuckle aids the economizer in its function.

PARTS

The LNG Economizer Test Tool PN: **20837106** is available through www.chartparts.com.

LNG Economizer Test Tool



LNG Economizer Test Tool can be used with a high pressure or low-pressure nitrogen gas supply.

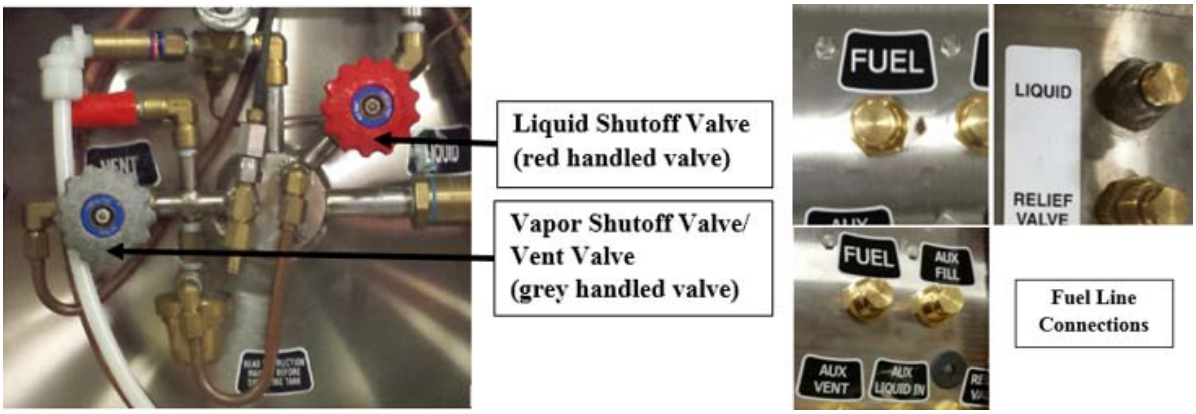
Minimum supply pressure should be 25 psig/1.7 bar above the desired economizer setting.

Note: Testing is recommended to be performed on tanks less than 7/8 full

This procedure is intended for use by trained technicians with experience on systems using LNG. Review all applicable safety documents before beginning this procedure. Refer to VT-0001

Safety

- ✓ **DO NOT** use shop air to operate the LNG Economizer Test Tool as this could create a flammable mixture inside of the tank. **Use nitrogen only**
- ✓ Testing should be performed in well ventilated areas.
- ✓ Over Pressure Relief Valve Cap **MUST** be in place on the pressure relief valve. Re-install or replace if missing or damaged. PN: 20727337
- ✓ Appropriate personal protection should be worn. Safety glasses, gloves, ear plugs, etc...
- ✓ Become familiar with the tank components that will be used.



Determining Set-Point & Adjusting the Economizer

Step 1: Vent the tank pressure to 20psig/1.4bar below the indicated pressure setting of the economizer, or 90psig/6.2bar, whichever is the highest pressure. Venting below 90psig/6.2bar can de-saturate the fuel and cause low pressure/poor engine performance issues. The indicated pressure can be found etched onto the economizer above the side port. See below:

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Step 2: Connect the LNG Economizer Test Tool to an acceptable source of nitrogen gas.

Step 3: Close the Liquid shutoff valve (red handle) on the LNG tank (both tanks if dual system) then operate the truck engine to consume the fuel in the lines from the tank to the engine prior to performing the next step. This will release most of the pressure from the lines and components in the system.

NOTE: There will be residual pressure in the fuel line that will need to be released
Either loosen a fuel fitting or open a fuel filter drain to release the remaining pressure to zero before connecting the test tool to the LNG tank

Step 4: Identify and locate a connection point:

Economizer Test Tool Connection Points

(Either port is suitable)

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Step 5: Connect the LNG Economizer Test Tool tubing to the red handled valve, or to the FUEL, LIQUID, or AUX LIQUID IN bulkhead fitting on the LNG tank shroud:

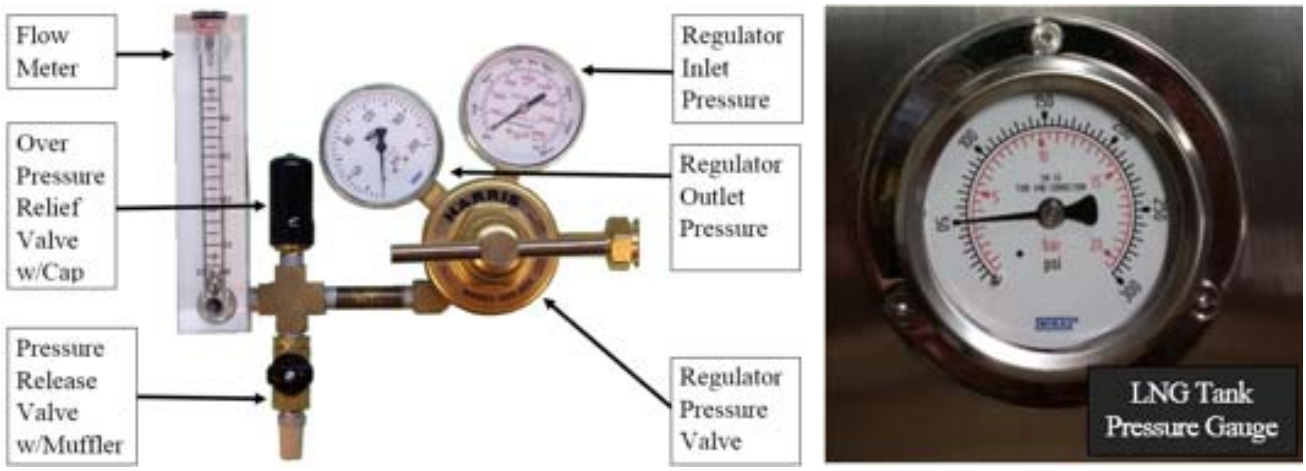
a) Standard Single tanks - disconnect the fuel line and remove the elbow at the fitting labeled FUEL or LIQUID on the top of the LNG tank shroud (12 o'clock position).

b) Standard Dual tanks - disconnect the fuel line and remove the elbow at the fitting labeled FUEL or LIQUID on the top of the LNG tank shroud (12 o'clock position).

c) Integrated Single tanks - disconnect the fuel line and remove the elbow at the fitting labeled FUEL or LIQUID on the shroud of the LNG tank shroud (2 o'clock for left tanks & 10 o'clock position for right tanks).

d) Integrated Dual tanks - disconnect the fuel line and remove the elbow at the fitting labeled AUX LIQUID IN or FUEL on the shroud of the LNG tank shroud (2 o'clock for left tanks & 10 o'clock position for right tanks).

Note: When performing this test on a multiple tank system you must connect to and test each tank individually.



Step 6: Close the Pressure Release Valve on the tool, slowly open the Liquid Shutoff Valve (red handle) on the LNG tank, and turn the truck key to the "ON" position.

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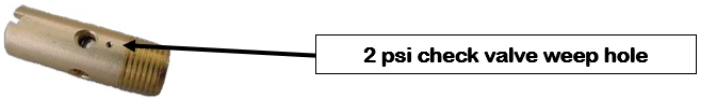
Step 7: Adjust the Pressure Regulator Valve on the test tool until outlet pressure is approximately 5-10psig/0.34-0.69bar above the pressure indicated on the LNG tank pressure gauge. Nitrogen gas should begin to flow into the LNG tank. The flow should be in the 5-20scfh range on the tool flow meter, and the ball should be stable and settled. This flow is going through the internal 2psi/0.14bar knuckle check valve weep hole, not through the economizer. Record the flow indicated by the center of the flow meter flow ball, as this is the new zero. Each tank will have its own new zero, and it may vary from tank to tank.



Note: The economizer and knuckle check valve should be closed at this point. If the flow meter exceeds 20scfh at these pressure settings either the economizer and/or the knuckle check valve is stuck open. If this happens, proceed to **Step 18**

Step 8: The economizer is considered open when it has a flow of 10scfh. Therefore, add 10scfh to the new zero found previously in Step 7.

Example: *Initial flow stabilizes at 15scfh, so 15scfh is the new zero. Add 10scfh to the new zero for a Target Flow of 25scfh. Record the Target Flow for testing and possible adjustments.*

		Example
Initial Flow	(new zero)	15 SCFH
Economizer Open	(add)	10 SCFH
Target Flow	(equals)	25 SCFH

Note: Each tank will have its own new zero, and it may vary from tank to tank.

Step 9: Increase the nitrogen gas pressure by adjusting the regulator pressure valve until the flow reaches the top of the tool flow meter or until it increases to at least the 60-80scfh range to open the economizer.

Caution: Never exceed 200psig (13.84bar) during this test as damage to the flowmeter could occur.

Re-install or replace the 200psig (13.84bar) Over Pressure Relief Valve Cap if it is missing or damaged. PN: 20727337

Step 10: While observing the flow meter, slowly decrease the pressure by adjusting the regulator pressure valve. Stop at the point at which the center of the flow ball indicates the Target Flow. The pressure displayed on the tool outlet pressure gauge is the set point for the economizer. If the meter flow falls below the Target Flow go back to Step 9.

Note: Economizer set point reading must be within +/- 5psig (0.34 bar) from the indicated set point.

Step 11: If adjustment is needed go to Step 12. Otherwise, proceed to Step 18.

Adjusting an Adjustable Economizer's Set Point

Step 12: Determine if the Economizer is adjustable.

There are two types of economizers, adjustable & non–adjustable:

- Adjustable economizers will have an adjustment screw and a locking nut.
- The non-adjustable is preset to a fixed pressure and the adjustment screw is locked in position and cut-off. If a non-adjustable economizer is found to be out of specifications it will need to be replaced. Contact Chart LNG Technical Service with the LNG tank serial number for an economizer replacement part number.

Adjustable

Non-adjustable

Step 13: Adjust the regulator outlet pressure to 5psig/0.3bar above the desired economizer set pressure by adjusting the regulator pressure valve. This additional 5psig/0.3bar is due to possible inaccuracies in gauges.

Example: *If desired economizer pressure setting is 120psig/8.3bar the regulator outlet pressure should be adjusted to 125psig/8.6bar.*

Step 14: Loosen the lock nut on the economizer, and then loosen the economizer adjustment screw until the tool flow meter increases to the 60-80scfh range to pre-load the economizer spring.

Step 15: Adjust the economizer adjustment screw until the tool flow meter is returned to the Target Flow from Step 8.

*(**Note: Do Not Over Adjust**. If the economizer adjustment screw is turned to the point where the meter flow falls below the Target Flow, you must loosen the economizer adjustment screw until the tool flow meter reaches 60-80scfh and repeat Step 15. If not, the adjustment will fail to reach the desired setting.)*

Step 16: Tighten the locking nut while using a second wrench to secure the adjustment screw from turning.

Step 17: Check to ensure the desired economizer set point by repeating Steps 6-10. Repeat the adjustment procedure if the economizer set point is not within +/- 5psig/0.34bar of the desired set point.

After the economizer settings have been determined the economizers can be tested for functionality.

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Troubleshooting the Economizer

Step 18: Defrost the tank plumbing by spraying it with a water hose, heating it with a heat gun, or allowing it to defrost naturally.

Step 19: Open the liquid shut-off (red handled) valve slowly on the LNG tank to be tested. If working with a multiple tank system, close the liquid shut-off (red handled) valve on the other tank(s). This will enable testing of one economizer at a time.

Step 20: Start the truck and allow it to run. Observe the economizer and the J-tube of the tank with the open liquid shut-off/red handled valve.

If the LNG tank pressure is below the economizer set pressure of that tank, the economizer should be closed and there should be no fuel moving through the economizer, and therefore no frost should be on the economizer and the plumbing attached above it.

Tank pressure below the economizer set point so there should be no flow through the economizer.
Frost should not be forming on the economizer or the plumbing above it

Tank pressure above the economizer set point so there should be flow through the economizer.
Frost should be forming on the economizer and the plumbing above it

If the tank pressure is below the economizer set point, and frost starts to form at the stainless pipes and brass fitting above the economizer, on the economizer, or on the economizer outlet elbow, then the economizer is not closing properly. Replace as needed.

Note: After several minutes of the engine running, the frost will begin to cover all the knuckle plumbing due to radiant cooling.

If during economizer set point testing the initial flow exceeded 20scfh and Step 18 through 20 resulted in a normal economizer function, the 2psi/0.14bar knuckle check valve may be stuck open or obstructed.

Step 21: For multiple tank systems repeat **Steps 18-20** for the remaining tanks.

Step 22: Close the Liquid Shutoff Valve and nitrogen gas supply, and slowly open the pressure release valve before removing the test equipment.

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Refer to VT-0001