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	<b>Capacitance Testing</b>			

## OVERVIEW

Chart LNG tanks incorporate a capacitance system for real time monitoring of the liquid level inside LNG tanks. This capacitance reading is converted to a signal that is sent to the fuel level gauge.

Capacitance testing may be necessary when:

- A sender short, or open circuit condition exists but is not found in the external wiring
- Any time a capacitance cable is replaced or suspect, or if an internal component is suspect. Testing will ensure that the circuit is within specification

## PARTS NEEDED

Capacitance for Chart tanks is measured in picofarads (pF), so the test equipment will need to be able to read at this level. ChartParts.com has a capacitance meter and the necessary leads available:



Capacitance meter PN: 11633137 standard test leads included

\* BNC test lead (with adapter) PN: 11385436 sold separately

## SAFETY

It is recommended to perform defueling and depressurizing of tanks in a well-ventilated area so as to avoid gas from concentrating in an area. When air to fuel mixture is correct, concentrated gases become flammable. Insure truck's parking brake is applied, wheels chocked, and ignition switch is in the "off" position. Check for leaks and repair as needed. Wear proper PPE as needed for defueling and depressurizing of tanks & testing.

**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 LNG Vehicle Tank Safety**



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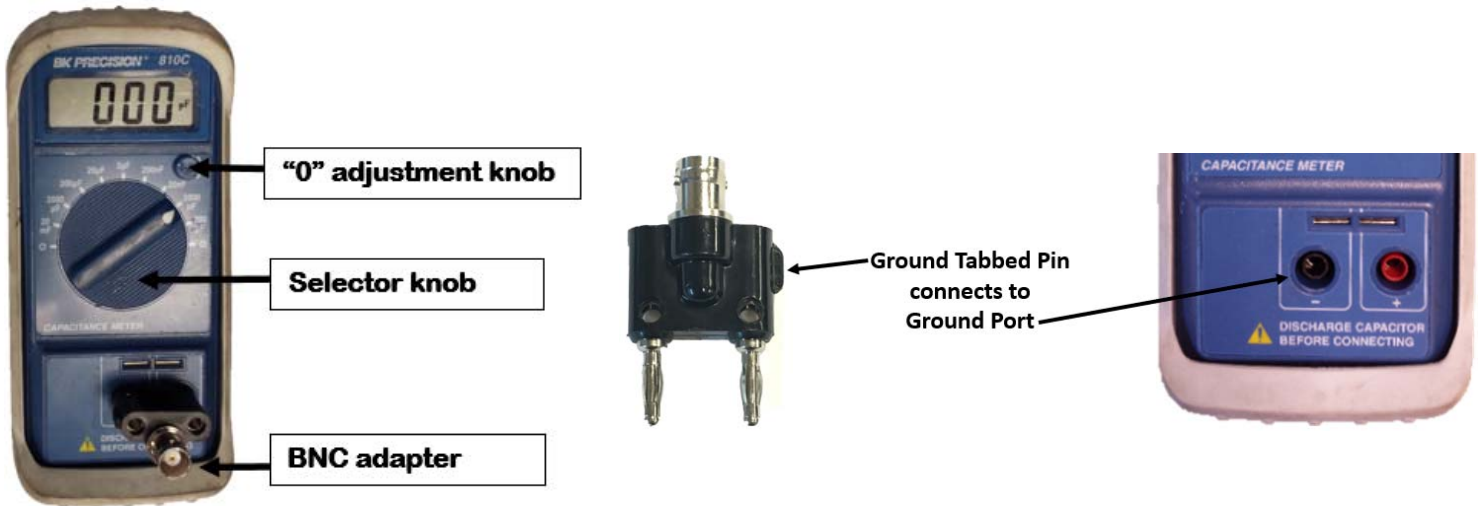
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## Capacitance Testing

### Measuring Capacitance



**Step 1:** Install the BNC two pin adapter into the capacitance meter (polarity sensitive), turn the selector knob on the meter to 2000 pF, and adjust the “0” adjustment knob until “000” is displayed:



**Note:**

Capacitance meter is polarity sensitive (ground pin to ground port)  
Improperly connected adaptors or cables will create an inaccurate capacitance reading

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## Capacitance Testing

### For Newer Style BNC Connectors

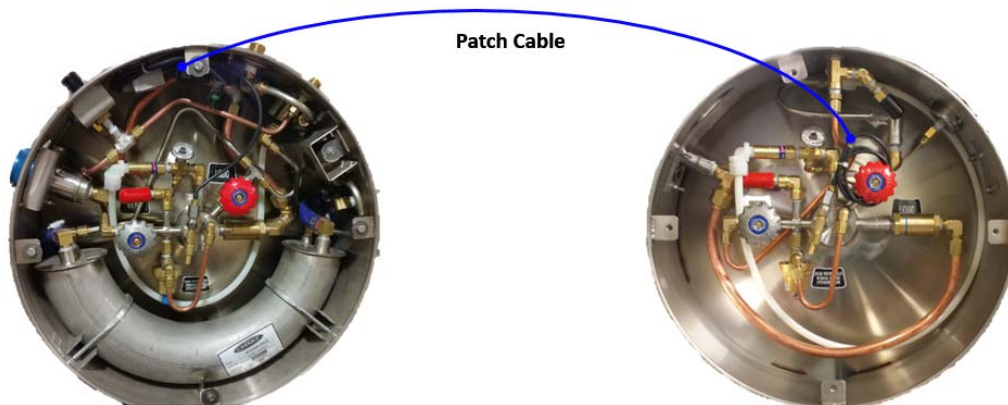
**Step 2:** Disconnect the feed through cable BNC connector from the single tank or primary/filling tank sending unit (on a dual tank system it may be connected either port) and attach it to the BNC adapter on the capacitance meter. Compare the reading to the capacitance table in **Step 18**. **Note:** If the tank contains LNG, capacitance readings will reflect that level as a reading within the range between the “Empty” & “Full” capacitances listed.



If capacitance readings are incorrect, a reading from the tank’s capacitance cable will be needed to verify the integrity of the sender cable and/or the tank’s capacitance cable.

If this measurement is needed, skip to **Step 10**

**Step 3:** For the secondary tank (dual tank system), disconnect the secondary tank’s patch cable from the sender unit on primary tank. Attach the patch cable to the meter. The reading should be approximately 185 pF higher when compared to the capacitance table in **Step 18** if the patch cable is 3m in length, and approximately 200 pF higher when compared to the capacitance table in **Step 18** if the patch cable is 3.4m in length. Cable length can be determined by contacting Chart Industries with the serial numbers from the tanks. **Note:** If the tank contains LNG, capacitance readings will reflect that level as a reading within the range between the “Empty” & “Full” capacitances listed.



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## Capacitance Testing

**Step 4:** If the secondary tank reading is out of specifications, the secondary tank will need to be tested without the patch cable. Use a razor knife to score into the entire length of the BNC heat shrink. Do not press so hard with the razor knife as to cut completely through the heat shrink, as this could damage the underlying components.



Use a heat gun to heat the heat shrink equally on both sides of the incision at 90 degrees to either side of the incision. The heat shrink will start to split at the incision and peel away from the BNC. Use a shop towel to remove the heat shrink and discard, and remove the excess glue residue.

**Note: Use caution, the heat shrink and its glue will be hot.**

**Step 5:** Attach the secondary tank's feed through cable BNC cable to meter. Due to the secondary tank having a longer feed through cable (1m), capacitance readings should be approximately 30 pF higher when compared to the capacitance table in **Step 18**. **Note:** If the tank contains LNG, the capacitance readings will reflect that level as a reading within the range between the "Empty" & "Full" capacitances listed.



If capacitance readings are incorrect, a reading from the tank's capacitance cable will be needed to verify the integrity of the sender cable and/or the tank's capacitance cable.

If this measurement is needed, skip to **Step 10**.

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## Capacitance Testing

**Step 6:** The patch cable can be tested by disconnecting it from the primary tank's sender unit and from the secondary tank's BNC connector. Use a razor knife to score a vertical incision into the entire length of the BNC heat shrink. Do not press so hard with the razor knife as to cut completely through the heat shrink, as this could damage the underlying components. Use a heat gun to heat the heat shrink equally on both sides of the incision at 90 degrees to either side of the incision. The heat shrink will start to split at the incision and peel away from the BNC. Use a shop towel to remove the heat shrink and discard, and remove excess glue residue. Connect the BNC connector to the meter. Prevent the open end of the patch cable from contacting any conductive surfaces. Patch cable readings should be approximately 185 pF for 3m & 200 pF for 3.4m. Cable length can be determined by contacting Chart Industries with the serial numbers from the tanks.



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## For Older Style Fuel Gauge Systems Using A BNC Nipple



**Step 7:** Use a razor knife to score a vertical incision into the entire length of the BNC heat shrink. Do not press so hard with the razor knife as to cut completely through the heat shrink, as this could damage the underlying components. Use a heat gun to heat the heat shrink equally on both sides of the incision at 90 degrees to either side of the incision. The heat shrink will start to split at the incision and peel away from the BNC. Use a shop towel to remove the heat shrink and discard, use caution as the heat shrink and its glue will be hot.

**Step 8:** Remove the BNC Cable connector from the BNC nipple. Twist it a ¼ turn counterclockwise to unlock and pull it away from the nipple to disconnect.

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## Capacitance Testing

**Step 9:** Attach the BNC cable adapter to the capacitance meter, zero the meter, and then attach it to the BNC connector on the tank. Compare the reading to the capacitance table in **Step 18**. **Note:** If the tank contains LNG, the capacitance readings will reflect that level as a reading within the range between the “Empty” & “Full” capacitances listed.



If the capacitance readings are incorrect, a reading from the tank’s capacitance cable will be needed to verify the integrity of the sender cable and/or the tank’s capacitance cable.

If this measurement is needed, proceed to **Step 10**.

### Measuring Capacitance at the Tank Capacitance Wire

**Step 10:** Defuel the tank per VT-0017.

**Step 11:** Fill the tank with 2 bar of nitrogen gas, then open the vent valve to exhaust the nitrogen gas pressure to 0 bar. Repeat nitrogen purge.

**Step 12:** Remove the cap and nut from the capped end of the feed through tee shown below:



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## Capacitance Testing

**Step 13:** Use a razor knife to score a vertical incision into the heat shrink. Do not press so hard with the razor knife as to cut completely through the heat shrink, as this could damage the underlying components. Use a heat gun to heat the heat shrink equally on both sides of the incision at 90 degrees to either side of the incision. The heat shrink will start to split at the incision and peel away. Use a shop towel or pliers to remove the heat shrink and discard, use caution as the heat shrink and its glue will be hot.

**Heat shrink & solder joint**



**Step 14:** Use a solder gun/iron to heat the exposed solder joint. De-solder and separate the two wires (Loosen the sender cable nut on the feed through and remove the sender cable if necessary).


**De-solder joint**



**Sender cable nut**

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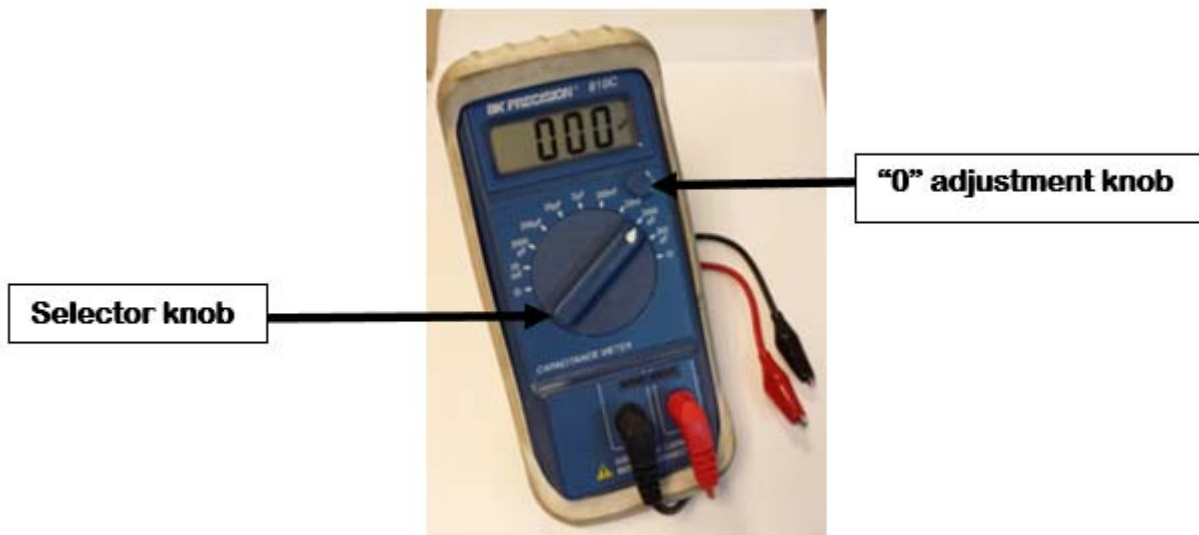


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**Step 15:** Connect standard test leads to the meter. Red to (+), black to (-)

**Step 16:** Turn the selector knob on the meter to 2000 pF, and adjust the “0” adjustment knob until “000” is displayed.

Ensure the two wires are completely separated from each other, no wire strands can be touching anything or each other.



**Step 17:** Connect black lead to a good grounding point on tank/plumbing area and connect the red lead to the center wire of the tank’s capacitance lead extending from the feed through.

Do not touch the cable ends or wires with your hands as this will change the capacitance readings.

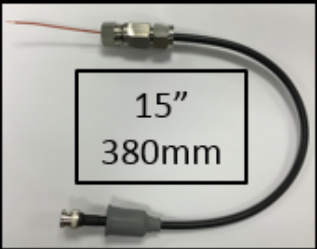


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 Refer to VT-0001 LNG Vehicle Tank Safety**


**Step 18:** Compare readings from all capacitance tests to the following graphs according to the tank size being tested and feed through cable (+/- 10 pF).

**Note:** If the tank contains LNG, the capacitance readings will reflect that level as a reading within the range between “Empty” & “Full” capacitances listed below.


		<b>Chart LNG Capacitance Specs</b>						
		15" Feed Through		27" Feed Through		Bare Wire		
		Outer Diameter	Empty	Full	Empty	Full	Empty	Full
<b>USDOT</b>		20"	287	397	322	432	262	372
		22"	314	437	349	472	289	412
		24"	342	477	377	512	317	452
		26"	370	516	405	551	345	491
		26" Bonus	380	531	415	566	355	506
<b>R110</b>	<b>IVECO</b>	660mm/26"	370	517	405	552	345	492
		660mm/26" Bonus	382	537	417	572	357	512
	<b>SCANIA</b>	560mm/22" VDO	343	437	372	466	312	406
		660mm/26" VDO	400	517	429	546	369	486
		660mm/26" Bonus VDO	404	527	433	556	373	496
		660mm/26" Bonus	346	516	406	576	346	516



15"  
380mm



27"  
690mm



**When measuring capacitance through the 11ft/3.3m patch cord between tanks add 195pF**

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