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Title: NEW Ultrasonic DEF Head Unit

Applies To: All SCR Vehicles

## CHANGE LOG

Please refer to the change log text box below for recent changes to this article:

10/29/2019 - Updated repair steps for ECM calibration  
 09/15/2019 - Updated  
 07/24/2019 - No content changes  
 06/05/2019 - Corrected table formatting. No content change.  
 05/21/2019 - Added in-lbs to Table 4

## DESCRIPTION

### 1. Overview

There is a NEW DEF head unit available. This document will guide the user through the differences between the two styles, when to replace a sensor, and what tools/kits are available when diagnostics lead to replacing the DEF head unit.

The current style DEF head unit has a float to measure the level and an LED to measure the DEF quality, shown in Figure 1 and 2 below. The NEW style DEF head unit uses only ultrasonic waves to measure the level and DEF quality, shown in Figure 3 below.



Figure 1: Float ONLY DEF Head Unit (FLS)

Figure 2: Float and Optical DEF Head Unit (QLS)

Figure 3: Ultrasonic DEF Head Unit

### 2. Compatibility

The current DEF head unit is compatible with all vehicles built between 2016 to present Emissions using SCR. Since the concentration sensor was not required until federal emissions 2016, vehicles built prior to 2016 will use a sensor without concentration functionality. This sensor will look identical in appearance to its counterpart with added concentration functionality.

**NOTE:**

**If an ultrasonic DEF head unit without concentration sensor functionality is installed on a vehicle that requires the concentration sensor, fault codes will be present and the correct ultrasonic DEF head unit must be installed.**

Navistar powered vehicles will **REQUIRE** a calibration update to the latest calibration for ECM and ACM at the time the ultrasonic DEF head unit is installed for the first time. Cummins powered vehicles do not require a calibration change.

1. Vehicles built with N9, N10 or N13 engines will require an updated calibration.
2. Vehicles built with A26 engines do **NOT** require an updated calibration. These engines were built with ultrasonic DEF head unit compatibility.

**NOTE:**

**Both Optical and Ultrasonic DEF head units will be available for service simultaneously. Ultrasonic DEF head units will replace the float and optical DEF head units as inventory diminishes. Some tank sizes will diminish inventory before others.**

**3. Ultrasonic DEF head Unit Boot Encapsulation Slow to Fill Alert**

The new ultrasonic DEF head unit has a silicone boot encapsulation around the concentration sensor and the bottom of the level tube. The sensor is susceptible to a delayed level reading due to the boot encapsulation which takes about five minutes to fill with DEF, but could take up to 15 minutes. Any time a new ultrasonic DEF head unit is installed, it should be dunked in the DEF 2-3 times at a rapid pace to initialize some flow of DEF through the boot encapsulation. If any low DEF level fault codes are active after installation such as 1761-17, 1761-18, or 1761-1, the boot encapsulation must be cleared of any air. Refer to the Repair Steps section for instructions to service the DEF head unit. For new sensors experiencing interference issues, refer to item 4. DEF Tank Cutting Tool.

**CAUTION:**

**If diesel fuel, oil, or coolant is ever found in the DEF tank, the sensor must be replaced.**

**4. DEF Tank Cutting Tool for Interference Issues During Installation**

If a float and optical DEF head unit is replaced with an ultrasonic DEF head unit, some units may experience interference when installing the ultrasonic DEF head unit in the tank. If any interference is witnessed, use the Ultrasonic Sensor Tank Cutting Tool. Refer to the Special Tools section to find the tool part number and instructions.

**NOTE:**

**All 7 gallon sensors will likely experience interference when attempting to install the ultrasonic sensor for the first time.**

**CAUTION:**

**Do NOT remove the tie straps from the ultrasonic DEF head unit. If the tie straps are compromised, the ultrasonic DEF head unit must be replaced.**

**5. 5 and 15 Gallon DEF Line Interference**

If a float and optical DEF head unit is replaced with an ultrasonic DEF head unit on 5 and 15 gallon tanks, the DEF lines **MUST** be replaced. Without replacing the DEF lines, the DEF head unit will not fit in its original location due to different DEF supply and return tube orientation. Refer to the Service Parts Information section to find the 5 and 15 gallon ultrasonic head unit kits.

**SYMPTOM(s)**

Not Applicable

**SPECIAL TOOL(s) / SOFTWARE**

**DEF TANK CUTTING TOOL**

If a float and optical DEF head unit is replaced with an ultrasonic DEF head unit, some units may experience interference when installing the ultrasonic DEF head unit in the tank. Follow Step 1 below to determine if the DEF tank opening is large enough to support the ultrasonic DEF head unit.

Step 1. Measure the opening of the DEF tank. The opening should be at least 90 mm in diameter in any direction. If the DEF tank opening is not at least 90 mm, the Ultrasonic Sensor Cutting Tool should be used to cut the tank opening to a larger size. Refer to Table 1 below for DEF tank cutting tool part number and instructions. The instructions are also included with the tool.

**NOTE:**

All 7 gallon sensors will likely experience interference when attempting to install the ultrasonic sensor for the first time.

**CAUTION:**

Do **NOT** remove the tie straps from the ultrasonic DEF head unit. If the tie straps are compromised, the ultrasonic DEF head unit must be replaced.

**Table 1: DEF Tank Cutting Tool**

Tool Description	Tool Number	Instructions
Ultrasonic Sensor Tank Cutting Tool	18-637-01	<a href="#">4328516R1</a>

**NOTE:**

Instructions are subject to revision, if printing discard after single use.

### SERVICE PARTS INFORMATION

Ultrasonic DEF head unit will become available in PDCs as float and optical DEF head unit supply diminish. Therefore, some tank sizes will become available before others. Refer to the overview in the Description section of this iKNow article to determine if this iKNow article applies.

DEF head unit must be ordered as critical unit down orders which requires a VIN to process the order. The part numbers for ultrasonic DEF head unit are listed in Table 2 below.

**Table 2: DEF Head Unit Part Numbers**

Part Number	Emissions Year	Description
4097721C91	2016 to Present Federal Emissions Year	TANK, DEF, 5 GAL, HEAD UNIT, QLS
4097722C91	2016 to Present Federal Emissions Year	TANK, DEF, 7 GAL, HEAD UNIT, QLS
4097723C91	2016 to Present Federal Emissions Year	TANK, DEF, 9.5 GAL, HEAD UNIT, QLS
4097724C91	2016 to Present Federal Emissions Year	TANK, DEF, 12 GAL, HEAD UNIT, QLS
4097725C91	2016 to Present Federal Emissions Year	TANK, DEF, 15 GAL, HEAD UNIT, QLS
4097727C91	2016 to Present Federal Emissions Year	TANK, DEF, 16/23 GAL, HEAD UNIT, QLS
4097728C91	2017 to Present Federal Emission Year	TANK, DEF, 10.6/15.9/25.2 GAL TANK, HEAD UNIT, QLS
4099716C91	2013 to 2015 Federal Emissions Year	TANK, DEF, 9.5 GAL, HEAD UNIT, FLS
4099715C91	2013 to 2015 Federal Emissions Year	TANK, DEF, 7 GAL, HEAD UNIT, FLS
4099717C91	2013 to 2015 Federal Emissions Year	TANK, DEF, 16/23 GAL, HEAD UNIT, FLS
2518086C1	All ultrasonic DEF head unit	FILTER, SSI DEF SENSOR
2518087C1	All ultrasonic DEF head unit	KIT, DEF SENSOR SEAL (SSI)

**NOTE:**

Federal emissions year is located in *Service Portal > Components* for the associated VIN.

### 5 AND 15 GALLON DEF LINE INTERFERENCE

If a float and optical DEF head unit is replaced with an ultrasonic DEF head unit on 5 and 15 gallon tanks, the DEF lines **MUST** be replaced. Without replacing the DEF lines, the DEF head unit will not fit in its original location due to different DEF supply and return tube orientation. Refer to Images 4 and 5 below to see the differences in DEF tube orientation.





Figure 4: DEF tube orientation of 5/15 gallon float/optical sensor



Figure 5: DEF tube orientation of 5/15 gallon ultrasonic sensor

Table 3 below is the comprehensive list of kits that should be ordered for 5 and 15 gallon DEF tanks **ONLY** when converting from float and optical DEF head unit to ultrasonic DEF head unit. Use the table appropriately to find the correct part number to order.

Kit Number	Emissions Year	Description	Additional Parts
2518077C92	2013-2016 Federal Emissions Year	KIT, 5 GAL DEF SENSOR (2013 EMISSIONS) includes sensor, two DEF lines, and vent hose	No additional parts required
2518080C92	2013-2016 Federal Emissions Year	KIT, 15 GAL DEF SENSOR (2013 EMISSIONS) includes sensor, two DEF lines, and vent hose	No additional parts required
2518078C92	2017 and beyond Federal Emissions Year	KIT, 5 GAL DEF SENSOR (2017 EMISSIONS) includes sensor, one DEF line, and vent hose. <b>Additional DEF line is required to be ordered separately.</b>	Reference table "2017 Emissions, 5 GAL Return Hose" to determine the additional return hose that needs to be ordered
2518081C92	2017 and beyond Federal Emissions Year	KIT, 15 GAL DEF SENSOR (2017 EMISSIONS) includes sensor, one DEF line, and vent hose. <b>Additional DEF line is required to be ordered separately.</b>	Reference table "2017 Emissions, 15GAL DEF Return Hose" to determine additional return hose that needs to be ordered

**For 5 gallon DEF Tanks:**

2017 EMISSIONS, 5GAL DEF RETURN HOSE (CHOOSE ONE BASED ON WHAT YOUR TRUCK WAS BUILT WITH)								
ACTION	PART #	DESCRIPTION	LENGTH (mm)	LENGTH (in)	"A" End Size w/elect. Conn.	"A" End Angle	"B" End Size	"B" End Angle
REMOVE	4078908C1	HOSE, DEF FLUID - RETURN	3650	143.7	5/16"	STRAIGHT	5/16"	90 DEG
ADD	4100837C1	HOSE, DEF FLUID - RETURN	3750	147.6	5/16"	90 DEG	5/16"	90 DEG
REMOVE	4078635C1	HOSE, DEF FLUID - RETURN	2400	94.5	5/16"	STRAIGHT	5/16"	90 DEG
ADD	4085807C1	HOSE, DEF FLUID - RETURN	2450	96.5	5/16"	90 DEG	5/16"	90 DEG
REMOVE	4080937C1	HOSE, DEF FLUID - RETURN	2300	90.6	5/16"	STRAIGHT	5/16"	90 DEG
ADD	4085807C1	HOSE, DEF FLUID - RETURN	2450	96.5	5/16"	90 DEG	5/16"	90 DEG
REMOVE	4079662C2	HOSE, DEF FLUID - RETURN	2700	106.3	5/16"	STRAIGHT	5/16"	90 DEG
ADD	4078098C1	HOSE, DEF FLUID - RETURN	2750	108.3	5/16"	90 DEG	5/16"	90 DEG
REMOVE	4100016C1	HOSE, DEF FLUID - RETURN	2300	90.6	5/16"	STRAIGHT	5/16"	STRAIGHT
ADD	4079659C1	HOSE, DEF FLUID - RETURN	2400	94.5	5/16"	90 DEG	5/16"	STRAIGHT

**For 15 gallon DEF Tanks:**

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2017 EMISSIONS, 15GAL DEF RETURN PIPING (CHOOSE ONE BASED ON WHAT YOUR TRUCK WAS BUILT WITH)								
ACTION	PART #	DESCRIPTION	LENGTH (mm)	LENGTH (in)	"A" End Size w/elect. Conn.	"A" End Angle	"B" End Size	"B" End Angle
REMOVE	4080101C1	HOSE, DEF FLUID - RETURN	1750	69	5/16"	STRAIGHT	5/16"	STRAIGHT
ADD	4101350C1	HOSE, DEF FLUID - RETURN	1700	67	5/16"	90 DEG	5/16"	STRAIGHT
REMOVE	4078635C1	HOSE, DEF FLUID - RETURN	2400	94.5	5/16"	STRAIGHT	5/16"	90 DEG
ADD	4096172C1	HOSE, DEF FLUID - RETURN	3100	122	5/16"	90 DEG	5/16"	STRAIGHT

**NOTE:**

Federal emissions year is located in *Service Portal > Components* for the associated VIN.

Refer to Repair Steps section below for assembly instructions.

### DIAGNOSTIC STEP(s)

When fault codes are present, refer to appropriate Fault Code Action Plan (FCAP) to locate proper repair guidelines.

### REPAIR STEP(s)

When servicing the ultrasonic DEF head unit and DEF lines, refer to [Exhaust Aftertreatment System with SCR EPA 10 Service Manual](#) for proper repair instructions. Use the proper torque sequence from Figure 6 and Table 4 below.

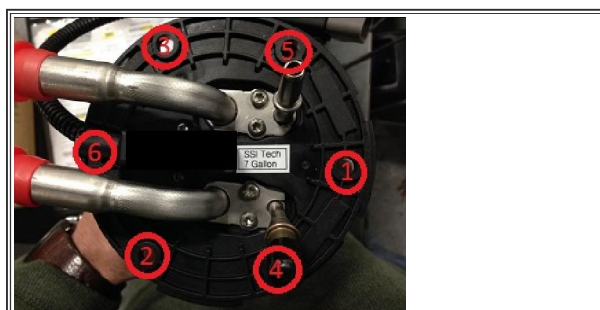


Figure 6: Ultrasonic DEF head unit torque sequence

Position	Torque Cycle 1		Torque Cycle 2	
	Nm	in-lb	Nm	in-lb
1	1-2 (Nm)	8.85-17.7 (inlbs)	4-9 (Nm)	35.4-79.66 (inlbs)
2	1-2 (Nm)	8.85-17.7 (inlbs)	4-9 (Nm)	35.4-79.66 (inlbs)
3	1-2 (Nm)	8.85-17.7 (inlbs)	4-9 (Nm)	35.4-79.66 (inlbs)
4	1-2 (Nm)	8.85-17.7 (inlbs)	4-9 (Nm)	35.4-79.66 (inlbs)
5	1-2 (Nm)	8.85-17.7 (inlbs)	4-9 (Nm)	35.4-79.66 (inlbs)
6	1-2 (Nm)	8.85-17.7 (inlbs)	4-9 (Nm)	35.4-79.66 (inlbs)

**NOTE:**

Instructions are subject to revision, if printing discard after single use.

### WARRANTY INFORMATION

Warranty Claim Coding:

<b>Group:</b>	18050 - SCR Aftertreatment
<b>Noun:</b>	124 - Sensor Assembly Def Tank

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**Standard Repair Time(s):**

Refer to the [SRT Manual](#) for Repair Times

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**OTHER RESOURCES**

[Master Service Information Site](#)

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