



**MAINTENANCE
INFORMATION**

MI15-51

DATE : DECEMBER 2015	SECTION : 22 - HVAC
SUBJECT : AIR CONDITIONING PERFORMANCE TEST	

IMPORTANT NOTICE
This test is recommended by PrevoSt to increase your vehicle's performance. Note that no reimbursement will be awarded for carrying out this modification.


APPLICATION


Model	VIN
H3-41, H3-45 coaches	 EQUIPPED WITH BITZER A/C COMPRESSOR
X3-45 coaches	


DESCRIPTION

Perform this test after a major repair or replacement of part on the air conditioning system which necessitated the removal of the refrigerant, or if you suspect a lack or surplus of refrigerant in the circuit.

REQUIRED TOOLS

	1 dual input thermocouple thermometer
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	Vehicles equipped with overhead compartment A/C systems: 3 dual input thermocouple thermometer
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	Other type of adequate thermometer
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PROCEDURE



DANGER

Park vehicle safely, apply parking brake, stop engine.

AIR CONDITIONING PERFORMANCE TEST PROCEDURE

1. The test must be done inside the service facility. A stabilized temperature inside the vehicle is required (if the vehicle was outside and the interior is very cold, it will be more difficult and will take more time to warm up).

**Requirement - Vehicle interior temperature and facility ambient temperature at the test station:
Between 60°F & 95°F (Between 15°C & 35°C)**

2. Complete what follows.

Write down the temperature (T°) outside the vehicle= _____ ° F

What is the relative humidity? ≤ 50% ou > 50%

3. With the results of step 2, use the table of page 4 to complete what follows.

T° to be reached inside the vehicle prior starting the « pull-down » (as per table) _____ ° F

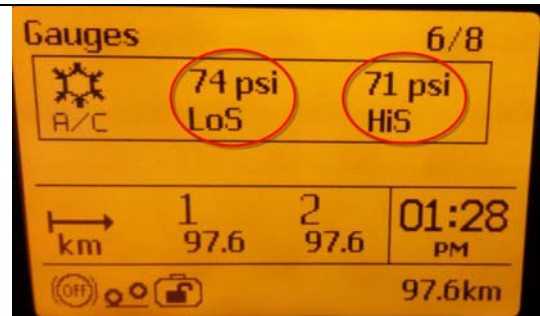
Maximum duration of « pull-down » (as per table) = _____ minutes

« Pull-down » stopping T° (as per table) = _____ ° F

4. On the DID, check and record the A/C compressor high side (HiS) and low side (LoS) pressure values.

LoS= _____ PSI

HiS = _____ PSI



5. Find in table of page 14 the pressure value corresponding to the actual ambient temperature.

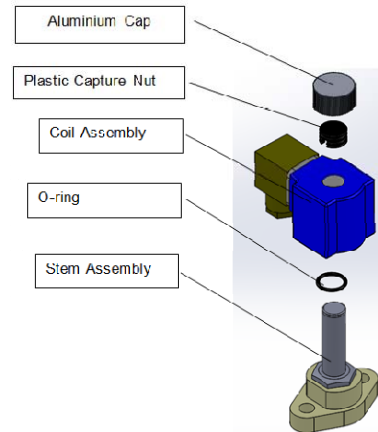
Check that:

Table pressure value ±10psi = LoS or HiS pressure

Note: LoS and HiS values should be very close. The air conditioning system must be stopped since a while so that the pressures have equalized.

Note: Pressure too low indicates that the charge of refrigerant is insufficient. If LoS = 34 psi and HiS = 248 psi, then there is a problem with the high side and low side pressure sensors on the A/C compressor. Check these components.

6. Remove the unloader coil on the A/C compressor. DO NOT unplug the unloader coil connector.



New clip-on coil type: Insert a flat screwdriver between the coil and the cylinder cover. Gently lift the screwdriver until the coil lifts.

Former coil type: Unscrew the aluminum cap. Remove the plastic capture nut. Insert a flat screwdriver between the coil and the cylinder cover. Gently lift the screwdriver until the coil lifts.

Pull-down parameters chart according to T ° outside of the vehicle and relative humidity				
T ° outside of the coach	Relative humidity	T ° required inside of the coach prior starting of pull-down	Maximum duration of pull-down (for a ΔT of 15°F)	Pull-down stopping T °
60°F to 74°F	n/a	*82°F	10 minutes	67°F
75°F	n/a	*82°F	11 minutes	67°F
76°F	n/a	*82°F	11 minutes	67°F
77°F	n/a	*82°F	12 minutes	67°F
78°F	n/a	*82°F	12 minutes	67°F
79°F	n/a	*82°F	13 minutes	67°F
80°F	≤ 50%	*82°F	13 minutes	67°F
80°F	> 50%	*82°F	15.5 minutes	67°F
81°F	≤ 50%	*82°F	14 minutes	67°F
81°F	> 50%	*82°F	16.5 minutes	67°F
82°F	≤ 50%	82°F	15 minutes	67°F
82°F	> 50%	82°F	17.5 minutes	67°F
83°F	≤ 50%	83°F	15 minutes	68°F
83°F	> 50%	83°F	17.5 minutes	68°F
84°F	≤ 50%	84°F	15 minutes	69°F
84°F	> 50%	84°F	17.5 minutes	69°F
85°F	≤ 50%	85°F	18 minutes	70°F
85°F	> 50%	85°F	20.5 minutes	70°F
86°F	≤ 50%	86°F	18 minutes	71°F
86°F	> 50%	86°F	20.5 minutes	71°F
87°F	≤ 50%	87°F	18 minutes	72°F
87°F	> 50%	87°F	20.5 minutes	72°F
88°F	≤ 50%	88°F	18 minutes	73°F
88°F	> 50%	88°F	20.5 minutes	73°F
89°F	≤ 50%	89°F	18 minutes	74°F
89°F	> 50%	89°F	20.5 minutes	74°F
90°F	≤ 50%	90°F	20 minutes	75°F
90°F	> 50%	90°F	22.5 minutes	75°F
91°F	≤ 50%	91°F	20 minutes	76°F
91°F	> 50%	91°F	22.5 minutes	76°F
92°F	≤ 50%	92°F	20 minutes	77°F
92°F	> 50%	92°F	22.5 minutes	77°F
93°F	≤ 50%	93°F	20 minutes	78°F
93°F	> 50%	93°F	22.5 minutes	78°F
94°F	≤ 50%	94°F	20 minutes	79°F
94°F	> 50%	94°F	22.5 minutes	79°F
95°F	≤ 50%	95°F	20 minutes	80°F
95°F	> 50%	95°F	22.5 minutes	80°F

*Préchauffage requis

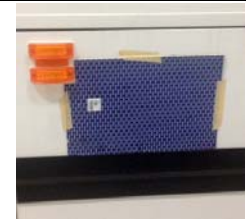
* preheating required

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7. Block the evaporator fresh air intake. You may use large masking tape, a piece of cardboard or similar products.



H3



X3

8. In order for the test to be valid, close all windows, the evaporator compartment door, the condenser compartment door and the entrance door.

9. Start the engine and set to FAST IDLE.



FAST IDLE SWITCH



PREHEATING REQUIRED (test performed in a cold environment).

10. Turn on the heating system if the ambient temperature inside the vehicle is lower than **82°F (28°C)** and adjust set points to the following values:

DRIVER side: **81°F (27°C)**

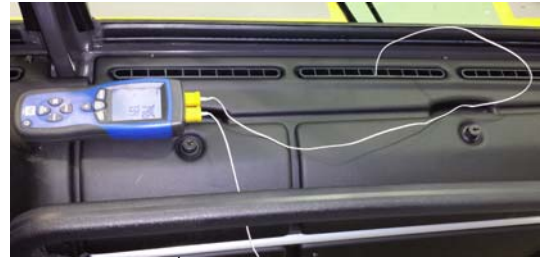
PASSENGER side: **82°F (28°C)**

- Press on REC button to activate air recirculation (1)
- Set the fan to maximum (2)
- Activate the manual defrost button (3)



NOTE: A preheating will not be required if the test is performed in a warm environment. If the ambient temperature inside the vehicle is 90°F for example, then the minimum required temperature at starting of pull-down is reached. The T° inside of the coach at starting of the pull-down will then be 90°F.

11. Install a thermocouple thermometer at the inlet and outlet of the front defrost unit. Sensors must be placed exactly where indicated. If the thermometer has an automatic continuous data recording function, **do not start measuring at this time.**



Insert the 1st sensor in right windshield defrost outlet, second register from the left.



Insert the 2nd sensor in the defrost return air intake, under the screw found at the center.

12. Check if the vehicle is equipped with the optional parcel rack air conditioning system (cooling function with an evaporator inside the unit).

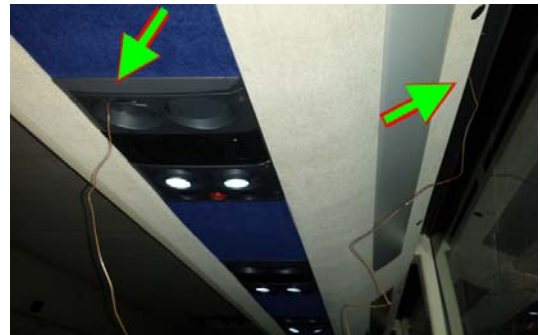
The presence of three screws indicates that an evaporator is installed in the parcel rack ventilation system.



For vehicles equipped with the optional parcel rack air conditioning system only:

13. Install one temperature sensor in the intake and one in the closest air register of each parcel rack A/C system (left & right). That makes 4 temperature sensors.

Note: Make sure that the overhead air registers are all closed.



14. If a preheating is in progress (step 8), continue heating up until inside temperature on the PASSENGER side reaches 84°F (29°C).

Note: The temperature displayed on the PASSENGER side of the HVAC control module is the actual ambient temperature in this area.



15. Now, adjust the set points to the minimum values:

DRIVER side: 60°F (16°C)

PASSENGER side: 60°F (16°C)

- Press on REC button to activate air recirculation (1)
- Set the fan to maximum (2)
- Press and activate the manual defrost button (3)

Note: The entrance door must remain closed at all time during the test.



STARTING OF PULL-DOWN

16. If a preheating (step 8) was done, check and record the A/C compressor high side (HiS) and low side (LoS) pressure values when the passenger area ambient temperature reaches 82°F (29°C).

If a preheating was not necessary, check and record the A/C compressor high side (HiS) and low side (LoS) pressure values at starting of the pull-down. Take note of "T° inside of the coach at starting of the pull-down"= _____ ° F

LoS= _____ psi

HiS = _____ psi

17. Start your timer at once. This is the starting of the pull-down.

18. On your thermometer, start the continuous moving average **T1-T2 AVG** data recording...

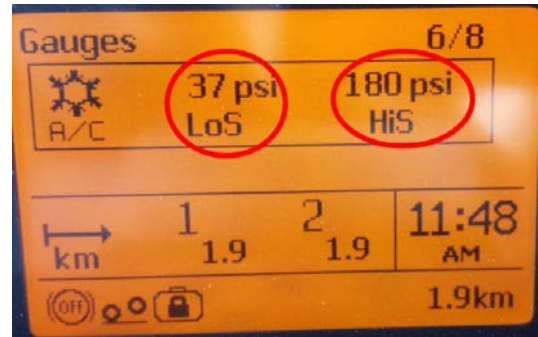
or

If this function is not available on your thermometer, note the value of temperature differential **T1-T2**, 5 minutes, 6 minutes and 7 minutes after the starting of the "pull-down".

T1-T2 @ 5 min = _____ ° F

T1-T2 @ 6 min = _____ ° F

T1-T2 @7 min = _____ ° F



19. While the temperature is decreasing inside the vehicle, go to the condenser compartment. Close the entrance door behind you. Check the moisture indicator.

No bubbles should be seen.

By color matching, the moisture indication should indicate CAUTION or DRY.

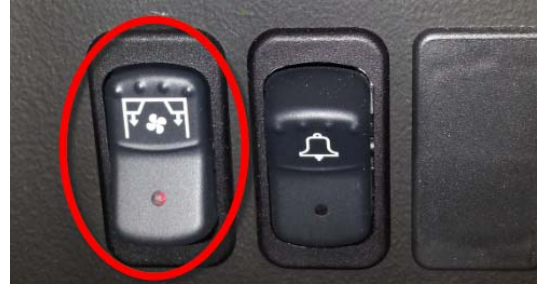
20. Close the condenser compartment door, return inside the vehicle and close the entrance door behind you.



For vehicles equipped with the optional parcel rack air conditioning system

21. Activate the parcel rack A/C system when reaching 5°F (3°C) over the “pull-down stopping T°” of the chart on page 4.

Example: If the “pull-down stopping T°” is 67°F (19°C), activate the switch at 72°F (22°C).



STOPPING OF PULL-DOWN

22. When the PASSENGER side displayed temperature has reached the “T° inside of the coach at stopping of pull-down” of the table on page 4...

- a) Check and record the A/C compressor high side (HiS) and low side (LoS) pressure values.

LoS= _____ psi

HiS = _____ psi

- b) Check and record the elapsed time on your timer. Elapsed time should not exceed the **Maximum duration of « pull-down »** (as per table)”.
Elapsed time= _____ min

- c) Take note of the average differential temperature T1-T2 AVG at the front defrost unit as measure by the thermometer.

Defrost T1-T2 AVG= _____ ° F

or

if this function is not available on your thermometer, calculate the average of T1-T2 values at 5 minutes, 6 minutes and 7 minutes.

Calculate the following average (take the + or – signs of values into account in the calculus):

$$\text{average T1-T2} = \frac{(T1-T2 \text{ 5min}) + (T1-T2 \text{ 6min}) + (T1-T2 \text{ 7min})}{3}$$

Average T1-T2= _____ ° F

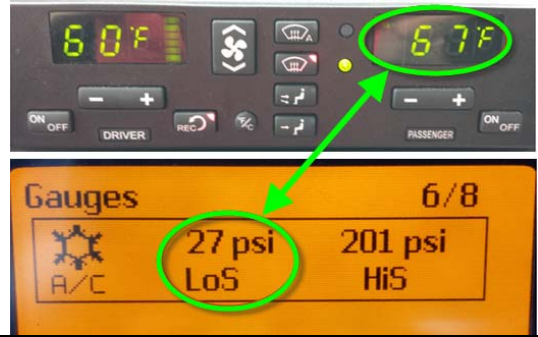
(If the result is negative (minus sign) do not consider the minus sign in this result.

Note: defrost T1-T2 AVG or average T1-T2 as calculated must be ≥ 9°F (5°C)



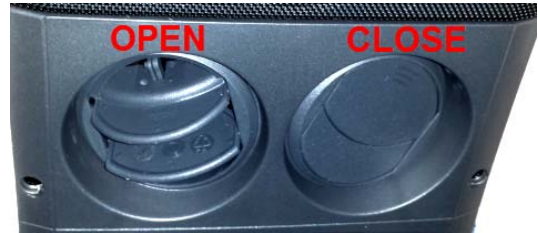
23. **SPECIFICATION:** For a PASSENGER side displayed ambient temperature within the range of **66°F to 70°F** (19° C & 21° C), the value of the low side pressure (LoS) must be between **25 PSI and 27 PSI**.

IMPORTANT: If the value is outside the above specification, adjustment of the expansion valve **superheat** is needed.



For vehicles equipped with the optional parcel rack air conditioning system:

24. For the entire vehicle (left & right side), at each pair of seats, open one of the two air registers.



For vehicles equipped with the optional parcel rack air conditioning system:

25. Record the temperature differential **T1-T2** between the intake temperature and outlet temperature of each parcel rack A/C unit (thermometers installed at step 13).

Left parcel rack A/C unit **T1-T2**= _____°

Right parcel rack A/C unit **T1-T2**= _____°

*Note: parcel rack A/C unit **T1-T2** should be > 15°F (8°C). Negative sign if present is not important.*



For vehicles equipped with the optional parcel rack air conditioning system:

26. Turn OFF the parcel rack A/C system.

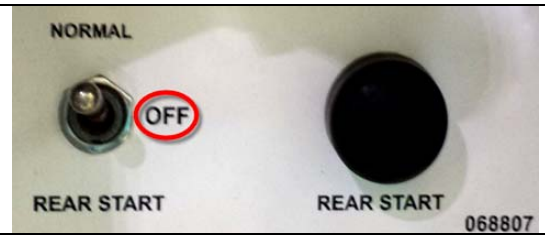


27. Deactivate the engine FAST IDLE.



FAST IDLE SWITCH

28. Stop the engine using the engine rear start switch.



29. Reinstall the unloader coil.



30. Set the rear start selector switch to NORMAL.

31. Return inside the vehicle. Start the engine and set to FAST IDLE.



32. Adjust the set points to the minimum values:

Driver side: 60°F (16°C)

Passenger side: 60°F (16°C)

- Press on REC button to activate air recirculation (1)
- Set the fan to maximum (2)
- Press and activate the manual defrost button (3)

Note: The entrance door must remain closed at all time during the test.



33. Increase the engine speed to **2000rpm** and maintain during 3 minutes.

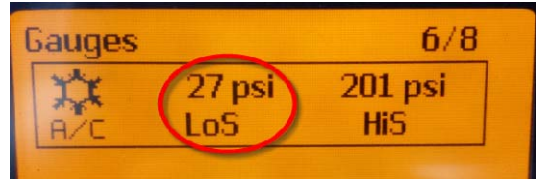


34. Check the displayed LoS value and record the lowest value obtained during the 3 minutes period.

Lowest LoS value= _____ PSI

Note: The low pressure warning signal should not activate. LoS value should normally be greater than 16 PSI.

LoS > 16 psi



35. Stop the engine.

36. Remove the evaporator fresh air intake obstruction

37. Performance test is completed.



PRESSURE VERSUS TEMPERATURE CHART

PSI	TEMPERATURE (°F)	TEMPERATURE (°C)	PSI	TEMPERATURE (°F)	TEMPERATURE (°C)
-5	-22	-30.00	56	57	13.89
-4	-21	-29.44	58	59	15.00
-3	-19	-28.33	60	60	15.56
-2	-18	-27.78	62	64	17.78
-1	-16	-26.67	64	65	18.33
0	-15	-26.11	66	66	18.89
1	-12	-24.44	68	68	20.00
2	-10	-23.33	70	69	20.56
3	-8	-22.22	72	71	21.67
4	-5	-20.56	74	72	22.22
5	-3	-19.44	76	73	22.78
6	-1	-18.33	78	75	23.89
7	1	-17.22	80	76	24.44
8	3	-16.11	85	79	26.11
9	5	-15.00	90	82	27.78
10	7	-13.89	95	85	29.44
11	8	-13.33	100	88	31.11
12	10	-12.22	105	90	32.22
13	12	-11.11	110	94	34.44
14	13	-10.56	115	96	35.56
15	15	-9.44	120	98	36.67
16	16	-8.89	125	100	37.78
17	18	-7.78	130	103	39.44
18	19	-7.22	135	105	40.56
19	21	-6.11	140	107	41.67
20	22	-5.56	145	109	42.78
21	24	-4.44	150	112	44.44
22	25	-3.89	155	114	45.56
23	26	-3.33	160	116	46.67
24	27	-2.78	165	118	47.78
25	29	-1.67	170	120	48.89
26	30	-1.11	175	122	50.00
27	31	-0.56	180	123	50.56
28	32	0.00	185	125	51.67
29	33	0.56	190	127	52.78
30	35	1.67	200	129	53.89
31	36	2.22	205	131	55.00
32	37	2.78	210	132	55.56
33	38	3.33	220	134	56.67
34	39	3.89	230	137	58.33
35	40	4.44	240	140	60.00
36	41	5.00	250	143	61.67
37	42	5.56	260	146	63.33
38	43	6.11	275	149	65.00
39	44	6.67	290	153	67.22
40	45	7.22	305	157	69.44
42	46	7.78	320	162	72.22
44	48	8.89	335	166	74.44
46	50	10.00	350	171	77.22
48	51	10.56	365	174	78.89
50	52	11.11	380	177	80.56
52	54	12.22	405	182	83.33
54	56	13.33	500	202	94.44