Espar Hydronic heater – '08 Navion iQ/'07 Sprinter Chassis.

A brief history… I removed the furnace from my unit to install a larger refrigerator, therefore needed a new source of interior heat for the coach.

The '07 thru '09 Dodge/MB NCV3 has a custom Espar D5WS Hydronic heater as standard equipment, but no way to access it, at least as I could determine, for use outside of supplemental engine heating. That use would not fulfill my requirements, so I proceeded to resolve the issue.

I started out having conversations with Dodge, Freightliner, and Mercedes Benz technicians to determine how the Espar operated along with the MB ECM. These conversations proved that this was not an item that they had much knowledge about, and is a "remove and replace" failure item, not shop repairable, therefore not worthy of in-depth knowledge at the dealership levels.

I then went to a local service shop, Thermo King West, and worked with them to find out what could be done with this unit. They contacted Espar in Ontario, Canada and determined that it may be possible to change out the D5WS's CPU to a generic one, but no guarantees that it would work.

Then I used the information website, Alldatadiy.com, to get as much knowledge myself of the wiring and control circuits of this one on the NCV3. I also read as much as I could find on modifications people had done to the I5/T1N chassis' Espar, which happens to be a generic D5WS unit.

Right off the top I found that MB had removed the ability to "start" the Espar by applying 12vdc to the yellow(#7) wire. This wire does not even exist in the MB vehicle harness. Instead, the MB Espar is controlled thru the CAN Bus from the ECM. I did find that wiring from Alldatadiy (http://www.alldatadiy.com/) and have attached pictures of it for reference.

At this point, I found a really great company, Lubrication Specialists (http://www.lubricationspecialist.com), who are an authorized Espr repair shop and worked with me to swap out the controller, overhaul, and verify operation of the Espar as a generic unit. The cost of this was approximately $475, and worth every bit of it. That allowed me to use the existing fuel pump, tank feed, and mounting hardware with no alterations to the chassis. I did have to install a relay to use the MB recirculating pump, and of course, the necessary hoses and heat exchanger to provide the coach with heat. Those additional items added another $200 to the project.

What follows here is some notes and photos of the project..

Determine if you have the Espar on your unit. Take a look under the driver's door and see if there is a small muffler visible, as shown here;

If so, it is possible to do this mod!

You need to identify where you are going to put the heat exchanger in the coach before you go any further. There are many different configurations, such as the Cozy III or a generic vehicle heater from a source like JEGS This is just two of them. You can also build your own, as I did.

Next locate the Espar. Here is a photo of the unit from below after it was reinstalled. The only visible difference is the new coolant lines added.

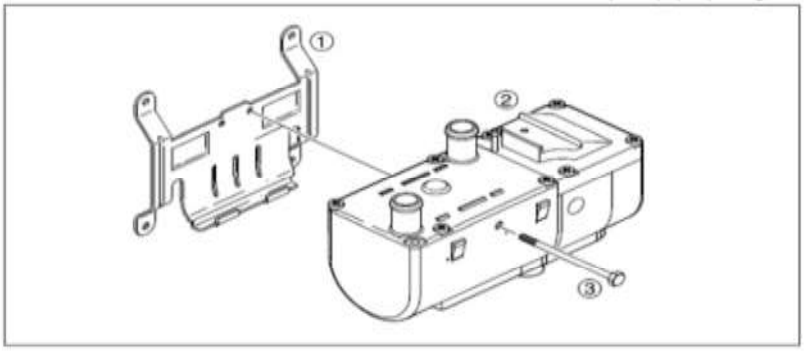
The two hoses can be clamped off here using the 4” vise grip method so you don’t lose all the coolant. Remember, this is the lowest point in the system. The best way is to use a two 4inch vise grip pliers, with electrical tape over the jaws, and clamp off the flow at the rubber hoses. Then use a couple of wine bottle corks to plug the lines once they have been removed.


There are three wiring harnesses, the primary power, the auxiliary coolant pump, and one on the dosing (fuel) pump. Here is some pic’s of the unit on the test bench to give you an idea of what’s there;


You can disconnect these three with a bit of effort, but they are really short and not much length to do that. If you plan to follow thru with this effort, you should just cut the individual wires and tape them up. The codes that the unit may throw to the ECM are info only, and won’t affect the driving, CEL, or the dreaded LHM. Disconnect the fuel line to the dosing pump on top of the unit. There are two tabs that you depress, and the line pulls straight off. It is a semi ridged line so it needs to be disconnected before the unit can come down. There is a tie wrap at the rear of the Espar bracket for the pipe that you will have to cut. Now there are three 10mm nuts, two at the front and one at the rear, which have to be undone to remove the unit.

Before you loosen those, take a minute and unscrew/loosen the clamps that WGO uses to hold the wire looms in place near the fuel filler pipe. Once you can lower the unit, you can loosen the hose clamps and remove the hoses. There is approx. 1 pint of coolant that you will lose, so put some rags down to catch it. If you plan not to use the rig during the time you are doing this then just put the corks in place and tighten them with the clamps. If you are going to use the rig, go to one of the auto stores and buy a 5/8" or ¾" coolant splice adapter and put it in place. This section of the coolant system is in series with the cab heater, so it would be nice to have flow if you are going somewhere.

After moving it all around to drain the coolant out, place the complete unit on a workbench and strip off a couple of parts. Remove the small clamps from the dosing pump diesel hose and slip the pump out of the rubber mount. Remove the large power connector from the bracket by sliding it out of the slot it is in. It is held in by a pair of metal tabs, so you may have to tap on it with a small ballpeen hammer.
Then remove the mounting bracket from the unit, as shown below. Don't discard the bolt, as it can be reused by applying Locktite to the threads.



① Heater bracket
② *HYDRONIC*
③ Fastening screw

At this point if you haven't already, I recommend that you contact Greg at Lubrication Specialists (http://www.lubricationspecialist.com) or get in touch with an Espar refurbish facility (let me know if you find another one) and discuss what you are doing. The Espar controller/CPU module, shown below,

Heater Controller

Sale Price: $347.70
Compared at: $463.58
You Save: $115.88

ECM fits hydronic models 25 2217 05//25 2219 05//25 2325 05 heaters.
Product ID : 22 5201 04 0011
Weight: 1.50 lbs

0 review(s)

is the part that you will need. You will need to purchase a new harness side connector, about $20, for the reinstall effort.

(side note here, they carry the EZ-106-S 14mm-1.5 Thread oil drain valve for the Sprinter for $28. A definite must have if you do your own work.)

By now you should have determined where the heat exchange is going to be located. Now you need to determine where the new controls are going to be. The controls will consist of a SPST switch (I used a lighted one from Radio Shack) and, if your exchanger fans have one, a speed controller.

The Espar has built in temperature controls, so the only part the rv's thermostat will be controlling is the exchanger fan. When you are using the Espar, you switch it on, and let it cycle through as it needs to keep the engine/exchangers at 150 to 170 degrees(approx.)

Here is a picture of the two self-built heat exchangers I installed;

The front exchanger is located at the bottom of the front drawers.

There are some items, wiring harness, ductwork, etc., that need to be moved around, and the drawer may need to be rebuilt. The stock drawer has only a horizontal depth 7”, so is pretty worthless. With some minor effort, I changed the horizontal depth to 14” and raised the bottom to provide clearance, while keeping 6½” vertical depth.

The controls, a lighted SPST switch for the Espar activation, the Exchanger fans, the recirculating pump, and a Pulse Wave Modulator (PWM) Variable DC speed controller are mounted on the wall of the closet. These items are shown in the as-built drawing further on in this document.

Also, after 3 years of use, an additional item was added, the High Altitude Sensor kit. It helps prevent “sooting up” the unit when operating for extended periods above 4500ft.

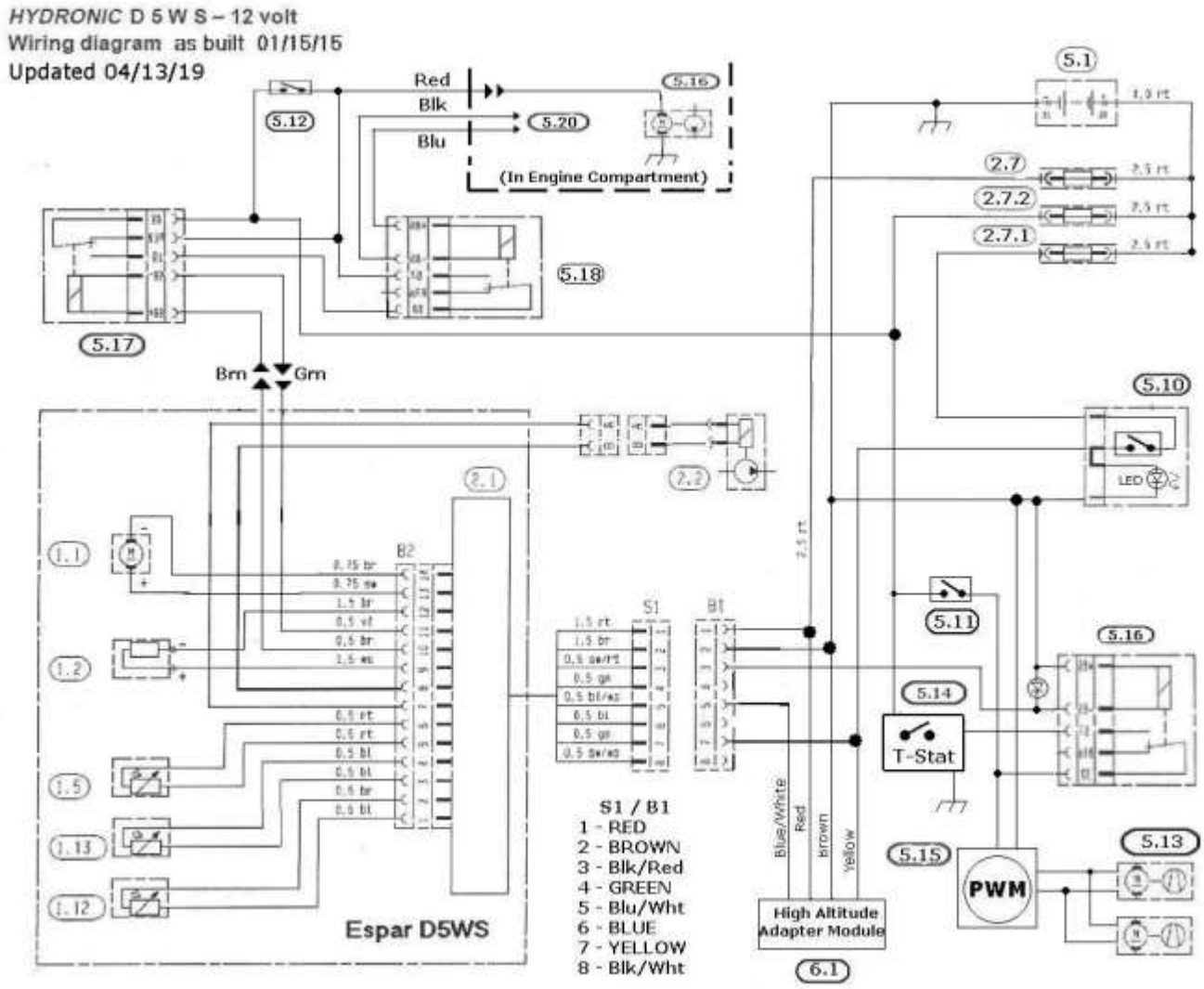
The plumbing is shown here, coming from the Espar, along the bottom, and up thru the propane tank area;



Once the Espar was reinstalled the rear hose, which is the output from the unit, is coupled into the hose going to the exchanger. The return line connects up to the steel line going towards the engine. The second picture is of the MB recirculating pump that is located behind the air filter box. There are two circles, the red one showing the pump, and the green one showing the new relay you need to install.


The relay is required to operate the entire setup when the engine is off The current draw is fairly small and shouldn't make a difference. The relay is controlled by the SPST switch for the Espar and is required so the REST function on the Sprinter will still work properly.

Here is the schematic of the project as-built and updated;



Espar D5WS System '08 NavioniQ

Parts List - As Built 04/13/19

1.1 Heater Motor
1.2 Glow Plug
1.5 Overheating Sensor

1.12 Flame Sensor
1.13 Temperature Sensor

2.1 Controller/CPU
2.2 Fuel Dosing Pump
2.7 20A Main Fuse - Fuse 1 in Battery Box
2.7.1 5A Actuation Fuse - Fuse 2 in Battery Box
2.7.2 15A Heating System Fuse - Convertor Box #4

5.1 Coach Batteries
5.10 Actuation Switch
5.11 Fan Override Switch
5.12 Pump Override Switch
5.13 Heat Exchanger Fan Motors - 2each
5.14 Coach Thermostat
5.15 Pulse Wave Modulator (PWM) -Variable DC Speed Controller
5.16 Fan Control Relay
5.17 Espar Water Pump Relay
5.18 Sprinter Water Pump Relay
5.20 Sprinter Recirculation Control Signal

6.0 High Altitude Compensating Module

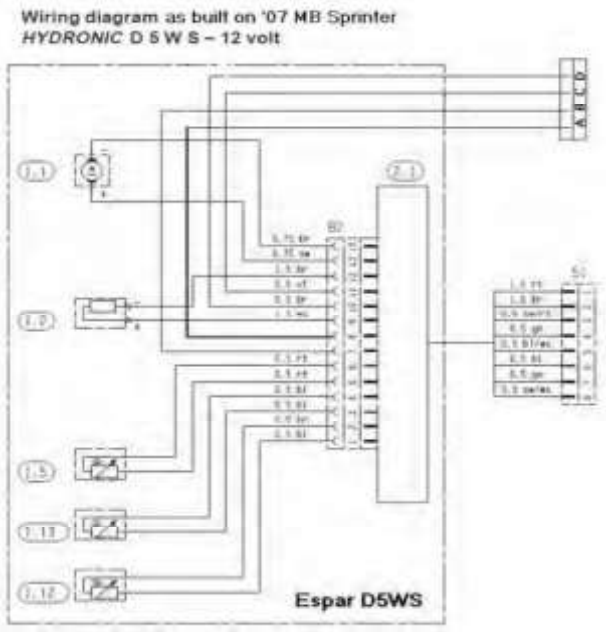
Espar Connector B1/S1

Pin#	Color	Function
1	Red	Main Power
2	Brn	Ground
3	Blk/Red	Fan Enable
4	Green	Not Used
5	Blu/Wht	Diag
6	Blu	Not Used
7	Yellow	Activation Power
8	Blk/Wht	Not Used

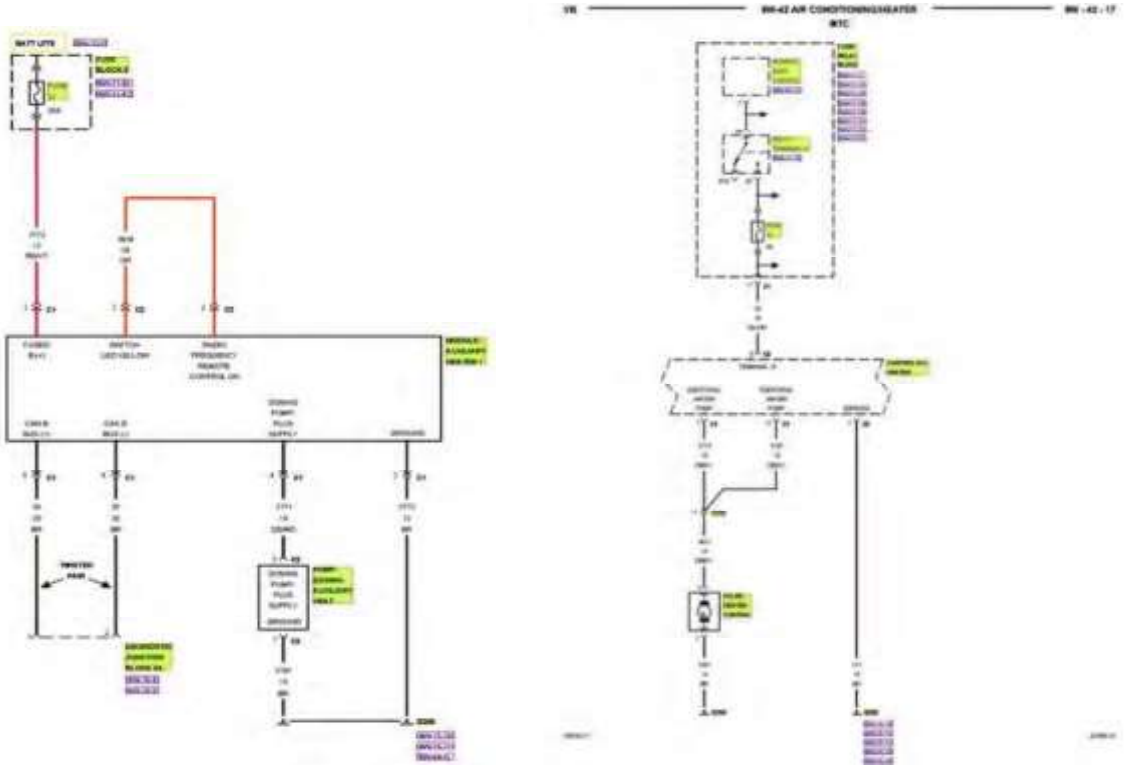
Espar Wire Color code

rt = Red
bl = Blue
ws = White
sw = Black
gn = Green
gr = Grey
go = Yellow
vi = Violet
br = Brown
li = Lilac

Here is the schematic of the original controller configuration as installed;



These are drawings of the original interconnections to the MB ECM;



Here is the basic flow diagram of the unit and a sectional diagram of the Espar and components;

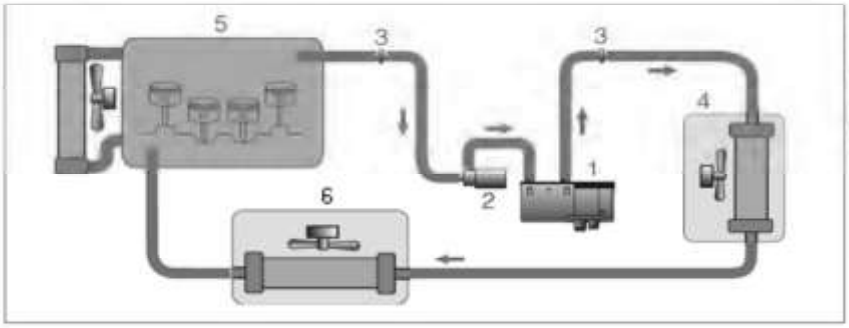
Connection to the cooling water circuit

Integrate the heater in the water feed pipe from the vehicle engine to the heat exchanger "inline connection"

Disconnect the water feed pipe from the vehicle engine to the vehicle heat exchanger. Connect up the heater with connection pieces and water hoses to the water feed pipe.
Route and connect a water hose from the pressure connection of the water pump to the water intake connection of the heater.

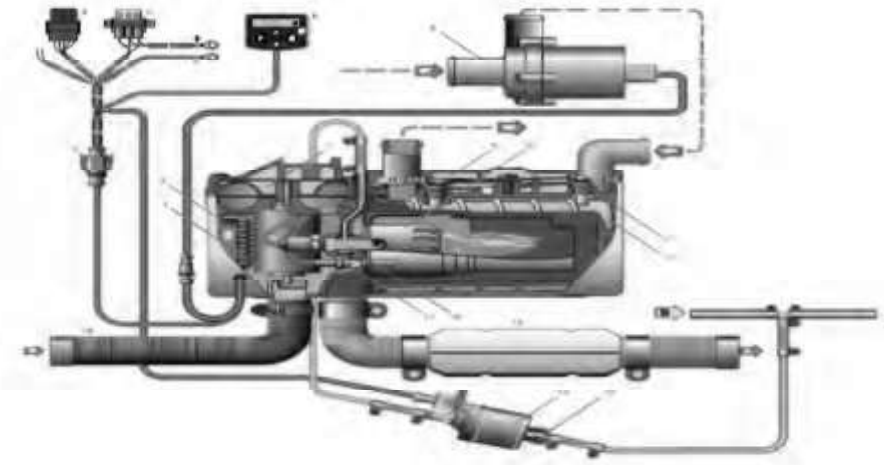
Heating characteristics

When the heater is switched on, the heat flows through the vehicle heat exchanger and the vehicle engine. Once the cooling water has reached a temperature of approx. 30 °C, depending on the selected fan setting the vehicle fan is switched on and the heat is also conveyed to the passenger compartment.



① Heater
② Water pump
③ Connection piece
④ Coach Heater
⑤ Vehicle engine
⑥ Chassis Heater

Sectional drawing *HYDRONIC* D 5 W S



1 Electric motor
2 Controller
3 Interface / 8-pole connector
4 Fan relay
5 Fuse holder
6 Mini timer
7 Combustion air fan
8 Water pump
9 Temperature sensor
10 Combustion chamber
11 Overheating sensor
12 Heat exchanger
13 Cup filter, fitted in dosing pump
14 Dosing pump
15 Exhaust pipe with exhaust silencer
16 Glow plug
17 Flame sensor
18 Combustion air pipe

A = exhaust
B = fuel
C = combustion air
WA = water discharge
WE = water intake

If you have any questions, or want better copies of the pictures within, please contact me at jmw@silkear.com