Migration from Uniwersal control to LesveDomeNet control

Erik Bryssinck – *version 2* - aug. 2018

important remark before starting

1. This description is made for the Uniwersal control (hardware) v4. You must carefully compare your control-system with this schematic drawing
2. I can not be held responsible for any errors. I myself have performed and tested it on my dome, and there are possible certain small differences between the different versions and domes.
3. before starting, place the control completely without tension !

The LesveDomeNet software works in a different way than Uniwersal. It is therefore not possible to adjust just a few wirings. The output relays connected to the Velleman K8055 card must all (4 pcs) be replaced. Different types and models can be used here. However, please note that the voltage of the coil must be 12VDC and the contacts can be used at least 8 A or better up to 16A. For the test I have taken 8A as contact current (especially for the 12VDC motors of the shutters)

What are the main differences and must be changed.

1. **Here can you see an overview of the in- and outputs of the 2 different solutions:**

function	Uniwersal Input	Uniwersal Output	LesveDomeNet input	LesveDomeNet output
azimuth sensor	1		1	
Home switch	3		2	
Direction Azimuth	2		4	
shutter OPEN	4			
shutter CLOSE	5			
OPEN shutter		3		5
CLOSE shutter		4		6
AZIMUTH CW		1		1
AZIMUTH CCW		2		2

2. **Outputs shutter and azimuth motor**

   The working of the LesveDomeSoftware is different. One output is always energized and the other output determines the direction, both for the shutter and the rotation.

For example: You want to open the shutters, the output 5 would be energized. If you want to close the shutters: output 5 **AND** output 6 are both energized for the LesveDomeNet solution.
This means that the 4 outputrelais must be changed and rewired. Because of the PCB with 4 relais of the Uniwersal solution, this board must be removed and can't be used again.

Relayboard must be removed

3. Home switch

Homeswitch contact must only be rewired from input 3 to input 2 of the Velleman printed circuit board.
Be aware !!: You must also remove the Velleman K8055 board because there is on the back a soldered wire from Output 2 to input 2 and must be removed with a soldering iron

4. Shutter open/close limit switch

Uniwersal has 2 inputs, 4 + 5 as be used in the control software and are the limit switches of the shutters upper and lower shutter. the shutter motors always stop at the limit switches. Uniwersal used this inputs for interupting the power and outputs of the Velleman. Uniwersal uses these extra limit-switches to interrupt the power to the motors and as input on the Velleman Board.
This isn't really needed for LesveDomeNet. **The shutter motors stop always on the limit switches.** This is for both system (Uniwersal & Lesvedomenet) the same. For LesveDomeNet is this extra security done by a timerfunction in the software. You need to enter the total duration that the shutters need to completely close or open, in the Lesvedome.net software as extra security. The power is shutting down after the time is reached, but the motors are stopped before that by the limit-switches. If this is not the case, please increase this time with a few seconds or determine again with manual control (remote controle) how many time it takes to open the shutters.
This function in Lesvedomenet, is an extra security if one of the limitswitches failed.

5. **Direction of azimuth motor.**

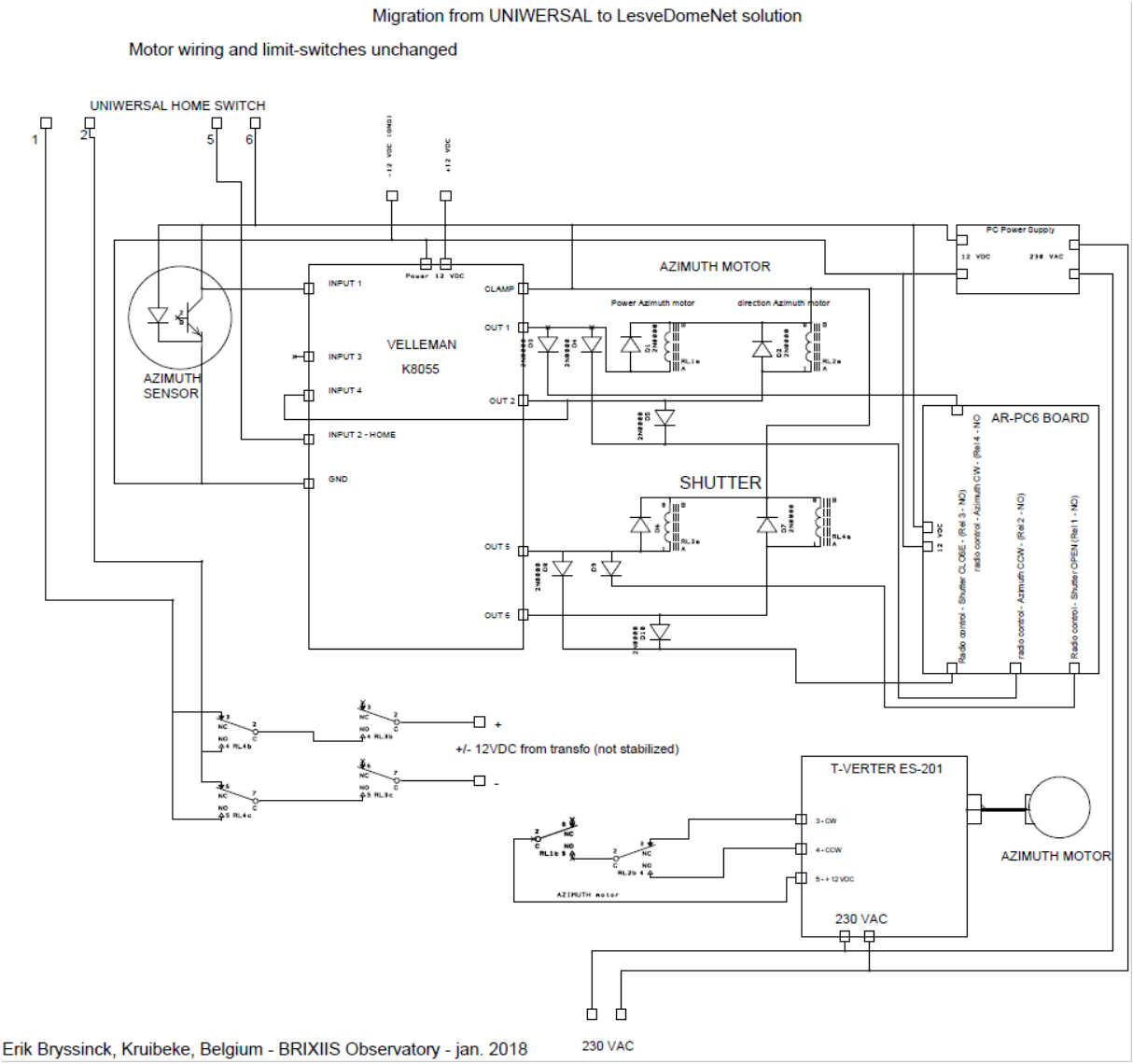
This is a hidden connection on the back of the Velleman K8055 board. This a soldered wire from output 2 to input 2. Please remove carefully this wire with a soldering iron. This function is by use of LesveDomeNet made with a wire via the screw connections.

6. **Azimuth sensor**

The existing azimuth sensor can also be used for the LesveDomeNet solution. There is normally no change needed here, if you are using the K8055**N** board.

Azimuth sensor on the azimuth motor of the Uniwersal dome 2.2M

Drawing of the LesveDomeNet solution for Uniwersal domes



Hardware solutions and what is needed:

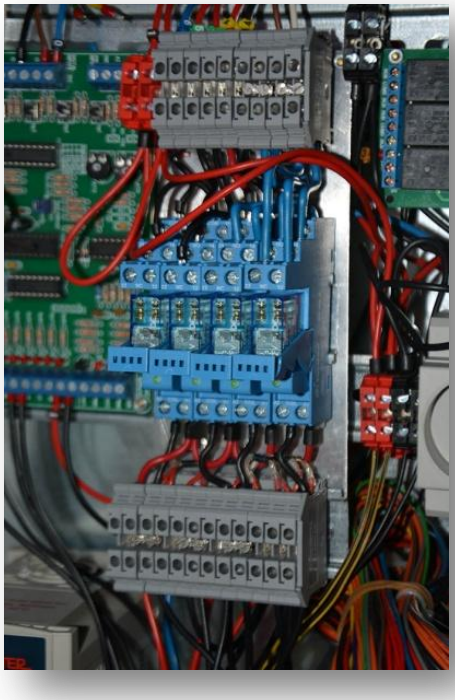
As first test i used 4 separate relais with 12VDC coil and double contacts 8 AMP (or more) + diode and ordered by Conrad:

Finder 95.95.3 Relaissocket + Finder 99.80.9.024.99 diode module + Finder 40.52.9.012.5000 Printrelais 12 V/DC 8 A 2x

contacts + Finder blue bracket + 6 pcs diode 1N4004

Of course you can use other relays like the Velleman R10HD122C + Velleman SO8P sockets

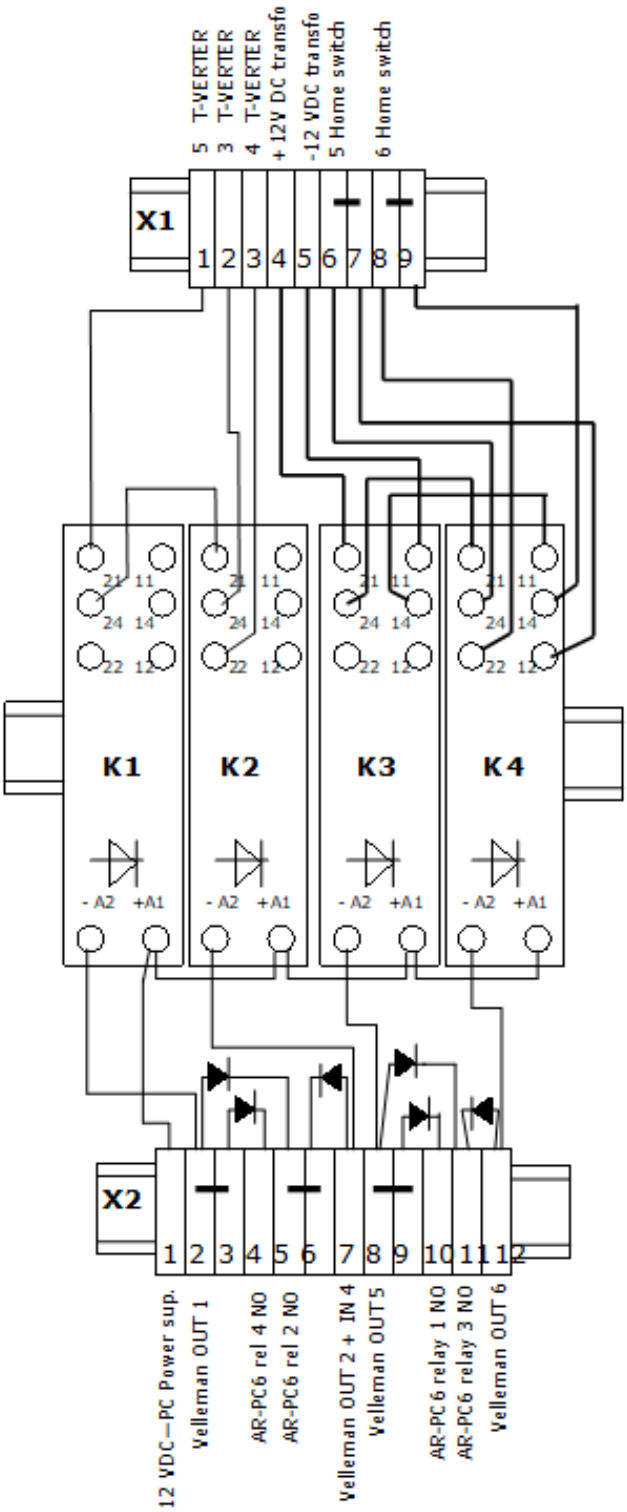
Here the image after my change from Uniwersal to LesveDomeNet hardware.



Next page can you find the wiring of the relays i used. Of course you can use other relays, better is relays with 10A or 20 A contacts, because the current for the upper shuttermotor is pretty high (about 20 AMPS – 12VDC)

in the diagram below the wires are thicker marks for the power of the shutter motor.
Please use 2.5 mm² section here or better 4 mm².
the 6 extra diodes are needed to be able to use the radio control (AR-PC6 board)

Relay wiring for Uniwersal dome conversion to LesveDomeNet software solution



part list

description	aantal
alu plate 2mm thickness 80mm x 200mm	1
Fibox TEMPO DR 215 DIN-rail 215 mm	1
Phoenix Contact UT 4 Serieklem-men UT	21
Phoenix Contact 0203454 - fixed bridge 10 positions	1
Finder 95.95.3 Relaissocket	4
Finder 99.80.9.024.99 relays acces-sory (diode + led)	4
Finder relay bracket	4
INDER 40.52.9.012.5000 Relay: DPDT 12VDC 8A/30VDC	4
wire 1,5 mm²	5m
wire 2,5 mm²	5m

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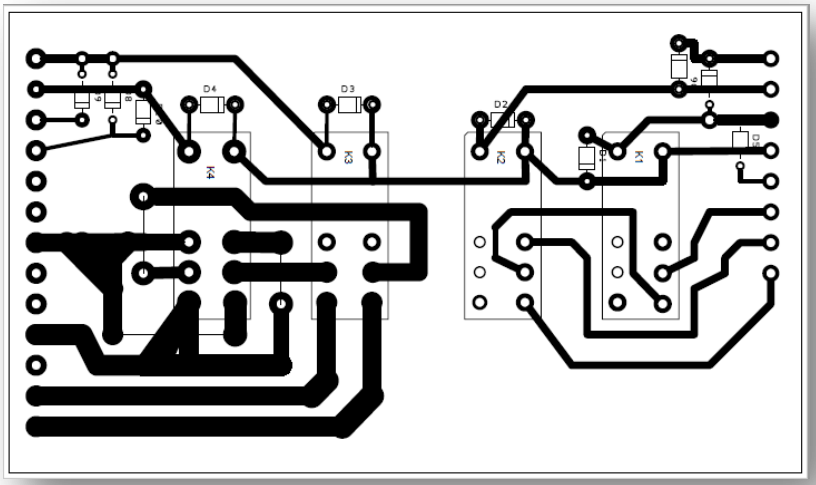
Other solution is use of PCB board. I designed a PCB board but i don't made it yet. I make it available here for those who want to make a PCB. (also available via this link



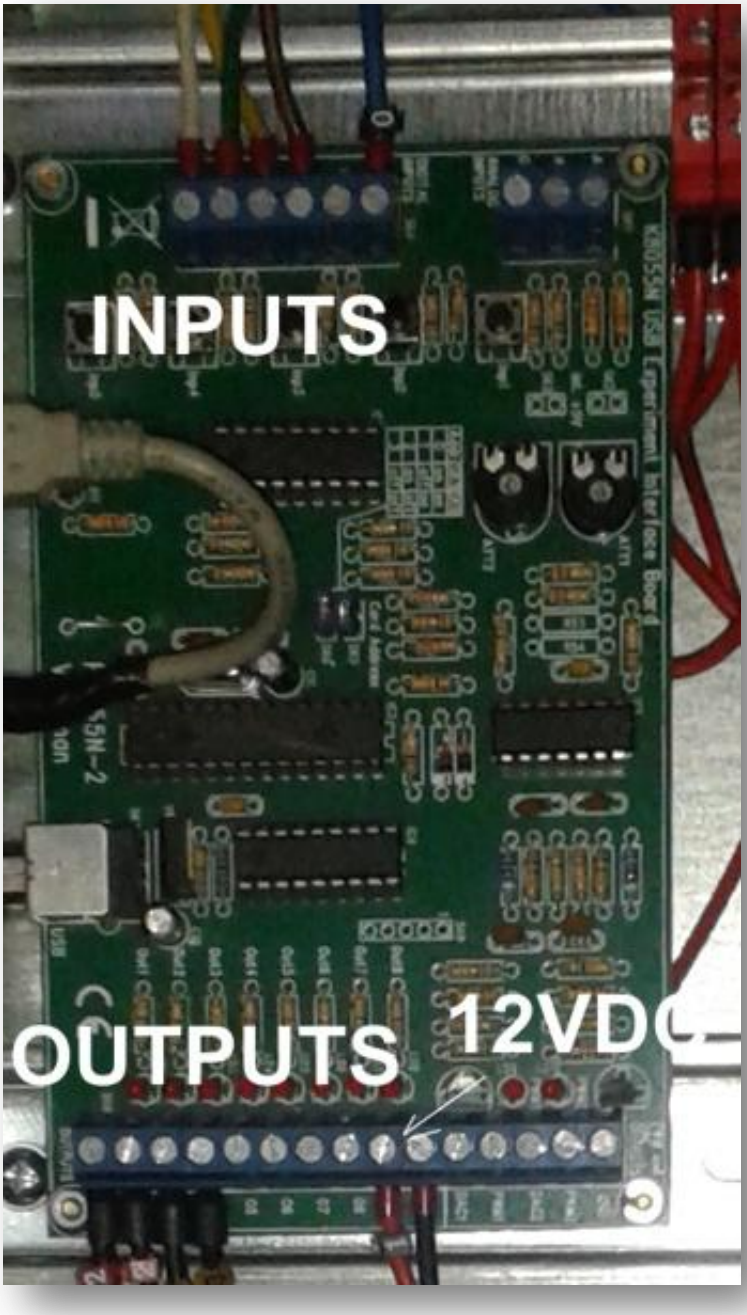
You can use the same relays : Finder 40.52.9.012.5000 Printrelais 12 V/DC 8 A on this PCB. You need therefore 10x diode 1N4004 and screw PCB-connectors as well.

Important ! The current of the shuttermotor is about 20 AMP. So you can better choose a relais that can switch the 20AMP for the motor.

Note: the printed circuit board need some extra wires to make bridges on the board. Also this board isn't tested, so if you want to use this board, please make first some tests or check the board.

how to start practically?

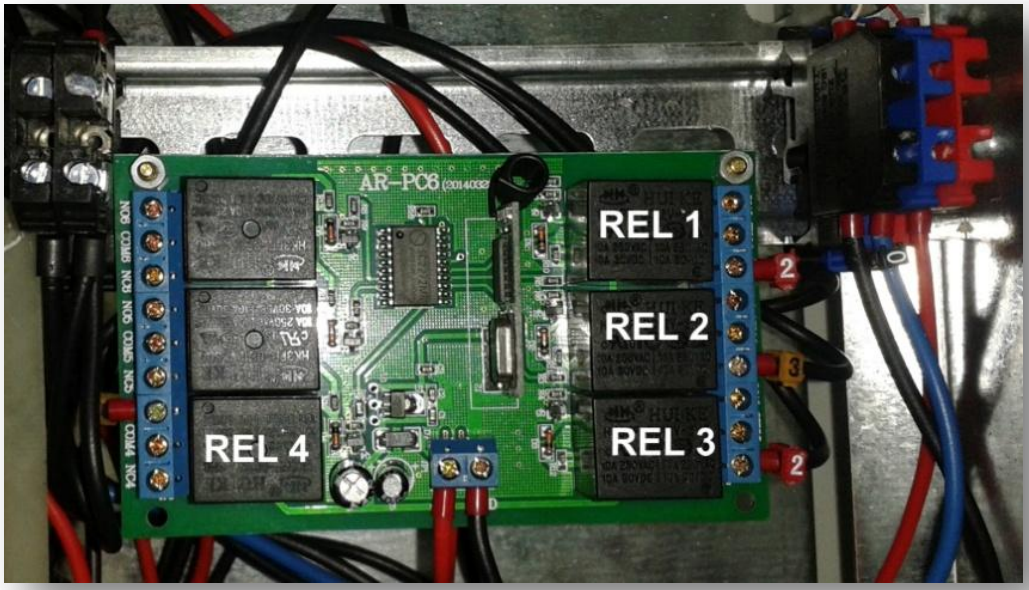
1. First start with assembling the relays like schematic wiring, if you take this solution of course.
2. pull the 230VAC plug out of the socket of the steering box.
3. I started with loosening the relayscard (**not the wires**) but the wires not loosened and the relay print hung aside (remains hanging on the wires)
4. Remove also the Velleman K8055N board. You see on the back of the PCB-board a wire between input 2 and output 2. This wire must be removed with a soldering iron. If you don't have a soldering iron, you can cut the wire on the connections.
5. mount the Velleman K8055N back to its original position
6. mount the relay ensemble on the existing din rails (note other versions are possible I have already noticed at other Uniwersal dome users)



Velleman K8055N board (before conversion)

7. Then you can start wire by wire to rewire the control box. I did this by starting with the velleman K8055N Board and remove the wire on input 3 (Home sensor) and move to input 2.
8. Remove the wires of Velleman input 4 + 5 they are not needed anymore (provide the wire ends with some insulation tape)
9. We leave Velleman INPUT1 as it is (azimuth sensor)
10. make a connection on Velleman K8055N: output 2 to input 4
11. Now we start with the 12VDC connection for the relays. Remove now the 12VDC wire from the old relay PCB-board and put this on the 12VDC relais assembly (X2:1)
12. Remove the Velleman 1 output wire. Possible are this 2 wires, 1 from Velleman board to old relays PCB board and other wire to the AR-PC6 radio control board.

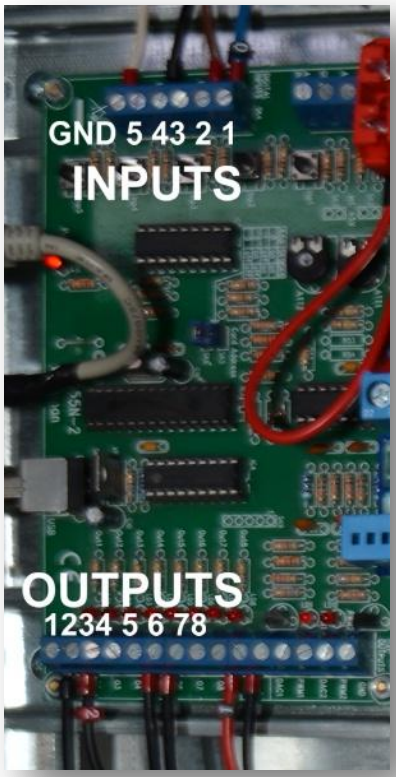
13. Remove these wires (could be used again with some shortening of the wires)
14. Make connection from Velleman OUT1 to new relays assembly X2:2
15. The same for output 2 of Velleman: remove the wired of OUT2 and the old relay PCB board
16. Make connection from Velleman OUT2 to X2:7 of the relays assembly
17. Remove output 3 of the Velleman board (2 wires)
18. Remove output 4 of the Velleman board (2 wires)
19. Make connection from Velleman OUT5 to X2:8
20. Make connection from Velleman OUT6 to X2:12
21. Remove the wires of the old relays PCB-board which are go to the T-Verter drive (3 wires)
22. Make now connection from T-Verter drive 5 to X1:1 of the new relay assembly.
23. Make connection from T-Verter drive 3 to X1:2 of the new relay assembly.
24. Make connection from T-Verter drive 4 to X1:3 of the new relay assembly.
25. Remove the wires of the old relays PCB-board which are go to the power (transfo) (red and black wire)
26. place the red wire coming from the power supply to X1: 4 and the black to X1: 5
27. now remove the (shielded) cable from the old relay PCB board which goes to the homeswitch for the power to the dome
28. connect this cable to the X1:6 en X1:8 (in my case it this brown to X1:6 and white to X1:8 but this can be different for other domes)
29. Normally all the wires of the old relays PCB-board are removed.
30. Next the connection to the AR-PC6 board are to made. Here you can see how i made the numbers of the outputs of the AR-PC6 radio control board.
31. you have to make the connections of these 4 relays to the new relays assembly. this means from AR-PC6 REL1 NO-connector to X2: 10, then REL2 NO-connector to X2: 5, then REL3 NO-connector to X2: 11 and last REL4 NO-connector to X2: 4



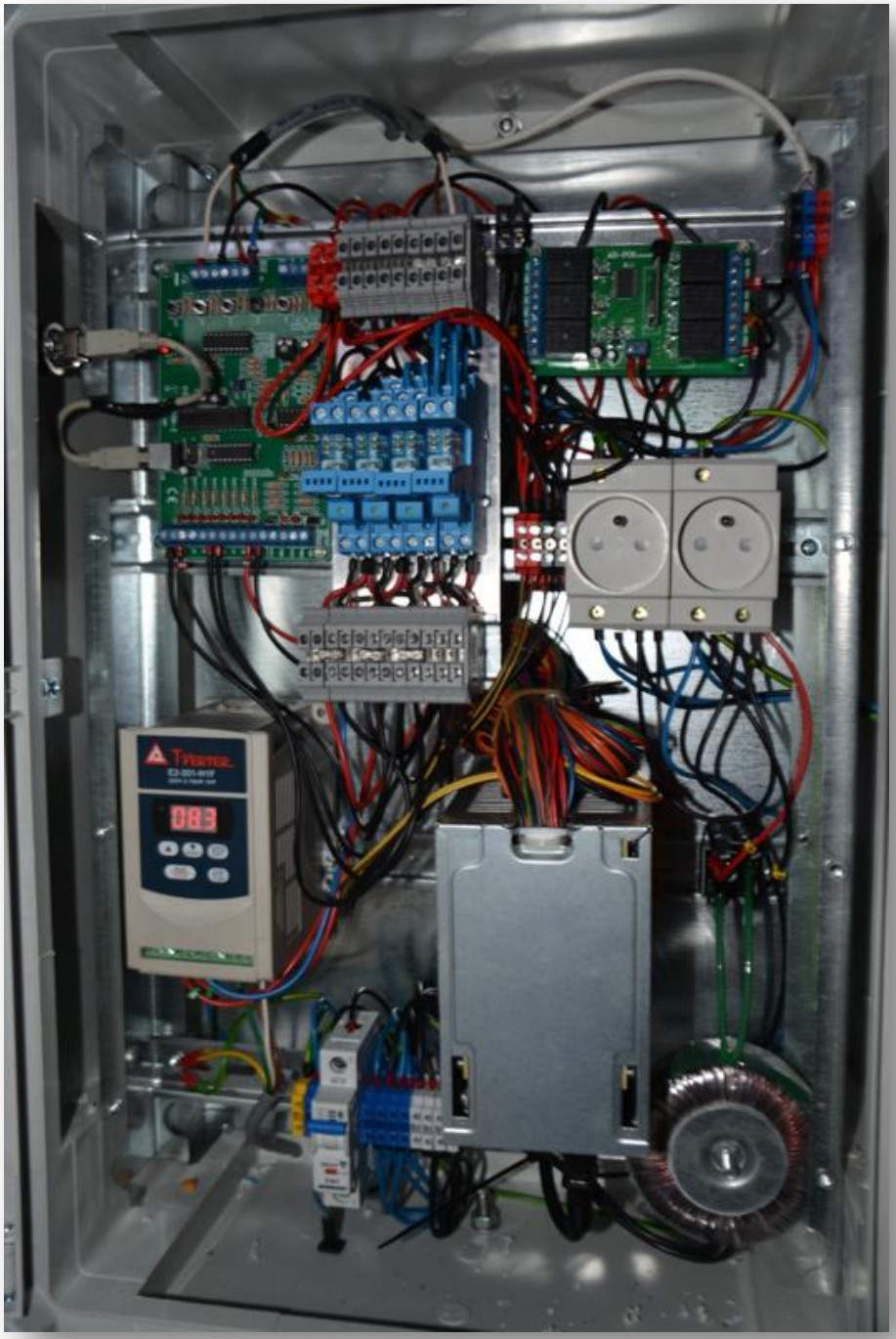
AR-PC6 radio remote control board

Remote control

32. You can check now the wires of all the boards that are changed:

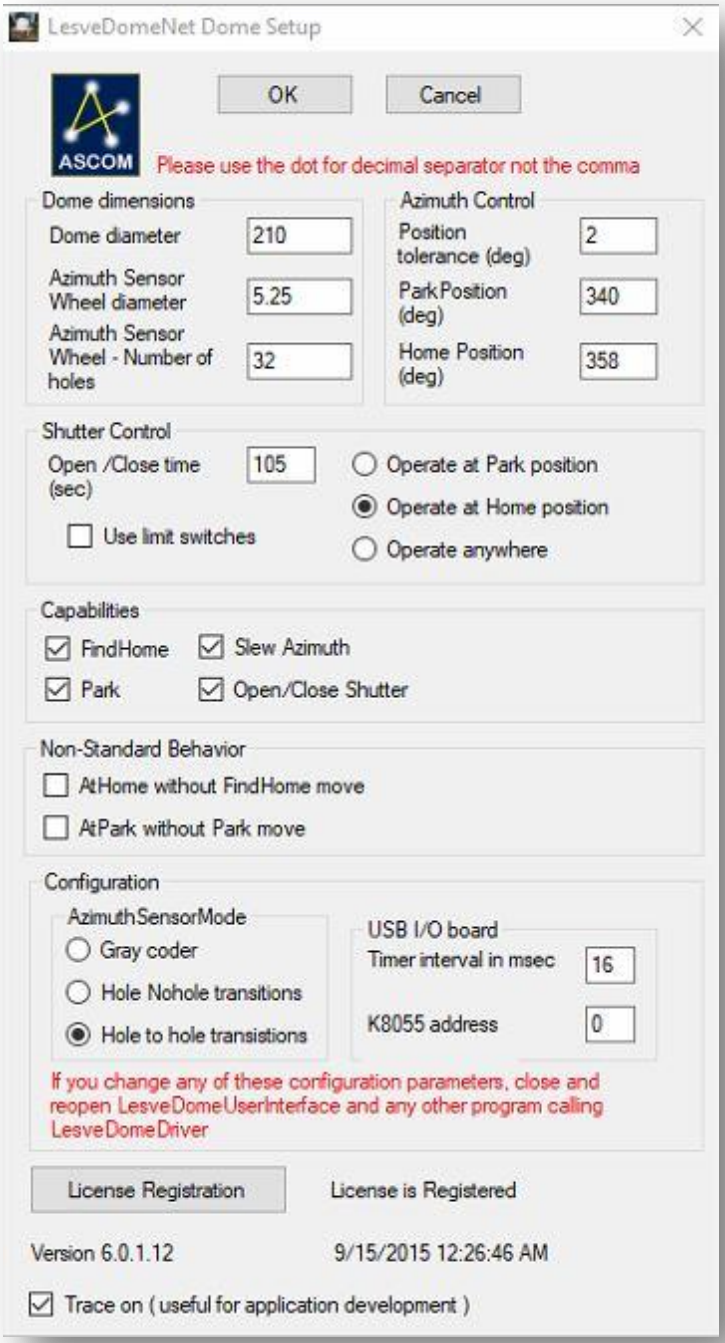


Velleman connections after conversion



33. After all changes are done, you can start with testing. First i did the testing with te radio remote control. After that is download the LesveDomeNet software and asked at Pierre De Ponthierre a trial license for 60 days for free.

After i received the trial license code i could start with entering the parameters. For detail , how to register and so on... of the software check the website of LesveDomeNet



My setting for the LesveDomeNet setup

You need the **dimensions of the dome in cm** (diameter), in my case 210 cm.

The **azimuth sensorwheel diameter** (you need here the diameter where the holes are made – center hole. In my case 5.25 cm

number of holes for a full revolution of the sensor wheel: in my case 32 holes.

The park- and homeposition in degrees compared to the North.

The shuttercontrol can only work in the Home Position -> check this box.

Open/closetime of the shutters. I times this via the manual control (radio control) and in my case i have about 90 sec. I entered 105 sec. This means after 105 sec. The power is shutdown of the output of the Vellemancard for the open/closing shutters. The shutters are stopped by the limitswitches. The timesetting is an extra security setting. You can also use the limitswitches signals on the homesensor 3 + 4 and connect to the analog inputs of the Vellemancard. See therefore the LesveDomeNet documentation. At the moment i did'nt choose this yet, but it is possible.

Velleman K8055N adress: in my case : 0

The azimuth sensor is working: set the function checkbox -> 'hole to hole'

USB I/O board time interval in msec.:

The Ascom LesveDomeNet driver reads the state of the Azimuth sensor at regular time intervals "Interrupts" (thru USB I/O). This time interval (or timer value) can be selected in the' LesveDomeNet Setup' window. At each interrupt, the LesveDomeNet driver will call 2 to 4 times the USB I/O board in function of "Azimuth sensor mode" This timer has to be short enough to be sure that you don't miss an Azimuth wheel transitions and not too short to let enough time to read/write the USB I/O module and let other programs to run. The exact time USB controller takes to execute commands is not well defined. In original Velleman documentation, it is said that 10 msec is needed. After Velleman have released new version for the "dll" claiming a lower value but not specified.

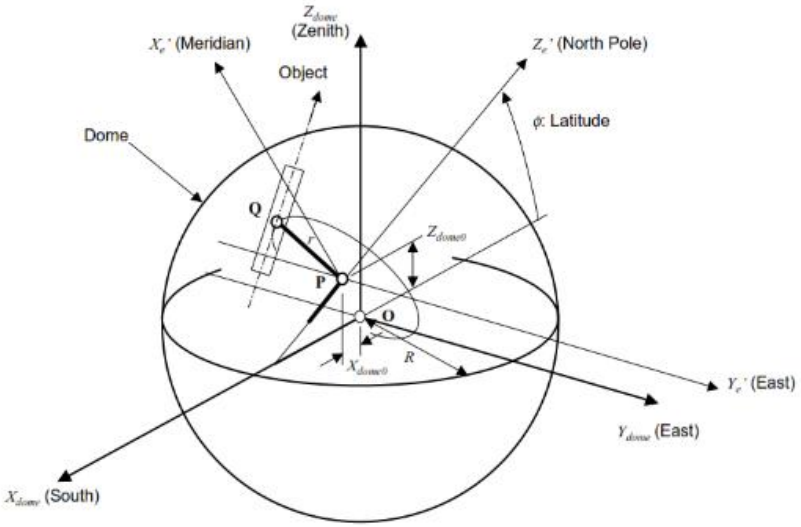
My dome has 1293 pulses for 1 complete turn of the dome (you have also entered also this value in the previous Uniwersal software). The speed of the dome is set to about
120sec by changing the frequency inverter by some trial and error to change the frequency and determine the time of 1 rotation.(see short manual i made how the speed can be changed in the frequency convertor T-verter. If you have another device, please check the manual of the manufacturer)

This means a timeinterval of about 10 msec.

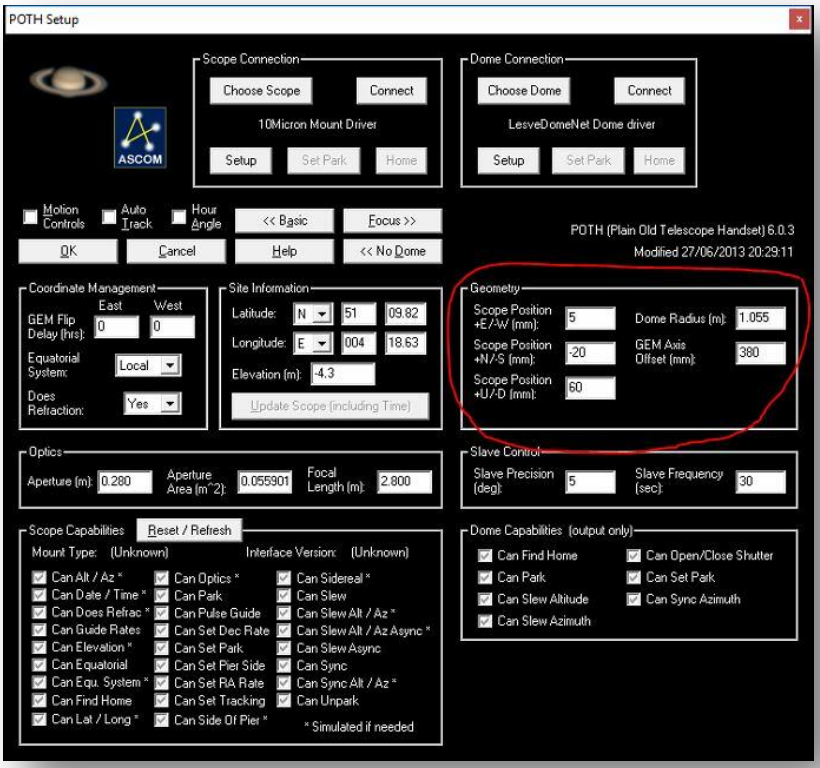
I entered the value 16 ms, because the Velleman read the inputs in steps of 16 msec i have read somewhere. Click OK and restart the application again. Now you can test the dome via the softwarebuttons.

Working with POTH ASCOM:

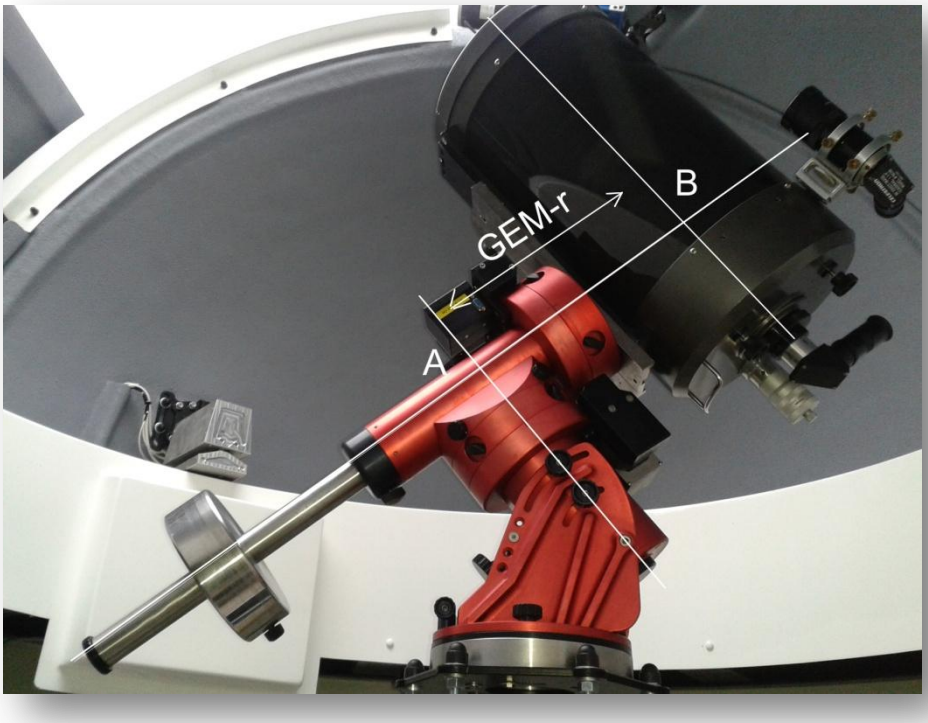
Now you can start with POTH ASCOM and select the LeveDomeNet dome driver. Goto Setup.



Please aware that the dome dimension must be entered carefully in the POTH ASCOM driver:



- ‘Dome radius’ is the **radius and NOT the diameter**
- Measure carefully the geometry xyz and GEM-r parameter and enter these values in the ASCOM POTH (check carefully the signs of these parameter) These parameters are very sensitive of the working/pointing of the dome. The correctness of these parameters determines the correctness of the slewing, certainly give extra attention to measuring these numbers.
- You must start the measure in the center of the RA/DEC axis point (see next image -> point A) to the tooth lath of the dome.
- Data entered in the POTH setup image are my settings of the dome.



For a GEM: Point A is the center of both : axis RA and DEC. And ref. Point to measure the xyz dimension of the dome and input of the ascom Lesvedome driver.
Point B is the intersection of the optical axis of the telescope and center dec. Axis.

Now you can start !

Extra link and software:

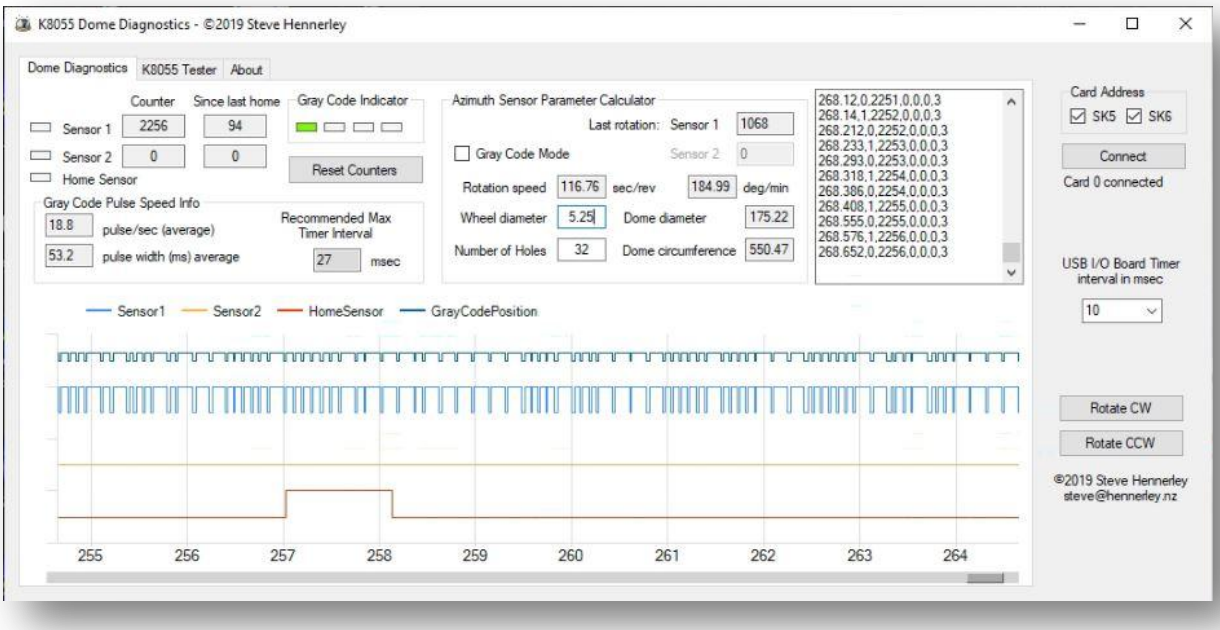
Steve Hennerley’s has made a software *K8055 Dome Diagnostics* program:

https://hennerley.wordpress.com/k8055DomeDiags/

Steve has developed this small diagnostic program for all domes that work with the Velleman K8055N board, so all Uniwersal domes and domes that work with LeveDomeNet software. This program gives a picture of the signals coming in and out of the Velleman-board. Important are the signals from the encoder. There are reports of interference signals that interfere with the operation

of the complete control system. This beautiful program puts its finger on the problem, so you can quickly detect the error and indicate a solution. Thank you Steve!

Here you find my test with this software:



As you can see, not all the impulses of the encoder are counted, but this is minor error (only 2-3 degrees for a complete turn of the dome). If you want this exact then you can choose for an GrayCode encoder like the KOYO TRD-NH3-RZWD (3 pulses/rotation). The power for this encoder is between 5-32 VDC which perfect can be used for the Uniwersal dome (12VDC).

Normally for 1 turn of my dome, i must count theoretically 1293 pulses (40 turns of the encoderwheel + 13 pulses), the software tells me that this is only 1068 pulses that are count by the K8055N board.

The signal of the home sensor is quite well, also there are no disturbing impulses to be seen on the home sensor over the entire course of the dome.

Erik Bryssinck – aug. 2019

Version history:
Version 1 – 3 febr. 2018 - wire diagram added + step by step manual
Version 2 – 17 aug.2018 – extra information about POTH ASCOM settings.
Version 3 30 august 2019: Steve Hennerley's diagnostic software added