

ScopeDome  
sky observatory



# The assembly Instructions

for ScopeDome 3M Dome

Hereby user guide describes, step by step, all the operations to be accomplished for ScopeDome proper assembling. The manufacturer recommends to set-up the dome according to the procedure hereby referred. Mounting the dome in recommended sequence ensures efficient dome's operation and - at the same time - allows avoiding unnecessary steps and waste of time when fitting-up the dome.



## Assembly preparation.

1. Make sure you have all dome's parts and suitable tools.
2. Prepare the place for dome's assembling. You will need a flat place, approx. 5.0x5.0m.

## View instruction photos from attached CD-Rom.

Each photo is worth more than thousand words. Lock through photos before assembly. They can be found at: "Assembly instruction photographs"

## Action Order.

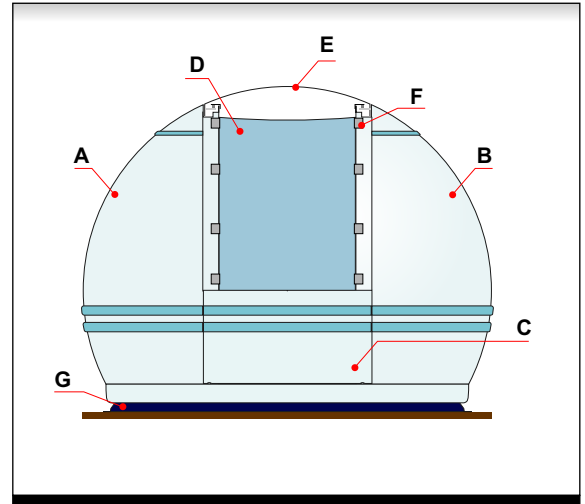
1. Read this manual understandingly.
2. Set-up base ring.
3. Screw together rotating parts of the dome (both sides, front and back panels).
4. Place the dome onto base ring.
5. Fit the shutter.
6. Check if the dome turns round loosely, and if the shutter is opening and closing easily.
7. Fit cog-rim for cog-wheel drive.
8. Fix rotary drive shield.
9. Fit rotary drive and shutter motor, Home Sensor, the encoder, encoder's cleaning tape, limit switches, inverters, shutter cable box and ScopeDome card.
10. Connect all elements according to diagram.
11. Check limit switches action
12. Install dome's drive software.

## Tools required to set-up the dome:

1. Automatic screwdriver with x-shaped ending
2. A small screwdriver with flat ending
3. Knife or scissors for cutting wires
4. Inbus keys set
5. Hex keys, screw keys set
6. Driller and drills
7. Universal meter

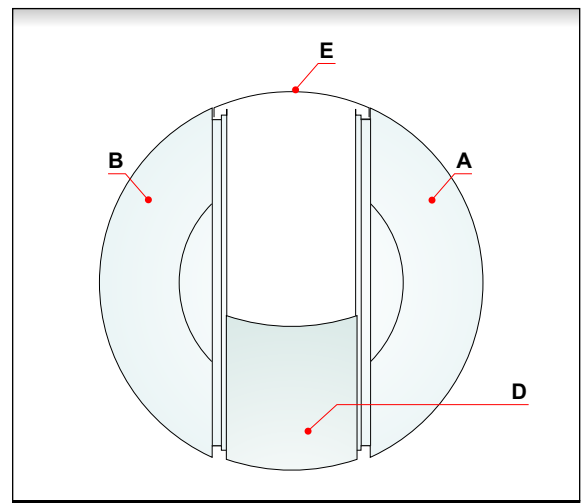
An additional person to help is required when fitting-up the dome.

If you plan to mount the dome on the base ring manually, you will need the assistance of four strong adults.



**Fig. 1 - Dome's diagram front view**

- A. Left side wall panel
- B. Right side wall panel
- C. Front panel
- D. Back panel
- E. Shutter
- F. Shutter securing holders
- G. Base ring



**Fig. 2 - Dome's diagram view from above**

- A. Left side wall panel
- B. Right side wall panel
- D. Back panel
- E. Shutter

## Base ring fitting

1. Put together and screw all four pieces of the base ring. Seal side joints with frost-resistance silicone, preventing wather from getting inside the dome.
2. Coat the bottom of base ring with frost-resistance silicone. Place the base ring onto observatory's curb-plate (or other basis). Seal all edges of base ring with frost-resistance silicone too.
3. Check if the ring base forms an ideal circle. If it's not perfectly round - adjust it carefully by hitting with gum hammer.
4. Screw the inner and outer ring flange with the observatory's crown rim, using 16 bolts.

## Dome's assembly

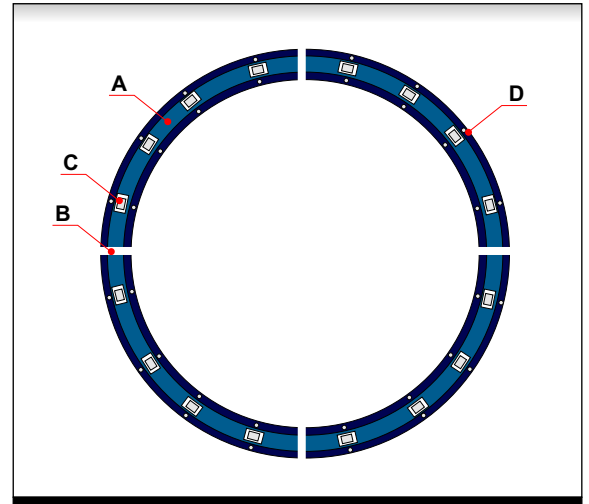
### Tip:

A carpentry holder will be very helpful during dome's mounting. It will help to adjust the levels of the driving ring with particular parts of the dome. First connect each section of the dome with loose bolts, and then using a carpentry holder - adjust the neighboring elements of the dome. Finally - tighten the bolts firmly.

### Tip:

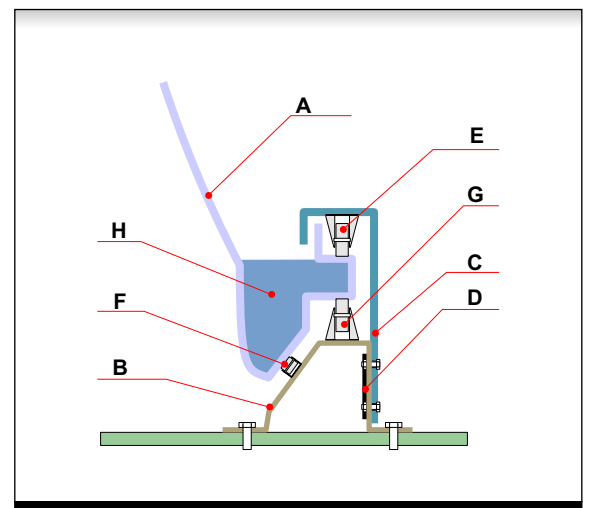
Do not forget to put the washers on both sides of all bolts connecting the elements of the dome.

1. Put one of the side panel and front panel side by side. Screw on both panels nearby driving ring.
2. Add the second side of the dome to previously connected elements. Screw on the second side of the dome with its front panel nearby the driving ring
3. Insert the rear panel of the ring between two sides and screw on rear module of the ring.
4. Adjust the joints of the driving ring with carpentry holder and finally screw on bolts of all joints of the driving ring.
5. Screw on all the bolts of the dome's front.
6. Put on the back panel on the sides, matching the holes. If the holes do not match perfectly, just slightly drill them up. If the dome's back panel does not cover side panels, just slightly stretch the dome's sides inwards while holding their tops. Screw on the dome's back.



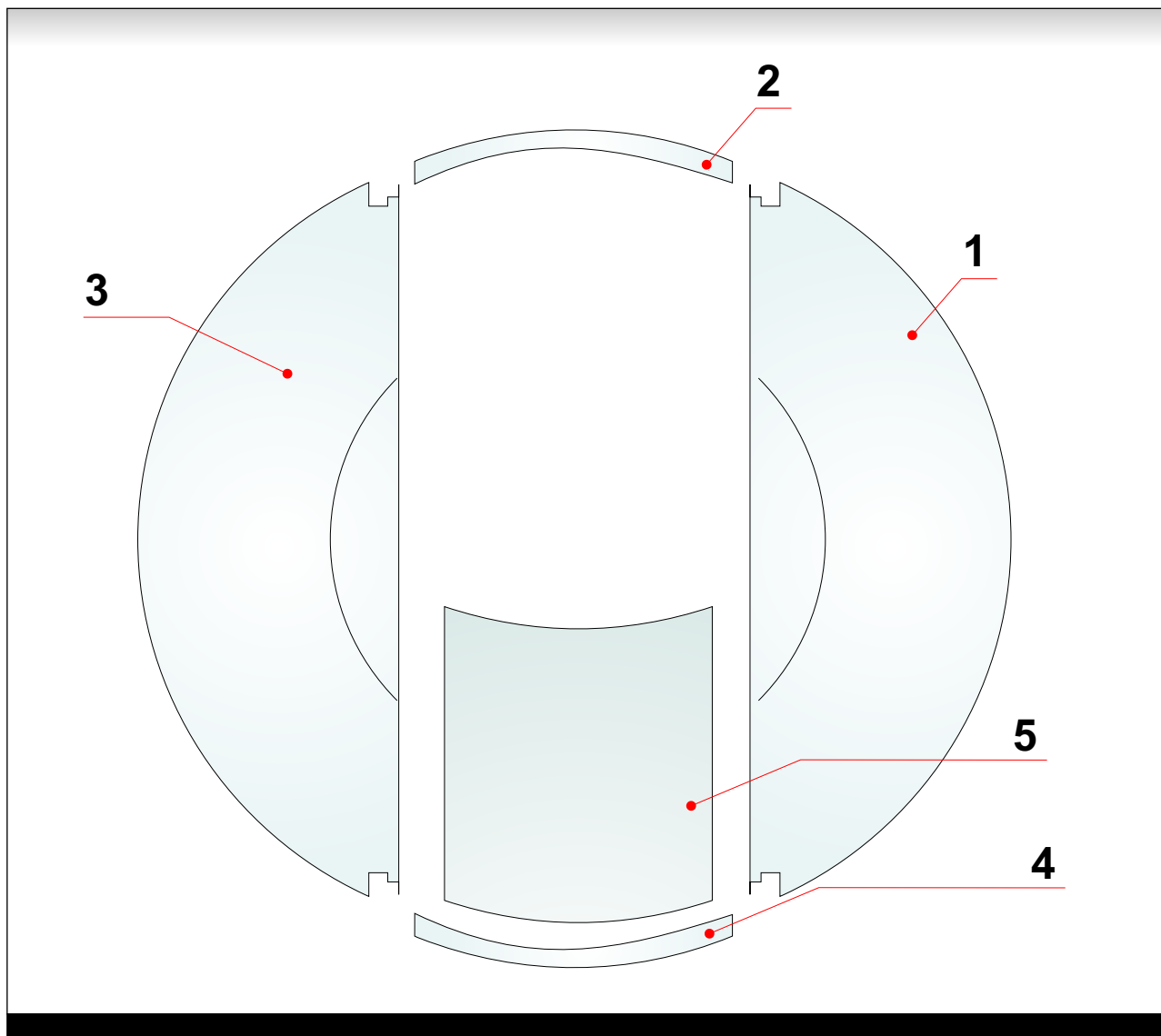
**Fig. 3 - Base ring scheme**

- A. Base ring element
- B. Ring connecting edges.
- C. Base ring main roller
- D. Base ring mounting flange



**Fig. 4 - Base ring section**

- A. Dome's side wall panel
- B. Base ring
- C. Shield
- D. Shield mounting plate
- E. Shield roll
- F. Base ring side roll
- G. Base ring main roll
- H. Dome's driver ring



**Fig. 5 - Sequence of dome's elements fitting-up**

1. Left side panel
2. Front panel
3. Right side panel
4. Rear driving ring module
5. Back panel
6. Shutter (invisible)

## Placing the dome onto base ring

1. Lift the dome and put it down onto the rollers of the base ring.
2. Check if the dome turns round easily; turn it several times around the axis.
3. After you fit the cog-rim drive, screw on drive shields to the base ring. Check if the upper rollers of the shields do not press the driving ring too much. There should be approximately a 1 mm distance between roller and the ring.

**Tip:**

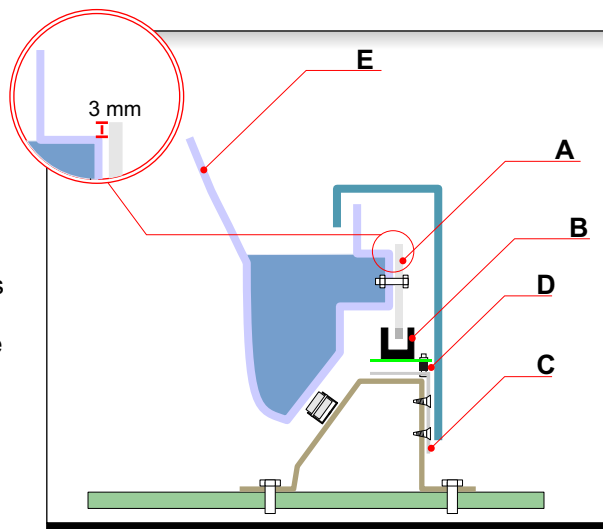
A properly assembled dome should turn round by a finger pressure applied to the front panel of the dome.

## Rotary drive cog-rim assembly

1. Place the cog-rim according to fig. 6 scheme.
2. Start with longer (1-meter long) elements. Screw each with the dome using at last four screws. Cog-rim shall stick out by approx. 3mm over dome's edge.
3. Do not tighten the screws at the beginning, leave some margin to allow free movement of cog-rim.
4. After fixing 7 longer segments, the last, short one shall be squeezed in e.g. pushed in with some force. Try to bend it forward into dome's interior and then just push the bulge to border on the dome (see fig 7).
5. Align and level cog-rim parts, fit joints focusing on cog geometry.
6. Tighter all screws.

**Tip:**

When fitting up the encoder, notice if it does not abrade the cog-rim. It is very easy to destroy it while rotating the dome.



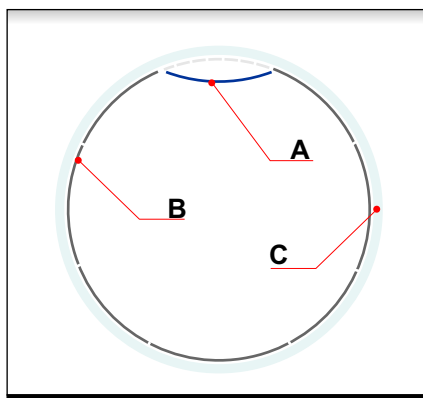
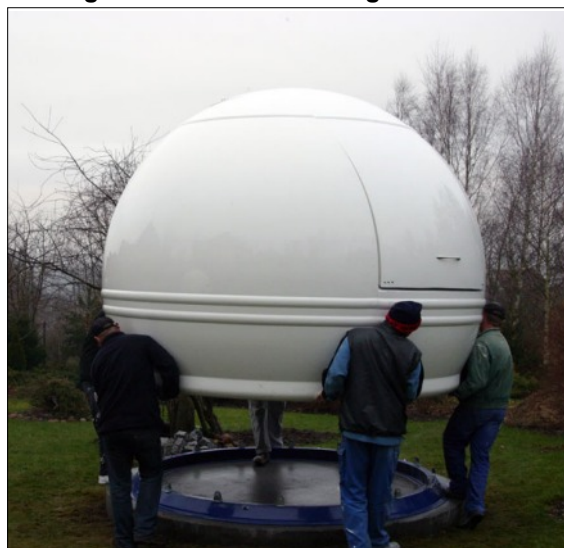
**Fig 6 - Cog-rim of rotary drive.**

- A. Cog-rim
- B. Encoder
- C. Encoder support
- D. Elastic pads (washers)
- E. Dome



**Base ring**

### Placing a dome onto base ring



**fig 7**

- A. Last segment of cog-rim
- B. Cog-rim
- C. Dome

## Fitting up the shutter.

### Action sequence.

1. Unscrew rear movement limiters.
2. Fix eight holders securing the shutter from being dragged away by strong wind (four holders at each side).
3. Screw on the decorative handles at the front and rear of the shutter.
4. Put the shutter onto the dome.
5. Fix limit switches clamp.
6. Screw on the rear movements limiters.

Mind correct orientation of shutter front and back. Shutter front has a specific incision which matches front panel of the dome. Securing holders shall be screwed on in a way to touch aluminum guide rails very slightly.

These rails shall be under holders rollers. It is more convenient to start shutter assembly from the dome's back. Properly mounted shutter has to open and close without resistance nor abrasion.

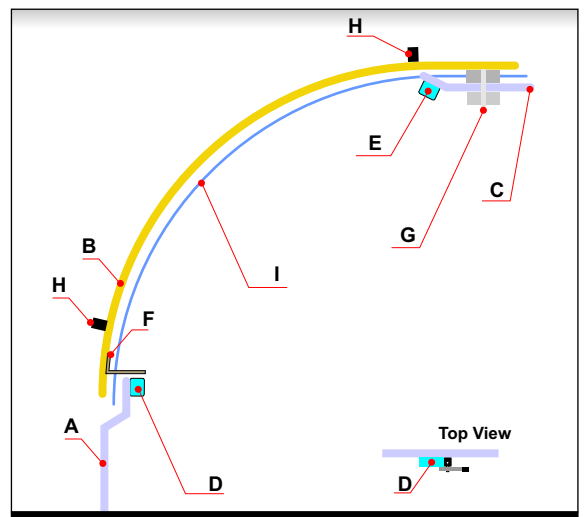
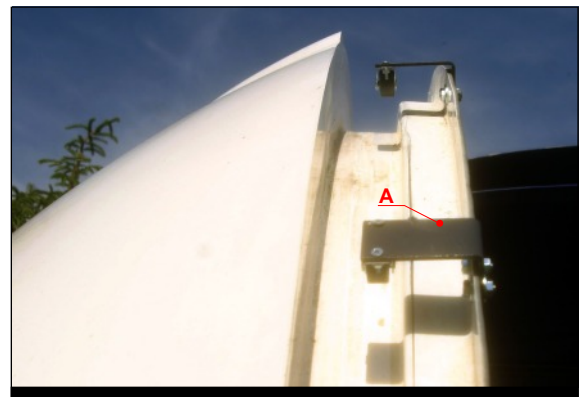
**Tip:**

The shutter without engine tends to fall down (it is not balanced well). Since you have automatics installed, the shutter is restrained by the driving cog-wheel. It is especially dangerous when the shutter falls down during opening.

The shutter shall be opened and closed in two steps - first grab the shutter at the front, open it just halfway and check if it does not start to fall down. Then walk around to the dome's back and open the shutter to the end position, holding it by the rear handle.



**Fig 8 - Shutter mechanics**  
 A. Securing holders  
 B. Limit switches pressure plate



**Fig. 9 - Shutter scheme**  
 A. Dome's front panel  
 B. Shutter  
 C. Dome's back panel  
 D. Limit switch Close  
 E. Limit switch Open  
 F. Limit switches pressure plate  
 G. Shutter drive  
 H. Decorative handle  
 I. Drive cog-rim



## Shutter drive assembly

### Action sequence.

1. Screw on motor main holder (L) at dome's top with the use of five screws.
2. Fix the cog-wheel (C) in drive motor module (M).
3. Screw on slightly drive motor with main shutter holder in a way that the cog-wheel would not touch shutter's cog-rim.
4. Adjust cog-wheel height so that cog-rim is at its middle point.
5. Fix end switches.
6. Test limit switches operation trying to set them active at approx. 2cm before full open/close of the shutter.
7. Press and tighten cog-wheel to shutter's cog-rim and screw on the bolts (K) fastening motor module.
8. Install motor and limit switches wiring.
9. Open and close the shutter several times using ScopeDome USB Card.
10. If the cog-wheel slips off cog-rim - stop the shutter at this point. Loosen screws fastening the motor module, then tighten the cog-wheel to cog-rim hitting 2X motor mounting plate with a hammer. Next screw on firmly four bolts fastening the motor module.
11. Test shutter drive operation again.
12. Check if the shutter power cable does not brush dome's engine during its revolution.

Shutter motor is powered by 14-core cable. Its both ends shall be fixed firmly - as not to be torn out if the dome proceeds too many turns. The cable shall be placed in a way it would not brush the dome's engine.

fig. 12 - Shutter drive.

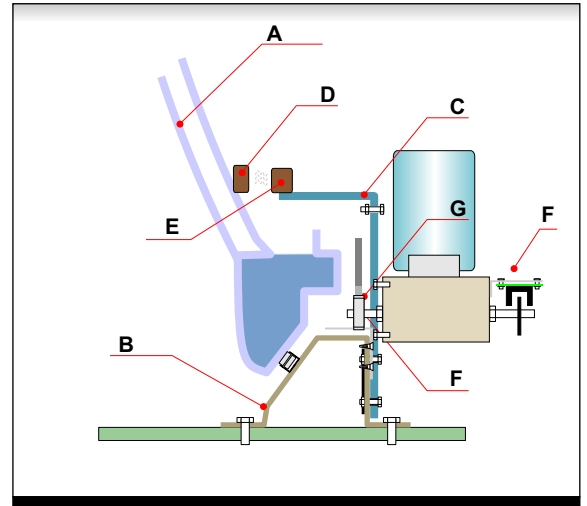
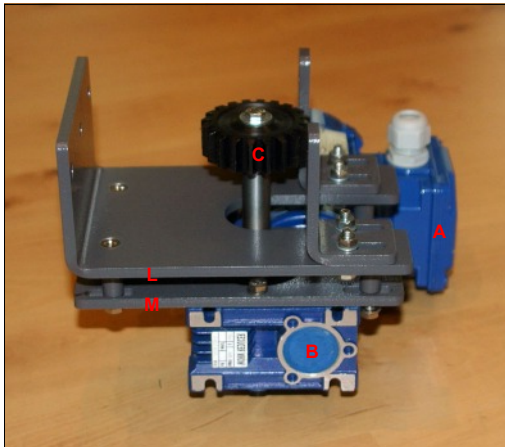


Fig. 10 - Encoder module on motor axis

- A. Dome's side panel
- B. Base ring.
- C. Shield holder/support
- D. Home sensor magnet
- E. Home sensor contractron
- F. Encoder module

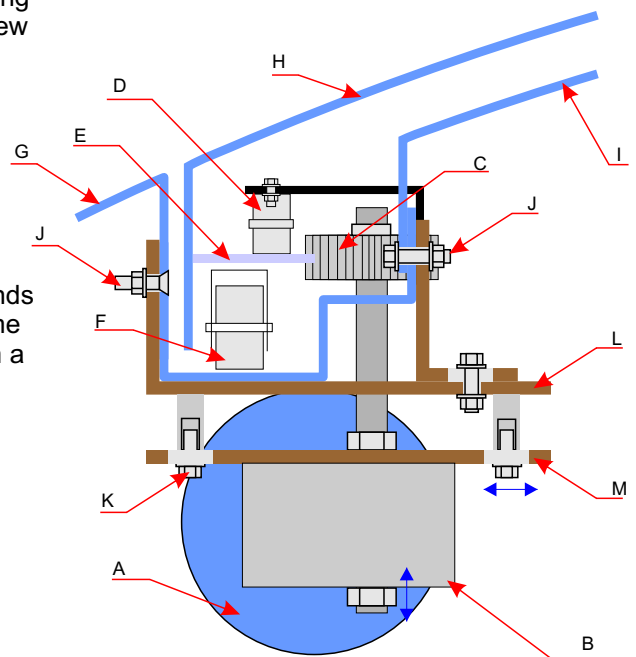


Fig. 11 - Shutter drive.

- A. Motor/Engine
- B. Motoreductor (i=80)
- C. Cog-wheel
- D. Shutter holder roller
- E. Cog-rim
- F. Shutter's main roller
- G. Dome's side panel
- H. Shutter panel
- I. Dome's back panel
- J. Bolts/Screws fastening the motor
- K. Roller pressure adjustment screws
- L. Motor main holder
- M. Motor module support.

## Electronics and driving systems fittings

**Tip:**

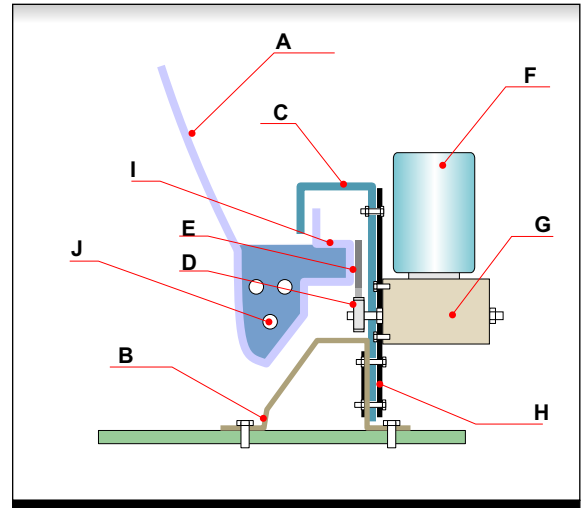
- Do not install shutter driving wire cables until you test the shutter motor system end switches action and the whole electronics.
- Before you install the drivers and electrical components, it is recommended to wash the dome using a garden hose. Without this operation removing the remains and debris will require much more effort.

1. Fit encoder sensor (see fig 6). Start to rotate the dome carefully, focusing your attention on possible cog-rim abrasion. Encoder could be damaged very easily if such abrasion appears.
2. Fit contactron "home" on drive shield.
3. Fit end switches on the front and the top of the shutter window.
4. Fit the end switches pressing plate on the shutter in a way that limit switches activate at about 2 cm before full closing or full opening of the shutter.
5. Put contactron "home" magnet on the dome's back at the distance from contactron "home" allowing contactron's switches to be active as briefly during the dome's rotation, as possible.
6. Stick encoder cleaning tape to cog-rim (see fig 10) at contactron magnet (Home Sensor) height.
7. Fit the cable box on the rotary part of the dome.
8. Fit the ScopeDome Card on the one of the drive shield or on scope's pier.
9. Fit the dome's driving motor on the drive shield opposite to ScopeDome Card.

**Tip:**

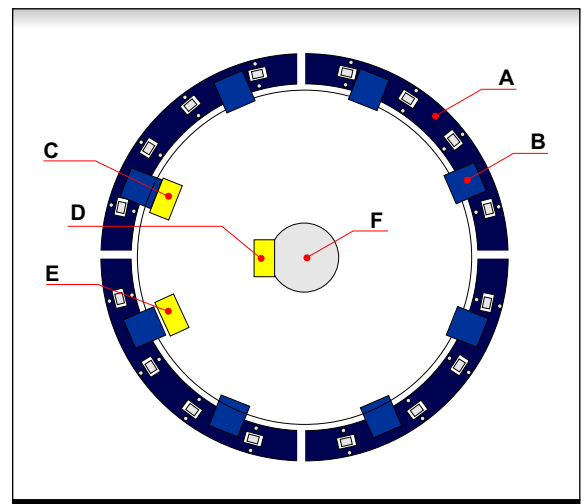
Limit switches control wiring and illumination wiring can be lead through the holes previously drilled in the side reinforcements close by shutter window.

10. Connect all elements and wiring according to the electrical diagram of the observatory.
11. Test driving motors and end switches.
12. Install control software and calibrate the dome. (Calibration description in Help menu).



**Fig. 13 - Dome's driving motor system scheme**

- A. Dome's side wall panel
- B. Base ring
- C. Cog-rim drive shield
- D. Cog-wheel
- E. Cog-rim
- F. Motor ( engine)
- G. Motor reductor (gear) (1/50)
- H. Engine's mounting plate
- I. Driving ring
- J. Driving ring bolt holes

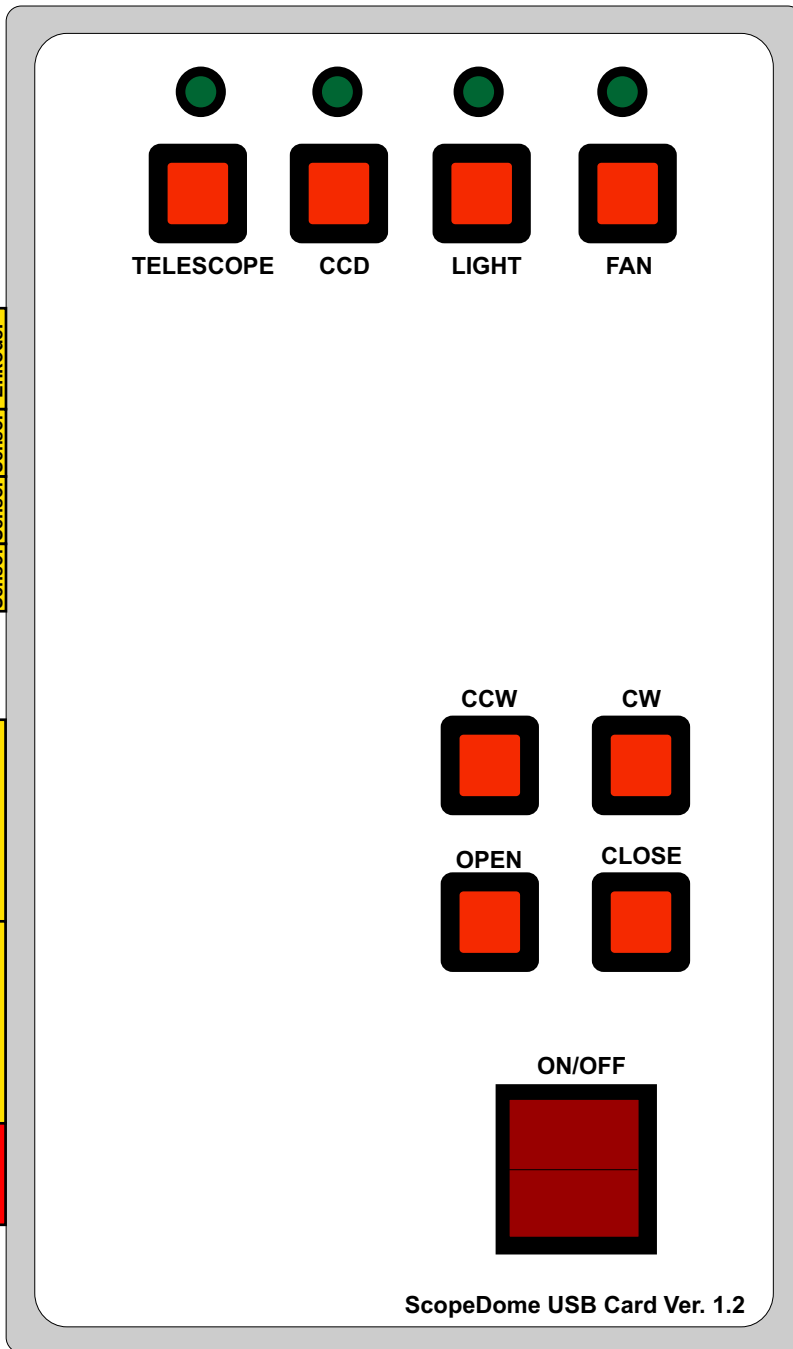
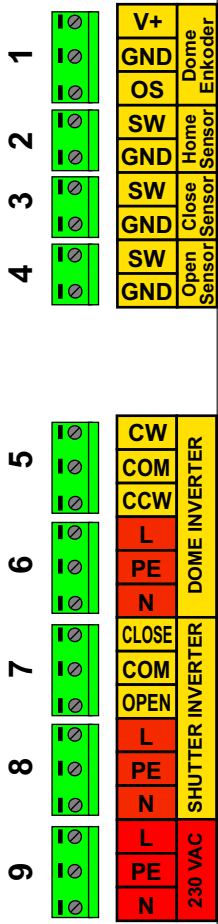


**Fig.14 - Electrical installation diagram**

- A. Base ring
- B. Cog-rim drive shield support/holder
- C. Main power supply box
- D. ScopeDome Card
- E. Driving motor system with roller
- F. Pier (a telescope basis)

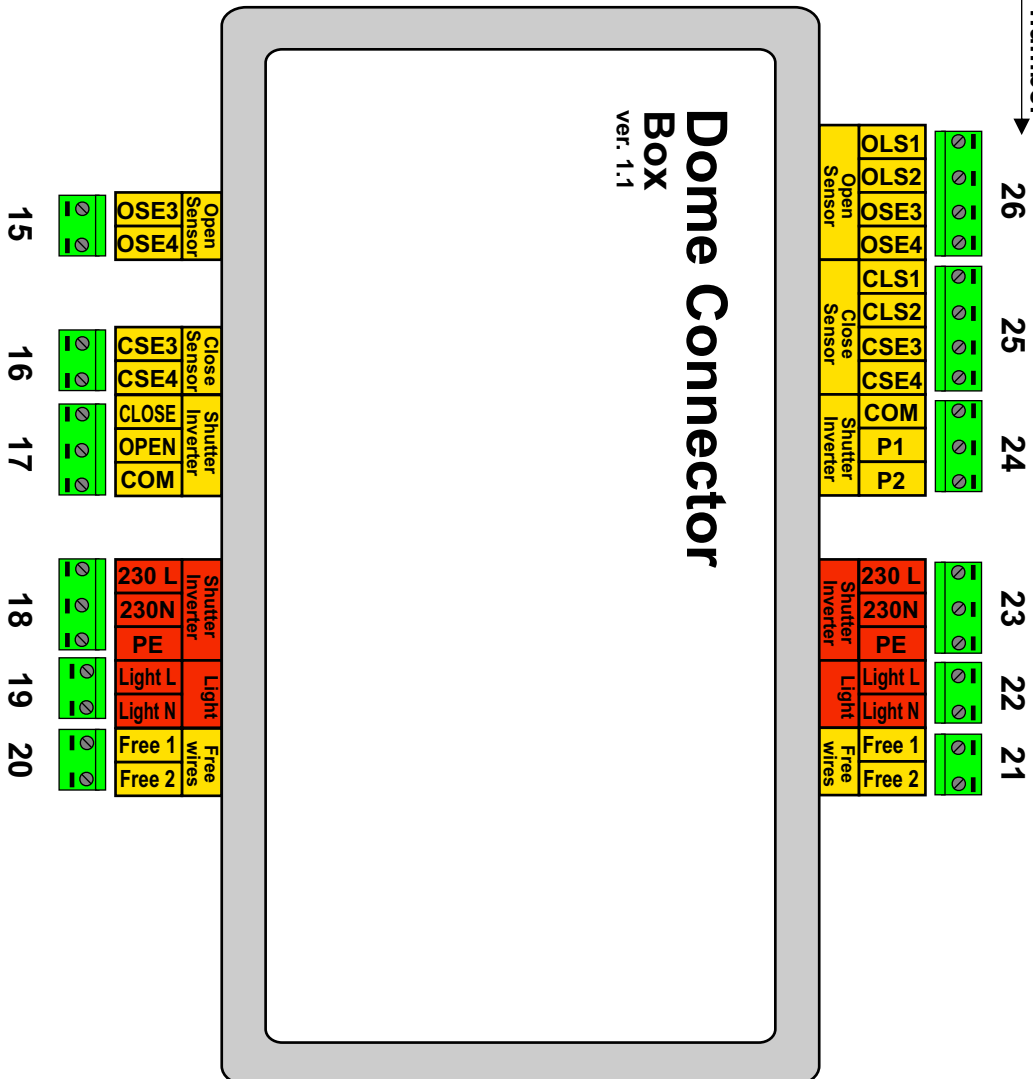


PlugAndPlay  
wires number →

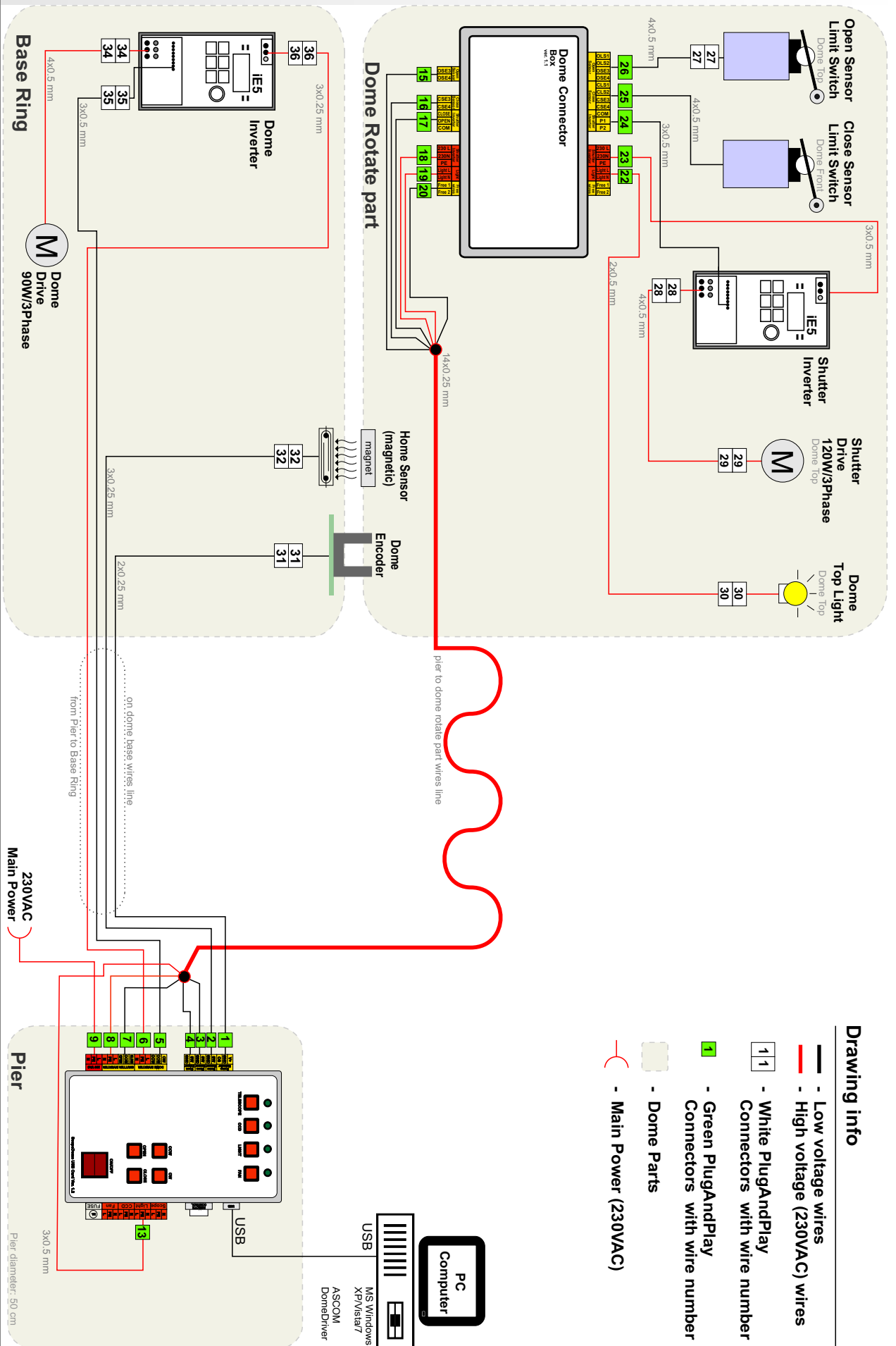


ScopeDome USB Card Ver. 1.2

PlugAndPlay  
wires number



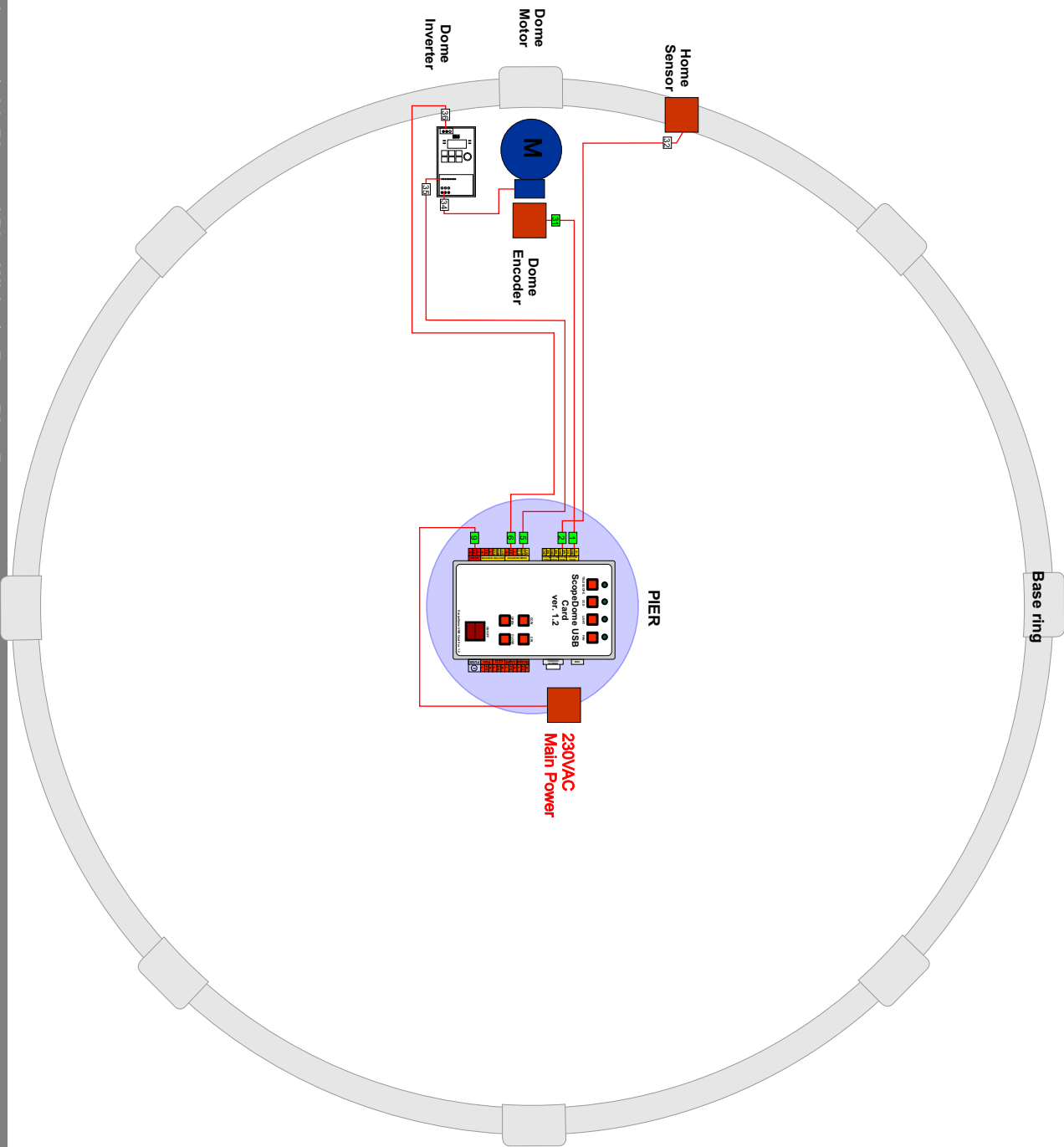
Observatory Block Diagram (with Plug and Play Wiring)

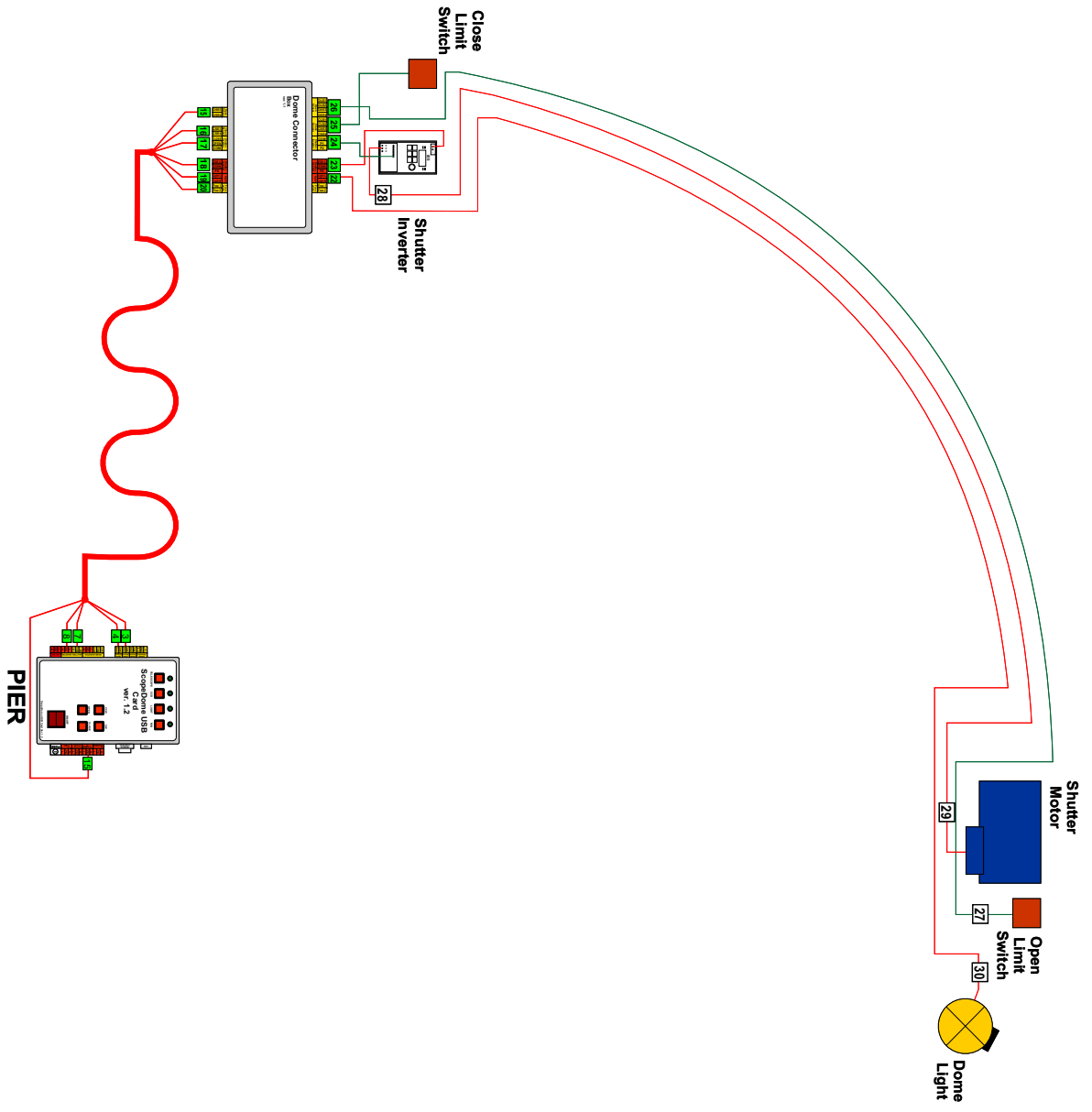


**Drawing info**

- - Low voltage wires
- - High voltage (230VAC) wires
- 1 1 - White PlugAndPlay Connectors with wire number
- - Green PlugAndPlay Connectors with wire number
- Dome Parts
- - Main Power (230VAC)

Observatory Block Diagram (with Plug and Play Wiring) - Base Ring Part





Observatory Block Diagram (with Plug and Play Wiring) - Rotate Part

