

Hyperion Observatory



Building an automatized
observatory



Index



- Choosing the structure and building the observatory
- Motorizing and power supply
- Controllers
- ASCOM driver
- Remote working
- Global scheme
- Difficulties and problems

Roll off roof vs. dome



■ Roll off roof

- Conventional building (concealed)
- Cheaper and easier to control
- Quicker thermal balance
- Little protection against wind and parasitic light
- Parking telescope before closing the roof

■ Dome

- More expensive and more difficult to control
- More conspicuous
- Protection against wind and light
- Can be closed when needed

Conditions at Caraquiz



- Windy
 - Wind enough to interfere with autoguiding
- High parasitic light
 - Some bothering street lights
- Location: dead end street (cul de sac)
 - Quite hidden from of malintentioned regards
- Clear preferency: Dome
 - If they were not so expensive ...
 - Let us look for and ask for prices...

Domes in the market



■ Exploradome

- Diameter: 2,40
- Motorization: No
- Material: Plastic
- Price: 3.000 €

■ Opinion:

- Bad aspect
- Very small



Domes in the market



■ Pulsar

- Diameter: 2,60
- Motorization: Optional
- MAterial: Fiberglass
- Price: 6.500 €

■ Opinion:

- Expensive
- Small



Domes in the market



- Sirius
- Diameter: 2,30
 - Motorization: Optional
 - MAterial: Fiberglass
 - Price: 7.300 €
- Opinion:
 - Expensive
 - Very small



Domes in the market



■ TI Pro-dome

- Diameter: 3 m
- Motorization: Included
- Material: Fiberglass
- Price: 10.200 €

■ Opinion:

- Interesting
- A little expensive



Domes in the market



■ Astro Haven

- Diameter: 2,10 m
- Motorization: Included
- Material: Fiberglass
- Price: \$ 15.900

■ Opinion:

- Too small
- Very expensive



Domes in the market



■ Scope Dome

- Diameter: 3,00 m
- Motorization: incluida
- Material: Poliester y fibra
- Price: 8.500 €

■ Opinion:

- Interestng
- Bad access



Domes in the market



■ Astrodomes

- Diameter: 2,90 m
- Motorization: Included
- Material: Fiberglass
- Price: 13.200 €

■ Opinion:

- Interesting
- Expensive



Domes in the market



■ Astrodomes Metal kit

- Diameter: 3,00 m
- Motorization: Included
- Material: Steel
- Price: 6.000 €

■ Opinion:

- Very interesting



Domes in the market



- Shipping is not included in the previous prices
- The cheaper domes (even some of the expensive ones) are pretty small.
- In general, except the domes from Astrodomes they are not easy to access (Think we are not so young 😊)
- Option: Metallic kit from Astrodomes
 - It is shipped in a compact parcel (240x100x30) weighting 400kg so shipping is much cheaper
 - Very easy and comfortable access

Building the observatory



Building the observatory



Final aspect



Dome



- Temperature control
 - Two components white paint
 - Internal coating with “Armaflex”
 - Even after hours of sun shining, there is a reasonable temperature inside the dome
 - If open at the sunset, the thermal balance is reached pretty soon

Motorization

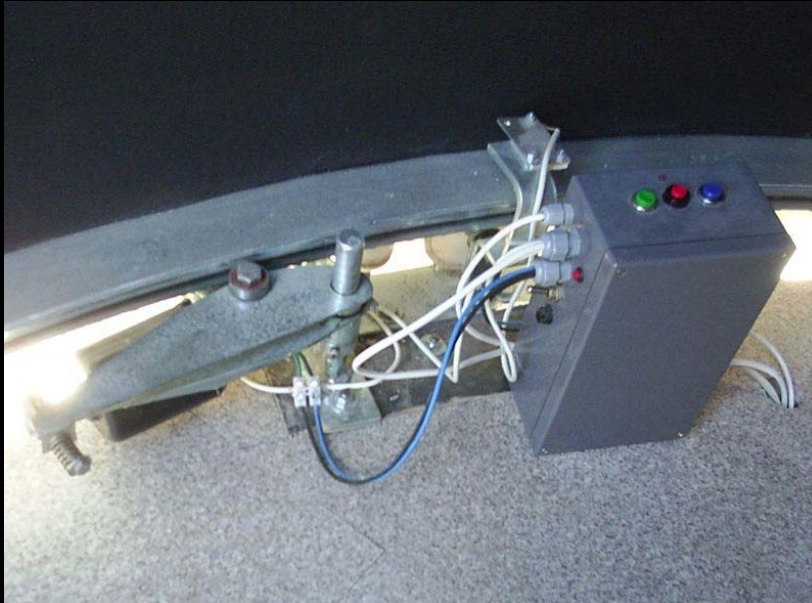
- Two identical motors
 - 12V motors with high torque (tractor wipper motors)
 - Module 3 pinion



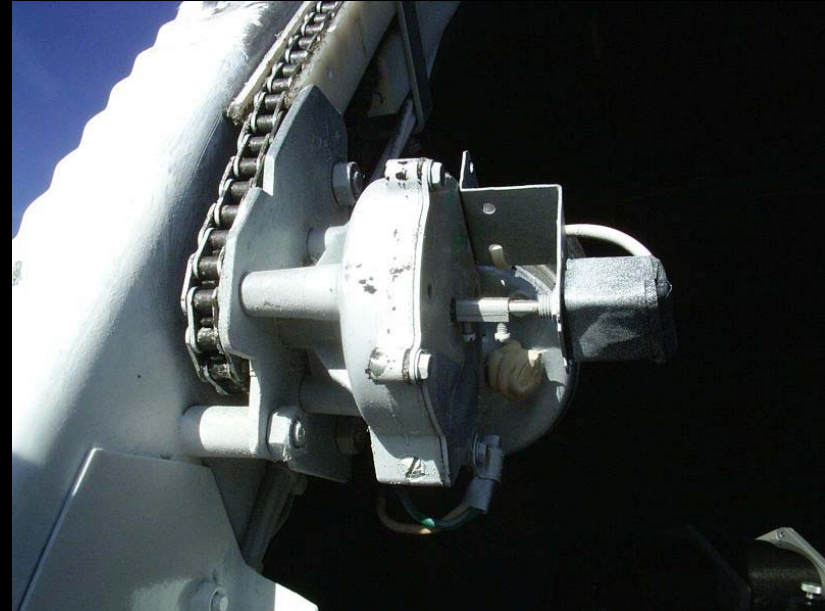
Motorization



Dome rotation



Opening/closing

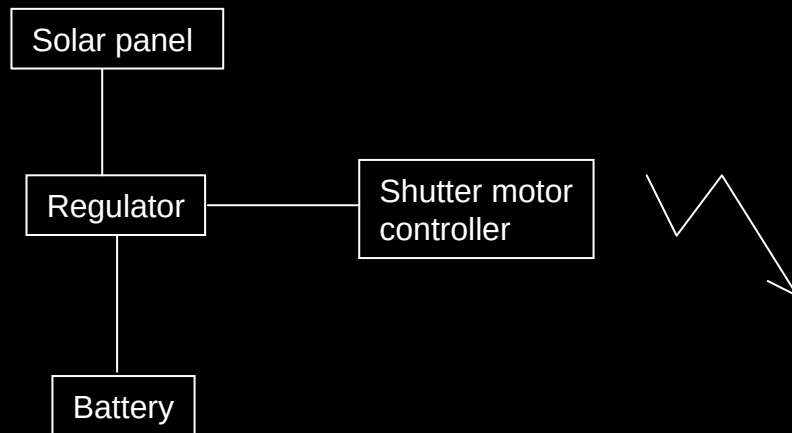


Control

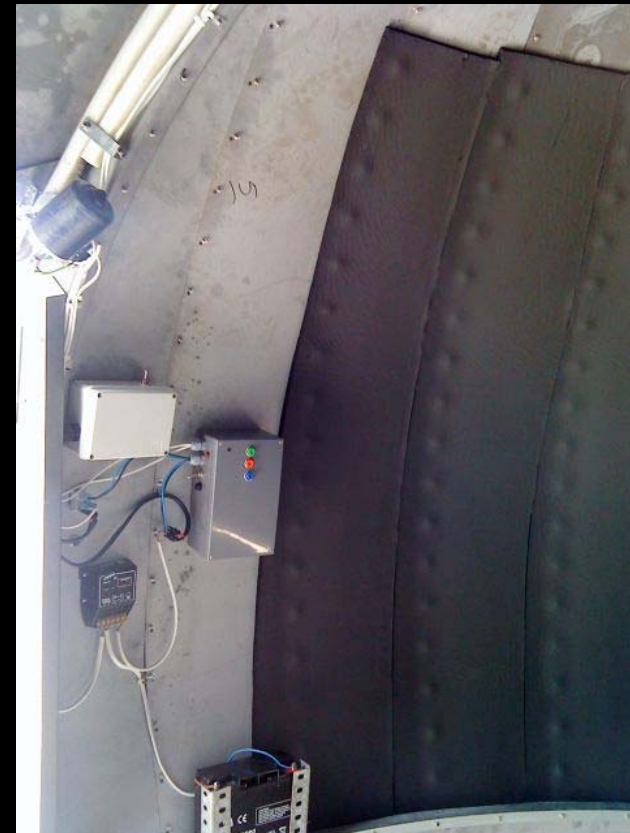


- Two independent controllers radio communicated
 - Rotation
 - Opening/Closing
- Power supply:
 - Mains (220V → 12V) for dome rotation
 - 12V battery for opening/closing
 - Battery recharge with solar pannel
- Mobile wires are avoided
 - Battery
 - Radio communication

Opening/closing power supply



- 10 W solar panel
- 10 A charge regulator
- 18 Ah battery



Controllers



- Pretty sophisticated (Overkill, it was a whim)
- Soft start and stop of the motors (trapezoidal)
- Rotation controller
 - Connected to the PC via RS232
 - Transmit the commands to the shutter controller (radiomodem).
 - It can position the dome with a resolution of 0.04°
 - A full turn of the dome generates 36000 encoder pulses
 - Positioning tolerance of four encoder pulses
- The shutter controller can position the shutter with the same resolution, 0.04°
- The PC ask the rotation controller the status of the dome every 0.25 seconds (azimuth and altitude)
- The rotation controller communicates with the shutter controller at least every 0.25s

Controllers



- Safety mechanisms
- Bad weather. The dome closes in case of:
 - Rain
 - Overcast
 - The status has to be maintained at least for 1 minute
- Electric anomalies
 - If the shutter controller does not receive orders during more than two minutes it closes the shutter
 - Radio communication failure between controllers:
 - Mains failure
 - The control program “hangs” (Windows)

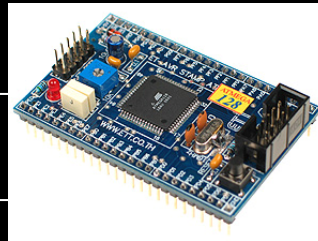
Rotation controller



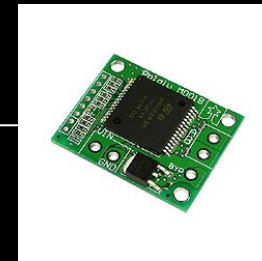
PC



Microcontroller



H- bridge



Motor



Magnetic switch



Radiomodem



Encoder

Shutter controller



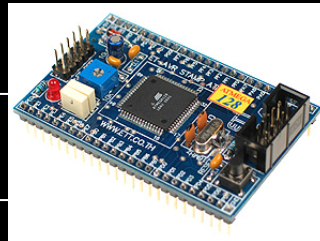
Magnetic switch



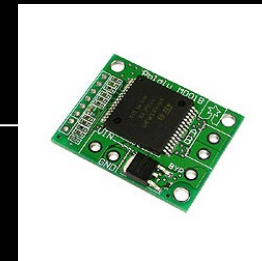
Magnetic switch



Microcontroller



H-bridge



Motor



Radiomodem



Encoder

Controllers



- Atmega128 microcontroller with two serial ports
 - Radiomodem communication
 - Control PC communication
- Radiomodem 433MHZ , 19200 bps
- H-bridge for 14 A
- Encoder of 512 pulses per turn (gray code)
 - Detects position and movement direction
- Magnetic limit switches and home switch

Controllers commands



	Comando	Respuesta
Begin	&B#	&#
Stop	&S#	&#
Go_home	&H#	&#
Move (Az)	&ZXXXX#	&#
Move (Alt)	&AYYYY#	&#
Run_az (ccw)	&L#	&#
Run_az (cw)	&R#	&#
Run_alt (up)	&U#	&#
Run_alt (down)	&D#	&#
Open_shutter	&O#	&#
Close_shutter	&C#	&#
Get_status	&G#	&GXXXXZZYYYYTT# &TXXXXRRYYYYRR#
Sync (Az)	&YXXXX#	&#
Put_calib_Az	&zXXXX	&#
Put_calib_Alt	&aYYYY	&#
Calibration	&T#	&#

XXXXX = azimuth
ZZ = status Az

YYYYY = altitud
TT = Status Alt

RR = Relleno

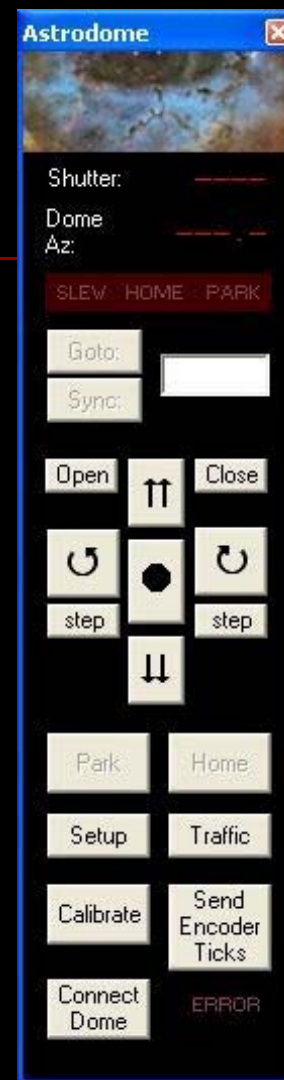
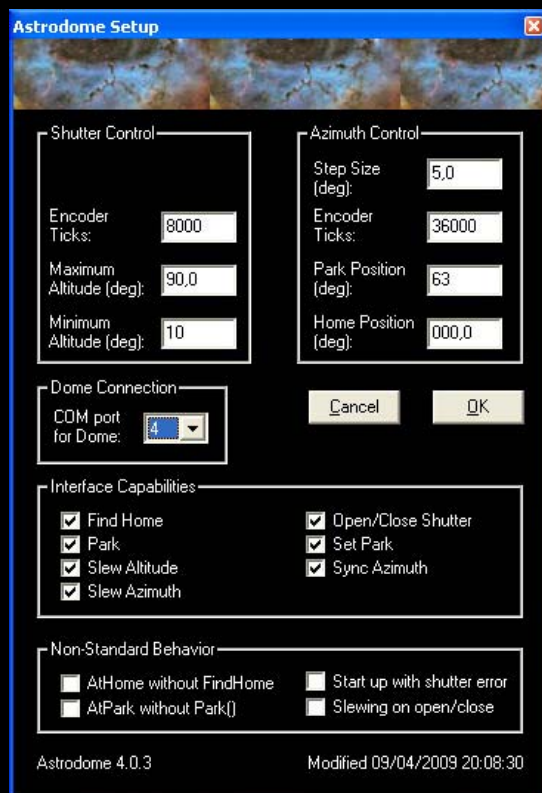
Status Az

slewing_ccw
slewing_cw
stopped
at_home
error

Status Alt (shutter)

open
closed
opening
closing
error

ASCOM driver



Remote working



■ Remote switch on and off

■ GSM_Auto

- Two programmable relays
- SMS and lost call
- Relay1: General ON/OFF
- Relay2: PC on



Remote working



- Connection from Madrid
 - Vía “Remote desk” of Windows
 - Alternative: TightVNC, RADMIN
- Dynamic IP problem:
 - DynDNS
 - At the beginning with software server
 - Currently with ADSL router

Remote working

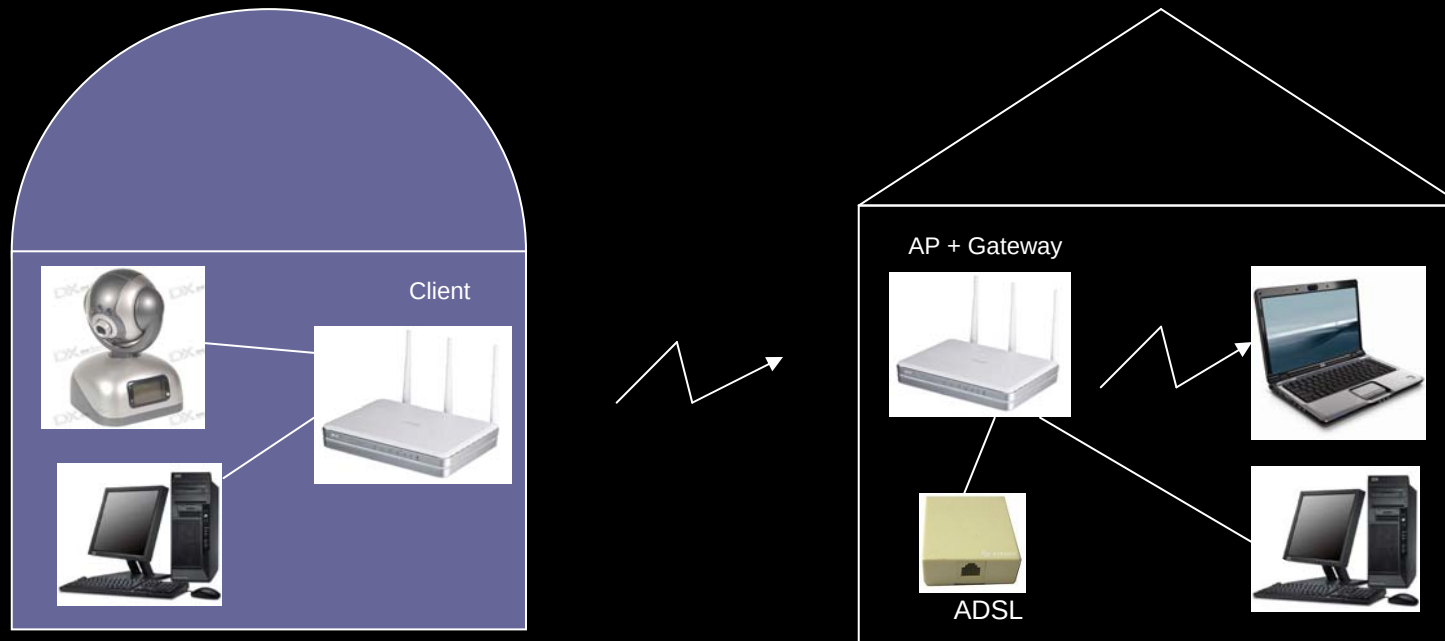


■ IP camera

- Images access and control via web
- Pan: 180°
- Tilt: 120°
- Automatic infrared Led,s disabled via web
- Digital inputs and outputs controlable via web



Communications at Caraquiz

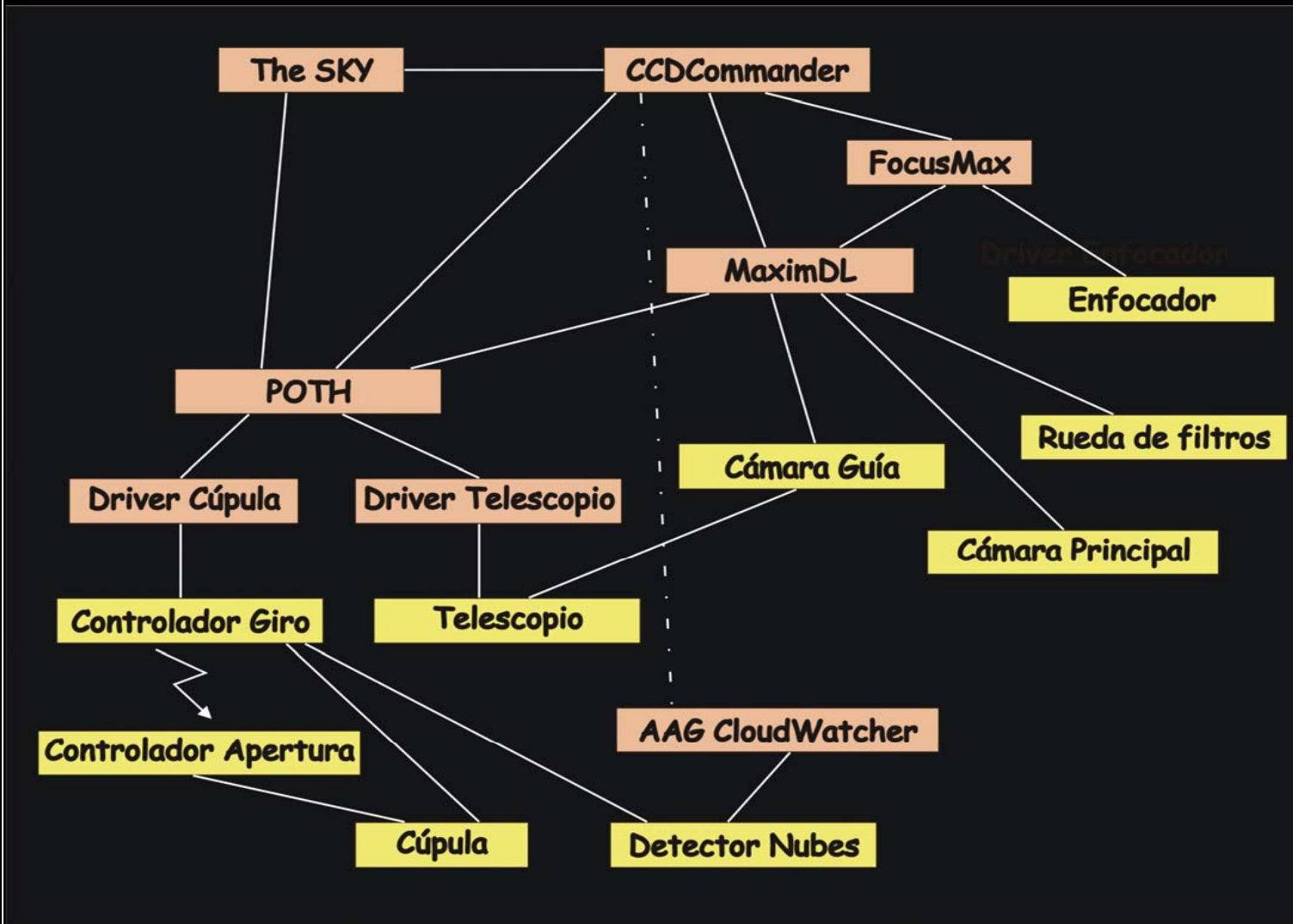


Running programs



- Sessions programming: CCDCommander
- Planetary: The Sky
- Cameras control: MaximDL
- Focusing: FocusMax
- Hub dome and telescope: POTH
- Dome control: My own ASCOM driver
- Clouds and rain detection: AAG CloudWatcher

Working scheme



Difficulties and problems



- Configuration of communications
 - AP, gateway, bridge, client... WDS
- Configuration of POTH to slave the dome to the telescope
 - Help from John Brewster
- Mechanical problems with the motors pinions (at the beginning)
- Definition of the mount limits (CCDCommander configuration)
- Sporadic closing of the shutter due to “glitches” in the clouds detector
 - Temporal filter
- Remote hanging of Windows
- We will see with the new ASA mount (The Titán mount with Gemini was already working pretty well)

New mount ASA DDM85



New mount ASA DDM85





Thank you very much

