TRAINING COURSE

ANTENNA AND PEDESTAL GROUP (APG)

Primary Surveillance Radar Systems
ATM

Nº doc.: 0066605020000MA03
Edición: A Revisión: 1
Fecha: 09/03/2020

Warning of Confidentiality

Signature Sheet

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Changes Record

DOCUMENT CHANGES RECORD				
EDITION	*REVISION*	*DATE*	*CHAPTER*	*REASON OF THE CHANGES*
A	0	15/04/2017	All	First Edition
A	1	09/03/2020	All	Second Edition

Acronyms

AC	Alternate Current
ACP	Azimuth Change Pulse
APG	Antenna and Pedestal Group
ARP	Azimuth Reset Pulse
BITE	Built-in test Equipment
cm	Centimeter
CH	Channel
CMS	Control and Monitor System
COTS	Commercial-Of-The-Shelf
CW	Clock Wise
CCW	Counter Clock Wise
dB	Decibel
DC	Direct Current
DRCG	Dual Rotary Control Group
EPG	Exciter and Processor Group

Acronyms

EMC	Electromagnetic Compatibility
GHz	Gigahertz
h	Hour
Hz	Hertz
Kg	Kilogram
Km	Kilometer
Kw	Kilowatt
KVA	Kilovoltamper
LAN	Local Area Network
LVA	Large Vertical Aperture
m	Meter
mm	millimeter
MSSR	Monopulse Secondary Surveillance Radar
NLFM	Non Lineal Frequency Modulation
NM (nmi)	Nautical Miles

Acronyms

PLC	Programmable Logic Controller
PSR	Primary Surveillance Radar
PTCP	Pedestal Top Control Panel
RJ	Rotary Joint
RF	Radiofrequency
rpm	Revolution per minute
s	Second
SLG	Local Control System
TGT	Target
WX	Weather
ºC	Celsius degree

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Introduction

- Block Diagram
- Functional Description and elements
- System composition

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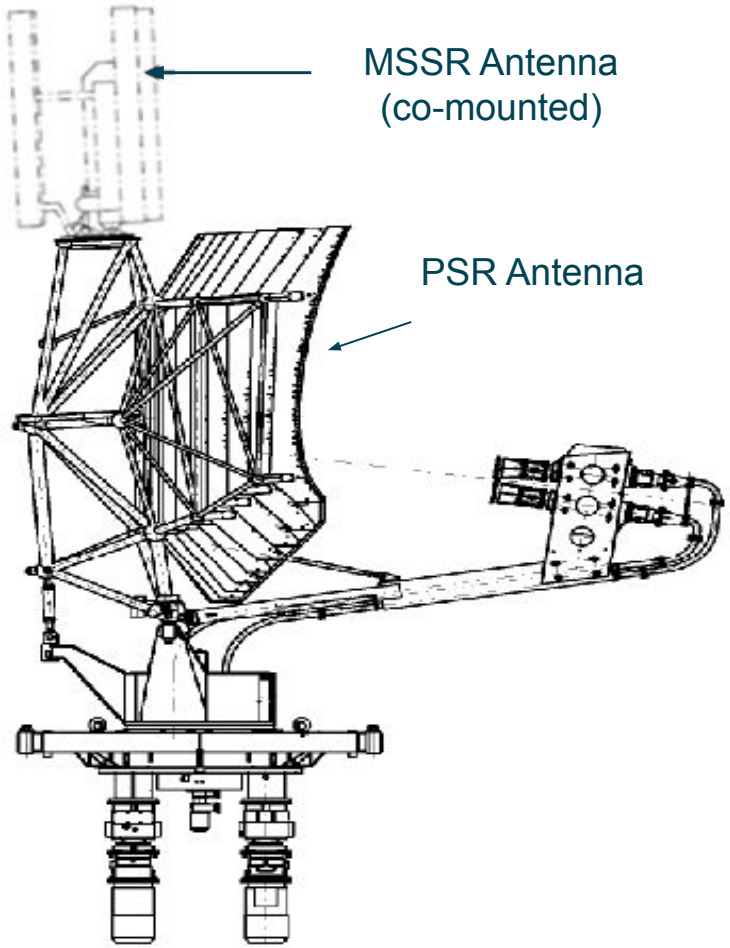
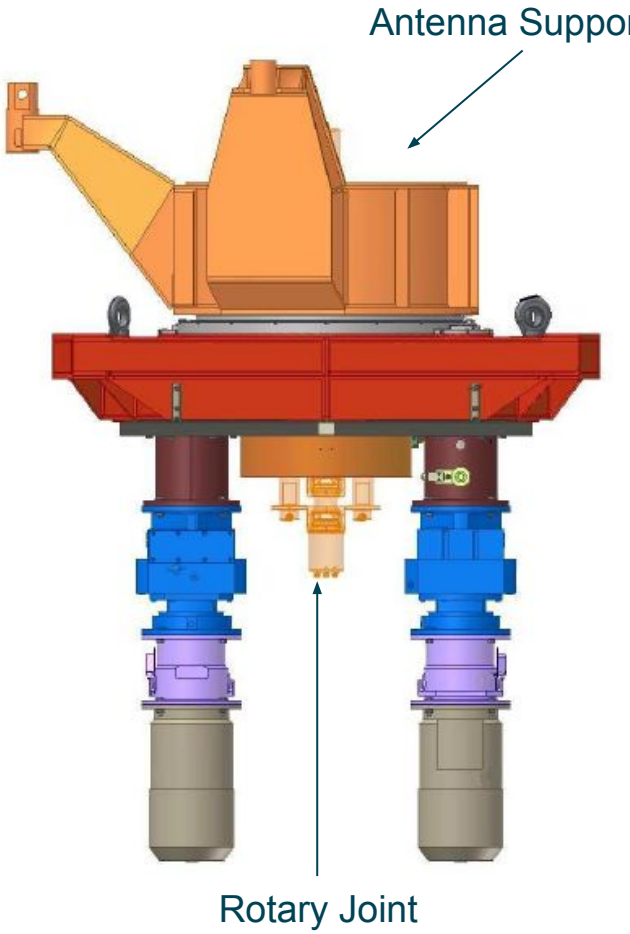
Block Diagram





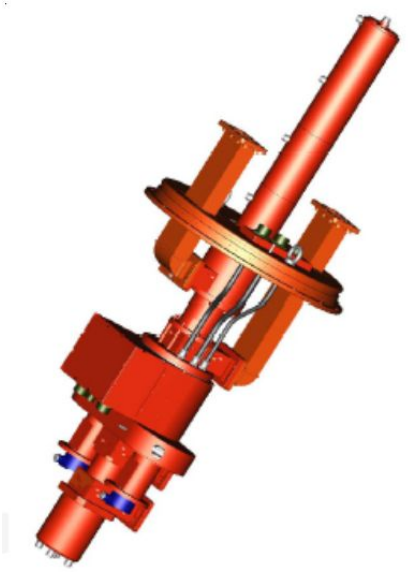
Functional Description and Elements

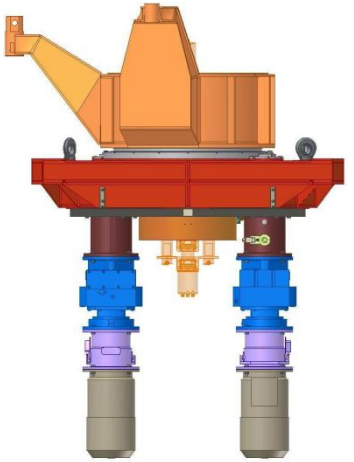
- Antenna subsystem transmits and receives RF signals and consists of:
  - A reflector.
  - Two feedhorns.
  - Polarizer.
- Pedestal subsystem performs antenna rotation and consists of:
  - Two motors.
  - Two gearboxes.
  - Two Electrical Clutches.
- Rotary joint subsystem consists of a fixed and a moving part and provides:
  - 7 RF channels:
    - 4 for PSR (2 for TGT in waveguide and 2 for WX in coaxial)
    - 3 for MSSR (coaxial)
  - 18 AC/DC slip-rings.
  - 2 encoders.
- The rotary joint is the interface between the APG and the sensor (for transmission and reception).
  - Reception: coaxial cable for weather low/high beams. Waveguide for target high beam and target low beam.
  - Transmission: Waveguide through low beam path.
- The high target channel is directed to the sensor through coaxial by means of a coupler after the rotatory joint.

System Composition

APG Performance

- Antenna (RAMET):
  - Gain > 34 dB.
  - Beam Width = 1.45 ± 0.05 degrees.
  - 2 elevation beams (HI-LOW).
  - 2 polarizations.
  - 2 Ch for Target + 2 Ch for Weather.
- Pedestal (RAMET):
  - Configurable Rotation Speed.
  - Dual Motors of 5.5 kW.
  - Includes Antenna Support.
- Rotary Joint (Cobham, Sivers Lab - Sweden):
  - 7 RF channels (4 PSR + 3 MSSR).
  - Dual Encoders.





APG Physical and Functional Description

- Antenna
- Pedestal
- Rotary Joint

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Antenna

Antenna

Introduction

- Antenna subsystem is a COTS element made by RAMET and performs RF signal transmission and reception in S-band (2.7 a 2.9 GHz).

- This subsystem is made up the next elements:

  - Reflector, provides an square cosecant elevation pattern.
  - Two feedhorn assembly, the top one (low beam) transmits and receives, and the bottom one (high beam), only receives.
  - Two polarizers, provides vertical linear and right-hand circular polarization (transmission and reception).
  - Two target channels (w/g) and two weather channels (coaxial).
  - Mechanical Tilt.

- In addition, it is made by optional elements such as:

  - Possibility of co-mounting a LVA antenna.
  - An obstruction light.
  - A lightning rod.

- Polarization changing and antenna turning monitoring.

Pedestal

Features

ELECTRIC REQUIREMENTS	
Pinion:	
Features	Steel
Bearing Ring - Fixed Case:	
Features	Dual motor, possibility of operation with one motor
Sensors	Oil level
Bearing Ring - Mobile Case:	
Features	Mechanical interface for S-Band PSR antenna.
Features	4 anchoring points and leveling points to adjust antenna tilt.
Antenna Support:	
Features	Mechanical interface between antenna and driving mechanism.

Pedestal

Features

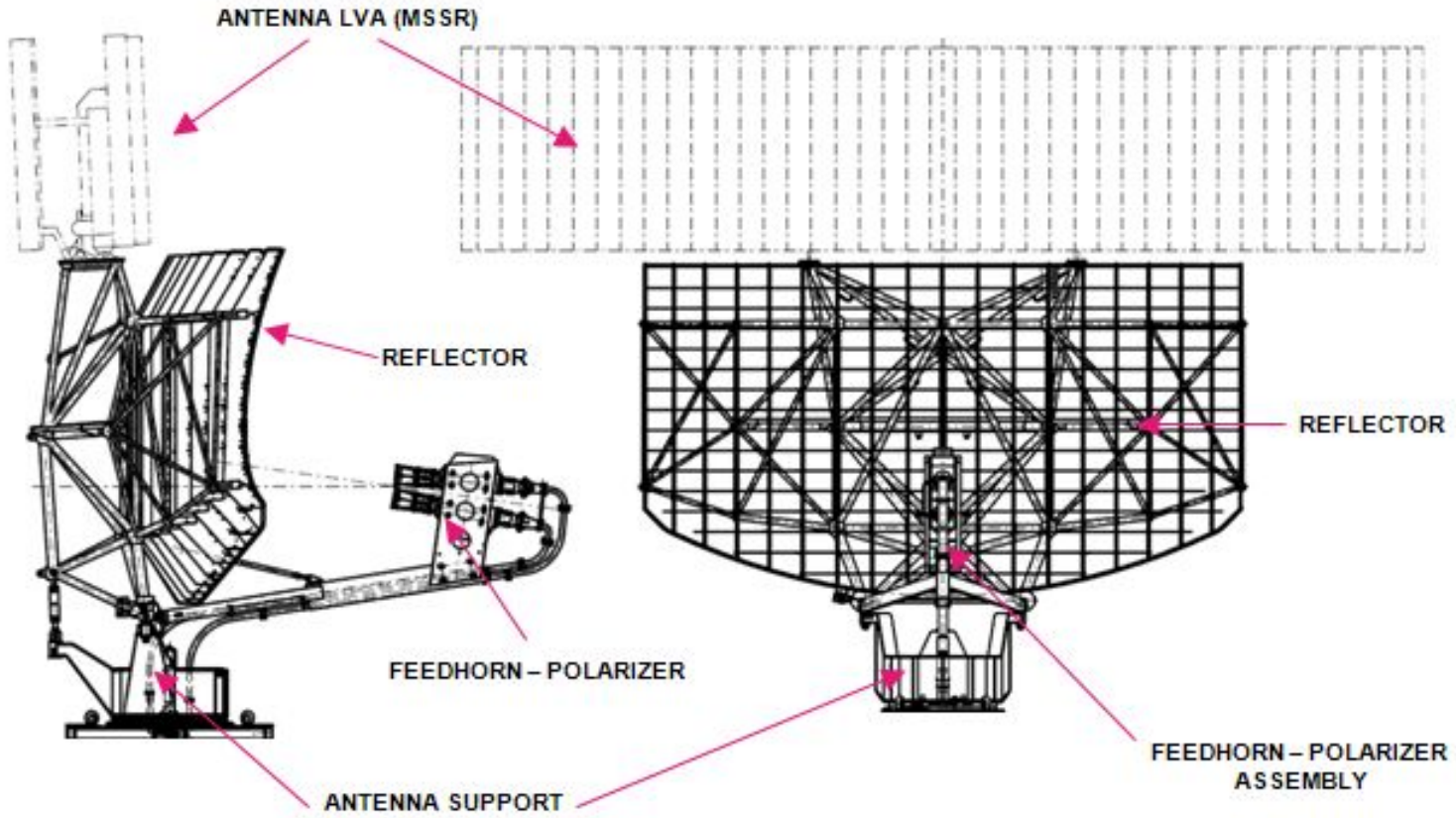
ELECTRIC REQUIREMENTS	
Input power	400V Three phases + Neutral
Input power frequency	50 Hz ± 5% and 60 Hz ± 5%
Power consumption	< 15kVA (when both motors are working)

SAFETY DEVICES	
Mechanical	Safety switch
Electrical	Pedestal interlock - disable mechanically the antenna rotation.

ENVIRONMENTAL CONDITIONS	
Temperature	-40º C to +70 ºC
Wind (Operative)	Up to 30 m/s (≈ 110 km/h)
Wind (Survival)	Up to 50 m/s (180 km/h)
Humidity	5% to 100% with condensation
Icing	Up to 4 mm

Antenna

Physical Diagram



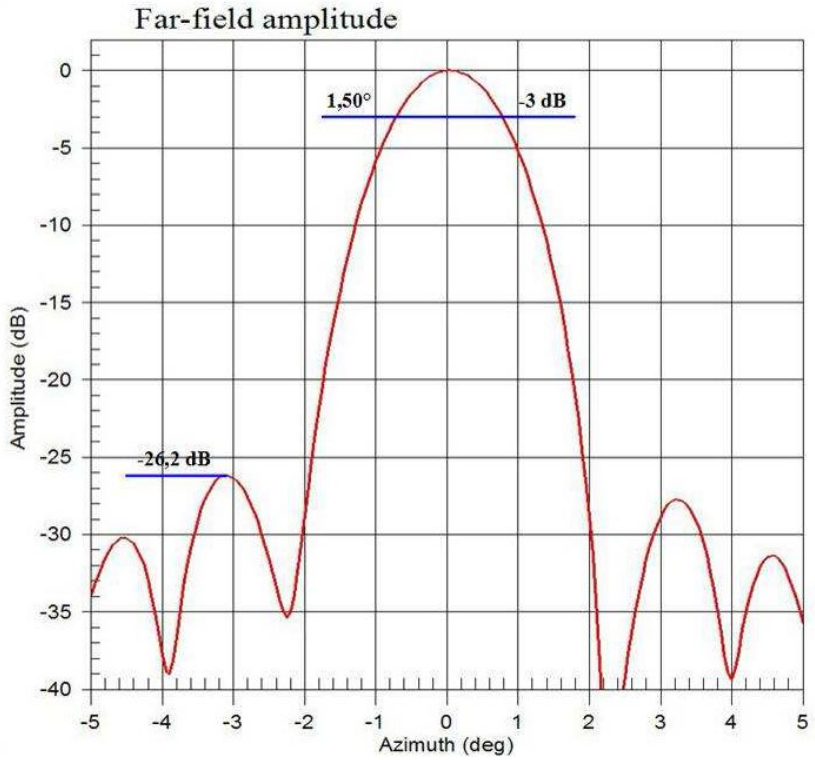
Antenna

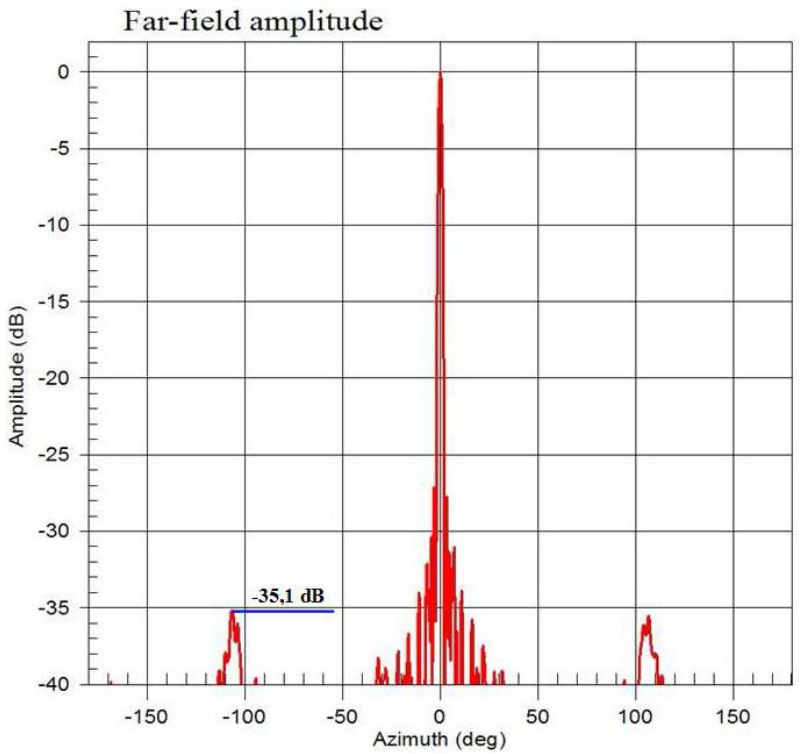
Operation

- Antenna element carries on the RF transmission (two pulses: a non-modulated short pulse and a NLFM long pulse generated on EPG and amplified by the transmitter), and the reception of the corresponding echoes.
- Transmission is performed by low beam (feedhorn assembly) and by means of the reflector, the transmission will be according to cosecant square pattern.
- Reception is performed by both beams (high and low). In the typical case:
  - High beam reception used for nearby coverage (reducing ground clutter).
  - Low beam reception used to further coverage.
- Every horn has two channels:
  - 2 wave guide channels → target high and low beams
  - 2 coaxial channels → weather high and low beams
- Antenna operates with two different polarizations in order to improve detection in case of weather clutter.
  - Polarization selectable: linear or circular.

Antenna

Azimuth Diagram

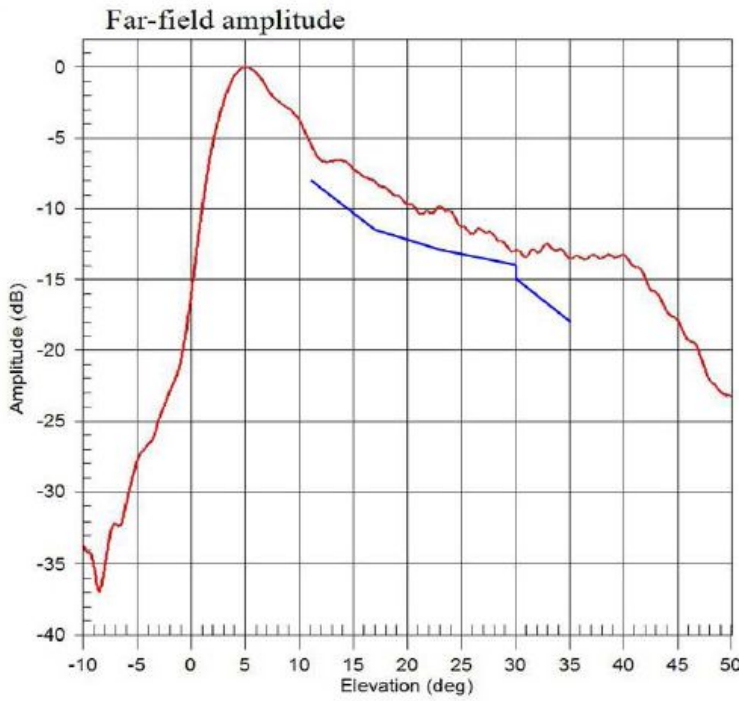


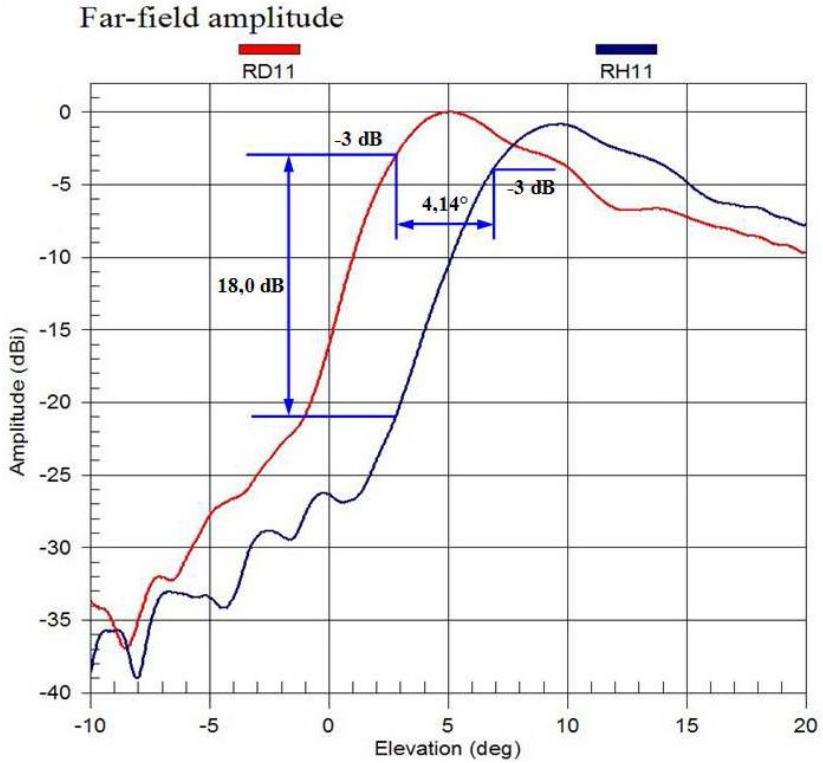


Antenna

Elevation Diagram

- Elevation diagram: cosecant squared pattern





Antenna

Polarization

- PSR antenna can transmit with two different polarizations.

- Features:

  - Transmission polarization: { Linear vertical. / Right handed circular → clockwise rotation.

  - Polarizer transmits and receives linear or circular polarization.

Antenna

Polarization

- POLARIZATION ADVANTAGES.

Symmetric objects (such as raindrops):

- Reflects circularly-polarized waves with the opposite sense of rotation. There is one reflection of the wave.
- Reflects lineal polarization in the same sense as it was sent.

Asymmetrical objects (such as aircraft):

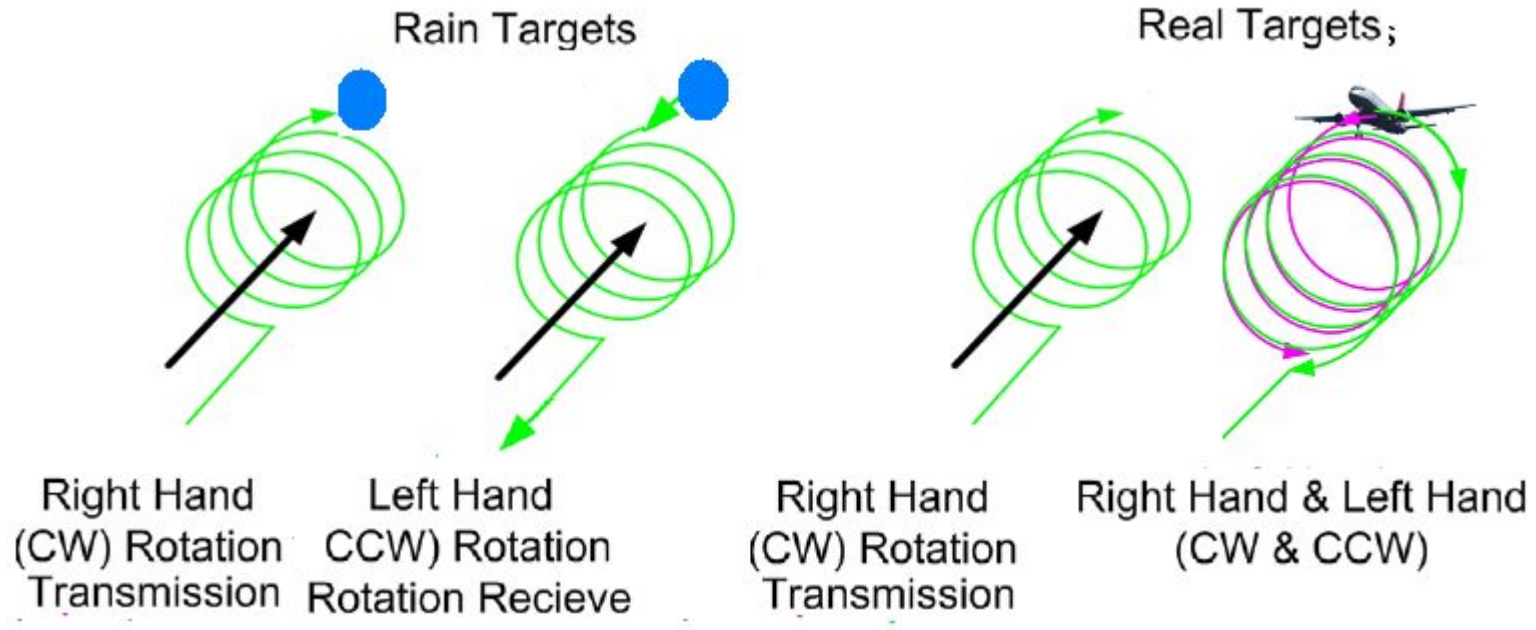
- Reflects circularly-polarized waves with the same and the opposite sense of rotation because they are odd and even numbers of reflections.
- Reflects lineal polarization in the same sense as it was sent.

Notice that transmitted circular polarization:

- 3 dB of losses in target echoes.
- >20 dB in spherical target echoes.

Antenna

Polarization



Antenna

Features

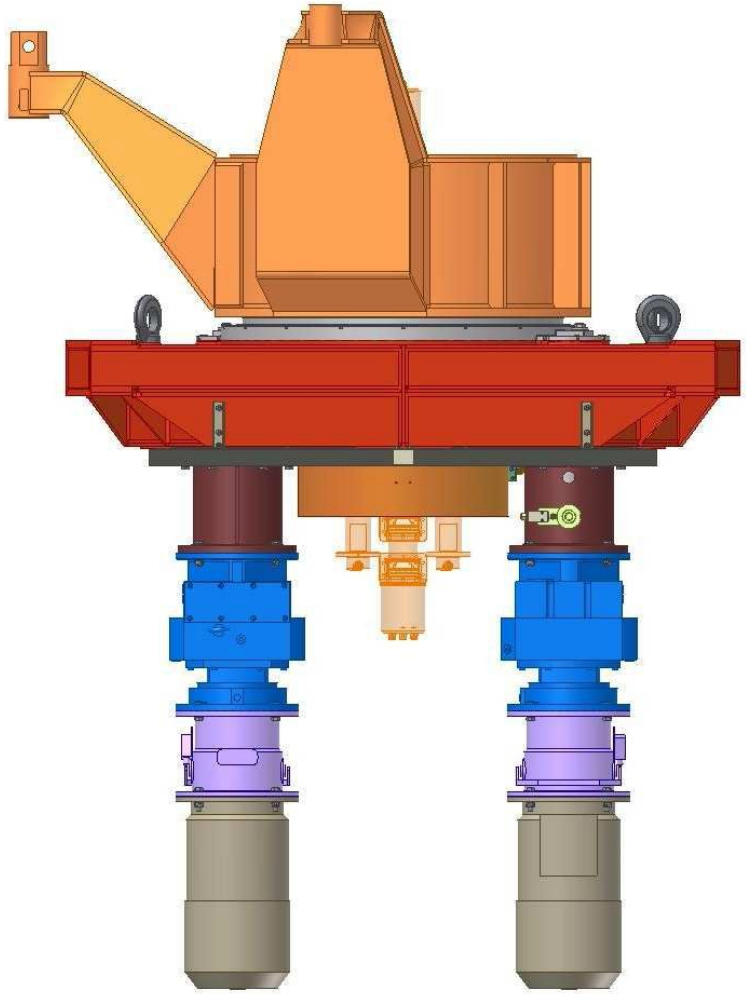
MECHANICAL FEATURES	
Frequency	2.7 – 2.9 GHz
ICR	20 dB min
Beamwidth 3 dB azimuth	Low beam 1.45º ± 0.05 High beam >1.3º
Beamwidth 3 dB elevation	Low beam >4.6º High beam >4.8º
Gain	Low beam 34dB, min High beam 32.5dB, min
Backward lobes	-35 dB (in relation with low beam peak)
Secondary lobes	Low beam -29 dB@±10º to ±30º, max Low beam -33 dB@±30º to ±180º, max High beam -22 dB, max
VSWR	1.35:1

Antenna

Features

MECHANICAL FEATURES	
Weight	2,764 kg with pedestal (including RJ) 800 kg without pedestal (only antenna)
Reflector Dimensions	2.8 m x 5 m
Reflector type	Azimuth parabolic, elevation conformed with grid surface
Rotation Speed	15 or 12 rpm (configurable)
Tilt	-3º to 6º

Pedestal



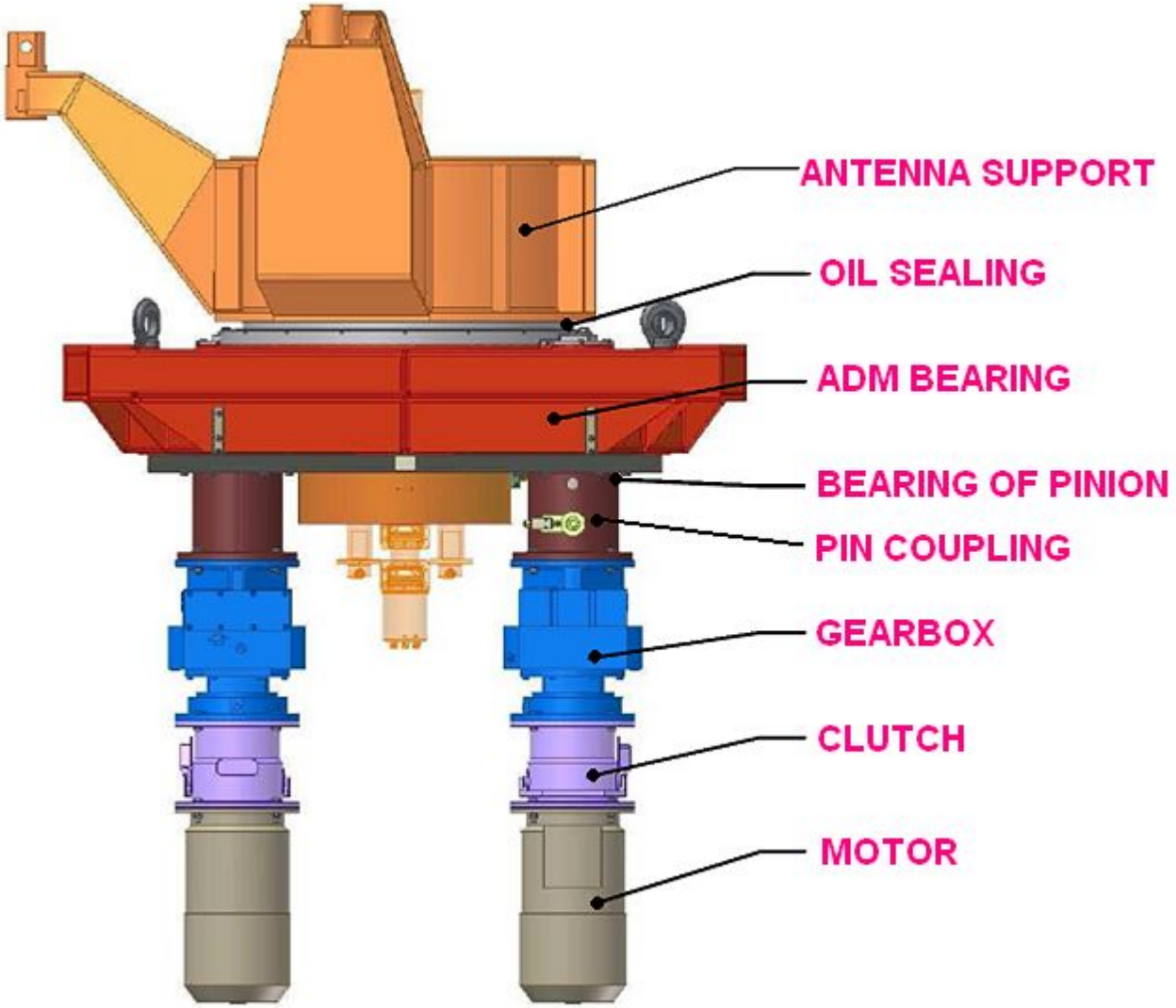
Pedestal

Introduction

- **Pedestal:**
  - Electromechanical system which able to give continuous rotation to the antenna.
  - Consists of a mobile case mounted on a large bearing and supported in its base by a fixed case which, at the same time, supports both power lines (motor + Electrical Clutch).
  - The pedestal shall allow the assembly of a rotary joint that transmits and receives the RF signals, AC/DC signals and angular transmission signals from the fixed case to the mobile case.

Pedestal

Physical Diagram



Pedestal

Description and Elements

- The pedestal subsystem is a electromechanical system which performs continuous antenna rotation (even with a co-mounted MSSR antenna).

- The system consists of the next elements:
  - Movement transmitter system:
    - **Two 5.5 kW motors with gearbox + coupling Electrical Clutch + pinion and bearing ring.**
  - Intermediate element:
    - **Connects the frame and the antenna drive mechanism with the antenna support.**
  - Electrical and Mechanical interfaces:
    - **Each motor has a Heating and a Thermistor terminal.**
    - **Oil level sensor**.
  - Antenna Locking:
    - **Antenna can be locked at any angle by the locking screw.**
  - Interlocks:
    - **Electrical: Pedestal Interlock.**
    - **Mech**

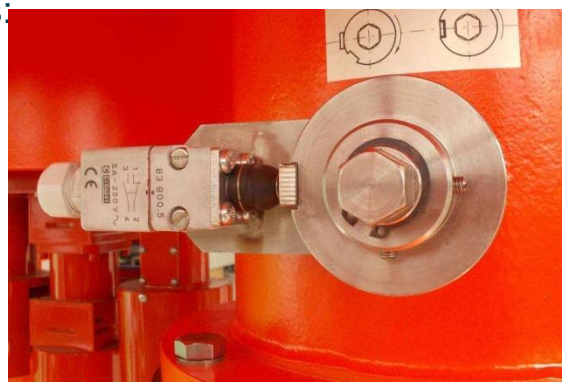
Pedestal

Operation

- The pedestal element is made up of two independent motors which allows a constant antenna speed (configurable), controlled by pedestal control panel (DRCG) or remotely by CMS.

- Is able to operate with only one motor.

- For safety purposes, the pedestal consists of mechanical and electrical interlocks:
  - Pedestal Interlock: after stopping the antenna, it can be locked at any angle (fixed turntable in a maintenance procedure, for example). When locked, it is not possible to start rotation.
  - Safety switch is a mechanical interlock, activated manually, blocking antenna turning.



- Pedestal status signals, such as oil level or temperature, are monitored in the CMS

Pedestal

Lubrication System

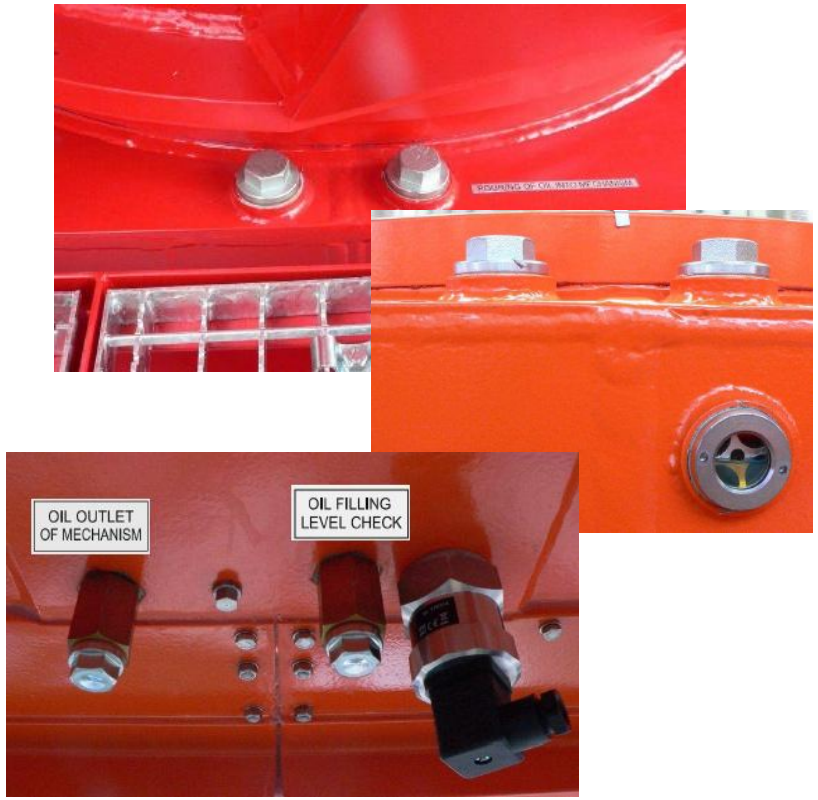
- Oil bath for turntable lubrication and for each drive train reducer.
- Long-life synthetic oil used as lubricant.
- Oil heaters to correct operation: gearbox and motors.
- Sensors to monitor oil level and temperature.
- Status reporting to DRCG:
  - Over Temperature.
  - Oil low level.

Pedestal

Lubrication System

Oil Sealing

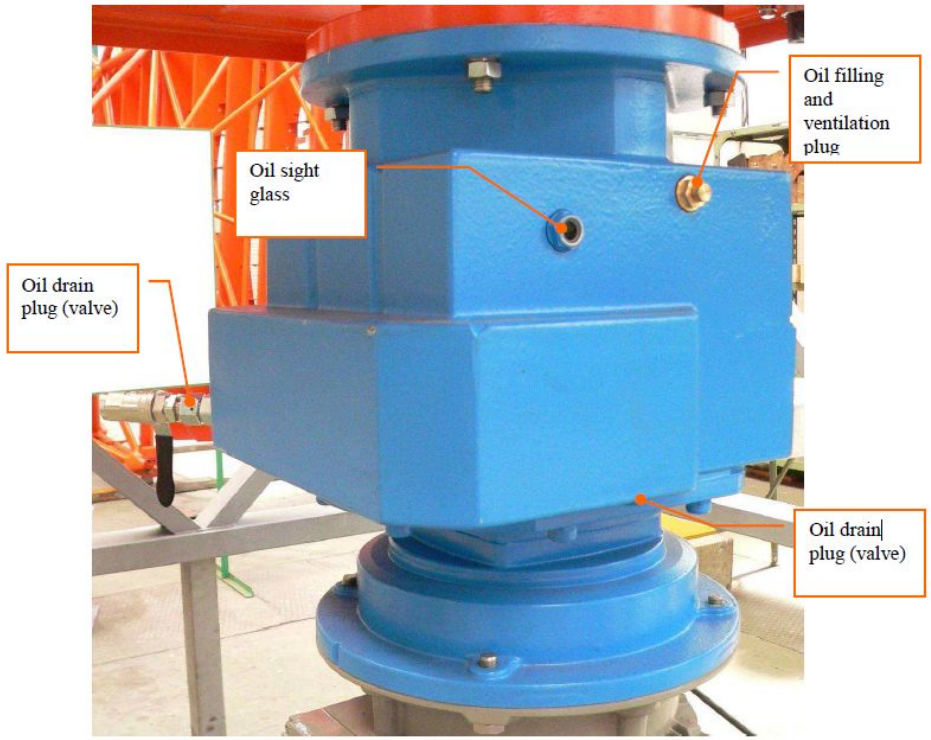
ADM Bearing



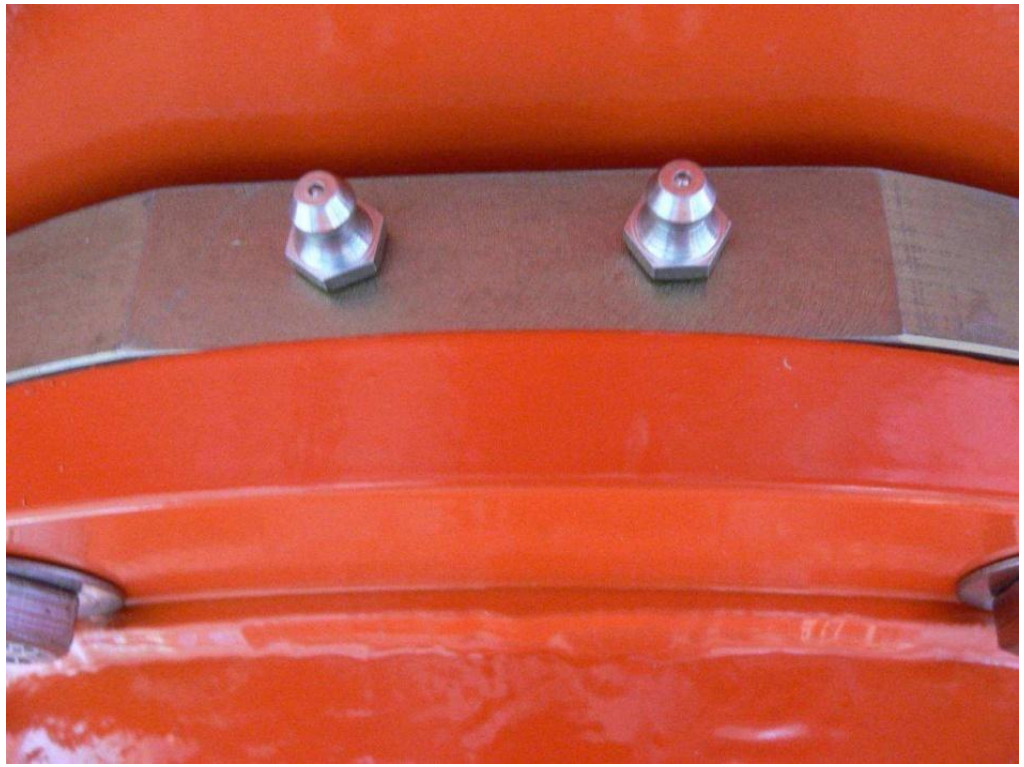
Pedestal

Lubrication System

Gearbox



Bearings of Pinions



Pedestal

Lubrication System

UNIT	FREQUENCY	LUBRICATION TYPE	FILL QUANTITY
Gearbox	12500 hours or 2 years	Shell Omala S4 GX150 or equivalent	7.5 liters
ADM Bearing	12500 hours or 2 years	Castrol Alphasyn GS 220	9.33 liters
Pin Coupling	20000 hours or 2 years	Aero Shell Grease 6	As required

Pedestal

Features

MOTOR UNIT	
Number of drives	2 redundant driving lines composed of the following elements each one: (1 motor, 1 gearbox, 1 Electrical Clutch and 1 pinion) and one bearing ring. Motor controllers necessary for speed adjustment.
Rotation speed	12 or 15 revolutions per minute, adjustable.
Motor/s:	
Output power	5.5 kW
Features	Equipped with heating elements. Possibility to change motors whitout stopping the antenna.
Sensors	Over temperature
Gearbox:	
Lubrication	Oil sight glass
Features	Two-helical gearboxes
Electrical Clutch:	
Sensors	Electrical Clutch Engaged/Disengaged
Features	Maximum torque 200 N.m
Features	Possibility of engage/disengage while rotation

Pedestal – Electromechanical Clutch

Features

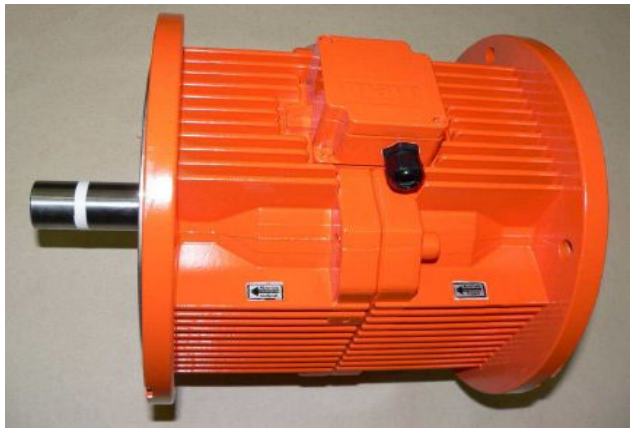
For safety reasons the engage/disengage of the electromechanical clutches is limited to the switches **only when both motors are stopped,** DRCG is in MAINTENANCE and PTCP is ON, because engage a stopped motor when the pedestal is turning can damage the drive line.

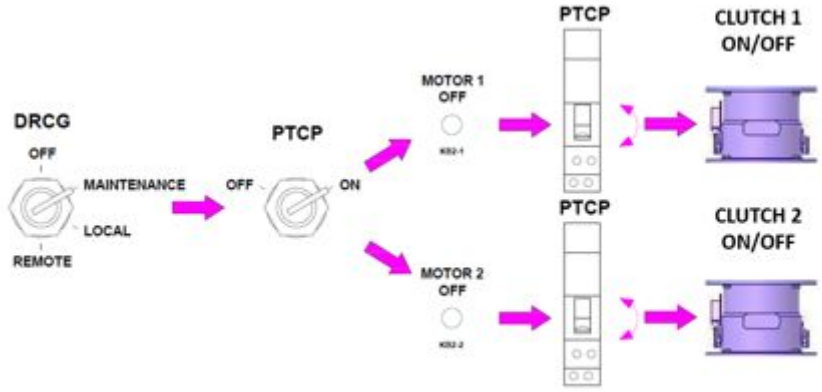
1) **Normal operation**: Clutches are controlled from PLC automatically, motors will be engaged if both motors are stopped or running at the same time. If any of them is stopped while the other is running, the stopped one will be disengaged.

2) **Control of clutches from PTCP switches** :

- DRCG: MAINTENANCE.
- PTCP: ON.

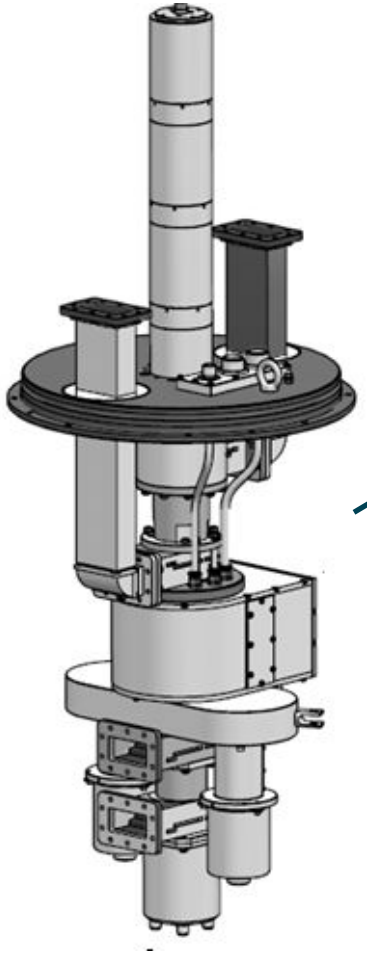
The following figure shows the sequence of operation for a correct operation with these switches.

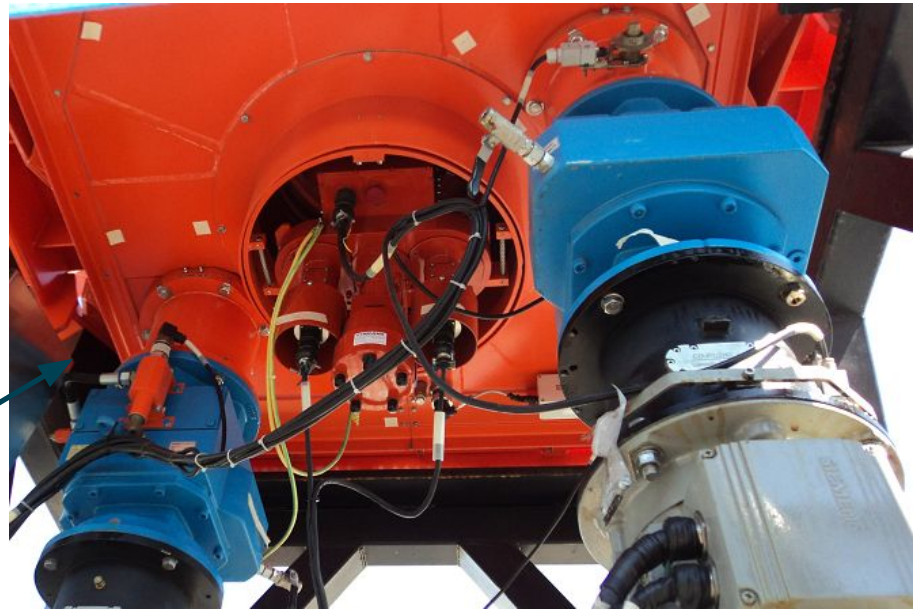




Activation and deactivation sequences for clutches in Maintenance Mode

Rotary Joint





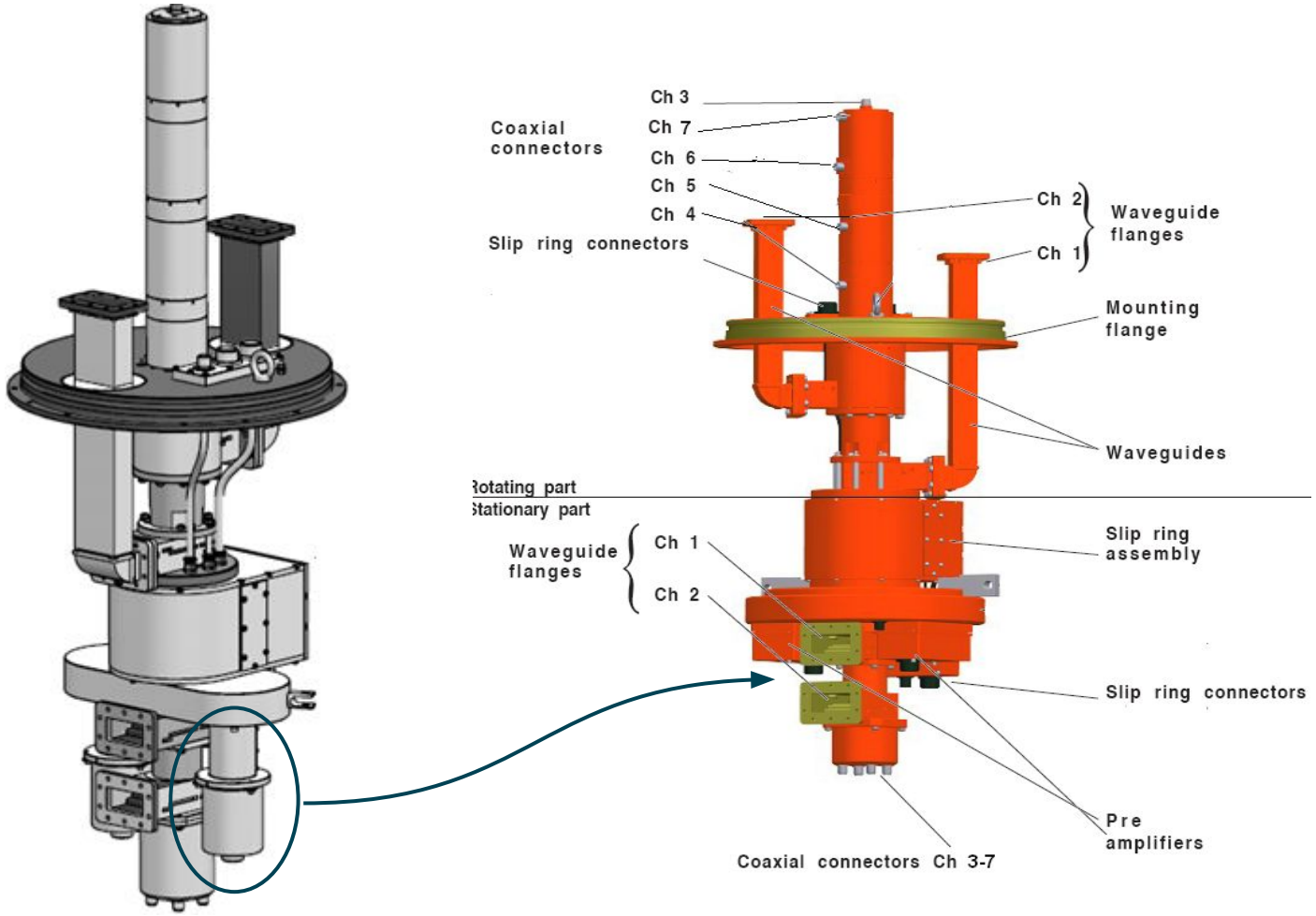
Rotary Joint

Introduction

- The rotary joint is an element of the APG. RF and electrical signals such as control, status and supply passed through it.
- Made up of the next elements:
  - 7 channels: 2 for target, 2 for weather and 3 for MSSR.
  - 18 Slip-rings: AC/DC signals transferring between the fixed and the moving part.
  - 2 redundant encoders.
- It has a cavity which accommodates a minimum of 18 slip-rings, used to transfer AC/DC signals: control, BITE or feed, towards some elements as the polarizer or the obstruction lights.
- The azimuth synchronism generators, or Encoders, transforms the azimuth antenna pointing into electric signals RS-422 (generates ACPs and ARP signals)

Rotary Joint

Physical Diagram



Rotary Joint

Operation

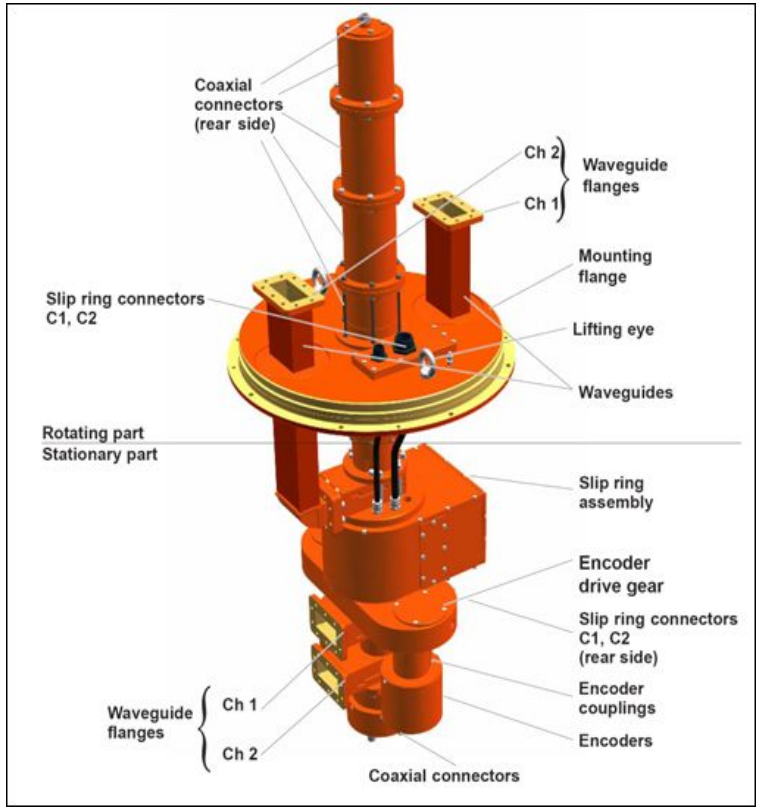
- RF signals are transmitted through antenna Low Beam (waveguide, specified to tolerate high peak power) and received through both beams.
  - High beam signal passes through waveguide in the antenna and rotary joint, and sent to the system through coaxial by means of a waveguide-coaxial coupler after the rotary joint.
  - In addition, MSSR channels can pass through rotary joint.

- The slip-rings are a set of AC/DC rings where status, control and supply signals passes through, from DRCG to the antenna.

- These signals are:
  - Polarizer status signals for both beams.
  - Polarizer control signals.
  - Obstruction light supplied signals.

Rotary Joint

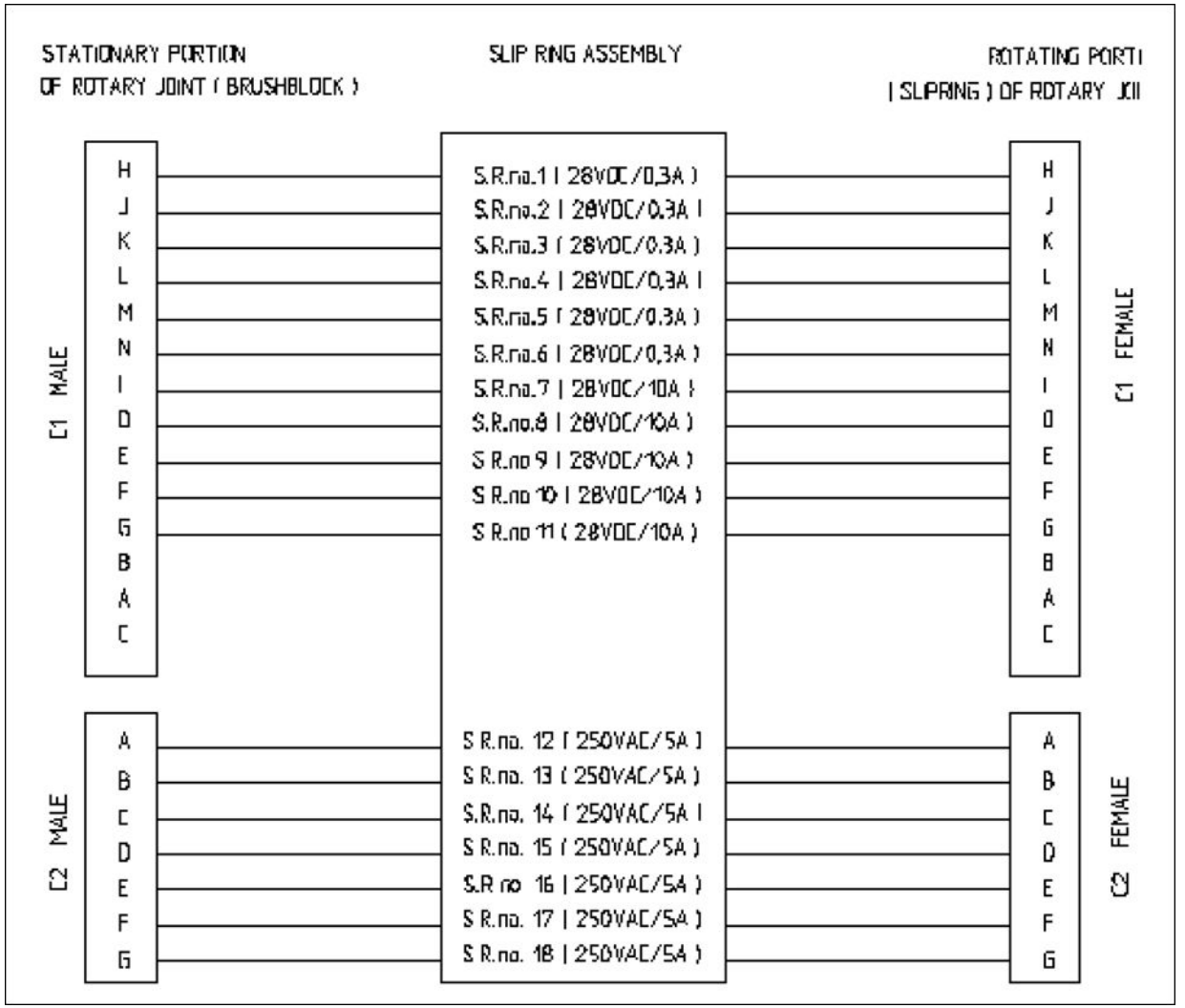
Slip-Rings



SLIPRINGS ROTARY JOINT				
C1	*DC Signals*	C2	AC Signals	
28VDC/0,3A	high beam circular status	250VAC/5A	power obstruction light	line
28VDC/0,3A	high beam linear status	250VAC/5A	power obstruction light	gnd
28VDC/0,3A	low beam circular status	250VAC/5A	power obstruction light	neutral
28VDC/0,3A	low beam linear status	250VAC/5A	power polarizer heater	line
28VDC/0,3A	28 DC RTN	250VAC/5A	power polarizer heater	neutral
28VDC/0,3A	28V DC **polarizer**	250VAC/5A	Spare	line
28VDC/10A	circular polarizer command	250VAC/5A	Spare	neutral
28VDC/10A	linear polarizer command			
28VDC/10A	28V **polarizer** 0Vdc (+28VDC RTN)			
28VDC/10A	Spare			
28VDC/10A	Spare			

Rotary Joint

Slip-Rings



Rotary Joint

Encoders

- The rotary joint includes two redundant angular position sensors or encoders.
- Encoder: electromechanical element that converts angular target position into a digital code.
  - Precision: 0.022º (14 bit).
  - Resolution 14 bits for 360º 16,384.
  - 2^{14} ACPs plus 1 ARP each north-mark.
  - Jitter < 10%.
- Controlling/supplied by DRCG and monitored by CMS.

Rotary Joint

Features

ROTARY JOINT CHANNELS SPECIFICATION							
	Ch1	Ch2	Ch3	Ch4	Ch5	Ch6	Ch7
Operational Frequency (GHz)	2.7 to 2.9	2.7 to 2.9	2.7 to 2.9	2.7 to 2.9	1.01 to 1.11	1.01 to 1.11	1.01 to 1.11
VSWR (MAX)	1.2:1	1.2:1	1.25:1	1.25:1	1.25:1	1.25:1	1.25:1
WOW MAX (variation of VSWR with rotation)	0.05	0.05	0.05	0.06	0.06	0.06	0.06
INSERTION LOSS (dB MAX)	0.15	0.25	0.65	0.65	0.65	0.65	0.65
PEAK POWER (kW)	200	5	5	5	5	5	5
AVERAGE POWER	5kW	75W	75W	75W	-	-	-
AVERAGE POWER (Short Term)	-	-	-	-	3000W	75W	75W
AVERAGE POWER (Long Term)	-	-	-	-	300W	75W	75W
ISOLATION	60 dB between channels						
TEMPERATURE	-40º to 70º						
PRESSURE (max)	30 PSI						

Rotary Joint

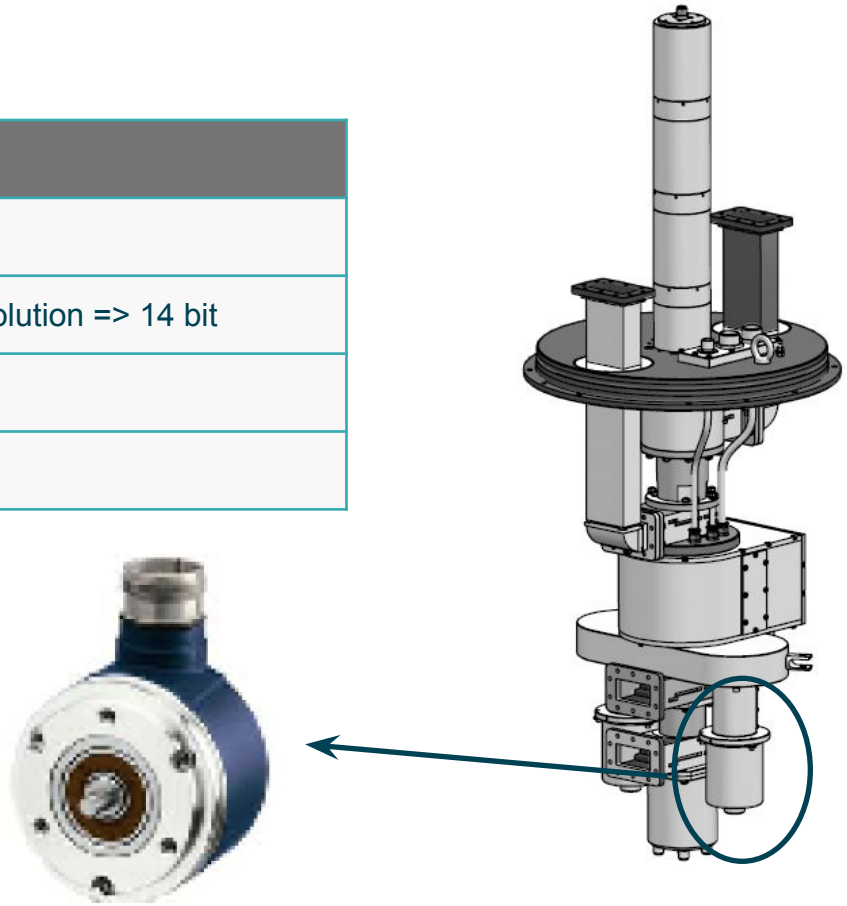
Features

GENERAL SPECIFICATIONS	
Isolation	60 dB between channels, minimum
Max. Radiation during the peak of power @ a distance of 0,2 m.	0.1 mW/cm2
Total weight	< 80 Kg
Height of rotary part	According to the pedestal
Height of the stationary part	According to the pedestal
Temperature range (operative)	-40º C to +70º C
Temperature range (storage)	-40º C to +70º C
Pressurization	30 PSI max.
Leakage	25cc/min MAX @ 5 PSI operational temperature range @ 10,000 feet over sea level
Rotation speed	15 rpm max.

Rotary Joint

Features

ENCODERS SPECIFICATIONS	
Number of encoders	2 redundant
Resolution	16,384 ACP + 1 ARP per revolution => 14 bit
Accuracy	0.022º
Jitter	< 10%



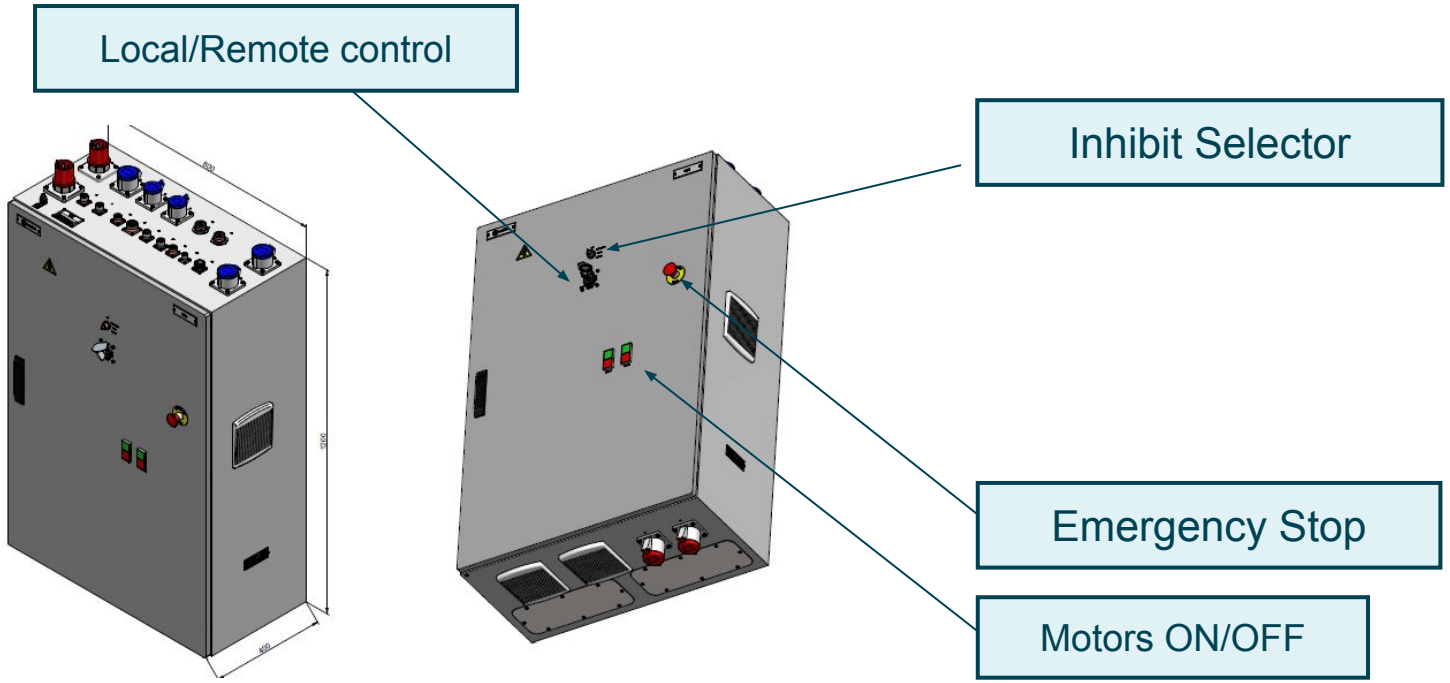
DRCG Physical and Functional Description

- Main Features
- Elements and Diagrams
- BITE
- Operation
- Features
- Pedestal Top Control Panel (PTCP)
- Junction Box

3

DRCG Elements and Diagrams

Front Diagram



Main Features

- Performs Antenna and Pedestal Group control and monitoring.
- Supplies the energy required to encoders and polarizer.
- It has been designed with a safety chain and different control modes: Local, Remote or Maintenance.
- Protects all lines, for both data and power, established between the radar head and the equipment installed in the tower, from possible overvoltages caused by lightning.
- Apart from monitoring the status of the equipment connected to the DRCG, it is reported to CMS via LAN communication.
- Controls the antenna turning speed by means of controllers.

Features

Power Supply	**400 VAC, 60 A, 50/60 Hz**
Control Panel	**Pedestal status or motor on-off (possibility to operate with one or two motors) monitoring.**
Motor Controllers	**Converts input alternate current into direct current to be converted in alternate current again later but with a frequency adjustment to 12 or 15 rpm depending on system configuration.**
Power Supplies	**24 VDC redundant** **For supply PLC, LEDs, encoders…**
PLC/ programmable switch	**24 inputs** **19 outputs**
Communication	**Two modules for redundant transmission Modbus/TCP**
Safety	**Switch to implement the safety chain** **Emergency button to emergency stopping.**
Operation Modes	**LOCAL: Starting up from DRCG** **MAINTENANCE: Allows the key to be removed from the control panel front** **REMOTE: Starting up from SLG**

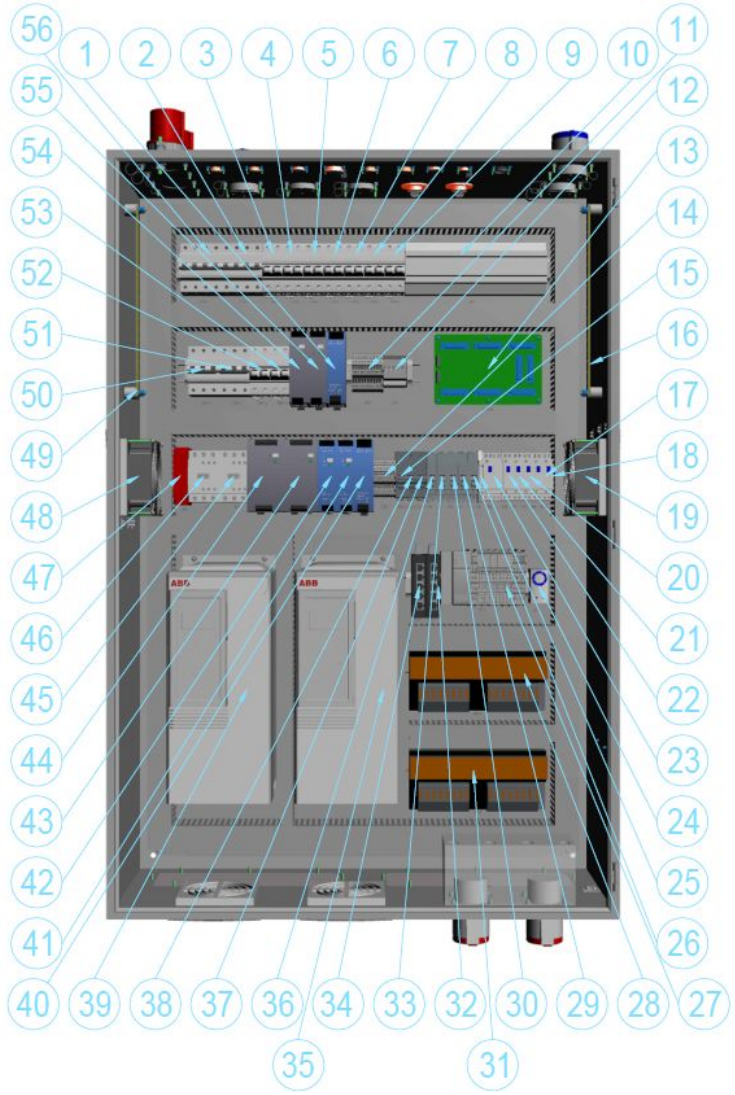
Elements and Diagrams

Internal Diagrams

- It is made up of the next elements, among others:
  - Circuit breakers to control the supply of the different elements.
  - Electrical protection devices: AC and DC protection.
  - Two redundant modules to perform communication (acquisition data module): Receive and transmit the status signals (received as 24 Vdc voltage) and performs BITE management by means of ModBus/TCP protocol.
  - Diodes board: To avoid undesired current returns.
  - Two motor controllers: Transforms alternate current into direct current in order to convert it later into alternate but varying its frequency to the determined value. Controls antenna turning speed and motor status.
  - A PLC/programmable relay: Controls status signals managed by the DRCG.
  - Two EMC filters: One for each driving line, responsible for attenuating undesired harmonic frequencies.
  - At the front panel: Monitors pedestal status, switching motors on/off etc.

Elements and Diagrams

Internal Diagrams



Elements and Diagrams

Internal Diagrams

1	**RPS**	**Redundancy module for 24V Power Supplies**
2	CB2	**Main breaker 2**
3	CB3	**Breaker for motor 1 heater**
4	CB4	**Breaker for motor 2 heater**
5	CB5	**Breaker for start-up warning, dusk sensor and obstruction lights**
6	CB6	**Breaker for fan B1**
7	CB7	**Breaker for fan B2**
8	CB8	**Breaker for power supply for clutch 2**
9	CB9	**Breaker for power supply for clutch 1**
10	RV	**Overvoltage Dischargers.**
11	TB1	**24 VDC and 0 VDC distribution terminals**
12	F1 a F5	**Protection fuses for 24 VDC**
13	DPCB	**DRCG interconnection board**
14	TB2	**Polarizer power supply and control distribution terminals**
15	CB14	**Breaker for polarizer power supply 1**
16	E3	**Ground for dischargers.**
17	K9	**Clutch 2 activation relay**
18	K10	**Clutch 2 heater activation relay**
19	B2	**Right side fan**
20	K8	**Clutch 1 heater activation relay**
21	K7	**Clutch 2 activation relay**
22	K6	**Obstruction lights activation relay**
23	K5	**Polarization control contactor**
24	**S11**	**Thermostat for fans**

Elements and Diagrams

Internal Diagrams

25	K4	Polarizer control activation relay
26	S10	Switch for Motor 2 Heater
27	PLC	Programmable Logic Controller
28	KB1	16 channels relays module 1
29	S9	Switch for Motor 1 Heater
30	S8	Switch for Encoder 2
31	KB2	16 channels relays module 2
32	SW2	Switch router 2
33	S7	Switch for Encoder 1
34	SW1	Switch router 1
35	DRV2	Motor Controller 2
36	S6	Obstruction lights switch
37	CB16	Breaker for anemometer power supply
38	CB15	Breaker for polarizer 2 power supply
39	DRV1	Motor Controller 1
40	RDC	Redundancy Module for DC converter of power supply for polarizer
41	DC2	DC converter power supply for polarizer 2
42	DC1	DC converter power supply for polarizer 1
43	PS4	Clutch 2 power supply
44	PS3	Clutch 1 power supply
45	K3	Motor Controller 2 Contactor
46	K2	Motor Controller 1 Contactor
47	K1	Safety relay
48	B1	Left side fan
49	E2	Ground bar for connectors and other elements (except dischargers)
50	CB10	Breaker for Motor Controller 1
51	CB11	Breaker for Motor Controller 2
52	CB12	Breaker for Power Supply 1
53	CB13	Breaker for Power Supply 2
54	PS1	24 VDC Power Suply 1
55	PS2	24 VDC Power Supply 2
56	CB1	Main breaker

BITE

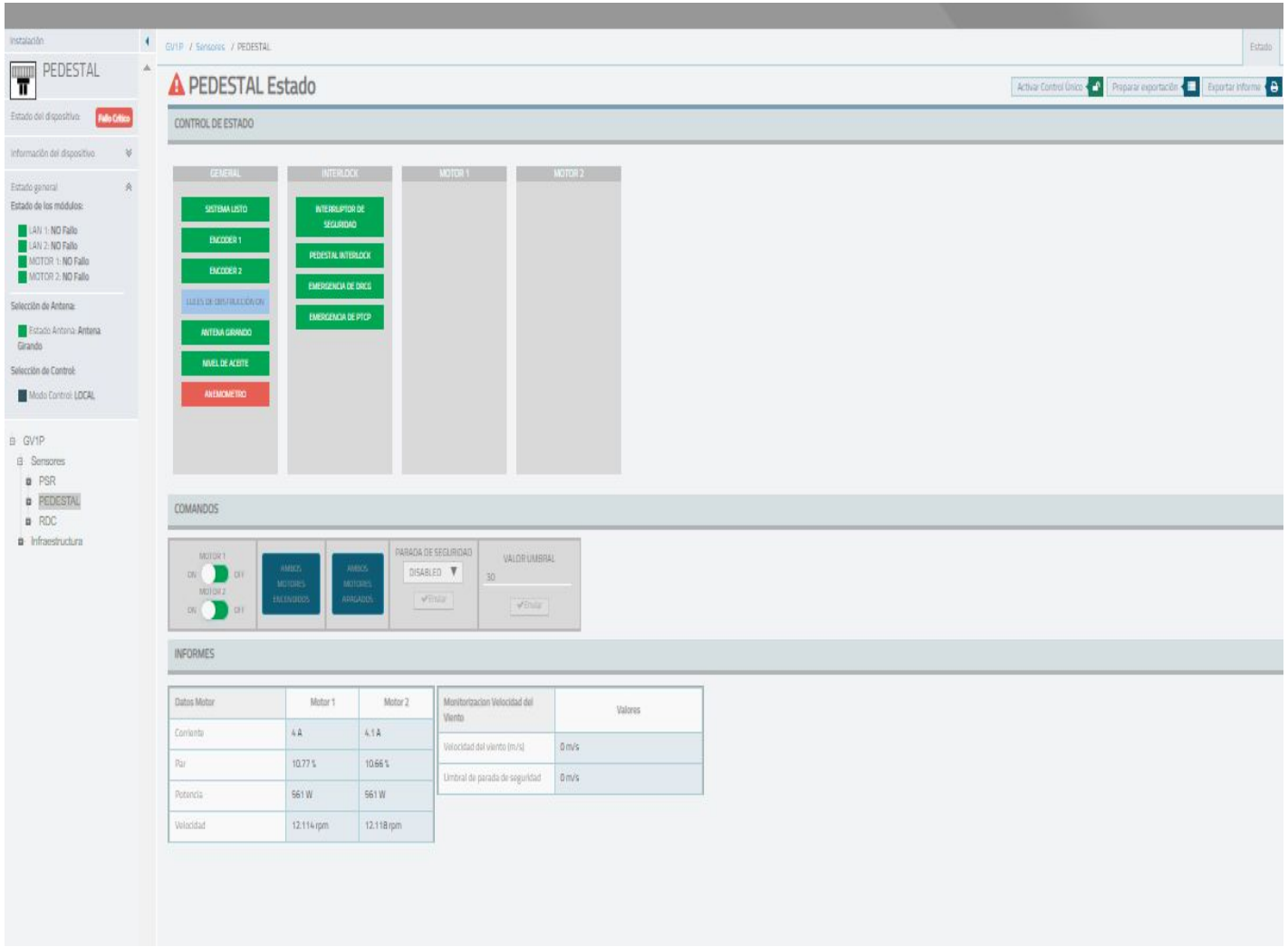
Connection

BITE signals coming from Antenna and Pedestal Group, are managed by means of the **PLC** firmware. These signals are pedestal status, equipment control, interlocks and controllers status signals.

All signals are received and packed by means of **acquisition data modules**. These signals are transmitted by means of Modbus/TCP protocol through two redundant LAN.

BITE

CMS Interface



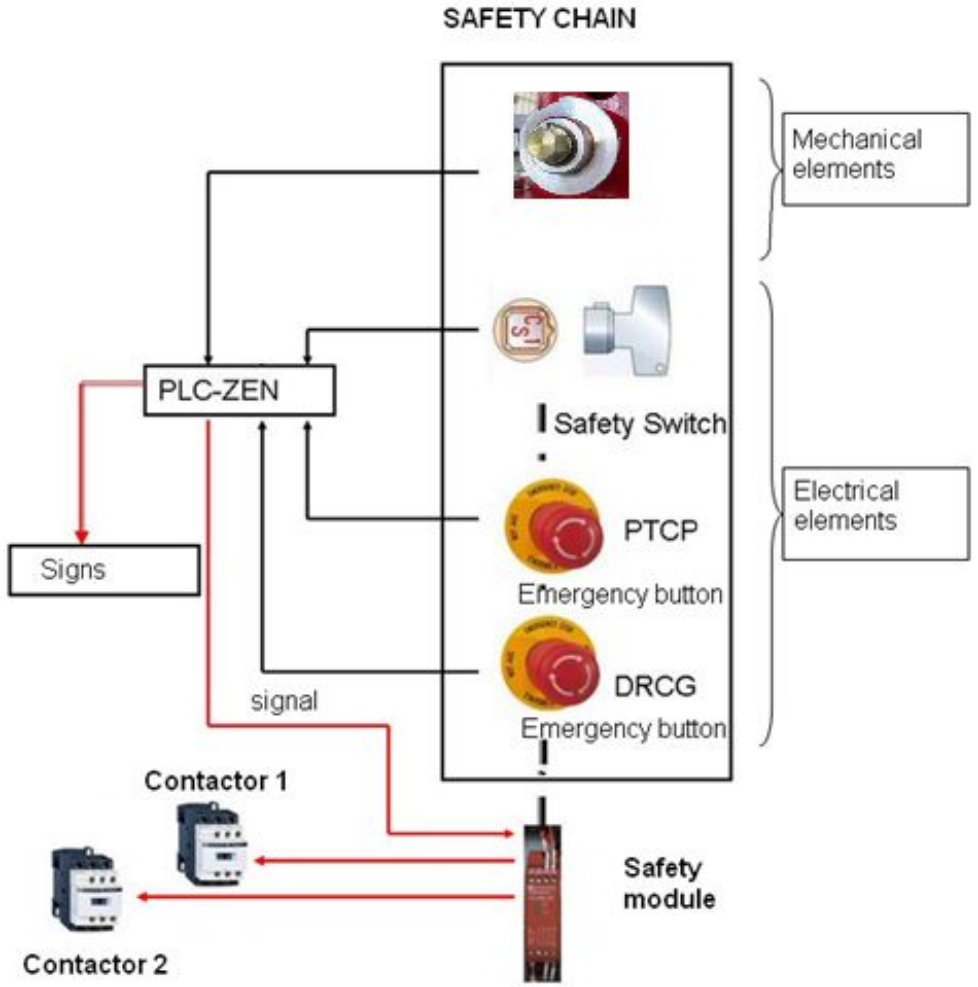
BITE

Alarms Example

ENCODER 1 ON ENCODER 2 ON	Encoder 1 and 2 are switch on.
ENCODER 1 ON ENCODER 2 OFF	Encoder 1 is switched on and encoder 2 is switched off. This status is considered as degraded working of the system, and this alarm will be also represented in oranger in the pedestal box of the SLG main screen.
ENCODER 1 OFF ENCODER 2 ON	Encoder 1 is switched off and encoder 2 is switched on. This status is considered as degraded working of the system, and this alarm will be also represented in orange in the pedestal box of the SLG main screen.
ENCODER 1 OFF ENCODER 2 OFF	Encoder 1 and 2 are switched off. This status is considered as a critical failure in the system because the radar does not have angular information. This alarm will be also represented with red colour in the pedestal box of the SLG main screen.

BITE

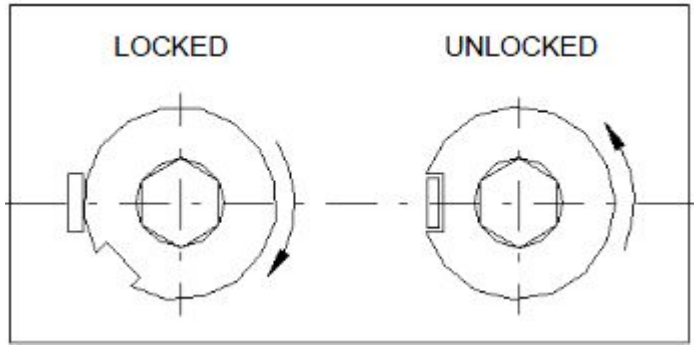
Safety Antenna and Pedestal Group Diagram



BITE

Safety Switch and Antenna Locking Mechanism

ANTENNA LOCKING



Operation

- Pedestal Control Panel performs the following operations:
  - Antenna turning by means of motors control. It is possible to operate only with one motor.
  - Possibility of cutting energy off by means of emergency buttons.
  - Various independent control modes:
    - **REMOTE:** Control from CMS.
    - **LOCAL:** Control from DRCG frontal panel.
    - **MAINTENANCE:** Remove the key to use the PTCP.

- Monitors their own devices and also controls equipment status.
- Each electric line from the radar, either 400 Vac three-phase/230Vac single phase alternate current or 24/28 Vdc direct current, is protected.
- The system supplies energy to some antenna devices such as encoders, heaters and obstruction lights.

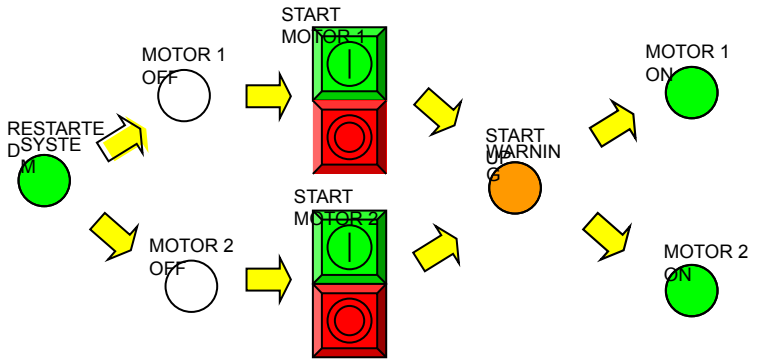
Operation

Master-Slave

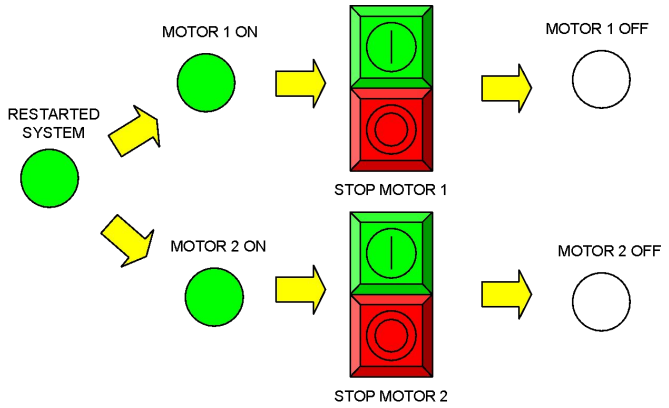
- Two frequency controllers: ABB ACS-800 three phases, AC, 7,5Kw.
  - Convert alternate current into direct current, to change again late into alternate but with different frequency.
- Both motors start using an acceleration ramp and stop by inertia in order not to damage transmission.
- Master-Slave.
  - Used to distribute the wear of both motors and improve the operation in case of adverse weather conditions (torque control).
  - First controller which receive the start command is the master.
  - Master establishes the speed of the set and transmits to the second one the torque indication to keep same torque in both.

Operation

- Starting procedure of both motors:



- Stopped of both motors procedure:



Pedestal Top Control Panel (PTCP)

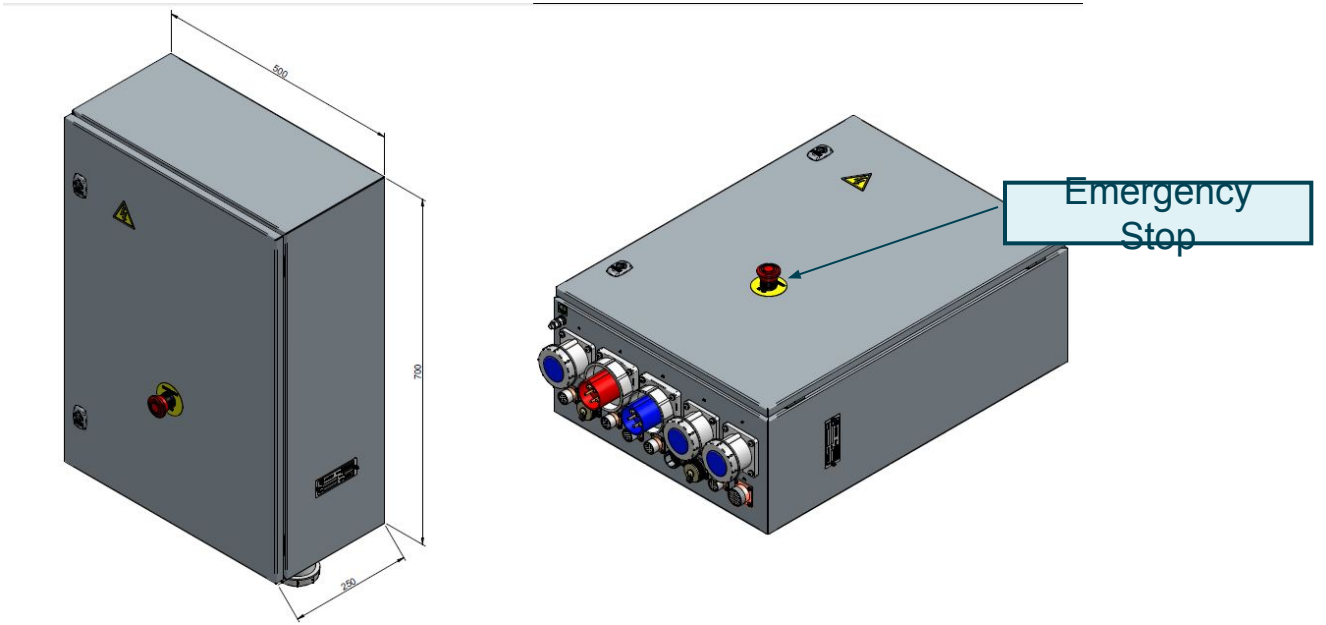
Operation

- PTCP (Pedestal Top Control Panel) is a control panel located in the motor room where pedestal is installed.

- Features:
  - PTCP – DRCG connection is complete. However, simultaneous controlling using both units is incompatible with safety **Independently controlled.**
  - PTCP is a reduced version of the DRCG for maintenance purposes.

Pedestal Top Control Panel (PTCP)

Frontal Panel



DRCG PHYSICAL AND FUNCTIONAL DESCRIPTION

Pedestal Top Control Panel (PTCP)

Features

Energy	**400 VAC, 60 A, 50/60 Hz**
Place	**Next to pedestal**
Main Function	**Signal transmission from DRCG to pedestal and viceversa. Used for maintenance purposes.** **Sensor and other pedestal elements energy centralization.**
Control Panel	**Pedestal status, on-off motors, encoders, interlock and other signals monitoring.**
Operation	**Start up/stop only are enabled by removing the key in maintenance mode in DRCG.**
Safety	**Emergency button for emergency stop**

Junction Box

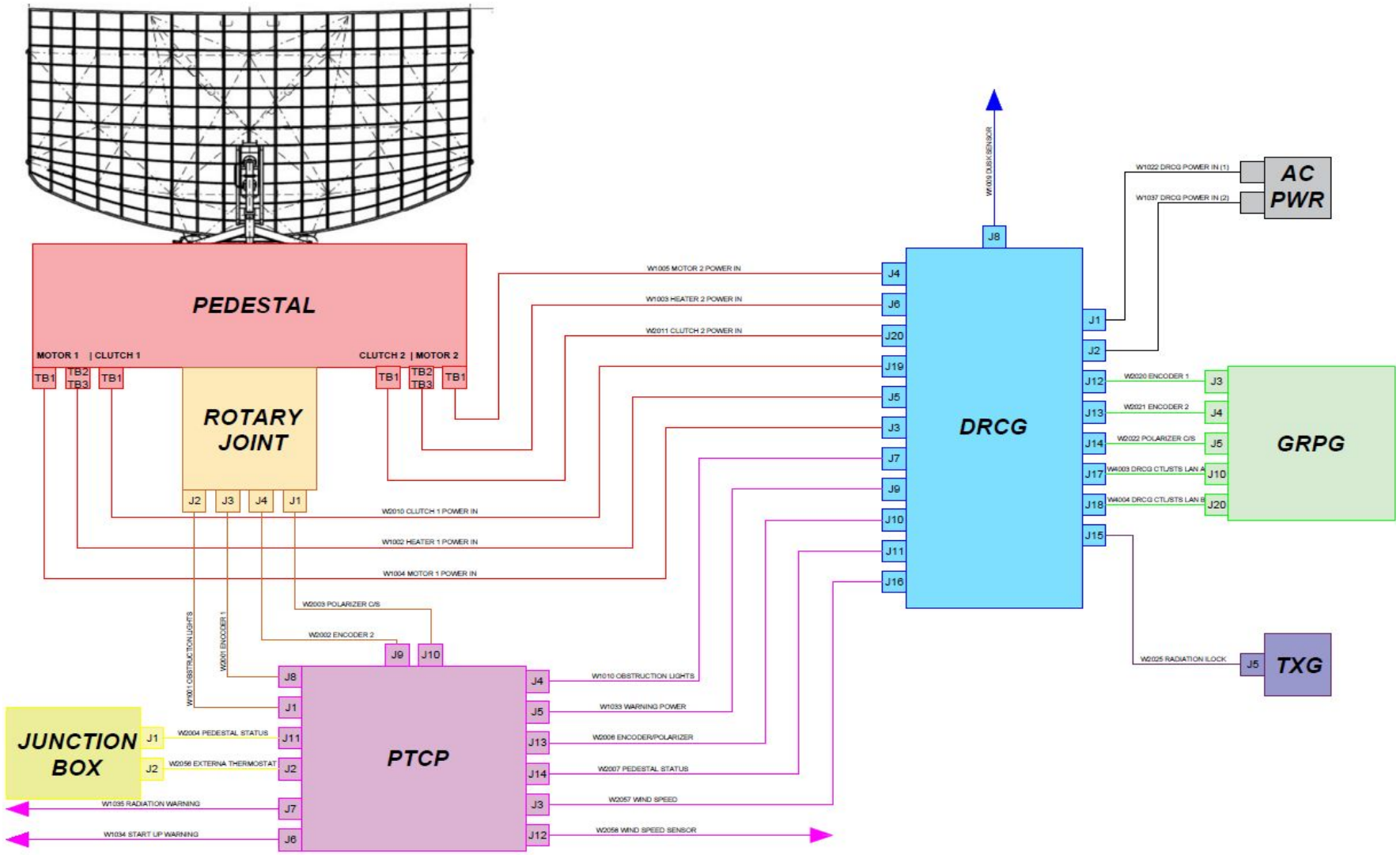
Features

- Internally is composed of interconnection terminals and a thermostat with a temperature probe that allows the activation of the heaters when outside temperature is below 10ºC.

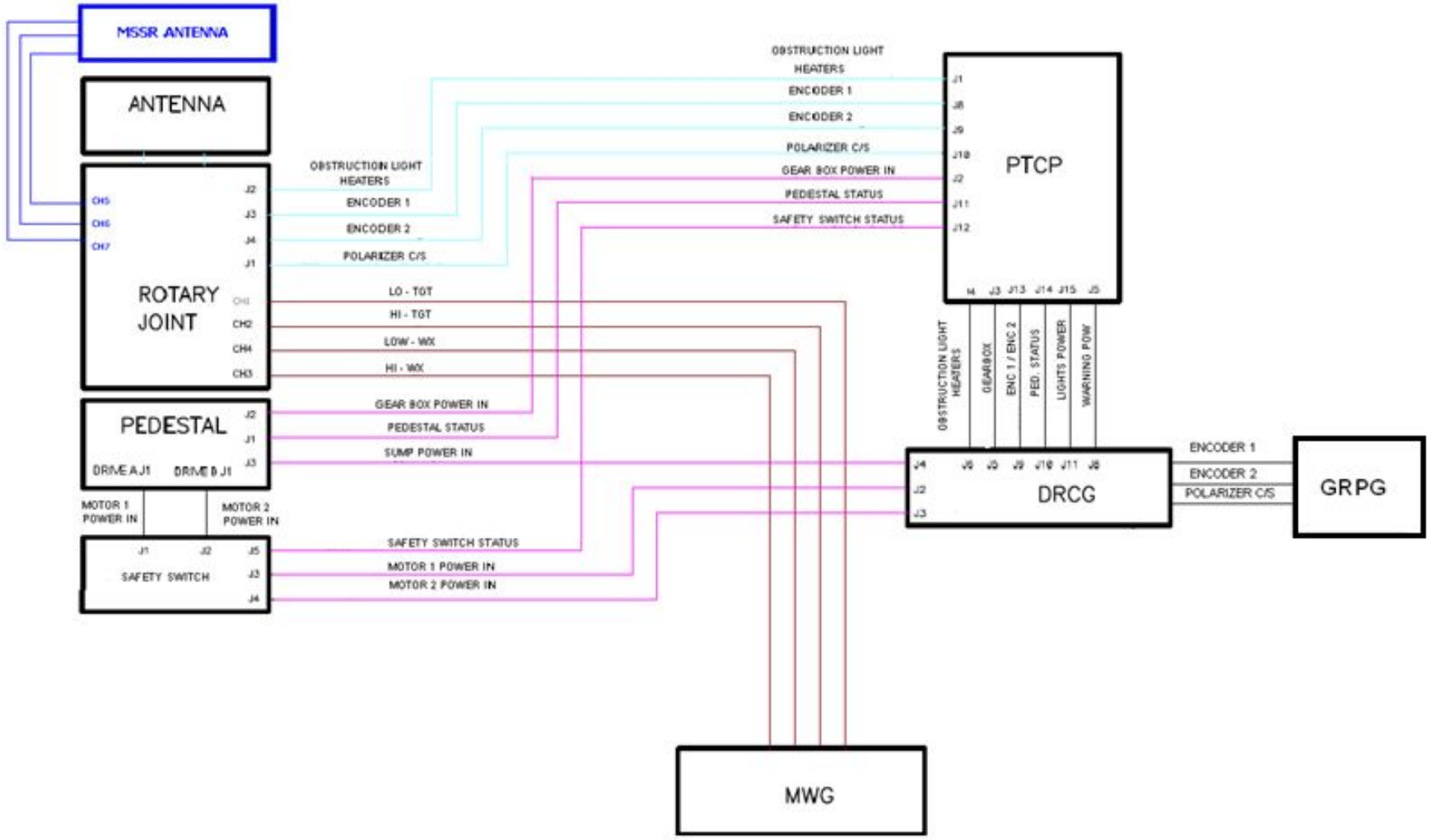
APG Interfaces

4

APG Interfaces



APG Interfaces




indra
At the core