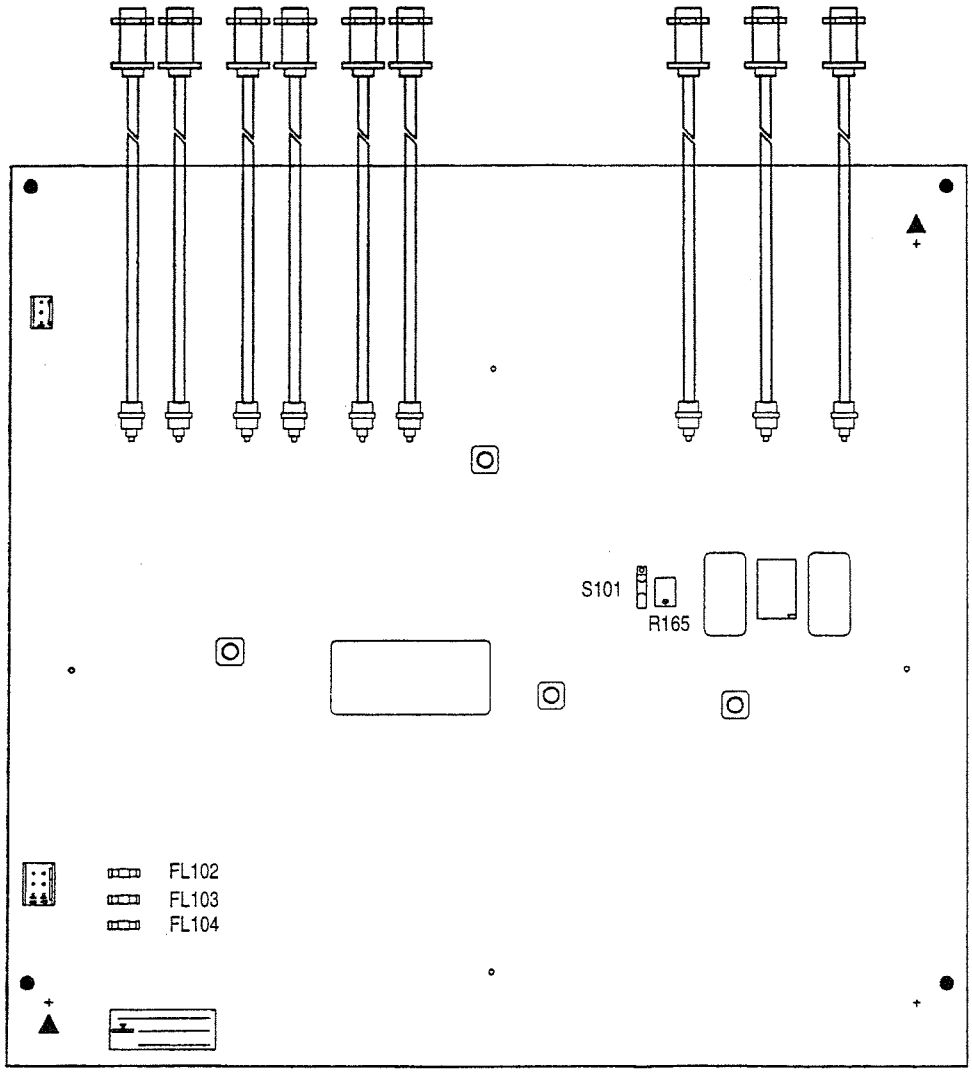

Figure 86 – Overall view of the 10 MHz distribution board

2.5.17.3 – Ports and displays

Figure 87 shows the front and rear panels of the unit.

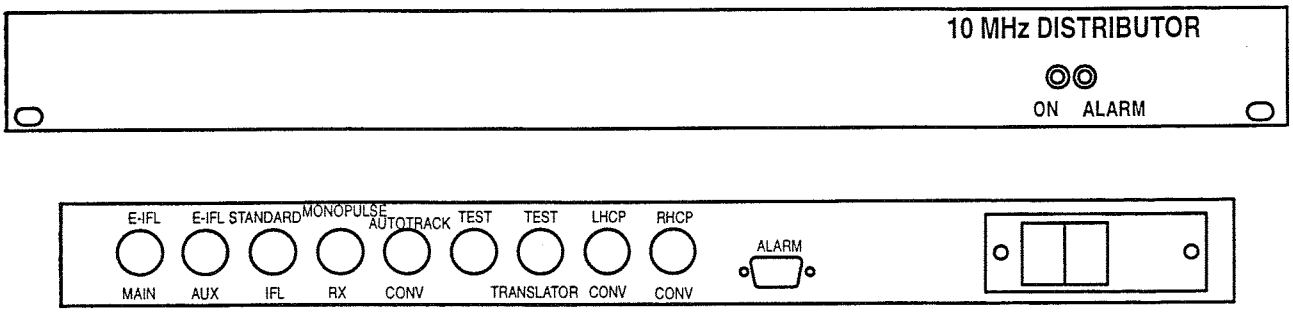

Figure 87 – Front and rear panels of the 10 MHz distributor

ITEM	COMPONENT	DESCRIPTION
ON	Green LED	Unit powered up and +5 V, +12 V and –12 V DC voltages present
ALARM	RED LED	General unit alarm (10 MHz or power supply level)
E-IFL MAIN	Female N connector	10 MHz main input from E–IFL
E-IFL AUX	Female N connector	10 MHz auxiliary input from E–IFL
STANDARD IFL	Female N connector	10 MHz input from GTS (standard IFL)
MONOPULSE RX	Female N connector	10 MHz output to autotrack monopulse receiver (optional)
AUTOTRACK CONV	Female N connector	10 MHz output to autotrack receive transposition (optional)
TEST	Female N connector	10 MHz test output
TEST TRANSLATOR	Female N connector	10 MHz output spare
LHCP CONV	Female N connector	10 MHz output to LHCP transposition
RHCP CONV	Female N connector	10 MHz output to RHCP transposition
ALARM	9–way female HE501 connector	10 MHz distribution unit alarm
–	Mains connector/switch/filter assembly	Unit's mains connector and power on/off switch (I/O)

2.5.17.4 – Connections

"ALARM" CONNECTOR

PIN	SIGNAL
1	Dry loop, open in alarm condition
2	
3 to 9	–

UNIT POWER SUPPLY CONNECTOR

PIN	SIGNAL
PH	Phase
N	Neutral
EARTH	Earth

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2.5.18 – Manual regeneration dehydrator (SOFRER 52 61 31 SO)

This dehydrator is intended to fill high frequency and ultra-high frequency line systems (coaxial cables, flexible and rigid waveguides etc.) with dry air.

The humidity of air is maintained at a level sufficiently low to avoid condensation. This air is dried and kept under low pressure within the lines, thus increasing reliability.

The device is integrated in a 2 units 19' subrack with an access cover on the top. Compressed air outlet is located on the left side of the unit (outlet for a flexible tube, inside diameter: 6).

2.5.18.1 – Operation

The dehydrator is of manual regeneration type. The drying cartridge is equipped with a humidity indicator. When the colour of the droplets changes from blue to pink (see curve on figure 91), the drying cartridge must be regenerated (see paragraph 5.2.3.1).

PNEUMATIC OPERATION

When the installation is filled, ambient air is sucked in by the compressor CO and passes through the drying cartridge CD.

The air is dried and delivered to the installation by means of the check valve CR via the filter FA.

The operating pressure is measured as close as possible of the air outlet by means of a piezo-resistive sensor MA.

The analogue value provided by the piezo-resistive sensor is processed to activate various elements : LED indicators, red "Alarm" LED, alarm relay, compressor.

The pneumatic system block-diagram is given by the figure 88 and an internal view by the figure 89.

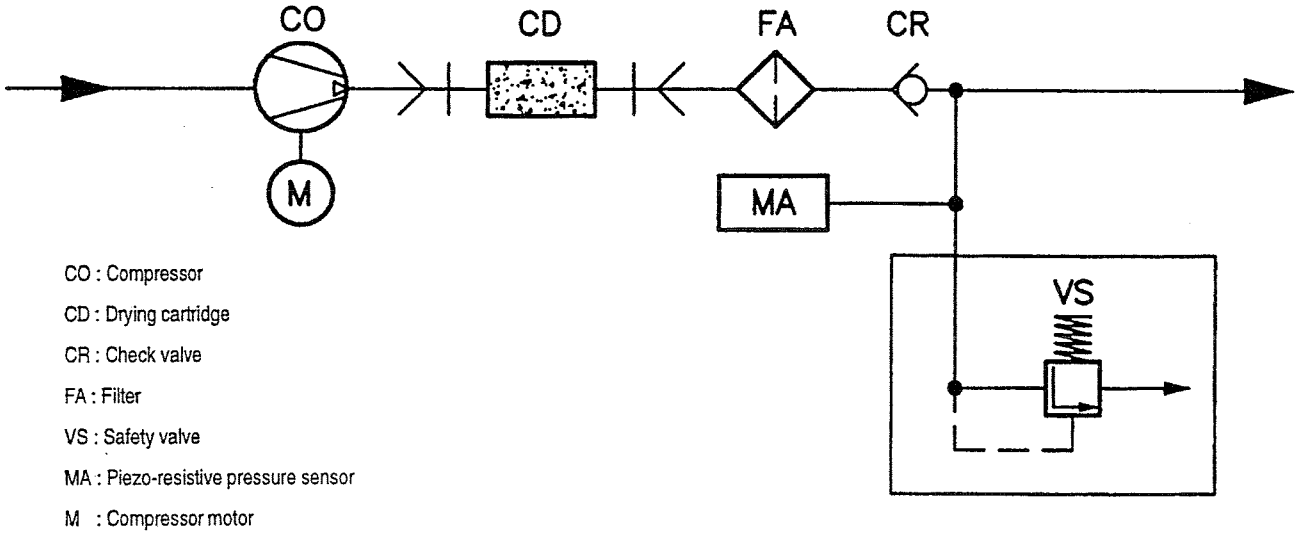


Figure 88 – Pneumatic circuit block-diagram

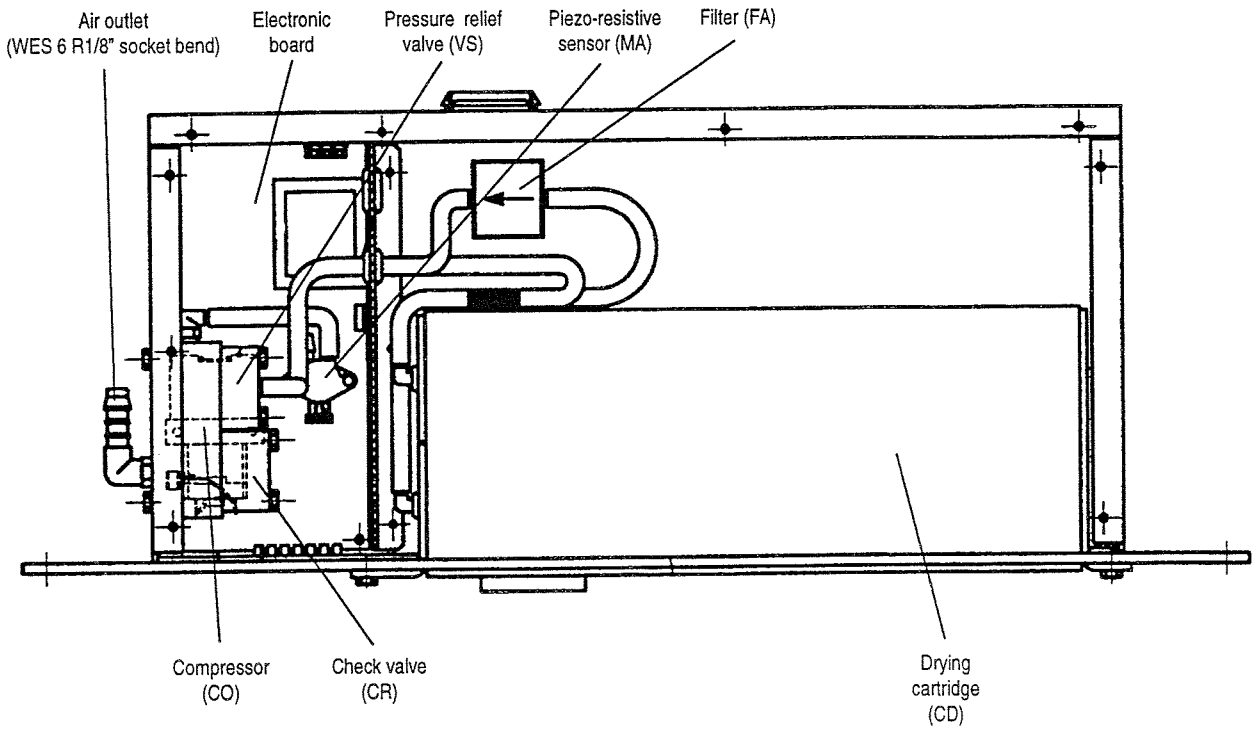


Figure 89 – Internal view

ALARMS

Two alarms are detected by the device:

- pressure dropping to 10 ± 3 hPa:
  - red indicator comes to ON status,
  - pressure alarm relay comes to standby status;
- motor time running reaching 40 ± 5 minutes:
  - time alarm relay comes to standby status.

The seven indicators are graduated from 10 to 40 hPa.

The first LED on the right (red pressure alarm LED) lights up between 0 and 12.5 hPa, the second between 15 and 22.5 hPa, the last from 35 hPa. The tolerance is ± 3 hPa.

2.5.18.2 – Setup

Not applicable.

2.5.18.3 – Indicators and ports

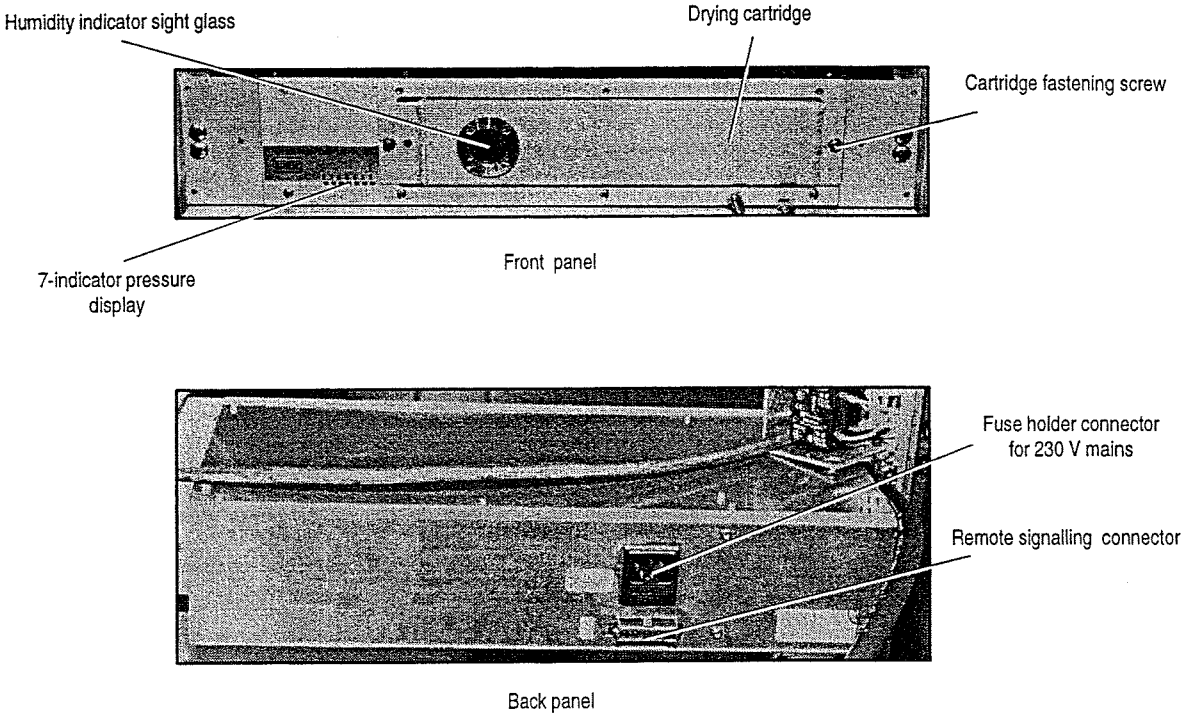


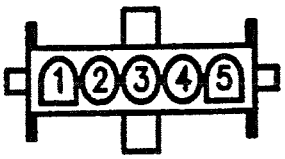
Figure 90 – Indicators and ports

2.5.18.4 – Connections

FUSE HOLDER CONNECTOR FOR 230 V MAINS

PIN	SIGNAL	SIGNIFICATION
A	–	Phase
B	–	Neutre
C	–	Terre

TELESIGNALLING CONNECTOR (HE15 5 pins female connector)



PIN	SIGNAL	SIGNIFICATION
1	–	Normally opened contact of pressure alarm relay
2	–	Normally closed contact of pressure alarm relay

PIN	SIGNAL	SIGNIFICATION
3	–	Normally opened contact of time alarm relay
4	–	Common contact of alarms relays
5	–	Normally opened contact of time alarm relay

2.5.18.5 – Characteristics

ELECTRICAL

Mains voltage	230 V – 50/60 Hz
Protection	Polarized input with protective diode Polyswitch with input reset (500 mA) 0.5 A fuse with time-delayed input
Power consumption	< 11 W
Alarm circuit cut-off	1 A max. 125 V max.

PNEUMATIC

Air flow	> 70 l/h
Pressure alarm	10 ± 3 hPa
Low pressure	20 ± 3 hPa
High pressure	40 ± 3 hPa
Dew point of air	40°C drop for an ambient temperature of 20°C and 95% relative humidity Ambient dew point : +19.5° Resulting dew point : +19.5° – 40°C = –20.5°C
Pressure control	Piezo-resistive pressure sensor
Protection against excess pressure	Safety valve opening at 180 ± 20 hPa for the compressor discharge rate
Airtightness of the device	When connected to a volume of 0.5 l, the 40 hPa pressure must not drop below 20 hPa within 15 minutes
Service life of the drying cartridge	See figure 91

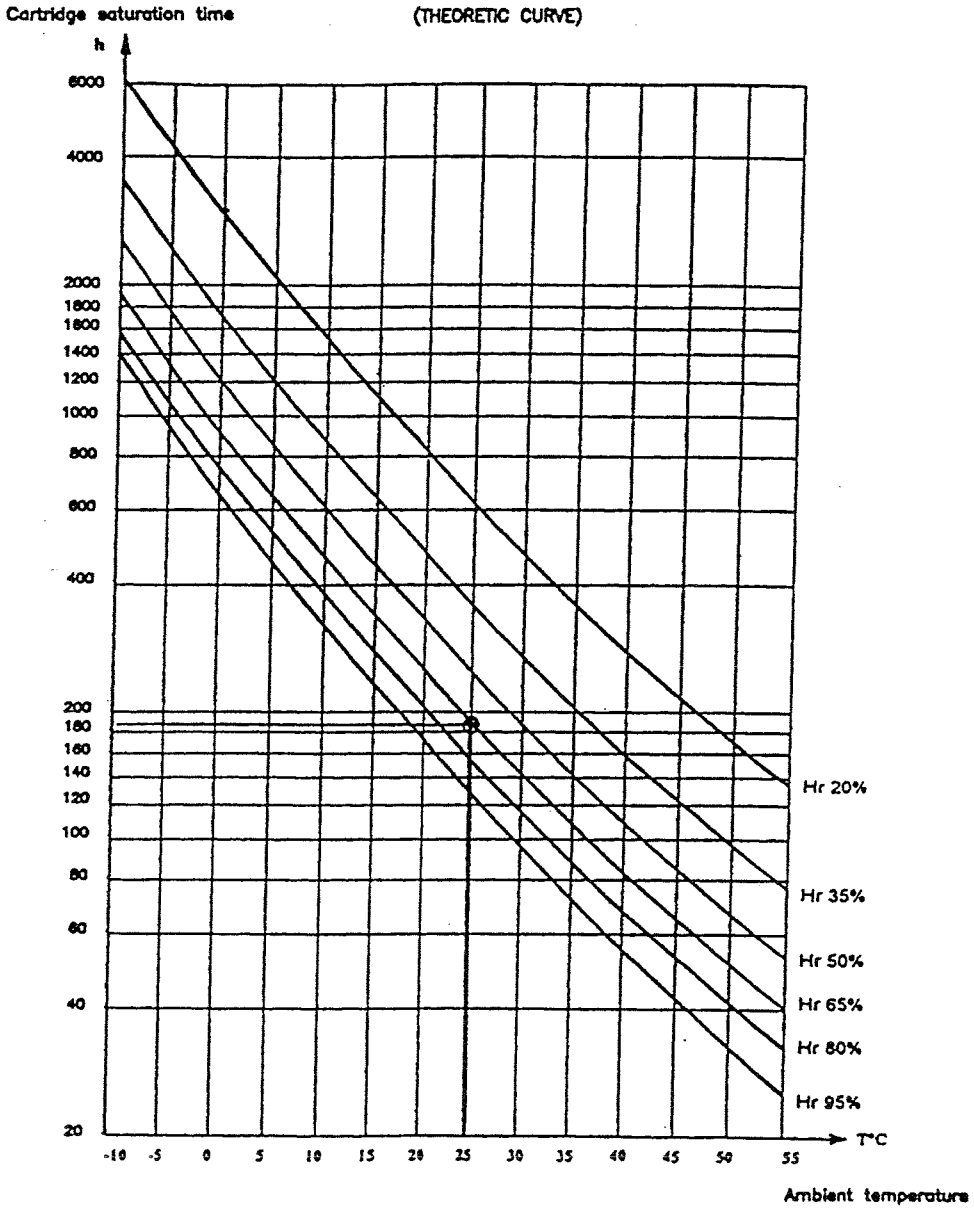


Figure 91 – Service life of the drying cartridge

EXAMPLE :

Calculation of the service life taking the duty cycle into account:

- ambient temperature : 25° C
- relative humidity : 65%
- installation leakage : 1 l/h
- compressor discharge rate : 80 l/h
- working time : 180 h
- duty cycle : 1/80
- service life : 180 x 80/1 = 14400 h, **i.e. 600 days (20 months).**

MECHANICAL

Height	88.1 mm (2U)
Width	483 mm (19')
Depth	196 mm
Mass	3.6 kg

ENVIRONMENTAL

Working temperature	-10° C to +55° C
Storage temperature	-40° C to +70° C
Relative ambient humidity	95% max.

2.5.19 – Autotrack option

Compared to the equipment of a standard antenna, the autotrack option requires the addition:

- for channel Δ :
  - in the antenna feed, of a tracking coupler replacing a circular waveguide component of the standard version and outputting the channel Δ signals,
  - of a low noise amplifier,
  - of a 7 GHz/2 GHz down-converter,
- for channel Σ :
  - a 20 dB coupler at the output of the 7 GHz/2 GHz down-converter, (LHCP or RHCP????),
- for both channels:
  - a two–channel tracking receiver which includes, at the input, a two–channel 2 GHz/70 MHz converter.

The autotrack option uses a beacon signal transmitted by the satellite.

Figure 92 is a functional block diagram of the autotrack option.

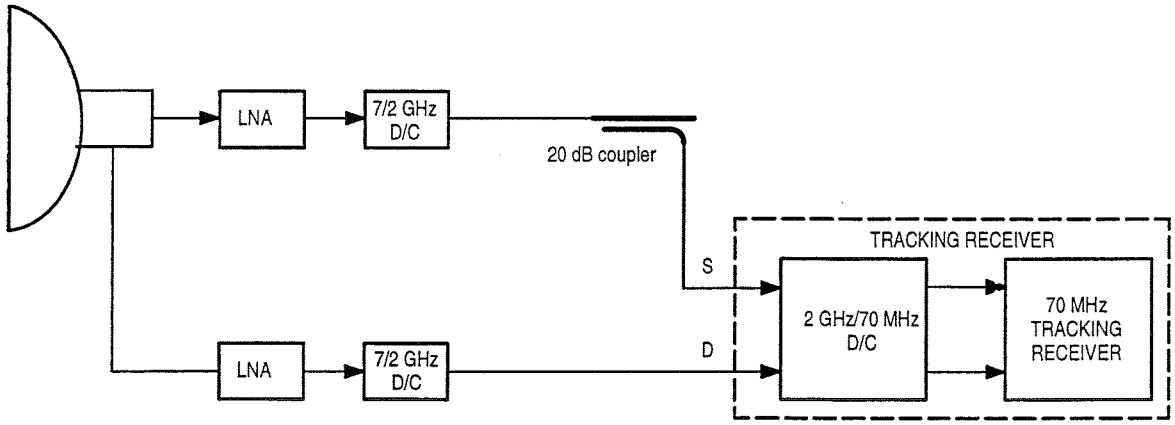


Figure 92 – Functional block diagram of the autotrack option

The tracking receiver is a two–channel receiver, with a summing channel (Σ) and an error channel (Δ), operating at a frequency of 70 MHz. The error channel (ρ,θ) is obtained by summing the channels ΔX and ΔY received in quadrature at the corresponding inputs. The receiver works with a noise–free or phase–modulated beacon signal with a low modulation index (less than 1.5 radians).

Alongside the conventional functions of a tracking receiver (automatic frequency hunting, sideband rejection, etc), the receiver performance is enhanced by the following special functions:

- automatic adjustment of the phase of the channel Δ on ACU command and storage of its value,
- automatic calibration,
- automatic correction of tracking voltages,
- 10 MHz output for the sum and error channels in the form of 10 MHz signals,
- output for testing the frequency of the local oscillator (or for measuring Doppler effect, depending on use),
- elevation output polarity reversal,

– remote management via an RS 232 link.

2.5.19.1 – Operation

7 GHz/2 GHz DOWN-CONVERTER

The 7 GHz/2 GHz converter (Figure 93) is made of the down-converter and power supply blocks of the GSG 401 up and down-converter, described in section 2.5.4.

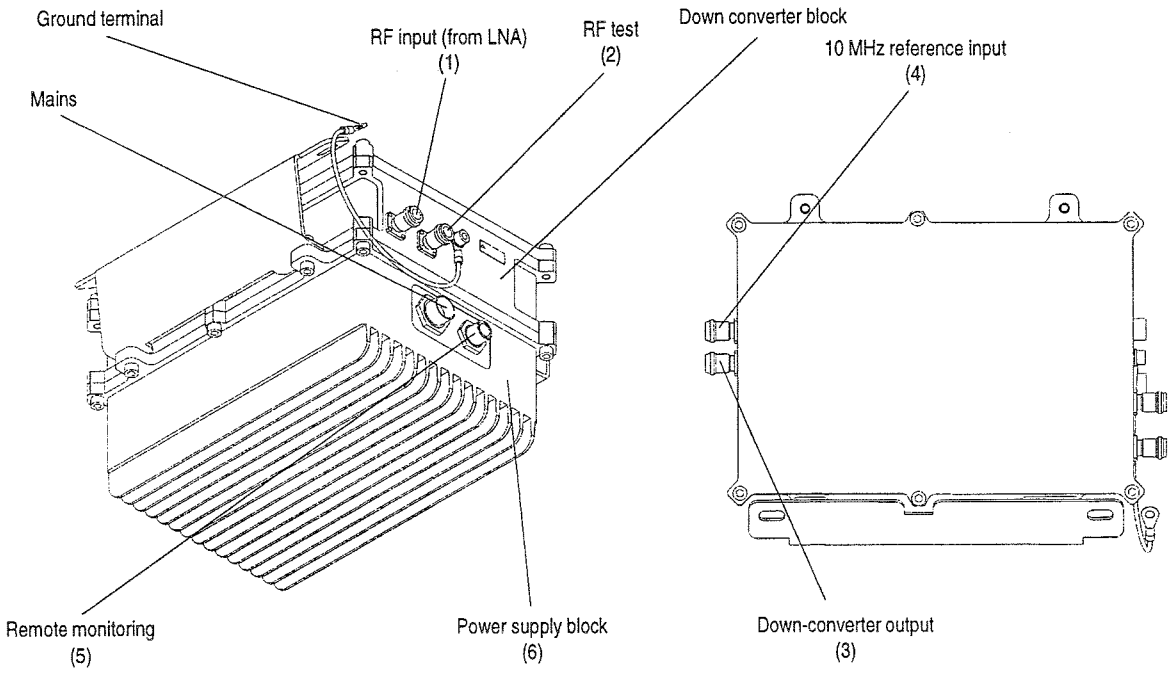


Figure 93 – Autotrack 7 GHz/2 GHz down-converter

TRACKING RECEIVER

The 2 GHz/70 MHz converter, at the input of the receiver, receives the signals from the channels Δ and Σ.

The receiver receives the signals from the two–channel down-converter, and generates the azimuth and elevation error signals used by the antenna servo mechanisms.

An auto–calibration mode, which compensates internal phase and amplitude variations for the tracking converter/receiver assembly, increases directional accuracy.

An internal synthesizer adapts the frequency of the receiver to that output from the transposition stage.

The receiver can be managed locally or remotely.

Figure 94 is a functional block diagram of the receiver.

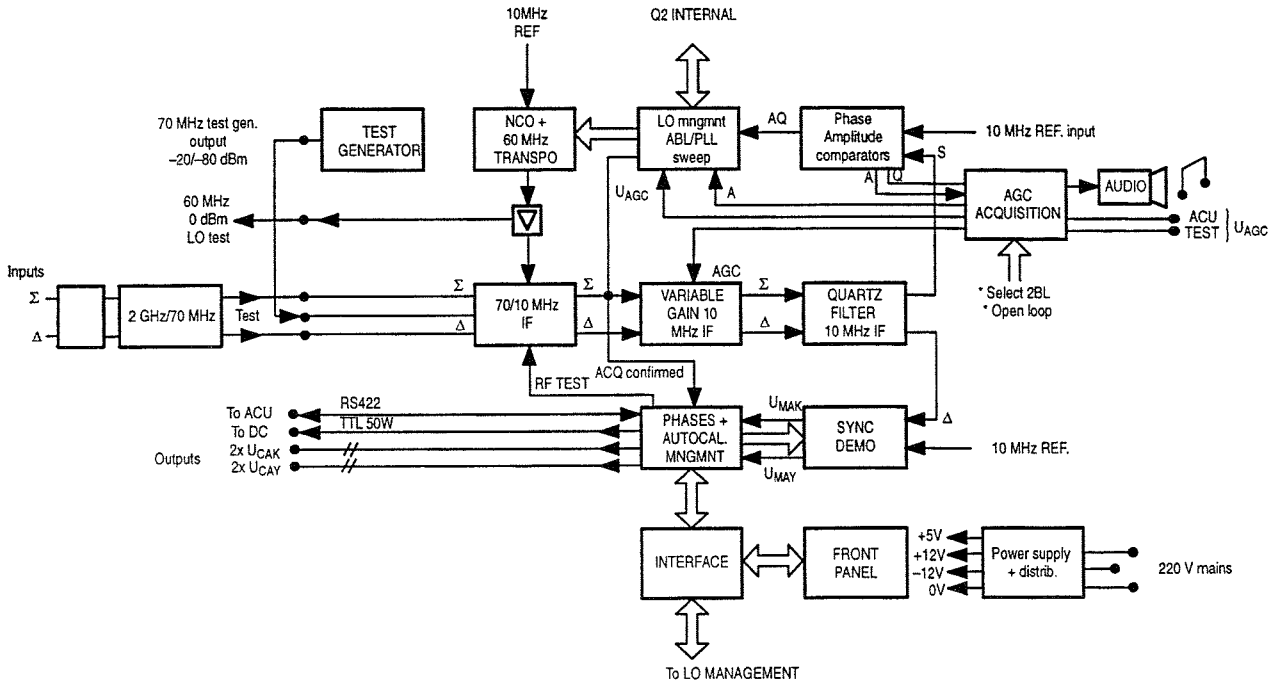


Figure 94 – Functional block diagram of the tracking receiver

2.5.19.2 – Configuration

Not applicable.

2.5.19.3 – Ports and displays

7 GHz/2 GHz DOWN-CONVERTER

ITEM (Figure 93)	COMPONENT	DESCRIPTION
1	Female N connector	Down converter RF input
2	Female N connector	RF test input (at the down converter input)
3	Female N connector	Down converter output (2085-2285 MHz)
4	Female N connector	10 MHz reference input
5	Female 6–way HE301 connector	Remote monitoring (isolated alarm loop output)
6	Male 3–way HE301 connector	Mains input

TRACKING RECEIVER

ITEM	COMPONENT	DESCRIPTION
?	Connector ?	Channel Σ input
?	Connector ?	Channel Δ input

?	Female BR2 connector	Tracking enable Loop closed to enable, open to disable
?	Female BNC connector	AGC1 beacon level output
?	Female BNC connector	AGC2 beacon level output
?	Female BNC connector	Error signal output ?
?	Female BNC connector	Error signal output ?
?	Female BNC connector	Error signal output ?
?	Female BNC connector	Error signal output ?

2.5.19.4 – Connections

LOW NOISE AMPLIFIER

?

TRACKING RECEIVER

?

2.5.19.5 – Specifications

ELECTRICAL SPECIFICATIONS

Input frequency	2025 to 2285 MHz in 100 kHz steps
Intermediate frequency	10 MHz
Reference frequency	10 MHz
Summing channel (Σ)	–20 to –100 dBm
Channel Σ/Δ level ratio	20 dB (typical)
Noise figure	< 12 dB
Manual gain control	Front panel
Bandwidth of 70 MHz IF signal	6 MHz
Automatic gain control (AGC)	Mode not consistent prior to acquisition Mode consistent after acquisition
AGC efficiency	> 80 dB
AGC time constants	1 – 10 – 100 ms
Image frequency rejection	> 80 dB
10 MHz frequency rejection	> 100 dB
RF input and output impedance	50 ohms (SWR < 1.25)
10 MHz IF signal bandwidth	20 kHz
Automatic hunting range	± 30 kHz ± 100 kHz ± 250 kHz

Autotrack range	± 250 kHz
Manual tracking range	± 250 kHz
Loopband (2BL) ?	100 Hz, 300 Hz, 1000 Hz
Sweep speed [automatic selection of f(2BL)] 2BL = 300 Hz 2BL = 1000 Hz	 8 kHz/s 80 kHz/s

TRACKING CHARACTERISTICS

Automatic correction of synchronous demodulator "zero"	
Automatic calibration including differential phase and differential gain correction receive transposition between channels Σ and Δ	
Automatic adjustment of channel Δ phase (512 points) in local mode or on ACU command in remote mode	
Maximum error voltage on tracking voltage of channels X and Y	± 10 V (for Σ/Δ = 20 dB)
Zero variation for channel P, Δ = 0	Automatic correction ripple voltage U < ± 20 mV
Decoupling between channels Σ and Δ	> 60 dB
State of outputs X and Y in the absence of phase locked loop	Forced to "0" by internal switching within the synchronous demodulator Ripple voltage U< 10 mV
Tracking enable output	Female BR2 connector Loop closed to enable
Beacon level outputs • AGC1 • AGC2	 Slope: 10 dB/V Sensitivity : –20 dBm = 2 V; –100 dBm = 10 V Slope: 0.5 dB/V Sensitivity : –20 dBm = 2 V; –20.5 dBm = 1 V (centered using a potentiometer accessed on the rear panel)
Error signals	Two outputs per signal (female BNC)

3 – Installation and commissioning

3.1 – Checking

– Check the condition of the packages. If any of them is damaged, pass on your reservations to the carrier within 48 hours.

3.2 – Installing the antenna

3.2.1 – Introduction

The antenna is installed when the civil engineering work has been carried out and approved. This work must be carried out in accordance with ALCATEL TELECOM specification reference AK/DED/96256 Ed.1 Rev.1, dated 1/7/1996. A compacted surface capable of supporting a 13 tonne telescopic crane needs to be provided around the pedestal supporting the antenna.

3.2.2 – Installation phases

A revoir

Installing the antenna is an eight–phase operation, as summarized in the table below. The order of the phases is such that operations requiring the presence of a lifting machine can be combined.

PHASE	DESIGNATION	TELESCOPIC CRANE	DURATION (Days)	QUALIFIED STAFF	SPECIFIC TOOLS
1	Unpacking & inventory		1	2	
2	Platform installation		3/4	2	
3	Reflector & hub assembly		1/2	3	
4	Pedestal tube installation	X	1/2	2	
5	Azimuth structure installation	X	1/2	2	
6	Elevation screw jack installation	X	1/4	2	
7	Reflector installation	X	1	2	Lifting tool
8	Azimuth axis vertical alignment & finishing		2	2	Adjust-ment tools

3.2.3 – Phase 1 : Unpacking and inventory

The components that make up the antenna are supplied in eight boxes, respectively containing:

- the pedestal tube,
- the azimuth structure,
- the reflector panels (2 boxes),
- the hub,
- the platform elements,
- the subreflector,
- the miscellaneous components.

To avoid having to move the boxes again (which requires a crane) for assembly purposes, on delivery it is advisable to place them in the position shown in figure 95. However, this ideal position for the boxes relative to the crane can be modified to take account of particular site access conditions.

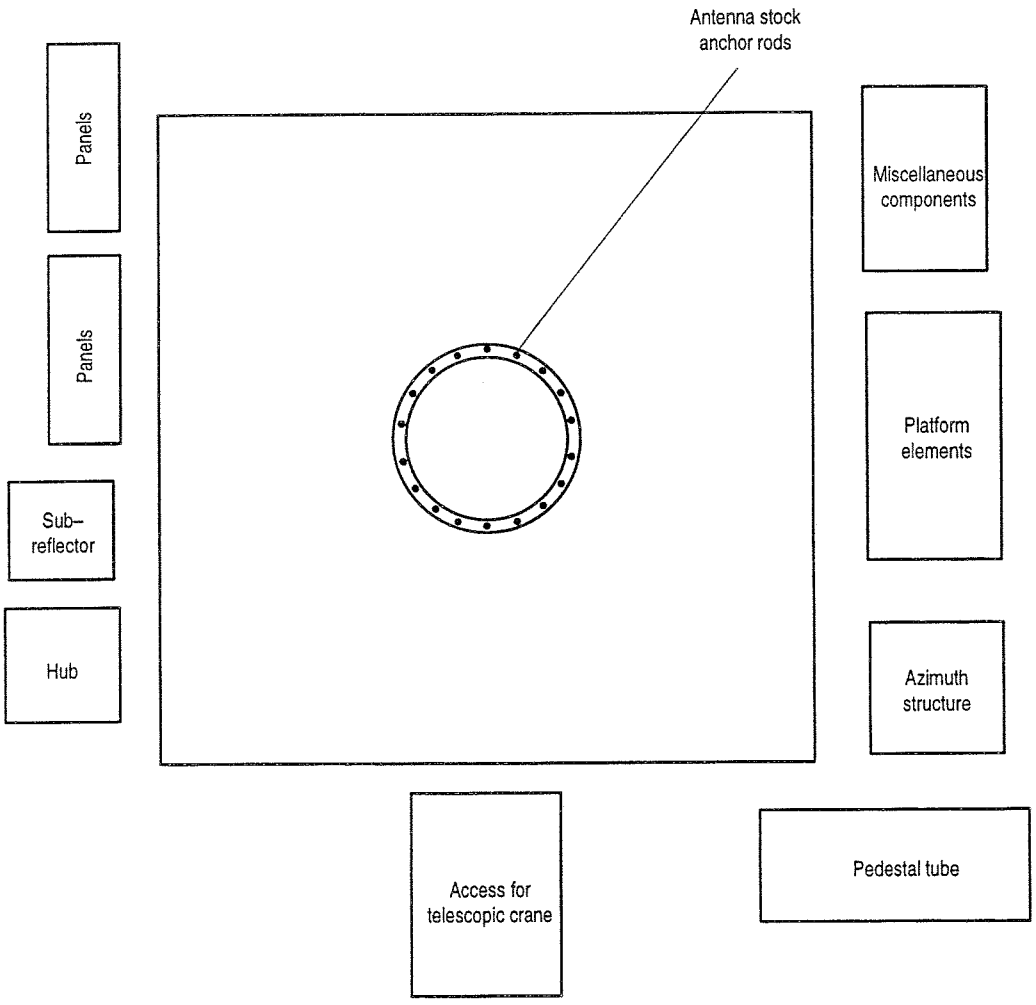


Figure 95 – Positions of boxes before installation

Panel boxes are to be tilted back slightly using blocks so that the panels do not slide out when the box is opened.

- Unpack the equipment (except reflector panels boxes) following the instructions marked on the packaging.
- Check that the delivery matches the delivery advice note. If there are any discrepancies, pass these on to Alcatel Telspace as quickly as possible.
- Carry out a visual inspection of the equipment and note any defects.

3.2.4 – Phase 2 : Platform installation

- remove the copper earth rail using a 13 mm spanner and screwdriver (Figure 96)

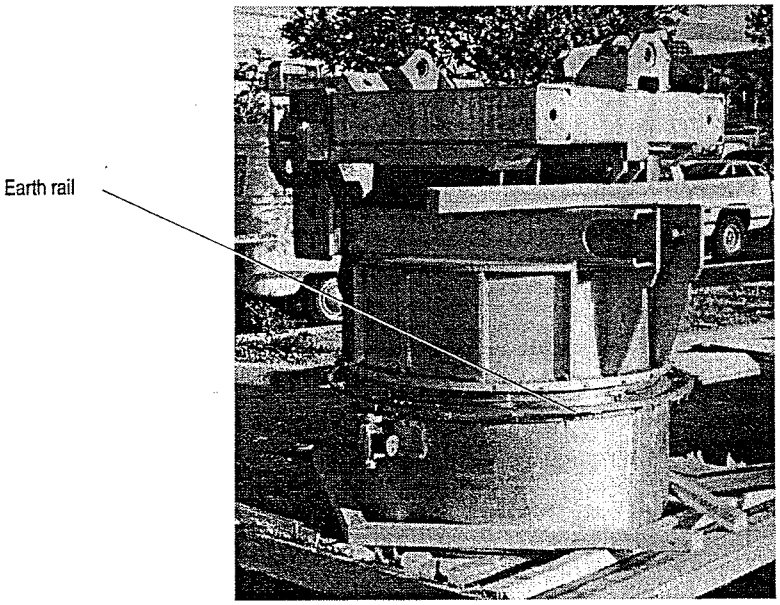


Figure 96 – Location of earth rail

- remove the crown wheel protection using a 13 mm spanner,
- mount the platforms and handrails on the azimuth structure (fixings shown in figure 97),

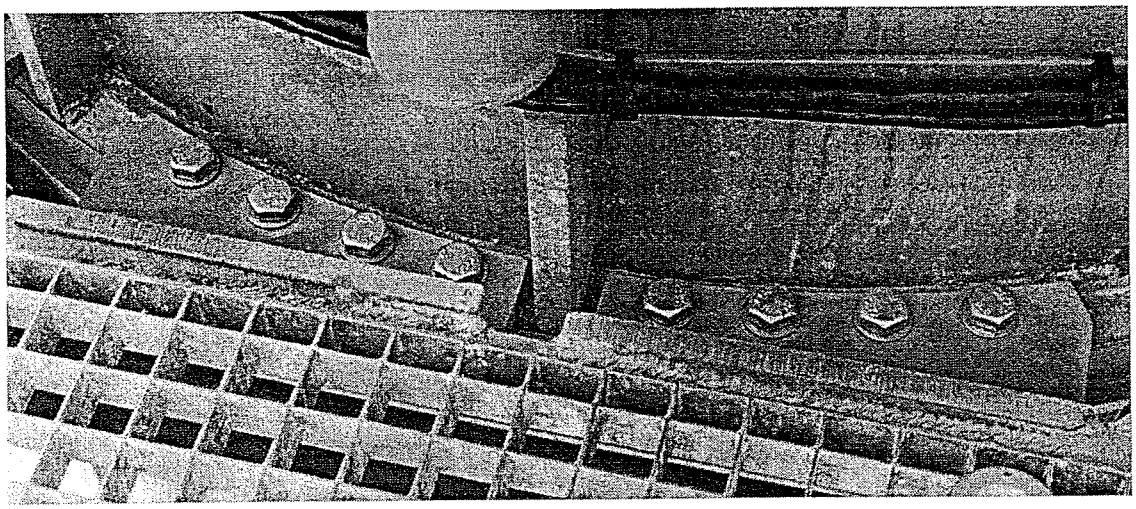
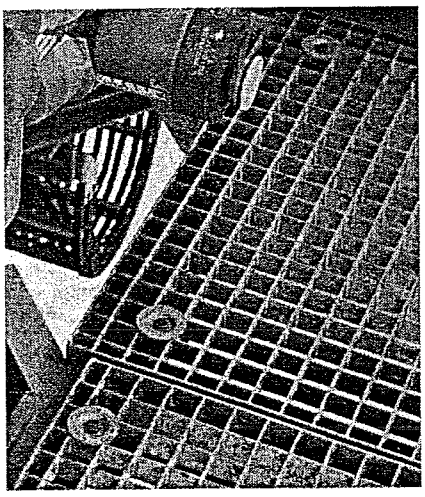
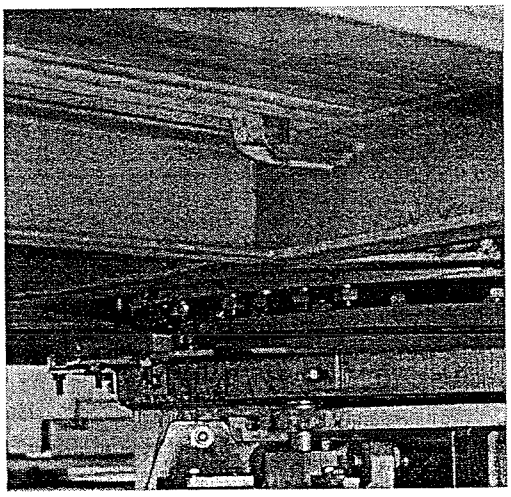


Figure 97 – Platform fixings

– fit the gratings in position. Fixings are shown in figure 98.



Top view



Bottom view

Figure 98 – Grating fixings

– lock the grating fixing screws using Loctite lacquer.
– put the elevation cable chains in position.
– replace the crown wheel protection and earth rail.
– with the platforms fitted, the assembly is as shown in figure 99.

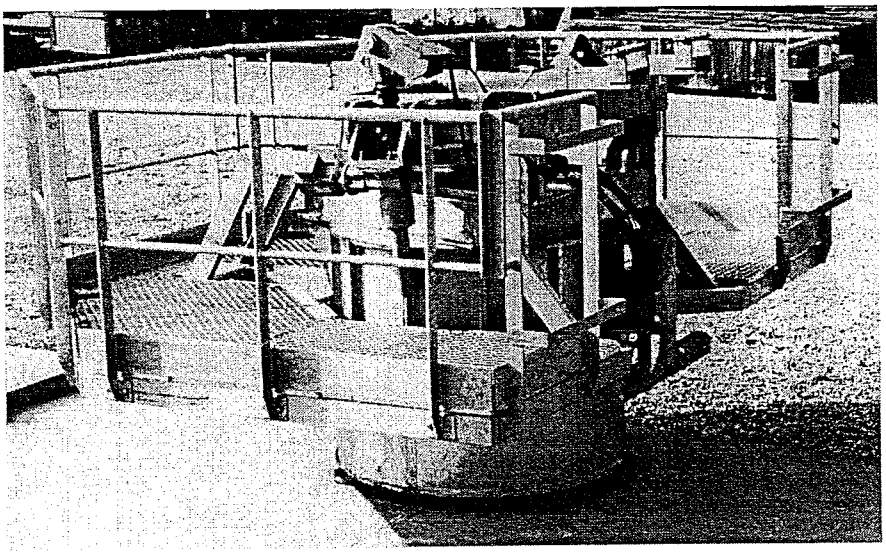


Figure 99 – Platform assembly

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3.2.5 – Phase 3 : Reflector and hub assembly

The feed is supplied mounted on the hub (Figure 100), in a package specially designed to enable the reflector to be assembled on the ground, without requiring lifting equipment.

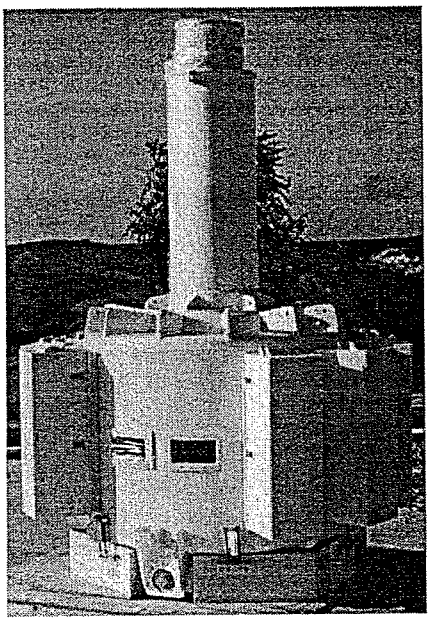

Figure 100 – Feed mounted on the hub

To open the package:

- open the lid,
- fold back the four sides onto the ground so that they can serve as a support for the hub.

3.2.5.1 – Subreflector assembly

- remove the cover consisting of two metal plates (Figure 101)

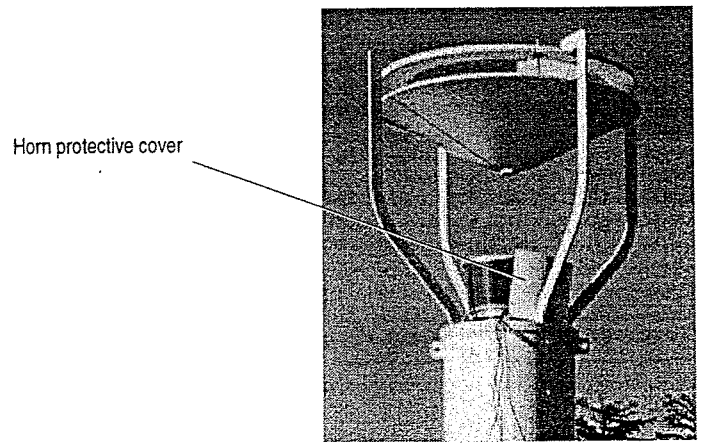

Figure 101 – Protective cover

- mount the quadripode on the feed (since the feed and subreflector are paired, check that their numbers are the same),

- run the subreflector de–icing cable down the strut and into the cover through the cable gland provided (Figure 102).
- connect the subreflector and horn de–icing cables to the power supply cable. This cable runs up the feed and into the cover through a cable gland, where it is connected using heat–shrinkable sleeves (Figure 102).

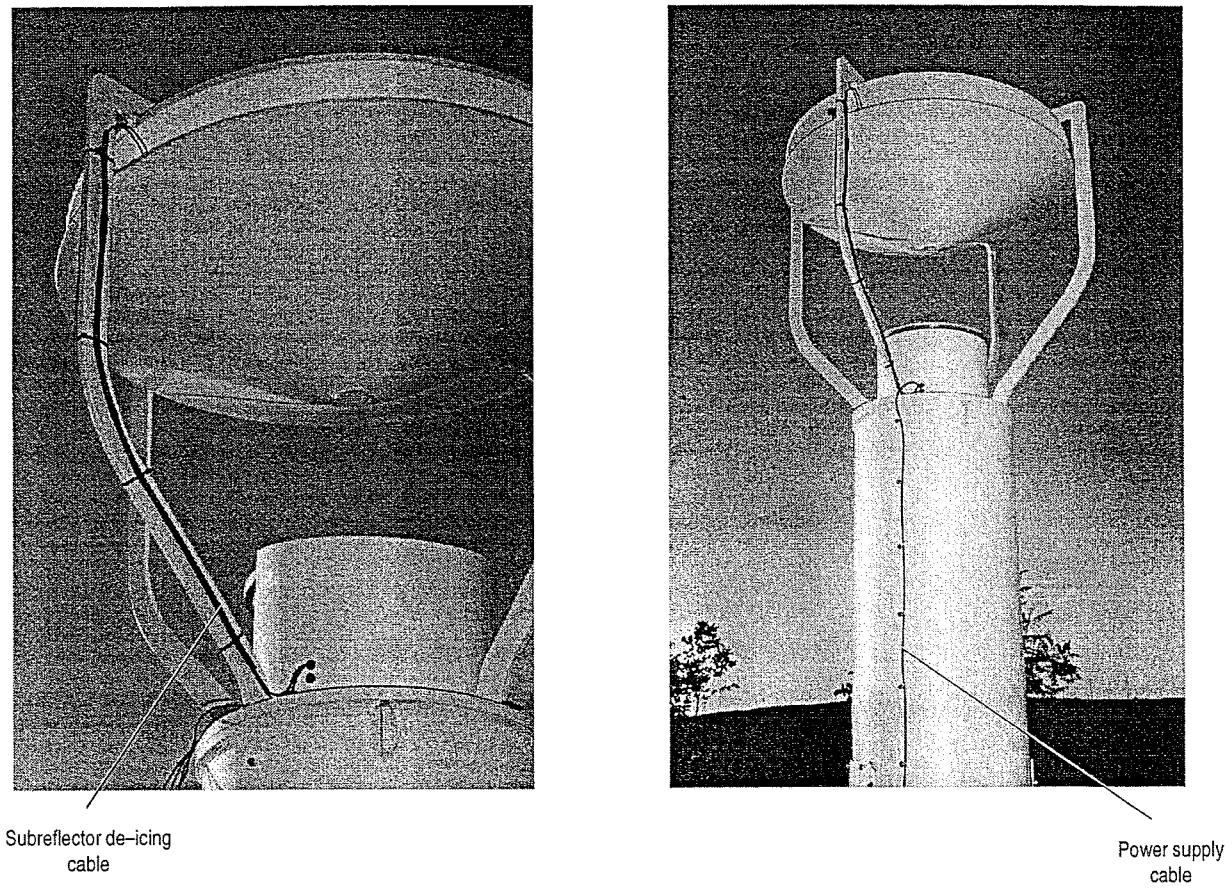

Figure 102 – Fitting the subreflector de–icing cable

- refit the cover.

3.2.5.2 – Assembling the reflector

– open the panel boxes (Figure 103).

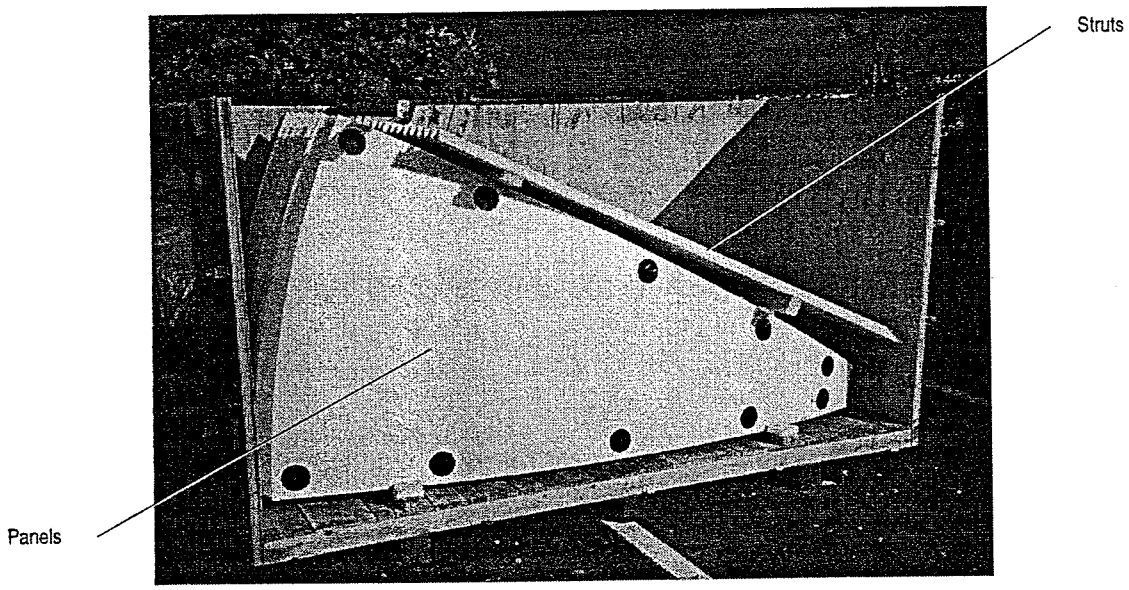

Figure 103 – Open panel box

– prepare the struts and fixing accessories (Figure 104).

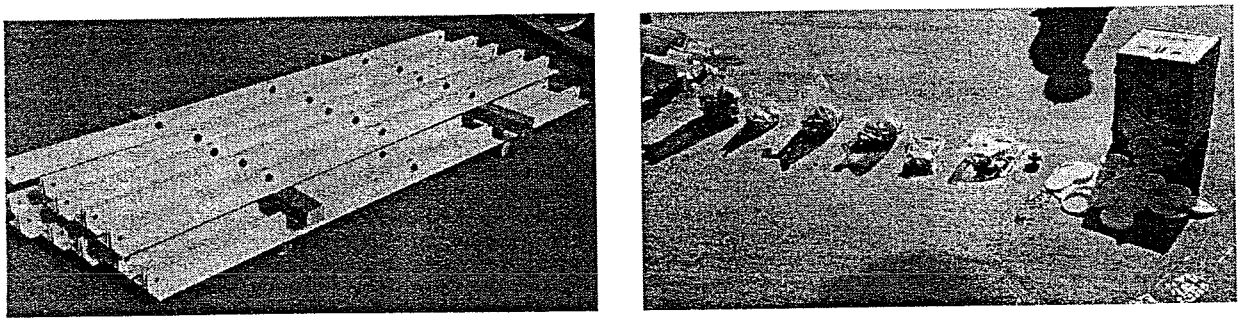

Figure 104 – Struts and fixing accessories

- assemble the struts in pairs, using nuts, bolts and washers at each end. A spacer provides a gap between the two struts (Figure 105). Calibrated bolts, unlike standard bolts, have a flat and are slightly longer. Do no tighten the bolts.
- finish assembling each pair of struts using three standard bolt/spacer/washer/nut assemblies. Tighten the bolts.

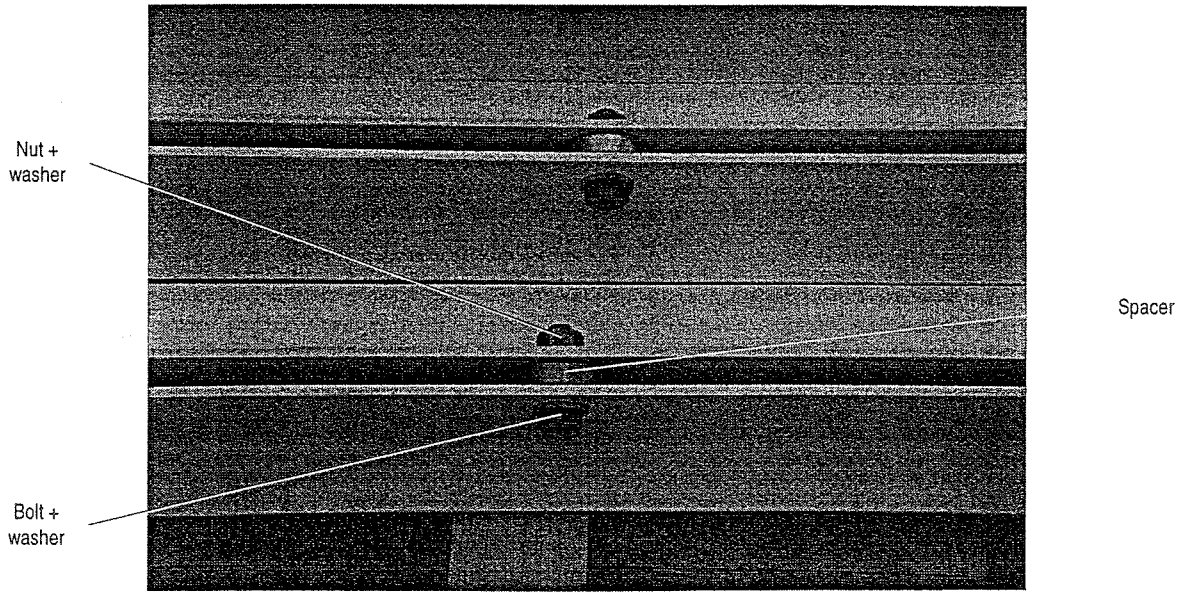

Figure 105 – Assembling pairs of struts

- fit two struts to the hub (this involves removing the calibrated bolt at one end and then refitting it to fix the strut to the hub. The spacer is replaced by the hub fixing pad). Do not tighten these bolts.

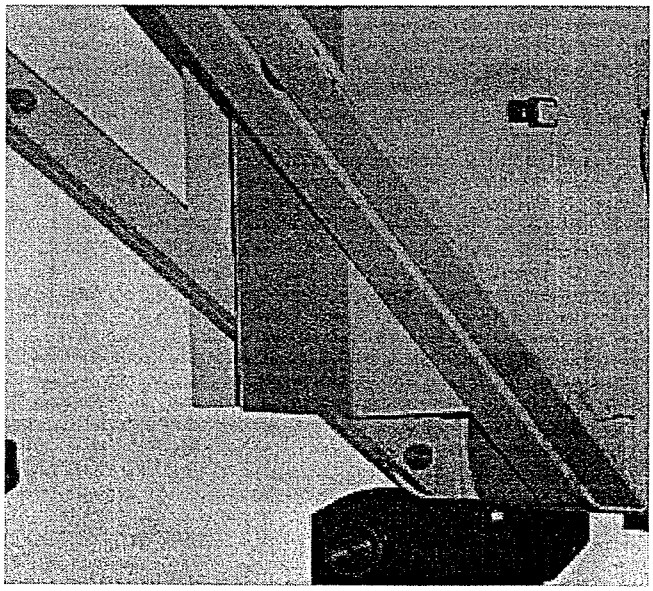

Figure 106 – Fitting struts to the hub

– the reflector consists of two types of panel, with and without plates for fixing the struts to the sides. Fit a panel with fixing plates to the hub and hold it in position using the two struts already fitted (Figure 107). Four bolt/washer/nut assemblies are required (two for the hub, and two for the struts). **Aluminium calibrated bolts, used for fixing the panel to the hub, must not be hammered through the hole.**

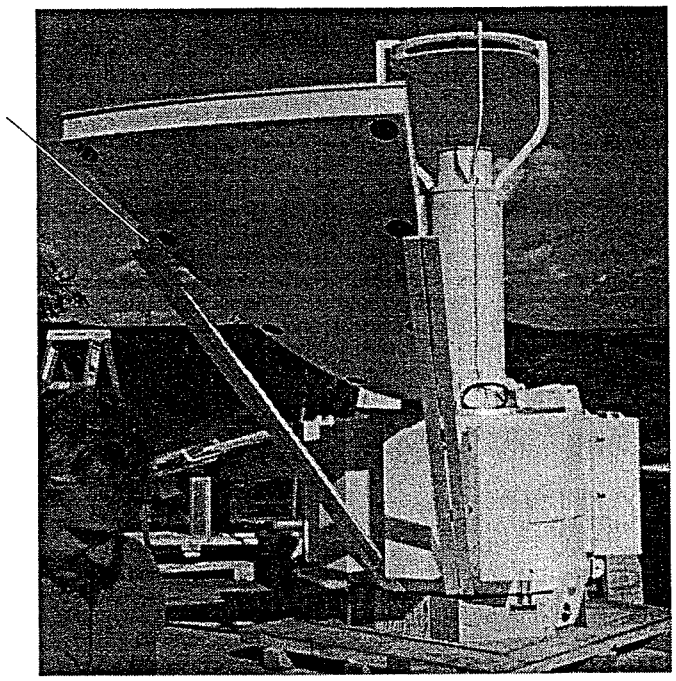

Figure 107 – Assembling the first panel

– follow the same procedure to assemble the six panels with fixing plates in alternate positions (Figure 108).

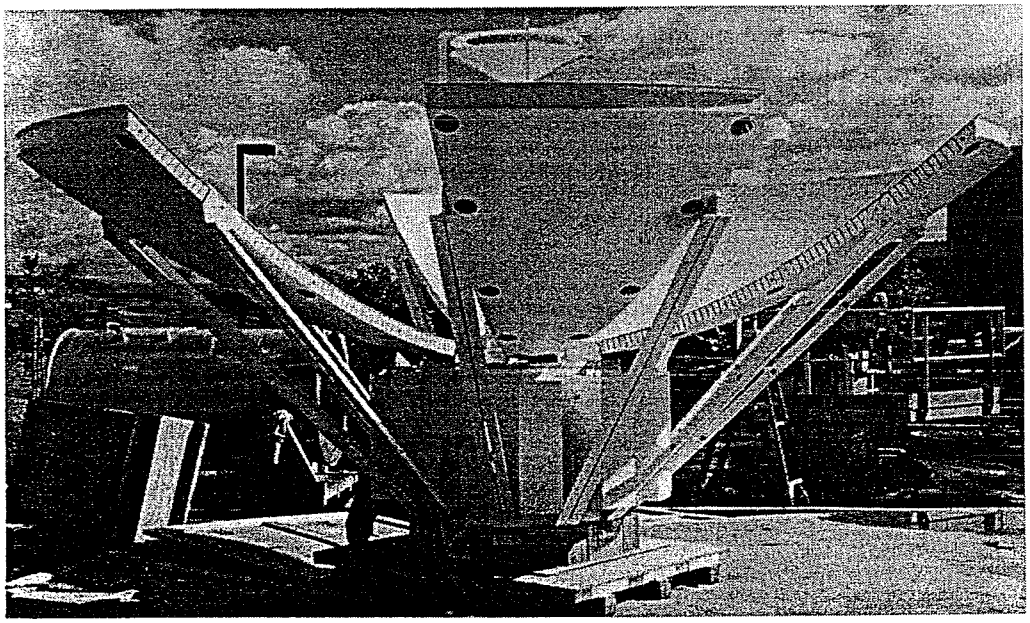

Figure 108 – Assembling panels with fixing plates

– fit the other panels. Use five bolt/washer/nut assemblies on each side of the panel to hold them together. These bolts are aluminium calibrated bolts. The bolts fixing the first panels to the hub must be removed and then refitted to hold both panels. Holes are provided in the backs of the panels to allow access to the fixing points.

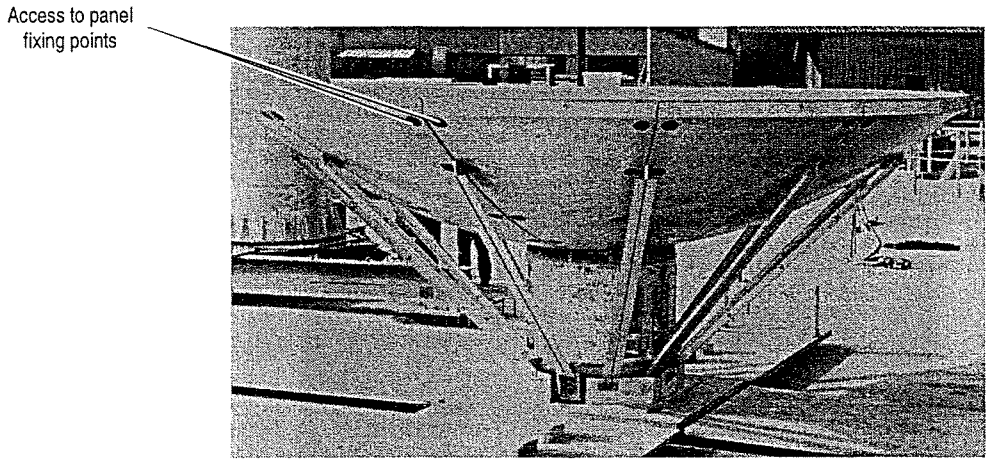

Figure 109 – Reflector assembled on the hub

– seal the fixing point access holes using the plastic caps provided, excluding the holes closest to the hub which will not be sealed until the de–icing system has been connected.

– connect the de–icing cables. A power supply cable is provided for each panel. Run the cable through the grommet and connect it to the de–icing wires inside the panel (Figure 110)

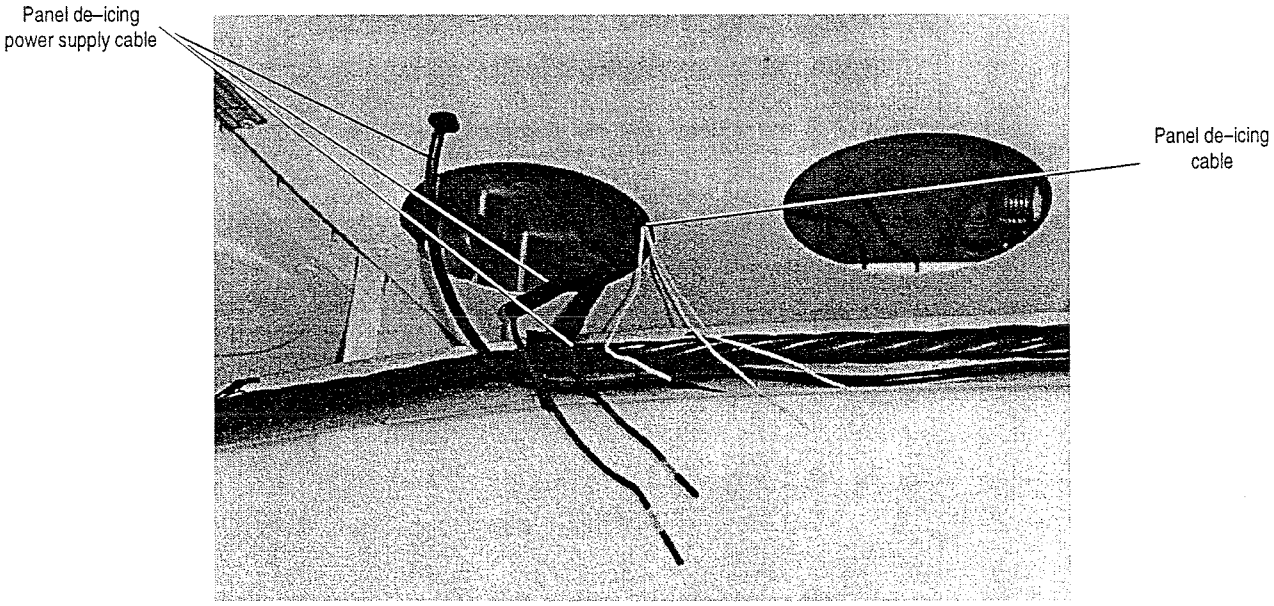

Figure 110 – De–icing cables

– the power supply cables are connected to the de–icing cables using heat–shrinkable sleeves (Figure 111)

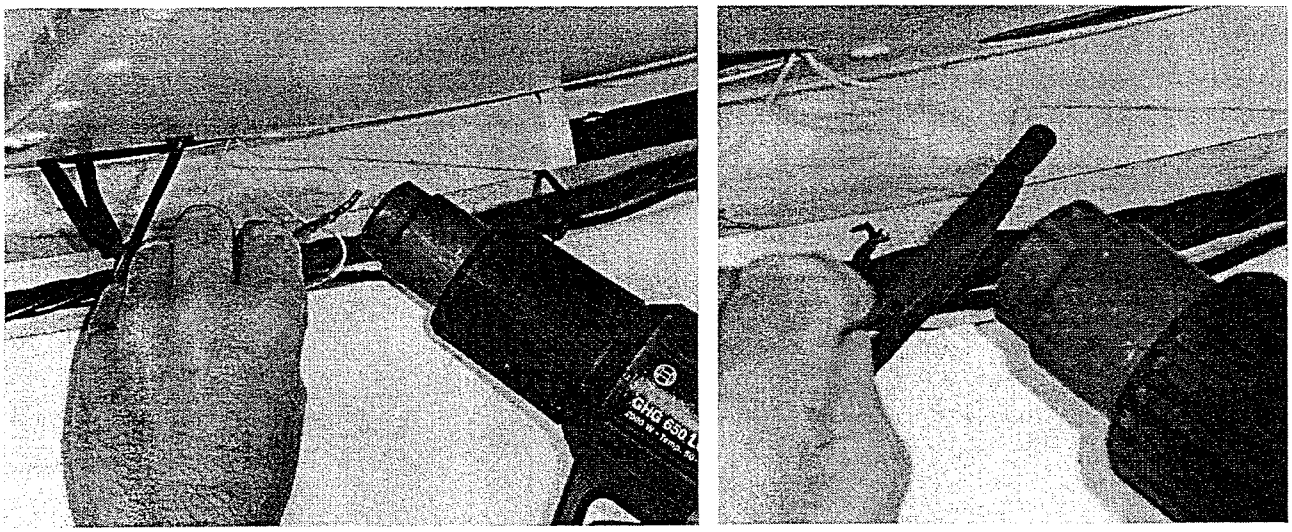

Figure 111 – Connecting the de–icing cables

– position the cables inside the panel and seal the access holes.

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3.2.6 – Phase 4 : Pedestal tube installation

– with the pedestal tube on the ground, fit the two ladders (positions are shown in figure 112 with the pedestal tube in position, but it is preferable to fit the ladders with the tube standing on the ground).

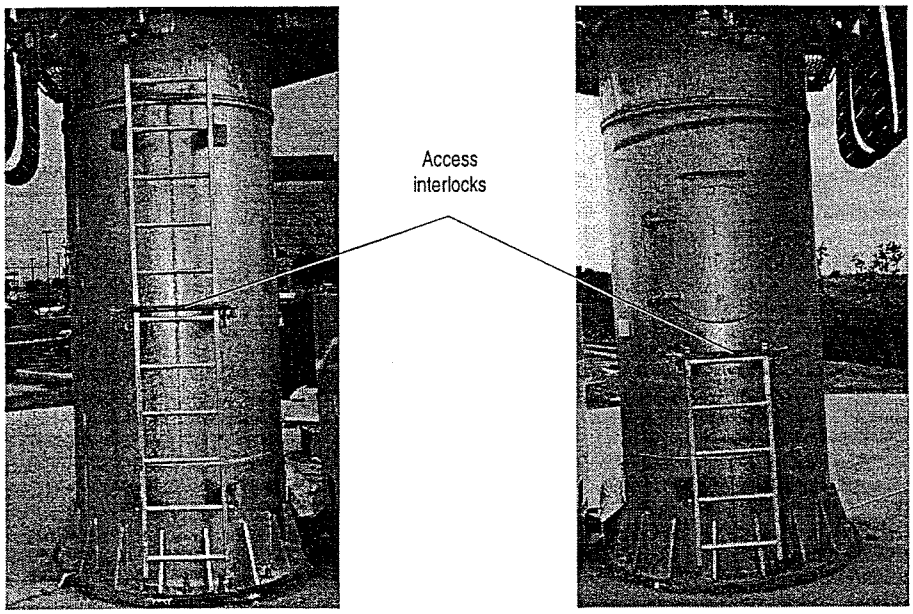


Figure 112 – Ladders fitted to pedestal tube

– also fit the access safety bars to the ladders (Figure 113), and associated safety interlock switches

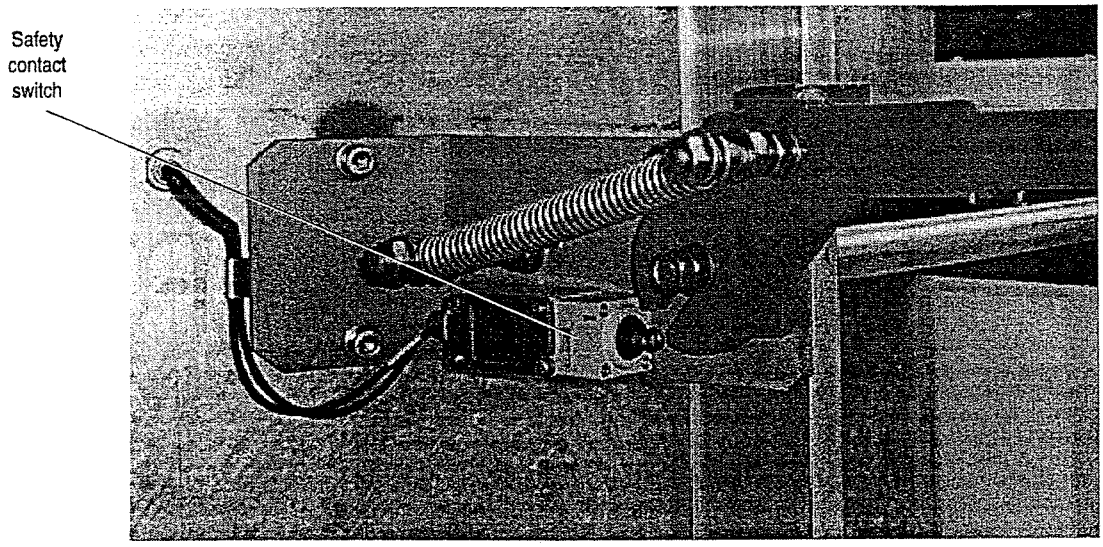


Figure 113 – Access safety interlock switches (Detail)

- the base of the pedestal tube is drilled (figure 114) :
  - 18 fixing holes,
  - six tapped holes for the positioning bolts (every 60 degrees).
- **grease the six positioning bolts thoroughly**, and screw into the lock nut allowing the bolts to project 40 to 50 mm.

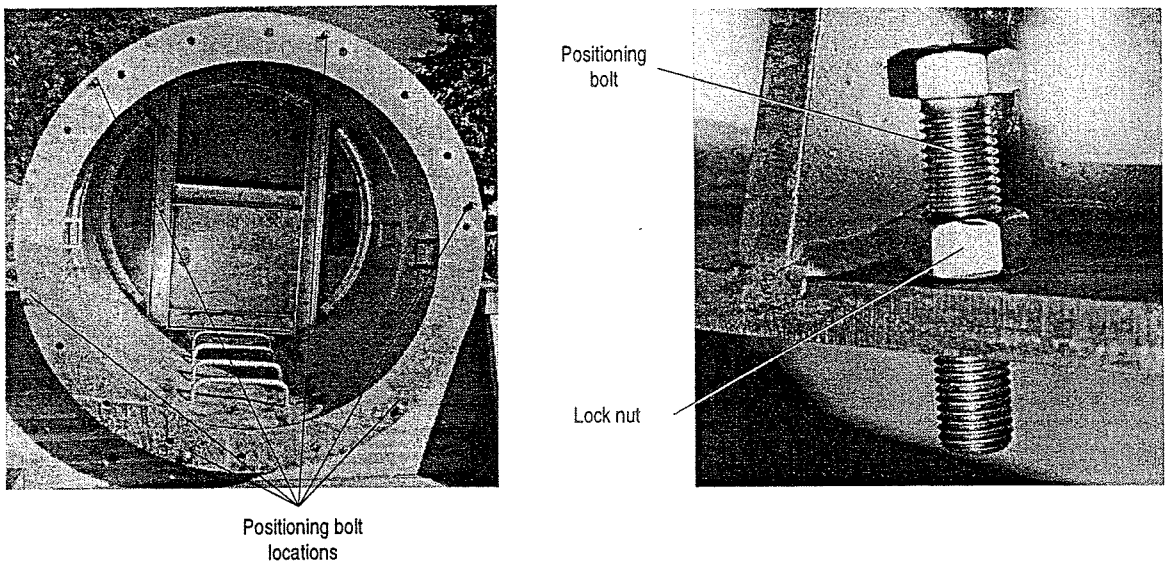


Figure 114 – Fitting the positioning bolts

- remove any washers and nuts from the anchor studs.
- remove the template, used for positioning the anchor studs.
- thoroughly clean and regrease the anchor studs (Figure 115).

Figure 115 – Anchor studs, nuts and washers

– sling the top of the pedestal tube at three points so that it can be lifted. Fix the rings and sling–line shackles using the azimuth structure fixing holes (Figure 116).

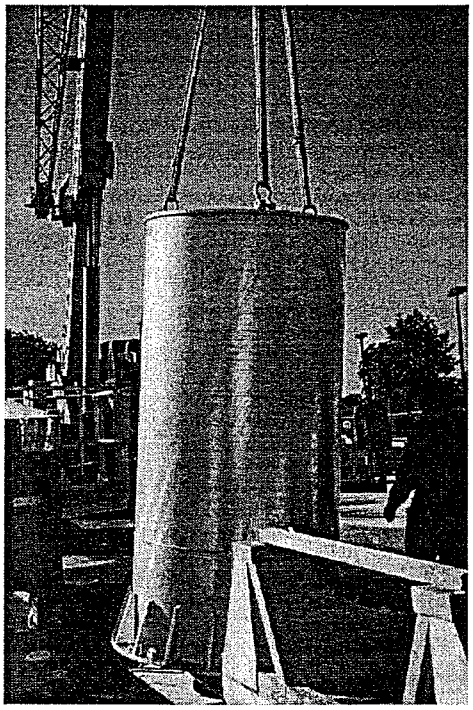


Figure 116 – Slinging the pedestal tube

– position the pedestal tube over the anchor studs, with the access hatch facing East, inserting the metal shims between the adjusting bolts and the concrete base (Figure 117).

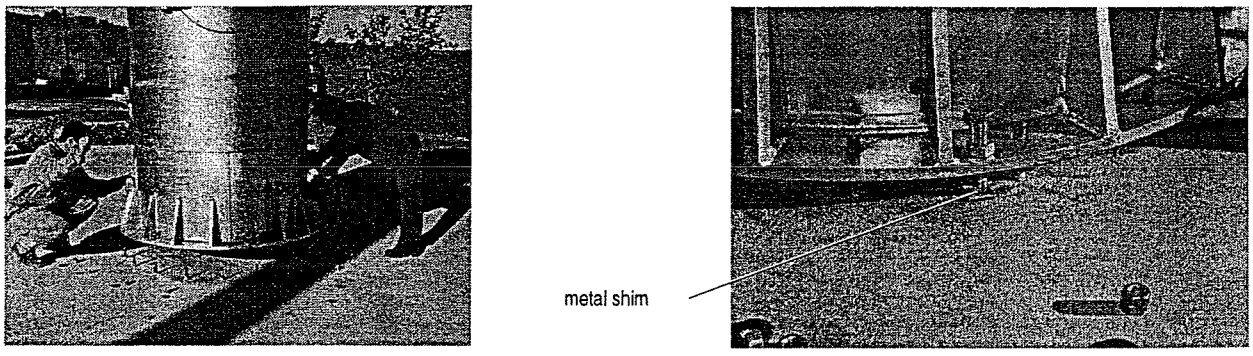


Figure 117 – Positioning the pedestal tube

– use a level, rule and the adjusting bolts to set the pedestal tube approximately vertical (Figure 118)

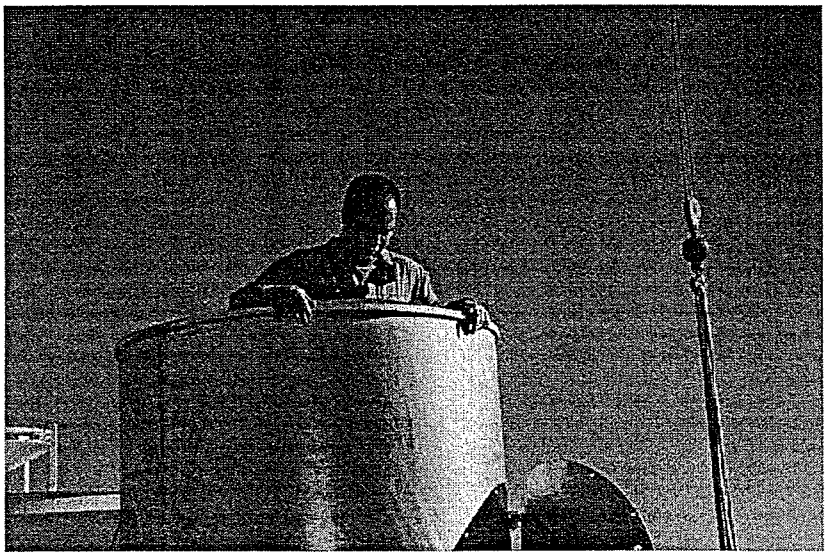


Figure 118 – Setting the tube approximately vertical

– place a flat washer and then a nut (diameter 20 mm) on each anchor stud. Screw on the nuts (diameter 20 mm) without tightening. Fit an additional nut on each anchor stud, to be used as a lock nut when the pedestal tube is finally fixed in position.

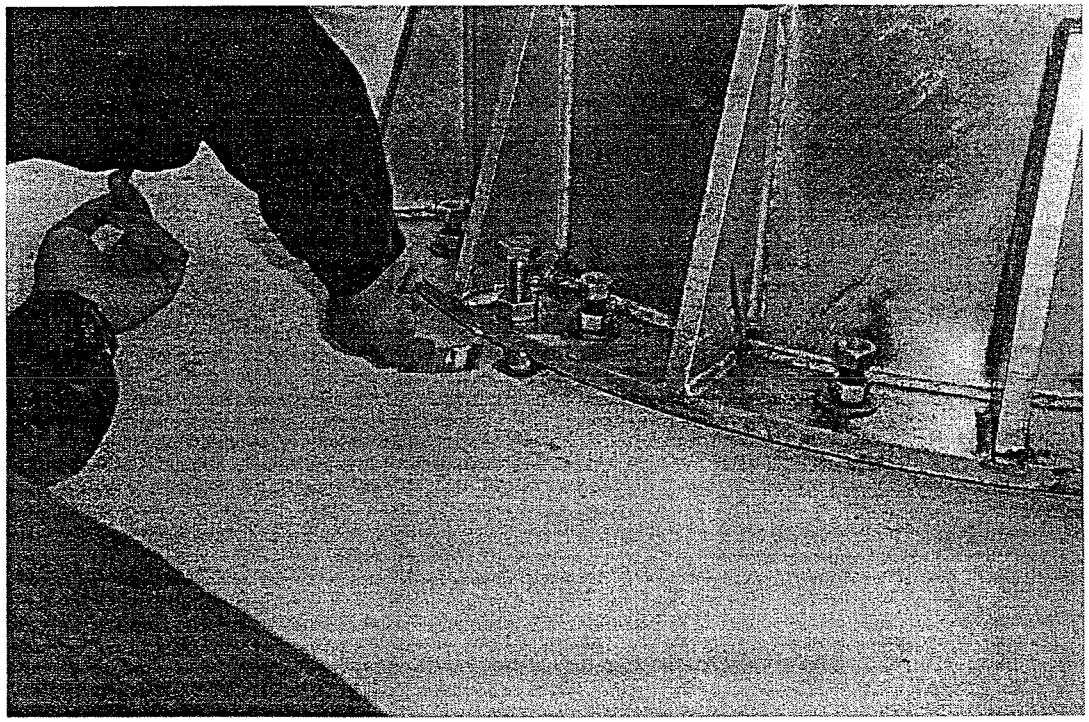


Figure 119 – Fitting the pedestal tube fixing nuts

3.2.7 – Phase 5 : Azimuth structure installation

– sling the azimuth platform at four points using 3–metre/6–tonne slings (Figure 120).

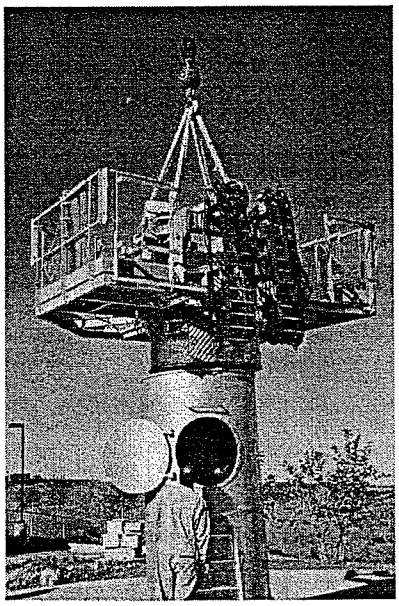


Figure 120 – Platform on slings

– at the top of the pedestal tube, apply two concentric transparent silicon seals where the tube and azimuth platform are to be joined (Figure 121). These seals will guarantee a tight fit.

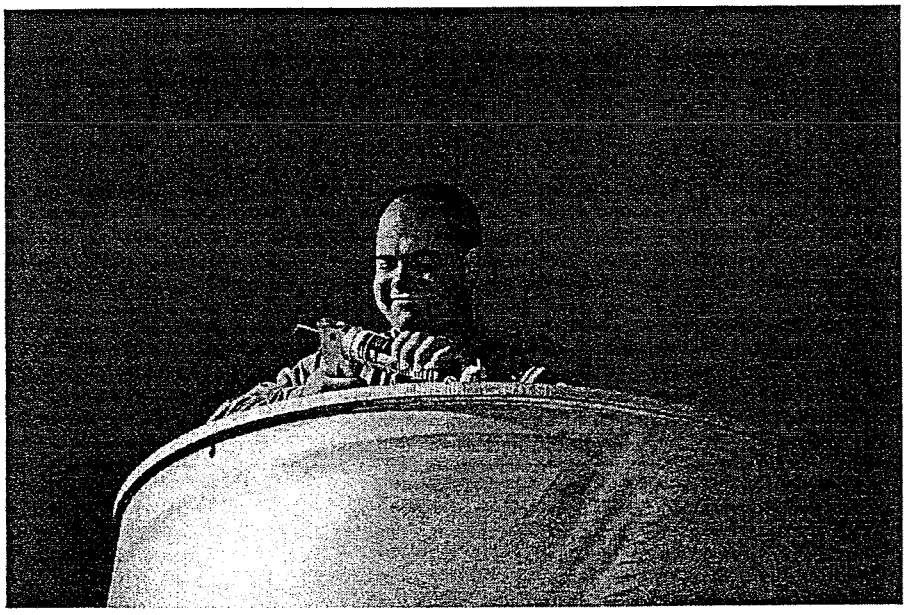


Figure 121 – Positioning the silicon seals

- offer up the tube part of the azimuth structure and guide it from inside the pedestal so that the front (the part with no handrail) is facing north,
- unwind the cables coiled inside the azimuth structure and run them inside the pedestal tube and out through the access hatch,
- lower the tube part of the azimuth structure onto the pedestal tube so that the 18 bolts can be inserted and fit the associated washers and nuts,

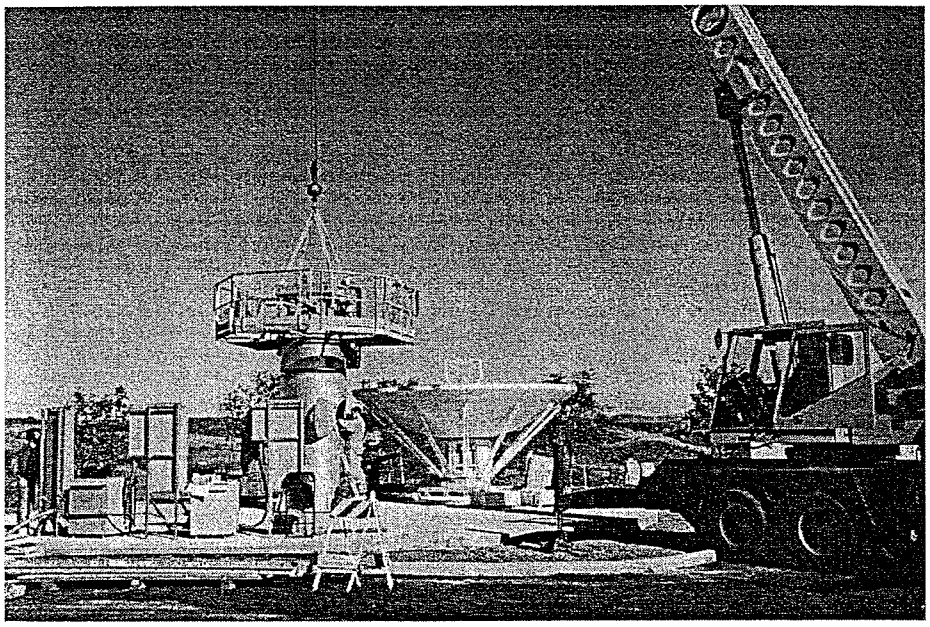


Figure 122 – Positioning the azimuth structure/platform assembly on the pedestal tube

- tighten the nuts moderately.

The following assembly operations require the presence of personnel on the platform. The following conditions apply:

- Maximum number of persons: 3
- Maximum load: 200 kg

3.2.8 – Phase 6 : Elevation screw jack installation

– remove the two elevation jack rotation trunnions which are held in place by four bolts,

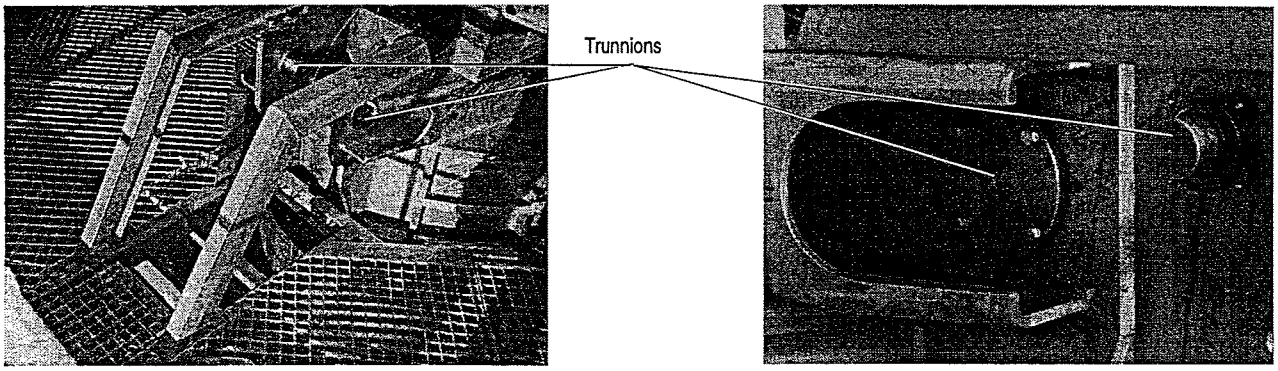


Figure 123 – Elevation jack rotation trunnions

– attach slings to the jack (Figure 124)

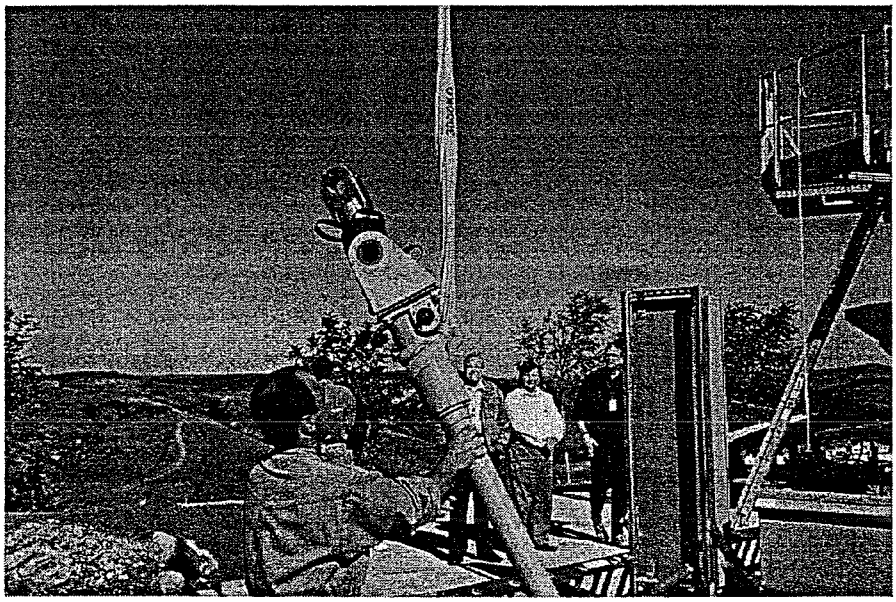


Figure 124 – Slinging and positioning the elevation jack

– position the jack so that the back of it passes through the rear part of the platform with its grating removed (Figure 125).

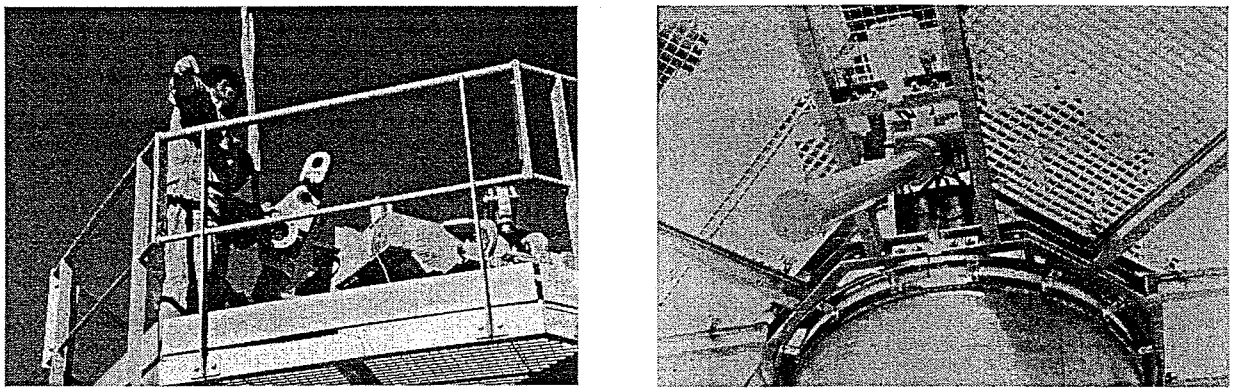


Figure 125 – Passing the jack through the platform

– position the jack so that its rotation axes are opposite those of the azimuth structure (Figure 126).

Figure 126 – Positioning the elevation jack

– reposition the two rotation trunnions in the jack stirrup (Figure 127).

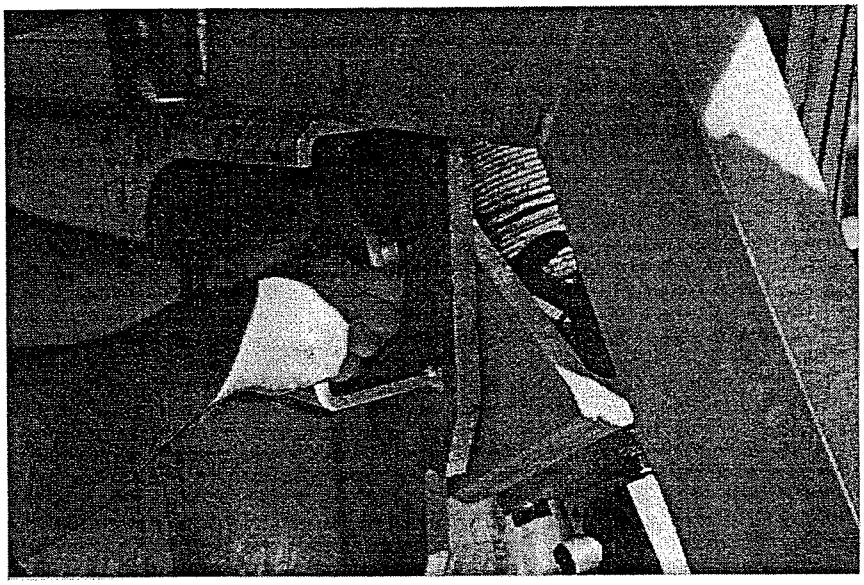
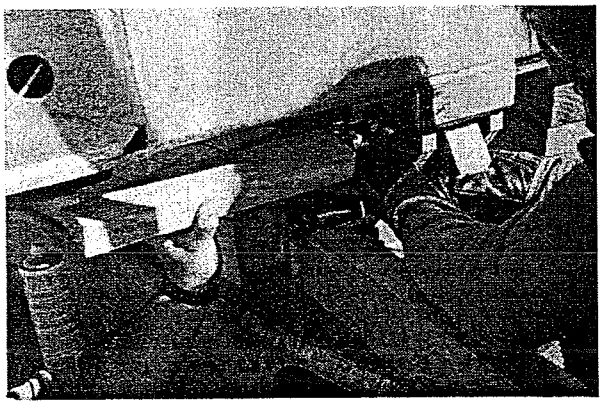


Figure 127 – Positioning the elevation jack rotation trunnions

– fit the joint trunnion to the elevation frame (Figure 128). If necessary, use a hammer, protecting the trunnion with a wooden block. The moving part of the azimuth structure continues to rest on the wooden blocks used for transport.



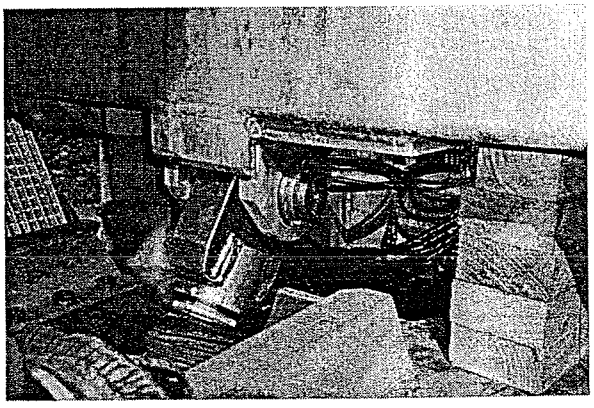


Figure 128 – Positioning the joint trunnion in the elevation frame

– separate the motor and reducer from the elevation axis rotation motor/reducer assembly (Figure 129 : caution, in this photo the junction box is not in its normal position, and the cable glands should be facing the reducer as shown in figure 37).

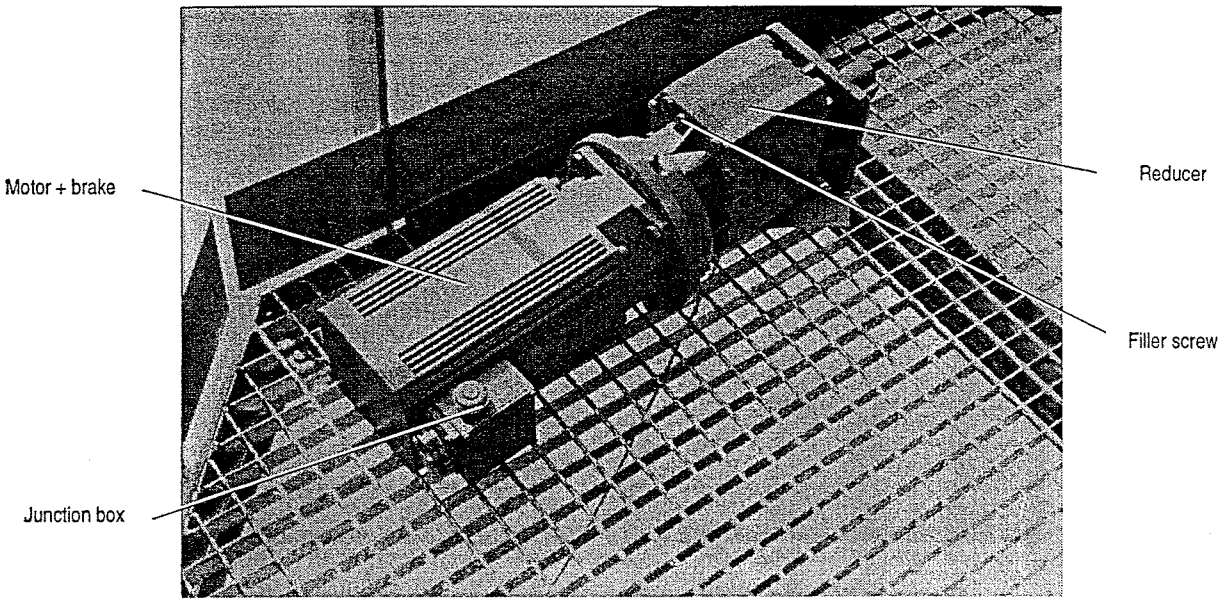


Figure 129 – Elevation motor/reducer assembly

– on the shaft of the reducer (jack side), fit the flexible coupling and secure it with an Allen key,
– mount the reducer on the jack (Figure 130)

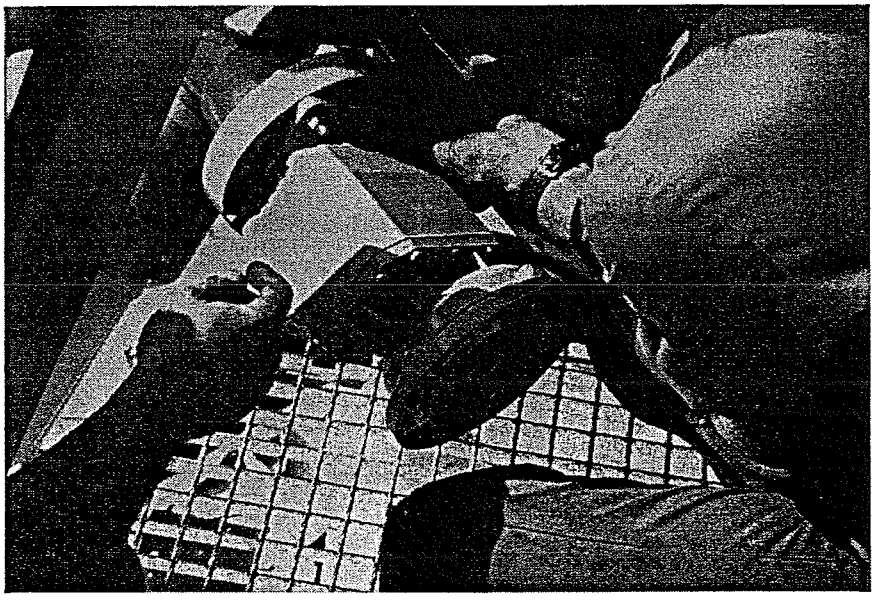


Figure 130 – Mounting the reducer

– refit the motor to the reducer, positioning it as shown in figure 131. The wiring of the junction box shown in the photo will be completed later.

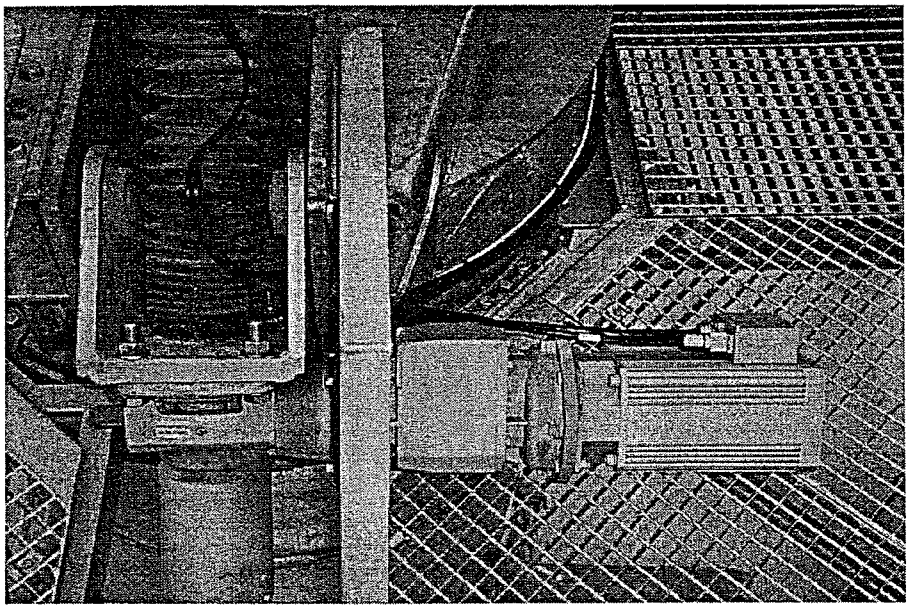


Figure 131 – Motor/reducer assembly in position

3.2.9 – Phase 7 : Reflector installation

- prepare three 3–metre/6–tonne slings and the lifting support (special tool supplied with the antenna). Using the shackles supplied fasten the lifting frame (Figure 132) :
  - to the crane's lifting cables,
  - to the slings.

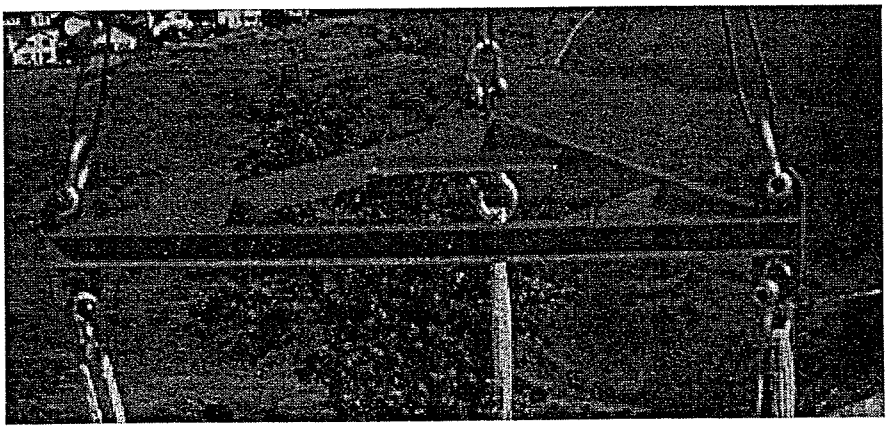


Figure 132 – Fixings on the lifting frame

- using a ladder, **carefully** climb inside the reflector to fix the slings to the three rings on the hub using shackles (Figure 133)

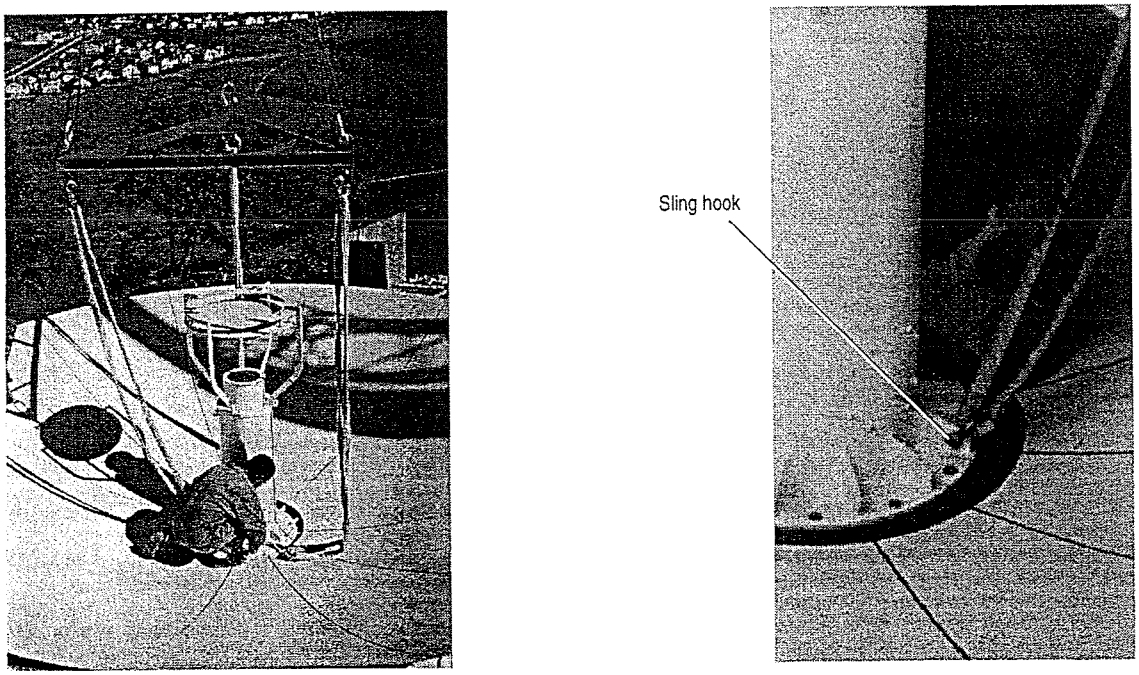


Figure 133 – Slinging the hub/reflector assembly

– lift the hub/reflector assembly (Figure 133)

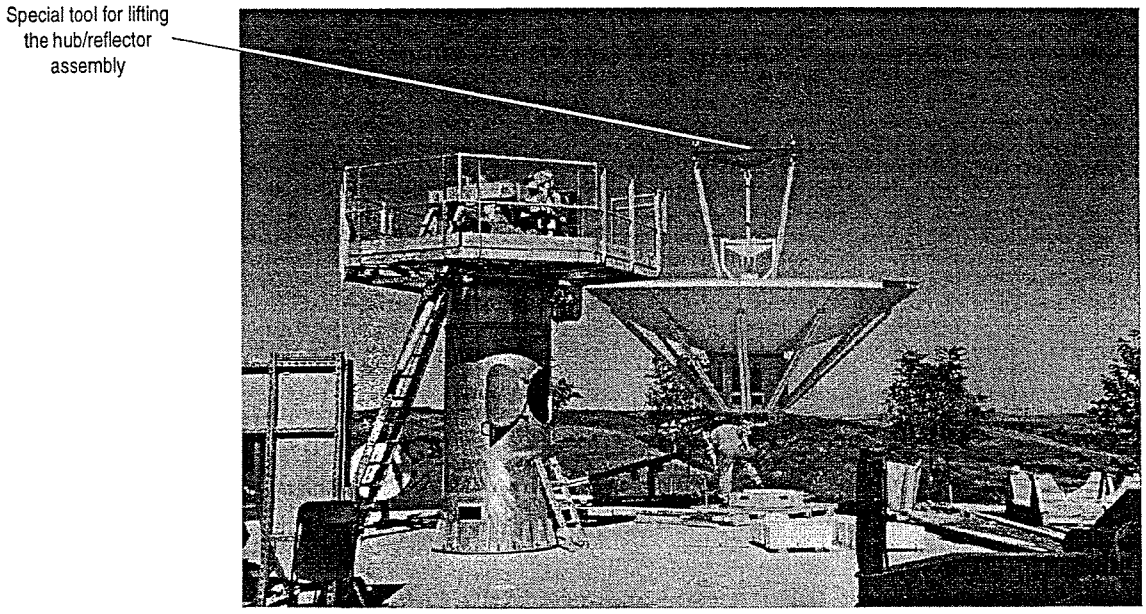


Figure 134 – Lifting the hub/reflector assembly

– with the platform slightly raised, dismantle the cross–elevation jack trunnion and fix the hub connecting piece (figure 135) to it. Fixing holes are located in the bottom part of the hub which will face East when the reflector is in place. This operation must be carried out at this stage so that the bolt/washer/nut assemblies can be fitted and tightened while there is access to the inside of the hub. The trunnion providing the link with the jack must be oriented towards the outside of the hub.

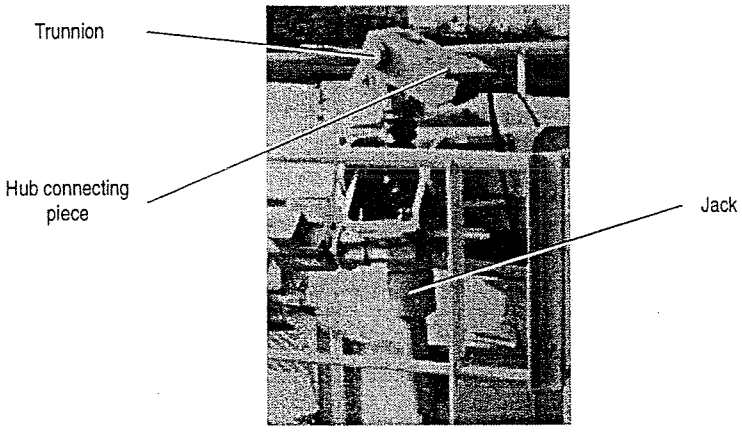


Figure 135 – Cross–elevation rotation control

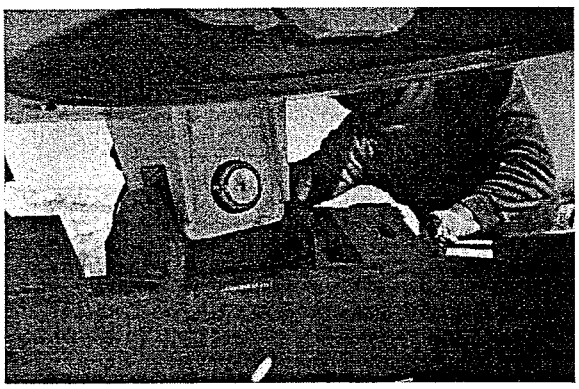
Since the next operation requires a fitter to be on the Northern part of the platform which has no handrail, a safety harness must be worn (Figure 136)

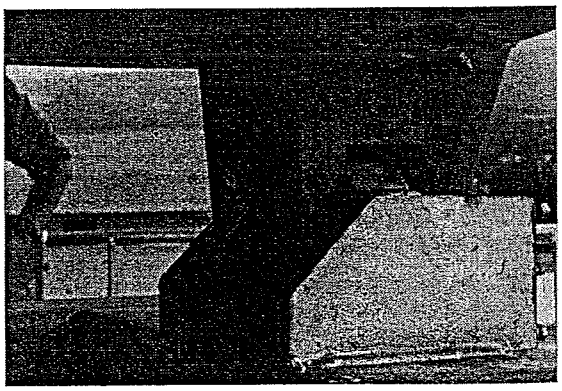
– from the platform, guide the installation of the reflector on the azimuth platform (Figure 136). The stirrup pieces of the hub's cross–elevation shaft should be positioned astride the azimuth platform bearings, as shown in figure 137. After checking that the bearings and trunnions are clean, fit them in position. This may involve using a hammer, inserting a wood block between the hammer and trunnion (Figure 138).

Figure 136 – Guiding the reflector and fitting the bottom trunnion

– The stirrup pieces of the hub's cross–elevation shaft should be positioned astride the azimuth platform bearings, as shown in figure 137. After checking that the bearings and trunnions are clean, place them in position. This may involve using a hammer, inserting a wood block between the hammer and trunnion (Figure 138).

Trunnion





Lower spindle

Upper spindle

Figure 137 – Cross–elevation rotation spindle

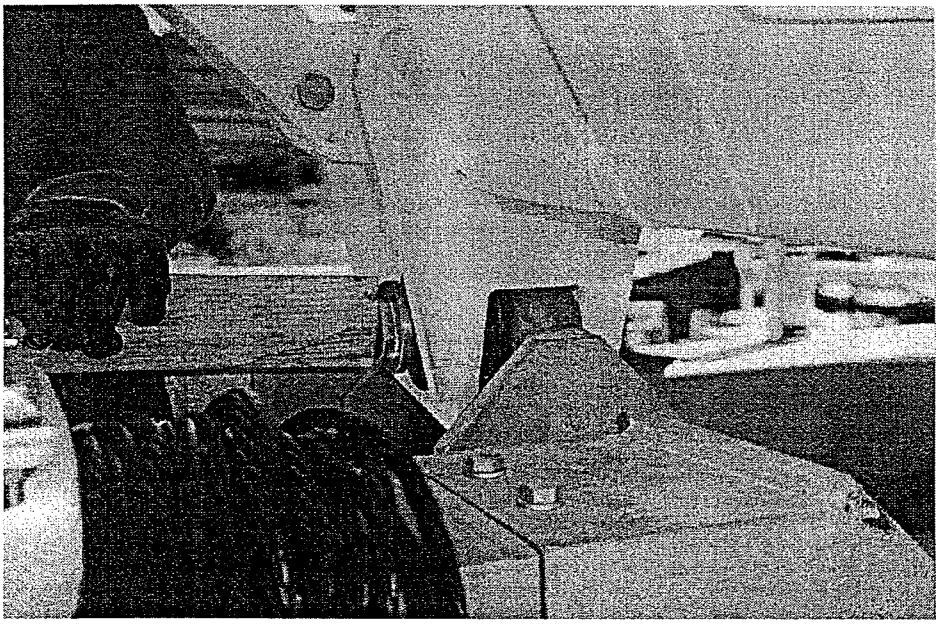


Figure 138 – Fitting a trunnion

– The trunnion with the cross–elevation encoder drive shaft should be placed on the top shaft (that is, the shaft positioned towards the back of the antenna, facing South).

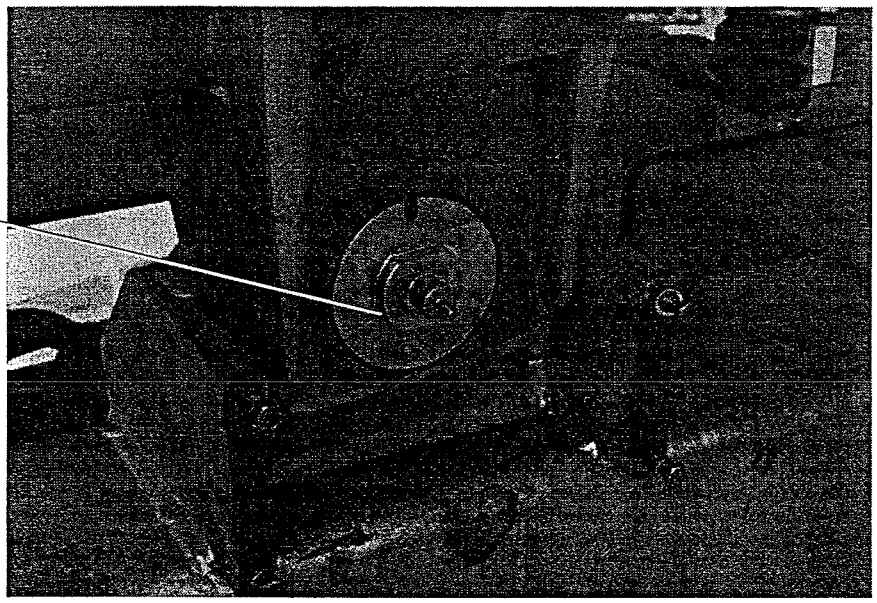


Figure 139 – Top cross–elevation rotation shaft

– replace the trunnion linking the cross–elevation jack to the hub (figure 140)

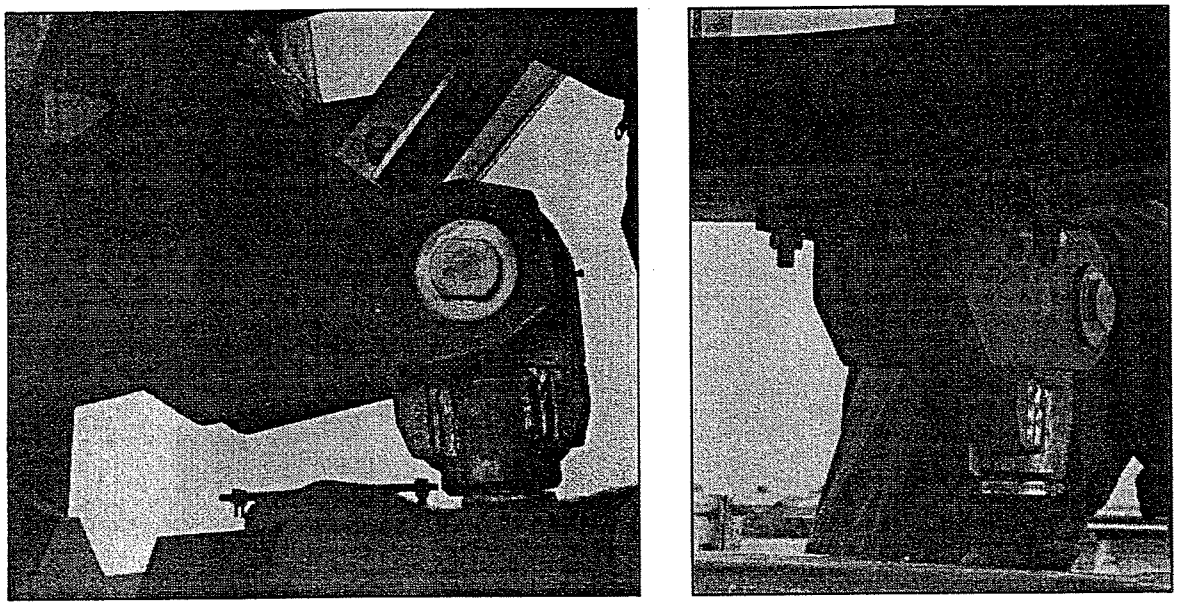


Figure 140 – Cross–elevation rotation control in place

– the antenna then appears as shown in figure 141.

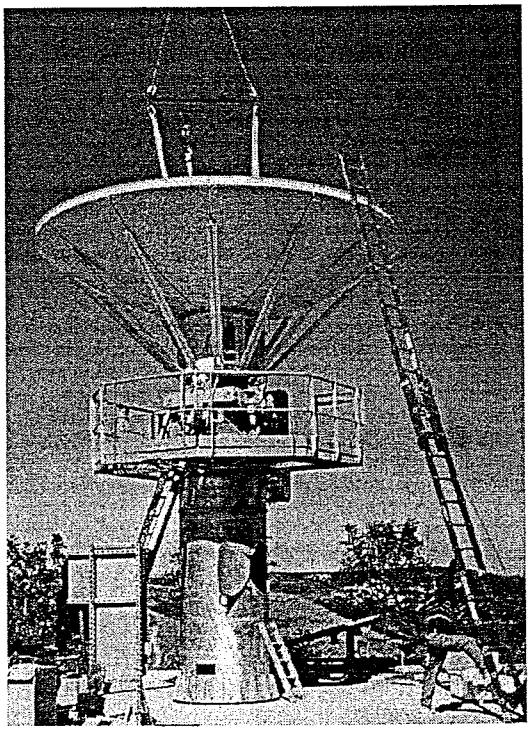


Figure 141 – Assembled antenna

- use a ladder at least 11 metres long, or a basket to gain access to the inside of the reflector (**carefully to avoid denting**) and remove the slings.
- tighten the bolts connecting the pedestal tube to the azimuth platform with hydraucame (preconstraint setting = 10000 daN). Stagger the tightening of the bolts to distribute the stresses.
- check and top up the oil level in elevation and cross–elevation reducers.

3.2.10 – Phase 8 : Azimuth axis vertical alignment adjustment and finishing

Phase 8 must be carried out after installing and connecting the outdoor rack, as described in section 3.3.

3.2.10.1 – Moving the antenna for the first time

Great care should be taken when moving the antenna for the first time, using the base control unit. A thorough knowledge of how the azimuth rotation electrical and mechanical protection devices operate is required to carry out the following operations. The operation of these devices is described in section 2.5.1.1.

Preliminary operations

Before initiating any movement, check:

- that variable speed drive units are correctly configured (connectors and software).
- tightness of the following
  - link between pedestal tube and azimuth crown wheel.
  - link between reflector and XEL axis (two swivel joint bearings) and the XEL jack head.
  - elevation jack at the jack head and azimuth structure (three trunnions).
- positions of zone indicators (out when the antenna is pointing due North, which is the case after installation). For additional information on how these indicators work, refer to section 2.5.1.1.

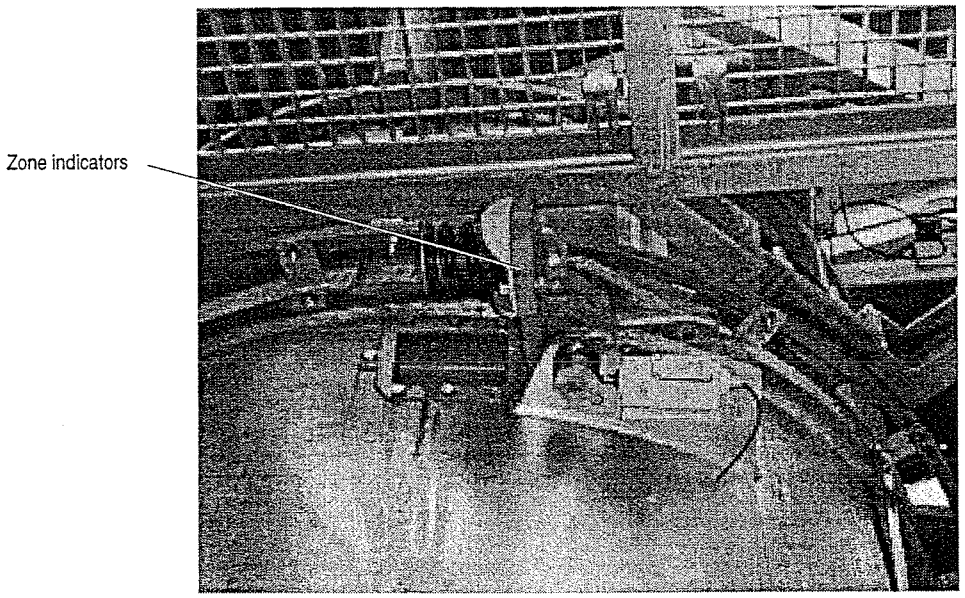


Figure 142 – Positioning of zone indicators

- with the antenna pointing due North, check inside the pedestal tube that the chain return device is in the correct position opposite the chain cable entry (Figure 143).
- check the positioning of the cams on the plate above the azimuth encoder (Figure 143).

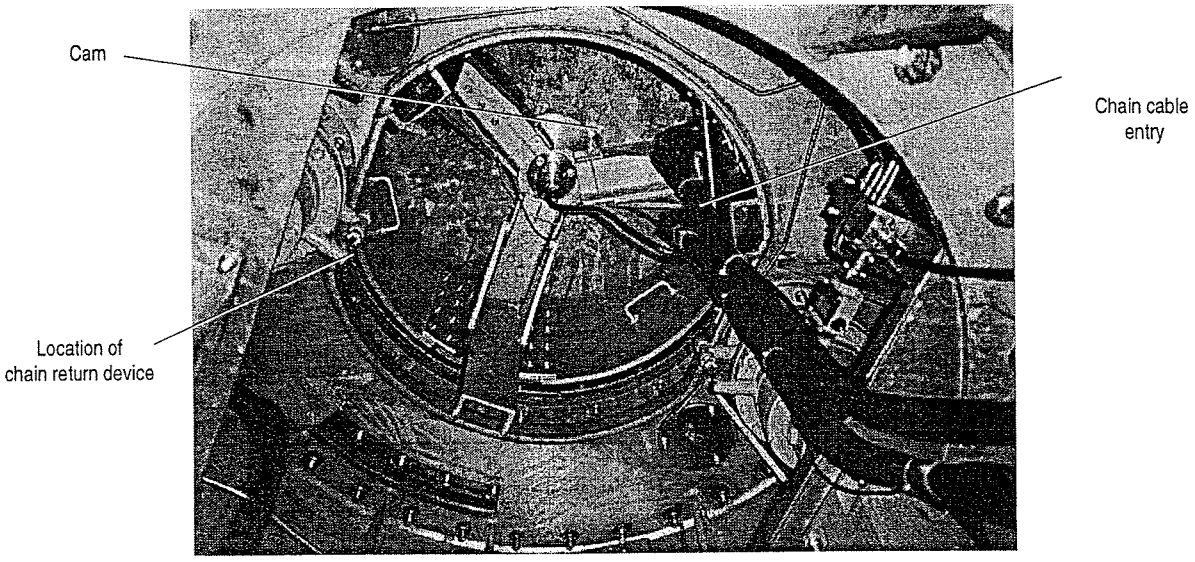


Figure 143 – Chain cable entry and cam positions

- check that the voltages are correct in the power distribution unit.
- power up the outdoor rack using the main circuit breaker.
- check that the emergency stop button on the righthand side of the rack operates correctly: all circuit breakers in the righthand section of the rack should drop out.
- set the circuit breaker switches up and check that when the emergency stop button is pressed on the platform unit, the same circuit breakers drop out.
- set the circuit breaker switches up.
- lower the ladder access safety bars (when they are up, antenna movement is disabled).
- open the rear door of the rack containing the ACP and connect a voltmeter across terminals TBANT 1 and 2 (Figure 144)
- the voltage across these terminals should be 24 V. If there is no voltage, check the wiring and fuse FU01 (24 V distribution).
- raise the two ladder access safety bars: check that the voltage drops to 0 V.
- check that the voltage goes back to 24 V when one bar is lowered.

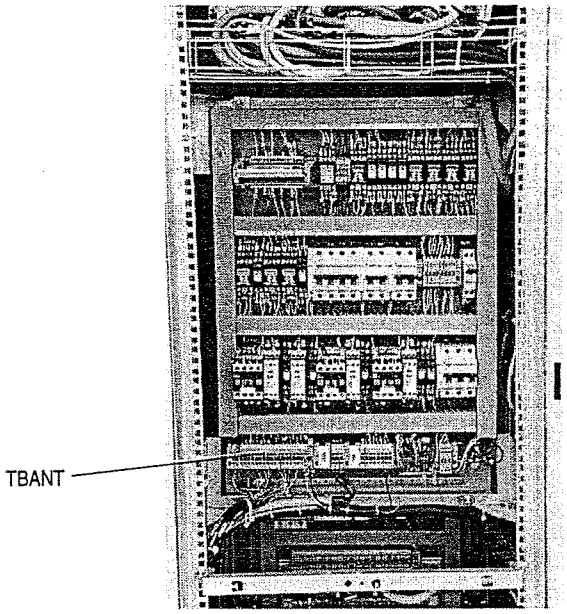


Figure 144 – ACP rear view

– check that the voltage at the azimuth zone contact terminal blocks is 24 V. Retract one of the cam springs (Figure 145) and check that the associated zone contact voltage drops to 0 V.

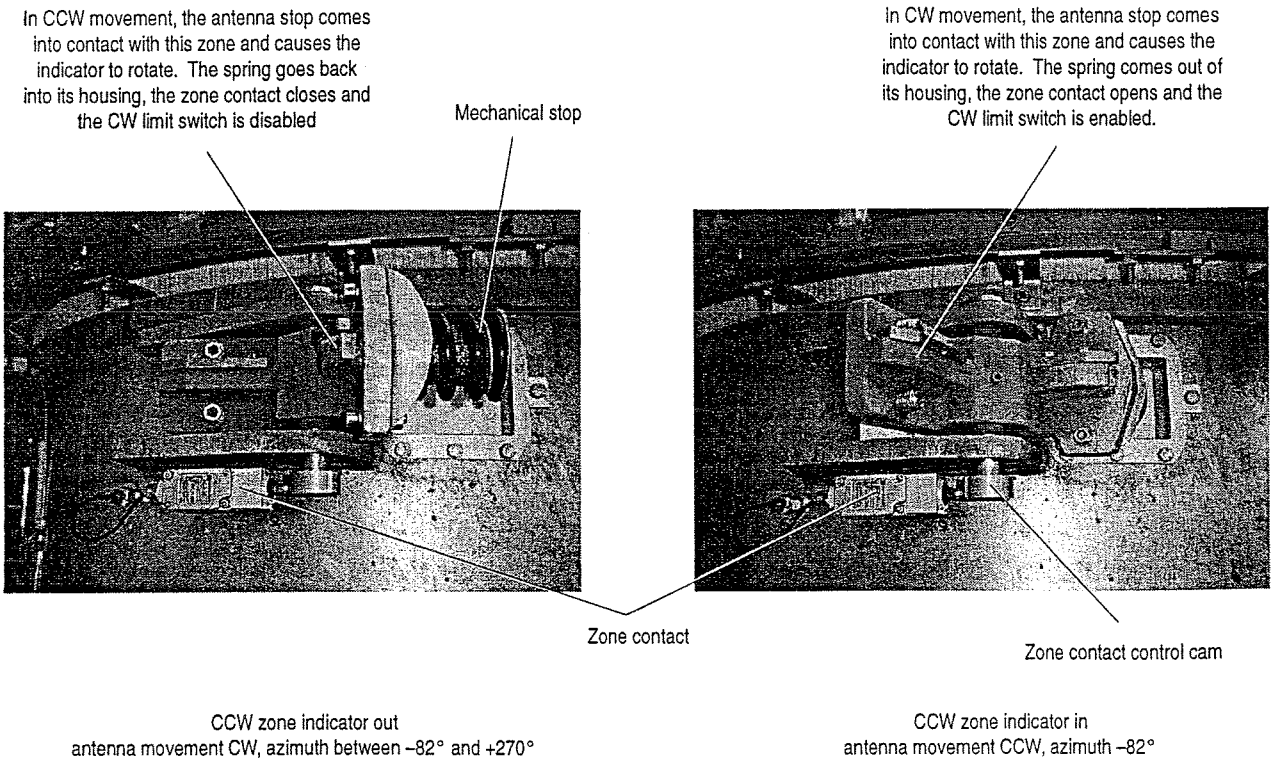


Figure 145 – CCW zone indicator

- also check the operation of the azimuth limit switches inside the pedestal tube by operating them manually. This requires:
  - an operator inside the pedestal tube (with safety bars down),
  - an operator to measure voltages in the outdoor rack.

  The voltage readings at the azimuth terminal block must be:
  - 24 V when the limit switch contact switch is not actuated,
  - 0 V when it is actuated.

If the measurements do not comply with the above indications, check the wiring and contact switches.

Figure 146 – Base control unit

Commissioning the base control unit

- connect the base control unit to the ACP.
- on the base control unit, set the three movement potentiometer controls to the mid position (0).
- set MAIN POWER to ON.
- set the ACU/LOCAL switch on the base control unit to LOCAL (ACU non–operational),

After setting the ACU/LOCAL switch to LOCAL, wait a few seconds (ACP relay energizing noise) before selecting one of the three modes (AZ, EL or XEL).

- the ACP motor (variable speed drive unit) control cooling fans must start up. Otherwise, trace the fault using the ACP wiring diagram.
- check that none of the variable speed drive units has an alarm condition (check through the window in the front panel of the ACP that the green LEDs are on). Otherwise, check the wiring of motors and associated encoders. It is also possible that a motor or variable speed drive unit is defective.

- with the ladder safety bars down, set the AZIMUTH switch on the base control unit to ON. Check at the rear of the ACP that relay KM21 operates.
- check the voltages on the brakes. The voltage across points 1 and 2, and points 3 and 4 on the brake motor terminal block must be 24 V.
- using the % SPEED AZ potentiometer control, rotate the antenna slightly (a few degrees) and observe the ammeters (AZ1 DRIVE and AZ2 DRIVE) on the ACP front panel (AMPS setting). They should show different readings. With the antenna stopped, one should indicate a positive current and the other a negative difference (taking account of play).

Azimuth displacement

- this requires an operator inside the pedestal tube and a second operator outside to check that all is well.
- switch to LOCAL mode, waiting for the ACP relays to energize.
- set the AZIMUTH switch on the base control unit to ON.
- rotate the antenna slowly towards East (CW direction):
  - actuate the CW limit switch (inside the pedestal tube) and verify that antenna movement stops.
  - hold the CW limit switch open and press the LIMITS OVERRIDE button on the base control unit. Check that the antenna does not move but that the brakes are released (characteristic noise).
  - still holding the CW limit switch open and pressing the LIMITS OVERRIDE pushbutton on the base control unit, turn the % SPEED AZ potentiometer control counterclockwise. Verify that the antenna rotates in the opposite direction.
- initiate small oscillating movements at low speed in the clockwise direction (use the % SPEED AZ) potentiometer control. Listen for any suspicious noises. Make sure that there is no significant ambient noise (crane, power shovel, etc).
- verify that the stop triggers the zone contact mechanism with no significant stress (Figure 147). The mechanical stop spring must flip into its housing.

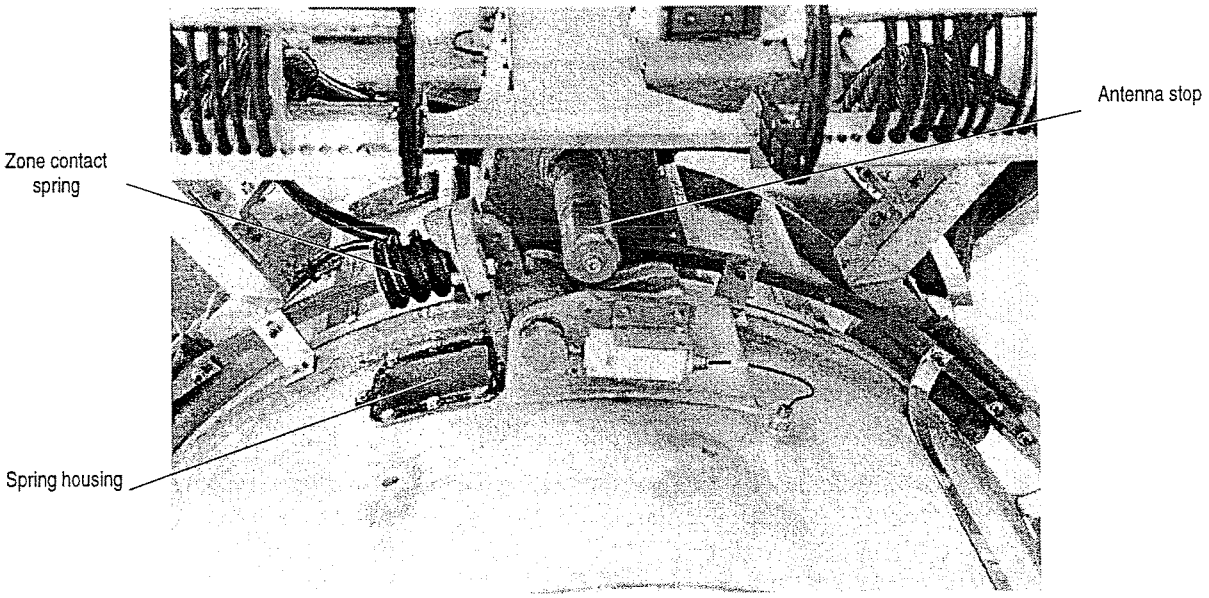


Figure 147 – Stop near the CW zone contact

- when the azimuth reaches approximately 250°, continue antenna movement clockwise, checking that there is no stress on the azimuth chain cables. The operator outside the pedestal tube should check out operation of the CCW zone contact retractable stop.

– reposition the antenna stop to due North and carry out the same operation in the CCW direction.

Elevation displacement

– orient the antenna (azimuth) to allow access to the platform hatch via the ladder on the pedestal tube.

– set the AZIMUTH switch on the base control unit to OFF.

– ask an operator to go up to the platform.

– set the ELEVATION switch on the base control unit to ON.

– because the antenna is shipped in the zenith position, the elevation limit switch is actuated and relay KM31 on the ACP idle. Check that it operates when the LIMITS OVERRIDE button is pressed.

– check that the voltage across terminals 5 and 6 on the motor brake terminal block is 24 V.

– initiate a slight movement DOWN using the % SPEED EL potentiometer control, to release the wooden blocks securing the elevation platform during transport and assembly. Leave them in position.

– set the ELEVATION switch to OFF. Motor torque is eliminated (ammeter on the ACP front panel) but the brake should operate. If the brake is defective, the antenna drops back onto the wooden blocks. If the brake operates normally, remove the wooden blocks.

– turn the UP/DOWN potentiometer control slightly to bring the antenna to 80°. Listen for any suspicious noise. Ensure that there is no significant ambient noise (crane, power shovel, etc...).

– initiate small oscillating movements (DOWN/UP) at low speed resulting in an overall movement down. At slight elevation angles, initiate relatively lengthy UP movements to check that the reflector moves upwards.

– preset the limit switch to around 0° using a level (verifying the vertical alignment of the azimuth structure, for instance).

– take the antenna up to 90° and use the level to adjust the limit switch to 90°. Do not exceed this value since the moving part of the jack could spring the base plug.

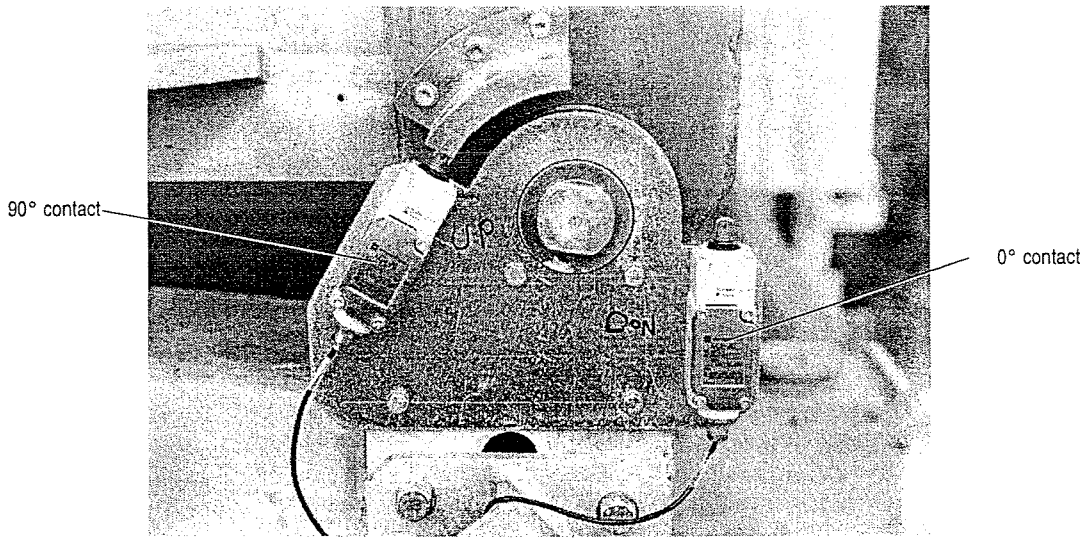


Figure 148 – Elevation limit switch contacts

Cross–elevation displacements

– set the ELEVATION switch on the base control unit to OFF.

- set the XEL switch on the base control unit to ON.
- check that the voltage across terminals 7 and 8 of the motor brake terminal block is 24 V.
- if the reflector has been correctly set straight:
  - initiate a slight +movement using the % SPEED XEL potentiometer control.
  - set the XEL switch to OFF. Motor torque is eliminated (ammeter on ACP front panel) but the brake should operate.
  - if the brake operates normally, initiate small oscillating movements (+/–) at low speed to obtain an overall movement in the – direction. The limit switches should be set so that the angle obtained is approximately 8° relative to the azimuth axis. Execute the same procedure in the opposite direction, still using an angle of 8°. Do not exceed an angle of ±9° since the moving part of the jack could spring the base plug (Figure 149).

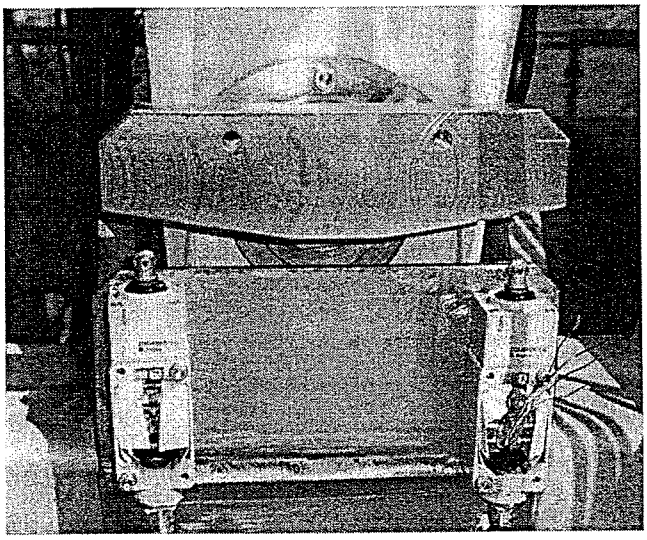


Figure 149 – XEL limit switch contacts

- if the reflector has been set at an angle on the XEL jack head side (for practical reasons):
  - follow the procedure described above, but the first overall movement must be in the –direction.

3.2.10.2 – Aligning the antenna vertically

This operation must be carried out in the absence of wind, with the sky overcast obscuring the sun or before sunrise and, if possible, after installing the ACU and ACP, to facilitate azimuth rotation of the antenna so that adjustments can be made.

Measurements of horizontal and vertical alignment must be made using a level with an accuracy of 0.5 (1 division = 5 millidegrees).

Carry out the following operations:

- remove every other vertical alignment bolt (a bolt must be left in position every 120 degrees).
- loosen the 18 fixing bolts slightly to allow the antenna some mobility.
- position the reflector to the zenith.
- position the antenna to 0° azimuth.
- place the level on the antenna reference plate and position it along the axis of an alignment bolt (to be referred to as bolt N° 1). The two other bolts will be referred to as bolt N° 2 and bolt N° 3 (Figure 150).

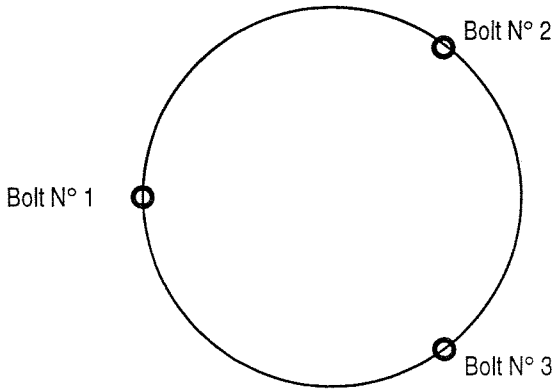
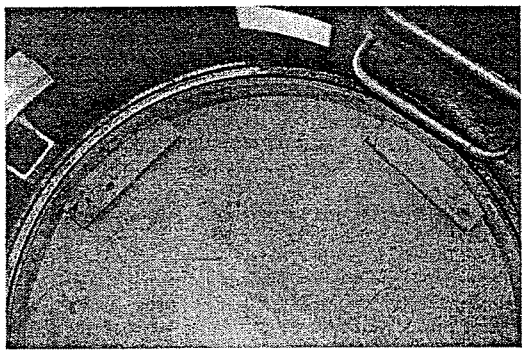


Figure 150 – Locations of vertical alignment bolts

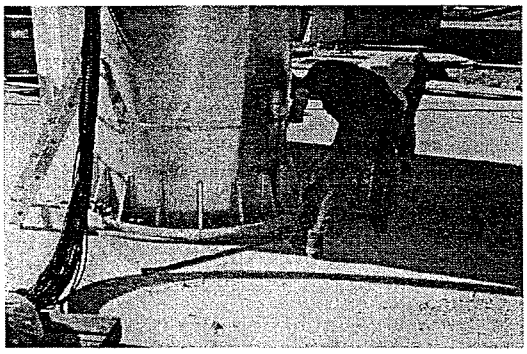
- align horizontally using bolt N° 1 to bring the bubble to the centre.
- turn the level through 180° and check that the bubble does not move (this checks the correct position of the reference plate). Otherwise, adjust the level and repeat this setting.
- using the base control unit, rotate the azimuth frame through 90°.
- return the bubble to the centre by adjusting bolts 2 and 3 alternately (for example, loosen one bolt by one turn and tighten the other by one turn so as to avoid modifying the previous setting).
- by rotating through 90°, check that the bubble remains within tolerance. Otherwise, repeat the settings.
- verify that the bubble remains within tolerance every 20° (5 millidegrees, which is one division). Since the encoders are not yet set, use the positions of the 18 fixing bolts spaced at 20° intervals to obtain the 20° angles.
- fit the three remaining alignment bolts and locknuts and tighten by hand.
- fit the nuts and tighten by hand or gently with a spanner (1/20 turn).
- check the vertical alignment after these operations. On a complete rotation of the antenna, deviation of the level bubble should not exceed one division on the level.
- do not move the antenna in the interval between setting the antenna's vertical alignment and pouring the non–shrinking cement (ENBECO).

3.2.10.3 – Finish

- after completing the operations for aligning the antenna vertically and checking these operations, assemble the internal and external shuttering up to the height of the pedestal tube baseplate (Figure 151).



Internal formwork



External formwork

Figure 151 – Formwork

- prepare the non–shrinking cement (MASTERFLOW 713) **following the manufacturer's instructions to the letter** (Figure 152).

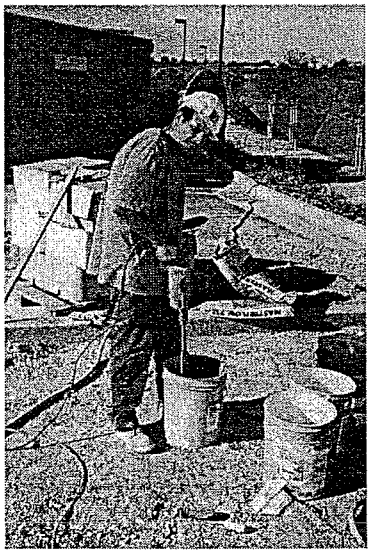


Figure 152 – Preparing the cement

- pour the cement into the shuttering, in the space between the concrete base and the pedestal tube's baseplate.
- allow to dry for two days.
- loosen the alignment bolt locknuts. Unscrew the alignment bolts by two or three turns (they can also be removed).
- tighten the nuts with a spanner, then with the hydraucame (preconstraint setting = 10000 daN), staggering these operations to distribute the consecutive stresses.
- tighten the locknuts.

3.3 – Installation of the "Outdoor" rack

3.3.1 – Installing the rack

- the outdoor rack is supplied on angle section for fixing to the ground.
- hoist the rack using the four rings on the top.
- position it over the anchor studs to the south of the antenna, with the front panel facing West.
- fix the rack to the ground using the four front and rear washer/nut assemblies.
- remove the lifting rings and keep them in case the rack needs to be moved again.

3.3.2 – Installing the rack equipment

The rack is supplied with the equipment in place. The layout is shown in figure 153.

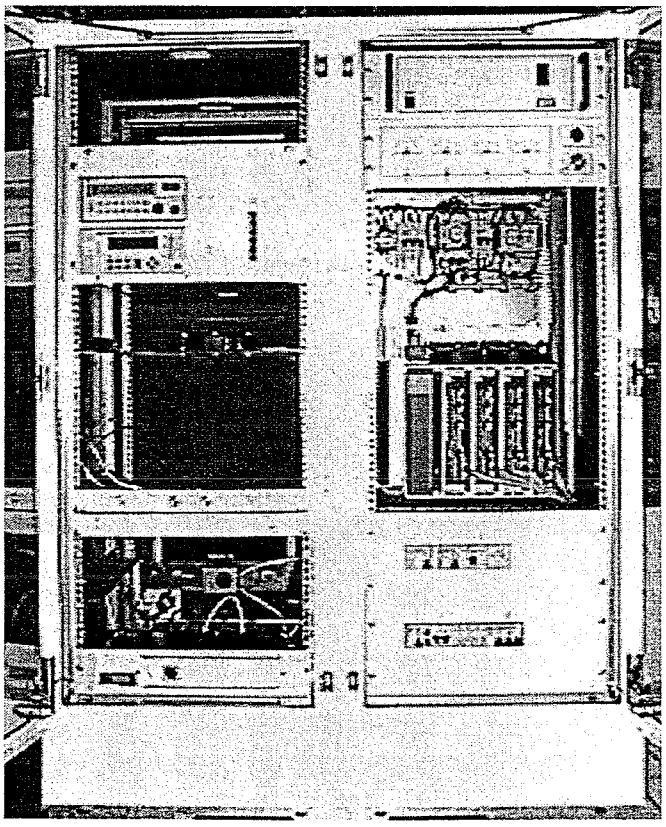


Figure 153 – Layout of the equipment in the "outdoor" rack

3.3.3 – Rack internal connections

The rack is wired internally in the factory, in compliance with the cable schedule given in section 1.2.

3.3.4 – Connections between the rack and the antenna

– the cables linking the antenna to the outdoor rack are factory–prepared and coiled inside the azimuth frame. They are uncoiled during antenna assembly and run out of the pedestal tube through the side access hatch. Run them through the rectangular opening at the base of the pedestal tube and into the rack through the side (Figures 154 and 155). Wire up the unit in compliance with the cable schedule given in section 1.3.

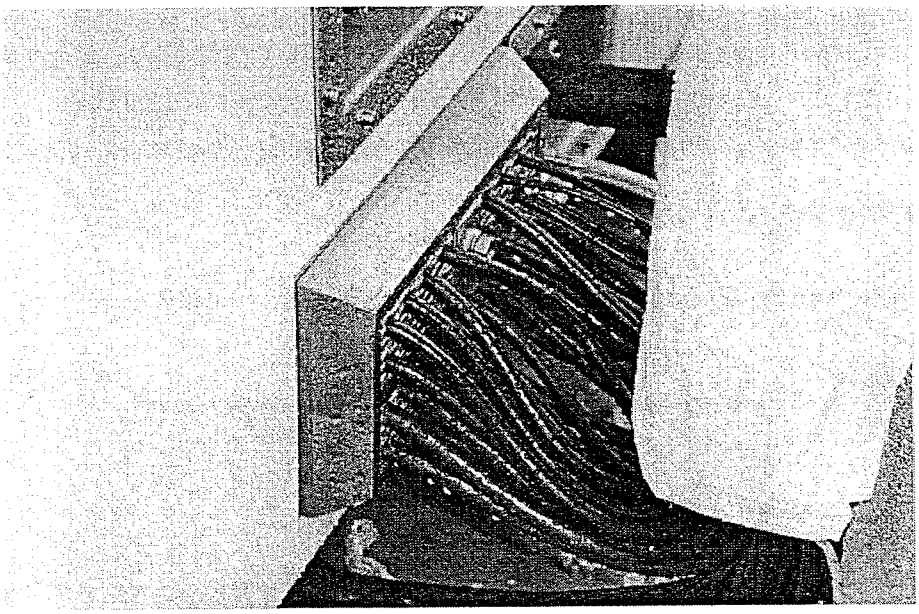


Figure 154 – Cable entry into the outdoor rack (coaxial cable version)

Figure 155 – Cable entry into the outdoor rack (optical fibre version)

3.3.5 – Connections between the rack and the gateway building

Refer to the cable schedule (section 1.4).

For an optical fibre indoor/outdoor link, the following precautions should be taken when installing the link:

- the bulkhead (Fibreoptic Adapter) and the optical connector should be clean, free of any trace of visible and invisible dirt and/or dust; this is why it is strongly recommended (requested) that **when not connected, the connectors and the bulkheads should be kept covered with the protection caps.**
- after cleaning the inside of the bulkhead (Fiberoptic Adapter), as is described in product operational manual (see important installation tip, hereafter), the inside connector belonging to the Laser or Photo diode should be carefully and tightly assembled.
  ATTENTION! the inner connector must not be loose!!
- the Fiberoptic Connecting Cable/Jumper should be carefully (**Attention to the Polarity Key)** and tightly assembled and **should be unscrewed half a turn** (Figure 156). This operation is mandatory to be performed, getting rid of the over pressure between the two connectors and improving significantly the Optical Power and the Stability of the FIL.

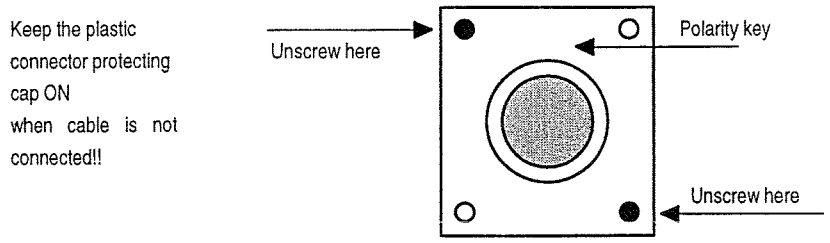
IMPORTANT INSTALLATION TIP

Cleaning Inside Fiberoptic Connector Tip

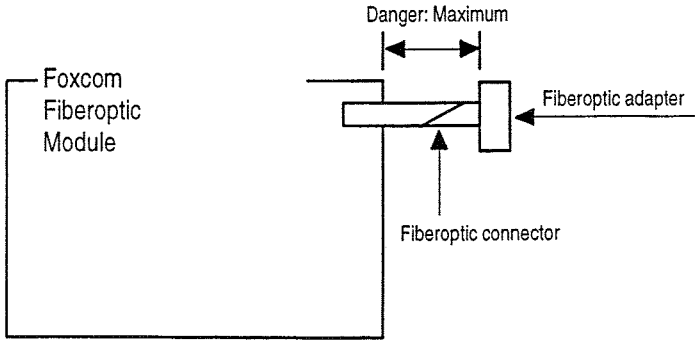
Problem : Low/no signal or noisy signal present at a Foxcom module.

Dirt on the inside connector tip can impair the flow of light causing problems in signal transmission. Foxcom modules are hermetically sealed but dirt can occasionally get in. Follow the procedures below to clean the inside connector tip.

- **NOTE! Take module out of rack/power supply before beginning operation.**
- unscrew the two screws on the fiberoptic adapter shown in the figure below.

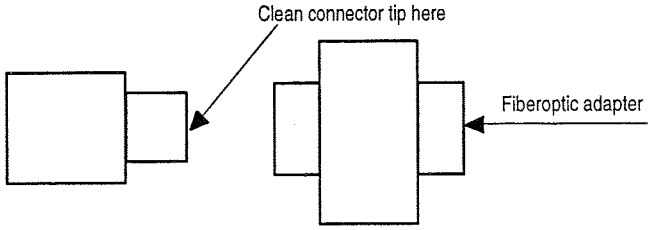


- gently pull the adapter with the inside fiberoptic connector away from the module, following the diagram below.
  IMPORTANT : DO NOT PULL THE ADAPTER MORE THAN 3 INCHES (7.5 cm) FROM THE MODULE (FIBER WILL BREAK!)



– carefully pull out the fiberoptic connector and clean the tip with a dry cloth.

No use should be made of Ethyl Alcohol or any other solvent unless vigorous polishing is followed afterwards with a dry lint free cloth. All alcohols (even 100% pure) leave a residue on glass.



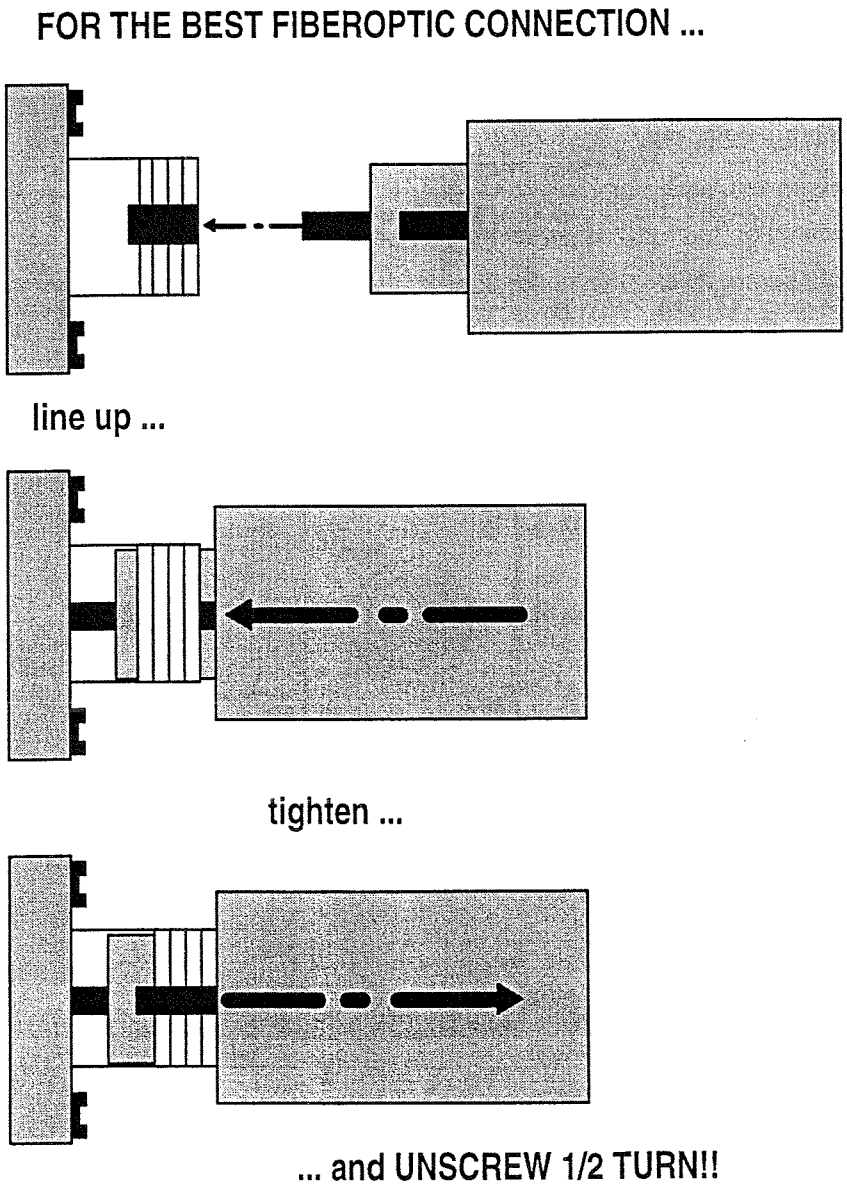


Figure 156 – Fiberoptic connection

3.3.6 – Power supply

– the rack power supply is drawn from the power distribution unit.

3.4 — Assembling antenna accessories

3.4.1 – Azimuth motors

– fit the azimuth motors inside the pedestal tube (Figure 157), inserting the flexible coupling and securing it with four bolt/washer/nut assemblies. Connect the power supply unit.

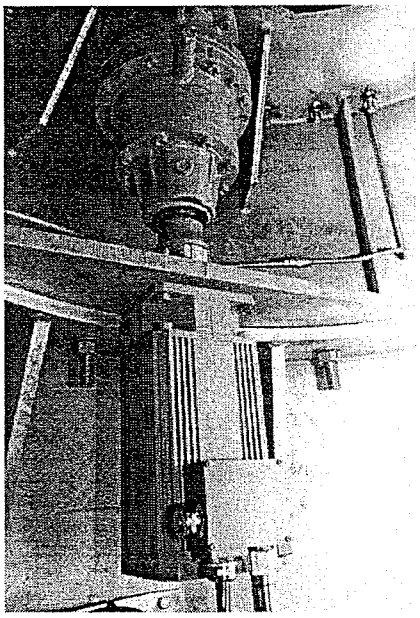


Figure 157 – Azimuth motor assembly

3.4.2 – Azimuth crown wheel grease pump

- fit the grease pump (Figure 158) inside the pedestal tube (access through hatch in the floor midway up the pedestal tube).

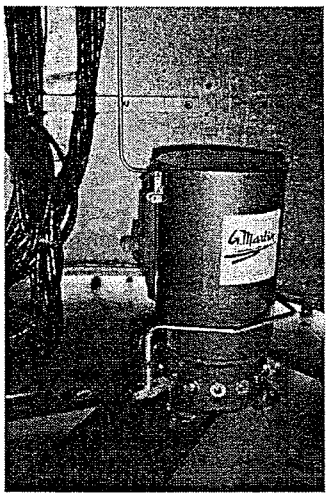


Figure 158 – Grease pump

- connect up the grease feed pipe and pump power supply cable. Check that the grease tank is full and run the pump for four to five hours, until the grease runs over the azimuth crown wheel drive gears.

3.4.3 – Encoders

3.4.3.1 – Azimuth encoder

- fit the azimuth encoder in the centre of the azimuth crown wheel (Figure 159)
- connect the ACU linking cable.

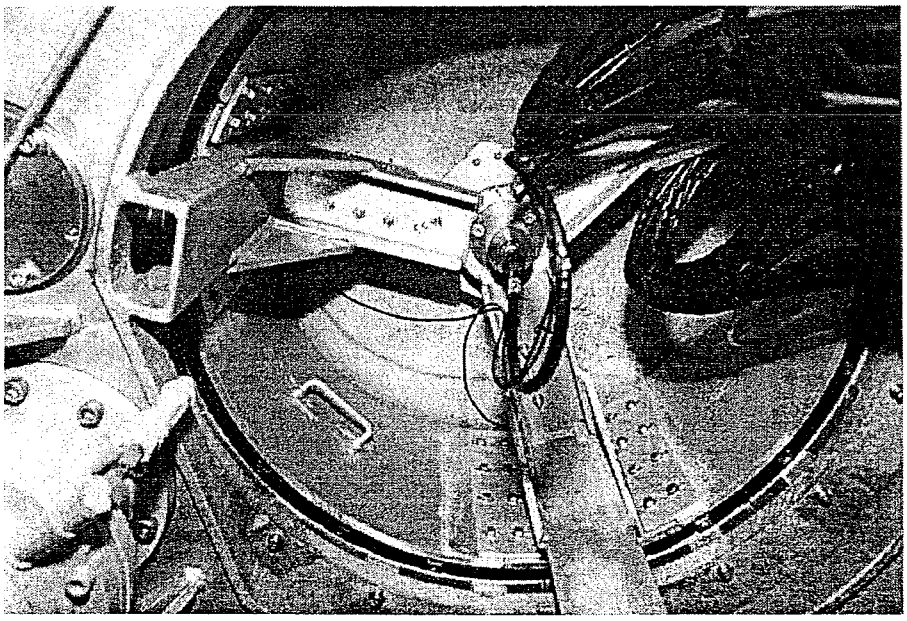


Figure 159 – Azimuth encoder assembly

3.4.3.2 – Elevation encoder

– fit the elevation encoder to the end of the trunnion shaft driving elevation rotation, located to the left of the antenna axis (Figure 160). Connect the ACU linking cable.

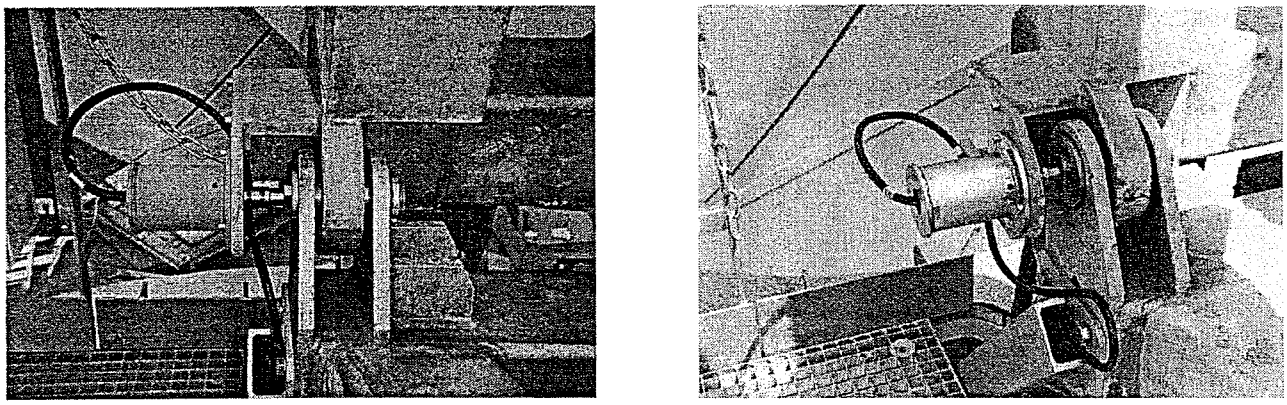


Figure 160 – Elevation encoder assembly

3.4.3.3 – Cross–elevation encoder

– assemble the encoder bracket on the supports located on each side of the upper cross–elevation spindle. The bracket is held in position by four Allen screws.

– assemble the encoder on the bracket and connect the ACU linking cable (Figure 161).

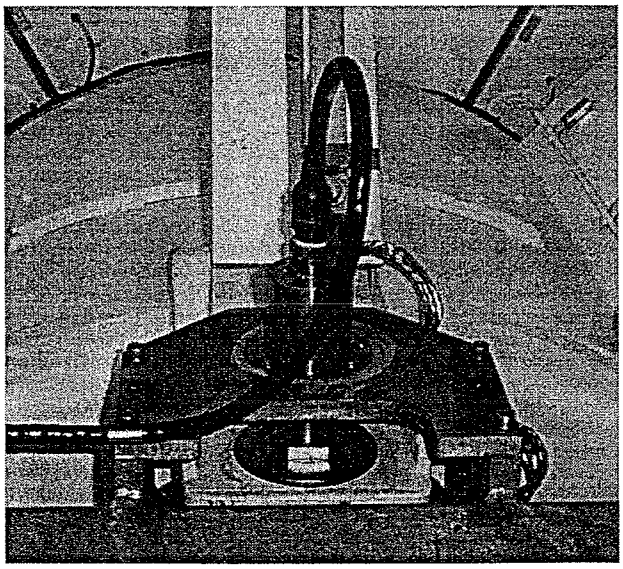


Figure 161 – Cross–elevation encoder assembly

3.4.3.4 – EL and XEL jack greasing cartridges

– fit the two greasing cartridges to the greasers on the EL and XEL jacks (Figure 162).

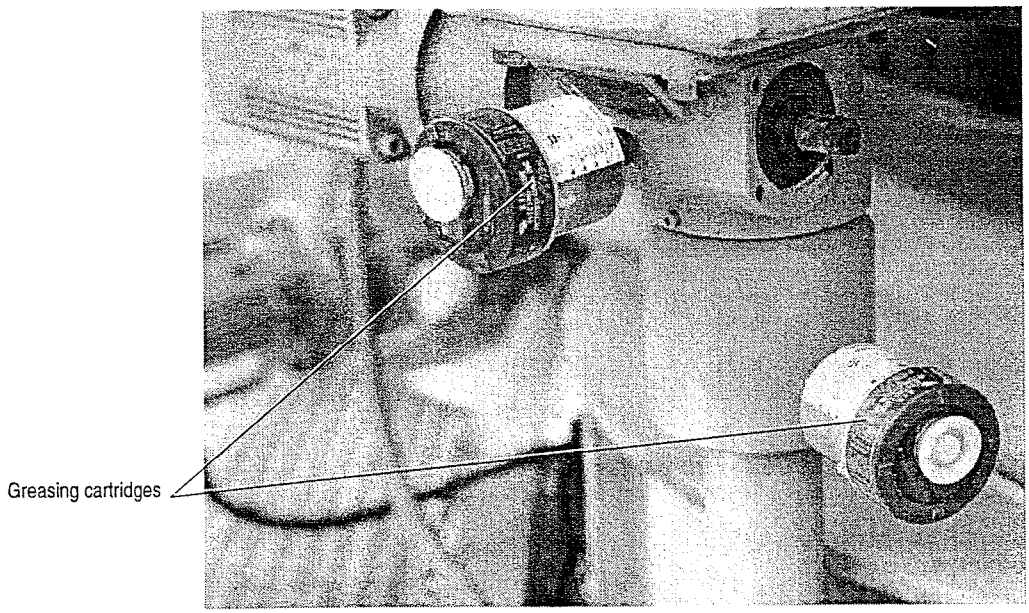


Figure 162 – Fitting greasing cartridges to a jack

– set each cartridge to 6 M (six months) and ON. Check that the LED on each cartridge flashes periodically.

3.4.4 – Lightning protector

Install the lightning protector.

3.5 – Adjusting the encoders

3.5.1 – Presetting the AZ/EL encoders. Adjusting the XEL encoder

- using the base control unit, orient the antenna as follows:
  - to the North (antenna mechanical zero reference ????).
  - to the zenith (90° elevation), using the spirit level on the reference surface.
  - cross–elevation axis to 0°, using the spirit level on the reference surface.
- connect the serial port on the portable PC to the ACU PARAMETERS connector,
- power up the PC and pull down the WINDOWS "Terminal" menu.
- in the "Position Sensor" menu, check that the values are as follows:
  - OFFset Angle AZ = 0.000
  - OFFset Angle EL = 0.000
  - OFFset Angle XEL = 0.000.

  Otherwise, set these values.
- disconnect the PC/ACU cable.
- connect the PC's serial port to the GTS input on the ACU rear panel. The cable must have an RS232/RS422 converter.
- start the GTS program and, in the "Detail" window, read the values of the AZ, EL and XEL angles. Note these values, for example:
  - AZ: 231.081
  - EL: 72.944
  - XEL: 176.111

  These values depend on the way the encoders have been assembled.
- calculate the offset values required to force these values to 0 (AX and XEL, or 90 (EL) as follows:
  - azimuth: the offset value should be between –180° and +180°, giving (Figure 163) :

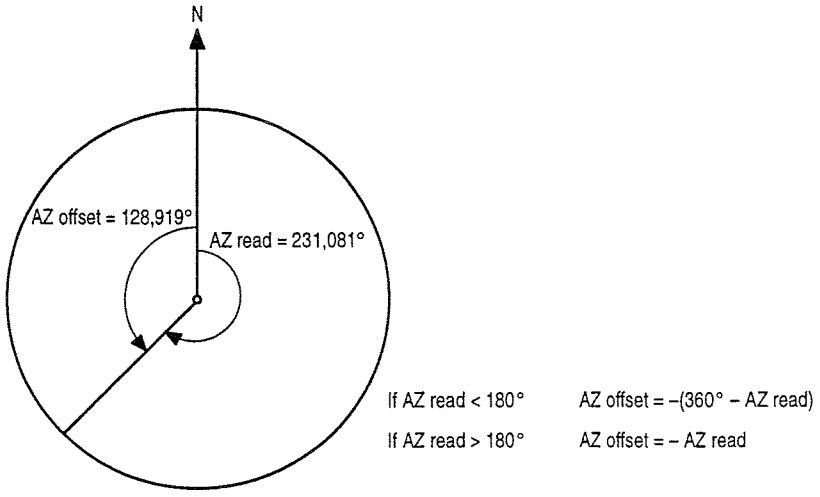


Figure 163 – Calculating the offset value

- elevation: the offset value is given by: EL offset = 90° – EL read

  ie, in the above example: 90° – 72,944° = 17,056°
- cross–elevation, the offset value is given by: XEL offset = – XEL read

  ie, in the above example: – 176,111°

– disconnect the cable from the GTS port on the ACU, and after removing the RS232/RS422 converter, connect it to the PARAMETERS input on the ACU front panel.
– select the "Terminal" menu, then "Position Sensor" and enter the calculated offset values. The azimuth value must be entered in millidegrees (128919)
– reconnect the computer to the ACU GTS input, inserting the RS232/RS422 adapter.
– start the GTS program and check in the "Detail" window that the values are:
  - AZ : 0.000
  - EL : 90.000
  - XEL : 0.000
– check that antenna displacements can be controlled from the PC in POSITION mode.

3.5.2 – Setting AZ and EL encoders

This procedure will check and/or define the pointing accuracy of the antenna. By running the procedure several times at different times of the day, repeatability of the readings has been shown to be about .03 degrees peak to peak. If the peak to peak readings are averaged to make corrections to the error offset the resulting correction can be expected to be within about .02 degrees. The specifications are .07 degrees.

– Connect the PC to the RS232/RS422 converter (RS232 side) using a DB 9 to DB 25 adapter.
– Connect the Converter power supply to line voltage
– Connect the RS 422 side of the converter to the Antenna indoor cabinet MC (monitor and control) connector using the adapter cable supplied.
– Start Windows 95 on the PC.
– Double click on the GTS.EXE Icon. If this icon is not on the desktop go to the Windows directory then open the Bereau sub–directory and double click the GTS.EXE file.
– This application brings up the GTS window. The MODE field will show CONNECTION LOST
– In the top menu bar choose CONNECT then ALCATEL CONNECT from the pull–down menu.

  The angles, time and alarm status will be displayed. If the ACU is synchronized, the ACU alarm will not be displayed. If an alarm is displayed, double click the ACU to bring up alarm details. The most common alarm is RTC NOT SYNCHRONIZED. This means that the time has not been reset after an ACU reset or power outage. Click OK.

The time must be verified or reset for this procedure. Time accuracy is extremely important to accuracy of the measurement. An offset of one second can cause spatial errors of up to .006 degree. Time must be set to UTC time. This means that the system time of the time server via the TCU can not be used to set the time as it is running on GPS time. GPS time differs from UTC by 12 seconds. A telephone time source is suggested to set time. In Aussaguel the time service can be obtained by dialing 03699. In San Diego the time can be obtained by dialing 619 853 1212. On short wave radio at 5, 10 or 15 MHz the time is given every minute.

Setting the time is a two part operation . The time is first set then the setting is confirmed.

To set the time :

– choose TIME on the menu bar, then SET TIME from the pull down menu. This brings up the SET TIME window.

- Enter the date (DAY/MONTH/YEAR) and a time a short while in the future. At the correct time click SET. If the time is accepted a SUCCESS message will be displayed in a field at the bottom of the SET TIME window. (The message is only displayed for one second). The new time and date will be displayed in the time field at the top of the GTS window. The ACU will show an alarm condition.
- Recheck the time displayed. If correct to within one second the time can then be confirmed by repeating the set time process. The time field at the top of the screen can be used as the time source to do this.
- After a valid confirmation time has been set, the ACU alarm will clear. If the first attempt at confirmation results in a failure to confirm, the confirmation can be retried as no change of time occurs when confirmation fails.

When the time has been set exit the GTS window.

- Open the EXCEL spreadsheet called SUN.XLS. This spreadsheet should have an Icon on the desktop.

  The spreadsheet has site–specific data in rows. In columns A, B, C of rows 1 to 4, check that the data is correct for your site. Row 8 contains the time parameters for the desired sun track ephemeris. Edit date and time (UTC) appropriately to provide a file in the near future. The file generated will contain data for 30 Minutes and 30 seconds of solar tracking if a 15 second interval is used. The interval is not the update interval but points that are used to generate commands. The commands are interpolated linearly between points.
- After editing the times on the spreadsheet, click the box that says "click here to build the file sun.trj for the ACU". When asked if you want to replace the existing file, choose yes (OUI).
- Exit the EXCEL spreadsheet. When asked if you want to save changes to the spreadsheet, choose no *(NON)*.
- Reopen the GTS.EXE application by double clicking the ICON
- Reconnect by selecting CONNECT from the menu bar and ALCATEL CONNECT from the pull–down menu
- Go to FILE in the menu bar and select OPEN from the pull-down menu. A trajectory file window will open, in the right hand large file field
- Double click on C:\ this returns you to the root of the C drive and displays the main directories. Choose the gts directory by double clicking it.
- Double click the sun.trj file in the left large field. The window will close and return you to the GTS window.
- In the menu bar choose MODE and PROGRAM TRACKING from the pull–down menu. The PROGRAM TRACK window will come up.
- Click the TRAJECTORY button. The PROGRAMMED TRACK window will appear with the ephemeris angles and tracking times.
- Click send to load the data into the ACU. The antenna will move to POA ???? if the time of the file has not yet been reached, or will move to the present sun position and proceed to program track if the file start time has already passed. A successful command will be acknowledged in the bottom part of this window by the message SUCCESS.
- Close the program track window. The TRACKING window will be displayed . The window will display time to POA and/or time left in the pass as appropriate.
- Configure the spectrum analyzer as follows:

CENTER FREQ.	2185 MHz
SPAN	0 Hz
SWEEP TIME	50 SEC
RESOLUTION B. W.	1 MHz
VIDEO B. W.	1 Hz

* ATTENUATOR	20 dB
# REF LEVEL	–40 dBm
LOG dB/DIV.	1 dB

* Attenuator setting is important : too much attenuation will increase the analyzer noise floor relative to the system noise floor. Too little will cause the analyzer to saturate on solar noise. The solar noise is about 18 to 20 dB above the system noise floor and about 600 MHz gets through the Rx front end filters. Given the system gain, this works out to about –7 dBm of total power at the spectrum analyzer input. This procedure is also the basic setup for doing solar Y factors for G/T testing. For this type of test, keeping the spectrum analyzer in the linear and non–noise limited region is vital to accurate measurements.

The reference level is variable. The level should be set for about midscale display when tracking the sun.

- Connect the spectrum analyzer to the Downlink IFL IF of the antenna to be tested (either right or left hand C P IF path may be used).
- After the antenna starts to track the sun, click on the MODIFY button in the TRACKING window. This allows an offset to be introduced to the ephemeris track. Enter an offset to produce a drop in signal level of 3 to 5 dB. This will be an offset of between .3 and .5 degrees. Note that the granularity of the command is .003 degrees, so the specified offset may not be entered exactly as typed. Use the display line function (if available on the spectrum analyzer) to mark the level of the signal. Note the displayed actual position offset in the tracking window. The granularity of this display is .006 degrees, so the specified and actual offsets may be different.
- Change the specified offset by the same amount in the opposite direction and fine tune the specified angle to obtain the same level as noted on the other side of the main lobe.
- Note this offset angle from the tracking window. Record the difference between the positive and negative offset values and divide by two. This is the pointing offset for this axis.
- Repeat offsets and readings for the other axis. Record the date and time of the measurement and the Az and El angles at which the readings were taken. These measurements should be repeated at different times of the day and often enough to gain confidence in the repeatability of the results. At least three sets of measurements are recommended.

4 – Operation

To Be Defined (QUALCOMM ?)

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5 – Maintenance

5.1 – Definitions

5.1.1 – Preventive maintenance

This involves a number of routine operations to reduce the risk of equipment failure.

5.1.2 – Corrective maintenance

This is for locating operating faults and correcting them as quickly as possible using as few operations as possible.

The station operator does this when alarms appear.

Faulty boards are replaced without being repaired.

5.1.3 – Technical expertise

Maintenance engineers must have a thorough knowledge of the equipment and its environment.

5.1.4 – Safety

Some preventive and corrective maintenance operations require the presence of personnel on the platform. The following conditions apply:

- Maximum number of persons: 3
- Maximum load: 200 kg

Personnel protection is provided by a guard rail and a chain placed in the axis of the elevation moving part of the antenna.

5.1.4.1 – Access to the platform and antenna pedestal tube

The platform and pedestal tube of the antenna are both accessed by ladders, each fitted with a red access safety bar associated with an electrical interlock switch (Figure 164).

When set to the up position, these bars prevent access to the platform and pedestal tube and allow the antenna to move.

Antenna movement is disabled by lowering either of these bars to gain access to the platform or the inside of the pedestal tube.

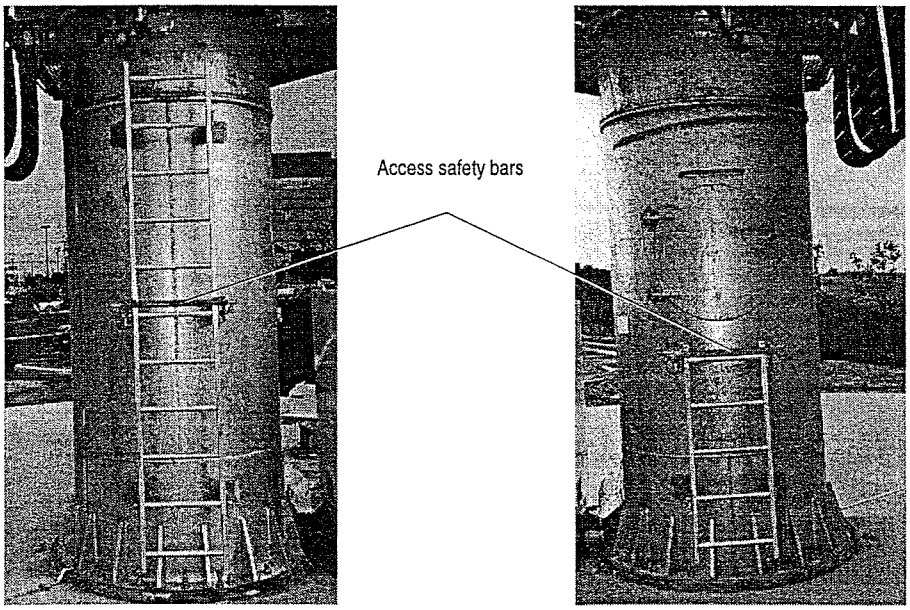

Figure 164 – Ladders and safety bars

5.1.4.2 – Emergency stop buttons

The antenna has two emergency stop buttons, located (Figure 165) :

- on the electrical cabinet on the right of the platform relative to the antenna axis,
- on the righthand side panel of the outdoor rack.

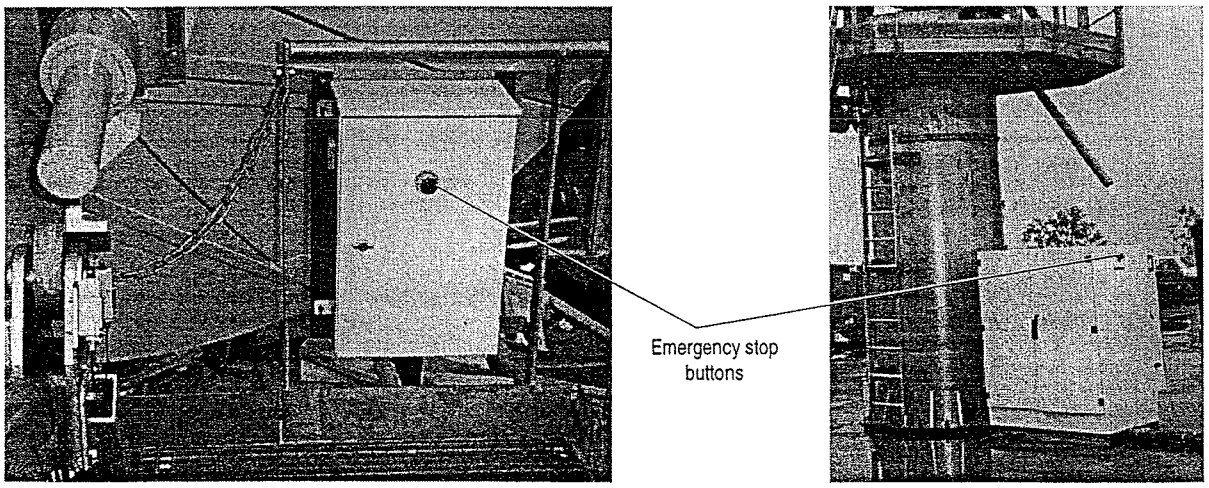

Figure 165 – Locations of emergency stop buttons

5.2 – Preventive maintenance

5.2.1 – Antenna

PERIODICITY	OPERATION	SPECIFIC TOOLS	QUALIFIED STAFF
Every 6 months	Visual checkings : • level of grease in tank of motor pump • lightning azimuth shunt brush contacts • cross-elevation and elevation jumper cables • screw-jacks gussets • corrosion points • bearings races		
	Cleaning : • excess of grease on the crown-wheel and pinions, if necessary • air filter on access panel of the hub		
	Filling : • grease tank of motor-pump		
	Changing : • drop-feed cartridges of screw-jacks • radome		
	Checking : • de-icing • encoder settings		
After the first 150 hours and every 10 years	Changing : • azimuth and elevation reducers oil		

5.2.1.1 – Checking the de–icing system

- the de–icing circuit on each panel is fuse–protected, and the system should be started up one fuse at a time.
- press the de–icer start button and hold it down to check that current is passing using an ammeter clip.
- repeat this operation for each panel and for the feed.
- check that sensors are working using a freezer spray.

5.2.1.2 – Encoder settings

- carry out the operations described in sections 3.5.

5.2.2 – Hub equipment

PERIODICITY	OPERATION	SPECIFIC TOOLS	QUALIFIED STAFF
Every 6 months	Visual checkings : • cables • corrosion points		

5.2.3 – Outdoor cabinet

5.2.3.1 – Regeneration of the drying cartridge of the pressure maintaining device

When the colour of the droplets of the humidity indicator changes from blue to pink, the drying cartridge must be regenerated as follows (for the service life of the drying cartridge, refer to the curve in the paragraph 2.5.18.5).

The regeneration operations are as follows :

- remove the cartridge by loosening the 2 fastening screws,
- uncouple the pneumatic links by pulling on the pneumatic couplings,
- heat the cartridge at 200° C for approximately 5 hours on a heating plate or any other heating means (the humidity indicator must be facing upwards).

To improve the heat distribution, an aluminium or copper plate (thickness : 12 mm min.) must be inserted between the heating plate and the drying cartridge (see figure 166).

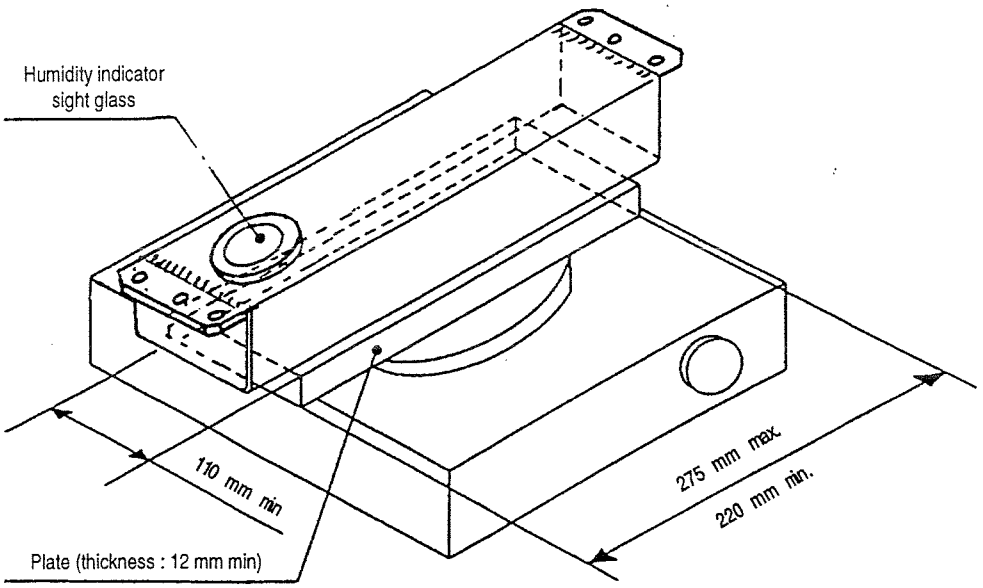

Figure 166 – Drying cartridge regeneration

CONTACT BETWEEN THE SIGHT GLASS AND THE HEATING PLATE IS FORBIDDEN
Do not overheat the drying cartridge (Maximal temperature : 250° C)

5.2.3.2 – Air conditioning

????

5.2.4 – Indoor cabinet equipment

TBD

5.3 – Corrective maintenance

5.3.1 – Troubleshooting

If the antenna malfunctions, carry out the following operations:

- (1) : check that the customer's power distribution unit circuit breakers are set to "On" and check for 220 V and 380 V voltages on all phases
- (2) : check that all circuit breakers in the outdoor rack are set to "On"
- (3) : check that the access safety bars on the antenna's ladders are set to the up position
- (4) : on all three axes, check that the antenna has not overshot the electrical limit switches. If so, use the base control unit to return it to the normal operating position
- (5) : check that all ACP circuit breakers are set to "On" (ACP front and rear panels)
- (6) : press the ACK button on the ACP
- (7) : reset the ACU using the "On/Off" button, powering down, then up again
- (8) : press the ACK button on the ACP
- (9) : check that the variable speed drive unit fans are operating. Otherwise, replace ACP fuse FU01 (4 amps). To do this, open the rear righthand door of the outdoor rack (but not for too long if the temperature is low, since the rack will then automatically power down) and go back to operation (7)
- (10) : check that a voltage (24 to 27 V) is present across terminals 9 and 10 of terminal block TB02 on the interface board (see section 2.5.13.3 page 142). If there is no voltage, replace the small fuse (1 amp) near TBANT20, behind the ACP, and go back to operation (7)
- (11) : connect the portable PC to the GTS port of the ACU, inserting an RS232/RS422 converter into the line, and check that there is no alarm. If there is, use the alarm readout to identify the defective subassembly.
- (12) : set the antenna to "position" mode and send a positioning command. If the command is executed normally, return to "Safe" mode, disconnect the PC from the GTS port and reconnect the link with the CER ????. If the antenna is not positioned correctly, contact the Alcatel Telspace MUST Department.

5.3.2 – Operations on the antenna

All motors are fitted with brakes. Since the jacks are reversible, the antenna brake does not operate when the elevation or cross–elevation motor is dismantled. When replacing the EL or XEL motor, **it is essential to secure the antenna** so that it does not start moving under its own weight or when blown by the wind. Appropriate procedures are described below.

5.3.2.1 – Replacing an azimuth motor

- set the antenna to the zenith position and switch the ACU out of service.
- cut off the power supply to the motor to be replaced.
- mark and disconnect the motor's power supply and brake cables.
- unscrew the four bolt/washer/nut assemblies holding the motor in position.
- remove the motor, but keep the flexible coupling.
- fit the new motor by reversing the above procedure, and inserting the flexible coupling between the motor and reducer shafts.
- reconnect the power supply and brake cables.
- switch on the motor.
- check that it operates correctly by rotating the antenna in azimuth using the base control unit.
- return the antenna to service.

5.3.2.2 – Replacing the elevation motor

- switch the ACU out of service.
- angle the reflector so that the jack replacement tool can be placed in position to secure the antenna when the brake (built into the motor) is removed. If there is no special tool, secure the reflector with a guy wire.
- cut off the elevation motor power supply.
- mark and disconnect the motor power supply and brake cables.
- separate the motor from the reducer, keeping the flexible coupling.
- fit the new motor by reversing the above procedure, inserting the flexible coupling between the motor and reducer shafts.
- reconnect the power supply and brake cables.
- switch on the motor.
- remove the jack replacement tool or wedge.
- check elevation displacement using the base control unit.
- return the antenna to service.

5.3.2.3 – Replacing the cross–elevation motor

- switch the ACU out of service.
- set the reflector to the zenith position.
- wedge the reflector in the cross–elevation axial position using a square wooden block inserted between the cross–elevation frame and the reflector, immobilizing the assembly with two guy wires.
- cut off the cross–elevation motor power supply.
- mark and disconnect the motor power supply and brake cables.
- separate the motor from the reducer, keeping the flexible coupling.
- fit the new motor by reversing the above procedure, and inserting the flexible coupling between the motor and reducer shafts.
- reconnect the power supply and brake cables.

- switch on the motor.
- remove the guy wires and wooden block.
- verify cross–elevation displacement using the base control unit.
- return the antenna to service.

5.3.2.4 – Replacing the elevation jack

- remove the motor as described in section 5.3.2.2.
- sling the jack, then dismantle it by reversing the assembly procedure described in section 3.2.8.
- fit the new jack, then the motor, and the cables.

5.3.2.5 – Replacing the cross–elevation jack

- remove the motor as described in section 5.3.2.3.
- sling the jack, then remove it.
- fit the new jack, then the motor, and the cables.

5.3.3 – Electronic equipment

5.3.3.1 – List of alarms

The following tables give, for each alarm :

- alarm appearance condition,
- automatic action performed by RFT (RF Terminal),
- operation to clear alarm,
- effect of alarm on traffic operation,
- effect of alarm on performances degradation,
- needs of staff on antenna site,
- alarm origin,
- actions to perform in GTS.

HUB THERMAL CONTACT ALARM	
ALARM DETECTION	ACU raises alarm if, one hour after ACU power-up, the thermal contact indicating that equipment at the hub has been powered-up (i.e. temperature at the hub is under 5° C) is still open
AUTOMATIC RFT ACTION	None
ALARM INDICATION CLEARED	ACU must reset
CONTINUED ANTENNA OPERATION	No. When alarm condition is present, hub equipment is not powered-up
PERFORMANCE DEGRADATIONS	Not applicable
OPERATOR ACTION REQUIRED AT ANTENNA	Yes

FAULT ISOLATION	Failure of hub heater
GTS ACTIONS	

COMBINER HIGH TEMPERATURE ALARM	
ALARM DETECTION	Thermal contact in combiner opens dry loop connected to ACU when temperature in combiner exceeds high threshold. This alarm can arise only when the SSPA output switch is connected to the dummy load and output is at maximum level
AUTOMATIC RFT ACTION	The ACU disables all SSPA modules of the chain
ALARM INDICATION CLEARED	When temperature falls below threshold (since ACU disables all SSPA modules of the corresponding transmit chain, temperature does fall below threshold and alarm eventually disappears)
CONTINUED ANTENNA OPERATION	Yes
PERFORMANCE DEGRADATIONS	Combiner is operating outside specified temperature range. Only one polarization transmit chain is affected
OPERATOR ACTION REQUIRED AT ANTENNA	Yes
FAULT ISOLATION	Manufacturing problem on dummy load
GTS ACTIONS	

OUTPUT SWITCH POSITION ALARM	
ALARM DETECTION	SSPA output switch returns its present position to ACU, coded on 2 dry loops. Alarm is raised by ACU if switch returns incoherent position.
AUTOMATIC RFT ACTION	ACU disables all the SSPA modules of the polarization chain.
ALARM INDICATION CLEARED	Not applicable
CONTINUED ANTENNA OPERATION	Yes
PERFORMANCE DEGRADATIONS	Only one polarization transmit chain is affected
OPERATOR ACTION REQUIRED AT ANTENNA	Yes
FAULT ISOLATION	Switch has failed
GTS ACTIONS	