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2.5.9 – Rack cooling control unit

The rack cooling control unit is located at the back of the outdoor rack, behind the ACP. It is mounted on hinges to enable access to the back side of the ACP

2.5.9.1 – Operation

The rack cooling control unit (see block diagram of figures 54 and 55) is made of :

- a power circuit (Figures 56 to 58).
- a control circuit (Figures 59 to 61).

Components layout of this unit is given on figure 63.

2.5.9.2 – User interface

See diagrams.

2.5.9.3 – Configuration

Not applicable.

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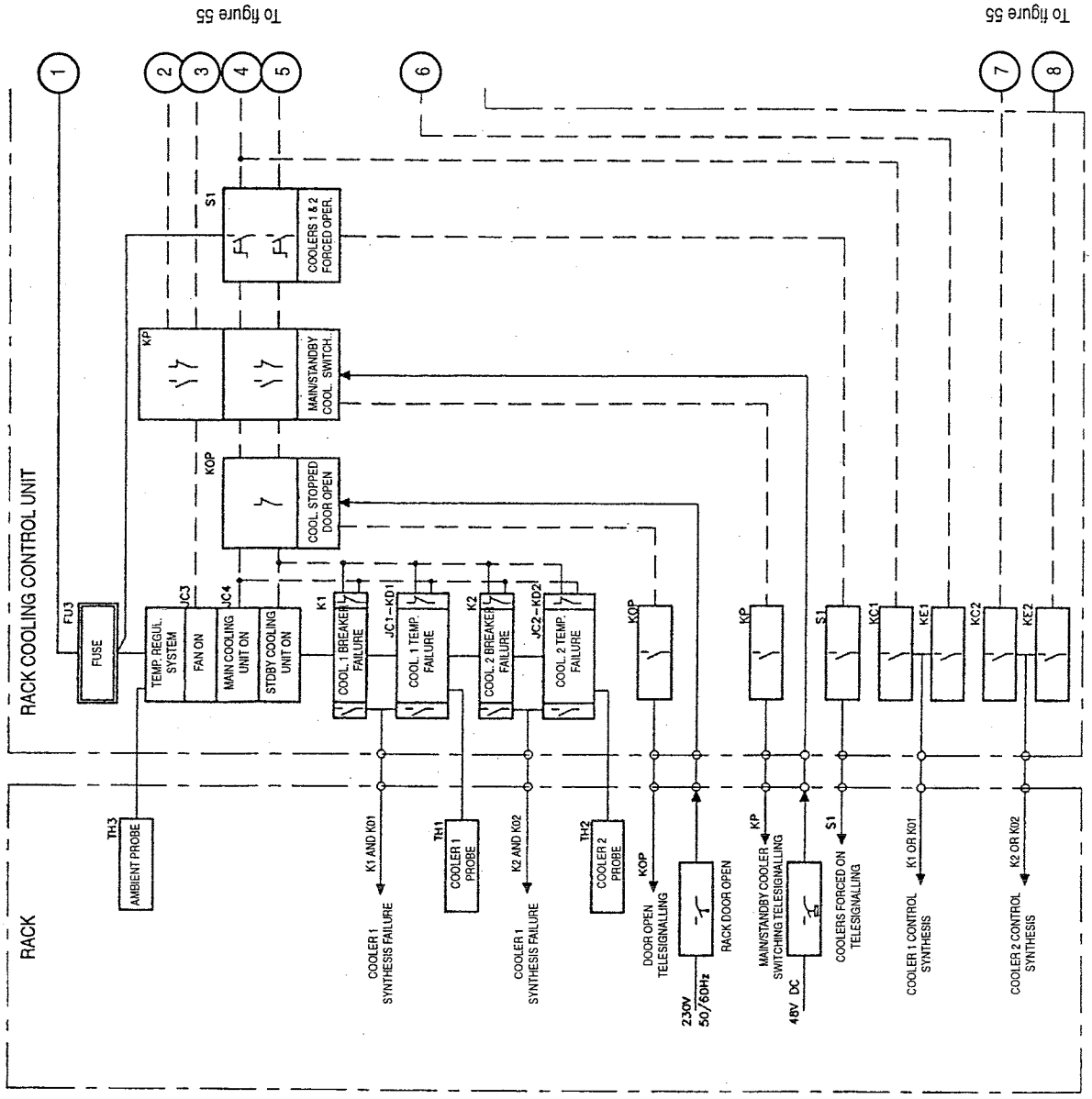

Figure 54 – Rack cooling block-diagram (1)

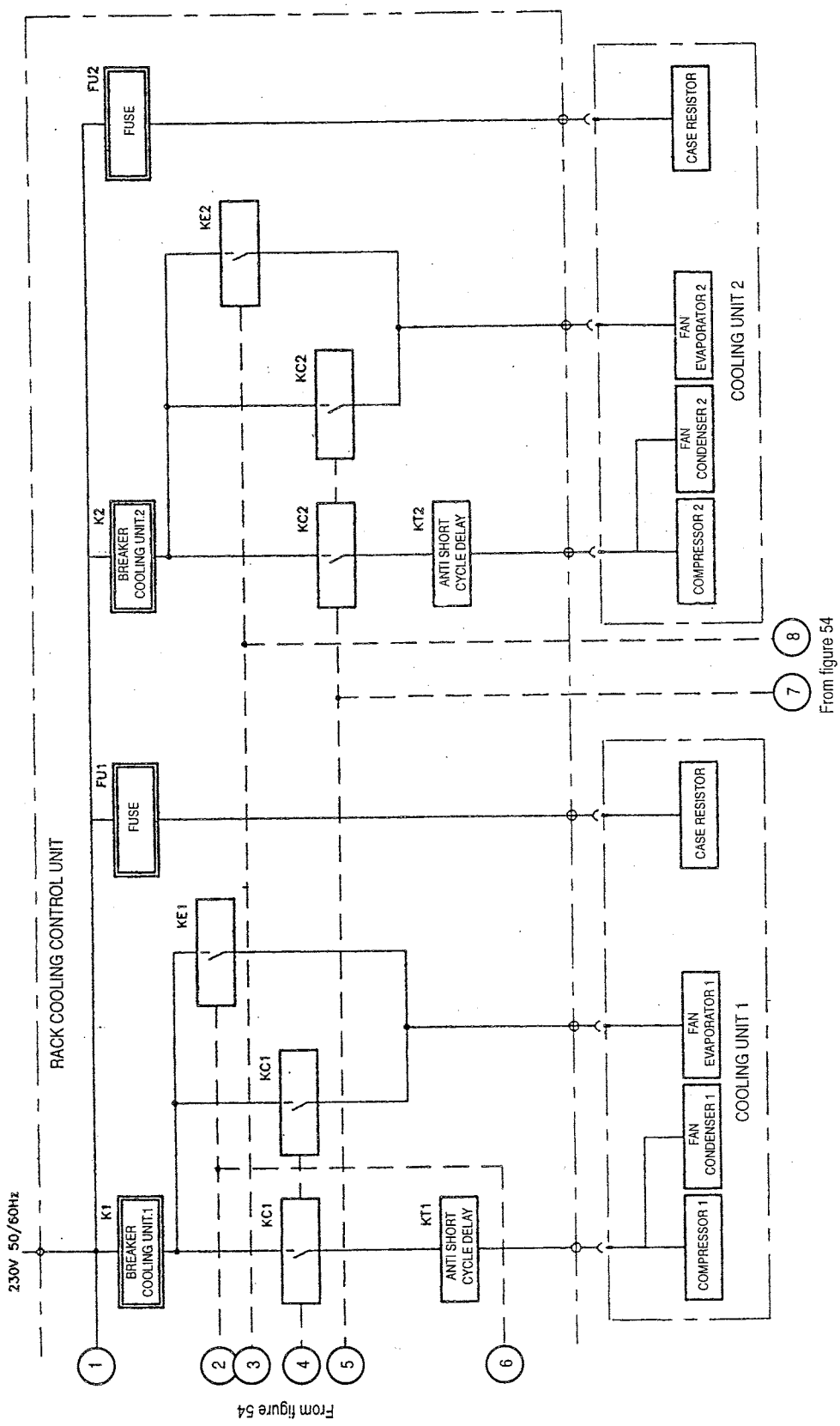

Figure 55 – Rack cooling block-diagram (2)

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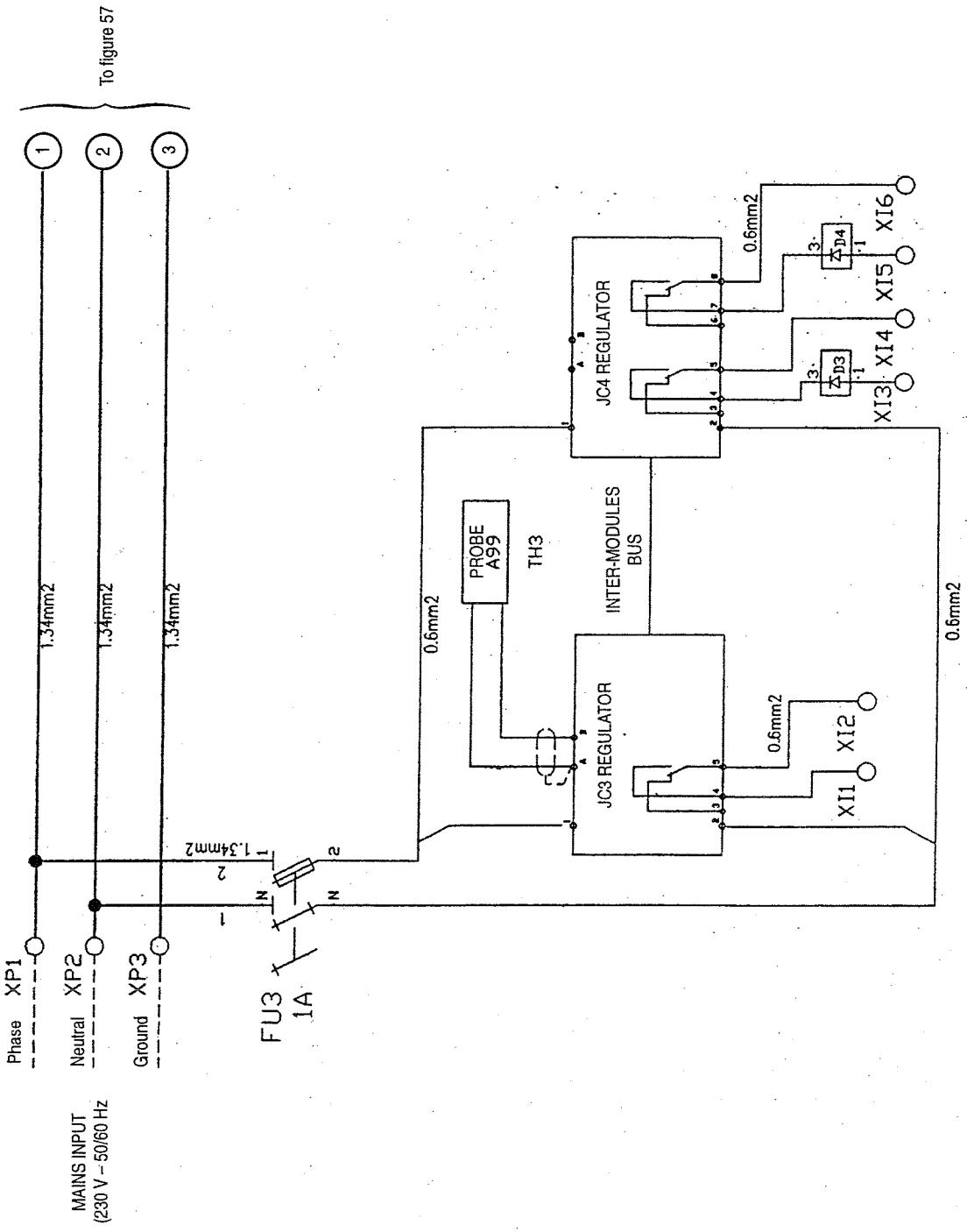

Figure 56 – Cooling control. Power circuits schematic diagram (1)

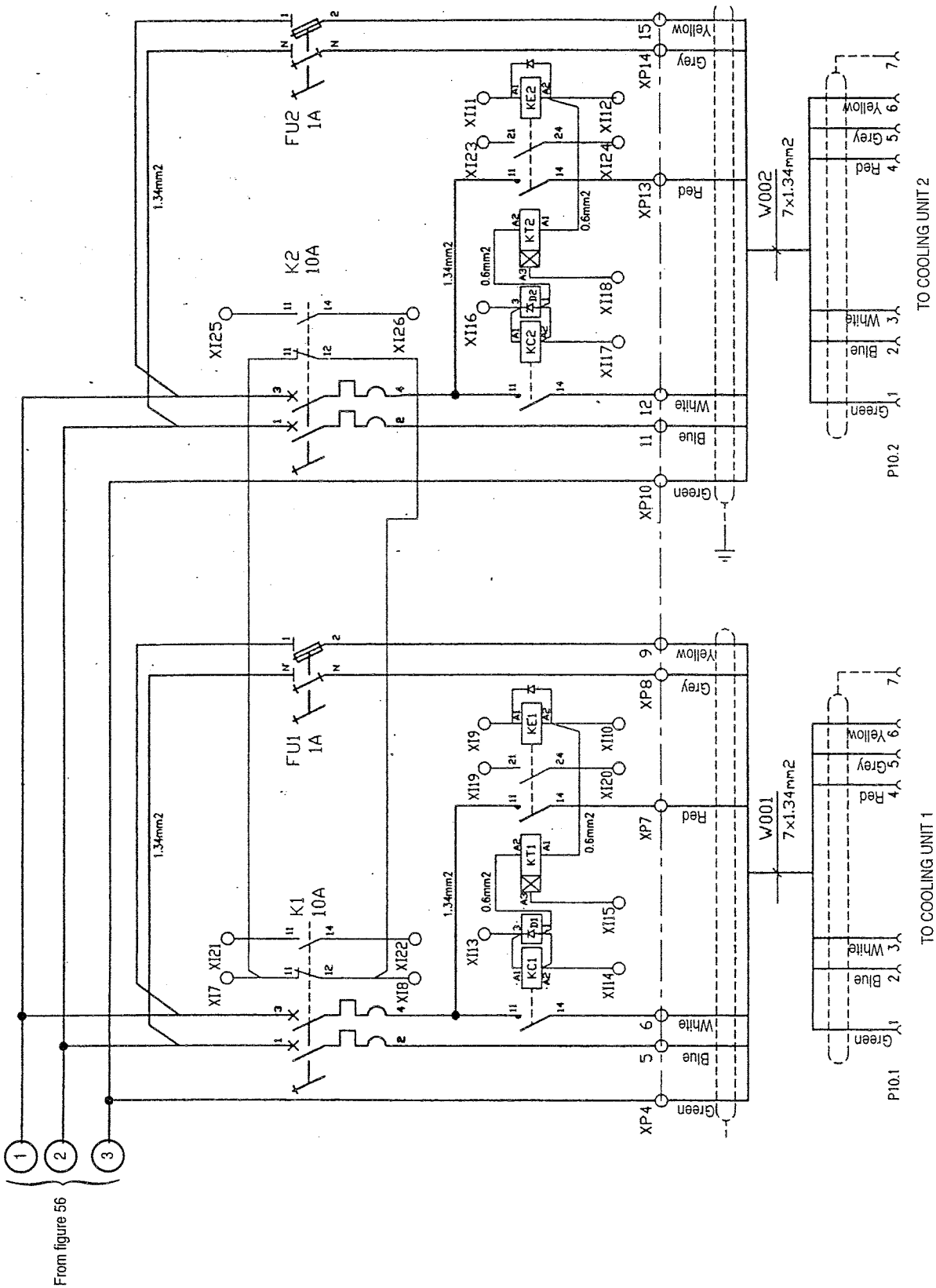

Figure 57 – Cooling control. Power circuits schematic diagram (2)

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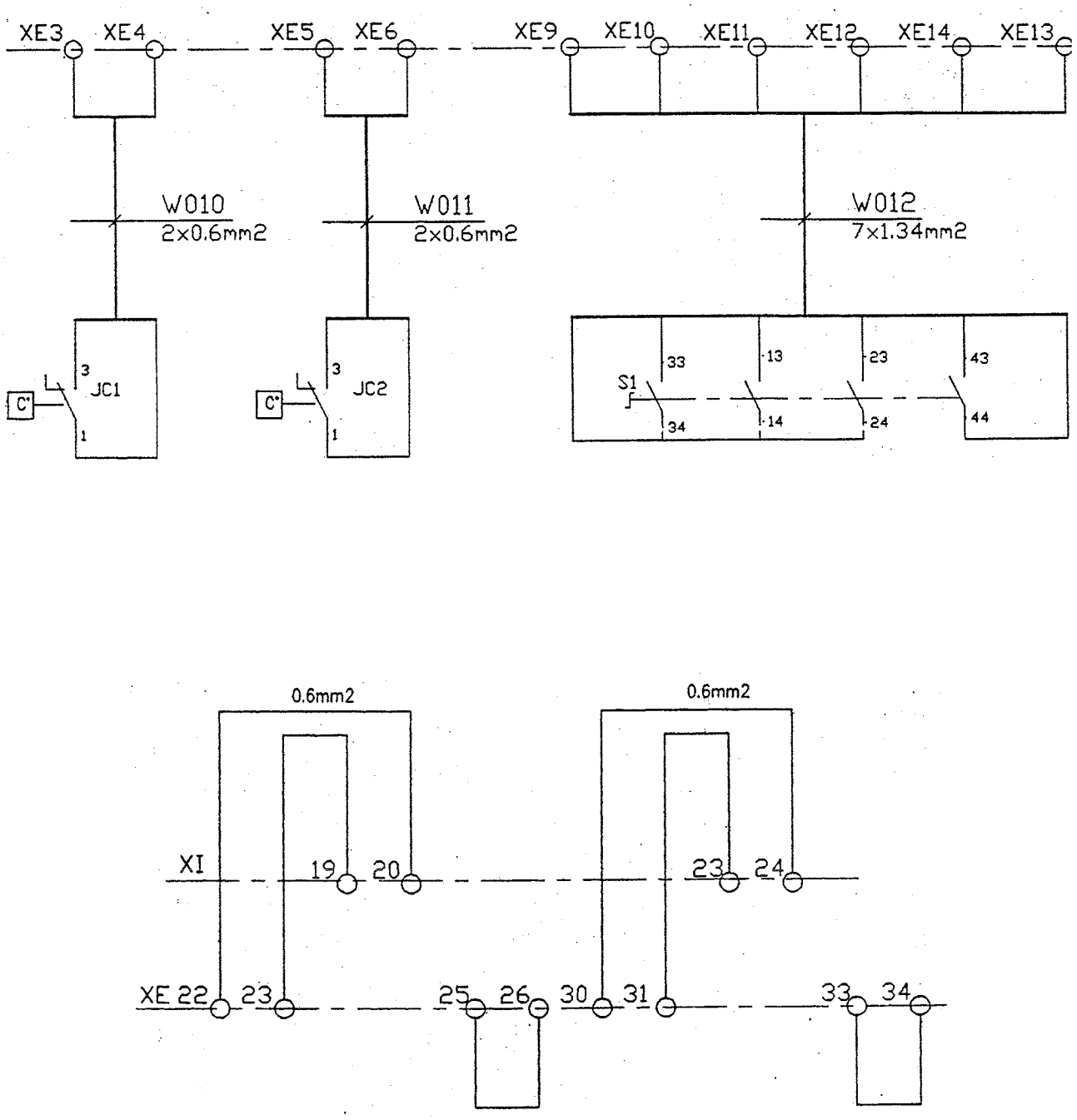

Figure 58 – Cooling control. Power circuits schematic diagram (3)

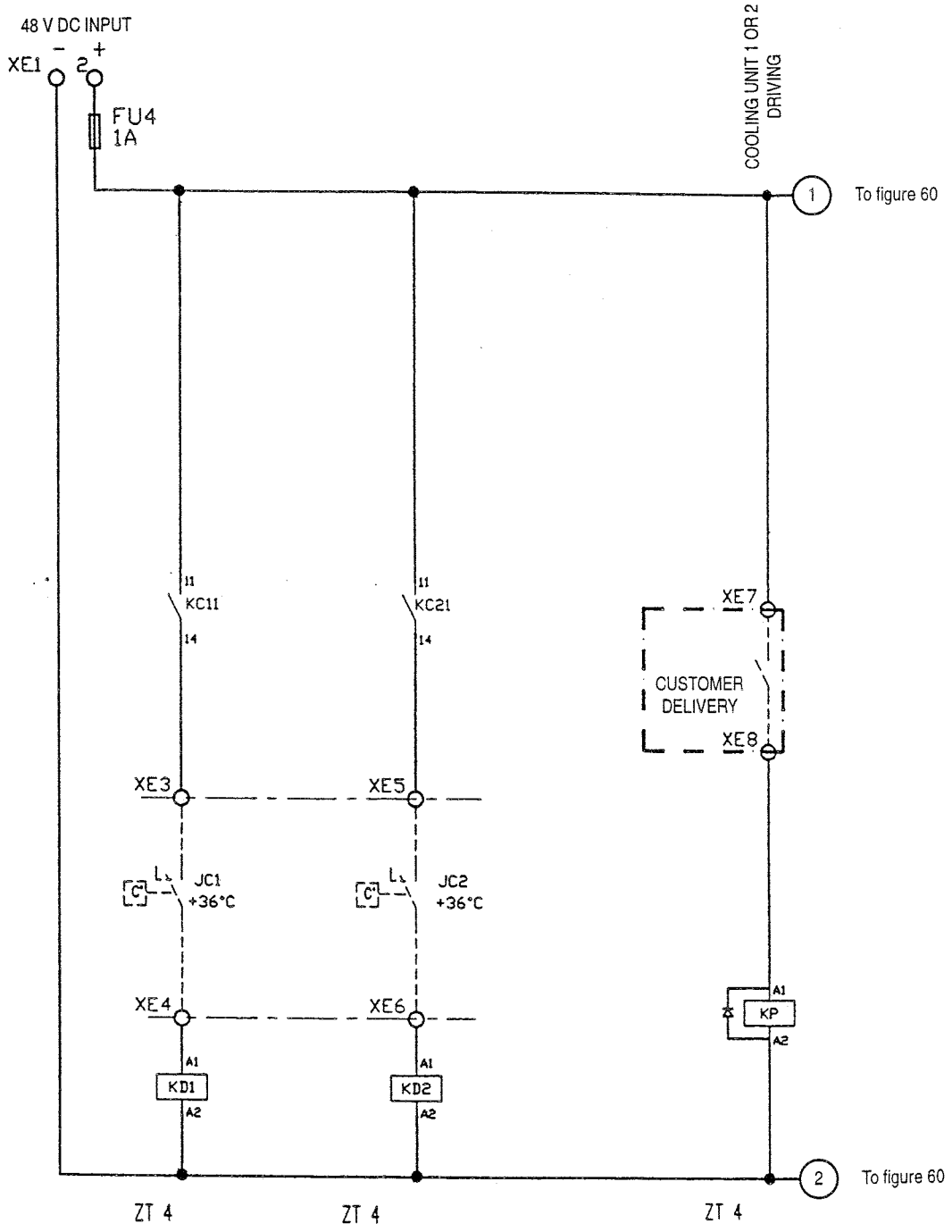

Figure 59 – Cooling control. Control circuits schematic diagram (1)

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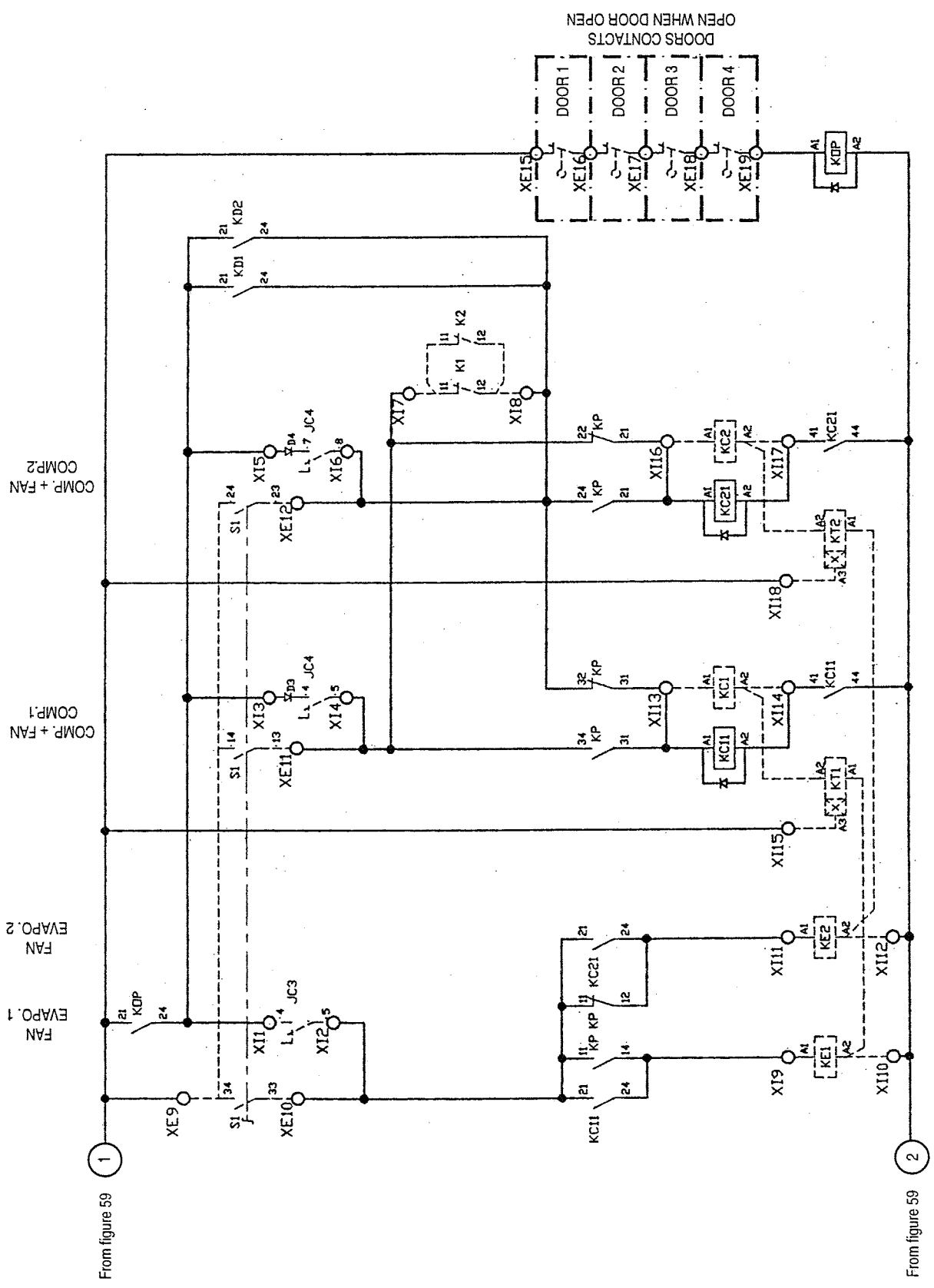

Figure 60 – Cooling control. Control circuits schematic diagram (2)

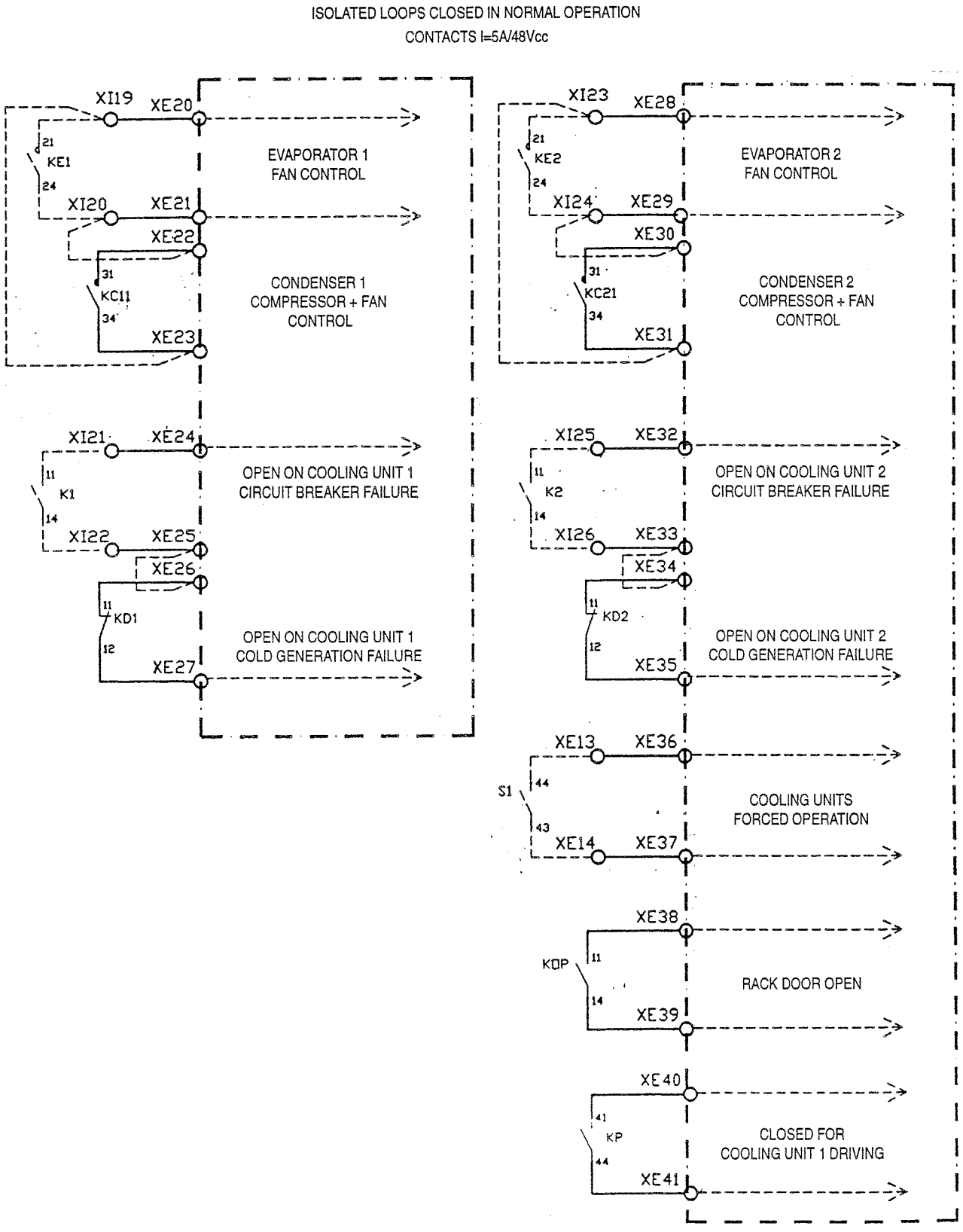

Figure 61 – Cooling control. Control circuits schematic diagram (6)

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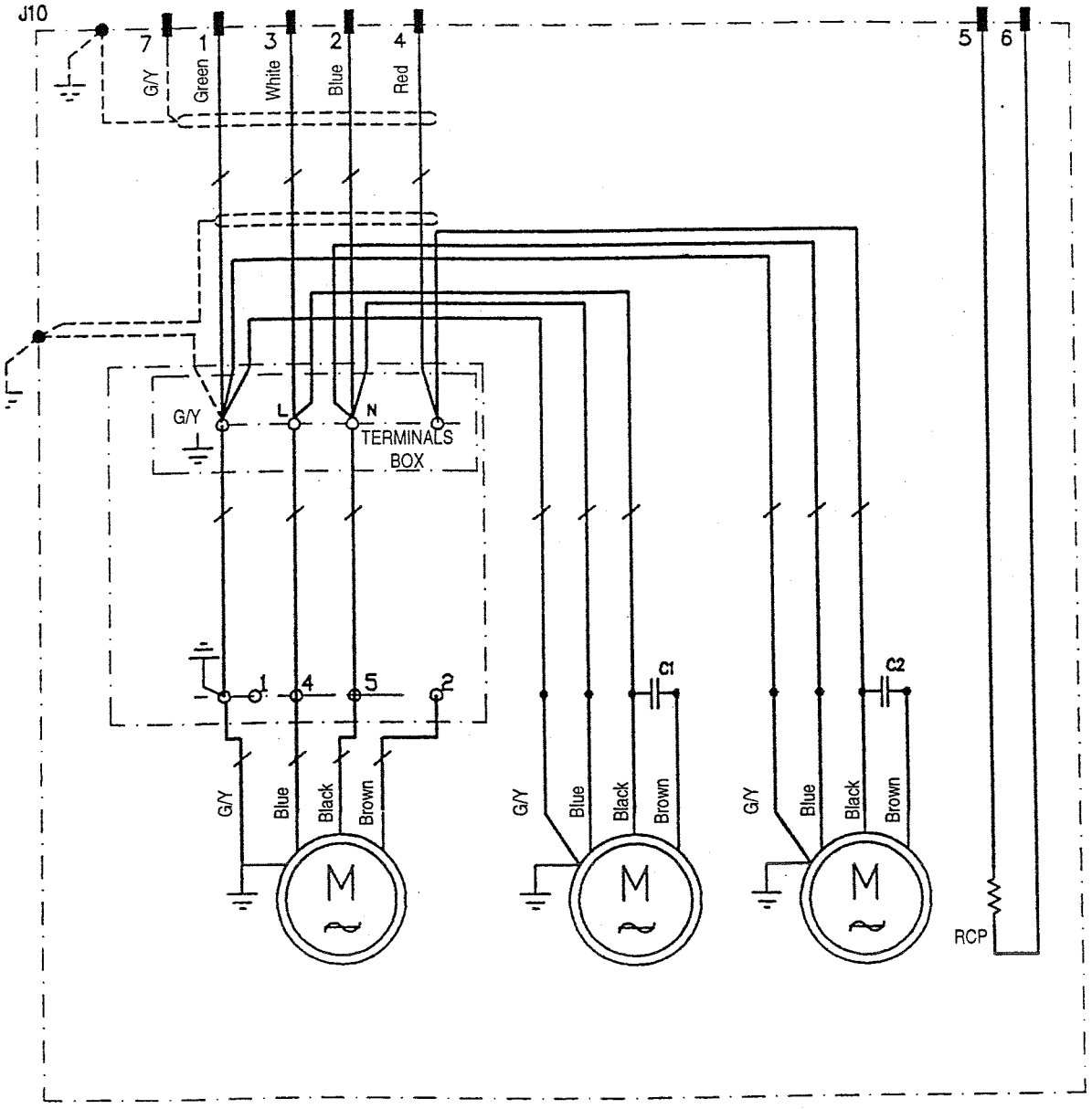

Figure 62 – Cooling unit – Schematic diagram

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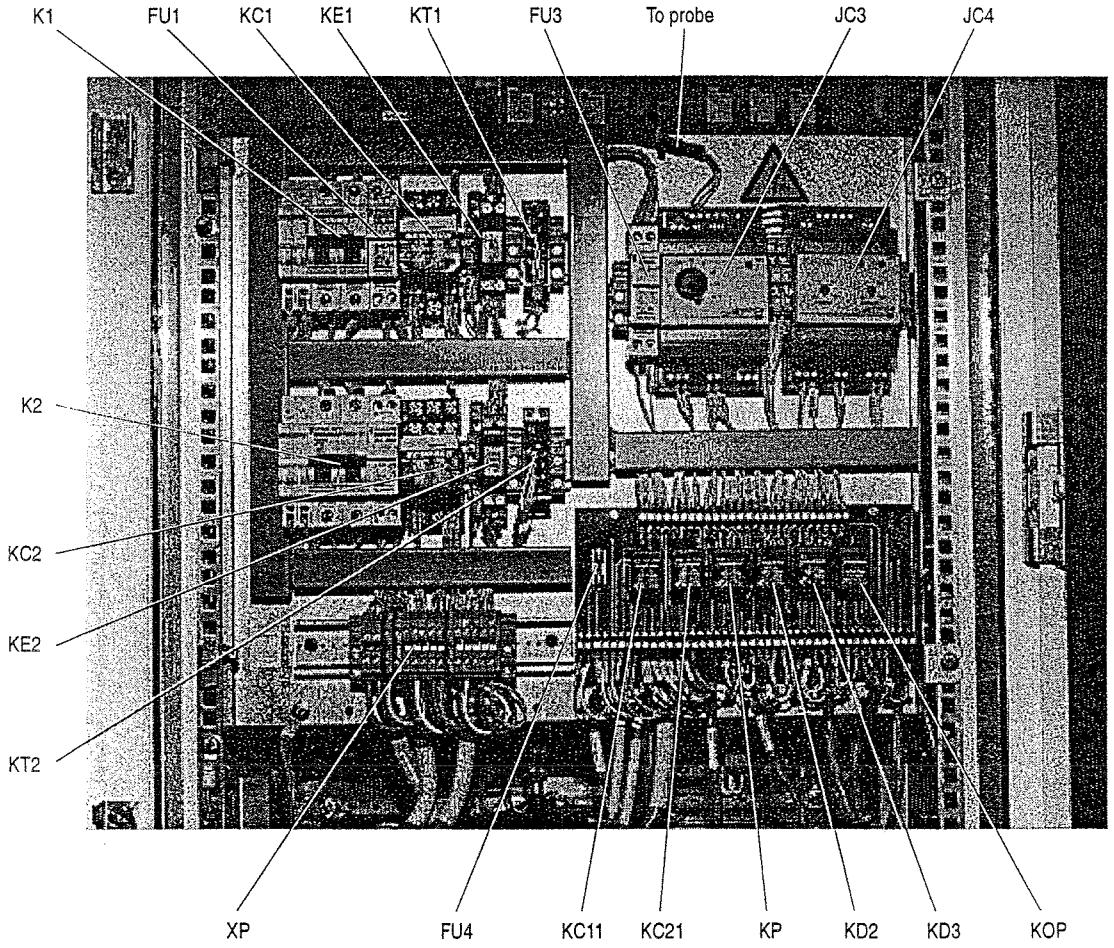

Figure 63 – Cooling control (Components layout)

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2.5.10 – AC300 Antenna Control Unit (ACU)

The AC300 Antenna Control Unit is made up by a 3U high subrack. It controls the position of a 3 axes antenna, and achieves the monitoring and control of the RF equipment.

The ACU operates in connection with:

- 1 Motor Controller (ACP), type ACP4M), for driving and monitoring the motors,
- 3 position encoders (AZ, EL and XEL) of optical and absolute type,
- all the RF equipment,
- all the safety switches,
- lubrication system for AZ axis,
- air coolers of the outdoor cabinet.

The ACU is normally remotely monitored and controlled from the GTS. A "Local PC", with "GTS replacement" software is supplied. This "Local PC" can replace the GTS for local maintenance operations.

2.5.10.1 – Operation

The ACU is based upon 2 microprocessors communicating via a double port memory.

- Microprocessor 68332 at 20MHz (8kbytes E2PROM, 1Mbytes EPROM, 256kbytes RAM),
- Microprocessor 68030 plus Math Coprocessor 68332 at 32MHz (1M bytes RAM, 2M bytes EPROM),
- 64 Digital inputs (24 volts),
- 24 Relay outputs,
- 3 analog outputs : –10V to +10V,
- 3 analog inputs : –10V to +10V,
- 14–20mA input,
- 3 RS232 serial ports (expandable to 5),
- 2 RS422 serial ports,
- 0.5Hz input (Even pulse),
- 3 Optical encoders inputs.

The block-diagram of the ACU is given by the figure 64.

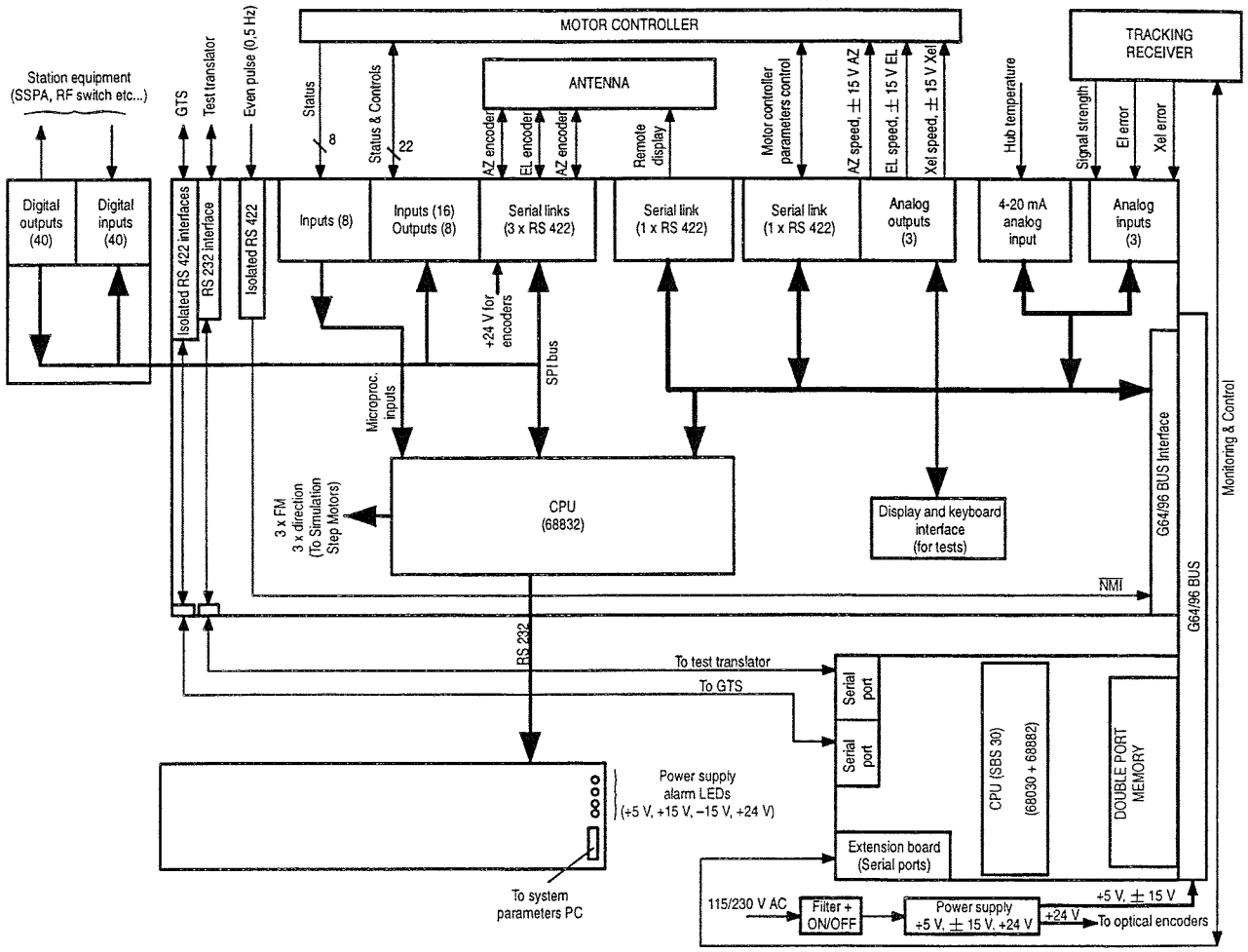

Figure 64 – Schéma synoptique de l'ACU

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ANTENNA OPERATION MODES

The ACU is controlling the antenna in five modes:

- SAFE:
  The 3 axes are stopped with brakes applied
- POSITION:
  The AZ and EL axes are controlled in position loop and their position can be modified from the GTS (or from the "Local PC". The XEL axis is in position loop at 0).
- STOW:
  The EL axis is driven to 90° and XEL axis is driven to 0°. Then the 3 axes are stopped with brakes applied.
- PROGRAMMED TRACK:
  The 3 axes operate in position loop. The ACU receives, from the GTS, a trajectory to be tracked with a time window defined by a start and stop time.
  Two types of trajectories are handled:
  - a non-zenithal trajectory (where maximum EL is lower than 70°), which does not need the use of the XEL axis (it is then fixed to 0°),

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- a zenithal trajectory (where maximum EL is higher than 70°), which needs the use of the XEL axis for reducing the constraints on the AZ axis.

– AUTO TRACK (available only in conjunction with an AutoTrack receiver):
AutoTrack starts like Programmed Track until Start Time.
Then, if no signal is received, the ACU drives the antenna around the trajectory, achieving a preprogrammed search pattern, until the autotrack receiver is locked and a sufficient signal level is received.
As soon as the signal is received, the ACU drives the AZ and EL axes in order to zero the errors fed by the Autotrack Receiver.
In case of loss of signal during this phase, the axes are driven by extrapolating their positions from history. This situation may last only 20 seconds after which the antenna reverts on the computed trajectory while searching for a signal around the trajectory.

RF SWITCHES OPERATION

The control of the RF switches is related to the antenna mode of operation and to the position of the EL axis.

In any antenna mode, if the EL axis is below a minimum position downloaded from the GTS (ELmini = f(AZ) is the masking table), the RF switch is forced to Dummy Load.

Beyond the EL mini position, the position of the RF switch is related to the configuration requested (downloaded from the GTS) and to the antenna mode as indicated below:

- Safe: always on Dummy Load,
- Position: matching to the configuration requested,
- Stow: always on Dummy Load,
- Programmed Track: matching to the configuration requested only between Start Time and Stop Time,
- AutoTrack: same as Programmed Track.

SSPA MONITORING AND CONTROL

The control of the SSPA is related to the configuration downloaded from the GTS and to error detection in RF equipment related to the SSPA (Up converter, RF switch, etc.).

The SSPA are enabled only through a configuration downloaded from the GTS.

The SSPA are disabled in different cases:

- disable command from the GTS,
- fault of the Up converter or RF switch of the same polarization,
- faulty SSPA, automatically disabled preventing from auto reenabling.

MONITORING AND CONTROL OF THE AZ LUBRICATION SYSTEM

The lubrication motor is turned On/Off periodically (period TBD).

MONITORING AND CONTROL OF THE AIR COOLING SYSTEM

The 2 Air Coolers are periodically enabled/disabled in order to ensure a normal temperature in the Outdoor Cabinet and to check each Air Cooler.

HUB TEMPERATURE MONITORING

The ACU monitors the Hub temperature and reports it to the GTS.

EQUIPMENT MONITORING

All the RF equipment as well as miscellaneous safety devices are monitored by the ACU and their status is reported to the GTS (Figure 65).

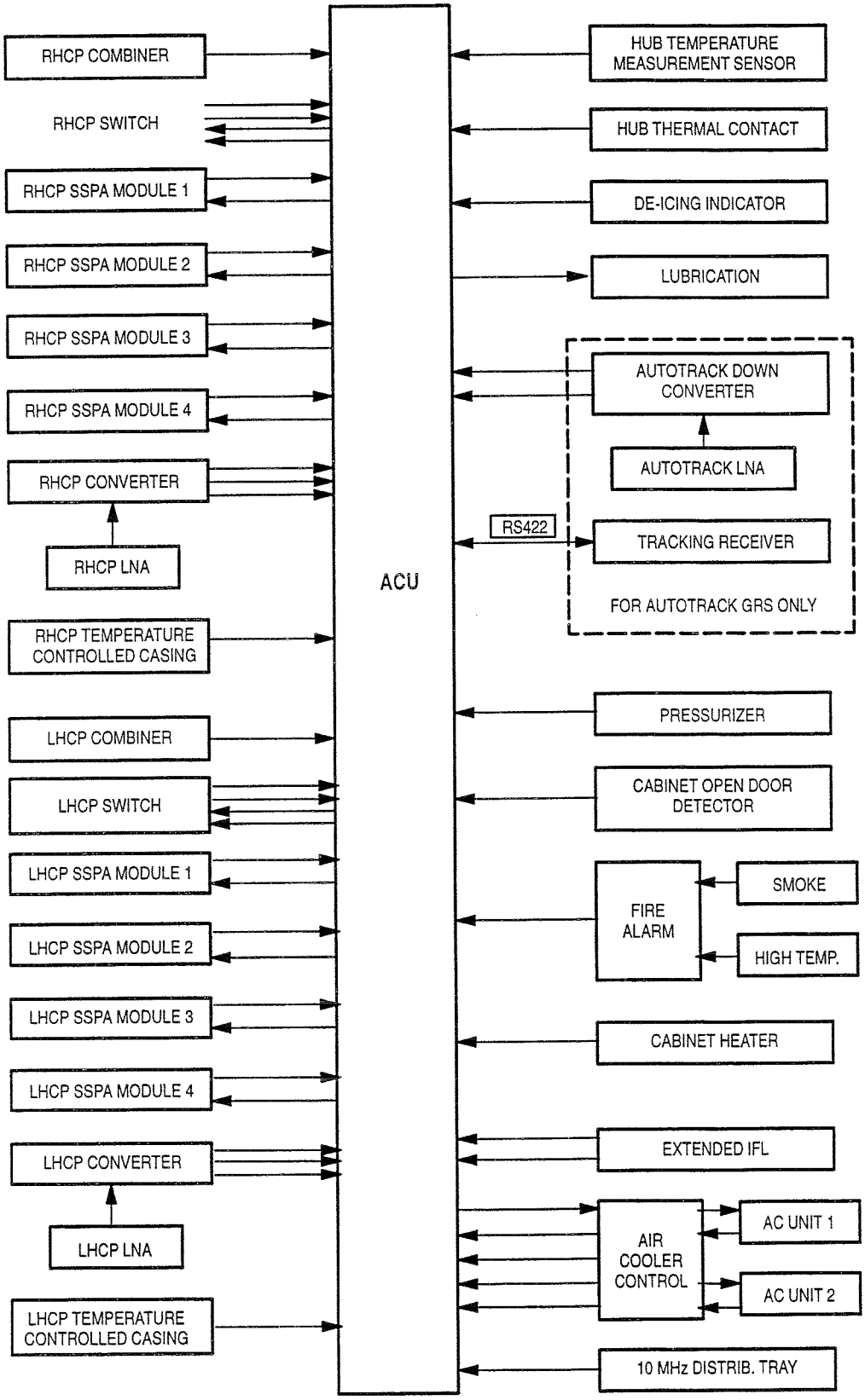

Figure 65 – Alarmes et commandes gérées par l'ACU

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MONITORING AND CONTROL OF THE MOTORS

The ACU drives the antenna through a Motor Controller named ACP4M.

The status of the Motor Controller is reported to the ACU then to the GTS.

The ACU turns the motors ON and OFF in accordance with the antenna mode; the velocity of each axis is supplied by the ACU.

Whenever the Motor Controller is in "local" mode (under control of an optional Remote Control Box), the ACU cannot drive the motors anymore.

DATE AND TIME HANDLING

The ACU builds Date and Time from 2 items:

- Time Setting command sent by the GTS,
- reception of an Even Pulse signal : 1 pulse every 2 seconds.

2.5.10.2 – User Interface

The ACU can only be controlled through a RS422 serial port called GTS.

In normal operation, this port is connected to the GTS.

In Maintenance operation, a PC, running a supplied specific software called Maintenance Software, (can replace the GTS).

The Maintenance Software has the features listed below:

- Block diagram of the station viewing : Antenna Position, global status of each subsystem,
- Display of the detailed status of all the subsystems upon operator request,
- Menus for sending commands: antenna mode, SSPA control, RF switch control, Exclusion map downloading, Time setting,
- In Programmed Track command, capacity for loading a trajectory from a file on disk,
- While in Programmed Track mode, real time storing of the actual trajectory (AZ, EL, XEL and AZ/EL/XEL position errors) in a disk file.

2.5.10.3 – Characteristics

ELECTRICAL

Main power	
• voltage	90 to 240 V AC
• frequency	47 to 440 Hz
• consumption	80 VA

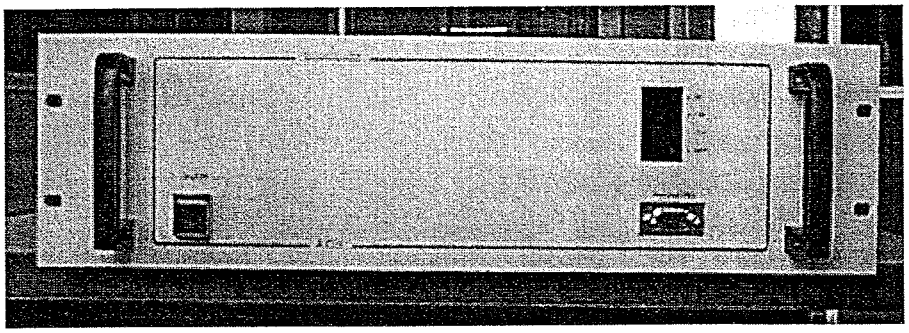
MECHANICAL

Dimensions	
• height	3U
• width	19 inches
• depth	600 mm
Weight	15 kg

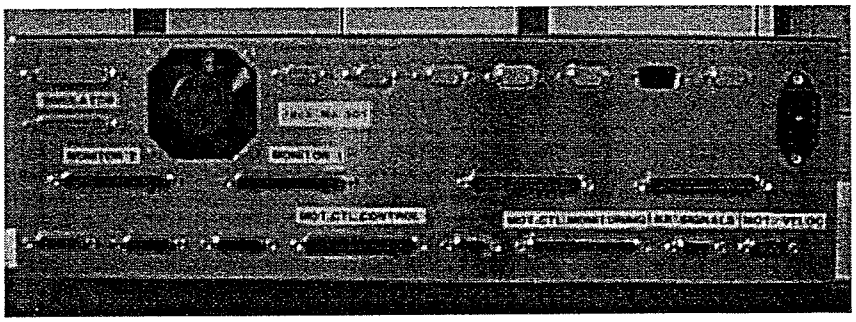
2.5.10.4 – Configuration

TBD

2.5.10.5 – Indicators, controls and ports



Front panel



Back panel

Figure 66 – Views of front and back panels of ACU

FRONT PANEL

NAME	ITEM	FUNCTION
ON/OFF	Switch	Power supply On/Off switch
+5 V	Green LED	+5 V DC present
+15 V	Green LED	+15 V DC present
–15 V	Green LED	–15 V DC present
–24 V	Green LED	–24 V DC present
PARAMETERS	9-pin male Sub–D connector	

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BACK PANEL

NAME	ITEM	FUNCTION
SIMULATOR	2 x 25-pin female Sub–D connectors	Links with antenna simulator
EVEN PULSES	9-pin female Sub–D connector	Even Seconds Timing Pulses coming from the Gateway building
TEST TRANSL.	9-pin female Sub–D connector	Not used
GTS	9-pin female Sub–D connector	RS422 bi–directional link with GTS
MOT. PARA	9-pin female Sub–D connector	
REM. DISPLAY	9-pin female Sub–D connector	
HUB TEMP.	9-pin female Sub–D connector	Analogue voltage representing hub temperature
MONITOR 1	37-pin female Sub–D connector	Monitoring informations received by ACU
MONITOR 2	37-pin female Sub–D connector	
CONTROL 1	37-pin male Sub–D connector	Controls sent by ACU
CONTROL 2	37-pin male Sub–D connector	
AZ POSIT.	15-pin female Sub–D connector	Link with azimuth coder
EL POSIT.	15-pin female Sub–D connector	Link with elevation coder
XEL POSIT.	15-pin female Sub–D connector	Link with cross-elevation coder
MOT. CTL. CONTROL	37-pin male Sub–D connector	Controls sent by ACU to antenna motors via ACP
RX MONITOR.	9-pin female Sub–D connector	
MOT. CTL. MONITORING	37-pin female Sub–D connector	Monitoring informations received by ACU from motors, brakes and limit switches
RX SIGNALS	9-pin female Sub–D connector	Signals received from tracking receiver (Auto-track option)
MOT.VELOC	9-pin male Sub–D connector	

TBD

2.5.10.6 – Connections

"AZ POSIT." CONNECTOR

See wiring book (Paragraph 1.3.4).

"EL POSIT." CONNECTOR

See wiring book (Paragraph 1.3.4).

"XEL POSIT." CONNECTOR

See wiring book (Paragraph 1.3.4).

"HUB TEMP." CONNECTOR

PIN	SIGNAL	STATUS
1		Analogue voltage representing hub temperature
2		
3 to 9	–	Spare

"EVEN PULSES" CONNECTOR

PIN	SIGNAL	STATUS
1	–	Spare
2	RX2 (–)	Even pulses (–)
3 to 7	–	Spare
8	RX2 (+)	Even pulses (+)
9	–	Spare

"GTS" CONNECTOR

PIN	SIGNAL	FUNCTION
1	RX1 (+)	Receiver input (+)
2	RX2 (–)	Receiver input (–)
3	GND	DC power return
4	TX2 (–)	Transmitter output (–)
5	TX1 (+)	Transmitter output (+)

"RX SIGNALS" CONNECTOR

PIN	SIGNAL	FUNCTION
1	–	Received beacon level
2	–	

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PIN	SIGNAL	FUNCTION
3	–	Tracking voltage (output X)
4	–	
5	–	Tracking voltage (output Y)
6	–	

"MOT. CTL. MONITORING" CONNECTOR

PIN	SIGNAL	STATUS
1	Speed controller ON	24 V = ON
2	24 V ON	24 V = ON
3	LOCAL	24 V = Motor controller in maintenance
4	AZ1 speed controller OK	24 V = OK
5	AZ2 speed controller OK	24 V = OK
6	AZ brake fault	24 V = OK
7	AZ brakes OFF	24 V = Brakes released
8	AZ CW limit	24 V = Limit NOT reached
9	AZ CCW prelimit	24 V = Limit NOT reached
10	AZ CW sector	24 V = Antenna AZ axis in CW zone
11	AZ CCW sector	24 V = Antenna AZ axis in CCW zone
12	EL speed controller OK	24 V = OK
13	EL brake fault	24 V = OK
14	EL brakes OFF	24 V = Brakes released
15	EL UP limit	24 V = Limit NOT reached
16	EL DOWN limit	24 V = Limit NOT reached
17	XEL speed controller OK	24 V = OK
18	XEL brake fault	24 V = OK
19	XEL brakes OFF	24 V = Brakes released
20	XEL right prelimit	24 V = Limit NOT reached
21	XEL left prelimit	24 V = Limit NOT reached

PIN	SIGNAL	STATUS
22	Not used	Not used
23	0 V of 24 V	0 V for inputs of pin numbers 1 to 7
24	0 V of 24 V	0 V for inputs of pin numbers 8 to 14
25	0 V of 24 V	0 V for inputs of pin numbers 15 to 22
26 to 37	Not used	Not used

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"MOT. CTL. CONTROL" CONNECTOR

PIN	SIGNAL	STATUS
1	Relay energized if 220 V Mains ON	Break contact of the relay
2		Make contact of the relay
3		Common contact of the relay
4	Relay energized if 220 V AUX ON	Break contact of the relay
5		Make contact of the relay
6		Common contact of the relay
7	Relay energized if AZ enabled	Break contact of the relay
8		Make contact of the relay
9		Common contact of the relay
10	Relay energized if EL enabled	Break contact of the relay
11		Make contact of the relay
12		Common contact of the relay
13	Relay energized if XEL enabled	Break contact of the relay
14		Make contact of the relay
15		Common contact of the relay
16	Relay energized if warming up in progress	Break contact of the relay
17		Make contact of the relay
18		Common contact of the relay

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PIN	SIGNAL	STATUS
19	Not used	Break contact of the relay
20		Make contact of the relay
21		Common contact of the relay
22	Not used	Break contact of the relay
23		Make contact of the relay
24		Common contact of the relay
25 to 37	Not used	Not used

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2.5.11 – ACP4M Antenna Control Power (ACP)

The ACP4M Motor controller is made up by a 15U high main chassis and a 3U high front panel. It achieves the interface between the ACU, type ACU300, and the motors/limit switches. It is equipped with 4 speed controllers for brushless motors driving 3 axes (AZ axis uses 2 motors in an antibacklash configuration).

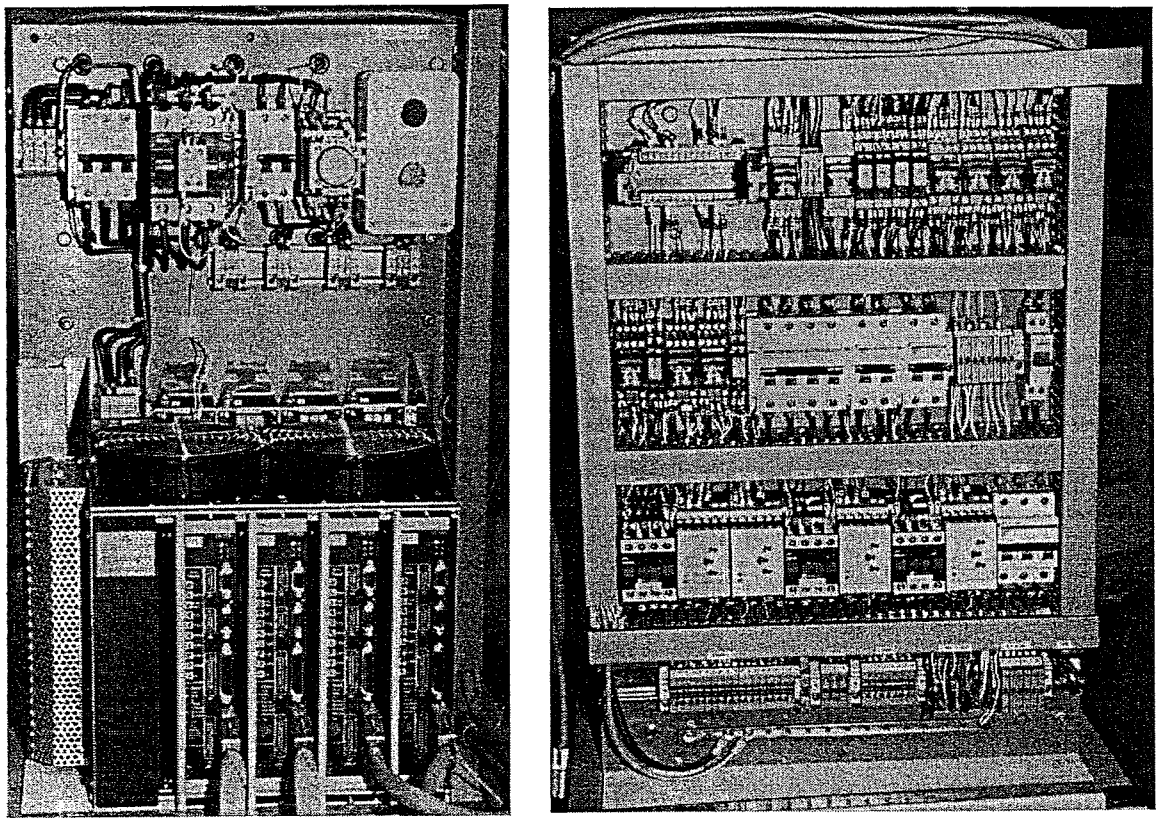

Figure 67 – Antenna Control Power assembly

2.5.11.1 – Operation

The Motor Controller ACP4M is normally monitored and controlled by the ACU but it can be controlled manually from a Remote Control Box; this control box may be used for maintenance operation.

GENERAL FEATURES

The Motor Controller is able to:

- turn each speed controller ON or OFF while releasing or applying the brake,
- control the velocity,
- handle the safety devices of the antenna:
  - limit switches,
  - emergency switch;
- handle its internal safety devices:
  - speed controllers fault status,
  - Circuit Breakers status,

- Brakes current monitoring.

Block-diagrams of the ACP are given in figures 69 (motors monitoring) et 70 (brakes monitoring).

VELOCITY CONTROL

The Motor Controller main purpose is to maintain the velocity of the axes through a velocity loop; the velocity to be maintained may come from the ACU or from the Remote Control Box.

The EL and XEL axes are equipped with a single motor which is controlled by a single Speed Controller.

The AZ axis is equipped with a couple of motors which are controlled each y a Speed Controller; the AZ axis is also equipped with an electronic board achieving the antibacklash configuration; this electronic board produces a torque bias between the two motors.

FRONT PANEL

The Motor Controller is equipped with a front panel (Figure 68) including:

- ACK : push-button for clearing a fault latched in a speed controller,
- Remote Control Box : socket for plugging the Remote Control Box in maintenance,
- 4 meters viewing the current/velocity of each of the 4 motors,
- 4 switches for selecting the display of current or velocity.

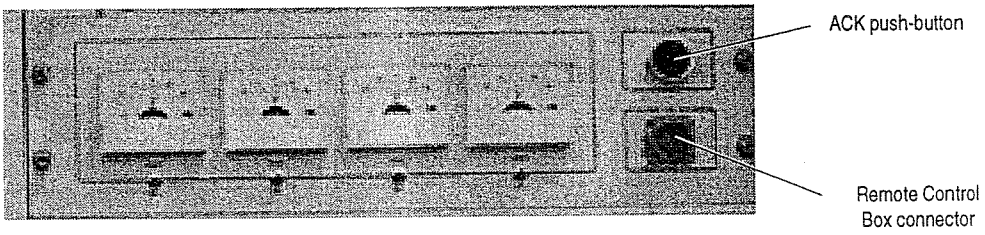

Figure 68 – AC4P front panel

INTERFACES

Interfaces with the ACU

The Motor Controller has cables terminated with connectors for being plugged in the sockets of the ACU rear panel.

- controls from the ACU (connector MOT.CTL. CONTROL)
  (Relay outputs for controlling the Powering On of the Motor Controller and of each axis)
- velocity command of the 3 axes from the ACU (connector MOT VELOCITY)
  (Analog signals)
- Datas to the Remote Control Box (connector REM.DISPLAY)
  (A serial port, transmitting antenna positions and motor controller status toward the display of the Remote Control Box)
- Status to the ACU (connector MOT.CTL. MONITORING)
  (Status of Speed controller, Breakers, Brakes, Limit switches)

Interfaces with the antenna safety devices

A terminal is located at the bottom of the rear side of the Motor Controller; here are connected all the safety switches of the antenna, as well as the AZ Zone indicators; additionally, this terminal feeds a 24V DC voltage to the other equipment status, also reported to the ACU.

Interface to the Motors

Power terminal: the 4 speed controllers are housed in a rack which features 4 terminals, one for each motor.

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Resolver connector: the resolver of each motor is directly plugged on the front panel of the relevant speed controller.

Temperature sensor: the temperature sensor of the motor is directly connected on the front panel of the relevant speed controller in the same connector as the resolver.

Interface to the Brakes

Each of the 4 Brakes is connected on a part of a specific terminal, TBRAKE.

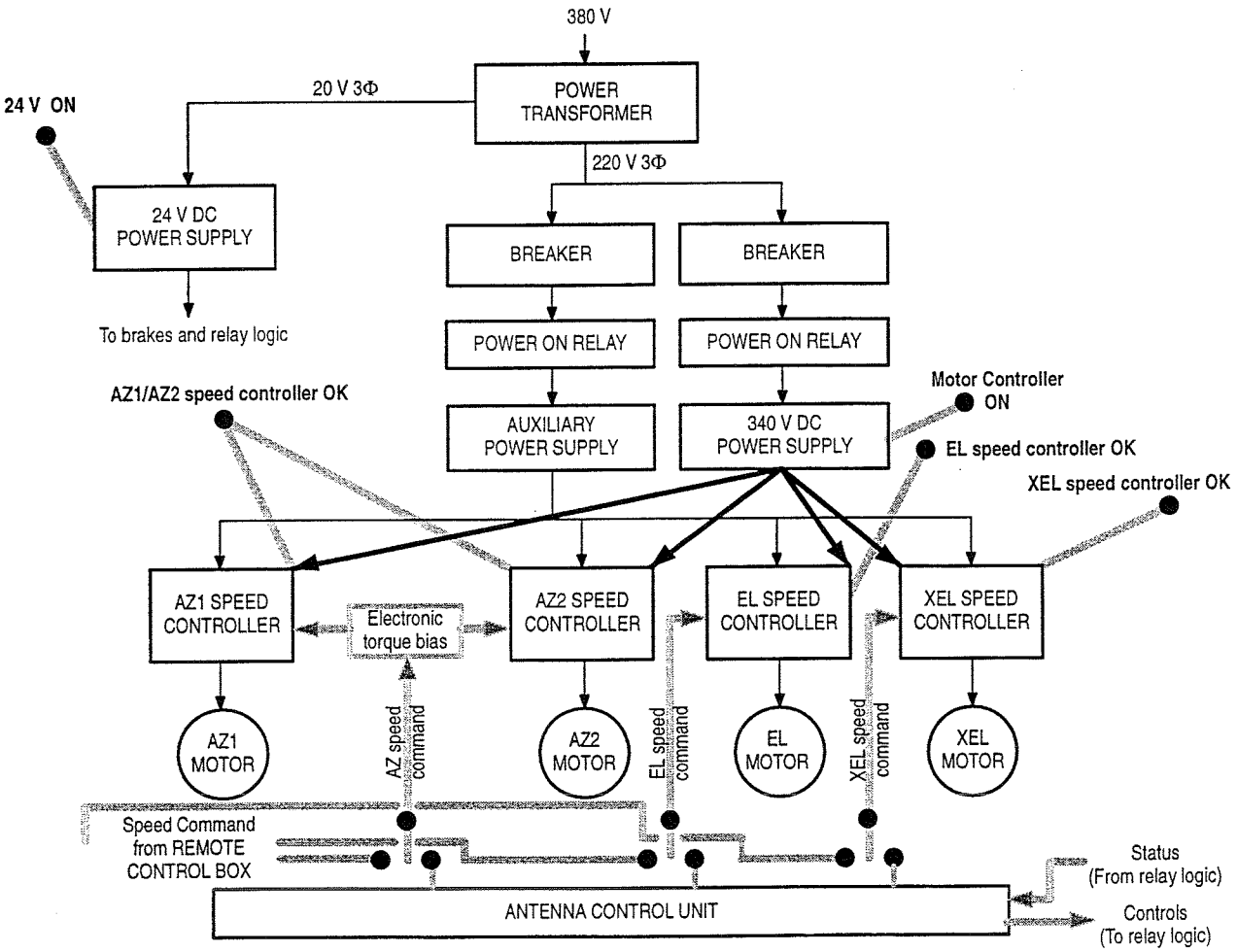

Figure 69 – ACP block diagram (1/2) – Motors controls

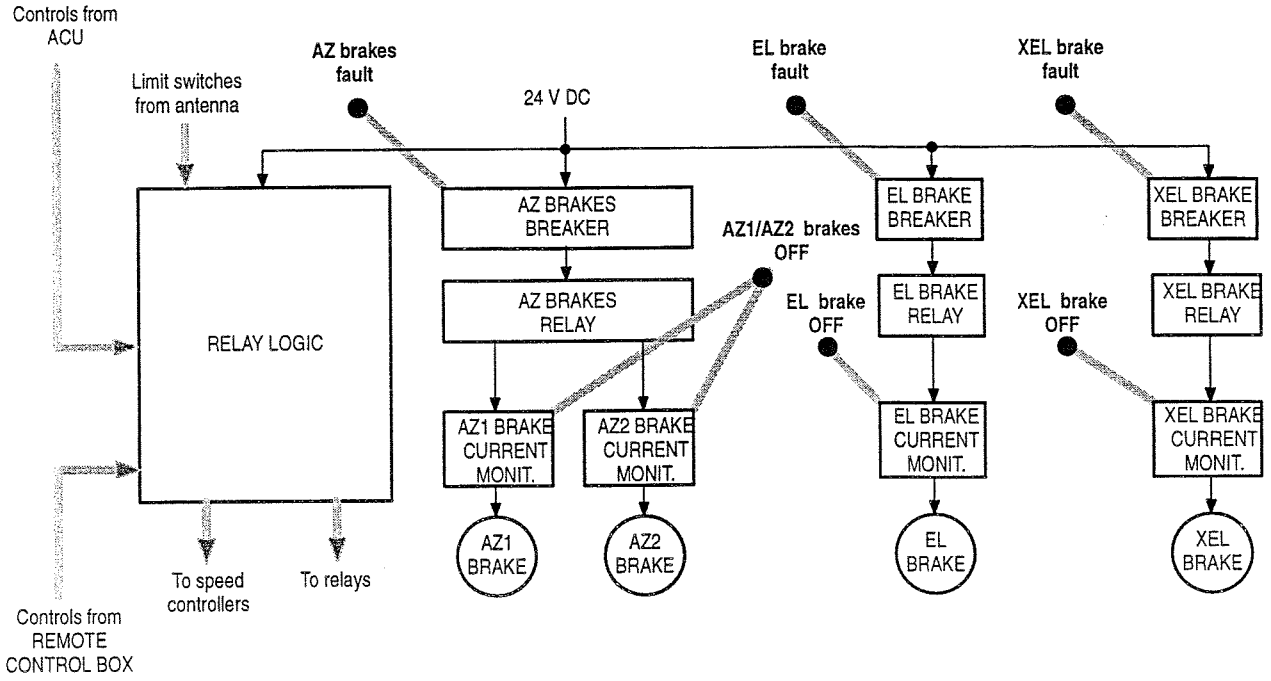

Figure 70 – ACP block diagram (2/2) – Brakes controls

2.5.11.2 – Safety Devices

SAFETY DEVICES OF THE ANTENNA

Limit Switches

Whenever an axis is driven to a limit switch, contact opens, the whole axis is disabled with brake applied.

For exiting the limit switch, use the Limit Override button of the Remote Control Box.

AZ Zone switches

When the AZ axis is in the CW Zone, the CCW limit switch is disabled.

When the AZ axis is in the CCW Zone, the CW limit switch is disabled

Emergency switch

The motor controller has one input for an emergency switch contact; opening this contact will cut the power (mains and 24V) of the whole Motor Controller.

MOTORS SAFETY HANDLING

The safety of each motor is handled by the relevant speed controller; the fault is displayed on the front panel of the speed controller with 4 LED (legend on the front panel).

The speed controller is monitoring:

- max current,
- RMS current,
- motor overtemperature,
- undervoltage, overvoltage,
- motor resolver fault.

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BRAKES SAFETY HANDLING

The safety of each brake is handled by:

- a breaker for each brake (except for AZ, one for the 2 brakes),
- a current monitoring reporting the status of each brake.

Whenever a brake is not released, the current flowing through the motor of the relevant axis is limited.

SUPPLIES SAFETY HANDLING

- breaker on the Main 220V 3-phase,
- breaker on the Auxiliary 220V 3-phase (feeding electronic control of the speed controllers),
- breaker on the 24VDC (derived from the 20V 3-phase input).

2.5.11.3 – Characteristics

ELECTRICAL

Supplies

Main power, for the motors	220 V 3-phase 50 Hz 8 kVA typical 12 kVA peak
Auxiliary power, for the relays	20 V 3-phase 160 VA max.

Voltage outputs

ACU monitoring inputs feeding • voltage • current capacity	 24 V DC (20 V 3-phase rectified but NOT filtered) 1 A max.
Brakes outputs (For each) • voltage • current capacity	 24 V DC (20 V 3-phase rectified but NOT filtered) 1.5 A max.
AZ motors outputs (For each) • voltage • current capacity	 310 V 3-phase 45 A peak 18 A permanent
EL motor output • voltage • current capacity	 310 V 3-phase 45 A peak 18 A permanent
XEL motor output • voltage • current capacity	 310 V 3-phase 25 A peak 15 A permanent

MECHANICAL

Main chassis	15U high, 420 mm width, 600 mm depth
Front panel	3U high, compatible with 19' cubicles, 100 mm depth

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2.5.12 – Remote Control Box

The Remote Control Box is a metal box which can be connected to the ACP front panel, via a long length cable. By means of this box, an operator can control the different antenna movements independantly from the ACU. This box is used during installation and maintenance operations.

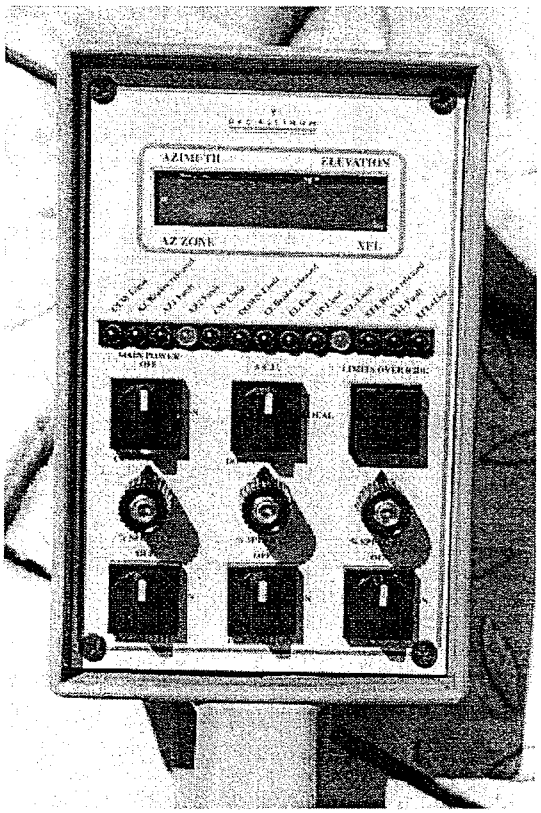

Figure 71 – Antenna Remote Control Box

2.5.12.1 – Operation

The Remote Control Box is fitted with:

- a Liquid Cristal Display, which displays antenna position informations,
- thirteen LEDs, displaying alarms and informations about status of motors, brakes and limit switches on the three axes,
- five 2-position switches, one pushbutton and three potentiometers,
- one cable with a connector for connection on the front panel of ACP.

2.5.12.2 – Controls and displays

The following table gives the function of each control and display.

ITEM	TYPE	FUNCTION
–	LCD display	Antenna position parameters display : • azimuth, elevation, cross-elevation angles • azimuth zone of antenna
CCW limit	LED	CCW limit switch activated

ITEM	TYPE	FUNCTION
AZ Brakes released	LED	Azimuth brakes released
AZ1 fault	LED	Azimuth motor 1 failure
AZ2 fault	LED	Azimuth motor 2 failure
CW limit	LED	CW limit switch activated
DOWN limit	LED	Elevation down limit switch activated
EL Brake released	LED	Elevation brake released
EL fault	LED	Elevation motor failure
UP limit	LED	Elevation up limit switch activated
XEL limit	LED	One of the two cross-elevation limit switches is activated
XEL Brake released	LED	Cross–elevation brake released
XEL fault	LED	Cross-elevation motor failure
XEL+Lim	LED	Cross-elevation general failure
MAIN POWER	2-position switch	Remote Control Box power supply ON/OFF switch
A.C.U. LOCAL	2-position switch	Antenna controlled via ACU Antenna controlled via Remote Control Box
LIMITS OVER RIDE	Pushbutton	When depressed, this pushbutton inhibits action of limit switches
AZIMUTH OFF ON	2-position switch	 Action of % SPEED AZ potentiometer disabled Action of % SPEED AZ potentiometer enabled
ELEVATION OFF ON	2-position switch	 Action of % SPEED EL potentiometer disabled Action of % SPEED EL potentiometer enabled
XEL OFF ON	2-position switch	 Action of % SPEED XEL potentiometer disabled Action of % SPEED XEL potentiometer enabled
% SPEED AZ CCW 0 CW	Potentiometer	 Adjustment of azimuth speed in CCW direction Azimuth movement stopped Adjustment of azimuth speed in CW direction

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ITEM	TYPE	FUNCTION
% SPEED EL	Potentiometer	
DOWN		Adjustment of elevation speed in down direction
0		Elevation movement stopped
UP		Adjustment of elevation speed in up direction
% SPEED XEL	Potentiometer	
–		Adjustment of cross-elevation speed in – direction
0		Cross-elevation movement stopped
+		Adjustment of cross-elevation speed in + direction

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2.5.13 – Interfacility link (IFL)

2.5.13.1 – Operation

The IFL contains all the equipment, cables and, where appropriate, optical fibres needed to interconnect the external components (antenna and "outdoor" rack) and the components located inside the building. two types of IFL are used, chosen on the basis of distance separating the building from the antennas:

- standard IFL for distances from 5 to 100 metres,
- E-IFL (Extended IFL) for distances from 100 metres to 5 kilometres.

The 10 MHz reference frequency and the transmit and receive signals for both polarizations are transmitted via:

- coaxial cables with the standard IFL,
- optical fibres with the E-IFL.

Data, commands and clock signals are transmitted via:

- shielded twisted pairs with the standard IFL,
- a five-channel bidirectional RS422 link, again optical fibre, with the E-IFL version.

Figure 72 is a functional block diagram of the link in the case of an E-IFL.

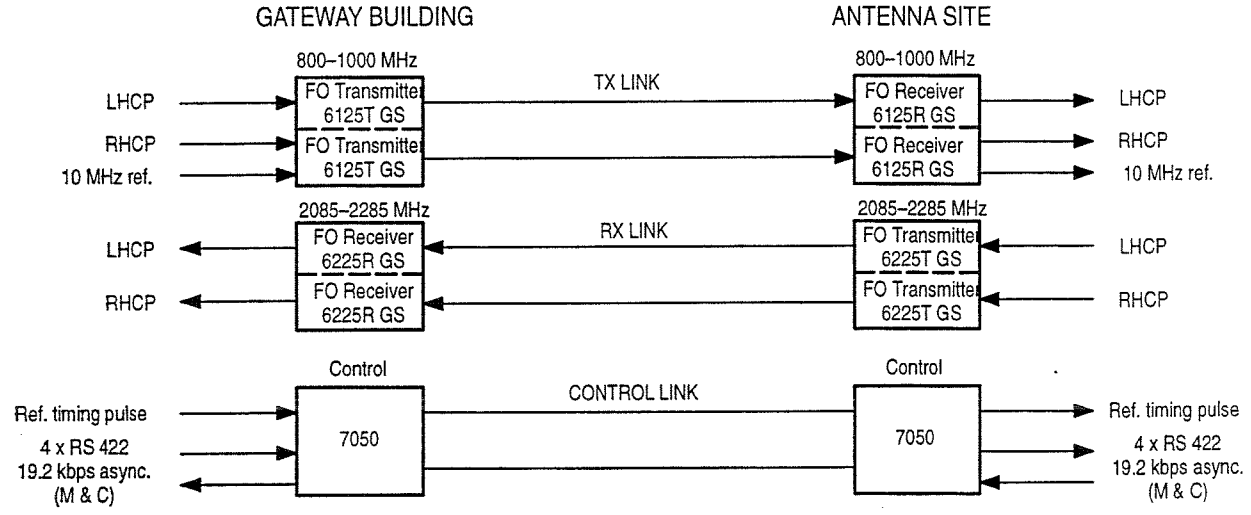

Figure 72 – Functional block diagram of links set up via the E-IFL

The signals to be transmitted via IFL are detailed in figure 73. Of these:

- from the GTS end:
  - two signals (10 MHz reference and even second timing pulse, ESTP), from the GTS, need to be processed in the ICCP subrack of the "indoor" rack,
  - the other signals are sent directly to the GSS, multiplexed in the case of the E-IFL,
- from the GRS end:
  - the 10 MHz reference signal is reshaped and distributed via the 10 MHz distribution subrack of the "outdoor" rack,

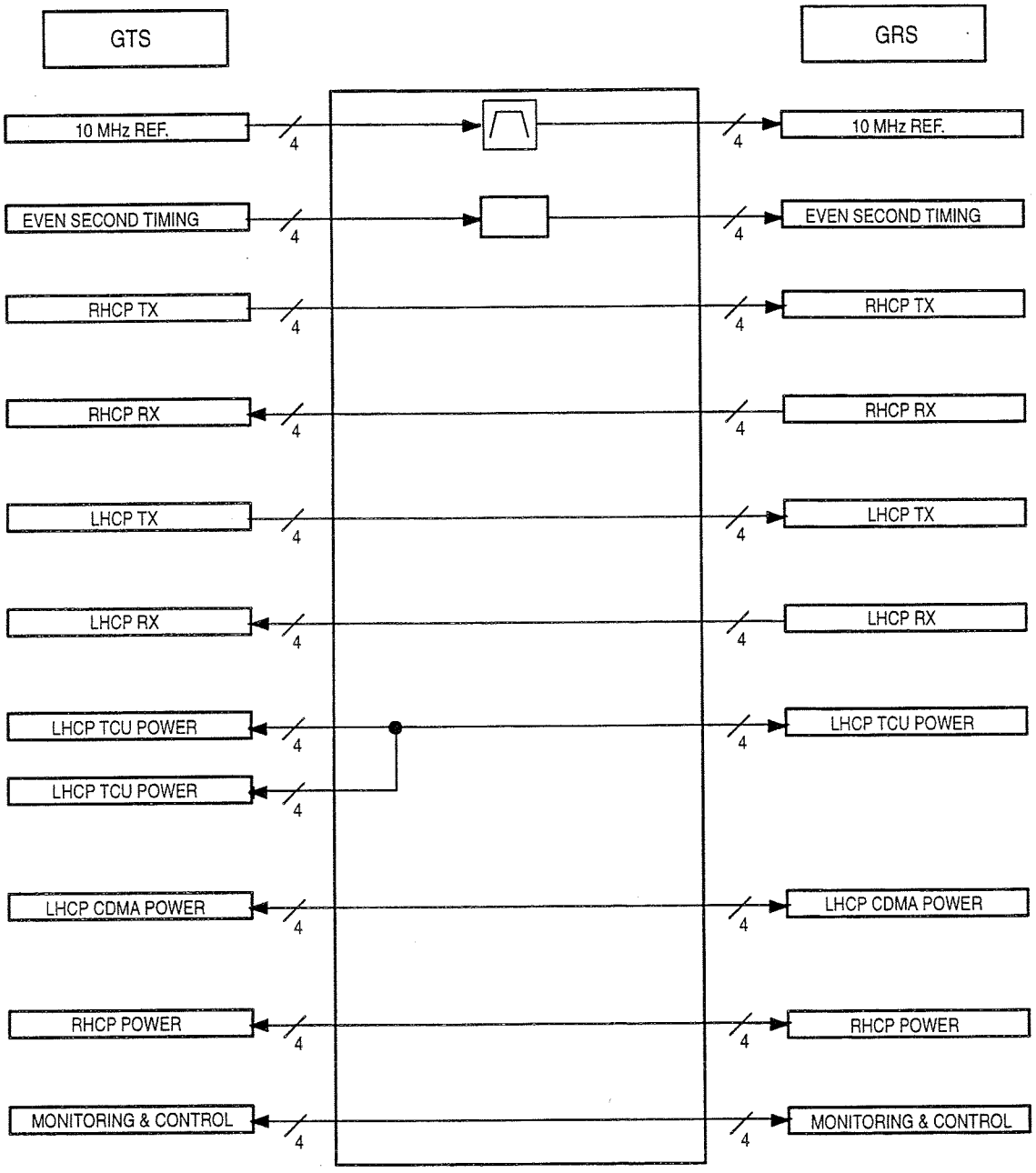

Figure 73 – GTS/GRS interface signals

- the transmit signals of both polarizations are fed through couplers before being transmitted to the equipment in the antenna hub,
- the receive signals of both polarizations, from the equipment in the antenna hub, are fed through couplers before being forwarded to the GTS,
- the other signals are sent directly to the "outdoor" rack and to the antenna equipment.

The couplers described above are incorporated in the RX–TX test subrack of the "outdoor" rack, and provide front panel test points for the four signals.

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The equipment is incorporated:

- in the ICC rack and in the IFL subracks of the "indoor" rack at the GTS end (for the four antennas),
- in the outdoor rack (10 MHz distribution subracks, test panel and interface board or E-IFL).

The interfaces between the GTS and the GRS (one antenna) are detailed by:

- figure 74 in the case of the standard IFL,
- figure 75 in the case of the E-IFL.

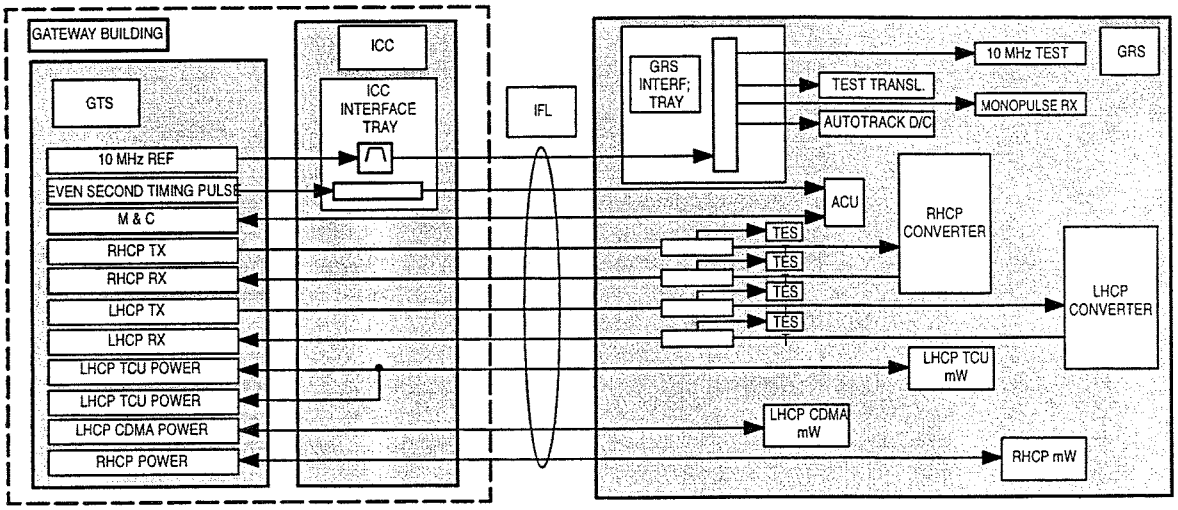

Figure 74 – GTS–GRS interfaces with standard IFL

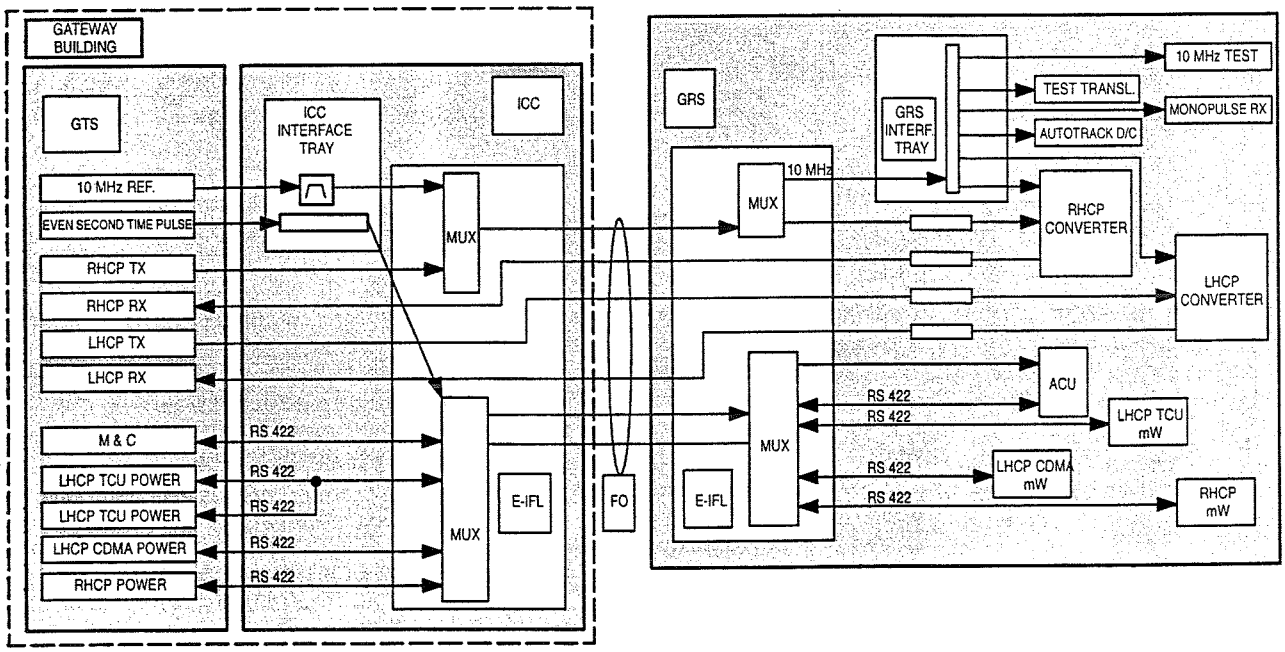

Figure 75 – GTS–GRS interfaces with E-IFL

2.5.13.2 – Configuration

A switch S101 (see section 2.5.13.3), located on the interface board must be set to indicate if the link with indoor equipment is via standard IFL (coaxial link) or via E-IFL (fiberoptical).

2.5.13.3 – Ports and displays

INTERFACE BOARD

An interface board is used either for standard IFL and for E-IFL. In this last case, RS422 connectors corresponding to fiberoptical links are not used. Figure 76 shows the layout of the interface board. The board is installed in the left half of the "Outdoor" rack, at the bottom of the rack. The switch S101 must be set according with the link type.

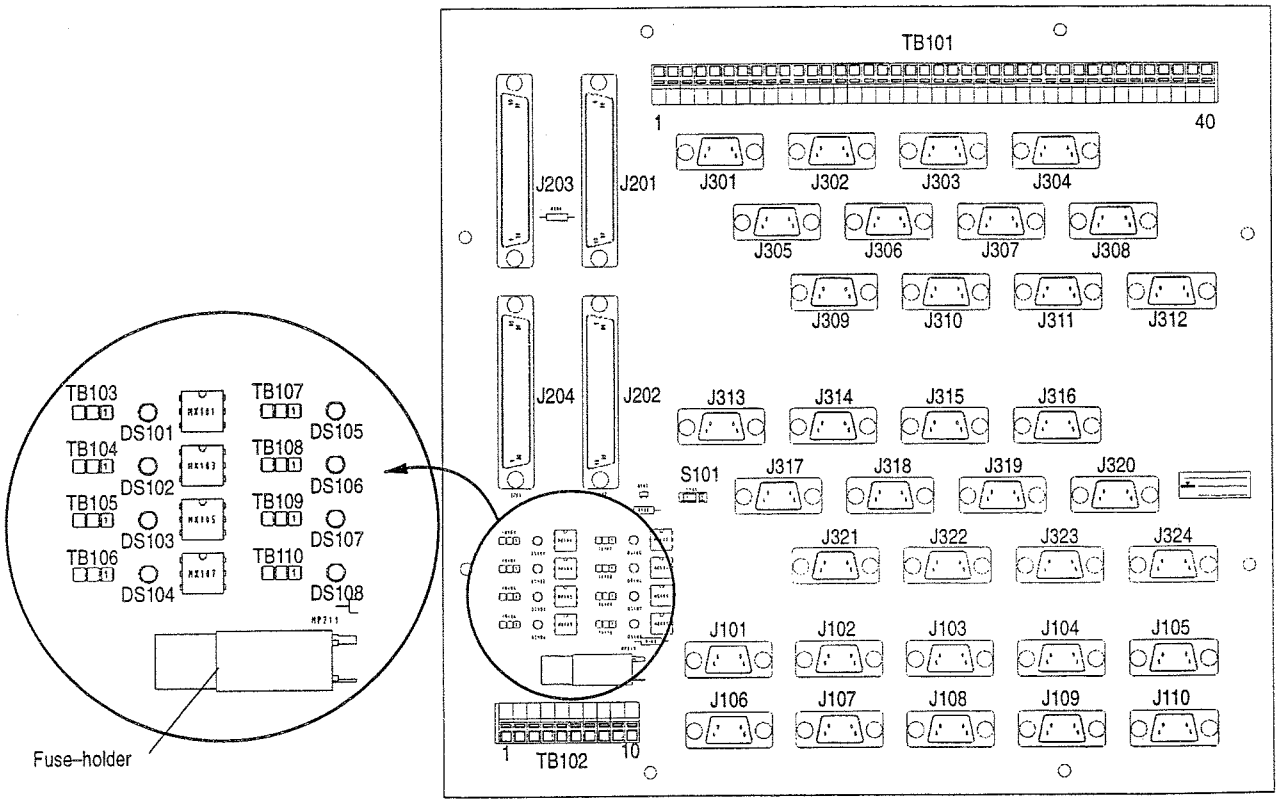

Figure 76 – Connector layout on the interface board

ITEM	COMPONENT	DESCRIPTION
DS101	Green LED	RHCP SSPA 1 operating, no alarm
DS102	Green LED	RHCP SSPA 2 operating, no alarm
DS103	Green LED	RHCP SSPA 3 operating, no alarm
DS104	Green LED	RHCP SSPA 4 operating, no alarm
DS105	Green LED	LHCP SSPA 1 operating, no alarm
DS106	Green LED	LHCP SSPA 2 operating, no alarm
DS107	Green LED	LHCP SSPA 3 operating, no alarm
DS108	Green LED	LHCP SSPA 4 operating, no alarm

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J101	9–way male Sub D connector	RS 422 link measuring RHCP EIRP, to ACU
J102	9–way male Sub D connector	RS 422 link measuring LHCP TCU power, to ACU
J103	9–way male Sub D connector	RS 422 link measuring LHCP CDMA power, to ACU
J104	9–way male Sub D connector	Even second timing pulse signal to "EV. PUL" connector of ACU
J105	9–way male Sub D connector	Link with "GTS" connector of ACU
J106	9–way female Sub D connector	RHCP EIRP RS 422 link to IN–RHCP connector of "Outdoor" rack
J107	9–way female Sub D connector	LHCP TCU power RS 422 link to IN–TCU connector of rack
J108	9–way female Sub D connector	LHCP CDMA power RS 422 link to in–CDMA connector of rack
J109	9–way female Sub D connector	RS 422 link to IN–ESTP connector of "Outdoor" rack (even second timing pulses)
J110	9–way female Sub D connector	RS 422 link to IN–GTS connector of "Outdoor" rack (monitoring and control link)
J201	37–way female Sub D connector	Link with "MON1" connector of ACU (Monitoring)
J202	37–way female Sub D connector	Link with "MON2" connector of ACU (Monitoring)
J203	37–way male Sub D connector	Link with "CONT1" connector of ACU (Control)
J204	37–way male Sub D connector	Link with "CONT2" connector of ACU (Control)
J301	9–way female Sub D connector	RHCP power amplifier "Antenna/Load" switch positioning controls and information
J302	9–way female Sub D connector	RHCP SSPA 1 commands and alarms
J303	9–way female Sub D connector	RHCP SSPA 2 commands and alarms
J304	9–way female Sub D connector	RHCP SSPA 3 commands and alarms
J305	9–way female Sub D connector	RHCP SSPA 4 commands and alarms
J306	9–way female Sub D connector	Isolated loop from RHCP combiner thermal contact
J307	9–way female Sub D connector	RHCP LNA and up and down-converters alarms
J308	9–way female Sub D connector	Isolated loop from thermal contact of RHCP thermostatically controlled box
J309	9–way female Sub D connector	LHCP power amplifier "Antenna/Load" switch positioning commands and information

J310	9–way female Sub D connector	LHCP SSPA 1 commands and alarms
J311	9–way female Sub D connector	LHCP SSPA 2 commands and alarms
J312	9–way female Sub D connector	LHCP SSPA 3 commands and alarms
J313	9–way female Sub D connector	LHCP SSPA 4 commands and alarms
J314	9–way female Sub D connector	Spare
J315	9–way female Sub D connector	LHCP LNA and up and down-converters alarms
J316	9–way female Sub D connector	Spare
J317	9–way female Sub D connector	Spare
J318	9–way female Sub D connector	Antenna de–icing system enable/disable control isolated loop
J319	9–way female Sub D connector	Lubrication
J320	9–way female Sub D connector	LNA and autotrack down-converter alarms (if autotrack option included)
J321	9–way female Sub D connector	Tracking receiver alarm (if autotrack option included)
J322	9–way female Sub D connector	ACU temperature monitoring
J323	9–way female Sub D connector	Spare
J324	9–way female Sub D connector	Spare
S101	2–position switch	Link type setting : Left position : Coaxial cable link Right position : E-IFL
TB101	40–way terminal block	Links with miscellaneous "Outdoor" rack equipment
TB102	10–way terminal block	48 V and 24 V power supply

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E-IFL

Figure 77 shows the front panels of the E-IFL subracks of the "indoor" and "outdoor" racks.

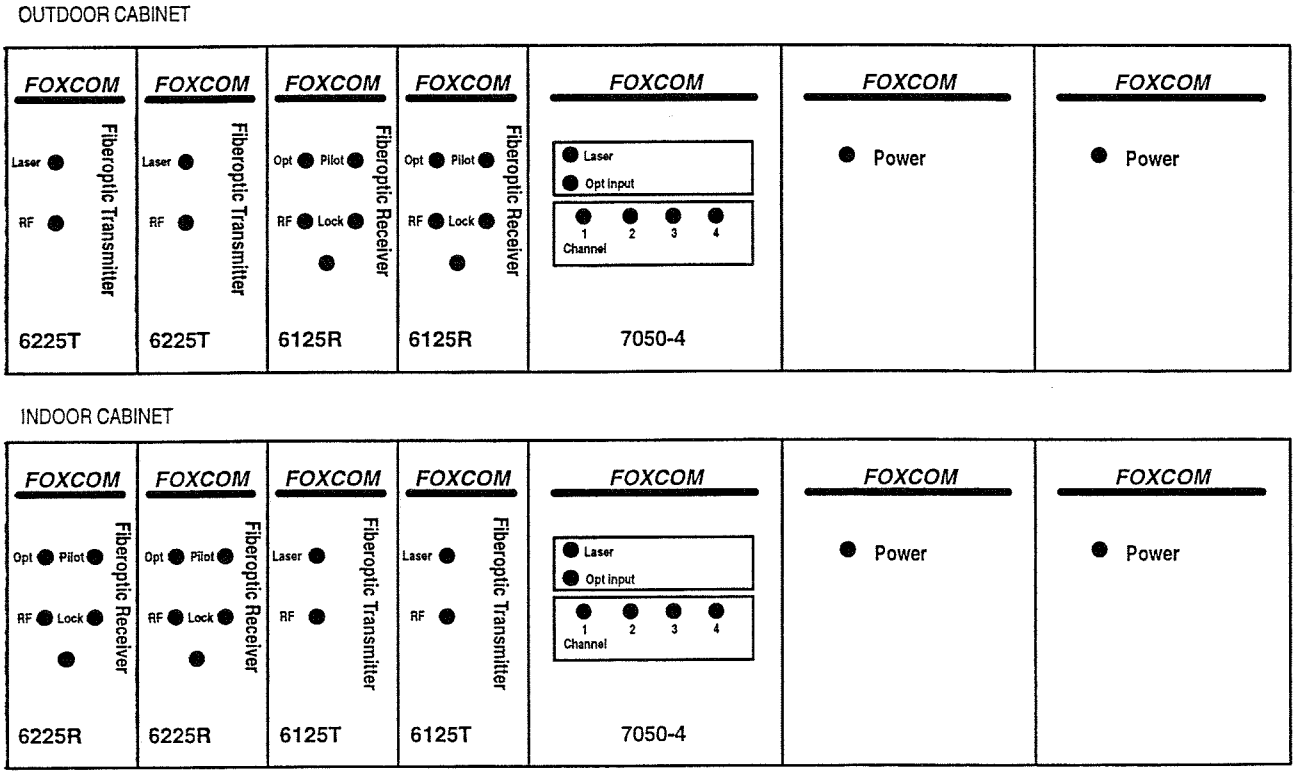

Figure 77 – E-IFL subracks front panels

TRANSMITTER

REPERE	ELEMENT	SIGNIFICATION
Laser	Green LED	ON : Normal optical and DC power conditions OFF : Laser opt. power out of range or DC not applied
RF	Green LED	ON : RF above –5 dBm at input OFF : RF below –5 dBm at input

RECEIVER

REPERE	ELEMENT	SIGNIFICATION
Opt.	Green LED	ON : Normal optical and DC power conditions OFF : Low opt. power or DC not applied
RF	Green LED	ON : RF output above –15 dBm OFF : RF output below –15 dBm

PILOT	Green LED	ON : Pilot signal present (Above 1 V) OFF : Low pilot signal
LOCK	Green LED	ON : AGC loop is locked OFF : AGC loop is unlocked

RS-422 DATA MULTIPLEXER

REPERE	ELEMENT	SIGNIFICATION
Laser	Green LED	ON : Laser optical power is normal OFF : Laser optical power is out of range
Opt input	Green LED	ON : Optical power existing fiber connection normal OFF : Optical power insufficient
Channel 1	Green LED	ON : Carrier received by channel 1 OFF : No data on channel 1
Channel 2	Green LED	ON : Carrier received by channel 2 OFF : No data on channel 2
Channel 3	Green LED	ON : Carrier received by channel 3 OFF : No data on channel 3
Channel 4	Green LED	ON : Carrier received by channel 4 OFF : No data on channel 4

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Figure 78 shows the rear panels of the E-IFL subracks in the "indoor" and "outdoor" racks.

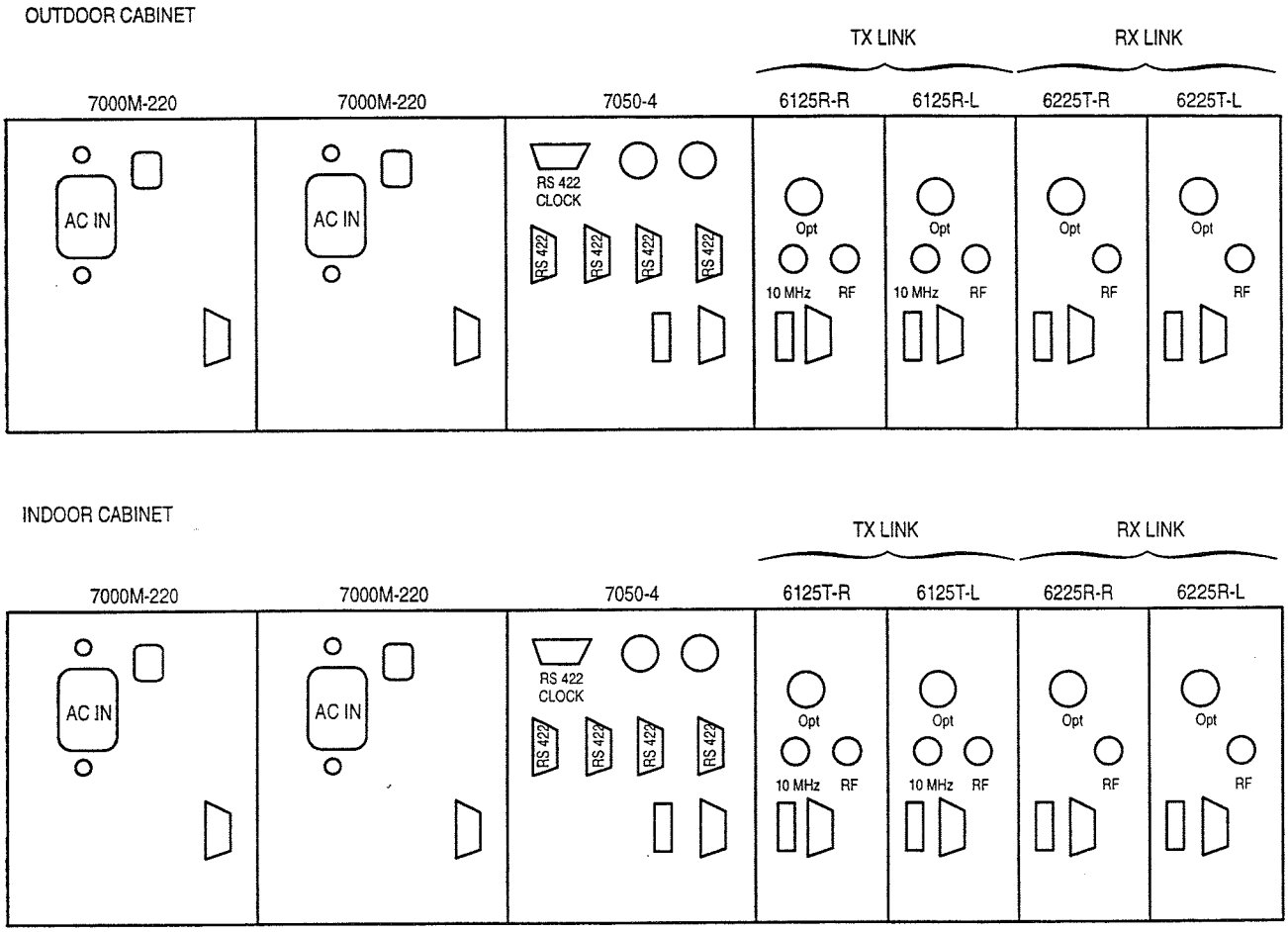

Figure 78 – E-IFL subracks back panels

TRANSMITTER

REPERE	ELEMENT	SIGNIFICATION
Opt	FC/APC connector	Optical fiber output
10 MHz	Female SMA connector	10 MHz reference input
RF	Female SMA connector	RF input (Antenna site : 2085-2285 MHz; Gate-way building : 800-1000 MHz)
–	6–pin MOLEX connector	TBD

RECEIVER

REPERE	ELEMENT	SIGNIFICATION
Opt	FC/APC connector	Optical fiber input
RF	Female SMA connector	RF output (Antenna site : 800-1000 MHz; Gateway building : 2085-2285 MHz)
–	6–pin MOLEX connector	TBD

MULTIPLEXER

REPERE	ELEMENT	SIGNIFICATION
RS 422 CLOCK	9 pin-D connector	Bi–directional clock channel
RS 422	9 pin-D connector	4 bi-directional 19.2 kbps asynchronous data channels
–	6–pin MOLEX connector	TBD

POWER SUPPLY

REPERE	ELEMENT	SIGNIFICATION
AC IN	–	Mains input

2.5.13.4 – Connectors

MULTIPLEXER RS 422 CLOCK CONNECTOR

PIN	SIGNAL	FUNCTION
1	RX1	Receiver input (+)
2	RX2	Receiver input (–)
3	GND	DC power return
4	TX2	Transmitter output (–)
5	TX1	Transmitter output (+)

MULTIPLEXER RS 422 DATA CHANNELS CONNECTORS

PIN	SIGNAL	FUNCTION
1	RX1	Receiver input (+)
2	RX2	Receiver input (–)

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PIN	SIGNAL	FUNCTION
3	GND	DC power return
4	TX2	Transmitter output (–)
5	TX1	Transmitter output (+)

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2.5.14 – ICC interface subrack

The ICC interface subrack takes the form of a 3U high 19" standard subrack. It processes the 10 MHz reference signal and the "even second timing pulse" signal before forwarding them to the GRS via the IFL or E-IFL.

2.5.14.1 – Operation

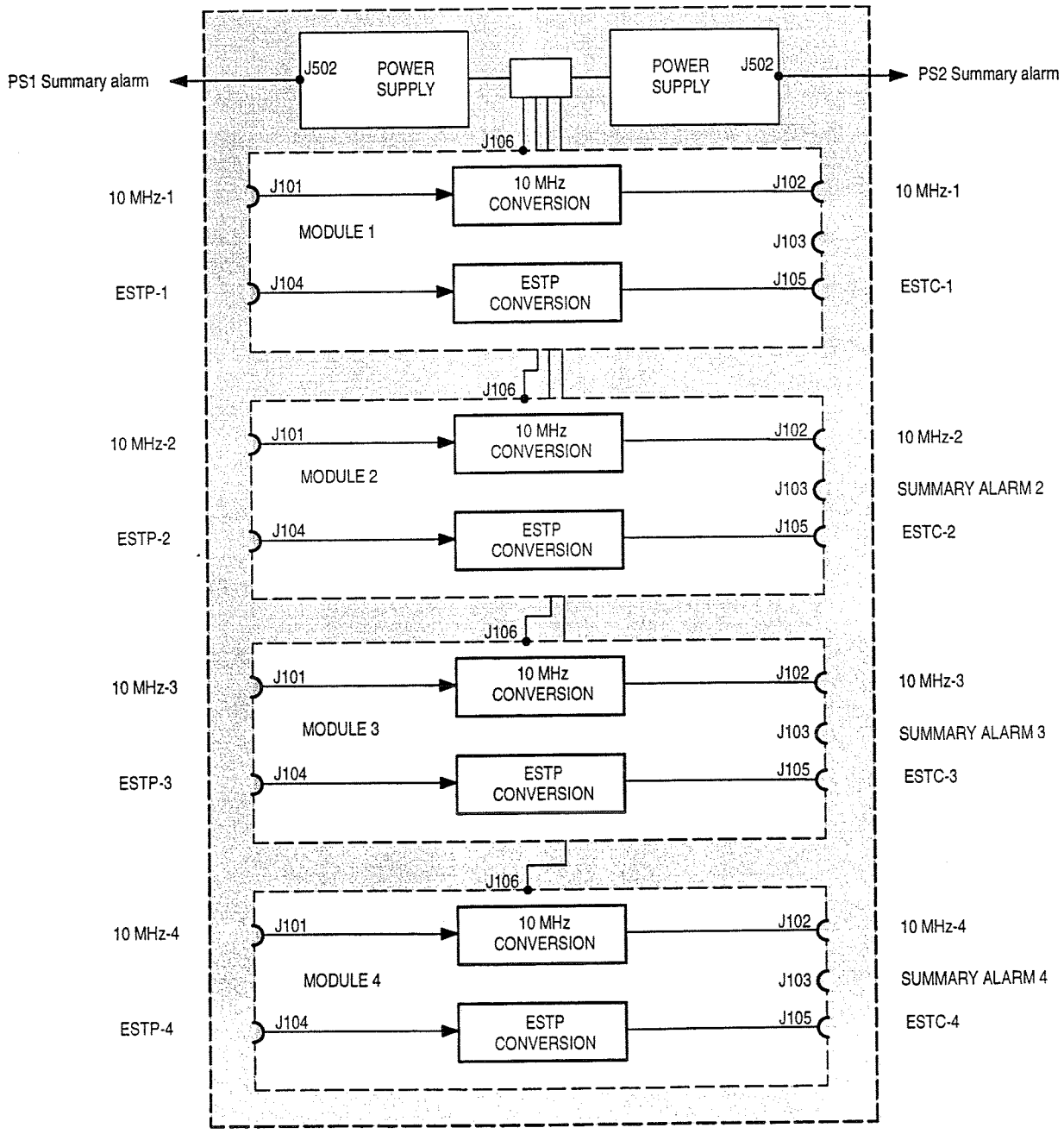

Figure 79 – Functional block diagram of the ICC interface

This subrack handles the following functions:

- conversion of the P-ECL standard 10 MHz reference signal to a sinusoidal signal for transmission to the GRS,
- conversion of the P-ECL standard "even second timing pulse" signal (ESTP) to an RS422 standard "even second timing clock" signal (ESTC). The characteristics of the signals before and after conversion are given by the table below:

CARACTERISTICS	P-ECL	RS 422
Period	2 seconds	2 seconds
"Low" state (active state)	101.7 ns	500 ms

The subrack has four identical interface modules (one for each antenna) and two power supply modules for redundancy. Figure 79 is a functional block diagram of the subrack. Each interface module has an alarm circuit marshalling all the alarms detected on it. The same applies for each power supply module.

On option, a line amplifier module can be integrated in the subrack. This module, is fitted with 8 line amplifiers (one for each polarization of each antenna). This module can be used when the length of links between gateway building and antennas is a little more than 100 meters.

2.5.14.2 – Configuration

Not applicable.

2.5.14.3 – Ports and displays

Figure 80 shows the front panel of the subrack.

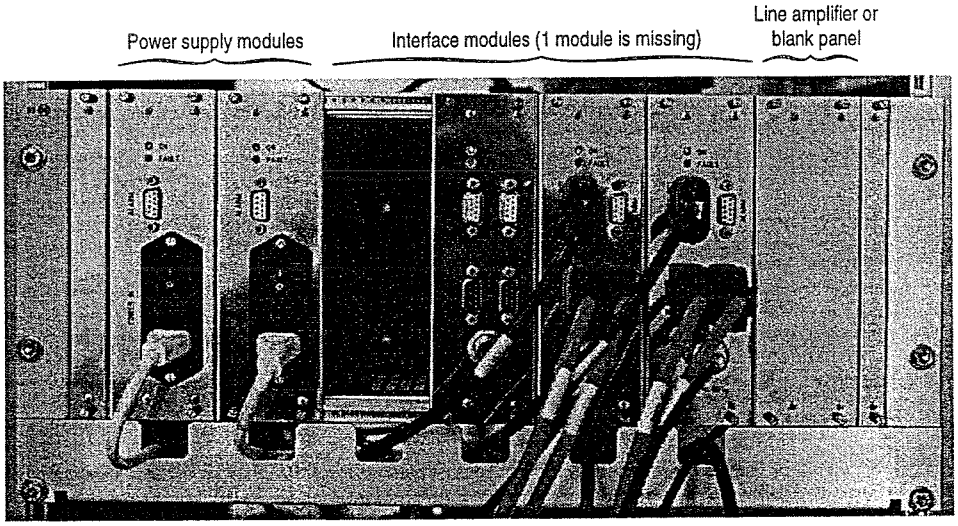

Figure 80 – Front panel of the ICC interface subrack

Description of front panels of the modules of the ICC interface subrack are given hereafter (Figure 81):

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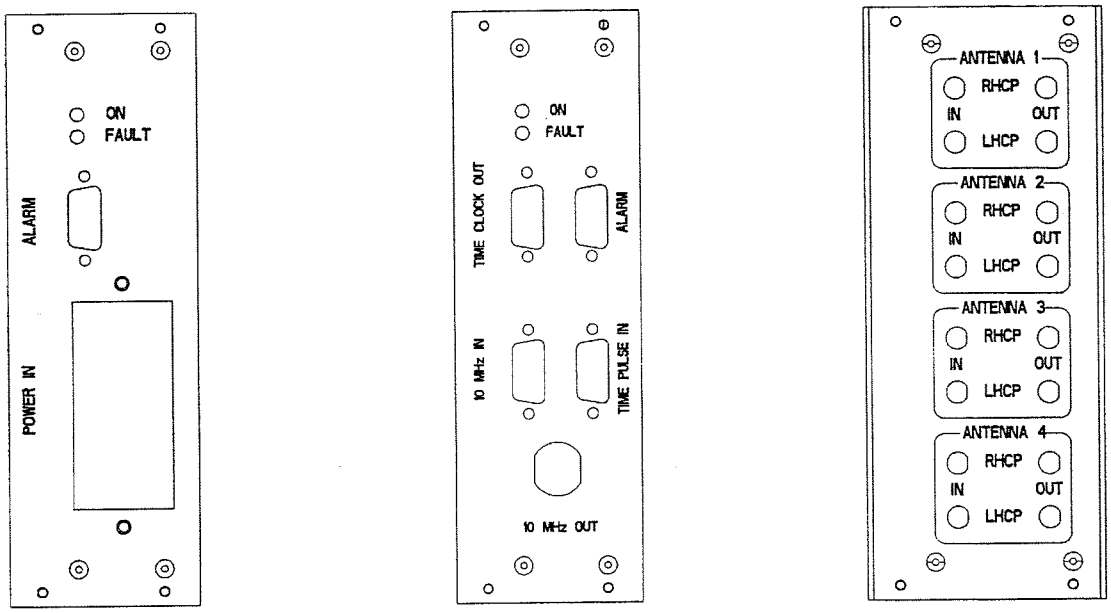

Power supply | Interface | Line amplifier

Figure 81 – ICC modules front panels

POWER SUPPLY MODULES

REFERENCE	COMPONENT	DESCRIPTION
ON	Green LED	Module supplies present
FAULT	Red LED	Module general alarm indicator
ALARM	9–way Sub D female connector	Module general alarm isolated loop
POWER IN	Mains block	Mains connector and ON/OFF switch

INTERFACE MODULES

REFERENCE	COMPONENT	DESCRIPTION
ON	Green LED	Module supplied
FAULT	Red LED	Module in failure (general alarm)
10 MHz IN	9–way Sub D male connector	10 MHz input
10 MHz OUT	Female N connector	Sinusoidal 10 MHz output
ALARM	9–way Sub D female connector	Module general alarm
TIME PULSE IN	9–way Sub D male connector	ESTP input
TIME CLOCK OUT	9–way Sub D male connector	ESTC output

OPTIONAL LINE AMPLIFIER MODULE

For each antenna, four connectors are available :

REFERENCE	COMPONENT	DESCRIPTION
RHCP IN	1,6/5,6 female connector	RHCP 10 MHz signal input (from ICC module)
LHCP IN	1,6/5,6 female connector	LHCP 10 MHz signal input (from ICC module)
RHCP OUT	1,6/5,6 female connector	RHCP 10 MHz signal output (to outdoor rack)
LHCP OUT	1,6/5,6 female connector	LHCP 10 MHz signal output (to outdoor rack)

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2.5.14.4 – Connections

POWER SUPPLY MODULES

CONNECTOR	PIN	FUNCTION
ALARM	4	Alarm loop output (–)
	5	Alarm loop output (+)

INTERFACE MODULES

CONNECTOR	PIN	FUNCTION
10 MHz IN	1	10 MHz input (+)
	2	10 MHz input (–)
TIME PULSE IN	1	ESTP input (+)
	2	ESTP input (–)
TIME CLOCK OUT	4	ESTC output (–)
	5	ESTC output (+)
ALARM	4	Alarm loop output (–)
	5	Alarm loop output (+)

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2.5.15 – Milliwattmeter subrack

LHCP TCU power measurement is taken by a "Hewlett-Packard" milliwattmeter with an IEEE 488 output.

LHCP CDMA and EIRP power measurements are taken by a "Gigatronix" two-input milliwattmeter with RS422 outputs.

These two milliwattmeters are incorporated in a 6U high, 19" standard subrack, the former being above the latter. This also accommodates the interface converter providing IEEE 488/RS422 conversion between the "Hewlett-Packard" milliwattmeter and the station monitoring equipment.

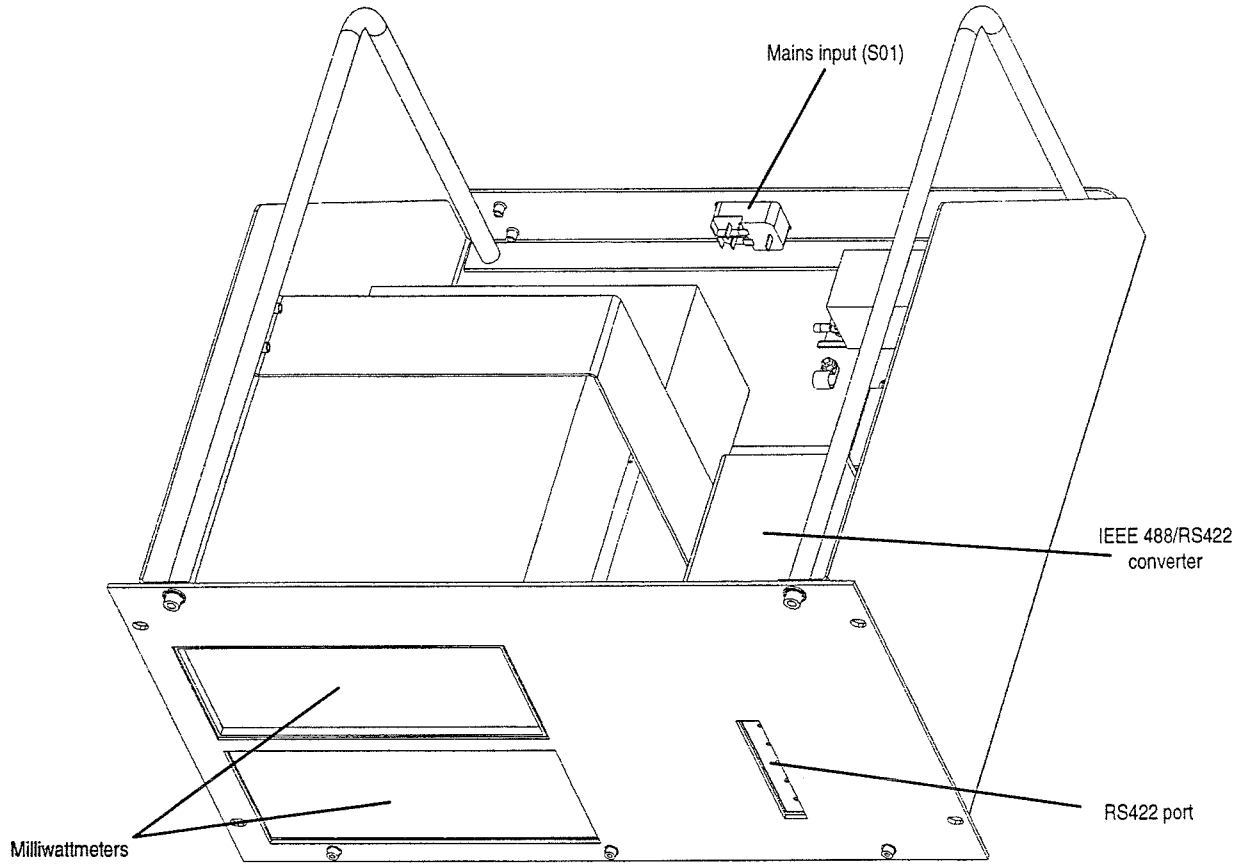

Figure 82 – Milliwattmeter subrack

Mains input connector S01 is at the back of the subrack.

2.5.15.1 – Operation

Each port of "Gigatronix" milliwattmeter receives a DC voltage reflecting the SHF power value to be measured from a probe inside the TCU/CDMA filter unit. This value is digitized by the milliwattmeter and delivered on an RS422 standard output.

The "Hewlett Packard" milliwattmeter receives also a DC voltage reflecting the SHF power value to be measured from a probe inside the TCU/CDMA filter unit. It delivers an IEEE 488 signal which is converted into an RS422 signals (and vice versa for commands received for the milliwattmeter) by means of a bus controller.

Figure 83 shows a wiring diagram for the subrack.

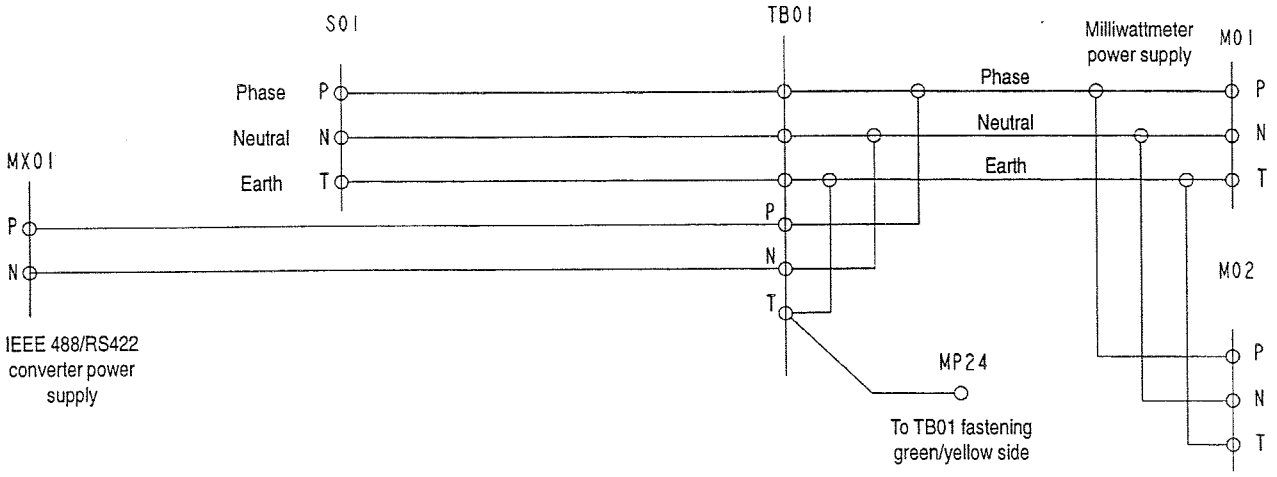

Figure 83 – Milliwattmeter subrack wiring diagram

2.5.15.2 – Ports and displays

The cables between the probes and the milliwattmeters are linked directly to the milliwattmeter inputs.

The IEEE 488 port of the "Hewlett-Packard" milliwattmeter is connected to the IEEE 488/RS422 converter port.

The RS422 ports of the converter is accessible on the front of the subrack.

ITEM	COMPONENT	DESCRIPTION
S01	Mains input connector	Mains input
–	25–way female Sub D connector	Converter RS 422 port

2.5.15.3 – Connections

MAINS CONNECTOR

PIN	FUNCTION
P	Phase
N	Neutral
T	Earth

RS422 PORT CONNECTOR

PIN	FUNCTION
1	–
2	TX2 (–) > RX2 (–)
3	RX2 (–) > TX2 (–)

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PIN	FUNCTION
4 to 6	–
7	Ground
8 to 13	–
14	TX1 (+) > RX1 (+)
15	–
16	RX1 (+) > TX1 (+)
17 to 25	–

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2.5.16 – Test panel

The test panel is a 1U high 19" standard subrack, fitted with:

- two 20 dB couplers operating in the 800/1000 MHz band (DH01),
- two 20 dB couplers operating in the 2000/2300 MHz band (DH02).

2.5.16.1 – Operation

Not applicable.

2.5.16.2 – Configuration

Not applicable.

2.5.16.3 – Ports

Figure 84 is a top view of the subrack, identifying the various ports.

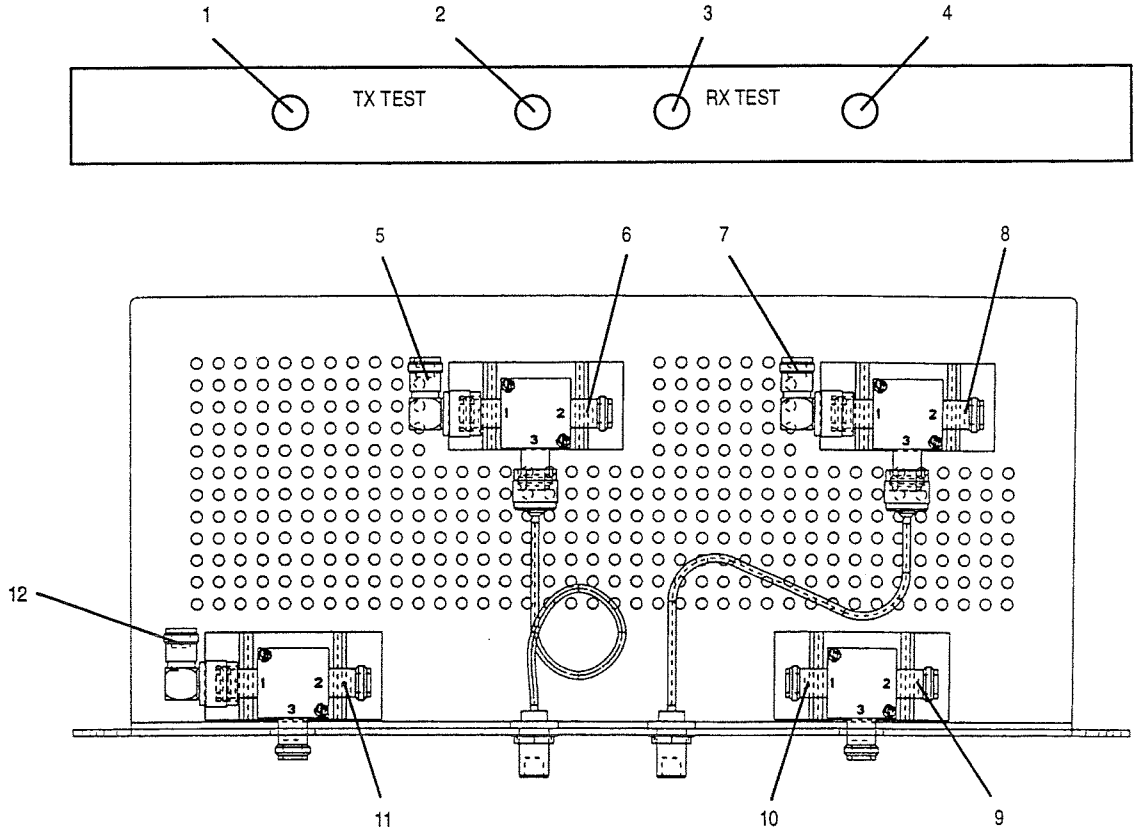

Figure 84 – Test panel (front panel and top view)

2.5.16.4 – Ports

ITEM (Fig. 84)	COMPONENT	DESCRIPTION
1	Female N connector	LHCP transmit transposition output test point?
2	Female N connector	RHCP transmit transposition output test point?

3	Female N connector	LHCP receive transposition input test point?
4	Female N connector	RHCP receive transposition input test point?
5	Female N connector	RHCP transmit IF signal input from "Outdoor" rack
6	Female N connector	RHCP transmit RF signal output to antenna hub (transmit transposition)
7	Female N connector	LHCP receive IF signal input from antenna hub (receive transposition)
8	Female N connector	LHCP receive IF signal output (input in the "Outdoor" rack)
9	Female N connector	RHCP receive IF signal output (input in the "Outdoor" rack)
10	Female N connector	RHCP receive iF signal input from antenna hub (receive transposition)
11	Female N connector	LHCP transmit IF signal output to antenna hub (transmit transposition)
12	Female N connector	LHCP transmit IF signal input from "Outdoor" rack

2.5.16.5 – Connections

Not applicable.

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2.5.17 – 10 MHz distributor

The 10 MHz distributor module is a 1U high, 19" standard subrack. It distributes the 10 MHz reference signal to the various subsystems of the "outdoor" rack and the antenna hub.

2.5.17.1 – Operation

Figure 85 is a functional block diagram of the unit.

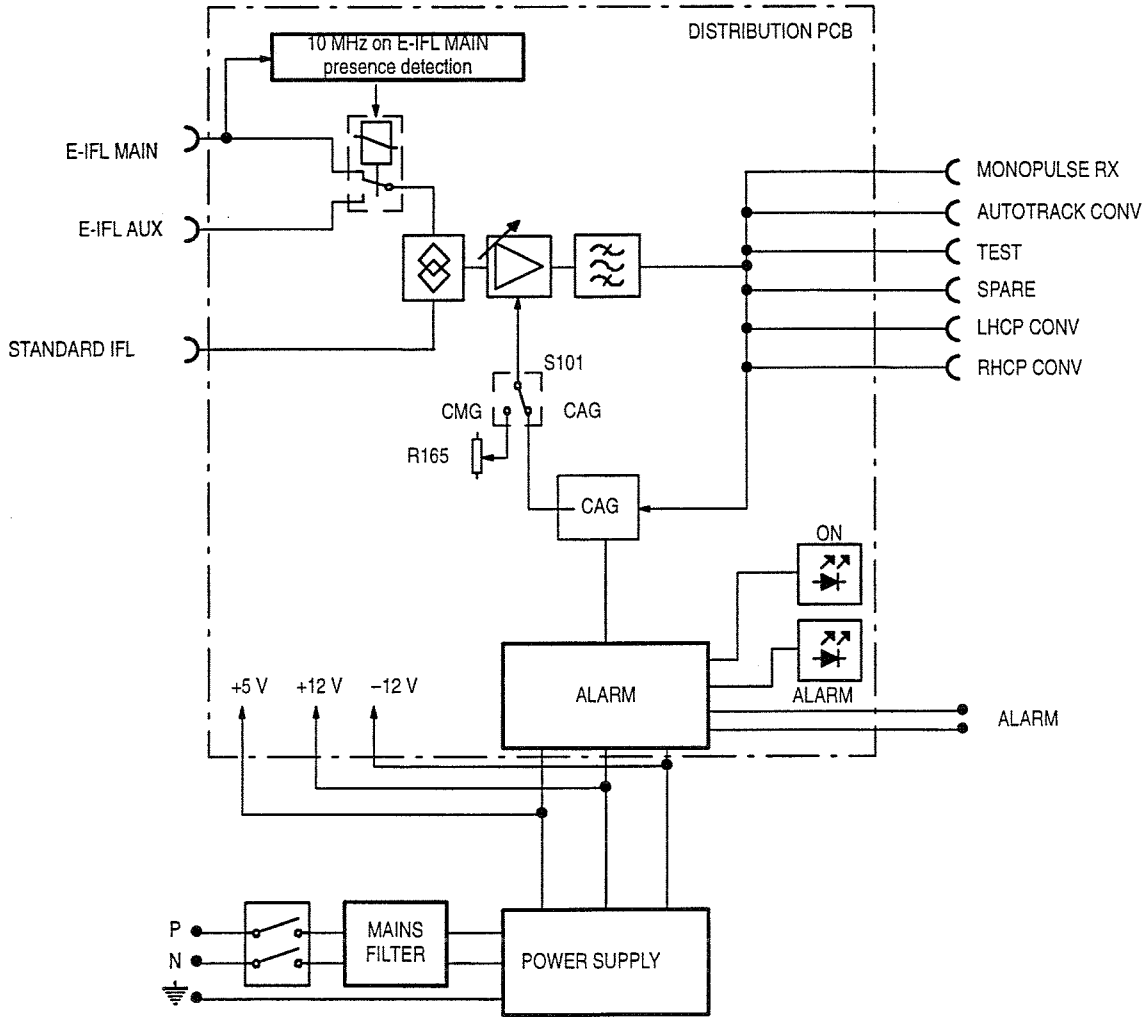

Figure 85 – Functional block diagram of the 10 MHz distribution unit

The unit has:

- a power supply module which receives mains supply and outputs +5 V, +12 V and –12 V regulated DC voltages. The mains is received via a block comprising:
  - mains connector,
  - "On/off" switch,
  - protection fuses (phase and neutral),

- mains filter.

– a board supporting the circuits for distributing the 10 MHz sinusoidal signal from the GTS or the E–IFL to the following equipment:
  - LHCP transposition,
  - RHCP transposition,
  - optional autotrack receive transposition,
  - optional autotrack monopulse receiver.

A 10 MHz signal test point is also provided.

An automatic gain control circuit (AGC) keeps the level of the 10 MHz signal constant at the output points.

Two inputs for the signals from the E–IFL are available for use (E–IFL MAIN and E–IFL AUX). An automatic detection device selects the auxiliary input if there is no signal on the main input. The standard IFL input is not switched, so signals must not be sent simultaneously to one of the E–IFL inputs and the standard IFL input.

A dry loop, which is open in an alarm condition, indicates the presence of one of the following alarms:

– absence of the 10 MHz signal at the unit output,

– power supply fault.

2.5.17.2 – – Configuration

Switch S01 on the 10 MHz distribution board, which is accessed by removing the perforated cover from the unit should be set to the "AGC" position (dot showing).

The "CMG" position (dot concealed) should be used only for measurements or for temporary degraded mode operation, in the even of failure of the AGC circuit, for example. In this mode of operation, the unit works with a fixed gain which can be adjusted by potentiometer R165 (see figure 86).

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