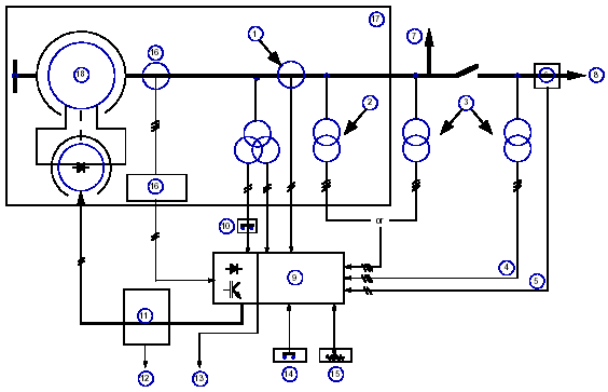
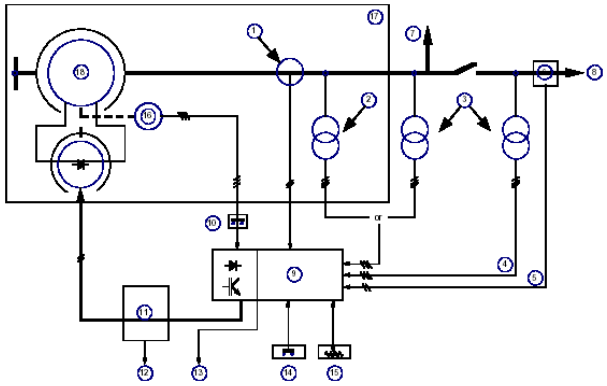
LEROY SOMER®

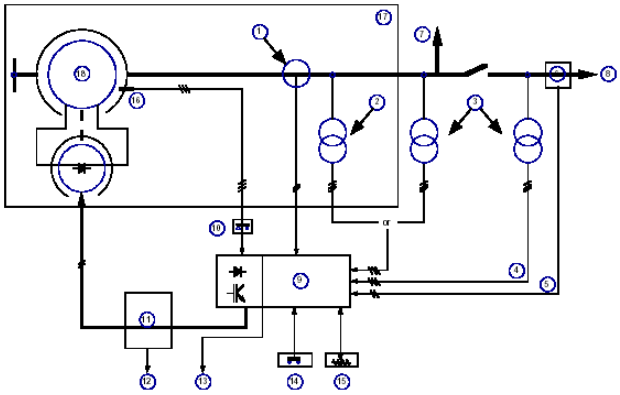
4900en – 12.2011 / a



SHUNT + booster



PMG



AREP

Digital Voltage Regulator
D630

Installation and maintenance

AVR MODEL D630

NOTE

THE ELECTRICAL WIRING DIAGRAM ARE ONLY GIVEN AS AN INDICATION. PLEASE REFER TO THE SPECIFIC DIAGRAMS OF YOUR ALTERNATOR

WARNING

TO PREVENT PERSONNAL INJURY OR EQUIPMENT DAMAGE, ONLY QUALIFIED TECHNICIANS/OPERATORS SHOULD INSTALL AND OPERATE THIS DEVICE

CAUTION

MEGGERS AND HIGH POTENTIAL TEST EQUIPMENT MUST NOT BE USED. INCORRECT USED OF SUCH EQUIPMENT COULD DAMAGE THE SEMICONDUCTORS CONTAINED IN THE AVR

AVR MODEL D630

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AVR MODEL D630

1) GENERAL PRESENTATION

1.1) APPLICATION

The AVR model D600 can be used with brushless self-excited type generators, "SHUNT", "SHUNT with BOOSTER" or "PMG" or “AREP” excitation. In case of "SHUNT with BOOSTER” the booster current is totally monitored by the AVR.
The AVR is able to ensure, depending of its constitution, solo operation, parallel operation between equivalent generators or parallel operation with the mains with P.F or KVAR regulation.

1.2) DESCRIPTION

The AVR model D630 is digital one composed of electronic cards which are included in a rack 19’ for mounting in cubicle. Its cards permit to acquire and control electrical values for the generator running.

Empty slots allows optional 4-20mA card to be added without any internal wiring modification.
It's also possible to add on microcontroller card, an external communication field bus

1.3) OPTIONAL CARDS

Base equipment allows voltage regulation with reactive load sharing when paralleling with other machines (1F) or power factor (or kVAr) regulation when parallel with mains (2F).

Following options can be plugged inside the DVR :

- Volt matching before coupling (U/U) (3F)
- P.F regulation on mains side via 4-20mA

Communication via field bus (one at a time) :

- Communication via PROFIBUS
- Communication via MODBUS
- Communication via MODBUS TCP
- Other field bus possible on request

1.4) WIRING

External interconnections are located on the top of the rack in form of two terminal blocks:
- A power / voltage terminal block (19 terminals, power with MCB)
- A command / control terminal block (45 terminals)
- Un bornier commande / contrôle (45 bornes)

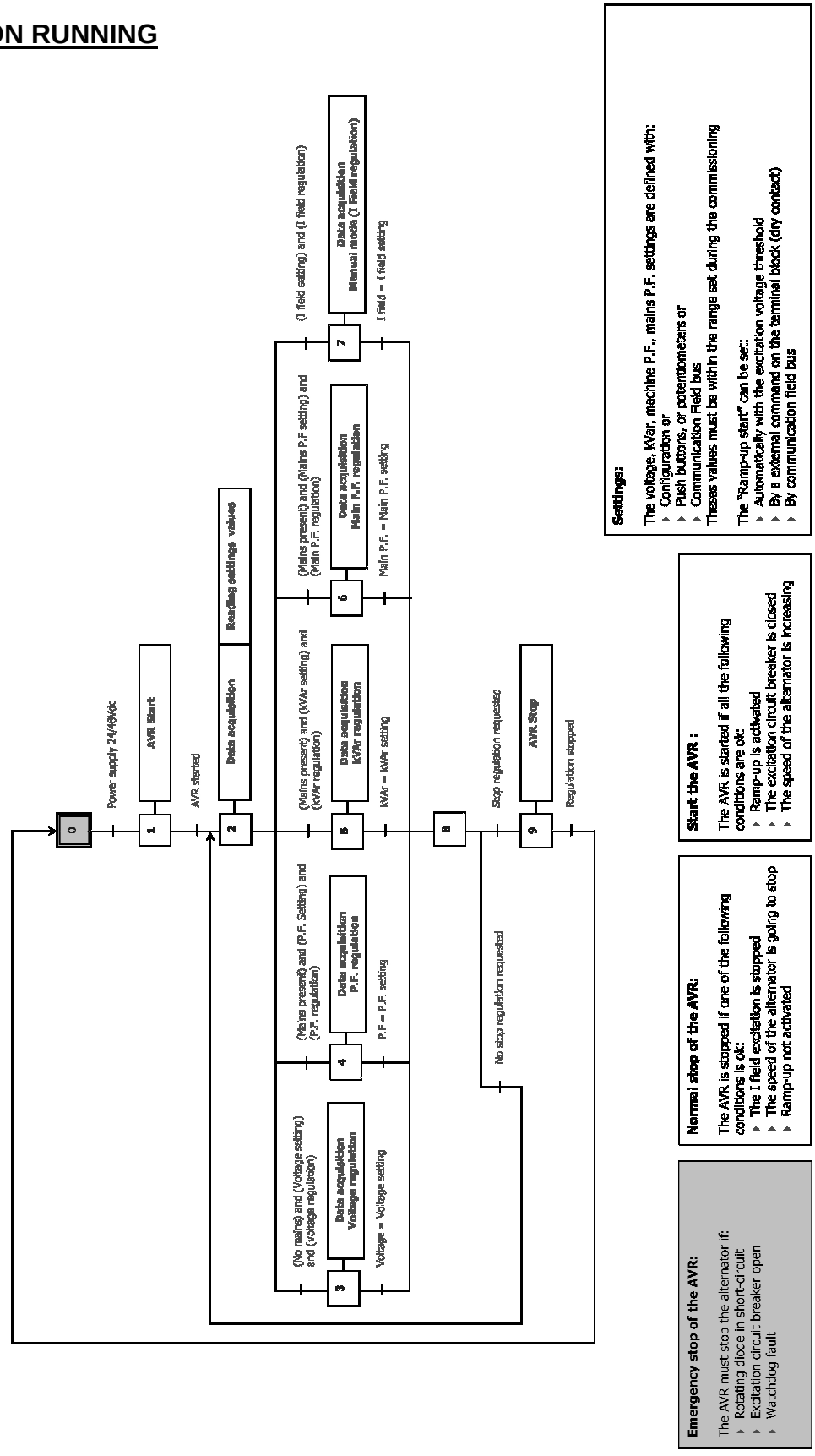
1.5) SPECIFICATIONS

- Voltage sensing
  - 100/115Vac 50Hz
  - 100/130Vac 60Hz
  - 380/420Vac 50Hz
  - 380/450Vac 60Hz
- Power supply (270Vac maximum)
  - Shunt + Booster = power transformers
  - AREP = auxiliaries windings
  - PMG = PMG windings
- Auxiliary power
  - 24/48Vdc 2A max (via supply card front connector)
- Field output
  - 15A nominal, 25A maximum for 10s on 5Ω minimum field resistance
- Voltage accuracy
  - +/-0.5% of the means of the three phases on linear load and without droop
- Voltage/ P.F setting range :
  - +/-10% Adjustable by mean of supervisor, push buttons or potentiometer.
- Droop setting range
  - -10% of nominal voltage at P.F.=0
- Under frequency protection
  - Adjustable threshold and slope from V/Hz to 3V
- Excitation Ceiling
  - Permanent 110% of If nominal, unlocked on voltage decrease
- Limitations
  - Excitation Max/min, Heat sink overheating,
- Protection
  - Watchdog, rotating diodes monitoring
- Alarm output
  - See affectation table (supervisor).

- Environment
  - Maximum ambient temperature -10℃ to +50℃
  - Fitting in control panel without excessive vibrations
  - CEM
    - **Emission** : EN 61000-6-4 (EN55011-Cl:A)
    - **Immunity** : EN 61000-6-2
    - Electrostatic discharges EN 61000-4-2
    - RF electromagnetic field EN 61000-4-3
    - Electrical fast transient/burst EN 61000-4-4
    - Surges EN 61000-4-5
    - Conducted disturbances induced by RF fields EN 61000-4-6

AVR MODEL D630

2) REGULATION RUNNING



AVR MODEL D630

3) ELEMENTS REFERENCE

DESIGNATION	N°Carte équipée	REMARQUES
Wired empty Rack	C51950311	SHUNT three phases (+ Booster)
Wired empty Rack	C51950312	SHUNT single phase (+ Booster)
Wired empty Rack	C51950313	AREP
Rack Wired empty Rack câblé	C51950314	PMG
Power block	C51950315	SHUNT triphasé (+ booster)
Power block	C51950316	SHUNT monophasé (+ booster)
Power block	C51950317	AREP
Power block	C51950318	PMG
Generator card Generator card	C51950200 C51950202	100 / 120V - 50 / 60Hz 400 / 450V - 50 / 60Hz
Mains card 3F	C51950220	100 / 120V - 50 / 60Hz
Mains card 3F	C51950222	400 / 450V - 50 / 60Hz
Mains card 2F	C51950210	
Mains card 1F	C51950215	
Supply card	C51950288	
Acquisition card	C51950289	
Microcontroler card	C51950290	
Driver card	C51950291	
LEM	C51950076	
4-20mA interface card	C51950326	
Fieldbus Profibus type	C51950292	
Fieldbus Modbus type	C51950293	
Fieldbus Ethernet type	C51950327	
= Base nécessaire		
= Options		

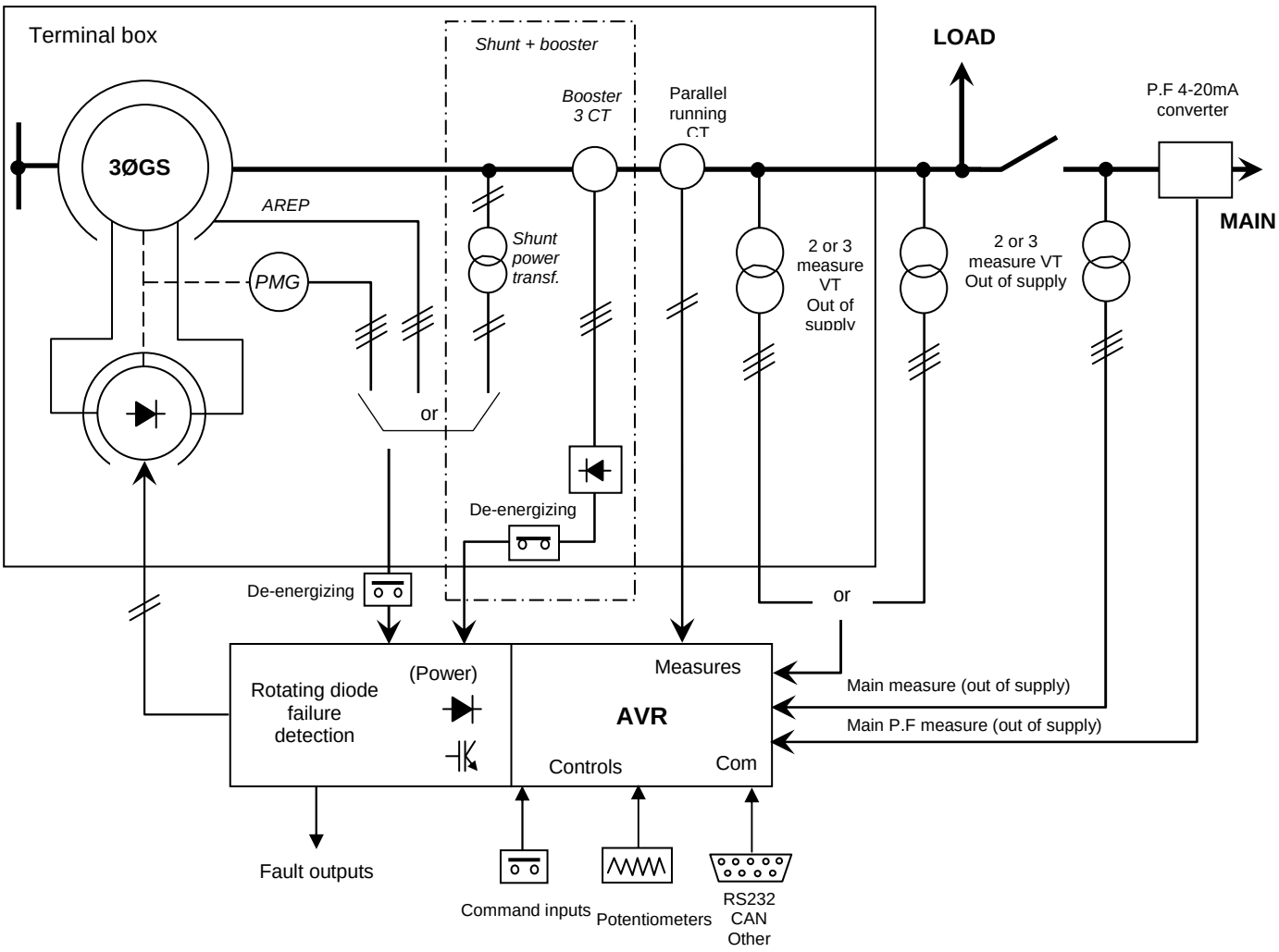
NOTE :
1F = Solo or parallel running between machines (voltage regulation + reactive sharing (droop))
2F = 1F + parallel running with the Mains (P.F or KVAR regulation)
3F = 2F + Volt matching (U/U)

IMPORTANT: Information given on this sheet will be important to order the spare parts.

4) GENERAL SYNOPTIC

Following schematics give all the usual information on the interconnections between the terminal block, the I/O connectors and the power block.

4.1) SYNOPTIQUE EXCITATION-RÉGULATION



5) CONNECTIQUE

N°BORNE	Voltage / Power terminal block	0F	1F	2F	3F
1	Phase 1 (U) generator (measure)	N	N	N	N
2	Phase 2 (V) generator (measure)	N	N	N	N
3	Phase 3 (W) generator (measure)	N	N	N	N
4	Entrée + flashing or pre-excitation (optional)	O	O	O	O
5	Output + Exciter	N	N	N	N
6	Output - Exciter	N	N	N	N
7	+ Booster input (nothing if AREP or PMG)	O	O	O	O
8	- Booster input (nothing if AREP or PMG)	O	O	O	O
9	Parallel CT S1		N	N	N
10	Parallel CT S2		N	N	N
11					
12	Phase 1 (U) Mains (measure)				N
13	Phase 2 (V) Mains (measure)				N
14	Phase 3 (W) Mains (measure)	N	N	N	N
15	Auxiliary power	N	N	N	N
16	Auxiliary power	N	N	N	N
17	Power supply (MCB)				
18	Power supply (MCB)				
19	Power supply (MCB)				
	BORNIER COMMAND / CONTROL				
20,20	Potentiometer shield (2 terminals)	O	O	O	O
21		O	O	O	O
22	Potentiometer external settings 10Kohm-2W (cursor)	O	O	O	O
23	Potentiometer external settings (low)	O	O	O	O
30	Potentiometer external settings (high)	O	O	O	O
33	Power factor regulation command			N	N
34	Power factor regulation command			N	N
35	Volt matching command				N
36	Volt matching command				N
37	Failure output (common)	O	O	O	O
38	Failure output (NC)	O	O	O	O
39	Failure output (NO)	O	O	O	O
42	Upper command for active regulation	O	O	O	O
43	Lower command for active regulation	O	O	O	O
44	Common	O	O	O	O
45	Upper command for field current regulation (MANU)	O	O	O	O
46	Lower command for field current regulation (MANU)	O	O	O	O
47	Cmd "AUTO / MANU" (Open = "AUTO")	O	O	O	O
48	Cmd "AUTO / MANU" (Open = "AUTO")	O	O	O	O
49	Image output of "AUTO / MANU" cmd	O	O	O	O
50	Image output of "AUTO / MANU" cmd	O	O	O	O
53	Command "P.F / KVAR" (Open = "P.F")	O	O	O	O
54….55	Reserve				
56	limitation Stator intensity command				
57…60	Reserve				
61	Ramp up cmd (with terminal 48) (see supervisor)	O	O	O	O
62	Power MCB auxiliary contact (common)	O	O	O	O
63	Power MCB auxiliary contact (NC)	O	O	O	O
64	Power MCB auxiliary contact (NO)	O	O	O	O

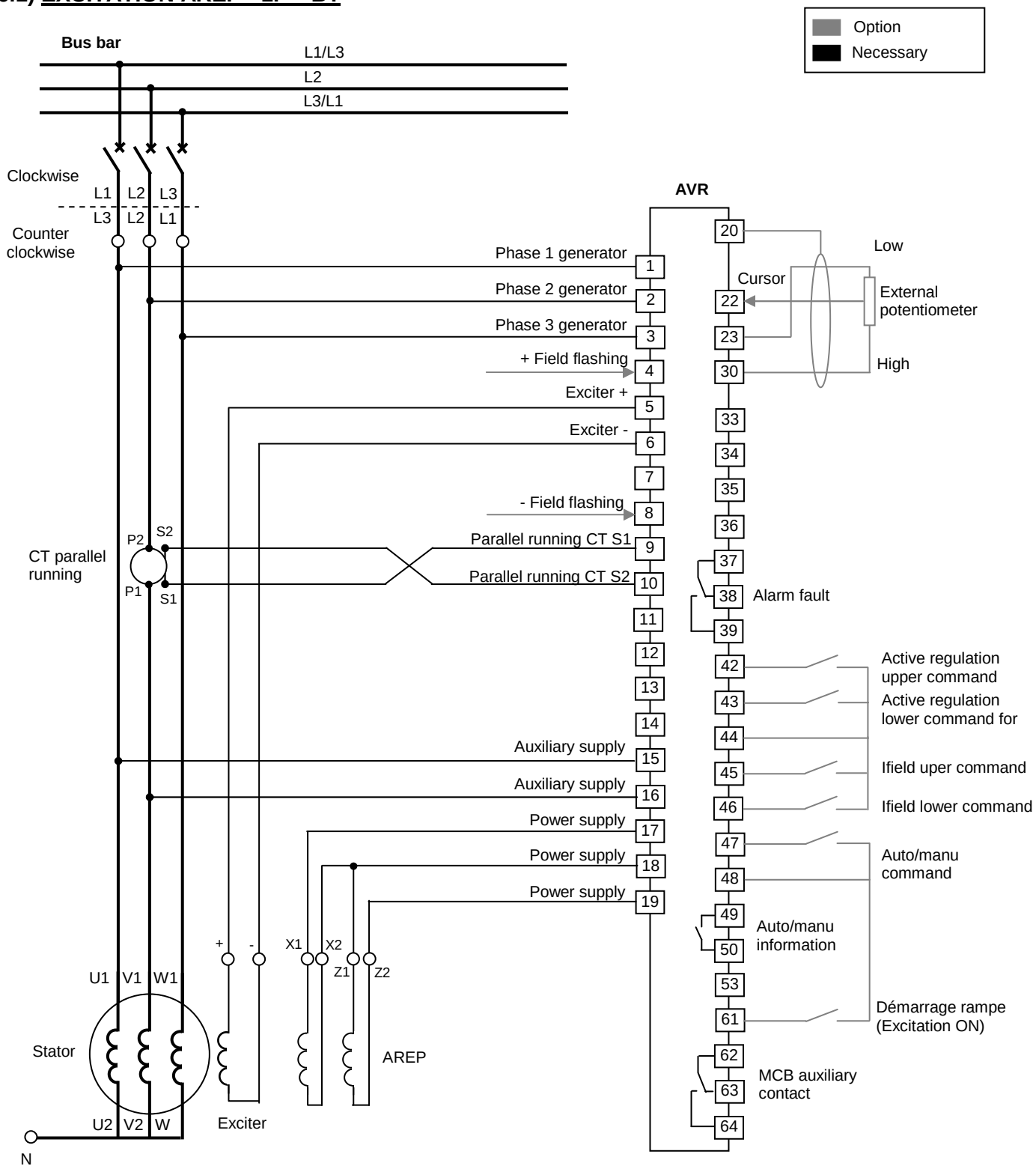
1F = Solo or // between machines operation
2F = 1F + // with the Mains
3F = 2F + Volt matching (U/U)

O = Optional wiring
N = Necessary wiring
Blank = N/A

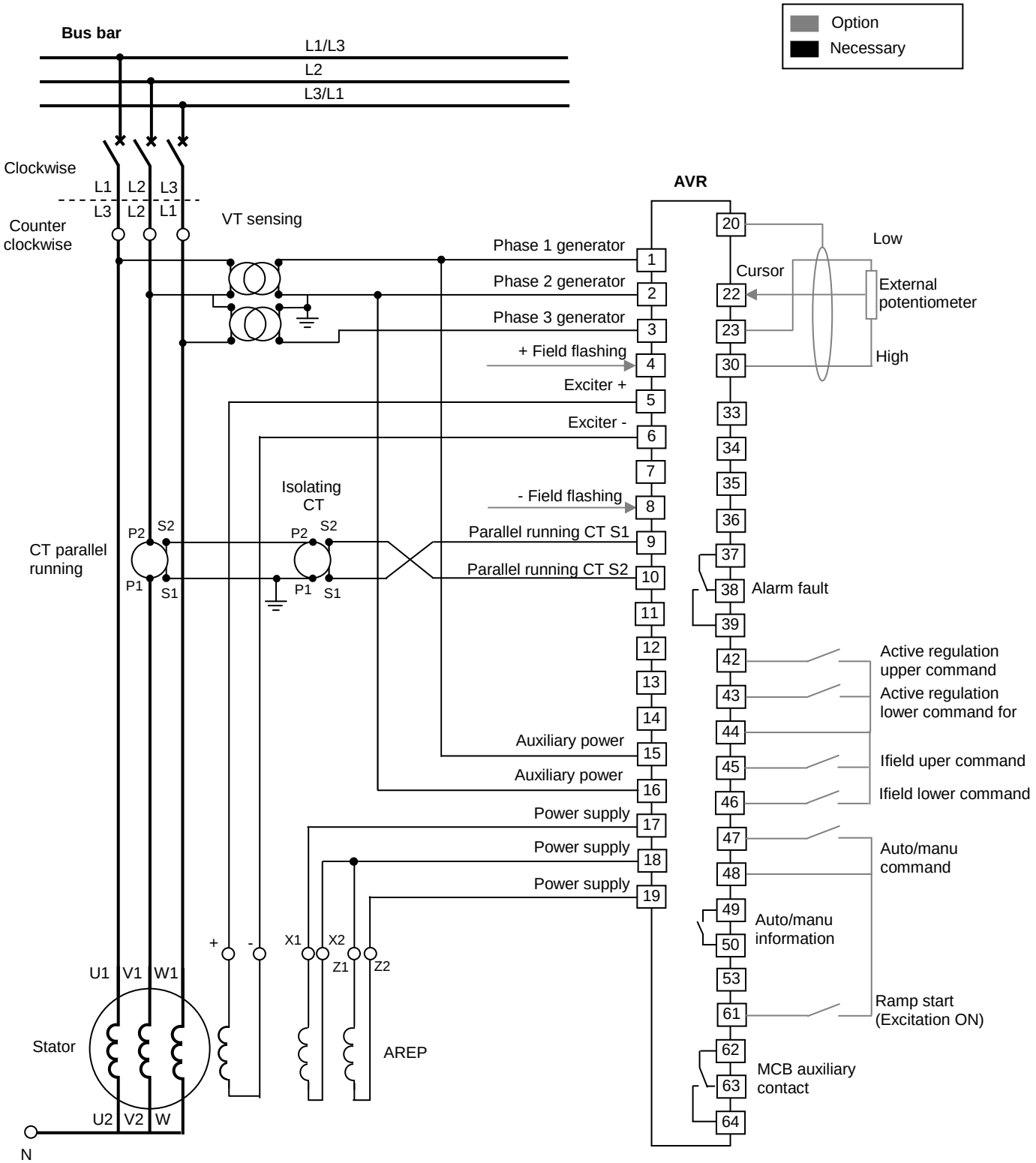
6) SCHEMAS D'INSTALLATION « TYPE »

Nota : The following figures are indicative. They can not substitute for diagrams supplied with the alternator.

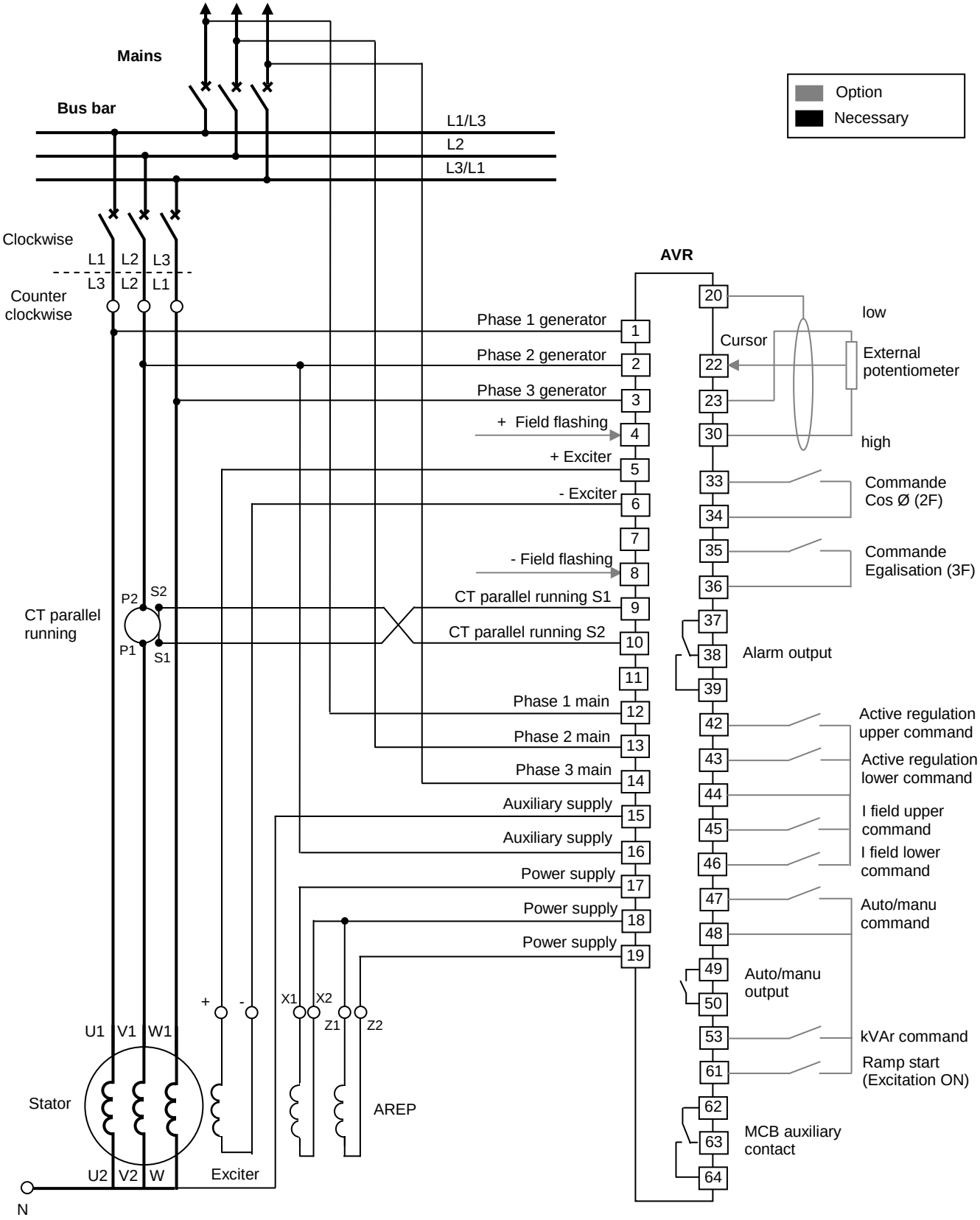
6.1) EXCITATION AREP - 1F – BT



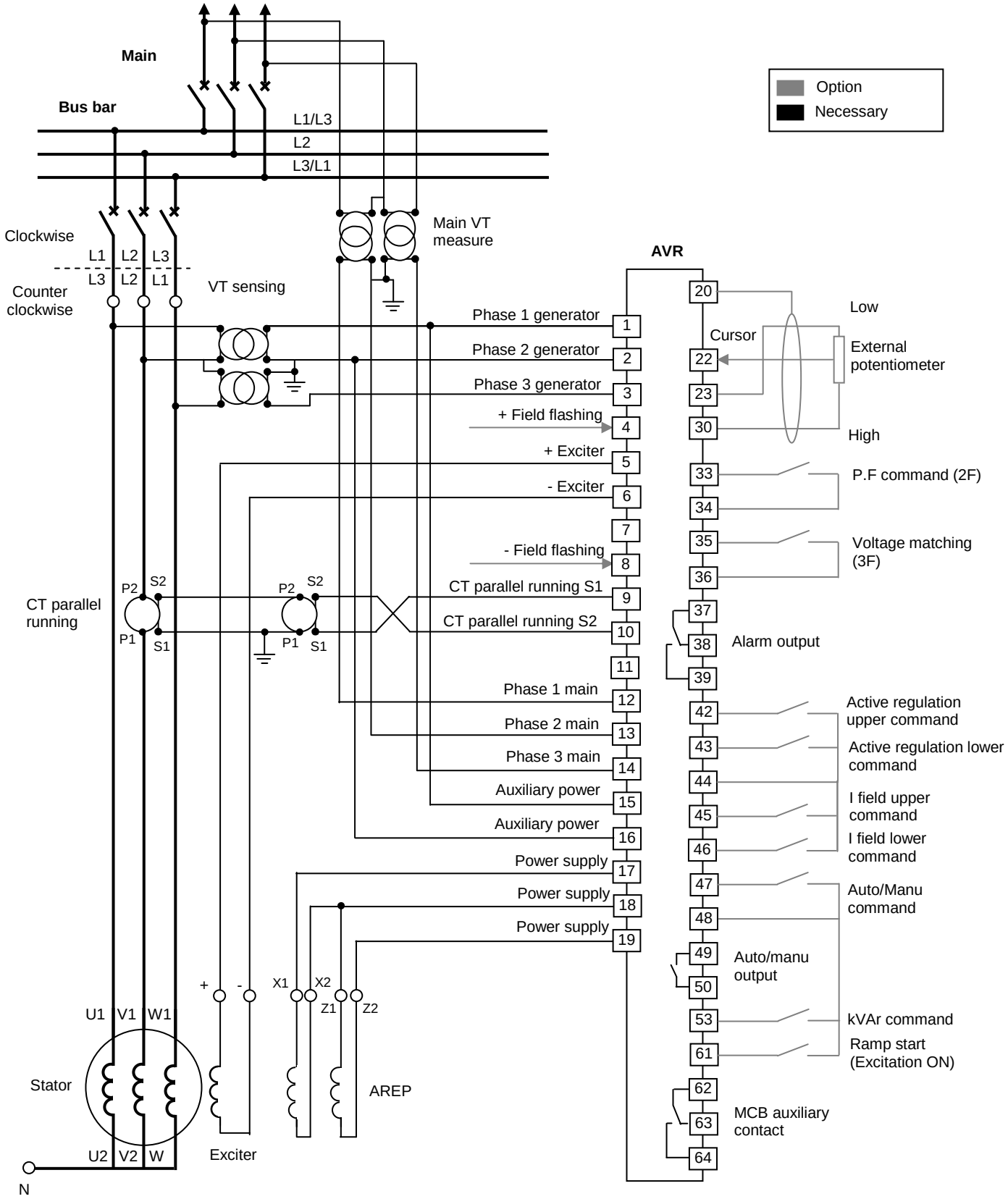
6.2) EXCITATION AREP – 1F –MT/HT



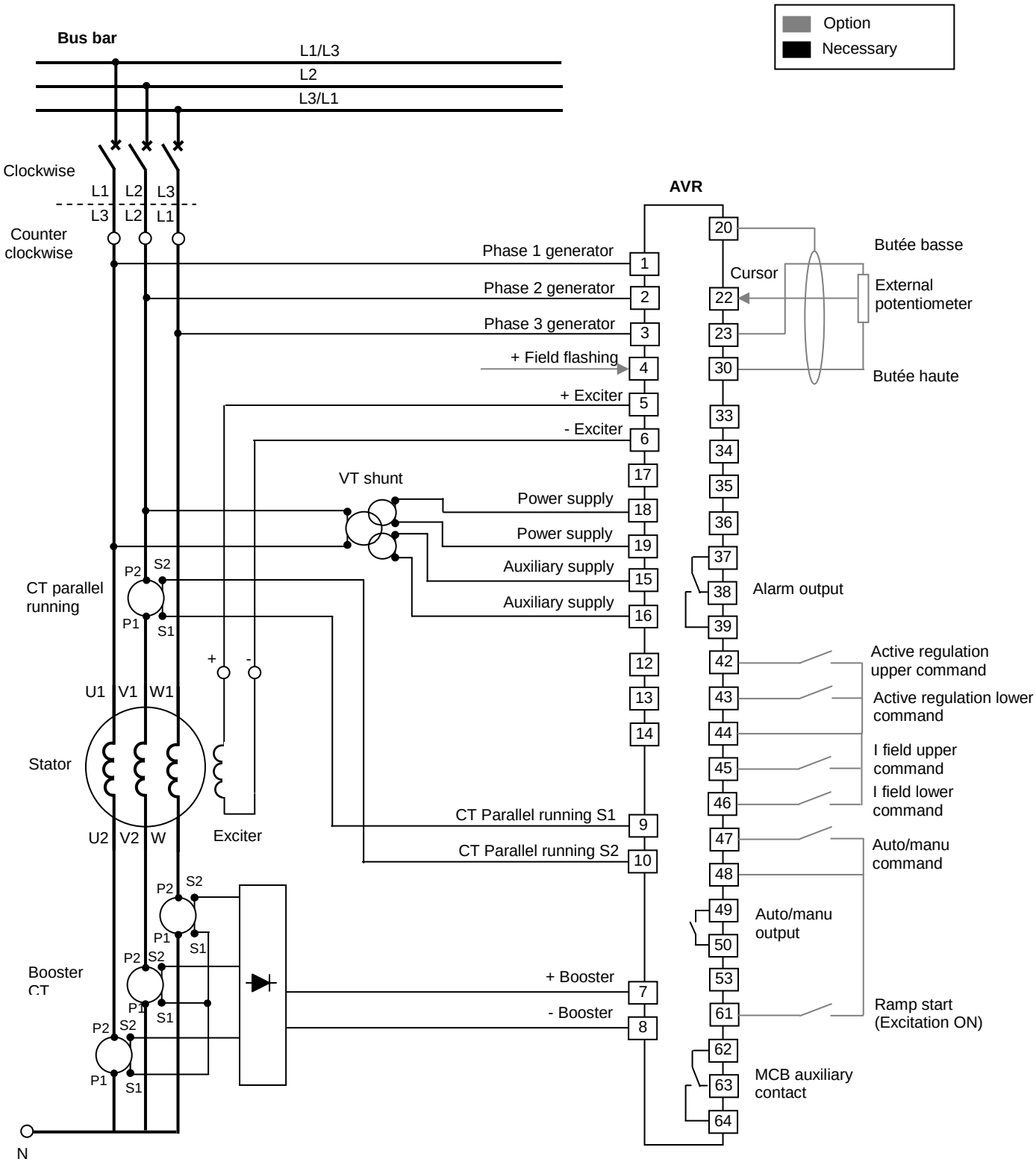
6.3) EXCITATION AREP – 3F – BT



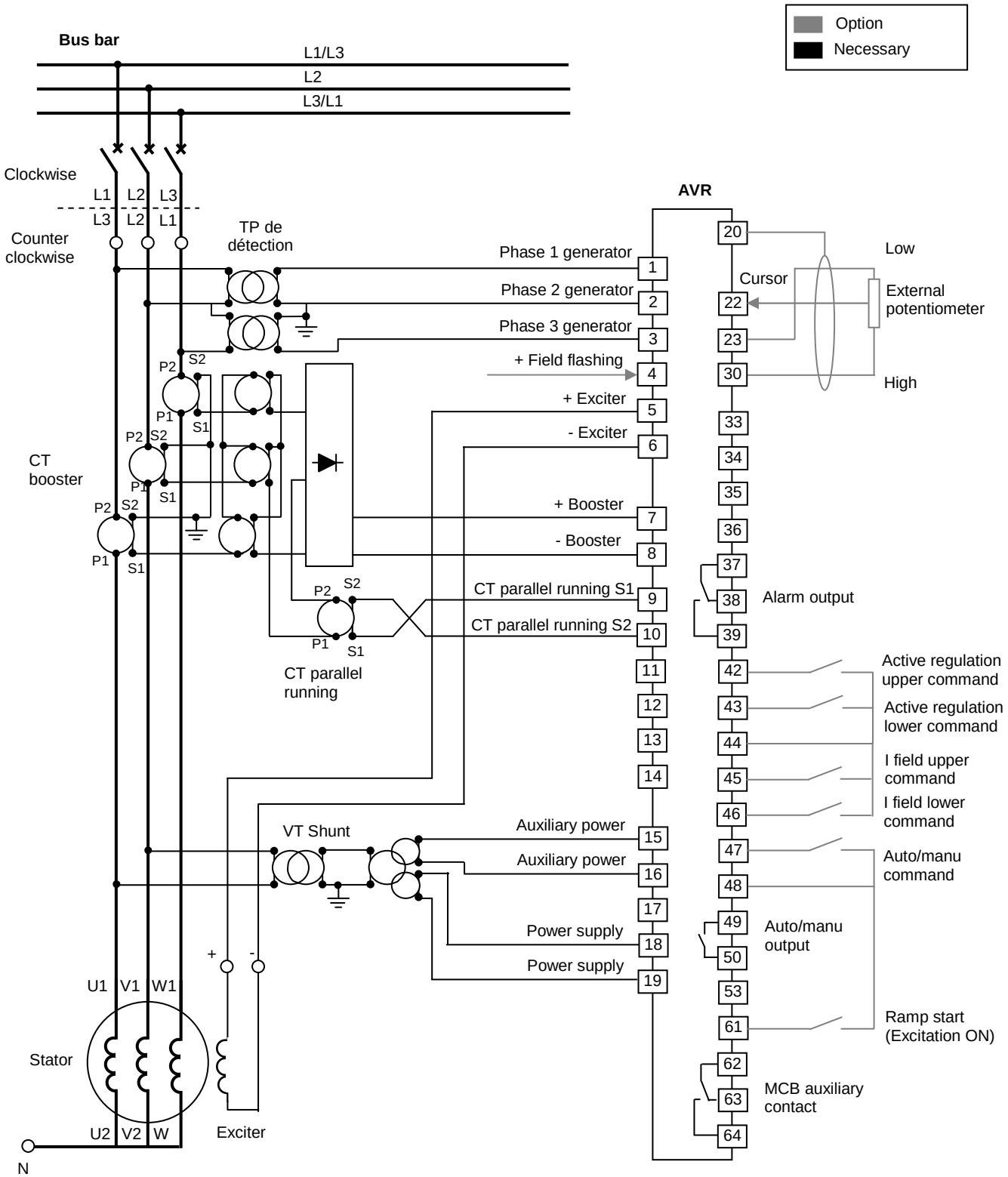
6.4) EXCITATION AREP – 3F - MT



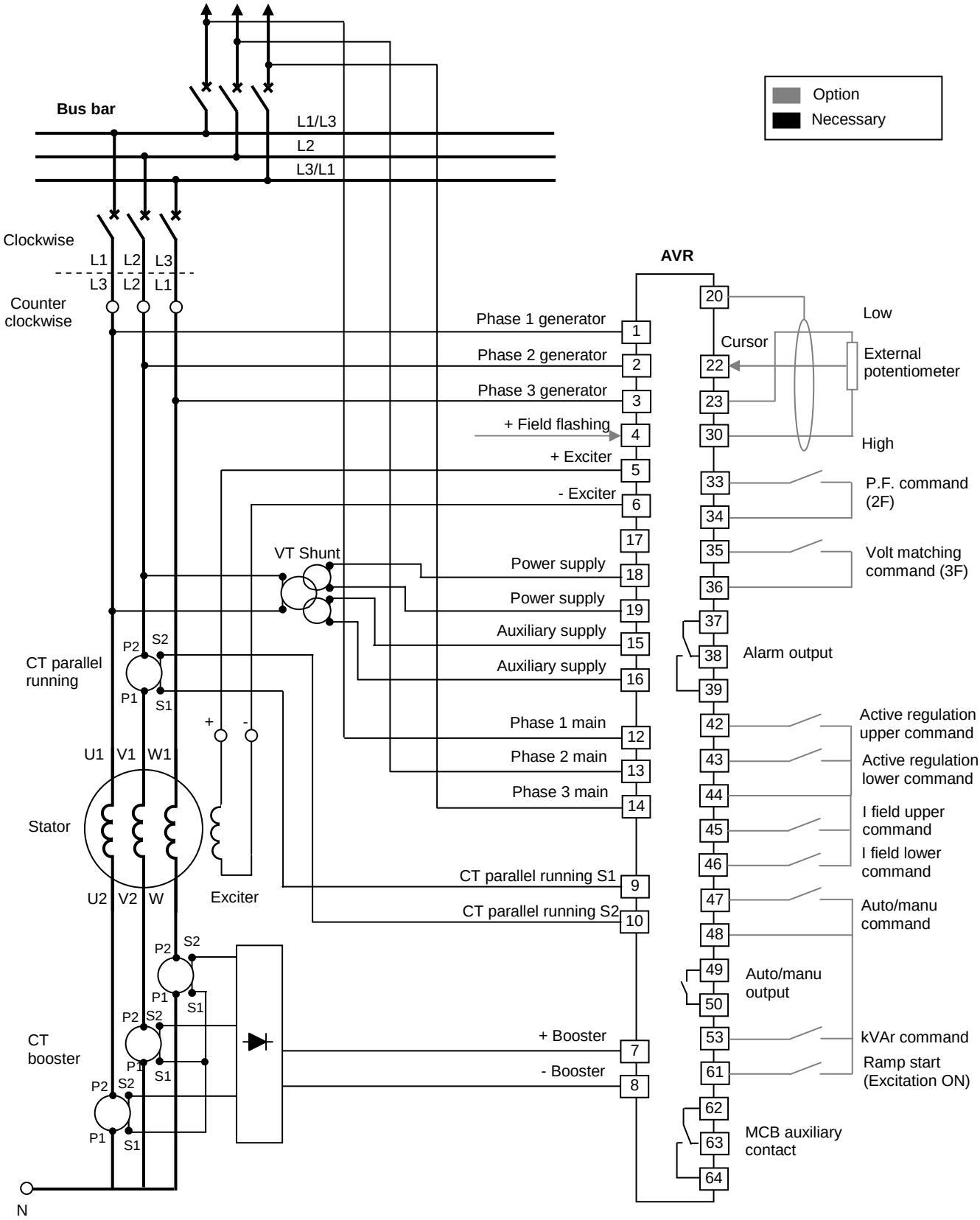
6.5) EXCITATION SHUNT+BOOSTER – 1F - BT



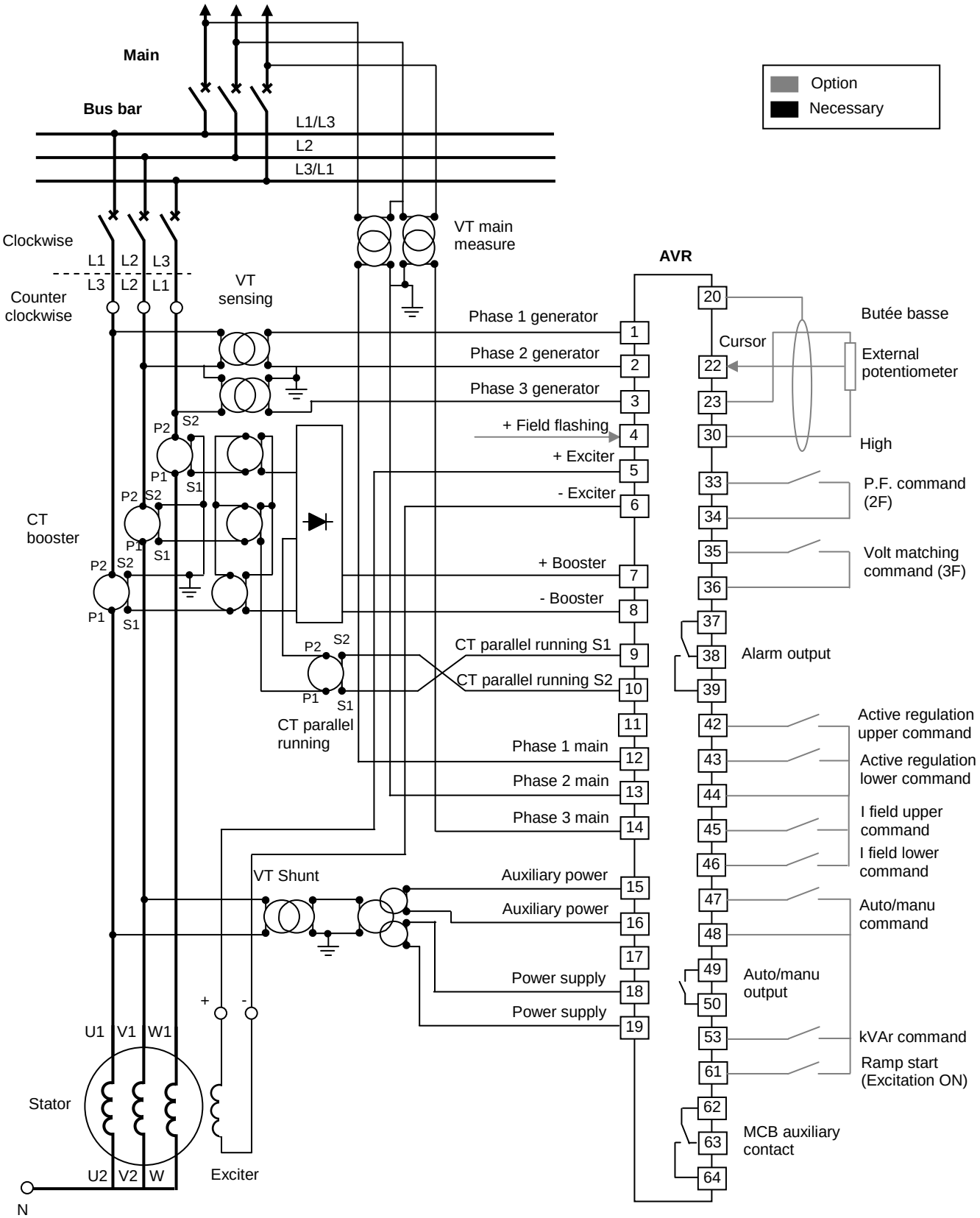
6.6) EXCITATION SHUNT+BOOSTER – 1F - MT



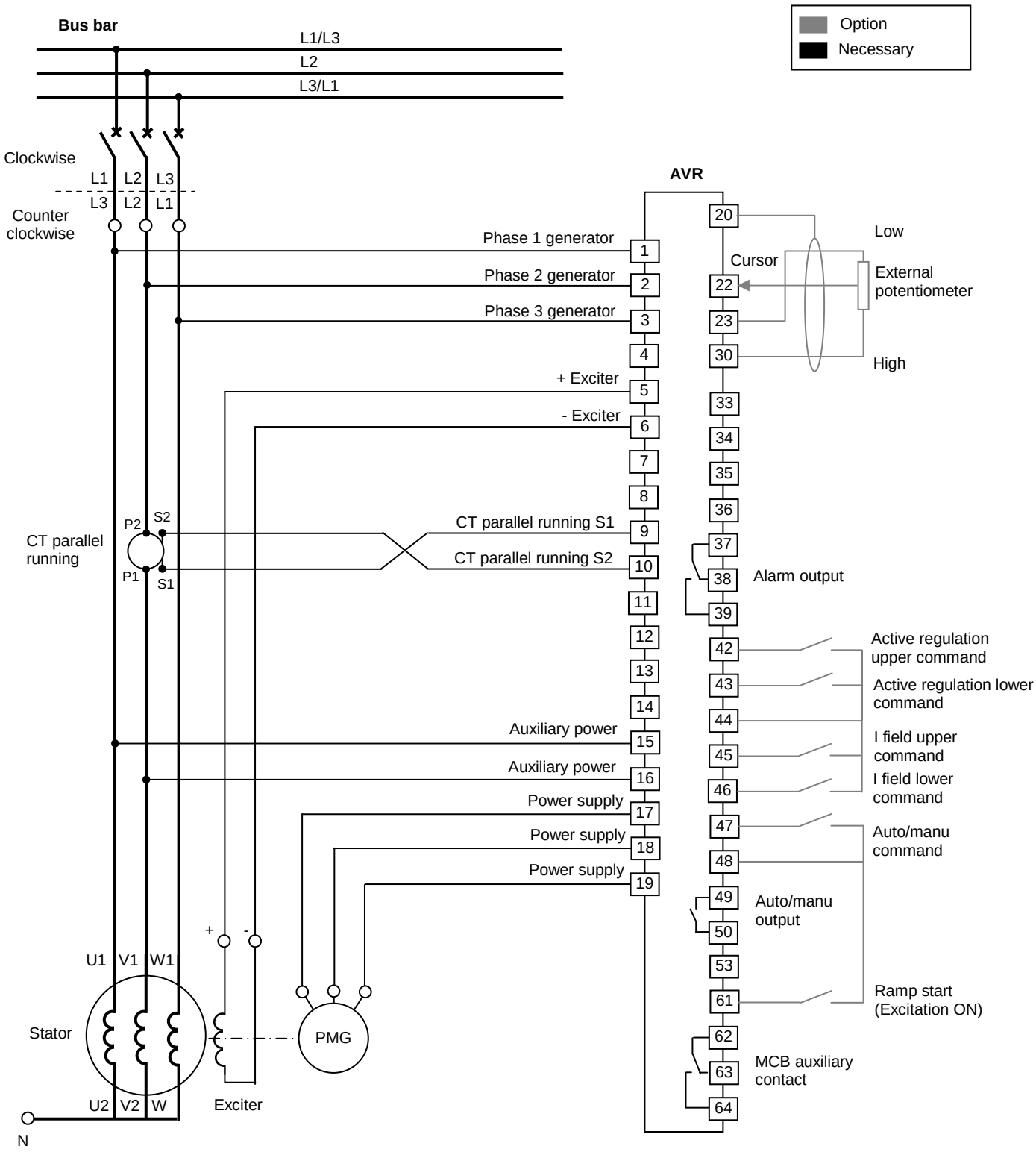
6.7) EXCITATION SHUNT + BOOSTER – 3F- BT



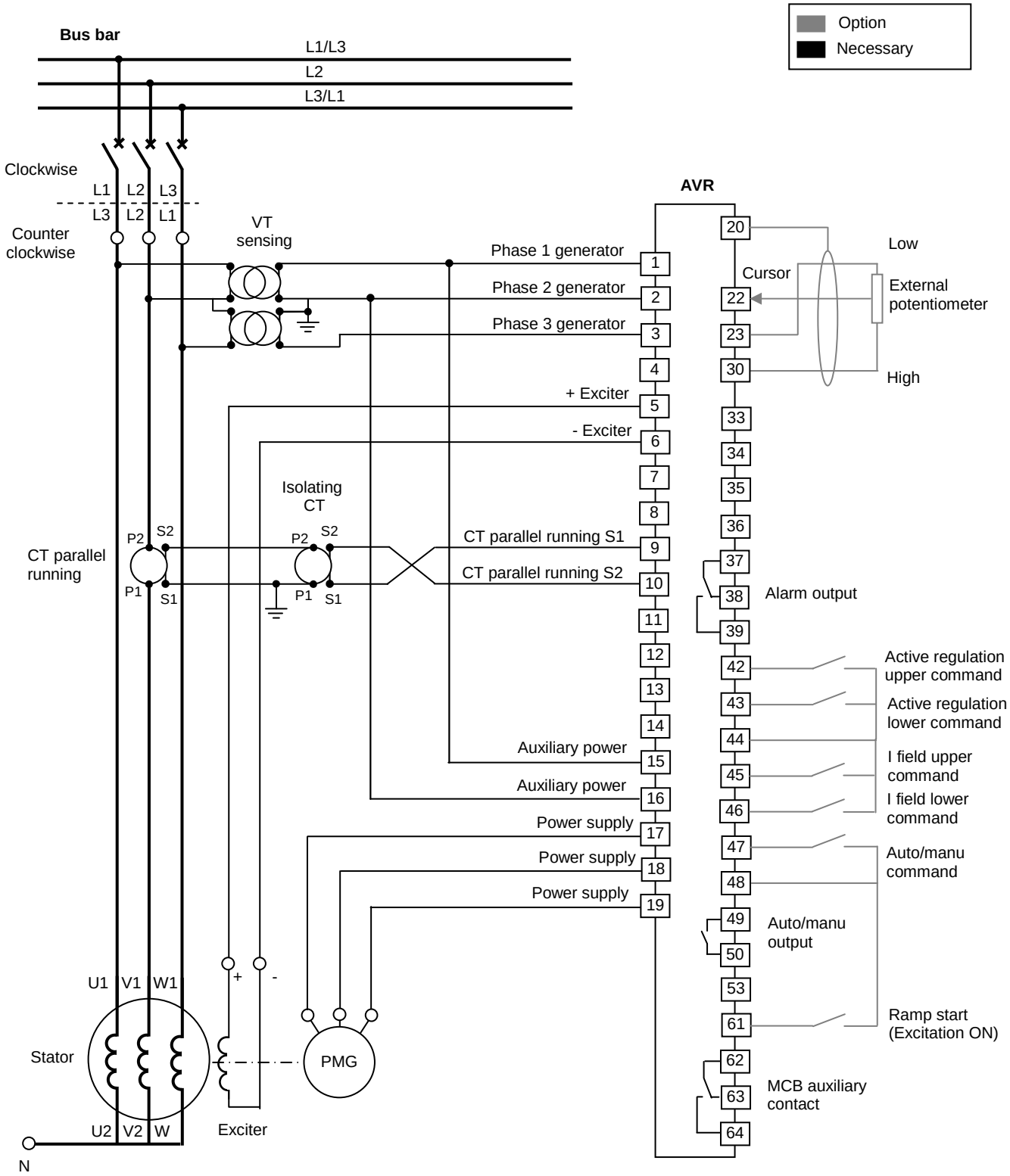
6.8) EXCITATION SHUNT+BOOSTER – 3F – MT



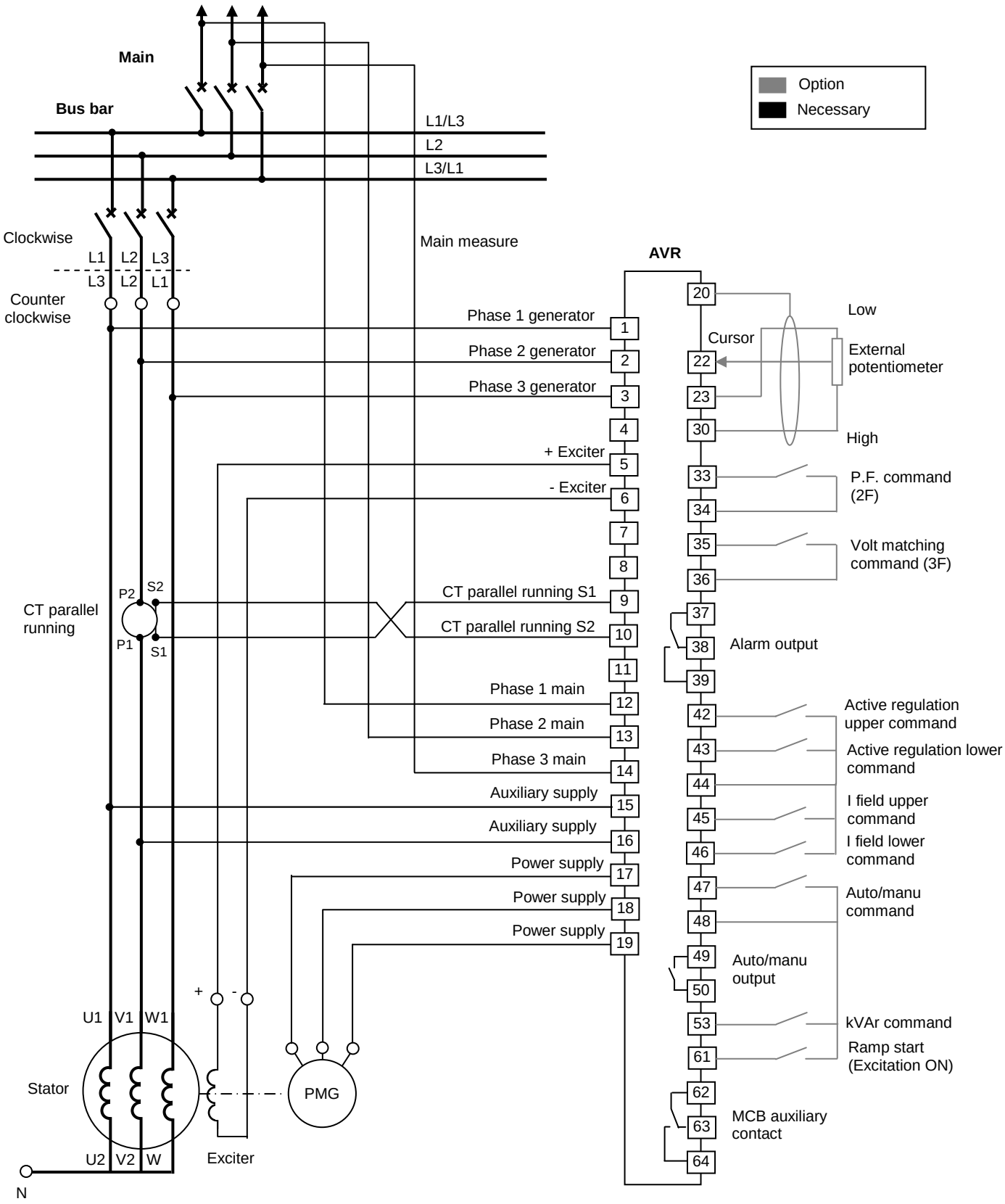
6.9) EXCITATION PMG – 1F – BT



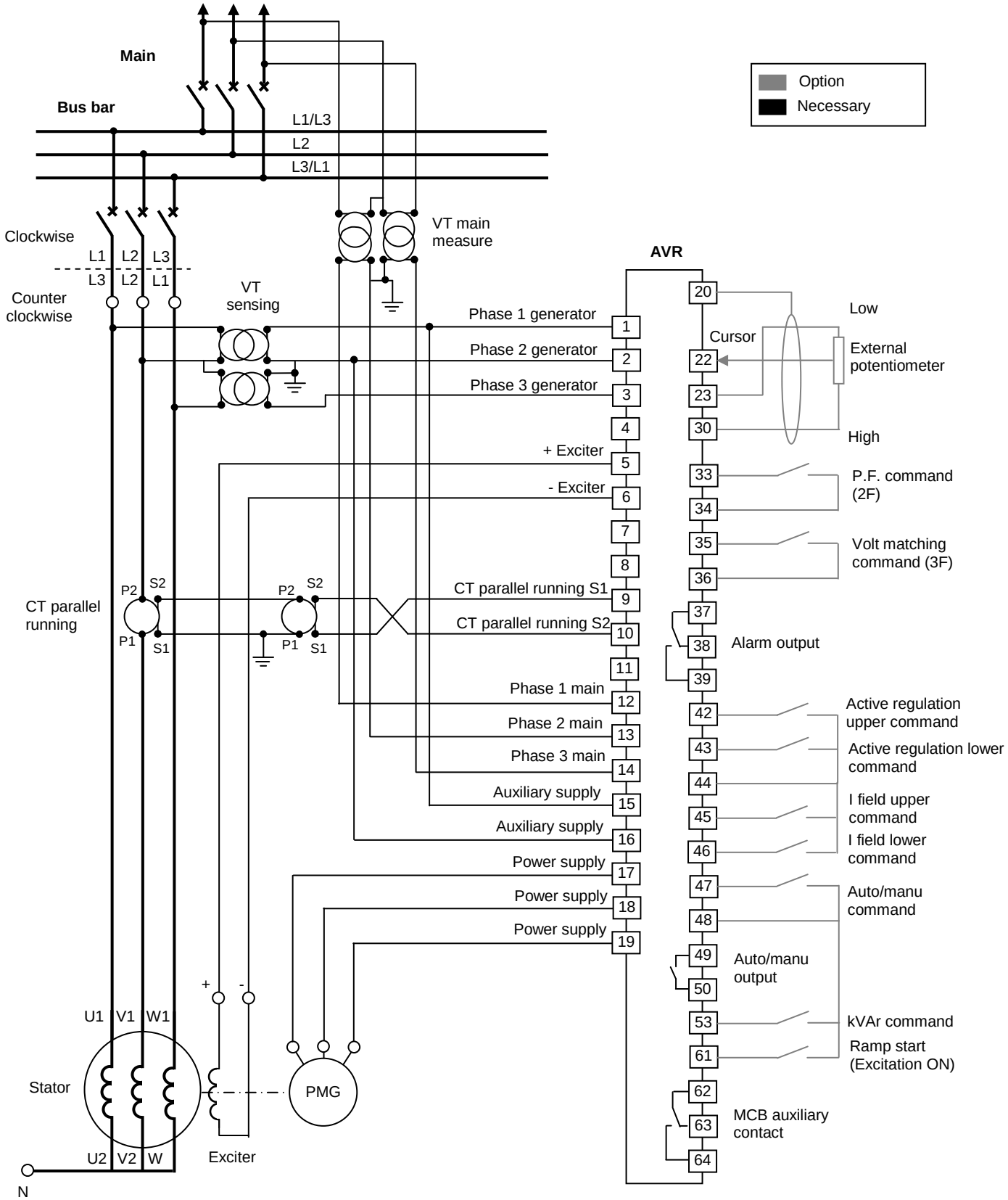
6.10) EXCITATION PMG – 1F – MT



6.11) EXCITATION PMG – 3F – BT

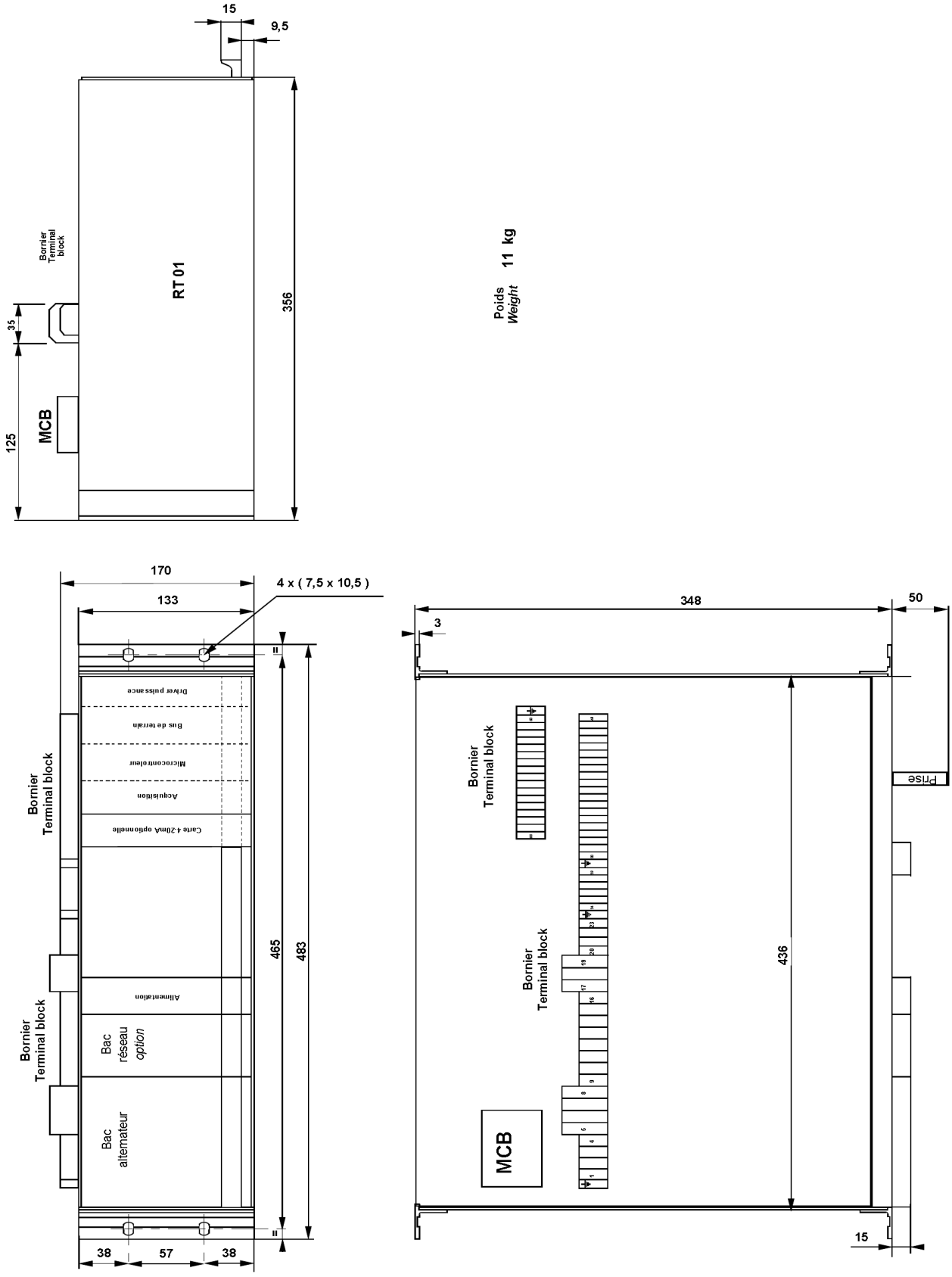


6.12) EXCITATION PMG – 3F – MT



AVR MODEL D630

7) AVR LAYOUT



8) GENERATOR I/O

8.1) FUNCTIONAL

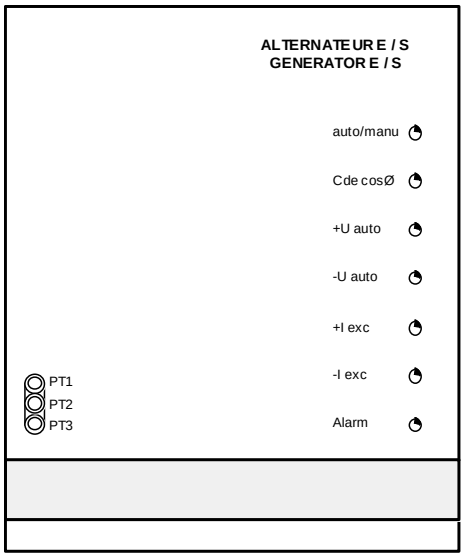
This unit is mainly an interface between external signals and low power electronics.
It is composed by :

- The adaptation three phase transformer between generator and mains input voltages (3F) and measurement circuits.
- The burden resistor of parallel CT.
- The adaptation transformer between input voltage and low power electronic supplies.
- The interface input relays between command / control terminals and internal circuits.
- The interface between 64pts BUS and the analog input / output terminals

8.2) SETTINGS

No one

8.3) GENERATOR I/O FRONT VIEW



8.4) LED

- LED 1 – AUTO/MANU : on when generator is on manual mode
- LED 2 – CMD COS Ø : on when P.F. command is closed on terminals (2F/3F)
- LED 3 – +U AUTO : upper regulation command is closed on terminals (push button for example)
- LED 4 – -U AUTO : lower regulation command is closed on terminals (push button for example)
- LED 5 – +I EXC : upper I field command is closed on terminals (push button for example)
- LED 6 – -I EXC : lower I field command is closed on terminals (push button for example)
- LED 7 – ALARM : on if a fault arrived on the power block.

Remark: Running one of these commands from the fieldbus communication, inhibits the functioning of the corresponding LED.

9) MAIN I/O (3F OPTION)

9.1) FUNCTIONAL

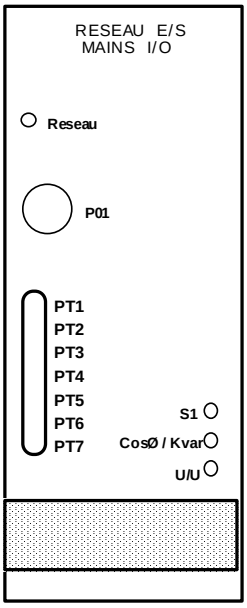
This unit is mainly an interface between external signals and low power electronics.
It is composed by:

- The adaptation three phase transformer between generator and mains input voltages (3F) and measurement circuits.
- The burden resistor of parallel CT.
- The adaptation transformer between input voltage and low power electronic supplies.
- The interface input relays between command / control terminals and internal circuits.
- The interface between 64pts BUS and the analogic input / output terminals

9.2) SETTINGS

- P01 : Mains input setting (factory preset)

9.3) MAIN I/O FRONT VIEW



9.4) LED

- LED 1 – RESEAU : on, when main voltage is present
- LED 2 – S1 : Reserve
- LED 3 – COS Ø / kVAr : on when P.F. command is closed on terminal block.
- LED 4 – U/U : on when volt matching command is closed on the terminal block.

10) SUPPLY CARD

10.1) FONCTIONNAL

- This card, from not regulated symmetrical voltage, generates +15Vdc, -15Vdc and the +5Vdc used by microcontroller.
- An external 24/48Vdc input allows the supply even machine at rest for communication with the supervisor (for regulator setting). A short cut of this external alimentation doesn't trouble the active regulation.

10.2) SUPPLY (J2)

- Terminal 1 : +24/48Vdc
- Terminal 2 : NC
- Terminal 3 : 0Vdc

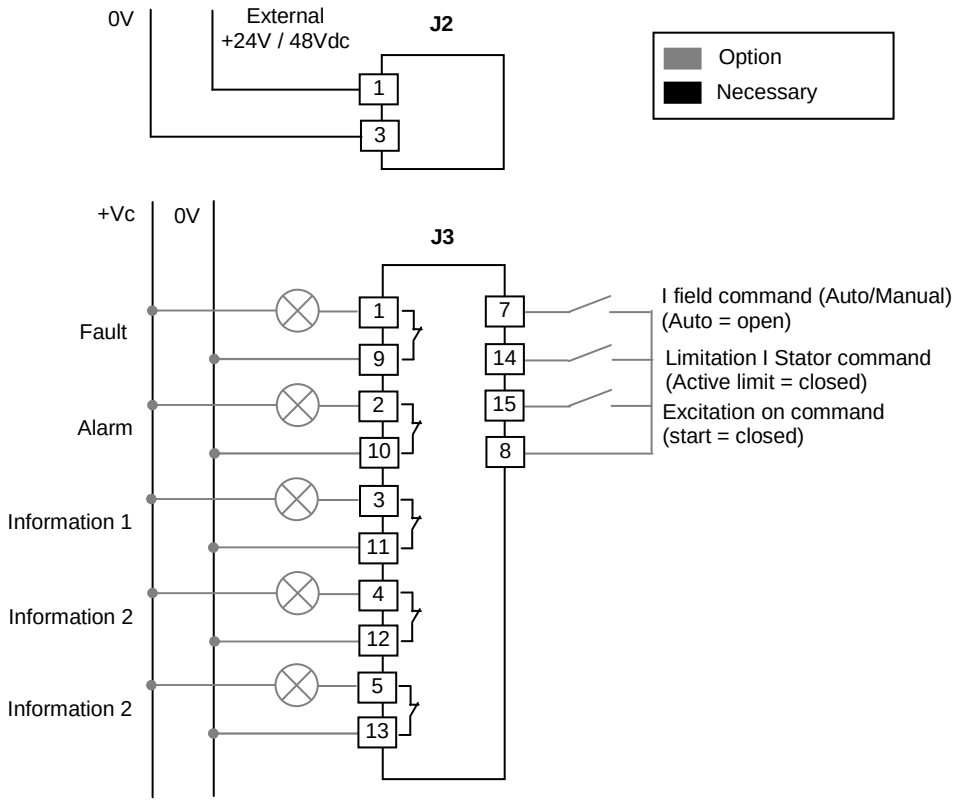
10.3) EXTERNAL INPUTS (J3)

- 7 / 8 : I field regulation command
- 14 / 8 : I Stator limitation
- 15 / 8 : Excitation ON command (see supervisor)

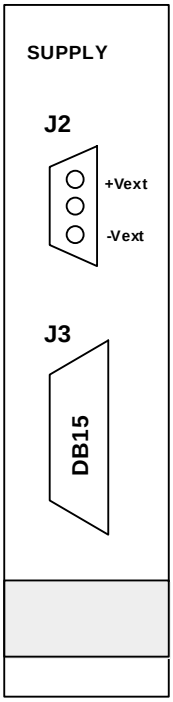
10.4) EXTERNAL OUTPUTS (J3)

- 1 -9 : Fault
- 2 -10 : Alarm output (see supervisor)
- 3 -11 : Info1 output (see supervisor)
- 4 -12 : Info2 output (see supervisor)
- 5 -13 : Info3 output (see supervisor)

10.5) SUPPLY CARD CONNECTIONS



10.6) SUPPLY CARD FRONT VIEW



11) ACQUISITION CARD

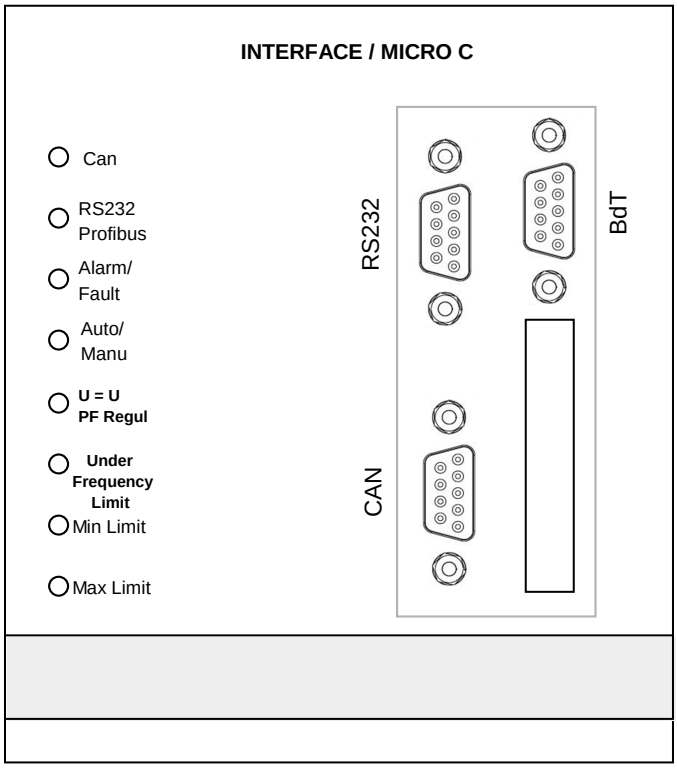
11.1) FONCTIONNAL

- This card is mainly an interface between analogic (voltage and current), logic I/O and the voltage level of the microcontroller (0-5Vdc)
- LEDs give from the microcontroller card, the different states of the system.
- **Communication is made with the microcontroller card through internal flat cable, it is necessary to unplug the two cards together.**

11.2) ADJUSTMENTS

None (see supervisor)

11.3) ACQUISITON AND MICROCONTROLLER CARDS FRONT VIEW



11.4) LED

- LED 1 - CAN : on, when CAN field bus is ok,
- LED 2 – RS232/Profibus: on, if there's the communication with supervisor, or if there's communication with field bus.
- LED 3 – ALARM/FAULT: on if a fault arrived on the acquisition card.
- LED 4 – AUTO/MANU: on if regulation is in automatic mode,
- LED 5 – U=U PF REGUL : on when equalization and main P.F.
- LED 6 – UNDER FREQUENCY LIMIT: on if under frequency.
- LED 7 – MIN LIMIT : on if low limit is reached
- LED 8 – MAX LIMIT: on if high limit is on.

12) MICROCONTROLLER CARD

12.1) FUNCTIONAL

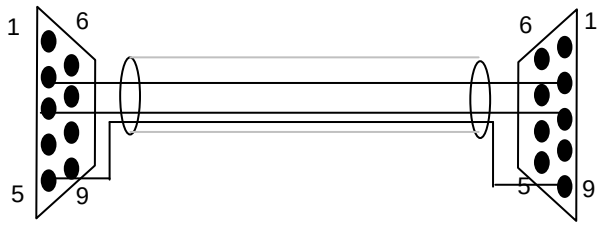
All the calculations, regulations and communications are made by this card

12.2) SETTINGS

- None (all by PC supervisor)
- Only 2 switch for soft flash (on the top and on the middle of the card)
- Switches :
  - To the front of the card = flashing.
  - Pushed to the back of the card = normal operation.
- Flashing procedure (see Supervisor D600 part)

12.3) INPUT / OUTPUT

12.3.1) WIRING DB9 D600 <-> PC



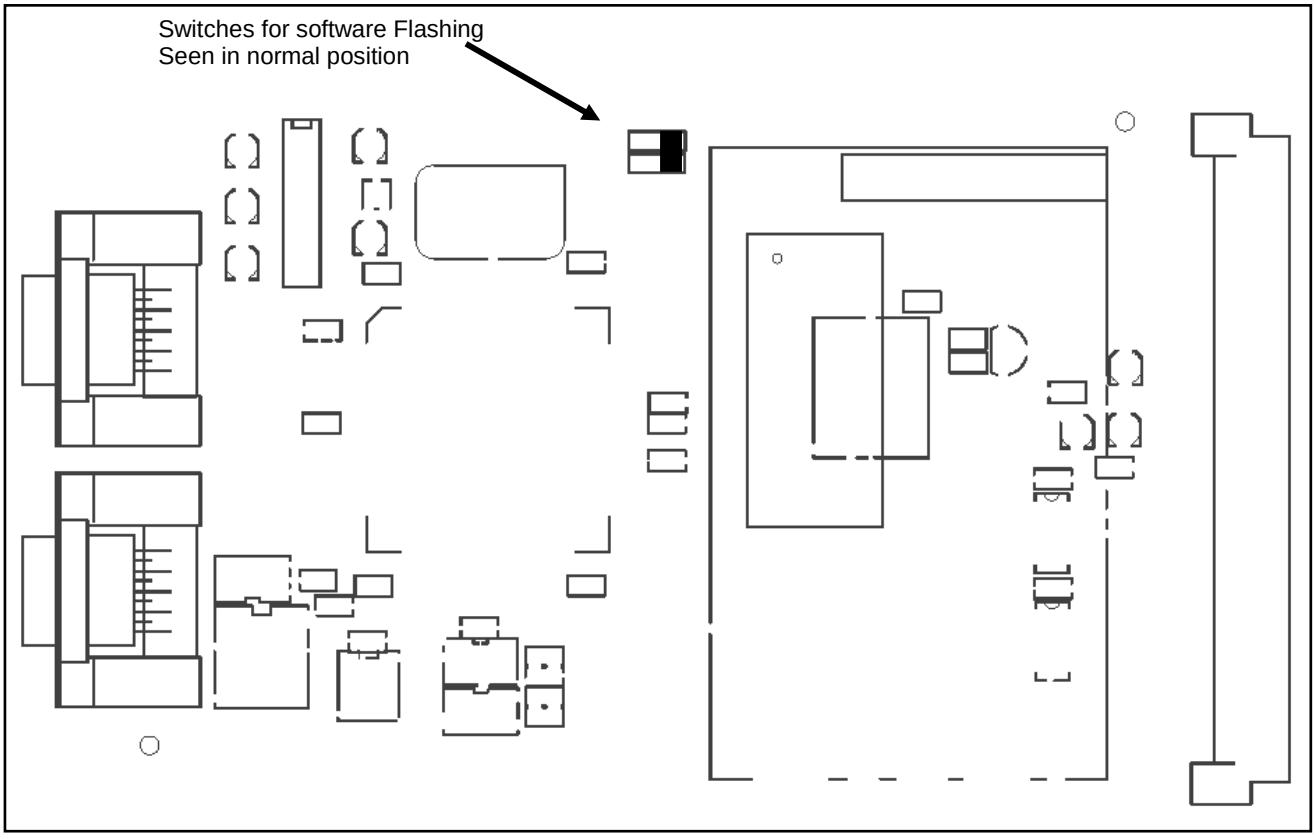
9 pts male
RS232
D600

9 pts female
PC

12.3.2) WIRING CAN

Future use, not connected

12.4) IMPLANTATION



13) DRIVER CARD

13.1) FUNCTIONAL

From the PWM of the microcontroller this card controls the field current given to the machine.

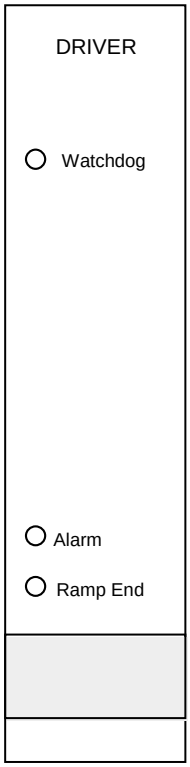
- It isolates also the power circuits command from the low level electronics.
- It measures and gives to the microcontroller isolated measures of the field current and of the voltage supply of power stage.
- A separate circuit monitors the switching of the power transistor and gives immediately an alarm in case of malfunction.
- The watchdog of the microcontroller is interfaced on this card.

13.2) SETTINGS

- P2: Calibration of Ifield measure.
- P1: Calibration of voltage supply measure

These 2 settings are factory made.

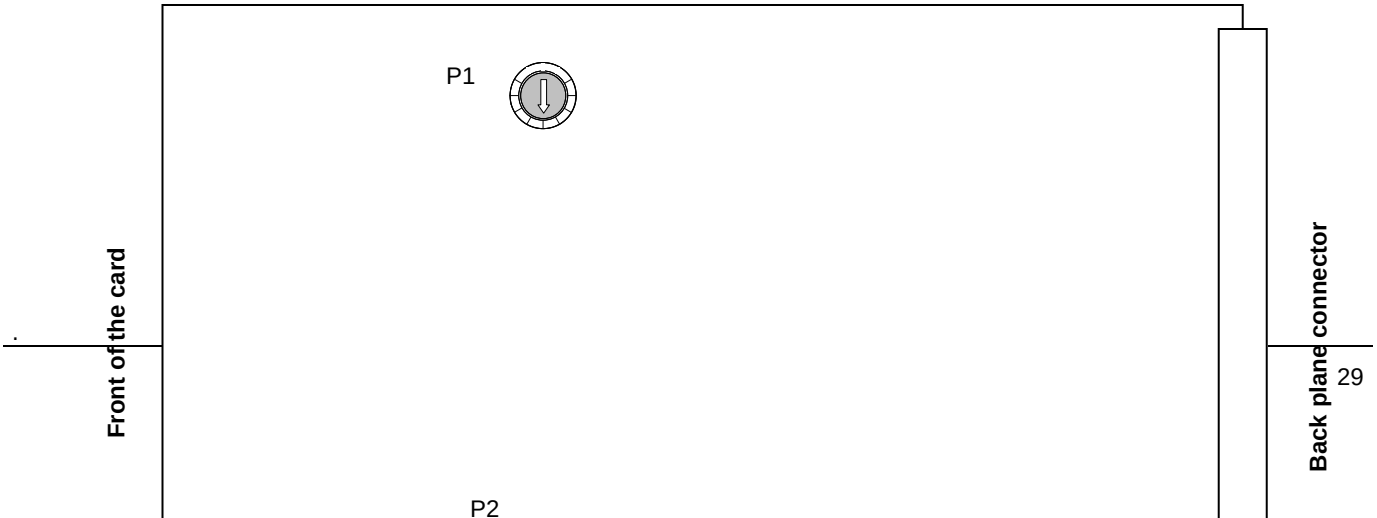
13.3) DRIVER CARD FRONT VIEW



13.4) LEDS

- LED 1 - WATCHDOG: Flashes. It represents the watchdog of the microcontroller.
- LED 2 – ALARM : on if a fault arrived on the driver card.
- LED 3 – RAMP END : on when the ramp is ended.

13.5) POTENTIOMETERS POSITIONS



Nota: Please, only touch to potentiometers positions with factory advice. You could totally disrupt your regulator

14) 4-20MA INTERFACE CARD (OPTION)

14.1) DESCRIPTION

This card is used when the P.F or KVAR regulation is wanted not at the generator terminals but at the mains input. For this a P.F or KVAR sensor with 4-20mA output is necessary and it must be located at the place where the regulation must be made.

14.2) FUNCTIONAL

- This card elaborates from 4-20mA signal an image of P.F (or KVAR) of the mains, The range between 4-20 mA and mains P.F is defined on supervisor screens.
- This kind of operation is indicated by the LED "L3" and by a contact (potential free) on the front connector.
- This type of running is selected by of a contact on front connector (7 and 9 on SubD contacts) and will be active on coupling (when contact between terminals 33,34 of main terminals will be closed). If the contact on front connector remains open, the regulation (P.F or KVAR) will be made at the

generator output, if it is closed, this is the 4-20mA information which is regulate function of the internal supervisor settings.

- If during operation, the measuring 4-20mA signal disappears, control returns automatically to regulation on the generator output side and this failure is indicated by LED L1 or L2 and by a contact on front connector.

- A second channel can be used as set point of the first channel or as a remote adjustment of the AVR (voltage, machine P.F or machine KVAR). The operating range is defined on supervisor screens. As on channel 1 if the 4-20mA disappears, output is inhibited and indicated by LED L2.

14.3) ADJUSTMENTS

Potentiometers: Factory preset, do not change the setting

Jumpers: they must be set as follow :

- CV1 A: If channel 1 used
- CV1 B: If channel 1 not used
- CV2 A: If channel 2 used
- CV2 B: If channel 2 not used
- CV3: Must be **B** position
- CV4: Must be **B** position
- CV5: Must be **A** position
- CV6: Must be **D** position

14.4) INPUTS / OUTPUTS

Front Connector (DB25)

- 13: Input + 4-20mA channel 1
- 25: Output 4-20mA channel 1

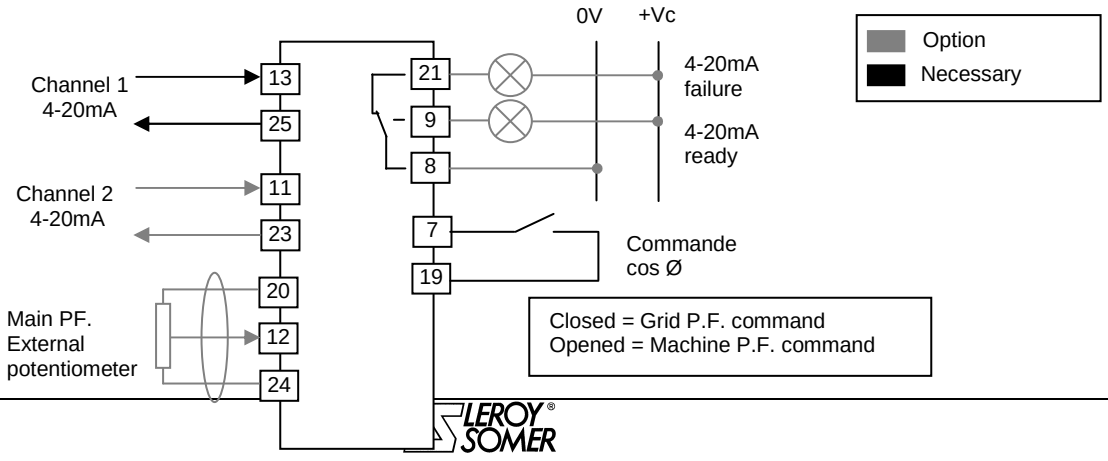
- 11: Input + 4-20mA channel 2
- 23: Output 4-20mA channel 2

- 12 : Extrernal potentiometer cursor for main P.F.regulation
- 20 : High
- 24 : Low

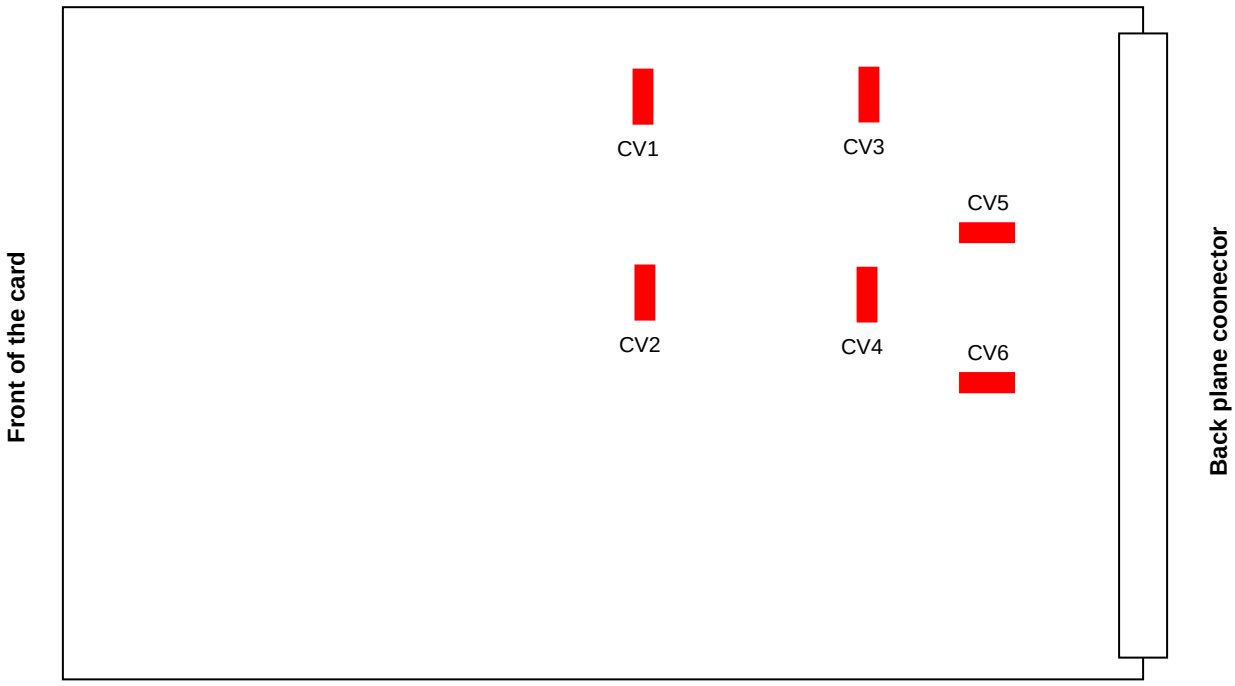
- 9: 4-20mA circuit open (NO)
- 21: 4-20mA circuit open (NC)
- 8: 4-20mA circuit open (Common)

- 7,19: Mains power factor regulation cmd

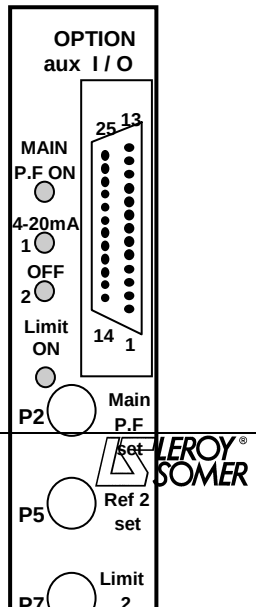
14.5) 4-20MA CARD WIRING



14.6) JUMPERS POSITIONS



14.7) 4-20MA CARD FRONT VIEW



14.8) LED

- LED 1 – MAIN P.F. ON: on when grid P.F. regulation is activated
- LED 2 – 4-20mA 1: on when 4-20mA opened on channel 1
- LED 3 – 4-20mA 2: on when 4-20mA opened on channel 2
- LED 4 – LIMIT ON: not used

15) SUPD600 SUPERVISOR

15.1) GENERALITIES

With SUPD600 supervisor offers possibilities to parameter different values of configuration, limitations and inputs and outputs of D600 regulator series. It also permits to control, with homepage, the regulation state and values of outputs as they are acquired by the regulator.

The exchanges with the regulator are carried out on the serial port RS232C COM1 of the PC.

15.2) SETUP

The SUPD600 supervisor can be set-up with the installation CD provided with your alternator, on a PC with Windows 98, 2000 or XP®. The operator interface exploits the possibilities related to this environment. Displacements in the screens are carried out, either using the mouse, or using the keyboard.
The pushbuttons give access the various functions software (launching of treatments, change of screen, etc).
The key < Escape > is reserved to exit the active windows The screens are sized with the format 800x600 256 colors.

15.3) APPLICATION LAUNCH

In the Windows 98, 2000 or XP environment, by double clicking using the mouse on the icon of the application.

15.4) SCREEN TYPE

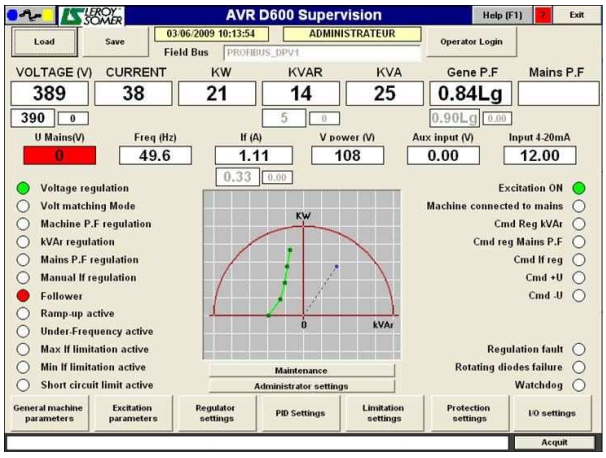
All the screens are composed of 3 distinct zones:
TOP OF SCREEN: This zone carries the title of the displayed window, as well as the two icons of access to the help (see Annex).
MEDIUM OF SCREEN: In this zone are displayed the various windows of the application, according to the requests of the operator.
These windows will allow:

- to visualize information coming from the D600 regulator
- to configure the D600 regulator

BOTTOM Of SCREEN: This zone (always present at the screen) is reserved for the display of the fault detected by the software, which can be removed by a pushbutton.

The messages are stored in a text file (SUP-D600\Data\HISTO_SUP.INI).

15.5) HOME PAGE



On the main screen, measurements of the D600 regulator are refreshed periodically. Measurements of voltage, current, kW, kVAr, kVA, P.F_M, U network, frequency, I field and V power in general change color according to their variation compared to nominal (as follows).

Color >+/- 10%: RED
Color >+/- 5%: ORANGE
Color 0 à +/- 5%: WHITE

Below the measured values, one finds the setting in progress (at least for the values of regulation), in black is given the setting of active regulation, the other settings remain shadowed as long as the associated regulations are not activated. It should be noted that the shadowed instructions are updated only when the associated regulations are activated.

On right-hand side of the measurement "aux input" is the measurement of the 4-20mA which appears only when one card 4-20mA is present in the regulator.

In the middle of the screen, the graph KW = f(kVAr) is plotted with the points of configuration (defined in the screen "Configuration limitations "), as well as the point of current operation.

Field Bus : It appears in this box, the type of Field Bus which equips the regulator and the state with its initialization.

Page select buttons :

- Access operator: Allows modification of the operator profile
- General machine configuration: Display the page of general configuration machine
- Configuration excitation: Display the page of configuration excitation
- Configuration regulator: Display the page of configuration regulator
- Adjustment PID: Display the page of adjustment PID
- Configuration limitations: Display the page of configuration limitations
- Configuration protections: Display the page of configuration protections
- Configuration I/O: Display the page of configuration inputs/outputs
- Load: The loading of a configuration stored on the PC allows.
- Save: Save the current configuration on the PC.
- Administrator Page: Display the administrator page.
- Close the supervisor: Quit SupD600 application.

Fieldbus :
This field shows the Fieldbus type (in red if it is not correctly initialized) or None it there is no fieldbus card inside the AVR.

15.6) OPERATOR ACCESS

The accesses are defined on 4 levels, from maximum level N1 to minimum level N4:

- N1 = Level Administrator ACEO
- N2 = Level Test bench / ASS ACEO
- N3 = Level Administrator CUSTOMER
- N4 = Level Operator CUSTOMER

- N1 access:

- Name: Administrator
- Password: Factory set

- N2 Access:
  - Name: Test bench or ASS
  - Password: Factory set

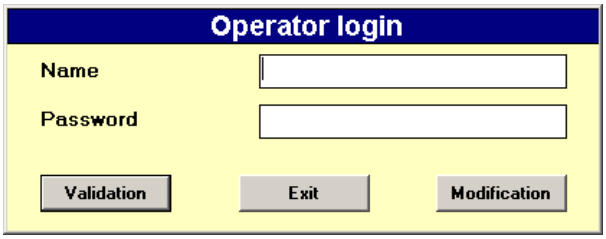
- N3 access:
  - Name: Admin
  - Password: Admin
  - This password can be modified by the Customer

- N4 access:
  - Name: User
  - Password: User
  - This password can be modified by the Customer

The operators of level 4 are configured by the administrator of level 3, which will define the accesses authorized in the window modification operator.

15.7) ACCESS OPERATOR WINDOW

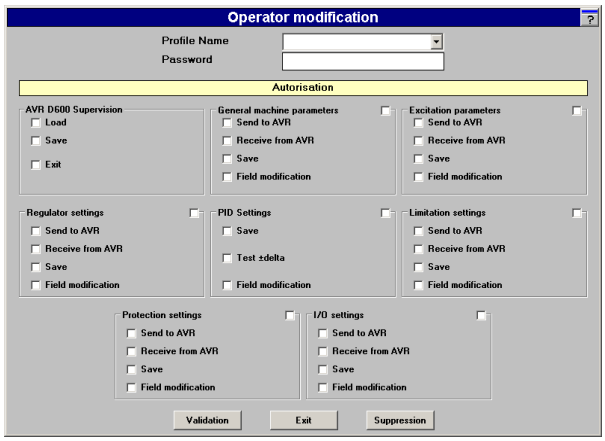
This window makes it possible to set or modify operator profile.



Buttons:

- Validation: Return to the principal screen after validity check of the inputs and update of the rights of access.
- Exit: Return to the principal screen without definite operator.
- Modification: Visualization of the window of definition of the access of level 4.

15.8) OPERATOR PROFILE PAGE



An operator "Administrator" can create, Modify or Remove operators.
The other operators cannot modify their password.

Each check gives the access authorization to the function to the operator concerned.
Example: the check "close the supervisor" authorizes this operator to leave the SupD600 utility.

Buttons:

- Validation: Validate the modification or creation of operators
- Exit: Return to the window of access operator
- Suppression: Delete the selected operator profile

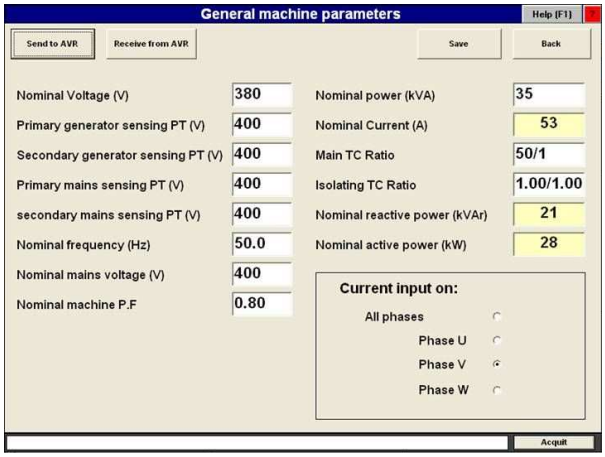
15.9) PUSH BUTTONS ON CONFIGURATION SCREENS

For all the screens of configuration, the pushbuttons are as follows:

- Send: After consistency check, load the data of the configuration typed into the regulator.
- Receive: download the current configuration from the regulator and display it.
- Save: Save the current configuration of the regulator in the PC (cf § 2.5.8).
- Back: Return to the homapage.

15.10) GENERAL MACHINE CONFIGURATION

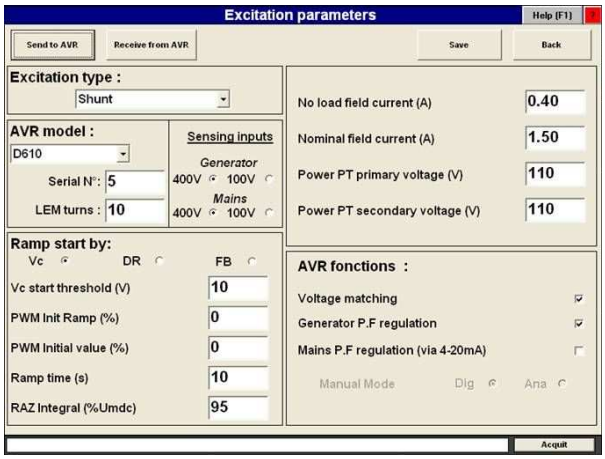
AVR MODEL D630



The modification of the values of nominal voltage, rated kVA or P.F involves the update of the values of rated current, kVAr and KW

- Nominal voltage: Nominal Generator voltage (between 0 and 20000V)
- Machine PT Primary voltage: between 0 and 20000V
- Machine PT secondary voltage: between 0 and 1000V
- Primary hands Pt voltage network: between 0 and 20000V
- Hands Pt secondary voltage: between 0 and 1000V
- Nominal Frequency: between 30 and 80Hz
- Nominal voltage network: Real nominal voltage of the network between 0 and 20000V
- Nominal P.F: according to the machine. Between 0.7 and 1.
- Nominal power: nominal kVA. According to the machine. Between 0 and 20000
- Nominal current: Calculated
- Main CT ratio: informed if supply MLS. From 0/1 to 15000/1
- Isolating CT ratio: informed if supply MLS. From 0/1 à 15000/1
- Nominal kVAr: Calculated
- Nominal KW: Calculated
- CT position: for future use.

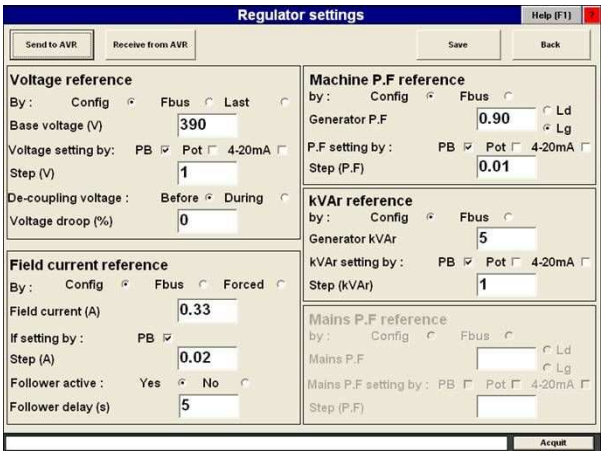
15.11) EXCITATION CONFIGURATION



This page permits to modify the following parameters:

- Excitation type: Shunt, Shunt Booster, AREP or PMG
- Regulator model : D610 or D630
- Serial number : Normally informed on test bench during factory test
- Hall sensor turns : Normally informed on test bench during factory test. Between 1 or 10.
- Ramp up start : Start mode selection
  - Vc : From the power supply voltage Vc
  - Dr : From a terminal block input
  - Fbus : From the Field Bus (Profibus for example)
- Vc threshold start : Voltage value allowing the ramp up start
- PWM Init Ramp : PWM init value at ramp up starting
- Initial PWM: PWM init value before ramp up starting. Between 0 and 100
- Ramp time : Ramp up time from 0 to If in short circuit (stopped at Un)
- Integral erase value: PID integral erasing value (in general 95%). Between 0 and 100
- No load field current: Between 0 and 50
- Nominal field current : Between 0 and 50
- Power PT primary voltage: Between 0 and 20000V
- Power PT secondary voltage: Between 0 and 20000V
- Regulator functions : 0,1,2 or 3F with or without I field regulation

15.12) AVR CONFIGURATION



The parameters "configuration" of the Voltage, Running Excitation, P.F_Gen, P.F_Mains and kVAr zones are visible only if the adjustment is made according to the "Configuration".

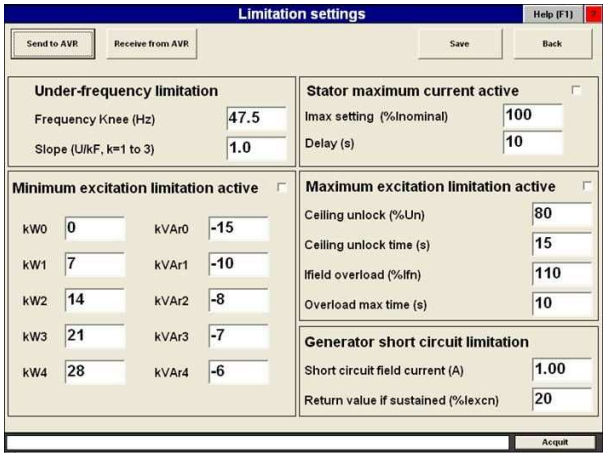
In the same way, the parameters "increment" of these same zones are visible only if the adjustment is made by "PB".

The selection in one of the zones of the adjustment by Pot or 4-20mA cancels the possibility of selection of this type of adjustment in the other zones.

In the zone "Adjustment of excitation current" , "Forced" check box makes operation of the regulator in "forced" manual as soon as one actuated the button "Send" independently of the state of the external contact (case of D630). When this box is stripped, one will turn or not in normal regulation according to the state of the external contact (case of D630).

- Voltage setting
  - According to config: will always start at the voltage set in "Voltage configuration"
  - According to Fbus: The voltage will be defined by the FieldBus (Profibus by ex)
  - Before stop: will start with last the voltage setting under operation
  - The voltage could be adjusted under operation by pushbutton (PB), by potentiometer input (pot), by a 4-20mA (requires a 4-20mA card) or by Fbus
  - Voltage on decoupling (before or during):
  - When decoupling from the network, gives the choice to remain at the voltage of the network (during) or to return to the voltage as it were before the coupling with the mains (before)
- Generator P. F setting:
  - According to config:
  - According to Fbus:
  - The P.F could be adjusted under operation by pushbutton (PB), the input potentiometer (pot) or by a 4-20mA (4-20mA card required) or by FieldBus
- kVAr setting :
  - According to config:
  - According to Fbus:
  - kVAr could be adjusted under operation by pushbutton (PB), the input potentiometer (pot) or by a 4-20mA (4-20mA card required) or by FieldBus
- Mains P.F setting (greyed if a 4*20mA is not present :
  - According to config:
  - According to Fbus:
  - P.F_M could be adjusted under operation by pushbutton (PB), the input potentiometer (pot) or by a 4-20mA (4-20mA card required) or by FieldBus
- Field current setting (manual mode) :
  - According to config: The command is done by contact on terminal block (D630) or by check box "Forced" (D610) and the adjustment by the config setting
  - According to Fbus: The command and/or the adjustment of the field current regulation are done by FieldBus
  - Forced: Allows to go directly in field current regulation through the supervisor.
  - The current could be adjusted under operation by pushbutton (PB) or by FieldBus.

15.13) LIMITATIONS CONFIGURATION



- Under frequency Limitation: The slope and the knee of operation in Under speed are here defined.

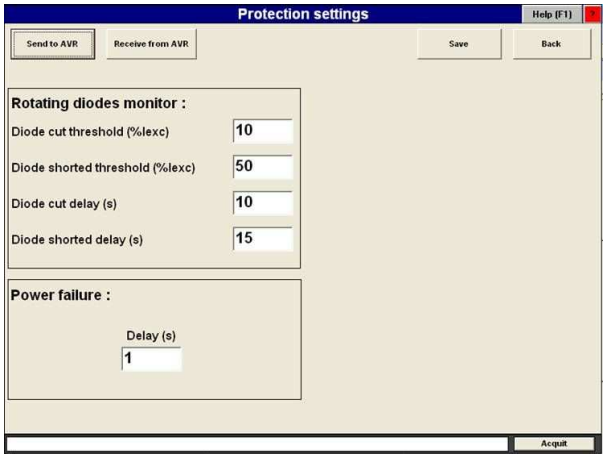
- Stator current limitation: This limit value is determined in time and value. At the end of the time delay, I field current go down to I field nominal current value.

- Excitation Minimum Limitation: The 5 co-ordinates (kW/kVAr) determine the curve which is displayed on the mains screen, the point of operation will be corrected if need be not to be has left curve thus plotted. This limitation is active only if the box "Excitation Mini Limit active" is checked.

- Excitation Maximum Limitation: The thermal overload in value and duration is given at this place; it is in general regulated for 110% of the nominal current. The value and the time of forcing ceiling set the fall of voltage one authorizes the excitation has to go up at its maximum and for how long (if the voltage did not go up before). These operations are activated only if the maximum box "limit of active excitation" is checked.

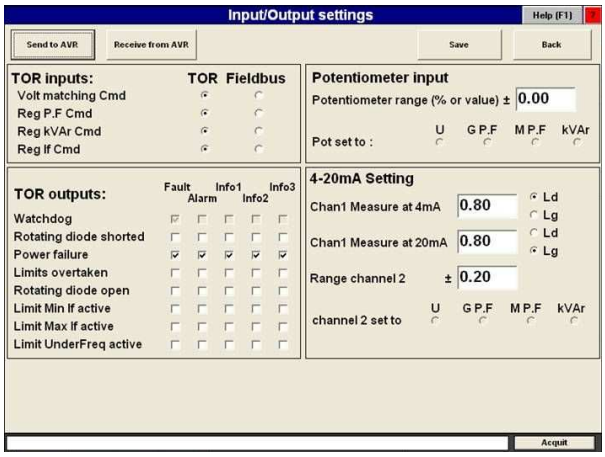
- Short Circuit field current limitation: Determines here the value of the operate current when the machine is in short circuit on the stator. This value will be maintained 10 seconds in the event of short maintained circuit. Beyond this time, the operate current will be brought back has the value specified in the box "Sustained Fault return value ". It should be noted that this limitation is ALWAYS active, independently of the state of check box "Excitation Max Limit active "

15.14) PROTECTION LIMITATIONS



Rotating diode failures are defined with a value and a time delay. It's not allowed to modify these values without referring back to the factory.

15.15) INPUTS/OUTPUTS CONFIGURATION



For the correspondence 4-20mA, as well as the entry potentiometer, their assignment is recalled, according to the definition carried out in the screen "Configuration Regulator".

- Logic Inputs :
  - Origins of the logic commands which activate the regulator are given here.
  - It should be noted that they are only the command. The adjustments must be set in the screen "Configuration Regulator".

- Logic outputs
  - Origins of the logic outputs, on the front of power card, are given here.
- Watchdog is automatically affected to the fault output (on a dry contact of the regulator), because if microcontroller doesn't work anymore, no one output will be activated.

15.16) LOADING CONFIGURATION

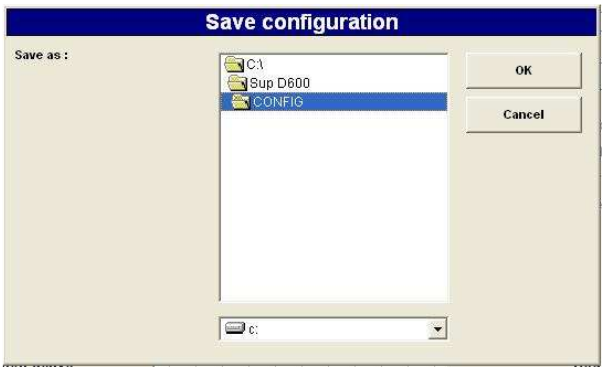
This window allows loading a configuration previously stored with possibility of change the default directory on the PC.

The data of the configuration are read and then displayed in all the screens of configuration. The update of the configuration of the regulator is made using the pushbuttons "Send".

Push Buttons :

- OK : Reading of the configuration file selected and update of the displayed data.
- Cancel : Back to the main screen without modification of configuration.

15.17) SAVING CONFIGURATION

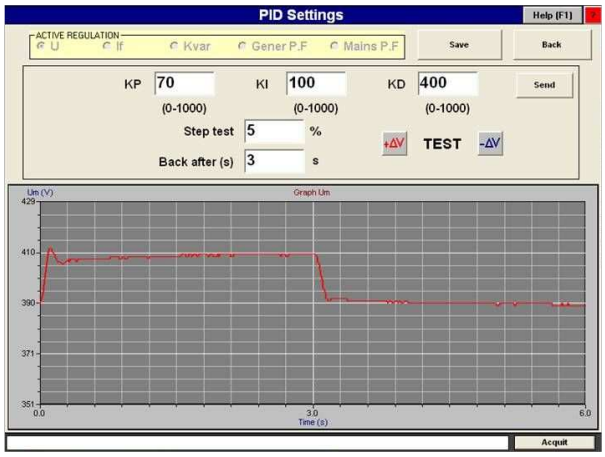


This window allows the saving of the current configuration of the regulator with possibility of modifying directory on the PC (by default, SUP-D600\Config).
The file of configuration is named: YYYYMMDDhhmmss.CFG and the file is in text format.

Push Buttons :

- OK : Saving of the current configuration of the regulator in a YYYYMMDDhhmmss.CFG file in the directory selected by the operator.
- Cancel : Back to the main screen without saving the configuration.

15.18) PID SETTING



On request for test (pushbuttons +Δ and –Δ), after control and validation, makes a step in the active regulation at the level input and on the double of the duration input and plot it on the screen.

The step values are validated and sent to immediately to the D600 as soon as + ΔV or –ΔV buttons are pushed.

The coefficients are those affected to the active regulation (different PID for each regulation)

Push Buttons:

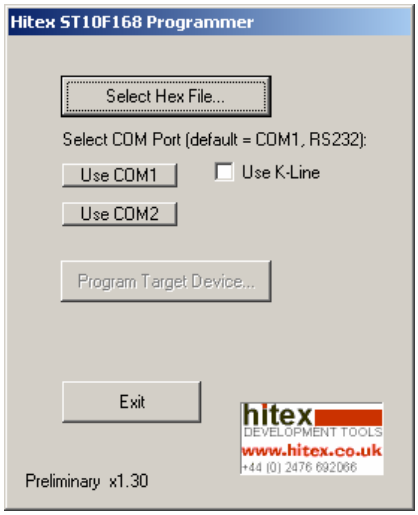
- Save: Save the current configuration of the regulator (cf. § 2.5.8).
- Back: Back to the main screen.

15.19) FLASHING THE REGULATOR

This procedure must be used only on emergency case or important fault of the regulator.

Upload via the RS232 cable:

- Regulator out of supply (machine stopped and 24/48V supply off)
- Put the switches on flashing position (see following page)
- Supply the 24/48V to the regulator
- Run the flash utility:
  - Start the Flash.exe application
  - Select Hex File : D600.H86
  - Use COM1
  - Program Target Device
  - Wait for complete message
  - Exit
- Regulator out of supply
- Put the switches on normal position
- Supply the 24/48V to the regulator
- Reload config and parameters into the regulator



- If all the LEDs are on, it's necessary to charge a new configuration in the AVR.

16) COMMUNICATON FIELDBUS CARD

16.1) AVAILABLE FIELDBUS NETWORKS

An optional card can be plugged on the microcontroller cartd allowing communication through a fieldbus MODBUS or PROFIBUS. See also:
http://www.anybus.com/products/abs.shtml)
Do not forget validation of the field bus on the supervisor SupD600 screens. (See part of SupD600)

The exchange data between the D610 and the Fielbus are given in the following tables.

16.2) GENERALITIES

On field bus, most of data can be read about the regulation and its parameters:

- Voltage, Ifield, kW, kVA, kVAr, P.F, frequency,
- Actual regulation mode running
- Limitations possibly active,
- Power default or diode default,
- Indication of possibly references out of the range, given by bus field,
- Droop of the machine.

It's also possible to pilot by field bus:

- Voltage,
- Power factor,
- kVAr,
- Power factor of the main (if 4-20mA card is used)
- Ramp start up
- With 2F function, kVAr regulation (instead of contact on terminal block),
- Manual mode (instead of contact on terminal block)

To pilot them by field bus, it's necessary to choose "FB" on the SupD600 supervisor on corresponding pages.

All the values, to be correctly interpreted, are associated with a multiplier coefficient.

16.3) CARDS

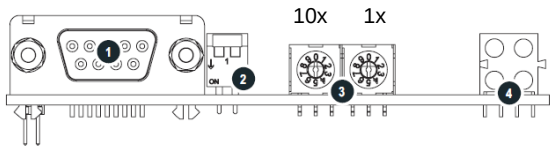
The field bus card is automatically initialized when the regulator start. It's also possible to see the type of the card on the SUPD600 supervisor.

The addressing is depending on the type of the card. It's usually realized by switches in front of the card.

All the following explanations are given as an indication. They can not substitute for official documents provided by ANYBUS

16.3.1) PROFIBUS

The "GSD" file of the card as been provided on the installation CD included with your machine. The address of the material must be set before the power up of the regulator, by the two switches ❸:

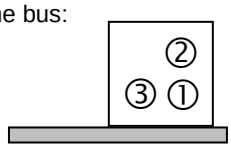


❶ : PROFIBUS connector
❷ : End line
❸ : Switches
❹ : Signalling LEDs.

The connector wiring is standard PROFIBUS.

The end line switch ❷ must be ON (on the bellow) only if the regulator is at the end of the bus

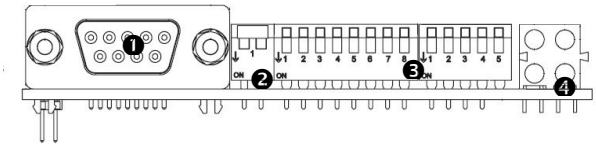
LEDs ❹ can view the status of the bus:



- LED 1 : Bus offline
- LED 2 : Bus online
- LED 3 : Diagnostic

16.3.2) MODBUS

The complete setup is done by the switches in front of the card. It must be set before the power up of the regulator.



❶ : MODBUS connector
❷ : End line
❸ : Switches
❹ : Signalling LEDs.

The card can be used on a field bus RS232 or RS485. The wiring connector is:

- RS 232 :
  - Connector : shield
  - 2 : TX Transmit signal
  - 3 : RX Receive signal
  - 5 : Ground
  - 6 : +5V

- RS 485 :
  - Connector : shield
  - 5 : ground
  - 6 : +5V
  - 7 : RS485 D0
  - 8 : RS485 D1

In case of RS485 bus, the end line switch ❷ must be ON (on the bellow) only if regulator is at the end of the field bus.

The address of the card can be set between 1 and 127 by switches 1 to 7 of the first block. A switch is "ON" (on the bellow) is interpreted as '1', "OFF" (on the top) is interpreted as '0'.

The switch '1' is MSB, and switch 7 is LSB. So, the addressing is realized as follows:

Binary value	MODBUS address
0000000	Not valid
0000001	1 (default setting)
0000010	2
0000011	3
…	…
1111111	127

The baudrate can be set with switches 8 of the first block, 1 and 2 of the second block

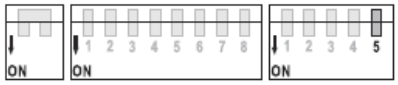
Binary value	MODBUS BAUDRATE
000	Not valid
001	1200
010	2400
011	4800
100	9600
101	19200 (default setting)
110	38400
111	76800

Parity is set on switches 3 and 4 :

Binary value	Parity
00	Non valid
01	None (default value)
10	Even
11	Odd

If parity is enabled, one stop bit is used. If parity is not enabled, two stop bits are used.

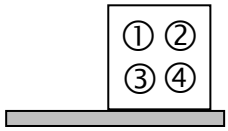
The physical interface type is set with switch 5, either RS232 or RS485.



Binary value	Interface
0	RS485
1	RS232

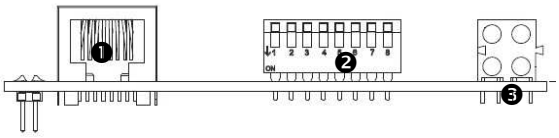
LEDs ❹ can view the status of the bus:

- LED 1 : Processing
- LED 2 : Bus error
- LED 3 : Bus ready
- LED 4 : Diagnostic



16.3.3) ETHERNET MODBUS

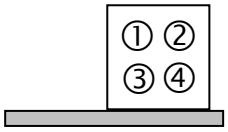
The setting of the end of IP address is done by the switches in front of the card. It must be set before the turning on of the regulator. The software setup of the complete IP address, provided by ANYBUS, is on the installation CD of your machine.



❶ : ETHERNET connector
❷ : Switches
❸ : Signalling LEDs.

LEDs located on ❸ permit to view the status of the bus :

- LED 1 : Processing
- LED 2 : Bus error
- LED 3 : Bus ready
- LED 4 : Diagnostic



16.4) RUNNING

16.4.1) GENERALITIES

As indicated before, it's possible to modify by the field bus, the different levels of the regulator.

The reference values are taken into account and sent by the bus on words of reading 23 to 27, listed below.

16.4.2) RANGE OF VALUES

As in SUPD600 supervisor, the levels have to be in a setting range in order to protect the alternator.

In case a value sent by field bus was outside the permissible range, the regulator will take automatically the value given in initial configuration and a corresponding bit of 'default value' will be activated in word 28.

This bit will take value '0' as soon as a value in permissible range will be given to the regulator.

16.4.3) WATCHDOG

The regulator has got a watchdog monitoring the communication by field bus, with a PLC or a supervisor, by the regular change of value of the word 11/1035 of frame reading bellow (information sent from the PLC of supervision).

Watchdog can be activated or not (precision to give during the installation of the machine).

- If watchdog is activated, and a communication breakdown occurs, the regulator will take automatically the values indicated in configuration mode.
- If watchdog is not activated, the regulator will maintain the last values received by field bus.

16.5) OUTPUT FRAME TO THE FIELDBUS

Adress	Contents	Multiplier coefficient	Unit/ assignment
0	K_MULT_U		
1	K_MULT_I		
2	K_MULT_KW		
3	K_MULT_KVA		
4	K_MULT_KVAR		
5	K_MULT_ COSϕ		
6	K_MULT_FREQ		
7	K_MULT_IEX		
8	Umdc	K_MULT_U	V
9	Imdc	K_MULT_I	A
10	KW	K_MULT_KW	KW
11	KVA	K_MULT_KVA	KVA
12	KVAR	K_MULT_KVAR	KVAR
13	Machine P.F	K_MULT_ COSϕ	
14	Vr	K_MULT_U	V
15	Frequency	K_MULT_FREQ	Hz
16	Ifield	K_MULT_IEX	A
17	CE (U/U cmd)		0 ou 1
18	CØ (P.F regulation cmd)		0 ou 1
19	CK (kVAr regulation cmd)		0 ou 1
20	SC (Mains P.F)		0 ou 1
21	CA (Ifield regulation cmd)		0 ou 1
22	Reference U	K_MULT_U	V
23	Reference Machine P.F.	K_MULT_ COSϕ	
24	Reference Main P.F.	K_MULT_ COSϕ	
25	Reference KVAR	K_MULT_KVAR	KVAR
26	Reference Ifield	K_MULT_IEX	A

27	Defaults « level out of range » « 0 » = ok « 1 » = on fault		Bit 0 : U Bit 1 : kVAr Bit 2 : Ifield Bit 3 : Machine P.F. Bit 4 : Main P.F. Bit 5 à 15 : not used
28	D600 defaults « 0 » = ok « 1 » = on fault		Bit 0 : Equalization but Main voltage < low level of main voltage Bit 1 : Field bus initialization Bit 2 : thermal failure Bit 3 : Diode short circuit Bit 4 : under-frequency Bit 5 : Max current before end of time Bit 6 : Low level Ifield Bit 7 : Max current after end of time Bit 8 : Power Bit 9 : Limiation Bit 10 : Ramp impossible Bit 11 : microcontroller Bit 12 à 15 : not used
29	D600 condition		Bit 0 : Voltage régulation Bit 1 : U/U regulation Bit 2 : Machine P.F regulation Bit 3 : kVAR regulation Bit 4 : Main P.F Bit 5 : Manual regulation Ifield Bit 6 : Start up ramp current Bit 7 : Under frequency Bit 8 : Maximum current detection Bit 9 : Minimum current detection Bit 10 : Limitation current short-circuit Bit 11 : Excitation started Bit 12 : Machine with main Bit 13 : Regulation kVAr command Bit 14 : Regulation Main P.F command Bit 15 : Manual regulation Ifield command
30	D600 condition (end)		Bit 0 : Pressing button U+ Bit 1 : Pressing button U- Bit 2 : Pressing button I+ Bit 3 : Pressing button I- Bit 4 : Power failure Bit 5 : Diodes failure Bit 6 : Watchdog microcontroller Bit 7 et 8 : follower - Bit 7 = 0 et Bit 8 = 0 : inactive - Bit 7 = 1 et Bit 8 = 0 : Correct - Bit 7 = 1 et Bit 8 = 1 : No correct Bit 9 : 4-20mA card in position Bit 10 : Regulation manual card in position Bit 11 : PWM not used Bit 12 à 15 : not used
31	Droop		%
32	Type of droop		1= kVAR, 2 = Tan Ø
33	Hour meter low weight word		

34	Hour meter high weight word		

16.6) INPUT FRAME FROM THE FIELDBUS

MODBUS Adress	PROFIBUS Adress	Contents	Multiplier coefficent	Unit/assignment
1024	0	CK_ Fieldbus		0(P.FM) or 1(kvar)
1025	1	Reference Fieldbus U	K_MULT_U	V
1026	2	Reference Fieldbus Machine P.F	K_MULT_ COSϕ	
1027	3	Reference Fieldbus KVAR	K_MULT_KVAR	KVAR
1028	4	Reference Fieldbus Main P.F	K_MULT_ COSϕ	
1029	5	Reference Fieldbus IField	K_MULT_IEX	A
1030	6	Communication watchdog		Between 0 and 32000 : (important is change during before the temporisation)

17) FIRST STARTING

CAUTION

Never energize the AVR when the driver card is removed. An overvoltage can appear and the power transistor can be damaged

17.1) GENERAL

- To be independent of the wiring between machine and D610, it must be useful to make a first running only with the remanent of the machine then in Ifield regulation.
- To make this maintain the excitation contacts open.
- Start the machine to the nominal speed
- Check the presence and the value of the three phases at the terminal block (terminals 1, 2, 3 of D610, the measure must be about 10% of the nominal
- Select Ifield regulation (manual mode) with the supervisor
- Close the excitation contact.
- Set the field current by mean of the supervisor.
- If possible load the machine to see if the current measurement is correct
- Open excitation contact.
- Return to normal regulation by the supervisor

17.2) START UP

- Start the machine to the nominal speed.
- If the voltage ids unstable (hunting) check the PID settings in the supervisor
- If the voltage is too low or too high, check the input transformer parameters in the supervisor and the voltage setting.

17.3) DE ENERGIZING (OPTIONAL)

- External contacts E01 must be used.
- E01 must be serial with terminal 14, 15, 16 of AVR (power input) and is opened for de-energizing.

17.4) SETTINGS

- There is no adjustment on the D610 itself.
- All the settings are made by mean of the supervisor utility

17.5) FIELD FLASHING

- Generally, field flashing is not necessary, but in some cases like long stop time or fault trip, it can be possible that the voltage does not appear naturally.

In this case, connect a 12Vdc to 24Vdc voltage source to the terminals 4 and 8 of AVR terminal block, + to 4 for a short time and remove it when the voltage increases.

17.6) PARALLEL WITH MACHINES (1F)

- The voltages and the droops of the machines to run in // must be set identical. For droop setting, see supervisor manual.
- The reactive currents (KVAR) must be shared, immediately after coupling, even the KW are not shared.
- If, immediately after coupling, the current increases abnormally, check if the parallel CT wires are not reversed. (9 et 10 of AVR terminal block)
- If the coupling is OK but if when the load increases, the P.F or the current have an abnormal value, check that the sensing phases at the input of the AVR are right connected. (U, V, W respectively to the terminals 1, 2, 3 if clockwise rotation or W, V, U, if counter clockwise rotation)
- If the phases are not right connected, the measures read on the supervisor are incorrect.

17.7) P.F REGULATION (2F)

- **The generator and mains voltages must be as equal as possible. The contact between terminals 30, 31 of AVR terminal block must be closed at the same time as the coupling and will remain closed as long as the generator is connected to the mains. It will be open when parallel between generators.**
- If, immediately after coupling, the current increases abnormally, check if the parallel CT wires are not reversed. (9 and 10 of AVR terminal block)
- If the coupling is OK but if when the load increases, the P.F or the current have an abnormal value, check that the sensing phases at the input of the AVR are right connected. (U, V, W respectively to the terminals 1, 2, 3 if clockwise rotation or W, V, U, if counter clockwise rotation)
- The PF value is normally factory set to 0.9. It can be adjust by mean of supervisor, push buttons or potentiometer card or by mean of an external potentiometer
- If the KVAR regulation is required terminals 37 and 38 must be short-circuited and the KVAR can be set by mean of supervisor, push buttons or potentiometer card or by mean of an external potentiometer.

- If the phases are not right connected, the measures read on the supervisor are incorrect.

17.8) MAINS P.F REGULATION

- Only available if an 4-20mA interface card is plugged into the AVR. (All adjustments/settings are factory made)
- The mains P.F measurement converter must be wired to the channel 1 input.
- The supervisor must be configured for the range of the P.F measurement converter.
- The reference can be given by Supervisor, external potentiometer, external contacts or field bus.
- Operation in this mode is controlled by a contact in front of the 4-20mA card or by the field bus command .

- Channel 2 is reserved for other possible 4-20mA regulation set point (see supervisor manual).

17.9) VOLTAGE MATCHING (U/U) (3F)

- This test must be made only the first start of the plant.
- At no load with the mains voltage image present to the terminal block (11, 12, 13).
- The Mains voltage can be read on home page of the supervisor utility and must have the right value. If not verify the transformer ratio set in the supervisor.
- Short circuit terminals 31, 32.
- The machine voltage must be equalized to the mains one.
- Remove the strap between terminals 31, 32.
- The initial check is made.
- In normal operation, the contact between terminals 31, 32 must be close with the synchronizer operation and open after coupling with the mains.

17.10) IFIELD REGULATION (MANUAL MODE)

- In manual operation it is possible to control directly
- the field current of the generator.
- A follower (optional) adjusts the setting of the field current automatically to the value of the active regulation with an adjustable delay. With this system it is possible to switch to manual operation at anytime without any change in the process (bump less). After that the control is given to the field current setting (supervisor or push buttons)
- When AUTO operation, a virtual LED indicates the state of the follower (OK or not OK) on the home screen of the supervisor.
- Switch to manual is possible by the mean of the supervisor, fieldbus or in front of the supply card
- This kind of operation can be used on first starting or to check the system after some problems.
- It cannot be used in solo operation because it is not possible to change the setting of the field current as fast at the load changes.

18) ANOMALIES AND INCIDENTS

Before any intervention, please note the position of knobs, straps and jumpers.

INCIDENT	CAUSE	SOLUTION
No voltage without exciting	No remanent	A field flashing is necessary
	De-energizing contact is open	Close the excitation contact
	An important load is present or the generator is on short-circuit	If it's possible, let the generator without load, else use an external power supply to realize field flashing.
	AVR on fault	Test it or change it
	Wires are disconnected or cut between the AVR and the generator	Please, verify the wires
	The ramp up command is not activated	Activate the ramp up command
During the start, the voltage doesn't increase and stays at remanent value	The Vc voltage is not decreased under its limit	Wait Vc decrease under the fixed limit
During the start, the voltage increase too fast and a important surge happens	The PID parameters are badly defined	Go to "PID settings" and set the different parameters. Try with steps tool on this page to validate new parameters.
	The transformers ratio is badly defined in supervisor	Verify the transformers ratio
Communication fault between the supervisor and the AVR	The RS232 wiring is defected	Verify that connections is well done and connectors well placed.
	The COM1 serial port setting is not correctly done.	Modify the parameters of COM1 serial port in : ▸ COM1 ▸ 9600 bauds ▸ 2 stop bytes, ▸ No parity
The communication fieldbus card is not detected.	The card is on fault	Change the card
	The card is badly plugged on the microcontroller card	Verify that card is well placed and its watchdog LED is running (flashing)
The AVR is not detected on the communication field bus.	The link between the AVR and the PLC is defected.	LED on communication field bus card is red and on. The link with the fild bus is defected or not connected. Try to chage it. When the link is correct, the green LED is on.
	For PROFIBUS Card, the right GSD file is not charged in the customer PLC	Put the corresponding GSD file (on the setup CD)
	The address is not correct	Put the same address on the customer PLC and on the communication card
The AVR get carried away at start	The 24Vdc supply is not on	Put the 24/48Vdc power on supply card (J2 connector)

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