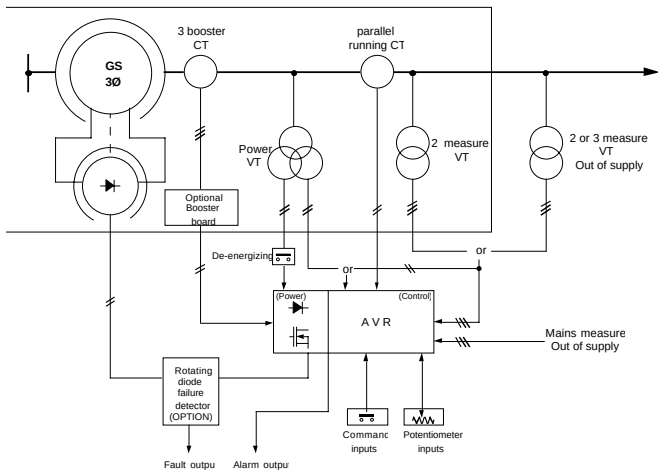
LEROY SOMER

Réf. 2352 - 4.33 / a - 6.96



AUTOMATIC VOLTAGE REGULATOR R630

Installation and maintenance

TABLE OF CONTENT

AVR CONSTITUTION 3

GENERAL DESCRIPTION : NT1950000 /a 4

CARDS DESCRIPTION : NT1950xxx 12

START-UP : NT1959000 /a 45

NOTE

THE ELECTRICAL CONNECTION 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 R630 — Constitutive elements

DESIGNATION	N° printed circuit board	N° complete card	N° instruction manual	REMARKS
Wired empty rack		C51950250	NT1950000/c-02/95	SHUNT (+booster)
Wired empty rack		C51950251	NT1950001/b-10/94	PMG
Complete Generator I/O board		C51950200	NT1950010/b-10/94	100 / 120V - 50 / 60Hz
Complete Generator I/O board		C51950202	NT1950010/b-10/94	400 / 450V - 50 / 60Hz
3F Complete Mains I/O board		C51950220	NT1950020/b-10/94	100 / 120V - 50 / 60Hz
3F Complete Mains I/O board		C51950222	NT1950020/b-10/94	400 / 450V - 50 / 60Hz
2F Complete Mains I/O board		C51950210		
1F Complete Interface board		C51950215		
Rack supply	CP1950040	C51950041	NT1950040/a-11/92	
Sensing	CP1950050	C51950051	NT1950050/a-11/92	
PID, limitation	CP1950060	C51950061	NT1950060/a-11/92	
Driver	CP1950070	C51950071	NT1950070/b-11/93	
CosØ, KVAR	CP1950080	C51950081	NT1950080/b-10/94	
Limit Istator	CP1950090	C51950091	NT1950090/a-11/92	
Manual mode 1	CP1950100	C51950101	NT1950100/a-02/93	
Digital U / P.F potentiometer	CP1950110	C51950111	NT1950110/a-01/94	
Digital Ified pot and Follower	CP1950115	C51950141	NT1950115/a-01/94	
Mains P.F régulation	CP1950120	C51950121	NT1950120/a-04/94	
Rotating diode fault detector	CP1950130	C51950131	NT1950130/a-06/96	Available June 1996

= Neccessary

= Optionals

IMPORTANT : The informations given by this sheet must be used to order spare parts. Take care of it.

AVR Model R630

General description

1 - APPLICATION

- The AVR model R600 can be used with brusless self-excited type generators, "SHUNT", "SHUNT with BOOSTER" or "SHUNT with PMG" 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 cosØ or KVAR regulation.

2 - DESCRIPTION

- The AVR model R631 is composed of electronic cards wich are included in a rack 19" .

- Except the necessary "Generator I/O", the optional "mains I/O" located on the left of the rack and the "driver" card located on the right, all the other cards can be plugged anywhere in the rack. Future optional cards could be added without any internal wiring modification.
- The rear flat cable (BUS 64 points) is given more long as it can be connected to an optional interface terminal block wich gives all the internal test points or in the future the possibility to connect another rack if the cards number will become too important.

3 - INTERCONNECTIONS

- External interconnections are located on the top of the rack in form of two terminal blocks:

- A power / voltage terminal block (19 terminals, one with a fuse)

- A command / control terminal block (41 terminals)

- A conventional wiring connect this terminal blocks to the power block fitted on a heatsink and also to the "generator I/O" and "mains I/O" to give an interface with the flat cable BUS 64 points.

- In the same manner a 8 points connector connects directly the driver card to the power block.

4 - OPTIONAL CARDS

- CosØ / KVAR regulation (2F)
- Voltage equalization with the mains (3F)
- Voltage and P.F digital potantiometers
- Manual operation
- Ifield digital potentiometer with follower
- Istator limitation
- Mains P.F or KVAR regulation from 4-20mA sensor
- Rotating diodes fault monitor

5 - SPECIFICATIONS

- Sensing voltage :
  - 100/110Vac 50Hz
  - 120/130Vac 60Hz
  - 380/420Vac 50Hz
  - 430/450Vac 60Hz

- Power supply :
  - Depend of generator(Adaptation by transformer). Maximum 180Vac 50/60Hz

- Field output :
  - 12 Amperes nominal, 24Amp maximum during 10s on 6Ω minimum

- Accuracy :
  - +/-1% of the means of the three phases on linear load and without droop

- Voltage setting range :
  - +/-10% of the nominal voltage by means of external optionnal potentiometer .

- Droop setting range :
  - - 7% of the nominal voltage at cosØ =0

- Under-frequency protection :
  - Adjustable threshold and slope from V/Hz to 2V/Hz

- Field ceiling :
  - 110% of If nominal permanently, unlocked in case of voltage decrease

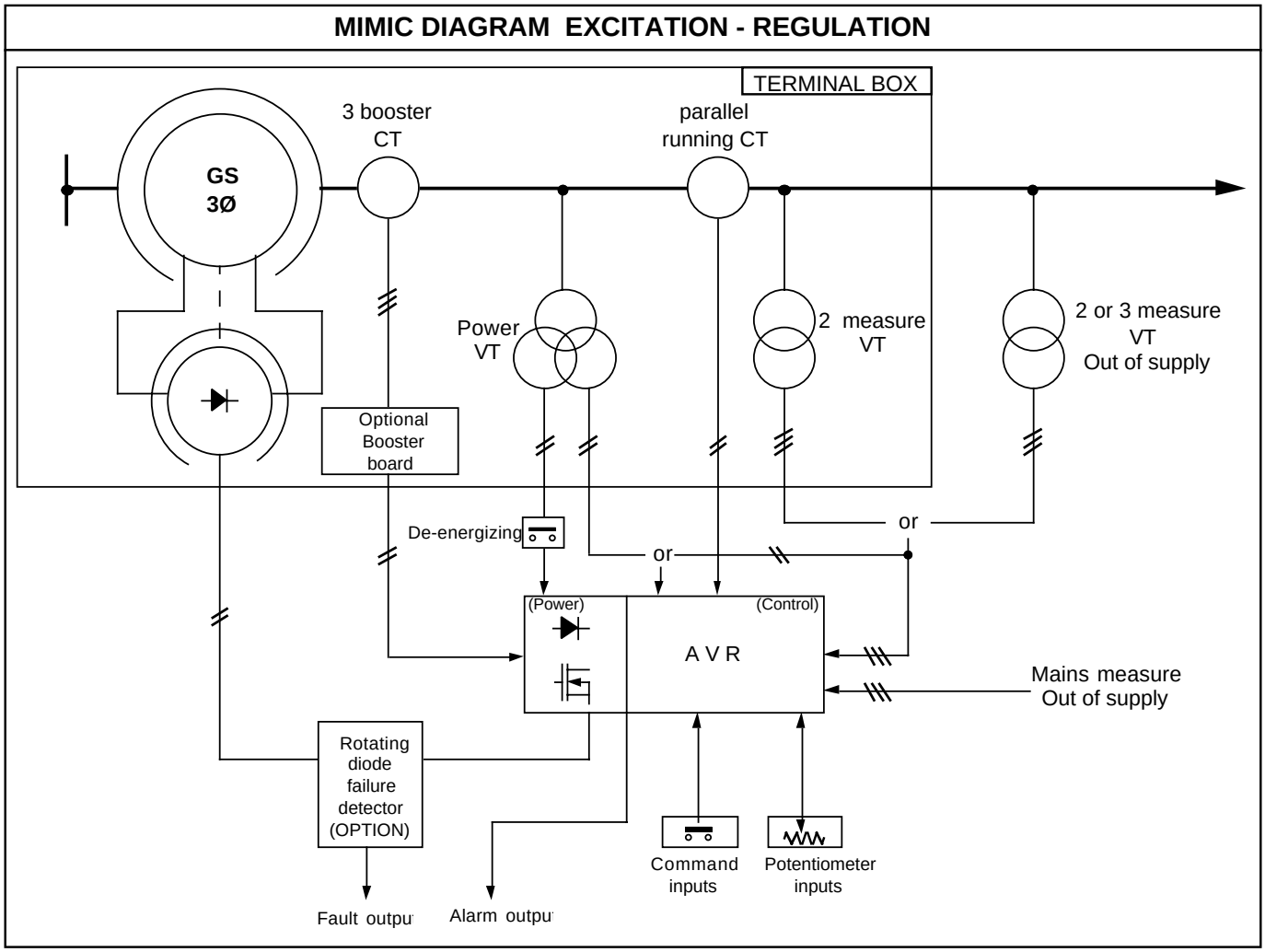
- Protection :
  - Heatsink overheating, exciter short-circuit

- Alarm output :
  - Heatsink overheating, too much ceiling unlocked time
- Environnement :
  - Maximum ambiant temperature -10°C to +50°C
  - Fitting in control panel without excessive vibrations

6 - SCHEMATICS AND DRAWINGS

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

MIMIC DIAGRAM EXCITATION - REGULATION



VOLTAGE / POWER TERMINAL BLOCK

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
U MACHINE	V MACHINE	W MACHINE	+ Field flash	+ Field	- Field	+ Booster	- Booster	// CT	// CT		U MAINS	V MAINS	W MAINS		Auxiliary voltage	Auxiliary voltage	Power supply	Power supply (fuse)

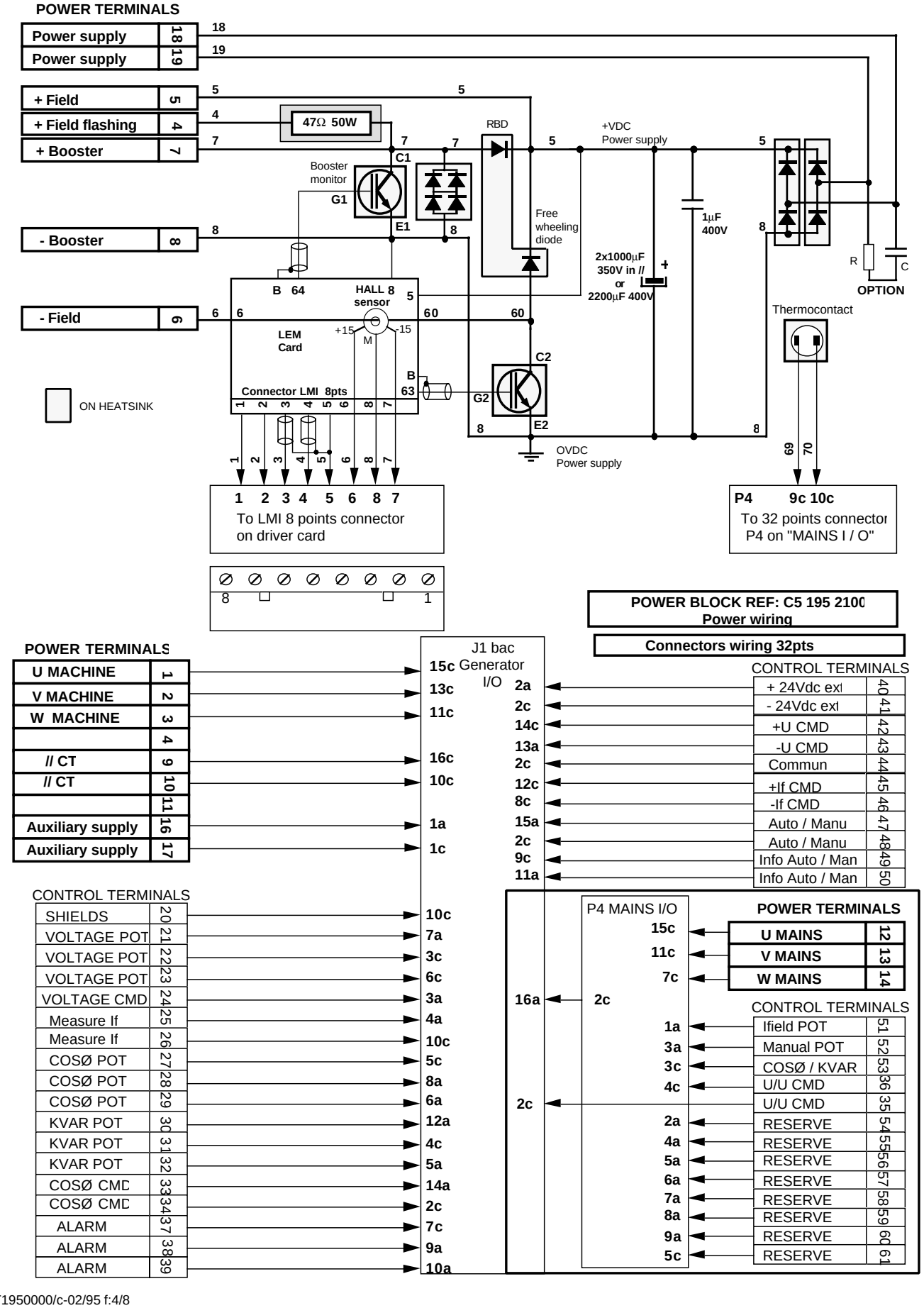
COMMAND / CONTROL TERMINAL BLOCK

20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
SHIELDS	VOLTAGE POT	VOLTAGE POT	VOLTAGE POT	VOLTAGE CMD	Measure If	Measure If	COSØ POT	COSØ POT	COSØ POT	KVAR POT	KVAR POT	KVAR POT	COSØ CMD	COSØ CMD	U/U CMD	U/U CMD	ALARM	ALARM	ALARM	+ 24Vdc ext	- 24Vdc ext	+ CMD U / P.F	- CMD U / P.F	Commun	+Iexc CMD	-Iexc CMD	Auto / Manu	Auto / Manu	Info Auto / Manu	Info Auto / Manu	Ifield Pot	Manual pot	COSØ / KVAR CMD	Réserve	Réserve	Réserve	Réserve	Réserve	Réserve	Réserve

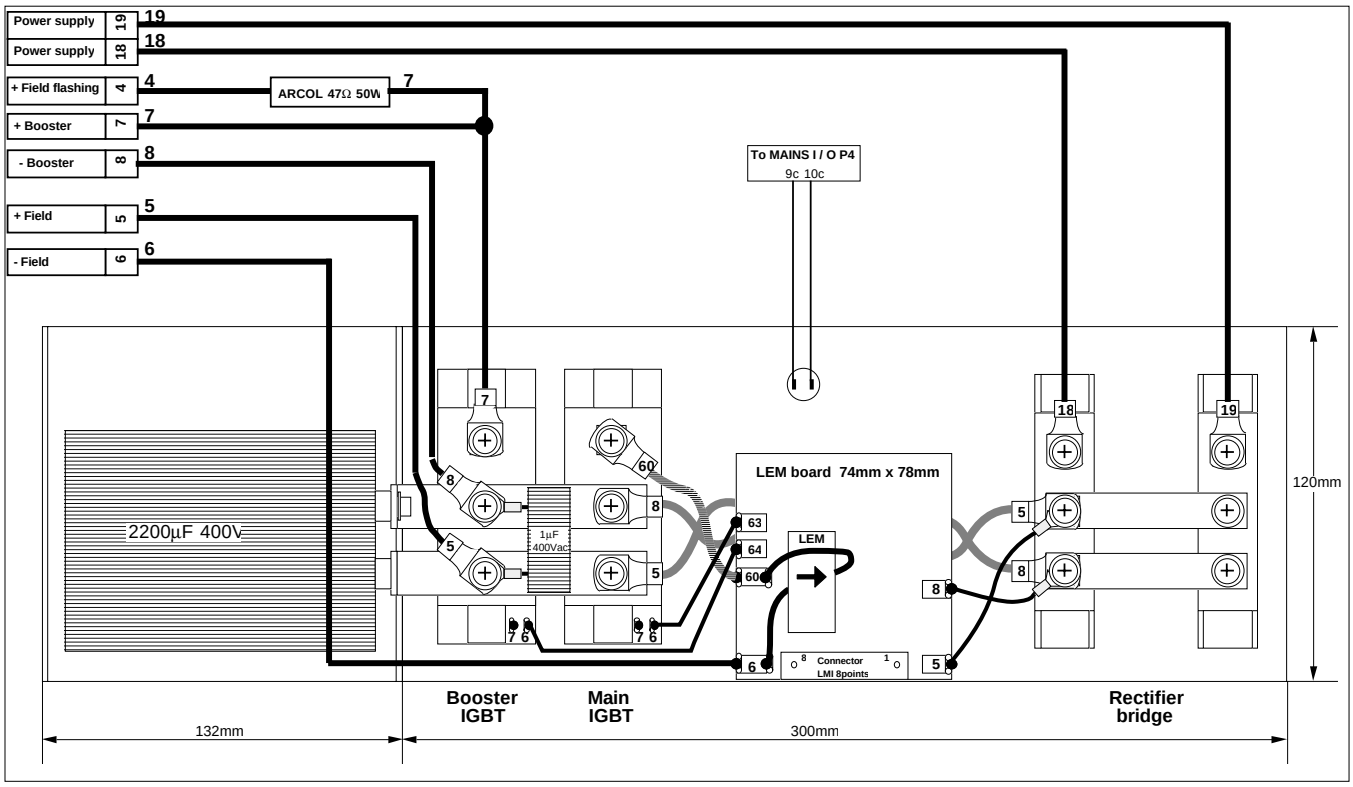
TERM N°	VOLTAGE / POWER TERMINAL BLOCK	0F	1F	2F	3F
1	Phase 1 (U) machine (measure)	N	N	N	N
2	Phase 2 (V) machine (measure)	N	N	N	N
3	Phase 3 (W) machine (measure)	N	N	N	N
4	+ fiel flashing or pre-excitation input (optional)	O	O	O	O
5	+ field output	N	N	N	N
6	- field output	N	N	N	N
7	+ booster input	O	O	O	O
8	- booster input	O	O	O	O
9	Paralleling CT phase 2 (V) S1		N	N	N
10	Paralleling CT phase 2 (V) S2		N	N	N
11	Not connected				
12	Phase 1 (U) mains (measure)				N
13	Phase 2 (V) mains (measure)				N
14	Phase 3 (W) mains (measure)				N
15	Not connected				
16	Auxiliairy voltage input	N	N	N	N
17	Auxiliairy voltage input	N	N	N	N
18	Power supply input	N	N	N	N
19	Power supply input (fused)	N	N	N	N
	COMMAND / CONTROL TERMINAL BLOCK				
20,20,20	Potentiometer shield (3 terminals)	O	O	O	O
21	External voltage potentiometer maximum CW)	O	O	O	O
22	External voltage potentiometer (10KΩ-2W) (cursor)	O	O	O	O
23	External voltage potentiometer (minimum CCW)	O	O	O	O
24	External voltage input (10Vdc, 0V to terminal 20)	O	O	O	O
25	Fied current measurement output (+Vdc)	O	O	O	O
26	Fied current measurement output (0V)	O	O	O	O
27	External cosØ potentiometer maximum CW)			O	O
28	External cosØ potentiometer (10KΩ-2W) (cursor)			O	O
29	External cosØ potentiometer (minimum CCW)			O	O
30	External KVAR potentiometer maximum CW)			O	O
31	External KVAR potentiometer (10KΩ-2W) (cursor)			O	O
32	External KVAR potentiometer (minimum CCW)			O	O
33	cosØ regulation command input			N	N
34	cosØ regulation command input			N	N
35	Voltage equalization command input				N
36	Voltage equalization command input				N
37	Overheating or ceiling unlocked time alarm (common)	O	O	O	O
38	Overheating or ceiling unlocked time alarm output (NC)	O	O	O	O
39	Overheating or ceiling unlocked time alarm output (NO)	O	O	O	O
40	External +24Vdc supply input (relay locking)	O	O	O	O
41	External 24Vdc supply input (relay locking) common	O	O	O	O
42	Upper command voltage and P.F	O	O	O	O
43	Lower command voltage and P.F	O	O	O	O
44	Common	O	O	O	O
45	Upper command Ifield (manu)	O	O	O	O
46	Lower command Ifield (manu)	O	O	O	O
47	"AUTO / MANU" command input (Open = "AUTO")	O	O	O	O
48	"AUTO / MANU" command input (Open = "AUTO")	O	O	O	O
49	"AUTO / MANU" image output	O	O	O	O
50	"AUTO / MANU" image output	O	O	O	O
51	Ifield direct manual setting potentiometer	O	O	O	O
52	Manual mode 1 card Ifield setting potentiometer (10KΩ)	O	O	O	O
53	CosØ / KVAR selection command input (/ terminal 48)			O	O
54	Reserve				
55	Reserve				
56	Reserve				
57	Reserve				

O = Optional
N = Neccessary
Nothing = Not applicable

O = Optional
N = Neccessary
Nothing = Not applicable


POWER TERMINALS
Power supply 18
Power supply 19
+ Field 5
+ Field flashing 4
+ Booster 7
- Booster 8
- Field 6
47Ω 50W
RBD
+VDC Power supply
Booster monitor
G1
C1
E1
Free wheeling diode
1µF 400V
2x1000µF 350V in // or 2200µF 400V
R
C
OPTION
B 64
HALL 8 sensor
LEM Card
+15
-15
M
Thermocontact
C2
G2
E2
B 63
Connector LMI 8pts
ON HEATSINK
OVDC Power supply
To LMI 8 points connector on driver card
P4 9c 10c
To 32 points connector P4 on "MAINS I / O"
POWER BLOCK REF: C5 195 2100
Power wiring
Connectors wiring 32pts
POWER TERMINALS
U MACHINE 1
V MACHINE 2
W MACHINE 3
// CT 9
// CT 10
Auxiliary supply 16
Auxiliary supply 17
CONTROL TERMINALS
SHIELDS 20
VOLTAGE POT 21
VOLTAGE POT 22
VOLTAGE POT 23
VOLTAGE CMD 24
Measure If 25
Measure If 26
COSØ POT 27
COSØ POT 28
COSØ POT 29
KVAR POT 30
KVAR POT 31
KVAR POT 32
COSØ CMD 33
COSØ CMD 34
ALARM 37
ALARM 38
ALARM 39
J1 bac Generator I/O
CONTROL TERMINALS
+ 24Vdc ext 40
- 24Vdc ext 41
+U CMD 42
-U CMD 43
Commun 44
+If CMD 45
-If CMD 46
Auto / Manu 47
Auto / Manu 48
Info Auto / Man 49
Info Auto / Man 50
P4 MAINS I/O
POWER TERMINALS
U MAINS 12
V MAINS 13
W MAINS 14
CONTROL TERMINALS
Ifield POT 51
Manual POT 52
COSØ / KVAR 53
U/U CMD 36
U/U CMD 35
RESERVE 54
RESERVE 55
RESERVE 56
RESERVE 57
RESERVE 58
RESERVE 59
RESERVE 60
RESERVE 61

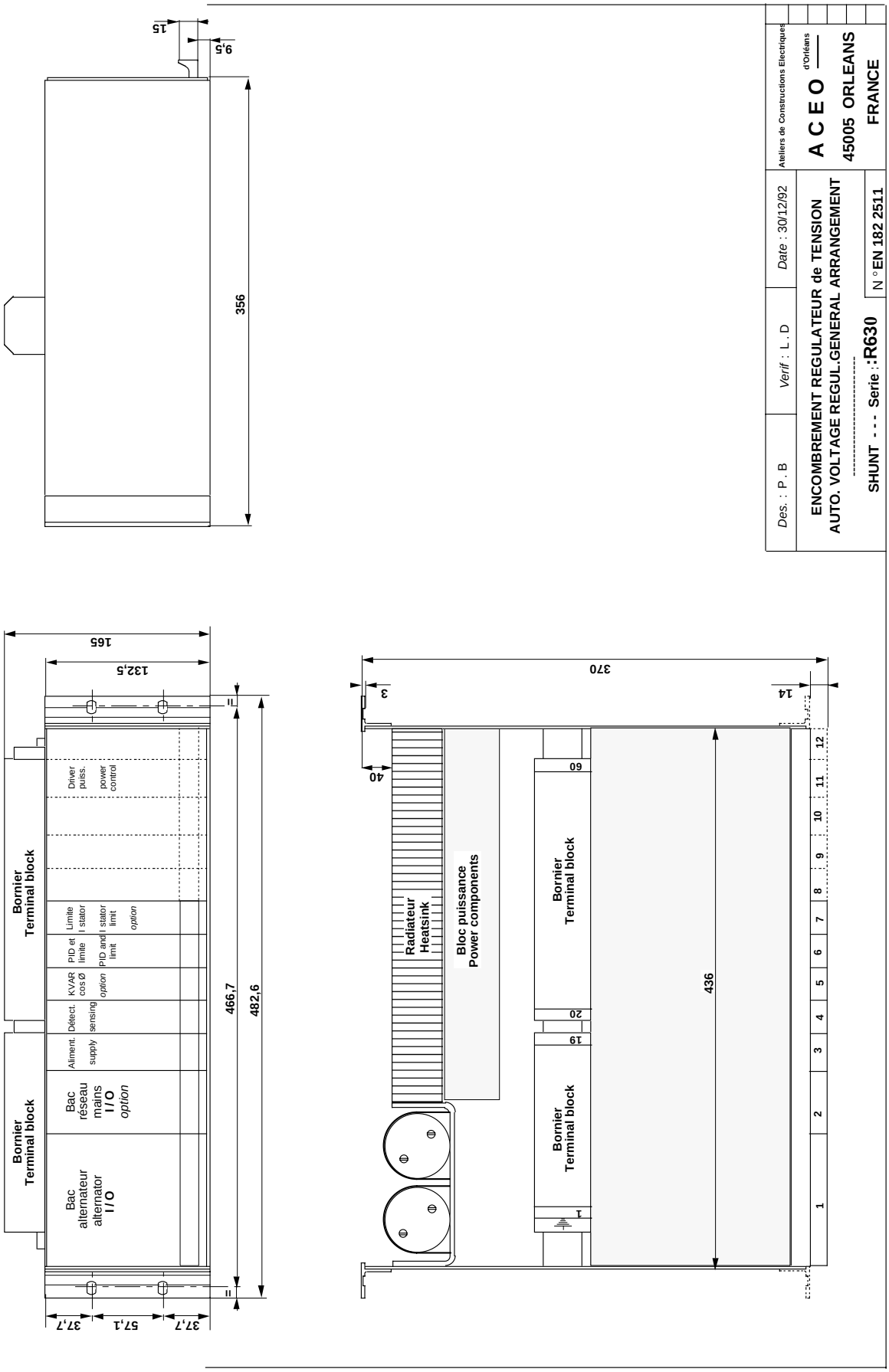
R630 POWER BLOCK SHUNT (+ BOOSTER)



- The following tables give interconnections between each card and the 64 points flat cable.
- Grey cases give signals origine.
- Other cases where they go.
- On the left we have two numbers :
  - First the connector numering
  - Second test block terminal number
- On the right we have a recapitulative of all the informations wich can be found on the test terminal block.

PIN	PIN	Gen I/O	Mains I/O	Supply	Sensing	PID, limit	CosØ,KVAR	Pot digital U	Pot digital Iexc	Manu mode	Driver	test output
1c	1	+Vcc	+Vcc	+Vcc	+Vcc	+Vcc	+Vcc	+Vcc	+Vcc	+Vcc	+Vcc	+Vcc
1a	2	+Vcc	+Vcc	+Vcc	+Vcc	+Vcc	+Vcc	+Vcc	+Vcc	+Vcc	+Vcc	+Vcc
2c	3	+Vdc alim		+Vdc alim								+Vdc alim
2a	4	+Vdc alim		+Vdc alim								+Vdc alim
3c	5	-Vdc alim		-Vdc alim								-Vdc alim
3a	6	-Vdc alim		-Vdc alim								-Vdc alim
4c	7	Vac puiss 1								Vac puiss 1	Vac puiss 1	Vac puiss 1
4a	8	Vac puiss 2									Vac puiss 2	Vac puiss 2
5c	9	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND
5a	10		Vac-dr1									Vac-dr1
6c	11		Vac-dr2									Vac-dr2
6a	12		Vac-dr3									Vac-dr3
7c	13	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND
7a	14	Vac-dm1			Vac-dm1							Vac-dm1
8c	15	Vac-dm2			Vac-dm2		Vac-dm2					Vac-dm2
8a	16	Vac-dm3			Vac-dm3							Vac-dm3
9c	17					V-10%				V-10%	V-10%	V-10%
9a	18	TI//			TI//		TI//					TI//
10c	19						Déphasage					Déphasage
10a	20		Ures			Ures						Ures
11c	21				Um	Um						Um
11a	22				Uref	Uref			Uref			Uref
12c	23					Correct PID				Correct PID		Correct PID
12a	24						IsinØ					IsinØ
13c	25					Uregl		Uregl				Uregl
13a	26					Statisme D	Statisme D					Statisme D
14c	27					cosØ, KVAR	cosØ, KVAR					cosØ,KVAR
14a	28					IcosØ	IcosØ					IcosØ
15c	29					Sauto		Sauto		Sauto	Sauto	Sauto
15a	30								Smanu	Smanu	Smanu	Smanu
16c	31							cde Iexc	cde Iexc	cde Iexc	cde Iexc	cde Iexc
16a	32	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND

PIN	PIN	Gen I/O	Mains I/O	Supply	Sensing	PID, limit	CosØ, KVAR	Pot dig U	Pot dig Iex	Manu mode	Driver puiss	test output
17c	33	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND
17a	34	Mes Iexc									Mes Iexc	Mes Iexc
18c	35	synchro									Perte synchro	Perte synchro
18a	36	I limit									I limit	I limit
19c	37	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND
19a	38	Fin rampe				Fin rampe					Fin rampe	Fin rampe
20c	39	U cosØ					U cosØ	U cosØ				U cosØ
20a	40		P.F/KVAR				P.F/KVAR	P.F/KVAR				P.F/KVAR
21c	41	U KVAR					U KVAR	U KVAR				U KVAR
21a	42	Pot tension				Pot tension						Pot tension
22c	43	U tension				U tension						U tension
22a	44	+Iexc							+Iexc			+Iexc
23c	45	-Iexc							-Iexc			-Iexc
23a	46	+Uauto						+Uauto				+Uauto
24c	47	-Uauto						-Uauto				-Uauto
24a	48	Cde reg cosØ				Cde reg cosØ						Cde reg cosØ
25c	49		Cde U=U			Cde U=U						Cde U=U
25a	50	cde auto/manu							Cde A/M	cde auto/manu	cde auto/manu	cde auto/manu
26c	51		Défaut T°C								Défaut T°C	Défaut T°C
26a	52											reserve
27c	53								Cde U	Cde U		Cde U
27a	54											reserve
28c	55											reserve
28a	56											reserve
29c	57											reserve
29a	58											reserve
30c	59								Max pot			Max pot Iexc
30a	60							Max pot				Max pot U/P.F
31c	61											reserve
31a	62	Alarm									Alarm	Alarm
32c	63	-Vcc	-Vcc	-Vcc	-Vcc	-Vcc	-Vcc	-Vcc	-Vcc	-Vcc	-Vcc	-Vcc
32a	64	-Vcc	-Vcc	-Vcc	-Vcc	-Vcc	-Vcc	-Vcc	-Vcc	-Vcc	-Vcc	-Vcc


15
9,5
356
Ateliers de Constructions Electriques d'Orléans
A C E O
45005 ORLEANS
FRANCE
Des. : P. B
Verif : L. D
Date : 30/12/92
ENCOMBREMENT REGULATEUR de TENSION
AUTO. VOLTAGE REGUL.GENERAL ARRANGEMENT
SHUNT - - - Serie : R630
N° EN 182 2511
165
132,5
466,7
482,6
37,7
57,1
37,7
Bornier Terminal block
Bac alternateur alternator I/O
Bac réseau mains I/O option
Aliment. supply
Détect. sensing
KVAR cos Ø option
PID et limite
PID and I limit
Limite I stator
I stator limit option
Driver puiss. power control
370
3
14
40
Radiateur Heatsink
Bloc puissance Power components
Bornier Terminal block
436
60
20
19
1
12
11
10
9
8
7
6
5
4
3
2
1

AVR Model R630 — Generator I / O

1 - FUNCTIONAL

- This unit is mainly an interface between external signals and low power electronics.

- It is composed by :
• The adaptation three phases transformer between input voltage 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

2 - ADJUSTMENTS

- Setting of the auxiliary input voltage (terminals 16,17) : (110 or 220Vac) by jumpers.

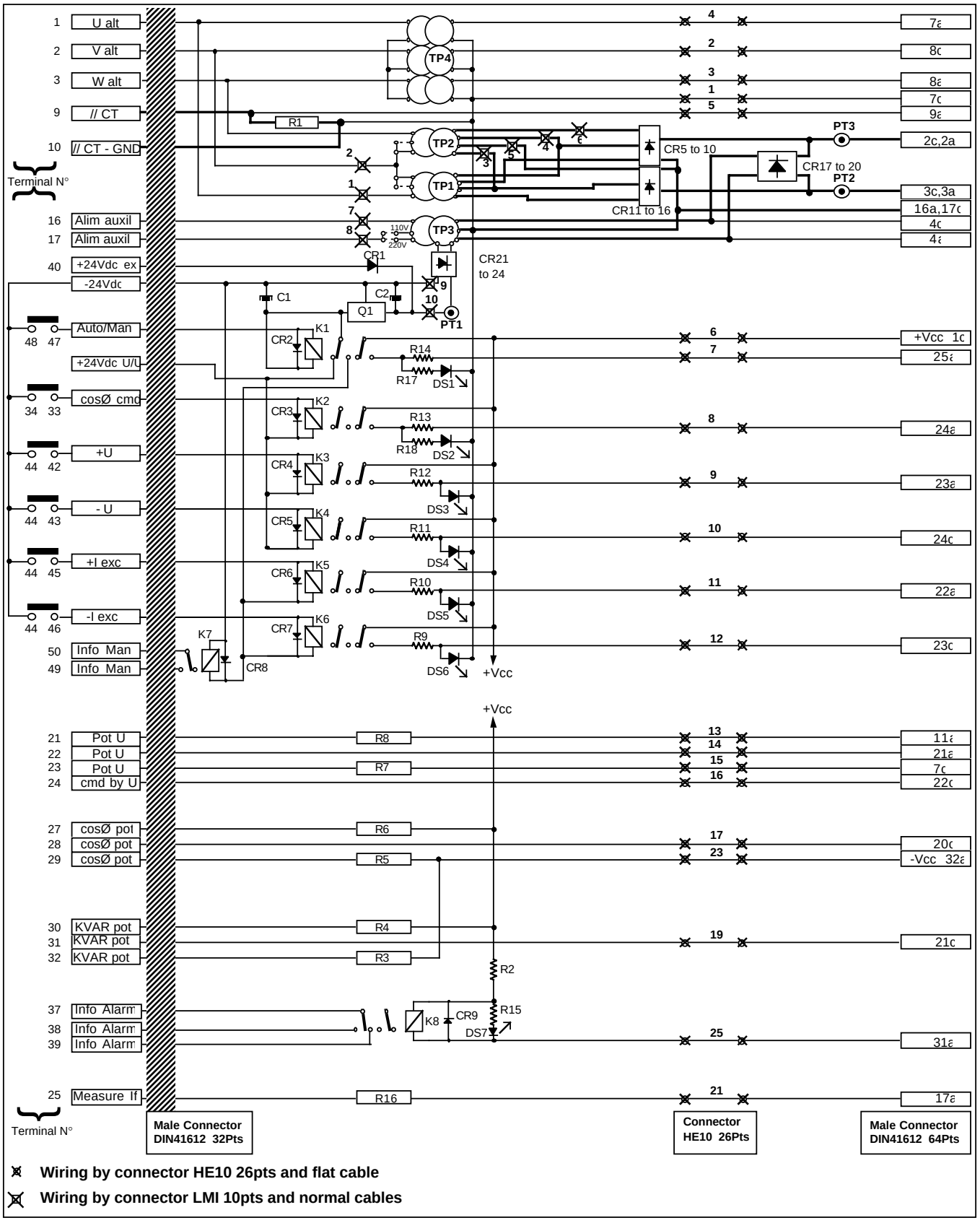
3 - INPUT / OUTPUT

See following table

INPUT TERMINAL	Connector 32 PTS	Type I / O	Interface	Connector 26 PTS	Connector BUS 64 PTS
1	15c	measure	transfo 3Ø TP4	4	7a
1	15c	alim	transfo TP2		
2	13c	measure	transfo 3Ø TP4	2	8c
2	13c	alim	transfo TP1/2		
3	11c	measure	transfo 3Ø TP4	3	8a
3	11c	alim	transfo TP1		
9	16c	measure	resistance RTI	5	9a
10	10c	measure	GND	1	7c
16	1a	alim	transfo TP3		4c
17	1c	alim	transfo TP3		4a
20	10c	shield	GND	1	7c
21	7a	signal	resistance	13	11a
22	3c	signal	direct	14	21a
23	6c	signal	resistance	15	7c
24	3a	signal	direct	16	22c
25	4a	signal	direct	21	17a
26	10c	signal	GND	1	7c
27	5c	signal	resistance	6	1c
28	8a	signal	direct	17	20c
29	6a	signal	resistance	23	32a
30	12a	signal	resistance	6	1c
31	4c	signal	direct	19	21c
32	5a	signal	resistance	23	32a
33	14a	cmd input	relay	8	24a
34	2c	cmd input	relay		
37	7c	cmd output	relay	25	31a
38	9a	cmd output	relay	25	31a
39	10a	cmd output	relay	25	31a
40	2a	ext supply	relay		
41	2c	ext supply	relay		
42	14c	cmd input	relay	9	23a
43	13a	cmd input	relay	10	24c
44	2c	common	relay		
45	12c	cmd input	relay	11	22a
46	8c	cmd input	relay	12	23c
47	15a	cmd input	relay	7	25a
48	2c	cmd input	relay		
49	9c	cmd output	relay	12	23c
50	11a	cmd output	relay		

AVR Model R630

Generator I / O

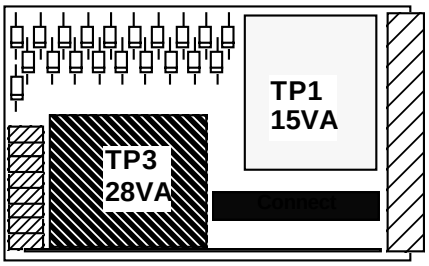


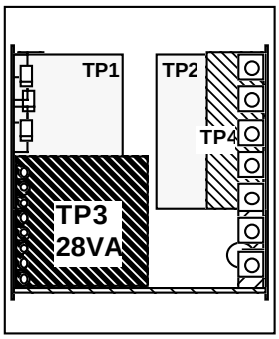
Wiring by connector HE10 26pts and flat cable

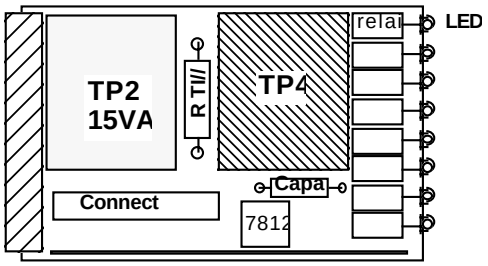
Wiring by connector LMI 10pts and normal cables

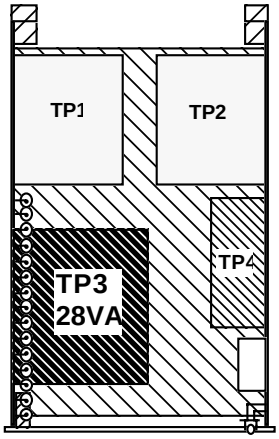
AVR Model R630

Generator I / O









ALTERNATEUR E / S
GENERATOR E / S

auto/manu

Cde cosØ

+U auto

-U auto

+I exc

-I exc

Alarm

PT1
PT2
PT3

AVR Model R630 — Supply card

1 - FUNCTIONAL

- This card, from not regulated symetrical voltage, generates +15Vdc and -15Vdc voltages with 0V common to both named +Vcc for +15V and Vdd for -15V in the following.
- The non regulated voltages are first filtered (C01, C02), pre-regulated to 20dc with ballast stages Q01 et Q02 and finally decreased to15V by means of RG01 et RG02 regulators.
- Its permanent current capability is 0,5 Amp on both polarity.

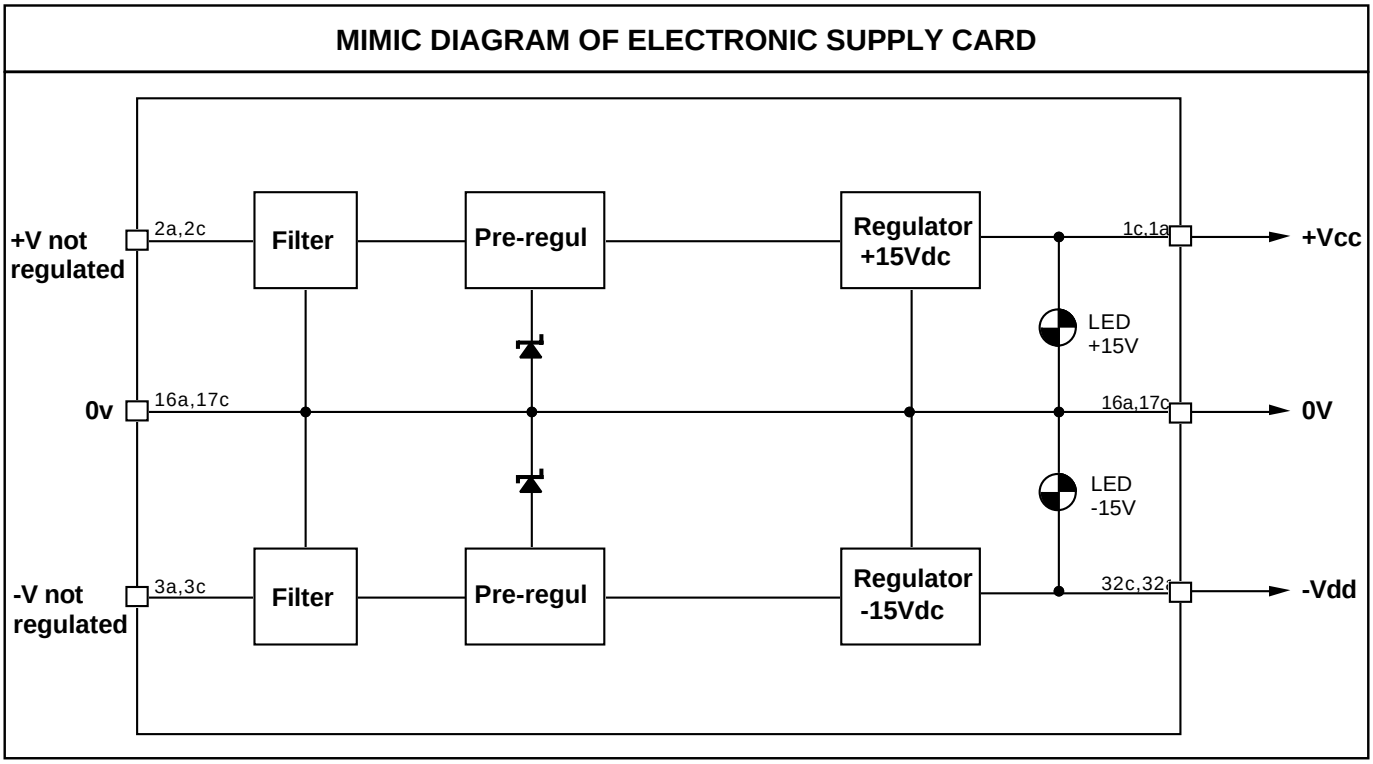
2 - ADJUSTMENTS

None

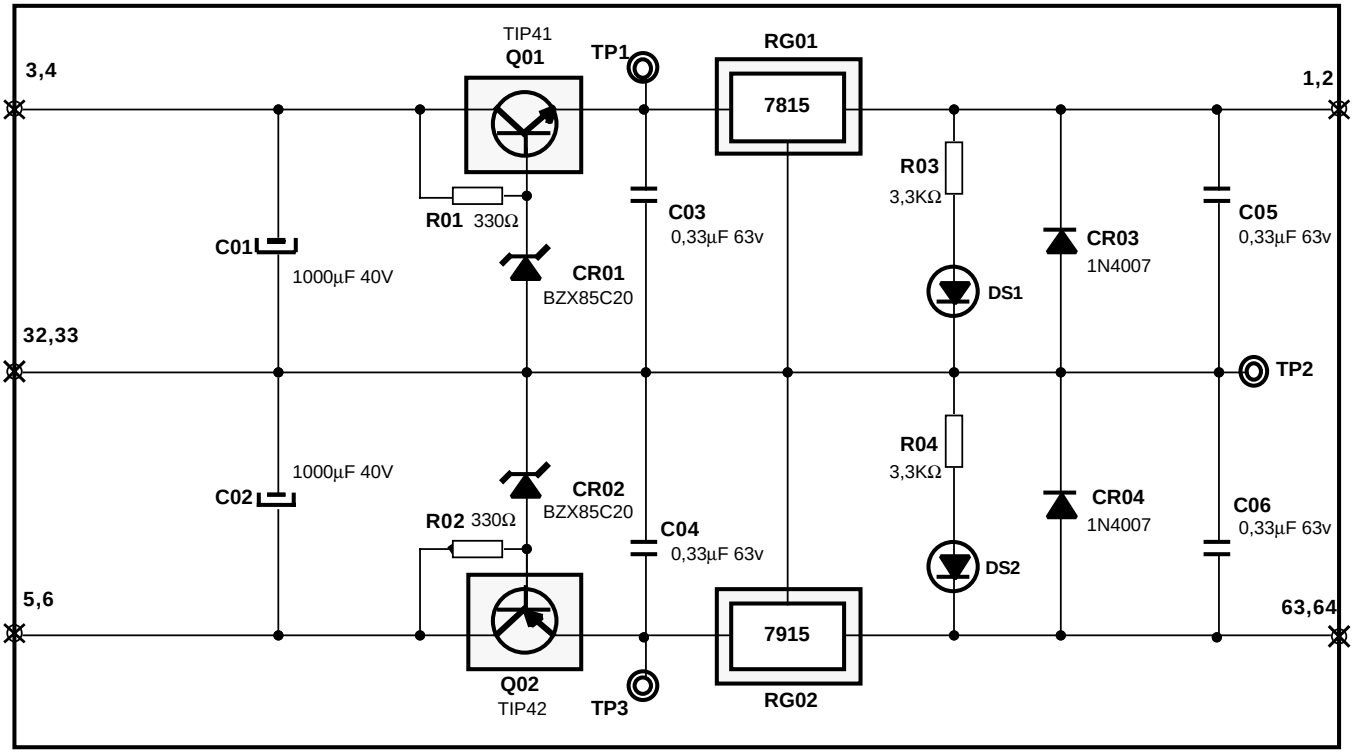
3 - INPUTS / OUTPUTS

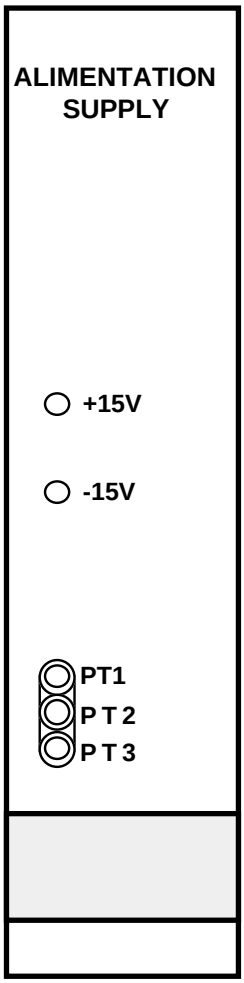
- 2a, 2c : Input +30Vdc not regulated
- 3a,3c : Input -30Vdc not regulated
- 1a,1c : Output +15Vdc regulated (Vcc)
- 32a,32c : Output -15Vdc regulated (Vdd)
- 16a,17c : Common electronic ground

MIMIC DIAGRAM OF ELECTRONIC SUPPLY CARD



AVR Model R630 — Supply card

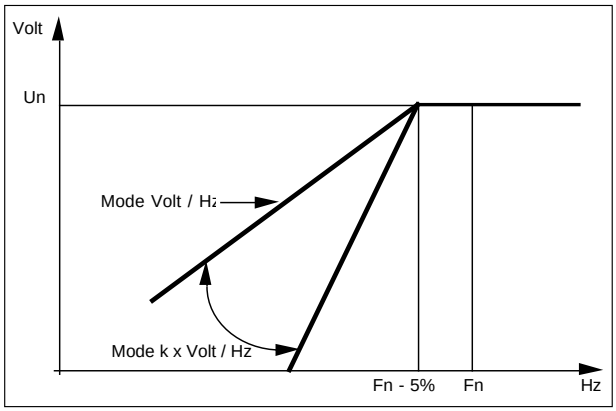




AVR Model R630 — Sensing card

1 - FUNCTIONAL

- This card elaborates from the three phases voltage image of the generator given by the "ALTERNATOR I/O" :
- A rectified, calibrated, filtered voltage Vm proportional to the stator voltage of the generator. Vm could be affected by droop depending of adjustment.
- A voltage function of the generator frequency, a part of which gives the reference set point named Vref.
- Vref is a constant above the underfrequency threshold set point (signaled by LED) and decreases below this threshold following a function depending of the position of the strap CV1:
  - In fixed V/Hz mode
  - In adjustable kVolt / Hz (see curve below)

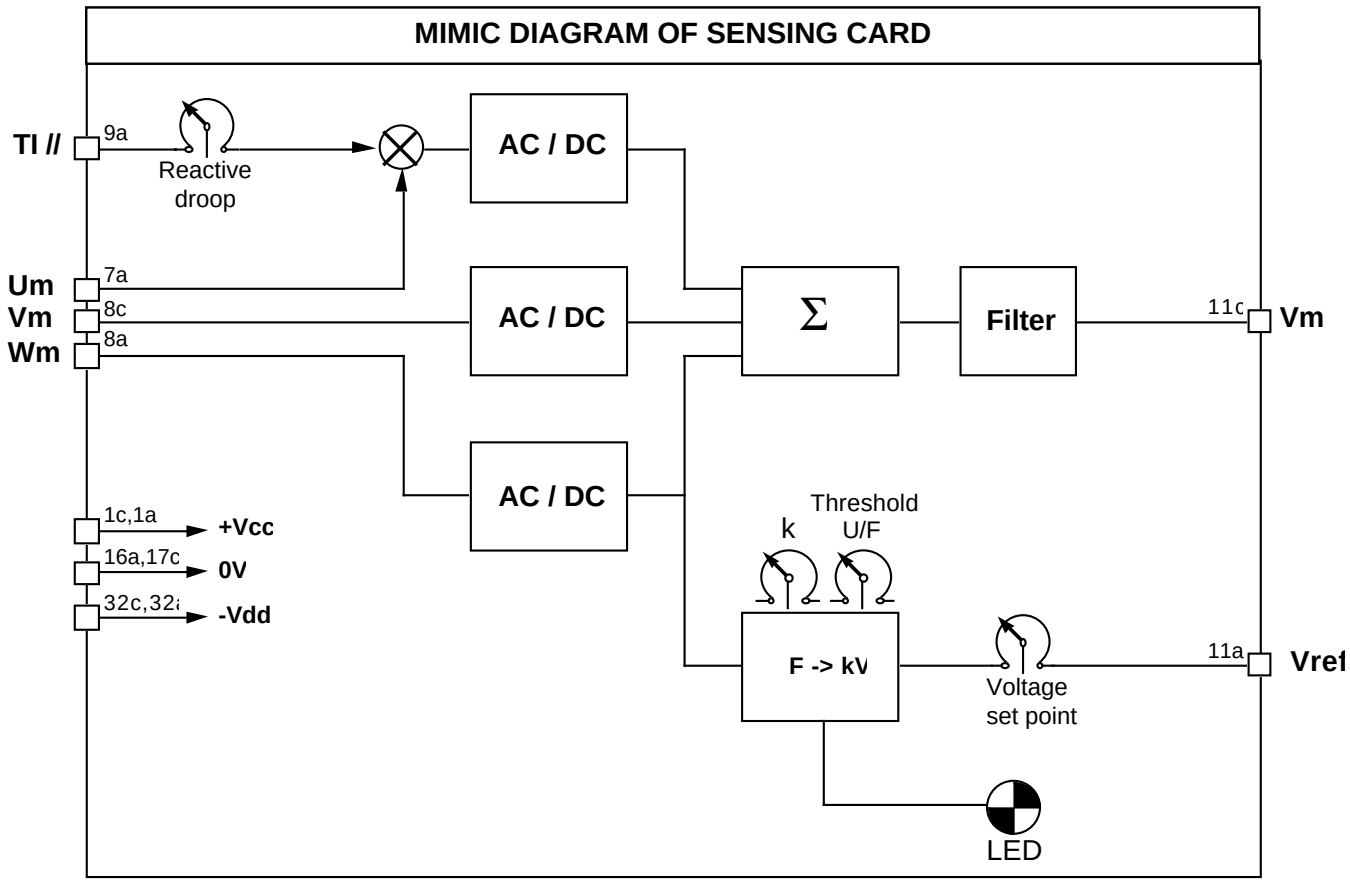


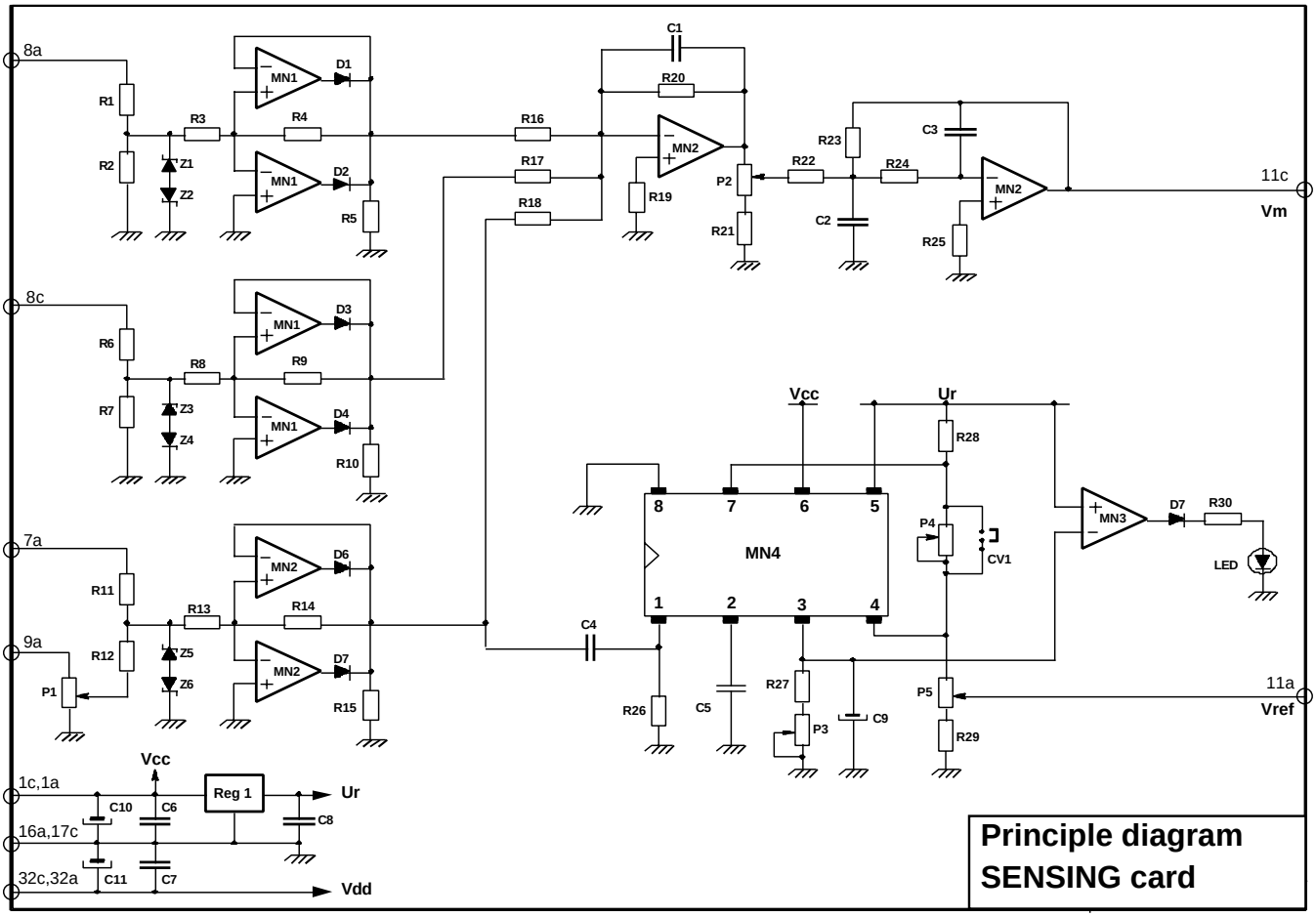
2 - ADJUSTMENTS

- P1 : Reactive droop adjust for parallel operation between equivalent machine.
- P2 : Vm adjust for nominal voltage. (9Vdc at Un)
- P3 : Underfrequency threshold adjust (normally Fn - 5%) signaled by LED.
- P4 : Underfrequency slope adjust (k) in kVolt / Hz mode ($1 \leq k \leq 2$)
- P5 : Voltage set point Vref for the nominal voltage (10Vdc at Un and Fn)

3 - INPUTS / OUTPUTS

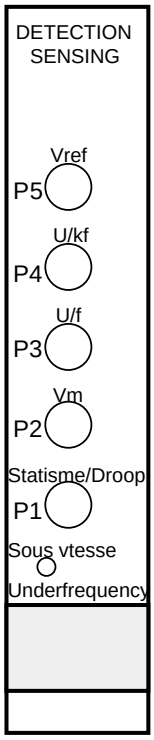
- 7a, 8a, 8c : Voltage inputs image of the generator (3 x 21Vac between each and the GND)
- 9a : Current input image of the generator stator current (1Vac pour In)
- 1a,1c : +15Vdc regulated (Vcc)
- 32a,32c : -15Vdc regulated (Vdd)
- 16a,17c : Common ground (GND or 0V)
- 11c : Voltage output image of the generator (Vm) 10Vdc at Un
- 11a : Voltage set point output (Vref) 10Vdc at Un and Fn





FRONT VIEW

SENSING CARD



AVR Model R630

PID, LIMIT card

1 - FUNCTIONAL

- This card, from Vm (machine voltage image), Vref (voltage set point) and complementary informations given in the following, elaborates the voltage command of the power driver card, which is the field current set point.

- Three operating modes are possible, depending of external informations :

• Solo operation or parallel operation between equivalent machines (1 Fonction)
(this is the normal mode)

• Parallel operation with the mains with power factor (COSØ) or KVAR regulation (2 Fonction)
(only if COSØ / KVAR card is fitted)

• Operation in voltage equalization mode between machine and mains before coupling (3 Fonction)
(only if "MAINS I / O" CARD is fitted)

1F : Machine image Vmis compared with the sum of Vref, Pext, etc voltages depending of used options and the resultant voltage (error voltage) feeds the PID.

2F : When cosØ cmd input is activated (+Vcc), the machine voltage Vm is compared to the voltage given from the cosØ/KVAR card and the result (error voltage) feeds the PID.

3F : When U/U cmd input is activated (+Vcc), the machine voltage Vm is compared to the voltage given from the "MAINS I / O" card and the result (error voltage) feeds the PID.

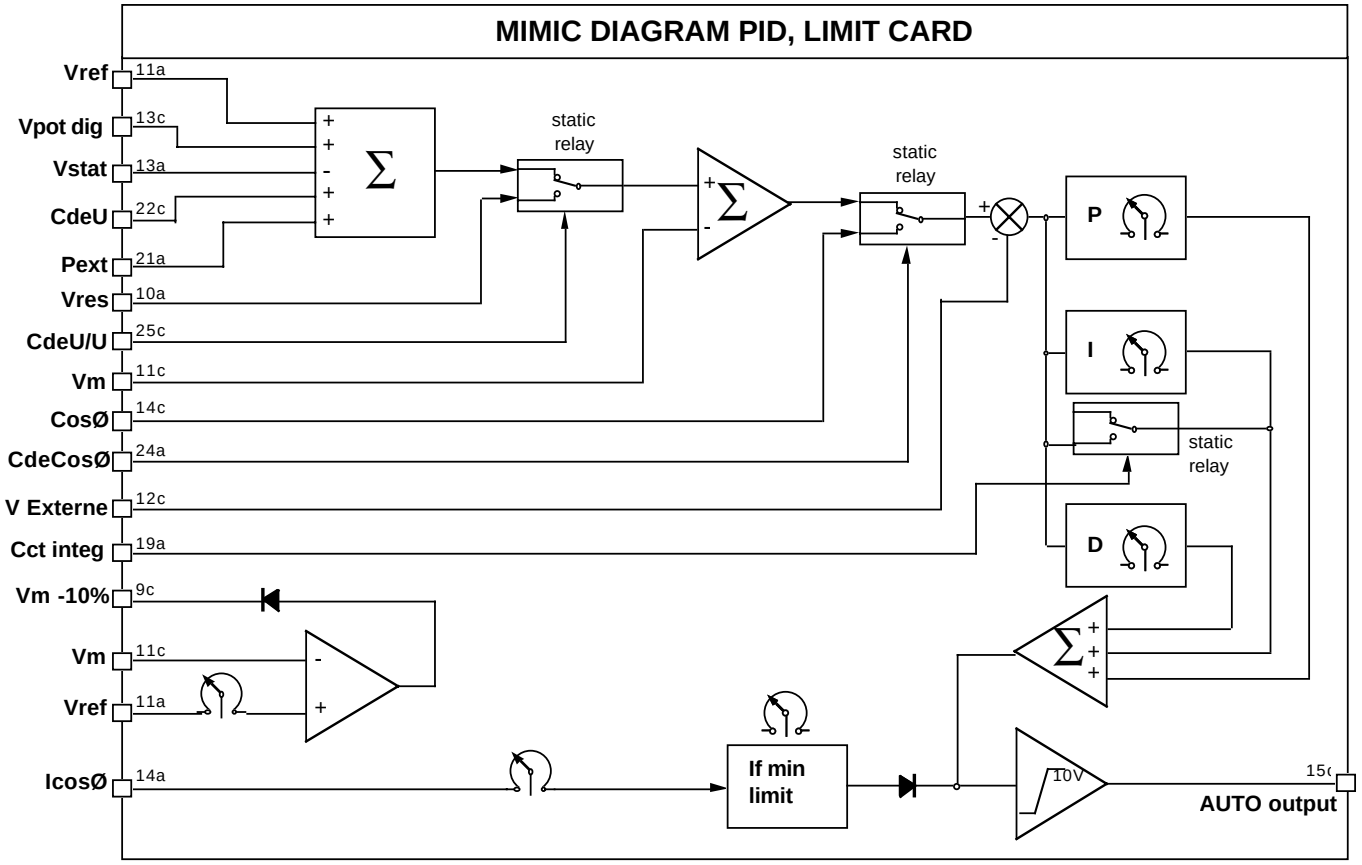
A compensation external input, given for specific applications is added to the error voltage and the resultant voltage is the real PID input. Each branch (P, I, D) of the PID, independently adjustable from the others, set the time constants of the AVR in regard to the generator. The integrator branch can be short-circuited, for example when starting-up.
These three outputs are added, limited to 10Vdc and then give the field current set voltage of the "automatic channel" which is the driver card input.
The minimum value of this signal can be limitated to avoid total loss of excitation of the generator. In case of parallel operation with the mains (cosØ/KVAR card), this limitation is a function of the active power supply by the generator, this information is given by the COSØ / KVAR card.
A separate stage detect if the generator voltage is below an adjustable value to unlock the normal field ceiling voltage from 110% of nominal to 160% (adjustable).

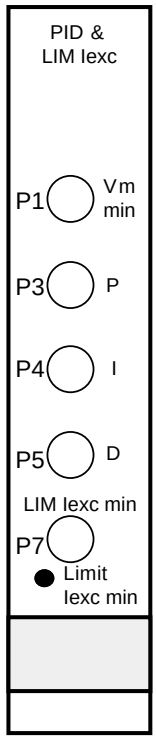
2 - ADJUSTMENTS

- P1 : Ceiling unlocked voltage threshold adjust (normally 90% Un).
- P2 : Proportionnal branch gain adjust (large signal)
- P3 : Proportionnal branch gain adjust
- P4 : Integrative branch time constant adjust
- P5 : Derivative branch gain adjust
- P6 : Derivative branch time constant adjust
- P7 : Minimum field limitation adjust
- P8 : Minimum field limitation, active power correction adjust

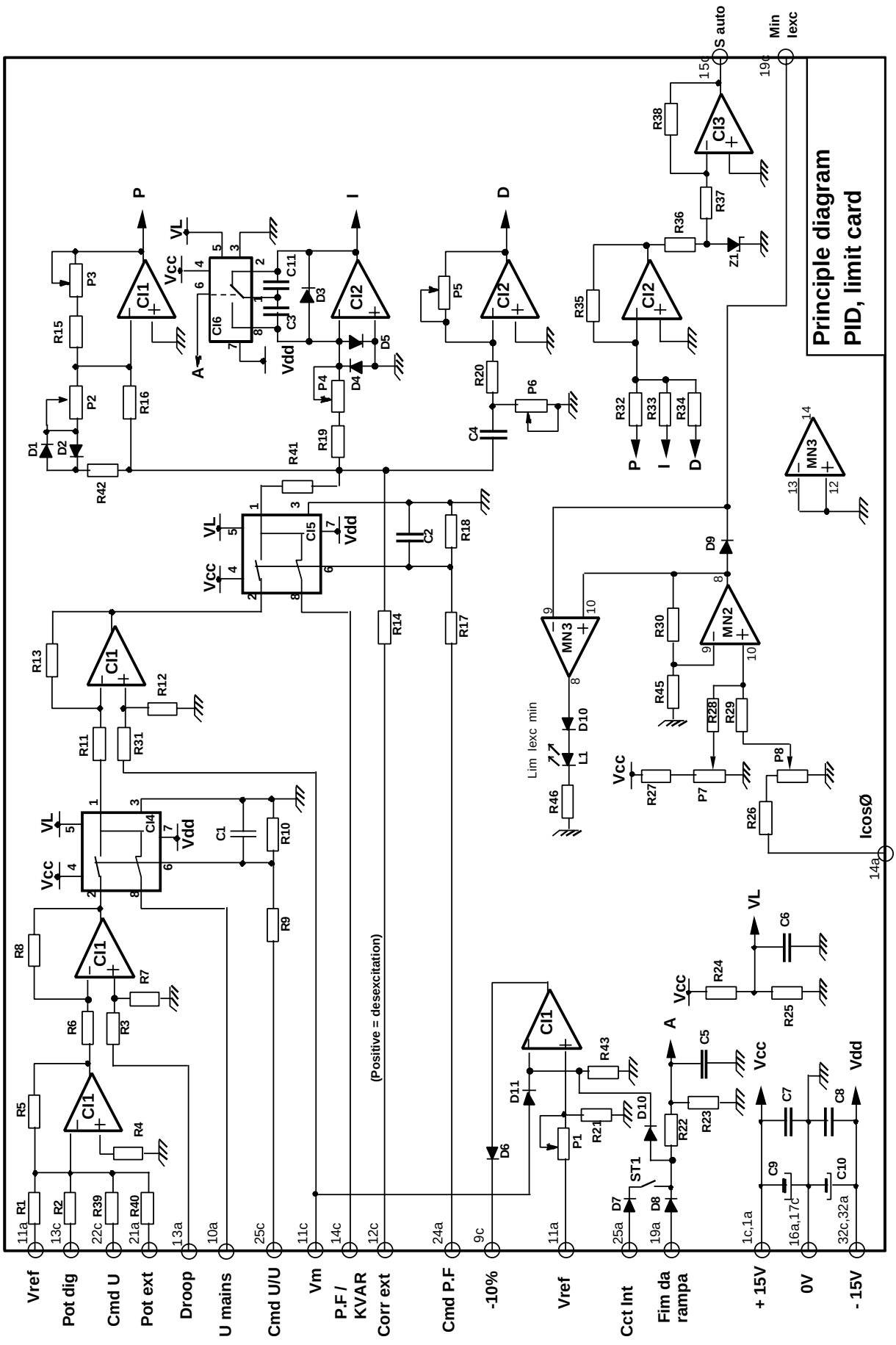
3 - INPUTS / OUTPUTS

- 11a : Voltage reference set point input. Vref
- 13c : Added signal to voltage reference set point input (option)
- 22c : Added signal to voltage reference set point input (external voltage option)
- 21a : Added signal to voltage reference set point input (external potentiometer option)
- 13a : Added signal to voltage reference set point input (differential droop option; with cosØ/KVAR card)
- 19a : Integrator short-circuit command input
- 10a : Mains image voltage input (3F) (with "MAINS I / O" card only)
- 14c : CosØ error voltage input (2F) (with cosØ/KVAR card)
- 25c : Voltage equalization command input (3F) (with "MAINS I / O" card only)
- 24a : CosØ regulation command input (2F) (with cosØ/KVAR card)
- 1a,1c : +15Vdc regulated (Vcc)
- 32a,32c : -15Vdc regulated (Vdd)
- 16a,17c : Common electronic ground
- 14a : Minimum field limitation, active power correction input
- 15c : Field current voltage control output "AUTO" channel





FRONT VIEW PID CARD


Principle diagram
PID, limit card
S auto
Min Iexc
P
I
D
VL
Vcc
Vdd
A
Lim Iexc min
(Positive = desexcitation)
IcosØ
Vref
Pot dig
Cmd U
Pot ext
Droop
U mains
Cmd U/U
Vm
P.F / KVAR
Corr ext
Cmd P.F
-10%
Vref
Cct Int
Fim da rampa
+ 15V
0V
- 15V

AVR Model R630 — Driver card

1 - FUNCTIONAL

This card controls from "AUTO" and "MANU" voltage reference and some additional informations detailed in the following, the exciter field current supply by the regulator and the booster (if used).

- Three operating mode are possible, depending of external informations :
  • Normal mode with 110% ceiling of If nominal.
  • Ceiling unlocked mode (160% minimum Ifield nominal) depending of the command input from the PID card with limited delay and alarm output in case of sustained undervoltage.
  • Maximum ceiling mode if the synchronisation voltage desappears (machine short-circuit) with limited (adjustable) field current.

- The "AUTO" or "MANU" reference voltage depending of the associated command input and also of the active limitations, is compared to the field current measurement and gives the error voltage which is after integration, compared to a sawtooth feed by the synchronisation voltage. The output of this stage is a variable duty cycle signal which controls the power transistors throught isolating optocouplors.

- This card can be supplied in three manners :
  • From the general supply of the rack in normal operation
  • Throught an isolated supply taken from the field voltage during start-up or generator short-circuit (Rack supply not present)
  • Directly from the field voltage for power transistor command.

The permanent limitation (110% de Iexc nominal) can be modified by the following conditions:
- Field ceiling unlocking on machine undervoltage condition. It inccreases from 110% (normal operation) to a minimum of 160% of the nominal field current during an adjustable time delay and then go back to 110%. An alarm is activated if this undervoltage is sustained afterward.
- Field ceiling unlocking on synchronisation voltage abcence. It increases to the maximum given by the sett-ing of P7.
- Field ceiling limitation caused by power heatsink overheating. On thermocontact action the ceiling is reduced to a value given by the setting of P8.
A separate circuit monitors the instantaneous current of the power transistor and reduces immediatly the command signal if its value increases above a fixed value. (Exciter or wiring short-circuit protection).

2 - ADJUSTMENTS

- P1 : Integrator time constant adjust.
- P2 : Unlocked ceiling time delay adjust. (generally 5s)
- P3 : Alarm time delay adjust after ceiling unlock.
- P4 : Permanent ceiling value adjust (generally 1,1If nominal)
- P5 : HALL sensor range adjust.
- P6 : Initial ramp-up adjust
- P7 : Maximum field current adjust (machine short-circuit)
- P8 : Maximum fieeld current in case of heatsink overheating.

3 - INPUTS / OUTPUTS

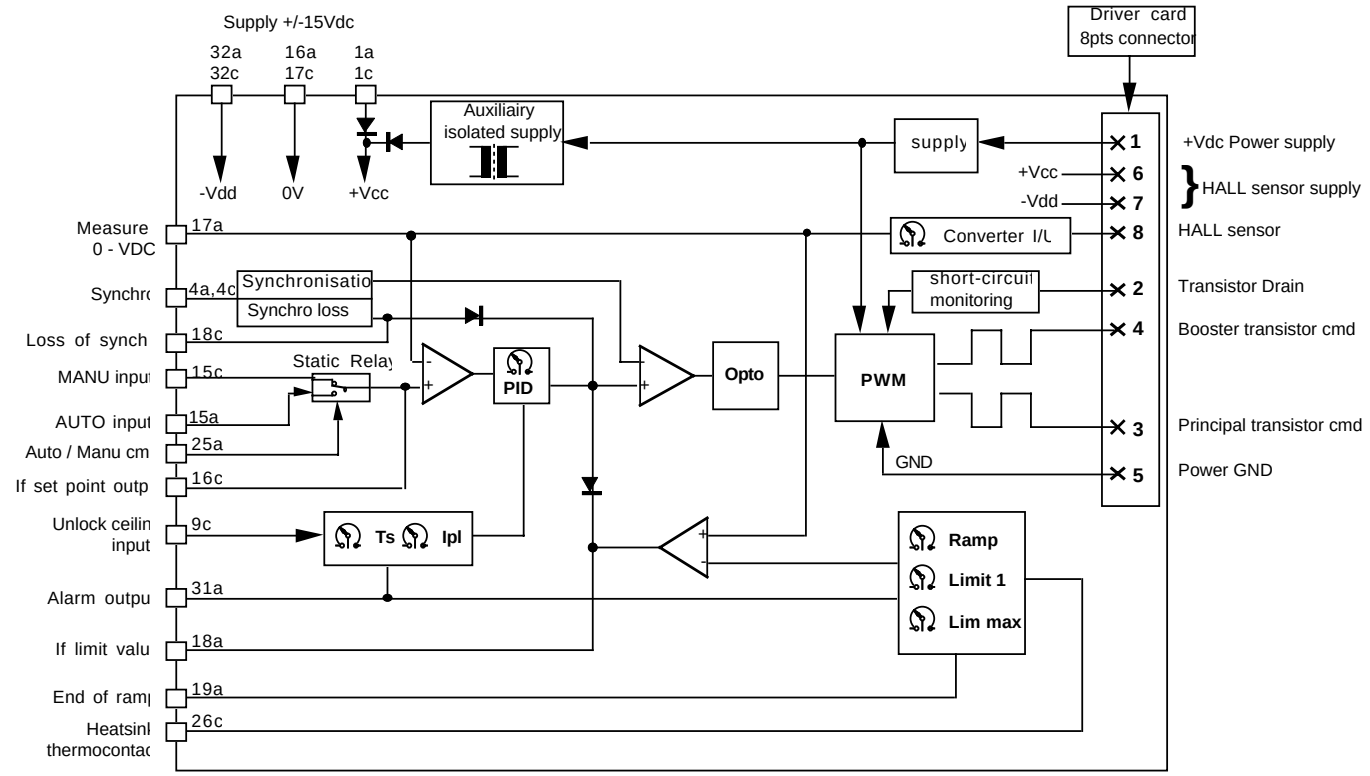
Flat cable (BUS 64points)

- 15c : If reference set point input "AUTO" channel
- 15a : If reference set point input "MANU" channel
- 25a : "AUTO / MANU" command input (0V = "AUTO")
- 9c : Unlocking ceiling command input
- 4a, 4c : Synchronisation voltage input
- 26c : Heatsink thermocontact input
- 1a,1c : +15Vdc regulated (Vcc)
- 32a,32c : -15Vdc regulated (Vdd)
- 16a,17c : Common ground (GND or 0V)
- 17a : Field current measure output
- 19a : End of ramp-up output signal
- 31a : Alarm output

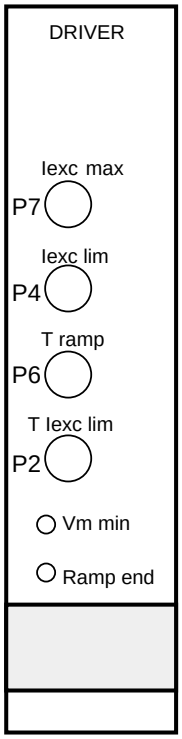
Card connector (8 points)

- 1 : Field voltage
- 2 : Main transistor drain
- 3 : Main transistor gate
- 4 : Booster transistor gate
- 5 : Power ground
- 6 : +Vcc HALL sensor
- 7 : -Vcc HALL sensor
- 8 : HALL sensor measure output

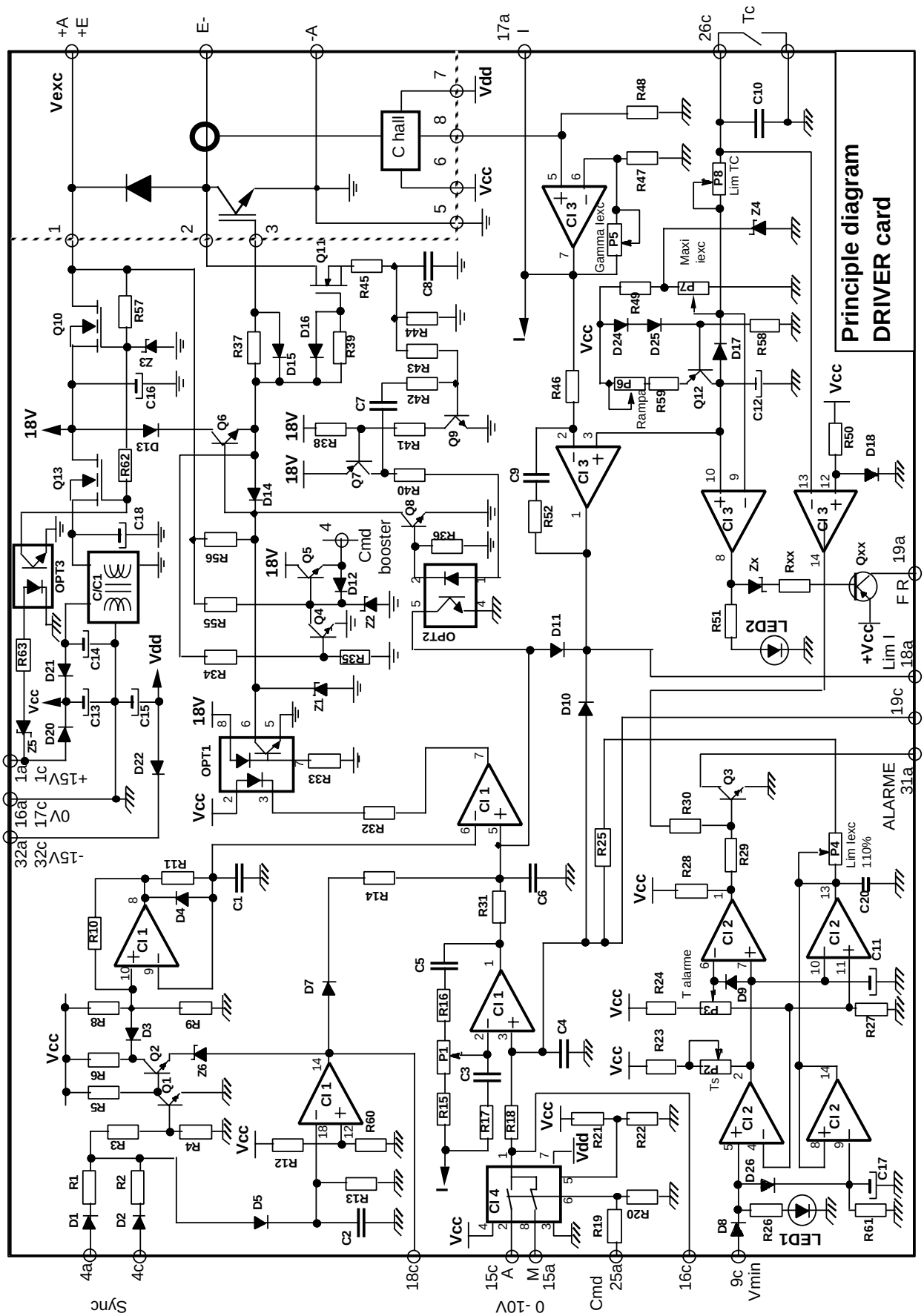
MIMIC DIAGRAM DRIVER CARD



FRONT VIEW DRIVER CARD



AVR Model R630 Driver card



AVR Model R630

Cos Ø - kVAR Optional card

1 - FUNCTIONAL

This card elaborates from generator current and voltage informations, the following signals:

- An image of the reactive current of the generator named (KVAR) used for KVAR regulation.

- An image of the phase shift between the voltage and the current of the generator named (Ø) used for cosØ (PF) regulation.

- An image of the active current of the generator named (KW) used for compensate the minimum Ifield limit of the PID card.

- The principle of measurement is to sample and hold the instantaneous value of the current when the instantaneous voltage reaches zero on positive slope.

- First the current image of the stator current is filtered and used directly for KVAR measure. Then it is derivated and used for KW measure. And then it is amplified to obtain square waves and integrated to give a sawtooth used to Ø measure.

- The voltage image is phase-shifted to compensate the phase shift of the current input filter and after amplification is fed to a monostable which gives the pulse signal (about 100µs) used by all the sample and hold circuits.

- KVAR and Ø values are compared with an internal and external (if used) setting and the difference is send to the PID card as an error signal. An external contact control an analog switch to select what information between KVAR and Ø will be regulated.

- Three informations (Ø, ΔØ, ΔKVAR) can be used as an alternative droop for solo operation.
  • Ø gives no droop at cosØ=1 and the voltage decreases at lagging PF.
  • ΔØ gives no droop at the cosØ setting and the voltage decreases at more lagging PF and opposite for more leading PF.
  • ΔKVAR gives no droop at the KVAR value setting and the voltage decreases with more KVAR and increases if less.

- The selection between these is made by mean of jumper (CAV) on the card (internal).

2 - ADJUSTMENTS

- P1 : KVAR internal setting.
- P2 : PF (cosØ) internal setting.
- P3 : Voltage phase shifter (internal)
- P4 : PF (cosØ) gain setting
- P5 : KVAR gain setting.
- P6 : Différential droop setting
- P7 : Pulse width setting (internal)

- Jumper CAV : Selection of droop type

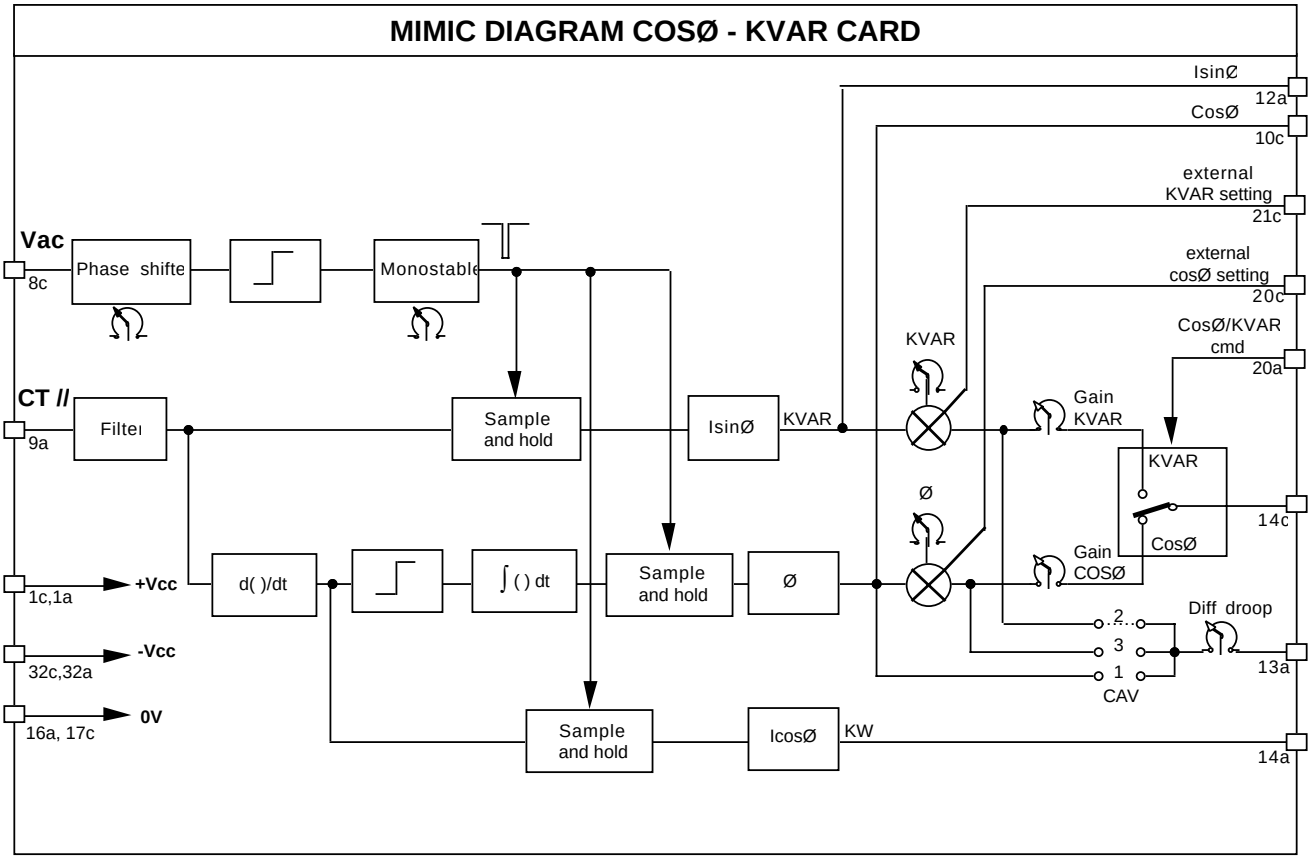
No : Reactive droop adjusted by P1 (sensing card)
CAV1 : No droop for cosØ=1 and droop if lagging.
CAV2 : No droop for KVAR setting (P1), voltage decreases if more KVAR (lagging) and opposite if less.
CAV3 : No droop for PF setting (P2), voltage decreases if more lagging and opposite if less or leading.

Nota : If the droop is used from this card, potentiometer P1 of the sensing card must be set to zero.

3 - INPUTS / OUTPUTS

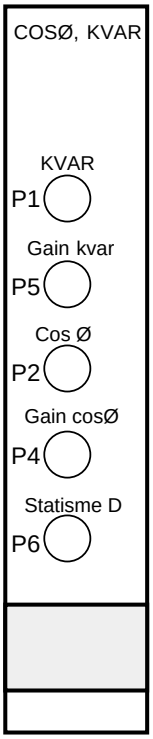
Flat cable (BUS 64points)

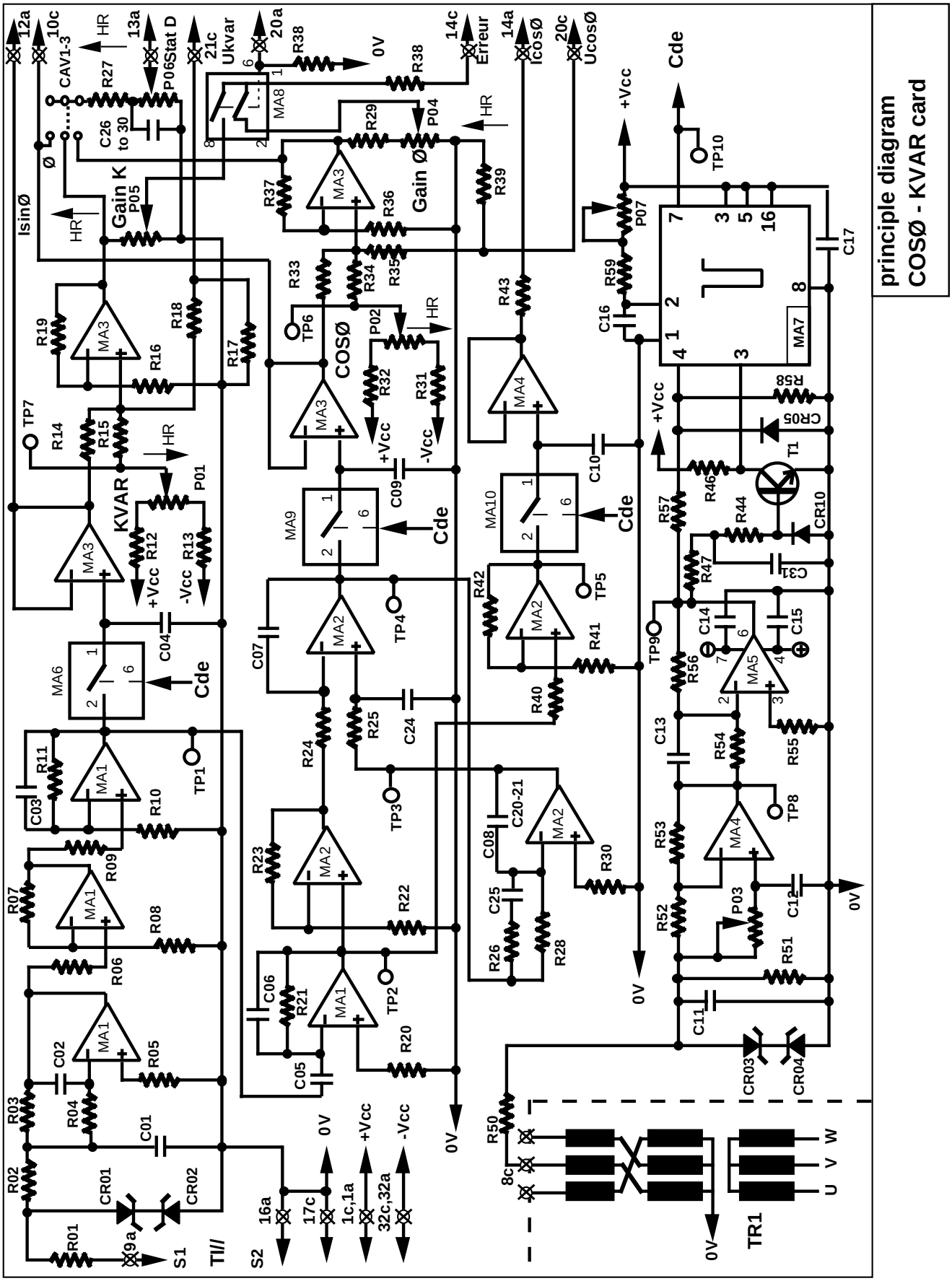
- 8c : Generator voltage image input
- 9a : Generator current image input
- 20a : Command input "cosØ / KVAR" (0V = "cosØ")
- 21c : External KVAR setting input
- 20c : External cosØ setting input
- 1a,1c : +15Vdc supply (Vcc)
- 32a,32c : -15Vdc supply (Vdd)
- 16a,17c : Common electronic ground
- 14c : Error signal output to PID card
- 13a : Droop signal output to sensing card
- 14a : KW signal output to PID card
- 12a : KVAR signal output
- 10c : Ø signal output



FRONT VIEW

COSØ - KVAR card




principle diagram
COSØ - KVAR card
12a
10c
CAV1-3
HR
13a
P06Stat D
21c
Ukvar
20a
R38
0V
14c
Erreur
14a
IcosØ
20c
UcosØ
Cde
+Vcc
TP10
R27
C26 to 30
MA8
R29
P04
R39
IsinØ
Gain K
P05
Gain Ø
R37
MA3
R36
R33
R34
R35
TP6
COSØ
P02
R43
C16
R59
P07
7
3
5
16
C17
MA7
R19
R18
R16
R17
R32
R31
MA4
R58
TP7
R14
R15
P01
KVAR
R12
R13
-Vcc
C09
C10
CR05
T1
R46
R57
R44
CR10
MA9
MA10
C04
MA6
C07
MA2
TP4
TP5
R42
R41
C14
C15
TP9
R56
MA5
R40
C13
R54
R55
C03
MA1
R11
R10
TP1
TP3
C08
C20-21
R30
R53
TP8
R24
R25
C24
R23
R22
C25
R26
R28
R52
P03
C12
R09
R07
R08
R06
C06
R21
TP2
R20
R51
C11
C02
R05
R03
R04
C01
R02
CR01
CR02
CR03
CR04
R50
8c
R01
9a
S1
TI//
S2
16a
17c
1c,1a
32c,32a
U V W
TR1

AVR Model R630

Optional mains I / O

1 - FONCTIONNAL

- This unit is mainly an interface between external signals and low power electronics.

- It is composed by :
  • The adaptation three phases transformer between input voltage and measurement circuits.
  • The AC/DC converter to give an image voltage of the mains voltage.
  • The interface input relays between command / control terminals and internal circuits.
  • The interface between 64pts BUS and the analogic input / output terminals.

2 - ADJUSTMENTS

- P01 : Ur setting for mains nominal voltage. (10Vdc for nominal value)

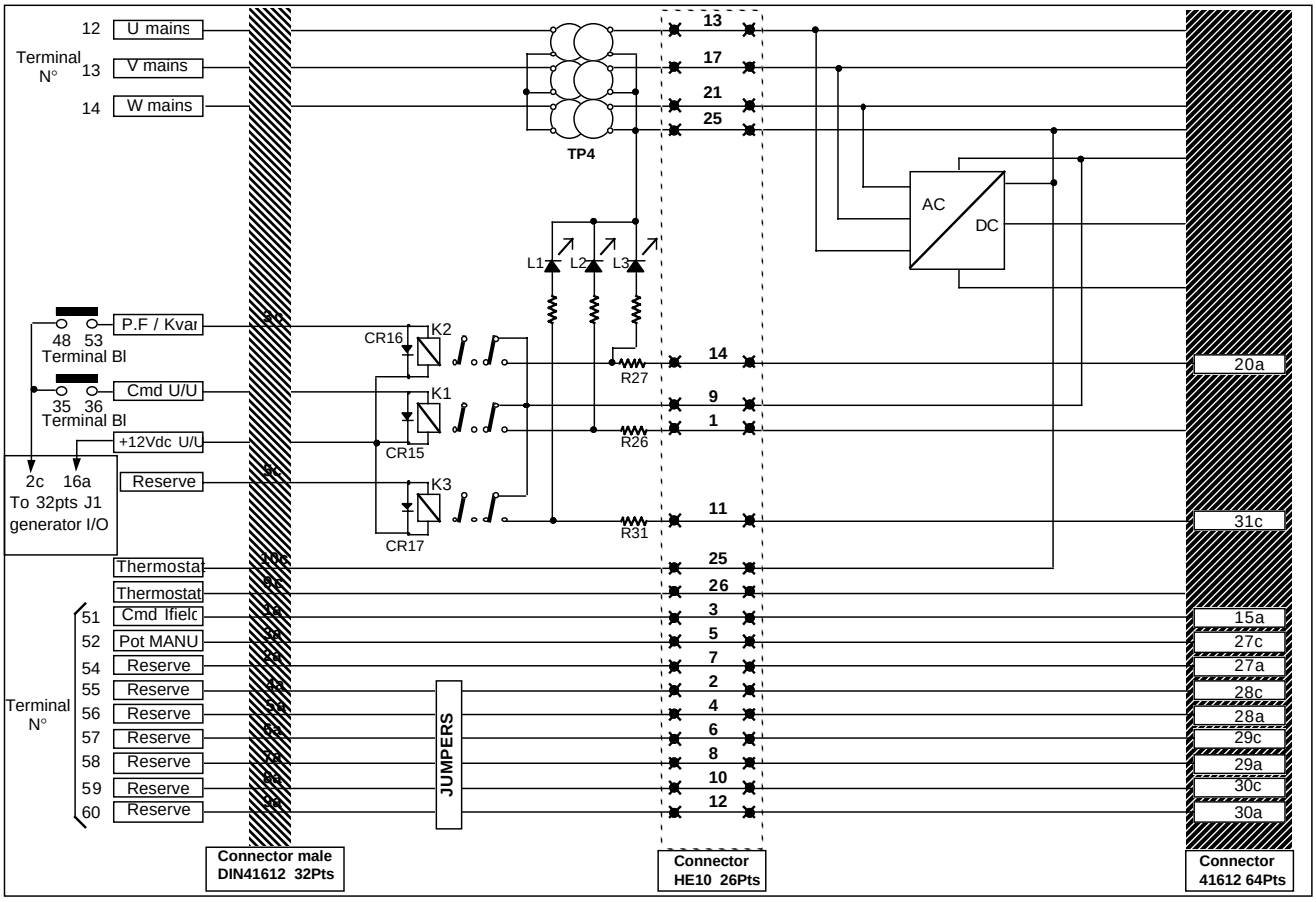
3 - INPUT / OUTPUT

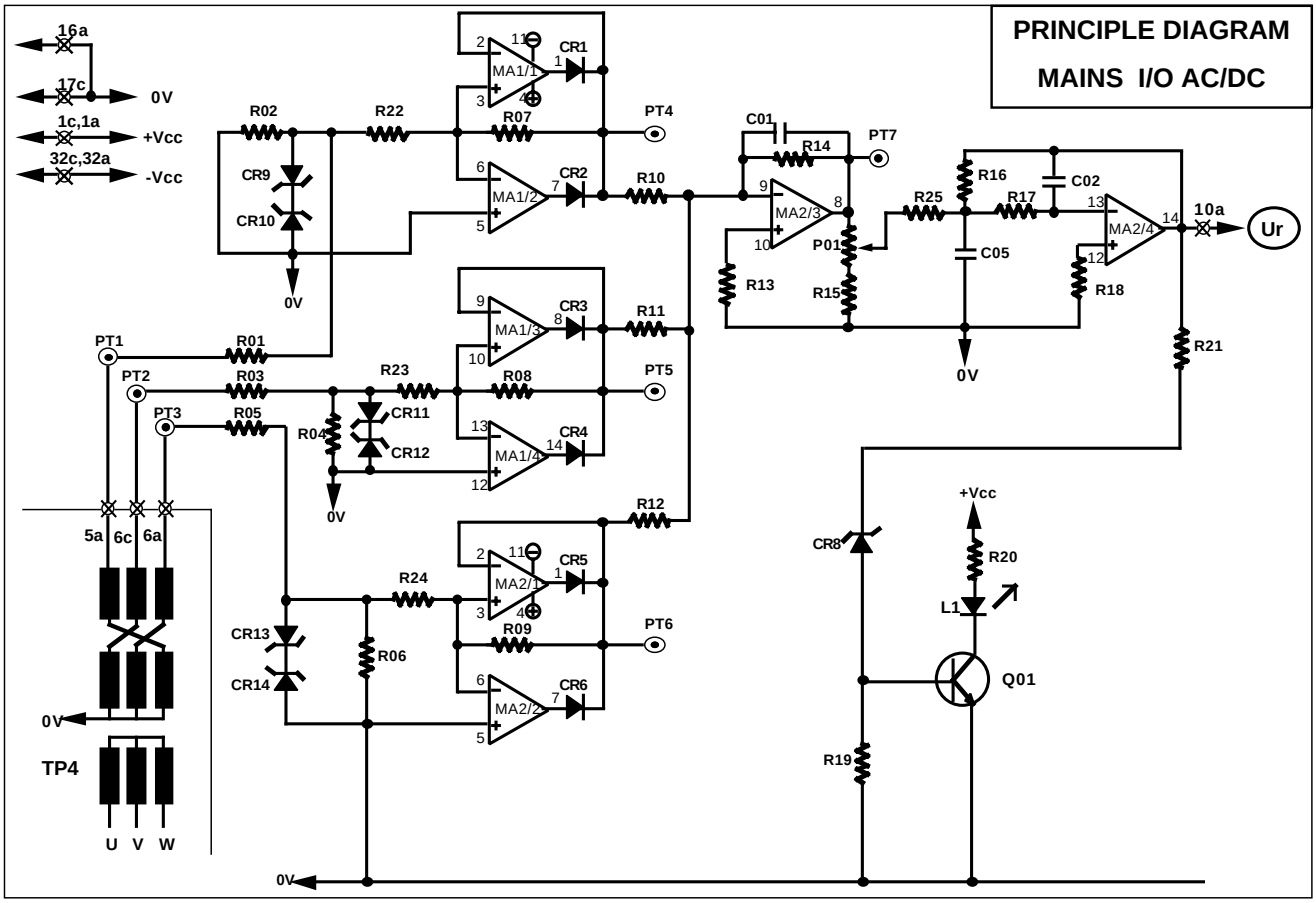
See following table.

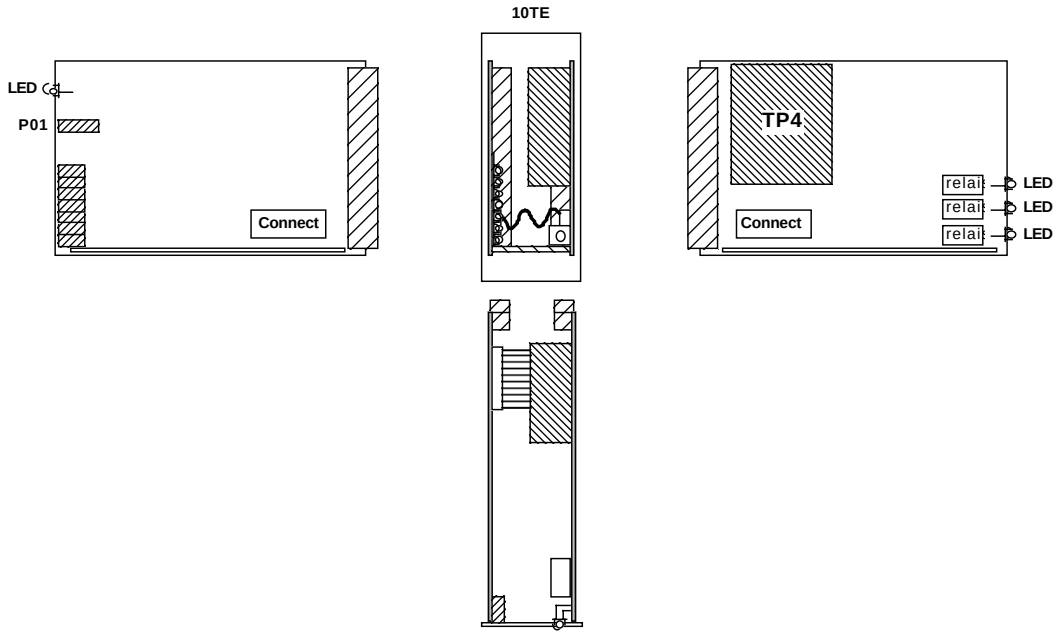
INPUT TERMINAL	Connector 32 PTS	Type I / O	Interface	Connector 26 PTS	Connector BUS 64 PTS
12	15c	sensing	3Ø transformer TP4	13	5a
13	13c	sensing	3Ø transformer TP4	17	6c
14	11c	sensing	3Ø transformer TP4	21	6a
51	1a	signal	direct	3	15a
52	3a	signal	direct	5	27c
54	2a	spare		7	27a
55	4a	spare		2	28c
56	5a	spare		4	28a
57	6a	spare		6	29c
58	7a	spare		8	29a
59	8a	spare		10	30c
60	9a	spare		12	30a
36	4c	cmd input	relay	1	25c
	2c	cmd input	relay	9	1c
53	3c	cmd input	relay	14	20a
	2c	cmd input	relay	9	1c
	10c	GND	direct	25	16a, 17c
	9c	thermocontact	direct	26	26c

AVR Model R630

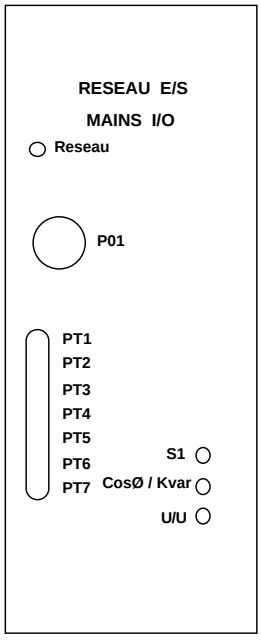
Optional mains I / O







INTERNAL VIEW
MAINS I / O



FRONT VIEW
MAINS I / O

AVR Model R610 / R630

Digital pot U / P.F Optional card

1 - FUNCTIONAL

This card replace two conventional motorized potentiometers :

- One for the remote voltage setting.
- One for power factor or reactive current setting.

- Switch between the two modes is made by the external P.F regulation order (terminals 33, 34) and switch between P.F and KVAR setting is made by the external order (terminals 48,53)

- Each last position is memorized when the control is switched or when the machine is stopped.

- Jumps (SW1 and SW2) allow the choice between unipolar or bipolar voltage output and the range is adjusted by means of potentiometers P02 and P03.

- Jumps SW3 and SW4 must be open for normal operation and are only used for special applications.

- Speed of all adjustments is controled by potentiometer P01.

- Two LED's (L1,L2) indicate the command orders + or - and four other LED's (L3,L4 and L5,L6) indicates the maximum and minimum position of voltage and P.F settings

NOTE : When this card fitted, the internal voltage setting (P05 on sensing card) must be used to give the center position of the range (if bipolar range) or the minimum setting in case of unipolar range (idem for P.F and Kvar internal setting on P.F card). An external setting potentiometer must not be used, the settings are made only by mean of push-buttons on terminals 42, 43, 44.

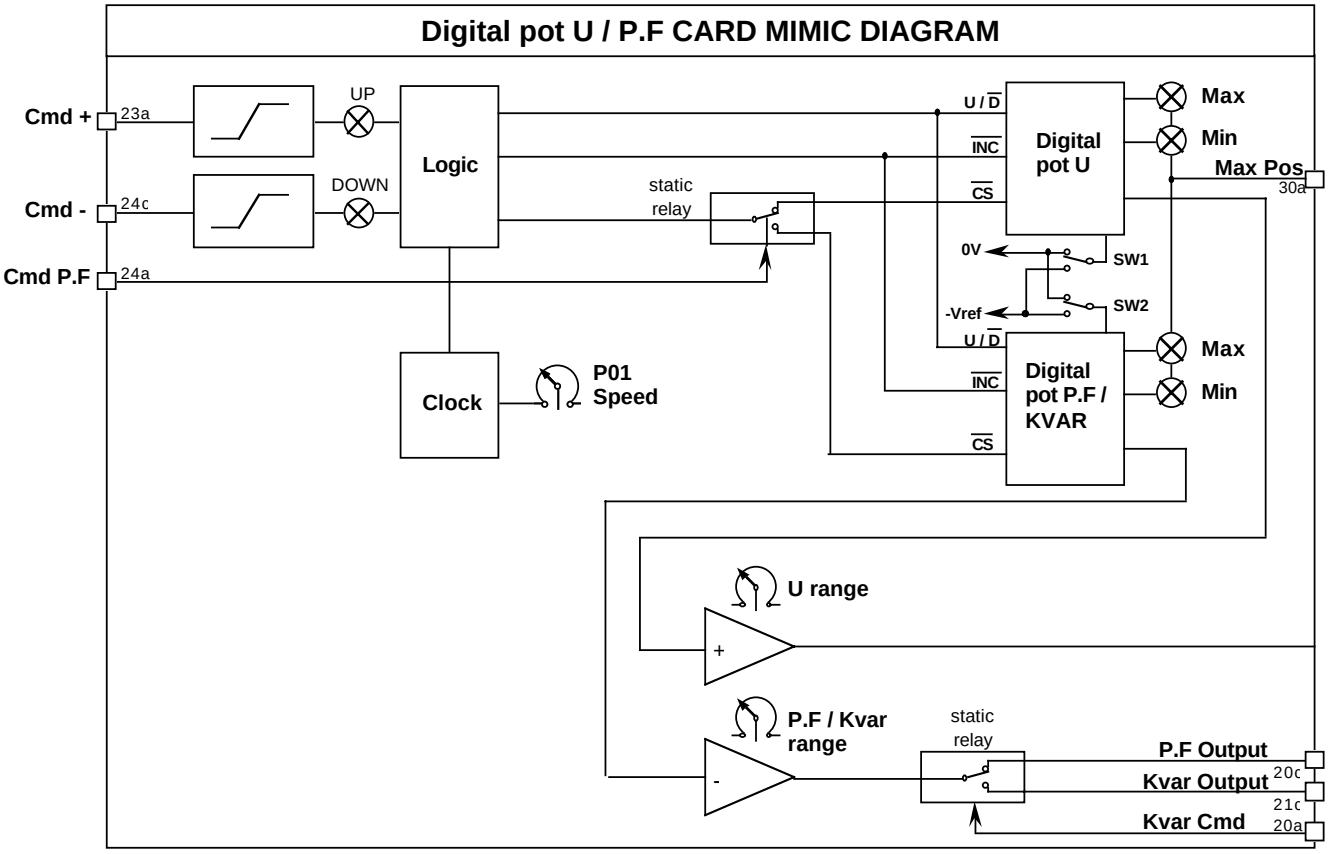
2 - ADJUSTMENTS

- P1 : Clock speed (total range time)
- P2 : Voltage range value
- P3 : P.F or KVAR range value
- SW1 : Voltage range polarity (0/+ or +/-)
- SW2 : P.F or KVAR range polarity (0/+ or +/-)

3 - INPUTS / OUTPUTS

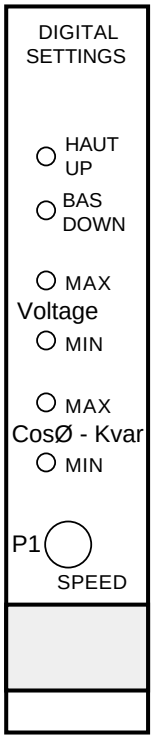
Flat cable (BUS 64 points)

- 24c : Cmd lower
- 23a : Cmd upper
- 16c : If reference set point input
- 15c : If reference set point input "AUTO" channel
- 24a : External P.F regulation order
- 20a : External P.F or KVAR regulation order
- 13c : Voltage setting output to PID card
- 20c,21c : P.F or KVAR setting output to P.F card
- 30a : Maximum position of settings
- 1a,1c : +15Vdc regulated (Vcc)
- 32a,32c : -15Vdc regulated (Vdd)
- 16a,17c : Common ground (GND or 0V)

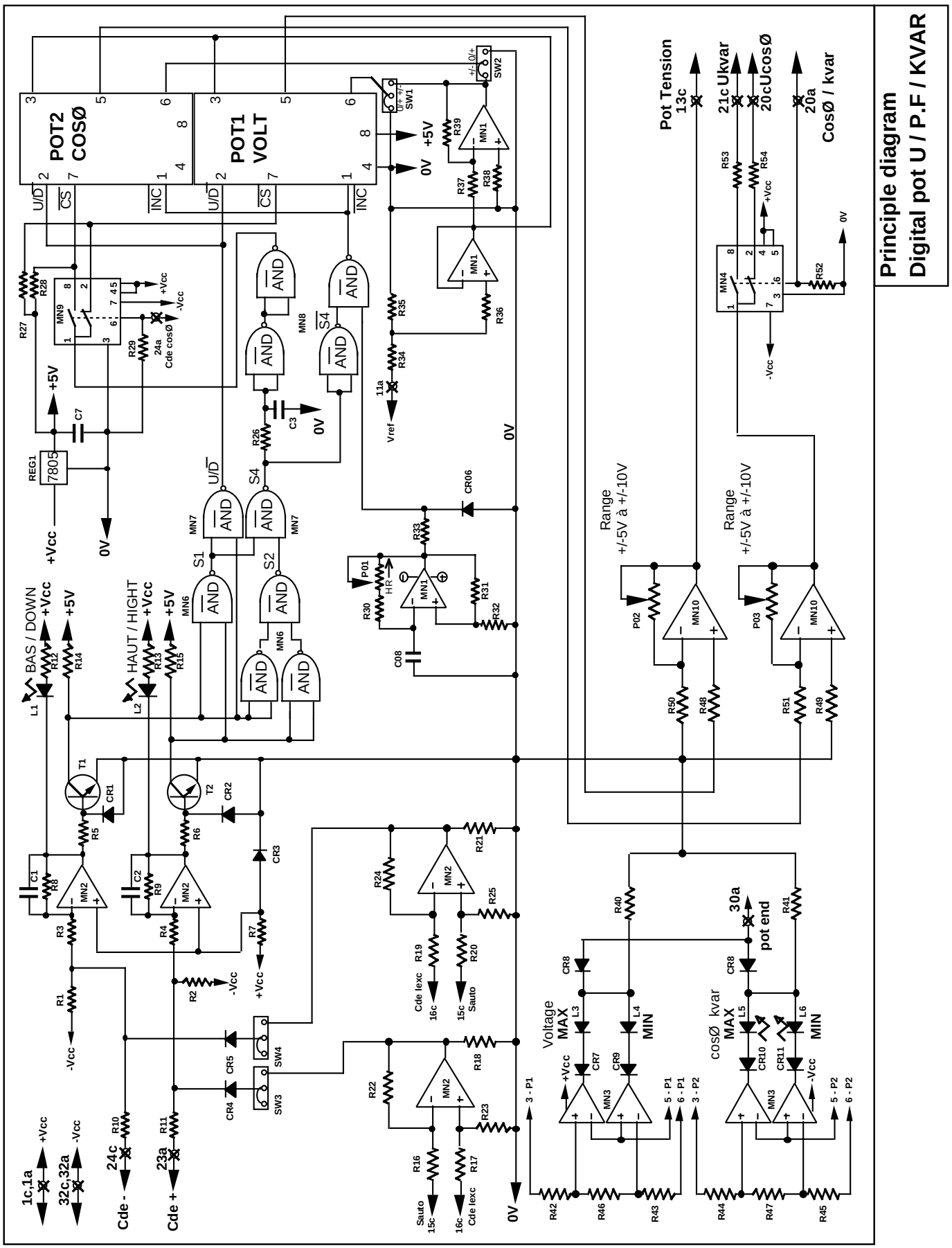


FRONT VIEW

Digital pot U / P.F



Digital pot U / P.F
Optional card



AVR Model R630

Manual mode 1 Optional card

1 - FUNCTIONAL

This card elaborates from internal setting (PO2) and external setting informations, the Ifield command signal given to "MANU" channel of the driver card.

- The Ifield output signal is limited or reduced if the generator voltage exceeds the limitation value sets by the potentiometer P01 (trip of the main breaker on load for example).

- This case of operation is indicated by the LED "LIMIT" and the Ifield setting must be decreased to a point under control.

- On MANU operation, the difference between MANU output and AUTO channel output gives a compensation signal which is used to compensate the PID to have always the MANU and AUTO channels outputs identical. With this circuit a smooth switching between MANU to AUTO is possible and operation will go back to the AUTO channel own settings.

- The ceiling can be unlocked on this operation, that is why it can be necessary to wait some seconds after the switching to return on MANU operation.

- On AUTO operation, these two channels are also monitored and the difference is indicated by three LEDs.
  - HIGH says that MANU channel is higher than AUTO
  - LOW says that MANU channel is lower than AUTO
  - OK says that MANU and AUTO channels are identical and smooth AUTO ---> MANU switching is possible.

NOTE : If a Ifield digital potentiometer is used, the internal setting (P02) must be set to 0 or under the no load field value and an external setting potentiometer must not be used. In that case the setting is made only by mean of push-buttons on terminals 44, 45, 46.

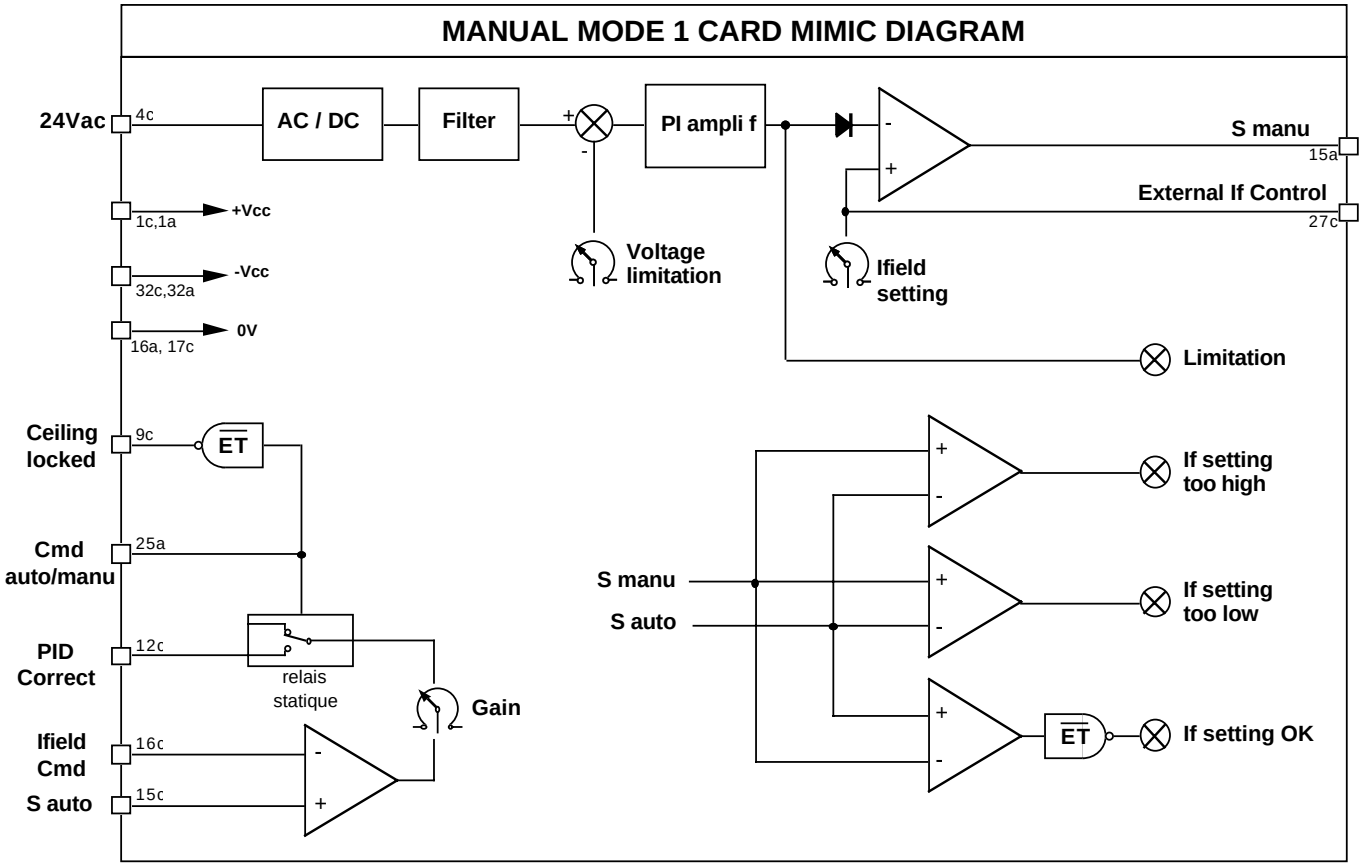
2 - ADJUSTMENTS

- P1 : Voltage limitation setting
- P2 : Internal Ifield value setting
- P3 : PID compensation gain setting
- P4 : Internal compensation setting

3 - INPUTS / OUTPUTS

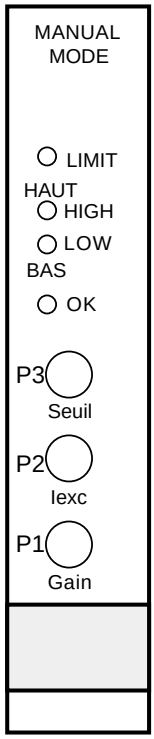
Flat cable (BUS 64points)

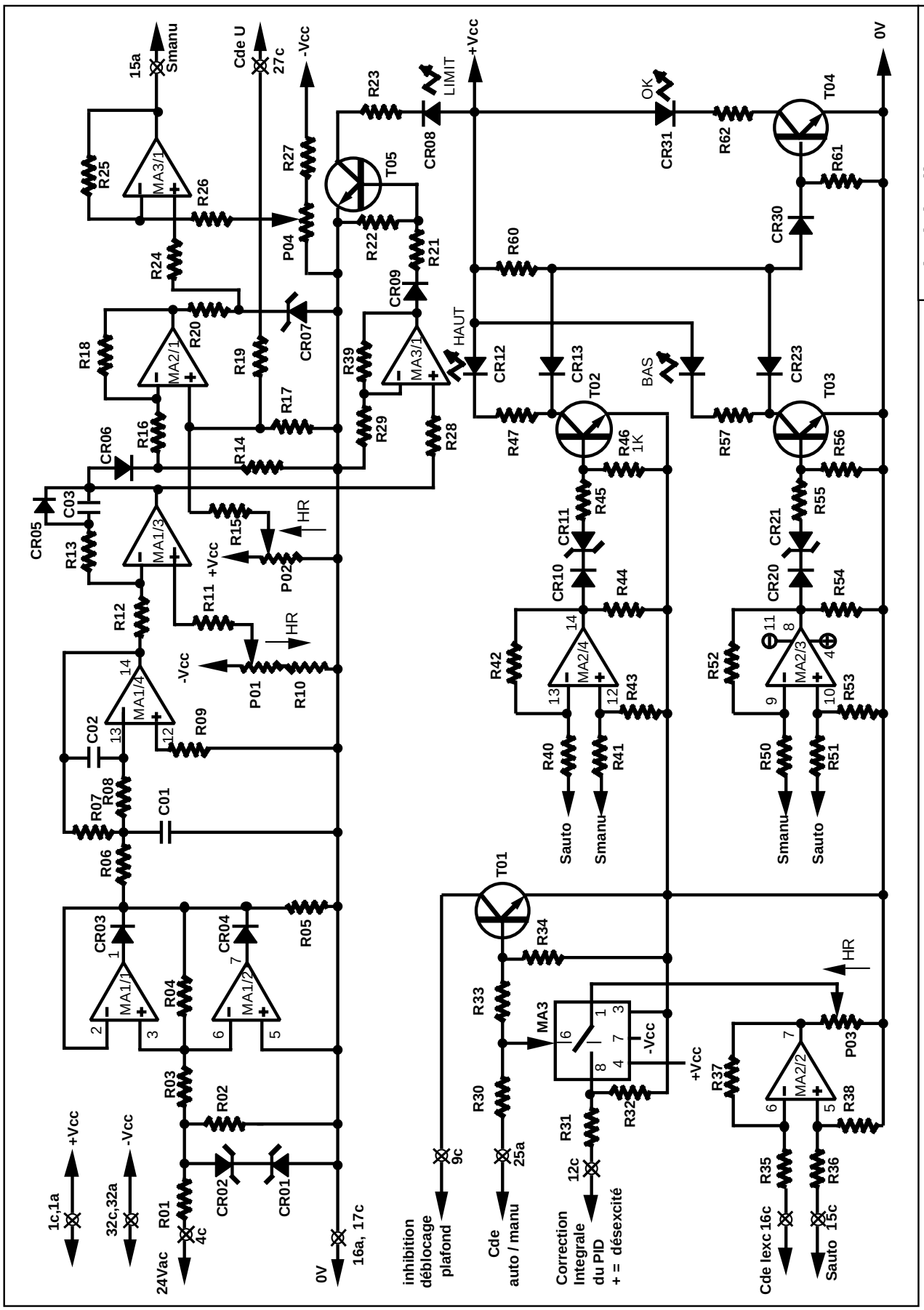
- 4c : 24Vac input image of the generator from "generator I/O" card
- 25a : "AUTO / MANU" command input (0V = "AUTO")
- 16c : If reference set point input
- 15c : If reference set point input "AUTO" channel
- 27c : External Ifield setting input
- 1a,1c : +15Vdc regulated (Vcc)
- 32a,32c : -15Vdc regulated (Vdd)
- 16a,17c : Common ground (GND or 0V)
- 15a : If set point output "MANU" channel
- 12c : PID compensation output
- 9c : Ceiling locked output



FRONT VIEW

Manual mode




Principle diagram
Manual mode 1 card
15a
Smanu
Cde U
27c
-Vcc
+Vcc
0V
LIMIT
OK
HAUT
BAS
HR
MA1/1
MA1/2
MA1/3
MA1/4
MA2/1
MA2/2
MA2/3
MA2/4
MA3/1
MA3
T01
T02
T03
T04
T05
CR01
CR02
CR03
CR04
CR05
CR06
CR07
CR08
CR09
CR10
CR11
CR12
CR13
CR20
CR21
CR23
CR30
CR31
C01
C02
C03
P01
P02
P03
P04
1c,1a
32c,32a
24Vac
4c
16a, 17c
9c
25a
12c
16c
15c
inhibition
déblocage
plafond
Cde
auto / manu
Correction
Integrale
du PID
+ = désexcité
Cde Iexc
Sauto
Sauto
Smanu
Smanu
Sauto
Smanu
1K

AVR Model R630

Digital pot Ifield Optional card

1 - FUNCTIONAL

This card replace one conventional motorized potentiometer in "MANU" mode and sets the "MANU" channel output always equal to the "AUTO" one to allow the smooth switching between the "AUTO" and "MANU" operation at any load (follower in "AUTO" mode).

- Switch between the two modes is made by the external "AUTO / MANU" order (terminals 47,48)

- Jumps SW1 allows the choice between voltage output taken from U/F control of the sensing card or from a 5V fixed reference and the range is adjusted by means of potentiometer P03.

- Jumps SW3 and SW4 must be open for normal operation and closed for follower operation.

- Speed of the adjustment is controled by potentiometer P01 in manual setting and by P02 in follower operation. P02 acts as a delay between an "AUTO" output variation and the "MANU" output response.

- Two LED's (L1,L2) indicate the command orders + or - and two other LED's (L3,L4) indicates the maximum and minimum position of Ifield settings

NOTE : When this card is fitted, the internal Ifield setting (P02 of manual mode card) must be set to 0 or under the no load field value and an external setting potentiometer must not be used. The Ifield setting is made only by mean of push-buttons on terminals 44, 45, 46.

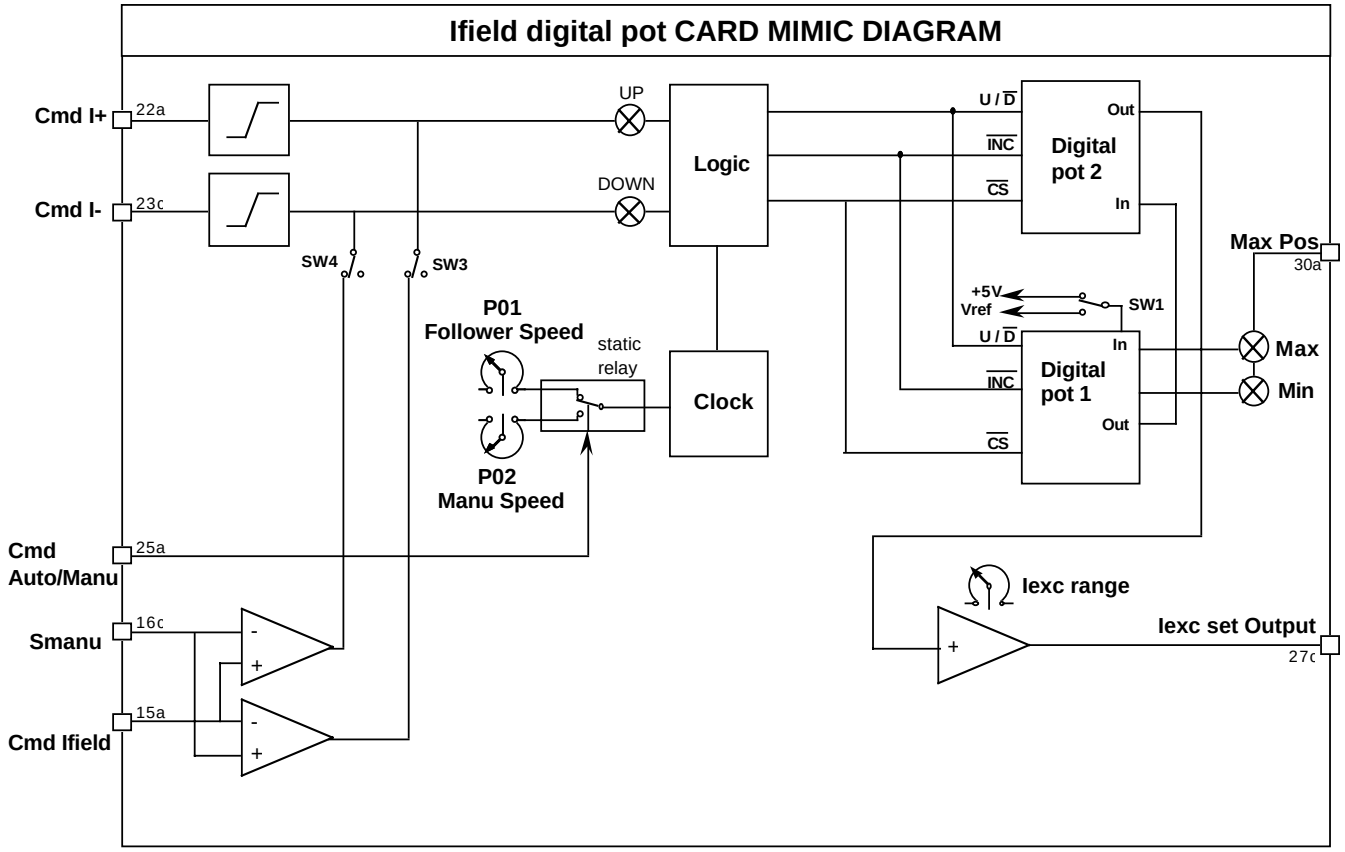
2) ADJUSTMENTS

- P1 : Clock speed (Time delay in follower mode)
- P2 : Clock speed (range time in "MANU" mode)
- P3 : Ifield range value
- SW1 : Voltage range fixed or U/F monitored
- SW3/4 : Normal (open) or follower (closed) operation

3 - INPUTS / OUTPUTS

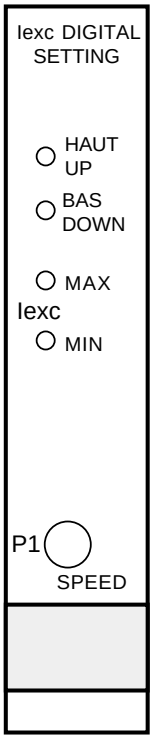
Flat cable (BUS 64points)

- 23c : Cmd lower
- 22a : Cmd upper
- 25a : Cmd "AUTO / MANU"
- 11a : U/F voltage reference
- 16c : If reference set point input
- 15a : If reference set point input "MANU" channel
- 27c : Ifield setting output to Manual mode card
- 30a : Maximum position of settings
- 1a,1c : +15Vdc regulated (Vcc)
- 32a,32c : -15Vdc regulated (Vdd)
- 16a,17c : Common ground (GND or 0V)

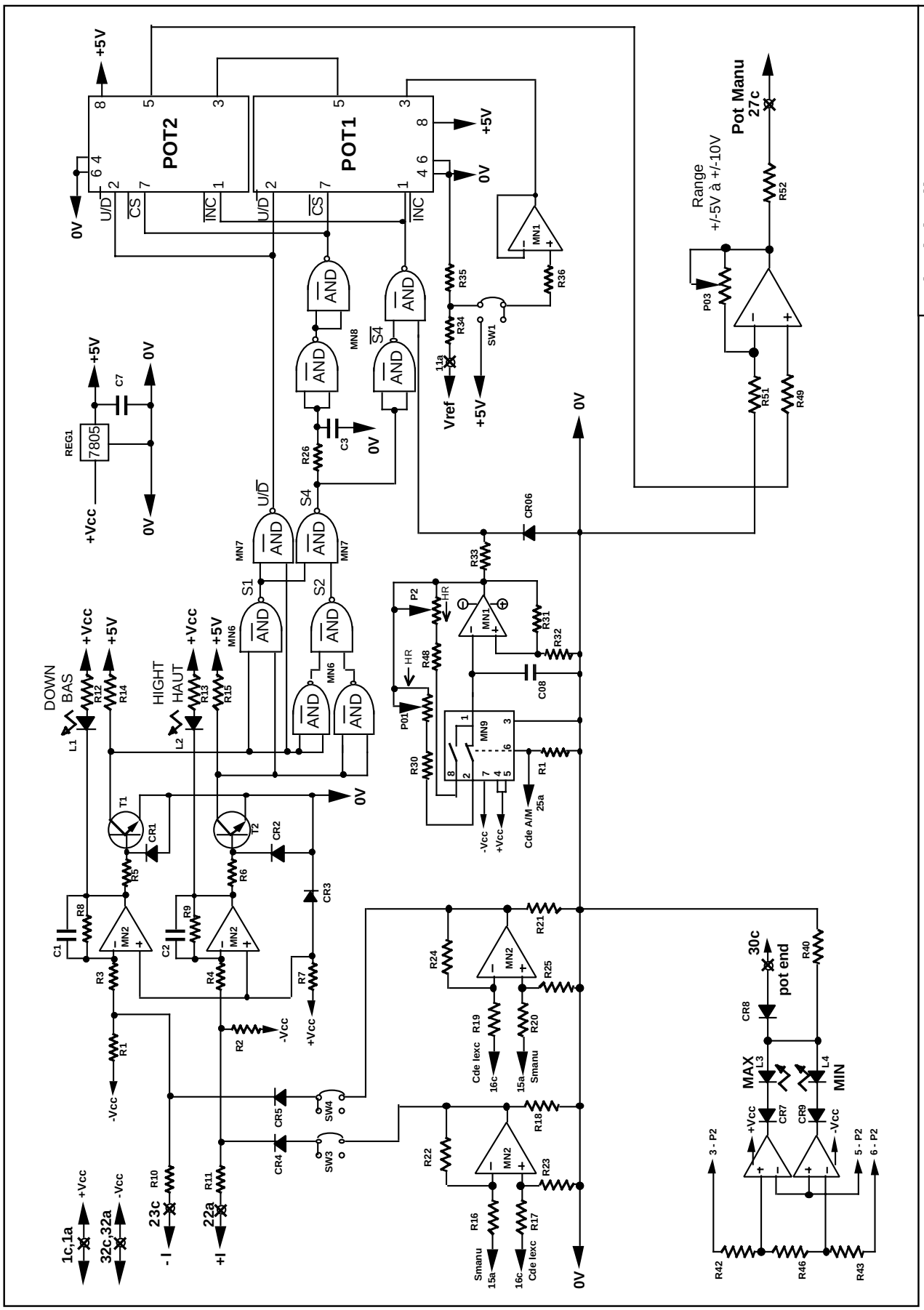


FRONT VIEW

Digital pot Ifield



Principle diagram
Ifield digital potentiometer



AVR Model R610 / R630

Mains P.F Regulation Optional card

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.

2 - FONCTIONAL

This card elaborates from setting informations and 4-20mA signal image of P.F (or KVAR) of the mains, the errorvoltage dending to the PID of the PID card.

- The error signal have an ajustable gain and can be inversed depending of the 4-20mA sensor output.

- This kind of operation is indicated by the LED "L3" and by a contact (potential free) on the front connector.

- This operation is selected by mean of a contact on front connectort 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.For KVAR) will be made at the generator output, if it is closed, this is the 4-20mA information wich is regulate function of the internal settings (P2 or channel 2 4-20mA) or/and external by the front connector.

- If during operation, the measuring 4-20mA signal deseappears, control is automatically return to regulation on the generator output side and this failure is indicated by LED L1 ou 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 voltage, P.F or KVAR on generator side. As on channel 1 if the 4-20mA deseappears, output is inhibited and indicated by LED L2.

- A field current limitation is given, active when a contact (front connector) is closed and indicated by LED L4. The limitatio is adjusted by P7 (Limit 2 set) and can be set between a maximum value preset by P7 on driver card and a minimum value preset by P8 on driver card.

- An signaling contact on the front connector gives (if they are used) the indication that one or more of the digital potentiometers are at maximum position .

3 - ADJUSTMENTS

Potentiometers

- P1 : Channel 1 range adjustment
- P2 : Reference set point channel 1
- P3 : Gain channel 1
- P4 : Channel 2 range adjustment
- P5 : Reference set point channel 2
- P6 : Gain channel 2
- P7 : Limit 2l adjustment

Jumpers - CV1 A
: Channel 1 used
- CV1 B : Channel 1 not used
- CV2 A : Channel 1 used
- CV2 B : Channel 2 not used
- CV3 A : Non inverting error channel 1
- CV3 B : Inverting error channel 1
- CV4 A : Non inverting error channel 2
- CV4 B : Inverting error channel 2
- CV5 A : Channel 1 in 4-20mA regulation channel 1
- CV5 B : Channel 1 in voltage setting
- CV5 C : Channel 1 in generator P.F setting
- CV5 D : Channel 1 in generator KVAR setting
- CV6 A : Channel 2 in 4-20mA regulation channel 2
- CV6 B : Channel 2 in voltage setting
- CV6 C : Channel 2 in generator P.F setting
- CV6 D : Channel 2 in generator KVAR setting
- CV6 E : Channel 2 in channel 1 setting

4 - INPUTS / OUTPUTS

Flat cable (BUS 64points)

- 12c : Error output to PID
- 21a : Output to voltage setting
- 20c : Output to generator P.F setting
- 21c : Output to generator KVAR setting
- 30a, c : Digital pot at maximum position
- 1a,1c : Supply +15Vdc regulated (Vcc)
- 32a,32c : Supply -15Vdc regulated (Vdd)
- 16a,17c : Common ground
- 23a : Cmd + U or + P.F
- 24c : Cmd - U or - P.F
- 14c : Output of generator side P.F card
- 24a : P.F regulation order
- 26c : Limitation 2 output to driver card

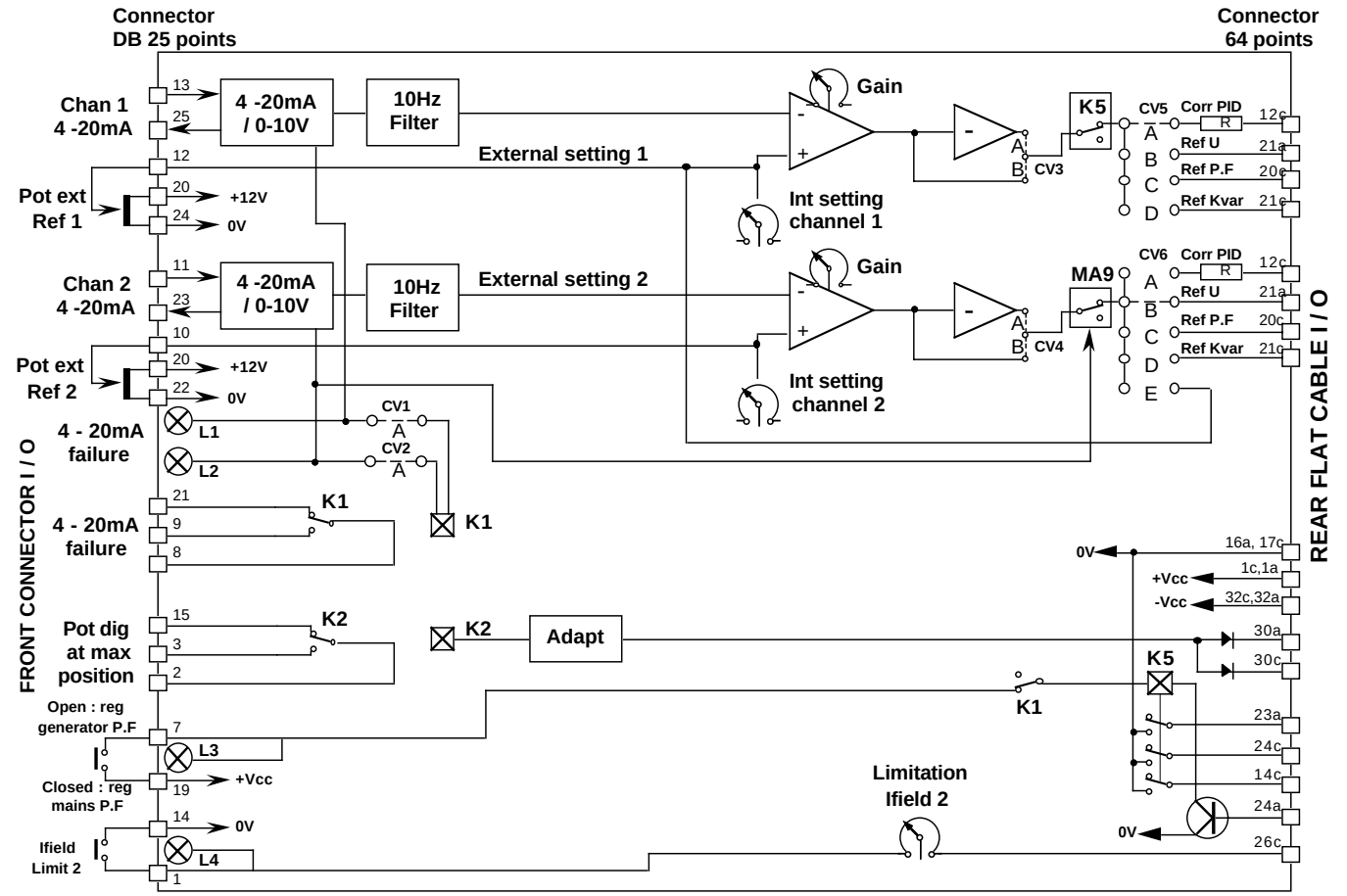
Front connector (DB25 points)

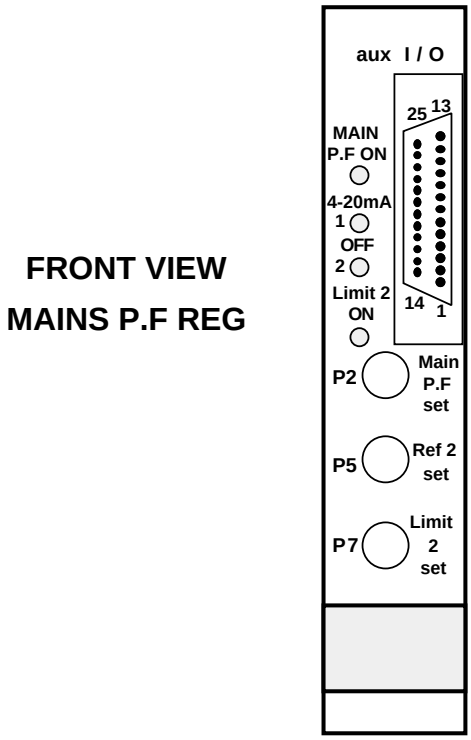
- 13 : + 4-20mA input channel 1
- 25 : 4-20mA output channel 1
- 20 : 12V to external setting potentiometer ch 1
- 12 : External setting potentiometer cursor ch 1
- 24 : Ground to external setting potentiometer
- 11 : + 4-20mA input channel 2
- 23 : 4-20mA output channel 2
- 20 : 12V to external setting potentiometer (ch 2)
- 10 : External setting potentiometer cursor ch 2
- 22 : Ground to external setting potentiomete
- 9 : 4-20mA failure (NO)
- 21 : 4-20mA failure (NF)
- 8 : 4-20mA failure (Commun)
- 3 : Digital pot at max position (NO)
- 15 : Digital pot at max position (NF)
- 2 : Digital pot at max position (Common)
- 7,19 : Contact regulation ch 1 active (mains P.F)
- 14,1 : Contact limitation 2 active

LED

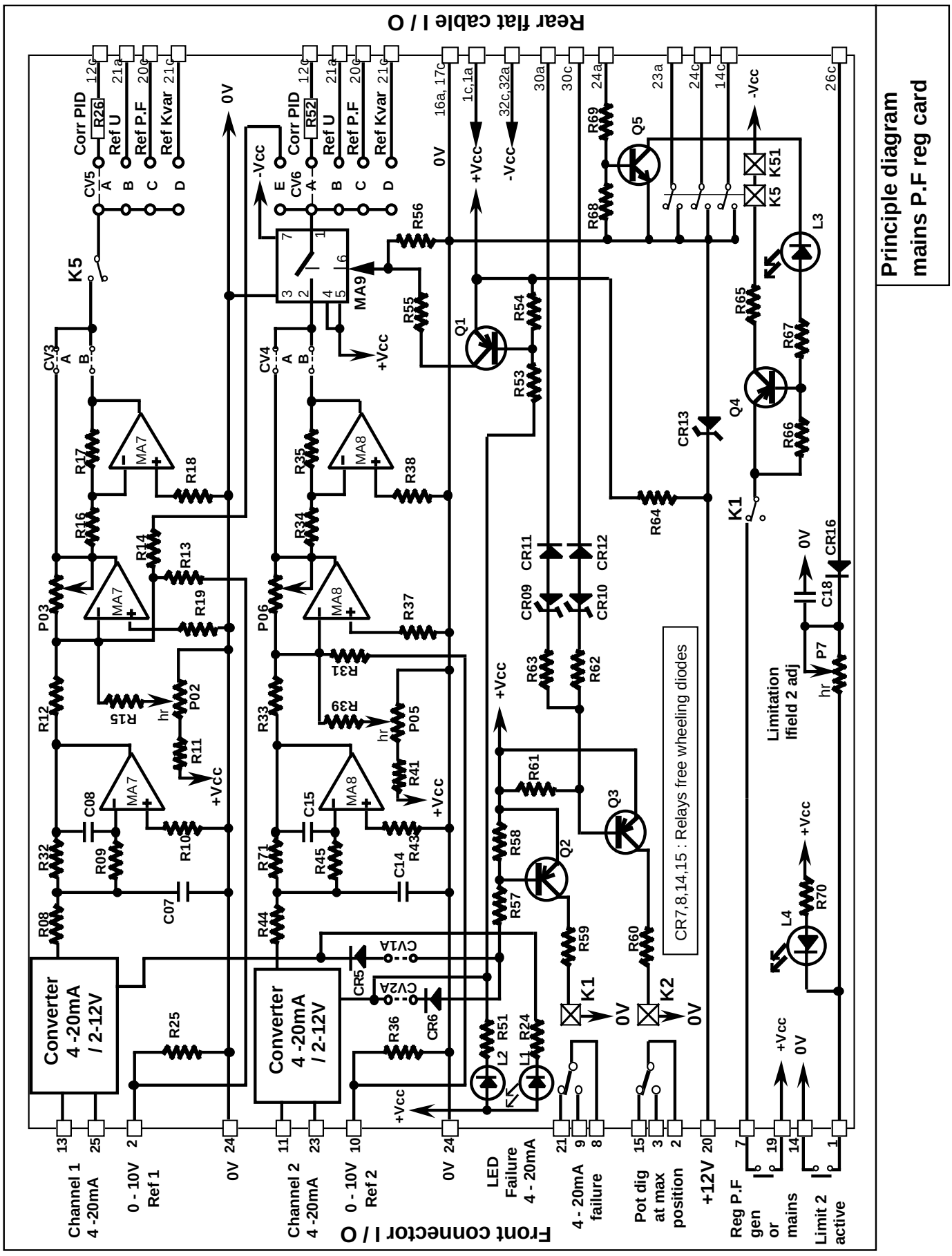
- L1, L2 : 4-20mA failure channel 1 or 2
- L3 : Channel 1 active
- L4 : Ifield limitation 2 active

MAINS P.F REGULATION CARD MIMIC DIAGRAM





FRONT VIEW
MAINS P.F REG


Principle diagram
mains P.F reg card
Rear flat cable I / O
Front connector I / O
Converter 4 -20mA / 2-12V
Converter 4 -20mA / 2-12V
MA7
MA8
MA9
Corr PID
Ref U
Ref P.F
Ref Kvar
CV5
CV6
CV1A
CV2A
K1
K2
K5
Q1
Q2
Q3
Q4
Q5
CR5
CR6
CR7,8,14,15 : Relays free wheeling diodes
Limitation Ifield 2 adj
Channel 1 4 -20mA
0 - 10V Ref 1
Channel 2 4 -20mA
0 - 10V Ref 2
LED Failure 4 - 20mA
4 - 20mA failure
Pot dig at max position
+12V
Reg P.F gen or mains
Limit 2 active
0V
+Vcc
-Vcc

AVR Model R610 / R630

LIMIT Istator Optional card

1 - FUNCTIONAL

- A voltage, image of the stator current of the machine, fed from the "ALTERNATOR I / O" card is rectified, filtered and compared to a reference voltage. The error signal gives a voltage correction which is added to the main PID input to maintain the stator current equal to the adjusted value.

- The reference voltage is applied with an initial ramp ajustable from 0,5 to about 4s.

- A front LED signals stator current limitation operation.

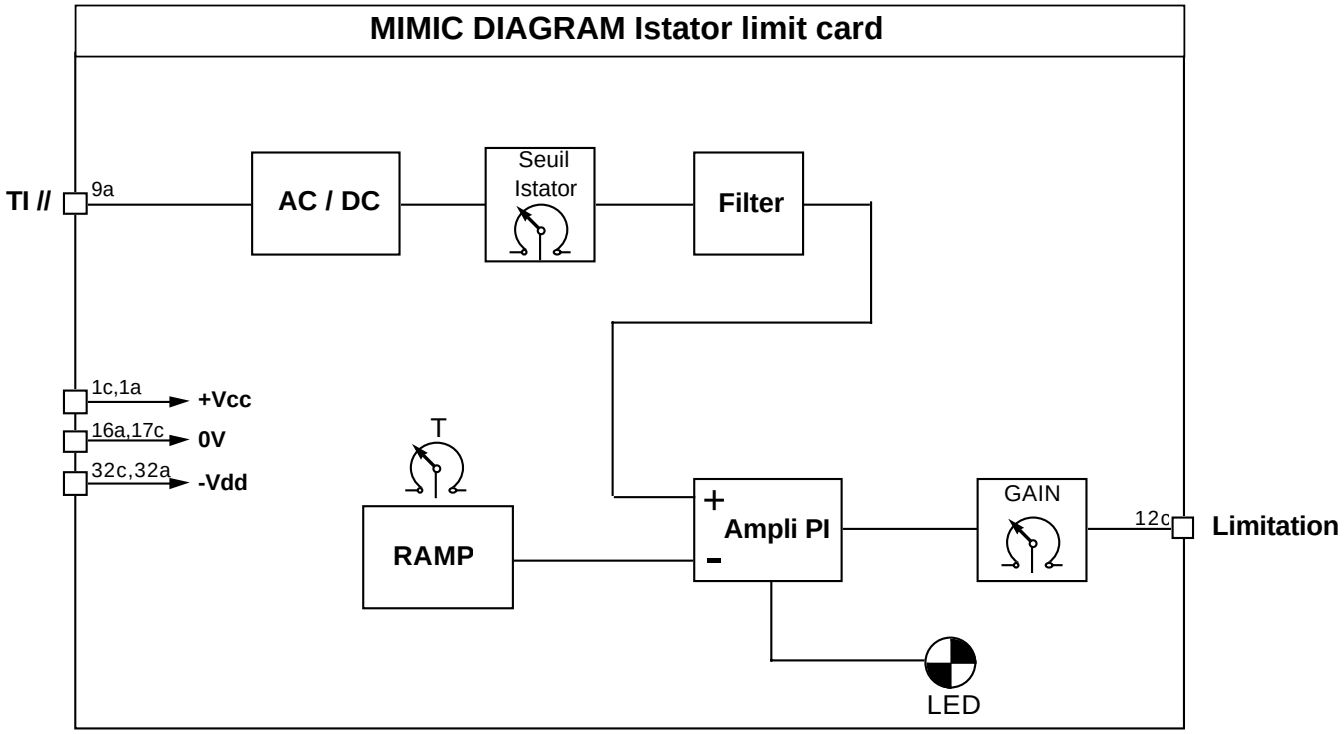
- When this card is used for soft-start operation, the AVR power transformer must be fed from a separate source during the start operation and can be switched on the generator output when the voltage have reached the nominal value. The switching must be as fast as possible (by relay, not by manual switch).

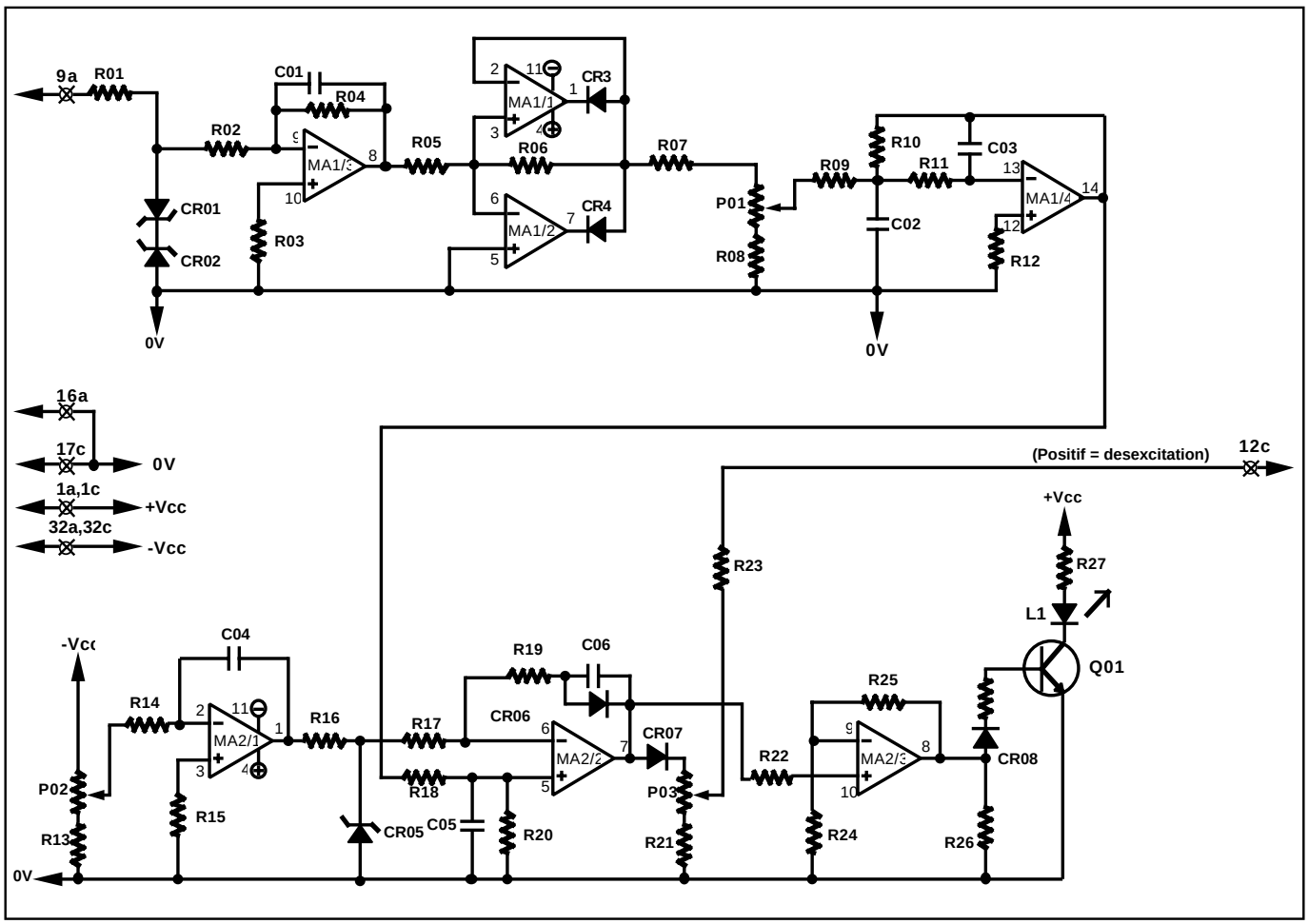
2 - REGLAGES

- P1 : Stator current limit adjust. (about 2In to 4In)
- P2 : Ramp-up time adjust. (0,5 à 4s environ)
- P3 : Output signal gain

3 - INPUTS /OUTPUTS

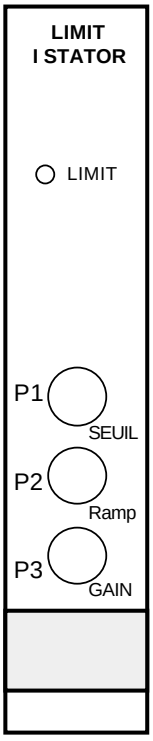
- 9a : Stator current image input (1Vac for In)
- 1a,1c : +15Vdc regulated (Vcc)
- 32a,32c : -15Vdc regulated (Vdd)
- 16a,17c : Common ground (GND or 0V)
- 12c : Voltage correction output to PID.





FRONT VIEW

Lim Istator card



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

1 - STARTING WITH MANUAL MODE CARD

- For initial start-up, the best is to use the manual mode for testing the sensing wires between the generator and the AVR.

- For this it is necessary to have a manual mode card plugged in the AVR. If not, see directly §2.

- Short-circuit terminals 47and 48 (AVR terminal block).

- Set the potentiometer P2 on manual card maximum CCW, start the prime mover up to the nominal speed.

- Turn slowly the potentiometer CW to obtain the nominal voltage.

- Check the presence and the value of the three phases at the AVR terminal block (terminals 1, 2, 3).

- Set the voltage to 5% above the nominal voltage.

- Check that the voltage between terminal 25 and 26 of the AVR terminal block is about one volt.

- If yes, remove the strap between terminals 47 and 48 of AVR terminal block.

- The voltage must reach the nominal value.

- Go to §3

2 - STARTING WITHOUT MANUAL MODE CARD

- Start the prime mover up to the nominal speed..

- If the voltage does not appear, check wires between AVR and the generator field (terminals 5 and 6 of AVR), and the also the wires between AVR and power transformer (terminals 18 and 19 of AVR). Check also the fuse inside the terminal 19 of AVR terminal block.

- If the voltage is too hight, check that the auxiliary voltage at the terminals 16 and 17 of AVR and the sensing voltages at the terminals 1, 2, 3 of the AVR terminal block are present.

- Adjust the nominal voltage with Vref (P5) of the sensing card for the middle position of the external voltage potentiometer (if used).

3 - DE-ENERGIZING (optional)

- External contacts E01 and E02 must be used.

- E01 must be serie with terminal 19 of AVR (power input) and is opened for de-energizing.

- E02 must short-circuit the booster output (if used) (terminals 7 and 8 of AVR) and is closed for de-energizing.

4 - ADJUSTMENTS

- Refer also to card descriptions.

- The AVR is normally preset in factory.

- The nominal voltage can be set by Vref (P5) on sensing card. Fine adjustment can be made by an external voltage potentiometer (10KΩ), (terminals 21,22,23)

- If an adjustment must be moved, note carefully the original setting for resetting in case of problems.

- If the strap V/Hz of sensing card is on kV/Hz position, the original setting is V/Hz and can be changed between V/Hz and 2V/Hz by potentiometer P4.

-The stability is adjusted with the machine in factory. If necessary, the response time can be changed by the setting of potentiometer P4 of PID card.

- Other settings are difficult to adjust without specific electronics equipments. It is better to not change them.

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.

6 - PARALLEL OPERATION (1F)

- The generator voltages must be as equal as possible.

- Same for the droop. If it is not possible to measure it, set the potentiometers P1 of the sensing cards all in the same position (middle set for example).
If the droop setting is made from cosØ/KVAR card (when used), see notice NT 1950080.

- The reactive currents (KVAR) must be shared, immediatly after coupling, even the KW are not shared.

- If, immediatly 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 cosØ 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).

7 - PARALLEL WITH THE MAINS (2F)

- The generator and mains voltages must be as equal as possible. (see §8 if MAIN I/O card is used). **The contact between terminals 33, 34** 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, immediatly 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 cosØ 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 0.8. It can be adjust by mean of potentiometer P2 on cosØ/KVAR card or by mean of an external potentiometer (10KΩ-1W) connected to AVR terminal block (27,28,29).

- If the KVAR regulation is required terminals 48 and 53 must be short-circuited and the KVAR can be set by mean of potentiometer P1 on cosØ/KVAR card or by mean of an external potentiometer (10KΩ-1W) connected to AVR terminal block (30, 31, 32).

- For droop setting, see notice NT 1950080.

8 - VOLTAGE EQUALISATION (3F)

- The following procedure must be made one time to take account of the mains transformer primary/secondary ratio.

- At no load and mains voltage present at terminals 12, 13, 14 of the AVR terminal block.

- Short circuit terminals 35,36 of the AVR terminal block

- Adjust P1 of MAIN I/O card to have generator and mains voltage as equal as possible.

- Remove the strap between terminals 35, 36 of the AVR terminal block.

- The initial setting is made.

In normal operation the contact between terminals 35, 36 of the AVR terminal block must be closed with synchronizer operation and can be opened after coupling.

9 - MANUAL OPERATION (if used)

- If a manual mode card is used, it is possible to control directly the field current of the generator.

- In automatic mode, adjust the potentiometer P2 on manual mode card to have the LEDs "HIGHT" and "LOW" off and the LED OK ligthing. At this time the manual setting is equal to the automatic channel control.

- Short-circuit the terminals 47,48 of the AVR terminal block gives control to the manual channel and the field current is adjusted by potentiometer P2 and/or by an external optionnal potentiometer (10KΩ-1W) connected to the terminals 30, 52, 23 of the AVR terminal block cusor on 52 and hot point on 30.

- This mode can be used when initial start-up of the generator, to make test after problems or when operating with the mains. It cannot be used when solo operation because it is not possible to follow the load variations.

- When coupling with the mains on load, if trip of the generator occurs, an overvoltage may occurs due to the fact that the field current setting is too hight regarding the load of the generator. On this case, an internal circuit of the card decreases the field current to limit the overvoltage approximatively to 110% of nominal. LED "LIMIT" on front of the card will light. The setting of field current must be reset manually to the no load value and the LED "LIMIT" will switch off.