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LIST OF ILLUSTRATIONS & TABLES

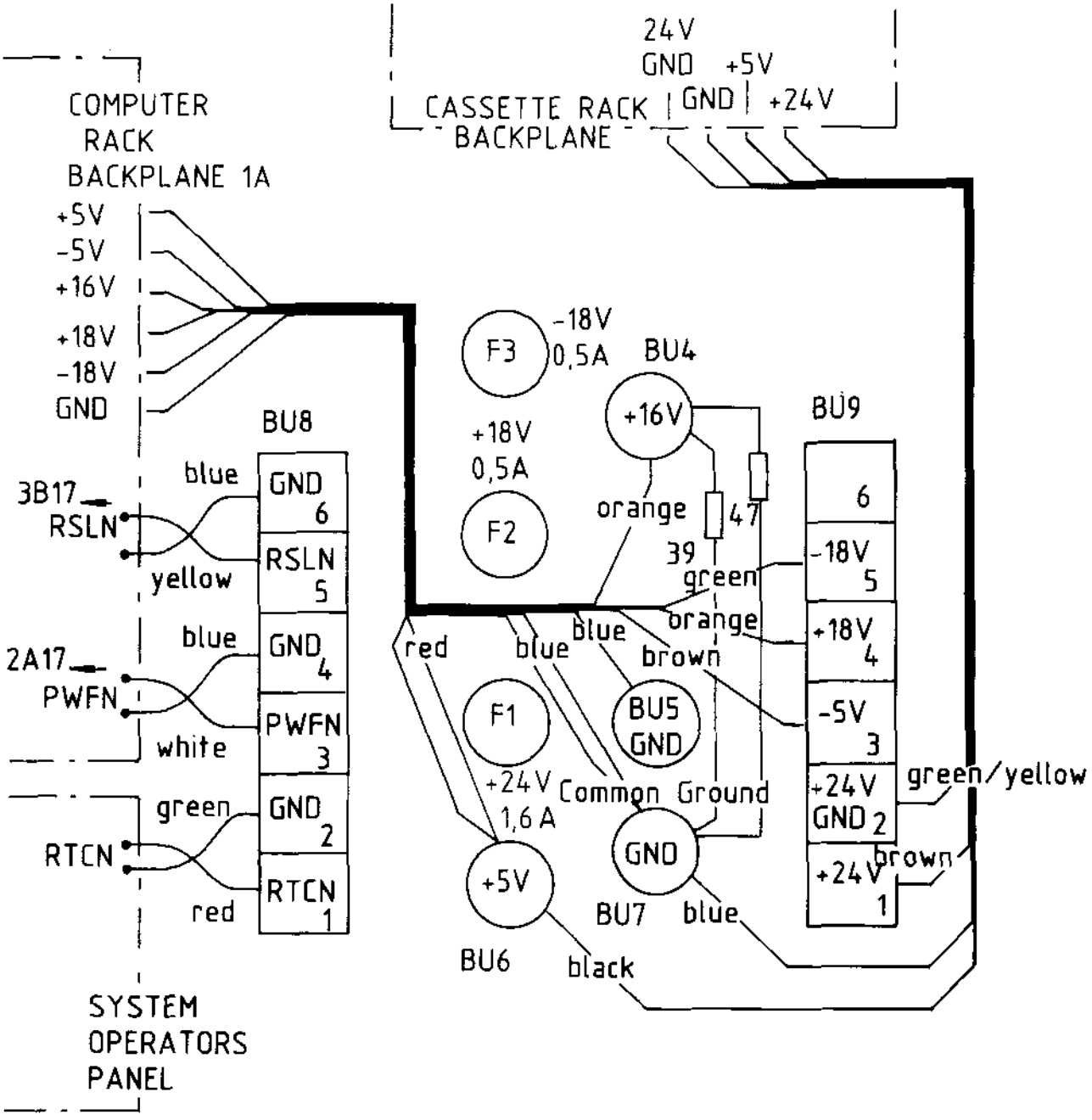
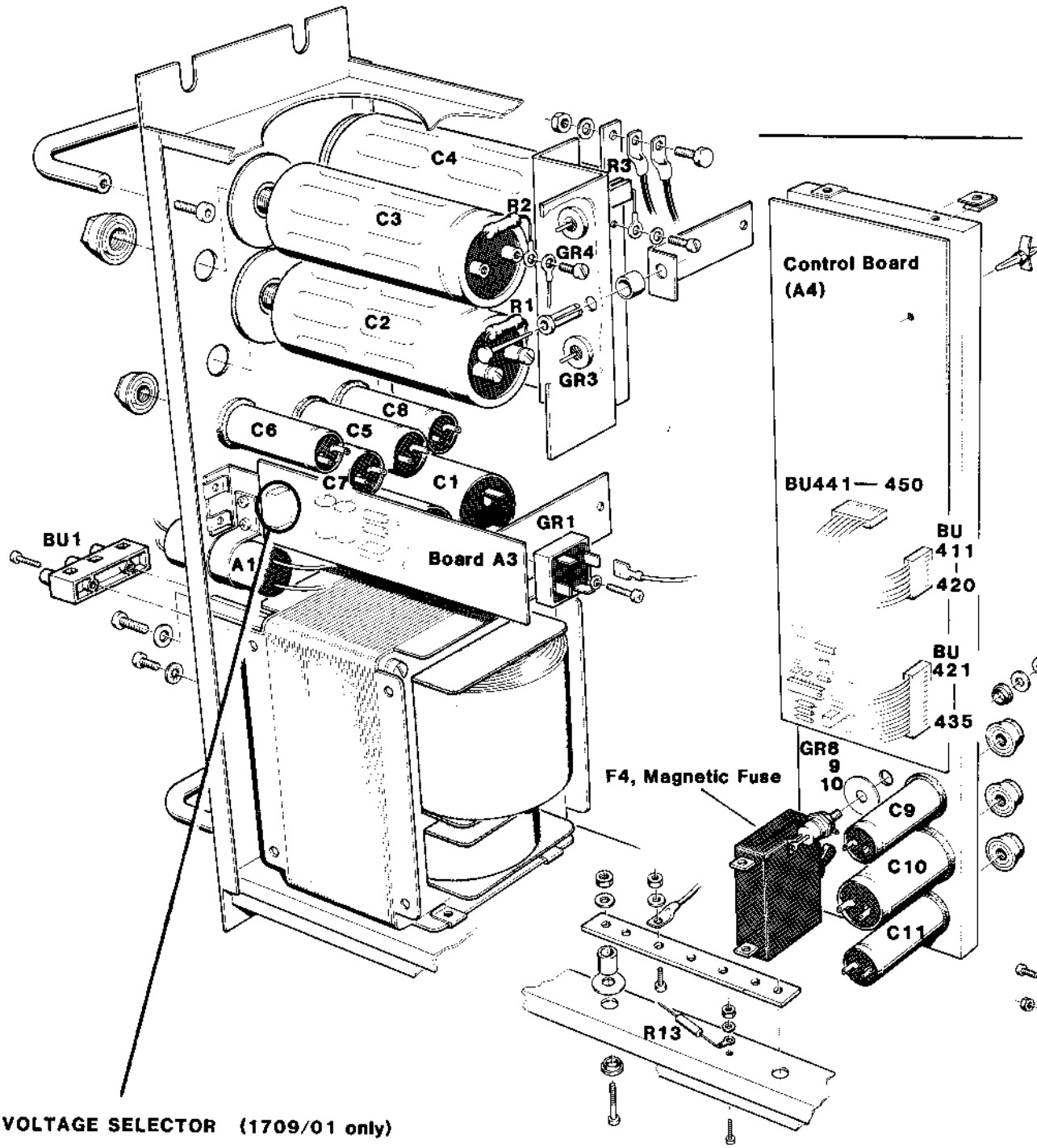
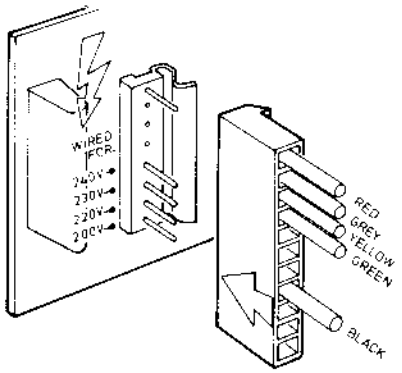


Figure 7.1.1 Connections PSU 1440

RECTIFIER



MAINS VOLTAGE SELECTOR (1709/01 only)

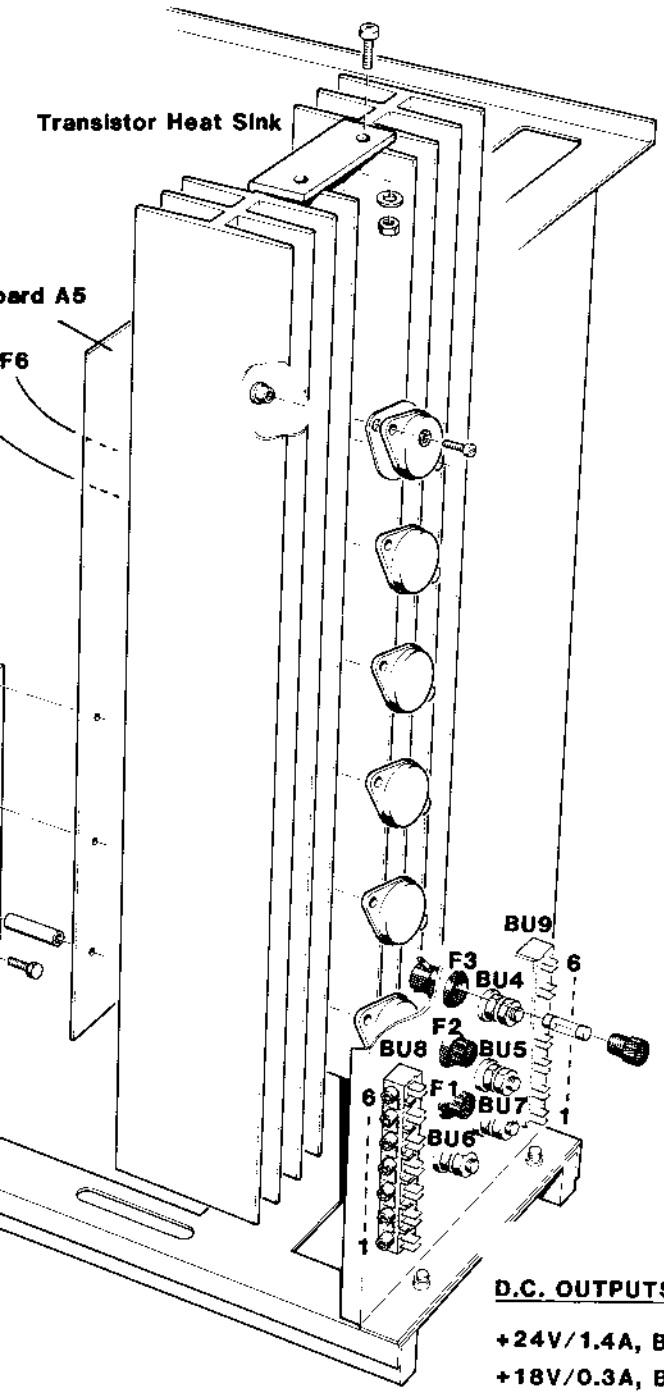


MAINS INPUT (BU1)

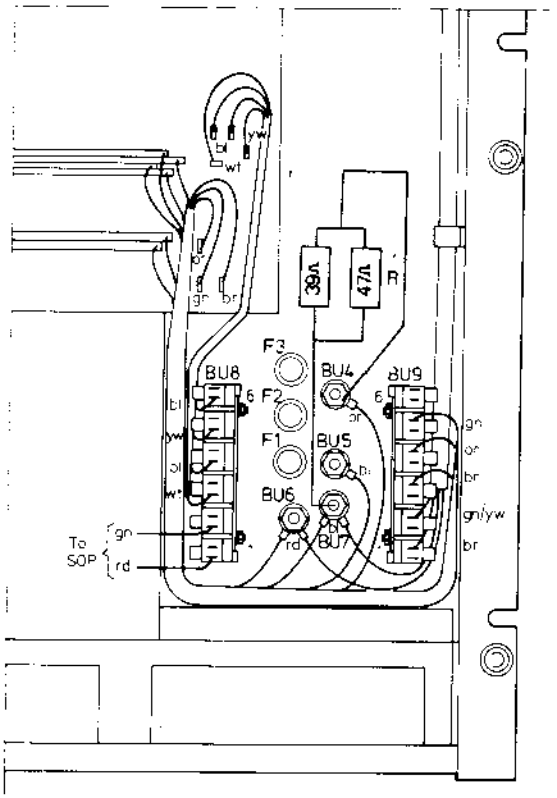
PE 1440 - 220V, 50Hz
PE 1709/01 - 200/220/230/240V, 50Hz
PE 1709/02 - 120V, 60Hz

Figure 7.1.2 Physical S

GULATOR



Later version

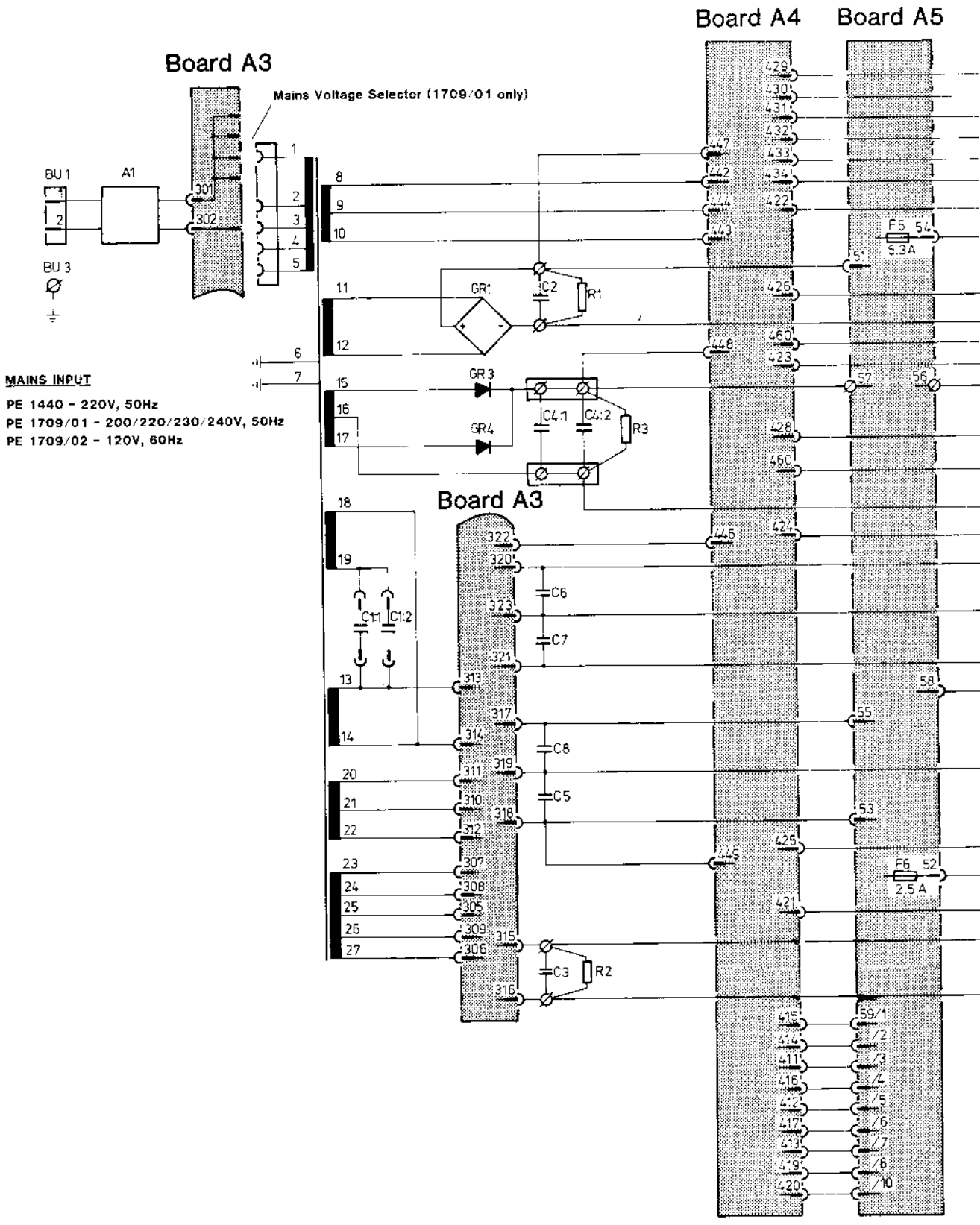


D.C. OUTPUTS (ALL MODELS)

+24V/1.4A, BU9/1 & 2 (GND)
+18V/0.3A, BU9/4
+16V/4.5A, BU4 & BU5 (GND)
+5V/30A, BU6 & BU7 (GND)
-5V/1.3A, BU9/3
-18V/0.3A, BU9/5

ure & Main Characteristics

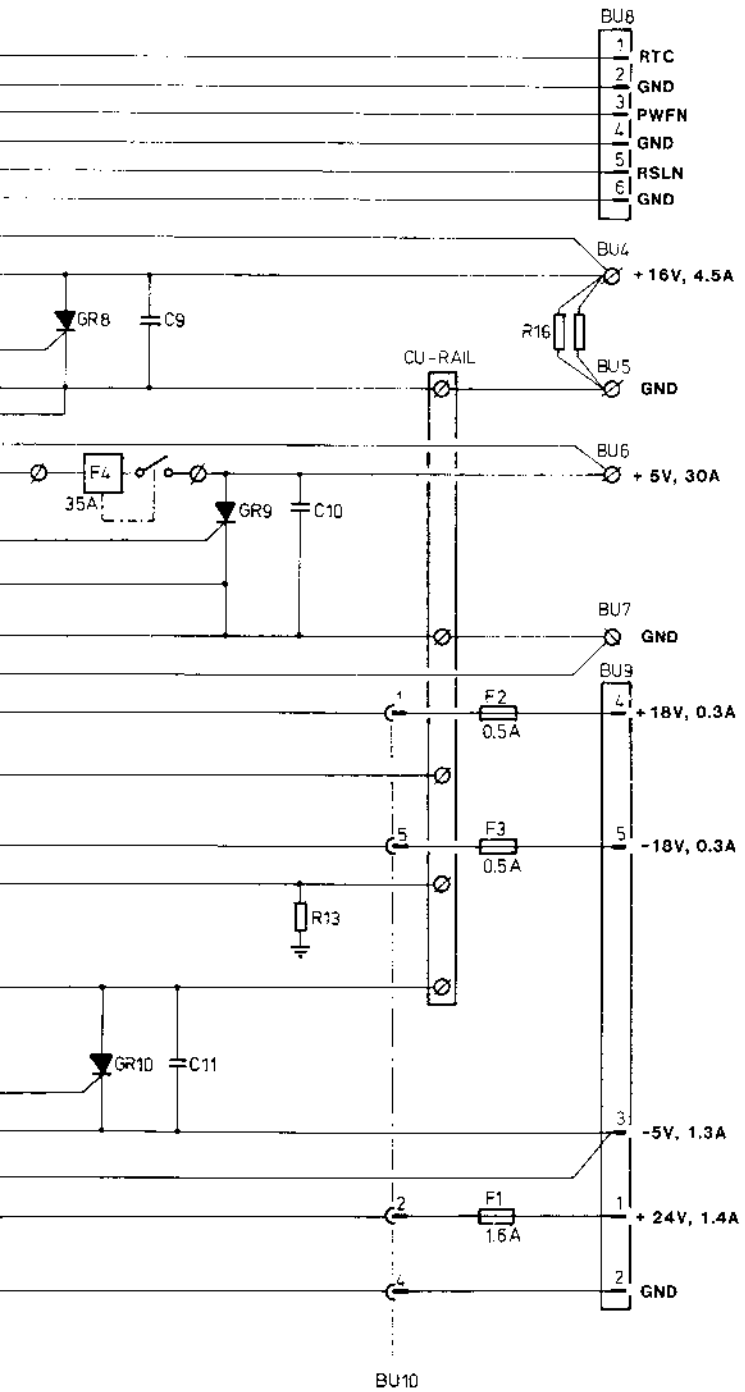
RECTIFIER


Board A4
Board A5
Board A3
Mains Voltage Selector (1709/01 only)
BU 1
A1
BU 3
301
302
1
2
3
4
5
6
7
8
9
10
11
12
15
16
17
18
19
13
14
20
21
22
23
24
25
26
27
GR1
C2
R1
GR3
GR4
C4:1
C4:2
R3
C11
C12
C6
C7
C8
C5
C3
R2
F5
5.3A
54
F6
2.5A
52
55
56
57
58
53
MAINS INPUT
PE 1440 - 220V, 50Hz
PE 1709/01 - 200/220/230/240V, 50Hz
PE 1709/02 - 120V, 60Hz

PSU - PE 1440
PE 1709/01, 02

REGULATOR

CONNECTOR LOCATIONS



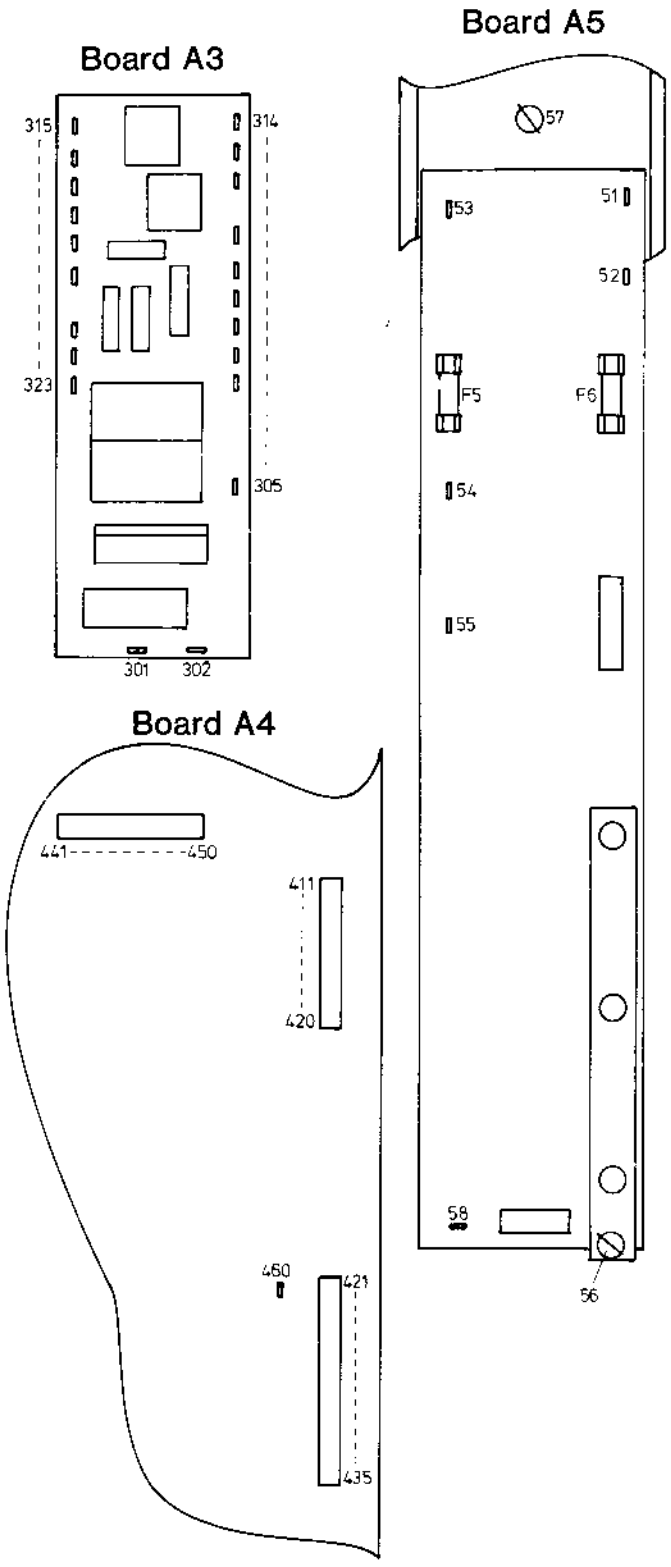
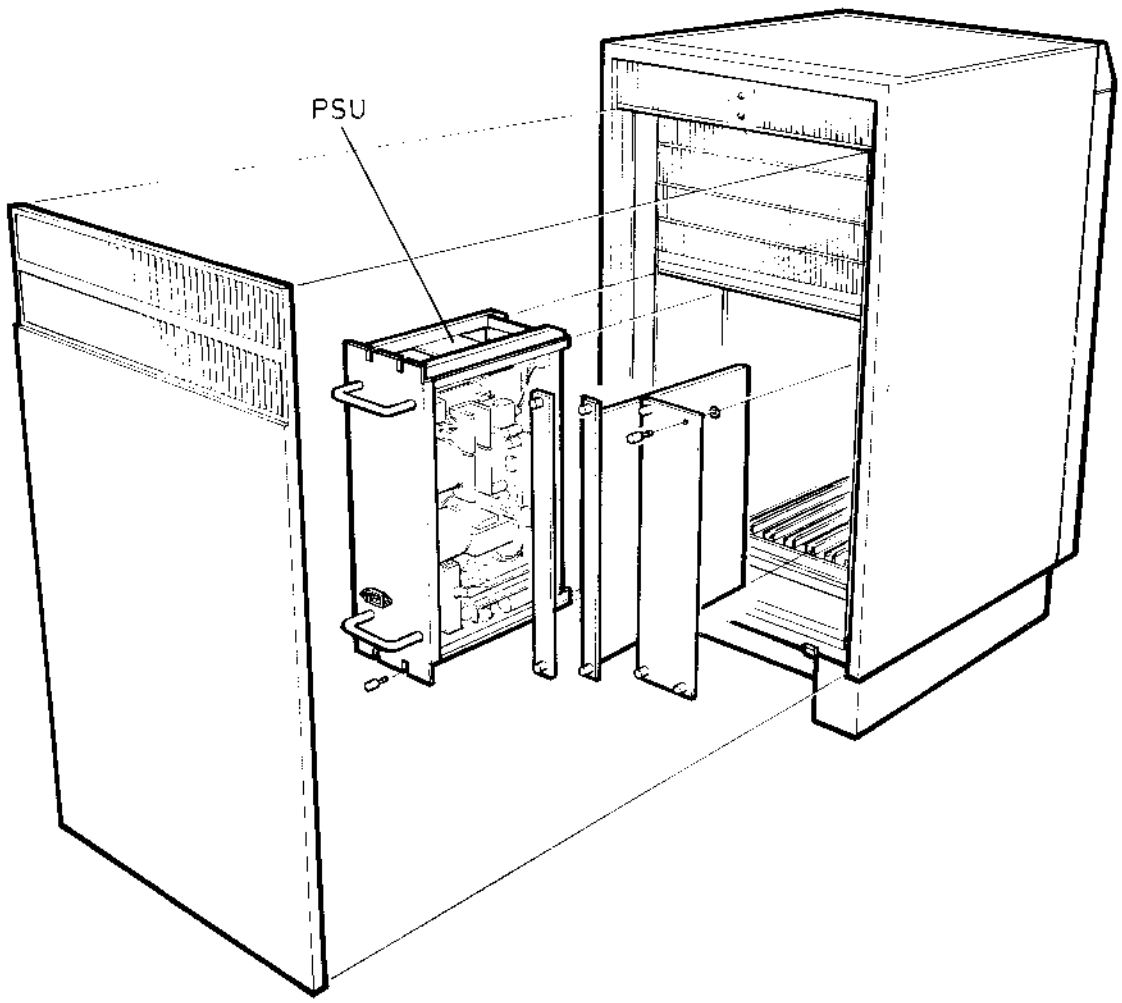


Figure 7.1.3 Submodules & Interconnections

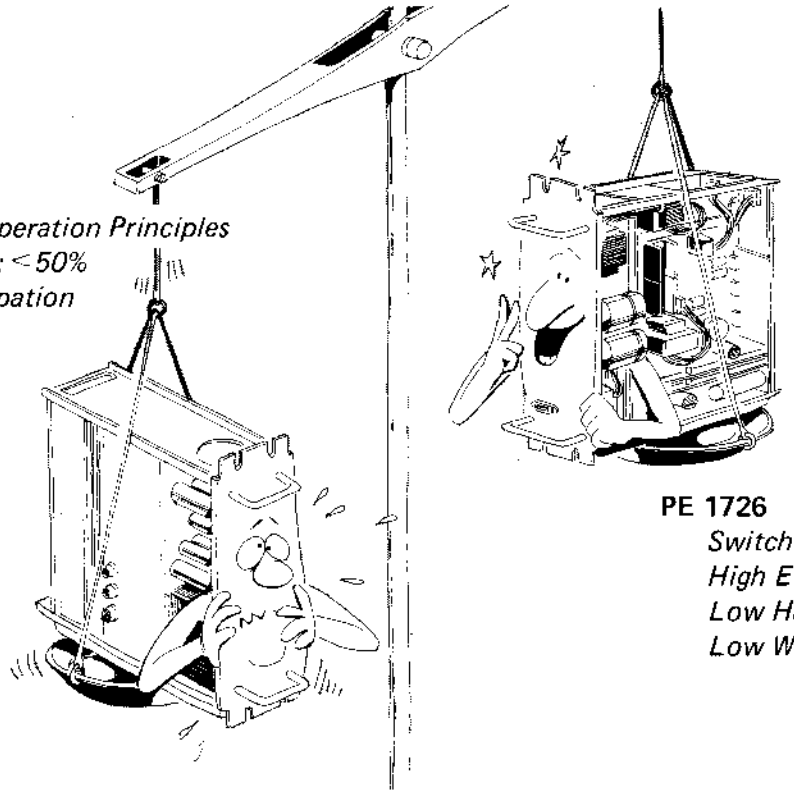


The PE 1726 is a modern, light-weight and high-efficient Power Supply Unit (PSU), that operates according to the switching mode principle. The unit is primarily designed for the Terminal Computers PTS 6812/6813 and the Extension Unit PTS 6864. However, the PSU is a complete sub-module for rack mounting and may also be used in other systems were requirements correspond to the PSU's performance.

Mains Input

The PSU can be adapted to mains voltages of 100-127V/60Hz or 200-240V/50Hz. An internal strap is used to adapt the unit to either the 100V-range or to the 200V-range. The specific voltage being at hand is then set with a mains voltage selector which can be operated from the outside. This selector can be set to either of the following voltages; 100V, 110V, 120V, 127V, 200V, 220V, 230V and 240V.

The mains voltage should be supplied via an external Magnetic Cicuit Breaker, that switches off at approximately 7.5A.



Earlier PSUs

Conventional Operation Principles
Low Efficiency; <50%
High Heat Dissipation
High Weight

PE 1726

Switching Mode Principle
High Efficiency; >70%
Low Heat Dissipation
Low Weight; 12 kg

Power Supply Unit PE 1726 compared with earlier types of similar PSUs

Output Voltages

Three outputs are provided for suppling 220V AC, two of which can be remotely switched on and off. The switching mode principle of operation is used to produce six D.C. outputs; +24V, ±18V, +16V and ±5V.

TECHNICAL DATA

Mains Requirements

Range 100V: 60Hz ± 2%, 100/110/120/127V ± 10%
Range 200V: 50Hz ± 2%, 200/220/230/240V ± 10%

A.C. Outputs & Remote Control

Supplied Voltages: 3 x 220V ± 10% / 0.4A (in total), 60 or 50Hz ± 2%

Control Signal : FDCN, operating within ordinary TTL levels (0 to +5V). Low level switches off two A.C. outputs.

Switch Frequency

The switch frequency, used for chopping the rectified mains voltage, is 25kHz

D.C. Outputs

Voltage	Accuracy	Maximum Load	Note
+24V	± 5%	2.4A	
+18V	± 5%	0.3A	
-18V	± 5%	0.3A	
+16V	± 2%	6.6A	"Crow bar" at output
+5V	± 3%	43.0A	
-5V	± 5%	1.2A	

Clock and Power Status Signals

The PSU also generates a clock signal (RTC = Real Time Clock) and three power status signals for the supplied computer logic. The RTC frequency is equal to the mains frequency being at hand.

One of the power status signals, POWER ONN, indicates that all D.C. voltages are present. The other two are used to reset the logic (RSLN) and to prewarn the computer of a coming power failure (PWFN).

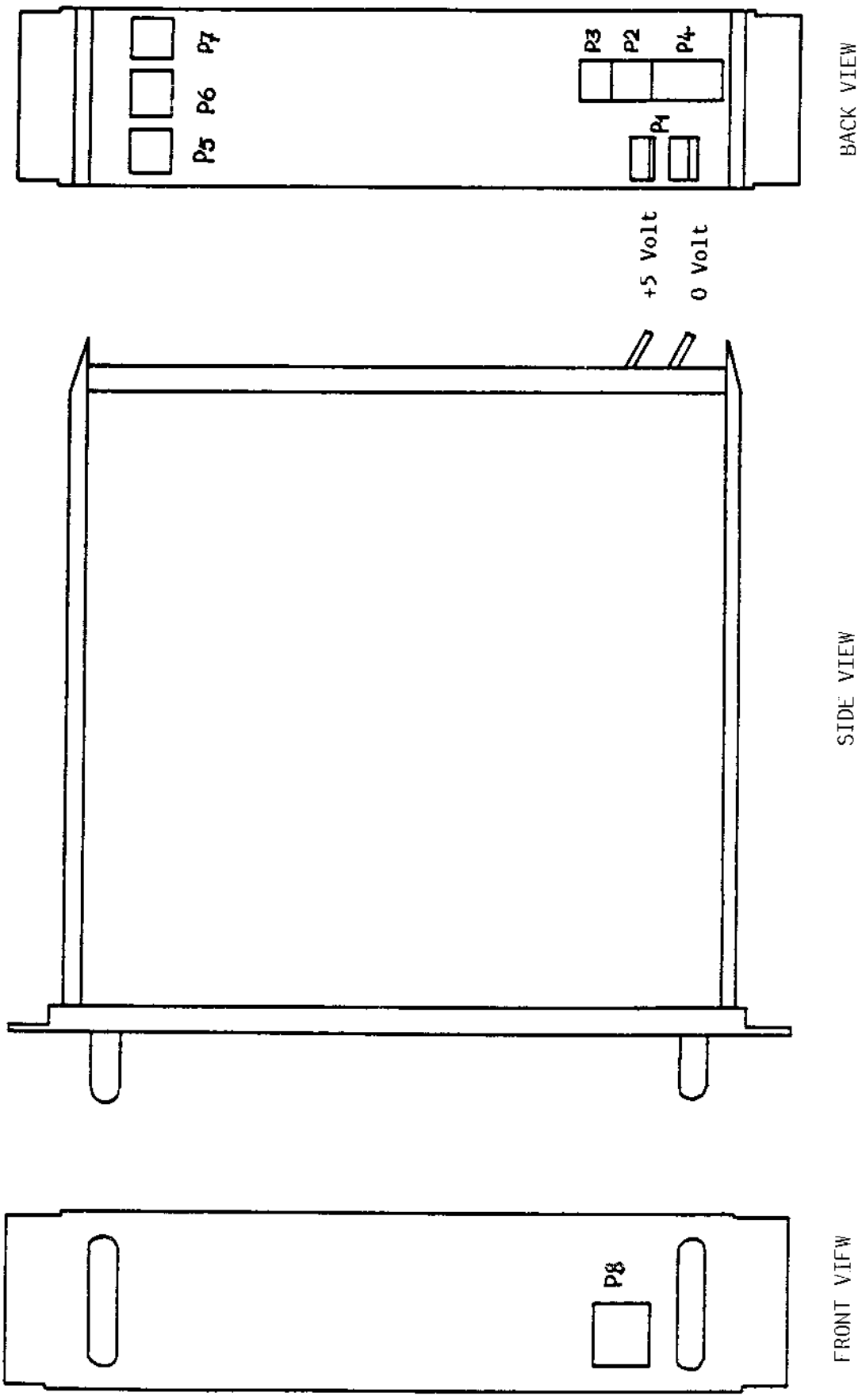


Figure 7.2.1a Connectors on PE 1726

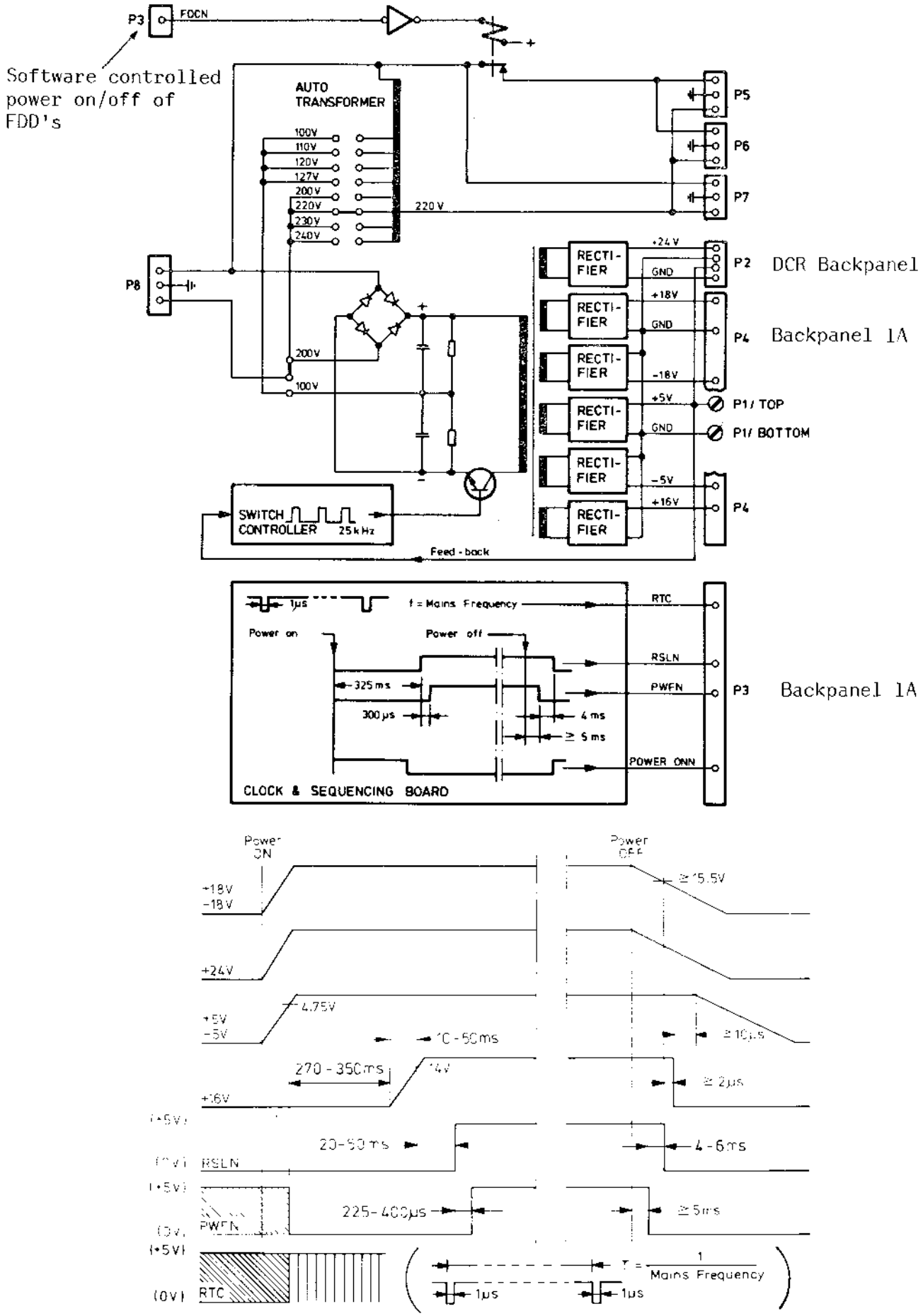


Figure 7.2.1b Sequencing of output voltages at on/off switchings

MAINS VOLTAGE SELECTION

Before connecting the PSU to a mains source the unit must be adapted to the voltage being at hand. First of all the internal strap, Figure 5-1, must be set into the appropriate position;

- Position 100V for mains voltages of 100-127V/60Hz
- Position 200V for mains voltages of 200-240V/50Hz

The mains voltage selector (available at the rear of the PSU) must then be set to the specific voltage being at hand; 100V, 110V, 120V, 127V (lower range) or to 200V, 220V, 230V, 240V (upper range).

CAUTION:

NEVER CHANGE STRAP OR SELECTOR POSITIONS WITH POWER CONNECTED

A.C. Outputs & Remote Control

The autotransformer supplies 220V A.C. via three output plugs. Two of these outputs can be remotely switched on and off via a relay, controlled by the FDCN signal. These outputs are intended for Flexible Disc Drives.

The third A.C. output cannot be controlled and is intended for a fan unit.

Generating D.C. Voltages

The switching mode principle of operation is used to generate the D.C. voltages. This means that the incoming mains voltage is rectified, chopped and transformed into desired low voltages.

Because of the voltage doubling in the 100V range (sub-section 1.4.1), the rectified voltage to be chopped is roughly the same in both the ranges. The chopping is controlled by a 25 kHz switch circuit that senses a feed-back from the +5V output. With the guidance of this feedback the switch circuit can regulate the pulse width, and thereby control the amount of energy transformed to the secondary side.

The low voltages obtained at the secondary side are then rectified and supplied via screw terminals (+5V) and output plugs.

Clock & Power Status Signals

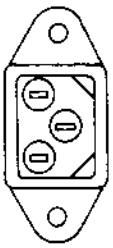
The RTC pulses generated have a duration of 1 µs and are repeated with the mains frequency being at hand.

From the instant of switching on the mains voltage the RSLN signal remains low for about 325 ms. The PWFN remains low for another 300 µs, but at this instant all D.C. voltages have been raised in the required sequence, and the supplied computer logic can start to work.

EXTERNAL INTERFACES

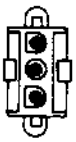
Mains Inlet

The mains inlet (P8) is a male connector, type: Otto Heil 6061-5-4.8.



A.C. Outputs

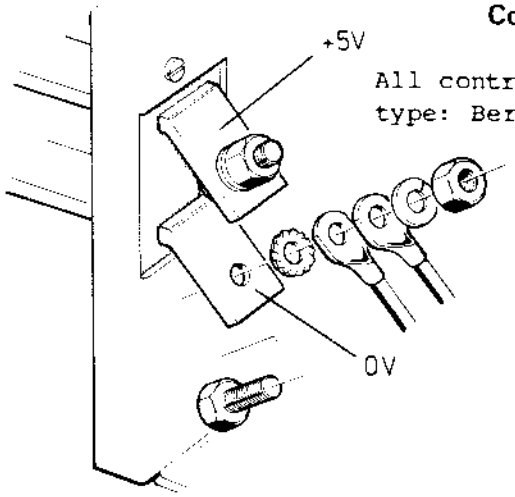
All A.C. outputs (P5, P6 and P7) are male connectors, type: AMP 350547-1.



D.C. Outputs

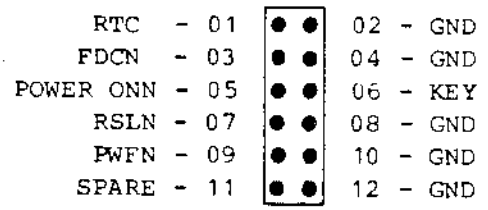
The D.C. voltages are supplied via screw terminals (P1) and two male connectors, P2 (type: Molex 09-81-1061) and P4 (type: Molex 09-81-1091).

Screw Terminal P1

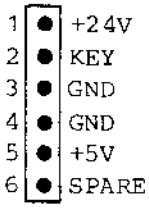


Control Signal Interface

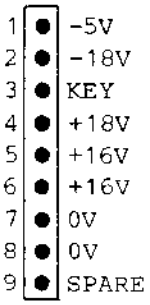
All control signals are taken via the male connector P3, type: Berg 75789-101-12.



Connector P2



Connector P4



NOTE

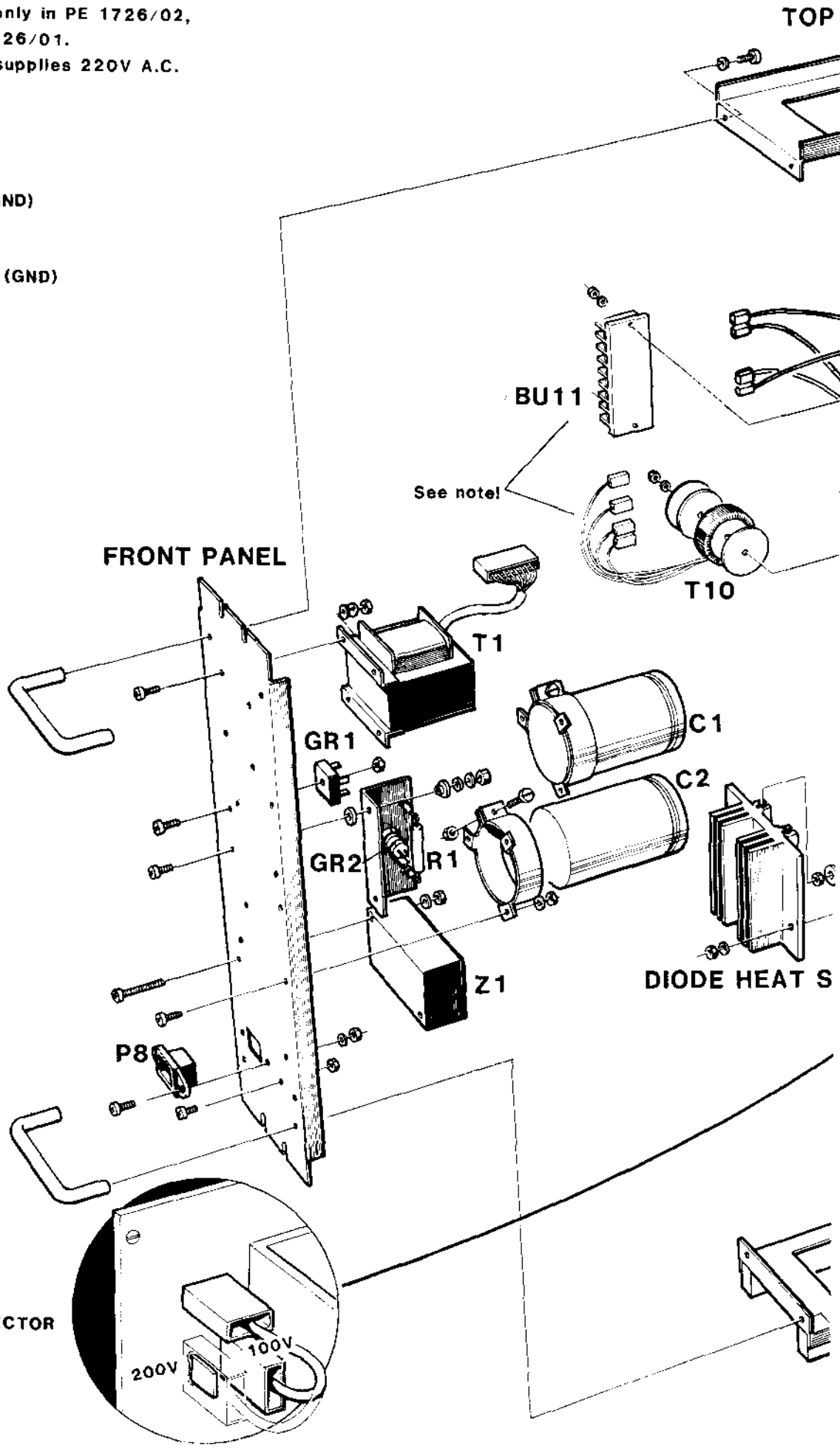
T10 and BU11 fitted only in PE 1726/02,
or in a modified PE 1726/01.
When missing the P7 supplies 220V A.C.

D.C. OUTPUTS

+24V/2.4A, P2/1 & 2 (GND)
+18V/0.3A, P4/4
+16V/6.6A, P4/5,6
+5V/43A, P1, P2/5 & 6 (GND)
-5V/1.2A, P4/1
-18V/0.3A, P4/2
GND, P4/7, 8, 9

MAINS INPUT (P8)

100 - 127V, 60Hz
200 - 240V, 50Hz



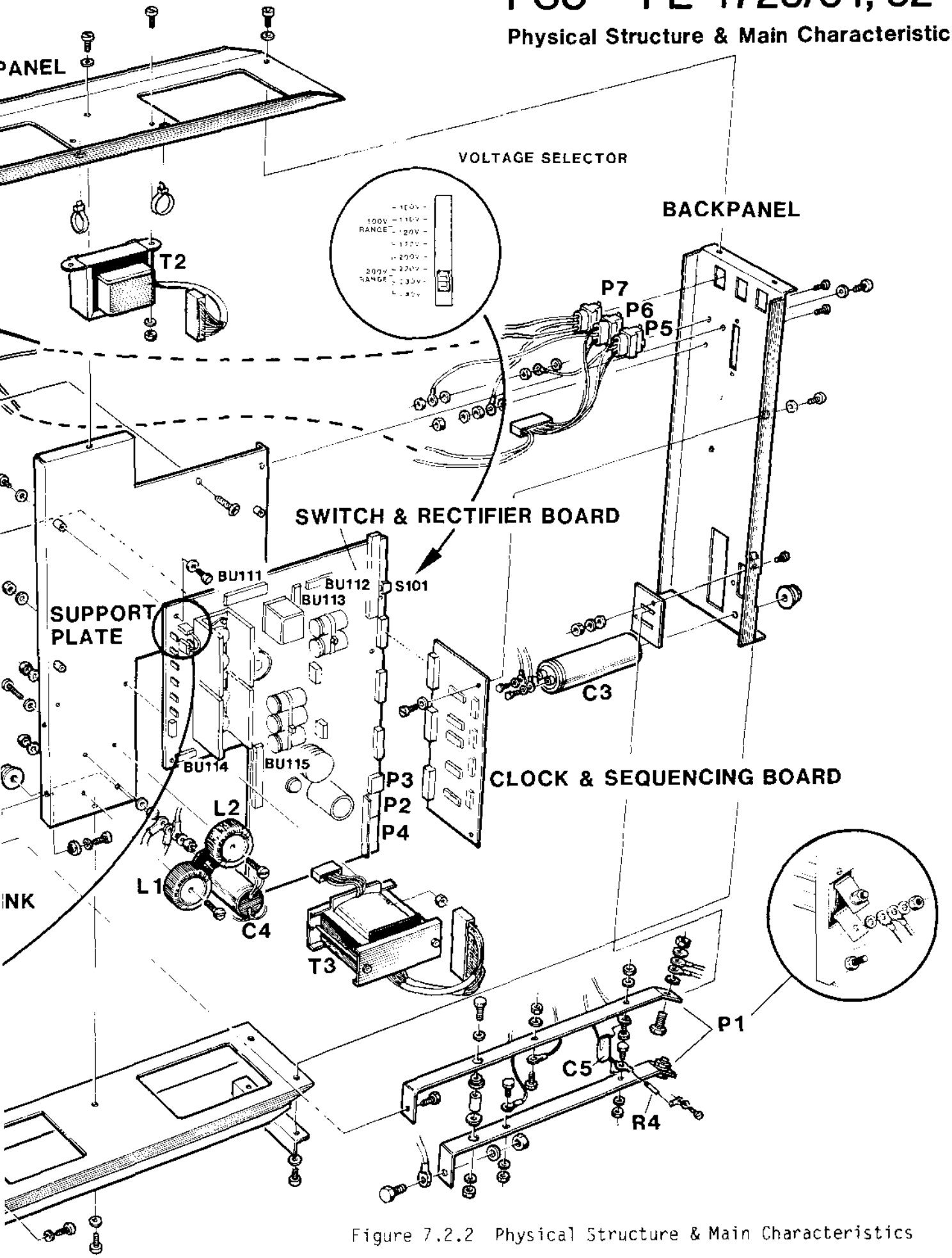
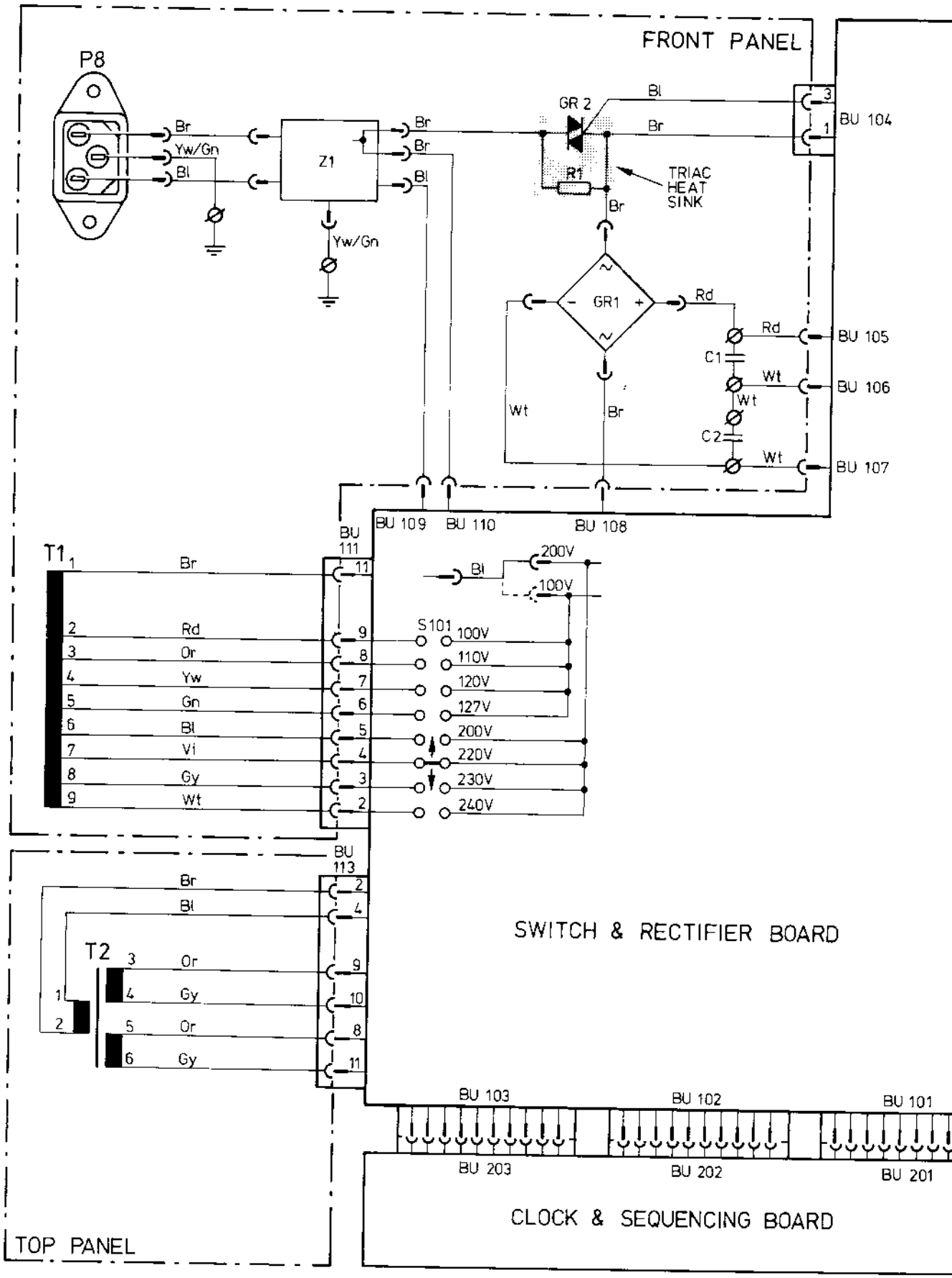


Figure 7.2.2 Physical Structure & Main Characteristics


FRONT PANEL
P8
Br
Yw/Gn
Bl
Z1
Yw/Gn
GR 2
R1
TRIAC HEAT SINK
GR1
Rd
C1
C2
Wt
BU 104
BU 105
BU 106
BU 107
BU 108
BU 109
BU 110
BU 111
T1
S101
100V
110V
120V
127V
200V
220V
230V
240V
BU 113
T2
SWITCH & RECTIFIER BOARD
BU 103
BU 102
BU 101
BU 203
BU 202
BU 201
CLOCK & SEQUENCING BOARD
TOP PANEL

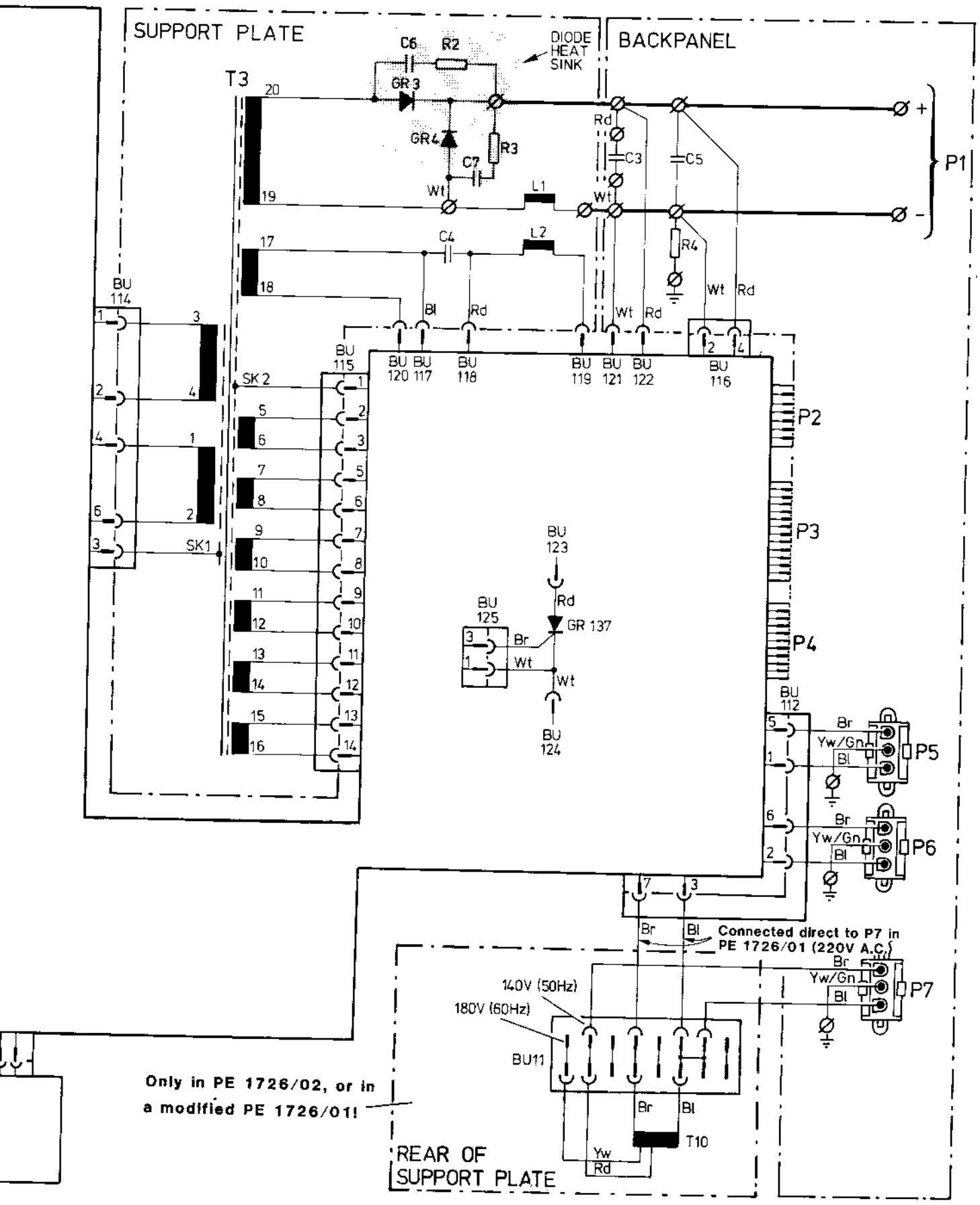
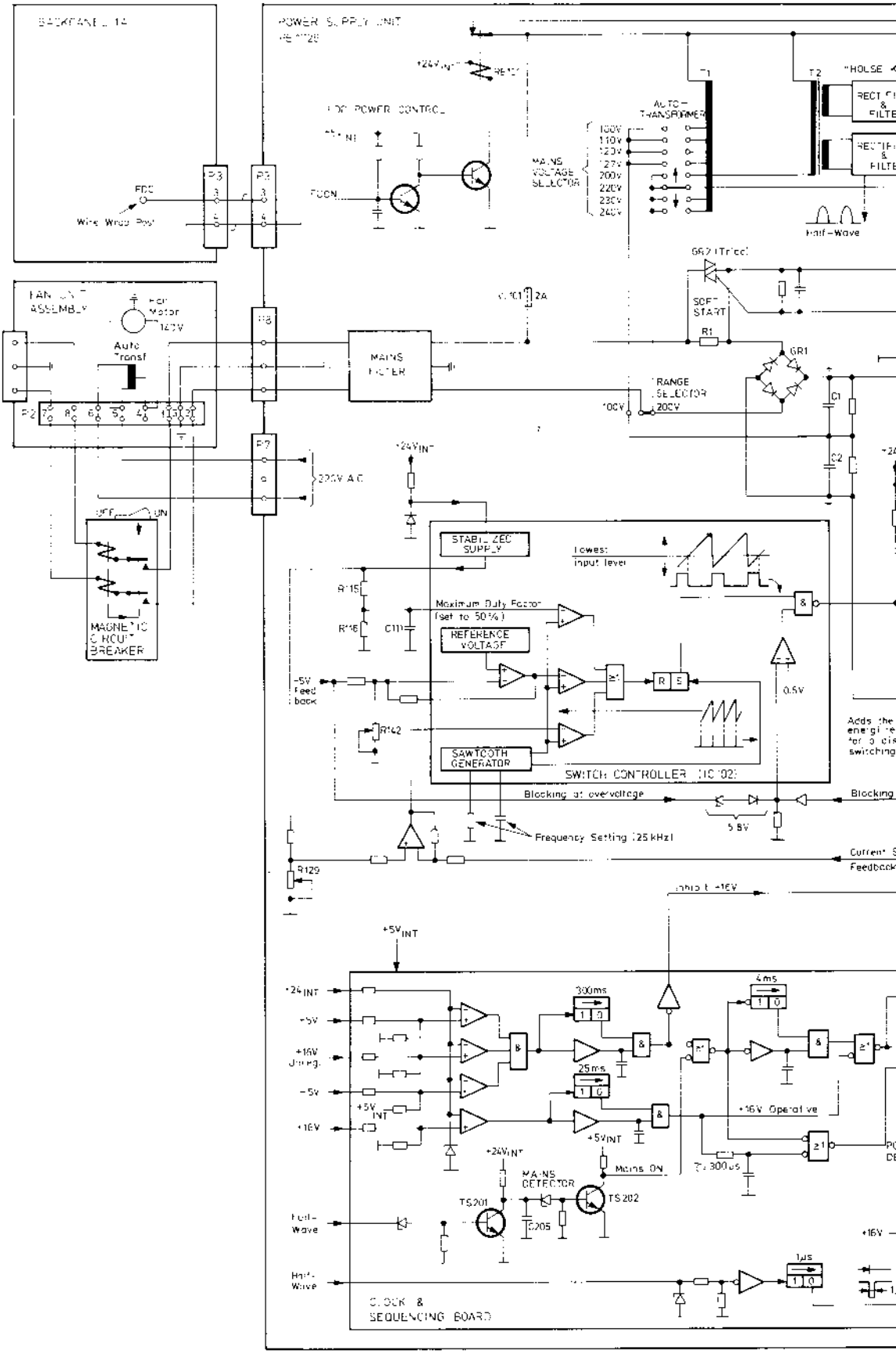


Figure 7.2.3 Submodules & Interconnections


BACKPANEL 14
POWER SUPPLY UNIT
FDC
Wire Wrap Post
FAN ASSEMBLY
Fan Motor 115V
Auto Transf
MAGNETIC CIRCUIT BREAKER
OFF
ON
FDC POWER CONTROL
MAINS VOLTAGE SELECTOR
100V
110V
120V
127V
200V
220V
230V
240V
AUTO-TRANSFORMER
Half-Wave
SOFT START
MAINS FILTER
RANGE SELECTOR
100V
200V
220V A.C.
+24VINT
STABILIZED SUPPLY
Lowest Input level
Maximum Duty Factor (set to 50%)
REFERENCE VOLTAGE
-5V Feed back
SAWTOOTH GENERATOR
SWITCH CONTROLLER CIC 902
Blocking at overvoltage
5.8V
0.5V
Frequency Setting (25 kHz)
+5VINT
+24 INT
+5V
+16V Unreg.
-5V
+16V
300ms
25ms
4ms
+16V Operative
Mains ON
MAINS DETECTOR
TS201
TS202
Full-Wave
Half-Wave
1µs
CLOCK & SEQUENCING BOARD

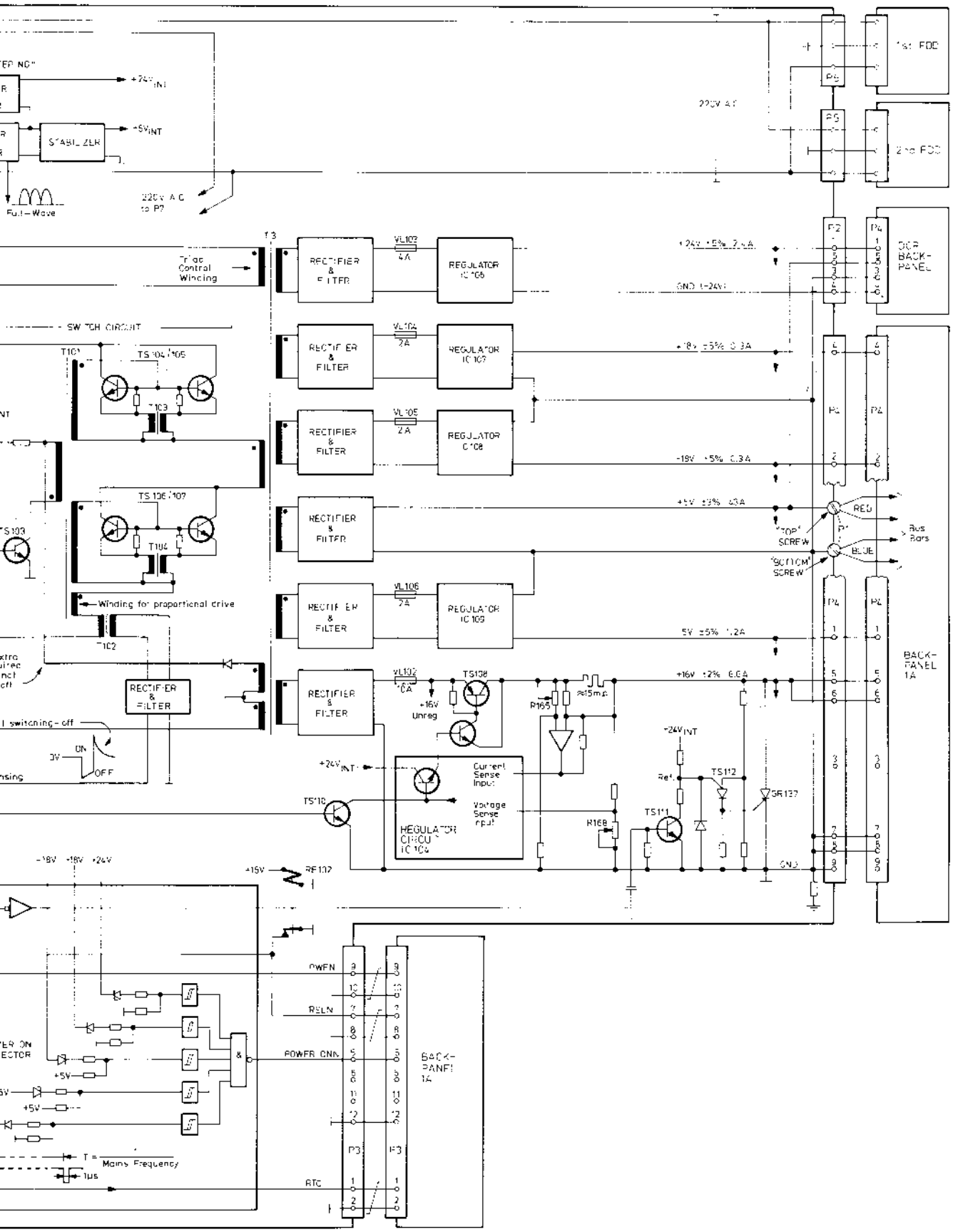


Figure 7.2.4 Functional Block Diagram of the PE 1726

FUNCTIONAL DESCRIPTION

Mains Input

The mains voltage coming in to the computer cabinet is connected to terminal block P2 on the fan unit assembly, and is then wired to a magnetic circuit breaker at the fore top part of the cabinet. The return wires from the breaker are then, via the terminal block, connected to the PSU.

The magnetic circuit breaker is a manually operated ON/OFF switch which automatically goes to the OFF state in case of overloading (> 7.5A).

Primary Rectifying

Range Selection

The mains voltage from the terminal block is taken in via P8 and a mains filter. Depending on the voltage range it is then connected to one of two possible branches. Voltages within the range 200-240V are connected to a full wave rectifier (GR1) and to the upper range input of the autotransformer T1.

A mains voltage between 100V and 127V is instead connected to a branch which leads to the lower range input of T1, and which makes the rectifier circuit operate like a voltage doubler (using just the two "upper" diodes of GR1). This voltage doubling means that the D.C. output of the rectifier circuit is roughly the same for both the mains voltage ranges.

Smooth Start Control

It should be noted that the series resistor R1 limits the starting-up current through the rectifier. The capacitors C1 and C2 would otherwise cause an unpermitted peak current at the instant of switching on the unit. However, when the unit has started to operate, the resistor will successively be short-circuited by a triac (GR2), which is controlled from an auxiliary winding on transformer T3.

Autotransformer & 220V Supply

At the input of the autotransformer T1 there is the Mains Voltage Selector which can be set to eight different voltages, four of each range. Any of the specified input voltages makes the autotransformer produce a 220V A.C. output. This output is used to supply two Flexible Disc Drives (via P5/P6) and a Fan Unit (via P7).

The outputs via P5/P6 are controlled by means of relay RE101. A low input signal (FDCN) on P3/3 stops the 220V supply by energizing the relay.

Internal D.C. Supply

Two voltages, +24V and +5V, are required for internal use within the power supply unit. These voltages are produced at the secondary side of transformer T2. The primary side of this transformer is fed with 200V from the autotransformer T1.

Two unfiltered signals are taken from the +5V rectifier, one Half-Wave and one Full-Wave. These signals are used on the Clock & Sequencing Board and are described later on.

Chopping The Rectified Mains Voltage

The rectified mains voltage is connected across a circuit consisting of a transformer winding provided with two switch transistors in parallel at each end. The winding is the primary one of T3; the transformer which supplies the low-voltages for producing the D.C. outputs.

Each pair of switch transistors is controlled from a separate winding on the secondary side of transformer T101. The primary winding is controlled by a pulse repetition frequency of 25 kHz via transistor TS103. When this transistor is switched on the switch transistors are cut off and vice versa. The emitter transformers T103/T104 are used to equalize the current through the switch transistors.

A third secondary winding of T101 makes the switch circuit operate proportionally, i.e. alterations in the current through the switch transistors (caused by load variations) are reflected back to the base currents.

An auxiliary winding on T3 supplies a voltage which is connected across the primary winding of T101 and transistor TS103. This arrangement gives the extra energi required to distinctly cut off the switch transistors when TS103 is switched on.

Secondary Rectifying & Regulation

General

Six secondary windings on T3 supplies suitable A.C. voltages for producing the six D.C. outputs. All A.C. voltages are rectified and filtered and all except +5V are regulated on the secondary side. The +5V is, as will be explained later, fed back for controlling the switch circuit and is consequently regulated from the primary side of T3.

Regulating +16V

Four of the five secondary regulators just consist of single IC chips, whilst the fifth (for +16V) is more complicated. The +16V is regulated by controlling the series transistor TS108 via a Regulator Circuit. This circuit has one current sense input and one voltage sense input. The current is sensed as a voltage drop across a series resistor of approximately 15 mOhms (part of the PCB foil). A differential amplifier then compares the sensed voltage with a fixed level (set with R165) and provides an amplified difference signal to the Regulator Circuit.

The voltage sense input is supplied from a voltage divider where the sense level may be adjusted with R168.

Across the +16V output there is also a "crow bar", i.e. a thyristor which short-circuits the output in case of over-voltage. The thyristor (GR137) is fired if the voltage exceeds 17.2V, because the uni-junction transistor TS112 is then switched on. Other circuits at the +16V output are explained later on.

Feedbacks to the Switch Controller

There are three feedbacks to the Switch Controller. Besides the +5V output from the secondary side (previously mentioned) there are two feedbacks from the primary side.

One of the primary feedbacks is a current sensing branch in the switch transistor loop. The sensing device is a current transformer (T102) that senses a reflection of the +5V load on the secondary side (other voltages are secondarily regulated and have a small influence on the primary side). The transformer supplies a voltage which, after rectifying and filtering, is compared with a reference voltage (set with R129). The comparison takes place in a differential amplifier that provides an amplified difference signal to the Switch Controller.

The second feedback from the primary side is obtained from another auxiliary winding on T3. This winding supplies a positive pulse each time the switch transistors are cut off.

Switch Controlling

Sawtooth Generator

The Switch Controller (IC102) contains a sawtooth generator that operates with a frequency of 25 kHz (set by means of an external RC network). Each time the generator starts a new ramp, the leading edge of a switch controlling pulse is raised by setting an internal latch element.

Maximum Duty Factor

The duration of this pulse is then depending on the feedback signals, but can never be more than 50% of the period time. This limit, the Maximum Duty Factor, prevents the transformer core from being saturated and is set by the voltage divider R115/R116. The level defined by these resistors is compared with the sawtooth waveform in a differential amplifier. When the sawtooth ramp comes to the fixed level, a signal is obtained which resets the latch element and thereby ends the switch controlling pulse. The capacitor C111 gives a smooth start, i.e. the pulse width is successively increased to the maximum.

Current Sense Feedback

The amplified difference signal from the current sense feedback is similarly compared with the sawtooth waveform in a second amplifier. The difference signal, decreasing when the current increases and vice versa, is scaled to operate below the Maximum Duty Factor. An increasing current will therefore shorten the switch controlling pulses and a decreasing current will make the pulses longer. In this way the Switch Controller regulates the amount of energy transformed to the secondary side.

+5V Feedback

A similar regulation is also effected by the +5V fed back. A part of this voltage (set with R142) is compared with a reference voltage and an amplified difference signal is obtained. This signal, also scaled to operate below the Maximum Duty Factor, controls the width of the switch controlling pulses in the same way as the current sense feedback. A raising voltage results in shorter pulses and a falling voltage gives longer pulses.

Overvoltage Feedback

The +5V fed back is also used to inhibit the output of the Switch Controller in case of over-voltage. If the voltage exceeds +6.4V the output gate will be blocked. This inhibiting method is also used to ensure that no pulse will be let through immediately after cutting off the switch transistors. An auxiliary winding on T3 (previously mentioned) supplies the inhibiting pulse.

Sequencing at Power Start

At the instant of switching on the Power Supply Unit the signal RSLN is active (connected to signal ground via RE102), whilst the signal PWFN is undefined because of no +5V supply. Both signals, generated on the Clock & Sequencing Board, are used for controlling the computer logic during Power Start/Stop sequences.

However, when the +5V output has raised to approximately 4.75V, the internal +5V supply is also operative and the PWFN signal is defined as active (low level). Simultaneously the following also takes place:

- The signal Inhibit +16V is raised and cuts off the series transistor (TS108) at the +16V output.

- A 300 ms monostable flip-flop is triggered (provided that the -5V output and the unregulated +16V are both operative) and maintains the inhibit signal during that period of time.

When the inhibit signal has been ended and the +16V output has come to approximately +14V, a 25 ms monostable flip-flop will be triggered. After these 25 ms the RSLN signal goes high (RE102 now also energized) and after another 300 µs the PWFN signal also goes high.

The power start sequence is now ended and the supplied computer logic can start to work. The reason for delaying the +16V is to establish a well defined reset state of the logic before the memory is made operative with the +16V supply. Otherwise there is a risk of having irrelevant information written into the memory.

Sequencing at Power Stop

When the Power Supply Unit is switched off the capacitor C205 on the Clock & Sequencing Board will be continuously charged (otherwise repeatedly discharged by the Full-Wave signal). The time constant is chosen such that at least 5 ms must elapse before the transistor TS202 switches on and indicates Mains Off. This delay means that mains interrupts shorter than 5 ms will not affect the power supply.

However, when Mains Off is indicated, the PWFN signal goes low and a 4 ms monostable flip-flop is triggered. After these 4 ms the RSLN signal also goes low and switches on the transistor TS111 at the +16V output. This means that the reference voltage to the uni-junction transistor TS112 is lowered to a level which makes the transistor switch on. The "crow bar" is therefore fired and the +16V output is consequently short-circuited. It should be noted that the +5V supply is maintained for another 10 µs, i. e. the memory is made inoperative before a falling +5V may cause an undefined reset state in the logic.

Power On Detector

The six D.C. voltages supplied are all sensed on the Clock & Sequencing Board. If the voltages are close to their nominal values (the accuracy is insufficient to indicate - "within specifications"), Schmitt-triggers will switch and open an AND-gate that indicates Power On. This signal is used to lit an indicator on the System Operator´s Panel.

Generating Real Time Clock

The Clock & Squencing Board also contains a circuit for generating a Real Time Clock, a clock signal to the computer logic. This signal is obtained by triggering a 1 µs monostable flip-flop with the mains frequency. The Half-Wave signal previously mentioned is "square formed" by a zener diode and is then used as a trigger pulse.

7.3 PSU PE 1773, for TC 6824

The PSU is built into a frame assembly consisting of a front panel and a back panel, held together by a top and a bottom plate.

The bottom plate is provided with two runners on which the unit can be slid into the computor rack, and on which the unit then stands. The top and bottom of the front panel has screw slots for fixing the unit to the rack. The front panel also has two handles.

The battery module is located externally on the front panel, with the battery input socket above and the mains input socket below. All other external connectors are located on the rear panel.

Three printed circuit boards are included in the PSU; the main board containing switch & rectifier components, one board containing clock and sequencing circuits and a third one containing secondary switch circuits for the back-up voltages. Some components are located directly on the frame.

MAINS INPUT (P11)

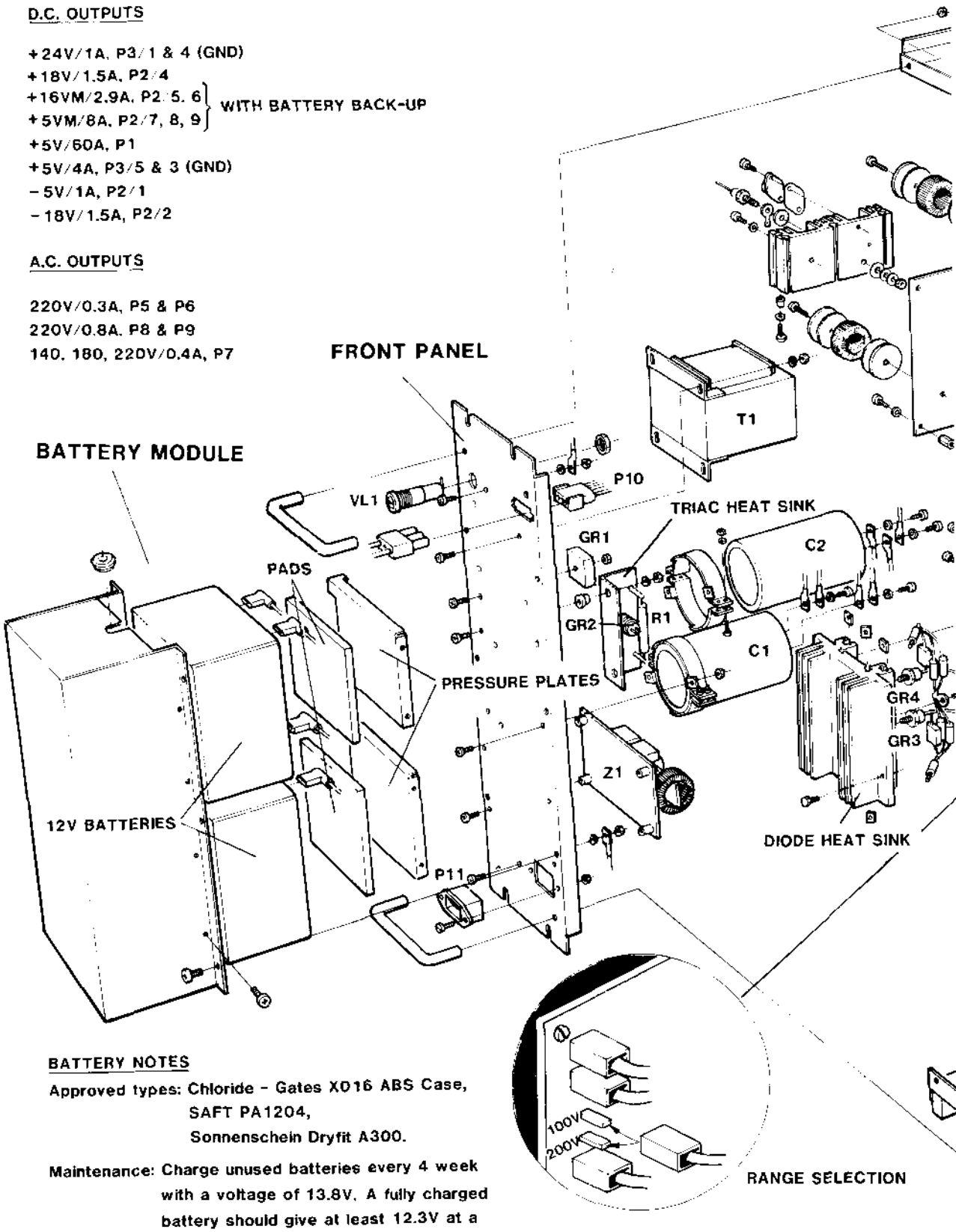
100 - 127V 60Hz
200 - 240V 50Hz

D.C. OUTPUTS

+24V/1A, P3/1 & 4 (GND)
+18V/1.5A, P2/4
+16VM/2.9A, P2/5, 6 } WITH BATTERY BACK-UP
+5VM/8A, P2/7, 8, 9 }
+5V/60A, P1
+5V/4A, P3/5 & 3 (GND)
-5V/1A, P2/1
-18V/1.5A, P2/2

A.C. OUTPUTS

220V/0.3A, P5 & P6
220V/0.8A, P8 & P9
140, 180, 220V/0.4A, P7



BATTERY NOTES

Approved types: Chloride - Gates X016 ABS Case,
SAFT PA1204,
Sonnenschein Dryfit A300.

Maintenance: Charge unused batteries every 4 week with a voltage of 13.8V. A fully charged battery should give at least 12.3V at a load of 0.5A.

PSU - PE 1773

Physical Structure & Main Characteristics

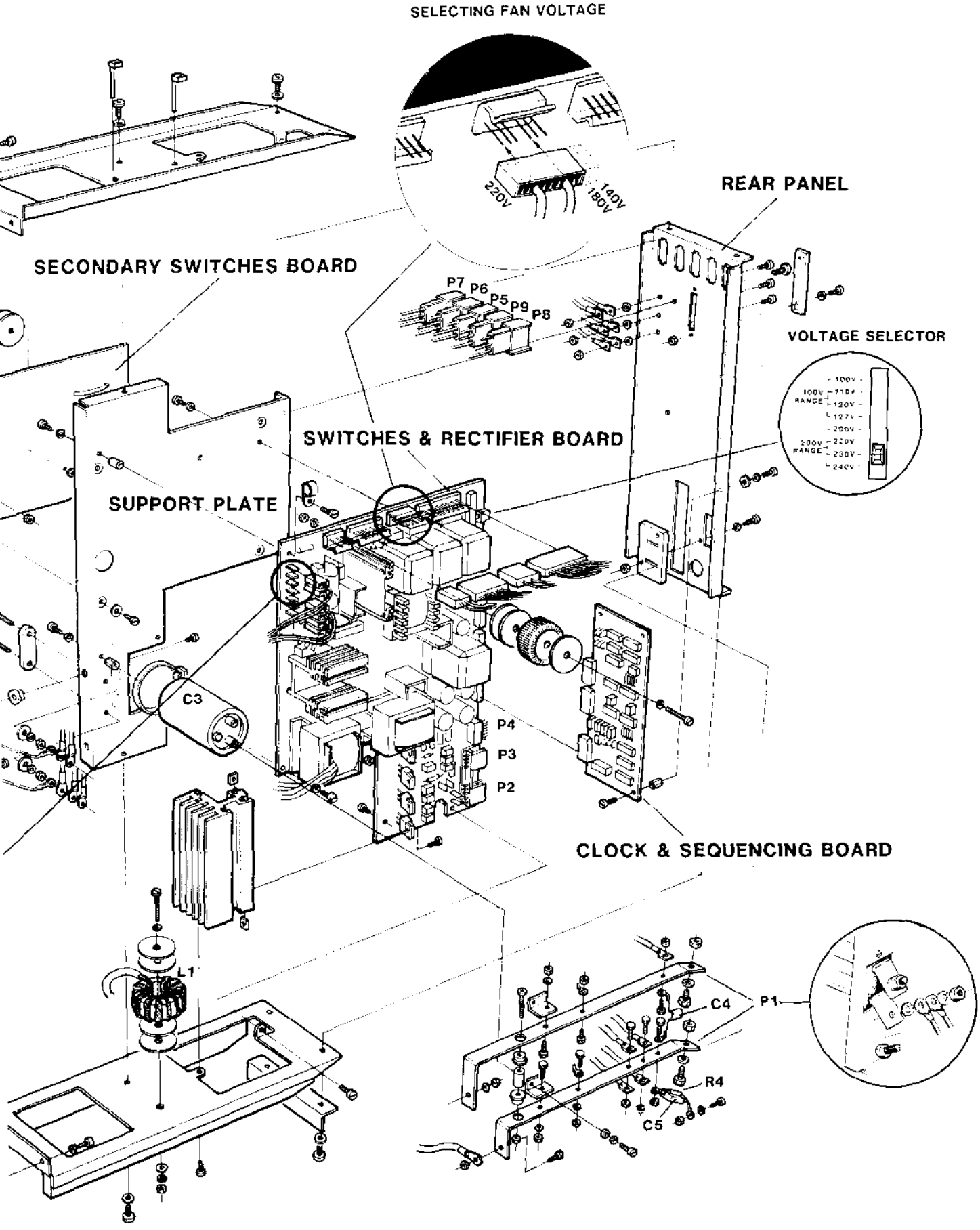
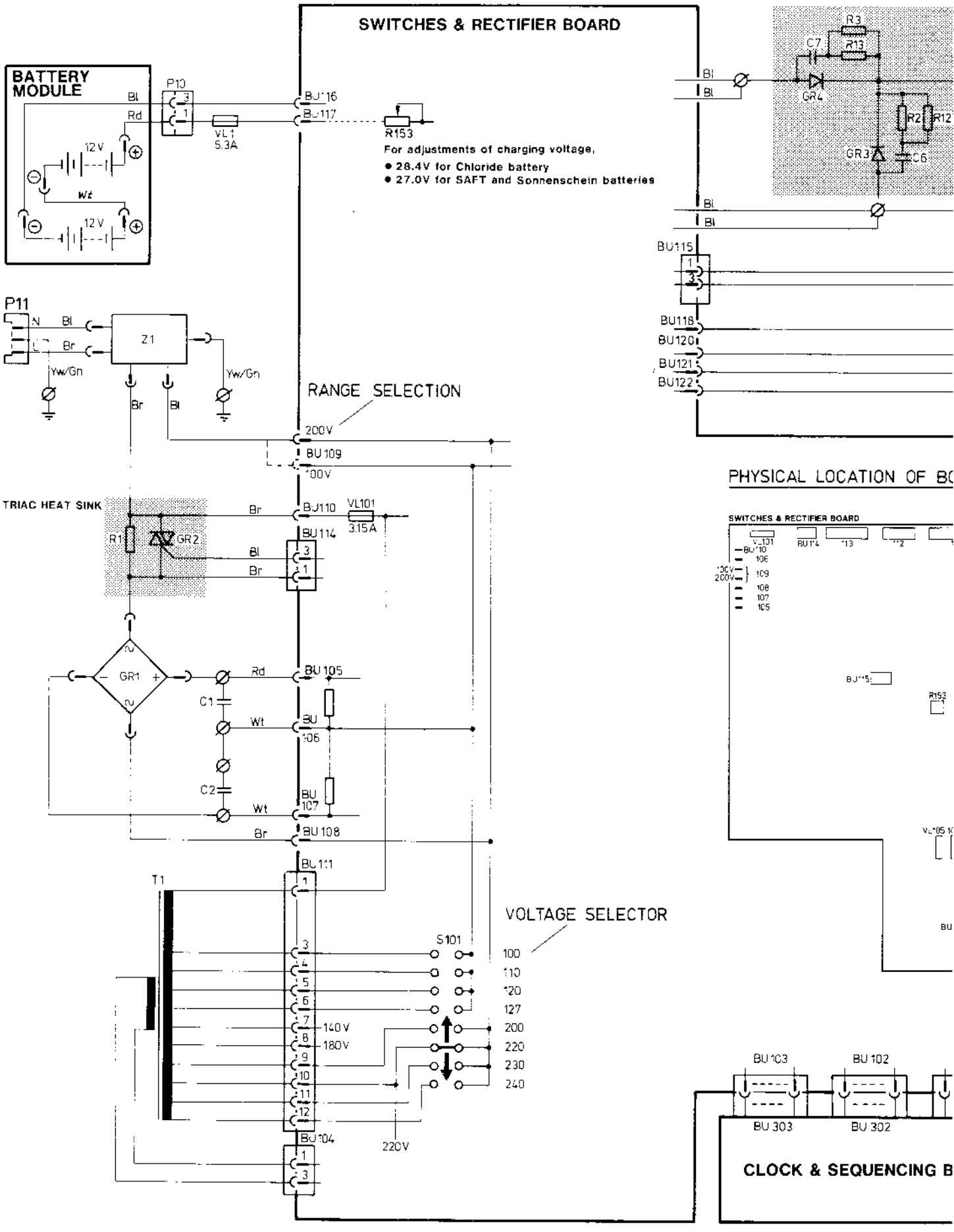


Figure 7.3.1 Assembly PE 1773


SWITCHES & RECTIFIER BOARD
BATTERY MODULE
Bl
Rd
Wt
12 V
12 V
P10
BU116
BU117
VL1
5.3A
R153
For adjustments of charging voltage,
• 28.4V for Chloride battery
• 27.0V for SAFT and Sonnenschein batteries
R3
C7
R13
GR4
R2
R12
GR3
C6
BU115
BU118
BU120
BU121
BU122
P11
N
L
Z1
Yw/Gn
Br
RANGE SELECTION
200V
BU 109
100V
TRIAC HEAT SINK
R1
GR2
BU110
VL101
3.15A
BU 114
GR1
C1
C2
BU 105
BU 106
BU 107
BU 108
BU 111
T1
VOLTAGE SELECTOR
S101
100
110
120
127
140 V
180V
200
220
230
240
220V
BU 104
PHYSICAL LOCATION OF BO
SWITCHES & RECTIFIER BOARD
BU 103
BU 102
BU 303
BU 302
CLOCK & SEQUENCING B

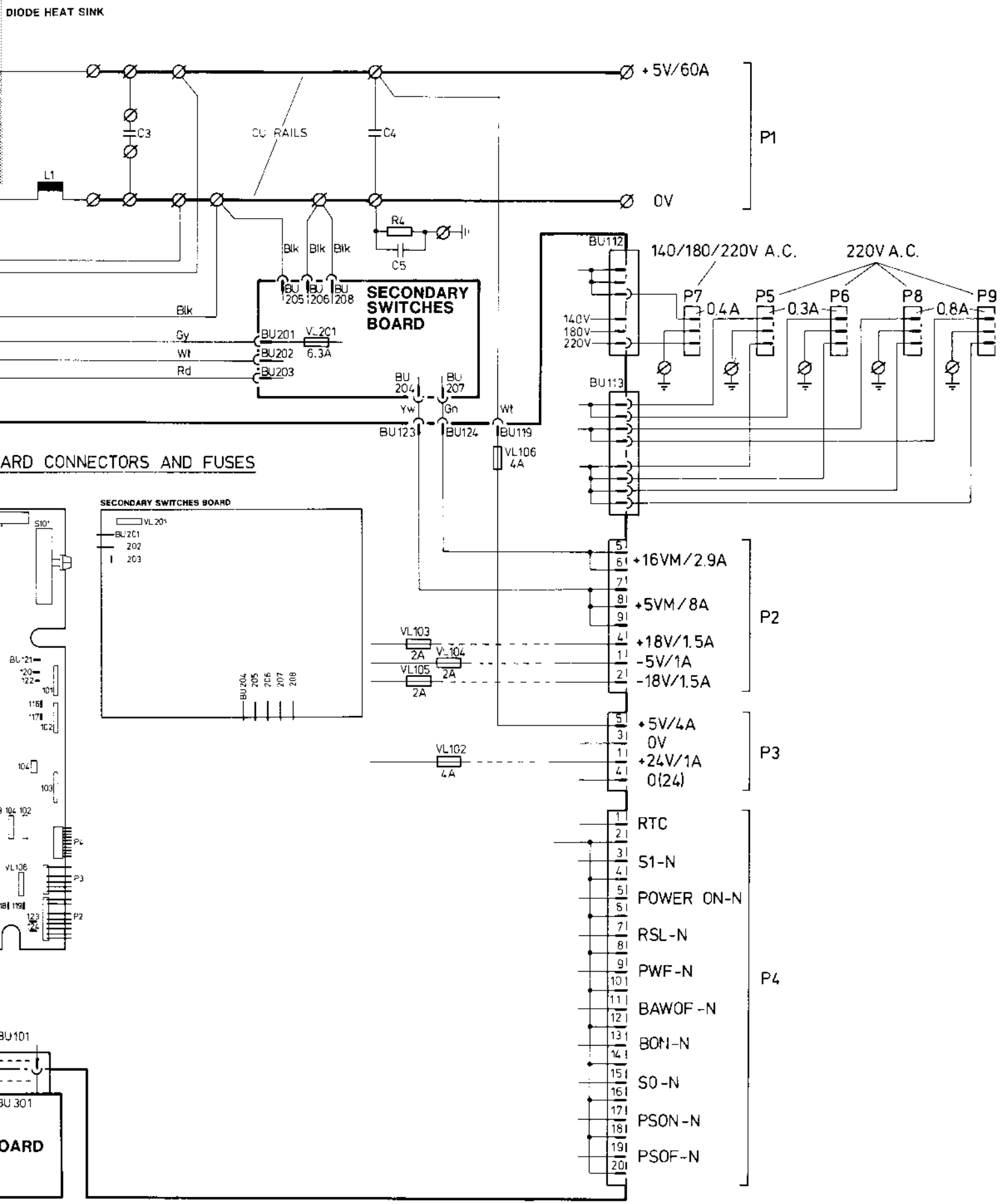


Figure 7.3.2 Internal Interfaces PE 1773

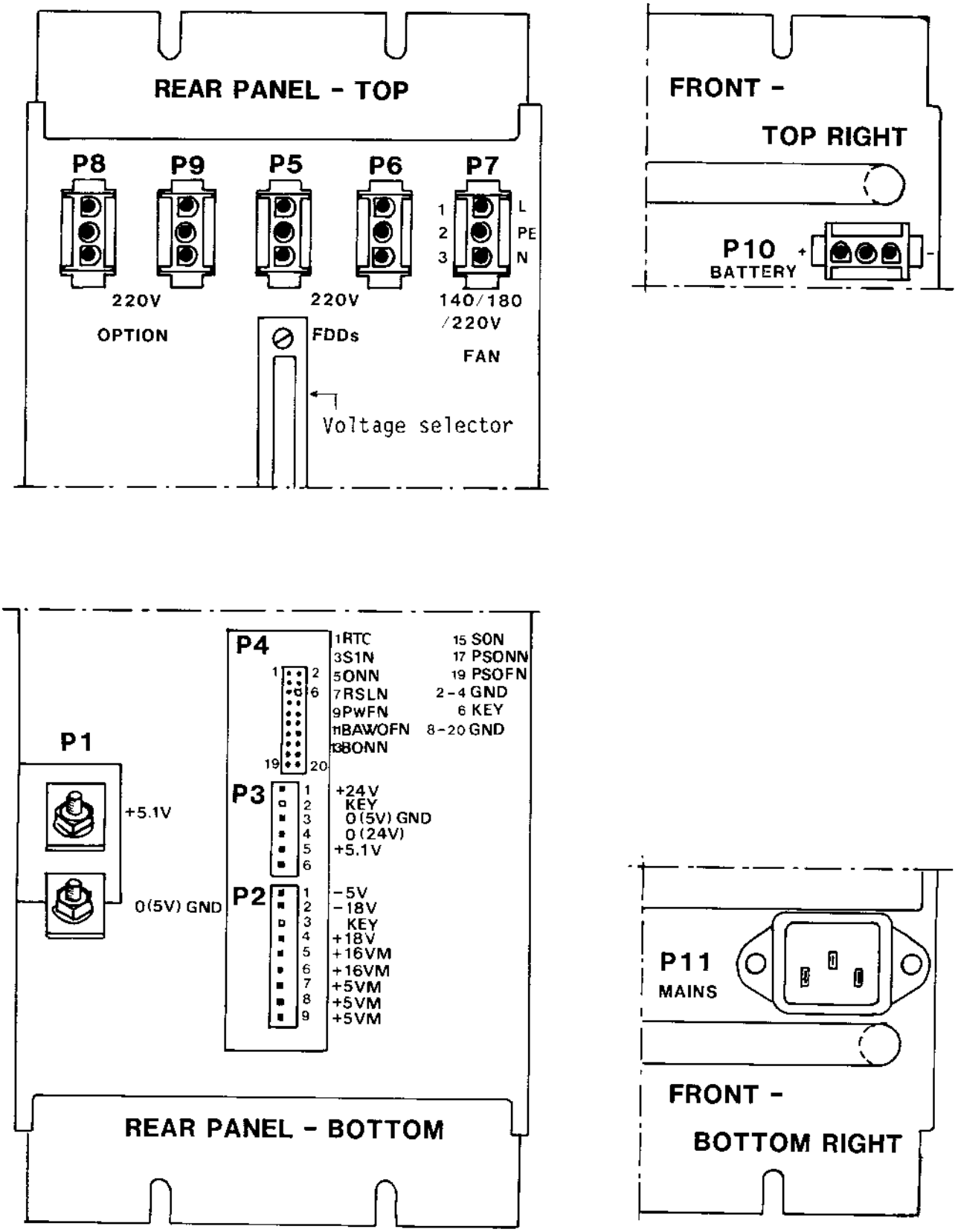


Figure 7.3.4 External Connectors

Rack Mounting

The PSU is slid into the rack on its runners, and is fixed by two screws at the top and the bottom of the front panel.

Connecting Rear Panel Plugs

Figure 7.3.4/5

When the PSU is fitted in the rack, the appropriate sockets can be connected to the PSU's output plugs. Ensure that:

- FDDs are supplied with 220V AC from the plugs P5 and P6.
- Optional equipment should be supplied with 220V from the plugs P8 and P9.
- The fan unit is supplied from plug P7.
- The cables for heavy +5V (5.1V) supply are screwed to terminal P1 as shown in figure

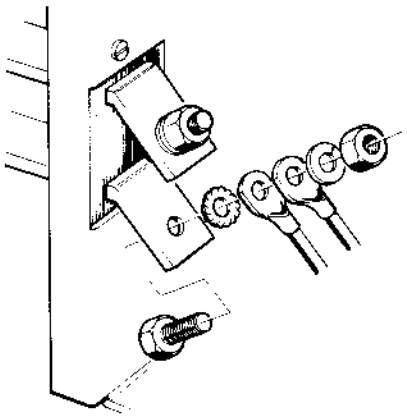


Figure 7.3.5 Fixing Heavy +5V Cables

Installing the Battery

Figure 7.3.6

The battery module, including the two 12V batteries, is delivered separately. The batteries are fully charged at the time when they are leaving the factory.

The batteries should be kept separately until the time for delivery to the customer. Before installation the batteries should be checked and if needed also charged. If the type of batteries is changed the charging voltage may have to be adjusted

When installing the batteries, the red cable from the P10 connector is fixed on the positive pole of one battery, while the blue cable is fixed on the negative pole of the other battery. The loose red cable supplied is used to connect the remaining two poles, completing a series connection.

The batteries are held in place by two pressure plates. A foam-rubber pad is placed between battery and plate. The plates fit into slots on one side of the battery box, while screws are used to fix the plates to the other side. Note that there are two possible positions for the pressure plates, allowing for different battery dimensions.

The battery box itself is fixed by screws to the front panel.

Connecting Front Panel Plugs

Connect the mains plug to the socket P11 and the battery plug to the socket P10 on the front panel.

The PSU is now installed and the terminal computor may be started from the operator's panel.

> **NOTE!**
>
> **The frequency on the RTC line is equal to the mains frequency. The TOSS version used by the system should include the applicable routine for calculating real time.**

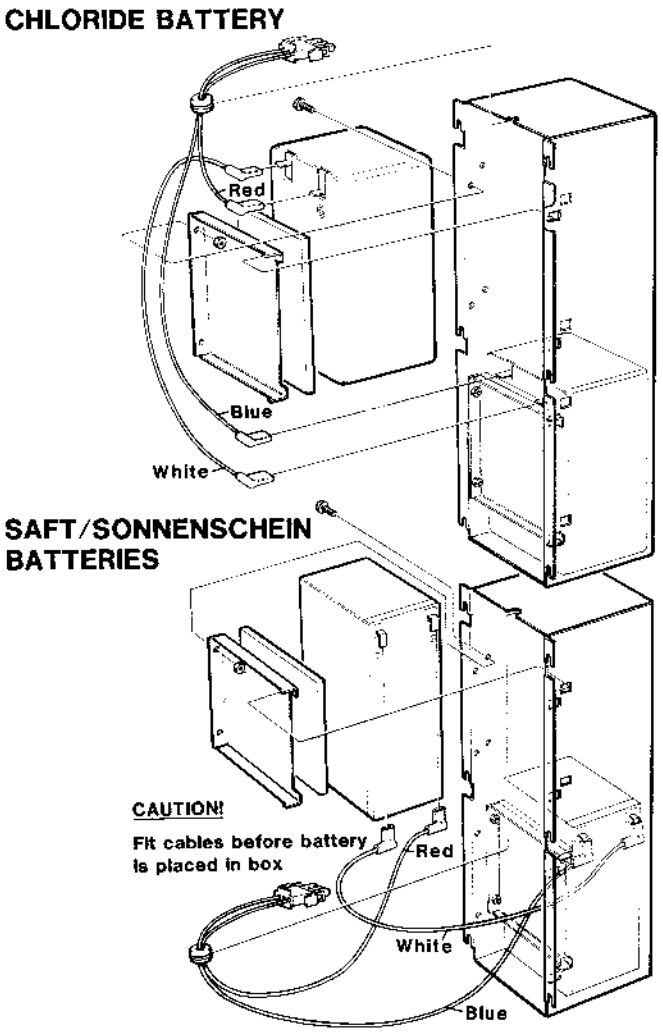


Figure 7.3.6 Battery Module

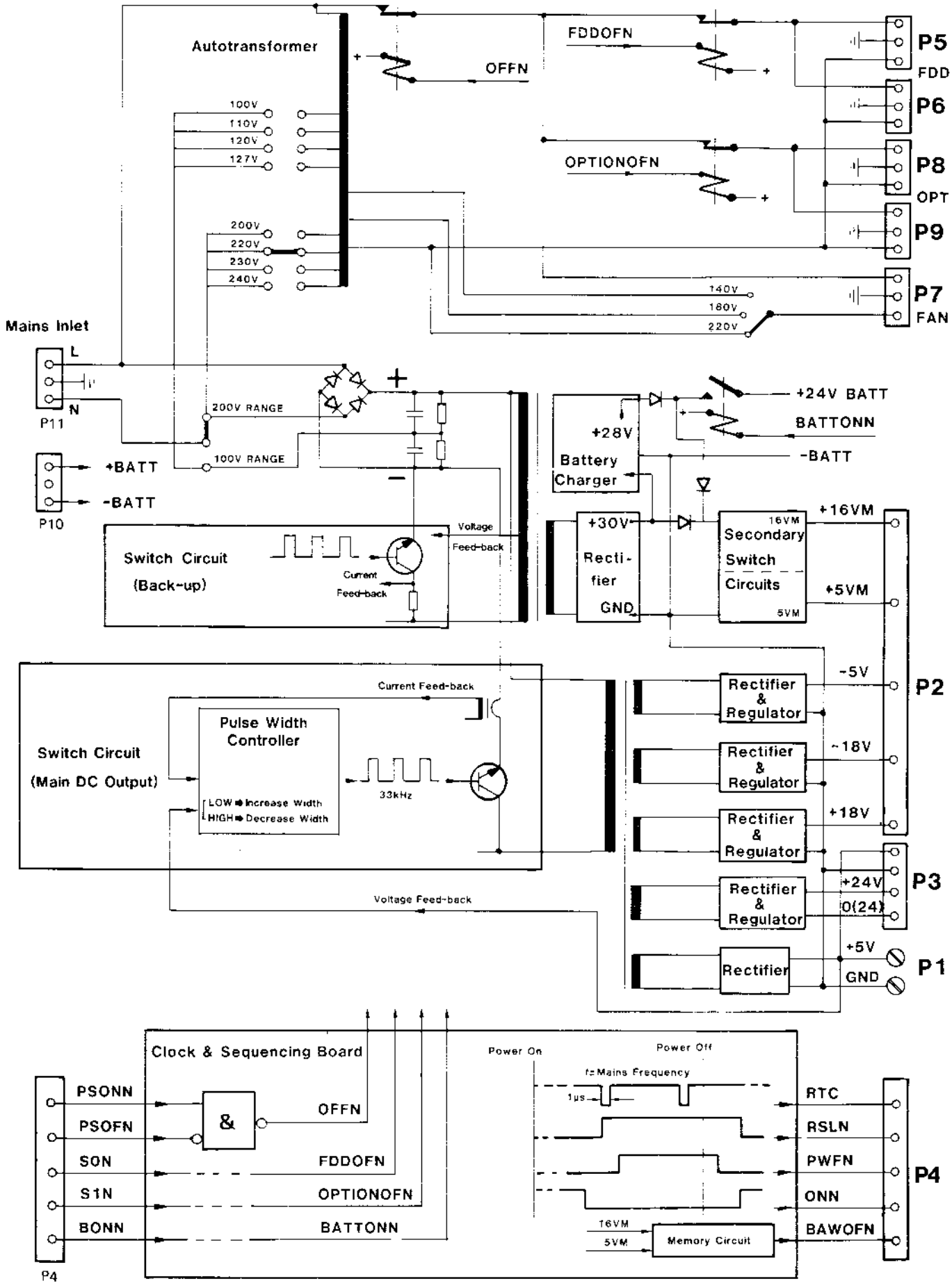
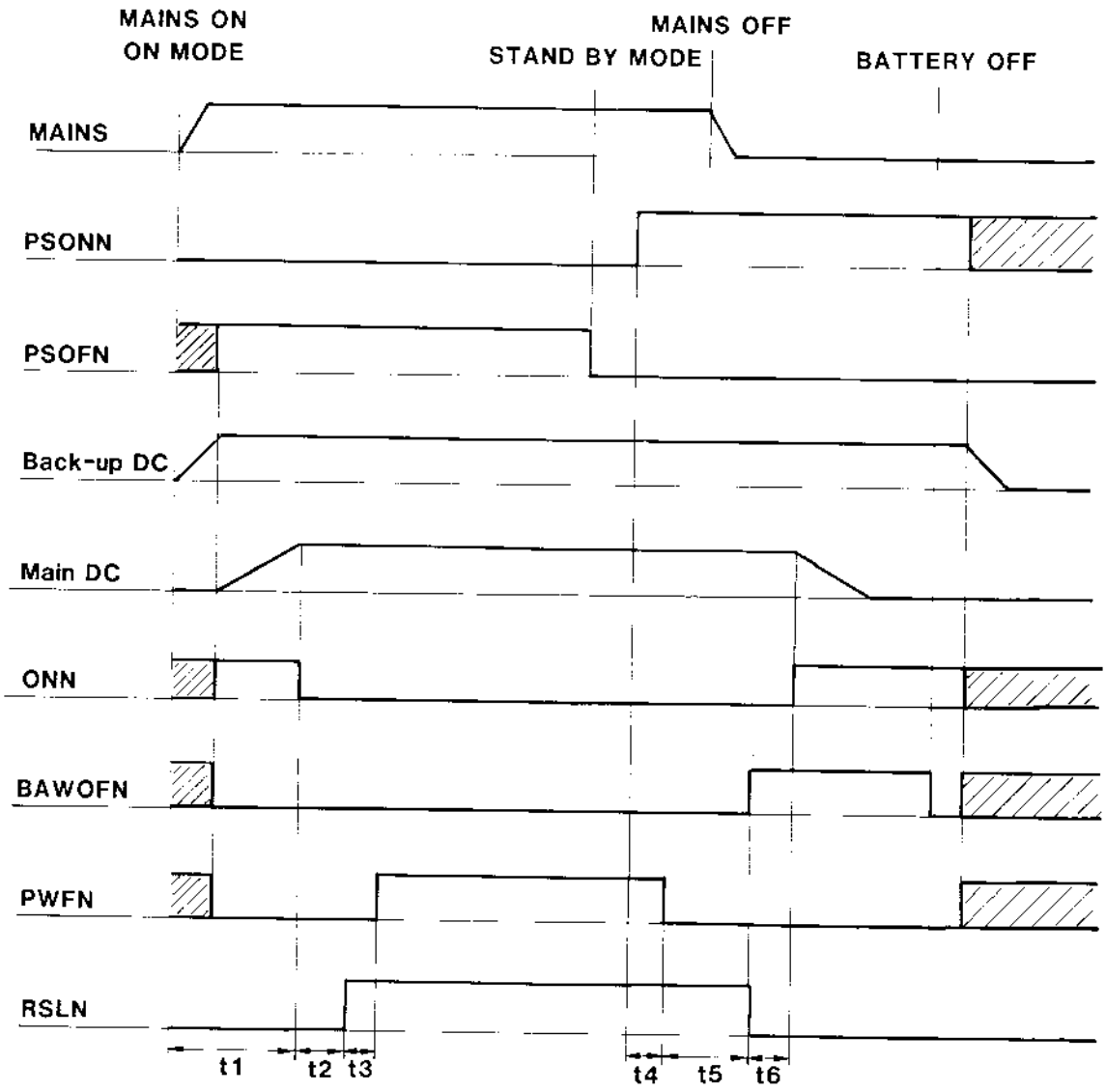


Figure 7.3.7 Block Diagram PE1773



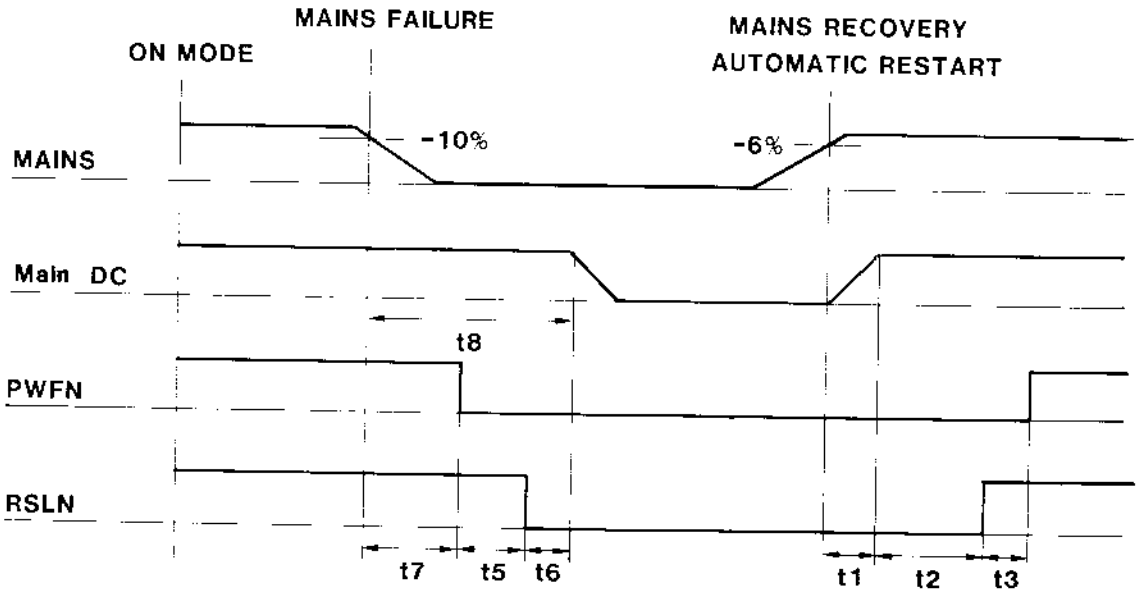


Figure 7.3.8 Sequence of Signals