PART4 — CABINETRY

Cabinets

1 Cabinetry

This chapter gives details of the basic and extension cabinets which are used for housing the rack mounting equipment defined in Part 2 and 3. Details of the mounting methods and associated hardware are also provided.

Note: When a system is delivered the assigned rack locations for the equipment within the cabinet together with the interconnections are shown in the accompanying Configuration Sheets. A sample set of these sheets is given in the Appendix.

Cabinets

P849-016	Basic cabinet comprising a 19 inch rack with a usable depth of 700 mm (27.5 inches) and mounting height of 36 standard units enclosed by side panels and rear door (see Figures 1.1 and 1.3).
P849-017	Basic cabinet as per P849-016 but including air ventilation unit with 2 fans (P849-040) and 10 ampere power distribution panel (P849-042).
P849-116	Extension cabinet for P849-016. Similar to P849-016 but without side panels. One of the side panels is removed from the basic cabinet in order to attach this extension; the side panel is then secured to the open side of the extension (see Figures 1.2, 1.3 and 1.4).
P849-117	Extension cabinet for P849-017. Same as P849-116 but including air ventilation unit with 2 fans (P849-040) and power distribution panel (See Figure 1.12).
P849-039	Mounting Kit which is required for a cabinet in which P824-002 moving head disc units are fitted. It consists of a new rear door, containing a ventilation unit, and a pedestal to be fitted at the front of the cabinet (see Figure 1.5).

Ancillaries

Table 2.1. in Part 1 should be used when assessing the total heat dissipation and power consumption levels for the Air Ventilation and Power Distribution requirements.

Air Ventilation

Convection cooling is sufficient for a cabinet housing equipment with a total heat dissipation up to 700 kcal/h (800 watts). Above this level of heat dissipation, forced air circulation by one of the following ventilation units is necessary. Apart from the number of fans, both units are similar and require 1 standard unit of rack height; details are shown in Figure 1.6.

P849-040	Air ventilation unit with 2 fans for heat dissipation levels between 700 and 1030 kcal/h (800 to 1200 watts).
P849-041	Air ventilation unit with 4 fans for heat dissipation levels between 1030 and 1300 kcal/h (1200 to 1500 watts).

Power Distribution

Two types of power distribution panel are available to suit different power consumption levels. Each panel is 2 standard rack unit in height; the details are shown in Figures 1.7, 1.8, 1.9, 1.10 and 1.11. The small distribution panel which is provided with the extension cabinet is shown in Figure 1.12.

P849-042	Power distribution panel with mains filter and switch; current capacity 10 amperes.
P849-043	Power distribution panel with mains filter and switch; current capacity 25 amperes.

Mounting Devices

The telescopic slides for the P831-110 tape formatter and P824-002 moving head disc, the mounting hinges for the P831-102/104 tape transports, and the fixed slides for all other items not mentioned are included as part of the unit.
Details of the telescopic slides used on the basic mounting boxes and equipment shelves will be found in Part 5 Chapter 2 of this manual.

Front Panels

P849-046	Front panel; height 1 standard rack unit
P849-047	Front panel; height 3 standard rack units
P849-048	Front panel; height 5 standard rack units
P849-049	Front panel; height 7 standard rack units

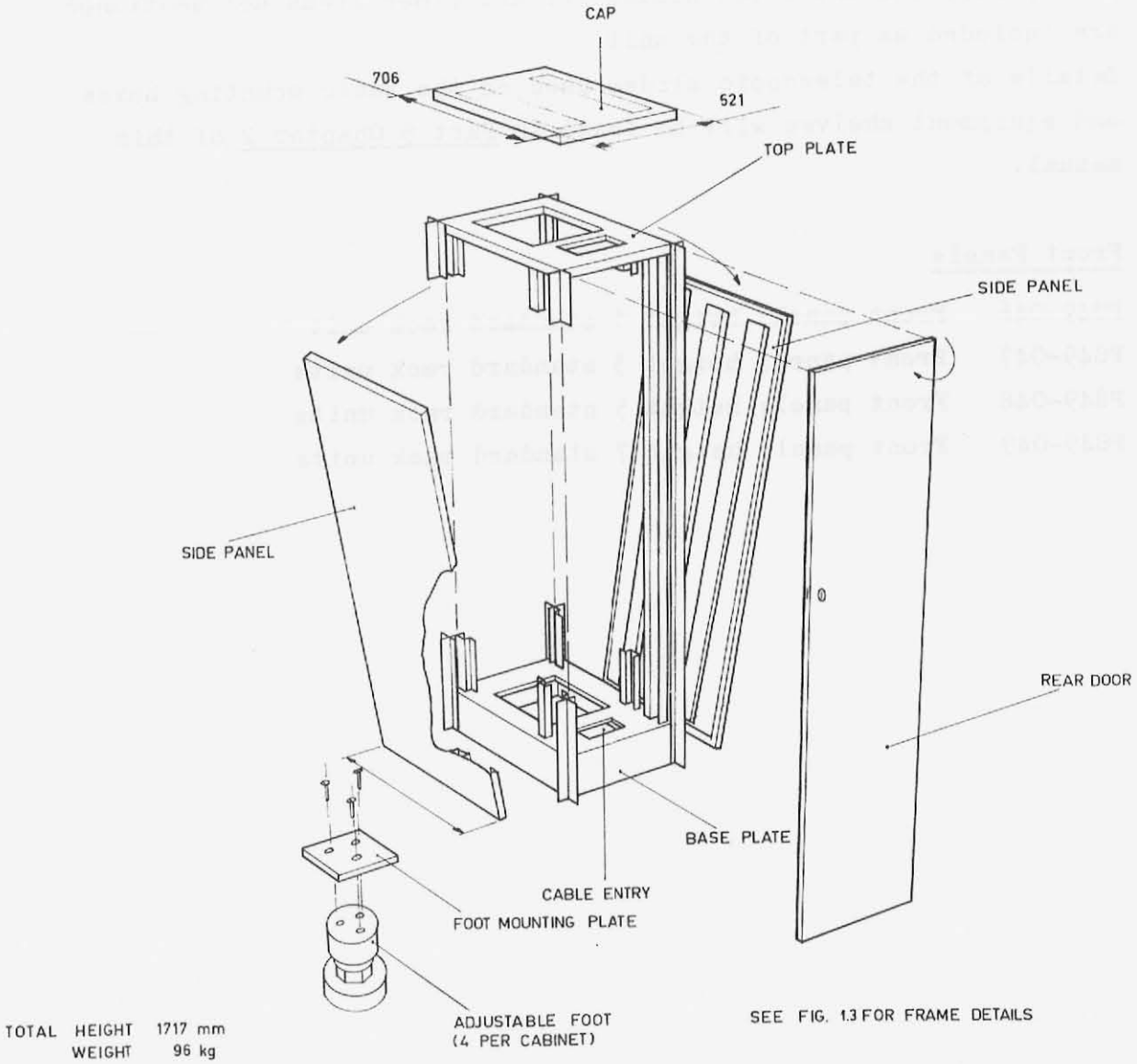


FIG. 1.1. BASIC CABINET

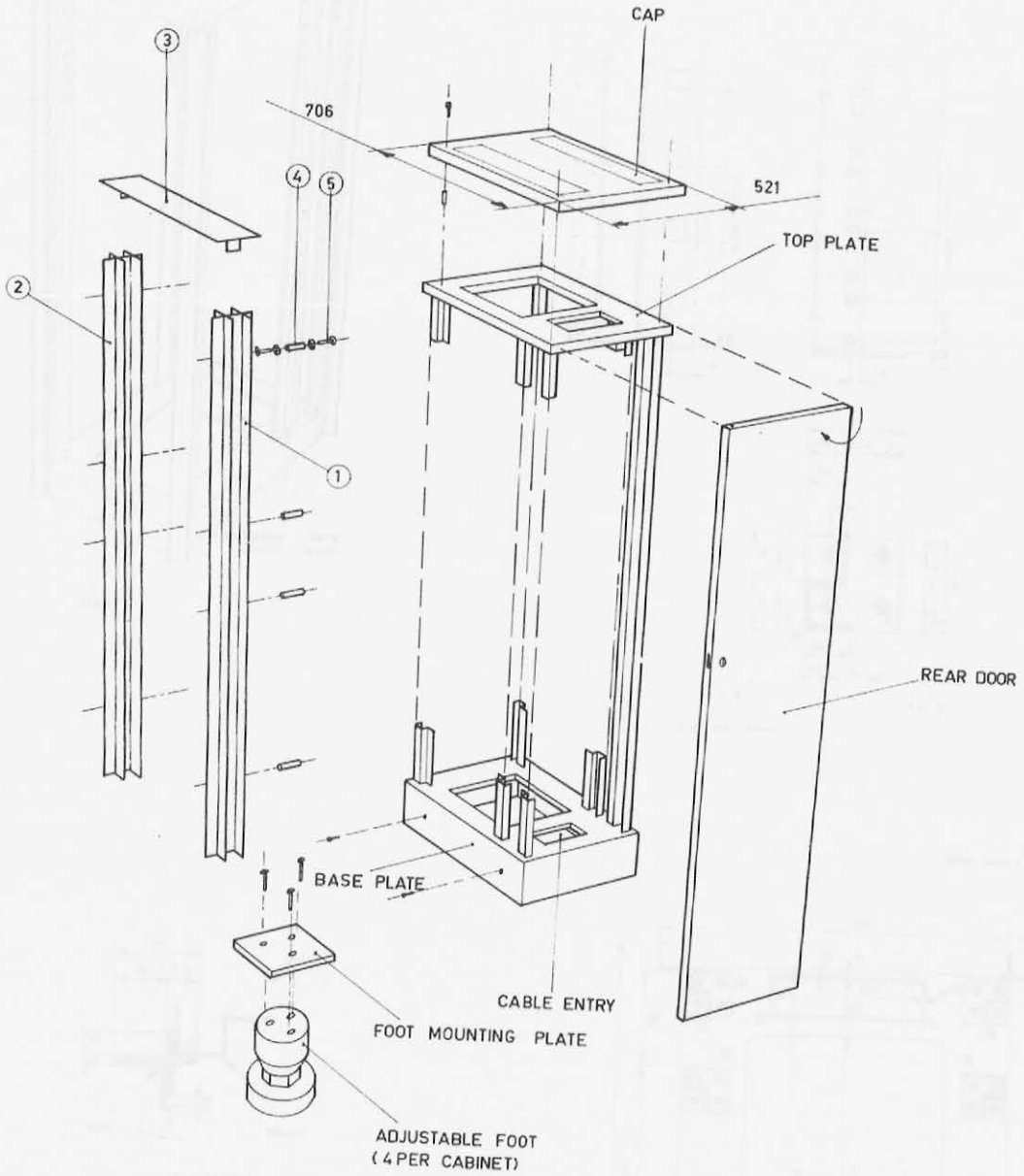
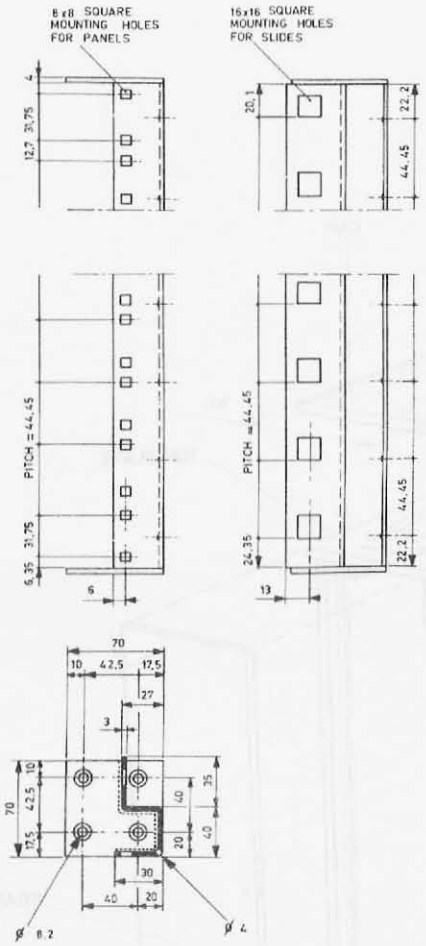
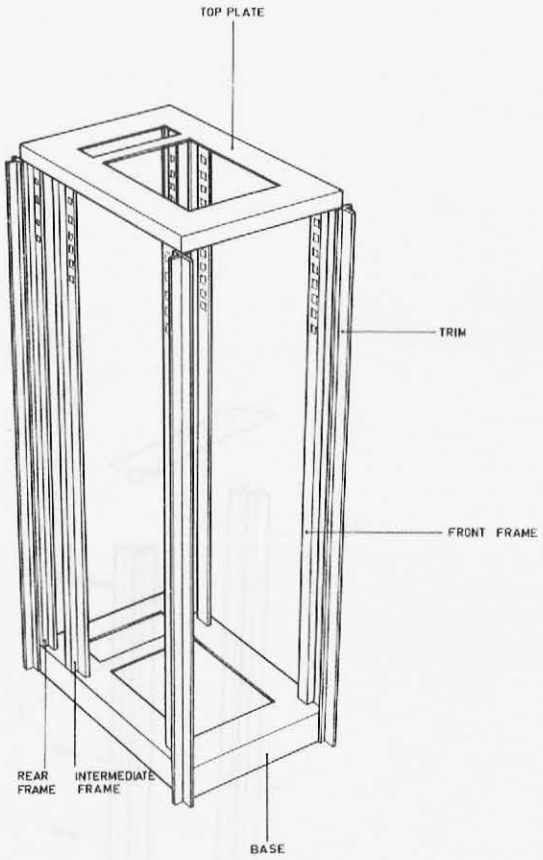
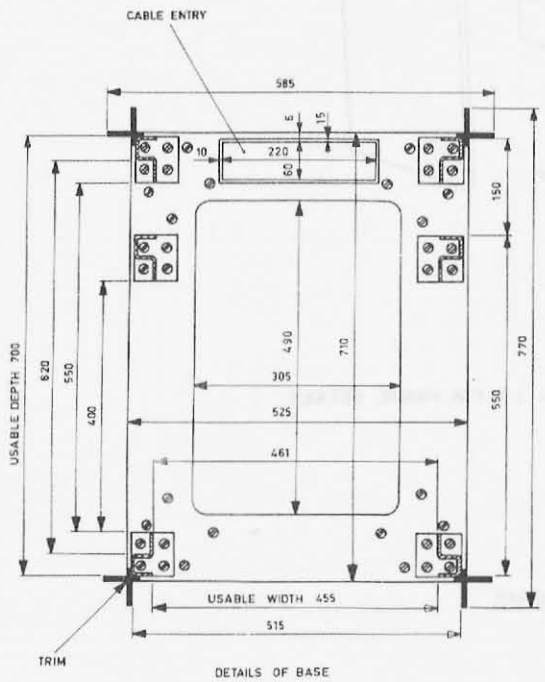
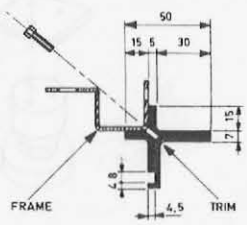


FIG. 1.2. EXTENSION CABINET



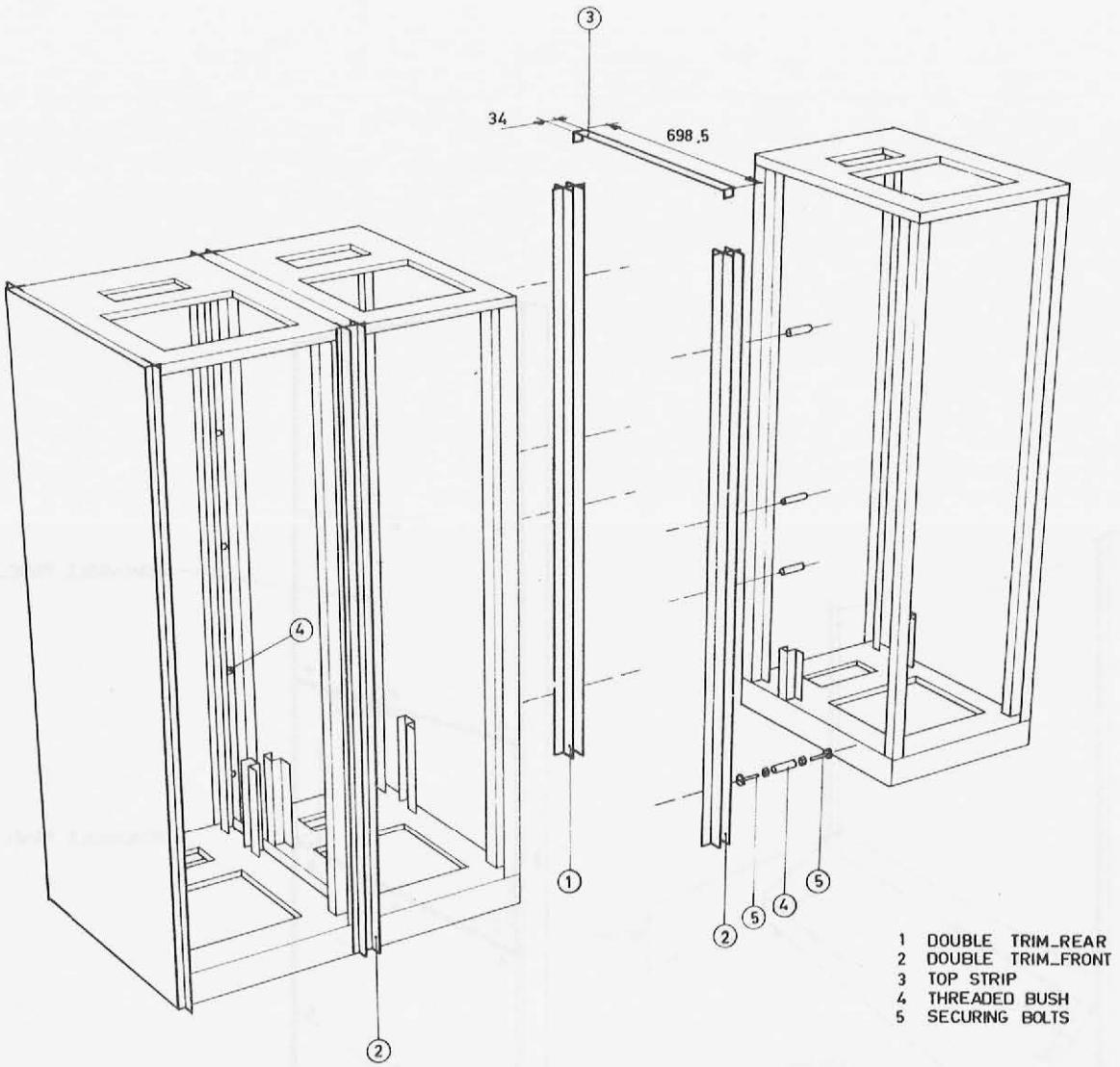






All dimensions are in mm

FIG. 1.3. CABINET FRAME



All dimensions are in mm

COUPLING DETAILS FOR ADJOINING RACKS

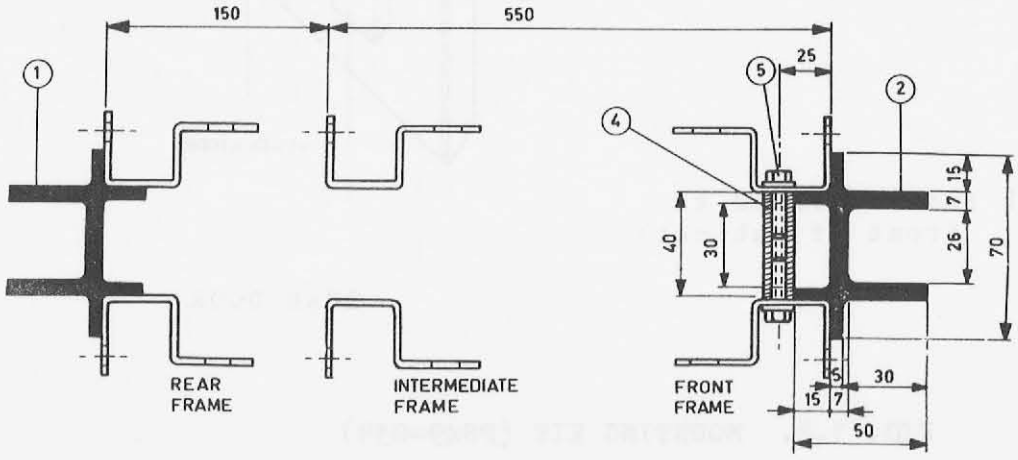
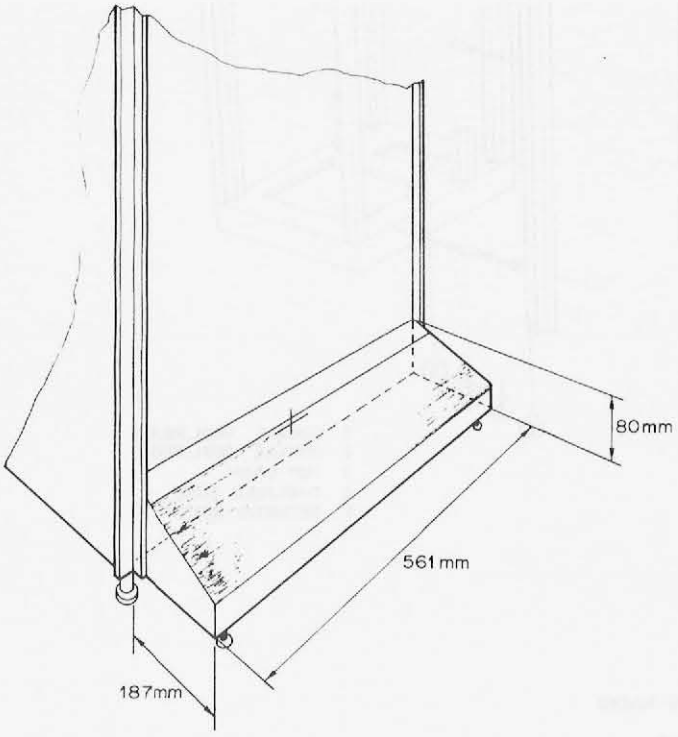
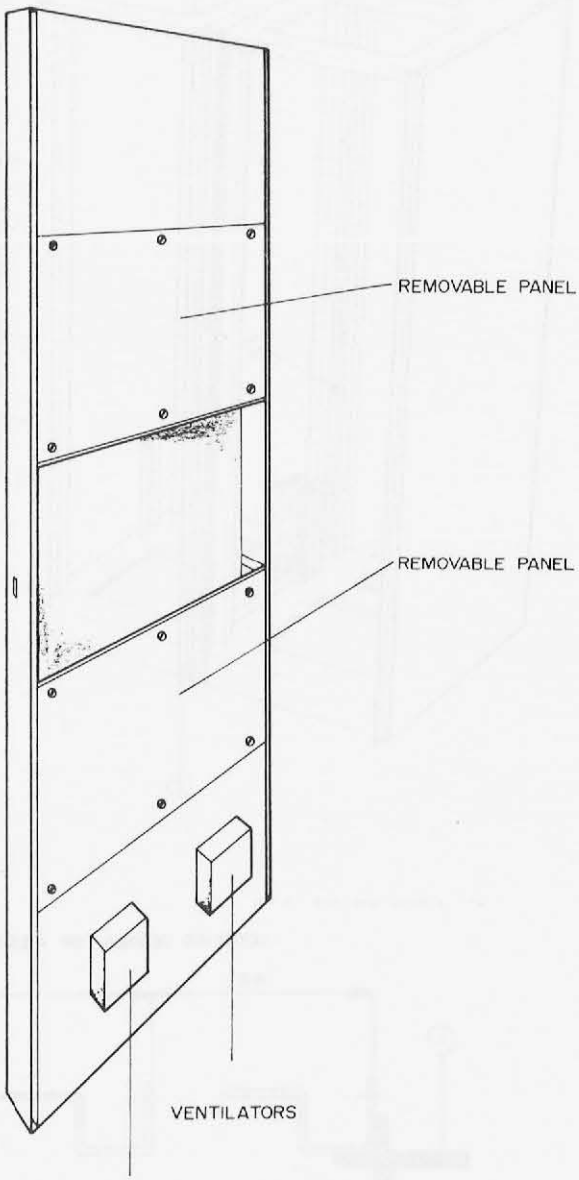


FIG. 1.4. METHOD OF ASSEMBLING BASIC AND EXTENSION CABINETS



PEDESTAL (shown fitted to front of cabinet)



REAR DOOR

FIG. 1.5. MOUNTING KIT (P849-039)

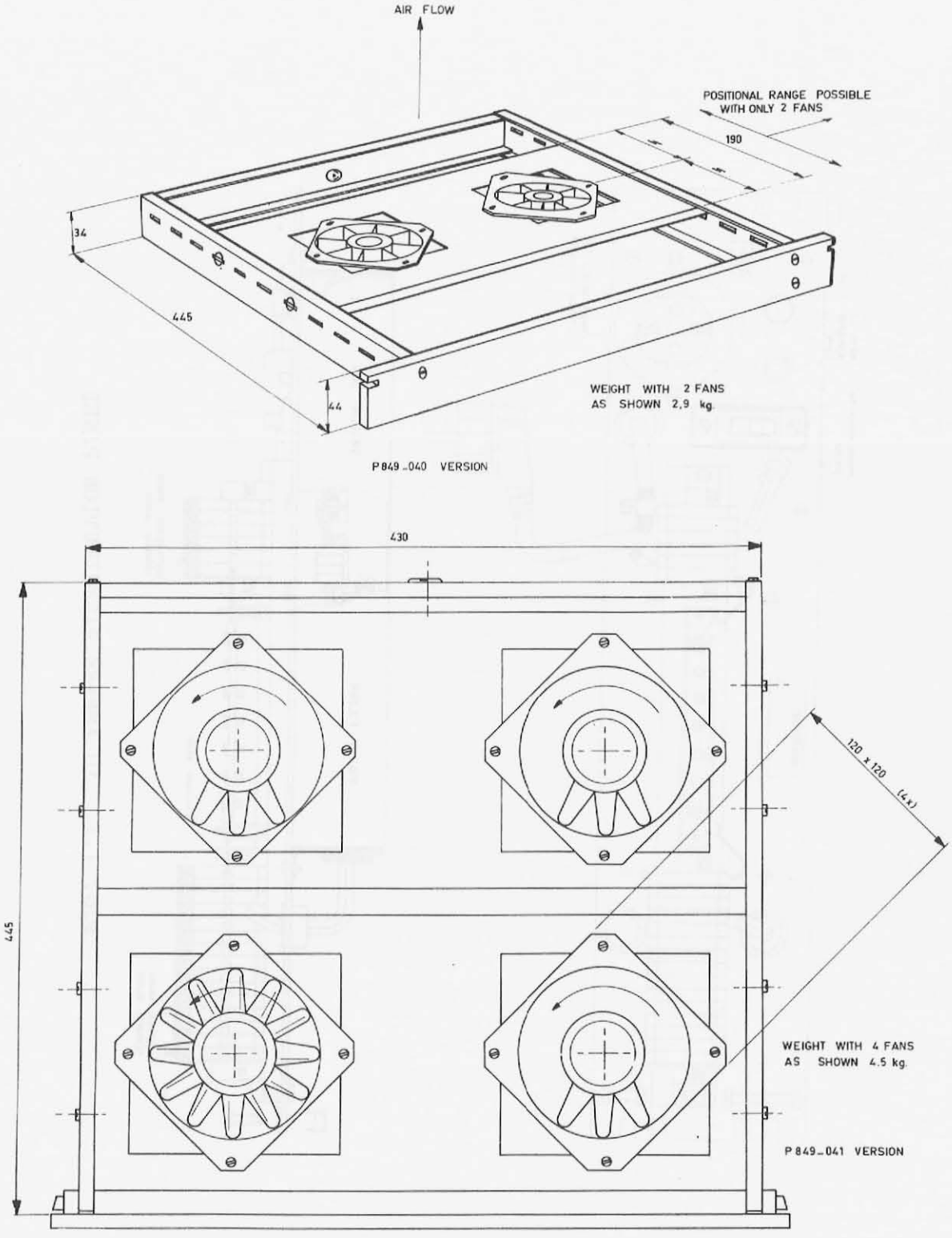


FIG. 1.6. VENTILATOR UNITS

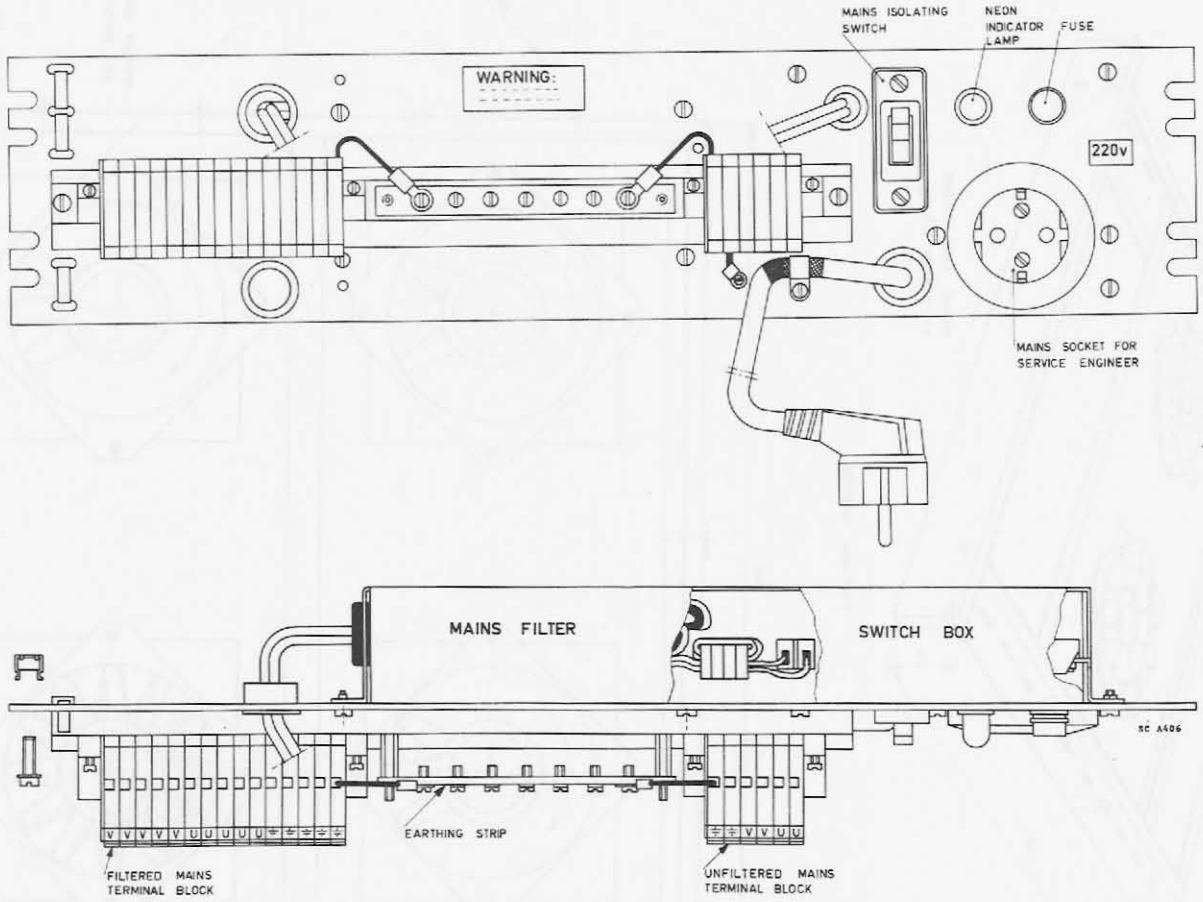


FIG. 1.7. 10 AMPERE DISTRIBUTION PANEL

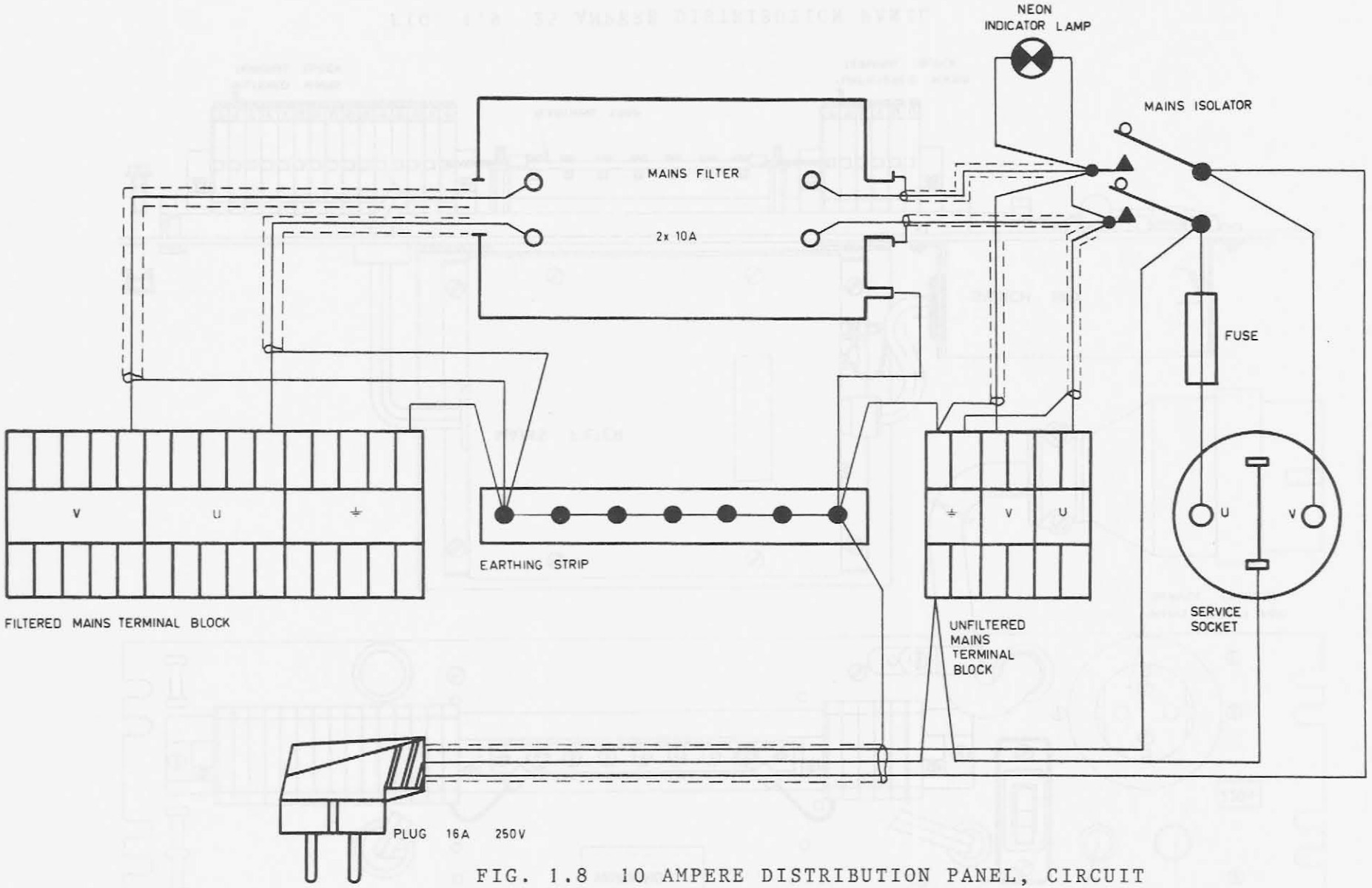


FIG. 1.8 10 AMPERE DISTRIBUTION PANEL, CIRCUIT

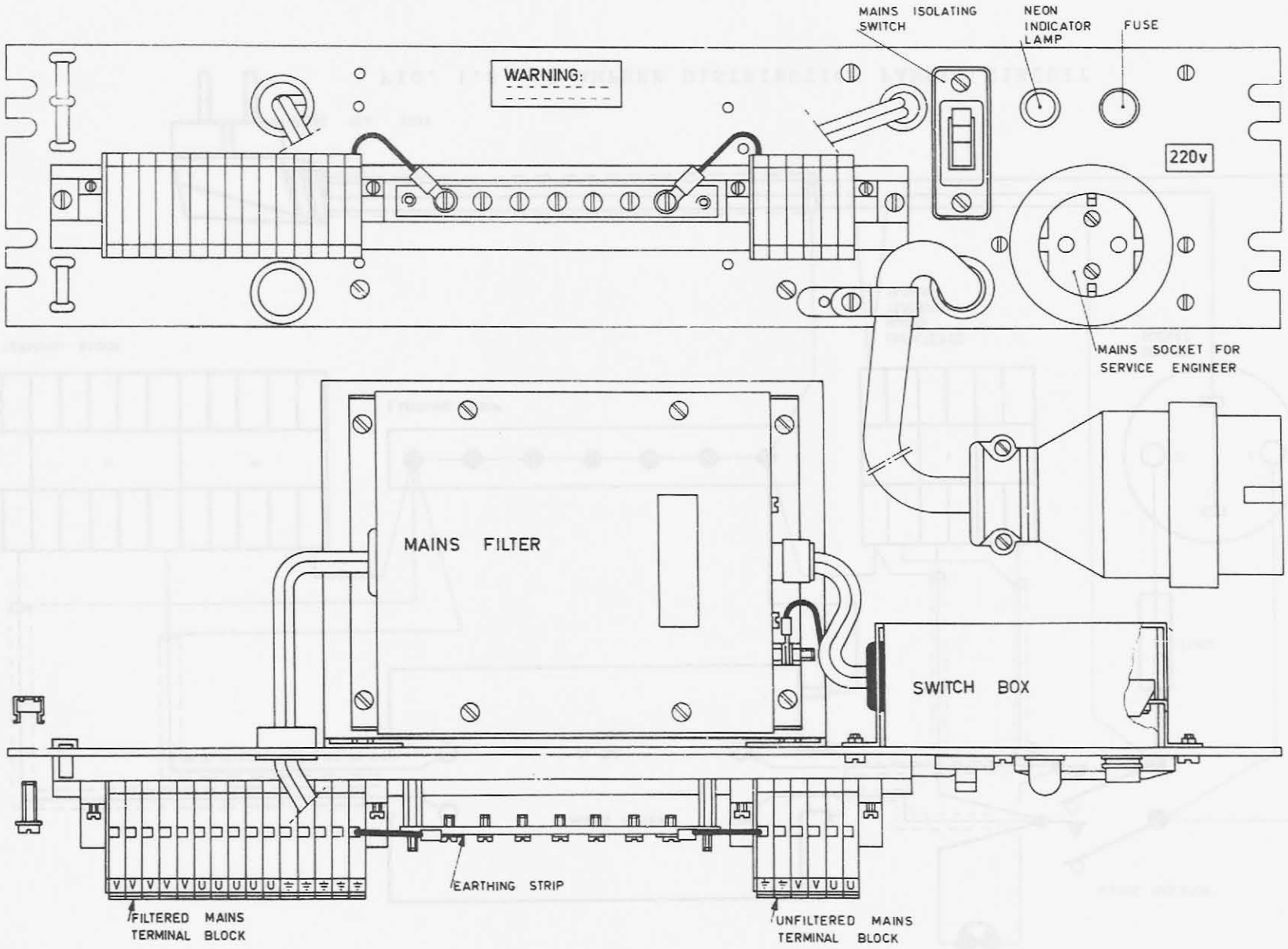


FIG. 1.9 25 AMPERE DISTRIBUTION PANEL

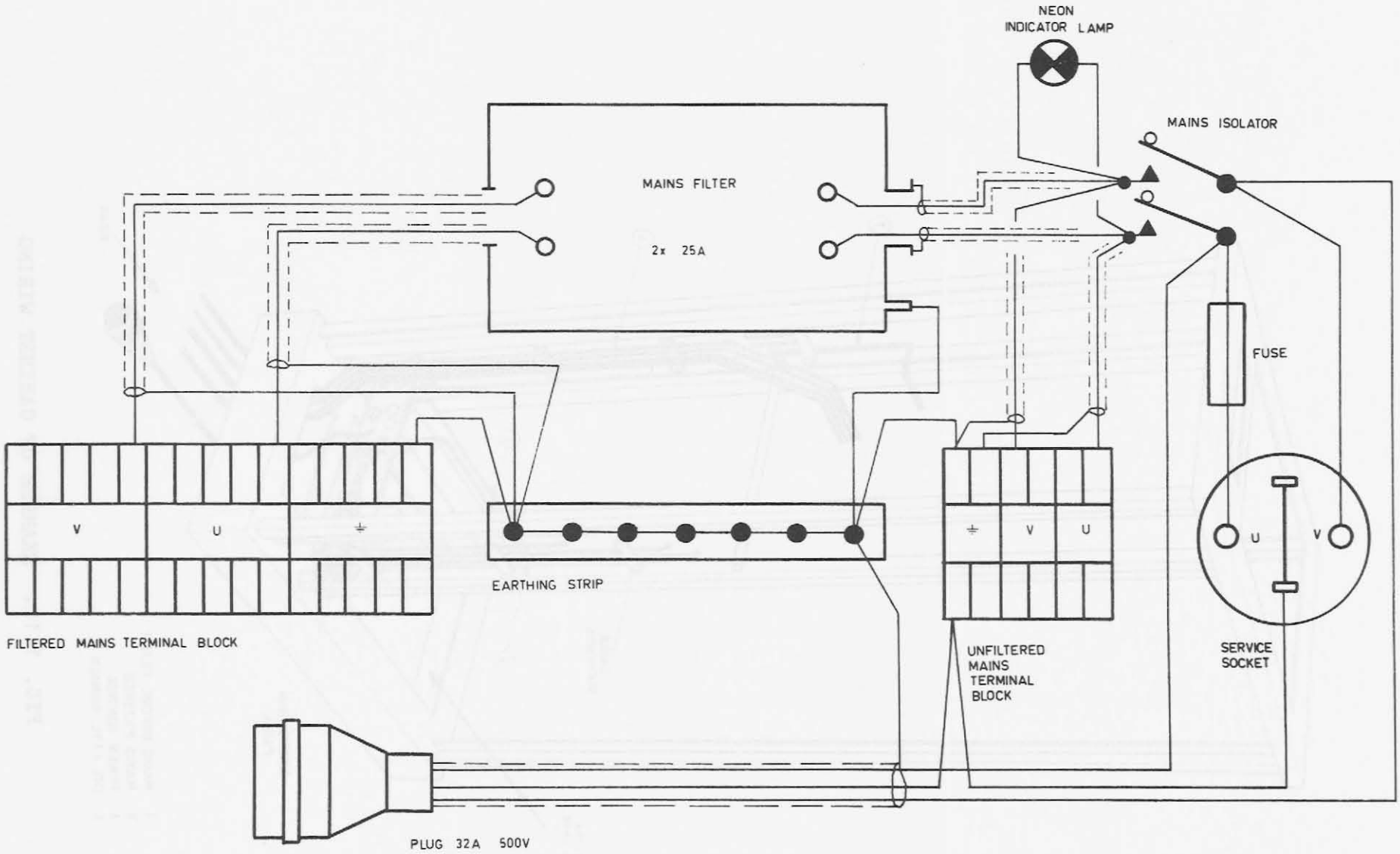


FIG. 1.10 25 AMPERE DISTRIBUTION PANEL, CIRCUIT

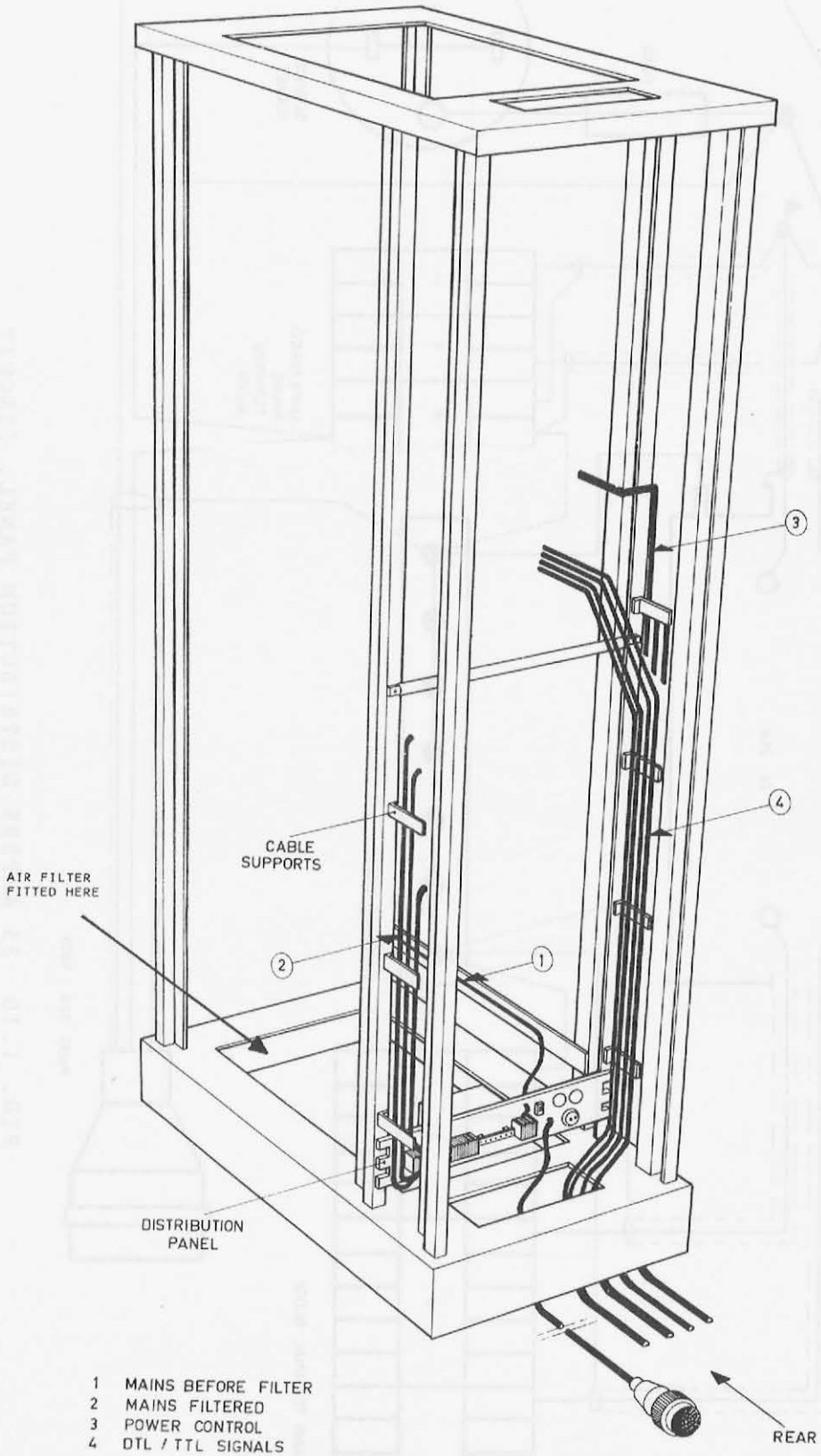


FIG. 1.11. EXAMPLE OF CABINET WIRING

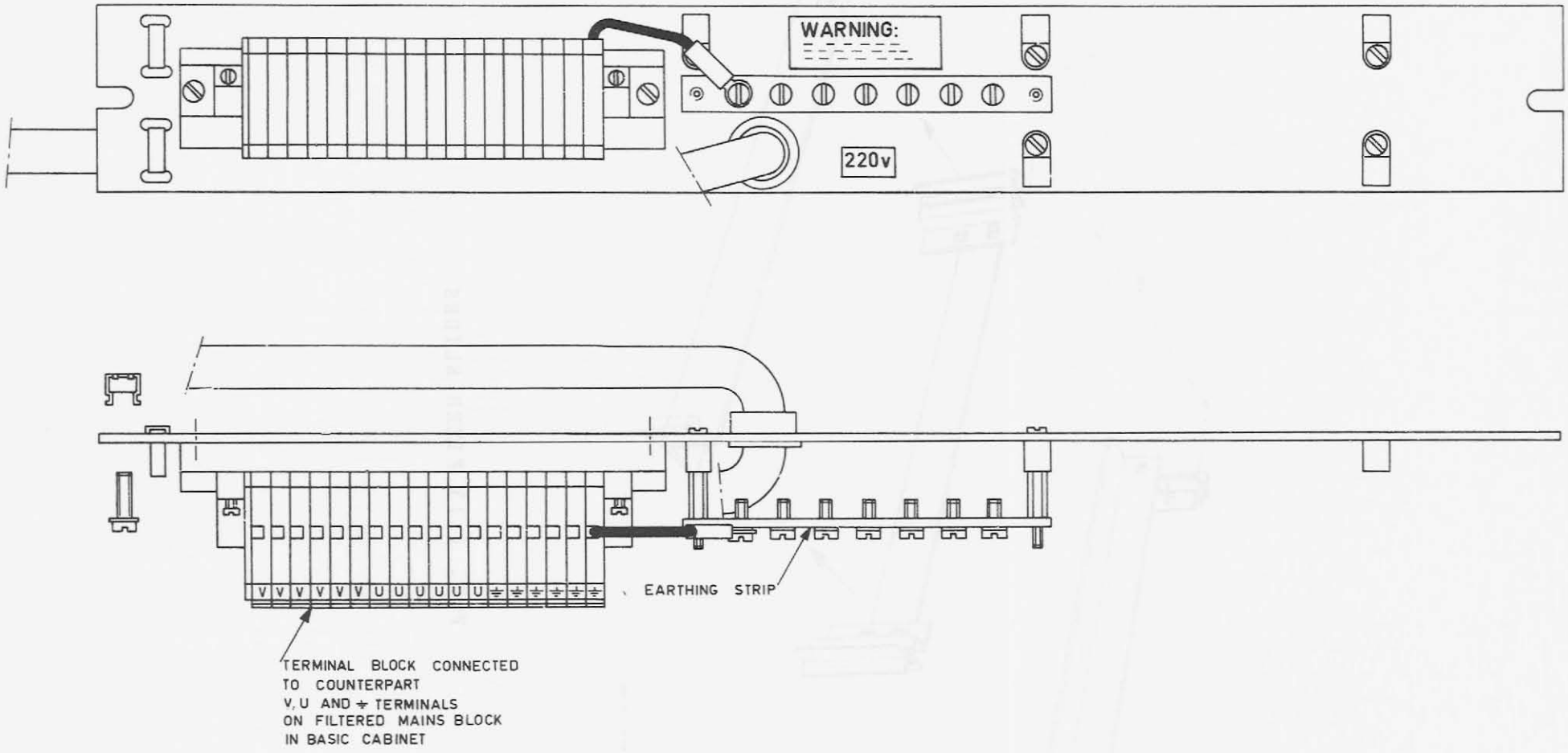
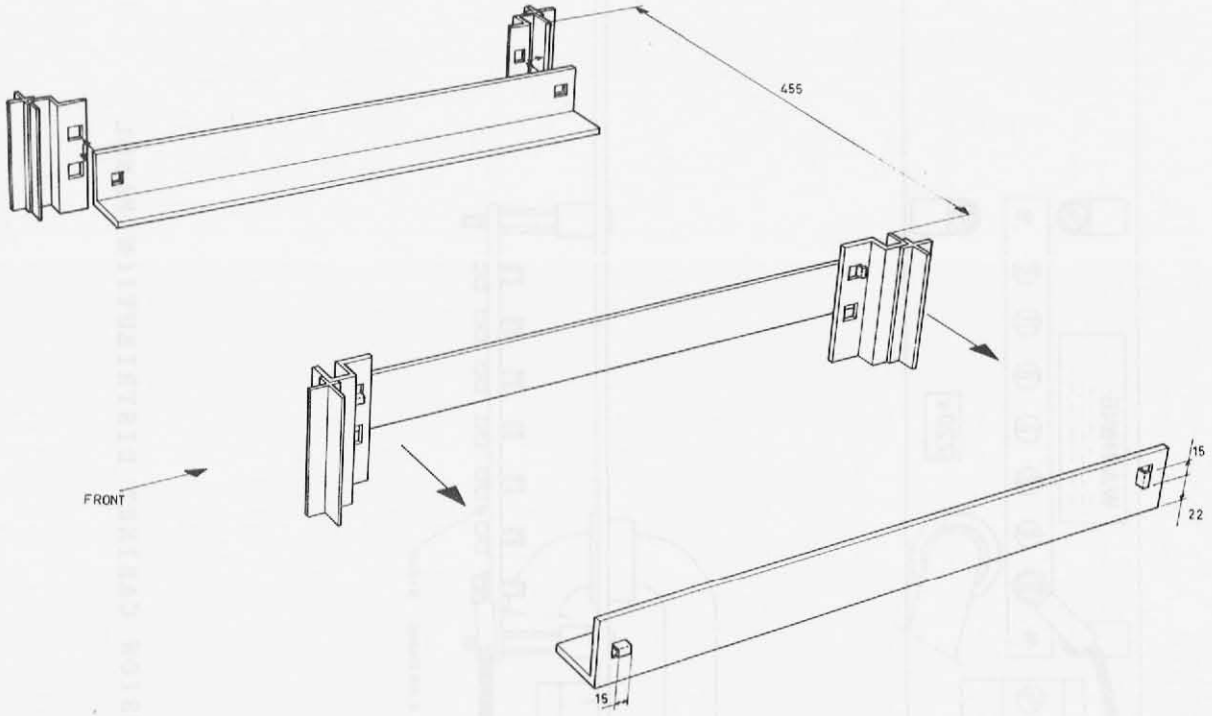


FIG. 1.12 EXTENSION CABINET DISTRIBUTION PANEL



All dimensions are in mm

FIG. 1.13 FIXED SLIDES

2 Configuration rules

This chapter contains a general outline of the rules normally adhered to in the factory when deciding the rack arrangement for a complete system configuration ordered by a customer. These rules are given here as they may be a useful guide for a customer who is either planning his own rack layout or wants to extend an existing rack configuration in the same layout pattern.

The rules are concerned mainly with uniformity of appearance and operational access and are not important from the system performance aspect. The only critical layout restrictions are with respect to certain interconnecting peripheral signal cables and transmission lines which are mentioned in Location Considerations as well as in earlier parts of this manual. As a general rule all the components of a sub-system (i.e. disc control unit, disc units, disc power supplies) are located in the same cabinet. This rule does not apply for a configuration including 4 tape transports or 4 fixed head discs.

The useful height of the rack is divided into the 7 imaginary levels shown in Table 2.1. and, apart from certain mounting positions for tape punch P803-001 and the circumstances where two tape transports are to be stored in one rack, all the items of equipment are mounted between the confines of these boundaries. The remaining space to completely fill a particular level is then occupied by whichever is appropriate of the 1,3,5 or 7 unit blank front panels available. When complete systems are delivered, which are assembled at the factory, maximum use of 7U panels is made to enhance the appearance of the system assembly and when separate items are delivered without cabinets each item is equipped with a front plate adapted to its height as follows:

Multicard Control Unit Equipment Shelf with a 3U plate.
Equipment shelf P843-001 with a 3U plate.
Equipment shelves P843-002/003 with a 5U plate.

The following levels have specific purposes:

Level 7	- nameplate (at front) and ventilation unit (at rear)
Levels 3,4 and 5	- primarily for devices requiring operator attention such as CPU basic mounting box, moving head disc unit, and punched tape reader with spare space used for tape punch or cassette tape drives.
Levels 1 and 2	- power distribution and tape formatter (at rear)

Location Considerations

Table 2.1. gives a resumé of possible unit locations within the defined levels but reference should also be made to Table 2.2. which gives a more comprehensive summary including the standard units of height needed at the front and rear of the rack.

In this section, the various location possibilities and limitations are discussed for each of the rack mounting devices.

P852M/P856M or P857M Basic Mounting Box (containing CPU)

These units, which contain their own power supply, are nearly always mounted in either level 5 or the upper part of level 4 for operational convenience. They can, however, be mounted in the lower part of level 4 or level 3 if other equipment requiring operator manipulation also needs to be located in the rack.

P801-001/P802-002 Punched Tape Reader

A punched tape reader is mounted in level 4 or level 5 under the basic mounting box for operational convenience.

P803-001 Tape Punch

It is usual to house a tape punch in the same rack as a punched tape reader. If levels 3,4 and 5 are fully occupied by other equipment it can be mounted in level 6 as the next choice or, if this level is also required for other equipment, it can be mounted in level 1 (part)

+ level 2. If the basic cabinet is fully occupied the tape punch can be mounted in an extension cabinet at a convenient level.

P824-002 Moving Head Disc

Moving head disc units include a power supply and are mounted in level 3, 4 or 5 for operational convenience. When using these disc units the cabinets are modified using kit P849-039.

P824-040 Moving Head Disc Control Unit

The interconnecting signal cable length of 7.5 metres (standard) necessitates this unit being housed in the same rack as the moving head discs. The unit (which can be fitted in the basic mounting box or in equipment shelf P843-001 - location details of which are given in this section) is located wherever it is most convenient for the system and where it complies with the signal cable length requirement.

P833-152 Equipment Shelf (containing up to 3 cassette tape drive units type P833-001)

This unit, which is self contained with its own power supply and control unit, can be mounted in level 5 or 6 for operator access and in either the basic cabinet or in an extension cabinet.

P843-001/P843-002/P843-003 and Multicard Control Unit Equipment Shelves

The equipment shelves can generally be located in whichever level is most convenient for the installation the main requirement being that the signal cable from the peripheral device will reach the control unit mounted within the shelf.

There are, however, certain rules which are intended to preserve the characteristies of the transmission medium when using the equipment shelves in a system. This may effect the location decided upon for a particular shelf. The rules are summarised as follows:

1. The transmission lines (GP bus) are always terminated in the basic mounting box at the CPU end but only at the other end of the line if the line is longer than 1 metre.
2. In addition to the basic mounting box a maximum number of 7 equipment shelves may be connected to the transmission line and it is recommended, though not obligatory that the boxes are connected at regular distances along the transmission line.
3. For shelves connected at regular distances the distance between consecutive boxes should be 2 metres minimum.

P831-002/004/006 Tape Transport

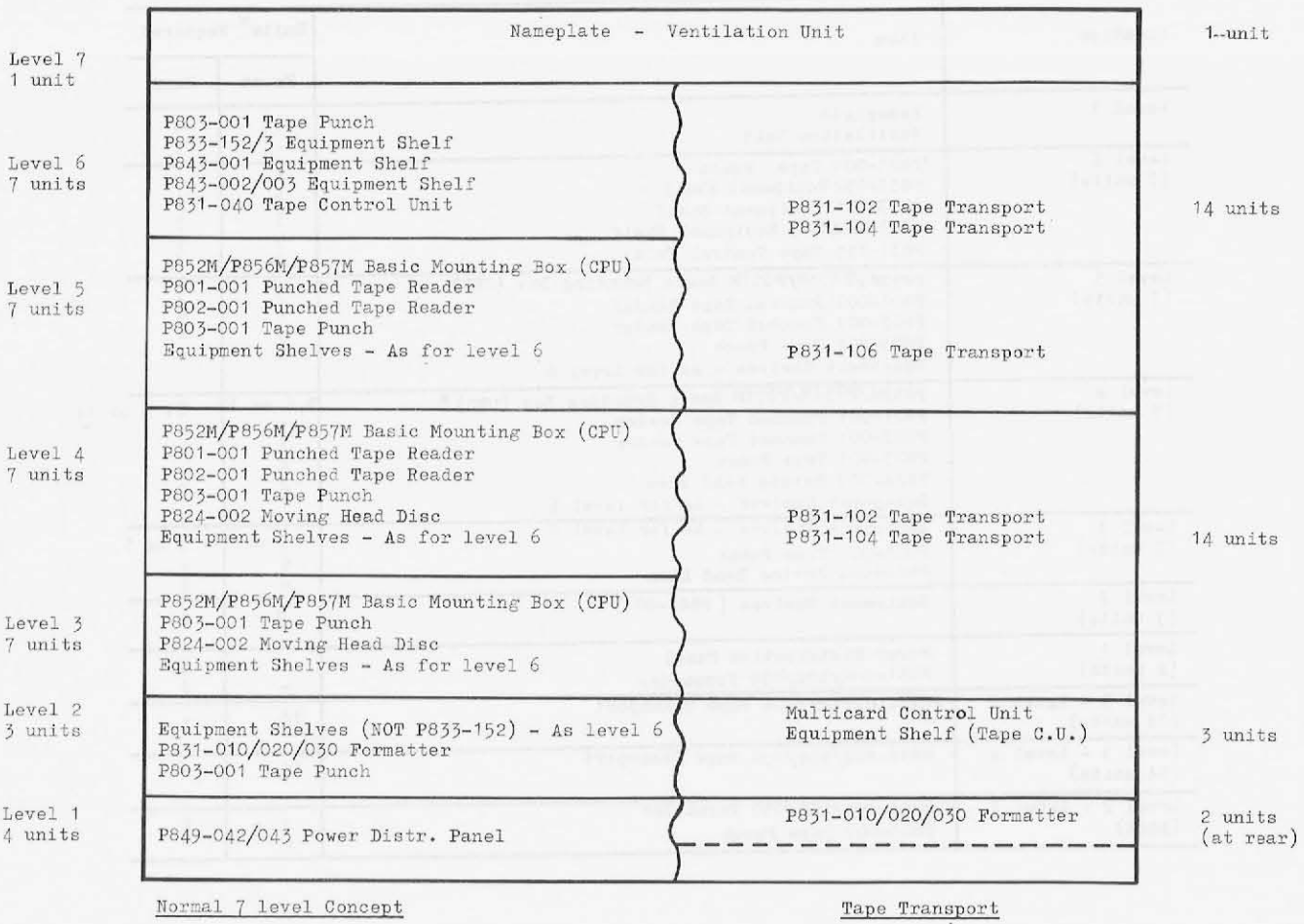
P831-010/020/030 Tape Formatter

P831-040 Tape Control Unit

If there is only one tape transport then this is mounted in either level 5 + level 6 or level 3 + level 4 whichever is most convenient in relationship to the other equipment fitted in the racks. The control unit (which is mounted in the multicard control unit equipment shelf) is located to conform to the location rules given for this shelf, and the formatter is located in level 1 at the rear.

If two transports are fitted they are located in an extension cabinet with one unit in level 5 + level 6 and the other in level 3 + level 4 leaving enough space to fit the control unit at the bottom in level 2. The formatter is mounted in level 1 at the rear.

Table 2.1 Rack Mounting Levels



Cabinet Layouts

Examples of standard cabinet layouts are given in Figures 2.1 and 2.2. Non -standard configurations are also possible.

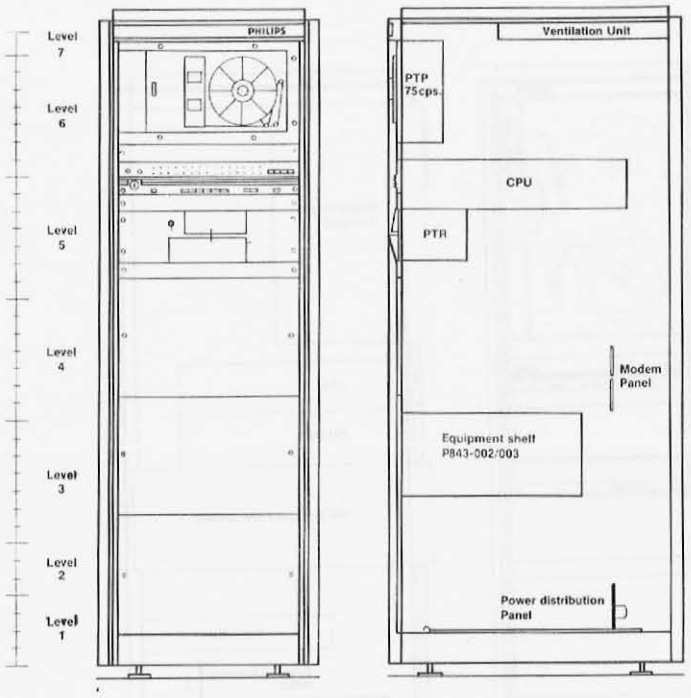
Table 2.2 Rack Location Summary

Location	Item	Units* Required	
		Front	Rear
Level 7	Nameplate	1	-
	Ventilation Unit	-	1
Level 6 (7 units)	P803-001 Tape Punch	6	-
	P833-152 Equipment Shelf	4	4
	P843-001 Equipment Shelf	3	3
	P843-002/003 Equipment Shelf	5	5
	P831-155 Tape Control Unit	3	3
Level 5 (7 units)	P852M/P856M/P857M Basic Mounting Box (CPU)	3	3
	P801-001 Punched Tape Reader	3	-
	P802-001 Punched Tape Reader	3	-
	P803-001 Tape Punch	6	-
	Equipment Shelves - As for level 6		
Level 4 (7 units)	P852M/P856M/P857M Basic Mounting Box (CPU)*	3,6 or 11	3, 6 or 11
	P801-001 Punched Tape Reader	3	-
	P802-001 Punched Tape Reader	3	-
	P803-001 Tape Punch	6	-
	P824-002 Moving Head Disc	6	6
	Equipment Shelves - As for level 6		
Level 3 (7 units)	Equipment Shelves - As for level 6	3 or 5	3 or 5
	P803-001 Tape Punch	6	-
	P824-002 Moving Head Disc	6	6
Level 2 (3 units)	Equipment Shelves (P843-001)	3	3
Level 1 (4 units)	Power Distribution Panel	-	3
	P831-010/020/030 Formatter	-	2
Level 5 + Level 6 (14 units)	P831-102/104/106 Tape Transport	14	-
Level 3 + Level 4 (14 units)	P831-102/104/106 Tape Transport	14	-
Level 2 + Level 1 (part)	P831-010/020/030 Formatter	-	2
	P803-001 Tape Punch	6	-

*1 Unit = 1.75 inch = 44.45 mm

* If P857M - 500 Series fitted (11 units) Level 5 + Level 4 (part) used

1 Central processor cabinet including PTR, PTP and equipment shelf



2 Central processor cabinet including Cassette tape drives, PTR, PTP and 2 MH discs.

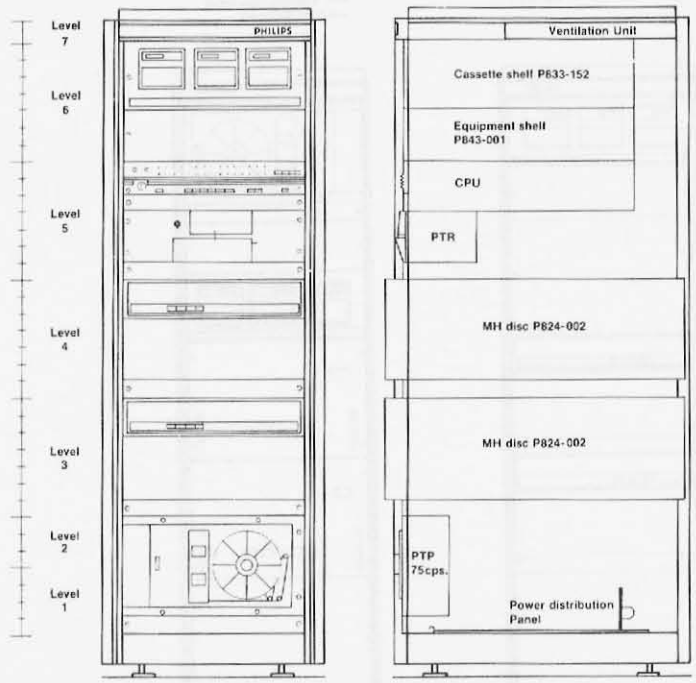
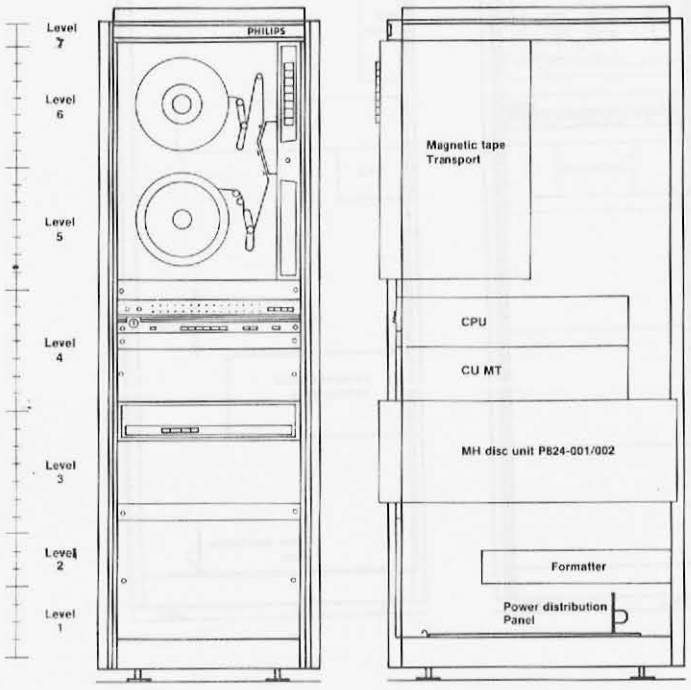


FIG. 2.1 P852M/P856M/P857M STANDARD CABINET LAYOUTS - 1

3 Central processor cabinet including MT unit and MH disc unit



4 Extension cabinet including Cassette tape drives and 2 MH disc units

5 Extension cabinet including PTP, Cassette tape drives and 2 FH disc units.

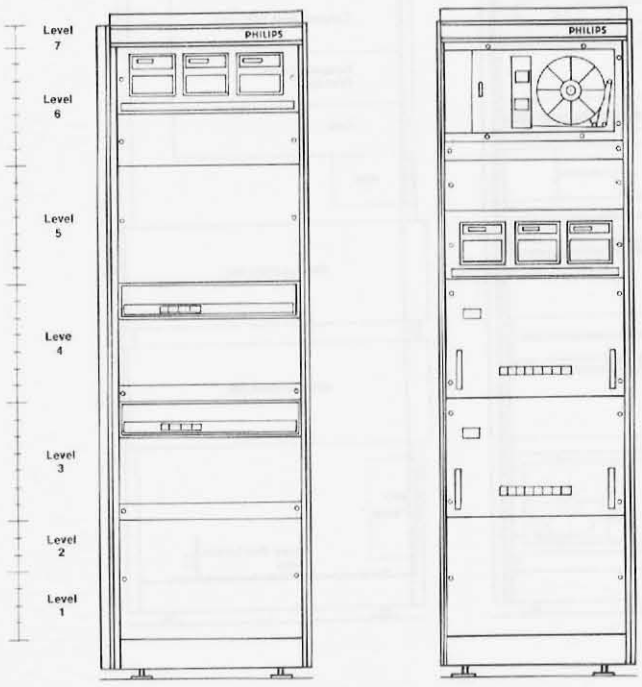


FIG. 2.2 P852M/P856M/P857M STANDARD CABINET LAYOUTS - 2

3 System Earthing and Cabinet Cabling rules

System Earthing Rules

The following is a general summary of the earthing rules for the rack equipment.

a) Each rack mounting unit must have an electrical ground (0 Volts) point and a mechanical ground or safety earth point. Both these points must be galvanically isolated and be accessible externally for electrical connection.

b) Each rack must have a mechanical ground or safety earth point to which the safety earth points of all the units mounted in the rack must be connected. The rack safety earth point must be electrically connected to the rack frame and to the earth wire of the power cable from the rack to the site mains.

c) The shields of cables must not be used as the inter unit safety earth conductor for although the shield is connected to mechanical earth at the CPU it is not necessarily so connected at the other end as this is dependent upon the particular system configuration requirements.

d) To minimize interference, the front panels, side plates and doors must be in good electrical contact with the rack framework.

e) The symbols used to identify the ground or earth points are:


Electrical ground (0 Volts)


Mechanical ground or safety earth.

Cabinet Cabling Rules

The rules given below for the cables and wiring inside the cabinets should be adhered to so that the system performance is not degraded by either internal or inter-rack electro-magnetic interference.

Separation of Circuits

Insulated Conductors which operate at different voltages must be separated by barriers or must be segregated from each other unless all the conductors are insulated for the highest voltage. Norms:

VDE	0804/4.65. part 11 - g.2.
	0804/5.72. part 14 - a.1.
UL	478 parts 6.29 - 6.30 and 6.31
CSA	C22.2 no.154 part 4.13

Note: The shielding of a cable can be considered as a barrier when it is connected to the protection wire.
(Norm: VDE 0804/4.65 par 11 - 9.23)

Proximity

Six categories of internal cables or wires are denoted in Table 3.1 with respect to the supplies or signals conveyed. Conductors of the same category can be bundled together but parallel runs of different categories must be separated by not less than the specified distance: the only permitted exception is for the mains wiring, provided that the shielding is increased - see Shielding-Mains Wiring.

The figures quoted in Table 3.1. are the minimum separation distances in centimetres between different categories of conductors running in parallel for a length of 100 centimetres. The actual separation distance for other lengths of parallel run is calculated using the following formula:

$$D_a = D_t - 4 \times \log_{10} \frac{100}{L_a} \text{ cm}$$

where D_a = actual separation distance required in cm.
D_t = distance given in table 3.1.
L_a = actual length of parallel run required in cm.

Example

The parallel run (L_a) required for mains before filter and mains filtered (1 and 2 in table) is a distance of 40 cm.

D_t (from table) = 12 cm.

therefore $D_a = 12 - 4 \log \frac{100}{40}$

$D_a = \underline{10.4}$ cm

Note: Zero or negative values derived from the formula signify that no separation is necessary.

Where different categories of conductors are crossing each other at right angles there is no mimimum separation distance requirement.

Shielding-general

The damping effect of the shielding specified in Table 3.1. must be at least 20 dB from 150 kHz to 30 MHz.

Shielding should extend over the entire length of the cable, preferably including the connectors but, where this is impracticable, the length of the unshielded portion of cable must not exceed 30 millimetres.

The shielding must be connected to safety earth, using earthing leads that are as short as possible and are of the same cross sectional area as the shielding.

Shielding-Mains Wiring

The mains wiring must be shielded and mounted against the rack frame. If the minimum separation distance from the other categories of conductor specified in Table 3.1. cannot be met then the damping effect of the shielding must be increased by 0.5 dB for each millimetre that the separation distance is reduced below the permitted minimum (leading the mains through an iron pipe may provide a solution)

Table 3.1. Cabinet Wiring Rules

↓ with respect to →	1	2	3	4	5	6	Remarks
1. Mains - before filter	-	12	12	12	12	12	Shielded
2. Mains - after filter	12	-	4	4	4	10	Shielded
3. Power Control	12	4	-	0	2	6	Shielded or twisted
4. DC - unstabilized	12	4	0	-	2	6	Twisted
5. DC - stabilized	12	4	2	2	-	2	Rails or twisted
6. DTL-TTL Signals	12	10	6	6	2	-	Twisted, coax, flatcable etc.

Note: 0 means - in the same cable

Return Connection

Each connection must have its own return connection running as close as possible to it. Under no circumstances must the rack frame be used as a direct or secondary return path. The minimum possible cable length should always be used.