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VP Series Relay

Miniature Cradle Relays

- World-wide compatibility
- mA/mV to 5A or 250V switching
- RoHS compliant
- Bistable magnetic latching types available
- Mounting options
- BT23 and BT32 approved types available
- Life tested to 100,000,000 mechanical operations
- Comprehensive technical service
- Broad custom capability

Keyswitch Varley™ VP Series miniature cradle relays offer contact, coil and mounting options to meet a wide range of applications. They are extremely reliable, proven through many years manufacture and use and are compatible with all similar products manufactured world-wide.

1. SUMMARY OF TYPES

1.1. BASIC VP SERIES

Contacts: – 2, 4, 6 & 8 pole contact arrangements are available, with a choice of contact materials to suit applications from low to heavy duty.

Coils: – Nominal coil voltages range from 6 to 200V DC and 6 to 110V AC to give the user a liberal choice of operating voltages.

AC Operation:– For AC operation a range is available with built in rectifiers.

Sensitive operation:– Special adjustments can be made which provide increased sensitivity of operation, denoted by ‘SEN’ in the ordering code.

Mounting:– Available as a plug-in relay (also suitable for direct wiring) or for printed circuit board mounting with alternative pin layouts.

Socket and Retaining Clip:– Relay sockets and retaining clips (ordered separately) are available to suit the different case sizes. Sockets are available with printed circuit pins or solder tags.

Omission of Earth Screw/Pin:– For Applications where an earth facility is not required, the earth screw or pin can be omitted, obviating the need to drill printed circuit boards or panels.

Earth Clip:– Wiring sockets are supplied complete with an earth clip (loose piece) enabling the relay to be earthed via the fixing screw.

1.2. VPR Series

Bistable, polarised relays with either single or double wound coils, capable of being pulsed at a minimum of 10 milliseconds.

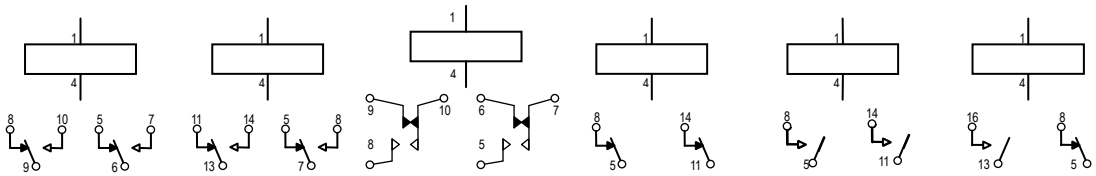
1.3. Telecom approved relays

These relays conform to British Telecom codes BT23 and BT32. For BT23 the contact material is always code 'G' while for BT32 code 'F' is used.

2. SCHEMATIC DIAGRAMS

The arrangements shown are applicable to all Basic VP Series relays. They are also applicable to the VPR Series where relevant; see Standard Contact Arrangements and Case Sizes. For additional contact arrangements available contact sales.

2 POLE



Light duty, TC, or 5A
2 changeovers

HD
2 changeovers

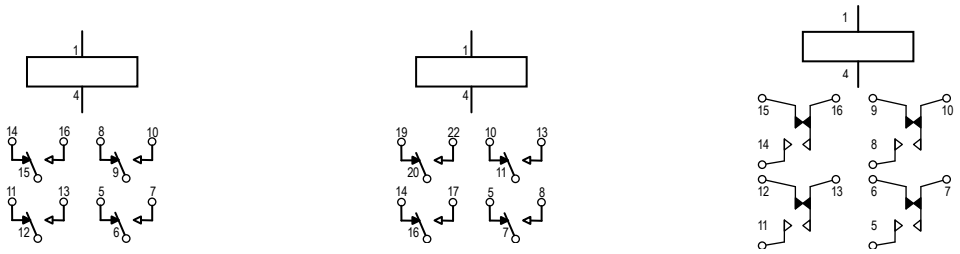
Light duty, TC
2 make before break

HI
2 break

HI
2 make

HI
1 make + 1 break

4 POLE

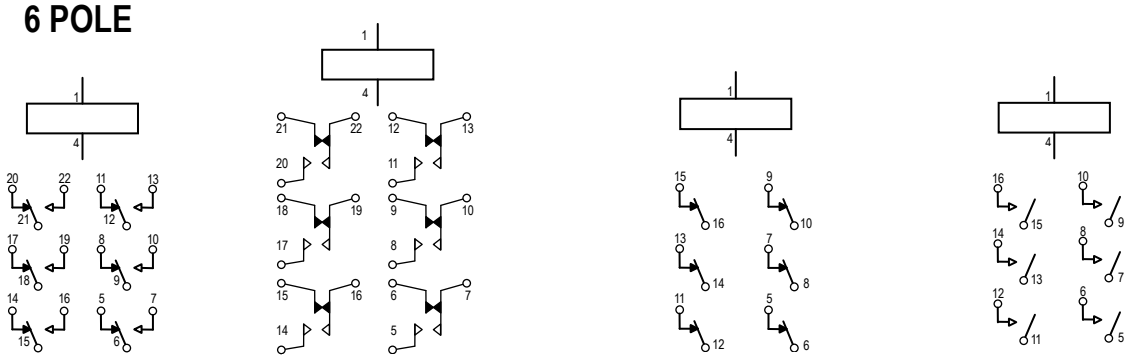


Light duty, TC, or 5A
4 changeover

HD
4 changeover

Light duty
4 make before break

6 POLE



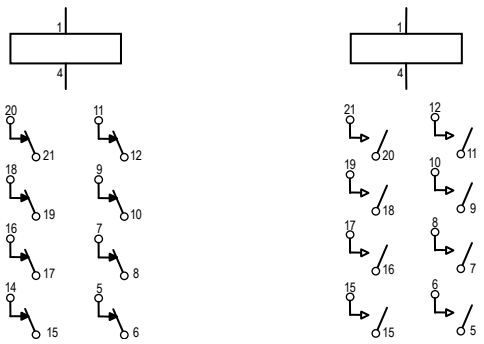
Light duty, TC, or 5A
6 changeover

Light duty
6 make before break

Light duty, TC, or 5A
6 break

Light duty, TC, or 5A
6 make

8 POLE



Light duty, TC, or 5A
8 break

Light duty, TC, or 5A
8 make

3. STANDARD CONTACT ARRANGEMENTS AND CASE SIZES

Table 1

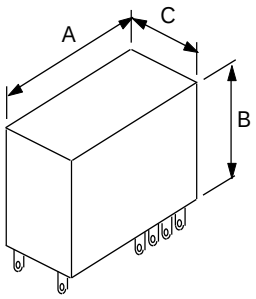
Contact Type		S / TC / 5A / HI				HD			
No. of Poles		2	4	6	8	2	4	6	8
Basic VP Series Case Sizes	M	1	2	2	3	2	3	n/a	n/a
	B	1	2	2	3	2	3	n/a	n/a
	C	1	2	3	n/a	2	3	n/a	n/a
VPR Series Case Sizes	M	1	2	2	n/a	2	3	n/a	n/a
	B	1	2	2	n/a	2	3	n/a	n/a
	C	1	2	n/a	n/a	2	3	n/a	n/a
SEN Options available for all types of Relays except HD and VPR Relays.									
M = make. B = break. C = changeover. S = standard single contact (0.25 or 1 amp). TC = twin contact (0.25 or 1 amp). 5A = 5 amp single contact. HI = High Insulation HD = heavy duty 5A contact (increased pin spacing). n/a = not available.									

- Note that the 5 amp (5A & I) contact material is 90% Silver with 10% Cadmium Oxide (D54X alloy). A relay fitted with 5 amp contacts in a quantity greater than two changeover or four make or four break, will have >0.1% Cadmium Oxide content.

3.1 Case Sizes, Socket & Retaining Clip Order Codes.

Table 2

Case Size	Dimensions (See drawing)			Printed Circuit Socket	Wiring Socket	Retaining Clip
	A	B	C	Order Code	Order Code	Order Code
1	24.4	30.1	18.5	SVP10P01	SVP10W01	SVP10RC01
2	30	30.1	18.5	SVP16P01	SVP16W01	SVP16RC01
3	36.6	30.1	18.5	SVP22P01	SVP22W01	SVP22RC00
An earth clip is supplied with each wiring socket (loose part)						



4. COIL DATA

4.1. BASIC VP SERIES – Table 3.

Short coils (case 1, 2, 3, see tables 1 & 2). The tables below list the characteristics of all standard Basic VP Series relay coils. Note, against 'Minimum Volts' the subheadings refer to various options, i.e. S = Low level or light duty single contacts, TC = twin contacts, 5A = 5 Amp contacts, HD = heavy duty contacts, SEN = sensitive adjustment. The characters below these subheadings refer to the number of poles and contact action, i.e. M = make, B = break, C = changeover.

Table 3

DC Coil (Nominal Voltage) Max. power at 20°C ambient = 2W						6	12	14	21	26	34	47	72	90	120
Resistance (ohm) ±10% (except *±15%) Number of Turns						52 1750	185 3200	280 3800	430 4700	700 5900	1250 7700	2500 11000	5800 16000	*9000 20000	*15000 24000
MAXIMUM VOLTS (40°C ambient)						10	19	23	29	37	49	70	106	128	166
Min Volts	S	TC	5A	HD	SEN										
	2C					2.6	5.0	6.5	8.0	11.0	15.0	21.0	33.0	42.0	58.0
	4C,6M,6B			2C		4.0	8.0	10.0	11.0	16.0	22.0	31.0	50.0	62.0	86.0
		2C	2C			3.4	6.8	7.7	10.2	13.2	19.0	27.0	41.0	50.0	70.0
					2C	2.3	4.3	5.3	6.4	8.2	11.0	17.0	23.5	30.0	43.0
		4C,6M,6B	4C 6M 6B	4C		4.8	9.6	11.4	14.6	19.0	27.0	38.4	58.0	72.0	100.0
					4C,6M,6B	3.3	6.3	7.7	10.0	12.3	16.5	26.0	35.0	43.5	58.0

4.2. M TYPE COILS – Table 4.

M Type (Short) coils for relays with 6C, 8M or 8B contact actions and for other actions where lower minimum operating voltage is required. Designated in the ordering code by 'M' immediately after the coil voltage.

Table 4

DC Coil (Nominal Voltage)						6M	12M	17M	21M	26M	34M	47M	65M	100M	120M
Resistance (ohm) ±10% (except *±15%) Number of Turns						28 1350	110 2700	220 3700	325 4450	530 5800	890 7300	1700 9900	3200 13400	7600 20700	*11750 24800
MAXIMUM VOLTS (40°C ambient)						7.4	14.6	20.6	25	32	42	56	77	120	150
Min Volts	S	TC	5A	HD	SEN										
	2C					1.9	3.9	5.4	6.5	8.3	11.0	15.5	21.5	33.0	43.0
	4C,6M,6B			2C		2.82	5.8	8.2	10.1	12.4	17.0	23.8	32.0	51.0	65.0
		2C	2C			2.36	4.9	6.9	8.5	10.6	14.3	20.4	29.0	46.0	59.0
					2C	2.54	3.2	4.4	5.6	6.9	8.9	11.9	19.2	28.0	35.0
		4C,6M,6B	4C,6M,6B	4C	6C,8M 8B	3.3	6.9	9.5	11.7	14.9	19.6	27.2	38.4	60.0	71.0
					4C,6M,6B	2.2	4.6	6.2	7.8	9.6	12.5	18.7	25.0	39.0	50.0
	6C,8M,8B					4.3	8.6	12.4	15.3	19.0	25.0	36.0	50.0	76.0	98.0
		6C,8M,8B	6C,8M,8B			6.0	11.0	17.0	20.0	25.0	33.0	45.0	60.0	90.0	115.0

4.3. BASIC VP SERIES WITH BUILT-IN RECTIFIERS FOR AC OPERATION – Table 5.

Designated in the ordering code by 'AC' immediately followed by the nominal voltage.
Short coils (Case 1, 2 or 3 see tables 1 & 2).

Table 5

Coil Type (Nominal Voltage)	Resistance Ohms ±10%	Voltage @ 50Hz	
		Maximum	Minimum
6AC (Double coil)	26 x 2	6.6	4.8
*12AC**	52	13.5	9.5
*24AC**	185	27	19
*42AC**	700	46	33
*50AC**	890	55	45
*60AC**	1250	66	48
*110AC**	4700	121	88

Coil power: 1.6VA max. 1.3W max.
Frequency range: 50-120Hz
Available contact combinations: 2C & 4C light duty contacts
2C, 4C, 6M or 6B twin contacts
2C, 4C, 6M or 6B 5amp contacts
2C heavy duty contacts (HD)

*12AC to 110AC have a single coil with a series/parallel diode arrangement.

4.4. VPR SERIES BISTABLE POLARISED RELAYS

Short coils (Case 1, 2 or 3 see tables 1 & 2)

These are bistable polarised relays having magnetic latching by means of a ceramic magnet. The relay can be pulsed at 10 milliseconds (minimum) sine or square wave. The physical dimensions and base terminals are identical to the Basic VP Series, and they are available in single or double wound coils.

Data in the tables below apply to available contact arrangements i.e. 2 or 4 pole changeover, 6 pole make or break.

4.4.1. SINGLE WOUND COILS AT 20°C (TERMINALS 1 &4) – Table 6.

Polarity (NC closed)
To change state
a) Apply positive to terminal 1
b) To return to NC closed, apply negative to terminal 1

Table 6

DC Coil (Nominal Voltage)	3	5	6	12	24	34	47	72	120
Resistance ohms ±10% (except *±15%)	9.6	23	49	200	560	1080	2040	4800	*13300
Number of turns	660	1020	1430	3000	5000	6800	9350	14000	24000
Nominal Voltage	3	5	6	12	24	34	47	72	120
Minimum Voltage	1.9	3	4.5	8.9	15.4	22	30	47	87
Maximum Voltage	4.2	6.5	9.4	19	33	44	60	93	150
Max. Pulse Voltage	6.5	10	16	30	51	72	98	154	280

4.4.2. DOUBLE WOUND COILS AT 20°C (TERMINALS 1 & 4 AND 2 & 3) – Table 7.

Each coil may be used separately as above. To change state using both coils

a) Apply positive to either terminal 1 or terminal 2.

b) To return to original position apply negative to terminal 1 or terminal 2

Table 7

DC Coils (nominal volts)		2.5	4	6	12	24	36	47	60	100
Resistance ohms ±10% (*±15%)	1 & 4	4.8	11.5	24.5	100	340	1020	1400	*2400	*6650
	2 & 3	4.8	11.5	24.5	100	400	1020	1400	*2400	*6650
Number of turns	1 & 4	310	490	730	1450	2600	4600	5100	6700	10900
	2 & 3	310	490	700	1450	3020	4220	5650	6700	10600
Minimum volts		2.0	3.2	4.8	9.4	19.5	33	38	51.5	92
Maximum volts (continuous)		3.0	4.6	6.7	13.4	26.5	42.5	50	65	108
Maximum pulse volts		7.0	10.5	15.5	31	65	100	120	160	280

5. RELAY CONTACTS.

5.1 CONTACT MATERIALS

Code A – Fine silver (gold flashed) – the most effective material for general purposes and has the highest conductivity of all metals. The bare metal is prone to tarnishing in sulphurous atmospheres, but in all but the very lightest of settings, the wiping action of all the contacts rapidly breaks down the film.

Code F – 95% Gold 5% Nickel – arc and weld resistant, hard wearing and the best material for low level applications. (BT type 32 Contact Material)

Code G – 60% Palladium, 40% Silver - It is arc resistant and the least costly of the tarnish-free alloys at normal temperatures. (BT type 23 Contact Material)

Code I – Silver Cadmium Oxide - a hard sintered alloy ideally suited for heavy duty applications with inductive loads. It is less prone to material transfer than Silver on DC circuits, but it is not suitable for low voltage low current applications.

5.2 CONTACT RATINGS – Table 8.

Table 8

Contact Type	Code	Max. Amps	Max. Volts	Max. Watts	Max. VA
Light duty Gold/Nickel (95%:5%) Single & Twin Contacts	**F**	**0.25**	**100**	**10**	**25**
Light duty Fine Silver (Gold Flash) Single & Twin Contacts	**A**	**1.0**	**100**	**30**	**60**
Light duty Palladium/Silver (60%:40%) Single & Twin Contacts	**G**	**1.0**	**100**	**30**	**60**
5 Amp† Silver/Cadmium Oxide Single contact	**I**	**5.0**	**250**	**100**	**200**
HD Fine Silver (Gold Flash) Single Contact	**A**	**5.0**	**250**	**100**	**200**

† Relays VP*/5A/*A*/* (silver) no longer available, replacement relays supplied with silver cadmium contacts (Code I)

5.3 CONTACT TYPES

Single light duty & 5 Amp — Suitable for most general purpose applications.

Twin (TC) light duty — Recommended for all critical applications that require reliable high integrity switching. The relays are constructed using two sets of standard contacts (of the selected type and rating) fixed to bifurcated contact springs.

Heavy duty (HD) — Made from fine silver (code A), the contacts are physically larger than the standard light duty contact to allow for increased dissipation. Double spacers are inserted between springs so that the spring set is larger than that on the normal duty 5 Amp (5A) contacts. Consequently the case size and terminal numbering is different from the 5A types.

6. RELAY CODE RECOGNITION.

Example of Relay Descriptive code = VP 4/ SEN/ PB/ 5A/ C I B /26 / T

Relay Series	
VP #	Standard relay
VPR #	Bistable polarised relay
# = Number of poles	2, 4, 6, or 8 (sets of contacts)
Operation	
Unspecified	Standard setting
SEN	Sensitive setting
Mounting style	
Unspecified	Plug-in/solder
PB	Plug-in/wired types
DM	Printed circuit – 2.54mm (0.1") grid
Contact type	
Unspecified	Standard light duty
TC	Twin contacts light duty
5A	5 Amp (silver cadmium oxide only)
HD	Heavy duty (silver)
Contact functions	
M	Make (N/O)
B	Break (N/O)
C	Changeover (C/O)
K	Make before break
Contact material	
A	Fine silver (gold flash)
F	Gold/Nickel (95%:5%)
G	Palladium/Silver (60%:40%)
I	Silver cadmium oxide
Terminal material	
B	Steel, nickel plated (standard)
Coil identification	
Coil voltage required	(for M type coils insert M after voltage; for bifiliar windings insert resistance in lieu of voltage)
(voltage^1)W(voltage^2)	Overlaid (twin) coil winding
Special requirements	
AC	Built-in rectifier
T	Tropicalised coil
RSD	Anti-residual stud
B	Bifilar windings
LES	Less earth screw (plug-in and PCB types)
LEP	Less earth pin (direct mount (DM) types)

Typical examples of relay codes: -

VP4/PB/CAB/26/RSD/T/LES Basic 4 pole changeover action with 2.8mm pitch PC terminals, 1 amp silver contacts, 26 volt DC coil, anti-residual stud, tropicalised, less earth screw.

VP4/CAB/24AC Basic 4 pole changeover action with 1 amp silver contacts, 24 volt coil with built-in rectifier for AC operation.

VP2/HD/CAB/430ohmB Basic 2 pole changeover action with heavy duty silver contacts, 430ohm bifilar windings.

VP6/BFB/26W26 (pull and hold) Basic 6 pole break action with 0.25 Amp gold nickel contacts, overlaid coils (26volt inner 'pull', 26 volt outer 'hold').

For product support, information on our extensive range of VP relay configurations and options available, project support enquiries and replacement support for cradle relays not available from their OEM's, contact sales.

7. Outline drawings and layout diagrams.

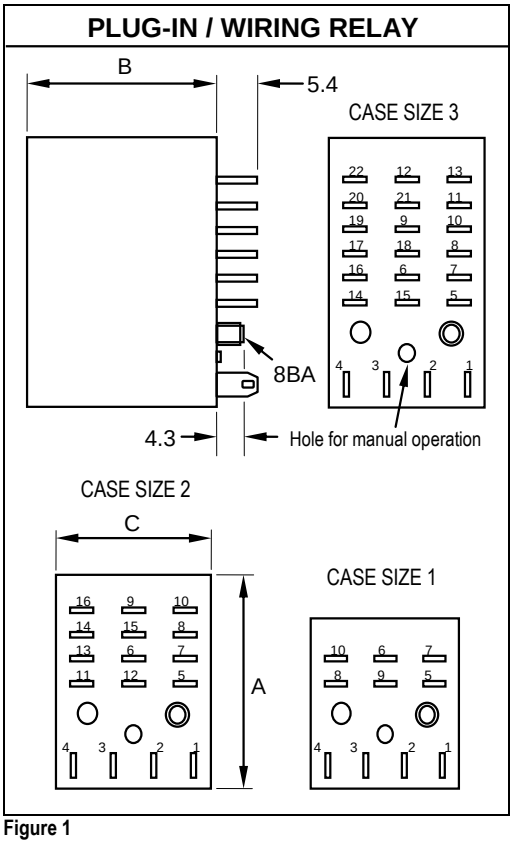


Figure 1

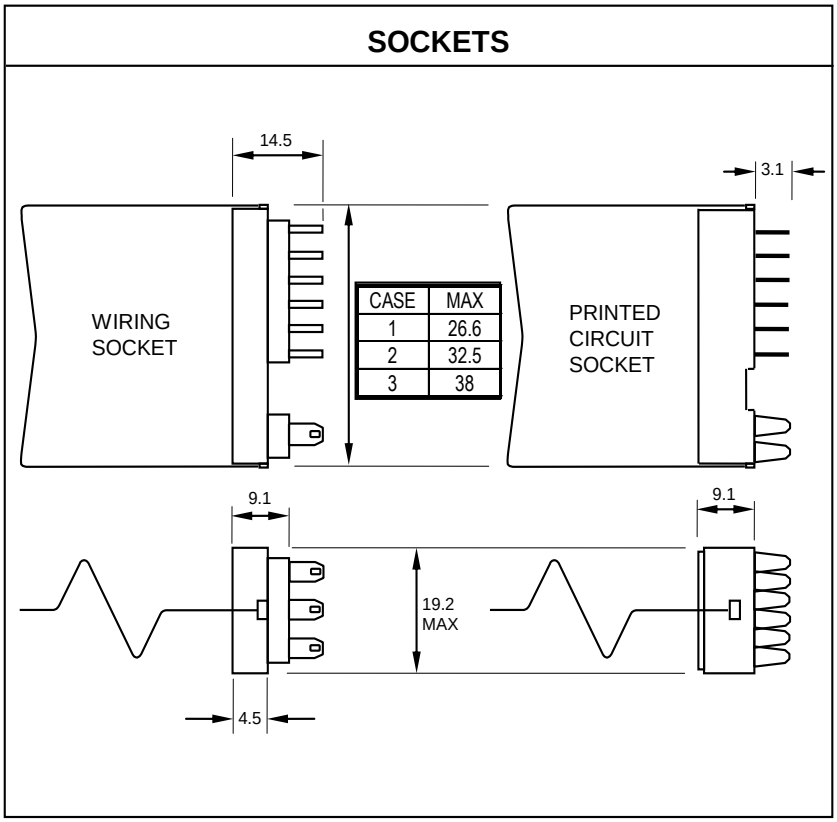


Figure 2

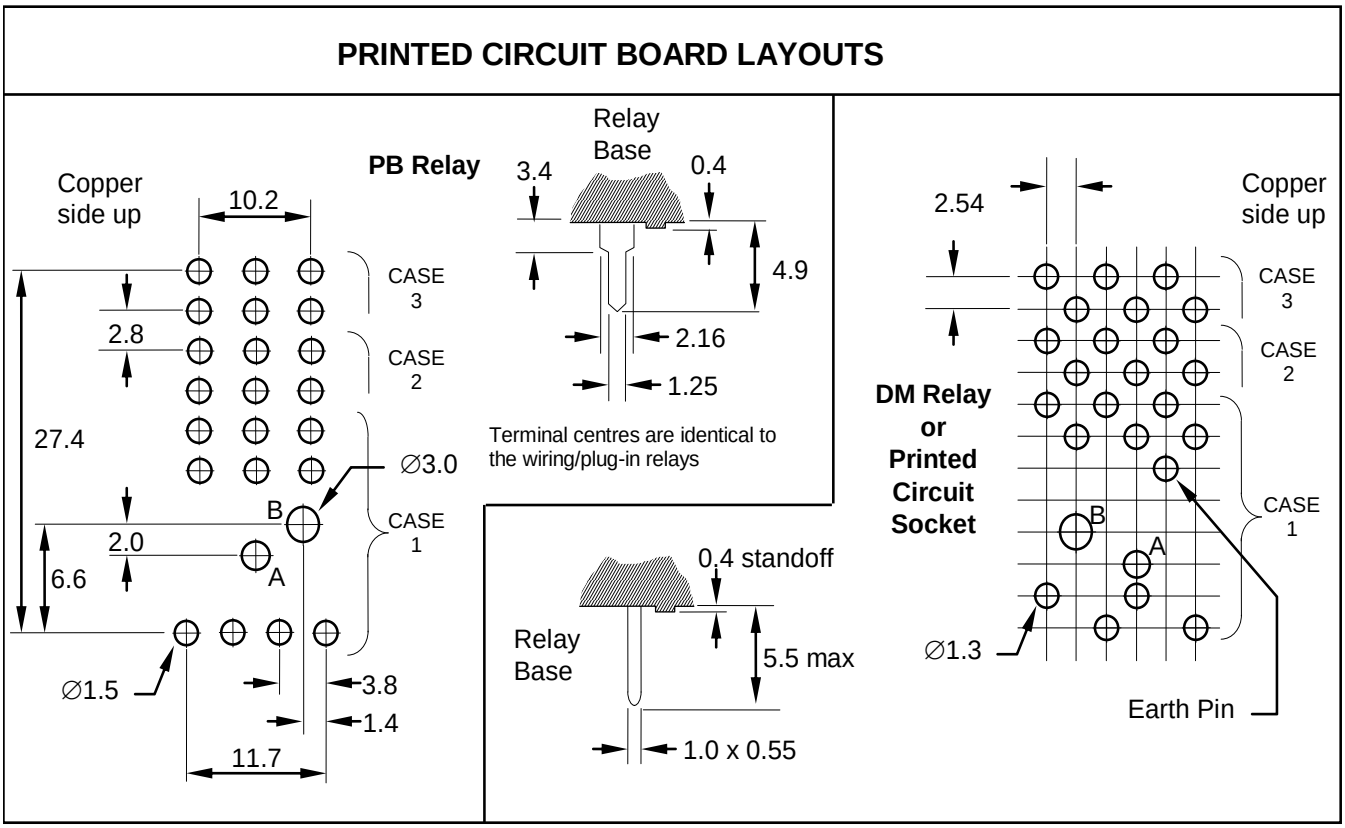


Figure 3

Terminal numbering is identical to plug-in wiring relays (figure 1), but with 'staggered' pin layout on DM & PC sockets as shown.
A – Hole for manual relay operation if required
B – Hole required for PB relay with standard 8BA earth/mounting stud. Not required for DM relay, PC socket or PB relay with LES in its code.

7.1 CONTACT NUMBERING

(See figs 1 & 2 for pin positions for each case size)
Relays with changeover contacts see table 9
Relays with make or break contacts see table 10

Table 9

	2 - pole				4 - pole								6 - pole					
Type	S, TC & 5A		HD		S, TC & 5A				HD				S, TC & 5A					
Case size	1		2		2				3				3					
NO COM NC	7 6 5	10 9 8	8 7 5	14 13 11	7 6 5	10 9 8	13 12 11	16 15 14	8 7 5	13 11 10	17 16 14	22 20 19	7 6 5	10 9 8	13 12 11	16 15 14	19 18 17	22 21 20

Table 10

	2-pole (case size 2)			6-pole (case size 2)						8-pole (case size 3)							
Contact pairs	5 8	11 14	13 16	5 6	7 8	9 10	11 12	13 14	15 16	5 6	7 8	9 10	11 12	14 15	16 17	18 19	20 21