



WS No. 19 Mark III

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R E S T R I C T E D

ELECTRICAL AND MECHANICAL  
ENGINEERING REGULATIONS  
(By Command of the Army Council)

TELECOMMUNICATIONS  
A 300

COLOUR CODING

RESISTORS AND CAPACITORS

Erratum

Note: This Page 0 will be filed immediately in front of Page 1, Issue 2, dated  
7 Aug 53

1. The following amendment will be made to this regulation.

Page 1, Table 1, multiplier for colour green,

Delete: 1000,000

Insert: 100,000

COLOUR CODINGRESISTORS AND CAPACITORS

Note: This issue, Pages 1 to 8, supersedes Pages 1 and 2 of Issue 1, dated 26 Oct 1943.

General

1. Both in the United Kingdom and the United States, systems have been adopted of indicating the value of resistors and capacitors by means of colours painted on to the components.
2. The nominal values of both resistors and capacitors are usually given to two significant figures in the systems at present in use, and so the nominal value of any component can be specified by the use of three colours, two to represent the significant figures and the third to represent a multiplier of a power of ten or number of cyphers. The same colours are used for significant figures and multipliers in almost all systems. These are given in Table 1.
3. Additional information, such as the tolerance to which the component is manufactured, can be specified by the use of additional colours. The significance of the additional colours used in particular systems is explained in detail in the following paragraphs.

Note: A coloured diagram illustrating the various forms that the colour code may take is published by the Air Ministry as Air Diagram No. AD. 5100. Command workshops, Central workshops and Training establishments in the UK and Base workshops and other Central establishments overseas may demand this diagram through the normal channels for demanding Army publications.

Colour	Significant figures	Multiplier
Black	0	1
Brown	1	10
Red	2	100
Orange	3	1,000
Yellow	4	10,000
Green	5	100,000
Blue	6	1,000,000
Violet	7	10,000,000
Grey	8	
White	9	
Gold	-	0.1
Silver	-	0.01

Table 1 - Significance of colours indicating value

RESISTORS

4. In the case of resistors, four colours are used in all systems to show the value and tolerance of the component, the systems differing only in the relative positioning of the colours. The significance of the colours used to indicate tolerance is shown in Table 2

Colour	Tolerance
Brown	$\pm 1\%$
Red	$\pm 2\%$
Gold	$\pm 5\%$
Silver	$\pm 10\%$
No colour	$\pm 20\%$

Table 2 - Resistors - tolerance colour code

Note: Generally it may be assumed that the percentage tolerance is equal to the numerical value of the colour as shown in Table 1. In rare cases other colours may be found indicating tolerances; for example, on resistors manufactured prior to March 1944, which may still be found in equipments, silver indicated  $\pm 20\%$  tolerance and no colour indicated  $\pm 10\%$ .

5. In the diagrams depicting resistors in the regulation, the four colours used are indicated as follows:-

- First significant figure : A
- Second significant figure : B
- Multiplier (or number of cyphers): C
- Tolerance : D

UK coding

6. Resistors having radial connecting wires (non-insulated types) and resistors having axial connecting wires (non-insulated and insulated types) are coloured as indicated in Fig 1.

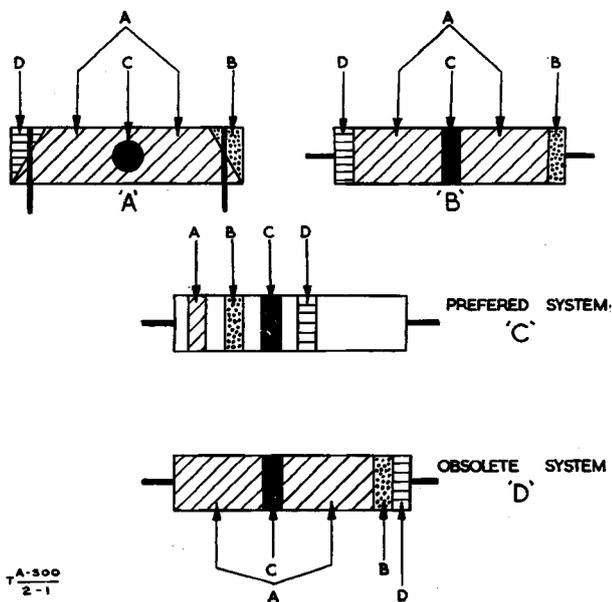


Fig 1 - UK colour coding - resistors

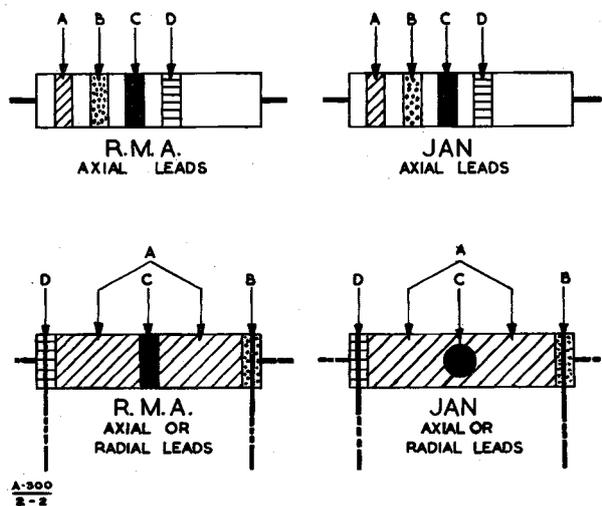


Fig 2 - USA colour coding - resistors

7. Some resistors may have an additional band, salmon pink in colour, or the general body colour may be salmon pink. Such a resistor is manufactured to Grade 1 specification, ie it is of the type normally known as 'High Stability'.

USA coding

8. Two systems of colour coding, which differ in minor particulars, are in use in the USA. These are illustrated in Fig 2. The R.M.A 3-band arrangement is stated to be discontinued by the USA, but resistors bearing this code may still be encountered in some equipments.

9. In the cases of components manufactured to civilian (R.M.A.) specification; insulated resistors (composition) with axial leads have tan, olive or white coloured bodies, and non-insulated resistors with axial leads have black bodies. Resistors of both insulated and non-insulated pattern may be found with radial leads. In the case of resistors manufactured to service (JAN) specification; those with axial leads are insulated, and those with radial leads are non-insulated.

## CAPACITORS

10. Colour coding of capacitors is more complicated than that of resistors, as additional information, such as the working voltage, the temperature coefficient and the type of construction, has to be included. Colour coding is applied to the ceramic, paper, and mica dielectric types, the larger components normally have the corresponding information printed on them. Values of capacitors are given in picofarads (micromicrofarads).

UK coding

## Ceramic dielectric capacitors

11. The significance of the colours used to indicate tolerance and temperature coefficient are shown in Table 3, and the relative positioning of the colours used is shown in Fig 3.

Colour	Temperature coefficient Parts in $10^6/^{\circ}\text{C}$	Tolerance	
		10pf or less	More than 10pf
Black	+0	+2.0pF	+20%
Brown	-30	+0.1pF	+1%
Red	-80		+2%
Orange	-150		+2.5%
Yellow	-220		
Green	-330	+0.5pF	+5%
Blue	-470		
Violet	-750		
Grey	+30	+0.25pF	
White	+100	+1.0pF	+10%

Table 3 - Ceramic capacitors - UK coding

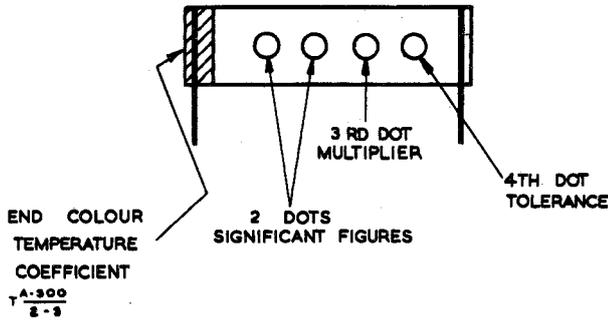


Fig 3 - UK colour coding - ceramic capacitors

Mica dielectric capacitors

12. The significance of the colours used to indicate type, tolerance and working voltage are shown in Table 4 and the relative positioning of the colours used is shown in Fig 4.

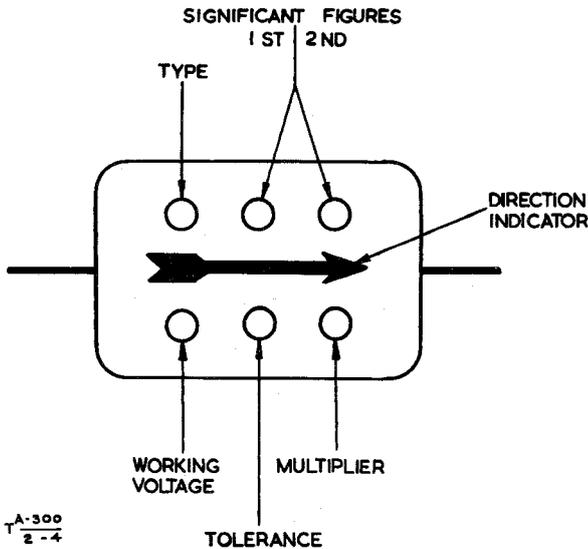


Fig 4 - UK colour coding - mica capacitors

Colour	Type	Tolerance	Max working voltage
Red	Metallized	$\pm 2\%$	350
Green	Foil	-	750
White	-	-	2000
Gold	-	$\pm 5\%$	-
Silver	-	$\pm 10\%$	-
Black or no colour	-	$\pm 20\%$	-

Table 4 - Mica capacitors - UK coding

USA coding

13. The civilian (R.M.A) and service (JAN) systems of coding capacitors differ more widely than do the corresponding systems of coding resistors, especially in the case of mica dielectric capacitors. The systems are accordingly described separately.

Ceramic dielectric capacitors

14. Components manufactured to R.M.A. specifications are coded on a 6-colour system, the colours being arranged as shown in Fig 5. The significance of the colours used to indicate tolerance and temperature coefficient are shown in Table 5. It will be seen that the values of components coded on this system are given to three significant figures.

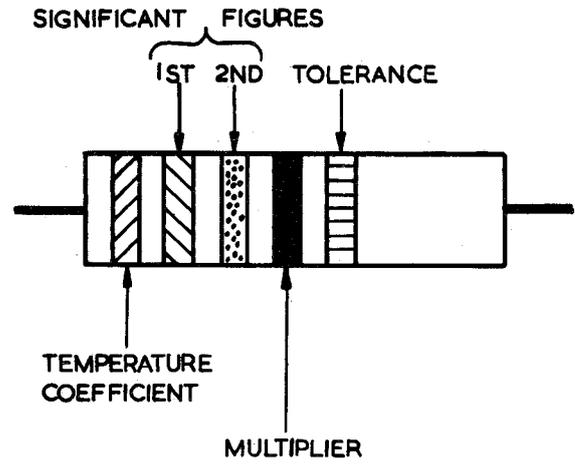
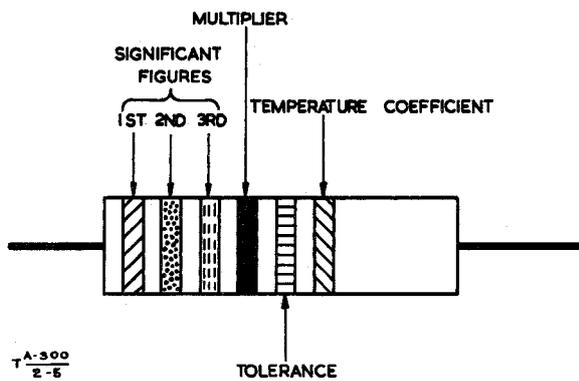


Fig 5 - USA (R.M.A.) colour coding)  
- ceramic capacitors

Colour	Tolerance	Temperature coefficient Parts in $10^6/^\circ\text{C}$
Black	+20%	-
Brown	+1%	-30
Red	+2%	-80
Orange	+3%	-120
Yellow	+4%	-220
Green	+5%	-330
Blue	+6%	-470
Violet	+7%	-750
Grey	+2.5%	-
White	+10%	-

Table 5 - Ceramic capacitors - USA  
(R.M.A) coding

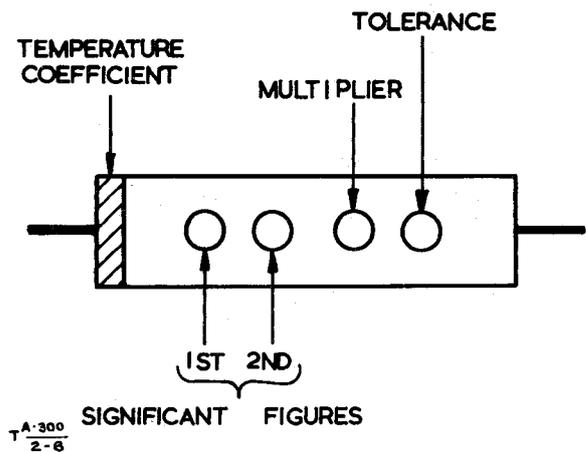


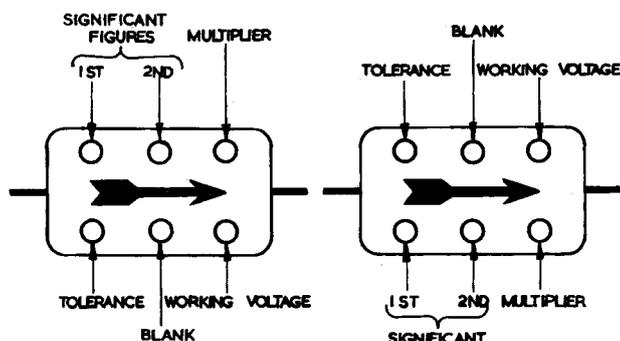
Fig 6 - USA (JAN) colour coding  
- ceramic capacitors

15. Components manufactured to JAN specifications are coded on a 5-colour system, the value being given to the usual two significant figures. The two possible arrangements of colours are shown in Fig 6, and the significance of the colours used to indicate tolerance and temperature coefficient are shown in Table 6.

Colour	Tolerance		Temperature coefficient Parts in 10 <sup>6</sup> /°C
	10pf or less	More than 10pF	
Black	+2pf	+20%	-
Brown	-	+1%	-30
Red	-	+2%	-80
Orange	+ 0.25pf	+2.5%	-150
Yellow	-	-	-220
Green	+0.5pf	+5%	-330
Blue	-	-	-470
Violet	-	-	-750
Grey	+0.25pf	-	-
White	+1pf	+10%	-

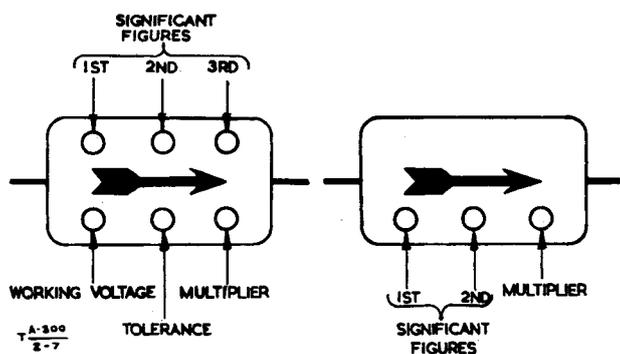
This system of coding uses the colours white and grey in place of gold and silver to denote multipliers of X 0.1 and X 0.01 respectively

Table 6 - Ceramic capacitors - USA (JAN) coding



Colour	Tolerance	Max working voltage
Brown	+1%	100
Red	+2%	200
Orange	+3%	300
Yellow	+4%	400
Green	+5%	500
Blue	+6%	600
Violet	+7%	700
Grey	+8%	800
White	+9%	900
Gold	+5%	1,000
Silver	+10%	2,000
No colour	+20%	500

Table 7 - Mica and Paper capacitors  
- USA (R.M.A.) coding



Mica and Paper dielectric capacitors

16. Mica and Paper capacitors manufactured to R.M.A. specifications are coded by the colouring of a number of dots moulded on the outer case. The various arrangements of the dots that may be found are shown in Fig 7, and the significance of the colours used is shown in Table 7. Some form of directional indication is incorporated in the moulded case to show the order in which the dots should be read; the arrows shown in Fig 7 are merely symbolic of this marking, which may take various forms

Fig 7 - USA (R.M.A.) colour coding  
- Mica and Paper capacitors

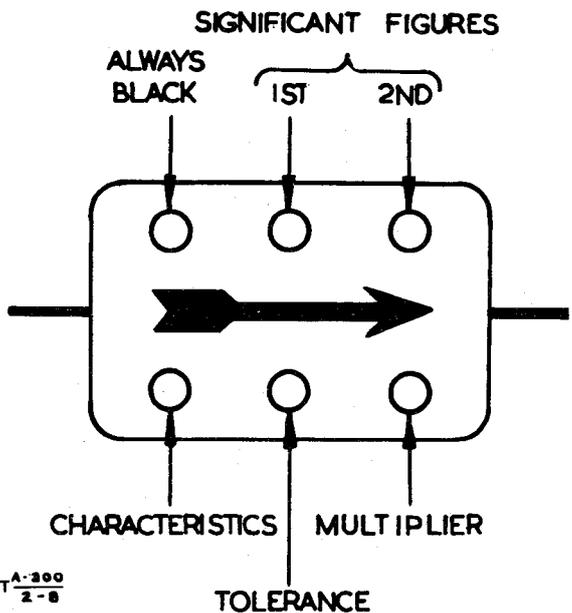
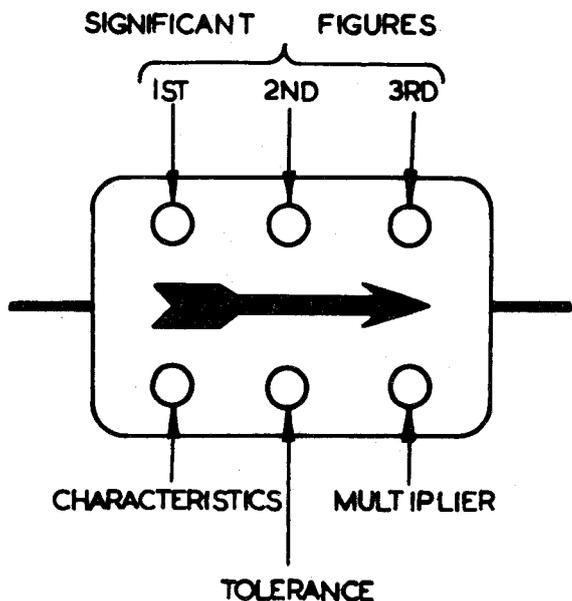
Colour	Tolerance	Characteristics		
		Dielectric	Temperature coefficient Parts in $10^6/^\circ\text{C}$	Max capacity drift
Black	+20%	Ordinary mica	-	-
Brown	+1%	Low-loss mica	-	-
Red	+2%	-	+200	0.5%
Orange	+3%	-	+100	0.2%
Yellow	+4%	-	+100	0.05%
Green	+5%	-	+50	0.025%
Blue	+6%	-	-50	0.025%
Violet	+7%			
Grey	+8%			
White	+9%			
Gold	+5%			
Silver	+10%			
No colour	+20%			

Table 8 - Mica capacitors - USA (JAN) coding.

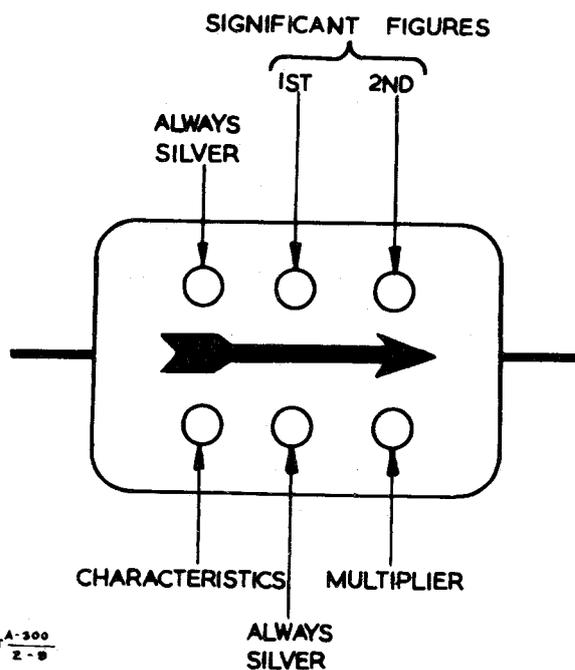
Colour	Characteristics			Tolerance
	Operating temperature range		Max capacity reduction +20°C to -40°C	
	°C	°F		
Black	-55 to +85	-67 to +185	10%	+60% -20%
Brown	-55 to +75	-67 to +167	10%	+60% -20%

Table 9 - Paper capacitors - USA (JAN) coding

17. Components manufactured to USA service (JAN) specifications are coded on similar systems : distinction is made between Mica and Paper dielectrics. The arrangements of the colours for Mica and Paper capacitors are shown in Figs 8 and 9 respectively, and the interpretation of the colours used in Tables 8 and 9.



T A-300  
2-8



T A-300  
2-8

Fig 8 - USA (JAN) colour coding - mica capacitors

Fig 9 - USA (JAN) colour coding - paper capacitors

HQ/MTDE/154/3/ME8/132

END