european space agency
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GENERAL REQUIREMENTS FOR

THE MARKING OF SCC COMPONENTS

ESA/SCC Basic Specification No. 21700

space components
coordination group

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		SCCG Chairman	ESA Director General or his Deputy
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DOCUMENTATION CHANGE NOTICE

Rev. Lette	Rev. Date	CHANGE Reference	CHANGE Item	Approved DCR No.
		This Issue supersedes Issue 4 and incorporates all modifications defined in Revisions 'A' and 'B' to Issue 4 and the changes agreed in the following DCR's:-		
		Cover Page		None
		DCN		None
		Para. 5.9.4	: In the Table, tolerance for Violet corrected	23809

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1. SCOPE

This specification defines the applicability of SCC marking and the general marking requirements for electronic components produced to the SCC system of specifications. The precise marking requirements for a component will always be detailed by means of the relevant Detail Specification.

2. APPLICABLE DOCUMENTS

This document should be read in conjunction with the following applicable documents:-

(a) ESA/SCC Basic Specification No. 22900, Total Dose Steady-State Irradiation Test Method.

(b) ESA/SCC Basic Specification No. 24800, Resistance to Solvents of Marking, Materials and Finishes.

(c) IEC Publication No. 62, Marking Codes for Resistors and Capacitors.

3. APPLICABILITY OF SCC MARKING

Components procured from a qualified source, whose qualification status is valid at the time of delivery, shall be marked with the ESA/SCC qualified components symbol to signify their conformance to the ESA/SCC qualification requirements and full compliance with the relevant ESA/SCC Generic and Detail Specifications. For such components, the marking requirements specified herein are mandatory.

Components failing test or inspection or non-conforming in any respect shall have any and all SCC marking removed or permanently obliterated.

Components procured from non-qualified sources, provided that they fully comply with the procurement requirements of the relevant ESA/SCC Generic and Detail Specifications, may be marked in accordance with the requirements specified herein.

4. GENERAL REQUIREMENTS

4.1 CHARACTERS AND NUMERALS

Alphabetic characters shall always be in upper case and numerals shall be of Arabic type. Letters and numbers shall be uniform in height, but the physical dimensions may be varied to suit particular requirements.

4.2 LOCATION OF MARKING

Unless otherwise specified in the relevant Detail Specification, the location of marking on a component shall be such that it is clearly visible under all normal mounting arrangements for the component.

The Process Identification Document (P.I.D.) shall give requirements for the physical location of marking on a component.

4.3 MARKING OF COMPONENTS

The marking actually required on a component will be specified in the relevant Detail Specification. This marking shall be done with respect to the following order of precedence:-

(a) Polarity/Pin marking.

(b) ESA/SCC qualified components symbol (for SCC qualified components only).

(c) Component number.

(d) Electrical characteristics.

(e) Date code.

(f) Serial number.

(g) Warning signs (BeO, electrostatic discharge, dangerous materials...).

(h) Manufacturer's name, symbol or logo.

(i) Additional (special-to-purpose) marking (see Para. 5.8)

4.4 LAY-OUT AND GROUPING OF MARKING

The marking required on a component in respect of:-

(a) The SCC Component Number.

(b) Electrical characteristics and ratings (if appropriate).

(c) Traceability information.

shall constitute three distinct groups and shall be so marked on the component. The relevant Detail Specification may specify the sequence and division or line spacing of the marking, but in any case the marking shall be so disposed that each of the groups is readily identifiable.

4.5 PERMANENCE OF MARKING

All marking shall remain legible after being submitted to all the tests and conditions specified for the component in the relevant Generic and Detail Specifications. When permanence of marking is called for in Chart IV and/or Chart V, it shall include a resistance of marking to solvent test as specified in ESA/SCC Basic Specification No. 24800.

5. MARKING CODES

5.1 POLARITY AND LEAD IDENTIFICATION

When applicable, the marking requirements for polarity and lead identification will be specified in the relevant Detail Specification. Such markings shall be applied to the components without exception and shall take precedence over all other marking requirements.

5.1.1 Polarity

Polarity, applicable to a lead, pin, terminal, etc. may be indicated on a component by one (or more) methods. Some of the most common of these are:-

(a) By marking or colouring one (or more) lead(s), pin(s), etc.

(b) By an indication on the case or body of the component, or by differences in the fabrication of opposite ends of the component.

One method may be more applicable to one type of component than another and the list is not necessarily complete.

The method most suited to the component being specified shall be adopted bearing in mind the possibility of damage to, or degradation of, the component and the precise requirements shall be clearly indicated in the relevant Detail Specification.

5.1.2 Lead or Pin Identification

In order to incorporate a component into an equipment such that it will properly perform its electrical function, it is usually necessary to identify at least one lead or pin, etc. Other lead identities (when required) are then usually derived by noting their location relative to this datum. Various methods are used for such identification, some of the most common of which are:-

(a) The positioning of the component according to some physical feature and noting the relative location of one lead, pin, etc..

(b) Fashioning a nick or joggle in one lead.

(c) The physical displacement of one lead (off-set).

(d) The use of a different material for one lead or a change of surface finish on one lead (paint, varnish, etc.).

(e) An increase (or decrease) in the length of one lead or other alteration in one of its dimensions.

(f) A mark on the case, moulding, etc. adjacent to one lead or a mark on the lead itself.

(g) Particular physical construction and/or shape of one lead (stud, hook, braid, etc).

(h) A combination (usually two) of the above methods.

One method may be more applicable to one type of component than another and the list is not necessarily exhaustive.

A method most suited to the component being specified shall be adopted bearing in mind the possibility of damage to, or degradation of, the component and the precise requirements shall be clearly indicated in the relevant Detail Specification.

5.2 ESA/SCC QUALIFIED COMPONENTS SYMBOL

The requirements for the construction of the symbol are given in Appendix 'A' . The symbol shall appear on all qualified components (see Para. 3) and, subject to the requirements of Para. 5.1, shall take precedence over all other marking requirements.

The ESA/SCC qualified components symbol shall be marked on the primary package when applicable.

5.3 THE SCC COMPONENT NUMBER

The SCC Component Number comprises coded references to the Generic and Detail Specifications relevant to the component, the type variant, the testing level and, if applicable, the total dose irradiation level.

The SCC Component Number to be marked on the component shall be as specified in the relevant Detail Specification.

The SCC Component Number shall be formed by grouping together the following:-

(a) The number of the applicable Detail Specification (which itself includes reference to the relevant Generic Specification).

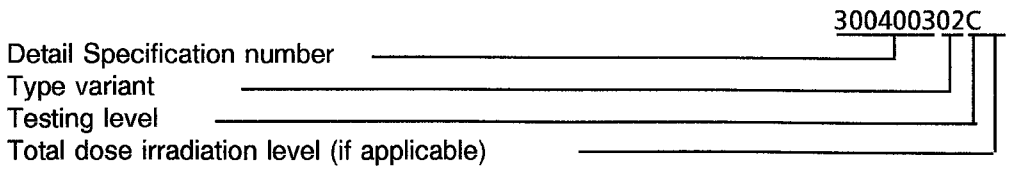
(b) The type variant number, starting with 01 even if no other variant is initially envisaged.

(c) The testing level of the component (B or C, as applicable).

(d) The total dose irradiation level (as applicable).

The Detail Specification shall specify the marking required and show, by an example, how the SCC Component Number is to be constituted and marked as a group.

EXAMPLE



5.3.1 Testing Level

The marking to indicate the testing level to which a component has been subjected shall be the letter B or C, as applicable.

5.3.2 Total Dose Irradiation Level

The marking to indicate the total dose irradiation level shall only be added to those components for which the test has been specified and which have been successfully tested to the level indicated by the marking.

The marking shall be as specified in ESA/SCC Basic Specification No. 22900.

5.4 CHARACTERISTICS AND RATINGS

The characteristics and ratings to be marked on a component shall comprise a combination of the following:-

(a) Numerical value.

(b) Tolerance.

(c) Temperature coefficient, where applicable.

(d) Rated voltage.

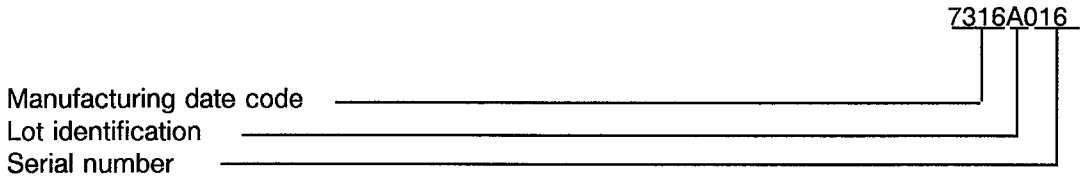
For the purpose of SCC marking, these parameters are coded and constituted into a marking group. The characteristics and ratings to be marked on the component shall be as specified in the relevant Detail Specification.

N.B.
For full coding tables and information, see Paras. 5.9, 5.10, 5.11 and 5.12.

5.5 TRACEABILITY INFORMATION

All components shall be marked with traceability information which shall comprise a manufacturing date code, a lot identification and, when applicable, a serial number. This information shall be coded in accordance with the codes specified herein and marked as a group in this order of sequence.

EXAMPLE



5.5.1 Manufacturing Date Code

A four-digit code number shall be used for the manufacturing date. The first two digits shall be the last two figures of the year of manufacture. The last two digits shall indicate the week of the year (i.e. 01 to 52), during which encapsulation or final production process occurred.

5.5.2 Lot Identification

If it is necessary to differentiate between more than one lot processed in the same week, a suffix letter (beginning with the letter 'A') shall be added to the date code. For a single lot, the suffix letter shall always be 'A'.

5.5.3 Serial Number

Where serialisation of components to testing level 'B' is required, a serial number consisting of two or more digits shall be used. Serial numbers shall run sequentially and shall not be duplicated if more than one sub-lot is taken from one production lot.

5.6 WARNING SIGNS

A warning sign will be required if a component is either susceptible to damage from external conditions or contains hazardous material(s). When such a warning is required, an appropriate safety clause shall be contained in the Detail Specification.

The symbol to be used to indicate the warning shall be selected from those given in Appendix 'B' of this specification and shall be marked on the component, and/or the packaging, as specified in the Detail Specification.

5.7 MANUFACTURER'S NAME, SYMBOL OR CODE

Provided it does not conflict with any of the requirements specified herein, the code and method used by the Manufacturer for his own marking is left to his discretion.

5.8 ADDITIONAL MARKING

In exceptional circumstances, additional (special-to-purpose) marking may be required. When such a requirement exists, it will be fully specified in the relevant Detail Specification, together with any degree of precedence, etc.

5.9 NUMERICAL VALUES

Numerical values shall be expressed by means of one of the codes detailed in Paras. 5.9.1, 5.9.2, 5.9.3 or 5.9.4.

These codes allow for the expression of two, three or four significant figures and the code chosen will depend on the size of the component, the range of values to be covered and the accuracy with which they are designated. The code to be used for a particular component shall be reproduced, or fully explained, in the relevant Detail Specification.

The numerical codes (Paras. 5.9.1, 5.9.2 and 5.9.3) are shown for resistors, using the letter 'R' as the decimal point indicator.

When one of these codes is used for the marking of capacitors or inductors, the letter 'C' or 'L' respectively shall be substituted for the letter 'R'. The unit quantity for marking shall be stated in the relevant Detail Specification and shall be:-

Ohms for resistors.

Pico-farads for capacitors.

Micro-henrys for inductors.

5.9.1 3-Digit Code

Numerical Value	Code
0.XX	RXX
X.X	XRX
XX	XX0
XX10^1	XX1
XX10^2	XX2
XX10^3	XX3
XX10^4	XX4
XX10^5	XX5
XX10^6	XX6
XX10^7	XX7
XX10^8	XX8
XX10^9	XX9

For values of 10 and above, the first two digits (X) represent significant figures and the last digit specifies the number of zeros to follow. When values of less than 10 are required, the letter (R, C or L) is used to indicate the decimal point.

When the letter is used, all succeeding digits represent significant figures, as in the following examples:-

R04 = 0.04Ω.

R25 = 0.25Ω.

5R0 = 5.0Ω.

8R5 = 8.5Ω.

5.9.2 4-Digit Code

Numerical Value	Code
0.XXX	RXXX
X.XX	XRXX
XX.X	XXRX
XXX	XXX0
$XXX10^1$	XXX1
$XXX10^2$	XXX2
$XXX10^3$	XXX3
$XXX10^4$	XXX4
$XXX10^5$	XXX5
$XXX10^6$	XXX6

For values of 100 and above, the first three digits (X) represent significant figures and the last digit specifies the number of zeros to follow.

When values of less than 100 are required, the letter (R, C or L) is used to indicate the decimal point.

When the letter is used, all succeeding digits represent significant figures, as in the following examples:-

R005 = 0.005Ω.

R025 = 0.025Ω.

R125 = 0.125Ω.

4R50 = 4.50Ω.

10R5 = 10.5Ω.

5.9.3 5-Digit Code

Numerical Value	Code
0.XXXX	RXXXX
X.XXX	XRXXX
XX.XX	XXRXX
XXX.X	XXXRX
XXXX	XXXX0
XXXX10^1	XXXX1
XXX10^2	XXXX2
XXXX10^3	XXXX3
XXXX10^4	XXXX4
XXXX10^5	XXXX5
XXXX10^6	XXXX6

For values of 1000 and above, the first four digits (X) represent significant figures and the last digit specifies the number of zeros to follow.

When values of less than 1000 are required, the letter (R, C or L) is used to indicate the decimal point.

When the letter is used, all succeeding digits represent significant figures, as in the following examples:-

R1000 = 0.1000Ω.

R1250 = 0.1250Ω.

5R500 = 5.500Ω.

25R05 = 25.05Ω.

150R5 = 150.5Ω.

5.9.4 Colour Code

In some cases (usually for small fixed resistors or capacitors), it may be more practicable to mark numerical value (and tolerance, see also Para. 5.10) by means of a colour code. When this is a requirement, the coding shall be in accordance with the following table:-

Colour	Significant Figure	Multiplier	Tolerance
Silver	-	10^{-2}	±10%
Gold	-	10^{-1}	±5%
Black	0	1.0	-
Brown	1	10	±1%
Red	2	10^{2}	±2%
Orange	3	10^{3}	-
Yellow	4	10^{4}	-
Green	5	10^{5}	±0.5%
Blue	6	10^{6}	±0.25%
Violet	7	10^{7}	±0.1%
Grey	8	10^{8}	-
White	9	10^{9}	-
None	-	-	±20%

For resistance values to two significant figures, the resistor shall be marked with three colour bands to indicate the numerical value. Resistance values to three significant figures shall be marked with four colour bands.

The colour band indicating tolerance shall be 1.5 to 2 times wider than that used to indicate the numerical value. The code shall be read from left to right, commencing with the value and the first band shall be the one nearest an end of the resistor. The bands shall be so placed and spaced that there can be no confusion in the coding.

N.B.
For resistors, the colour code conforms to IEC 62.
If this code is used for capacitors, the precise requirements, disposition of colour bands or dots, etc. shall be clearly specified in the relevant Detail Specification.

5.10 TOLERANCE

To indicate tolerance on numerical values, a letter code shall be used. Tolerances, as applicable, shall be tabulated in the relevant Detail Specification and each allocated a code letter. Wherever possible, the following codes, conforming to IEC 62, should be used.

5.10.1 Symmetrical Tolerances in Percent

Tolerance (%)	Code Letter
± 0.005	E
± 0.01	L
± 0.02	P
± 0.05	W
± 0.1	B
± 0.25	C
± 0.5	D
± 1.0	F
± 2.0	G
± 5.0	J
± 10	K
± 20	M
± 30	N

5.10.2 Asymmetrical Tolerances in Percent

Tolerance (%)	Code Letter
-10 +30	Q
-10 +50	T
-20 +50	S
-20 +80	Z

5.10.3 Tolerances on Capacitance - Values below 10pF

Tolerance (% or pF)	Code Letter
± 0.1	B
± 0.25	C
± 0.5	D
± 1.0	F

Where a range of tolerances applicable to a specific component is not covered by the above, it shall be tabulated in the relevant Detail Specification and a letter code allocated.

In the case where the colour code is used for numerical value, the appropriate colour for tolerance shall be used, as shown in the table in Para. 5.9.4.

5.11 TEMPERATURE COEFFICIENT

To indicate the temperature coefficient applicable to a component, a numerical code shall be used. The range of applicable temperature coefficients shall be tabulated in the relevant Detail Specification and each allocated a single digit (1-9) code.

For symmetrical temperature coefficients and where applicable, the following code shall be used.

Temperature Coefficient ±ppm/°C	10	25	50	100	150	200	250	500
Digit	1	2	3	4	5	6	7	8

Where a range of temperature coefficients applicable to a specific component is not covered by the above or where asymmetrical temperature coefficients are involved, they shall be tabulated in the relevant Detail Specification and a digit code allocated.

5.12 RATED VOLTAGE

The rated voltage applicable to a component shall be indicated by a letter code. The range of applicable rated voltages shall be tabulated in the relevant Detail Specification and each allocated a single letter code. Wherever applicable, the following codes shall be used.

For Capacitors, Tantalum, Solid Dielectric,

Glass,

Aluminium, Solid Dielectric,

Mica.

Rated Voltage	6.0	6.3	8.0	10	15	20	25	30	35	40	50
Code Letter	A	B	C	D	E	F	G	H	J	K	L

Rated Voltage	60	63	75	100	150	160	200	250	300	400	500
Code Letter	M	N	P	Q	R	S	T	U	V	W	Y

For Capacitors, Ceramic,

Metallised Plastic Film.

Rated Voltage	25	40	50	63	100	160	200	250	300	400	500
Code Letter	A	B	C	D	E	F	G	H	J	K	L

Rated Voltage	1.0k	1.6k	2.0k	2.5k	3.0k	4.0k	6.0k	6.3k	8.0k	10k	12.5k
Code Letter	M	N	P	Q	R	S	T	U	V	W	Y

Where a range of rated voltages applicable to a specific component is not covered by the above, they shall be tabulated in the relevant Detail Specification and letter codes allocated.

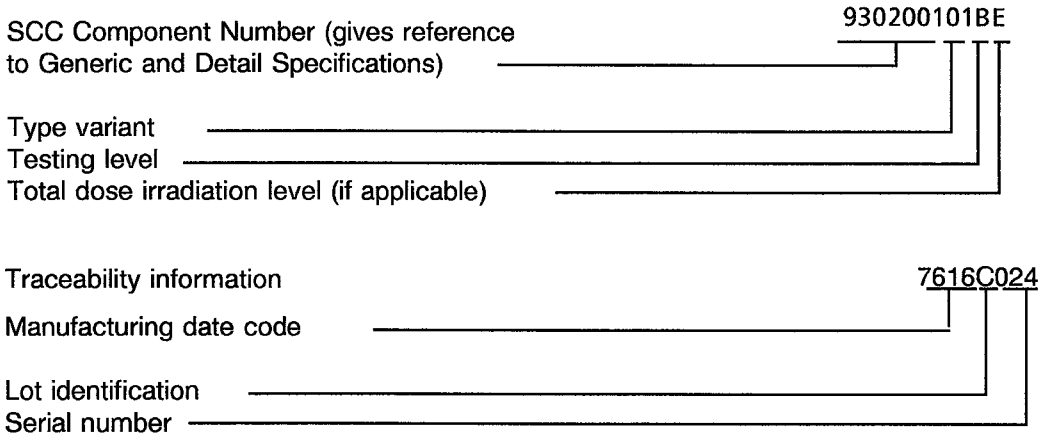
6. EXAMPLES OF SCC MARKING

The relevant Detail Specification will show, by an example, how the SCC marking for a component is to be constituted and marked. Shown below are examples of the type of marking which may be specified for different components. It is emphasised that these examples are typical and for illustrative purposes only.

SEMICONDUCTOR
Marking

SCC Component Number: 930200101BE
Traceability information: 7616C024

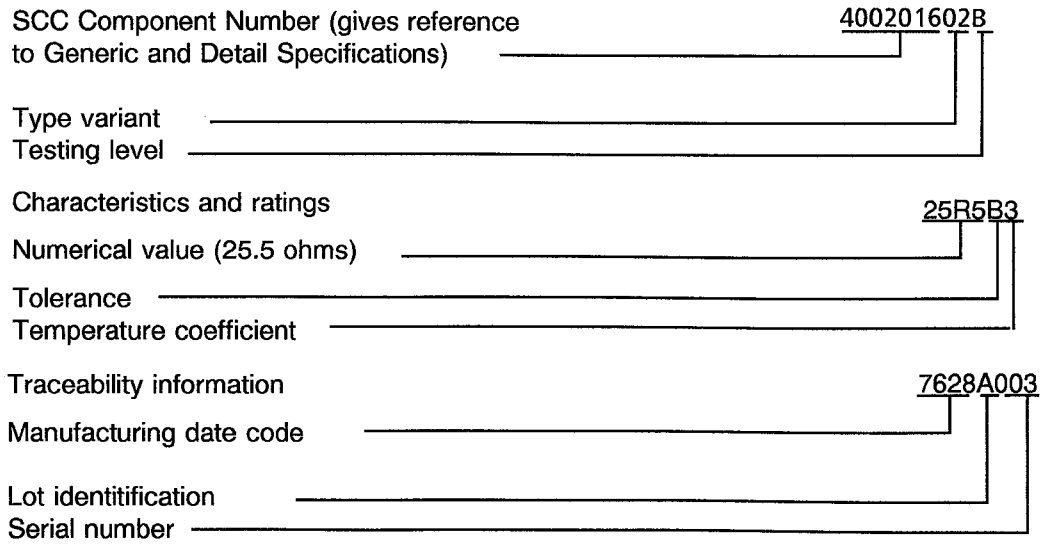
Key



RESISTOR WIRE-WOUND PRECISION
Marking

SCC Component Number: 400201602B
Characteristics and ratings: 25R5B3
Traceability information: 7628A003

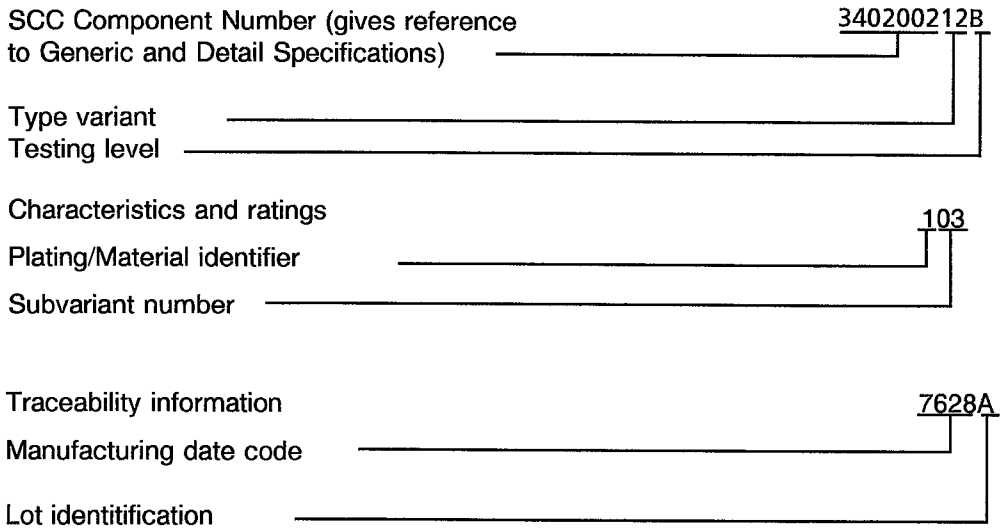
Key



RF CONNECTORS, COAXIAL
Marking

SCC Component Number: 340200212B
Characteristics and ratings: 103
Traceability information: 7628A

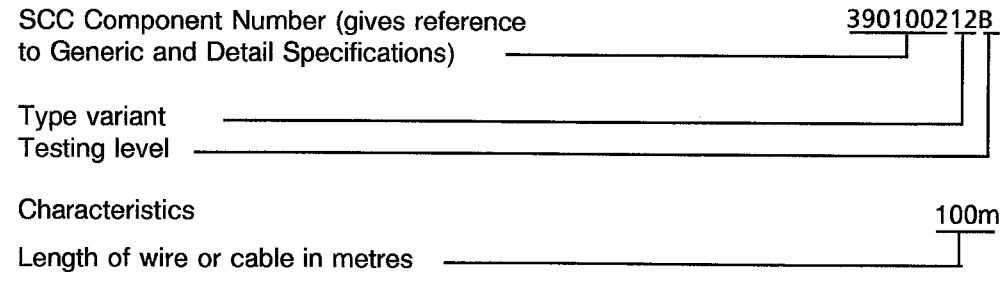
Key



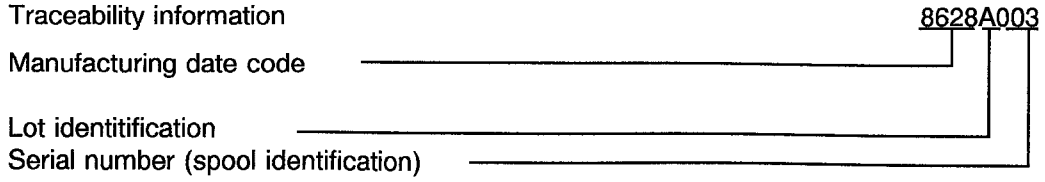
WIRES AND CABLES
Marking

SCC Component Number: 390100212B
Characteristics: 100m
Traceability information: 8628A003

Key

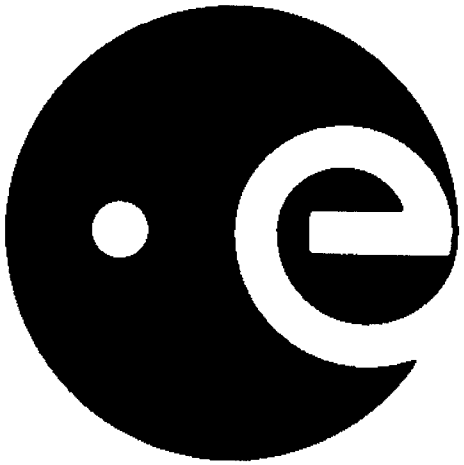


N.B.
If less than 100m, insert '0' in first block. If more than 1 length on 1 spool, repeat.



APPENDIX 'A'

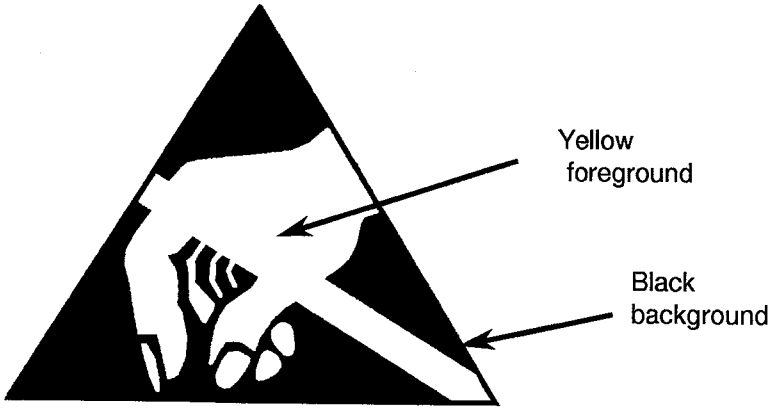
ESA/SCC QUALIFIED COMPONENTS SYMBOL



APPENDIX 'B'

WARNING SIGNS

1. Electrostatic Discharge Symbol



2. Beryllium Oxide Symbol

BeO