

Guide to the use of BS 3939 and BS EN 60617, *Graphical symbols for diagrams*

Committees responsible for this British Standard

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Foreword

This British Standard has been prepared by Technical Committee GEL/3.

It is a guide to the use of the BS 3939 series and the BS EN 60617 series of standards.

All the symbols in the various Parts of BS 3939 are identical with those in IEC 617 and are widely accepted worldwide.

It is envisaged that all Parts of IEC 617 will in the near future be adopted by the European Committee for Standardization (CENELEC) as EN 60617 and will eventually replace BS 3939. At the present only Part 13 of IEC 617 has been adopted by CENELEC, this being published in the UK as BS EN 60617-13:1993.

BS 3939 consists of the following Parts:

- *Part 1: General information, general index;*
- *Part 2: Symbol elements, qualifying symbols and other symbols having general application;*
- *Part 3: Conductors and connecting devices;*
- *Part 4: Passive components;*
- *Part 5: Semi-conductors and electron tubes;*
- *Part 6: Production and conversion of electrical energy;*
- *Part 7: Switchgear, controlgear and protective devices;*
- *Part 8: Measuring instruments, lamps and signalling devices;*
- *Part 9: Telecommunications: switching and peripheral equipment;*
- *Part 10: Telecommunications: transmission;*
- *Part 11: Architectural and topographical installation plans and diagrams;*
- *Part 12: Guide for binary logic elements.*

BS EN 60617 consists of the following Part:

- *Part 13: Analogue elements.*

This guide provides a general introduction to each of the Parts of BS 3939 and BS EN 60617 and outlines the general principles governing the usage of, and the methods of combining, symbols.

An Application Guide to IEC 617-12 and IEC 617-13 is currently being produced by IEC SC3A. It is expected that when this document is published an identical British Standard publication will follow.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 54, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Section 1. General

1.1 Scope

This Guide gives general information and guidance on the use of BS 3939: *Graphical symbols for electrical power, telecommunications and electronics diagrams* and BS EN 60617-13: *Graphical symbols for diagrams — Part 13: Analogue elements*.

1.2 Informative references

This guide refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this guide are listed on the inside back cover, but reference should be made to the latest editions.

1.3 Definitions

For the purposes of this standard the following definitions apply.

NOTE The following definitions are given in BS 3939-1 and BS EN 61082-1.

1.3.1

symbol element

a simple figure with a defined meaning which has to be combined with other figures to form the complete symbol for a device or a concept

1.3.2

general symbol

a symbol, usually simple, common to a whole family of items, and characteristic of that family

1.3.3

qualifying symbol

a symbol added to another to provide additional information

1.3.4

block symbol

a simple graphical symbol, representing an assembly of items and intended to indicate the function of the assembly, neither giving details about the items nor taking account of all connections

1.3.5

block diagram

an overview diagram using block symbols predominantly

1.3.6

circuit diagram

a diagram showing the implementation of the circuits of a system, sub-system, installation, part, equipment, software, etc., depicting components and connections by means of graphical symbols arranged to show the functions but without necessarily taking into account the physical sizes, shapes, or locations of the items

1.3.7

connection diagram

a diagram showing or listing the connections of an installation or equipment

1.3.8

interconnection diagram

a connection diagram showing the connections among different constructional units

Section 2. Principal types of diagram

NOTE This Section describes the four principal types of diagram. For other types of diagram, reference should be made to BS EN 61082-1 which gives a comprehensive classification of diagrams.

2.1 Block diagram

A block diagram is a relatively simple diagram in which an installation or equipment, together with its functional interrelationships, are represented by block symbols, symbols or block outlines with annotations, without necessarily showing all the connections.

See Figure 1 and Figure 2.

2.2 Circuit diagram

A circuit diagram shows in full the functioning of a circuit, depicting all its essential components and connections by means of graphical symbols. Its arrangement should show the operation as clearly as possible without regard to the physical layout of the various items, parts or connections. It helps the understanding of the circuit.

See Figure 3 to Figure 5.

2.3 Connection diagram

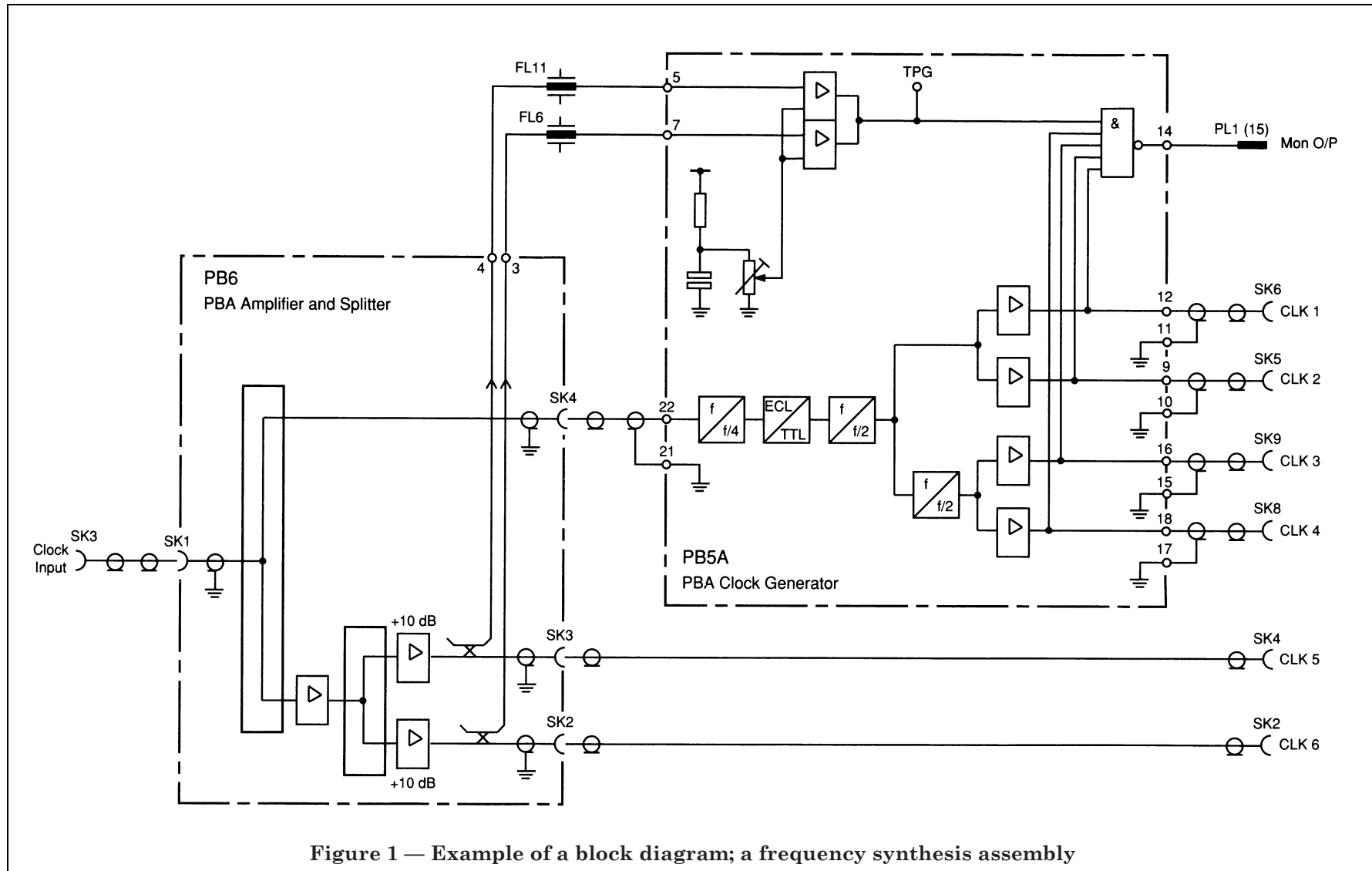
A connection diagram shows the detailed connections between components or items of equipment and in some cases the routing of these connections. Its purpose is to help the wiring of a circuit.

See Figure 6.

2.4 Interconnection diagram

An interconnection diagram represents the connections between the different units of an installation. Its purpose is to show the external connections of a unit (the internal connections being shown in a wiring diagram).

See Figure 7 and Figure 8.





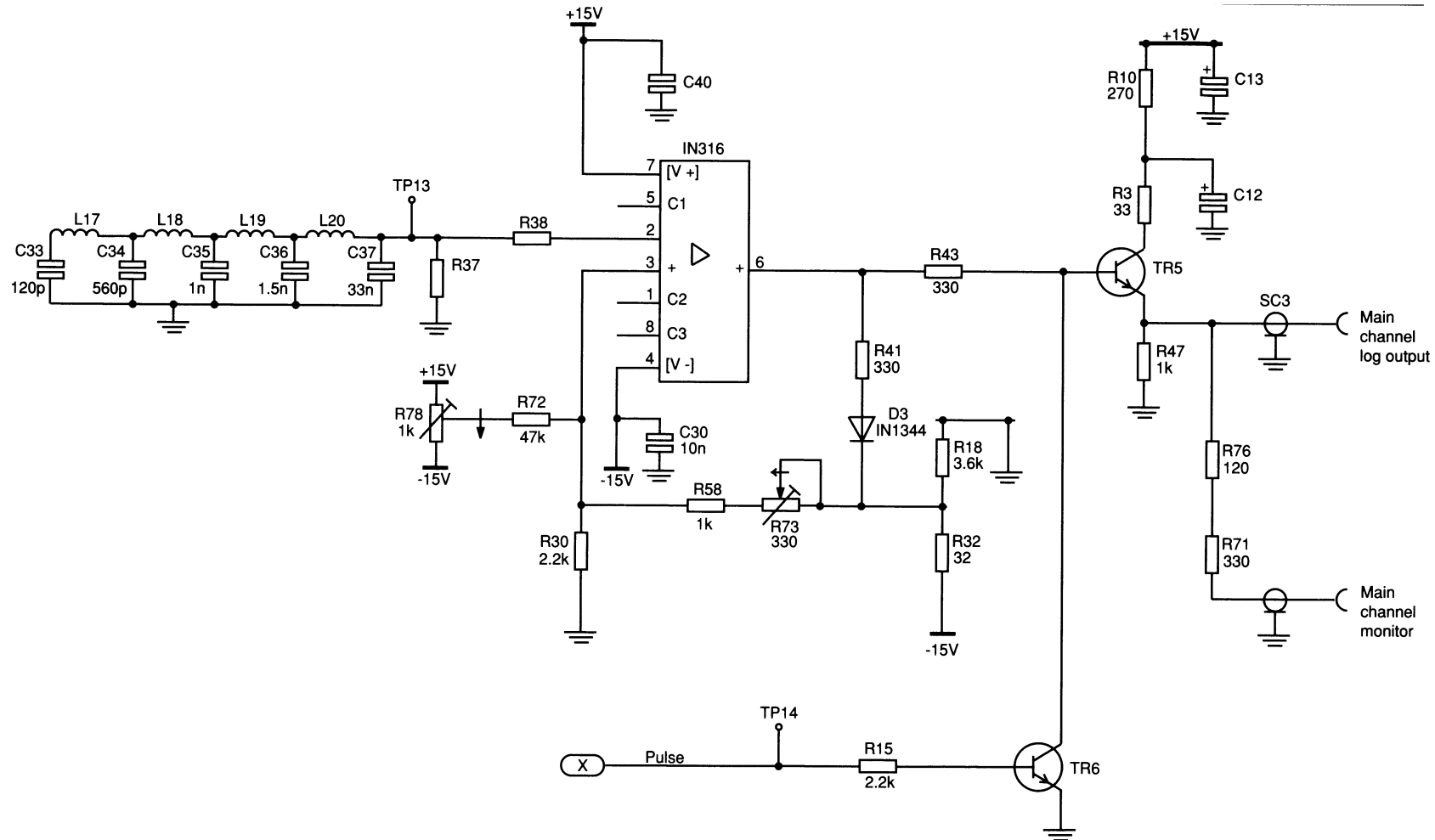


Figure 3 — Example of part of an analogue circuit diagram; a main channel detector

35

3A Clock Generator

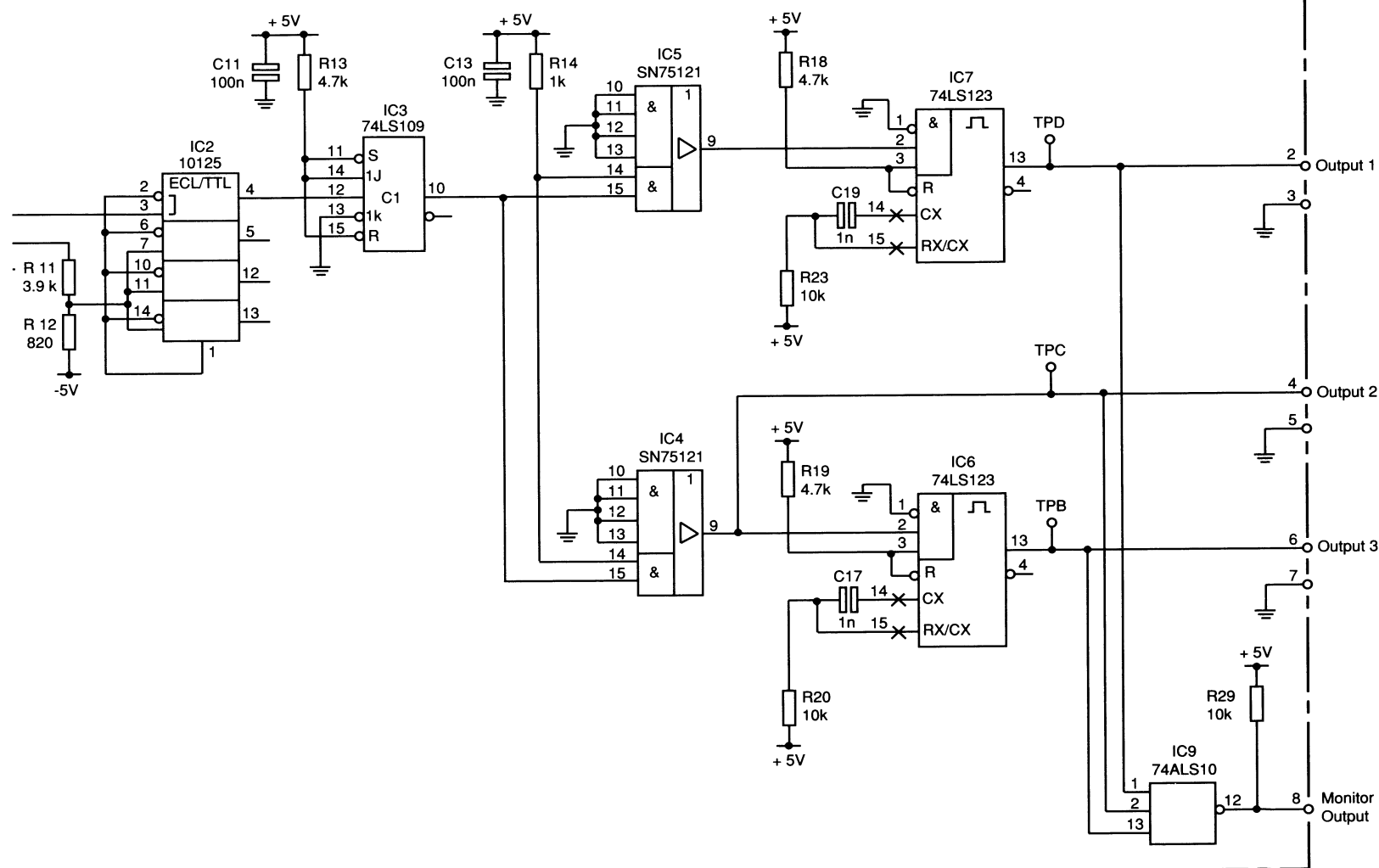


Figure 4 — Example of a digital circuit diagram; a frequency generation circuit board

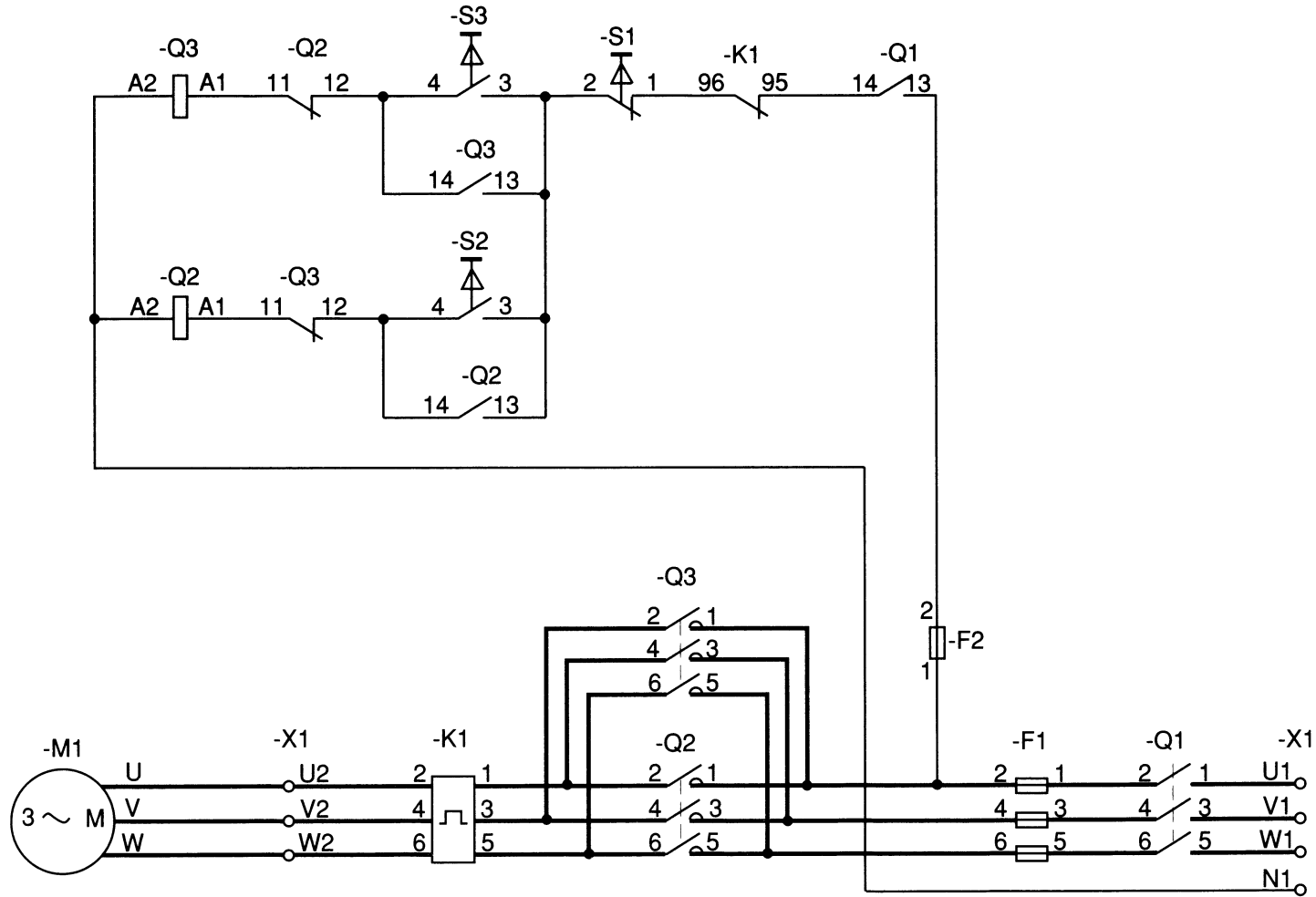


Figure 5 — Example of a circuit diagram using detached representation

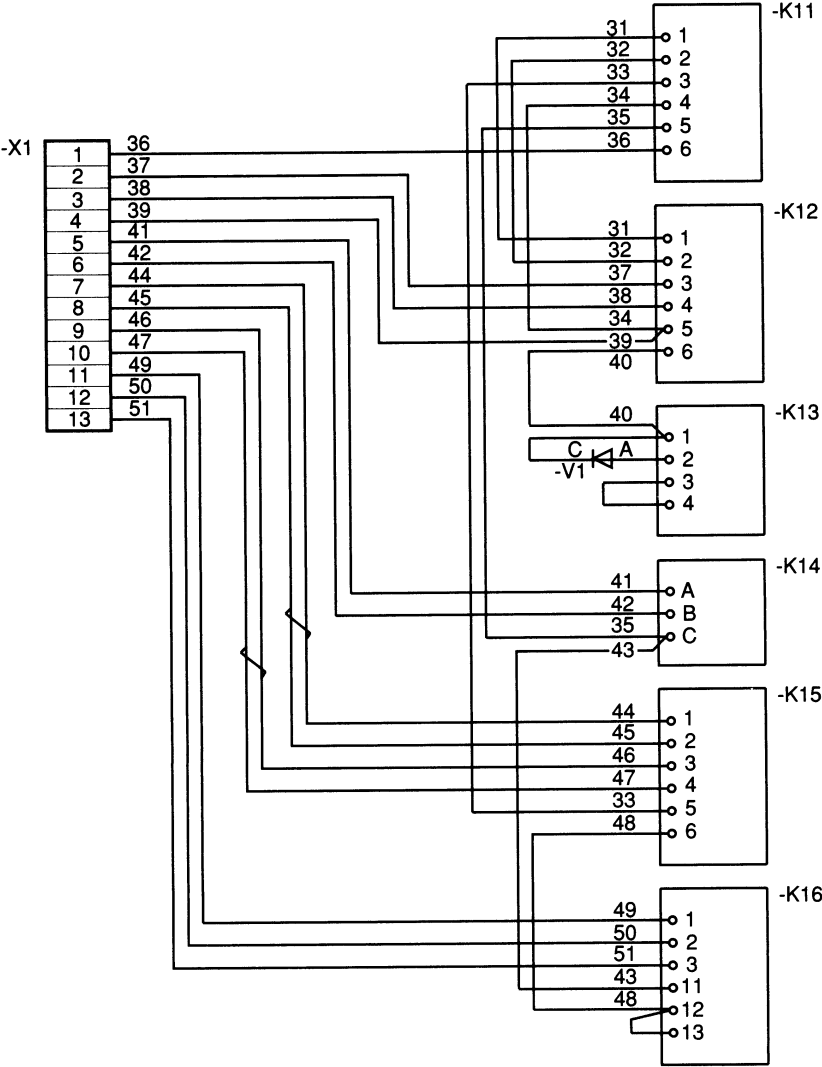


Figure 6 — Example of a unit connection diagram using continuous lines

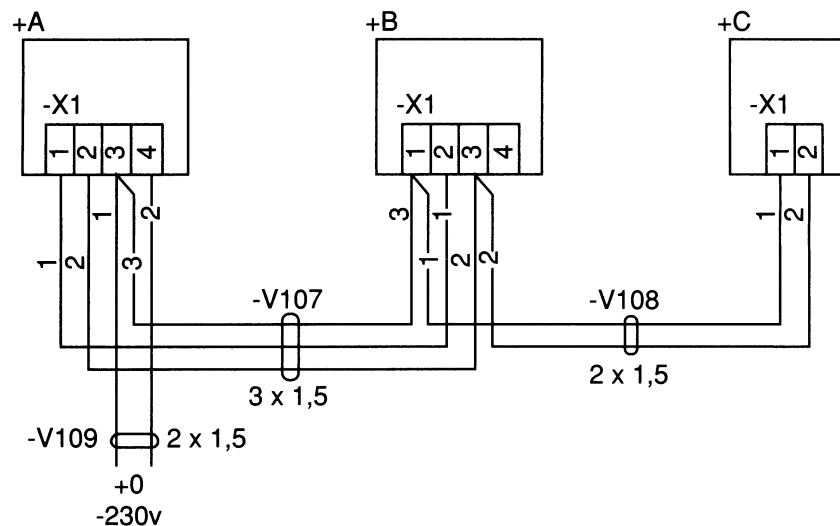


Figure 7 — Example of an interconnection diagram using multi-line representation

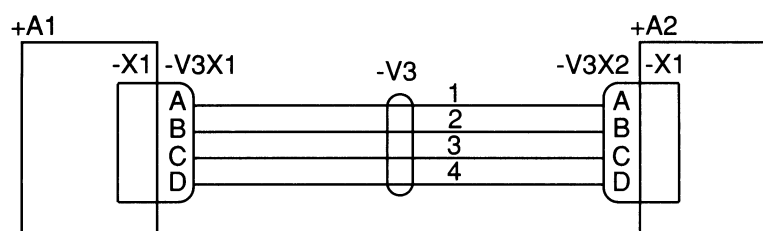


Figure 8 — Example of an interconnection diagram with cable end connectors

Section 3. Use of qualifying symbols, symbol elements and other symbols

3.1 General

The symbols given in BS 3939 and BS EN 60617-13 may be combined to produce more complex and more descriptive symbols.

The relationships between the symbol definitions defined in clauses 1.3.1, 1.3.2, 1.3.3 and 1.3.4 are shown in Figure 9. The diagram shows that general, qualifying and block symbols are all made up of symbol elements, and that combinations of these form the two main types of symbols used in diagrams, which are:

- a) component symbols which represent actual physical devices;
- b) functional symbols which generally represent a theoretical concept.

NOTE The term “graphical symbol” applies to all of the symbol definitions in the diagram.
The examples given in sections 3.2 and 3.3 illustrate the concept of combinative symbology.

3.2 Use of qualifying symbols

Qualifying symbols are added to general or block symbols where necessary in order to define more closely the item concerned.

Example 1. The qualifying symbol representing variability can be added to the general symbol for a resistor, forming a component symbol for a variable resistor (see Figure 10).

Example 2. The qualifying symbol representing pre-set adjustment can be added to the block symbol for an attenuator, forming a functional symbol for a pre-set attenuator (see Figure 11).

Qualifying symbols cannot be employed independently, but it should be noted that component symbols may also be used for qualifying purposes, for example, the symbol for a piezo-electric crystal may be inserted into the symbol for a microphone to produce a component symbol for a crystal microphone (see Figure 12).

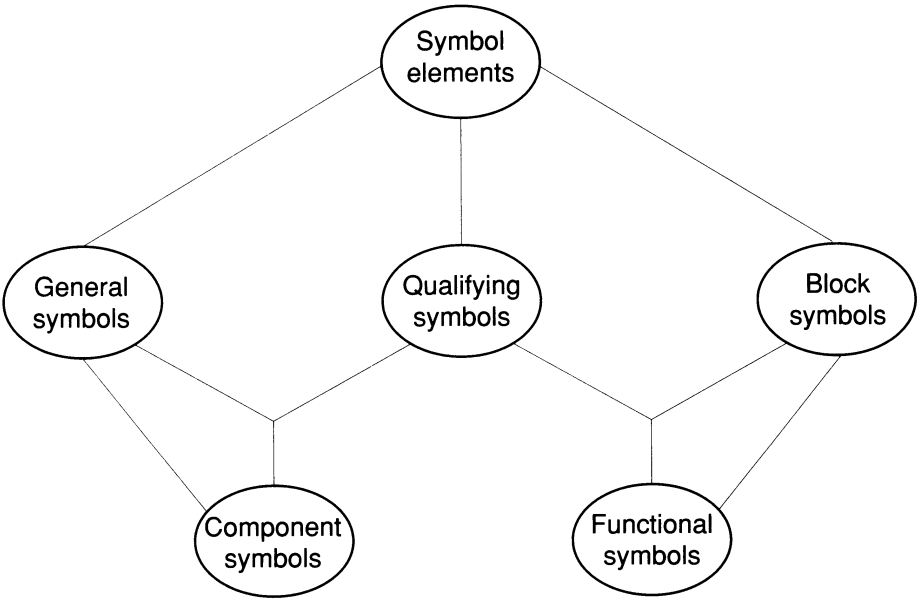


Figure 9 — Relationships between symbol definitions

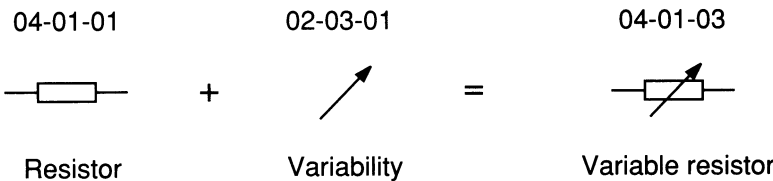
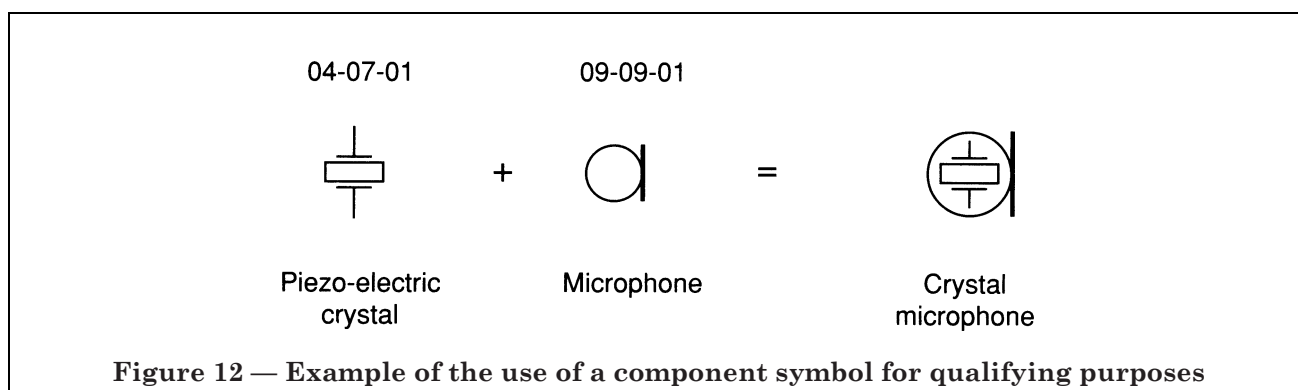
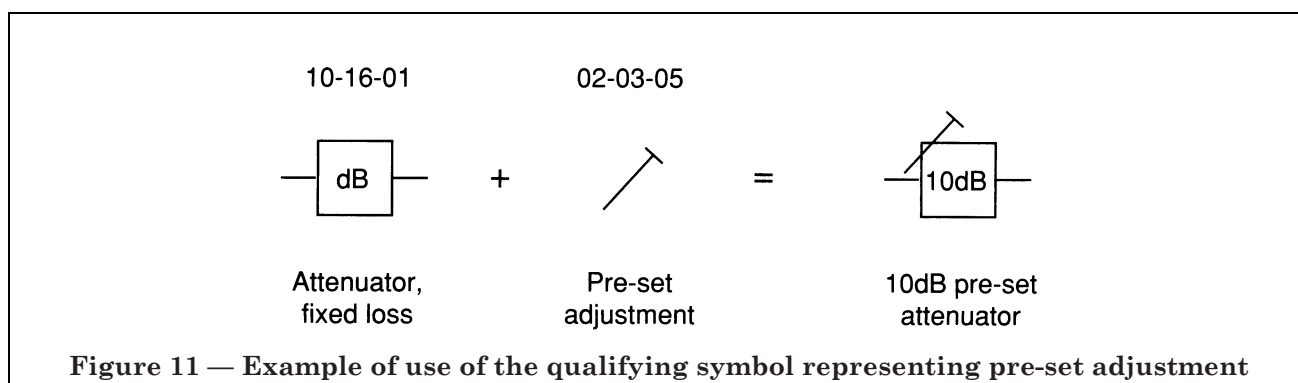


Figure 10 — Example of the use of the qualifying symbol representing variability



3.3 Use of symbol elements and other symbols

If the symbol for a particular type of component cannot be found, it should nevertheless be possible to produce it from the graphical symbols found in the standard.

Figure 13 to Figure 15 show further examples of how component and block symbols of varying complexity have been built up using this approach, and include the reference numbers which appear for each symbol in the appropriate Part of BS 3939.

NOTE It is possible for different versions of a symbol for the same device to be created by individual interpretation. This is acceptable as long as the function is correctly conveyed, and only one version of the symbol is used on the drawing.

Figure 13 shows a symbol for a resistive device with a positive temperature coefficient, used for circuit protection. The device undergoes a large, abrupt change in resistance when heated above a specific temperature. Circuit operation is automatically resumed when the operating temperature returns to normal. A minimum reset time prevents continuous cycling.

In this application, the function has been compared to that of a fused switch, and this symbol has been added as a further qualifying symbol.

Figure 14 shows a symbol for a voltage to frequency converter, consisting of an input amplifier, a precision oscillator, and an open collector output stage. Note the use of the symbols to differentiate between the digital output and the analogue input signals, and also the non-logic connections.

Figure 15 illustrates one version of a double pole, three position lever operated switch. The symbol shows the functional operation of the switch, which is locking in the upper position, with a spring return from the lower to the middle position. The middle position is the “no connect” off position. The switch is shown with numbered terminals, and front panel markings.

