

BS 376-2:2015



BSI Standards Publication

Railway signalling symbols – Part 2: Specification for symbols for circuit diagrams

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Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 40, an inside back cover and a back cover.

Foreword

Publishing information

This part of BS 376 is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 30 April 2015. It was prepared by Technical Committee GEL/9/1, *Signalling and communications*, under the Technical Committee GEL/9, *Railway electrotechnical applications*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

This part of BS 376 supersedes BS 376-2:1954 *Railway Signalling Symbols – Part 2: Wiring symbols and written circuits*, which is withdrawn.

Relationship with other publications

BS 376 is issued in two parts, namely:

- BS 376, Railway signalling symbols – Part 1: *Specification for schematic symbols*

Part 1 shows schematic symbols designed for use on railway layout plans to show the signalling requirements.

- BS 376, Railway signalling symbols – Part 2: *Symbols for circuit diagrams – Specification*

Part 2 (this part) shows the actual apparatus used, with its electrical connections and simplified wiring diagrams.

Information about this document

This is a full revision of the standard, updated to current practice.

This standard has its origins in a specification published by the Railway Signal Association in the USA in 1911, by which date a scheme of symbols and nomenclature for electrically operated apparatus had evolved, using both written circuits and wiring symbols. Subsequent issues of the standard have sought to be backward-compatible with the original scheme, since signalling documentation is maintained for the whole life of the signalling.

A standard system of nomenclature and labelling of wires is specified.

Typical applications are illustrated in Annex A.

If a symbol required for railway signalling purposes does not appear in this standard, the symbol should be taken from an appropriate British Standard or International Standard.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is "shall".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Requirements in this standard are drafted in accordance with *The BSI guide to standardization – Section 2: Rules for the structure, drafting and presentation of British Standards*, subclause 11.3.1, which states, "Requirements should be expressed using wording such as: 'When tested as described in Annex A, the product shall ...'". This means that only those products that are capable of passing the specified test will be deemed to conform to this standard.

This part of BS 376-2 shows railway signalling symbols for written circuits and the traditional wiring symbols in tables side by side.

When necessary, to avoid confusion, diagrams may be marked with the following reference:

Symbols to BS 376-2:2015

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

1 Scope

This British Standard specifies the symbols to be used on railway signalling circuit diagrams but does not provide guidance on their application.

It also gives a standard system of nomenclature and labelling of wires such that each wire can be readily identified with that shown on the circuit diagram.

This British Standard does not cover symbols for high voltage power distribution, telecommunications or electronic products. These are covered in IEC 60617 or an appropriate British Standard.

This British Standard does not include proprietary systems and specialized applications.

NOTE 1 The symbols in this British Standard provide for apparatus in general use. Wiring symbols have been designed so that they can be combined together where one does not represent the complete device. In this British Standard, where certain elements are added for illustrative purposes, they are shown by dashed lines. If additional information is required to support the symbol, a “#” may be used to reference a note on the diagram.

NOTE 2 The size of symbols as drawn are in proportion but are not necessarily relative to one another; nor do they give the specific size to be used. The relative thickness of lines may also be varied, e.g. for contact elements.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 7645, *Code for designation of colours*

BS 8586, *Pin codes for BR 930 series relays – Specification*

3 Terms and definitions

For the purposes of this part of BS 376, the following terms and definitions apply.

3.1 biased (relay, device)

two-position electromagnetic device, being either:

- a) a polar device in which the armature in the de-energized state is driven in a specified direction (normal or reverse) by magnetism, gravity or spring; or
- b) a neutral device operating only when current flows through the coil in a specified direction (known as “d.c. biased”)

3.2 normal (state)

display or position of a piece of apparatus in a designated state (usually its quiescent state)

3.3 polar (relay, device)

two- or three-position electromagnetic device with two energized states (normal and reverse) depending upon the direction or phase of the current flowing through the coil

NOTE A two-position device can either stick in its last operated position, or be biased in the de-energised state.

3.4 polarized

circuit or armature in which the resulting operation is dependent on the polarity or phase of the current

NOTE A polarized circuit can either operate a polar device or a pair of d.c. biased devices wired in opposition.

3.5 stick (relay)

two-position electromagnetic device which is maintained in an operated state, being either:

- a polar device held in its last operated position by magnetism, gravity or spring, until operated in the opposite sense; or
- a neutral relay held energized over its own front contact until de-energized by other circuit conditions

4 Signalling relays and circuit diagrams**4.1 Circuit diagrams**

Signalling circuit diagrams shall follow one of three types of representation:

- the now commonly used straight line diagram, also known as a written circuit, in which the symbols, with abbreviated designations, are drawn in a straight line, the two ends of which represent the terminals of the source of supply;
- the traditional method using wiring symbols in which, generally, each complete piece of apparatus is represented by a symbol, for example a direct current relay comprising a coil and at least one moving contact;
- a hybrid circuit plan, no longer widely used, by which internal wiring or analysis is shown with wiring symbols, in conjunction with written circuits representing through circuits.

NOTE 1 The symbols for each type of circuit diagram are given in Table 2 to Table 10.

NOTE 2 The intended nomenclature for the circuits is shown opposite each symbol. Further details of nomenclature are given in Clause 7.

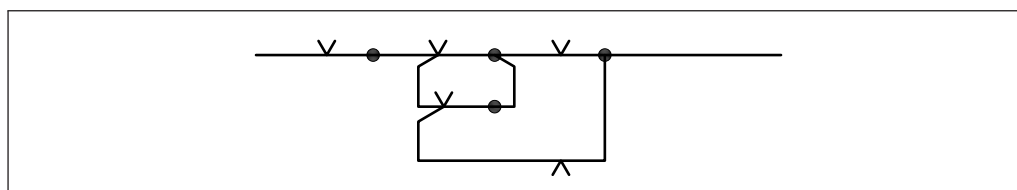
NOTE 3 For comparison, examples of circuit diagrams using written circuits and wiring symbols are illustrated in Annex A.

4.2 Written circuits

For written circuits, the following conventions shall be conformed to, as appropriate:

- Wires shall be clearly drawn in straight lines irrespective of the relative positions of the apparatus, as shown in Figure 1.

Figure 1 Drawing of wires in written circuits



- Unless otherwise indicated, the left, or upper, termination of the line shall be considered to be positive, or feed of supply.

NOTE 1 This is in accordance with the general convention given in 7.3.

NOTE 2 Orientation of the symbols may be varied to suit.

NOTE 3 Electrical supply nomenclature is given in 5.2.

- c) The number of each contact in the relay shall be indicated by a numeral or an alphanumeric under the circuit line in accordance with 7.3. This shall also apply to lever bands, circuit controllers and other contacts.
- d) Because constituent components, such as relay coils and contacts, are separated in written circuits, a schedule shall be provided for each apparatus to analyse the terminals used.

NOTE 4 Such an analysis may incorporate circuit diagram sheet number and number of wires on each terminal. It may be applied to terminal and fuse racks, as well as relays, lever bands and circuit controllers.

4.3 Wiring symbols

For wiring symbols, the following conventions shall be conformed to, as appropriate:

- a) Relays shall be shown by combining the symbols given in Table 2 and Table 3, as illustrated in Table 1.

NOTE 1 Wiring symbols may be laid out so as to depict the relative positions of the apparatus, as shown in Figure A.4.

Table 1 Combination of wiring symbols examples

Description	Combined symbol
D.C. neutral relay, fitted with one independent front contact and one independent back contact, and shown energized	
A.C. relay, double element with three-position armature fitted with one N and one R dependent contact	
D.C. neutral polar relay with neutral armature fitted with one front and one back dependent contacts and polarized armature, fitted with one N and one R dependent contacts	

NOTE 2 Wiring symbols may be drawn to show the quiescent state of the circuit.

- b) The sign ~ shall be used to indicate alternating current. Unless so indicated, direct current shall be assumed, for example:

Electromagnet a.c.

Bell a.c.

4.4 Symbols for relay coils and relay contacts

On circuit diagrams the symbols for relay coils given in Table 2 and the symbols for relay contacts given in Table 3 shall be used, as appropriate.

Table 2 Relay coils (electromagnets)

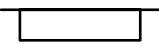
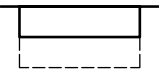
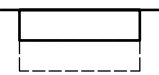
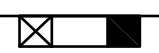
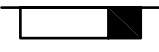
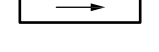
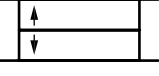
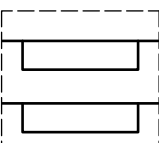
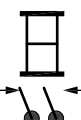
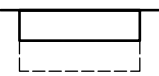
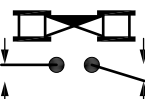
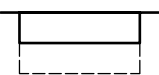
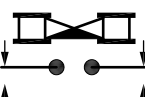
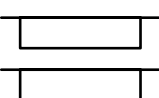
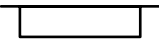
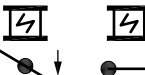
Symbol No.	Nomenclature	Description	Written circuit	Wiring Symbol
2.1	L, R, V, W	Electromagnet, polar or non-polar ^{A)}		
2.2	R	Electromagnet, with double winding ^{B)}	 C)	
2.3	R Q	Electromagnetic system, requiring two energized windings (a.c.)	 C)	
2.4	R	Electromagnet, slow acting ^{D)}		
2.5	R	Electromagnet, slow release ^{D)}		
2.6	R	Electromagnet, slow pick-up ^{D)}		
2.7	R	D.C. biased relay, operating only when current flows through coil in direction of arrow		
2.8	R	Magnetically latched non-polar relay, the single armature remaining in its last operated position until relay is next energized or released	 C)	
2.9	R	Magnetic stick polar relay, the single armature remaining in its last operated position until relay is energized in the opposite sense	 C)	
2.10	R	Interlocked relay, mechanical interlocking preventing both armatures assuming fully energized position at the same time	 C)	
2.11	R	Interlocked relay, mechanical interlocking preventing both armatures assuming fully de-energized position at the same time	 C)	
2.12	R R	Relay with twin independent coils and armatures		 E)
2.13	R	Flasher relay		

Table 2 Relay coils (electromagnets)

Symbol No.	Nomenclature	Description	Written circuit	Wiring Symbol
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^{A)} General symbol to be used for lock, relay, trainstop, point valve, etc.

^{B)} Add note if differentially wound.

^{C)} Each winding shown separately or together. A dotted line shows that reference to the other circuit is required.

^{D)} Typically 150 ms or greater.

^{E)} Example shows coils wired in parallel for integrity.

Table 3 Relay contacts

Symbol No.	Nomenclature	Description	Written circuit	Wiring symbol ^{A)}		
3.1	F & A	Contact on non-polarized armature. Front contact closed when relay is energized				
3.2	B & A	Contact on non-polarized armature. Back contact closed when relay is de-energized				
3.3	N & A	Contact on three-position polarized armature. N contact closed only when relay is energized to N position				
3.4	D & A	Contact on three-position polarized armature. D contact closed only when relay is de-energized				
3.5	R & A	Contact on three-position polarized armature. R contact closed only when relay is energized to R position				
3.6	N & A	Contact on two-position polarized armature, N contact remaining closed until relay is energized to R position				
3.7	R & A	Contact on two-position polarized armature, R contact remaining closed until relay is energized to N position				
3.8	N & A	Contact on two-position polarized armature, biased by magnetism, gravity or spring in direction of arrow. N contact biased to normal ^{B)}				

Table 3 Relay contacts

Symbol No.	Nomenclature	Description	Written circuit	Wiring symbol ^{A)}		
3.9	R & A	Contact on two-position polarized armature, biased by magnetism, gravity or spring in direction of arrow. R contact biased to normal ^{B)}				
3.10	F, A, B	Contact examples: contacts on non-polarized armature, normally energized	dependent independent	dependent independent	independent	
3.11	N, A, R	Contact examples: contacts on two-position polarized armature				
3.12	N, A, R D & A	Contact examples: contacts on three-position polarized armature				

Table 3 Relay contacts

Symbol No.	Nomenclature	Description	Written circuit	Wiring symbol ^{A)}	
3.13	F, A, B	Bridging contacts on non-polarized armature, both contacts closed during movement of armature		energized 	de-energized
3.14	F	Double break contacts on non-polarized armature. Front contact closed when magnet energized			
3.15	B	Double break contacts on non-polarized armature. Back contact closed when magnet de-energized			
3.16	JR ^{C)} F & A	Time controlled contact. Front contact makes a specified time after relay energized (delayed operation) or breaks a specified time after relay de-energized (delayed release)		delayed release timer 	delayed operation timer
3.17	JR ^{C)} B & A	Time controlled contact. Back contact breaks a specified time after relay energized (delayed operation) or makes a specified time after relay de-energized (delayed release)			
3.18	F & A	Contact fitted with magnetic blow-out			
3.19	—	Contacts on flasher relay		or 	

^{A)} Showing the quiescent state of the circuit as energized or de-energized.

^{B)} Arrow always points left for biased to normal; right for biased to reverse.

^{C)} Time to be specified beside JR name.

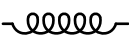
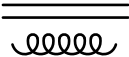
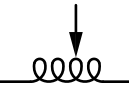
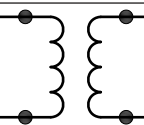
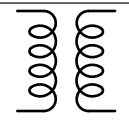
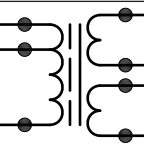
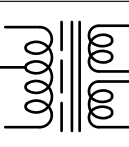
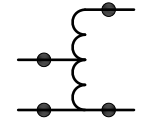
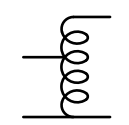
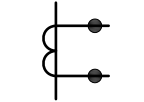
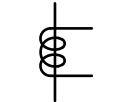
5 Electrical supply to railway signalling apparatus

5.1 Symbols for low voltage supply arrangements

Where low voltage (LV) or extra-low voltage electrical supply arrangements are to be shown on a railway signalling circuit diagram, the symbols given in Table 4 shall be used, as appropriate.

NOTE For high voltage or three-phase supply and power schematics, see also IEC 60617.

Table 4 Transformers, switchgear, earthing and other LV supply arrangements

Symbol No.	Nomenclature	Description	Written circuit	Wiring symbol
4.1	I	Inductor, choke, general symbol ^{A)}	 B)	
4.2	I	Inductor with magnetic core	 B)	
4.3	I	Inductor, variable	 B)	
4.4	T	Transformer, general symbol	 B)	
4.5	T	Transformer with magnetic core, screen, multiple windings and tapings	 B)	
4.6	T	Auto-transformer	 B)	
4.7	T	Current transformer	 B)	
4.8	J	Half wave rectifier, diode, general symbol		
4.9	–	Light emitting diode (LED)	