



AUSTRALIAN RAIL TRACK CORPORATION LTD

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Infrastructure Engineering Manual – Glossary of Signalling Terms

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About This Standard

This glossary is a collection of common railway signalling terms and their meanings according to historical usage by signalling engineers in the NSW railways.

Meanings may not correspond to usage of similar terms in other rail systems. The glossary is intended as general information.

Persons complying with railway safeworking procedure requirements or with signalling specification requirements, or responding to other signalling documents, are to follow the definitions and usage contained in those publications and documents.

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ABSOLUTE BLOCK

A system of train operation that prevents more than one train being in the block section at any one time.

ACCEPT LEVER

The lever or control device that is operated in order to accept a train towards the signaller's interlocking from the adjacent interlocking or section.

ADVANCED TRAIN CONTROL SYSTEM (ATCS)

An incomplete American development for advanced signalling and train control systems founded on a standard specification for a digital data communications network including a train-based communications platform. ATCS specifications would incorporate transmission based positive train separation as well as non-signalling features such as locomotive health monitoring.

'A' LIGHT

An indication in the form of a letter 'A' mounted on a running signal which when displayed instructs the driver to treat the running signal as an automatic signal.

ANNETT KEY

A key with wards which is fitted either to a staff or a large handle and which is used to operate the Annett lock on interlocking equipment or to operate a Duplex lock.

ANNETT LOCK

A lock operated by an annett key and used to lock, release or operate signalling equipment.

APPROACH CLEARING

A term used in connection with the clearing of a signal upon the approach of a train.

APPROACH LIGHTING

A method of illuminating signal lights upon the approach of a train.

APPROACH LOCKING

Approach locking is track locking applied to prevent the alteration of points interlocked by a route, or the setting of an opposing route, once the signal for the route has been cleared and an approaching train has received an indication that the signal has been cleared.

AREA OF CONTROL

The extent of track subject to the control of a single signaller. Includes any automatic signalling supervised by the signaller.

AUTOMATIC NORMALISATION OF CATCH-POINTS

Catch-points which are automatically operated to the normal position when the route is normalised after the passage of a train.

AUTOMATIC RECLEARING

Automatic reclearing, when initiated by the signaller, enables a controlled running signal route which has already been set, to operate in the same manner as automatic signals and thus avoid the need for the signaller to 'restroke' the signal to clear it again after the passage of a train. This feature is not generally provided if there is risk of wrong road movements occurring.

AUTOMATIC ROUTE NORMALISATION

The automatic normalising of signal routes after a train passes the signal.

AUTOMATIC ROUTE SETTING

A system which is used in conjunction with an interlocking system to automatically operate signals and points for the passage of trains.

Signal routes over facing points which are set automatically for trains based on information derived from timetables, train describers and/or a priority based algorithm.

AUTOMATIC SIGNALLING SYSTEM

A system of safeworking used on double lines in track-circuited sections between adjacent controlled interlockings. In this system the section between two controlled interlockings is usually equipped with automatic signals so that more than one train may travel in the same direction at one time.

AUTOMATIC SWITCH BOX

Equipment associated with a staff instrument at an unattended station in an Electric Train Staff section. The automatic switch box enables an electric train staff for the section to be withdrawn from the staff instrument at the opposite end of the section, provided the staff instruments are in phase, as they would be if there is no other staff already withdrawn.

AUTOMATIC TRAIN OPERATION (ATO)

A system that includes Automatic Train Protection but also can start up, accelerate, coast, slow or stop the train in accordance with information received and without input from a driver.

AUTOMATIC TRAIN PROTECTION (ATP)

A system which supervises train speed and target speed, alerts the driver of the braking requirement, and enforces braking when necessary. The system may be intermittent, semi-continuous or continuous according to its track-to-train transmission updating characteristics.

AUTOMATIC TRAIN REPORTING

The automatic reporting of the running of individual trains which is compared against the timetable. The information is usually derived from computer based train describer systems and the train's identity is recorded at the time it passes nominated signals, or over nominated track circuits, or over track transponders, or is entered manually at nominated locations. The details are usually compared with the actual timetable stored in a computer and reported by exception to nominated terminals on the computer's network.

AUTOMATIC TRAINSTOP SYSTEM

A system which uses trainstops for braking enforcement. The trainstops are operated by the signalling system and initiate an emergency brake application on a passing fitted train if the train should have stopped or has been detected as travelling above the required speed.

AUTOMATIC VEHICLE IDENTIFICATION (AVI)

A system which positively identifies a vehicle as it passes a location by reading an identification label on the vehicle, and relays this information to a control centre.

AUTOMATIC WARNING SYSTEM (AWS)

A British Railways' intermittent track to train audible warning system, which supervises the driver's reaction to signal caution aspects and indicates to the driver the passing of a clear aspect. Mostly advisory, however it will cause a brake application to be made automatically if the driver fails to react when approaching a restrictive aspect.

AVAILABILITY

The probability that a system will be able to perform its designated function when required for use.

The percentage of operational time that an item is able to perform its designated function.

The probability that a signalling system is able to exercise effective control and management of train movements. This may be divided into availability at various levels of functionality –

- with full functionality
- with reduced functionality but without resort to alternative systems of control, and without more than minimal delay to train services.
- under emergency control arrangements, using alternative controls or alternative systems of safeworking.

AXLE COUNTERS

Equipment used to detect and indicate whether a section of track is occupied by a train, or part of a train. It does this by counting the number of axles of each train as it enters and leaves the section.

BACK LIGHT

A light showing through a small glass - covered opening in the back of a signal lamp. A back light is used to provide signallers at night with a means of checking the position of a semaphore signal arm and the operation of the signal light.

BALISE (SEE TRANSPONDER)

BALLAST RESISTANCE

The resistance offered by the ballast, sleepers, etc., to the flow of leakage current from one rail of a track circuit to the other.

BEACON (SEE TRANSPONDER)

BERTH TRACK

The track circuit immediately on the approach side of a signal.

BI-DIRECTIONAL SIGNALLING SYSTEM

A system of safeworking with signalling provided to allow the movement of trains in both directions over a line.

BLOCK INSTRUMENTS

Instruments fixed at each end of a block telegraph section and fitted with visual indicators which act as a reminder to the signaller as to the state of that block telegraph section. The block indicator in these block instruments shows “Line Closed”, “Line Clear”, “Train on Line” and “Train Arrived”.

BLOCK POST

A temporary safeworking location located within a pilot staff or block working section to increase the flow of traffic and worked in accordance with the safeworking procedures.

BLOCK SECTION

A length of running line of defined limits, the entry to which is usually governed by stop signals.

BLOCK TELEGRAPH SYSTEM

A system of safeworking used on double lines, usually in non track-circuited areas. Each interlocking is equipped with a block instrument(s). The instruments are electrically interconnected between interlockings to allow signallers to transmit train working signals to each other and to indicate the condition of the section. Under normal conditions, the authority for a train to occupy a section between interlockings is the clearing of the starting or home/starting signal.

BLOCK WORKING

Any method of working trains where a train must not depart from a safeworking location until the preceding train has either arrived complete at the safeworking location in advance, or has been reported as having been placed clear of the line.

BLOCKING

A means to prevent clearance of a signal when it is desired to inhibit entry of a train movement into the block section governed by the signal.

BLOCKING FACILITY

A device applied by signallers to the controls of signals and points and to other safeworking equipment in order to prevent the controls or equipment from being operated. Blocking facilities remind the signaller not to operate these lever, switches, keyboard commands or safeworking equipment.

BLOCKING, FIELD

Vital blocking which makes use of a vital relay located at the controlled point or remote controlled interlocking.

BLOCKING, NON VITAL

Non-vital blocking is blocking which is incorporated in an Operator Interface or Train Control System to inhibit specific controls to call routes and points from being sent out to an interlocking.

BLOCKING, VITAL

Blocking which is incorporated in the interlocking apparatus and uses vital equipment to prevent the operation of particular signalling apparatus. Operator controls to apply blocking are independent of controls to remove the blocking.

BOARD, ADVISORY SPEED

A distinctive speed board indicating to drivers to reduce the speed of the train so that the train is not travelling in excess of the speed shown on the board before passing the next signal ahead. However, as soon as the driver observes that the next signal ahead is displaying a full clear indication, normal track speed for that indication may be resumed. The driver does not allow the train to exceed any other lower temporary or permanent track or train speed restrictions, irrespective of the speed indicated by the advisory speed board.

BOARD, CAUTION

A temporary speed board with the word CAUTION and a speed plate attached to warn drivers of the speed at which trains are to travel over the next portion of the line which may be unsafe at normal speed.

BOARD, CLEARANCE

A board at the end of a temporary speed board zone with the word CLEARANCE to indicate to drivers that normal track speed can be resumed.

BOARD, LIMIT OF SHUNT

A safeworking notice board on a running line indicating a point beyond which shunting movements must not be made.

BOARD, PERMANENT SPEED

A fixed board which indicates to the driver the maximum allowable speed for trains on the portion of line ahead up to the next speed board.

BOARD, STOP

A safeworking notice board inscribed “Stop”, at which all trains must stop and must not pass until authorised.

BOARD, WARNING

A temporary speed board with the word WARNING and a speed plate attached to warn drivers of the speed at which trains are to travel over the next portion of the line which may be unsafe at normal speed.

BOLT LOCK

A metal bar or plunger, combined with a cross-slide and arranged in such a manner as to prevent movement of the cross-slide when the plunger is inserted.

BOND

Usually refers to a conductive cable or wire connecting to rails of a track to provide a reliable low electrical resistance path for track circuit and/or traction return currents.

BOND, ELECTROLYSIS (SEE ELECTROLYSIS BOND)

BOND, IMPEDANCE

A centre tapped iron cored coil connected between the rails that has a high reactance to track circuit alternating currents but low resistance to DC traction return current. It is used to provide a continuous path for traction return current where insulated joints are used to separate adjacent track circuits.

BOND, PLUG

A traction bond with the termination on each end of the bond consisting of a cylindrical plug which forms a close fit in a hole drilled in the rail web. It is secured in place by the expanding action of a bond plug being driven into a hole through its centre.

BOND PLUG

The bullet-shaped piece of steel which is used to secure a plug bond.

BOND, RAIL

A bond connected to adjoining rails to ensure reliable electrical conductivity around mechanical rail joints.

BOND, RESONATED IMPEDANCE

An impedance bond provided with a secondary winding, connected to a capacitor, to increase the impedance of the bond to track circuit currents.

BOND, TRACTION

A bond of low resistance providing a reliable path for the traction return current around non-insulated rail joints.

BOND, WELDED

A bond which is welded to the rails.

BOND WIRE

Solid or stranded wire which is welded or pinned with channel pins around rail joints to provide reliable electrical conductivity.

BONDING, PARALLEL

The bonding of both rails of a turnout such that they are connected in parallel with the other straight rails comprising the track circuit.

BONDING, SERIES

The bonding of both rails of a turnout such that all rails comprising a track circuit are connected in series.

BONDING, SERIES/PARALLEL

The bonding of one rail of a turnout as series bonding and the other rail of the turnout as parallel bonding.

BOOTLEG

A protection for track circuit wires where the wires leave the conduit or ground near the rail. Generally a termination point between wires that connect to the rails and the corresponding cable leads that go to the trackside equipment location.

BRAKE DELAY TIME

The time which elapses after a brake application is initiated until the train brakes start to apply.

BRAKING CURVES

Plots of speed against distance for the braking performance of particular trains from various speeds over various gradients.

BRAKING DISTANCE

For a nominated portion of railway the maximum distance which any train operating on such portion of railway at its maximum authorised speed, will travel during a full service application of the brakes, between the point where such application is initiated and the point where the train comes to a stop.

BROKEN RAIL DETECTION

The detection of broken rails, usually through failure of track circuits which use the rails as conductors.

CAB SIGNAL

Apparatus installed in the driver's cab for giving visual and/or audible indication as to the signal aspect, or position of semaphore arms, or in lieu of fixed signals.

CABLE

An insulated electrical conductor, or group of conductors separately insulated and contained within the one insulating sheath.

CABLE, AERIAL

A multi-conductor cable, designed for erection on an overhead line wire route.

CABLE, CO-AXIAL

An insulated conductor within a conductive sleeve covered by an insulating sheath. The conductor and sleeve form the two conductors of the one circuit.

CABLE JOINT

The electrical in-line connection of the conductors of two lengths of cable and the insulation and sealing of those connections.

CABLE JOINT, RE-ENTERABLE

A form of cable joint housing which is not permanently sealed, permitting subsequent access to the joint interior without destruction of the housing or cable.

CABLE, LEAKY CO-AXIAL

A special co-axial cable which radiates radio transmission signals continuously along its length.

CABLE, OPTICAL FIBRE

A medium for long-distance transmission of data by transmission of light pulses by total internal reflection along a fine glass fibre. A number of individual fibres with mechanical protection are usually built up into a single optical fibre cable.

CABLE, PIT

A partially buried chamber through which underground cables run and are accessible at that point. Frequently installed to facilitate the pulling of cables through underground conduits.

CABLE ROUTE

The route and its method of construction for cables running between equipment locations (main cables) or between equipment locations and trackside equipment (tail cables, local cables).

CABLE ROUTE, RE-ENTERABLE

A cable route where the cables can be added or removed from the route e.g. surface troughing or underground conduit.

CABLE ROUTE, UNDERLINE CROSSING (ULX)

An underline crossing (under track crossing) where the cable route crosses under the track from one side of the line to the other, usually at right angles to the track.

CABLE TROUGHING

Lidded ducting for housing cable runs in surface cable routes, e.g. ground level troughing GLT or troughing elevated on posts (pegline).

CATCH-POINTS

A set of points usually comprising a single switch or run-off lead, the normal position of which provides an open trap to a movement in the facing direction resulting in an enforced derailment thus avoiding a potential collision between movements. When the catch-points are closed they enable authorised facing and trailing moves to take place.

CATCH ROD

A rod connected to the catch handle of a mechanical lever which engages, directly or through the means of a catch block, with the quadrant of the interlocking frame, to hold the lever in the desired position.

CHANNEL PIN

Grooved, tapered steel pin which is used to secure a bond wire to form a reliable connection between the rail and bond wire. It is driven into the hole in the web of the rail alongside the bond wire.

CHECK RAIL

A rail or guide placed 45mm inside the running face of the rail to prevent wheel flanges passing on the wrong side of the tip of the “V” crossing. The check rail may also be used in other applications where it is desirable to provide an additional guide for wheel flanges.

CHROMATICITY (Signal Lenses)

Colour quality expressed numerically.

CHROMATICITY CO-ORDINATES

Two numbers that fix the position of a point on a colour diagram in order to numerically and graphically represent the colour of a lens or light source. The numbers represent the proportions of two of three primary colours in a mixture that matches the colour specified. These proportions are expressed in terms of the co-ordinates x, y in the CIE colorimetric system (AS 2633).

CIRCUIT CONTROLLER

A device for opening and closing electric circuits.

CIRCUIT, POLARISED

A circuit path in which the flow of electric current is reversed from time to time.

CLEAR

A proceed indication displayed by a signal.

The highest (least restrictive) proceed indication displayed by an upper quadrant semaphore signal.

In reference to a track circuit or block section or signal route, the absence of a train.

CLEARANCE BAR

A bar fixed alongside the rail and terminating at the clearing point of two converging lines. The clearance bar is interlocked with the points in such a manner that they cannot be moved while a train is passing over or standing on the bar.

CLEARANCE POINT

The nominated point where rail vehicles or trains are deemed clear of others at converging points or other locations.

CLEARANCE POST

A white post approximately 150 mm above rail level fixed at the clearance point of two converging lines. Where necessary a white light is displayed on the clearance post during dark.

CLEARING CONTROL

A control used on some Block Telegraph sections. On sections where clearing control is in operation, it prevents the block instrument at B from giving “Train arrived” until the train has arrived complete within the home signal at B.

CLEARING POINT

A nominated location on a running line at or beyond the home signal at an interlocking. The line must be clear to this location before the signaller can accept a train from the signal or interlocking in the rear. In track circuit areas the clearing point is at the end of the overlap track.

CLOSING KEYS

Interlocking keys with bow handles for securing frames at stations and other places when closed.

CLOSING LEVER

A lever, in an interlocking machine, which, when operated to reverse, will cause the signals on the main line through routes to either operate automatically or remain in the clear position.

COMMISSIONING (of signalling equipment)

Commissioning is the final phase of the implementation of signalling installation work where the installed equipment is permanently connected through, set to work, tested, accepted as ready to bring into use, and then brought into operational use in accordance with the safeworking procedures. Once commissioned, signalling equipment is to be operated and maintained by authorised, suitably competent persons, and is to be formally booked out of use, in accordance with the safeworking procedures, when no longer operationally required or when work, which could interfere with the safe operation of the signalling equipment, is to be carried out.

COMMON RETURN CIRCUIT

A term applied where one wire is used for the return of more than one electric circuit.

COMPENSATOR

An appliance with a pair of cranks so connected as to reverse the direction of travel in a run of iron rodding, and thereby counteract the expansion or contraction caused by changes of temperature.

COMPUTER BASED INTERLOCKING (CBI)

A computerised software system for providing the interlocking between points and signals.

CONDITIONAL CLEARANCE

The clearance of a train stop or signal at a reduced overlap clearance point, conditional upon trains approaching the train stop or signal at a reduced speed commensurate with the requirement of a reduced overlap distance.

CONFLICTING ROUTES

Two or more routes, opposing, converging, or intersecting, over which train movements cannot be made simultaneously without possibility of collision.

CONTACT

A pair of conducting pieces which co-act to open or close an electric circuit.

CONTACT, ADJUSTMENT

Adjustment of the operating linkages, cams, armature, or the position of the contact pieces, to open and close the contact as required in relation to the operating mechanism.

CONTACT, ARMATURE

The moving contact piece of a relay that connects to, and moves in unison with, the relay armature.

CONTACT, BACK

That contact of a relay which is closed (made) only when the relay is de-energised (dropped).

CONTACT, BIFURCATED

Contact which splits into two near the contact end, to provide two co-acting but independent contact actions for increased contact reliability.

CONTACT, CARBON SILVER

Contact surfaces composed of silver impregnated carbon to prevent contact surfaces fusing together; this is considered to be a risk with using metal to metal contacts in signalling circuits, particularly front contacts of devices with gravity drop away.

CONTACT, DEPENDENT

A changeover contact of a relay where the contact armature connects to either a front contact point or a back contact point, depending on whether the relay is energised or de-energised.

CONTACT, FRONT

That contact of a relay which is closed (made) only when the relay is energised (pickedup).

CONTACT, GOLD FLASHED

Contact surfaces treated with a thin film of gold to provide a reliable, low resistance, clean electrical contact, particularly in low voltage circuits.

CONTACT, NORMAL

A term used to designate a current carrying contact when the operating mechanism is in the normal position.

CONTACT, POINT

The fixed contact piece for either a front or back contact of a relay.

CONTACT RESISTANCE

The electrical resistance produced by the contact of two conductive surfaces.

CONTACT, REVERSE

A term used to designate a current carrying contact when the operating mechanism is in the reverse position.

CONTACT, ROTARY

Contact where the moving contact piece is a conductive segment on a rotary drum which turns to bring the segment into contact with the fixed contact piece.

CONTACT, WHEEL-RAIL

The quality of the electrical connection made between a train wheel and the rail surface on which it is standing or rolling.

CONTACT WIPE

A wiping action as contact surfaces initially come together and compress, to provide a reliable, low resistance electrical contact.

CONTACTOR

An electromagnetic device, usually a solenoid with tractive armature, which operates heavy duty contacts for controlling high current electrical circuits.

CONTACTOR, EMERGENCY CHANGEOVER

A contractor which changes over the load on a power supply to the emergency standby supply when the normal power supplies fails and changes it back when the normal power supply is restored.

CONTROL INDICATOR

An indicator on the track indicator diagram in signal boxes worked under the Track Block system. When the signaller at B reverses the accepting lever, the control indicator at A displays a white light indicating that the section from A to the clearing point at B is unoccupied and that B has accepted the train.

CONTROL PANEL

A panel which incorporates a layout of tracks for the area controlled from the signal box and which contains levers for the control of signals, routes, points, releases, etc. In certain cases, the control panel is combined into the track indicator diagram.

CONTROL REPEATER

An indicator on the track indicator diagram in signal boxes worked under the Track Block system. When the signaller at B reverses the accepting lever, the control repeater at B will display a green light.

CRANK

A lever, the arms of which form an angle, which pivots around an axis and is used to transmit motion from one rod to another rod.

CRANK, ACCOMMODATING

A two-arm crank with vertical axis, one arm of which is curved to facilitate connection.

CRANK, ADJUSTABLE

A right-angle crank, one arm of which is provided with means for varying its effective length.

CRANK, ECONOMICAL MOVEMENT

A hatchet crank in the drive of an EP facing point operating mechanism. The crank movement operates the facing point lock plunger and the points drive rod in the proper sequence, firstly operating the plunger lock slide to unlock the facing point lock, then driving the point switches over, and finally operating the plunger lock slide to lock the points in their new position.

CRANK HANDLE

An appliance by which electric and electro-hydraulic point machines can be manually operated.

CROSSING

A track structure used at the intersection of two running rails to provide support for wheels and passageways for their flanges, thus permitting wheels on either rail to cross the other.

CROSSING, DIAMOND

Where one track crosses over another track and consisting of 2 “V” crossings and 2 “K” crossings.

CROSSING, K

Where one rail crosses another and the running faces for the train wheels are in the form of the letter “K”.

CROSSING LOOP

A running line connected to a main line within an interlocking where trains may be held in service and not stabled to cross trains or permit other trains to pass. Usually provided in single line areas.

CROSSING, V

Where one rail crosses another and the running faces for the train wheels are in the form of the letter “V”.

CROSSING, SWING NOSE

A “V” crossing with movable point.

CROSSING, SWITCHED K

A “K” crossing with movable points.

CROSS-ARM

A timber arm, usually fastened at right angles to an electrical service pole, designed to carry the pins and insulators to which aerial line wires may be attached. The line wires are conductors for an electrical circuit e.g. signalling circuit, telecommunications circuit.

CROSSOVER

Two back to back turnouts with the track between the crossings arranged to form a continuous passage between two nearby and generally parallel tracks. Used to divert trains from one track to another.

CTC (CENTRALISED TRAFFIC CONTROL)

A system of working whereby the signals and points at a number of adjoining signalled sections, including interlockings, are operated remotely from a centralised train control centre.

CUT TRACK

A track circuit which has its feed open circuited by the front contacts of the next track relay ahead so that the track circuit cannot pick up until the next track circuit picks up.

DARK TERRITORY

An American term for non-signalled territory.

DEAD SECTION

A section of track, either within a track circuit or between two track circuits, the rails of which are not part of a track circuit for detecting trains.

DE-ENERGISED POSITION

The position assumed by the moving member of an electromagnetic device when the device is deprived of its operating current. Mostly the moving member opens and closes electrical contacts which are used in control and/or indication circuits.

DEPRESSION BAR

A bar fixed along side the rail at rail level and when depressed by the flanges of a wheel prevents the movement of points.

DERAIL (DERAILER)

A safety device consisting of a hinged ramp placed across the rail at specified locations within an interlocking. When seated over the rail head it will deflect a low speed movement off the rails resulting in an enforced derailment. When swung away from the rail head the derail enables authorised facing and trailing movements to take place. A derail is used to derail any train or vehicle which is in danger of fouling an adjacent line.

DETECTOR, DRAGGING EQUIPMENT

A device capable of detecting equipment dragging from a passing train.

DETECTOR, END OF TRAIN (SEE END OF TRAIN DETECTOR)

DETECTOR, FLAT WHEEL

Also known as a wheel impact detector, detects the presence of a flattened wheel surface on a passing train by detecting the vibration produced by the impact occurring as the flat portion comes into contact with the rail surface at each revolution of the wheel.

DETECTOR, GROUND FAULT

A detector similar to a slip detector but installed vertically to detect vertical displacement of the ground, including ground heave due to related ground movement.

DETECTOR, HIGH-WIDE LOAD

A device capable of detecting excessive heights or widths on a passing train with respect to accepted track structure clearances.

DETECTOR, HOT BOX

A device capable of detecting abnormal heating in axle journal bearings on passing trains.

DETECTOR, HOT WHEEL

A device capable of detecting abnormal heating in wheels on passing trains.

DETECTOR, POINT (SEE POINT DETECTOR)

DETECTOR, PROXIMITY

An induction loop device in the track which is operated electromagnetically by the proximity of a rail vehicle above the detector.

DETECTOR, ROCKFALL

A detector installed to detect large objects falling from a cliff or slope above the track and operated when trip wires between fixed points are broken or stretched. Used to raise alarms and/or place protecting signals to stop.

DETECTOR, SLIP

A device capable of detecting track instability, and operated when the distance over the ground increases between two fixed points being monitored. The detector is used to raise alarms and/or place protecting signals to stop.

DETECTOR, WHEEL

A magnetic treadle which sensors the presence or passage of a train wheel.

DIAGRAM, ILLUMINATED

A signal-box diagram giving, by means of illumination, automatic indications of the occupancy or otherwise of the tracks within the controlled and/or adjoining areas. It may also include the automatic indication of the signal aspects and/or positions and the positions of points, etc.

DIAGRAM, SIGNAL-BOX

A diagrammatic representation of the area controlled from the signal box, for the guidance of the signaller.

DIMMING SWITCH

A switch, located in a signal box, used to decrease the brightness of colour light signals at night and increase it during daylight.

DOUBLE LINE

Two adjacent, parallel, running lines. In double line areas, trains are generally permitted to travel in one direction only on each line (except during bi-directional or single line working).

DOUBLE LINE TRACK BLOCK SYSTEM

A track block system of safeworking, used on double lines, which allows trains to travel in one direction only on each line.

DOUBLE SWITCHED CIRCUITS

Circuits which are switched on both the active and common (or positive and negative) sides of the controlled function by each of the controlling functions.

DOWN LINE

In a double line area, the line normally used by trains travelling away from Sydney.

DROP-AWAY VALUE

The value of the voltage at which the front contacts of a relay just open under certain specified conditions.

DUPLEX LOCK

A lock operated by an annett key to release another annett key which is then used to unlock signalling equipment. One key is always held captive in the Duplex lock when the other is out.

DYNAMIC BRAKING

A method of braking in which the motor is used as a generator and the kinetic energy of the apparatus is employed as the actuating means of exciting a retarding force.

EARTH

The conducting mass of the ground; the process of directly connecting to an earth mat, or earth rod.

EARTH LEAKAGE DETECTOR

An instrument for indicating electrical current leakage from a normally isolated circuit to earth.

EARTH ROD

A metal rod with earth wire connection to disperse current into the ground for safety.

EARTHING

Earthing of signalling equipment to protect staff from high voltage power supplies and electrification systems and to assist in protecting equipment from lightning. Signalling circuits are insulated/isolated from earth and the presence of any earth fault on wiring is a definite danger to signalling circuitry and calls for protective measures to be taken.

EARTHING CONDUCTOR

A conductor connecting any portion of the earthing system to the portion of the installation or equipment required to be earthed, or to any other portion of the earthing system.

ELECTRIC STAFF INSTRUMENT

(ELECTRIC TRAIN STAFF INSTRUMENT)

An electrically operated instrument, installed at each end of an electric staff section, which contains and controls the issue of staffs for the section. The staff instruments are electrically interlocked so that only one electric staff for the section can be obtained from either of the two instruments at any one time.

ELECTRIC STAFF SYSTEM (ELECTRIC TRAIN STAFF SYSTEM)

A system of safeworking, usually used on single lines in non track-circuited areas, to allow trains to travel safely in either direction. Under normal conditions the authority for a train to occupy the section is a metal token known as an electric staff obtained from an electric train staff instrument.

ELECTRIC TRAIN STAFF INSTRUMENT, INTERMEDIATE

Intermediate Electric Train Staff instruments are provided at junctions and sidings within an electric train staff section to restore the staff instruments at each end of the section to phase when a train has been admitted to the branch line or stored in a siding. The intermediate Electric Train Staff instrument also allows a train to enter an electric train staff section from a branch line or siding.

ELECTROLYSIS BOND

A device for electrically connecting a buried utility service (pipeline or cable) to adjacent DC traction return rails, to prevent electrolysis damage to the service by stray traction currents. The electrolysis bond incorporates equipment for the control of magnitude and direction of current flowing between the buried service and traction rails.

ELECTROLYSIS BOND CHOKE

A centre-tapped, medium current rated inductor used to provide a balanced traction-neutral connection to the rails, at locations where the track circuits cannot operate reliably with only one rail connected to the buried service.

ELECTROMAGNETIC INTERFERENCE (EMI), ELECTROMAGNETIC COMPATIBILITY (EMC)

The signalling electrical system requires to be protected against and have immunity to electrical interference in its operating environment and is required to not generate electrical interference that adversely affects other important systems in its environment. This is called electromagnetic compatibility. Electromagnetic interference includes radiated interference due to magnetic induction, capacitive coupling and radio transmissions.

EMERGENCY CROSSOVER

A crossover in a double line automatic section where the points at both ends of the crossover are directly protected by automatic signals and the points are XL locked.

EMERGENCY RELEASE KEYS

Keys that when removed from their Emergency Releasing Lock hold protecting signals at stop and permit the emergency operation of points.

EMERGENCY SWITCH MACHINE LOCK (ESML)

Equipment which is interlocked with protecting signals and the controlling mechanisms of power operated points so that the points can be manually operated when required in an emergency.

EMERGENCY SWITCH MACHINE LOCK KEY

Key held in the signal box to unlock emergency equipment cupboard housing ESML handle.

EMERGENCY RELEASING LOCK

Equipment which is interlocked with protecting signals and holds an emergency releasing key used to release points in an emergency.

END OF TRAIN DETECTOR

A receiver mounted in the track which detects the passing of a transmitter mounted on the end of a train. On non track circuited lines, can be used at turnout clearance points to provide an indication to the signalling system that a train is in clear.

ENERGISE

To provide an electrically operated device with its operating current or voltage.

ENTRANCE – EXIT (NX)

An entrance-exit type of route control system of interlocking whereby the signaller operates one pushbutton at the commencement and a second at the finish of the required route.

ENVIRONMENT

The aggregate of all conditions influencing a product or service, including physical location, operating characteristics of surrounding or nearby equipment, actions of people, conditions of temperature, humidity, salt spray, acceleration, shock, vibration, radiation, electromagnetic interference, and contaminants, in the surrounding area.

EP Electro-pneumatic.

EUROPEAN RAIL TRAFFIC MANAGEMENT SYSTEM (ERTMS)

A European standard development associated with the European Train Control System (ETCS). A transmission based signalling system, train location based rather than wayside signalling based.

EUROPEAN TRAIN CONTROL SYSTEM (ETCS)

A three level, unified, modular Automatic Train Protection Specification to enhance interoperability across Europe.

FACING MOVEMENT

The movement of a train over points which are facing points for the direction in which the train is moving.

FACING POINT LOCK

A mechanical bolt lock provided in connection with the mechanism for operating facing points for the purpose of securing them firmly in position against the stock rail.

FACING POINT LOCK BAR

A lifting bar which is located at facing points and is connected to the facing point lock to prevent the points from being moved if a train is on the bar.

FAIL SAFE

A design property of an item in which the specified failure mode is predominantly in the safe direction.

The capability of an item of equipment or system to ensure that any failure in a predictable or specified mode will result only in that item or system reaching and remaining in a safe condition.

FAIL SAFE DESIGN

Signalling fail safe systems are designed on the closed loop principle where input energy is necessary to retain a permissive output. In vital circuit design, a normally energised electric circuit, on being opened or de-energised, will cause the controlled function to assume its most restrictive state. (Also, the opening of any common return conductor will not cause two or more functions to operate in series).

FAIL SAFE EQUIPMENT

Items of signalling equipment are fail safe where they are particularly specified, designed, manufactured, installed, inspected, tested and maintained such that the chance of an unsafe side failure is very low. Component parts are robust, electrical leakage distances are long, operating characteristics have large margins, etc.

FAILURE, CONDITIONAL

Equipment condition with equipment parameters or operation outside the specification limits although still providing the required function.

FAILURE, FUNCTIONAL

Failure of equipment to perform its required function.

FALSE PROCEED

A failure of a signalling system, device or appliance to indicate or function as intended which results in less restriction than is required.

A proceed authority issued in unsafe or potentially unsafe conditions.

Examples of false proceeds are movement authorities issued with route occupied, points not correctly closed and locked, approach or route locking not properly applied or able to be prematurely released, or conflicting routes not properly locked out. False proceeds also include the loss of warning to a road motorist when level crossing protection fails to operate adequately with a train approaching.

A fleeting, false signal indication is not considered to be a false proceed unless its duration is sufficient for a driver to see, interpret and initiate the action authorised by the indication. (Processor-based signalling systems use sequential processing and checking of system operation and outputs. If fleeting outputs appear, these can exist for a brief interval before the checking functions act to correct the situation).

FLANK PROTECTION

Signal routes are protected from converging traffic on adjoining lines by stop signals set back an “overlap” distance from the fouling point or by catch points or crossover points trapping movements on these flanks. If such protecting trap points are not installed, protection may be provided by including in signal controls the track circuits on these flanks back to the protecting signals.

FOCUSING

Alignment of a signal to provide train drivers with acceptable sighting of signal indications.

FOULING TRACK CIRCUIT

A track circuit near where lines converge or cross and where a train (including the overhang of the train) on the track circuit could be within the clearance point with other lines.

FROG (SEE CROSSING)

GLOBAL POSITIONING SYSTEM

A satellite communications system able to be used to determine the position of individual trains and of fixed locations and equipment and transmit the information to a control centre and/or to the train.

GROUND FRAME

One or more mechanical levers in a ground level interlocking frame, which may be provided with interlocking.

GUARDS INDICATOR

A lunar white light in a case inscribed “guard’s indicator” provided on the platform which, when illuminated, indicates to the guard of a train that the signal at the departure end of the platform is showing a proceed indication. The guard would not give the “right away” signal to the driver to depart until there is an indication that the platform exit signal is clear.

GUARDS KEYS

Interlocking keys, with bow handles, for securing interlocking frames at intermediate sidings on double lines.

HALF PILOT STAFF

One half of a pilot staff with key. Usually secured in a pilot staff lock located on or adjacent to the starting signal into a single line section.

HANDSIGNAL

A regulation signal given to a train driver by using hands or flags during daylight or hand lamps during darkness or heavy fog. Includes the use of detonators where required.

HANDSIGNALLER

A certified employee who is responsible for displaying handsignals (by using flags during daylight and a hand lamp during darkness) and, where required, for applying and removing detonators to or from the line in conjunction with these handsignals.

HEADWAY

The headway of a line is the closest spacing between (the heads of) two following trains, so that the second train can safely maintain the same speed as the first. This usually means that the second train is sufficiently far behind the first that its driver does not see an unduly restrictive signal aspect.

HEADWAY, OPERATING

The minimum spacing between trains, based on the specified maximum line capacity in trains per hour.

HOLD CLEAR

A term used to designate a device for holding a signal in any position other than its most restrictive.

HUMAN FACTORS

All scientific biomedical and sociological facts and considerations that constitute characteristics of humankind. These include principles and applications in the areas of human engineering, personnel selection, training, life support, job performance aids and human performance evaluation.

IMPEDANCE BOND, NEUTRAL LEADS

Cables connecting the mid-point of an impedance bond in one track circuit to the mid-point of an impedance bond on the adjoining track circuit or to the traction rail of an adjoining single rail track circuit.

IMPEDANCE BOND, SIDE LEADS

Cables each side of the impedance bond connecting the bond to the adjacent rails of the track circuit.

IN ADVANCE

A position along the line ahead of a given position, when facing the direction a train travels on the line. The area through which a train travels after passing a given position.

IN REAR

A position along the line behind a given position, when facing the direction a train travels on the line. The area through which a train has travelled before reaching a given position.

INDICATION LOCK

An electric lock connected to a mechanical lever of an interlocking machine to prevent the full movement and release of interlocking by the lever until the signals, points or other units operated, or directly affected by such lever, are in the proper position.

INDICATOR

A device used to convey information, usually visually.

INSULATED BLOCK JOINT

A joint in which electrical insulation is provided between adjoining rails. Assembled from insulating end posts, ferrules and side pieces or manufactured as a glued insulated joint.

INSULATION RESISTANCE

The electrical resistance offered by the insulation on any current-carrying part or conductor.

INTERLOCKED POINTS

A set or series of points the control of which is interlocked with other functions of the interlocking.

INTERLOCKING

An electrical, electronic or mechanical means of making the operation of one piece of apparatus dependent upon certain predetermined conditions being fulfilled by other apparatus. The logic by which routes that conflict are prevented from being set at the same time.

INTERLOCKING (AREA)

A line or lines fitted with points and fixed signals, at locations where trains can be diverted onto different lines. The points and signals are controlled by a signaller and are interlocked to prevent conflicting or unsafe movements.

INTERLOCKING, BACK

Interlocking produced on the interlocking part by the position taken up by the interlocked part.

INTERLOCKING, CONDITIONAL

Interlocking between two movable parts occasioned by the particular positions of other parts.

INTERLOCKING, DIRECT

Interlocking produced by direct action of the interlocking apparatus (or groups of apparatus) on the fittings interlocked and which is independent of all other apparatus.

INTERLOCKING, ELECTROMECHANICAL

An interlocking area with an interlocking machine controlling both power and mechanically operated signalling field equipment.

INTERLOCKING, INDIRECT

Interlocking between two movable parts not effected directly in the system constituted by these two parts, but existing nevertheless by reason of the presence of direct interlocking between the parts in question and another part external to that system.

INTERLOCKING KEY

A means of obtaining the effect of interlocking by release and transfer of a captive key and without physical connection between the items of equipment concerned.

INTERLOCKING MACHINE OR FRAME

Any lever or collection of levers provided for the purpose of operating or controlling points and/or signals at a mechanical or power interlocking. Mechanical interlocking is provided between the levers.

INTERLOCKING MACHINE, MECHANICAL

An interlocking machine with large mechanical levers designed to operate the signals, points and other signalling field equipment mechanically, although some equipment may also be controlled electrically.

INTERLOCKING MACHINE, POWER

An interlocking machine with small mechanical type levers or pistol grip slide levers with mechanical interlocking provided between the levers which operate circuit controllers for a power interlocking.

INTERLOCKING, MECHANICAL

An interlocking area where the points and signals are directly connected by wires and rods to the levers of a mechanical interlocking machine and are operated by the signaller or other qualified employee.

INTERLOCKING, POWER

An interlocking area where the points and signals are operated electrically, hydraulically or pneumatically. They are controlled by a signaller using an interlocking machine or relay interlocking control unit.

INTERLOCKING, RELAY

A power interlocking area where the interlocking between lever functions is achieved electrically by interdependent relay circuits. The signaller operates the levers on a relay interlocking control unit.

INTERLOCKING, ROUTE CONTROL SYSTEM

A system whereby a route is set and the signal leading over it is cleared by the signaller operating a route setting button or buttons. Two types are in use, one being the “Entrance-Exit” or “Push-Push” type whereby the signaller operates one push-button at the commencement and a second at the finish of the route. The other is the “one control switch” (OCS) type whereby a separate switch or push-button is provided for each route on a signal and the signaller operates the switch or push-button for the route required. The interlocking between routes may be relay interlocking or computer based interlocking.

INTEROPERABILITY

A term used to mean the uninterrupted movement of trains from differing countries (states) across international (state) borders.

IRREGULARITY

The failure of a signalling unit or subsystem which is contrary to the design requirements, is not fail-safe, and which in combination with other failures may bring the system to an unsafe condition.

This does not include common, predictable failure modes which are taken into account in the system design, such as train stop failing to return to the normal position, signal lamps failed, or mechanical signals “hanging off” due to tight signal wires requiring adjustment by the signaller.

It does include vital relays falsely “sticking up”, even when this is protected against by the system design (such as back-proving) with the system remaining failsafe.

IRREGULAR SIGNAL INDICATIONS

A signal which is displaying a non-valid indication, e.g. a colour light signal which is displaying no light or an irregular combination of colour lights or irregular flashing lights, or a semaphore signal with an abnormal signal arm indication.

ISOLATING RELAY (ELECTRIC TRAIN STAFF INSTRUMENT)

A relay provided on long electric train staff sections to isolate the electric staff line circuit from the main electric lock in the staff instrument. This prevents the high DC voltages necessary to overcome voltage drop on the line from being applied to the main electric lock and potentially sustaining an arc across open lock controlling contacts and falsely allowing a staff to be released.

ISOLATING RELAY (POINTS)

A relay provided to isolate the electric power from point operating mechanisms other than when the points are required to be moved and providing that a selection of critical track locking is not against the movement.

KEY STAFF

A train staff or electric staff with a key fitted permanently at one end. This key operates an Annett lock.

LAMP PROVING

A method of monitoring the lamp operating circuits in a running signal such that a total failure of the signal lamp which should be operating results in a change of state of a fail-safe lamp proving function. The signal in rear is replaced to a more restrictive warning indication if the required lamp is proved out.

LANDMARK

Provided instead of a distant signal at places where it is necessary, in all cases, for trains to approach with caution.

LEVEL CROSSING

A location where the railway line and a road or a pedestrian walkway intersect on the same level.

LEVEL CROSSING, AUTOMATIC

A level crossing equipped with flashing lights, audible warning devices and, sometimes, half boom barriers, which are normally controlled entirely by the approach of a train and not normally interlocked with the signals.

LEVEL CROSSING, CONTROLLED

A level crossing with active warning operated under supervision and interlocked with protecting signals. It may be monitored by closed circuit television (CCTV) where the level crossing is out of sight of the controlling signal box.

LEVEL CROSSING, (OPEN)

A public level crossing which provides unrestricted access for vehicles and pedestrians to cross the line and which is protected only by warning signs.

LEVEL CROSSING, (PRIVATE)

A level crossing which provides access for vehicles and pedestrians to cross the line to private property and which is protected by swing gates or cattle grids.

LEVEL CROSSING, TAIL FLASHING

The term used to describe the effect on single lines of a level crossing warning system continuing to operate as the tail of the train departs, as if it were an opposite direction approaching train. It may occur in some systems with a light engine or other short, fast, self-propelled vehicle.

LEVER

Any device used by the signaller to control interlocking equipment. Note: Where the term “lever” is used, it also includes switches, keys and pushbuttons.

LEVER SLEEVE

Piece of equipment placed over a lever as a blocking facility to physically prevent it from being operated.

LEVER STICK

A circuit in track circuited areas, which insures that a signal lever is returned by the signaller to the normal or normal indication position after each train movement before the signal can be again cleared.

LIFTING BAR

When this type of bar is operated, it rises to rail surface level and falls again once it is in position. If a train is passing over the bar, the wheels prevent the bar from lifting and consequently prevent the associated points from being unlocked or operated.

LINE CAPACITY

Over a given line, the limiting number of train services, including stopping services, that the safeworking system allows to pass a given point in a given period of time, usually expressed as the maximum number of trains per hour.

LINE POLE

The poles in an overhead line route which carry the cross-arms supporting the line wires or cables.

LINE WIRES

Electrical circuit single conductor wires or cables erected on an overhead line route.

LOCAL CONTROL

The term local control shall apply to an interlocking which is normally operated under remote control, but due to particular operational needs is provided with facilities to enable it to be controlled locally by operations staff. This would normally be a regular occurrence and typically where heavy local shunting operations are involved.

LOCAL CONTROL (EMERGENCY)

The term emergency local control shall apply to an interlocking which is normally operated under remote control, but due to the effects of a partial or total loss of the remote control system, or for operation during planned maintenance works, or for testing and other maintenance requirements, is provided with facilities to enable it to be controlled locally by operations staff.

LOCAL CONTROL PANEL

A control panel located at an interlocking which is normally remotely controlled from another location. The local control panel may be switched to local working when required, on the direction of the train controller.

LOCK DROP CONTACT

A proving contact fitted to a gravity operated electric lock. The contact is closed when the lock is in its locking position.

LOCK, ELECTRIC

An electromagnetic device which prevents or restricts the movement of a mechanical lever in an interlocking frame, or other appliance, from being partially or completely operated.

LOCK, FORCED DROP

An electric lock in which the locking member is mechanically forced down to the locked position.

LOCKING BAR

A bar in a mechanical interlocking machine to which the locking dogs are attached.

LOCKING DOG

A steel block attached to a locking bar or tappet of an interlocking machine, by means of which locking between levers is accomplished.

LUNAR WHITE

One of the standard colours used in railway signalling established by Specification for Roundels, Lenses, Association of American Railroads (AAR) Manual, namely, red, yellow, green, lunar white for roundels, lenses. Lunar White is white with a blue tinge.

MAIN LINE INDICATOR

Wayside Indicators provided in Train Order Working territory to indicate to a driver travelling on the authority of Train Order, that the interlocking equipment, such as points and level crossings, are set for the train to proceed.

MAINTAINABILITY

The ability of a system under given conditions to be retained in or restored to a state in which it can perform the required function more effectively.

The capacity of a system to

- receive routine maintenance while performing its normal duties without disruption to services,
- have redundant units replaced, tested and returned to service, while continuing to perform its normal duties without disruption to services, and
- be restored to normal service in minimum time, after a failure which disrupts the normal service operation of the system.

MAINTENANCE RELEASES

A releasing switch provided on bi-directionally signalled double lines to enable maintenance staff to block the section for signalling movements in the reverse direction.

MICRO-SWITCH

An electrical contact, usually sealed, with a snap-action, very short changeover movement activated by a plunger.

MINIATURE LEVERS

Electrical control switches within relay interlocking control units.

MOTION SENSING DETECTOR

A device used to sense the presence, motion and direction of travel of a train. A device used to detect the movement of a train.

“MOVING BLOCK”

Headways on conventional fixed block signalling systems are based on the longest braking distance required for the train types and maximum train speeds permitted on the line. There is a practical limit to headway improvement by providing additional, graded warning signals between the first warning signal and the signal at stop.

The concept of “moving block” systems is that of a flexible block between the end of a preceding train and the head of a following train. This “moving block” varies with the speed being travelled by the two trains and is minimised to the braking distance of the following train at the speed it is travelling plus an overlap distance.

“Moving block” systems require Transmission Based Signalling systems, not systems based on conventional track circuits and line side signals.

NON-INTERLOCKED POINTS (ON SIGNALLED RUNNING LINES)

Points which are not interlocked with the signalling and which must be securely locked by spike, point clips or clamps, and XL locks.

NON-STORAGE OPERATION (ANTI PRE-SELECTION)

A term used when pre-selection (storage) of a route is not provided and where the control to move points can only be set up if the points are free or available at the moment the control is applied.

NON VITAL

Signalling equipment and circuits are considered non vital where failure to function correctly would not cause an unsafe outcome of the signalling system. Non-vital equipment and circuits do not affect the safe operation of the signalling system.

NORMAL POSITION

The position in which signal and other devices are assumed to normally lie, according to rule, convention or otherwise, i.e., stop aspect displayed, points set for main track, devices energised or de-energised, etc. The normal position generally refers to the position where the protection is applied e.g. signals at stop, releases locked and not available.

NORMALISE

Cancellation of a set route and release of the interlocking including approach locking, but not including route locking being maintained by a train within the route.

ONE CONTROL SWITCH (OCS)

A type of route control system of interlocking whereby a separate switch or push button is provided for each route on a signal and the signaller operates the switch or pushbutton for the route required.

OPERATOR

The person or organisation responsible for managing the operation of trains on the railway.

OPERATOR INTERFACE

The interface between the signalling system and the signaller which provides all the information and functionality needed by the signaller to control and monitor the signalling system.

OPERATOR INTERFACE STATION (OIS)

The term operator interface station is taken to mean any microprocessor based manmachine interface, typically any graphic user interface (GUI) using a keyboard, mouse and any array of visual display units (VDU's) to form a workstation for the purpose of train control.

OPERATOR'S KEYS

Keys used to operate or release ground frames, driver's pushbuttons and other equipment in Train Order Working territory.

OPERATOR'S (FORTRESS) LOCKS

Locks located on ground frames, driver's pushbuttons and other equipment in Train Order Working territory.

OPTOISOLATOR

Device for controlling the switching of an electric circuit with high electrical isolation between controlling and switched circuits. Uses photoelectric devices to transmit the controlling signal across the insulating gap.

ORDINARY TRAIN STAFF

A form of token used in the working of a single line.

OVERLAP

The length of track beyond a stop signal which must be unoccupied before the stop signal next in rear can display a proceed indication.

The distance the control of one signal extends into the section which another signal, or signals, govern.

The overlap is associated with a signal route on a running line. It is provided to secure a margin of safety by establishing and maintaining a minimum separation distance between a train approaching or within the signal route and any other train authorised to occupy the line ahead of the signal route.

OVERLAP MAINTENANCE

If a choice of overlaps exists beyond a stop signal then the clearing of the signal in rear will lock any facing points in the overlap beyond the stop signal to prevent the operation of those points towards an overlap that is not free, or is occupied (running signals); overlap maintenance will maintain that locking when an approaching train has passed the signal in rear.

OVERLAP SWINGING

Changing the overlap of a set route to an alternative overlap that is not locked with the route that is set, and that is unoccupied if the route set is a running route. In route control interlockings, overlap swinging is generally implemented automatically when a separate route is requested which requires the original overlap facing points in the alternative position.

PANEL PROCESSOR

A microprocessor interfacing between the Operator Interface and the signalling interlocking and building the information sets required from the input data elements.

PERMISSIVE WORKING

A method of working in which permission may be given for one or more trains to enter the section, on the authority of the fixed signals, before the preceding train is clear of the section.

PHANTOM ASPECT

An aspect displayed by a colour light signal, different from the aspect intended, caused by a light from an external source being reflected by the optical system of the signal.

PICK UP

The energisation of an electromagnetic device to pick up and close its front contacts.

PICK-UP VALUE

The electrical value which, when applied to an electromagnetic instrument, will cause the moving member to move to the position which will just close the front contacts or visually indicate its energised position.

PILOT STAFF

A token which authorises a driver to proceed into a section in accordance with safeworking procedures for emergency pilot staff working.

PILOT STAFF LOCK

An annett lock at a single line starting signal which holds a half pilot staff for the single line section. Removal of the half pilot staff operates a pilot staff lock contact which disconnects the section control circuits and prevents the starting signals at each end of the section from clearing.

PILOT STAFF WITH KEY

A staff in two halves with a key at each end. Each half is secured in a pilot staff lock box at each end of a single line track block or track control signalling section. For use in the case of starting signal failure or obstruction on the single line.

PLUNGER (Facing Point Lock)

The part of a facing point lock which secures the lock rod to the plunger stand when the points switch is locked.

POINT CLAMP

A lockable heavy duty clamp for manually securing a point switch to the stockrail for an extended period.

POINT CLAMP LOCK

A type of point operating mechanism which clamps the point switch to the stock rail. It provides direct switch to stockrail facing point locking through a vertically operating clamp arm and includes in-built point switch and lock detection and is hydraulically powered.

POINT CLAW LOCK

A point operating mechanism which provides direct switch to stockrail facing point locking through a horizontally operating claw arm which requires external point switch and lock detection and is powered by a purpose built electric point machine or electro-pneumatic (EP) motor.

POINT CLIP

A lockable clip for manually securing a point switch to the stock rail.

POINT DETECTOR

A device that prevents a signal from being cleared if the points, to which the signal applies, are not in the correct position.

A circuit controller which is part of the points operating mechanism and operated by a rod connected to a points switch or movable crossing to indicate that the toe of the point switch is within a specified distance of the stock rail.

POINT EXTENSION IRON

A bracket bolted to the toe of a point switch which provides an extended connection point for point detector rods.

POINT INDICATOR (Electrical)

A colour light signal for indicating the position of points or derail.

POINT INDICATOR (Mechanical)

A device mechanically actuated by a lever, or a points switch, to indicate the position of the points.

POINT MACHINE

An encased type of point operating mechanism by which points, derailleurs, swing nose crossings, etc., are moved by power and in which may be included a means for locking and detecting the points.

POINT MACHINE, IN-SLEEPER

A hollow steel sleeper containing the drive and lock mechanism (usually claw lock, pawl lock or similar) and the detection connections. The sleeper may also contain the operating mechanism and detector or these may be attached to the end of the sleeper.

POINT OPERATING MECHANISM

A mechanism for changing the direction a set of points is lying.

POINT PAWL LOCK

A point operating mechanism which provides direct switch to stockrail facing point locking through a vertically operating pawl arm which requires external point switch and lock detection and is powered by a purpose built electric point machine or electro-pneumatic (EP) motor.

POINT SWITCH

A movable tapered track rail, the point of which is designed to fit against the stock rail. The pointed end of the switch rail (switch blade) is referred to as the “toe” and the other end, the pivot end, as the “heel”.

POINT SWITCH ROLLERS

A roller under a point switch and fixed to the stockrail, which lifts the point switch off the slide plate as the switch moves from the closed to the open position and vice versa. Several rollers can be fitted along each point switch to facilitate movement, especially for heavy switches on super elevated track.

POINT SWITCH, TANGENTIAL

A design of points where the stockrail forms a tangent to the curve through the point switch.

POINT SWITCH ASSYMETRIC

A design of switch in which the switch rail cross section is assymetric about its vertical axis and the height of the switch rail is approximately 2/3 the height of the stockrail. Points with assymetric switches are also tangential.

POINTS

A pair of point switches installed in a turnout.

POINTS, BACK DRIVE

A second drive position on the point switches used where the length of the switch is such that a single drive will leave the back part of the switch hanging off the stockrail. Location of the back drive is determined by switch length and it may be operated by rodding from the drive or by a separate point operating mechanism.

POINTS, COMPOUND (see POINTS, DOUBLE SLIP)

POINTS, DOUBLE-SLIP

A combination of a crossing and two connecting tracks, located within the limits of the crossing, each being made up of a right-hand points switch from one track and a left-hand points switch from the other track, which unite to form the respective connecting tracks without additional frogs.

POINTS, DUAL CONTROL

A power operated point machine also equipped for hand operation.

POINTS, EP, AIR CONTROL VALVE

The assembly of valves which control the operation of the points air motor and where applicable the facing point lock plunger motor. The air control valve normally consists of a number of solenoid valves which control air flow to and the position of a main spool valve which controls air flow to and exhaust from the motor.

POINTS, EP, INDICATION BOX

Contacts within a box mounted on track between the point switches and activated by the facing point lock plunger lock slide on facing points with an electro-pneumatic (EP) point operating mechanism. The contacts verify the position of the plunger.

POINTS, EP, PLUNGER LOCK

An electrically operated lock which locks the facing point lock plunger lock slide on a set of electro-pneumatic (EP) operated facing points to prevent unlocking of the points except as required and provided critical track locking is not against the movement of the points.

POINTS, FACING

A turnout which presents a train with a choice of routes in the direction that the train is proceeding. (The converse is a set of trailing points where two lines converge in the direction of travel).

POINTS, FLANGEWAY

The gap between the back of the open switch and the running face of the stockrail to allow passage of the wheel flange.

POINTS, POWER-OPERATED

Points operated by some form of energy, usually electrical, pneumatic or hydraulic.

POINTS, SINGLE-SLIP

A combination of a crossing and single connecting track, located within the limits of the crossing, and made up of a right-hand switch from the other track, which unite to form the connecting track without additional crossings.

POINTS, SPRING

Points equipped with a spring device which forces the point switches to their original position after being trailed through and holds them under spring compression.

POINTS, TRAILABLE

Points which can be trailed through without damaging the points equipment and which either stay in the trailed position or return to normal after the passage of a train.

POINTS, TRAILING

A turnout where two lines converge in the direction of travel.

POINTS, TRAP

Catch-points or other facing points on a line which provide protection for another line by diverting train and vehicle movements on the line away from the protected line.

POLARITY REVERSAL (PHASING)

The reversal of the polarity between similar adjoining track circuits across the insulating block joints to prevent the possibility of one track circuit feed falsely energising the relay of the adjoining track circuit in the event of breakdown of the insulating block joints.

POSITIVE TRAIN SEPARATION (PTS)

An American automatic train protection system specification evolving from their Advanced Train Control System specification. The Positive Train Separation system is intended to overlay existing signalling systems to provide enforcement and is transmission based using radio links to the train.

POWER SUPPLY CONDITIONER

A device which filters and corrects the waveform and voltage of a mains power supply for sensitive electronic equipment.

POWER SUPPLY, STATIC SWITCH

An all electronic emergency changeover device for power supplies.

POWER SUPPLY, UNINTERRUPTIBLE

A redundant power supply system which is such that on failure of one supply the redundant supply will maintain the output to the load without interruption.

PROCEED AUTHORITY

Information delivered to the driver or train, indicating that the route ahead is in a safe condition and that the train is authorised to occupy it.

PROCEED INDICATION

Any signal indication other than stop.

PROCESSING CAPACITY

The maximum number of control and indication input/output processing cycles per unit of time that can be handled without incurring any cycle processing delay. For any given system this will result in a maximum number of field objects the system is able to control, which is also a function of the complexity of the controlling / interlocking logic between the field objects.

PROCESSING SPEED

The speed with which the system processes a control or indication input, and outputs the required response to the field or signaller respectively.

PROTOCOL

A set of rules that govern the operation of functional units to achieve communication. In data transmission, mainly based on message structures and timing.

RADIO ELECTRONIC TOKEN BLOCK (RETB)

A British developed signalling system in which proceed authorities are issued in the form of data transmitted as addressed telegrams (electronic tokens), over a secure voice and data radio transmission system, between the signaller and the train driver acting in co-operation. The controlling signal box is equipped with an electronic interlocking which has custody of the electronic tokens and is responsible for their safe management.

RAIL LEVEL

The level of the running surface of the lowest rail of the pair of rails.

REDUNDANCY

- **Redundancy (1)**

The use of multiple units of equipment operating to perform the same function so that, in the event of the failure of any one of them, the performance of the function continues with minimal or no interruption. In most configurations the units are generally considered as being either primary (responsible for performing the function) or secondary (responsible for maintaining function in the event of a primary unit failure).

- **Redundancy (2)**

The use of multiple units of equipment performing the same function, arranged so that the delivery of a function output is dependent on all, or the majority of, units generating the same output/being in agreement on the output to be delivered.

- **Diversity**

The redundancy technique, used in the design of safety electronic processing/control systems, of providing multiple, independent hardware and/or software paths with correct operation proven by correspondence of the results.

- Hot Standby

Form of redundancy in which the 'spare' or secondary equipment is continuously operating and generating output simultaneously with the primary equipment. Results in no discernible interruption to system function on failure of the primary unit.

- Warm Standby

Form of redundancy in which the secondary equipment is continuously operating, but is not enabled to generate outputs except in the event of a failure of the primary equipment. Results in a short period of loss of function until the system completes transfer to the secondary unit.

- Cold Standby

Form of redundancy in which the secondary equipment is normally powered down, to be switched in and begin operating and generating output after a failure of the primary equipment. Results in a loss of system function while the secondary equipment powers up and reaches operational status.

RELAY

A device by means of which one electrical circuit is indirectly controlled by a change in the same or in another circuit. Generally an electromagnetic device operating a number of contacts. Vital signalling relays are designed and manufactured to high safety integrity and reliability standards.

RELAY, AC

A type of relay which is operated by an alternating current. One type of AC relay is an AC vane relay.

RELAY, BIASED

A relay which will operate to its energised position by current of one polarity only, and will return to its de-energised position when current is removed.

RELAY, FLASHER

A relay so designed that, when energised, its contacts open and close at pre-determined intervals. Flasher relay contacts may be mechanical or electronic.

RELAY INTERLOCKING CONTROL UNIT

An interlocking control unit, which is fitted with electrical switches called 'miniature levers' (either pushbutton, toggle key or rotary switch type). The miniature levers do not directly operate the points and signals. Instead, they operate interdependent electrical relays which check that there are no conflicting movements set before the required points and signals are operated.

RELAY, LINE

A relay receiving its operating energy through conductors of which the track rails form no part.

RELAY, MAGNETIC LATCH

A relay, the armature of which remains at full stroke in its last energised position when its control circuit is opened.

RELAY, NEUTRAL

A relay which operates in response to a pre-determined change of the current in the controlling circuit, irrespective of the direction of the current.

RELAY, PLUG IN

A relay designed to plug into a plug board. The electrical connections are permanently made to the plug board allowing the relays to be changed without any disconnection of individual wires. The plug boards are usually pin coded to prevent an incorrect type of relay being fitted.

RELAY, POLYPHASE

An alternating current relay having two or more windings, operating on an induction motor principle, all windings of which must be properly energised.

RELAY, QUICK PICK

A relay which, when energy is applied, will pick up quicker than an ordinary relay.

RELAY, QUICK RELEASE

A relay which, when the controlling circuit is opened or completely shunted, will drop away quicker than an ordinary relay.

RELAY, SHELF MOUNTED PLUG IN

A conversion unit which directly replaces a shelf type relay. Once installed, any further relay replacement is by replacing the plug in relay portion of the assembly.

RELAY, SHELF TYPE

A relay designed for installation on a shelf or other flat surface. The electrical connections are made to individual terminals on its top surface.

RELAY, SLOW PICK-UP

A relay which, when energy is applied, will pick up slower than an ordinary relay.

RELAY, SLOW RELEASE

A relay which, when the controlling circuit is opened or completely shunted, will drop away slower than an ordinary relay.

RELAY, TIME LIMIT

A relay which will not close its front contacts or open its back contacts, or both, until the expiration of a definite time interval after the relay has been energised.

RELAY, TRACK

A relay receiving all or part of its operating energy from a circuit of which the rails are the essential part, and responding to the presence of vehicles on the track.

RELAY, VANE TYPE

A type of alternating current relay in which a light metal disc or vane moves in response to a change of the current in the controlling circuit.

RELEASE, EMERGENCY MANUAL

A bypassing of the safeguards built into an interlocking. Some failures of equipment within the interlocking will prevent the signalling of trains. Under certain controlled conditions and prescribed procedures it is sometimes acceptable for the safeguard to be momentarily bypassed to allow the signalling to be operated.

RELEASING SWITCH

An electric lock located adjacent to a ground frame which when energised enables a switch to be turned to release a key to unlock the ground frame. The releasing switch is interlocked with the signalling.

RELIABILITY

The probability that during a certain period of time a system performs the functions described in the specification of requirements under the stated conditions (environment, costs, inputs and hardware, time constraints).

This is measured in terms of the average period that individual components or subsystems are able to exercise their defined functions as required.

REMOTE CONTROL

A term applied to the control (and indication) of points and/or signals at isolated locations a considerable distance away, usually by means of a small number of conductors.

REMOTE CONTROL OVERRIDE

An alternate, simpler system provided to keep traffic moving in the event of failure of electronic remote control equipment whereby certain signal routes can be set to automatic operation.

REPEATER

A device conveying information as to the condition of an operated unit.

REVERSE POSITION

The opposite position to the normal position.

ROD, BACK

The bar or rod connecting the switches usually placed one sleeper bay back from the front rod to provide extra support for the switches.

ROD, DETECTOR

The rod(s) connecting each switch to the detector mechanism (whether combined with the drive mechanism or separate).

ROD, DRIVE

The rod between the drive mechanism and the front rod.

ROD, FRONT

The bar or rod connecting the point switches to which the drive is coupled.

ROD, LOCK

A bar or rod connecting the point switches to which the facing point lock is attached or on which the facing point lock operates. Usually placed as close as possible to the tip of the switch.

ROUTE

A train path over a single section of track from one fixed point to another, for which the signalling system can issue a valid proceed authority.

Each individual route from a signal, including each running route, each subsidiary route, and each shunting route. Additionally, routes may include authorised paths intersecting with a signalled route, e.g. each hand-signalled movement from or onto a signalled track at ground frame points constitutes a route, as do the roadway and pedestrian paths at protected level crossings.

ROUTE INDICATOR

An indicator working in conjunction with a signal indication. It is provided at the divergence of two or more lines, and indicates to the driver the route to be taken by the train.

ROUTE LOCKING

Maintenance of locking between signals and/or points by the presence of a train on the intervening track circuits.

ROUTE LOCKING, SECTIONAL RELEASE

Directional stick relays or equivalent unlocking the route in sections. The purpose is to release points or other devices in the route after the rear of a train movement has cleared them.

RUNNING FACE

The inside face of the head of a running rail which contacts the flange of the train wheel.

RUNNING LINE

A line (other than a siding) which is used for the through movement of trains.

SAFETY Safety is:

- a circumstance in which the risk is less than the boundary risk. The boundary risk is the greatest acceptable system-related risk of a particular technical process or state, usually limited by the safety-related stipulations made according to the predominant opinion of experts and in compliance with the protective intentions of legislation.
- freedom from unacceptable risk of harm.
- the likelihood that a system does not lead to a state in which human life or environment are endangered. Note: safety relates to all aspects of a system, all its subsystems, to the environment in which it operates, to human factors such as operator error or wrongdoing, and to incorrect data.

For the signalling system, safety is an acceptable low risk of:

- accident – collision or derailment resulting in death or injury to people on or about the railway
- wrong-side failure
- irregularity (that may lead to a wrong-side failure)
- signaller injury or incapacity
- maintainer injury or incapacity

SAFETY, FUNCTIONAL

The ability of a safety-related system to carry out the actions necessary to achieve a safe state for the equipment under control, or to maintain a safe state for the equipment under control.

The capacity of a safeworking system to maintain safe train operation with protection against unsafe outcomes due to failure of

- system hardware
- system software
- signaller analysis or decision making
- signaller-driver communication
- driver comprehension, judgement or response

SAFETY INTEGRITY

The probability of a safety-related system performing its required safety function under the required conditions and within the required time interval.

SAFETY - RELATED SYSTEM

A system by which the safe operation of equipment or process is achieved, either as an integral part of the control function or as a system designed to respond to a hazardous condition independently of the control function.

SAFEWORKING

Systems and procedures for the working of trains safely and for the protection of employees, passengers, freight and vehicles on or about the line.

SAFEWORKING SYSTEM

An integrated system of operating procedures and technology for the safe operation of trains and the protection of people and property on or about the railway.

A defined set of operating procedures for the operation of trains. On a major railway system, a number of different systems of safeworking may be used, some associated with specific forms of signalling infrastructure, and some independent of signalling hardware.

SCADA SYSTEM

A Supervisory Control And Data Acquisition telemetry system.

SECTION

In double or multiple line areas, the portion of running line between the yard limits of adjacent attended interlockings. In single line areas, the portion of running line between the yard limits of adjacent interlockings.

SELECTION

The logic by which signals are allowed to show a proceed indication only when all conditions have been satisfied.

SHUNT

A by-path introduced into an electric circuit.

SHUNT, TRAIN

A by-path in a track circuit formed by the wheels and axles of a vehicle occupying that section of the track, the value of which is usually expressed in ohms to indicate the efficiency of the operation of the track circuit.

SHUNTING SENSITIVITY

The shunting sensitivity of a track circuit is expressed in terms of its Drop Shunt value.

SIDE LIGHT

A small glass aperture in colour light signals and Type 'F' level crossing lights units to give a side view of the aspect illuminated.

SIGHTING DISTANCE

The maximum distance from a signal at which a driver of an approaching train can discern the signal aspect in the signal ahead.

SIGNAL, ABSOLUTE

Any signal that must not be passed at stop without the signaller's permission.

SIGNAL, ACCEPT

A controlled signal fitted with a designation plate inscribed "ACCEPT", or fitted with an interlocking name plate inscribed with the name of the controlling signal box.

An accept signal is provided at the entrance to an interlocking which is at the exit end of a double line automatic section. The signal is used by the signaller to control the approach of trains from an area outside of the signaller's control to the controlled signal next ahead.

SIGNAL, ACCEPT/HOME

A controlled signal provided in place of an accept signal at some interlockings which are located at the exit end of a double line automatic section.

The signal directly protects points, level crossings or other risks and allows the signaller to control the approach of trains from an area outside of the signaller's control to the controlled signal next ahead.

SIGNAL ASPECT

A term used to describe light indications of signals as opposed to indications given by semaphore arms.

SIGNAL, AUTOMATIC

A permissive signal which is controlled entirely by the passage of trains, as they occupy and clear the controlling track circuits. The signal controls the movements of trains over the portion of line between the automatic signal and the next signal ahead. The upper and lower signal lights are staggered to distinguish automatic signals from controlled signals, otherwise the letter “A” is displayed.

SIGNAL, BANNER

A type of semaphore signal with a small semaphore arm enclosed behind glass, which gives its indication by horizontal or inclined positions of the arm which is illuminated at night.

SIGNAL BOX

The structure which houses the interlocking machine from which points and signals at an interlocking are controlled.

SIGNAL, CALLING ON

Subsidiary signal fixed under the accept/home, home or home/starting signal for the route concerned and when showing a “proceed” indication authorises the driver to proceed under control into a section of line which may be obstructed at any point.

SIGNAL, CLOSE UP

A subsidiary signal fixed on the post of a signal and indicating, when cleared, that the line ahead is clear to the next “stop” signal only.

SIGNAL, COLOUR LIGHT

A fixed signal which uses coloured electric lights to give the signal indications during both daylight and dark.

SIGNAL, CONDITIONALLY CLEARED

A signal that may clear from a stop to a low-speed or caution indication as a train approaches, provided that the train speed is compatible with a reduced overlap.

SIGNAL, CONTROLLED

Any fixed signal which is controlled from an interlocking by a signaller.

SIGNAL, DEAD END

Shunting signals applying to short movements from the running line to a dead end siding or yard.

SIGNAL, DISTANT

A fixed signal placed at not less than braking distance from a fixed signal which can indicate stop. The purpose of a distant signal is to indicate to the driver the indication of the next signal.

Distant signals generally only display a caution or a clear indication.

However, distant signals in double line automatic areas may also display a stop indication when the line between the distant signal and the next signal ahead is occupied or if the distant signal fails.

A distant signal can be controlled from a signal box or operate in conjunction with the indications displayed by the signal ahead.

Where more than one distant signal is controlled from a signal box, the distant signals are described in the order in which they are approached by a train, e.g.

outer distant - inner distant
or outer distant - intermediate distant - inner distant

SIGNAL, DWARF

Small size semaphore or colour light signals which can be either mechanically or power worked. These signals are usually used where they can be easily seen from short distance and the speed of approaching trains is low, such as in a shunting yard.

SIGNAL, FIXED

Manual or power operated signals which are permanently located alongside or above the line.

SIGNAL, HOME

A controlled signal which directly protects a permanent risk within an interlocking, e.g. a set of points or a level crossing.

A home signal is either controlled by the signaller or can be fixed to permanently display a stop indication.

Where more than one home signal is controlled from a signal box, the home signals are described in the order in which they are approached by a train travelling towards the signal box, e.g. home – second home – third home – etc.

SIGNAL, HOME/STARTING

A controlled signal which directly protects points, level crossings, or other permanent risks. When cleared, this signal also gives the driver authority to enter the section provided that, where required, the driver is in possession of the authority for the section.

SIGNAL INDICATION

The visual indication of the position or aspect of a fixed signal.

SIGNAL, INDICATOR

A fixed signal co-acting with another signal and fixed on the same post or adjacent thereto, for the purpose of giving continuity of view to the train driver.

SIGNAL, JUNCTION REPEATER

A Junction Repeater is displayed at the signal in rear of the signal at the junction, when that signal is cleared, to inform the driver which way the junction is set. It consists of five lunar white lights inclined towards the direction the route ahead is set. Generally used to provide drivers of heavy freight trains with advance information that a route through a high speed turnout is clear.

SIGNAL, LOW SPEED INDICATION

A signal indication consisting of a small green light fixed below the “stop” indication on a running signal. The low speed indication is provided to facilitate working where closer headway is desired for following trains and permits a train to approach and pass the signal at a restricted speed, usually 25 kph in trainstop fitted areas. Used also at crossing loops in single line areas where overlaps for crossing moves are minimal.

SIGNAL, LOWER QUADRANT

A two position semaphore signal which has an arm that operates from a horizontal position downwards when cleared.

SIGNAL, MARKER LIGHT

A small light fixed to a single light colour light signal post for the purpose of indicating the location of a signal in the event of the main signal light having failed. Off-set to the right on an automatic signal and directly underneath the main signal on a controlled signal.

SIGNAL OFF

The signal displaying a proceed indication.

SIGNAL ON

The signal at stop.

SIGNAL, OUTER HOME

An outer home signal is a controlled signal which controls the movement of trains over the portion of line between that signal and the next signal in advance where a risk may only exist under certain circumstances. For example, a risk may exist for an approaching train when another train is required to shunt back outside a home signal towards the outer home signal.

SIGNAL, PERMISSIVE

A fixed signal that can be passed at stop after stopping without the signaller's permission, in accordance with safeworking procedures.

SIGNAL POSITION

A term used to describe indications of signals given by semaphore arms.

SIGNAL, POSITION LIGHT

A fixed signal in which the indications are given by the position of two or more lights.

SIGNAL, POWER WORKED

Fixed signals worked by electricity or compressed air.

SIGNAL REPEATER

An indicator, in a signal box, which indicates whether a signal is at stop or clear.

SIGNAL, REPEATER

A signal fixed on the approach side of a fixed signal in order to give advance information to a driver of the aspect or position of the fixed signal to which it refers.

SIGNAL, REVERSER

A device introduced into the operating connections of a mechanically operated fixed signal, which enables the train passage to replace the signal to stop independently of the signaller.

SIGNAL ROUTE

A section of track from a signal which provides an authority to proceed into that section up to the next signal, buffer stop, stop board, or limit of shuntboard, that represents the limit of the authority to proceed.

SIGNAL, RUNNING

A signal used for running movements between one signal and the next.

SIGNAL, SEARCHLIGHT

A fixed signal of single unit type in which one of two or three aspects can be shown by means of a movable vane, and so constructed that a beam of light is passed through a colour filter fixed to this vane, the light beam being transmitted in a concentrated beam by means of a reflector and a special lens.

SIGNAL SELECTOR

An item of interlocking equipment which ensures that when two or more signals are worked from the same lever only the signal for which the points are set can be cleared.

SIGNAL, SEMAPHORE

A fixed signal by which the day indications are given with a semaphore arm and the night indications by lights.

SIGNAL, SEMI AUTOMATIC

A fixed signal which can be controlled by a signaller but which can also be switched to “automatic”. When the signal is in “automatic”, it is operated by the location of train over track circuits on the departure side of the signal.

SIGNAL, SHUNT AHEAD

Subsidiary signals fixed on the post of a home/starting or starting signal, and giving authority for the signal to be passed for shunting purposes only into a single line section.

SIGNAL, SHUNTING

Signals used for low speed movements from sidings to main lines, and vice versa, and within sidings, and from one running line to another and for movements past a running signal at stop.

SIGNAL, SPLITTING DISTANTS

Two distant signals erected side by side, to tell a driver in advance which way the train is being routed at the junction ahead.

SIGNAL, STARTING

A controlled signal which, when cleared, gives the driver authority to enter the section provided that, where required, the driver is in possession of the authority for the section.

SIGNAL, SUBSIDIARY

A small semaphore or light signal provided below a running signal.

SIGNAL, TONNAGE

Signals at which trains over a prescribed load must be brought to a stand unless the signal is showing the full clear indication. The purpose is to prevent trains being brought to a stand on a heavy rising grade.

SIGNAL, TRACK CONTROLLED

Signals, partially or wholly controlled by track circuits, which return to their most restrictive position after a train passes.

SIGNAL, UPPER QUADRANT

A semaphore signal which, when operated to the proceed position, is either 45° or 90° above the horizontal.

SIGNAL, WRONG ROAD

Signals used for movements in the wrong running direction on a running line.

SIGNALLER

The person whose duty it is to enter train control commands into the signalling system, and to observe the status of the signalling system and the trains upon it. This includes the duties of “train controller”, in Train Order Working areas.

SIGNALLING, DOUBLE LIGHT

A system of colour light signalling where a running signal indication is given by two colour lights.

SIGNALLING, MULTIPLE-ASPECT

A fixed colour light signal capable of giving three or more aspects.

SIGNALLING RAIL

The rail so designated in rail track circuits in electrified areas, which is not designed to carry electric traction return currents. The other rail of the pair is designated the traction rail.

SIGNALLING, ROUTE

An arrangement of signal aspects or indications which convey to the driver the route on which the train is to travel.

SIGNALLING, SINGLE LIGHT

A system of colour light signalling where the running signal indication is given by a single colour light (plus a band of three lights for a turnout indication).

SIGNALLING, SPEED

A combination of signalling aspects which conveys to the driver the speed at which he is permitted to proceed.

SIGNALLING SYSTEM

A system which provides a means to safely regulate the movement of trains on a railway through the use of appropriate technology.

The signalling system is an integral part of a safeworking system and employs technical equipment to provide safe and efficient control of the movements of a stated quantity of rail traffic over a given network of track.

The safeworking system includes operating procedures for train movements should the signalling system fail.

The signalling system refers to the whole of the technology established between the signaller and the train or driver, by which control decisions for the safe and efficient movement of the train through the area of control establish a safe route for the train and are communicated to the train and its driver, and by which the signaller receives information on the state of the track and the location of trains on it.

The notional boundaries of the signalling system are at the signaller's hands and eyes, the train wheels and the driver's eyes, and the running rails (for points and train detection).

SIGNALLING, TWO POSITION/TWO ASPECT

Signalling using stop signals that only show two indications, "Stop" and "Clear", preceded by distant signals showing only "Caution" or "Clear".

SINGLE LINE

A single running line on which trains can travel in either direction.

SINGLE LINE TRACK BLOCK

A track block system of safeworking used on single lines which allows only one train to be in the section between interlockings at any one time.

SL LOCK

A general safeworking padlock with keys held by authorised operations and engineering staff.

SOLENOID

An electromagnetic device used to open and close contacts in an electrical circuit or to open and close a valve in an electro-pneumatic or hydraulic pressure line.

SOLID STATE INTERLOCKING (SSI)

A British developed computer based interlocking system using high integrity microprocessor based technology both for the central interlocking (Multi-Processor Module - MPM) and for the trackside controls (Trackside Function Modules - TFM's).

SPARK-GAP CONNECTION

An arrestor which connects a stanchion or metal structure to the traction return rail when the arrestor breaks down due to stray traction voltage on the structure. Stray traction voltage may be caused by insulation breakdown or direct contact with the 1500 volt DC traction overhead. The arrestor breakdown short circuits the traction feeder and trips the circuit breaker to remove the traction supply from the overhead.

SPECTACLE

That part of a semaphore signal which holds the roundels for the light indication at night and to which the signal arm is fastened.

STAFF

The token used in a train staff system, the possession of which gives the train permission to enter a block section.

STAFF STATION

An interlocking which is provided in order to work the Staff and Ticket or Electric Train Staff system.

STARTING SIGNAL CONTROL

A control on the starting signal in most Block Telegraph sections. This control prevents the signaller from clearing the starting or home/starting signal unless the block instrument is showing "line clear".

STICK CIRCUIT

A term applied to a circuit used to maintain a relay or similar unit energised through its own contact.

Signalling relay control circuits may include Approach Sticks (re: approach locking), Route Sticks (re: route locking), Direction Sticks (re: direction proving), Track Sticks (re: signal control relay down proving), and/or Lever Sticks (re: reclearing of a controlled signal after train passage).

STOCKRAIL

The rail against which the point of a point switch rests.

STOCKRAIL, JOGGLED

A stockrail joggled such that a thick tipped point switch fits into the set in the stockrail, so that the running face of the switch lines up with the running face of the stockrail. With facing points the opposite point switch is frequently housed.

STRETCHER BAR

Part of the points equipment for the purpose of maintaining the required distance between the switches of a pair of points. It may be either insulated or non-insulated.

SURGE PROTECTION

Equipment and systems for protecting electrical operating systems from transient electrical overload conditions due to external influences such as lightning, power supply switching, fault conditions.

SWITCH, FLEXIBLE

A continuous point switch that is “heel-less”; with the heel block bolted solidly through the switch.

SWITCH, HOUSED

A point switch which has a guide placed alongside it (and over it when in the open position), the purpose of which is to hold wheel flanges away from the tip of the opposite switch and/or away from a joggle in the stockrail (See Stockrail, Joggled).

SWITCH MACHINE (SEE POINT MACHINE)

SWITCH, SWITCH BLADE (SEE POINT SWITCH)

SWITCHES, INDEPENDENT

Points with each point switch of the pair of point switches separately and independently interlocked and controlled.

TAPPET

A device, usually a notched metal bar, which actuates the mechanical locking of a mechanical interlocking machine by the movement of the lever.

TELEMETRY SYSTEM

Equipment for multiplexing control and/or indication inputs for transmission over a telecommunications bearer or radio link. The messages for transmission are encoded and decoded by the telemetry equipment at the ends of the transmission line. Multiplexing may be Time Division Multiplexing (TDM) or Frequency Division Multiplexing (FDM). Used for remote control from a central office location to one or more field stations.

TELEPHONE BLOCK WORKING

A method of block working which is maintained by telephone. A signaller must not allow a train to enter the block section until the previous train has been reported by telephone as having arrived complete at the next block location.

TELEPHONE TRAIN CONTROL SYSTEM

A telephone system which connects the Train Control Centre to all other operational locations in that control area, so that the train controller can efficiently direct the movement of trains.

TEST, ANALYSIS

This is an inspection of items of equipment for conformance of component type, rating, indexing, labelling, and allocation to the documentation details of the design plans, diagrams, analysis sheets and specification.

TEST, ASPECT SEQUENCE

An aspect sequence test is the verification of the signal's aspects and aspect sequence, in accordance with the design drawings and any special aspect sequence charts drawn up specifically for this test.

TEST, CONTINUITY

This is the process whereby the wiring is checked to see that it is in conformity with the wiring diagrams and that all wires are continuous from termination point to termination point.

This test is generally carried out simultaneously with a wire count and insulation test.

TEST, CIRCUIT FUNCTION TEST TO WIRING DIAGRAM

This is the energisation of each circuit, or part of a circuit, and verifying by operation or disconnection that each and every control device, fuse and link is effective in controlling the circuit function in accordance with the circuit diagram. The specific contacts on control devices such as relays are not verified.

TEST, CIRCUIT STRAP AND FUNCTION TEST TO WIRING DIAGRAM

This a more in-depth circuit function test. It is the energisation of each circuit, or part of circuit, and verifying by operation or disconnection that each and every control contact, fuse and link is effective in controlling the circuit function in accordance with the circuit diagram.

As each control contact is operated to open the circuit, a strap is applied across the contact and re-energisation of the circuit is verified by observation of the voltmeter and circuit function.

TEST, CONTACT PROVING

This is an apparatus inspection and apparatus function test to prove that equipment contacts are the correct type, are correctly adjusted and electrically open and close when the equipment is operated.

TEST, CORRESPONDENCE

This is a through test to verify that a function is in correspondence with its respective controlling equipment and/or indicating equipment. It includes an out of correspondence test to prove that if the function does not fully respond then that is detected.

TEST, DESIGN INTEGRITY

This is a system interlocking and control function test similar to the Function Test to the Control Tables, but working from the operational requirements and signalling principles, not directly from Interlocking and Control Tables or Aspect Sequence Charts.

TEST, FACING POINT LOCK

A test generally carried out by inserting an obstruction gauge between the stockrail and the closing switch of facing points to confirm that the facing point lock of the point operating mechanism cannot complete its operation and to confirm that the points detection indicates that the points are not safe for the passage of trains.

TEST, FUNCTION

This is a test in which a function is operated by power through its controls to test that it achieves its specified purpose and includes testing that it will assume a safe state when the power is removed.

TEST, FUNCTION TEST TO CONTROL TABLES

This is the operation of the equipment from the control panel, keyboard, levers, switches, or VDU (Visual Display Unit) to verify that the system operates safely in accordance with the electrical interlocking and controls incorporated in the design drawings, namely the Control Tables.

TEST, INSULATION

This is a test of the resistance of the insulation between an electrical circuit conductor and “earth” or directly between the conductors of two separate electrical circuits. The test is made at a specified voltage which is high compared to the circuit voltage.

TEST, LEVEL CROSSING

This is an operational test of level crossing control circuits to check for adequate protection time, time of operation, etc. The checks are made by comparison with Track Plans, Control Tables etc.

TEST, MECHANICAL INTERLOCKING

This is a test of mechanical interlocking in interlocking frames, releasing keys/annett locks, half pilot staff locks, staff instruments, mechanical detectors, etc, to Locking Tables, Locking Diagrams and Working Sketches.

TEST, NULL COUNT

This is a check against the circuit book analysis sheets to verify that there are no wires terminated on spare contacts of relays and other operating mechanisms, nor on spare fuses, links, terminals, and all other spare termination points.

TEST, ON-SITE

These are tests using signalling power supplies of equipment and circuits installed in signalling structures with the track side equipment connected.

TEST, POINTS CORRESPONDENCE

This is a test to ensure that the position of a set of points is in agreement with that required by the interlocking.

TEST, PRE-SITE

These are tests of manufactured equipment and circuits using temporary supplies prior to site installation. These are generally not certification tests, but rather quality control tests.

TEST, SET TO WORK

This is not a certification test but part of the process of setting the equipment to work correctly. It is the initial powering up of the signalling circuitry and local apparatus at a relay room or location case to test that it is able to carry out its function correctly.

TEST, THROUGH FUNCTION

This is a circuit function test of a circuit or series of related circuits running between locations, e.g. signal boxes, relay rooms, etc, to ensure the fuses, links and control devices effectively control the final function. It includes through function testing from a signaller's control on the operator interface to the operation of the trackside signalling equipment, and to its change-of-state indication back to the signaller's indicator diagram.

TEST, WIRE COUNT

This is a count of the number of conductors terminated on each wire termination point and at every wire termination point. The count is certified against the circuit wiring diagrams and cross checked against the analysis sheets.

TIME DISTANCE CURVES

Time distance curves are employed in the planning of signal positions. The time is plotted vertically against a horizontal distance scale, and the curves indicate the position of a train at any particular time for the section of the line under consideration.

TIME RELEASE

A device used to prevent the operation of an operative unit until after the expiration of a predetermined time interval after the device has been actuated.

TOKEN

An object which must accompany a train as the authority for the train to occupy the section. A token can be a metal staff, a ticket or a special authority.

TOKEN SYSTEM

A system regulating the traffic on single track lines, under which the right to enter a section is given to the train through delivery of a token to the train driver. This token usually consists of a staff.

TRACK BLOCK SYSTEM

A system of safeworking used on single or double lines in track-circuited areas.

TRACK CIRCUIT, AC

A track circuit with a 50 hertz Alternating Current track feed.

TRACK CIRCUIT, AC/DC

A track circuit with a rectified Alternating Current track feed.

TRACK CIRCUIT, AUDIO FREQUENCY

A “jointless” track circuit where each track circuit along a track operates alternately at one of two modulated audio frequencies, and separation between adjacent track circuits is achieved via tuned loops instead of insulated block joints. There are two types of design, one in which the receiver is operated by changes in the track voltage across the rails and one where the receiver is operated by changes in the current in the rails.

TRACK CIRCUIT

An electrical circuit where current is carried through the rails and is used to detect the presence of a train when the train’s axles short circuit the current. Track circuits are used in the operation and control of points and signals.

TRACK CIRCUIT, CENTRE-FED

A track circuit wherein the current is supplied at or near the centre with relays at each end.

TRACK CIRCUIT, CODED

Impulse current track circuit in which the number, frequency, polarity or duration of the impulses, or several of these characteristics at a time, are utilised in order to permit selection of action on one or more receiving apparatus units, specially adjusted for these and connected to the same track circuit.

TRACK CIRCUIT, DC

A track circuit with a Direct Current track feed.

TRACK CIRCUIT, DOUBLE RAIL

Track circuit in which both rails are used for traction return, and also for track circuit currents, with separation between adjacent track circuits being achieved by insulating joints in both rails, or electronic separation joints.

TRACK CIRCUIT, DROP SHUNT

The maximum resistance in ohms which will cause the track relay contacts to drop away when this resistance is placed between the rails of the track circuit at the most adverse shunting location.

TRACK CIRCUIT, HIGH VOLTAGE IMPULSE

A track circuit fed by high voltage pulses of particular shape and size which are recognised by a receiver and special track relay.

TRACK CIRCUIT, OVERLAY

A track circuit installed on a section of track over which one or more existing track circuits are operating. Overlay track circuits are usually audio-frequency systems, configured so that the main and overlay track circuits operate independently of each other.

TRACK CIRCUIT, PREVENT SHUNT

Maximum value of the resistance which, placed between the two rails of a track circuit, will prevent the energisation of the track relay.

TRACK CIRCUIT, SHIELDING IMPEDANCE

A series resistor, parallel inductance impedance unit inserted in a single rail 50 hertz AC track relay circuit to limit, divert and prevent traction return DC current affecting the AC track relay.

TRACK CIRCUIT, SINGLE RAIL

A track circuit in which one rail is used as a common rail for traction return, and the other is divided into sections by means of insulating joints.

TRACK CIRCUIT, WESTRAK

A track circuit with an Alternating Current track feed and a Direct Current track relay connected in parallel at the feed end with a half-wave rectifier connected across the track at the other end of the track circuit.

TRACK CONTROL SYSTEM

A system of safeworking used on single or double lines in track-circuited areas (or on single lines provided with axle counting equipment).

TRACK INDICATOR

An indicator, in a signal box, which shows the signaller whether or not the portion of track-circuited line represented by that indicator is occupied by a train. At some interlockings, where only certain portions of lines are track-circuited, individual track indicators are provided. At fully track-circuited interlockings the indicators are grouped together to form a track indicator diagram.

TRACK INDICATOR DIAGRAM

An illuminated diagram which indicates whether the track circuits within the controlled and adjoining areas of a signal box are occupied by trains. The diagram may also include indications of routes set, signal repeaters, points indicators, control repeaters, time releases, power supplies, etc.

TRACK LOCKING

Locking of signals or points applied and maintained by the presence of trains on particular sections of track, as detected by track circuits.

TRACK STICK

A circuit provided to prove that a signal has returned to stop, and its signal control relays have de-energised, after the passage of a train.

TRACTION RAIL

The rail(s) in which traction current is returned to the substation.

TRAILING MOVEMENT

The movement of a train over points which are trailing points for the direction in which the train is moving.

TRAIN BAR

A bar which is connected to the facing point lock and which is used to span the additional distance if the home signal is located further from the points than the length of a single facing point lock bar.

TRAIN CONTROL SYSTEM

The term Train Control System (TCS) shall be taken to mean one or more microprocessor based operator interface stations with the processing capacity to handle route setting, automatic route setting, train tracking, train describing, train reporting, event logging and all similar functionality.

TRAIN CONTROLLER

A certified employee who is responsible for planning, organising and controlling all train services in accordance with the timetable and train priorities and, in the event of a disruption to service, for scheduling the available facilities to restore the service as quickly and safely as possible in accordance with safeworking procedures.

TRAIN DESCRIBER

Signalling equipment provided to identify trains individually on a signaller's track indicator diagram, console unit, video display unit or video projection screen.

Train Describers provide signallers with a visual display showing the identity and location of trains within their area of control, with the facility for interposing, modification and interrogation of train description and with alarms that warn signallers of events taking place associated with the Train Describer.

TRAIN DESCRIBER FRINGE BOX

A signal box controlling a location that is an entry point for a train describer system. The fringe box contains train describer equipment and train identification details can be entered manually for the next train(s) to depart the particular controlled location.

TRAIN GRAPH

A plot of actual and projected train movements on a graph with axis of location versus time. Used by train controllers to predict crossing locations for opposing trains on single line sections and to manage the train movements accordingly. It serves also as a record of actual crossing locations and times.

TRAIN OPERATED ROUTE RELEASE (see AUTOMATIC ROUTE NORMALISATION)

TRAIN ORDER WORKING

A system of safeworking on single lines where train movements are governed by Train Orders issued by a Train Controller, who ensures that no conflicting train orders are on issue.

TRAIN ORDERS, COMPUTER ASSISTED

A computer system which assists the Train Controller in compiling, issuing, cancelling and recording train, mishap and shunt orders and track warrants, and provides a graphical representation of the extent of orders and warrants issued, location of trains and crossings programmed.

TRAIN RADIO

A radio system use to aid train operations and to provide communications between train crews, train controllers, and track maintenance staff.

TRAINSTOP

A device located on the track, usually adjacent to fixed signals, and fitted with an arm which is raised when the signal is at stop. If a train fitted with a trip valve passes the trainstop when the trainstop is in the raised position, the trip valve will strike the raised trainstop arm and apply the train's brakes.

TRAINSTOP, CONDITIONALLY CLEARED

A trainstop arm which moves from the raised (tripping) position to the lowered (cleared) position when a train approaches, provided that the train is approaching the train stop at the correct speed.

TRAIN WARNING AND PROTECTION SYSTEM (TWPS)

A British advancement of their Automatic Warning System (AWS) with overspeed sensors and trainstop loops added in the track to transmit to fitted trains and enforce braking as required by the signal indication.

TRANSMISSION BASED SIGNALLING (COMMUNICATION BASED SIGNALLING)

A closed loop system which uses digital radio to provide vital data transmission between on-board train systems and signalling control systems.

The concept of a Transmission Based Signalling is one in which each train in an area of control continuously informs a central signalling system details of its position, speed and acceleration, and the central signalling system continuously transmits to the train a limit of authority and details about the trains required speed profile. In this concept, by using train-to-control centre radio systems, the track side equipment may become limited to point operating mechanisms and passive track mounted transponders used to give reference points for on-board tachometers so that effects such as slip, slide and wheel wear can be accommodated.

TRANSPONDER

A unit usually mounted in the track and used to transmit information between track and train at short range radio frequencies. An antenna on the train passes over the transponder and one interrogates the other. The transponder may be passive and powered by carrier energy transmitted from the train, or be active, transmitting continuously or only when interrogated by a train. The transponder may hold fixed information and/or receive updated information through connection to the signalling system.

TREADLE

A device mounted next to a rail by which the deflection of the rail (due to the passage of an engine or vehicle) or the impact of the train wheels, or other means, operates a contact to open or close an electric circuit to detect the passage of train wheels.

TRIP VALVE

A pneumatic valve mounted near the left-hand leading axle of multiple unit electric trains. If a train passes a trainstop when the trainstop arm is in the raised position, the trip valve arm will be moved backwards by the raised trainstop arm. The train's brakes will then be automatically applied.

TURNOUT

The assembly of stockrails, point switches, crossings and closure rails by means of which rolling stock may be diverted from one track to another.

UNATTENDED INTERLOCKING

The term used to describe an interlocking which is not being controlled by a signaller. At some unattended interlockings the signals and points are worked by the train crew.

UNIDIRECTIONAL SIGNALLING

Signalling provided to allow the movement of trains in one direction only over a line.

UNIT LEVER OPERATION

A method of signalling control with a separate lever for each set of points, each release switch and each signal. In setting up a signal route, the signaller is required to operate the levers for required points and/or releases individually before operating the lever for the particular signal. This contrasts with route control systems, entrance/exit or one control switch.

UP LINE

In a double line area, the line normally used by trains travelling towards Sydney.

VALIDATION

Confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled.

The test and evaluation of the integrated software system to ensure compliance with users' requirements. Validation is generally used to refer to a larger process than verification (see below). In particular, whereas verification tests software against the specification for that software, validation of the system is concerned with whether the operation of the system provides the results needed by the user. Validation therefore involves consideration of whether the specification of a system sufficiently and accurately represents the needs of the user.

Validation is the process of establishing that the system as specified meets the requirements for use in its intended application.

VERIFICATION

Testing and evaluation of an item of equipment or a system to assure compliance with its specification or other requirements.

Confirmation by examination and provision of objective evidence that the specified requirements have been fulfilled.

Verification refers to the inspection and testing of the system at each phase of its safety lifecycle, including the utilisation phase, to ensure that the system meets its specification requirements.

VISUAL DISPLAY UNIT (VDU)

Terminal device usually incorporating a cathode ray tube with a screen on which text and graphics can be displayed. Used as an I/O (input/output) device in conjunction with a keyboard or a mouse for interactive computing.

VITAL

Signalling equipment and circuits are considered vital where failure to function correctly could cause an unsafe outcome either directly or together with another signalling equipment or circuit failure. Vital signalling equipment is equipment whose safe operation is fundamental to the safe operation of the signalling system. Equipment for use in this mode should have been designed to ensure that it will not fail in an unsafe manner. This may well involve designing it in such a way that should it fail it will fail in a predetermined state which does not lead to an unsafe situation. Such equipment is termed “fail-safe”.

WARNING LIGHT

A light provided for warning employees of approaching trains. The warning light is illuminated when there is no train approaching.

WAYSIDE

Equipment and/or structures installed at locations alongside the Permanent Way. These may also be referred to as “lineside” or “trackside”.

WRONG SIDE FAILURE

Failure of a signalling unit or subsystem which brings the system to a hazardous condition where the movement of trains could be endangered by allowing a false proceed authority to be given.

XL LOCK

A special safeworking padlock with a limited number of keys held by authorised operations staff.

YARD LIMITS

The defined area at an interlocking where yard working applies.

YARD WORKING

A method of working trains within yard limits.