AUSTRALIAN RAIL TRACK CORPORATION LTD

**Discipline: Engineering (Signalling)** **Category: Standard**

# Signalling Documentation and Drawings

## SCP 06

### Applicability

| | | | |
|---|---|---|---|
| **New South Wales** | ✓ | **CRIA (NSW CRN)** | ✓ |

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# 1 Introduction

## 1.1 General

This document sets out ARTC's standards, practices and procedures for the preparation, presentation and use of design and design related documentation and drawings required for new and altered signalling works.

## 1.2 Definitions

| Term or acronym | Description |
|---|---|
| Australian Rail Track Corporation | Hereinafter referred to as 'ARTC', the owner of the infrastructure. |
| IWMP | The person, company, corporation or authority which, as Infrastructure Works and Maintenance Provider or equivalent, has entered into an Alliance Contract or Deed of Agreement with ARTC for infrastructure management, maintenance and construction of one or more parts of the rail system. |
| IWMP representative | The person, company, corporation or authority employed or contracted by the IWMP and appointed to manage the fulfilment of the works. This may involve the management of more than the one contract. The term 'IWMP representative' shall be taken to include any person authorised to act on behalf of the IWMP representative. |
| Contractor | The person, company, corporation or authority contracted to implement the specified works relating to ARTC infrastructure. The term contractor shall be taken to include any sub-contractors engaged in the works. |
| Design Engineer in Charge | The person employed by the contractor who has the responsibility to ensure design work is carried out to schedule, to provide the required system performance and to ensure the safety and integrity of the signalling operating and control system designs. |
| Signal Design Manager | The person employed by the IWMP who is the IWMP signalling design authority and responsible for authorising and approving design changes to the existing signalling system in accordance with ARTC design standards.<br>The Signal Design Manager is also responsible for the review of a contractor's designs and advising the IWMP representative and the commissioning engineer of any concerns with the contractor's designs or design process. |
| Drawings | Drawings shall be defined in this context as site specific or standard documented layouts, plans, diagrams, tables, schematics and the like that set out the design and/or configuration of signalling infrastructure assets (e.g. physical dimensions and composition, temporal and/or spatial arrangements, physical and/or logical interconnections) either existing, pre-existing, or proposed. |
| Documents and Drawings | Documents and drawings shall be defined in the context of this standard as technical documents and technical drawings relating to the infrastructure asset and its life cycle (specification, design, manufacture, construction, test and commission, operation, maintenance, modification, disposal) and shall not include documents or drawings relating to correspondence, administration, finance, marketing, human resource management, project management, contract management and the like. |
| Independent Checker (Independent Signalling Design Checking Engineer) | A suitably experienced, fit and competent Signalling Design Engineer who is responsible for checking that the prepared signalling design is safe and reliable and in accordance with standard signalling principles and practices, and is operationally functional as specified. The independent signalling design checking engineer may not necessarily be responsible for checking documentation detail, equipment ratings or the integrity of non-vital aspects that would not |

| Term or acronym | Description |
|---|---|
| | impact on the safety integrity or reliability of the signalling system.<br><br>The independent checker is a signalling design checker who has the necessary level of independence to check safety-related features of signalling designs to a very high degree of certainty of not making the same, or similar, mistake as the designer and who has the necessary level of experience, fitness and competence to ensure the safety-related features are all present and correct.<br><br>In some cases, as stipulated in the project specification, the independent checker may be provided by the IWMP. |
| Approval Terms | Unless otherwise explicit from the context, the terms 'for approval', 'for consideration', 'for agreement', 'for acceptance', 'for permission to use', 'for review', 'shall be submitted', 'shall submit', 'as approved', 'as agreed', 'as accepted' and 'permitted for use', shall refer to the requirement to obtain, on the basis of a written submission, formal acceptance from the IWMP representative, or other specifically nominated authority, prior to incorporation as part of the works or use in work under the Contract.<br><br>Except where expressly and formally requested as a waiver, deviation or variation to the Contract, the normal process of consideration, review and acceptance for use of submitted documents and drawings shall not provide acceptance of any noncompliance or limited compliance or of any error or deficiency, and shall not relieve the Contractor of their responsibilities under the Contract. |

## 1.3 Applicable Documents

This standard shall be read in conjunction with the project specification, any general conditions attached thereto and other standards and documents comprising the Contract.

In particular, this standard shall be read in conjunction with the following ARTC publications:

- SCP 01 Signalling Control Systems
- SCP 16 Signalling Operator Interface
- SCP06F-01 Modification Instruction form
- SDS 00 Introduction
- SDS 25 Signalling Circuit Design Standards
- SPS 01 Standard Requirements for Signalling Electronic Systems
- ESC-21-01 Inspection and Testing of Signalling – Roles, Responsibilities and Authorities
- ESC-21-02 Inspection and Testing of Signalling – Plans, Programs, Documentation and Packages
- ESC-21-03 Inspection and Testing of Signalling – Inspection and Testing Principles
- ESC-04-01 Signal Sighting and Position
- ESD-25-01 CAD and Drafting Manual for Signalling Drawings
- ESI-07-02 Signals Design Documentation

## 1.4 Contractor Responsibilities

The contractor shall be responsible for:

- Compliance with the requirements, practices and procedures set out or referenced in this standard, except as otherwise expressly approved in writing by the ARTC Executive Manager Standards, Systems and Performance or nominated signalling representative with delegated engineering authority for standards waivers.
- The provision of safe, reliable and fit for purpose signalling design in accordance with ARTC's design principles, practices and standards as set out in ARTC publications SDS 00 Signalling Design Principles, SCP 01 Signalling Control Systems, SDS 25 Signalling Circuit Design Standards and SCP 16 Signalling Operator Interface, as well as in accordance with the requirements set out in this standard, in the project specification, and in specified signalling plans and specified control tables.
- Signalling SSI data designs shall conform to the current BR Codes of Practice for Data Preparation, augmented and amended by the current ARTC supplements for ARTC applications. Other CBI systems shall conform with their respective application notes or Codes of Practice.
- Requesting details of ARTC's standard design practice where there are any vital signalling designs that are not covered by ARTC standard practices in the standard.
- Preparing and submitting a proposed design for a typical application for type approval review at an early stage where no standard design practices are provided by ARTC following a request.
- The supply of three copies when design or design related documents, drawings and software are required to be submitted or supplied, unless otherwise specified or agreed. (The IWMP or a nominated representative may copy the documents, drawings or software submitted, but the IWMP and the nominated representative shall be responsible for the documentation control of the additional copies and for ensuring their destruction when no longer required.)
- The provision of all documents and drawings necessary for the satisfactory completion and performance of the works and for the satisfactory progress of the work under the Contract.
- Alterations to any documentation and/or drawings provided by the IWMP or ARTC, pursuant to the terms of the Contract, where such alterations are necessary for the performance of the work under the Contract.
- Preparation of all documentation and drawings relevant to the works that are required to form part of ARTC's permanent records, in a manner that is suitable for and shall facilitate incorporation into the current permanent records.
- Production and presentation of ARTC documents and drawings in accordance with ARTC's standard documentation and drawing practices, including templates and formats, title blocks, numbering and naming conventions, symbols and nomenclature, indexing and version control practices, addition and deletion annotation practices, circuit book content arrangements and book binding practices. ARTC's standard practices are detailed in this standard and its appendices.
- Obtaining ARTC drawing numbers from the ARTC Configuration Management Administrator through the IWMP representative.
- Requesting details of ARTC's standard drawing practices where these are not covered in the standard.
- Preparing and submitting a proposed drawing practice for review and approval where no standard practices are provided by ARTC following a request.
- The presentation and delivery of new and altered final drawings so they fit into ARTC's existing series of drawings to form an ordered, comprehensive, consistent and cohesive set in accordance with ARTC's standard documentation and drawing practices, including drawing registration numbering practices, without the necessity for any modification to the existing series of drawings that are not affected by the work under the Contract. If it is necessary for other existing drawings not directly affected by the works to be renumbered or otherwise modified to achieve an ordered, consistent and cohesive set in accordance with ARTC's standard drawing practices, then those other drawings shall be considered

included in the work under the Contract and shall be modified to comply with the requirements.

- The preparation of permanent configuration drawings in digital format.
- The preparation and delivery of all configuration documents and design drawings such that future corrections, additions, deletions, amendments or presentation changes can be readily made by others and are not dependent on any propriety process that is not an industry standard or an expensive conversion before the change can be made.
- Configuration management of designs and drawings.
- The provision and maintenance of a register of all drawings and copies of drawings issued for the works and work under the Contract, showing all identification details of each drawing issued (e.g. drawing number and/or title, type of drawing, purpose of copy, version number and date, copy number, copy holder name and receipt acknowledgment, issue date, history and current status).
- Transmittal of all documents and drawings using standard transmittal forms detailing the issue. Registering the issue details and recording and following up receipt acknowledgments.
- Employment and adherence to documentation control procedures for all documentation and drawings prepared and/or used for the work under the Contract.
- Document and version control of all Contract design documents and drawings.
- Registering of the issue and current status of all Contract design documents and drawings.
- Selection of suitably experienced, fit and competent persons for design engineer in charge, designer, independent checker, design approver and design integrity tester.
- Demonstration of proof of experience, fitness and competence of design personnel.
- Submission of the details and proof of competence of the design engineer In charge, independent checker, design approver and design integrity tester to the IWMP.
- Ensuring the independent checker is accepted by the ARTC Manager Standards after assessment by the ARTC Executive Manager Standards, Systems and Performance or nominated signalling representative.
- Recording of errors and omissions of designers, independent checkers, design approvers, design integrity testers and recording of corrective actions.
- Submitting justification and obtaining approval for desirable variations to the standard requirements from the ARTC Manager Standards after detailed assessment by the ARTC Executive Manager Standards, Systems and Performance or nominated signalling representative with appropriate delegated engineering authority for standards waivers.
- Submission of review copies of design drawings and SCP06F-01 Modification Instruction forms, for consideration for IWMP acceptance, after sign off by the contractor's designer, independent checker and design approver.
- Corrective action in line with IWMP amendment requirements following the return of review copies submitted for consideration for IWMP acceptance, and resubmission of corrected documents and drawings, after sign off (as for original submission).
- Provision in the Contract Works Program of 28 days from the date of receipt by the IWMP representative for the IWMP's consideration of submitted review copies/SCP06F-01 Modification Instruction forms (including for any and all resubmissions) and the inclusion of these periods in the Contract Works Program. Provision of an additional seven days review time per each 25 routes or part thereof in excess of the maximum 75 routes covered by the 28 day review period.
- Provision of testing copies of all documents and drawings requiring inspection and testing of compliance to the design.
- Handover to the IWMP commissioning engineer of each and every test copy with inspection and test annotations and testers' certification signatures and tester in charge's endorsement signature, as testing of the particular test copy drawing or test copy book of drawings is completed.

- Updating of master design documents and drawings as required.
- Ensuring all documents and drawings being used at any time are the latest version, are correct and they are the appropriate copies.
- Handover of all documents and drawings as required.
- Provision of design closure lists of the total set of approved design documents and drawings to which the installation has been designed.
- Safe custody, security and control of any alterable replicas of ARTC masters of existing design documents and drawings provided to the contractor for updating with amendments and changes due to the works, and for integration of the design documentation and drawing work under the Contract with the existing documents and drawings.
- The provision of interim maintenance copies at the time of commissioning for the Drawing Management System, maintenance staff and maintenance management personnel.
- The provision of an asset (equipment) register in the format required by the IWMP and ARTC, two weeks prior to commissioning.
- The provision of any other data and information required for ARTC's GIS systems in the format required, as stipulated in the project specification.
- The provision of data required for changes that affect ARTC's network control system data sets, in the format required, prior to commissioning the changes.
- The provision of data required for updating ARTC's MTRAIN simulation system, namely the positions of signals, the positions of their clearance points and the signal aspect sequence controls.
- Confirming actual site conditions and details for inclusion on track insulation plans, when using ARTC Permanent Way layout drawings as an aid.
- Advising the IWMP representative of any required alterations to control tables where these were issued as specified control tables by the IWMP, arising from detailed design, construction, testing and setting to work of signalling systems. (The IWMP representative will issue new copies of the specified control tables, which will contain the approved alterations.)
- Production of straight line signalling plans, utilising the information given on any specified track plans.
- The preparation and submission for review and then the distribution of sufficient approved copies of commissioning notices at least seven days prior to the commencement of the commissioning, with copies for all personnel involved in the commissioning who need to know.
- Delivery of the final master copy of the drivers diagram at least ten weeks prior to commissioning and delivery of the write up for advertising the work in a Safe Notice at least nine weeks prior to commissioning.
- Delivery to the IWMP representative, within 14 days after the commissioning of each stage of the works, three white prints of all related documents and drawings plus a software copy of all digitised design documents and drawings, amended to final modifications, together with the test copy master.

  The designer in charge and the designer who carried out the checking of these documents and drawings to verify them as final, shall both sign the test copy master of each document and drawing to certify that the final documents and drawings have been updated and are accurate to the approved designs and to the as-built, tested and commissioned installation, and are in accordance with the contract requirements, including the contract documentation requirements. The designer shall also sign the master of the final drawing to verify the drawing has been verified, and updated where required, to the test copy master.
- Correction of final documents, drawings and software advised as unacceptable and resubmission of the corrected documents, drawings and software within seven days of the advice.
- Provision, within seven days of advice of acceptance of the final documents and drawings, of new or altered drawings with a common related version number and date, reproducibles

including all negatives, master and duplicate master software, plus three prints of all documents and drawings including detailed site survey drawings, control tables, signal scheme plans and TFM allocation plans (where applicable) and attesting that they have been checked and signed off as checked by suitably competent and responsible members of the contractor's staff and are in accordance with the relevant Contract requirements; provision of these in accordance with ARTC's standard drawing practices and document management processes, ready for immediate use and ready for immediate integration into ARTC's existing documents and drawings without the need for alteration to the existing documents and drawings other than the removal of superseded documents and drawings. The documents and drawings are to be accompanied by a standard transmittal form detailing each and every document and drawing transmitted.

(Notwithstanding, should any of the documents, drawings or software, or any of the copies thereof provided in accordance with the requirements of the Contract, be revealed at some time to be inaccurate or otherwise not in accordance with the specified Contract requirements, the contractor shall remedy the situation promptly by replacing the incorrect documents, drawings or software and the copies thereof with correct documents and so on, with issue and version dates amended where applicable. The contractor's liability shall include the recovery and updating of controlled copies issued from the deficient documents, drawings or software. The contractor shall investigate how the error may have occurred and not been picked up by the contractor's checking, and shall review the possibility that other documents, drawings and software may be in error, and shall attest that any subject to doubt have been rechecked and are correct.)

- The handover of all final masters and final print copies of documents and drawings correct in accordance with the requirements, within 28 days of commissioning.

The final drawings to be prepared and handed over include:

- signalling plans, (track plans, working sketches)
- control tables
- circuit drawings and books
- detailed site survey drawings
- Signal Sighting forms
- driver's diagrams
- track insulation plans (track bonding plans)
- level crossing layout plans
- installation drawings
- mechanical drawings
- structures drawings
- clearance diagrams
- equipment housing layout plans.

Documents to be prepared and handed over include:

- equipment register system manuals
- equipment manuals

*Note: Late delivery of correct final documents and drawings is subject to Liquidated Damages.*

# 2 Documentation and Drawings

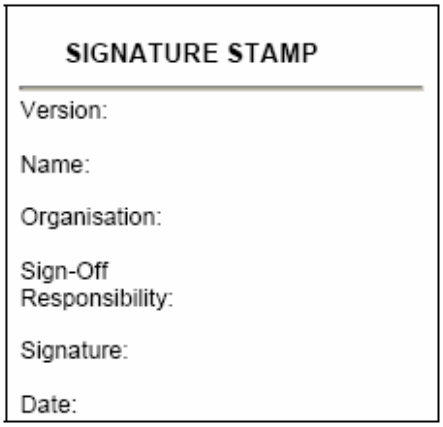
## 2.1 General

Refer to ESD-25-01 CAD and Drafting Manual for Signalling Drawings and ESI-07-02 Signals Design Documentation.

## 2.2 Signature Stamps

Drawings shall include a signature stamp to be completed on copies to certify the current sign off status of the drawing (e.g. signed and dated by either the designer, checker or independent checker depending on the status of the drawing). The independent checker would not sign off unless they have a drawing signed off by the designer and similarly the approver would not sign off unless they have seen the drawing with the independent checker's signature. The approver would sign off in a separate position on the master and the approver's signature remains on the drawing with the date of approval becoming the drawing version date.

Following is an example of a signature stamp:




On master tracing negatives, the signature shall be written on the tracing.

On digitised masters, the person's name shall be entered in the respective position when the corresponding signature has been obtained on a paper copy.

Labels on magnetic discs shall include the information as shown for disc labels in Appendix C.

The version number and date of the drawing becomes the version number and date of the most recent approved amendment. The drawing original date and previous amendment dates shall be also retained on the drawing.

*Note: Where drawings are sheets that are to be kept as pages in a book of drawings, the cover sheet shall include the above details (as also shall the individual drawings sheets) and in addition the books shall include control pages inclusive of amendment details.*

The cover sheet for a book of drawings shall show the version number and date of the most recent version number and date of any drawing in the book.

The cover sheet shall also provide an entry to show the copy number and the copy holder name, as shall the control pages for the book.

Version numbers and dates shall be incorporated on each and every drawing at and from the time they are first signed off as designed, checked and approved and submitted for review.

The version numbers for signed off drawings for new and/or altered works shall start at 0.1 and should also have an alphabetic suffix to denote they are not yet as built drawings (e.g. version 0.1A).

Drawings prepared as a set at around the same time should be given a common version date that is not earlier than the approval date.

After a drawing is signed off and given its first version number and date, there is to be no change commenced to the drawing unless a description of the proposed amendment is filled in conspicuously on the drawing and the status of the drawing in circulation is to be obviously under amendment. The amendment template will then be progressively filled in by the designer, independent checker and approver as the drawing is changed to its new updated version number and date. The word DRAFT should be written on the drawing in the signature's spaces pertaining to the amendment until replaced by the actual signature.

Version numbers shall increase by one decimal point for each issue of minor amendments. Drawings for new and/or altered works shall increase the alphabetic suffix by one letter for each reissue of the whole drawing for major amendments. As-built drawings shall have a similar system of version numbers, originating at version 1.0 but without any alphabetic suffix and shall increase by one whole integer for each reissue of the whole drawing for major amendments.

Each controlled copy of the same drawing should be individually designated its own copy number.

Copies of drawings issued for a particular phase of the work shall be identifiable with that phase even where the same drawing is unaltered from the copy for an earlier phase. The version number and date for the drawing should remain the same unless the drawing has been altered.

Title blocks shall generally be positioned in the bottom right hand corner of drawings. In the case of roll plans, title blocks shall be positioned at the right hand end of drawings with an abbreviated title block at the left hand end. For circuit diagrams, the version number and version date shall appear within the border and in the top left hand corner of each and every circuit diagram sheet. Refer to the standard circuit drawings in SDS 25 Signalling Circuit Design Standards. For books of drawings, the current version number and version date of the book and of each of the drawing sheets shall be individually recorded on documentation control pages and an amendment sheet. A brief description of each amendment for all jobs shall also be provided (refer to Appendix H). Company names and/or logos shall not be prominent.

- New pages for existing circuit books may be numbered with alphabetic suffixes where appropriate (e.g. existing altered page N020 replaced by new pages N020A, NO20B) to avoid renumbering subsequent pages that are otherwise unaltered.
- The index and table of contents shall be amended for the whole of an existing book that has undergone any alterations, including page number changes. A new cover sheet and set of control pages inclusive of amendment records, shall also be provided for the whole of the book.
- All drawings and documentation applicable to temporary works including stage work and interface work shall be clearly endorsed as such on each drawing sheet. All details necessary for such temporary works should be added to a reproducible copy of the existing arrangements and/or to a reproducible copy of final arrangements as appropriate to facilitate production of the temporary or stage work drawing.
- The practice for showing work comprising alterations shall include the detailing of existing wiring, equipment and structures to be removed, as they exist, but with line work dotted and highlighted with unfilled arrows and crossed out. New work shall be shown in full line work highlighted with filled arrows.
- If drawings are prepared in advance and issued for work to be carried out after other work that is not yet completed and certified, then there shall be a means to separately identify on these drawings not only the work to be carried out and the original existing work, but also the other work that will be carried out and completed prior to this work being carried out. For example, the latter work could be annotated with asterisks with a note describing the work to which the asterisk refers. Before the work for which this latest drawing is prepared is carried out and connected, it must be verified that the previous work has been duly installed, inspected and certified to be in accordance with these drawings.
- All copies of documents and drawings shall be designated as to their purpose as follows:
    - correlation copy (for certification of existing details)
    - review copy
    - construction copy
    - test copy

- certification copy (test master copy)
- commissioning copy or commissioning/interim maintenance copy
- final/as-built copy
- general correspondence.

Methods of identifying drawings to all users for the different type of copies (e.g. review copy, construction copy) shall be obvious and strictly followed. Test copies should be printed on pink paper and final/as-built copies shall be printed on white paper.

Each and every book of drawings shall be provided with a cover sheet and with control and amendment pages in accordance with Appendix H.

- Suitable hard PVC coated covers shall be provided for all final books descriptively titled to show contents including, where applicable, the area contained within the book, the book number and the location (and reference number) where the book is to be kept. Cover titles shall be submitted for acceptance. Books shall be bound such that individual pages may be replaced or added in the future.

## 2.3 Design Checking and Approval Process

Signalling designs shall be prepared by a signal designer, self checked and signed off before being passed to a separate Signal Design Engineer for checking.

Non safety-related aspects of signalling system design may be checked by a competent Signal Design Engineer who need not be totally independent but shall not have designed, or have been closely involved in the design of, any part of the signalling that is being checked. (The independent checker shall be totally independent.)

*Note: Signalling system reliability is a safety-related aspect.*

The independent checker (independent signalling design checking engineer) is required to sign off safety-related signalling designs as independently checked and correct before passing them to another Signal Design Engineer for approval prior to issue.

The design approver shall sign off the designs to attest they have been properly prepared and independently checked by suitably fit, competent and experienced signal designers, working in a suitably controlled environment, applying the approved processes and authorised standards and to attest that the prepared and checked designs are fit for purpose as specified.

Design integrity testing to signalling principles and control table requirements shall be carried out and certified after the designs are installed by an experienced Signal Design Engineer (not the signal designer who prepared the design), as appointed by the design approver. Design integrity testing is described in ESC-21-01 Inspection and Testing of Signalling – Roles, Responsibilities and Authorities and ESC-21-02 Inspection and Testing of Signalling – Plans, Programs, Documentation and Packages.

The designer, independent checker, design approver and design integrity tester shall be demonstrably fit, competent and qualified to perform the duties required.

The independent checker must be a carefully selected, suitably qualified and experienced Signalling Design Engineer who is not the designer's controlling officer nor anyone else who has participated, or has been an involved observer, in working out a design solution of the design requiring checking. The independent checker in marking up deficient designs is to highlight the deficiency and not provide the design solution. The same checking engineer is to check that all parts of the design that need to be changed in correcting the deficiency pointed out by the checking engineer have been properly changed by the designer and that only those changes and no other changes are made.

Independent checkers must not make design corrections or become involved in altering designs or in providing input to design solutions, which they will be required to check.

The independent checker should not be accountable to the project Signalling Design Engineer in Charge or any other designer in the project team, nor to any project person who has a responsibility for project time and cost aspects that could conflict with project quality, safety and reliability, but should be accountable to a person who has safety and quality responsibilities

related to the project. At the same time the independent checker is required to be acceptable (as suitably experienced, fit and competent) to the signalling project design engineer in charge.

The independent checker is required to be accredited by the ARTC Manager Standards after assessment by the ARTC Executive Manager, Standards, Systems and Performance or a nominated signalling representative.

The independent checker shall keep a record of the designer's errors and omissions and pass this record onto the design approver for that officer's information when approving the designs.

The design approver shall maintain this record and a record of any design deficiencies that are not detected by the independent checker.

Design errors or omissions that are discovered by the design integrity tester shall also be recorded against the designer and/or independent checker, as applicable. Design errors or omissions that are revealed at a later stage following the completion of design integrity testing shall be recorded against those responsible including against the design integrity tester, as applicable.

Error and omission records shall be constantly reviewed and determinations made as to the competence of the designer, independent checker and design integrity tester and appropriate action taken to ensure the designs will be safe and meet the contract requirements.

The design checking procedure shall be consistent with Appendix I unless otherwise approved by the ARTC Manager Standards.

## 2.4 Review Copy Documents and Drawings

- All documents and drawings prepared or modified by a contractor shall be submitted for consideration as review copies and each drawing shall carry a version number and date.

  All documented drawings ready for submission for review shall have been internally checked by the signal designer and the design engineer in charge (or the designer's immediate supervisor) and also separately checked by the independent checker. Where the design engineer in charge does the design then, as there are no more senior signalling designers on the project design, no other internal checking is required.

  All such review copies shall be signed by the design engineer in charge or other nominated design approver, verifying that they have assured themselves the review copies are in accordance with the specified requirements and attesting that they have been designed by competent design engineers and independently checked by competent and independent design checking engineers. The signatures of the design engineer and the independent design checking engineer shall also be included on the design drawings.

- Unless specified otherwise, three review copies of all drawings, sketches and other written information shall be submitted for consideration within the specified times and at an orderly rate in accordance with the Works Program.

- The foregoing requirements shall also apply to all revisions.

- After review, a copy of the document or drawing submitted for review will be returned with:

  (a) a decision as to whether or not the document or drawing is accepted for use for the purpose of the Contract and with permission so to use them by stamping the document or drawing:

  'Permitted pursuant to sub-clause… of the General Conditions of Contract'

  OR

  'Permitted as marked pursuant to sub-clause … of the General Conditions of Contract'

  OR

  'Not permitted. To be resubmitted, pursuant to sub-clause … of the General Conditions of Contract'

  OR

  (b) a decision as to whether or not any section or portion of the document or drawing is accepted for use for the purposes of the Contract, being that section or portion of the

document or drawing clearly identified as such, and with permission so to use that section or portion by stamping the document or drawing within the limits marked on the document or drawing in the same manner described in sub clause (a) herein.

OR

(c) no decision as to whether or not the document or drawing or any section or portion of it is accepted for use for the purposes of the Contract, at the discretion of the IWMP representative, by stamping the document or drawing as a whole or within the limits marked on the document or drawing (i.e. on that section or portion 'Not considered pursuant to sub-clause … of the General Conditions of Contract'.

*Note: Where the General Conditions of Contract are N.P.W.C. Edition 3 (1981) the sub-clause referred to is sub-clause 8.4.*

- All documents and drawings returned from review will be duly signed and dated by the reviewer.

  Those documents and drawings stamped as 'Not Permitted' shall be resubmitted for further consideration once acted upon.

  Documents and drawings that require changes consequent upon documents or drawings being returned as 'Permitted as marked' shall be changed accordingly and resubmitted for consideration. Any returned document or drawing within a bound set stamped as 'Permitted as Marked' which is not affected should not be resubmitted. In simple, straight forward cases, the construction copies should also be prepared and issued for that phase where acceptance of the resubmitted change is a formality. Should the relevant 'Permitted as Marked' review copy documents and/or drawings (inclusive of all related documents and/or drawings that, as a natural consequence, are affected by changes to marked documents or drawings) fail to be properly amended, the situation shall be remedied without extension of time or increase in costs.

  As with all design documents and drawings submitted, all changed documents and drawings resubmitted shall be signed off by the designer, independent checker and approver and shall carry an updated version number and date.

  When the drawing is being amended to the reviewer's comments, the amendment description shall indicate this. If a separate amendment is made for the same version that is additional to the reviewer's comments, then that additional amendment shall be a separate amendment entry in the amendment template.

  Documents and drawings resubmitted as amended shall have an updated version number and date. Cover sheets and control pages for books of drawings, some of which have been amended, shall be updated and resubmitted with the amended drawings.

  All other returned documents and drawings can be regarded as ready for the preparation of construction copies.

  Notwithstanding the stamping of any document as 'Not considered pursuant to subclause … of the General Conditions of Contract', any further revisions of the same document or drawing shall be submitted for review.

## 2.5 Construction Copy Documents and Drawings

Construction copy documents and drawings shall be based on the returned review copy documents and drawings and shall include all amendments nominated on the returned review copy documents and drawings.

When construction copy documents and drawings have been issued, no alteration shall be made to the documents and drawings except by amended drawings issued in accordance with the normal checking, approval and issue process, with amended control pages for books, or on an SCP06F-01 Modification Instruction form, or agreed equivalent, as detailed hereinafter. Generally, SCP06F-01 Modification Instruction forms should only be used for the commissioning period.

## 2.6 Test Copy Documents and Drawings

Test copy documents and drawings shall be provided in accordance with the requirements outlined in ESC-21-01 Inspection and Testing of Signalling – Roles, Responsibilities and Authorities and ESC-21-02 Inspection and Testing of Signalling – Plans, Programs, Documentation and Packages.

Only designated test copy drawings, including designated SCP06F-01 Modification Instruction forms, should be used for certification testing. If in an emergency any other copy of the drawing is used, it shall be treated as a test copy and arrangements shall be made to immediately register it as such and for its original purpose to be cancelled and otherwise accommodated. Details of the change shall be documented in the document control system register.

## 2.7 Using the Test Copy Master as the Certification Copy

A certification copy is any copy of a drawing that has been used by a person in authority to certify that the installation has been inspected, tested and verified to be in accordance with the details on that drawing, as marked and signed off.

The test copy master and test copy master duplicate shall be updated with all new or amended pages issued (inclusive of control pages) and with all SCP06F-01 Modification Instruction forms issued, until all the work is satisfactorily tested and the work has been commissioned into use. The final documents and drawings shall be brought up to date using the test copy master, while also checking against the design office copies of the latest approved and issued drawings.

The tester in charge shall sign off the test copy masters, inclusive of each drawing within each test copy master book of drawings, to certify that they accurately represent the approved, tested and commissioned as-built status.

When the final documents and drawings have been updated against the test copy masters, the designer responsible for the updating and the project Signal Design Engineer in Charge shall each endorse the test copy master with their name, signature and date to certify that the final documents and drawings have been correctly updated.

## 2.8 Commissioning Copy Documents and Drawings

A sufficient number of copies of commissioning copy documents and drawings, as agreed, shall be supplied for the use of all requiring reference to commissioning copy documents and drawings.

During the commissioning, any modifications shall be submitted for approval using the SCP06F-01 Modification Instruction form or agreed equivalent. A copy of each tested and certified SCP06F-01 Modification Instruction form shall be attached to the relevant sheets of the test copy master and test copy master duplicate for the commissioning engineer.

Interim maintenance copies shall be made available for the commissioning and photocopies of the certified SCP06F-01 Modified Instruction forms generated during the commissioning shall be attached to the relevant sheets to correct them to become the same as the test copy master.

Sufficient interim maintenance copies, as agreed, shall be left on site for the use of maintenance staff and shall be available to them at the end of the commissioning period.

Commissioning copies and interim maintenance copies may be able to be used to suit both purposes and in such cases could be issued as commissioning/interim maintenance copies.

An interim maintenance copy shall be provided in accordance with ESI-07-02 Signals Design Documentation within two days of commissioning the respective equipment.

# 3 Signalling Plans

Refer to Section 3 Signalling Plans in ESD-25-01 CAD and Drafting Manual for Signalling Drawings.

# 4 Signalling Control Tables and Associated Circuits

## 4.1 Control Tables

Where control tables are designed by the contractor, they shall be prepared and subject to design review, similarly to other design drawings.

The control tables shall include the information requirements as set out in Appendix J and be similar in format; either portrait or landscape.

Books of control table sheets shall have control pages including amendment details, similarly to circuit books complying with Appendix H.

## 4.2 Information on Circuit Drawings

Drawings of signalling and associated circuits shall be submitted as complete interlockings and complete areas for each location. They shall be comprehensive and fully detailed. Such drawings shall contain all the information and details necessary for checking of design, construction, setting to work, testing, commissioning and maintenance. The following shall be included in such drawings:

- All wiring and circuit elements, including internal wiring of equipment, with each and every circuit drawn separately.
- Identification and numbering of contacts, cable cores, circuit breakers, fuses, terminals, arresters, busbars etc.
- Track circuit adjustment connections.
- Tappings, ratings, capacity etc. and relevant details of items of equipment.
- Signalling telephone circuits.
- Internal wiring of control panels, consoles and indication panels, diagrams etc.
- Internal circuits of power supplies and other units. Power supply arrangements, switchboard wiring, power mains distribution and lightning protection details.
- Contact analysis sheets incorporating all relays in appropriate groupings. The contact list shall show the relay name at the right hand side of each page, type, contact arrangement, location and for each relay contact, the circuit name.
- Schematic layouts of all apparatus racks for all equipment locations. Relay rack schematics shall show each relay position, with details of the relay function, relay type and contact arrangement.
- Layout details for equipment, fuses, busbars, terminals etc. located in cubicles, panels, consoles etc.
- Cable core lists for all external cables, showing the name and size of each cable and the circuit(s) on each core. Spare cores shall be designated as 'spare'. Details of each cable detailing all mid-section junction points as well as all termination points.
- Wire sizes for all cables and wiring.
- A table showing for each signal and points turnout, the applicable longest braking distances, line speeds, applicable train braking curve, signal indication sequences and distances, approaching the particular signal or turnout.
- A table showing for each circuit timer, the track circuit length, the line speed, the timing check speed and the time setting.

## 4.3 Digital Format

ARTC's standard practice for the preparation of signalling circuit drawings and diagrams in digital format and the transfer of circuit book information to digital format is contained in Appendices A to C of this standard.

## 4.4 Size of Circuit Drawings

Signalling circuit diagrams shall be set out and drawn on size A3 sheets (sheet 420 x 297, border 396 x 273).

Folded pages shall not be used except where specifically allowed by the signalling drawing administrator. Each separate circuit shall be drawn complete within a page. Where a circuit will not fit on an A3 sheet it may be continued on subsequent A3 sheets provided the break points are logically selected to provide good continuity for ease of reading such circuits (refer to Appendix A: Extended Sheets). Line break points shall be clearly labelled by drawing a circle at the end of the line, with an alphabetical reference to the continuation of the circuit, also marked with a lettered circle, on the next page.

The number of sheets shall be kept to a minimum. Circuits shall be drawn positive/active fuse to negative/common terminal left to right across the page and no circuit elements shall be drawn in return lines right to left unless the circuit is symmetrically double switched in which case the negative/common leg shall be drawn right to left with the circuit elements shown directly under their counterpart in the positive/active leg. All circuits shall be drawn in a clear, logical and uncluttered manner with adequate vertical spacing between circuit elements. Ease of reading and understanding shall be given first priority in setting out circuits.

## 4.5 Copies of Drawings

Copies of drawings detailing signalling and associated circuits shall be made up into books on the basis of one or more books per interlocking. In general, the automatic signalling section on the Sydney side of an interlocking shall be included in the book for the interlocking.

## 4.6 Circuit Books

Each circuit book shall include circuit book control page(s) and circuit book amendment sheets (refer to Appendix H) plus comprehensive indexes and consecutively numbered pages. The index shall show the circuit group names written in full, in alphabetical order, with the appropriate nomenclature shown in parentheses and with page numbers shown. Where more than one book is required for an interlocking, specific reference shall be made in the master index (a copy of which shall be placed in each book) to show in which book each item is contained.

## 4.7 Suitable Covers

Suitable hard PVC coated covers shall be provided for all signalling circuit books.

## 4.8 Presentation

Circuits shall be presented in numerical order within circuit groups. Circuit groups throughout the book shall be in the order shown in Appendix D of this standard. A title shall be included at the beginning of each group of circuits and each circuit shall be appropriately named.

## 4.9 Numbering

Each circuit book sheet shall display a circuit book number to be allocated upon request.

## 4.10 Size of the Circuit Book

Books shall be of a manageable size and weight, as agreed. Books shall have a maximum thickness of 25 mm. If necessary, books may be divided into volumes of related information to achieve this requirement (e.g. a volume containing all circuits and a volume containing rack layout information and contact and termination lists). Division of books shall be at logical points generally at the end of a group of circuits and shall be subject to approval.

### 4.11 Deletions, Modifications and Alterations

Where deletions, modifications or additions are required to existing circuit sheets or associated drawings, such deletions, modifications or additions shall be carried out using whatever medium applies to the existing circuits or drawings (e.g. ink tracing, CAD. etc).

Wiring and items to be removed shall be indicated by the use of dotted lines and unfilled arrows.

Wiring and items to be added to existing circuits shall be highlighted by filled arrows.

A sufficient number of unfilled and filled arrows shall be shown to remove any doubt as to the part to which the circuit refers.

Complete new circuits shall be indicated by a filled arrow pointing to the circuit title and the function.

### 4.12 Working Circuits

When the work is complete and the dotted wiring and items are removed, the arrows shall be deleted from the drawings. New work shall be transferred to the circuit layer if necessary. The drawings should then represent the working circuits and should be plotted and copies provided.

# 5 Insulation Test Books

Insulation test books shall be prepared with the name of each circuit and the page on which it is shown on the sheets typed, using upper case letters. The sheets shall be assembled in books, one book for each circuit book.

# 6 Modification Record Book

A number of uniquely identified modification record books containing sequentially numbered, multiple copy, SCP06F-01 Modification Instruction forms shall be prepared to ARTC's standard format or agreed equivalent to facilitate proposed modification, amendment or revision to drawings, sketches and other written matter to be documented.

The books shall be registered and kept in safe custody and issued only to authorised personnel who shall sign for the issue. The details of all issues shall be recorded.

SCP06F-01 Modification Instruction forms shall be identified as to the phase of the work in which they were generated (e.g. construction phase, testing phase or commissioning phase). Generally they shall only be used in the commissioning phase.

SCP06F-01 Modification Instruction forms setting out new or altered designs shall be subject to the same review process as the original design.

Only modifications affecting one circuit book sheet shall be shown on any one SCP06F-01 Modification Instruction form in order to facilitate the attachment of a copy of the form to the correct circuit sheet.

All circuit modifications shall show at least one clear contact or terminal and all wiring connecting to both sides of that clear contact or terminal.

The modification record book shall contain SCP06F-01 Modification Instruction forms in quadruplicate. Copies of the reviewed and accepted SCP06F-01 Modification Instruction forms shall be distributed as follows:

- Copy 1 – To the contractor's site for implementation and attaching to the master set of drawings for the relevant phase.
- Copy 2 – To the contractor's office for records.
- Copy 3 – To the Signal Design Manager's office for attachment to the relevant set of contract drawings.
- Copy 4 – To the IWMP representative's site office for attachment to the relevant set of contract drawings.

In addition to the test copy master and test copy master duplicate sets of drawings, any other controlled copies of documents or drawings being modified shall also be endorsed with the SCP06F-01 Modification Instruction form number, and with such endorsement, signed and dated by the contractor or IWMP representative, as applicable.

# 7 Stageworks

## 7.1 Submission of Stagework Documents

Where temporary stage works and interface works are required, or where individual items of equipment are to be staged prior to commissioning, review copies of stage/interface circuit drawings, signalling plans, track insulation plans, etc. shall be submitted for review in good and sufficient time to be accepted and then to execute the associated work in an orderly manner in accordance with the Contract Works Program. Allowance shall be made for the magnitude of the work, constraints involved with working on in-service systems and other current activities. Documentation and drawings for temporary stage works shall be subject to the same processes as for a stage to be commissioned, that is with the same process of review copies, construction copies, test copies, commissioning copies, interim maintenance copies, except as otherwise agreed with the IWMP because of the minimal size and complexity of the work.

## 7.2 Stagework Design and Updating when Implemented

Wherever practical, designs for stagework shall generally be separately packaged to facilitate the certification and return of the stagework documents and drawings for prompt updating of the masters and delivery of final documents and drawings covering that stage, unless other arrangements are agreed.

This includes the provision of separate test copy masters for significant stageworks.

In all cases, stagework must be certified and the certification copies (normally test copy masters) of the stagework documents and drawings shall be signed by the tester in charge at the time the stagework is commissioned.

Where a subsequent stage or separate work affecting a given signalling design document or drawing is to be commissioned within four weeks after the commissioning of a previous stage or separate work, then it may be agreed, if acceptable, that the delivery of final documents and drawings for the previous stage be deferred in order to incorporate the subsequent alterations at the next stage.

# 8 Site Depot Layout Plans

## 8.1 Details to be Displayed

Layout plans for site construction depots shall show the positioning of all buildings, material and equipment storage areas, workshops, amenity facilities, car parking etc. and shall detail arrangements for fencing, gates, power supplies, telephones, water, sewerage etc. Details shall also be included of existing permanent facilities including buildings, fences, structures, roads, railway track, overhead services etc. and suitable reference measurements to such items shall also be included.

# 9 Detailed Site Survey Drawings

## 9.1 General

Refer to Section 5 Detail Site Surveys in ESD-25-01 CAD and Drafting Manual for Signalling Drawings.

## 9.2 Cable Routes

The Detailed Site Survey Drawings shall show the following information with respect to cable routes:

- The location of all cable and air main routes with respect to the nearest rail and any other major structures. The maximum distance between reference measurements, even on cable routes which are parallel to the track for long distances, shall be 50 metres. The distances from fences can be shown as an additional reference but these shall not be used as the only reference measurement, as the position of fences may change over the years.
- The distance from each overhead traction wiring structure. Each structure identification number shall be shown.
- The type, location, depth, numbers and length of cables, cable ducts or pipes. A cross-section of the pipe arrangement shall be shown indicating pipe occupancy and spare ducts or pipes.
- The different types of cable route to be clearly shown (i.e. Type 1, Type 2).
- Cable pits and cable turning chambers.
- Underline and under-road crossings.
- The arrangement of cable routes through creeks or waterways.
- The arrangement of cable routes on embankments, viaducts, gantries, railway bridges etc.
- The location and identification of all relay rooms, equipment cases and trackside signalling and telecommunications equipment.
- The location of cable heads and cable termination points.
- The location of cable joints.
- The location of telecommunications cable loading coils and repeater units.
- The location of cable route markers.
- The location and type, including the conductor sizes and number of cores, of all signalling and telecommunications cables (main and local).
- The location and type of all power supply cables including 2 kV, 11 kV etc.
- Aerial cable routes, where applicable.
- The location and identification number of all poles or structures on ARTC land.
- The location of air lines, manifolds, compressors etc.

The as-built drawings to be supplied include Detailed Site Survey Drawings for the total work, including any Detailed Site Survey Drawings issued by ARTC.

The final/as-built Detailed Site Survey Drawings shall include a schedule with full details of the cable installation and nominate the function of each cable plus the cable supplier's drum number.

# 10 Installation Drawings

## 10.1 Details to be Displayed

Installation drawings shall be prepared for use where standard installation drawings issued by ARTC are not applicable. They shall show methods and techniques required to overcome hazards or special situations.

## 10.2 Submission

The installation drawing number system proposed to be used shall be submitted for consideration before being used.

# 11 Signal Sighting Forms

Refer to ESC-04-01 Signal Sighting and Position.

# 12 Drivers Diagrams and Safe Notice Insertions

## 12.1 General

When it is necessary to carry out engineering work that involves:

- the bringing into use of new signals, train stops, points, level crossing warning equipment or safeworking equipment
- the bringing into use of new lines or sidings
- changes to the location of signals, intermediate train stops, points, level crossing warning equipment, additional lineside signalling equipment or safeworking equipment
- the permanent disconnection or removal of signals, train stops, points, level crossing warning equipment, additional lineside signalling equipment or safeworking equipment
- the removal, closure or alteration of lines or sidings
- the installation of new points prior to being brought into use

the work must be advertised in a Safe Notice to ensure that at least one week's notice is given of the work to be carried out.

The Drivers Diagram is used in conjunction with the text in the Safe Notice to describe the operation of the track and signalling arrangements. The Safe Notice and Drivers Diagram are published by ARTC's Operations Manager, North/South and are subject to their review.

## 12.2 Drivers Diagrams

Drivers Diagrams shall include the whole of the works including interlocking areas and automatic signalled sections and are required both for final arrangements and also for all temporary stages of the works. Separate Drivers Diagrams are required for each stage. Diagrams shall be produced in accordance with ARTC's standard requirements and practice (refer to Appendix G). A typical Drivers Diagram will be made available on request.

Original CAD drawings of Drivers Diagrams shall be drawn and detailed to a size suitable for reduction prior to issue to drivers.

A PDF copy of the final accepted Drivers Diagram shall be provided in good and sufficient time for advertising the work in a Safe Notice.

## 12.3 Safe Notice Insertions

Safe Notices provide, for the area concerned, a complete description of the signalling system and its operation, including associated telecommunications facilities.

The following information is included:

- description of any track alterations
- general description of the Signalling systems, including the type of interlocking and relevant regulations
- systems of train working
- sections between signal boxes
- numbering and designation of signals and points
- details of the routes available from each signal
- details of releases available
- details of operation of the signaller's control panel

- details of alarms provided and action to be taken when an alarm situation arises
- emergency working in failure conditions
- communications arrangements for safeworking
- any special instructions.

Copies of previous Safe Notice insertions, indicative of the requirements, can be made available on request.

The Safe Notice write up shall be provided in good and sufficient time for review, publishing and distribution by the ARTC Operations Manager, North/South.

# 13 Track Insulation Plans

Refer to Section 4 Track Insulation Plans in ESD-25-01 CAD and Drafting Manual for Signalling Drawings.

# 14 Equipment Housing and Layout Plans

Refer to Section 7 Other Drawings in ESD-25-01 CAD and Drafting Manual for Signalling Drawings.

# 15 Level Crossing Layout Plans

Refer to Section 7 Other Drawings in ESD-25-01 CAD and Drafting Manual for Signalling Drawings.

# 16 Mechanical Drawings

Refer to Section 7 Other Drawings in ESD-25-01 CAD and Drafting Manual for Signalling Drawings.

# 17 Structures and Buildings

Refer to Section 7 Other Drawings in ESD-25-01 CAD and Drafting Manual for Signalling Drawings.

# 18 Clearance Diagrams

Refer to Section 7 Other Drawings in ESD-25-01 CAD and Drafting Manual for Signalling Drawings.

# 19 System Manuals

System manuals shall include formats, setouts and procedures as used in ARTC's signalling documentation, which includes the following publications:

- signalling design principles
- signalling maintenance procedures
- standard circuit designs
- equipment manuals
- technical procedures
- operators manuals
- training manuals.

Maintenance manuals and system manuals shall generally be presented in the following four volumes:

- Installation and maintenance
- Engineering
- Operations
- Training.

## 19.1 Installation and Maintenance Volume

The installation and maintenance volume shall contain all information and data necessary to provide:

- a description of the system and circuitry
- basic principles of the system
- methods of installation, adjustment and setting to work
- recommended periodic maintenance tests, adjustments and tasks
- fault diagnosis and rectification (flow diagrams, circuits and diagrams showing the interrelationship of sub-assemblies and components should be included).

This volume shall also contain a listing and application of recommended test equipment and a listing of sub-assemblies and components, with part numbers, which are required to carry out first level (field) maintenance and repair.

First line maintenance and fault identification and rectification will be carried out by the following personnel:

- electrical signalling equipment - accredited electrical tradespersons
- mechanical signalling equipment - accredited skilled non-tradespersons
- communications equipment - accredited telecommunications technicians

This volume of the manual will be used by first line maintenance and fault rectification personnel and shall be structured accordingly.

## 19.2 Engineering Volume

The engineering volume shall provide all of the information, data and diagrams to provide:

- the theory and principles of the system
- detailed system design and circuitry
- system operation
- second line maintenance and fault rectification
- design and implementation of system modifications.

This volume will be used by professional and semi-professional personnel and shall be structured accordingly.

## 19.3 Operating Volume

The operating volume will be used by operations personnel and shall provide sufficient information to cover all aspects of the operator/system interface and to allow the operator to use the system in all of its modes.

## 19.4 Training Volume(s)

The training volumes shall include the same information as the maintenance, engineering and operating volumes. This information shall be expanded where advantageous to include

examples of fault finding and rectification, details of how to make best use of the information provided and to highlight pitfalls.

Video training aids shall relate to and shall be considered as additional to the training volumes and shall be colour DVD or mpeg format.

# 20 Equipment Manuals

Generally equipment manuals shall be produced in one volume and shall include sufficient information, data and diagrams to provide:

- a description of the operation of the piece of equipment and its place in the system
- operating attributes of the piece of equipment
- method of installation, adjustment and setting to work
- periodic maintenance tests, adjustments and tasks
- fault diagnosis and rectification for first level (field) maintenance
- methods of component replacement and overhaul
- test equipment and special tools required
- fault diagnosis and rectification at overhaul
- spare parts listings with part numbers and drawings/diagrams for every separable part in the piece of equipment.

Where there is a considerable difference in complexity and detail between first and second level maintenance/overhaul tasks, the equipment manual may be produced in maintenance and overhaul volumes.

# 21 Manual Format

The format for the manuals shall be submitted to the Executive Manager, Standards, Systems and Performance or their nominated representative for review.

# 22 Manuals and Other Documentation for Electronic Systems

The manuals and other documentation for electronic systems shall meet the requirements of Sections 19, 20 and 21 of this standard and the requirements detailed in SPS 01 Standard Requirements for Signalling Electronic Systems.

# 23 Commissioning Documentation

## 23.1 Commissioning Notice

The contractor shall be responsible for the production of the commissioning notices.

The commissioning notice forms part of the Commissioning Work Package which is defined in ESC-21-02 Inspection and Testing of Signalling – Plans, Programs, Documentation and Packages.

Commissioning notices are for the use of all employees engaged in, or associated with the commissioning.

Details shown on the notice shall include the following:

- location to be commissioned

- description of the work
- commissioning dates and periods
- commissioning limits
- commissioning program
- communications arrangements
- rostering of staff
- list of equipment and documents and drawings to be utilised
- booking-on procedures
- reporting procedures
- reporting centre
- list of telephone numbers
- first aid arrangements
- vehicles and tools.

Copies of approved commissioning notices shall be issued prior to commencement of commissioning. Sufficient copies, as agreed, shall be issued to provide one copy for each person involved in or with the commissioning who needs to know, plus an additional six copies.

# 24 Equipment Register (Asset Register)

## 24.1 Details to be Included

The Equipment Register, which may be referred to in some documents as the Asset Register, shall include all new equipment and all existing equipment retained within the renewal area of the Contract and shall also include and show separately all new (or renamed) equipment outside the renewal area which was altered consequential to the work. Where existing equipment is renamed, or where new equipment replaces existing equipment, the list shall specifically show the old equipment which has been changed or deleted.

The Equipment Register for each stage shall be provided in the format required at least two weeks prior to the commissioning of the respective equipment.

## 24.2 Equipment Register

The Equipment Register shall list the following items of equipment:

- signal boxes/consoles
- signals
- track circuits
- train stops
- points (ends)
- level crossings
- main power supply locations
- relay rooms, huts and cupboards
- releasing switches
- safeworking instruments
- remote control units
- train describer units
- computer based interlockings (SSI equipment)

- cable route
- cable.

For each item of equipment, excluding cable route and cable, the following shall be recorded:

- district
- section
- location
- equipment ID
- classification (C)
- type (T)
- make/model (if applicable)
- local ID code (Location No.)
- ARTC line code
- description code
- number of relays of each type in the location
- installation date (month/year)
- kilometreage located
- replacement year
- line (e.g. Up Illawarra Local)

For cable route and cable, the following details shall be recorded:

- district
- section
- from location (i.e. equipment cupboard number)
- from location kilometres
- to location (i.e. equipment cupboard number)
- to location kilometres
- length in kilometres
- ARTC line code
- category
- type
- description
- replacement value
- installation date
- replacement year
- responsibility code
- record number
- adjacent line (e.g. Up Illawarra Local).

## 24.3 Coding Details

These details shall be in accordance with ARTC's coding and standards for naming equipment (i.e. the equipment ID). These details will be supplied on request.

Special care shall be given to ensure the coded details are provided in the correct columns.

## 24.4 Layout of Assets Fields

The Equipment Register file can be produced using a spreadsheet, database, or word processor program provided the following criteria are met:

- Each item of equipment is recorded on a separate line.
- Each line shall start with a space character.
- The following information for items of equipment, excluding cable route and cable shall be laid out in fields with the following data, order and size:

  District (3 char), Section (6 char), Location (10 char), Classification (1 char), Type (1 char), Make/Model (6 char), Local ID Code (8 char), Line (4 char), Installation Date (4 char), Kilometreage Located (9 char) Description Code (29 char), Relays Q(3 char) AC (2 char) DC (2 char), NV (2 char), Equipment Cost (8 char), Replacement Year (4 char).
- The following information for cable route and cable shall be laid out in fields with the following data, order and size:

  District (3 char), Section (6 char), From Location (10 char), From Location Kilometres (8 char), To Location (10 char), To Location Kilometres (8 char), Length (7 char), Line Code (4 char), Category (1 char), Type (1 char), Description (29 char), Replacement Value (8 char), Installation Date (4 char), Replacement Year (4 char), Responsibility Code (4 char), Record Number (5 char), Spare (3 char).
- Each field shall be separated by two spaces, all fields shall be left justified except for the Kilometreage Located, From Location Kilometres and To Location Kilometres fields, which shall be right justified with three decimal places and include the decimal point.

# 25 Appendix A: Symbols for Plans and Drawings

## 25.1 Track Plan and Working Sketch Symbols

Refer to Section 11 Appendix 4: Symbols for Plans and Drawings – NSW Standards in ESD-25-01 CAD and Drafting Manual for Signalling Drawings.

## 25.2 Prototype Drawing Environment

Refer to Section 2.4 Drawing Layers, Section 2.5 Linework and Section 2.6 Text in ESD-25-01 CAD and Drafting Manual for Signalling Drawings.

## 25.3 Digital Drawing Format for Signalling Circuit Drawings

Current digitised signalling plans and drawings are in MicroStation version 4.0 (signalling plans, track insulation plans) and AutoCAD 10i (circuit diagrams). New and amended drawings shall preferably be prepared using AutoCAD LTv2, LT97 or AutoCAD Release 12, 13 or 14. Alternatively, any well supported, reliable drafting software that can save or export files in .dxf format, which can then be opened and edited in AutoCAD LT97 or AutoCAD Release 14, or which can save in a .dwg format, which can then be opened and edited by AutoCAD LT97 or AutoCAD Release 14, may be used.

Drawings shall be stored on write once compact discs.

The circuit drawing filename shall be ACAD.dwg. System variables and support operating variables in the circuit drawing shall be preset to values listed in the following tables.

### 25.3.1 Systems Variables

| Variable Name | Type | Value | Description |
|---|---|---|---|
| ANGBASE | Real | 0 | Angle 0 direction |
| ANGDIR | Integer | 0 | Counter-clockwise |
| ATTMODE | Integer | 0 | Attribute display mode (0=off) |
| AUNITS | Integer | 0 | Angular units mode (0=degrees) |
| AUPREC | Integer | 0 | Angular units decimal places |
| AXISMODE | Integer | 0 | Axis mode (0=off) |
| AXISUNIT | Point | 0,0 | Axis spacing, X and Y |
| BLIPMODE | Integer | 1 | Marker blips (1=on) |
| CHAMFERA | Real | 0 | First chamfer distance |
| CHAMFERB | Real | 0 | Second chamfer distance |
| CLAYER | String | 3 | Current layer |
| CORDS | Integer | 2 | Continuous update/angle-distance |
| DRAGMODE | Integer | 2 | Automatic dragging |
| ELEVATION | Real | 0 | Current 3D elevation |
| EXTMAX | Point | 396,273 | Upper right drawing uses extents |
| EXTMIN | Point | 0,0 | Lower left drawing uses extents |
| FILLETRAD | Real | 0 | Fillet radius |
| FILLMODE | Integer | 1 | Fill mode (1=on) |
| GRIDMODE | Integer | 1 | Grid mode (1=on) |
| GRIDUNIT | Point | 5,5 | Grid unit spacing |
| INSBASE | Point | 0,0 | Insertion base point |
| LIMCHECK | Integer | 1 | Limits checking (1=on) |
| LIMMAX | Point | 396,273 | Upper right drawing limits |
| LIMMIN | Point | 0,0 | Lower left drawing limits |
| LTSCALE | Real | 10 | Global linetype scale factor |
| LUNITS | Integer | 2 | Linear units mode (2=decimal) |
| LUPREC | Integer | 2 | Linear units decimal places |
| M I RRTEXT | Integer | 0 | Mirror (0=retain text direction) |
| ORTHOMODE | Integer | 0 | Ortho mode (0=off) |
| OSMODE | Integer | 0 | Object snap mode (0=off) |
| PDMODE | Integer | 0 | Point display mode |
| PDSIZE | Integer | 0 | Point display size |
| QTEXTMODE | Integer | 0 | Quick text mode (0=off) |
| REGENMODE | Integer | 0 | Automatic regeneration (1=on) |
| SKETCHINC | Real | 0 | Sketch record increment |
| SKPOLY | Integer | 0 | Sketch generate (1=polyline) |
| SNAPANG | Real | 0 | Snap/grid rotation angle |
| SNAPBASE | Point | 0,0 | Snap/grid origin point |
| SNAPISOPAIR | Integer | 0 | Current isometric plane (0=left) |

| Variable Name | Type | Value | Description |
|---|---|---|---|
| SNAPMODE | Integer | 1 | Snap mode (1=on) |
| SNAPSTYL | Integer | 0 | Snap style (0=stand) |
| SNAPUNIT | Point | 5,5 | Snap spacing, X and Y |
| THICKNESS | Real | 0 | Current 3D thickness |
| TRACEWID | Real | 0.5 | Default trace width |
| VIEWSIZE | Real | 273 | Current view height (drawing units) |
| VPOINTX | Real | 0 | X component of current 3D viewpoint |
| VPIONTY | Real | 0 | Y component of current 3D viewpoint |
| VPOINTZ | Real | 0 | Z component of current 3D viewpoint |

*Note: System variables shown above are saved in the drawing, therefore the variables shall be reset (if changed) upon exiting the AutoCAD drawing editor.*

## 25.4 Support Operating Variables

Support operating variables are the external files that the drawing searches for on entry to the AutoCAD editor. These variables store the file names of the support files and if these variables are altered to suit other application support files, these support operating variables shall be reset in accordance with the following support file list.

**Support File List**

| File Name | Function |
|---|---|
| ACAD.LSP | lisp program file |
| ACAD.MNX | menu compiled file |
| TXT.SHX | standard drawing text font |

*Note: For cover sheets, an additional text font file is allowed (i.e. HELV.SHX standard cover sheet text font). Other support files such as text fonts (.SHX files) and pattern files (.PAT) shall not be referenced in the drawing.*

## 25.5 Signalling Circuit Symbols

Circuit and analysis drawings shall be created using the standard prototype drawing (ACAD.dwg) as a template.

ACAD.dwg shall contain the standard A3 border in the form of a block.

The A3 border block is a master sheet block. A library of standard master sheet blocks already exist (e.g. Q type relay analysis sheet, cable analysis sheet, fuse and terminal list sheets etc.).

Master sheet blocks shall be inserted in the drawing at (0,0), X scale factor = 1, Y scale factor = 1 and rotation angle = 0 degrees.

The first character of the block name M indicates a master sheet block.

*Note: Master sheet blocks listed are the only acceptable blocks that may be placed in any circuit drawing for the purpose of a master sheet. Where a master sheet that is not listed needs to be created, then full details of the sheet shall be referred for approval.*

**Master Sheet**

| Filename | Block Name | Description |
|---|---|---|
| MANAL01.DWG | MANAL01 | Anlaysis 1 – 'Q' relays |
| MANAL02.DWG | MANAL02 | Analysis 2 – 'Q' relays (level crossing) |
| MANAL03.DWG | MANAL03 | Analysis 3 – Track VT1 relays |
| MANAL04.DWG | MANAL04 | Analysis 4 – Track JEUMONT relays |
| MANAL05.DWG | MANAL05 | Analysis 5 – Non Vital HH23 series relays |
| MANAL06.DWG | MANAL06 | Analysis 6 – Non Vital PC Board relays |
| MANAL07.DWG | MANAL07 | Analysis 7 – Large Plug-In AL/BL relays |
| MANAL08.DWG | MANAL08 | Analysis 8 – AC SHELF TYPE relays |
| MBORDA3.DWG | MBORDA3 | Border A3 – drawing sheet boarder |
| MCABL01.DWG | MCABL01 | Cable List 1 – terminal no.s blank |
| MCABL02.DWG | MCABL02 | Cable List 2 – terminal no.s (1-50) |
| MCOVE01.DWG | MCOVE01 | Cover 1 – Circuit book coversheet |
| MINDX01.DWG | MINDX01 | Index 1 – Circuit book index |
| MLEVR01.DWG | MLEVR01 | Lever Rotary List 1 |
| MPCBL01.DWG | MPCBL01 | PCB Layout 1 – Non Vital 54 way (Type 1) |
| MPCBL02.DWG | MPCBL02 | PCB Layout 2 – Non vital 54 way (Type 2) |
| MRACK01.DWG | MRACK01 | Rack Layout 1 – 10x20 (GEC) |
| MTERM01.DWG | MTERM01 | Terminal List 1 – Fuse and terminal |
| MTERM02.DWG | MTERM02 | Terminal List 2 – Terminal (Interrack) |

## 25.6 Signalling Circuit Symbols

Refer to Section 2.8 Signalling Circuit Symbols in ESD-25-01 CAD and Drafting Manual for Signalling Drawings.

## 25.7 Block Name Insertion and Definition Table

Refer to Section 10 Appendix 3: Signal Design AutoCAD Circuit Block List – NSW Standards in ESD-25-01 CAD and Drafting Manual for Signalling Drawings.

## 25.8

## 25.9

## 25.10 Circuit Drawing

One circuit sheet per file is permitted.

The circuit sheet (MBORDA3) shall be 396mm (X direction) and 273mm (Y direction).

A row of information boxes exist at the top of the drawing sheet. Details for each box are as follows:

Box number one is the top left hand corner.

| Box No. | Area (mm) | Information | No. of (max) | Charac (mm) | Size Justified | Text Position (X.Y) |
|---|---|---|---|---|---|---|
| 1 | 20X5 | Standard Master sheet date | 10 | 1.75 | Centre | @ 10,269 |
| 2 | 20x5 | Standard Master sheet issue number | 6 | 2.5 | Centre | @ 30,269 |
| 3 | 20x5 | Maintenance issue (1) Number | 8 | 2.5 | Centre | @ 50,269 |
| 4 | 20x5 | Maintenance issue (2) Number | 8 | 2.5 | Centre | @ 70,269 |
| 5 | 20x5 | Revision date (3) | 8 | 2.5 | Centre | @ 90,269 |
| 6 | 20x5 | Time applicable to date no 5 | - | 2.5 | Centre | @ |
| 7 | 20x5 | Plot date | - | 2.5 | Centre | @ |
| 8 | 20x5 | Revision number | 6 | 1.75 | Centre | @ 150,269 |
| 9 | 20x5 | File name | 8 | 2.5 | Centre | @ 170,269 |
| 10 | 146x5 | Sheet heading | 45 | 3 | Left | @ 181,269 |
| 11 | 20x5 | Extended sheet PART | 10 | 1.75 | Centre | @ 336,269 |
| 12 | 25x5 | Sheet number | 3 | 3 | Right | @ 369,269 |
| 13 | 25x5 | Circuit book number | 3 | 3 | Right | @ 394,269 |

## 25.11 Extended Sheets

Where a complete circuit will not fit on a standard A3 circuit sheet, then an extended sheet may be used.

An extended sheet is created by placing a number of A3 borders (MBORDA3) end to end in a horizontal direction within the one file.

*Note: This is the only case where more than one drawing can appear in the same file.*

The placement of A3 borders in this pattern will cause certain system variables to be altered. The X component of the system variable (and in some cases the Y component) will change proportionally to the number of sheet parts required to make up the extended sheet.

The following equations demonstrate this:

**Insertion point for A3 border**

**(MBORDA3)**

Y=0

X = [369 x (A-1)]

where A= extended sheet part number

**Limits of extended sheet**

LIMMIN - variable shall remain unchanged.

Y=0

X=0

LIMMAX - maximum drawing limits shall be set to:

Y = 273

X = (396 x B)

where B= total number of sheet parts required to make up the extended sheet

**Drawing extents of extended sheet**

EXTMIN - variable shall remain unchanged.

Y=0

X=0

EXTMAX - maximum drawing extents shall be set to:

Y = 273

S = (396 x B)

where B= total number of sheet parts required to make up the extended sheet

Where a circuit is required to be drawn from one sheet to another, the wire shall not be drawn through the border. The wire shall be terminated on the first sheet using ZLABEL block, then restarted on the second sheet using another ZLABEL block.

The circuit termination ZLABEL block allows for the placement of text using MULTI¬TEXT program, to identify the wire on separate sheets parts.

The labelling for circuit wire termination shall be an alphabetical character (i.e. AZ) and shall be placed in the ZLABEL block of the terminating wire and the same character shall again be used on the next sheet part in a ZLABEL block to restart the wire. Labelling for various terminations on the same sheet or circuit shall be unique. The name of the circuit function (i.e. NLR, RLR, (R)PR) shall be placed about the circuit wire being terminated to a ZLABEL block.

Circuits shall be broken in logical places (e.g. point lock relay circuit would have locking on the first sheet, relays and setting on the second sheet).

## 25.12 Plotting of Circuit Drawings

Refer to Section 2.9 Plotting of Circuit Drawings in ESD-25-01 CAD and Drafting Manual for Signalling Drawings.

## 25.13 Laser Printing of Circuit Drawings

A laser printer may also be used to produce hard copies on A4 80 gsm media. The following details apply:

| **Size** | **mm** |
|---|---|
| Plot origin | (5.00, 0.00) |
| Plot area | 193,00 wide by 266.70 high (max size) |

2D plots are rotated 90 degrees.

Clockwise plot width is 0.08.

Plot shall be scaled to fit available area.

## 25.14 File Names for AutoCAD Drawing Files

Refer to Section 2.12 Filenames in ESD-25-01 CAD and Drafting Manual for Signalling Drawings.

## 25.15 Storage of Drawing Files on Compact Discs

Refer to Section 2.12 Filenames in ESD-25-01 CAD and Drafting Manual for Signalling Drawings.

## 25.16 Version Numbering

Refer to Section 2.12 Filenames in ESD-25-01 CAD and Drafting Manual for Signalling Drawings.

## 25.17 Format for Signalling Plans and Track Insulation Plans

Refer to Section 3.5 Format for Signalling Plans and Section 4 Track Insulation Plans in ESD-25-01 CAD and Drafting Manual for Signalling Drawings.

## 25.18 Detailed Site Survey Drawings

Refer to Section 5.2 Detail Site Survey Drawing Format in ESD-25-01 CAD and Drafting Manual for Signalling Drawings.

# 26 Appendix B: Circuit Nomenclatures

| Relay name | | Meaning | Function | Located at |
|---|---|---|---|---|
| | | | **ROUTE SETTING AND OCS SYSTEMS** | |
| RUR} | Signals | REVERSE ROUTE RELAY | PICKS WHEN ROUTE IS SET. CALLS POINTS TO CORRECT POSITION | INTERLOCKING |
| NLR} | | NORMAL LOCK RELAY | MAIN INTERLOCKING RELAY. INDICATES WHEN ROUTE IS NORMAL | INTERLOCKING |
| IR | | ISOLATING RELAY | CUTS POINT MOTOR CIRCUIT TO ENSURE NO MOVEMENT DUE TO LEAKAGE CURRENTS | POINT LOC |
| RLR} | Points | REVERSE LOCK RELAY | MAIN INTERLOCKING RELAY FOR POINTS NORMAL POSITION | INTERLOCKING |
| NLR} | | NORMAL LOCK RELAY | MAIN INTERLOCKING RELAY FOR POINTS REVERSE POSITION | INTERLOCKING |
| WZR | Points | POINTS FREE RELAY | INDICATES POINTS FREE AND WOULD RESPOND TO A CALL | INTERLOCKING |
| WJR | Points | POINTS TIMER RELAY | PROVIDES ADDITIONAL TIME DELAY BEFORE POINTS BECOME FREE (to cover bobbing tracks) | INTERLOCKING |
| NLKPR | | POINTS NORMAL AND LOCKED INDIC RELAY | CHECKS THAT POINTS ARE IN THE NORMAL POSITION AND LOCKED | INTERLOCKING |
| RLKPR | | POINTS REVERSE AND LOCKED INDIC RELAY | CHECKS THAT POINTS ARE IN THE REVERSE POSITION AND LOCKED | INTERLOCKING |
| NWKR | | NORMAL POINTS INDICATING RELAY | INDICATES NORMAL POINT POSITION | INTERLOCKING |
| RWKR | | REVERSE POINTS INDICATING RELAY | INDICATES REVERSE POINTS POSITION | INTERLOCKING |
| NKR | | NORMAL INDIC RELAY | INDICATES POINTS NORMAL | POINTS LOC |
| RKR | | REVERSE INDIC RELAY | INDICATES POINTS REVERSE | POINTS LOC |
| NWAR | | NORMAL POINTS AVAILABLE RELAY | DETERMINES IF POINTS WOULD GO NORMAL IF OTHER CONDITIONAL LOCKING RELEASED | INTERLOCKING |
| RWAR | | REVERSE POINTS AVAILABLE RELAY | DETERMINES IF POINTS WOULD GO REVERSE IF OTHER CONDITIONAL LOCKING RELEASED | INTERLOCKING |
| NOLR | | NORMAL OVERLAP RELAY | SELECTS NORMAL OVERLAP IF CLEAR | INTERLOCKING |
| ROLR | | REVERSE OVERLAP RELAY | SELECTS REVERSE OVERLAP IF CLEAR | INTERLOCKING |
| | | | **SIGNAL CONTROLS** | |
| SR | | LEVER STICK RELAY | PREVENTS SIGNALS AUTOMATICALLY RELEASING AFTER TRAINS | INTERLOCKING |
| UCR | | ROUTE CHECKING RELAY | CHECKS ALL TRACKS AND POINTS DETECTION FOR SIGNAL CONTROLS | INTERLOCKING |
| LSpR<br>HR | | LOW SPEED RELAY<br>SIGNAL CAUTION RELAY | OPERATES LOW SPEED LIGHT<br>OPERATES SIGNAL LIGHTS TO CAUTION | SIGNAL LOC<br>SIGNAL LOC |

| Relay name | | Meaning | Function | Located at |
|---|---|---|---|---|
| HDR<br>DR<br>ECR<br>NGPR | | SIGNAL MEDIUM RELAY<br>SIGNAL CLEAR RELAY<br>LAMP CHECKING RLY<br>SIGNAL NORMAL REPEAT RELAY | OPERATES SIGNAL LIGHTS TO MEDIUM<br>OPERATES SIGNAL LIGHTS TO CLEAR<br>PROVES LAMP ALIGHT<br>PROVES SIGNAL (and trainstop) IS NORMAL | SIGNAL LOC<br>SIGNAL LOC<br>SIGNAL LOC<br>INTERLOCKING |
| RGPR | | SIGNAL REVERSE INDICATING RELAY | INDICATES SIGNAL CLEARED | INTERLOCKING |
| | | | **TRAIN STOPS** | |
| VNR | | TRAIN STOP NORMAL RELAY | TRAIN STOP NORMAL RELAY | SIGNAL LOC |
| VRR | | TRAINS STOP REVERSE RELAY | TRAIN STOP REVERSE RELAY | SIGNAL LOC |
| VCSR | | TRAIN STOP CHECKING STICK RELAY | PROVES TRAIN STOP NORMALISING AFTER TRAIN PASSAGE | SIGNAL LOC |
| VR | | TRAIN STOP RELAY (Contractor) | OPERATES TRAIN STOP | SIGNAL LOC |
| | | | **TRACK LOCKING** | |
| ALSR | | APPROACH LOCK STICK RELAY | HOLDS LOCKING IF SIGNAL REPLACED IN FACE OF TRAIN | INTERLOCKING |
| ALSJR | | APPROACH LOCK TIMER RELAY | TIMES OUT APPROACH LOCKING | INTERLOCKING |
| (M) AR | | MAIN APPROACH RELAY | DROPS WHEN MAIN ASPECT AT SIGNAL IS CLEARED AND HELD BY APPROACH STICK | INTERLOCKING |
| USR | | ROUTE STICK RELAY | HOLDS LOCKING AFTER TRAIN ENTERS ROUTE | INTERLOCKING |
| JR | | TIMING RELAY | TRACK TIMING TO RELEASE ROUTE LOCKING OR CONDITIONALLY CLEAR SIGNALS DEPENDING ON APPLICATION | INTERLOCKING |
| DPU | | DATA PICK-UP UNIT | DETECTS POSITION OF TRAIN ON TRACK CIRCUIT (Principally audio frequency types) | SIGNAL LOCK |
| POJR | | POWER OFF TIMER RELAY | DISCONNECTS QUICK RELEASE PATH IN APPROACH STICKS AND TZR TO RETAIN LOCKING DURING POWER OUTAGES | INTERLOCKNG |
| | | | **RELEASING SWITCHES** | |
| NR | | NORMAL RELAY | DETECTS RELEASING SWITCH NORMAL | INTERLOCKING |
| NKR | | NORMAL INDICATING RELAY | DETECTS RELEASING SWITCH NORMAL (For Diagram) | INTERLOCKING |
| | | | SINGLE LINE AND BI-DIRECTIONAL | |
| YR | | DISENGAGING RELAY | CALLS SECTION CONTROL WHEN SETTING ROUTE INTO SINGLE LINE SECTION | INTERLOCKING |
| DDSR | | DOWN DIRECTION STICK RELAY | PROVES TRAIN TRAVELLING IN DOWN DIRECTION | INTERLOCKING<br>LEVEL CROSSING<br>SIGNAL LOC |
| UDSR | | UP DIRECTION STICK RELAY | PROVES TRAIN TRAVELLING IN UP DIRECTION | |

| Relay name | | Meaning | Function | Located at |
|---|---|---|---|---|
| DSCR | | DOWN SECTION CONTROL RELAY | CHECKS SECTION CLEAR FOR DOWN TRAIN | INTERLOCKING |
| USCR | | UP SECTION CONTROL RELAY | CHECKS SECTION CLEAR FOR UP TRAIN | INTERLOCKING |
| DSCJR | | DN SECTION CONTROL TIMER RELAY | CHECKS SECTION CLEAR FOR REQUIRED TIME | INTERLOCKING |
| USCJR | | UP SECTION CONTROL | CHECKS SECTION CLEAR FOR REQUIRED TIME | INTERLOCKING |
| SCR | | SECTION CONTROL RELAY | CHECKS SECTION | INTERLOCKING |
| UGNR | | UP SIGNAL NORMAL RELAY | PROVES UP DIRECTION SIGNALS NORMAL | |
| DGNR | | DOWN SIGNAL NORMAL RELAY | PROVES DN DIRECTION SIGNALS NORMAL | |
| XR | | CROSSING CONTROL | OPERATES LEVEL CROSSING EQUIPMENT | CROSSING LOC |
| DSPR | | DIRECTION STICK | } | |
| | | REPEAT RELAY | } ENSURES CROSSING FAILS SAFE IF | OTS SECTION |
| DSJR | | DIRECTION STICK | } DIRECTION STICKS FAIL TO DROP AWAY | CROSSING LOC |
| | | TIMER RELAY | } AFTER TRAIN | |
| | | | ROUTE SETTING - NON-VITAL | |
| | | | DIAGRAM RELAYS | |
| FEKR | | BUTTON LIGHT INDIC | CAUSES BUTTON LIGHT TO FLASH WHEN | CONTROLPANEL |
| | | (FLASHING) RELAY | COMMENCE RELAY OPERATED | LOCATION |
| FEK2R | | BUTTON LIGHT INDIC | CAUSES BUTTON LIGHT TO BECOME | CONTROLPANEL |
| | | No2 (STEADY) RELAY | STEADY AND INITIATES ROUTE LIGHTS | LOCATION |
| | | | WHEN ROUTE SETS | |
| NWKKR | | NORMAL POINTS | OPERATES NORMAL FLASHING LIGHTS | CONTROLPANEL |
| | | INDICATION RELAY | IN ROUTE OVER POINTS AND LIGHT | LOCATION |
| | | | BEHIND POINT LEVER | |
| RWKKR | | REVERSE POINTS | OPERATES REVERSE FLASHING LIGHTS | CONTROLPANEL |
| | | INDICATION RELAY | IN ROUTE OVER POINTS AND LIGHT | LOCATION |
| | | | BEHIND POINTS LEVER | |
| WZKR | | POINTS FREE | OPERATES GREEN FREE LIGHT BEHIND | CONTROLPANEL |
| | | INDICATION RELAY | POINT LEVER | LOCATION |
| TUR | | TRACK ROUTE | DROPS OUT IF POINTS TRACK OCCUPIED | CONTROLPANEL |
| | | RELAY | WITH NO ROUTE SET TO ILLUMINATE ALL | LOCATION |

| Relay name | | Meaning | Function | Located at |
|---|---|---|---|---|
| | | | RED LIGHTS OVER POINTS | |
| UR | | ROUTE RELAY | WHEN ROUTE SET, ROUTE RELAY | CONTROLPANEL |
| | | | OPERATES WHITE ROUTE LIGHTS | LOCATION |
| UZR | | No2 ROUTE RELAY | USED IF MORE THAN ONE TRACK CIRCUIT | CONTROLPANEL |
| | | | IN ROUTE | LOCATION |
| | | | IF ROUTE IS NORMALISED AFTER TRAIN | |
| | | | TAKES ROUTE, ROUTE RELAYS HOLD ROUTE | |
| | | | LIGHTS IN FRONT OF TRAIN | |
| UK2R | | ROUTE INDICATING | SECOND REPEAT OF UR | CONTROLPANEL |
| | | RELAY No2 | | LOCATION |
| U2KR | | No2 ROUTE | FIRST REPEAT OF U2R | CONTROLPANEL |
| | | INDICATING RELAY | | LOCATION |
| TKR | | TRACK INDICATING | TRACK CIRCUIT INDICATING RELAY | CONTROL PANEL |
| | | RELAY | FOR DIAGRAM | LOCATION |
| JKR | | TIMER INDICATING | TIME RELEASE LIGHT FOR DIAGRAM | CONTROL PANEL |
| | | RELAY | | LOCATION |
| NGKKR | | SIGNAL NORMAL | } | |
| | | INDICATING RELAY | } DIAGRAM INDICATION FORSIGNAL | CONTROLPANEL |
| RGKKR | | SIGNAL REVERSE INDICATING RELAY | }REPEATER | LOCATION |
| ALSKR | | APPROACH LOCK STICK INDICATING RELAY | PROVIDES FLASHING RED SIGNAL REPEATER IF SIGNAL IS AT STOP BUT APPROACH LOCKED | CONTROLPANEL LOCATION |
| GZKR | | SIGNAL SPECIAL INDICATING RELAY | FLASHES FIRST WHITE ROUTE LIGHT IF LEVER STICK OR RUR IS DOWN | CONTROL PANEL LOCATION |
| | | | **ROUTE SETTING -NON VITAL CONTROL RELAYS** | |
| (N)R | | NORMAL RELAY | } | |
| (R)R | | REVERSE RELAY | } REPEATS POINT LEVER POSITION | INTERLOCKING |
| (C)R | | ENTRE RELAY | } | |
| RSR | | ROUTE SETTING RELAY | SETS ROUTES WHEN BUTTON PRESSED | INTERLOCKING |
| UNR | | ROUTE NORMAL RELAY | CANCELS ROUTE WHEN BUTTON PRESSED | INTERLOCKING |
| NZR | | NORMAL SETTING RELAY | SETS POINTS NORMAL WHEN ROUTE CANCELLED | INTERLOCKING |
| RZR | | REVERSE SETTING RELAY | SETS POINTS REVERSE WHEN ROUTE CANCELLED | INTERLOCKING |

Extracted from B.S. 376: Part 2: 1954

## 26.1 Notes and Recommendations on the Nomenclature for Circuits

In order to provide a concise, graphic code for marking the units on plans, the following system has evolved which makes use of a designation made up of two parts, namely:

- Numerical Prefix

  The number of the principal lever, signal, track circuit etc. entering into the control of, or controlled by, the unit.

- Alphabetical Term

  Consisting of one or more letters. When the letter is used singly or finally it is used as a noun and designates the general kind of unit. Preceding letters, which are used as adjectives, denote the purpose of the unit.

Where reference is to be made to the position of levers, switches, push buttons or any other device operated by the signalman, as in the case of a lever lock or a relay representing a lever position, the letters shall be used in brackets immediately before the final letter.

The complete designation of a unit is written as follows:

1 OHR (without dots or dashes)

| (Numerical prefix) | (Prefix letter) | (Final Letter) |
|---|---|---|
| 10 | H | R |

In the example, 10 is the number of the signal, but when used to refer to the signal, it will be 10G. When the figure is used alone, it will be understood to refer to the lever, thumb switch, push button or other equipment actuated by the signalman for the control of the signal, thus 10(N)R indicates a relay repeating the normal position of the lever, thumb switch, etc. To avoid confusion, there should be no duplication of numbers for thumb switches, levers, etc.

10R indicates a relay associated with signal 10 and 10HR indicates a relay controlling the caution aspect of signal 10. In other words, the letter R means relay in general; the letter H indicates that the function of this relay is to control the caution aspect; and the number 10 definitely indicates the signal which this ‘caution’ relay controls.

Indices are used to denote:

- a specific terminal
- a specific signal where more than one is operated by one lever
- a specific relay where more than one is connected in parallel on account of insufficiency of contacts on one relay.

In terms where the last letter is not a capital letter, the final capital letter in the designation shall still be read as a ‘noun’ letter.

Example: 14KRfA1

Explanation: Number 1 terminal of fuse A of number 14 indicating relay.

As far as practicable, assigned letters are suggested, either because they are the first letter in the words they represent (e.g. B, Block) or because of usage (e.g. D, Clear; H, Caution). But many letters stand for names which cannot be associated and are arbitrary symbols only (e.g. J. Rectifier; U, train description apparatus). Some of the letters represent several different meanings or words, depending on their position with respect to numerals and other letters; if the scheme is used consistently there should be no mistake in meaning.

To provide for exceptional cases where the symbols do not cover the whole of the conditions, a detailed description may be placed in brackets after the symbol. For example, a relay repeating a lever normal, a point indicating relay and a number of track circuits may be shown as below, and in such a case, the relay should preferably be given a distinctive individual number. A convenient way would be to start the numbers for such relays at 1000, which would avoid confusion with any other numbers:

1010 PR 10(M), 10WKR, ATR, BTPR, CTR, DTP2R

Due to the use of a distinctive number, it will only be necessary to use the designation 1010PR for the label of the relay or the labelling of wires, but it is recommended that the full description

be shown at least once on each sheet of drawings, so that it is available for ready reference and indicates the complete control for the appropriate relay. It would be convenient for these complete details to be shown in one corner of the diagram, if they are not shown as complete symbols in the body of the diagram itself.

In the case of an item where there is no actual designation, a descriptive word may be included in the brackets, such as 1 OR (Overload).

## 26.2 Nomenclature Meaning of Letters

| Description Term (Prefix Letter) | |
|---|---|
| A. | Approach: Automatic |
| B. | Block: Bolt |
| C. | Checking or Proving: Coding |
| D. | Clear (green): Decoding. |
| E. | Light: Heat (externally applied) Emergency: Earth |
| F. | Fog. |
| G. | Signal |
| H. | Caution |
| HD. | Medium or Lower Yellow |
| I. | |
| J. | Time (delayed action) |
| K. | Indicating or detecting |
| L. | Locking: Left |
| M. | Marker: Magnetic |
| N. | Normal |
| O. | Retarder |
| P. | Repeating |
| Q. | Treadle or bar |
| R. | Reverse: Right: Danger (red) |
| S. | Stick |
| T. | Track Circuit |
| U. | Route (aspect displayed to be shown in brackets indicating) |
| V. | Train stop |
| W. | Points |
| X. | Audible indicator (such as bell, buzzer, horn). Level or highway crossing. |
| Y. | Slotting or disengaging |
| Z. | Special (to be explained on plan) |
| Up. | Up (direction of traffic) |
| Dn. | Down (direction of traffic) |

| Apparatus (Last Letter) | |
|---|---|
| A. | |
| B. | Block Instrument |
| C. | Contact |
| D. | |
| E. | Electric lamp (illuminating): Earth |
| F. | Fogging apparatus (e.g. detonator placer) |
| G. | Signal apparatus, including light signals |
| H. | Capacitor |
| I. | Inductor |
| J. | Rectifier |
| K. | Indicator (visual) |
| L. | Lock |
| M. | Motor |
| N. | Release: Hand operated switch, push-button or key |
| O. | Resistor |
| P. | Lever latch or trigger contact |
| Q. | Local coil of double element relay |
| R. | Relay or contactor (line or track element of double element relay) |
| S. | |
| T. | Transformer: Transmitter |
| t. | Terminal |
| U. | Train description apparatus (for route) |
| V. | Train stop apparatus |
| W. | Points operating apparatus |
| X. | Audible indicator (such as bell, buzzer, horn) |
| Y. | Disengaging apparatus |
| Z. | Special unit (to be explained on plan) |
| | |
| | |

# 27 Appendix C: Standard Practice for the Preparation of Signalling Circuit Drawings in Digital Format

Current digitised signalling plans and drawings are in MicroStation version 4.0 (signalling plans, track insulation plans) and AutoCAD 10i (circuit diagrams). New and amended drawings shall preferably be prepared using AutoCAD LTv2, LT97 or AutoCAD Release 12, 13 or 14. Alternatively any well supported, reliable drafting software which can save or export files in .dxf format which can then be opened and edited by AutoCAD LT97 or AutoCAD Release 14, or which can save in a .dwg format which can then be opened and edited by AutoCAD LT97 or AutoCAD Release 14, may be used.

## 27.1 Compact Disc Labels

Compact disc labels shall contain the following information:

| AUSTRALIAN RAIL TRACK CORPORATION | |
|---|---|
| **Copy Purpose:**<br>**Copy Name/No:** | **Copy Holder:** |
| **Drawing Type:** | |
| **Drawing Name:** | |
| **Job Name:** | |
| **Drawing/Book No:** | **Sheets No …… to ……** |
| **Version Number:** | **Version Date:** |
| **Disc No …… of ……** | **Drawing Software:** |
| **File No:** | **Job No:** |

## 27.2 Drawings

- One circuit drawing per file.
- File name shall be in the following order (eight characters long).

| 3 | 4 | 3 |
|---|---|---|
| characters | characters | characters |
| Circuit Book number | Sheet Number | File Type |
| (leading zeros required) | (leading zeros required) | |

Example: Circuit book - CB15 Page 9

File name would be C0150009.DWG

- Drawings shall be A3 size:

  Overall sheet size: 420 mm x 297 mm

  Drawing area size: 396 mm x 273 mm
- Drawing symbols – definition and sizes to be approved
- Drawing layers - to be specified by ARTC (i.e. text layers, drawing layers, dotted mode layers etc.).

## 27.3 Magnetic and Hard Copy Drawings

### 27.3.1 Magnetic Drawings

**Drawings supplied on compact discs**

Where a number of compact discs are provided for a particular circuit book, each compact disc shall be labelled showing the following:

- Copy purpose (e.g. review copy, construction copy, test copy, commissioning copy, maintenance copy)
- Copy name/number (e.g. master copy, master backup copy, copy number one)
- Copy holder: (name person issued to – responsible for*)*
- Drawing type: (e.g. signalling plan, track insulation plan, circuit book, etc.)
- Drawing name: (e.g. geographic location/area)
- Job name: (as applicable or not)
- Drawing book/number: (e.g. CB… or xxxxx)
- Sheets number …… to …… (as applicable)
- Version number:
- Version date:
- Disc number …… of ……
- Drawing software: (e.g. AutoCAD.REL14)
- File number: (as applicable)
- Job number: (as applicable)

If ten compact discs are required for a circuit book, the compact disc number shall be in the following form:

COMPACT DISC NUMBER 1 OF 10

COMPACT DISC NUMBER 10 OF 10

All compact discs shall be supported by file lists.

**Backup copies of compact discs**

Each drawing compact disc supplied shall have one backup copy provided. These backup copy compact discs shall have labels attached and be detailed as the drawing compact discs. The backup copy shall carry the name BACKUP COPY DRAWINGS.

### 27.3.2 Hard Copy Drawings

- One paper copy of each drawing shall be supplied on paper 80 gsm A3 size.
- Drawings shall be produced by either:
  - pen
  - ink jet

    or
  - laser printing (not dot matrix).
- If produced by laser printing, a sample copy showing line thickness shall be submitted for approval.
- Pen sizes for circuit drawings if ink produced are to be approved.
- Drawings shall not be bound together and shall be supplied in a suitable form of protection in number order.

## 27.4 Code Identification

Refer to Section 1.9 Code Identification in ESD-25-01 CAD and Drafting Manual for Signalling Drawings.

## 27.5 Numbering for Mechanical Drawings

| | |
|---|---|
| M01-000 | Mechanical and Electro Mechanical Signal Equipment |
| M01-100 | Colour Light Signals – Arrangements and Details Main Running Signals |
| M01-200 | Subsidiary Colour Light Signals - Arrangements and Details |
| M01-300 | Signal Bases and Foundations |
| M01-400 | Signal Gantries and Cages |
| M02-000 | Mechanical and Electro Pneumatic Points, Rodding, Stretchers, Lockbars and Fittings. Ground Frames, Signal Box Mechanical Fittings All Extension Pieces |
| M02-200 | Electric Points - Stretchers and Fittings |
| M02-500 | Points Timbers. Details |
| M03-000 | Detectors, Lever Locks, Releasing Switches, Mechanical Interlocking Components |
| M03-100 | Annett and Duplex Locks and Keys Train Staff Equipment |
| M03-200 | Clamp Lock Points Equipment |
| M03-300 | Electric Points Machine Components, E.P. Points Equipment, Plunger Lock, Indication Box |
| M04-000 | Train Stops |
| M04-100 | Impedance Bonds, Bond Equipment |
| M04-200 | Track Circuits - Arrangements and Equipment, Insulated Rail Joints |
| M05-000 | Notice Boards and Mounting Brackets |
| M05-100 | Equipment Cases and Bases, ESML Cases |
| M05-200 | Control Panels and Diagrams |

| | |
|---|---|
| M05-300 | Miscellaneous |
| M06-000 | Level Crossing Layouts |
| M06-200 | Level Crossing Signals and Booms, Equipment and Signs |
| M06-300 | Level Crossing Huts and Equipment |
| M07-000 | Signal and Communications Building Layouts and Details |
| M07-100 | Cable Ducts. Layouts and Duct Equipment |
| M08-000 | Power Supply Switch Boards |
| M08-100 | Surge Suppression Equipment |
| M08-200 | Technical Section Drawings |
| M09-000 | Telephones |
| M09-100 | Linewire Equipment |
| M09-200 | Cable Jointing and Terminating Equipment Racks |
| M10-000 | Electro Pneumatic Points. Layouts and Material Lists |
| M10-081 | Electric Points. Layouts and Material Lists |
| M10-301 | Manual Points. Layouts and Material Lists |
| M10-500 | Points Design Data |
| M11-000 | Feeder Switch and Access Interlocking |
| M11-100 | Special Tools |
| M11-200 | Ticket Machines, Passenger Information Displays |
| M11-300 | Miscellaneous |
| M11-400 | Air Reticulation |

# 28 Appendix D: Circuit Book Arrangements

Refer to Section 2.2 Circuit Book Layout in ESD-25-01 CAD and Drafting Manual for Signalling Drawings.

# 29 Appendix E: Signal Sighting Forms

Refer to ESC-04-01 Signal Sighting and Position.

# 30 Appendix F

Refer to Section 1.3 Applicable Documents.

# 31 Appendix G: Drivers Diagrams

Refer to Section 6 Drivers Diagrams and Weekly Notice Insertions in ESD-25-01 CAD and Drafting Manual for Signalling Drawings.

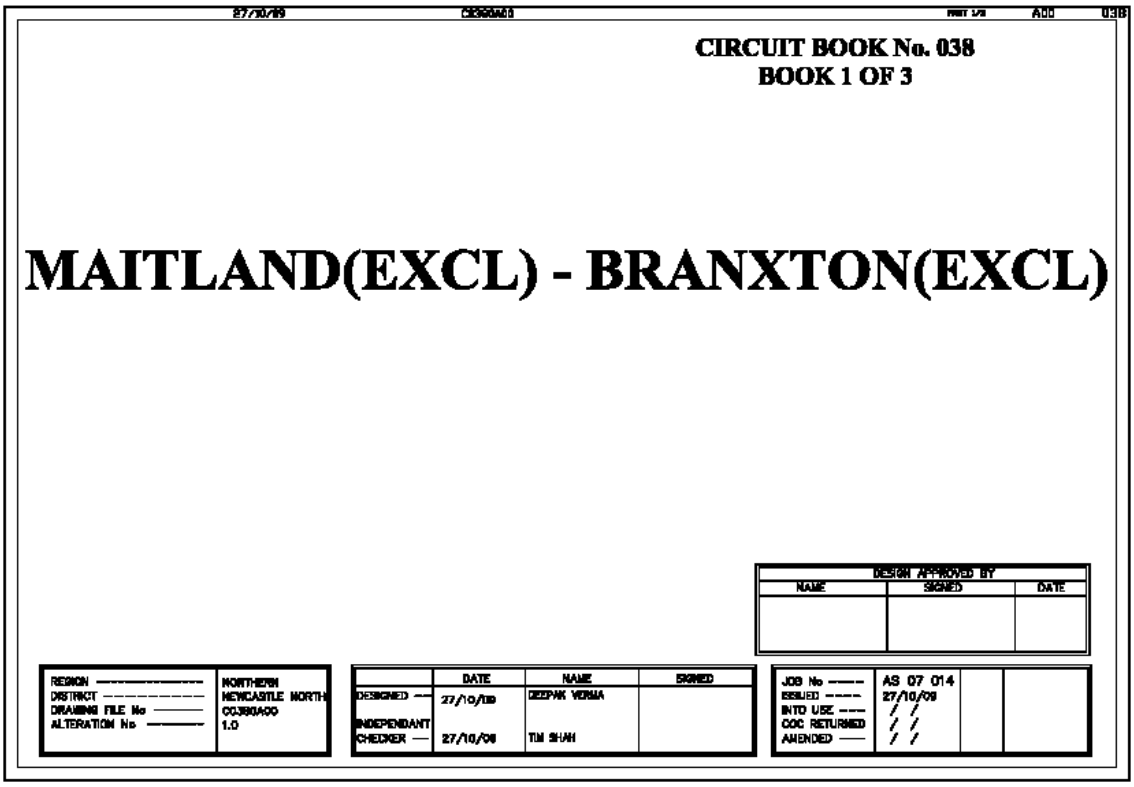
# 32 Appendix H: Control Page and Amendment Sheet

Each circuit book or group of circuits covering an interlocking location shall be organised with the following sheets for configuration management purposes:

- cover sheet
- control sheet
- amendment sheet.

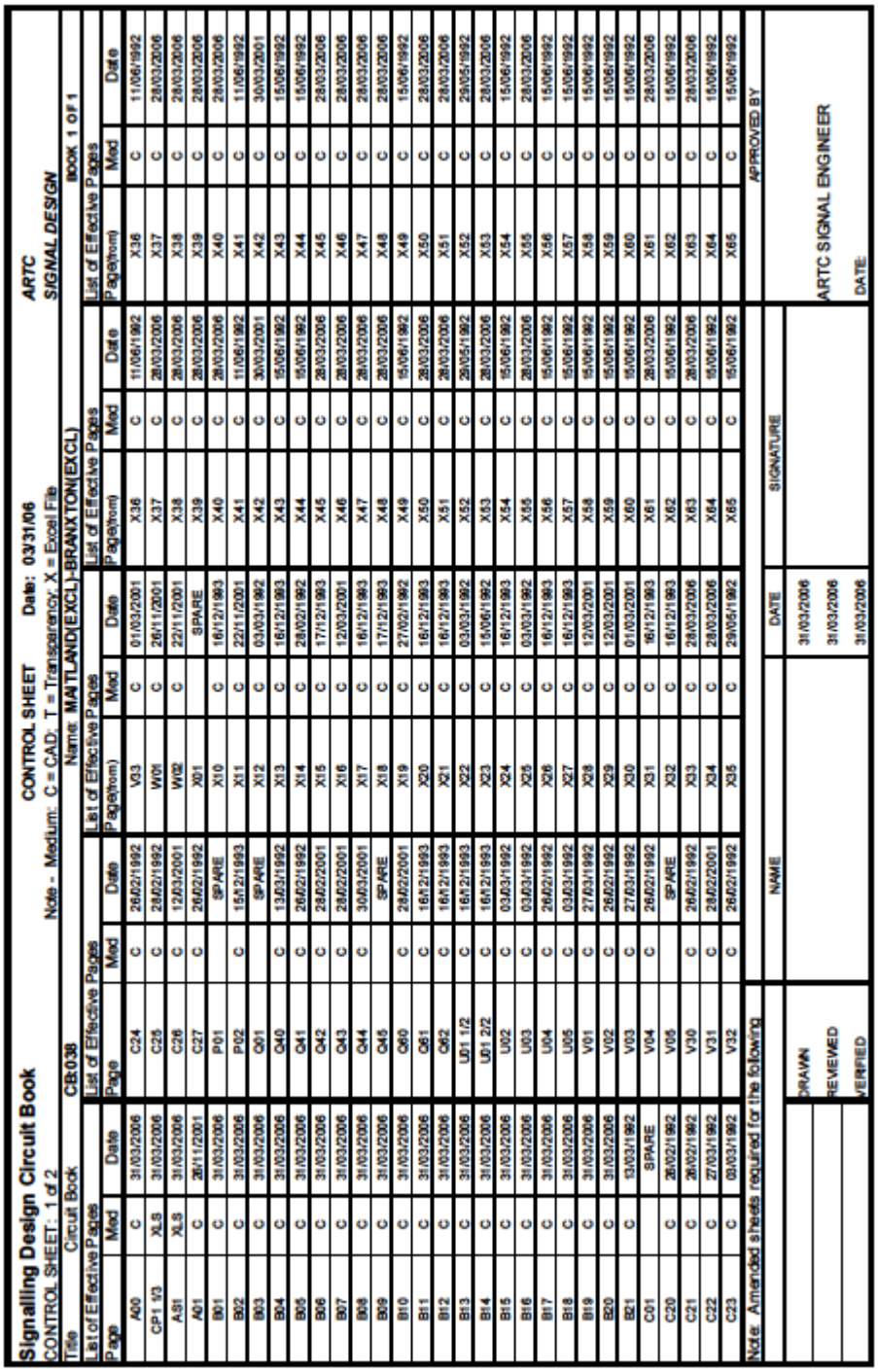
## 32.1 Cover Sheet

This covers the document description and approved status.



## 32.2 Control Sheet

This lists each sheet in the group and the status date of each sheet.



**Signalling Design Circuit Book** — CONTROL SHEET Date: 03/31/06 — ARTC — SIGNAL DESIGN

CONTROL SHEET: 1 of 2 — Note - Medium: C = CAD; T = Transparency; X = Excel File

Title: Circuit Book — CB.038 — Name: MAITLAND(EXCL)-BRANXTON(EXCL) — BOOK 1 OF 1

| List of Effective Pages | | | List of Effective Pages | | | List of Effective Pages | | | List of Effective Pages | | | List of Effective Pages | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Page | Mod | Date | Page | Mod | Date | Page(from) | Mod | Date | Page(from) | Mod | Date | Page(from) | Mod | Date |
| A00 | C | 31/03/2006 | C24 | C | 26/02/1992 | V03 | C | 01/03/2001 | X36 | C | 11/06/1992 | X36 | C | 11/06/1992 |
| CP1 t/3 | XLS | 31/03/2006 | C25 | C | 28/02/1992 | W01 | C | 26/11/2001 | X37 | C | 28/03/2006 | X37 | C | 28/03/2006 |
| A01 | XLS | 31/03/2006 | C26 | C | 12/03/2001 | W02 | C | 22/11/2001 | X38 | C | 28/03/2006 | X38 | C | 28/03/2006 |
| B01 | C | 26/11/2001 | C27 | C | 26/02/1992 | X01 | | SPARE | X39 | C | 28/03/2006 | X39 | C | 28/03/2006 |
| B02 | C | 31/03/2006 | P01 | | SPARE | X10 | C | 16/12/1993 | X40 | C | 28/03/2006 | X40 | C | 28/03/2006 |
| B03 | C | 31/03/2006 | P02 | C | 15/12/1993 | X11 | C | 22/11/2001 | X41 | C | 11/06/1992 | X41 | C | 11/06/1992 |
| B04 | C | 31/03/2006 | Q01 | | SPARE | X12 | C | 03/03/1992 | X42 | C | 30/03/2001 | X42 | C | 30/03/2001 |
| B05 | C | 31/03/2006 | Q40 | C | 13/03/1992 | X13 | C | 16/12/1993 | X43 | C | 15/06/1992 | X43 | C | 15/06/1992 |
| B06 | C | 31/03/2006 | Q41 | C | 26/02/1992 | X14 | C | 28/02/1992 | X44 | C | 15/06/1992 | X44 | C | 15/06/1992 |
| B07 | C | 31/03/2006 | Q42 | C | 28/02/2001 | X15 | C | 17/12/1993 | X45 | C | 28/03/2006 | X45 | C | 28/03/2006 |
| B08 | C | 31/03/2006 | Q43 | C | 24/02/2001 | X16 | C | 12/03/2001 | X46 | C | 28/03/2006 | X46 | C | 28/03/2006 |
| B09 | C | 31/03/2006 | Q44 | C | 30/03/2001 | X17 | C | 16/12/1993 | X47 | C | 28/03/2006 | X47 | C | 28/03/2006 |
| B10 | C | 31/03/2006 | Q45 | | SPARE | X18 | C | 17/12/1993 | X48 | C | 28/03/2006 | X48 | C | 28/03/2006 |
| B11 | C | 31/03/2006 | Q60 | C | 28/02/2001 | X19 | C | 27/02/1992 | X49 | C | 15/06/1992 | X49 | C | 15/06/1992 |
| B12 | C | 31/03/2006 | Q61 | C | 16/12/1993 | X20 | C | 16/12/1993 | X50 | C | 28/03/2006 | X50 | C | 28/03/2006 |
| B13 | C | 31/03/2006 | Q62 | C | 16/12/1993 | X21 | C | 16/12/1993 | X51 | C | 28/03/2006 | X51 | C | 28/03/2006 |
| B14 | C | 31/03/2006 | U01 1/2 | C | 16/12/1993 | X22 | C | 03/03/1992 | X52 | C | 29/05/1992 | X52 | C | 29/05/1992 |
| B15 | C | 31/03/2006 | U01 2/2 | C | 16/12/1993 | X23 | C | 15/06/1992 | X53 | C | 28/03/2006 | X53 | C | 28/03/2006 |
| B16 | C | 31/03/2006 | U02 | C | 03/03/1992 | X24 | C | 16/12/1993 | X54 | C | 15/06/1992 | X54 | C | 15/06/1992 |
| B17 | C | 31/03/2006 | U03 | C | 03/03/1992 | X25 | C | 03/03/1992 | X55 | C | 28/03/2006 | X55 | C | 28/03/2006 |
| B18 | C | 31/03/2006 | U04 | C | 26/02/1992 | X26 | C | 16/12/1993 | X56 | C | 15/06/1992 | X56 | C | 15/06/1992 |
| B19 | C | 31/03/2006 | U05 | C | 03/03/1992 | X27 | C | 16/12/1993 | X57 | C | 15/06/1992 | X57 | C | 15/06/1992 |
| B20 | C | 31/03/2006 | V01 | C | 27/03/1992 | X28 | C | 12/03/2001 | X58 | C | 15/06/1992 | X58 | C | 15/06/1992 |
| B21 | C | 31/03/2006 | V02 | C | 26/02/1992 | X29 | C | 12/03/2001 | X59 | C | 15/06/1992 | X59 | C | 15/06/1992 |
| C01 | | SPARE | V03 | C | 27/03/1992 | X30 | C | 01/03/2001 | X60 | C | 15/06/1992 | X60 | C | 15/06/1992 |
| C20 | C | 26/02/1992 | V04 | C | 26/02/1992 | X31 | C | 16/12/1993 | X61 | C | 28/03/2006 | X61 | C | 28/03/2006 |
| C21 | C | 26/02/1992 | V05 | | SPARE | X32 | C | 16/12/1993 | X62 | C | 15/06/1992 | X62 | C | 15/06/1992 |
| C22 | C | 27/03/1992 | V30 | C | 26/02/1992 | X33 | C | 28/03/2006 | X63 | C | 28/03/2006 | X63 | C | 28/03/2006 |
| C23 | C | 03/03/1992 | V31 | C | 28/02/2001 | X34 | C | 28/03/2006 | X64 | C | 15/06/1992 | X64 | C | 15/06/1992 |
| | | | V32 | C | 26/02/1992 | X35 | C | 29/05/1992 | X65 | C | 15/06/1992 | X65 | C | 15/06/1992 |

Note: Amended sheets required for the following

| | NAME | DATE | SIGNATURE |
|---|---|---|---|
| DRAWN | | 31/03/2006 | |
| REVIEWED | | 31/03/2006 | |
| VERIFIED | | 31/03/2006 | |

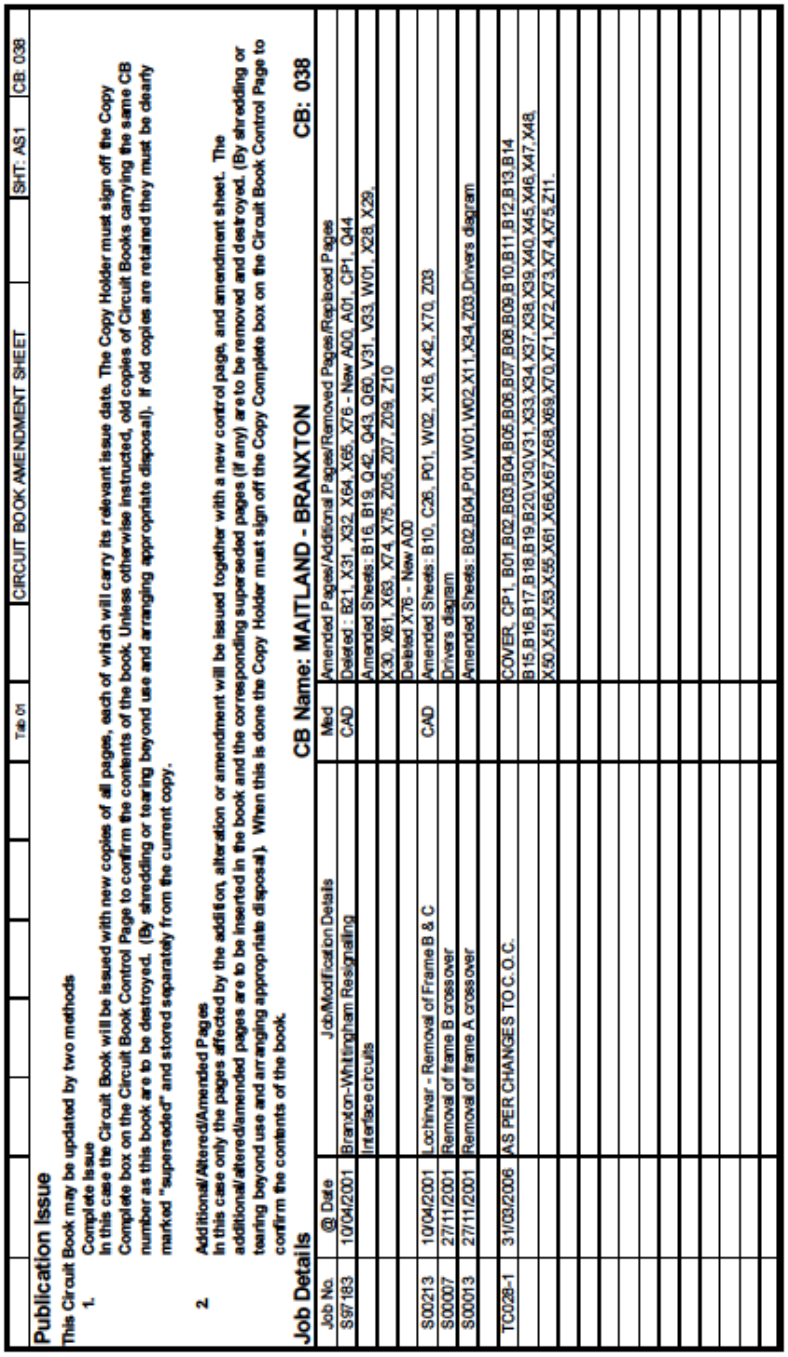
APPROVED BY

ARTC SIGNAL ENGINEER

DATE:

## 32.3 Amendment Sheet

This includes an entry for each job or change to the group of drawings.



CIRCUIT BOOK AMENDMENT SHEET | Tab 01 | SHT: AS1 | CB: 038

**Publication Issue**

This Circuit Book may be updated by two methods

1. Complete Issue
   In this case the Circuit Book will be issued with new copies of all pages, each of which will carry its relevant issue date. The Copy Holder must sign off the Copy Complete box on the Circuit Book Control Page to confirm the contents of the book. Unless otherwise instructed, old copies of Circuit Books carrying the same CB number as this book are to be destroyed. (By shredding or tearing beyond use and arranging appropriate disposal). If old copies are retained they must be clearly marked "superseded" and stored separately from the current copy.
2. Additional/Altered/Amended Pages
   In this case only the pages affected by the addition, alteration or amendment will be issued together with a new control page, and amendment sheet. The additional/altered/amended pages are to be inserted in the book and the corresponding superseded pages (if any) are to be removed and destroyed. (By shredding or tearing beyond use and arranging appropriate disposal). When this is done the Copy Holder must sign off the Copy Complete box on the Circuit Book Control Page to confirm the contents of the book.

**Job Details** — **CB Name: MAITLAND - BRANXTON** — **CB: 038**

| Job No. | @ Date | Job/Modification Details | Mod | Amended Pages/Additional Pages/Removed Pages/Replaced Pages |
|---|---|---|---|---|
| S97183 | 10/04/2001 | Branxton-Whittingham Resignalling | CAD | Deleted : B21, X31, X32, X64, X65, X76 - New A00, A01, CP1, Q44 |
| | | Interface circuits | | Amended Sheets: B16, B19, Q42, Q43, Q60, V31, V33, W01, X28, X29, X30, X61, X63, X74, X75, Z05, Z07, Z09, Z10 |
| | | | | Deleted X76 - New A00 |
| S00213 | 10/04/2001 | Lochinvar - Removal of Frame B & C | CAD | Amended Sheets: B10, C26, P01, W02, X16, X42, X70, Z03 |
| S00007 | 27/11/2001 | Removal of frame B crossover | | Drivers diagram |
| S00013 | 27/11/2001 | Removal of frame A crossover | | Amended Sheets: B02,B04,P01,W01,W02,X11,X34,Z03,Drivers diagram |
| TC028-1 | 31/03/2006 | AS PER CHANGES TO C.O.C. | | COVER, CP1, B01,B02,B03,B04,B05,B06,B07,B08,B09,B10,B11,B12,B13,B14 B15,B16,B17,B18,B19,B20,V30,V31,X33,X34,X37,X38,X39,X40,X45,X46,X47,X48, X50,X51,X53,X55,X61,X66,X67,X68,X69,X70,X71,X72,X73,X74,X75,Z11. |

## 32.4 Control Tables

For control tables grouped into books, the information in Sections 32.1, 32.2 and 32.3 also applies.

# 33 Appendix I: Checking of Signalling Design for New Works and Alterations

## 33.1 Checking Objectives

A signalling project's objective is to effectively implement a safe, reliable signalling installation that meets the functional requirements in accordance with standards and within the approved costs and time scales.

Prior to commissioning signalling work into use for traffic operations, the installation is checked and tested to verify that it is safe, reliable and meets the functional requirements, in accordance with standards.

Prior to issuing the approved design, the design is independently checked to verify it is safe, reliable and meets the functional requirements, in accordance with standard signalling principles and practices, including the circuit design standards.

It is not possible to verify that a design is correct to standard solely by field functional testing; rigorous design checking is necessary to ensure that all safety features are included, that there are no unsafe inclusions and that the design is to the proven standard arrangements for safe operation.

The primary focus of independent checking of design is therefore to ensure the design is safe.

For reasons of efficiency, the design is also independently checked to ensure:

- the design meets the functional requirements
- the design contains no deficiencies that could result in an operationally unreliable or restrictive installation
- the design contains no errors that could result in significant rework.

Rework increases risk exposure and needs to be minimised; signalling rework in safety related areas must be rigorously controlled.

All design modifications to provide added functionality, remove deficiencies, remedy errors (or for any other reason) are subject to the same checking process and, as a general rule, are carried out by the original designer and independent checker.

## 33.2 Checking Process

The checking process for signalling design involves:

- The signal designer who is required to fully check their own work.
- The signal designer's immediate signalling design supervisor, where that signalling design supervisor has provided any technical guidance, direction or input to the design, or a nominated suitably fit and competent signalling design checking engineer. This person may the project Signal Design Engineer In Charge.
- An independent signalling design checking engineer (independent checker), appropriately experienced and suitably fit and competent.
- The project Signal Design Engineer In Charge, or a nominated suitably fit and competent signalling design approval authority (design approver), who examines the designs and satisfies themselves that they have been comprehensively and properly checked by competent and independent checkers.

The signalling design checking process covers a full check of designs for soundness, safety, reliability, functionality and compliance with standards. The checking may be considered as two aspects. These are:

1. Checking for any errors or deficiencies in designs relating to sound engineering design practice, interface compatibility, completeness, correctness of documentation detail, power

supply calculations, voltage drop calculations, cable sizes, timing calculations, typing and ratings of equipment and the like. This may be performed by a suitably fit and competent Signalling Design Engineer who is not the designer but may not be fully independent (checker).

2. Checking for any errors or deficiencies in the design relating to signalling safety, reliability, compliance with design standards and signalling principles and practices and operational functionality. This shall be performed by a suitably experienced, fit and competent Signalling Design Checking Engineer who is independent (independent checker).

Both aspects could be checked by the independent checker or the first aspect could be checked by a separate checking engineer who is not the designer but who may not be fully independent.

## 33.3 Error Reporting

Errors found in the checking and approval process prior to issue shall be recorded and the design returned to the designer with advice of the problem. The designer corrects the error and checks whether there are other similar or related instances in the whole of the design that may need correction. The designer submits the corrected design to the checking engineer(s) with advice of everything that has been changed. The checking engineer(s) checks that all cases of the error have been corrected.

Errors discovered in issued designs shall be brought to the attention of the designer and the checking engineer(s) and are recorded against the respective designer and checking engineer.

The project Signal Design Engineer In Charge monitors the performance of designers, checking engineers and design integrity testers and assesses whether any errors or deficiencies in their work are knowledge based, procedure based or due to complacency, haste, fatigue, etc and takes (and records) appropriate action as required.

## 33.4 Design Integrity Testing

A design integrity test by a suitably experienced Senior Design Engineer is generally carried out for major signalling works or for complex designs such as those incorporating multiple overlap sequencing where it is difficult for designers and checking engineers to visualise indirect locking and timing implications in all the operational circumstances that might cause operational problems.

The design integrity test is complementary to, and not a substitute for, in-depth design checking. Design integrity testing is described in ESC-21-03 Inspection and Testing of Signalling – Inspection and Testing Principles.

# 34 Appendix J: Control Table Formats

| **Control Table for Signals** | | **Control/Location** | |
|---|---|---|---|
| Signal | | Route | |
| Commence | | Finish | |
| First Proceed Aspect | | Train Stop | |
| Auto-Reclearing | | Auto-Normalising | |
| Requires Routes Normal | | | |
| Requires Routes Reverse | | Requires Routes Clear | |
| Also Sets | | Set By | |
| Sets, Locks and Detects Points Normal | | | |
| Sets, Locks and Detects Points Reverse | | | |
| Sets and Indirectly Locks Normal | | | |
| Sets and Indirectly Locks Reverse | | | |
| Sets Points in Sequence | | | |
| Requires Tracks Clear | | | |
| Clearing Delayed Until | | | |
| Requires Lever Stick | | | |
| Higher Aspects Require | | | |
| Route Locked By | Track Circuit | After Using Route | Released By |
| | | | |
| Approach Locked By | Track Circuit | | Released By |
| | | | |
| Remarks | | | |
| Legend | | | |
| Version Number | | Version Date | |
| Name | Designed By | Independently Checked By | Approved By |
| | | | |
| Signature | | | |
| Date | | | |

| **Control Table for Points** | | **Control/Location** | |
|---|---|---|---|
| Point | | | |
| Set and Locked Normal By | | | |
| Set Only Normal By | | | |
| Set and Locked Reverse By | | | |
| Set Only Reverse By | | | |
| Route Locked Normal By | Track Circuit | After Using Route | Released By |
| | | | |
| Route Locked Reverse By | | | |
| Locked Normal for Overlap Maintenance By | | | |
| Locked Reverse for Overlap Maintenance By | | | |
| Remarks | | | |
| Version Number | | Version Date | |
| Name | Designed By | Independently Checked By | Approved By |
| | | | |
| Signature | | | |
| Date | | | |

# 35 Appendix K: SCP06F-01 Modification Instruction Form

The SCP06F-01 Modification Instruction form is available on the ARTC Engineering Extranet.