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Resetting of Frauscher Axle Counter Systems

ESS-05-01

Applicability

ARTC Network Wide

SMS

Publication Requirement

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ESD-05-13

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1.0	20 Dec 23	Standards	Stakeholders	Manager Signalling Standards	Head of Engineering Standards 10/01/2024

Amendment Record

Amendment Version #	Date Reviewed	Clause	Description of Amendment
1.0	20 Dec 23	various	Updated examples of reset procedures, cooperative reset, supervisory reset, counter head control and other minor changes. Included direct serial connection between axle counter and CBI. Document renumbered as per EGP-01-02.

Table of Contents

1 Introduction

1.1 Purpose

The purpose of this document is to provide a consistent approach and guidance to the application of resetting axle counters throughout the ARTC rail network.

1.2 Scope

This document covers Frauscher axle counters that are type approved for use on the ARTC rail network. It covers the reset of those axle counters only. This document covers the principle for axle counter reset method which can be used on the network. Actual reset method will need to be chosen by the designer based on site specific requirements in consultation with the business unit signal engineering team and ARTC operations.

This document is applicable to entire ARTC network.

1.3 Document Owner

The Head of Engineering Standards is the Document Owner. For any query, initial contact to be made at standards@artc.com.au.

1.4 Responsibilities

Signal Design Engineers are responsible for implementation of this standard.

Signal Design Engineer is responsible to design the appropriate reset method based on local site requirements to ensure the SFAIRP outcome in consultation with ARTC operations, Signals Maintenance Engineer and Frauscher (Axle counter manufacturer).

1.5 Terms & Definition

For the purpose of this document, the terms and definition are as follow:

Terms	Definition
BSI	Overvoltage Connection Box
CHC	Counting Head Control
DIRN	Defined Interstate Rail Network
FdS	Frauscher Diagnostic System
GAK	Local Disconnection Box
NCC	Network Control Centre
OEM	Original Equipment Manufacturer
OHW	Overhead Wiring
SAP	Signal Arrangement Plan
SFAIRP	So Far As Is Reasonably Practicable
SRAC	Safety Related Application Conditions

TCS	Train Control System
TOW	Train Order Working

1.6 References

Document Code	Title
ESD-05-14	Frauscher Axle Counter Systems
ESD-05-15	Design Guideline for Frauscher Axle Counters
AS 7651	Axle Counters
D20002-3	Installation / Operation - Frauscher Advanced Counter FAdC
D20003-3	Maintenance - Frauscher Advanced Counter FAdC
D20001-4	Design and Planning Manual – Frauscher Advanced Counter FAdC
D20006-2	Frauscher Diagnostic System FDS001 for FAdC
D21000-1	Brief description – Frauscher Advanced Counter
D21001-2	System Documentation – Frauscher Advanced Counter FAdC R2
D21003	SRAC List Frauscher Advanced Counter FAdC R2
D4181-1	Design and application of supervisor sections for axle counting system FAdC R2
D4182-1	Reset options for the axle counting system FAdC® R2
D4183-1	Design and application of Counting Head Control for axle counting system FAdC R2
PdM100041	Technical Manual FAdC R2 – Frauscher
OPE-PR-005	Axle Counter Reset Procedure Spencer Junction to Tarcoola

2 General Principles

Axle counters are a discrete form of track vacancy detection. They determine whether a section of track is clear by counting wheels in and out of the section. There are three possible states for an axle counter section: clear, occupied and disturbed (error).

The track clear indication provided by the axle counter system is based on the following being true:

1. The track was clear of rail traffic initially,
2. Since that time, the number of axles counted in has been equal to the number of axles counted out,
3. No rail traffic has entered mid-section by an undetected path.

The operation of the axle counter system addresses only the second item.

The evidence for the track section being clear shall come from an independent source.

Certain circumstances will require the axle counter section to be reset. These include:

a. After powering on the axle counter system
b. After a power disturbance in the electrical supply to the axle counter system
c. When the axle counter section has entered a disturbed state and not been configured to recover automatically
d. After an axle counter miscount
e. After maintenance or construction activities
f. After failures in the axle counter system equipment
g. After the axle counter equipment has been re-connected
h. The putting-on or taking-off of Road Rail vehicles within an axle counter train detection section

Resetting can take place automatically managed by the axle counter system via Supervisory or Counting Head Control under certain controlled circumstances or will require the intervention of a authorised person to carry out a local reset or will require the co-operation of two authorised persons for remote resets.

Appropriate checks shall be undertaken by system or authorised person to ensure that track section is only reset when there is no rail traffics or obstacles in the track section.

If reset operations are necessary, several times within couple of train runs then the cause for the reset operations shall be clarified and eliminated.

The following conditions shall be met when carrying out a reset.

- the whole track section shall be clear of rail traffic
- wheel sensors shall not be occupied (i.e., no wheel/s standing right above or in a position to influence any wheel sensor for that track section)
- there shall be no system failures or errors (e.g., no wheel sensor, evaluation board or communication error)

The designer shall ensure that Frauscher Safety Related Application Conditions (SRAC) are complied with for the resetting of the axle counter. The designer shall consider using the reset types

which reduces the risk of human error such as supervisory reset, counting head control, sweep train. Axle counter reset requirements and methods are determined by the context elements surrounding the need for each type of reset.

These context elements can be categorised in the following section.

2.1 Reset Types

2.1.1 Immediate reset

The track section is immediately set to “clear” state (a count of zero) and the signal interlocking treats the train detection section as clear / unoccupied.

An immediate reset may be undertaken in any case where sufficient independent evidence of the track being clear of rail traffic is available to the person undertaking the reset.

The following are suitable sources of such independent evidence:

- A track circuit (or series of track circuits) which cover(s) at a minimum the whole of the track section covered by the axle counter track section indicating that it is clear of rail traffic,
- An axle counter supervisory section (or series of supervisory sections) which cover(s) at a minimum the whole of the track section covered by the axle counter track section indicating that it is clear of rail traffic ,Direct visual inspection of the whole of the axle counter track section that it is not occupied by any rail traffic, when done directly by a person authorising the resetting of the axle counter track section. In cases where the track section is too long to see all at once from a single location, this observation shall be supplanted by direct knowledge of network controller that no rail traffic has entered the track section since the authorising person referred to commenced inspection of the track section,
- A train travelling the full length of the axle counter section for the purposes of establishing that it is not occupied by any rail traffic. An authorised person on the train shall report to the person authorising the reset of the axle counter section both on entering the section and after departing the section for the evidence to be regarded as valid. The second report shall include confirmation that the train was complete when it departed the track section,
- An authorised engineer observing new infrastructure and having direct knowledge that no rail traffic has ever occupied the axle counter track section.

2.1.2 Delayed reset

The track section is set to “clear” state after a time defined in the logic associated with the axle counter. The time delay in this case imposes a simple time lock on the setting of the track section to clear.

In this case, if an axle count (either in or out) associated with the track section is detected prior to the expiry of the timer, the process for resetting will be aborted.

A delayed reset may be undertaken in any case where independent evidence of the track being clear available to the person undertaking the reset is not regarded as sufficient to allow an immediate reset to occur, but that after the expiry of the time period, either the occupied track

section will have completed performing its required function, or resetting the track section will otherwise be regarded as sufficiently safe.

Below is the example where a delayed reset can be used.

- An axle counter track section which are part of a level crossing approach in a non-signalled area.

2.1.3 Preparatory or Sweep Train reset

This reset mode will only be accepted by the axle counter when a miscount or other transient fault has occurred and there are no system or hardware faults.

A preparatory reset may be used over points or on long single line sections where the signal technician cannot traverse the entire section and give an assurance that it is clear of all rail traffic. The request is input directly into the axle counter system and if the reset request is accepted, the axle counter system will use the next train as a “sweep train” across the sections awaiting a reset. The axle counter shall compare the count in and the count out as provided by the sweep train and if there is a match, the axle counter system will recover those track sections to clear and normal operation shall resume.

For a relay interface the track relay/s will ‘pick’ normally after the sweep train. Where there is no remote indication of a sweep reset request being accepted by the axle counter system, the signal technician will need to monitor the axle counter system via the FdS or ASD monitor to confirm that the preparatory reset has been accepted by the axle counter system.

When a ‘sweep train’ reset is initiated, the track section’s status is immediately changed from “disturbed” to “awaiting a sweep train” when the request has been accepted by the axle counter system. As the sweep train enters the section the axles are counted in, and as the train exits the section the axles are counted out and when the count reaches zero, the section is immediately set to “clear”. The axle counter system can output this “awaiting a sweep train” status so that when applied to a train control system display the track section can be displayed as a unique colour to highlight the systems’ status.

- The signal protecting the entry to the track section shall be blocked by the network controller prior to the sweep train entering the section,
- The network controller shall communicate with the rail traffic crew on the sweep train who shall report that the train is fully clear of the track section before the block may be removed.

This is a system-controlled reset that once initiated and accepted by the axle counter system cannot be aborted without local intervention by a signal technician.

2.2 Reset Initiator

2.2.1 Local

Reset undertaken at the location by an authorised person who has inspected the track section and verified it to be clear.

Methods which may be specified for local reset are:

- Use of a local reset panel designed and constructed specifically for performing resets at that location. The reset panel is hard wired directly with the axle counter system or local CBI.

- Where no reset panel is provided and IO-EXB modules are used for the fail-safe output of clear/occupied track section indications, use of the 2 toggle switches on the front of the applicable IO-EXB may be used when appropriately configured.
- Where a direct serial connection is used to transmit axle counter data into a CBI – no IO-EXBs in use, a local technician reset panel shall be provided to reset each track section individually.

2.2.2 Control Centre (Remote)

This is a reset requested by the Network Control Centre (NCC) responsible for rail traffic movements over the track section.

The procedure may involve an immediate reset, a delayed reset, or a sweep reset. The exact option available will be dependent upon the site-specific equipment configuration and the evidence available to the person authorising the reset is sufficient for the circumstances.

Methods which may be specified for control centre reset are:

- Use of the signal control panel used for controlling the signalling system at remote locations. The panel will have a sub-menu allowing the network controller to remotely initiate a sweep reset which is sent to either the axle counter system or remote interlocking via the same non-vital telemetry system used to send signalling controls to remote sites. The commands received at the remote location shall conform with the manufacturer's requirements and local system configuration so that a reset request can be accepted, processed and acknowledged.

2.2.3 Co-operative

This reset option can be undertaken involving the Network Controller and either a local authorised person or an Operational Supervisor within the NCC in a combined process.

The procedure may involve an immediate reset, a delayed reset, or a sweep reset. The exact option available will be dependent upon the site-specific equipment configuration and the evidence available to the persons authorising the reset is sufficient for the circumstances.

Methods which may be specified for the control centre portion of the reset are:

- Use of the signal control panel used for controlling the signalling system at NCC. The panel will have a sub-menu allowing the network controller to remotely initiate a reset which is sent to either the axle counter system or remote interlocking via the same non-vital telemetry system used to send signalling controls to remote sites.
- Where the 2nd person is an Operational Supervisor, they will have a similar sub-menu on a separate and geographically distant control panel from the Network Controller that will require an input to be generated by the Operational Supervisor within a specific time period of the reset being requested for the reset to be processed.

Methods which may be specified for the local portion of the reset are described in Section 2.2.1.

2.2.4 Programmed or Automatic

Reset undertaken automatically by either the interlocking or the axle counter system based on available vital data which confirms that the track is clear.

Such reset may be issued:

- By the axle counter system based on the operation of supervisor sections implemented in accordance with the manufacturer's specification.
- By the interlocking based on interlocking conditions which mimic the functionality provided by supervisor sections or utilise other train detection system inputs such as track circuit information in addition to axle counter information and implemented in accordance with manufacturer's specification. Reset commands of this type issued by the interlocking for this purpose shall be via a vital interface to the axle counter system using Frauscher Safe Ethernet (FSE) protocol.

2.3 Infrastructure Type

2.3.1 Signalled

The axle counter track section is in the block or overlap of a signal and may be either plain track or part of a turnout or other complex item of trackwork.

The method for reset in such track sections with no overlay in place and in normal operational circumstances may be a combination of both immediate automatic (supervisory) resets, a sweep reset or a remote reset. The exact nature of the reset process for each track section shall be determined as part of the signalling design process and approved by the local Signal Maintenance Engineer and business unit.

Immediate reset may also be used by authorised personnel as part of engineering works when the signalling system is not currently booked into service.

2.3.1.1 Over Points and Crossings

Where a reset is required for an axle counter section over the points and crossings, additional safety checks will be required to be undertaken prior to any reset being requested or carried out.

In the following arrangements, if the affected track section is disturbed it shall show occupied and the points shall be locked in the current position – deadlocked. The following options are outlined on the basis that no supervisory resets are configured.

This is also applicable if catch points are utilised within the highlighted track section.

If the next train movement is for the same lie of points, the following options may be used based on site specific situation and risk assessment;

- a local reset, or
- a remote sweep reset, or
- a cooperative reset

If the next train movement is for the opposite lie of points;

- a local reset to release the deadlocking, or
- a cooperative reset,

2.3.2 Overlay

The axle counter track section overlays another form of train detection which is able to provide independent assessment of the presence of a train.

The method for reset in such infrastructure in normal operational circumstances may be either a supervisory reset or a reset based on the information provided by the other train detection system. In both cases it can be an immediate reset.

2.3.3 Non-Signalled

The axle counter track section is in an area covered by train order working or alternative safe working system; the axle counter track section is not used as part of the safeworking system providing movement authorities to rail traffic.

The methods for reset in such infrastructure with no overlay in place and in normal operational circumstances will be either an immediate automatic (supervisory) reset or an immediate local reset.

2.4 Counter State

2.4.1 Start-up

At start-up, the axle counter has just been brought into or returned to service and no authorised rail traffic movements have been issued by the interlocking.

This situation can include situations where normal authorities are re-commencing after a fault.

Procedures shall be put in place during works to ensure that either no rail traffic are present within the area being brought into service or return to service, or, that those that are present are at a stand and will remain so. In such cases, immediate local resets may be implemented by authorised personnel to any track sections that are clear of rail traffic.

2.4.2 Failed

A component of the axle counter system is currently failed and resetting is not technically possible.

Under these conditions authorised personnel will rectify the axle counter system fault and when appropriate manage the return to normal operation in accordance with section 2.4.1.

2.4.3 Miscount

The axle counter system is working correctly but a track occupancy is registered due to a discrepancy between axles counted into and out of a train detection section.

This is a common reason for an axle counter to require a reset.

2.4.4 Road Rail Vehicle (RRV) On/Off

Road rail vehicles should not enter (get on) or leave (get off) the network in the mid-section of an axle counter train detection system.

The road rail vehicles operator shall contact the Network Controller and gain the appropriate authority before the road rail vehicle may enter the network.

Road rail vehicles should only enter and exit the network at specific locations so that axle counting systems shall not be disturbed by their movement;

- At non-train detected maintenance sidings
- At approved sites where train detection is achieved by conventional track circuits only

Road rail vehicles may leave the network at active level crossing locations. Where axle counters are utilised, an authorised worker shall be present to reset the axle counter system at the level crossing location once the road rail vehicle is clear of the rail corridor.

Axle counter CHC functionality may be implemented where appropriate to support the operation of road/rail vehicles without affecting axle counting systems.

3 Examples of Reset Procedures

Each state within the ARTC network uses different keying for personnel carrying out safeworking activities. The following information is applicable across all of the following sections where a reference to a ‘key’ is made;

- New South Wales/Queensland/Victoria – OP3 key (yellow band)
- South Australia/Western Australia – S key or S Boyd key

3.1 Resetting at Level Crossings

Axle counter train detection is routinely used for isolated level crossings in safeworking systems that may not utilise those axle counters as part of a movement or section authority for that section. They can also be installed in axle counter or a track circuited area as an overlay arrangement – in this situation care shall be taken to ensure that correlation takes place between the two types of train detection systems.

The reset switch is to be mounted in a special housing secured with a special safeworking key (see section 3), which keeps the key captive when unlocked. A three (3) position switch, sprung to the centre shall be used. Centre is the normal position; the reset procedure is thus-

1. Turning to the left (position 1) and holding for minimum 1 second and then,
2. Turning to right (position 2) and holding for minimum 1 second,
3. Return to centre termed normal, to complete the operation.

Each axle counter track section is to be separately indicated using LED’s mounted in the housing, they indicate red for occupied or disturbed. A green LED shall indicate track section clear. Whilst the reset type is immediate, a timer shall be used to ensure the level crossing protection shall continue to operate once all the track sections have been reset with the timer being set to 120 seconds. There shall be a flashing red LED underneath the reset switch which shall indicate that the timer is timing.

Level crossing reset arrangements of this type shall include all track sections that are used for the control of the level crossing – that is, all track sections for a level crossing shall be reset from a single location at the level crossing itself.

Once the track sections are indicated clear and the level crossing operation has extinguished, the reset switch housing is to be resecured.

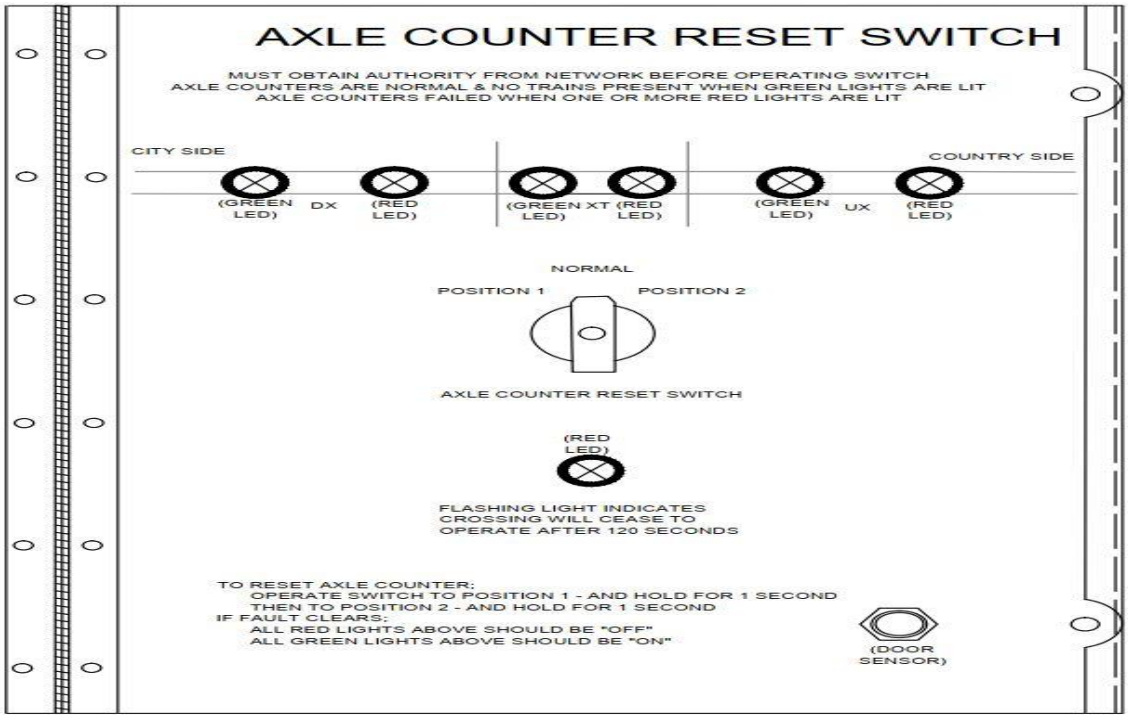


Figure 1 – Reset Panel Template

3.2 Remote Level Crossing Reset in a CTC Area using Overlay Axle Counters

The mid-section level crossing is located within a track block area using track circuits for train detection for the CTC display. The level crossing is activated by overlay arrangement of axle counter train detection sections. The axle counter train detection sections are displayed on the Phoenix train control system as additional text. When an axle counter train detection section is clear, the associated text will display steady white text. When an axle counter train detection section circuit is occupied or in a failed condition the associated text will display steady red text. The level crossing text on the Phoenix train control system will flash red when the level crossing warning equipment is activated.

The reset procedure is initiated by the Network Controller, the following steps are taken;

1. The Network Controller identifies the axle counter train detection section as failed showing occupied on the Phoenix train control system.
2. The Network Controller contacts the Rail Traffic Crew of the last train or track vehicle that passed through the section to verify that it is complete and clear of the level crossing.
3. When the last train or track vehicle is confirmed as complete and clear of the level crossing, the Network Controller requests a remote axle counter reset of the particular axle counters train detection section via the Phoenix train control system.
4. If the reset is successful, the axle counter train detection section will indicate clear with steady white text displayed on the Phoenix train control system.
5. If the reset is not successful, the Network Controller must request a site attendance by the local signals maintenance representative to investigate and effect repairs as required.

3.3 Resetting at non-CTC Motorised Crossing Loop Applications

The reset switches are to be mounted in a special housing secured with a special safeworking key (see section 3), which keeps the key captive when unlocked.

An individual three (3) position switch, sprung to the centre shall be used for each track section. Centre is the normal position; the reset procedure is thus-

1. Turning to the left (position 1) and holding for minimum 1 second and then,
2. Turning to right (position 2) and holding for minimum 1 second,
3. Return to centre termed normal, to complete the operation.

Each axle counter track section is to be separately indicated using LED's mounted in the housing, they indicate red for occupied or disturbed. A green LED shall indicate track section clear.

This style of reset is immediate meaning that the track section reset is immediately able to release point locking for example.

Once the required reset action/s have been successful and the track sections are indicated clear, the reset switch housing is to be resecured.

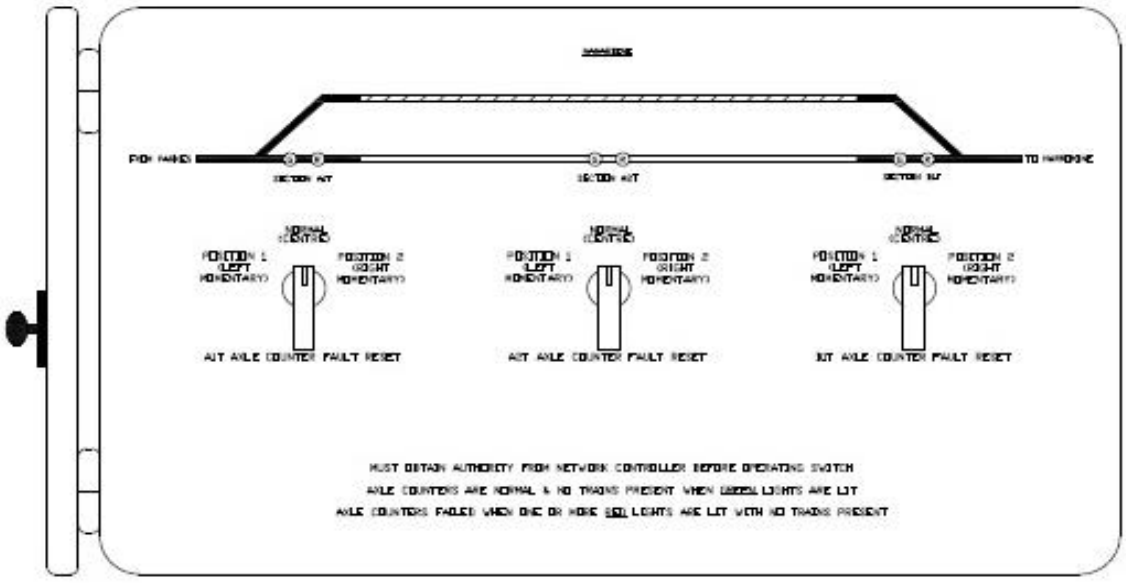


Figure 2 – Loop Reset Panel Example

3.4 Engineering Reset – Local Axle Counter Equipment

To facilitate a local technician reset by authorised signalling personnel, the following actions shall be undertaken for the particular arrangement of axle counter equipment on site.

3.4.1 I/O-EXB via Toggle Switches

The affected track section is to be confirmed as either section A or B on the IO-EXB – use the 'Display' toggle switch to display the 'Reset Required' indication in the display window, and then operate both toggle switches as per below:

1. Push both toggle switches together to the left and hold for at least 0.5 seconds.
2. Release both toggle switches and within 1.0 seconds.
3. Push both toggle switches together to the right and hold for at least 0.5 seconds and release.

This type of reset is possible only when the front panel elements of the IO-EXB are not configured as “disabled” in the configuration word “Toggle switches of the IO-EXB”. The type of reset operation is also defined in this configuration word.

The duration of the actuation sequence 1 – 3 shall not exceed 30s. If the reset process takes longer than 30s, then the reset is rejected, and the actuation process shall start again.

3.4.2 Local Reset – No I/O EXB

This form of local reset is only applied when a direct serial connection is used between the axle counter card file and a CBI – where no I/O-EXBs are in use.

A local technician reset panel shall be constructed that takes a similar form to the style shown in Section 3.3 and will be mounted within the same enclosure as the axle counter cardfile and the CBI. This reset panel will provide inputs into the CBI that will enable the CBI to control the resetting process with the direct link to the axle counter system – and then send outputs back to the local reset panel to confirm resets have been effective.

An individual three (3)- position switch, sprung to the centre shall be used for each track section. Centre is the normal position; the reset procedure is thus-

1. Turning to the left (position 1) and holding for minimum 1 second and then,
2. Turning to right (position 2) and holding for minimum 1 second,
3. Return to centre termed normal, to complete the operation.

Each axle counter track section is to be separately indicated using LED’s mounted in the panel, they indicate red for occupied or disturbed. A green LED shall indicate track section clear.

The front panel elements of the AEB shall be configured as “disabled” in the configuration word “Toggle switches of the AEB”. The type of reset operation is also defined in this configuration word.

3.5 Remote Signaller

This reset mode will only be accepted by the axle counter system when a miscount or other transient fault has occurred and there are no system or hardware faults. The reset is immediate and unconditional. Reset systems of this type are not preferred on the ARTC network and if required for the new works shall be supported by the risk assessment.

3.6 Remote Signaller and Local Technician

This is a co-operative reset and will only be accepted by the axle counter when a miscount or other transient fault has occurred and there are no system or hardware faults. The reset is immediate and unconditional. Signal technician should check the entire length of the track section to ensure that there is no rail traffic or obstacles on the track section.

Step 1: Axle counter fault

An axle counter miscount/failure occurs, in this case 17BT- Highlighted in Red at Glenfield.

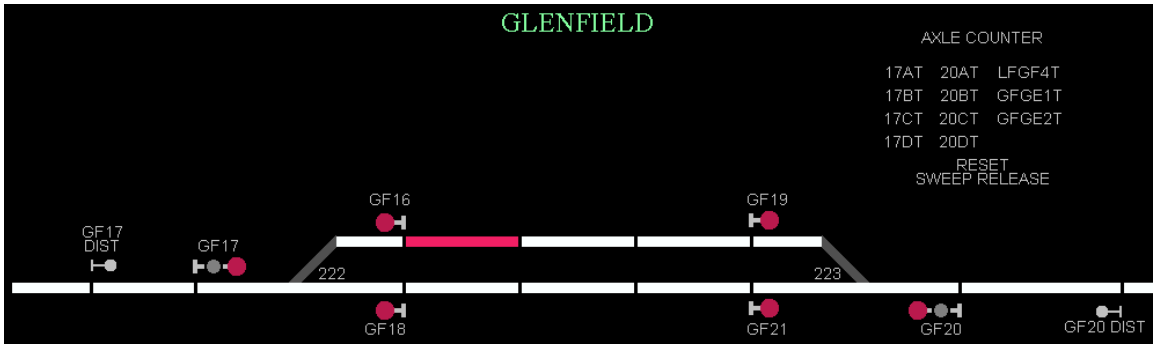


Figure 3

Step 2: Axle counter reset

The Network Controller resets the axle counter section by clicking the Reset Select ("17BT" in this case) then the "RESET". The Select Indication under the track lights to confirm which axle counter section is being reset.

The Reset Select and "RESET" will be automatically de-selected 5 seconds after being clicked.

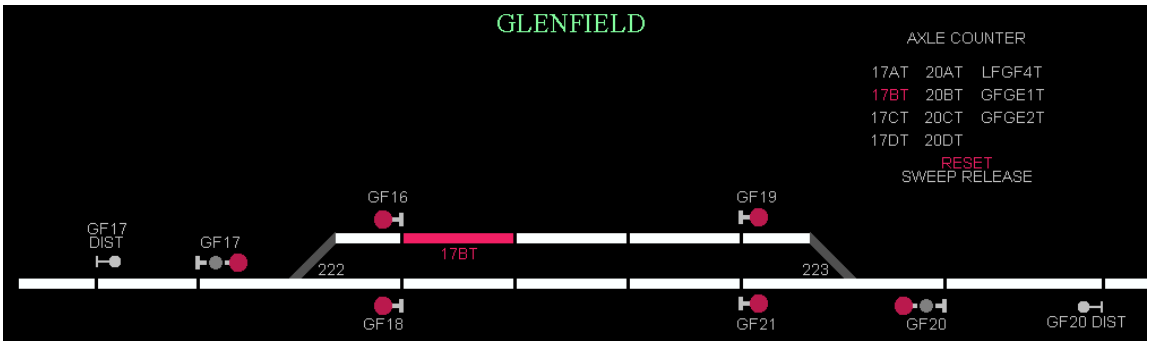


Figure 4

Step 3: Aspect restricted track

The axle counter section is reset and the track now shows clear. However, the track now has aspect restrictions in place. This is indicated by the Select Indication under the track ("17BT" in this case) flashing red.

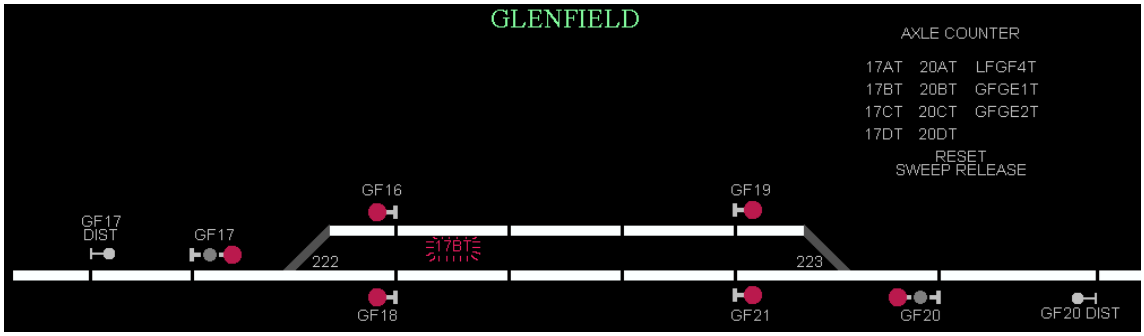


Figure 5

Step 4: Co-operative Sweep initiate

The Network Controller initiates the co-operative sweep release by clicking the Sweep Select ("17BT" in this case) then the "SWEEP RELEASE".

The Sweep Select and “SWEEP RELEASE” will be automatically de-selected 5 seconds after being clicked.

NOTE: Steps 4 to 6 must be completed within a 60 second period as shown by the “SWEEP RELEASE” piece remaining solid. If steps 4 to 6 are not completed within this time, the process will be aborted and the "SWEEP RELEASE" will return to solid white.

Figure 6

Step 5: Co-operative Sweep acknowledge.

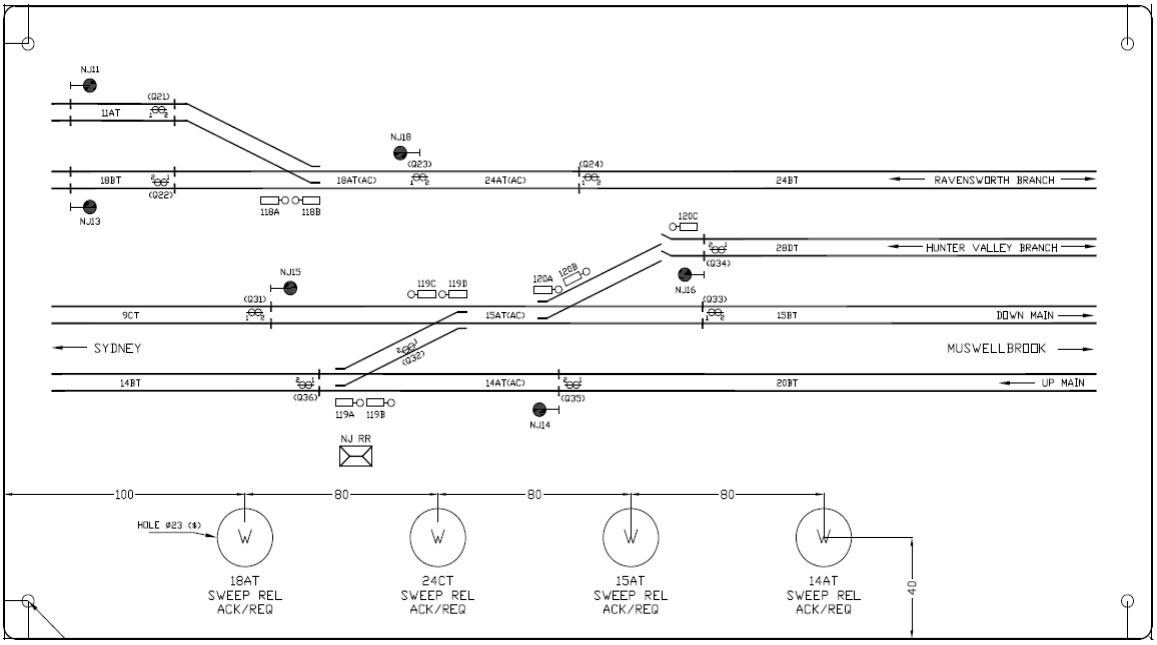


Figure 7

The field technician presses and holds the track sweep acknowledge button. The “SWEEP RELEASE” will now flash.

Figure 8

Step 6: Co-operative Sweep finish

The Network Controller completes the co-operative sweep release by again clicking the flashing "SWEEP RELEASE" piece. The "SWEEP RELEASE" will return to steady white and the aspect restriction removed.

3.7 Reset with sweep train and sweep path

Reset Requirements

The Reset requirements require a combination of Operations rules and Technical interfaces. The overall objective is to ensure that the section is clear before the system is reset to clear.

Reset – a remote reset input to set the axle counter to clear.

Pre-reset – a local pushbutton on the equipment which can be operated in association with the Reset input.

Sweep – a logical function which after a reset function looks for a balanced axle count in and axle count out before restoring to clear and normal operation.

Aspect Restriction – this entails not permitting the aspect to show a proceed indication, when the route is set. However, track locking of points is released, which permits the points to be swung to an alternate path for the next train after the failure initiating the reset requirement. The aspect restriction only applies to the signal section of a route and not to an overlap of a signal route.

Reset operations will need to be different for the various Failure Modes because each of these presents a different set of risks.

Failure Mode 1 – Conditional Reset Process for last count out. Network Controller controlling the section will communicate with the last train to cross the section and verify that the train is complete. Network Controller will operate the Reset function for the specific axle counter section. See the technical requirements for the reset function. This will release the track locking associated with the track section. The Reset function will also provide an aspect restriction to prevent the signal clearing, however, the points will be able to be moved and routes across the section will be able to be set. The Network Controller will need to confirm to the rail traffic crew that the route is set, points locked and to proceed past the red signal up to the next signal and prepared to stop clear of any obstruction. The passage of the train into and out of the track section will complete the Reset Process and the track section will operate normally after this action.

Failure Mode 2 – Conditional Reset Process for last count in (infrequent event). Network Controller controlling the section will communicate with the last train to cross the section and verify that the train is complete. The Signal Technician will confirm from observation as reasonably possible that there is no training the track section. The Signal Technician will ask the Network Controller to confirm that he has verified that the last train through the section was complete. The Signal Technician will operate the Pre-reset button on the axle counter module. Network Controller will operate the Reset function for the specific axle counter section. See the technical requirements for the reset function. This will release the track locking associated with the track section. The Reset function will also provide an aspect restriction to prevent the signal clearing, however, the points will be able to be moved and routes across the section will be able to be set. The Network Controller will need to confirm to the rail traffic crew that the route is set, points locked and to proceed past the red signal up to the next signal and prepared to stop clear of any obstruction. The passage of the train into and out of the track section will complete the Reset Process and the track section will operate normally after this action.

Failure Mode 3 – Conditional Reset Process for power up. Network Controller controlling the section will communicate with the last train to cross the section and verify that the train is complete. The Signal Technician will confirm from observation as reasonably possible that there is no train in the track section. The Signal Technician will ask the Network Controller to confirm that he has verified that the last train through the section was complete. The Signal Technician will set power up for the axle counter module. Network Controller will operate the Reset function for the specific axle counter section. See the technical requirements for the reset function. This will release the track locking associated with the track section. The Reset function will also provide an aspect restriction to prevent the signal clearing, however, the points will be able to be moved and routes across the section will be able to be set. The Network Controller will need to confirm to the rail traffic crew that the route is set, points locked and to proceed past the red signal up to the next signal and prepared to stop clear of any obstruction. The passage of the train into and out of the track section will complete the Reset Process and the track section will operate normally after this action.

Reset Technical Requirements

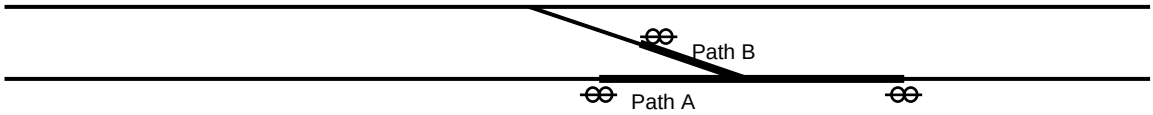
The remote signallers reset will operate through a switch on the control panel or a function on the signal control system VDU. Control panel switches shall be rotary spring action switches restoring to normal position. The VDU interface shall have a general reset function which enables the specific options for the signaller to select the specific track section axle counter to be reset. The output shall operate a stick function in the signalling for each path over the axle counter section. The stick function shall operate the reset input to the axle counter section and apply an aspect restriction to each route or path over the track section. The respective stick function shall return to normal after one train movement (sweep train) over its respective track section. A bidirectional path is only required to have a sweep train pass over it in one direction.

Sweep Function and Aspect Restriction

Where an axle counter section is over a section of track (without turnouts), only one sweep train is required. This may be in either direction. Where the axle counter section is over a set (or sets) of turnouts with two or more paths then a separate stick function may be required for the aspect restriction for each separate path (unidirectional or bidirectional). The respective aspect restriction shall only be released after a sweep train movement over the respective path.

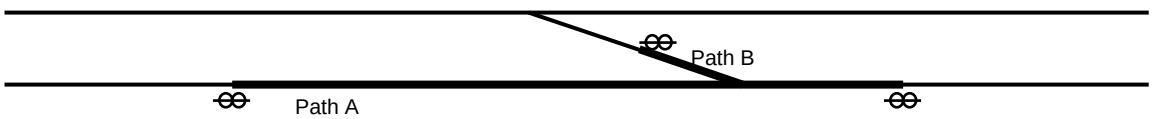
The following scenarios define the clearance of the aspect restrictions for specific sweep trains. The signalling design shall be implemented to achieve these requirements.

Reset Scenario 1



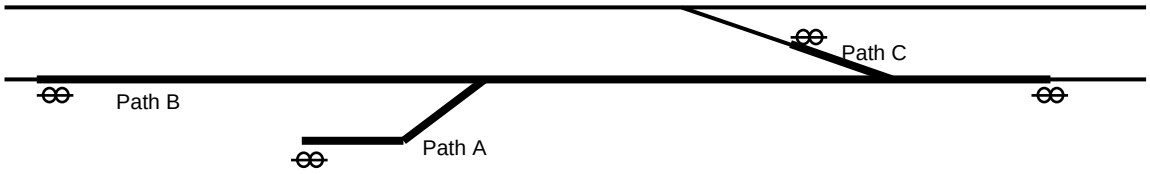
The axle counter heads are located 3.5m – 4m minimum from the clearance point for the turnout. The range of 3.5m to 4m is mentioned depending upon the site constraints. In this case, a sweep train over one path will also confirm that the other path is clear. Only one stick function is required

Reset Scenario 2



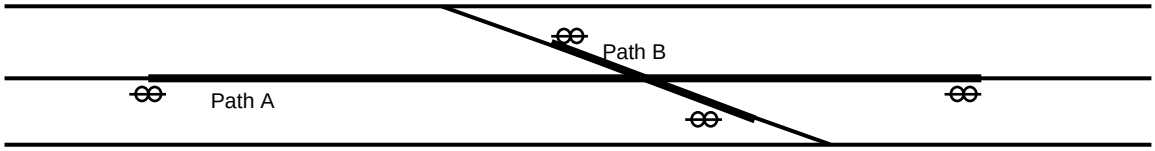
The axle counter heads are located such that path A extends beyond the clearance point for the turnout. Separate stick functions are required for each path. A sweep train on path A will also clear path B. However, a sweep train on path B shall clear path B only.

Reset Scenario 3



This has an axle counter section over multiple sets of turnouts with paths A, B and C. Axle counter heads for paths A and B are beyond the clearance point for the turnouts. Separate stick functions are required for each of the three paths. Path C is cleared by a sweep train over paths A or B or C. However, Paths A and B shall require a sweep train over the respective path.

Reset Scenario 4



This has an axle counter section over a diamond crossing or two turnouts with two paths. The axle counter heads for path B are at the clearance point for the turnouts/diamond crossing. Separate stick functions are required for each of three paths. Path A is cleared by a sweep train only on path A. Path B is cleared by a sweep train on either path A or path B.