Ref No: 08-08-10-009

New Equipment & Systems Approval
Axle Counter System

1. Determination of Need
There are current projects being progressed to improve the capacity to transport coal in the Hunter Valley to the ports of Kooragang Island and Port Waratah. These will increase the utilisation of the available track capacity to a very high level with reliability and availability of the track and signal infrastructure being critical to meeting the task. Review of existing failures has shown that point machines and points track circuits were the dominant failure causes resulting in delays to trains and lost train paths. The requirement for glued insulated joints in point track circuits contributed significantly to these point track circuit failures. There was an average of 21 glued insulated joint failures in each of 2002 and 2003 causing on average 800 minutes of train delay per annum. With the high train loads (target 120GMTpa) and high axle loads of 30T, the only option to address this issue is the removal of the glued insulated joint. This requires an alternative means for detecting the presence of trains.

Axle counters were first used in Germany in the 1960s and are now extensively used in Germany, Austria, Holland and Britain to monitor track occupancy. Because of their minimal interface to the track infrastructure they are providing economic, performance and reliability benefits in excess of the traditional signalling track circuits. They also continue to provide the level of signalling integrity required for the safety of the signalling system.

The axle counters are microprocessor based and have different operation and failure modes to the traditional track circuit. These have been considered as part of the evaluation of the product. A workshop was held with operations and engineering staff to review the processes for reinstatement of equipment after maintenance and renewal activities (including the passage of light rail track maintenance vehicles).

Axle Counters have been used in NSW and Queensland since 1985-1988. These were for long single line sections with an axle counter/evaluator at each end. The NSW installation was from Unanderra to Moss Vale (5 sections) in 1988. This proposal is a new application for technology which has significantly advanced in 20 years. This new configuration may have up to 6 counting heads for a complex turnout arrangement, all controlled from one Axle Counter Module.

The Request for Type Approval (Attachment D) details the significant life cycle cost savings and reduced failures resulting from the use of axle counters over points.

Lloyd’s Register Rail have undertaken an overall risk assessment of the safety hazards for the Frauscher axle counter. This included a review of the technical reliability and trial results. This assessment did not undertake a Safety Case as this was assumed based on Safety Type Approval for the product in Germany, Austria, Poland and Spain. This included a Risk Workshop with ARTC Operations to Review the processes for Reset after system interruption.
2. Significant Change or Not

This change in equipment is assessed as **MAJOR**

This proposal involves the use of axle counter technology in lieu of the traditional signalling track circuit as a means of train detection. The philosophy for train detection using axle counters is based on the event of trains (axles) entering and departing the track section which is different from track circuits, which monitor the condition of electrical detection of an axle bridging the two rails for the nominated track section.

The interface to and operation of the rest of the signalling system is basically common for both the axle counter and the track circuit. However, in failure conditions the traditional track circuit self resets to detect the presence of trains. For an axle counter a power supply interruption, failure or miscount requires an alternate process to confirm that there are no trains in the track section, when the axle count is reset to zero. Track Maintenance Vehicle equipment will still operate under block working conditions or possessions. These were covered in the Reset Process Risk Assessment Workshop (Attachment B)

The axle counter installation eliminates the requirement for an average of 5 glued insulated joints per turnout. However, it does not provide for detection of broken rails which *may* be detected by track circuits. With points there are a number of situations were broken rails are not detected by track circuits. Broken rails are also not detected by track circuits in many other cases and we do not rely upon track circuits for this issue.

3. Review Panel

The systems review panel for the *Points Axle Counter System* was:

- John Gifford – Signals Manager North & Hunter
- Trevor Moore – Signalling Standards Engineer

4. Equipment Suitability

- Use in other rail networks

Axle Counter Systems has been approved for use by rail authorities in: Germany (since the 1960s), Austria, Britain, Poland, Spain, South Africa copies of Type Approval Certificates are available if required. The new microprocessor based axle counters have also been approved for use in Queensland and they are being installed on the Regional Fast Rail project in Victoria (conditional approval by Freight Australia in April 2004). This covers approximately 50 units on the Bendigo and Traralgon lines.

These locations provide a similar range of conditions for environmental and train operations to that which is expected on the ARTC network including the Hunter Valley Corridor.

- Use in the ARTC network

There has been a trial installation at Sandgate Junction since September 2004 and a commissioned pilot installation at Koorangang Coal Terminal since September 2003. These are providing reliable operation with the equipment configuration as detailed in this proposal.

Older style axle counter units from Siemens have been operational at Unanderra to Moss Vale since 1988. These are used over long single line sections with vital data links between each section end. These long single line sections will be covered in a future submission.
- **Issues arising from Usage of the equipment/system**

  A Risk Assessment/Hazard Workshop has identified the Reset Process following changes to the infrastructure or the use of track maintenance vehicles as requiring special processes. These have been identified in the attached report from Lloyd’s Register Rail. The proposed Reset Process is detailed in Attachment A.

- **Changes required to infrastructure or systems for use of the equipment**

  The proposed system will otherwise interface to the signalling interlocking system in the same way as the traditional signalling track circuit relay.

5. **Approval**

  It is recommended that New Systems Approval for Axle Counter System (including new generation microprocessor based systems) be accepted for use over points and short sections.

  It is recommended that New Equipment Approval for the Frauscher ACS2000 axle counter system be accepted for use as above.

6. **Conditions for Approval**

  That the Reset Procedures for axle counters for use over points and short track sections be in accordance with Attachment A. That the Operations rules for the Reset Process are to be documented and distributed to Engineering Staff, Operations Staff and Train Operators.

  Where there is a VDU interface then a special command is required for the Reset Process. This must be implemented in the logic for the VDU system and provide a secure method for issuing the command through the non-vital system to the signalling / axle counter.

**Equipment Review Panel**

Signed:

John Gifford  
Signals Manager  
_______________  date  April 2005

Trevor Moore  
Signalling Standards Engineer  
_______________  date  April 2005

**RECOMMENDED to Safety Committee**

John Cowie  
Manager Standards & Systems  
_______________  Date  ___________

**APPROVAL Number** ___________

Safety Committee Meeting of  
**APPROVED / NOT APPROVED**

Conditions of Approval
ATTACHMENTS

Attachment A
Requirements for Reset Procedure

Attachment B
Lloyd’s Register Report – Axle Counter Reset Process Risk Assessment

Attachment C
Lloyd’s Register Report – Axle Counter Hunter Valley Junctions Application Risk Assessment

Attachment D
Request for Type Approval