ECP Brake Standardization
Passenger and Commuter Equipment

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2013 Rail Conference
Passenger brake control was developed by George Westinghouse through an evolution of control equipment

- Straight air brake
- Triple Valves – brake pipe control
- D22 type equipment
- 26 type equipment (circa 1950s)
Limitations:
• Train length – 24 cars plus locomotive
• Brake command transmission time – 24 seconds
• Service portion weight – 75 pounds
Brake Control Background
Freight Brake Development

- NYAB and Wabtec have developed with the participation of the AAR a electronic control pneumatic (ECP) brake equipment
- The ECP brake equipment has been conformed to the AAR S4200 standard series
ECP Freight Brake Control
Train Configuration

- Car Control Device
- EOT
- Power Supply
- Trainline Communication Controller
- Operator Interface Unit
- Brake Valve
- Car ID Module & Car-Car Connector
ECP Brake System
Background

- PRIIA Next Generation Equipment Committee (NGEC) has issued these technical specifications and require that the equipment is delivered ECP ready
  - Bi-level cars
  - Single level cars
  - Diesel Electric Locomotive
  - Diesel Multiple Unit – in final approval
- PRIIA NGEC Trainset Technical Specification requires the ECP System
- PRIIA NGEC will develop a dual mode locomotive technical specification which will specify that it be ECP ready
- AAR standards address the freight requirements for locomotives and freight cars but not passenger equipment.
ECP Brake System
Equipment Order Status

Equipment on order that is ECP ready
– Amtrak Electric Locomotives – Siemens
– Amtrak Long Distance Single Level Cars – CAF
– Caltrans/IDOT Bi-level Passenger Cars – Nippon Sharyo

Equipment to be ordered that is ECP ready
– Caltrans/IDOT Diesel-Electric Locomotives
ECP Brake System
General Requirements

Standards to be harmonized with AAR S4200 series as practical

- The ECP system shall be powered by the ECP trainline and from a low voltage source on each car
- The car control device will be configured for emulation mode (default) for use in mixed consists
- The system will be configured to cause brakes to be released in the event of an electronic fault
- A pneumatic emergency brake application shall result in the event of a train separation
- The ECP system shall incorporate component standardization in accordance with current PRIIA requirements as practical
ECP Brake System
Stakeholder Concerns

Areas to be addressed
- Mechanical interfaces
- Electrical interfaces to existing trainlines
- Emulation operation
- Message sets
- Emergency & dead-in-tow operations

Stakeholders and Standard Development Team – PRESS Mechanical Group
- Amtrak, State Authorities and Commuter Rail Operators
- FRA Representation – Safety and Research
- Brake Equipment Suppliers
- Car and Locomotive Builders
- Consultants
ECP Brake System
Development Outcome and Path

Outcome
- Multiple APTA safety standards to support passenger ECP
- Inclusion in 49 CFR 238 for Tier I applications

Schedule and Meetings
APTA PRESS formal approval process including public comments
- First meeting – October 2013
- Two face – to – face meetings (Maximum 3)
- Web conferences to be utilized
- Estimated completion March 2014
ECP Brake System
Standard Development

S-4200 Electronically Controlled Pneumatic (ECP) Cable-Based Brake System – Performance Requirements
– Primary performance document for the equipment
– Add emulation requirements

S-4210 ECP Cable-Based Brake System Cable, Connectors, and Junction Boxes – Performance Specification
– Common components to the freight equipment that will need to be maintained for interchangeability
– Exception will be the battery source for the emulation operation

S-4220 ECP Cable-Based Brake Power Supply – Performance Specification
– Little or no change anticipated as this is the power supply for the cable based system and interfaces with the brake control equipment

S-4230 Intratrain Communication for Cable-Based Freight Train Control Systems
– Message structure should be the exception to the freight brake system and those specifically required for the passenger / commuter rail operations

Standards in white font are the main focal point of this group
Standards in black have been determined to only require minor changes
S-4240 ECP Brake System – Approval Procedure
- As APTA is not an approval body (as is AAR), how will the approvals be obtained as it is not desired that each railroad should not have to submit a plan to the FRA

S-4250 Performance Requirements for ITC-Controlled Cable Based Distributed Power Systems
- As passenger/commuter operations do not utilize distributed power there should be little need for this standard
- Cab car will need to be configured for remote control operation to minimize the power supply requirements, if possible

S-4260 ECP Brake and Wire Distributed Power Interoperability Test Procedures
- These test procedures may not be required as this standard supplements S4250

New Standard for Single Car Testing is required

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Standards in black have been determined to only require minor changes
**ECP Standard Development**

**Current Status**

- **Performance Standard (based on AAR S-4200)**
  - First Draft – in review
  - Technical working group from Amtrak, New York Air Brake and Wabtec
  - 26C performance metrics are used for development of emulation mode

- **Cabling Standard (based on AAR S-4210)**
  - First draft reviewed and final preparation

- **AAR Coordination**
  - Obtain permission to use existing documents during the standard development process for working group members
  - Establish AAR standard usage by reference or direct copy
  - Establish long term cooperation for coordination of standard revisions through memorandum of understanding
ECP Brake System
Current Activities

• Safety Analysis
  – Preliminary Hazard Analysis (PHA)
  – Operating and Support Hazard Analysis (OSHA)
  – Safety Traceability Matrix (STM)
  – FMECA required for performance standard (similar to Freight FMECA)

• Intent of analysis
  – Gain FRA acceptance of the product for application in the general rail system
  – Utilize these documents during actual vehicle procurement for railroad system safety plan acceptance

• FRA Coordination
  – Three meetings held to date
  – Discussion on gaining FRA acceptance of the passenger ECP product based on freight in-service experience and planned safety analysis
ECP Brake System
Issues Moving Forward

- **Emulation mode**
  - Performance in mixed consists with 26C pneumatic brake equipment
  - Battery source other than ECP cable trainline
  - Rescue mode by non ECP equipped locomotive

- **Detection of requested operating mode**
  - Equipment to be configured to operate in emulation mode
  - End of train determination without end-of-train (EOT) device

- **Cab car operation**
  - Utilization of distributed power operation from the cab car controls to the locomotive in push operations
  - Controlling cab determination based on push-pull operations

- Equipment approval for general rail service
ECP Brake System Testing Status

- Lab testing
  - Development of performance data
  - Development of emulation mode operation as default
  - Develop cab car operation using distributed power signal transmission capabilities
  - Interoperability testing with each suppliers’ equipment
ECP Brake System
Testing Status

- Initial train testing
  - Amtrak has agreed to provide a 5 car train for emulation mode
  - Test a single ECP car control portion in emulation mode from each supplier
  - Locomotive, 4 coaches (2 coaches with ECP car control portion) and 1 cab car

ECP car control portion replaces 26C service portion (based on Amtrak LDSL cars)
ECP Brake System Testing Status

- Future testing
  - Modify test train for ECP operation all coaches from locomotive
  - Verify car control device change for emulation to ECP operation
  - Modify cab car for ECP operation utilizing distributed power signal transmission
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QUESTIONS