

ECP Brake Standardization Passenger and Commuter Equipment

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Brake Control Background Evolution

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)

Brake Control Background

26C Type Equipment

Limitations:

- Train length – 24 cars plus locomotive
- Brake command transmission time – 24 seconds
- Service portion weight – 75 pounds



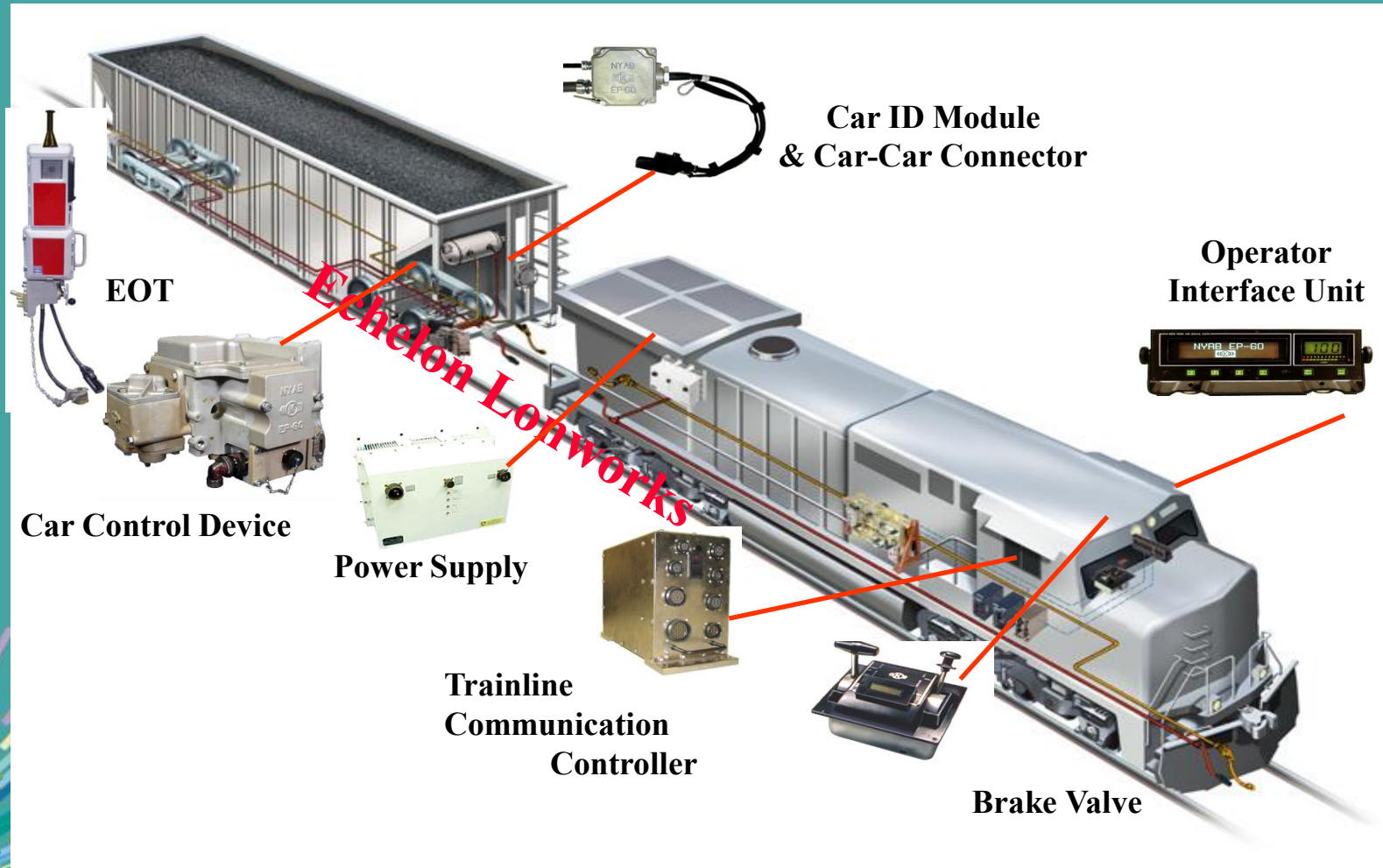
Brake Control Background

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



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

ECP Brake System Standard Development

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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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

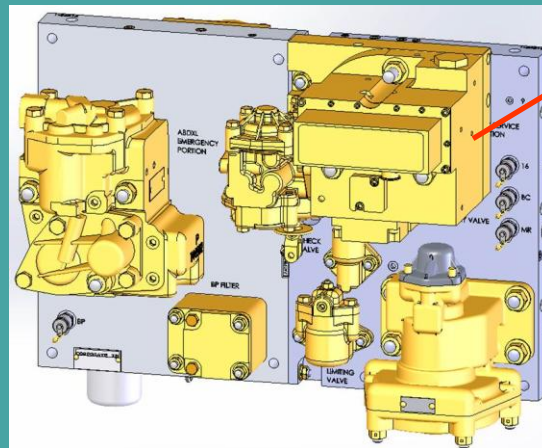
- Emulation mode
 - Performance in mixed consists with 26C pneumatic brake equipment
 - Battery source other than ECP cable trainline
 - Rescue mode by non ECP equipped locomotive
- Detection of requested operating mode
 - Equipment to be configured to operate in emulation mode
 - End of train determination 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