

**Maintenance Enhancement Objectives Behind the New
Advanced – Technology Railcars for the SEPTA Regional
Rail Lines**



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Silverliner V

The new SEPTA Silverliner V Railcars, currently in operational testing, employ a significant amount of advanced technology in many of the vehicle subsystems.

- Computerized control systems for
 - ✓ AC propulsion
 - ✓ dynamic braking including regeneration
- Digital fault displays
- Sensitive spin/slide detection systems
- Electronic communication systems
 - ✓ provide passengers audio and visual information
- Automatic Train Control/Cab Signal
 - ✓ microprocessor based systems



Emphasis Given During Design



- Interaction with maintenance and operating personnel
- Enhanced maintainability of the new fleet
- High reliability requirements of the new fleet
- Operating personnel review of the cab mock-up
- Reduce overall maintenance cost

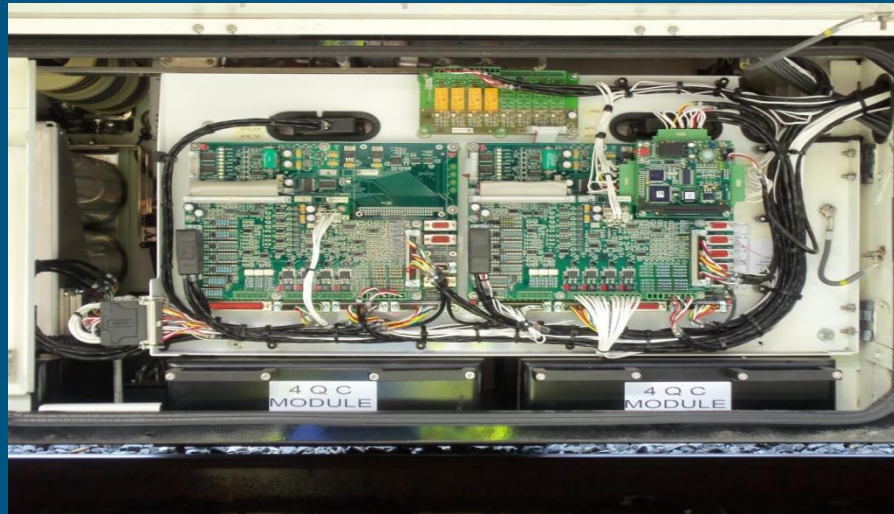
Spin-Slide Detection

- Microprocessor based
 - ✓ Improved response
 - Incremental changes in wheel/axle speed
 - Excessive speed differences among (4) axles
- Almost instantaneous reactions
- Minimize wheel flats

Reduced Motor Control Maintenance

Utilizing solid state technology for propulsion and auxiliary electrical control systems will:

- Minimize contactors, relays, rotating pieces
- Significantly reduce inspection and replacement cost
- Reduced overhaul cost



Advanced Technology Concerns

Microprocessor based controls have been incorporated into various systems.

- Heating and Air Conditioning
- Communications
- Automatic Train Control (ATC)
- Doors
- Propulsion and braking

Systems can provide information that is current as well as historical.

- Must be readily accessible,
specific to user needs

Advanced Technology Concerns

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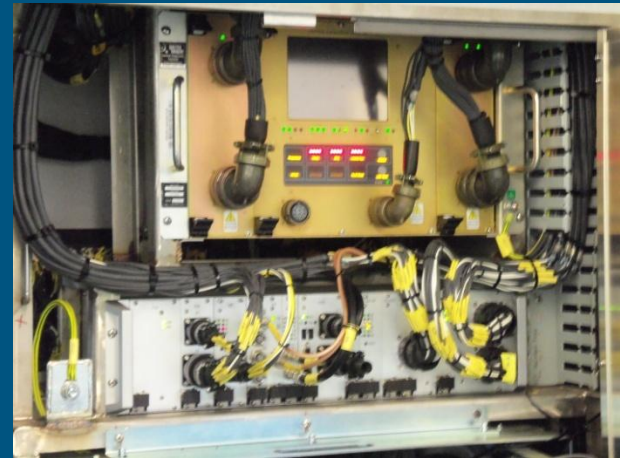
The prime manufacturer and system supplier shared this mutual objective to provide vehicle information.

- Developed Fault Information System (FIS)
 - ✓ Incorporated into each car
- FIS provides detailed information
 - ✓ Build in diagnostics
 - ✓ Assist maintenance personnel with troubleshooting
 - ✓ Previous faults
- FIS will continually monitor and provide system status
 - ✓ Reduced function checks (periodic inspection)



Central Diagnostic System (CDS)

- Collect relevant data from sub-systems
- Allow access to the fault information
- Central Diagnostic Terminal (CDT)
 - Provides in-depth information to maintenance personnel
 - Vehicle status information - car/trainline
 - Access information for CDT display/laptop
- Fault information will be downloaded via WiFi at various locations
 - Capable of having critical fault information prior to vehicle returning to the yard.



Central Diagnostic System

(continued)

Fault Display Panel (FDP)

- Provides critical fault information to the operator
- Operator can pass information onto Control Center for determination on action required

FDP is flexible and can be re-programmed to change what fault indicators trigger indicator.

Information provided to operator is limited to areas affecting safe train operations.

Conductor has access to the CDT in order to provide additional information as required by the Control Center.

Education

Raising the employees skill level to meet the requirements of maintaining new technology is always a challenge.

SEPTA is providing:

- Pre-delivery in-house training developing/improving skill sets
- 10 week vendor training on subsystems
 - ✓ Extensive focus on diagnostic tools

Summary

Solid state equipment, along with improved diagnostic capabilities will combine to provide a vehicle that should have increased reliability and reduced overall maintenance.

However, this requires a commitment to education and training designed to raise the capabilities of today's workforce in understanding and maintaining an ever changing technology driven vehicle.