

IEEE Standard for the Functioning of Interfaces Among Propulsion, Friction Brake, and Train-Borne Master Control on Rail Rapid Transit Vehicles

IEEE Vehicular Technology Society

Sponsored by the
Rail Transportation Standards Committee

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Abstract: The interfaces between and among functional systems on rail rapid transit vehicles are prescribed. The systems themselves are treated as “black boxes”; requirements for the input signals and the output response are given. For each category of interface, three types are listed in increasing technical sophistication.

Keywords: friction brake, IEEE 1475™, interfaces, master control, propulsion, rail vehicles, rapid transit

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Introduction

This introduction is not part of IEEE Std 1475-2012, IEEE Standard for the Functioning of Interfaces Among Propulsion, Friction Brake, and Train-Borne Master Control on Rail Rapid Transit Vehicles.

This introduction provides background on the rationale used to develop this standard, which may aid in the understanding, usage, and applicability of this standard.

Rail transit vehicles have been notable for their lack of standardization. Some real-life factors have contributed to this, primarily because of historic differences in the civil infrastructure and electrical power supply. This standard sets forth a framework for the interfaces among the propulsion system, friction brake system, and master control, but does not attempt to standardize the individual systems themselves and does not dictate that all vehicles must use the most advanced technology available.

This standard applies to rail transit vehicles, which are usually, but not exclusively, electrically powered. These vehicles include railway electric multiple unit (EMU) cars, Heavy rail vehicles (HRVs) (subway or elevated cars), Light rail vehicles (LRVs) (streetcars), including units that combine powered and unpowered trucks or axles. All of these vehicles can be operated under the control of a driver or varying levels of complexity of train control computer, which are lumped together for this purpose as vehicle on-board (master) control (VOBC). In general, the type of train operation does not normally affect the propulsion/brake interface, and this standard can be applied irrespective of the presence or absence of a human driver. Fully automated, driverless implementations of the above vehicle types are sometimes included in the mode of transit referred to as automated guideway transit (AGT) and, to the extent that the vehicle does not have other unique requirements, this standard can be applied. It is not intended that this standard be universally required for all AGT systems, and neither is it intended that this standard apply to locomotives hauling trains nor to locomotive-hauled (including “push-pull”) cars.

The classes of railway vehicles (such as those termed diesel multiple unit [DMU]), which use a diesel engine or other nonelectric prime mover, have features of the propulsion and braking systems used in these vehicles that are similar to those used in conventional electrically powered vehicles. To the extent that these systems are similar to those used in electrically powered vehicles, this standard can be applied.

This specification applies specifically to newly designed or newly modified systems. It is understood that for the necessity of backwards compatibility to older vehicles, which may employ what would be considered non-standard trainline systems, that the specific interface requirements of this standard do not strictly apply. It should be noted, however, that some of the concepts of redundancy and checking are still applicable.

NOTE 1—Self-propelled railway vehicles operating on common carrier railroad trackage are subject to regulations issued by governmental bodies (e.g., federal, state, and local bodies). In selected jurisdictions, this is also true for rail transit vehicles. The user should recognize that such regulations always take precedence over a consensus standard.

NOTE 2—Master control, as defined in 3.1 and utilized herein, is a term selected to apply broadly to any VOBC from manual control as historically understood, to all forms of automatic train control (including, but not limited to, automatic train protection, automatic train stop, automatic train operation, and cab signals and all combinations thereof).

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1. Overview

1.1 Scope

This standard specifies the interface functionality among propulsion, friction brake, and train-borne master control. The standard encompasses performance parameters, communication methods and the means for measurement and verification of performance. Third party systems performing functions traditionally carried out in one of the above systems are also covered.

1.2 Purpose

IEEE Std 1475 contains specifications leading to standardization, compatibility and interchangeability of functional protocols for interfaces among train-borne master control, propulsion, friction brake, spin-slide control, etc., reducing first cost and recurrent integration problems. This standard, in use by car-builders and system suppliers, has lowered costs, reduced vehicle introduction problems, improved reliability, and facilitated upgrades. It further helps prioritize safety functionality.