



U.S. Department
of Transportation

**Federal Railroad
Administration**

1200 New Jersey Avenue, SE
Washington, DC 20590

DEC 27 2012

Mr. Keith Holt
Assistant Chief Engineer–Signals
National Passenger Railroad Corporation
30th Street Station, Box 41
Philadelphia, PA 19104

**Re: Type Approval (FRA-TA-2012-001) and System Certification for Amtrak's
Incremental Train Control System**

Dear Mr. Holt:

The Federal Railroad Administration (FRA), subsequent to Amtrak's Request for Expedited Certification (REC) of the Incremental Train Control System (ITCS), and upon Amtrak's successful actions taken to resolve the remaining issues that were presented within FRA's May 1, 2012, letter with enclosure, hereby grants Amtrak Type Approval (FRA-TA-2012-001) and System Certification for the ITCS.

FRA finds that the ITCS described and built on the Amtrak line between Porter, Indiana, and Kalamazoo, Michigan, satisfies the requirements for Positive Train Control (PTC) systems as specified within Title 49 Code of Federal Regulations (CFR) Part 236, Subpart I–Positive Train Control Systems. Accordingly, FRA approves the Amtrak request for an expedited Type Approval and System Certification of the ITCS and is issuing the enclosed Type Approval for the ITCS in accordance with 49 CFR Sections 236.1009(f) and (g), and 236.1013(b); and, by way of this letter, grants System Certification for ITCS in accordance with 49 CFR § 236.1031.

FRA would like to remind you that the ITCS must be developed, implemented, and maintained as defined in the Type Approval issued for the ITCS. Any modifications of the ITCS beyond the provisions outlined in the Type Approval will require submittal of a Request for Amendment (RFA) for the modified PTC system, in accordance with 49 CFR §§ 236.1009(b) and 236.1013–*PTC Development Plan and Notice of Product of Intent content requirements and Type Approval*. FRA may reconsider the Type Approval or System Certification upon revelation of factors outlined in 49 CFR § 236.1009(g).

FRA review and approval are required for each RFA, and they must be fully justified to and approved by the Associate Administrator for Railroad Safety/Chief Safety Officer. An impact assessment statement that clearly identifies the potential impact of the change must also accompany requests for amendments to the Type Approval or System Certification. Each

railroad using this ITCS Type Approval for the implementation of a PTC system is responsible for the assessment of potential impact of any amendments to this Type Approval on their operations, their PTC system implementation, making appropriate PTC system modifications, and requesting Type Approval modifications to ensure system interoperability with other PTC system implementation.

Due to the design of the ITCS, Amtrak must only allow exclusive track occupancy to protect roadway workers, unless Amtrak implements an Employee-In-Charge (EIC) terminal that allows the EIC to control access of a train into and through a work zone.

Neither this Type Approval nor System Certification authorizes the use of electronic delivery of authorities as the sole means of relaying authorities to the train crew. Until such time as FRA has approved digital delivery of authorities for the sole means of conveying authority limits, both authorities (paper and electronic) shall be compared. In the event of a conflict between the two authorities, the most restrictive of the authorities shall apply.

Neither this Type Approval nor System Certification represents automatic approval of the use of the ITCS for vital applications by other railroads. A system is an organized, purposeful structure regarded as a whole and consisting of interrelated and interdependent elements (components, entities, and factors). All claims of a vital implementation of the ITCS as a vital system must be demonstrated to the satisfaction of FRA in the individual submitting railroad's PTCSP. The use of the ITCS in vital applications by an individual railroad is not authorized unless certified by FRA for that specific railroad application.

All railroads electing to use this Type Approval are reminded of the requirements of 49 CFR § 236.1015(b) and (c) regarding using Type Approvals in support of a PTC Safety Plan.

Should you have any questions regarding this letter or its conditions, please feel free to contact Mr. Robert Scieszinski, PTC Branch Chief at (360) 883-5811 or Robert.Scieszinski@dot.gov.

Sincerely,



Robert C. Lauby
Deputy Associate Administrator
for Regulatory and Legislative Operations

Enclosure



U.S. Department
of Transportation

**Federal Railroad
Administration**

Type Approval Number: FRA-TA-2012-001

TYPE APPROVAL

This Type Approval is issued to attest that the following system meets the minimum regulatory performance requirements for Positive Train Control (PTC) systems required by Section 104 of the Rail Safety Improvement Act (RSIA) of 2008 and by 49 Code of Federal Regulations (CFR) Part 236, Subpart I.

System

Incremental Train Control System

ITCS

This Type Approval is not valid if presented without the full attachment schedule composed of seven sections.

This Type Approval may expire 5 years from the date of issuance if at least one PTC system has not been issued a System Certification using the subject system.

For Federal Railroad Administration,

At: 1200 New Jersey Ave SE

Washington DC 20590

Jo Strang

Associate Administrator for Railroad Safety/Chief Safety Officer

Date of Issue: December 26, 2012

This Type Approval remains valid until the date 5 years from its issuance, unless canceled or revoked, subject to automatic and indefinite extension provided that at least one FRA PTC System Certification using the subject PTC system has been issued within that period and not revoked, and the system remains satisfactory in service. This Type Approval will not be valid if the applicant makes any safety-critical changes or modifications to the approved system, which have not been notified to, and agreed upon, by the Federal Railroad Administration.

This Type Approval consists of 6 pages.

THE SCHEDULE OF APPROVAL

1. PRODUCT DESCRIPTION

1.1 Purpose

The Incremental Train Control System (ITCS) was designed and manufactured by General Electric Transportation Systems Global Signaling, to serve as a vital overlay that provides automatic warning and enforcement of a positive train stop in conjunction with wayside stop signal indications of a Traffic Control System and other limits of authorities; allowable train speed for permanent and temporary speed restrictions; and, advanced highway-rail grade crossing warning system activation for train operations up to 110 mph.

1.2. Main System Components

ITCS is constituted of the following components designed, built, operated, and maintained to the specifications in Section 2:

1.2.1 Onboard Computer (OBC)

The OBC is an enhanced version of the GE UltraCab II, augmented with GPS, displays, and additional interfaces into the locomotive. The OBC performs two logical functions, the Automatic Train Protection (ATP) function, and the Location Processing function. The ATP function performs communication tasks, determines the train's speed, displays information to the train operator, and provides vital braking enforcement. The Location Processing function determines the location of the train.

1.2.2 Wayside Servers

In addition to performing the Wayside Interface Unit (WIU) functions, a WIU-Server provides an interface to the communication network to collect statuses from all wayside WIUs for communication to the OBC on trains. The WIU-Server also contains an interface to the Office Terminals through the Office to Wayside Link.

At each server are two GPS reference stations. The GPS antenna position for each reference station is surveyed for accuracy to within one foot. The reference stations provide the differential corrections to the GPS Receiver Interface Module (GPSRIM) pairs located on the trains while the trains are within the server's region. Each reference station provides correction data for one half of each train's GPSRIM pair. One of the reference stations also provides UTC time to the WIU-Server for time tagging log information and a highly accurate time base to the TD220 radio for synchronizing its time division multiple access (TDMA) transmissions over the communication network.

1.2.3 Communications Network

The Train to Wayside Communication (TWC) Network provides a bi-directional data communications link between the onboard equipment and the wayside equipment. Each OBC and WIU-Server in the ITCS system has a unique ITCS address. The TD220 radio interprets an ITCS address in order to direct a received message to the intended device.

1.2.4 Highway-rail Grade Crossing Warning Systems

In ITCS, highway-rail grade crossing warning systems communicate to the WIU-Servers, and in turn, to the OBC of all approaching trains. The warning systems can be pre-started to activate for trains operating at speeds above the capability of the conventional control circuitry start speeds in order to maintain minimum warning times that would not otherwise be provided by the conventional approach track circuits. In this way, ITCS can safely activate the warning systems at any speed authorized above the speed associated with the conventional approach circuits. The warning system advanced activation feature also provides continuous warning system health information to the OBC of all approaching trains so that if any warning system malfunction or other undesired condition exists at the crossing, it can be reported to the OBC of the train such that ITCS may warn and enforce the train as is appropriate in association with the health condition.

2. DOCUMENTS AND DRAWINGS

- 2.1 EP-5900 Software Management Control Plan for Processor-Based Signal & Train Control Systems – latest revision
- 2.2 SMP 38406 – Software Management Control Plan for Microprocessor Based Train Control System, Amtrak Mechanical Department – latest revision
- 2.3 ITCS Configuration Management Plan ITCS– latest revision
- 2.4 Amtrak/Michigan ITCS System Design Document (082754-000) – Rev. A03
- 2.5 ITCS Application Layer Message Catalog and Data Dictionary (082800-172) –Rev. A04
- 2.6 ITCS Link Layer 5, 3, 2 Protocol ICD (082800-208) – Rev. A14
- 2.7 Amtrak Michigan ITCS V&V OBC External Interface Control Document (082754-206) – Rev. A06
- 2.8 ITCS V&V Wayside Physical Interface Control Document (082754-207) – Rev.A03
- 2.9 ITCS Field Test Plan (082754-070) – Rev. A37
- 2.10 ITCS Field Test Plan for Freight (082754-07x) – Rev. A03

- 2.11 OBC Location Processor Field Test Plan (082754-073) – Rev. A12
- 2.12 ITCS Amtrak Michigan Operations Manual (100105-004) – Rev. A03
- 2.13 ITCS Trainborne Equipment Installation & Service Manual (100104-003) – Rev.A03
- 2.14 ITCS Maintenance Schedule Outline – Rev. A00
- 2.15 ITCS Amtrak System Operating & Support Hazard Analysis (082754-327) – Rev.A05
- 2.16 ITCS-Amtrak Operations and Support Safety Critical Items List (Hazard Log Trace) (082754-310) – Rev. A01
- 2.17 ITCS – Amtrak System Safety Critical Items List (082754-306) – Rev. A01

3. APPLICATION/LIMITATIONS/PROVISIONS

3.1 Application

ITCS may be used to achieve PTC functionalities required by 49 CFR Part 236, Subpart I, on employing railroad properties. The ITCS system shall be operated and maintained as specified in the ITCS Configuration Management Plan ITCS – latest revision, ITCS Amtrak Michigan Operations Manual (100105-004) – Rev. A03, ITCS Trainborne Equipment Installation & Service Manual (100104-003) – Rev. A03 and ITCS Maintenance Schedule Outline – Rev. A00 or an FRA approved equivalent.

3.2. Limitations

3.2.1 The use of ITCS assumes employment of advanced activation of highway-rail grade crossing warning systems. Operation of ITCS at speeds above 79 miles per hour requires functioning highway-rail grade crossings with advanced activation coupled to the ITCS system. Highway-rail grade crossings where train speeds exceed 79 miles per hour must include identification to the motorists that trains through the crossing may be engaged in high-speed operations.

3.2.2 All radio communication messages must be communicated in a fail-safe manner so that they are delivered to the proper recipient, intact, timely and in order, or are not received at all. Failure to receive messages can have no impact on system safety.

3.2.3 The maximum operational speed with ITCS equipped components is 110 mph. ITCS must be cut in and operational. When ITCS is cut out, Amtrak must comply with the failure en route limitations of § 236.1029, or those identified within its PTCSP and as approved by FRA.

3.2.4 This Type Approval is valid only for ITCS software versions:

Host Communications Processing Unit (OBC): Version 0807

Location Processing Unit (OBC): Version 0802

WIU-Server Vital Logic Processor (VLP): Version 4.15

This TA is valid only for the following locomotive types:

1. Amtrak Genesis P42
2. Amtrak F40 NPCU
3. Amtrak P32
4. Norfolk Southern GP38-2
5. Norfolk Southern G40-2

3.2.5 This Type Approval does not represent automatic approval of the use of ITCS. Use of ITCS applications by an individual railroad is not authorized unless the system is certified by FRA for that specific railroad.

3.3 Provisions

3.3.1 Prior to use of ITCS on any other class of locomotive, the locomotive class must complete successful testing acceptable to FRA that demonstrates the ITCS software release operates correctly on that locomotive.

3.3.2 The track shall be maintained to at least Class 6 standards in accordance with Title 49 CFR Part 213, Subpart G. If the track does not meet the requirements of Subpart G, ITCS operations shall be restricted to the maximum authorized speed indicated at 49 CFR § 213.9 for the track class that it does meet.

3.3.3 Amtrak shall promptly notify FRA of any changes to the procedures associated with the training, operation, test, and maintenance of the ITCS, along with the corresponding document title, version number, and date. Copies of all of this documentation will be made available to FRA upon request.

4. TYPE APPROVAL VALIDITY

This Type Approval will remain valid if any of the listed ITCS components are upgraded to a newer version as long as the manufacturer or railroad presenting this Type Approval notifies FRA, and FRA agrees that no safety-critical change is introduced to the intended functionality and/or applicability of the named components. FRA will require a proof that newer versions of ITCS components underwent a full safety engineering analysis, full regression testing if applicable, meet all software safety criteria, and did not in any way compromise safety.

Any significant modification to ITCS hardware and/or software components that changes the intended safety-critical functionality and/or applicability of ITCS will require a new Type Approval.

Any deviations from the documents and drawings listed in Section 2 and the supplementary conditions listed in Section 3 that introduce safety-critical changes in the ITCS system principle of operation or applicability, will require a new Type Approval.

5. PRODUCTION SURVEY REQUIREMENTS

ITCS is to be manufactured and installed in accordance with the approved type described in this Type Approval. Conformance testing of the installed system must be done to assure that the system faithfully implements the specifications and meets the interoperability requirements. The documentation on conformance testing of ITCS hardware/software must follow a standard format that includes the description of the product, condition to claim conformance, core profile, extension profile (if applicable), implementation define features, alternative features (if applicable), reference implementation used, and conformance test suite used and subject to FRA approval.

The FRA reserves the right to attend test and examinations of installation work or perform relevant audits.

6. SYSTEM CERTIFICATION PROCESS FOR THE USERS OF THIS TYPE APPROVAL

This Type Approval does not constitute system certification for revenue operation. In order to obtain system certification for the system designed and build using ITCS architecture under this Type Approval, the applicant referencing this Type Approval must fulfill all the requirements of 49 CFR Part 236, Subpart I, § 236. 1015.

7. DISCLAIMER

Neither the United States Government or any of its employees, makes any warranty, express or implied, including the warranties of merchantability and fitness for a particular purpose, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial products, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government, and shall not be used for advertising or product endorsement purposes.

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