**Test Plan & Results**

for

**Train Controller (NSECS-TNC)**

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ECE/COE 1186: Software Engineering

**Date**

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**1. Introduction**

This document shall describe the proper testing procedure for the Train Controller (TNC) module for the North Shore Extension Control System (NSECS).

**1.1. Purpose**

The purpose of this document is to guide maintenance workers in the proper testing of the TNC, and to illustrate to the stakeholders how the TNC will be tested.

**1.2. Scope**

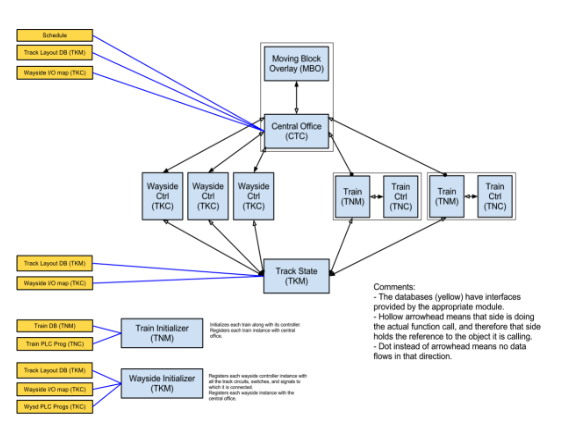
The context of this test plan is only within the confines of the TNC. Although the Train Model (TNM) normally interacts with the TNC, only the TNC’s outputs shall be verified.

**1.3. References**

* + WP2 Project Grading v1.pdf
  + Train Controller SRS submitted with Work Package 1
  + Train Controller Software Design Description submitted with Work

Package 2

**1.4. Level in the overall sequence**



**1.5. Test classes and overall test conditions**

Component tests shall be used to verify if each sub-component functions accordingly in conjunction with all of the system’s sub-components to meet the specified system requirements. Test classes shall be normal usage and error/shutdown testing classes.

**2. Details for this level of test plan**

This section shall outline the details for the test, which features are being tested and their relationship to the system requirements. Testing approach and criteria will also be outlined.

**2.1 Test items and their identifiers**

The main objects being tested in this system are the Train Controller UI and the Train Controller. These objects shall be tested in accordance with the specified requirements documentation and for overall system integration.

**2.2 Features to be tested**

1. Train Controller UI-Train Controller interface

2. Train Model-Train Controller interface

3. Brake Response of Train Controller

4. Engine Response of Train Controller

5. Light Response of Train Controller

6. Station Response of Train Controller

**2.3 Features not to be tested**

1. Auto TrainPLC creation upon TNM adding additional trains

2. Improper Input

* The Train Controller UI will ignore any improper input and go with the last proper input, or the default if no proper input was given.

**2.4 Approach**

Black box testing shall be the taken approach for functional feature testing, while white box testing shall be used for non-functional feature testing.

**2.5 Item pass/fail criteria**

Criteria shall be assertion based and items shall either pass or fail depending on the expected result. Test results will be tallied up to give the user total number of assertions that pass/failed within a given test class.

**2.6 Test deliverables**

* Level Test Plan(s)
* Level Test Cases
* Level Test Logs
* Level Test Report

**3. Test management**

Owner maintenance shall be responsible for running the verification and validation tests that are detailed within this document. Note there is risk in running this test with a PLC on a real train before the Brake Response of Train Controller (Test 3) is verified.

**4. Test Cases**

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| **4.1 Train ControllerUI-Train Controller Interface** | | | |
| Test that the TNC\_UI and TrainController are communicating. Run the TNC\_Test. If the Train Controller’s UI does not load, count this case as a failure. If it does load, look at the value for “Current Power.” If the display reads “-1,” this case fails. If the UI displays thia as non-negative number, this case passes. Note that if this case fails all other cases fail by default. | | | |
| **P / F** | **Tester** | **Date** | **Comments** |
| P | Dom Visco | 4/25/2013 |  |

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| --- | --- | --- | --- |
| **4.2 Train Model-Train Controller Interface** | | | |
| Test that the Train Model and Train Controller are communicating. Exit out of the Train Controller UI and run the main NSECS program (CTCOffice). If the CTC UI, Train Model UI, and Train Controller UI do not open, this case fails. Press “Start” in the CTC Office UI. Position the TNM UI and TNC UI next to each other. If the times in each window are more than a second off from each other, this case fails. Otherwise, this case passes. | | | |
| **P / F** | **Tester** | **Date** | **Comments** |
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| **4.3 Brake Response of Train Controller** | | | |
| Test that the TrainController responds correctly in case of an emergency. Exit out of the various UIs open. Run the TNC\_Test. Set the Current Velocity Override to 10 by typing “10” in the field to the right of “Current Velocity Override,” pressing the “set” button to the right of the text field, and pressing the “Current Velocity Override Toggle” button below “Current Velocity Override.” If current velocity does not read “10,” this case fails. If “Service Brake State” does not read “Engaged,” the case fails. Enter a Setpoint Velocity of 100 by entering “100” in the field next to “Setpoint Velocity” and hit the “set” button to the right of that. The Service Brake should read “Disengaged,” if not this case fails. Press the “Power Failure Override Toggle” button once. If the Service Brake does not read “Engaged” this case fails. Press the “Broken Rail Override Toggle” button once. If the E-Brake does not read “Engaged” this case fails. Otherwise, this case passes. | | | |
| **P / F** | **Tester** | **Date** | **Comments** |
| P | Dom Visco | 4/25/2013 |  |

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| **4.4 Engine Response of Train Controller** | | | |
| Test that the engine provides power when needed. Exit out of the TNC UI and run TNC\_Test again. Set the Setpoint Velocity to “10.” If the Current Power is not greater than 0 or either brake is engaged, the case fails. Now set the Current Velocity Override to 0.5 more than the PLC Chosen Velocity. If the Current Power does not drop to 0, the case fails. If the Service Brake engages, the case fails. Otherwise the case passes. | | | |
| **P / F** | **Tester** | **Date** | **Comments** |
| P | Dom Visco | 4/25/2013 |  |

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| **4.5 Light Response of Train Controller** | | | |
| Test that the lights are off during daylight hours when the train is above ground, and on otherwise. Exit out of the TNC UI and run TNC\_Test again. If the lights are not off, the case fails. Set the Time Override to “0,” if the lights do not turn on the case fails. Set the Track Block Number Override to “-2” and the Time Override to “12,” if the lights turn off the case fails. Otherwise the case passes. | | | |
| **P / F** | **Tester** | **Date** | **Comments** |
| P | Dom Visco | 4/25/2013 |  |

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| **4.6 Station Response of Train Controller** | | | |
| Test that the passenger control systems work properly. Exit out of the TNC UI and run TNC\_Test again. If the space to the right of Current Announcement is not blank, the case fails. Set the Track Block Number Override to “-2” and engage the toggle. If the Service Brake does not engage, the case fails. If the Current Announcement State does not read “Now arriving at -2 Station,” the case fails. Set the Current Velocity Override to 0 and engage the toggle. If the doors do not open and the power does not remain at 0 for 35 seconds (approximate when measuring, it either stops or it doesn’t), the case fails. If after 35 seconds the doors do not close and the power does not rise above 0, the case fails. Otherwise the case passes. | | | |
| **P / F** | **Tester** | **Date** | **Comments** |
| P | Dom Visco | 4/25/2013 |  |

**5. General**

This section will describe the methods by which the quality of the tests

will be ensured.

**5.1 Quality Assurance Plan**

This document shall be reviewed by another developer on the team that is not tasked with the Train Controller to ensure that all requirements are be tested appropriately. In addition this team member shall ensure that all tests aren’t written with the intention to be passed, thus preventing any test biases. Multiple test objects will be run concurrently to ensure that all objects will behave continuously as expected.

**5.2 Metrics**

The number of tests which ultimately passed (the most recent entry for a

test is (P)assed), ultimately failed (the most recent entry for a test

is (F)ailed due to lack of time to bring it to a passing status), and

were not tested will all be reported. Per test, the number of times

that a task was failed may also be reported.

**5.3 Test coverage**

As stated in section 2.5, there is no partial pass or partial failure; so all requirements in the description of a test must pass in order for that test to pass.

**5.4 Glossary**

TNM – Train Model

TNC – Train Controller

NSECS – North Shore Extension Control System

**5.5 Document Change Procedures and History**

For future versions of this document, the new document version will be appended on the end of the file name with a “v”. For example, version 3 of this document would have the file name, “BreathlessBovine-<LastName>-<FirstName>-TPv3”. Also, it is okay if the reviser fills in his/her own name and the new date on the first page as long as s/he creates an entry in the table below. If typos, spacing, or some other non-technical details are changed in the document, then a new version of the document should NOT be created.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Version** | **Reviser** | **Date** | **Sections Changed** | **Description of Changes** |
| 1 | Ben Tomasulo | 3/28/2013 | All | Created the first revision of the test plans for the train controller module. |
| 2 | Ben Tomasulo | 4/25/2013 | 2, 4 | Changed the test cases to reflect the final product. |