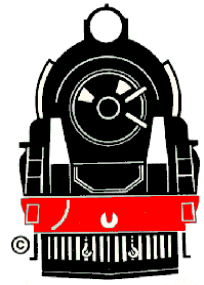


STEAM Incorporated
THE ENGINE SHED
Paekakariki
P.O. Box 4
Paekakariki 6450



Calibration & Certification of Dataloggers

Or

Are You Sure Your Datalogger Is Operating Correctly ???

Introduction:

Long-standing heritage 'main line' operators still use the Otari Electronics Dataloggers on their locomotives, to record the speed of excursion trains.

- New 'main line' operators who may be using the Kaitiaki Datalogger, will find the calibration principles discussed still of interest for their operation.
- Problems have arisen in the past (in our Society as in others), whether the datalogger fitted to a locomotive prior to an excursion, was working correctly.
- With Otari Electronic's Peter Clark's assistance, a **new Procedure** has been established at our Society to ensure the correct **CALIBRATION** and **OPERATION** of the datalogger, **BEFORE EACH 'MAIN LINE' EXCURSION.**
- This Procedure also provides Peter Clark with **absolute and traceable Speed and Time / Date references** recorded in the datalogger's memory, information we believe he has been previously lacking.
- By following a new Procedure such as described, all 'main line' operators may be saved from deep embarrassment, should their datalogger/s be found to be not operating correctly when safety rules say they should.
- Although the 'main line' rules may change in the future (i.e. all operators to use the Kaitiaki Datalogger), the principle being discussed is just as valid.

‘Main Line’ Operation Datalogger Requirements

- Tranz Rail requires the ‘main line’ operator’s datalogger/s to be certified annually - this is normally only the datalogger (taken from the locomotive) !!!
- To date, there appears to be no Tranz Rail move to require the certification of the DATALOGGER LOCOMOTIVE INSTALLATION - without care, this may yet come.
- The Otari Electronics datalogger has in-built diagnostic functions to assist locomotives crews to establish its correct operation - Are all clear in its use ?
 - At power on - both LED’s flash; then - the “Operation” LED flashes;
 - When recording data, the “Communication” LED shows steady.
- Particularly for steam locomotives, how does one prove operation prior to the excursion departure (as prior to steam pressure build-up, no electricity supply ? After that, no time / space to work on electronic devices in the cab)
- More particularly, are all operators clear how to **prove the datalogger installation in situ** (i.e., is it recording the locomotive speed correctly) ?

Accurate & Traceable Calibration of Datalogger Problems

- Previously, to establish a speed calibration datum value, Peter Clark has taken an average of readings as relating to an actual trip (Who has been asked to give Peter an accurate run-time description after the excursion ?).
- This old method is not accurate, and not really satisfactory !!!
- Further, a minor matter: The datalogger’s time-clock may have lost / gained time since the last calibration - this may be an issue on data play-back !!!
- A simple procedure is needed, to establish an absolute speed calibration (and time / date reference) recorded in the datalogger, prior to each run !!!

The following simple Datalogger Calibration Procedure is thus described, for consideration and possible implimentation by all ‘main line’ operators.

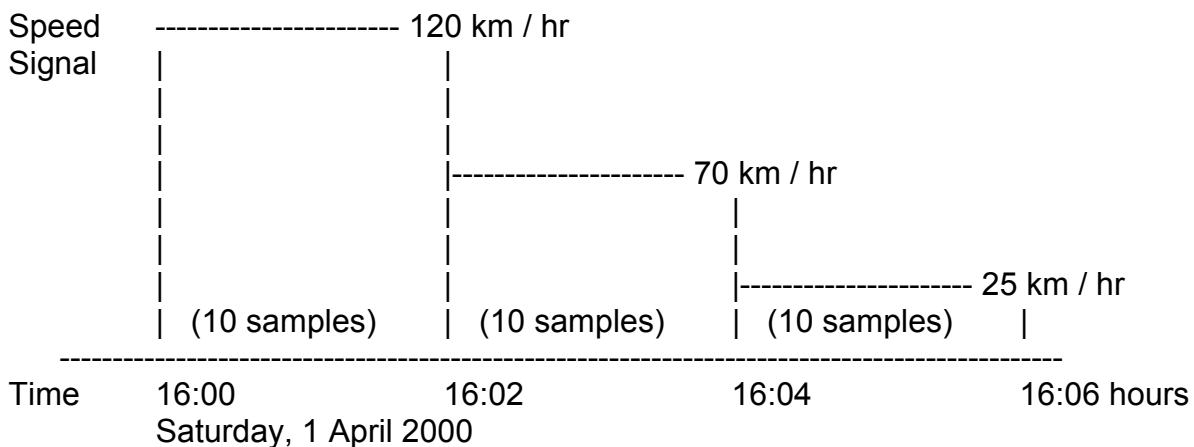
Pre-requisite to the Procedure - Speedometer Checks

- How often do groups prove calibration of their locomotive’s speedometers ?
- (Bench calibration check done at commissioning, or whenever ... ???)
- (Our group’s Safety Plan requires the speedometer checked each excursion. Simple check method: arrange for the driver to hold the train speed steady to a set speedometer reading, and time the run between 0.5 km track pegs:
Speed = $0.5 \times 3600 / \text{time (secs)}$!!! i.e. 70 km / hr = 26.0 secs)

- Having an accurately calibrated locomotive speedometer system, then provides a simple method to calibrate the datalogger data recording.

Procedure Demonstrated with Steam Loco Style Speedometer

- The Procedure to be demonstrated is based on the early style Westinghouse steam locomotive speedometer, **but the principle is applicable to others !**
- **Test Procedure:**
- Once the Locomotive Speedometer INSTALLATION is calibrated, **use the Speedometer display as an input speed signal reference**, and artificially power the datalogger input to record a known speed, at a known time / date.
 - 1) (For steam locomotives when not in steam, provide a 24V - 32V DC power source to power the datalogger, to proceed with the procedure);
 - 2) Disconnect the speedometer / datalogger from the speedometer wheel device (i.e.: the Westinghouse tachometer 10V AC = 1000 rpm; our locomotives use a Pyle National plug / socket fitting in the tender-cab cable);
 - 3) Connect a simple adjustable 0 - 10V 50Hz AC voltage source to power the speedometer display / datalogger (50Hz supply is OK), to read say:
 - Maximum speed: 120 km / hr, for 2 or 3 minutes; (the Otari datalogger records active data, once every 20 seconds !!!)
 - Normal speed: 70 km / hr, for 2 or 3 minutes;
 - Lower key speed: 25 km /hr, for 2 or 3 minutes;
 - 4) Record the absolute time (and date) of each speed signal, when applied.
 - 5) Remove the voltage sources, and re-fit the tachometer cable plug.



Operational Procedure

- Prove the subsequent correct operation of the speedometer and / or datalogger system after restoring the speedometer circuit:
 - Check the speedometer is reading correctly;
 - Check the Otari Electronics Datalogger “Communication” LED shows “steady” at speeds above ~5 km / hr.

Conclusion

- This Datalogger Calibration Procedure is simple and straight forward !!!
(using an acceptable method of “proof of calibration”.)
 - The test equipment required is simple and in-expensive; no special tools !!!
 - An absolute assurance can be given that the **Locomotive Datalogger Installation** is working correctly for each ‘main line’ operation !!!
 - An absolute Speed and Time/Date reference is established in the Datalogger memory prior to each excursion (to assist Peter Clark in later analysis).
 - The principle of the Procedure can be applied to other speedometer types.
 - Most importantly, there should be **no more problems with faulty locomotive speedometer / datalogger installations !!!**
-

Author

Graeme Clover
Steam Incorporated

NRFS Conference 2000

Disclaimer

While all care has been taken in the preparation of this document the author gives no assurance as to the accuracy of any information or advice contained. In no event shall the National Federation of Rail Societies Inc, Steam Incorporated or the author be liable for any incidental or consequential damages resulting from use of the information provided.

Copyright

Copyright ©2000 National Federation of Rail Societies and the author. This document may not be reproduced, sold or hired in part or whole for commercial or monetary gain. Otherwise this document may be freely copied or distributed.