

Issued by:	ENGINEERING DESIGN PERFORMANCE SPECIFICATION	No: TS/ED/2013/4
Approved by:	Engine Development Directorate Research Designs and Standards Organisation, Manak Nagar, Lucknow	First issued: May-2013 Supersedes:
Subject	Interfacing device to interface the Engine Control Unit (ECU) of the Electronic Fuel Injection System with Microprocessor Based Control System (MBCS) of the ALCo locomotives	
Affects Models	DLW built 16 cylinder 3100/3300/3600 hpALCo locomotives	
Ref. Drawings		
Originator		
Supplier	The following information is the property of Engine Development Directorate of Research Designs and Standards Organisation, Manak Nagar, Lucknow and must be treated as privileged communication between suppliers and Indian Railways	

1. INTRODUCTION

In the Electronic Fuel Injection(EFI) system all the features of existing governor of the locomotive will be taken over by Engine Control Unit (ECU). Interfacing device is to be used to interface the Engine Control Unit of the EFI system with the Microprocessor Based Control System (MBCS) of the locomotive.

2. GENERAL OPERATING CONDITION

2.1 Environment

Interfacing device is to be fitted in the nose compartment or any other suitable location of the locomotive, the Interfacing device is to be designed for the temperature range of 0 to 105 °C.

3. EXPECTED PERFORMANCE

3.1 Maximum acceptable failure rate in two years, including all failure modes is 0.25%.

4. FUNCTIONAL REQUIREMENTS

The main function of the interfacing device is to interface the Engine Control Unit (ECU) to the Microprocessor Based Control System (MBCS) of the locomotive. Engine notch signal in the form of four bit binary signal (through four wires) from the MBCS through locomotive terminal board is transfer to the ECU through interface box, which goes to the ECU for further processing. At present, the engine governing on the locomotives is carried out by Microcontroller Based Governor (MCBG).A microcontroller controlled DC stepper motor is used to control the fuel rack of the diesel engine of the locomotive. The basic function of the governor is to control the speed of the engine based on throttle handle position (notch). A secondary function is to control the load on the engine electrically, through an interface with the Microprocessor Based Control System (MBCS). This maintains a preset constant horsepower at each notch position. In addition to these functions, the functionalities also include air manifold pressure based fuel limiting, hot engine water and low lube oil pressure shutdown etc..

Five signals are transferred from MBCS to Engine Governor. Of these, 4 are notch signals via wire no. 15A, 12A, 7C, 3A. LCP (Load Control Potentiometer) signal is transferred from Engine Governor to MBCS by wire no. 29A. LCP signal range is from 24V to 72V. In normal condition of the engine (under-loaded or optimally loaded), the LCP voltage is 24Volts, when the engine is overloaded, the LCP signal will vary to maintain the engine rpm by increasing the LCP voltage up to a maximum limit of 72 volts.

5. DESIGN SPECIFICATIONS

S.No.	Parameters	Details
1.	Operating Voltage	0-72 V DC
2.	Storage Temperature	-55 to 105 °C
3.	Ambient Temperature	-40 to 80 °C
4.	Air Humidity	Up to 98% at 55 °C
5.	Contamination	Resistant against substances typically present in the engine environment
6.	Vibration	Max. 9g with 64-2000 Hz
7.	Shock	50g, 11 ms, Half Sine Wave
8.	Protection Grade	IP-65
9.	Isolation resistance	>1MΩ with 48V DC

5.1 Inputs:

- (i) Four notch signals (0-72V) from MBCS
- (ii) LCP signal (4to20mA) from ECU

5.2 Outputs:

- (i) LCP signal (0-68V) to locomotive terminal board

6. PRODUCTION INSPECTION FOR QUALITY ASSURANCE

The method of inspection and sample size shall be arrived at by mutual negotiations between the supplier and Indian Railways's quality control department and vendor quality assurance committee. All test procedures called out on any applicable Engineering Test Instructions must be followed. The manufacturer to indicate applicable engineering test instructions for their equipment.