



THE DRIVING FORCE BEHIND POWERFUL IDEAS

MICROPROCESSOR BASED LOCOMOTIVE CONTROL SYSTEM - MEP 660



MEDHATM Servo Drives Pvt. Ltd., established in 1984 is an R&D focussed company dedicated to railway products. Over last 25 years, MEDHA's inhouse design teams have developed various world class hi-tech products and systems for application in Locomotives, Coaches and Stations/ Yards. MEDHA's state of art Design Centre and Manufacturing facilities employs over 900 people who are constantly striving to apply latest technologies to create innovative products in wide range of fields like Control Electronics, Power Electronics, Electro-mechanical systems and Signaling Systems. All new developments and modifications go through stringent testing, validation and verification of both hardware and software, many times going beyond customer specification requirements.

MEDHA has well equipped manufacturing facilities that are **ISO 9001:2000** certified by American Quality Assessors (accredited by **ANAB**). Facilities include automated assembly of Surface Mounted Devices on PCBs, CNC machines, various test equipment and custom test jigs for in process and final inspection of all manufactured goods. MEDHA supplies products for Locomotives including IGBT based AC Traction Control Systems for Diesel Locomotives, various models of microprocessor based Locomotive Control Systems including control panel and electricals for Diesel and Electric locomotives, microprocessor based Governors, 180 kVA 3 phase Static Converters for Electric Locomotives, Speed and Event recorders, TFT LCD Driver Display screens, End of Train Telemetry, etc. For signaling applications, MEDHA has developed Electronic Interlocking system and Integrated Signaling Power Supplies. For coaches, MEDHA supplies various models of underslung naturally cooled inverters ranging from 2.5 kVA to 50 kVA.



MICROPROCESSOR BASED LOCOMOTIVE CONTROL SYSTEM – MEP 660

B E N E F I T S

- Improves Locomotive Availability (reduced down times)
- Improves Adhesion (Creep Control philosophy)
- Improves Engine Utilization (GHP based control)
- Reduces Life-cycle Costs
- Monitors all Traction Equipment on-board for Safe Operating Margins
- Customizable parameter settings to adapt to different locomotive types without changing software
- Modular expandable platform for added functionality like Automatic Engine Start Stop, Remote Monitoring, Distributed Power Control, End of Train Telemetry, etc for fuel savings, increased availability and usage.



DISPLAY UNIT



RDB (RPM Distribution Box)

Salient Features

Excitation and Auxiliary Generator Control

- Continuously monitors Train Line signals (MU signals) and controls excitation of the Alternator based on the operating requests of the driver.
- Measures various analog and digital feedback signals from Traction equipment and controls Alternator excitation to maintain constant Gross Horse Power (GHP) load on the Diesel engine.
- Ambient temperature correction, altitude correction, and fuel specific gravity correction provided for site HP calculation.
- Control excitation of Auxiliary Generator to maintain constant output voltage for charging battery and powering auxiliaries, in spite of variation in Engine speed from IDLE to 8th notch.
- Accurate digital PID control eliminates need for potentiometer settings making the system free of adjustments for life time.

Propulsion and Dynamic Braking Control

- Digital propulsion control eliminates various interlocking relays, interlocks and associated wiring. This enhances reliability of the locomotive and eases maintenance.

Wheel Slip Control

- Improved adhesion from Wheel Creep philosophy.
- Individual speeds of all 6 axles and currents of all 6 Traction Motors are measured to accurately calculate Wheel Slip.
- During Wheel Slip, Alternator excitation is controlled to deliver maximum possible Tractive Effort depending on adhesion between wheel and rail under given environmental and track conditions.

Fault Diagnostics and Tolerance

- Continuously checks for abnormalities in the functioning of all locomotive systems. When a fault is identified, preventive actions like isolating sub-system or limiting power etc. are taken to prevent further damage to the faulty equipment and other connected equipment without driver intervention. Fault message and associated restrictions imposed displayed on Display.
- Automatic Fault Recovery recognition and intimation to driver
- In case of many faults, built in fault tolerance supports continued operation of locomotive with reduced functionality.
- Fault log contains fault messages along with date/time stamps and 90 data packs consisting of various (about 200) locomotive signals. One data pack per second is recorded from 60 seconds before declaration of fault to 30 seconds after it.
- Fault viewing and clearing via display or laptop, with 3 different password protected access levels depending on criticality of faults.

Inputs, Outputs, Sensors

- Non-contact Hall effect sensors for current and voltage measurements
- All input and output (including PWM output) interfaces locomotive signals of 72VDC are optically isolated, reverse polarity and surge protected. Outputs are further overload and short circuit protected.
- IGBT based PWM outputs for Alternator Excitation Control and Auxiliary Generator Field Control.
- Switch Mode Power Supply with built in protection against reverse polarity, input over voltage, input over current and short circuit.

Locomotive Equipment Protection

- Monitors currents, voltages and temperatures of Engine, Alternator, Traction Motors, Auxiliary Generator, Exciter, etc and controls them to operate within set limits. This enhances life of traction equipment, improves reliability and locomotive availability.
- Engine protections like Low water, Low Lube Oil Pressure, High temperature, mechanical speed limit etc.
- Thermal protection for Traction Motors (using thermal modeling) and reduced Tractive Effort operation when hot.

Programmable Parameters and Display

- Various user programmable parameters can be set via a Laptop. System has been customized to various types of locomotives with different types of Traction equipment without software changes.
- 256x64 Graphical VFD display with 24 key Membrane keypad for multi-lingual support.
- Menu driven user selectable continuous display of various groups of operating parameters on the Display Unit.

Event Recorder

- Built in Event Recorder for recording operational parameters of locomotive in both internal (short and long term memories) and external memory.
- Statistics like lifetime counters, trip counters and notch-wise counters for energy generated, distance traveled and engine run time.

Other Features

- Vigilance Control (Driver Alerter) to ensure driver alertness
- USB port to downloading and programming all data like Event Recorder data, fault data packs, Locomotive Health Data, Steady State information data, customizable parameters, etc.
- Manual and auto test modes to help maintenance staff identify faults.
- Self load test with dynamic brake resistors as electrical load for verifying functioning of Engine and Alternator.
- Automatic Emergency Brake to avoid runaway train on steep gradients.
- Compressor controlled based on Main Reservoir pressure sensed.
- Extended Dynamic Braking range with additional contactors
- Pre-lubrication and post-lubrication for enhancing Engine life.
- Fixed set speed operation for automatic loading/unloading operations.
- Automatic Flasher Light Control in case of train parting etc.
- Fire Alert Alarm in case of Fire hazards.
- Maintenance free equipment with plug-in modules for ease of servicing.
- Wiring and Control Cabinet components minimized for higher reliability.

Add-on Modules / Features

- Automatic Engine Start Stop or Auxiliary Power Unit, Power Setter and Low Idle functionality for Fuel savings.
- Remote Monitoring of Locomotives for health status, faults, etc. using wireless communications and Internet Server.
- Distributed Power Control Enabled for future addition.
- Computer Controlled Brake System interface.
- LCD Driver TFT Display interface.
- End of Train Telemetry.



ADB (Analog Distribution Box)



VOLTAGE SENSOR



TEMPERATURE SENSOR



PRESSURE SENSOR



TM SPEED SENSOR



CT (Current Sensor)

Technical Specifications		
Power Supply	:	40 to 100VDC
Digital Inputs	:	144 inputs for interfacing 72VDC signals. Optically isolated, reverse polarity and surge protected
Frequency Inputs	:	6 inputs for Traction Motor speed and 2 for Engine speed and 8 spare inputs
Analog Inputs	:	40 inputs for interfacing Analog signals. Optically isolated
Digital Outputs	:	64 outputs for driving 72VDC loads. Optically isolated, reverse polarity & surge protected, overload and short circuit protected.
PWM Outputs	:	2 outputs for Exciter and Auxiliary Generator field control
Analog Outputs	:	4 Current Outputs & 4 Voltage Outputs. Optically isolated
Fault Log Memory	:	700 faults with Date/Time stamps and Fault Data Packs
Communication Ports	:	<ul style="list-style-type: none"> ● RS485 Port for Display Unit interface ● RS485 Port for Electronic Governor MEG 601 Comm. ● RS485 Port for LCD TFT Driver display interface ● RS485 Port for Electronic Air Brake system interface ● RS232 Port for On-Line Data Log ● RS232 Port for External Memory Card Interface ● CAN comm. port for Distributed Power control interface ● CAN comm. port for Spare ● USB Port for Configuration upload ● USB Port for Fault Data, Locomotive Health Data and Event Recorder Data download with LAPTOP ● USB Port for Fault Data, Locomotive Health Data and Event Recorder Data download with Pen Drive
Display / Keyboard	:	256 x 64 Graphical Vacuum Fluorescent Display with 24 key Membrane keyboard
Interconnections	:	Polarized MS Round Circular Threaded Connectors or Bayonet Connectors
Protections	:	EMI, EMC, and ESD protections