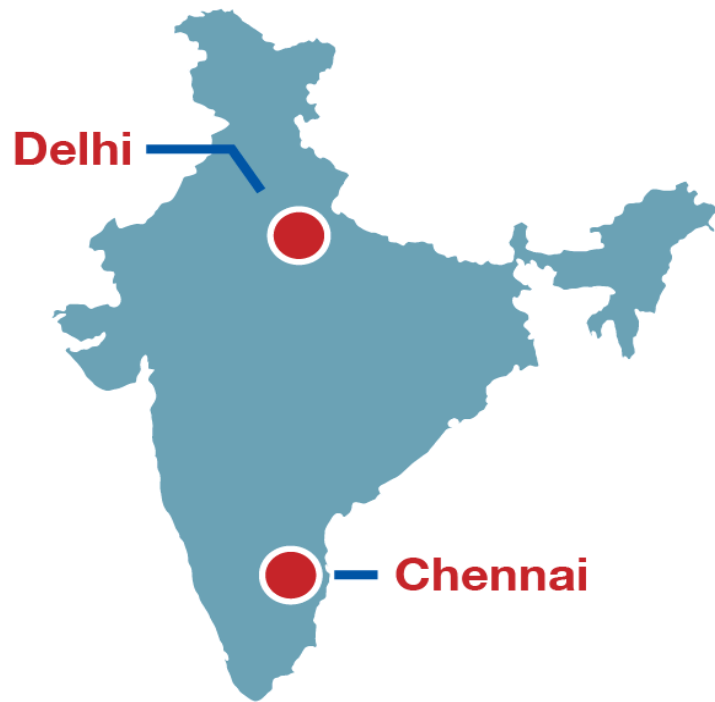


Ansaldo STS & ETCS Implementation in India



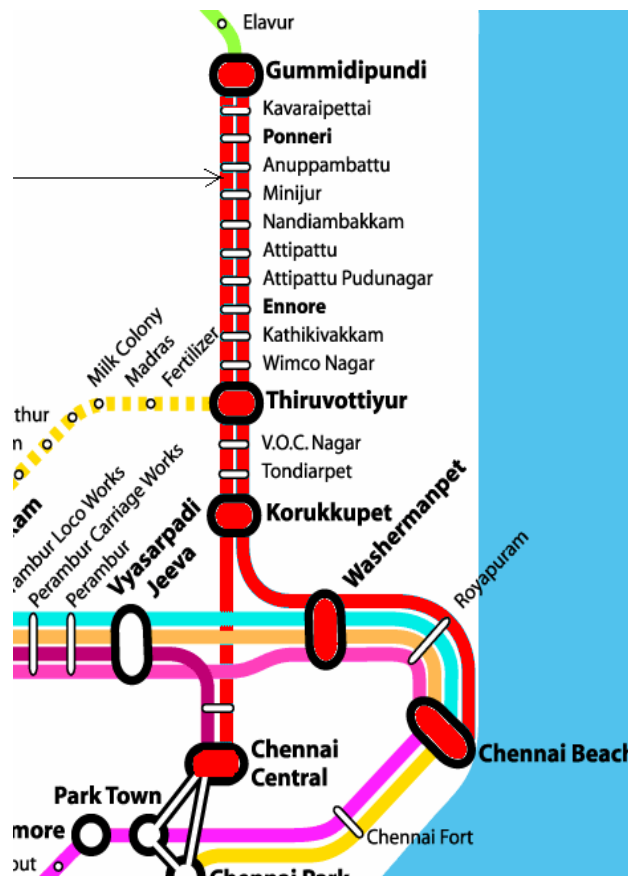
ETCS Implementation in India



Ansaldo was awarded the First European Train Control Systems in India for 50 route Kms and 84 EMU coaches for Chennai suburban in Southern Railway

Another order for 190 route Kms and 35 locos between Delhi and Agra in North Central Railway

Pilot Project 1 : Chennai – Gummidipundi (TPWS-S)



Description	Details
Section	- Chennai Beach to Gummidipundi - Chennai Central to Korukkupet
Number of stations	19
Length	50 Km
Current signalling	- Relay interlocking - Absolute block working
Transportation capacity	60,000 passengers/day
On-board equipment	84 EMUs to be fitted-out
Wayside equipment	150 Signals to be fitted-out

Pilot Project 2 : Delhi – Agra (TPWS-N)



Description	Details
Section	New Delhi - Agra
Number of stations	27
Length	168 Km
Current signalling	<ul style="list-style-type: none"> - Relay interlocking - Absolute/Auto block
Transportation capacity	40,000 passengers/day
On-board equipment	35 Locos
Wayside equipment	580 Signals to be fitted-out

Advantages of TPWS System



Assists Railway Operators to meet their safety and modernisation goals by

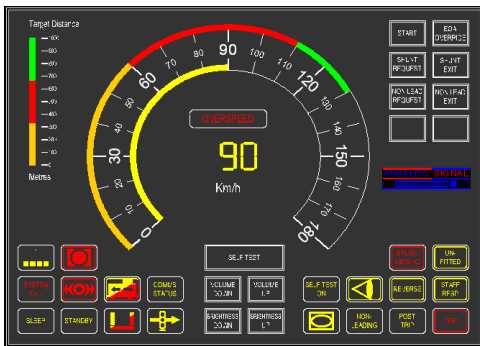
- Providing a safety protection mechanism against reduced headway of the trains for increasing line capacity
- Eliminating human errors leading to :
 - Signals passed at danger
 - Overspeeding

The advantages are

- Enhanced Safety beyond the capability of legacy ATP
- Significant capacity improvement with reduced headway
- Assures higher level of safety even at higher operational speed
- Providing a widely accepted standard
- Accommodating multiple vendors and interoperability
- Providing a robust platform for technology upgradation in future
- Permitting customisation to meet Indian Railway's needs
- Facilitates normal operation of train in dense foggy condition where visibility is near zero

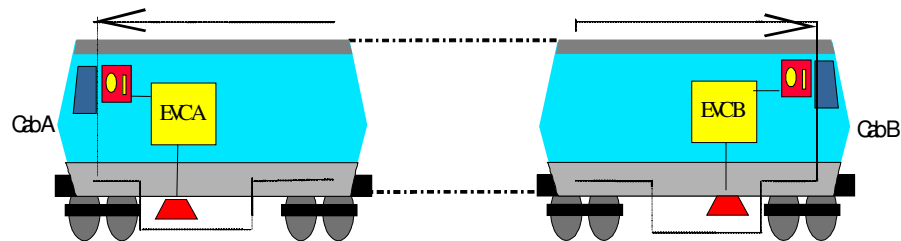
TPWS – Benefits to the drivers

Aids the motormen of loco by various information as under on the panel of Driver Machine Interface fixed in front of him.



- **Permitted speed**
- **Actual speed**
- **Target distance**
- **Target speed**
- **Level of operation (One or Zero)**
- **Modes of operation (Unfitted, Full supervision, Staff responsible etc.)**
- **Over speed indication by visible/audible warning in two stages.**
- **Service and Emergency brake indication**
- **Facility to operate train under special conditions as per Railway rules**

ERTMS Level 1 On-Board



On Board Equipment

On Board Computer (OBC)

Balise Transmission Module (BTM) and Antenna

Driver Machine Interface (DMI)

Wheel sensors

Input data to be fed

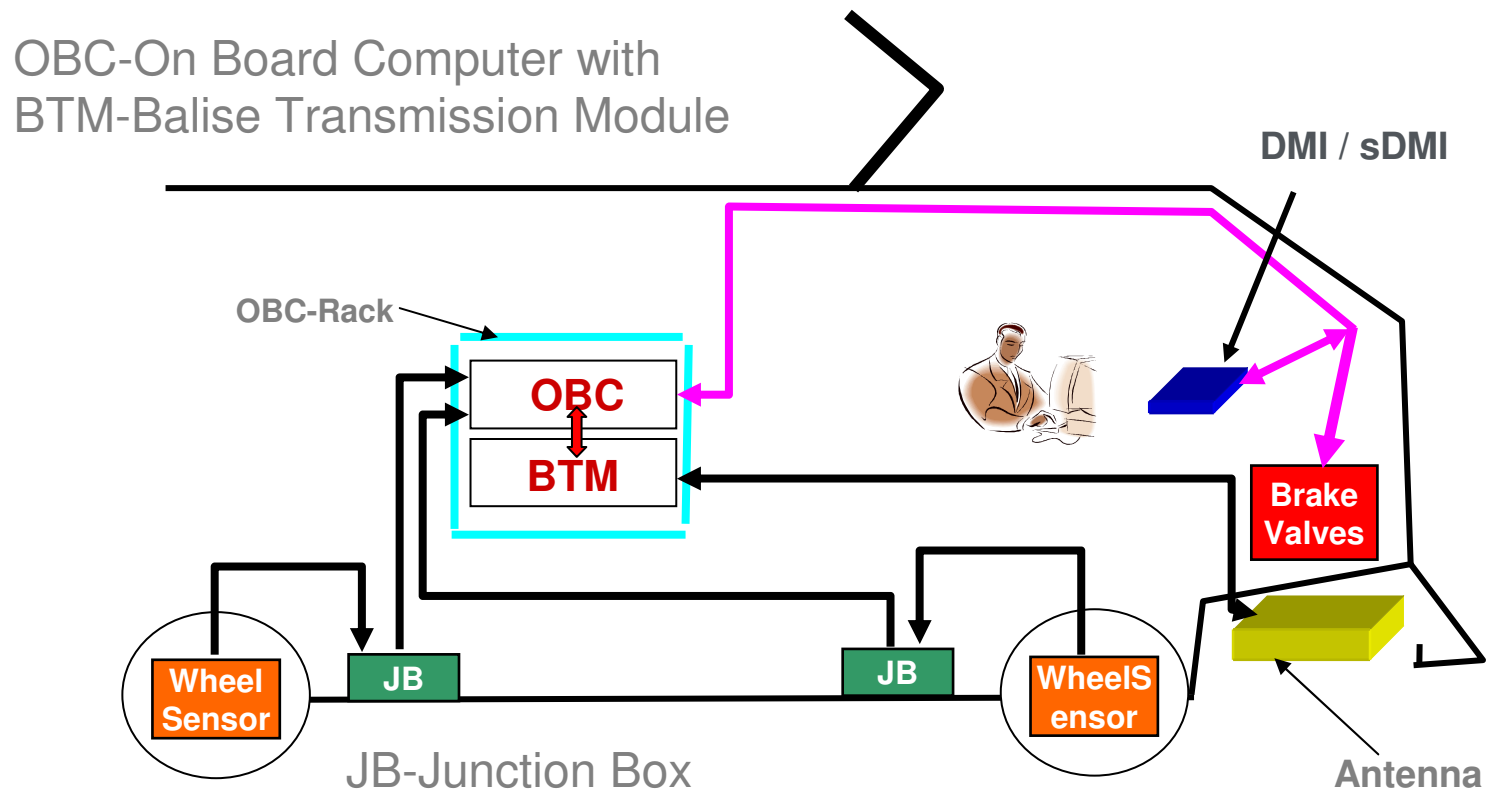
Length of train, wheel dia, deceleration factor

Maximum permitted speed of train

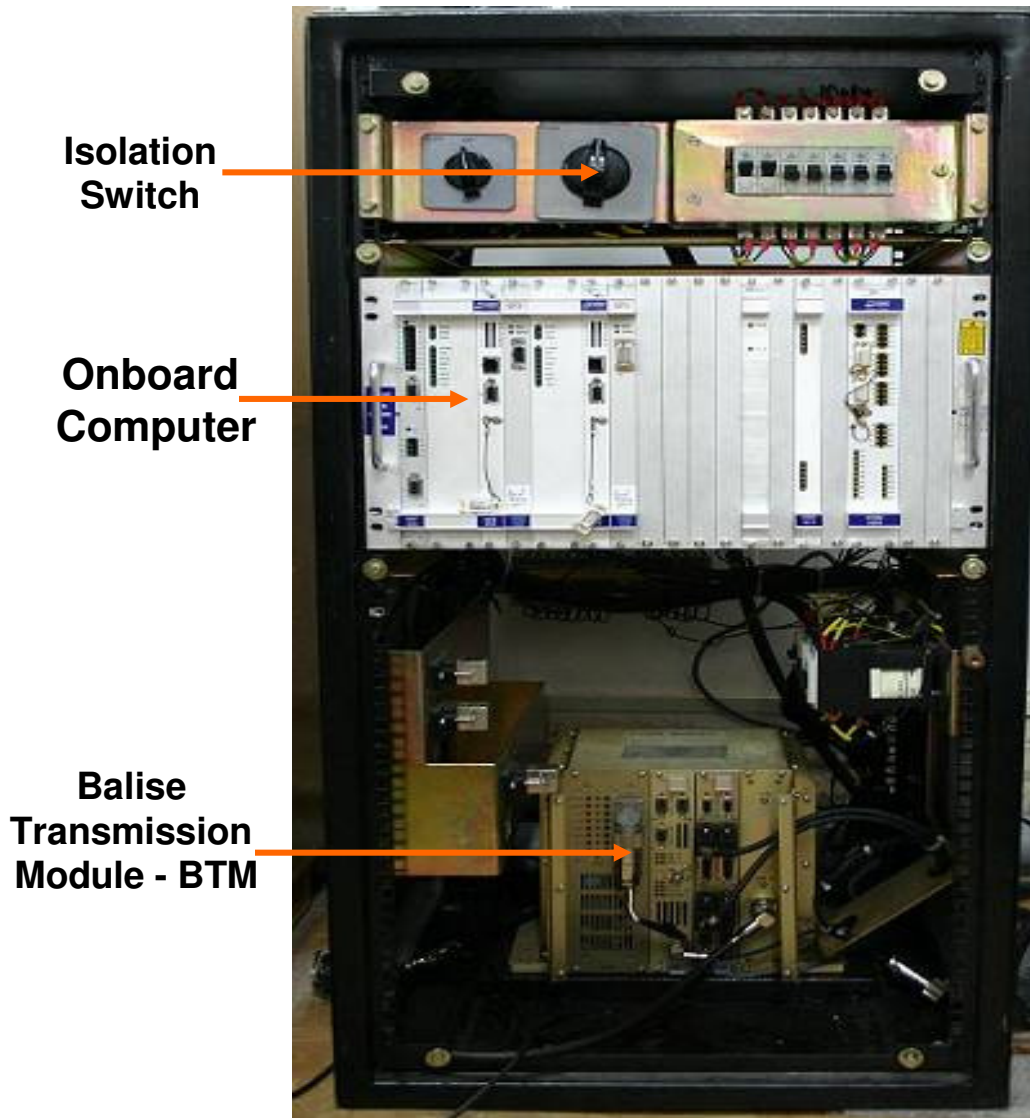
On board Equipment Functions

- Reception of movement authorities and track description
- Selection of the most restrictive speed
- Calculation of dynamic speed profile and display permitted speed on DMI / sDMI
- Comparison of the actual speed with the permitted speed and commanding Brake when required
- Provide audio - visual warnings

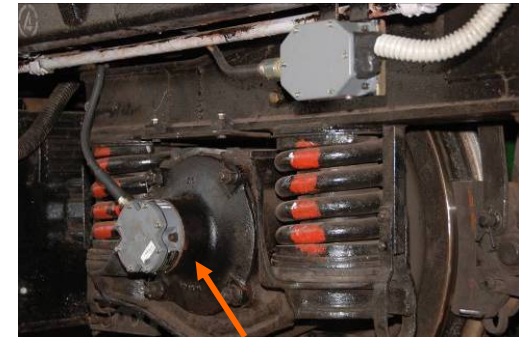
ON BOARD EQUIPMENT LAYOUT DIAGRAM



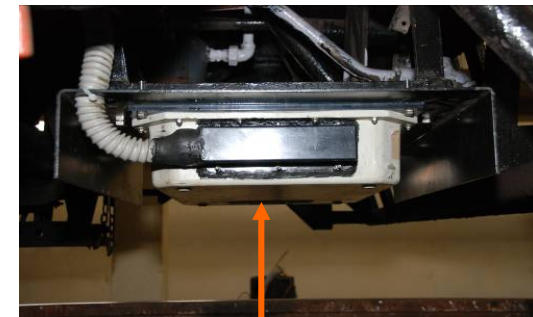
Onboard Components



PSTI Cabinet



Wheel Sensor



Antenna



sDMI

ERTMS Level 1 Trackside Equipments

Equipments

Lineside Electronic Unit (LEU)

Eurobalise

Input data to be fed

Movement Authority and speed profile depending on signal aspect

Sectional gradients, permanent speed restrictions, mode transitions etc.



Equipment Functions

Determine movement authorities according to the underlying signaling system of Railway

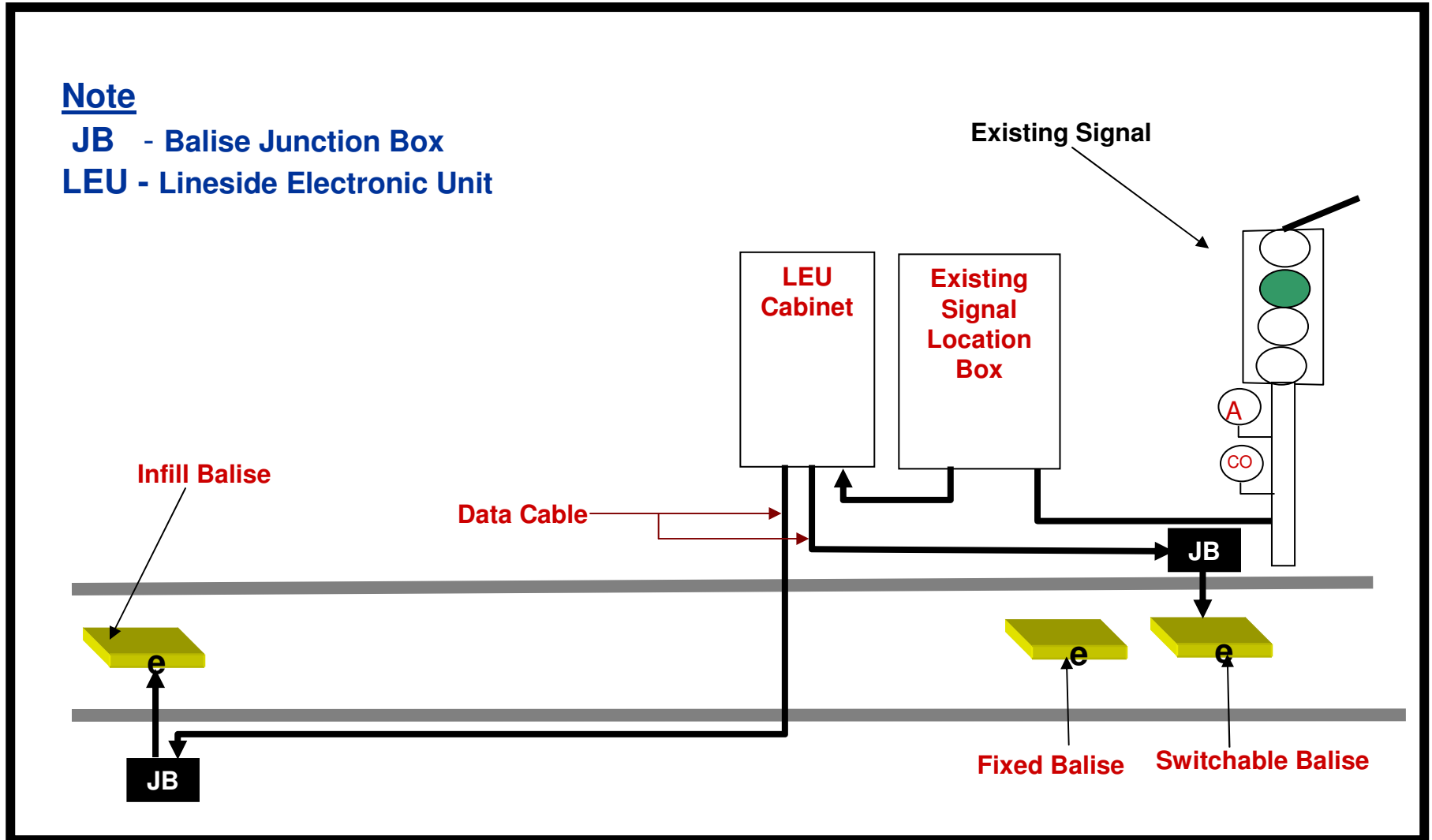
Transmit movement authorities and track description to the train

TRACK-SIDE EQUIPMENT LAYOUT DIAGRAM

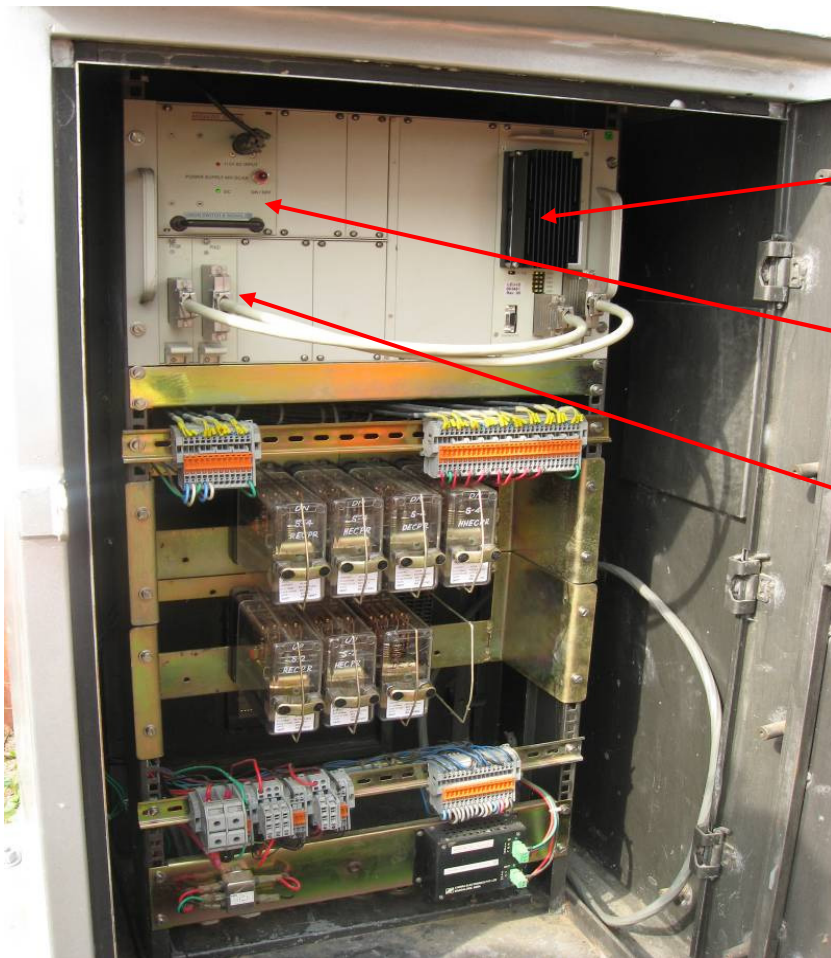
Note

JB - Balise Junction Box

LEU - Lineside Electronic Unit



Trackside Equipment



LEU cabinet with one
LEU-ID module

Power Supply Module

PIND & PFSK module with
interconnecting cable

LEU rack used
in India



Balise

Challenges of TPWS in India

Environment

The operational environment including temperature, dust, EMI/EMC etc are quite different in India as compared to Europe. This was leading to occasional interruptions in the system.

This has been resolved by improving the ventilation and cooling arrangements, shielding and filtering of the inputs.

Accommodation of Onboard Equipment in Locos

Presently the onboard equipment is housed in a single rack. This is fine for EMU coaches but for electric locos, it is an issue. This will be resolved by placing the different onboard subsystems in the available space inside the loco.

Configuration of the Train Characteristics

The braking curve is computed based particularly on the onboard parameters and it is important to feed the correct parameters for better brake characteristics. This is at the final stage.

Man-Machine Interface

A Simplified Driver Machine Interface (sDMI) was considered for use in Indian Railways. This had undergone several changes to suit customer's requirements.

Challenges of TPWS in India

continued ...

Disturbances in Trackside Power Supply

The 110Vac trackside power supply was having occasional BROWN OUTs and voltage dips resulting in interruptions in the trackside equipment. This was resolved by incorporating a power backup and increasing the working range of the PSU.

Changes in Configuration and Site Plan

Occasional changes in signalling layout and design plan had delayed the project from time to time. This has been overcome by proper coordination with the customer.

Track Maintenance

Level-1 is dependent on Balises. However during cleaning of the ballast all the balises need to be removed to avoid damages to the units. This poses a big maintenance challenge.

Cable damage

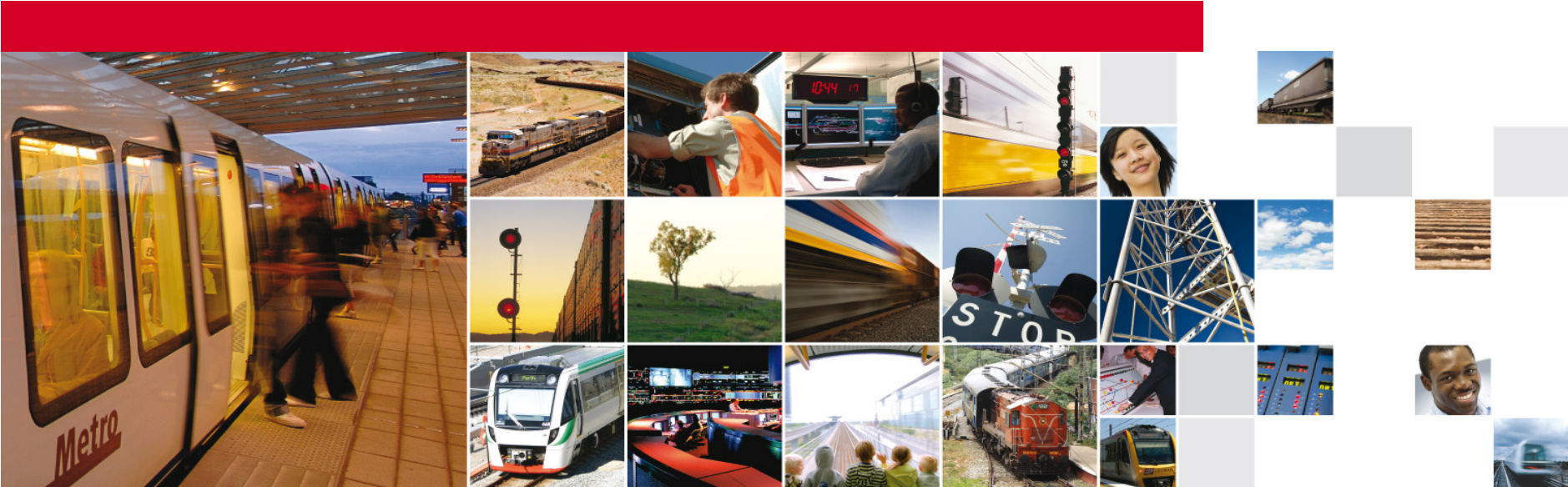
Switchable balises are connected to the LEU with data cable which occasionally suffer from damage during other trackside work or theft.

Theft of earthing wires provided a number of unexpected issues which have now been resolved by using GI wire.

Way Forward

- Resolve the current issues and commission TPWS(S) by end Nov'10 and TPWS(N) by end Dec'10.
- Manage future projects much better with the lessons learnt from the current projects.
- Propose a system architecture for better reliability and availability target.
- Migration to Level-2 which would drastically resolve the trackside problems. It would also help in reducing trackside signalling infrastructure cost and provide upgradation to future train management using the moving block concept.
- Integrate with TMS for better train management

Thank You ...



Global Resources
Local Response
Complete Transportation Solutions

