



# Railway Signaling Solution based on Wireless Communication

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Based on the technology for railway signaling solution, LS ELECTRIC provides the most appropriate signaling solutions for each site environment from automatically operated urban rail transit to high speed rail

## LS ELECTRIC's Railway Signaling Solution

### Urban Transit

- CBTC
- ATS (Automatic Train Supervision)
- ATC/ATO System
- CBI (Computer-based Interlocking)

### MAIN LINE

- CTC (Centralized Traffic Control)
- CBI (Computer-based Interlocking)
- ETCS Level 1 and ETCS Level 2
- AF Track Circuit

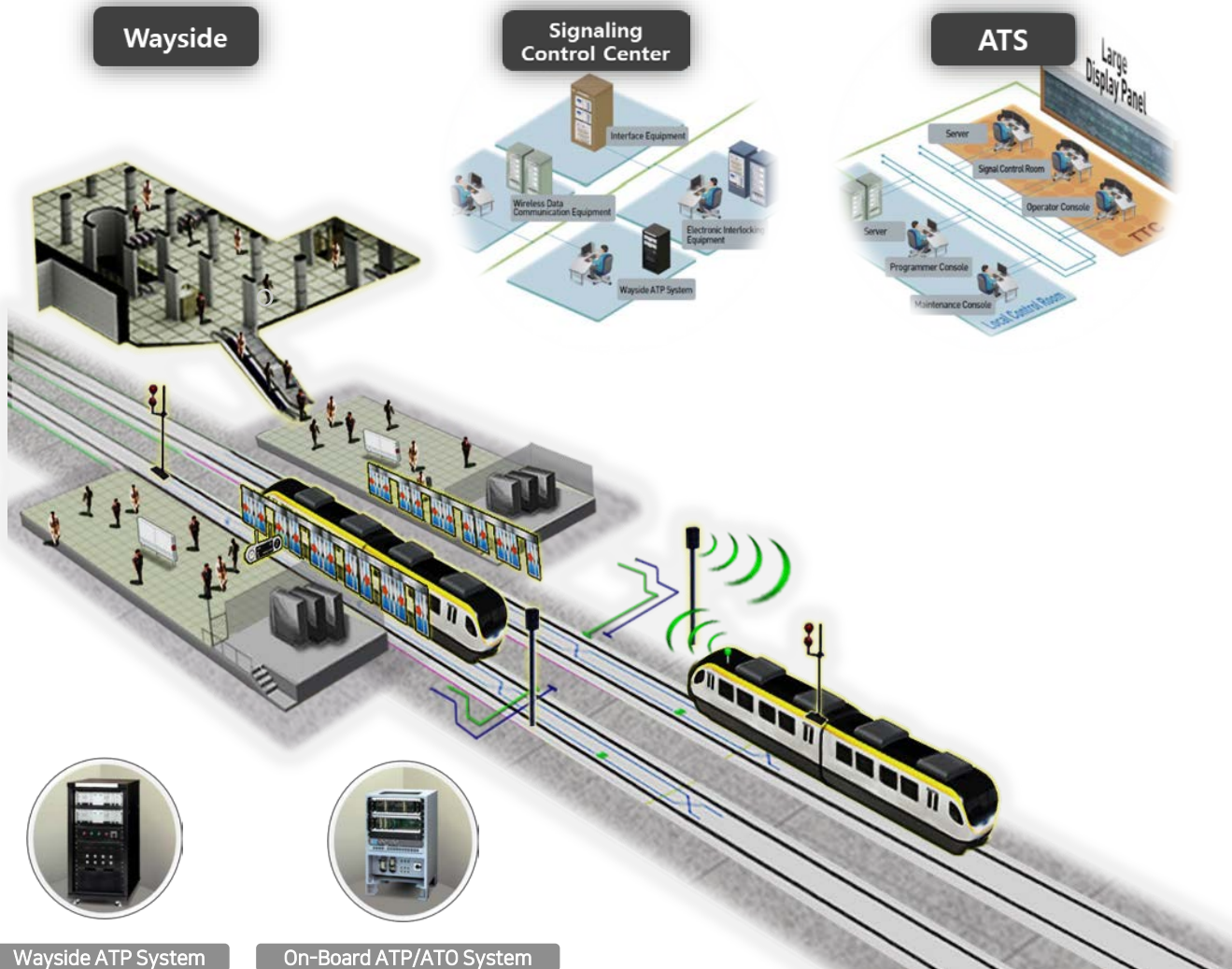
### HIGH SPEED LINE

- CTC (Centralized Traffic Control)
- ATC (Automatic Train Control)
- IXL (Interlocking System)



# Automatic Unmanned CBTC System for urban Transit

## Communication Based Train Control, LTran-CX™



### ATS : Automatic Train Supervisor

A system monitors and controls overall train and passenger operations

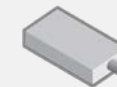
- ✓ Train Operation Management
- ✓ Operation / Route / Delayed Train Control
- ✓ Management of Public Announcement System and Recording System, and etc.

### CBI (Computer-based Interlocking)

A system that interlocks and controls trackside equipment for train operation



Wayside ATP



Point Machine



SIL4 Certificate

### Wayside ATP / On-Board ATP ATO System

A system that implements remote train control system based on wireless communication

- ✓ Automatic Train Protection on a Real-time
- ✓ Fully unmanned automatic operation Based on wireless communication (LTE-R, Wi-Fi, GSM-R)
- ✓ SIL4 certified system compliant with IEC Standard

# ETCS Level 1 and Level 2 System for main line and High speed rail

## European Train Control System, LTran-RX™




**CTC : Centralized Traffic Control**

A system monitors and controls overall train and passenger operations.

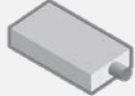
- ✓ Train Operation Management
- ✓ Operation / Route / Delayed Train Control
- ✓ Management of Public Announcement System and Recording System, and etc.

**CBI (Computer-based Interlocking)**

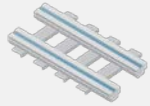
A system that interlocks and controls trackside equipment for railway operator to determine train operation route




Signals




Point Machine



Track Circuit



SIL4 Certification



Wayside ATP

**ERTMS / ETCS Level 1 and 2 System**

**ETCS Level 2 System**

- ✓ Automatic Train Protection on a Real-time
- ✓ Based on wireless Communication (LTE-R, Wi-Fi, GSM-R and etc.)
- ✓ SIL4 certified system compliant

**ETCS Level 1 System**

- ✓ Automatic Train Protection
- ✓ Consisting of LEU and Balise
- ✓ SIL4 certified system compliant



Wayside ATP System (RBC)



On-Board ATP System (OVC)

# Railway Major Record

- Signalling System
- Traction System



**[LS ELECTRIC'S Major Record in Railway ]**

- Seoul-Busan, Seoul-Mokpo, Metropolitan High Speed Rail Signaling/ Traction System Supply (ATC, IXL)
- Incheon International Airport Shuttle IAT Signaling/Traction/Telecommunication System Supply
- Seoul Metro Line 7 Signaling / Traction/ Telecommunication System Supply (ATC/ATO, CBI)
- Seoul Metro Line 3,4,5,6,7,8 Signaling / Traction System Supply (ATC/ATO)
- Busan Metro Line 1,2 Signaling / Traction System Supply (ATC/ATO)
- Deague Line 1, 2 Signaling / Traction Supply (ATC)
- Bangladesh Chinki-Chittagong 11 station Signaling System Supply (CBI, CTC)
- Bangladesh ADB AkhauraLaksam 12 station Signaling System Supply (CBI, CTC)
- Bangladesh 13 station Railway Modernization Signaling System Supply (CBI)
- Bangladesh Laksam-Chinki Astana Double Track Signaling System Supply (CBI, CTC)
- Bangladesh Tongi-Bhairab Bazar Double Track Signaling System Supply (CBI)
- Bangladesh Akhaura Junction Signaling Modernization (CBI)
- Bangladesh Akhaura-Sylhet 10 station Signaling System Supply (CBI)
- Thailand ST5 Signaling & Communication System Supply (CBI, ETCS L1, CTC)
- Thailand ST4 Signaling & Communication System Supply(CBI, CTC)
- Thailand ST1 Signaling & Communication System Supply(CBI, CTC)
- Taiwan Taidong Depot Signaling System Supply (CBI)
- Taiwan Taiding 3 station Signaling System Supply (CBI)
- Seoul Shinlim LRT (CBTC, in progress)
- Bangladesh Dohazari-Cox's Bazar Signaling System Supply (CBI, in progress)
- Bangladesh Dhaka-Narayaganj Signaling System Supply (CBI, , in progress)
- Thailand ST9 (North East Line) Signaling & Communication System Supply (CBI, ETCS L1, CTC, in progress)
- Thailand East Line Signaling System Supply (CBI, ETCS L1, in progress)