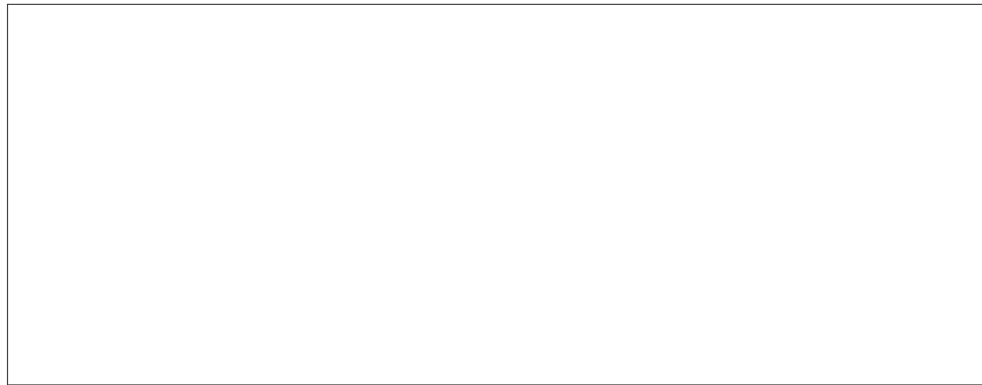


KYOSAN ELECTRIC MFG.CO.,LTD.



<https://www.kyosan.co.jp/>



THSR SIGNALING SYSTEM

The first oversea project to use Shinkansen technology

Taiwan High Speed Rail (THSR) is the first overseas project where Shinkansen technology was implemented. The line first opened for service between Banciao station, near Taipei city, and Zuoying station, on January 2007. And then, it opened between Banciao station and Taipei station on March 2007, bringing the whole line into operation. Kyosan, one of the railway signaling system consortium members, supports the safety and stable transport of THSR.





Taipei Station

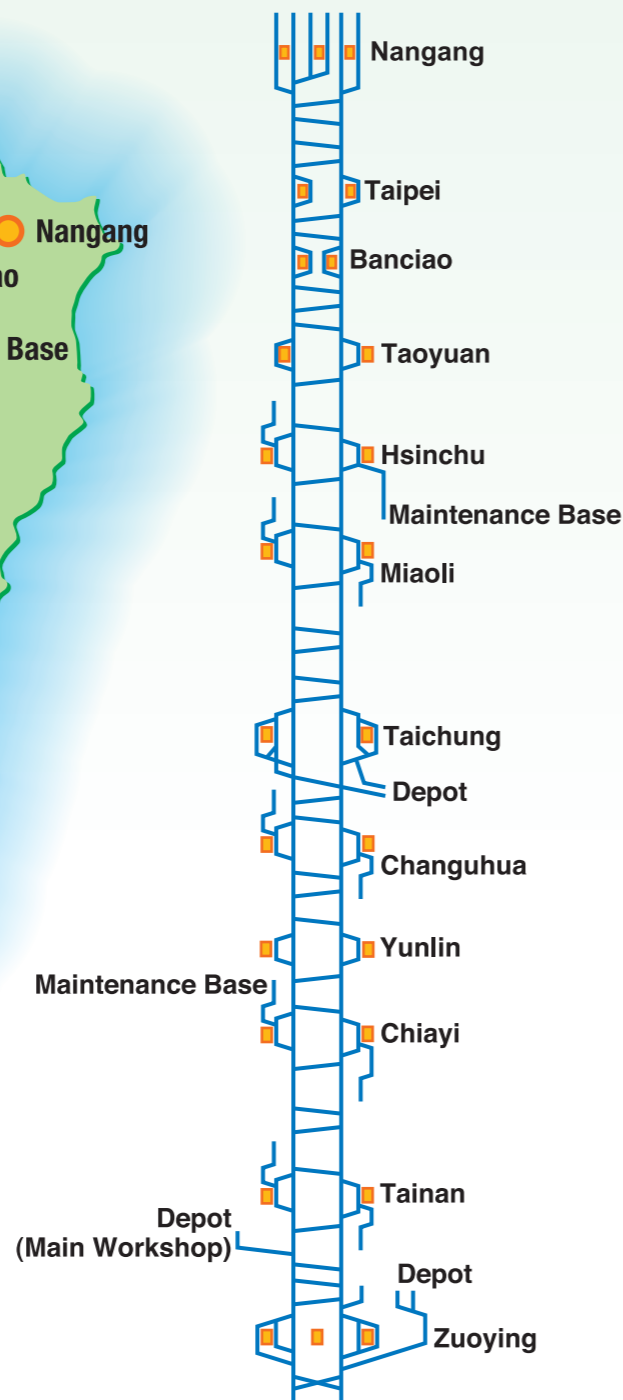
Location

There are 12 stations on approximately 350 km of the line from Nangang station (Taipei city) to Zuoying station (Kaohsiung city). Also, depots, a main workshop, and an operation control center are equipped along the line.

Location



Track Layouts



Feature

The THSR signaling system utilizes its own unique functions which adopt distance-to-go ATP technology.



Taoyuan OCC (Operation Control Center)

- Fail-Safe CPU and transmission for enhanced reliability
- Superior maintainability by centralizing maintenance information
- Universal consoles adopted
- Temporary speed restriction system for earthquakes, fallen obstacles on the track, wing and rain etc.



Signaling Equipment Rack



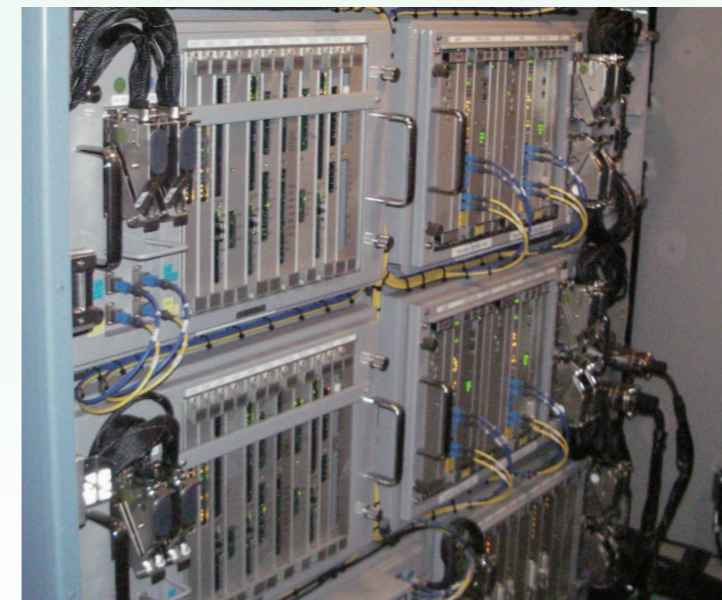
THSR at Depot



Overrun Protection for 03 Loop



Protective Device Case



ATP On-Board equipment



Shunting Signal



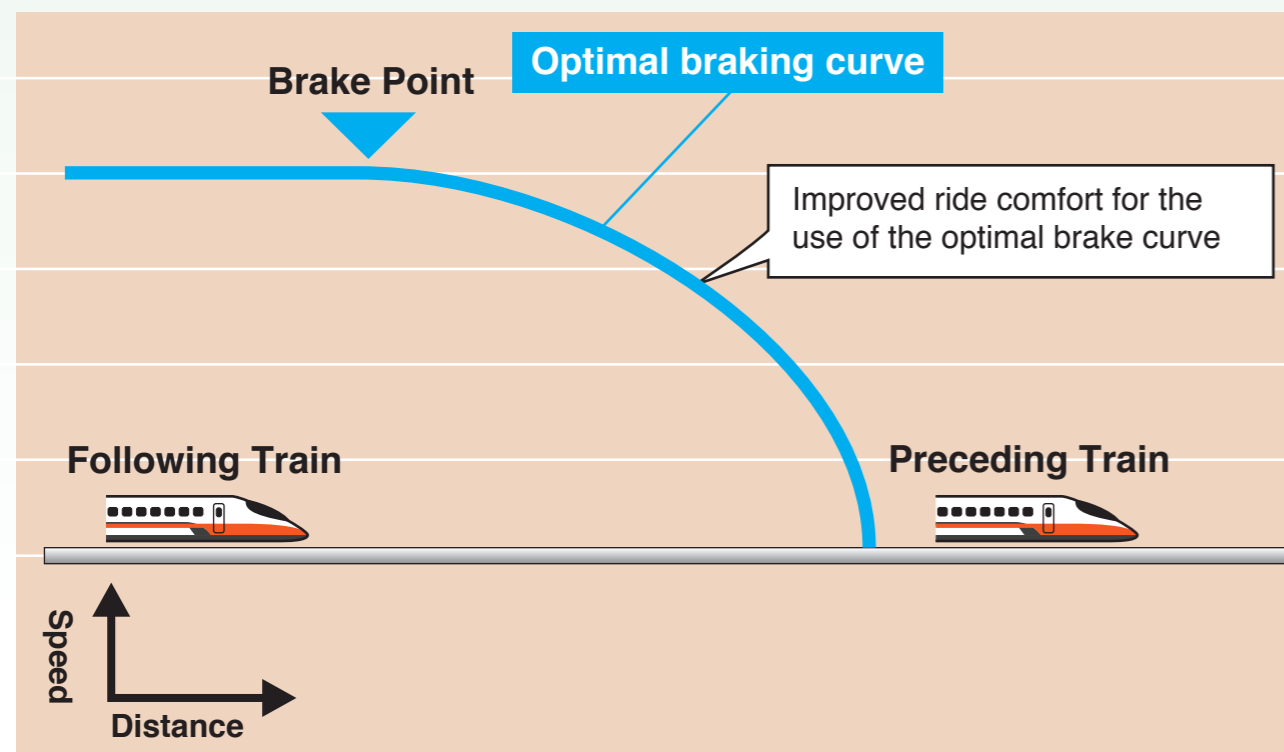
Universal Console

Function

1. THSR ATP system

The ATP system adopts distance-to-go ATP technology. The optimal braking control in accordance with the performance of each train leads to the following. The ATP On-Board equipment is using the function below.

- Shortened train headway
- More stable rail transport
- Superior ride quality
- Reduced time of train service delay recovery



2. Bidirectional Operation

THSR is a double track structure of East and West lines (In-bound and Out-bound). Each line is capable of bidirectional ATP operation throughout the line.

This system captures train direction, train number and ATP signal through the wayside equipment.

3. TSR

TSR can be set and released the temporary speed restriction per unit of track. When the abnormal situation is occurred, TSR will be set automatically in order to regulate the train speed.

4. SPAD

If the On-Board ATP system fails, a fallback single system called SPAD (Signal Passed At Danger protection) will come into operation. This allows trains to move at limited speed and protects them using wayside controlled signals. This is a basic transponder based train stop system which in the event of a train passing a signal at danger will apply the emergency brakes. It is used in conjunction with a fallback wayside indicator system to allow movement from station to station.

5. Interlocking

THSR uses electric interlocking equipment, and is installed on the main line and in the depot. This equipment uses a redundant LAN system, and is configured inside the station equipment room.

6. Others

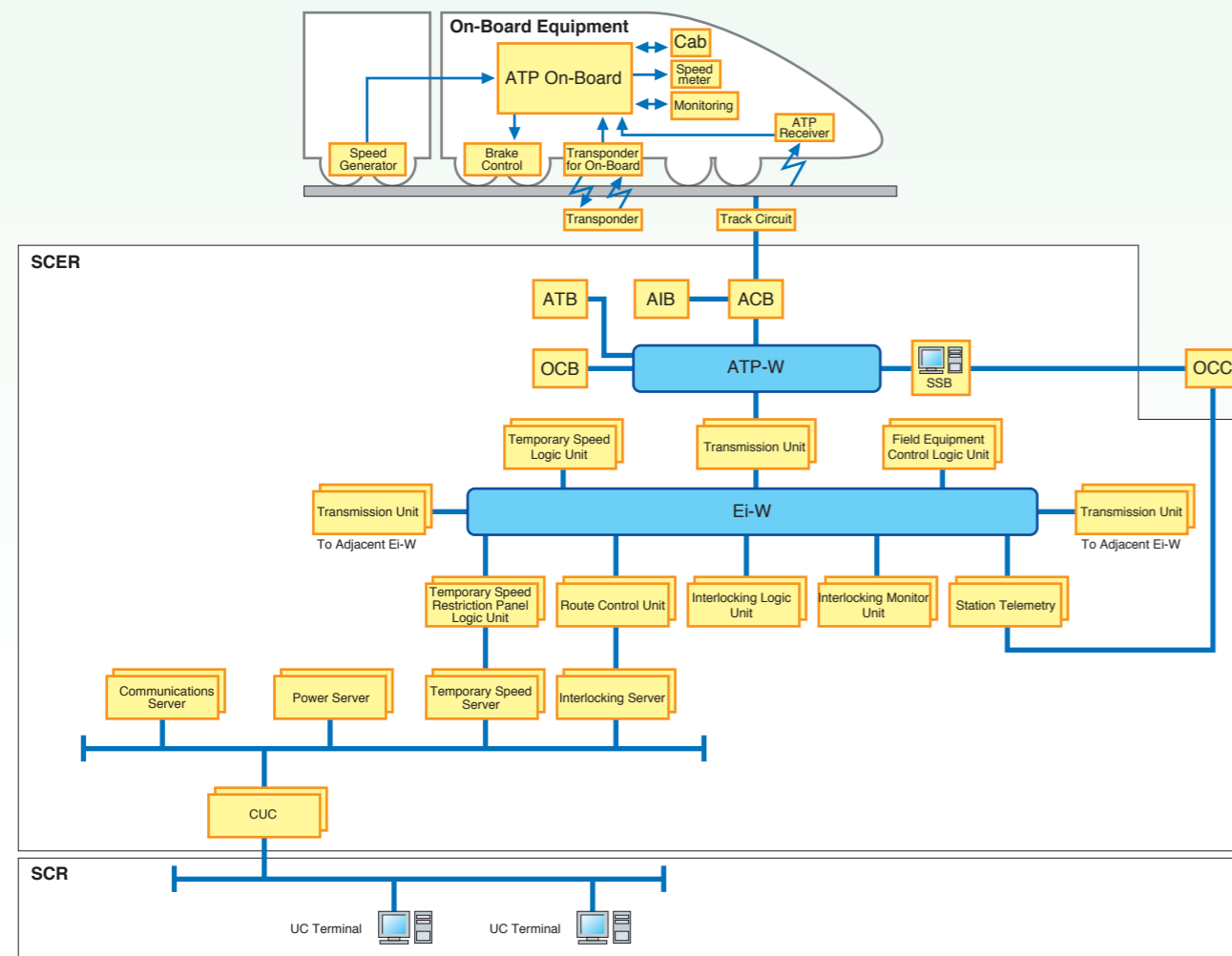
Our transponder provide information to the ATP system to control a number of other functions such as the non-tie feeding, the PSSC (Programmed Station Stop Control) .

Block Diagrams

1. Block Diagrams

The figure shows a schematic view of the THSR signal system, and the table shows specifications of the THSR signal facility function. Subject of wayside equipment is summarizing and accommodating in SCER (Signaling and Communication Equipment Room) or ISCER (Intermediate Signaling and Communication Equipment Room) which sets at intervals of 7 to 10 km in wayside.

Wayside equipment is configured in SSB, ACB and OCB etc. These system are connected by ATP-W (LAN). On-Board equipment is installed in the first car and the last car. Also, interlocking equipment is possible to perform distribution of process load by plural numbers of Ei logic unit at a large-scale station.



- SCER** Signaling and Communication Equipment Room
- SCR** Station Control Room
- Ei-W** Interlocking Wire
- ATP-W** ATP-Wire
- OCC** Operation Control Center
- OCB** 03 Signal Control Logic Bay
- ATB** ATP Translator Bay
- ACB** ATP Signal Control Logic Bay
- AIB** ATP Interface Bay
- SSB** ATP Supervision Bay
- CUC** Common UC Server
- UC** Universal Console

2. Performance

Item		Performance
Regular Signaling System		Bidirectional operation for each track Single-Step Following Control by continuous induction type ATP
Control Patterns	Profile Types	Protection Profile, Driving Profile
	Fluctuate Protection	03 Loop Section or 1 Block Section
	On-Board Distance Correction	On-Board integrational distance correction by non-electric source transponder ground coil for point correction
Location of 03 Facilities		Guarantee Safety Margin Point Section SPAD(Signal Passed At Danger) Protection by Call-On
Types of CAB Signal		Main Route, Shunt Route, Call-On Route
ATP Control	ATP Signal Specification	Ch1 : 575Hz Ch2 : 625Hz
	03 Signal Specification	1305Hz
	Signal Transmission System	Right and Wrong Switching Circuit · Double-rail Track Circuit
Route Control	Maximum Route Number	600 (2 Interlocking Logic Units)
	Station to Station Route Control	Bidirectional Semi-automatic Control (Ei-LAN connects to Adjacent LAN)
Temporary Speed Restriction	Manual	5 levels temporary speed restriction to main track and subsidiary main track
	Automatic	Automatic 0 speed limit : earthquake, landslide, train falling, fallen rock, TSP operation occurs
Train Numbering System	System	On-Board train numbering system (transponder system)
	Loading and Tracking	Receive On-Board train number at source point, after that shift by train tracking till terminal
CTC - LAN		DataTransmission System
OCS Control without Power Supply		Deterrent approaching to no power applied section There are no speed limit in no power applied section
Tie feeding system and control		E/W line non-tie feeding VCB ON/OFF control for E/W line crossing train
Rescue troubled train, Operation at failure section		Operation by Call-On route which is installed all block
Train Shunting		Train Shunting by CAB Signal Shunt Route
Operating Support Function		Automatic Stop Control by PSSC(main station) Door-opening Control
Substitute Protection System	Operating System	Manual Operation based on Fallback Wayside Indicator
	Train Detect	ATP Track Circuit
	Train Protection	Stop Signal SPAD Protection
Main Line-Depot Switching		Manual Switching from ATP to Depot at Transfer Track
Protection System in Depot	Operating System	Fallback Wayside Indicator
	Train Detect	Single Rail Track Circuit 100Hz
	Train Protection	Failure Departure Protection at Stop Signal Terminal Overrun Protection
Interlocking / Temporary Speed Restriction Panel		Universal Console