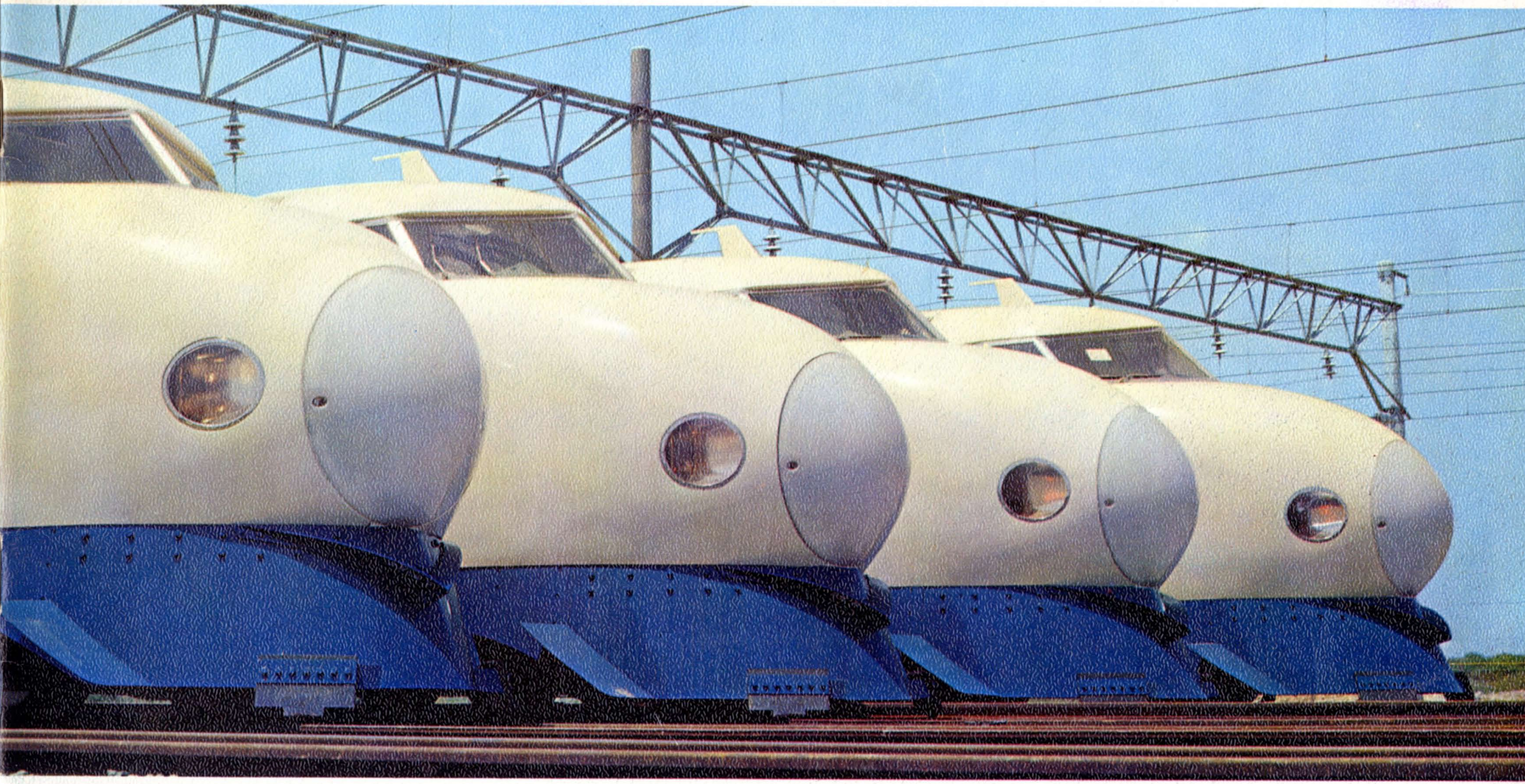
THE NEW TOKAIDO LINE



JAPANESE NATIONAL RAILWAYS

THE NEW TOKAIDO LINE

I. How the New Tokaido Line Came About

Revival of Pre-war Plan for a New Trunk Line

A plan for a standard-gauge "bullet" train to connect Tokyo with Osaka in 4.5 hours, or Tokyo with Shimonoseki in 9 hours, was discussed even before World War II—a 15-year project, to extend from 1940 to 1954. Work actually began on the New Tanna Tunnel, though it had to be suspended because of the war.

The "new trunk line" then dreamed of has now come true, 20 years later, with the debut of super-express trains, named "Hikari" (Light), which operate between Tokyo and Shin-Osaka at a top speed of 200 km/h (125 mph).

This, naturally might not have been realized had it not been for the remarkable post-war growth of the national economy, and a corresponding increase in traffic demand.

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The Tokaido Line, the Main Artery of Japan

The areas lying along the Tokaido Line are the economic and cultural centers of the nation, with 40% of the total population and 70% of the industrial output concentrated in this belt. The old Tokaido Line has naturally been playing a vital role carrying as much as 25% of JNR's total freight and passenger traffic, on its route, which is less than 3 % of the total network. How far, with its limited transport capacity, could it stand the ever increasing traffic—annually increasing at rates of nearly 8% of passengers and 5% of freight, more than the average system-wide rate of increase?

Old Tokaido Line Saturated

To meet this situation, JNR made many improvements so that more trains could be operated, and schedules were increased from 90 to 120 passenger trains and 60 to 70 freight trains, one way, per day. This must be called "excessive" on the basis of the generally accepted maximum of 120 trains one way over a double track such as the Tokaido Line.

On the section between Tokyo and Osaka an expressway is under construction, part of which has already been completed between Nagoya and Kobe. However, traffic increases in the future will mostly be borne by the Tokaido Line, as the shift of traffic from the railway to this expressway is estimated at the most to amount to only 10% of passengers and 5% of freight.

A new double-track railway line along the Tokaido route was thus born out of imperative necessity.

Trend of Traffic Volume on the Tokaido Line

Classification / Year	Passengers carried (in 100 million passenger-km)			Froight carried (in 100 million ton-km)		
	Passenger-km	Index	Ratio to nation-wide haulage	Ton-km	Index	Ratio to nation-wide haulage
1956	233	100	24%	107	100	23 %
1957	241	103	24	110	102	23
1958	254	109	24	103	96	23
1959	279	120	24	112	105	23
1960	309	133	25	123	115	23
1961	335	144	26	136	127	24
1962	362	156	26	131	122	23
1963	390	167	26	134	125	23

Trend of the Number of Trains operated on the Tokaido Line (one way)

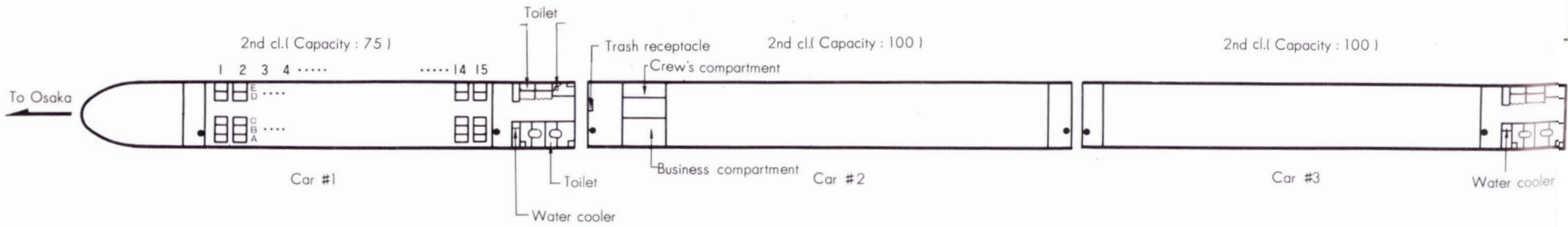
Section		Passenger trains	Freight trains	Total
Kozu-Odawara (One way)	Oct. '56	71	43	114
	„ '57	83	46	129
	„ '58	84	45	129
	„ '59	94	46	140
	„ '60	99	53	152
	„ '61	127	59	186
	„ '62	128	65	193
	Apr. '63	128	65	193
Kusatsu-Kyoto (One way)	Oct. '56	63	56	119
	„ '57	75	56	131
	„ '58	76	54	130
	„ '59	85	59	144
	„ '60	89	63	152
	„ '61	110	66	176
	„ '62	122	76	198
	Apr. '63	122	76	198

Present Status of the Tokaido Route

	Area	Population (October 1, 1962)	Income Distribution (1961)	Value of Manufactured Goods transported (1962)
	(in km^2)	(in thousands)	(in thousand million yen)	(in thousand million yen)
Nation-wide	369,082	95,178	14,196.4	17,662.8
Tokaido route	61,082	42,345	8,227.3	12,407.7
Ratio	16.5 %	44.5 %	56.6 %	70.2 %

II. Services on the New Tokaido Line

● Denotes location of a railway map.



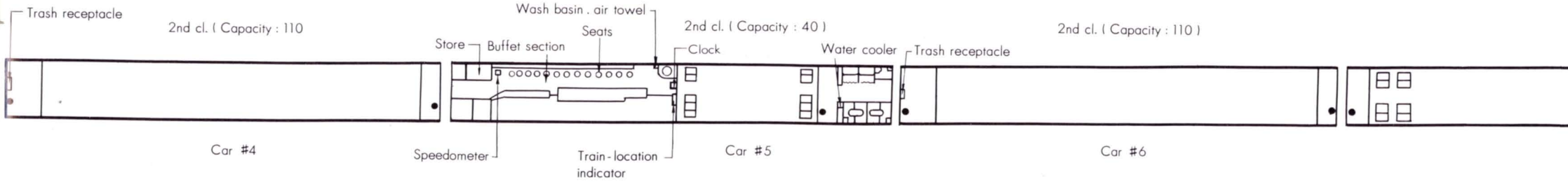
Transport Capacity to Increase Radically

Initially the New Tokaido Line can carry, together with the old line, approximately 56,000 passengers a day, representing an increase of 16,000 passengers, or 40% more than before.

The seating capacity of each train on the new standard-gauge line is 987, including both 1st and 2nd classes, as against 618 in the "Tsubame-type" limited express on the old line, which shows an increase of 60%.

Comparison of Seating Capacity

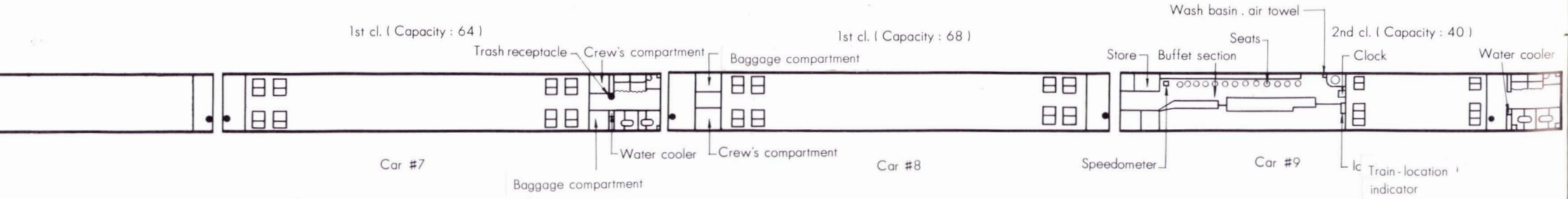
	Super-express or limited express on the new line.	Tsubame-type limited express on the old line.
1st class	132 seats (13%)	174 seats (28%)
2nd class	855 seats (87%)	444 seats (72%)
Total	987 seats (100%)	618 seats (100%)



Passenger Service

In the initial stage of operation, passenger trains only—super expresses and limited expresses-will be in service. The Tokyo-Osaka route, 515 km (320 miles), will be covered in 4 hours by the super express trains which stop at two points Nagoya and Kyoto, and in 5 hours by the limited express train which stops at all 10 intermediate stations.

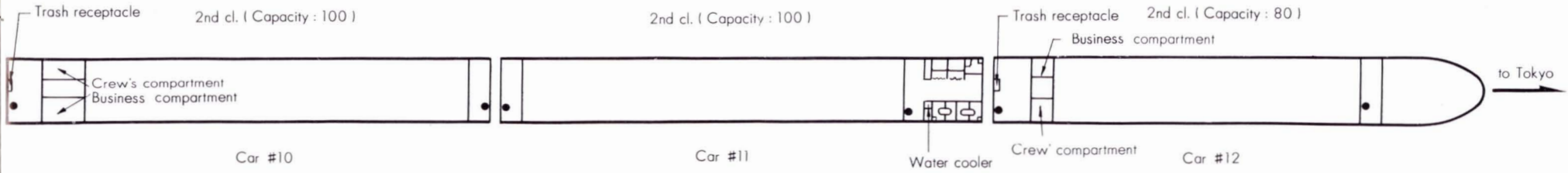
As the roadbed of the new line settles down, the running time will be shortened to 3 and 4 hours respectively.



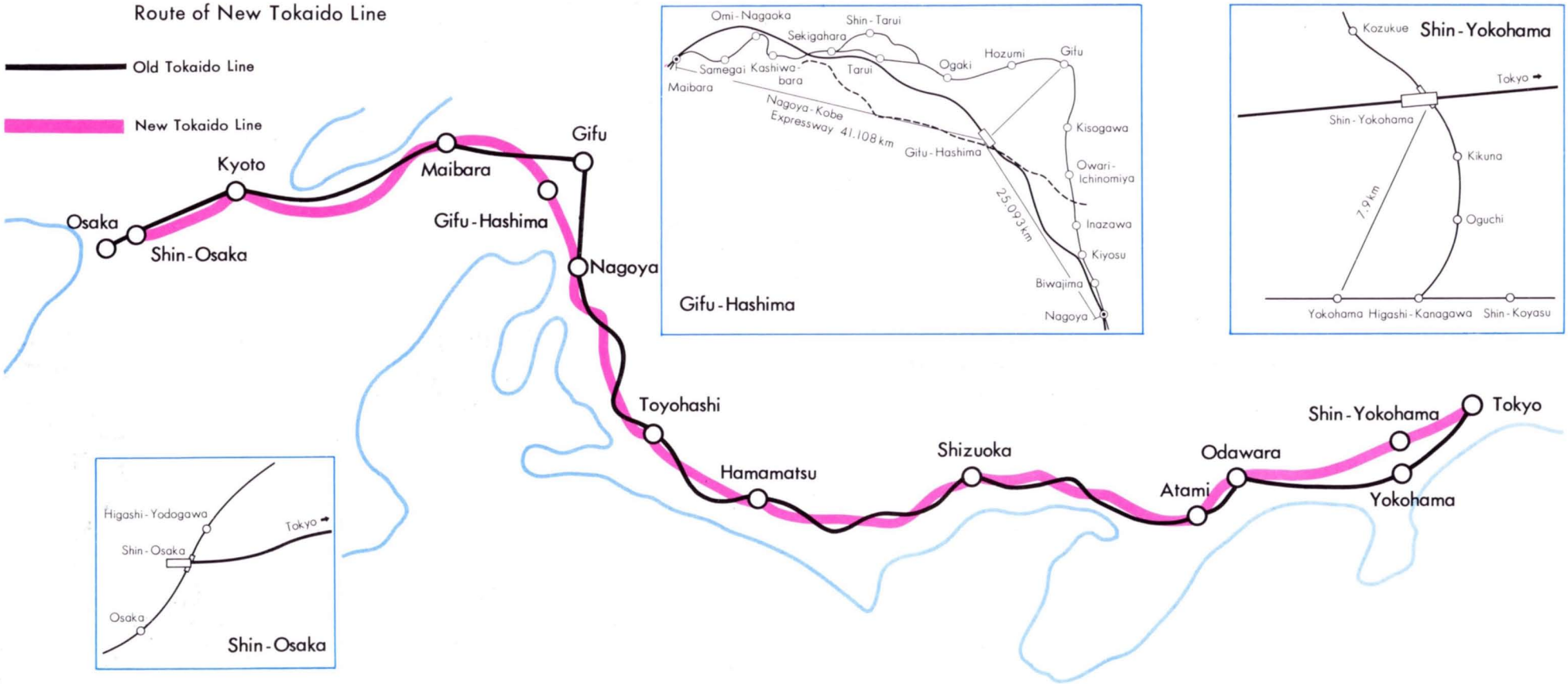
Starting Point of the New Tokaido Lines, of Tokyo Station

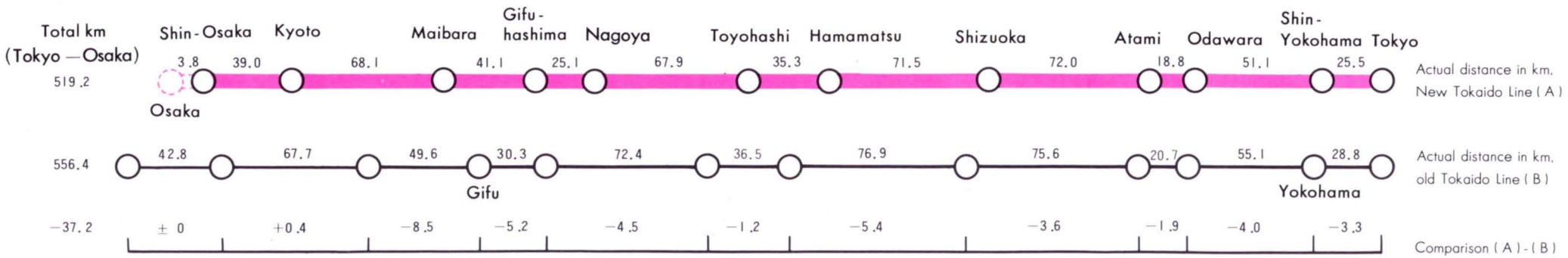
Fare and Charge

Basic fares on the new line are the same as on the old line. Limited express charges, are classified as A, B, and C according to the train-running time. Class A is for trains which run between Tokyo and Shin-Osaka in 3 hours, class B in 4 hours and the C in 5 hours; hence, for the time being only, Class B and Class C charges are applicable (Refer to Tables of Fares & Charges on page 24).



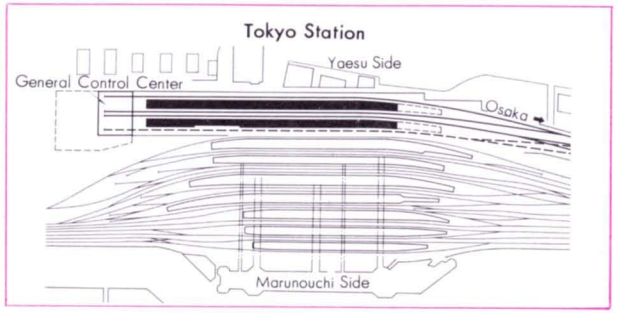
Route of New Tokaido Line

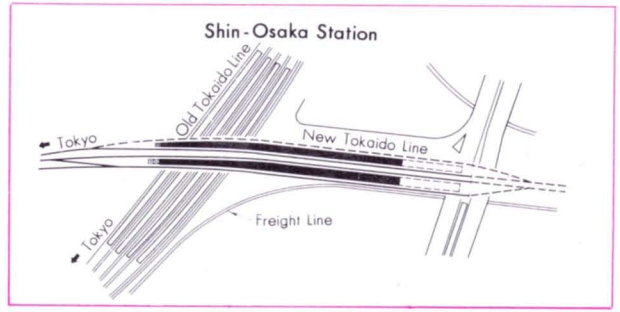




Comparison of distance between stations on two lines, old and new

(The figures shown on the old line represent fare-calculating kilo-meterage.)





Sale of Limited Express Tickets

For passengers traveling on the New Tokaido Line, two kinds of tickets,the basic fare ticket and the limited express ticket, are required, regardless of whether they take the Super Express Hikari or the Limited Express Kodama.

The limited express tickets, as in the case of the old line, are sold three weeks in advance at the offices of the Japan Travel Bureau and Nippon Travel Agency, and one week in advance at any JNR station.

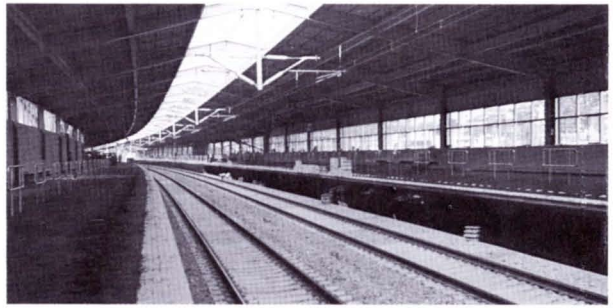
Tokyo Station

Shin-Yokohama Station

Odawara Station

Stations

Atami Station

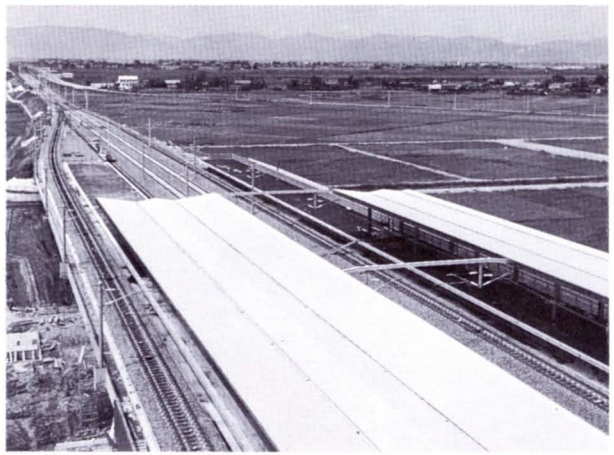


Shizuoka Station

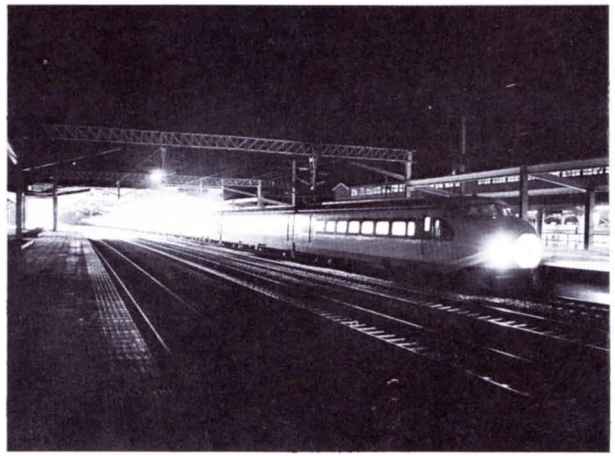
There are 12 stations in all on the New Tokaido Line, including the two terminals of Tokyo and Shin-Osaka. The intermediate stations are Shin-Yokohama, Odawara, Atami, Shizuoka, Hamamatsu, Toyohashi, Nagoya, Gifu-Hashima, Maibara and Kyoto.

Stations, other than Shin-Yokohama, Gifu-Hashima and Shin-Osaka, are located adjacent to the stations on the old line. Even though Shin-Osaka station is not adjacent to Osaka Station it is on the old line and has convenient facilities for interchange of passengers between the new and the old lines. Escalators have been installed at Tokyo, Atami, Nagoya, Kyoto and Shin-Osaka stations. Information boards, ticket windows and gates (wickets), and even ash trays have all been made to an uniform design, and can be easily distinguished from those of the old line.

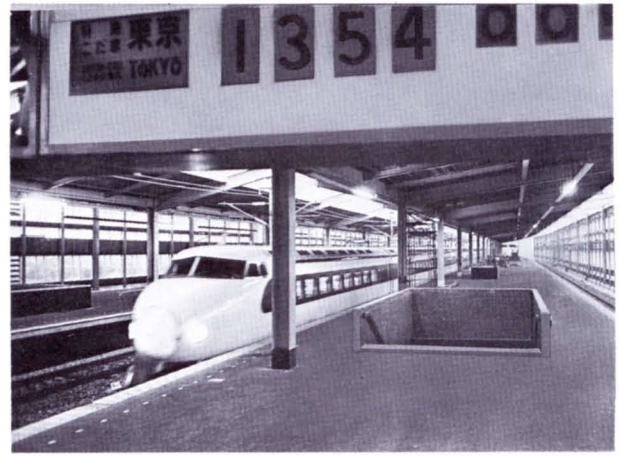
Gifu-Hashima Station



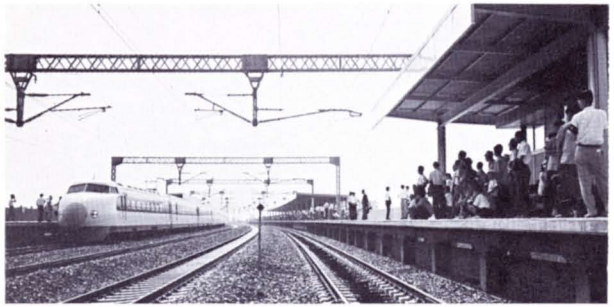
Maibara Station



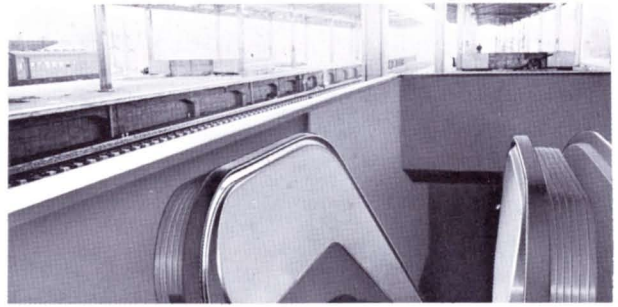
Kyoto Station



Hamamatsu Station



Escalator at Nagoya Station



Nagoya Station

Shin-Osaka Station

Station Names and Locations

Station	Location	Track
Tokyo	Added to the existing station with connecting passages to the old station.	Elevated
Shin-Yokohama	Newly built between Kikuna and Kozukue, with an overpass to connect with a new station built on the Yokohama Line.	"
Odawara	Added to the west side of the old station. Connection is made by an underpass.	"
Atami	"	"
Shizuoka	Added to the south side of the old station building, and connection is made by an overpass.	"
Hamamatsu	On the south side of the old station. connected by an overpass.	"

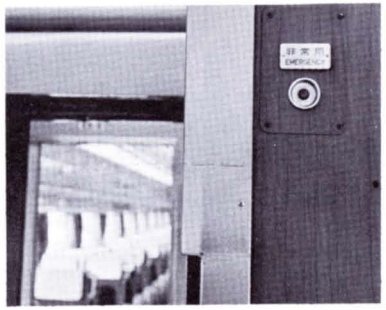
Station	Location	Track
Toyohashi	On the south side of the old station. connected by an overpass.	Ground level
Nagoya	Built on the west side of the old station, connected by underpasses.	Elevated
Gifu-Hashima	Newly built in Hashima City.	"
Maibara	On the Lake Biwa side of the old station, connected by an overpass.	Ground level
Kyoto	On the south side of the existing station, connected by an overpass.	Elevated
Shin-Osaka	Newly built between Higashi-Yodogawa and Osaka to serve both the old and the new line. Three storied, with a concourse provided on the second floor for connection between the old and new line.	"

Accommodation

All trains—super expresses and limited expresses—consist of 12 coaches, two 1st-class and ten 2nd-class, of which two are of buffet-passenger combination type. Since the new standard-gauge track is about 37 cm (14 in.) broader, railcars are 42 cm (16 in.) wider, 10 cm (2 in.) higher and 5 m (16.5 ft.) longer than those of limited express trains on other lines.

Cars are all air-conditioned and made sufficiently air-tight for protection against sudden changes in air pressure inside cars when entering tunnels at high speed.

Three-Face Mirror in Toilet



Emergency Bell

Wash Basin & Air Towel

III. Fixed Installations and Rolling Stock

Fixed Installations

Principal Tunnels

Tunnels (over 2 km)		Tunnels (over 2 km)	
Name	Length (m)	Name	Length (m)
Shin-Tanna	7,959	Makinohara	2,917
Nangoyama	5,170	Sekigahara	2,810
Otohayama	5,008	Nihonzaka	2,198
Kambara	4,934	Sakanosaka	2,713
Yui	3,993	Higashiyama	2,094
Izumigoe	3,193	Okitsu	2,023

Principal Bridges

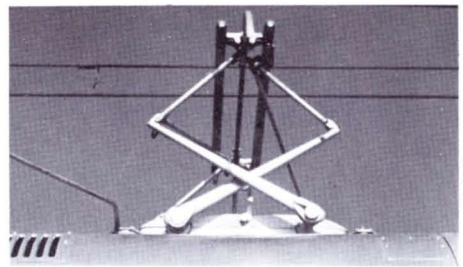
Bridges		Bridges	
Name	Length (m)	Name	Length (m)
Fujigawa	1,373	Sagamigawa	668
Kisogawa	1,001	Abekawa	595
Oigawa	987	Nagaragawa	571
Tenryugawa	901	Hamana No. 3	505
Yasugawa	748	Ibigawa	489

In supporting large-type rails of a new design, prestressed concrete sleepers are used. Rails are welded together into lengths of 1.500 m (about one mile). These rails are again joined together by expansion joints, which are designed for smooth riding.

The roadbed is, for the major part, an embankment or bridge-type elevated structure, so as to keep the railway line on a separate level from roads, waterways or other railway lines. There is not one grade crossing on the entire route.

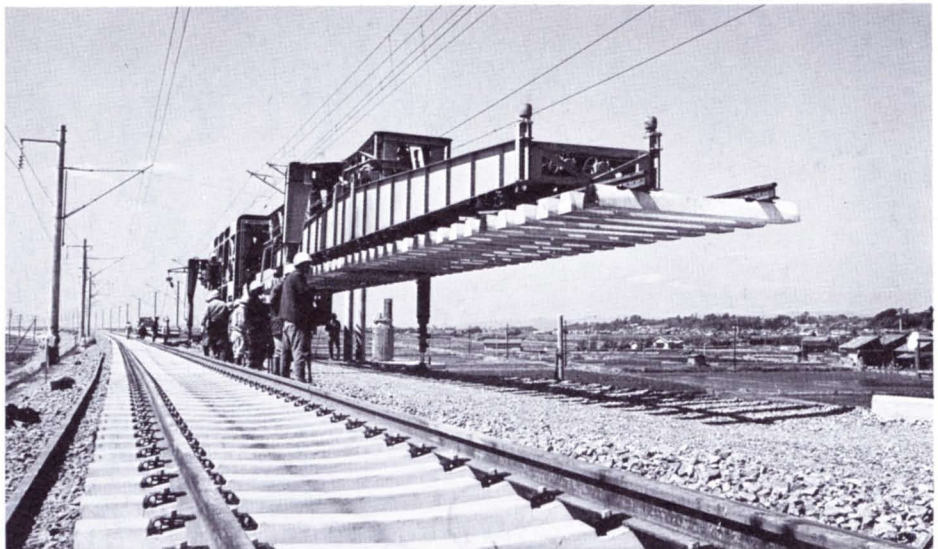
The longest tunnel is the New Tanna Tunnel which is 7,959 m in length. This tunnel was completed in 4½ years, making a striking contrast with the old Tanna Tunnel which took as long as 16 years to complete.

The longest bridge on the new line is the Fujigawa Bridge (1,374 m long), 145 m longer than the Aganogawa Bridge (1,229 m long) on the Uetsu Line, which used to be the longest of all the JNR bridges.



Pantograph

Scene of Rail Laying



Roadbed and Track

Elevated track structure	Aggregate length: About 103.8 km, (64 miles) excluding station structures.
Bridges (over 100 m)	About 21 km (13 miles) in aggregate total length.
Tunnels	About 68.2 km (42 miles) in aggregate total length.
Gauge	Standard gauge of 1,435 mm (4' 8½")
Rail weight	53.3 kg/m.
Rail length	1,500 m or about 1 mile (long welded rail)
Sleepers	Prestressed concrete sleepers.
Rail fastening	Double elastic fastening.
Turnouts	Movable nose turnout (Permissible speeds are 200 km/h when going straight and 70 km/h when diverging).
Radius of curvature (standard)	2,500 m (0.7 degree) minimum.
Maximum cant	200 mm. (6 in)
Maximum grade	150 ‰ (20/1,000 is permitted if the grade section is less than 1,000 m in length).
Center-to-center distance between tracks except in yards	4,200 mm. (13 ft)

Electric Installations

Traction system	25 kV a.c. at 60 cps.
Height of contact wire (standard)	5,000 mm ± 100 mm above roil surf ace.
Catenary	Compound catenary with composite wire adjuster.
Support	Concrete poles and steel pipe poles with cantilever brackets.
Substation	25 places. Total capacity 30,000 kVA. Substations are unmanned and are remote-controlled from Tokyo.

Rolling Stock

Data on Rolling Stock

Color:
Outsides are two-tone, ivory white and blue. Inside, golden yellow for 1st class and silvery gray for 2nd class coaches.

Seat arrangement:
1st class····· 2 reclining seats in a row on each side with an aisle inbetween.
2nd class·····Reversible seats, 2 on one side and 3 on the other, with an aisle inbetween.

Seating capacity:
1st class····· Averaging 64.
2nd class·····Averaging 100.

Size of car:
Length 25 m × height 3.98 × width 3.38 m.

Truck:
High-speed 2-axle bogie.

Weight:
About 60 tons with passengers loaded to full seating capacity.

Power output:
8,160 kW for the 12-coach train.

Electric system:
Two permanently coupled cars form one electrical unit.
Silicon rectifiers and DC traction motors.

Operation system:
A.T.C (Automatic Train Control) and C.T.C (Centralized Traffic Control) combined.

Brakes:
Dynamic brake for speeds above 50km and disc brake for lower speeds.

Principal equipment:
Main transformer ··· 1,550 kVA.
Silicon rectifier····· 1,627 kW.
Traction motor····· output 170 kW.
voltage 415 V.
current 450 A.
revolution 2,200 rpm.

Other features :
Cars are all air-conditioned. Windows are fixed. Toilet and washroom facilities are installed in each two-car unit, equipped with a tank to store contents until arrival at a depot.

The railcars for the New Tokaido Line are equipped with large-sized traction motors on all axles.

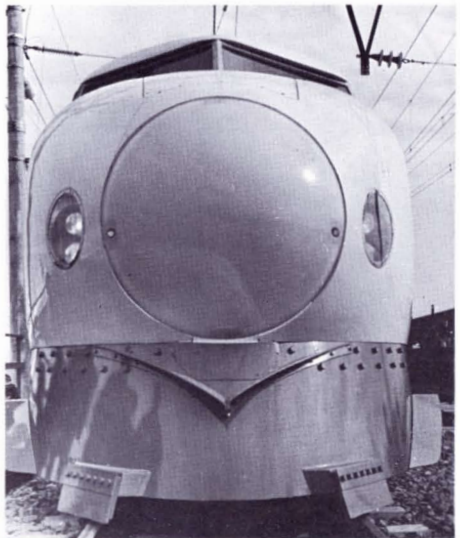
Electric current of 25 kV a.c. at 60 cps which is collected from the trolley wire by the pantographs is stepped down to 1.5 kV or less by main transformer and converted into d.c. by silicon rectifiers.

Since the new line is standard-gauge, cars are wider than those of the old line. They are 5 m (16 ft) longer. Each train consisting of 12 coaches is 300 m. (about 330 yards).

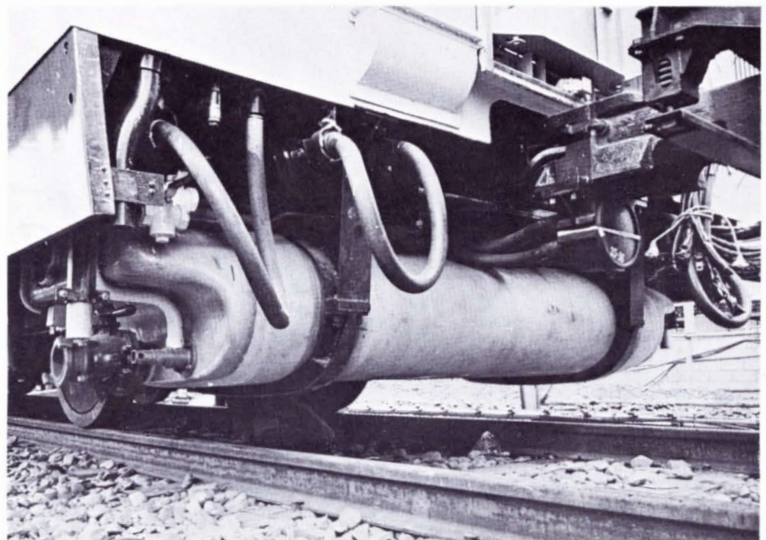
Both ends of the train are streamlined so as to reduce air resistance; the nose, ball-shaped acrylic plastic, glimmers with light from the head lamps fitted on both sides. In the space under the motorman's cab are housed the receiver of the ATC system, train radio equipment, air-conditioning apparatus, and other devices.

A toilet and a washroom are installed on every other car. Filth or flushed water is contained in the receptacle under the floor and dumped out at the depot. This system of night-soil disposal adopted on the New Tokaido Line trains is the first of its kind in the world.

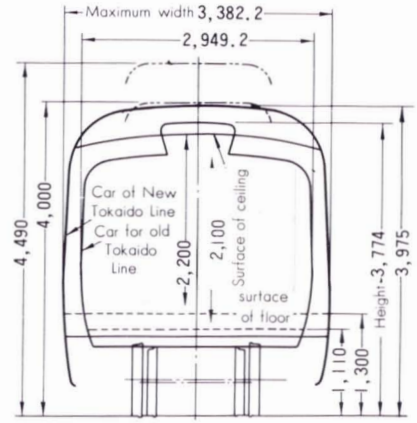
Ball-Shaped Nose of Train



Discharge Tank



Comparison of Cross-section of car body



IV. Safety Precautions

Truck (bogie)

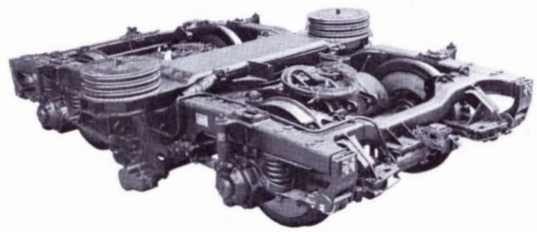
In the construction of the New Tokaido Line, the best of Japan's technology and JNR's experience were fully utilized. In Consequently, it has been made quite feasible to run trains even at 250 km/h (159 mph). However, actual scheduled speed is held down to 200 km/h (125 mph) at the maximum so as to provide a sufficient margin of safety. It is needless to say that safety is guaranteed in all aspects of rolling stock, track and electric installations.

The primary requisite for a train to run at extra high speeds with great stability is that both the rolling stock and track must be capable of withstanding such high-speed operation. The train might be derailed if the quality of car bogies were poor.

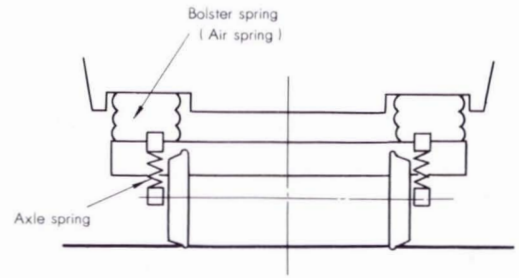
The truck used for New Tokaido Line trains has been developed by the JNR's Technical Research Institute after exhaustive research and experiments on prototype models.

Unlike the conventional type of trucks used for the older limited express electric railcars, it is a 2-axle truck without swing bolster and is constructed in such a way as to directly support the air-springs and car body. This construction shows good performance especially against lateral vibrations.

Truck ---



Structure of Truck

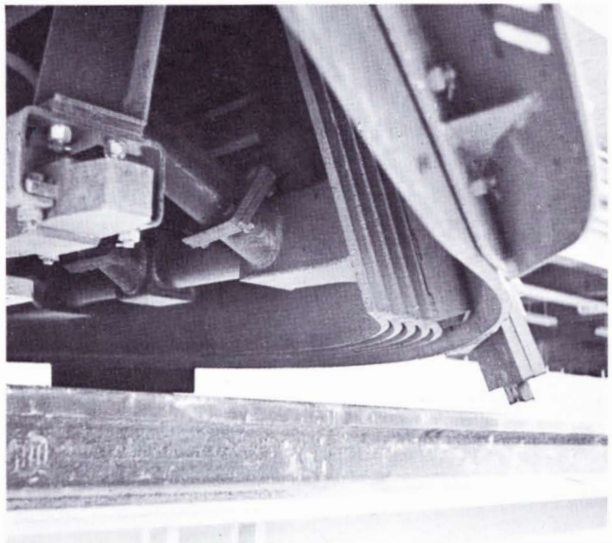


Train-end Protector

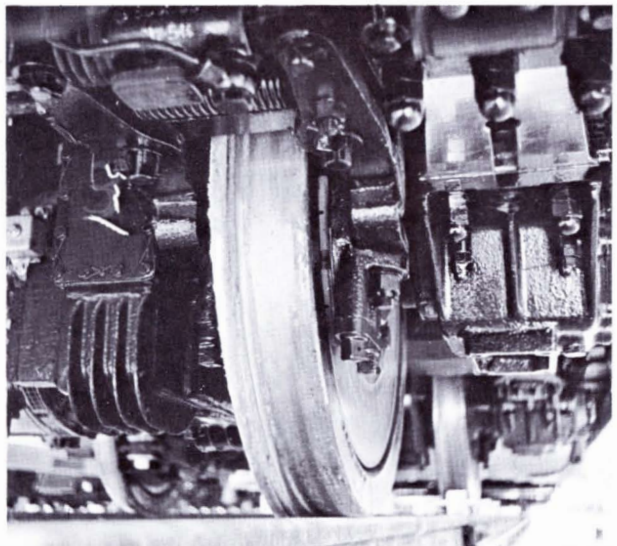
To ensure safety against any obstacles on the rail, a strong protector of 3-fold construction is attached, at both ends of each train. The first is a skirt made of steel plate as thick as 16 mm, encircling the front lower part of the car. The second is a guard made of special rubber, attached to the tip of the skirt above the rail face, and then finally an armor of 5-layer steel plates, each 16 mm (0.6 in.) thick, is installed to line the skirt. The truck is equipped, in addition, with a pair of life guards to knock off smaller obstacles which the armor inside the skirt might miss.

The dynamic brake functions at speeds above 50 km/h (30mph), and when the speed of a train is reduced to 50 km/h the air brake is made to act automatically. The brake system is so arranged that even if the dynamic brake should fail the air brake will function automatically.

Train-end Protector



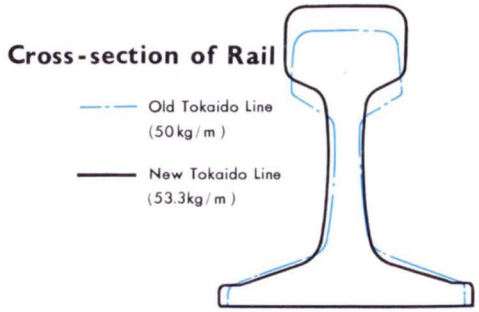
Disc Brake

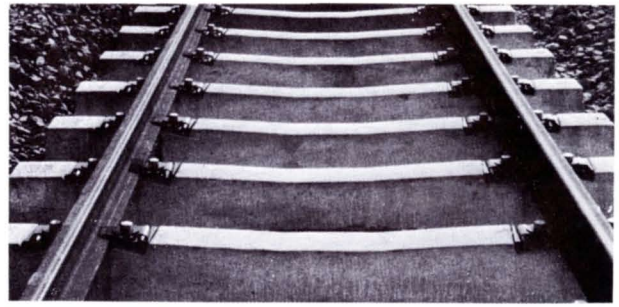


Radio Telephone installed in Motorman's Cab

Rail

Cross-section of Rail





Spring Clip of Rail Fastening Device

Rail of a new cross section, heavier than the conventional one, was adopted to provide strength sufficient to withstand high speed and to maintain safety. Rails are welded into long rails to eliminate rail joints where rail breakage is apt to occur, and to improve the riding quality.

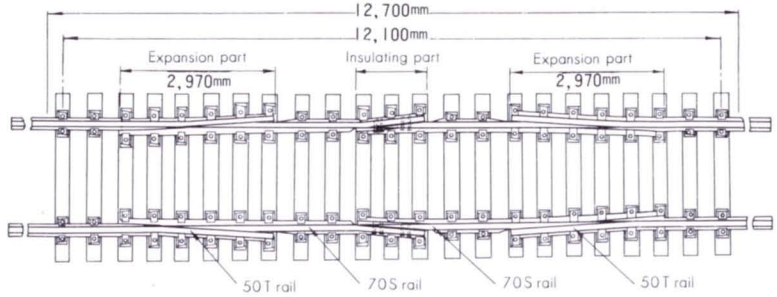
A new movable-nose turnout is used in order for trains to pass through at 200 km/h.

Fastening of the sleeper and rail is by a double-elastic system. Under this system, a spring and a clip hold the rail to the sleeper and a rubber pad is applied between them, to absorb car vibrations and to reduce strain on the track.

Crossing with Morable Nose

Expansion Joint

Expansion joint equipped with insulating joint

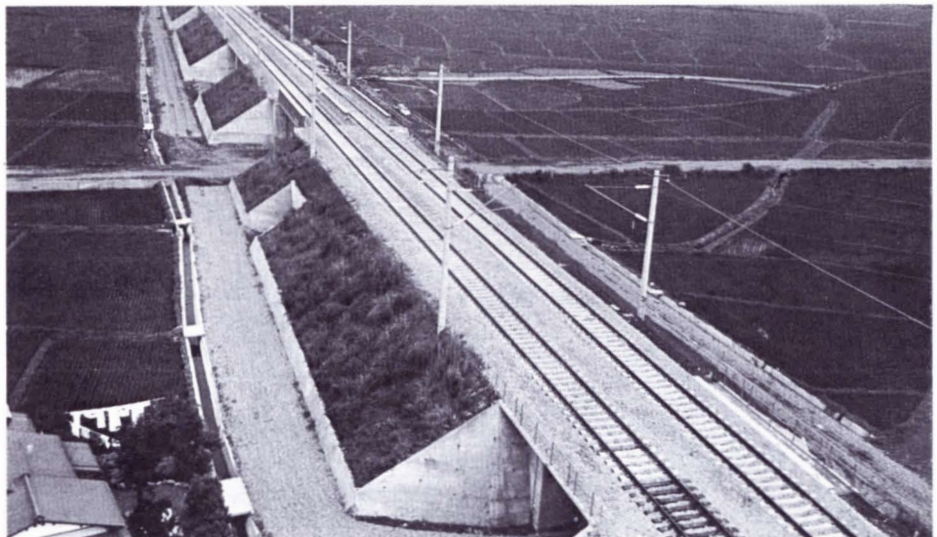


Grade Separation

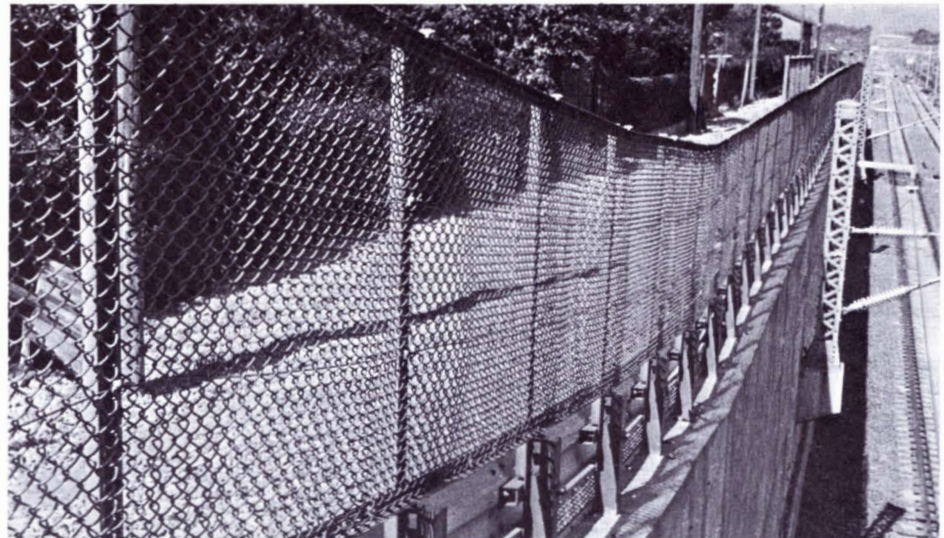
Crossings with highways, waterways and other railway lines are on separate levels, and grade crossings are completely eliminated.

To prevent automobiles from dropping down onto the track or from bumping against supports on the New Tokaido Line, protective fences and protective banking are installed. As to the problem of tresspassers on the track, protective fences are also installed wherever necessary.

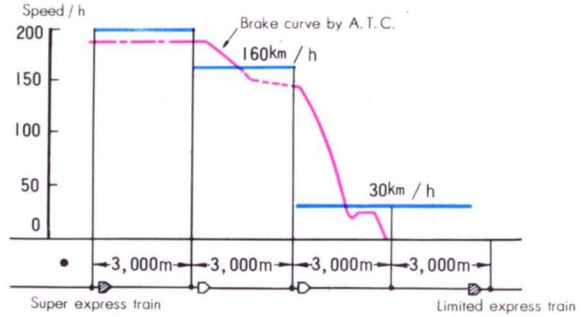
Grade Separation



Track Protection Fence



Safety Devices for Train Operation



The bold lines indicate the speeds whose signal is displayed in the motorman's cab.

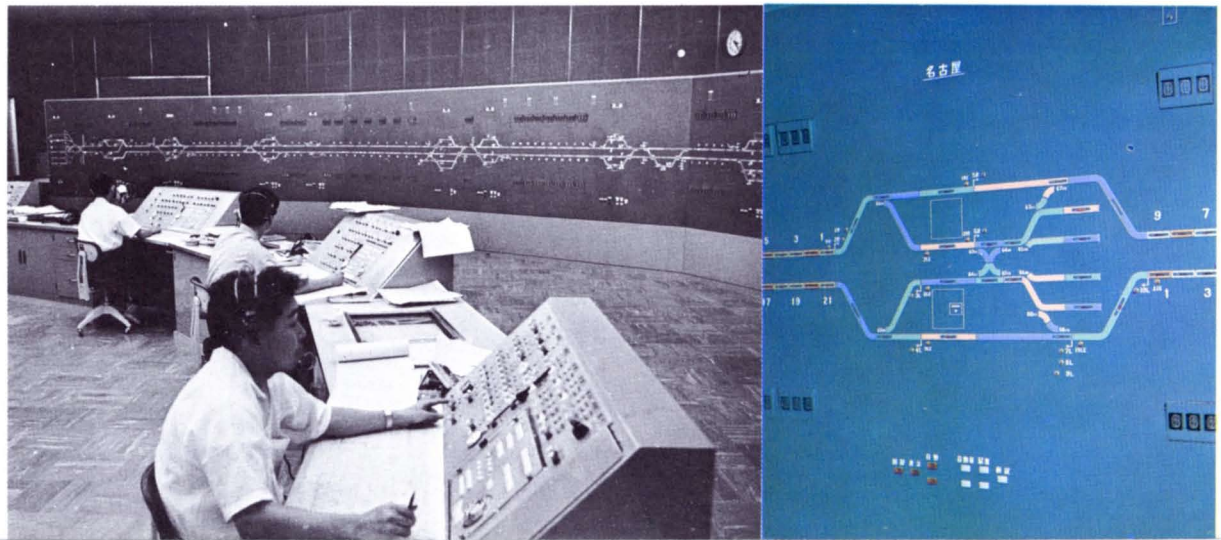
Safety of trains operation is guaranteed by A. T. C. (Automatic Train Control) and C.T.C. (Centralized Traffic Control) devices, in which the latest electronic techniques are fully utilized.

The conventional system, where it is required to keep a constant watch on wayside signals, has been abandoned, and the new line uses cab signals combined with the brake system for automatic operation. Brakes are automatically applied or released according to whether the train speed is higher or lower than the speed indicated by the signal.
Thus accidents due to misreading of signal indications or carelessness on the part of a motorman can now be eliminated.

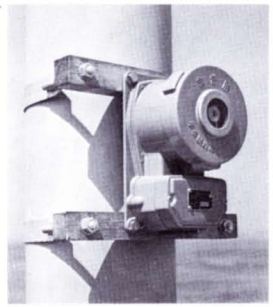
To maintain a smooth and efficient flow of traffic on the line, an indication board through which the locations of trains over the entire line can be seen at a glance is installed in the train dispatch room of the General Control Center at Tokyo Station. Here, movement of all trains can be watched. By means of the radio telephone system, any train on the entire line can be contacted simultaneously or individually for necessary instructions. Switches at all stations can be thrown by handling levers on the operation panel installed in front of the indication board.

A.T.C Equipment in Motorman's Cab

C.T.C Equipment of General Control Center



Other Safety Measures



Emergency Switch Installed along Track

Telephone for Emergency Call

In order to obtain the best effect of safe train operation, other steps, were also taken to protect against all possible troubles.

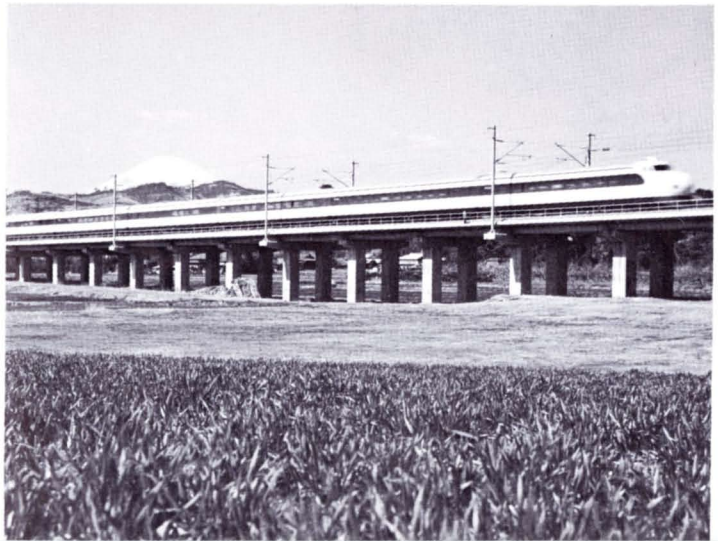
For instance, to protect the train from natural calamities such as floods, an adequate margin has been given in designing the structures against the maximum flood level reached in the past, and flood openings are installed at places considered necessary.

Against storm disasters, anemometers are installed at 24 places over the entire line noted for strong winds. Also installed is a device that send an alarm signal to the control center in Tokyo in case the wind velocity exceeds a certain limit.

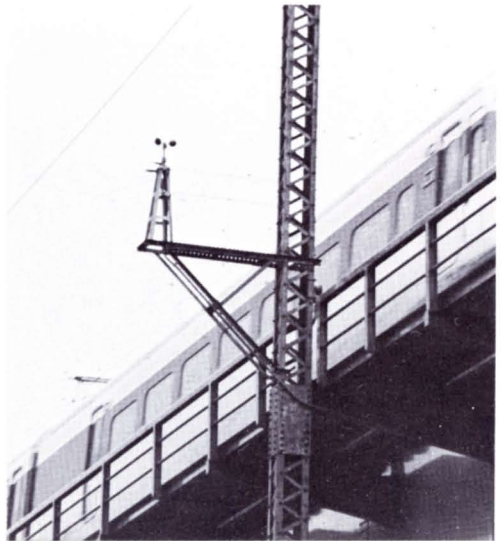
A close watch is maintained on the track throughout the entire line. Furthermore, in case of an emergency any one can push buttons of switches installed at very short intervals along the line. With this, the power goes off in the affected section, automatically bringing trains to a stop.

Maintenance and inspection of tracks is performed by means of a high-speed track inspection car which is capable of carrying out measurement of track conditions while running at 200 km/h.

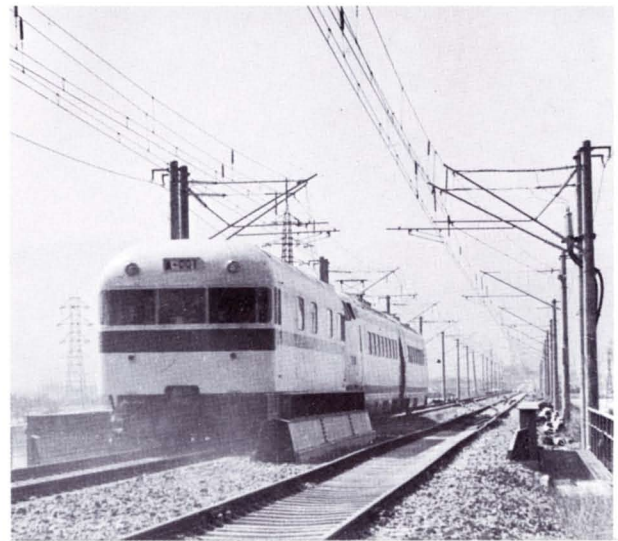
Bridge over Flood Opening



Wayside Anemometer



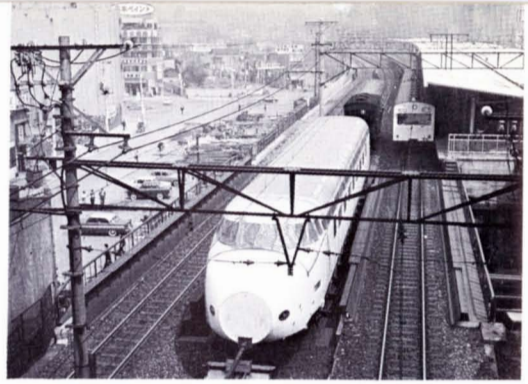
High-Speed Track Inspection Car



V. Chronology

Ground Breaking Ceremony Held at the East Portal of New Tanna Tunnel (April 20, 1959)

Signing Loan Contact at the International Bank for Reconstruction and Development (May 2, 1961)



Prototype Car is brought to the Test-Run Section (April 16, 1962)

May 10, 1956 Commitee for Increase of Traffic Capacity of Tokaido Line was established at JNR Head Office.

August 30, 1957 By the decision of the Cabinet, the JNR Trunk Line Investigation Commitee was established to investigate and deliberate on matters needed for the increase of transport capacity on the Tokaido and other main lines and for modernization of transport patterns on those lines. The Committee consisted of 34 members.

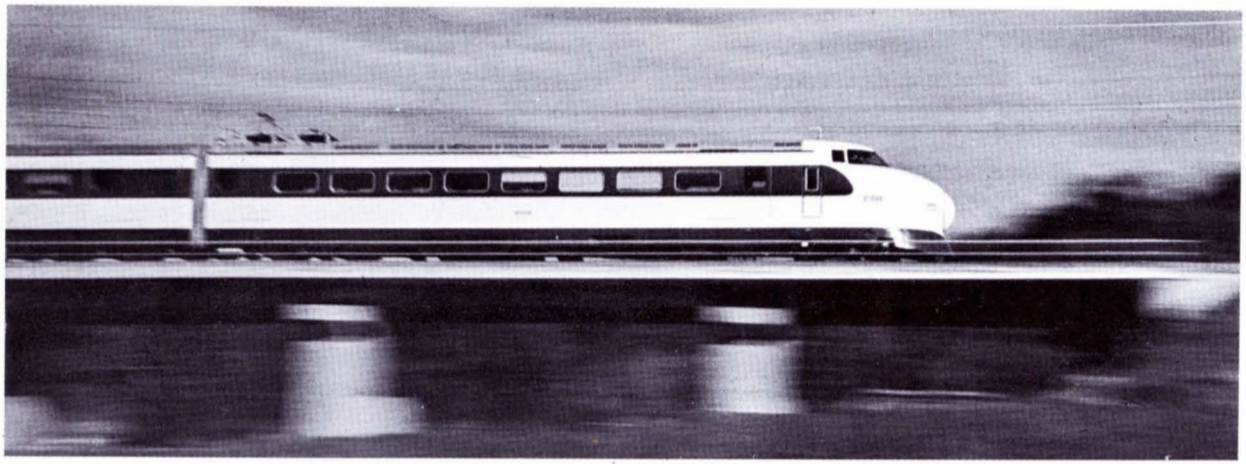
July 7, 1958 Chairman of the Trunk Line Investigation Committee submitted its final report to the Minister of Transportation to the effect that the Government and the JNR should decide and make efforts to strongly push ahead the construction of the New Tokaido Line in preference to all other projects.

April 20, 1959 Ground breaking ceremony for the New Tokaido Line held at the east portal of the New Tanna Tunnel.

May 5, 1960 The mission of the International Bank for Reconstruction and Development came to Japan to investigate economic and technical problems related to the construction of the New Tokaido Line.

May 2, 1961 Contract was signed at the International Bank for Reconstruction and Development (World Bank) in Washington for a loan of $80 million (28.8 thousand million yen).

October 18, 1961 The entire route between Tokyo and Osaka was decided.



200km/h Run was recorded for the first time (October 31, 1962)

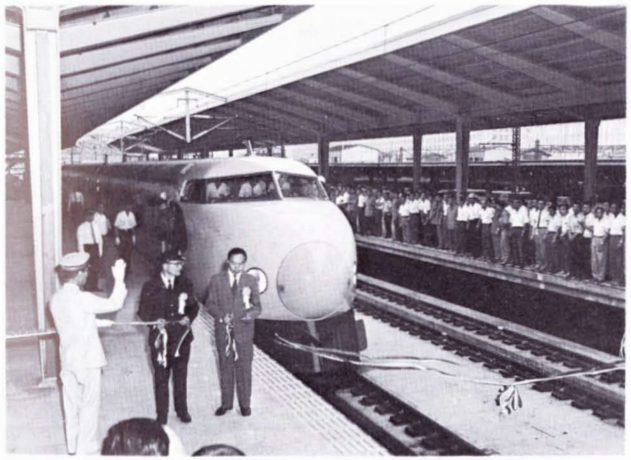
Rail Laying Completed (July 1, 1964)

Test Run, with Ex-president Sogo attending (June 23, 1962)

Construction of New Tanna Tunnel under Way

Both Headings of New Tanna Tunnel Meet (September 20, 1962)

April 16, 1962	First prototype car was completed.
June 23, 1962	Test runs were commenced on the Test-Run Section.
October 31, 1962	The prototype train on the Test-Run Section of the New Tokaido Line established a record speed of 200 km / h.
March 30, 1963	The prototype train on the Test-Run Section made a record speed of 256 km / h.
March 2, 1964	The test run of a 6-car train for commercial service was commenced and a record of 210 km/h was made.
July 1, 1964	Track laying was completed for the entire line (515.4km).
July 25, 1964	Test runs were commenced over the entire route.
August 25, 1964	A test run of a super-express was carried out with success, linking Tokyo and Shin-Osaka in four hours.
October 1, 1964	The New Tokaido Line was officially opened to traffic.



Train for Commercial Service Appears at Tokyo Station (July 15, 1964)

Full-length Test Run Started (August 25, 1964)

The Entire Route Covered in 4 Hours (August 25, 1964)

Connecting Trains Between New & Old Tokaido Lines

SPX : Super Express Train　　LEX : Limited Express Train　　EXP : Express Train　　S E : Semi-Express Train

R (cup symbol) : Applicable to all New Tokaido Line trains.

Kms.	New Tokaido Line	LEX Kodama (205)	LEX Kodama (207)	SPX Hikari (1)	LEX Kodama (101)	SPX Hikari (3)	LEX Kodama (103)	SPX Hikari (5)	LEX Kodama (105)	SPX Hikari (7)	LEX Kodama (107)	SPX Hikari (9)	SPX Hikari (11)	LEX Kodama (109)	LEX Kodama (111)	SPX Hikari (13)	LEX Kodama (113)	SPX Hikari (15)	LEX Kodama (115)	SPX Hikari (17)	LEX Kodama (117)	SPX Hikari (19)	LEX Kodama (119)	SPX Hikari (21)			LEX Kodama (121)	SPX Hikari (23)	LEX Kodama (123)	SPX Hikari (25)	SPX Hikari (21)	LEX Kodama (201)	LEX Kodama (203)
0.0	TOKYO Lv	...	...	600	630	700	730	800	830	900	930	1000	1100	1130	1230	1300	1330	1400	1430	1500	1530	1600	1630	1700	...	...	1730	1800	1830	1900	2000	2030	2130
28.8	SHIN-YOKOHAMA 〃	...	...	↓	649	↓	749	↓	849	↓	949	↓	↓	1149	1249	↓	1349	↓	1449	↓	1549	↓	1649	↓	...	...	1749	↓	1849	↓	↓	2049	2149
83.9	ODAWARA 〃	...	...	↓	715	↓	815	↓	915	↓	1015	↓	↓	1215	1315	↓	1415	↓	1515	↓	1615	↓	1715	↓	...	...	1815	↓	1915	↓	↓	2115	2215
104.6	ATAMI 〃	...	...	↓	728	↓	828	↓	928	↓	1028	↓	↓	1228	1328	↓	1428	↓	1528	↓	1628	↓	1728	↓	...	...	1828	↓	1928	↓	↓	2128	2228
180.2	SHIZUOKA 〃	...	705	↓	805	↓	905	↓	1005	↓	1105	↓	↓	1305	1405	↓	1505	↓	1605	↓	1705	↓	1805	↓	...	...	1905	↓	2005	↓	↓	2205	2303
257.1	HAMAMATSU 〃	...	747	↓	847	↓	947	↓	1047	↓	1147	↓	↓	1343	1447	↓	1547	↓	1647	↓	1747	↓	1847	↓	...	...	1947	↓	2047	↓	↓	2243	...
293.6	TOYOHASHI 〃	...	809	↓	909	↓	1009	↓	1109	↓	1209	↓	↓	1405	1509	↓	1609	↓	1709	↓	1809	↓	1909	↓	...	...	2009	↓	2109	↓	↓	2305	...
366.0	NAGOYA 〃	745	845	829	945	929	1045	1029	1145	1129	1245	1229	1329	1442	1545	1529	1645	1629	1745	1729	1845	1829	1945	1929	...	...	2045	2029	2145	2129	2229	2338	...
396.3	GIFU-HASHIMA 〃	802	902	↓	1002	↓	1102	↓	1202	↓	1302	↓	↓	1500	1602	↓	1702	↓	1802	↓	1902	↓	2002	↓	...	...	2102	↓	2202	↓	↓	...	...
445.9	MAIBARA 〃	829	929	↓	1029	↓	1129	↓	1229	↓	1329	↓	↓	1528	1629	↓	1729	↓	1829	↓	1929	↓	2029	↓	...	...	2129	↓	2229	↓	↓	...	...
513.6	KYOTO 〃	905	1005	936	1105	1036	1205	1136	1305	1236	1405	1336	1436	1605	1705	1636	1805	1736	1905	1836	2005	1936	2105	2036	...	...	2205	2136	2305	2236	2336	...	...
552.6	SHIN-OSAKA Ar	930	1030	1000	1130	1100	1230	1200	1330	1300	1430	1400	1500	1630	1730	1700	1830	1800	1930	1900	2030	2000	2130	2100	...	...	2230	2200	2330	2300	2400	...	...

For train connection — Time required between Shin-Osaka & Osaka Stations (platform to platform): About 40 minutes.

Kms.		LEX 3 Midori	EXP 901 Daisen	EXP 601 Satsuma	S E 313 Washu (2)	LEX 1 Tsubame	S E 809 Misasa	LEX 3 Hato	LEX 2007 Yunagi	EXP 2203 Shiroyama	LEX 2009 Shioji	S E 315 Washu (3)	S E 605 Tajima (1)	EXP 305 Miyajima (2)	S E 317 Washu (4)	EXP 1203 Sakurajima	S E 2313 Bingo (2)	EXP 31 Kirishima	EXP 201 Hyuga	EXP 203 Hinokuni	EXP 33 Unzen Saikai	EXP 205 Genkai	EXP 1207 Hayatomo	EXP 207 Amakusa	EXP 209 Hirado	EXP 603 Aso	EXP 35 Takachiho	EXP 301 Ondo	S E 2305 Nanaura	LEX 1 Sakura	LEX 3 Mizuho		
552.6	SHIN-OSAKA Lv	1030	1050	1102	...	1220	...	1330	1420	1434	1520	1524	...	...	1713	...	1845	↓	1951	1955	↓	2030	...	2114	...	2218	↓	2310	2337	↓	↓	...	...
556.4	OSAKA 〃	1040	1059	1112	1150	1230	1240	1340	1430	1445	1530	1535	1656	1700	1730	1818	1855	1905	2001	2015	2026	2046	2048	2125	2142	2236	2300	2330	2553	2350	139	...	...
589.5	KOBE 〃	1105	1133	1142	1217	↓	1307	1404	↓	1514	↓	1603	1723	1734	1757	1850	1923	1941	2031	2045	2057	2118	2122	2157	2217	2310	2337	001	023	016	↓	...	...
644.3	HIMEJI 〃	1156	1235	1244	1307	1338	1404	1449	1537	1614	1643	1701	1827	1834	1848	1950	2018	2042	2141	2145	2158	2223	2231	2301	2321	014	038	102	124	↓	↓	...	...
732.9	OKAYAMA 〃	1305	1408	1401	1423	1444	...	1558	1644	1728	1748	1820	...	1944	2009	2121	2134	2204	2305	2310	2320	2343	2353	024	050	141	203	226	248	211	402	...	...
765.8	UNO 〃	‖	Ar Taisha 1830	‖	1501	‖		‖	1720	‖	‖	1858		‖	2052	‖	‖	‖	‖	‖	‖	‖	‖	‖	‖	‖	‖	‖	‖	‖	‖	...	...
984.8	HIROSHIMA 〃	1522		1648	...	1701	Ar Agei 1821	1813	...	2047	2013		Ar Tottori 2152	2210	...	036		120	202	220	227	251	314	330	347	447	524	607	651	443	628	...	...
936.2	IWAKUNI 〃	↓		1738	...	↓	Ar Tsukida 1658	1848	...	2131	2049	Lv Kyoto 1453	Ar Niimi 2150	...	...	123	Ar Mihara 2300	203	244	↓	309	336	355	414	430	530	608	653	...	↓	↓	...	...
983.3	TOKUYAMA 〃	1652	Lv Kyoto, 1015	1846	...	1828		↓	...	2251	2147			...	...	229		318	355	↓	421	447	510	519	545	640	719	825	...	617	↓	...	...
1,027.6	OGORI 〃	1730		1932	...	↓		2021	...	2340	↓	...		...	...	315	...	406	442	452	508	537	556	610	630	730	808	910	...	↓	848	...	...
1,096.5	SHIMONOSEKI 〃	1831		2101	...	2011		2126	...	104	2320	...		...	...	429	...	519	603	609	629	700	716	727	753	850	923	1023	...	806	954	...	...
1,102.8	MOJI 〃	↓	...	2121	...	2024	Mimasaka (2)	2139	...	118	...	...	Mimasaka (1)	...	...	444	...	533	619	627	644	715	731	741	812	905	942	...	...	818	1006	...	...
1,108.3	KOKURA 〃	1847	...	2138	...	↓		↓	...	128	...	...		...	...	453	...	542	628	637	654	728	742	751	827	915	950	...	...	↓	↓	...	...
1,176.5	HAKATA 〃	1944	...	2301	...	2130		2245	...	252	...	...		...	...	608	...	657	658	753	817	843	900	‖	941	1037	‖	...	Lv Tokyo 1635	928	1119	...	...
1,294.9	KUMAMOTO 〃	2135	...	127		...		...	...	523	...	...		...	...	834	...	924	‖	1020	‖	‖	...	1151	‖	1307	‖	...		‖	1323	...	...
1,230.1	SAGA 〃	‖	...	‖	Lv Nagoya 805	...	...	...	...	‖	...	...	...	...	...	‖	...	‖	‖	...	921	951	...	Lv Kyoto 2041	1043	Lv Nagoya 1920	‖	...		1018	Lv Tokyo 1820	...	...
1,293.6	SASEBO 〃	‖	...	‖		...	...	...	...	‖	...	...	...	...	...	‖	Lv Tokyo 1100	‖	‖	Ar Miyakonojo 1507	1057	‖	...		1229		‖	Lv Tokyo 1435		‖		...	...
1,337.2	NAGASAKI 〃	‖	...	‖		...	...	...	...	‖	...	...	...	...	...	‖		‖	‖		1144	1216	...		...		‖			1228		...	...
1,229.2	BEPPU 〃	2055	...	‖		...	...	...	...	‖	...	...	...	...	...	‖		‖	859		Lv Tokyo 1230	Lv Kyoto 2000	...	...	...	...	1225		...	...		...	...
1,241.3	OITA 〃	2110	...	‖	...	...	...	...	...	‖	...	...	...	...	...	‖		‖	933				...	...	...	...	1250		...	...		...	...
1,448.3	MIYAZAKI 〃	...	...	‖	...	...	...	...	...	‖	...	...	...	...	...	‖		‖	1348				...	...	...	...	1708		...	...		...	...
1,493.6	NISHI-KAGOSHIMA Ar	...	...	544	...	...	...	...	...	930	...	...	...	...	...	1233		1335	...	...	...	...	...	...	...	...	1953		...	...	...	...	...

For train connection — Time required between Shin-Osaka & Osaka Stations (platform to platform): About 40 minutes.

Kms.		S E 2306 Nanaura	EXP 604 Aso	EXP 1208 Hayatomo	EXP 34 Unzen Saikai	EXP 302 Ondo	EXP 202 Hyuga	EXP 210 Hirado
0.0	NISHI-KAGOSHIMA Lv	...	...	...	...	...	...	...
125.9	MIYAZAKI 〃	...	...	...	...	Lv Miyakonojo 1230	1344	...
332.9	OITA 〃	...	...	...	...		1756	...
345.0	BEPPU 〃	...	...	...	...		1814	...
0.0	NAGASAKI 〃	...	...	...	1500		‖	...
88.1	SASEBO 〃	...	...	...	1550		‖	1710
107.1	SAGA 〃	...	...	...	1733		‖	1844
198.7	KUMAMOTO 〃	...	1517	...	‖		‖	‖
317.1	HAKATA 〃	...	1748	1822	1850	...	‖	1951
385.3	KOKURA 〃	...	1857	1948	1957	...	2055	2059
390.8	MOJI 〃	...	1914	2003	2010	...	2108	2113
397.1	SHIMONOSEKI 〃	...	1928	2020	2026	1855	2122	2130
466.0	OGORI 〃	...	2048	2139	2147	2013	2235	2247
510.3	TOKUYAMA 〃	...	2142	2229	2238	2100	2324	2337
557.4	IWAKUNI 〃	...	2300	2334	2347	2209	028	045
598.8	HIROSHIMA 〃	2230	2350	018	035	2310	112	132
793.6	UNO 〃	‖	‖	‖	‖	‖	‖	‖
760.7	OKAYAMA 〃	235	245	330	342	355	426	444
849.3	HIMEJI 〃	401	412	445	503	517	545	611
904.1	KOBE 〃	459	511	548	600	617	644	709
937.2	OSAKA Ar	531	542	618	630	648	715	740
941.0	SHIN-OSAKA 〃	540	553	...	↓	700	724	750

Kms.	New Tokaido Line	LEX Kodama (202)	LEX Kodama (204)	SPX Hikari (2)	LEX Kodama (102)	SPX Hikari (4)		LEX Kodama (104)
941.0	SHIN-OSAKA Lv	...	...	600	630	700	...	730
980.0	KYOTO 〃	...	...	622	654	722	...	754
1,047.7	MAIBARA 〃	...	...	↓	728	↓	...	828
1,097.3	GIFU-HASHIMA 〃	...	...	↓	754	↓	...	854
1,127.6	NAGOYA 〃	...	630	728	813	828	...	913
1,200.0	TOYOHASHI 〃	...	704	↓	847	↓	...	947
1,236.5	HAMAMATSU 〃	...	727	↓	914	↓	...	1014
1,313.4	SHIZUOKA 〃	700	804	↓	951	↓	...	1051
1,389.0	ATAMI 〃	736	840	↓	1027	↓	...	1127
1,409.7	ODAWARA 〃	751	855	↓	1042	↓	...	1142
1,464.8	SHIN-YOKOHAMA 〃	817	921	↓	1108	↓	...	1208
1,493.6	TOKYO Ar	839	943	1000	1130	1100	...	1230

EXP	EXP	EXP	EXP	EXP	LEX	EXP	EXP	S E	S E	S E	EXP	EXP	LEX	LEX	S E	S E	LEX	S E	EXP	S E	EXP	LEX	S E	EXP	LEX	EXP	EXP	EXP	LEX		
206	36	208	204	1204	1206	32	1202	606	2312	312	302	2204	2010	2006	2810	314	2	2314	902	3606	602	4	316	1114	4	304	28	2202	8		
Genkai	Takachiho	Amakusa	Hinokuni	Sakurajima	Genkai (2)	Kirishima	Hyuga (2)	Tajima (1)	Bingo (1)	Washu (1)	Miyajima (1)	Shiroyama	Shioji	Yunagi	Misasa / Mimasaka	Washu (2)	Hato	Bingo (1)	Daisen	Yuami	Satsuma	Tsubame	Washu (3)	Harima	Midori	Kanmon	Seto	Tsukushi	Matsukaze		
...	1150	...	...	1535	...	1603	...	...	...	...	...	1935	...	...	...	...	...	...	...	...	2311	...	...	...	...	...	...	...	...	...	...
...	1447	...	...	‖	...	‖	...	...	...	...	...	‖	...	...	...	...	...	...	...	...	‖	...	...	...	...	...	...	...	...	...	...
...	1916	...	...	‖	...	‖	2115	Lv Minami-noboka 1833	...	...	...	‖	...	...	...	...	...	...	...	...	‖	...	...	...	...	...	...	...	...	...	...
...	1931	...	...	‖	...	‖	2134		...	...	...	‖	...	...	...	...	...	...	...	...	‖	...	...	...	...	...	...	...	...	...	...
1633	‖	...	...	‖	1830	‖	‖	...	...	...	...	‖	...	...	...	...	...	...	...	...	‖	...	...	...	...	...	...	...	...	...	...
‖	‖	...	...	‖	‖	‖	‖	...	...	...	...	‖	...	...	...	...	...	...	...	...	‖	...	...	...	...	...	...	...	...	...	...
1857	‖	...	...	‖	2106	‖	‖	...	...	...	...	‖	...	...	...	...	...	...	...	...	‖	...	...	...	...	...	...	...	...	...	...
‖	‖	1809	1915	1947	‖	2020	‖	...	...	...	...	2349	...	...	...	...	...	...	...	...	335	...	...	...	830	...	...	...	...	...	...
2009	‖	‖	2143	2209	2215	2249	‖	...	...	...	...	218	...	...	...	...	710	...	...	...	605	845	...	...	1023	...	...	917	...	...	...
2119	2203	2206	2248	2318	2328	2354	005	Lv Mimasaka (1)	...	...	...	321	...	...	...	...	↓	...	...	...	725	↓	...	...	1123	...	...	1024	...	...	...
2135	2224	2229	2304	2331	2341	006	016	Lv Tottori 558 / Lv Niimi 555	...	...	...	334	...	...	...	...	822	...	...	...	742	957	...	...	↓	...	...	1042	...	...	...
2150	2239	2246	2318	2346	2356	020	029	Lv Mihara 710	...	...	...	348	630	...	Lv Tsukida 1143 / Lv Agei 1005	...	836	...	...	...	756	1010	...	...	1137	1040	...	1058	...	...	...
2309	2351	003	038	055	109	128	147	...	...	...	...	505	↓	...	...	...	936	...	...	...	906	↓	...	...	1236	1145	...	1213	...	...	...
002	043	057	↓	145	159	219	237	...	...	...	...	554	808	...	...	...	↓	...	...	...	955	1150	...	...	1313	1227	...	1302	...	...	...
120	201	211	235	256	308	331	349	...	...	...	...	705	907	...	...	...	1109	...	...	...	1111	↓	...	...	↓	1334	...	1423	...	...	...
210	245	259	331	343	353	418	438	...	...	725	805	945	...	...	...	...	1141	...	...	...	1158	1322	...	...	1445	1420	...	1513	...	...	...
‖	‖	‖	‖	‖	‖	‖	‖	...	...	830	‖	‖	‖	1240	...	1310	‖	...	...	...	‖	‖	1515	...	‖	‖	1635	‖	...	...	...
524	550	612	626	643	704	722	748	...	846	917	957	1101	1212	1316	...	1354	1405	1451	1442	...	1505	1540	1557	...	1703	1651	1728	1811	...	...	...
642	706	735	742	808	822	844	908	929	1004	1034	1110	1221	1318	1421	1432	1514	1511	1601	1609	1612	1623	1647	1709	1740	1810	1812	1846	1928	...	...	...
751	805	837	843	905	917	944	1014	1019	1051	1122	1157	1326	↓	↓	1522	1608	1555	1655	1700	1711	1722	↓	1803	1836	1858	1915	1942	2021	...	...	...
828	836	907	915	937	951	1016	1044	1048	1120	1150	1225	1405	1425	1527	1550	1636	1620	1723	1728	1742	1758	1802	1831	1910	1925	1955	2016	2055	2102	...	...
837	↓	918	930	...	...	↓	...	...	...	1200	1237	1419	1435	1535	...	1648	1630	...	1737	...	1807	1812	1840	↓	1935	...	↓	...	↓	...	...

Via San-in L. / Fukuchiyama L. / Lv Hakata 820

SPX	LEX	SPX	LEX		SPX	SPX		LEX		LEX	SPX	LEX	SPX	LEX		SPX	LEX	SPX	LEX		SPX	LEX		SPX	LEX		SPX	SPX		LEX	LEX
Hikari (6)	Kodama (106)	Hikari (8)	Kodama (108)		Hikari (10)	Hikari (12)		Kodama (110)		Kodama (112)	Hikari (14)	Kodama (114)	Hikari (16)	Kodama (116)		Hikari (18)	Kodama (118)	Hikari (20)	Kodama (120)		Hikari (22)	Kodama (122)		Hikari (24)	Kodama (124)		Hikari (26)	Hikari (28)		Kodama (206)	Kodama (208)
800	830	900	930	...	1000	1100	...	1130	...	1230	1300	1330	1400	1430	...	1500	1530	1600	1630	...	1700	1730	...	1800	1830	...	1900	2000	...	2030	2130
822	854	922	954	...	1022	1122	...	1154	...	1254	1322	1354	1422	1454	...	1522	1554	1622	1654	...	1722	1754	...	1822	1854	...	1922	2022	...	2054	2154
↓	928	↓	1028	...	↓	↓	...	1228	...	1328	↓	1428	↓	1528	...	↓	1628	↓	1728	...	↓	1828	...	↓	1928	...	↓	↓	...	2128	2228
↓	954	↓	1054	...	↓	↓	...	1254	...	1354	↓	1454	↓	1554	...	↓	1654	↓	1754	...	↓	1854	...	↓	1954	...	↓	↓	...	2154	2254
928	1013	1028	1113	...	1128	1228	...	1313	...	1413	1428	1513	1528	1613	...	1628	1713	1728	1813	...	1828	1913	...	1928	2013	...	2028	2128	...	2213	2310
↓	1047	↓	1147	...	↓	↓	...	1347	...	1447	↓	1547	↓	1647	...	↓	1747	↓	1847	...	↓	1947	...	↓	2047	...	↓	↓	...	2247	...
↓	1114	↓	1214	...	↓	↓	...	1410	...	1514	↓	1614	↓	1714	...	↓	1814	↓	1914	...	↓	2014	...	↓	2114	...	↓	↓	...	2310	...
↓	1151	↓	1251	...	↓	↓	...	1448	...	1551	↓	1651	↓	1751	...	↓	1851	↓	1951	...	↓	2051	...	↓	2151	...	↓	↓	...	2345	...
↓	1227	↓	1327	...	↓	↓	...	1525	...	1627	↓	1727	↓	1827	...	↓	1927	↓	2027	...	↓	2127	...	↓	2227	...	↓	↓	...	...	...
↓	1242	↓	1342	...	↓	↓	...	1541	...	1642	↓	1742	↓	1842	...	↓	1942	↓	2042	...	↓	2142	...	↓	2242	...	↓	↓	...	...	...
↓	1308	↓	1408	...	↓	↓	...	1608	...	1708	↓	1808	↓	1908	...	↓	2008	↓	2108	...	↓	2208	...	↓	2308	...	↓	↓	...	...	...
1200	1330	1300	1430	...	1400	1500	...	1630	...	1730	1700	1830	1800	1930	...	1900	2030	2000	2130	...	2100	2230	...	2200	2330	...	2300	2400	...	...	...

Fares & charges (In Yen)

Limited Express Charges

	1 km – 200 km		201 km – 400 km		401 km – 600 km	
	1st class	2nd class	1st class	2nd class	1st class	2nd class
Class A charge	1,320 yen	600 yen	2,640 yen	1,200 yen	3,520 yen	1,600 yen
Class B charge	1,110	500	2,200	1,000	2,860	1,300
Class C charge	880	400	1,760	800	2,420	1,100
Sections applicable	Tokyo - Atami Nagoya - Shin-Osaka		Tokyo - Nagoya		Tokyo - Shi-Osaka	

Fares & Charges for Super Express "Hikari"

		Tokyo	Nagoya	Kyoto
Shin-Osaka	2nd	2,480	1,020	610
	1st	5,030	2,060	1,310
Kyoto	2nd	2,420	910	
	1st	4,920	1,860	
Nagoya	2nd	1,920		
	1st	3,890		

Fares & Charges for Limited Express "Kodama"

		Kyoto	Maibara	Gifu-Hashima	Nagoya	Toyoha-shi	Hama-matsu	Shizuo-ka	Atami	Odawa-ra	Shin-Yo-kohama	Tokyo
Shin-Yo-kohama	1st	1,090	1,430	1,690	1,840	3,100	3,290	3,470	4,330	4,370	4,510	4,590
	2nd	510	900	840	920	1,530	1,630	1,730	2,140	2,160	2,240	2,280
Odawa-ra	1st										1,180	1,320
	2nd										560	640
Atami	1st									990	1,270	1,420
	2nd									460	610	690
Shizuo-ka	1st								1,270	1,380	1,650	1,800
	2nd								610	670	820	900
Hama-matsu	1st							1,290	1,670	1,760	2,920	3,070
	2nd							620	830	880	1,430	1,510
Toyoha-shi	1st						1,090	1,470	1,840	2,830	3,100	3,250
	2nd						510	720	920	1,380	1,530	1,610
Nagoya	1st					1,270	1,430	1,840	3,100	3,190	3,380	3,450
	2nd					610	700	920	1,530	1,580	1,680	1,720
Gifu-Hashima	1st				1,050	1,420	1,600	2,860	3,250	3,320	3,450	3,520
	2nd				490	690	790	1,400	1,610	1,650	1,720	1,760
Maibara	1st			1,140	1,290	1,670	1,840	3,120	3,400	3,430	4,240	4,310
	2nd			540	620	830	920	1,540	1,690	1,710	2,090	2,130
Kyoto	1st		1,230	1,490	1,640	2,880	3,070	3,380	4,220	4,280	4,400	4,480
	2nd		590	730	810	1,410	1,510	1,680	2,080	2,110	2,180	2,220

Remark : 1st class fares & charges include tax.