

Railway Operators in Japan 8

Tokai Region

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Regional Overview

The Tokai region is located almost in the middle of the Japanese archipelago, covering Shizuoka, Aichi and Mie prefectures, and the southern part of Gifu Prefecture. Nagoya City, the capital of Aichi Prefecture, is the most important city in the region with a population of about 2.1 million. This is much smaller than Tokyo, Yokohama or Osaka but is still Japan's fourth largest city.

The region faces the Pacific Ocean and has a mild climate. The population density is high and there are many industries located in Tokai. As a result, a major transportation corridor crosses the region from east to west. The old Tokaido highway linked Edo (today's Tokyo) with Osaka from the earliest days of the feudal era, but coastal shipping also played an important transport role in the area for centuries. The Tokaido main line was built along part of the old Tokaido highway (from which the line took its name). Most of the basic railway infrastructure in the Tokaido region had been completed by 1889.

The northern part of the region is mostly mountains and the population is sparse, although the natural beauty of the area has made it a famous tourist destination. Mount Fuji is in this area on the boundary between Shizuoka and Yamanashi prefectures.

Overview of Rail Network

Japan's two most important railway lines cross the Tokai region—the 589.5-km Tokaido main line between Tokyo and Kobe, which links Japan's two largest cities, Tokyo and Osaka, and the 552.6-km Tokaido Shinkansen between Tokyo and Shin Osaka Station. The Tokaido Shinkansen opened in 1964 and now plays the leading role in long-

distance passenger services, while the older Tokaido main line handles short-haul passenger transport and freight.

Before Japanese National Railways (JNR) was privatized in 1987, the Tokaido main line was operated as a single line, but since the privatization, it is divided between three of the six regional passenger operators (JRs)—JR East, JR Central and JR West. JR Central operates the 341.3-km central section of the line crossing the Tokai region from Atami (Shizuoka Prefecture) to Maibara (Shiga Prefecture).

By contrast, JR Central operates the entire Tokaido Shinkansen from Tokyo to Shin Osaka Station. If government policymakers had followed the same model as used for the regional separation of rail operations, JR East and JR West would be running operations over their own track sections near Tokyo and Osaka. However, it was decided not to use the same model because of the greater efficiency achieved by operating the Tokaido Shinkansen as a single entity.

The Tokaido main line and the Tokaido Shinkansen offer connections to many other rail lines. Many of the conventional lines connected to Shinkansen stations operate limited express trains forming regional intercity routes.

There are also a number of important urban transit networks, notably in Nagoya and Gifu City (Gifu Prefecture). Nagoya Railroad Co., Ltd. (Meitetsu) is another major player in addition to JR Central. Meitetsu operates almost 500 km of lines centred on Nagoya and is the region's only major private operator. As a consequence, JR Central and Meitetsu are fierce competitors in some parts of the region. There are a number of underused lines as well. Some are operated by JR Central and Meitetsu, others by smaller operators. All face difficult economic challenges, but their operators are trying to maintain services through a variety of measures.

Intercity Transport

Tokaido shinkansen

The Tokaido Shinkansen was built in order to increase capacity in the corridor served by the old Tokaido main line. It opened on 1 October 1964 just in time for the 1964 Tokyo Summer Olympics. During this period, Japan was experiencing astounding economic growth with construction of expressways and other major infrastructure projects. It was also the time when railways were declining in Europe and North America. There were fears that the decline would spread to Japan and the new shinkansen would lose money. But the line became a success, both technologically and economically, prompting other industrialized countries to develop their own high-speed railways. It also led to the construction of other shinkansen lines in Japan.

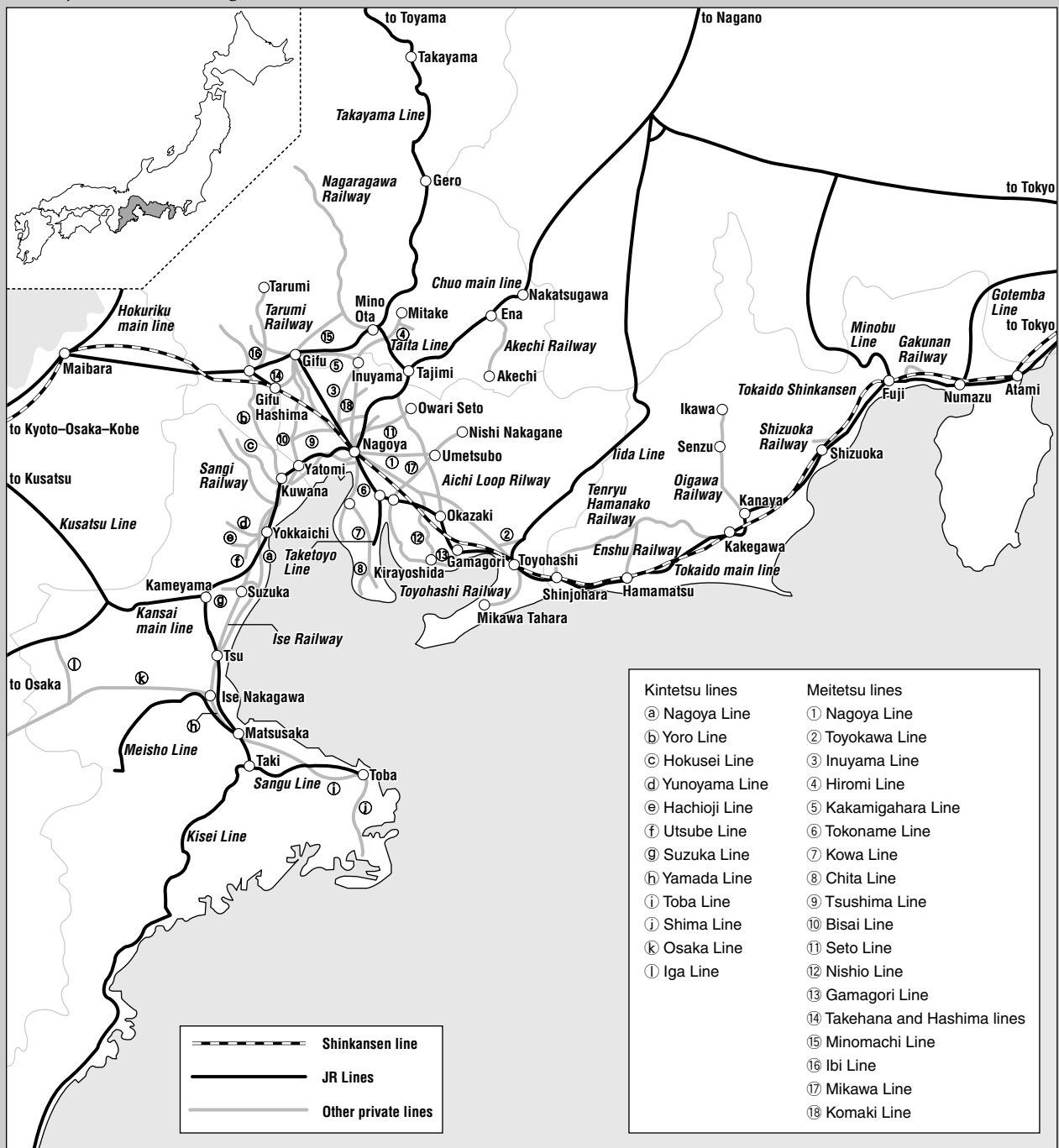
When JNR was privatized and divided in 1987, shinkansen operations were treated as a special case. The infrastructure and rolling stock of the conventional lines became the property of the regional JRs, but the shinkansen facilities became the property of a new body called the Shinkansen Holding Corporation (SHC). The first plans called for the three JRs to operate the shinkansen and pay annual rental fees to the SHC. However, this arrangement would have resulted in the three JRs assuming long-term debt that might have hindered later sales of shares in the new companies. To remedy this failing in the first plan, it was decided that the three JRs would purchase the shinkansen facilities in 1991 for ¥9.2 trillion apportioned between the three companies according to their financial resources. JR Central's share for the Tokaido Shinkansen was about ¥5.1 trillion and is being repaid through 60 annual installments. Due to the enormous debt burden, the government also introduced preferential tax measures.

The Tokaido Shinkansen has changed greatly since privatization, especially in the last decade. First, it is faster; when

the JRs were launched, the fastest *Hikari* (Light) service took 2 hours and 52 minutes between Tokyo and Shin Osaka. In 1992,

the new *Nozomi* (Hope) with Series 300 rolling stock cut this to 2 hours and 30 minutes by running at maximum speeds

Railway Lines in Tokai Region



Size and Financial Status of Railways in Tokai Region

	Route-km	Number of Employees	Capital (¥million)	Operating Revenues (¥million)		Operating Expenses (¥million)		Operating Profits/Losses (¥million)		Ordinary Profits/ Losses (¥million)
				Railway	Non-railway	Railway	Non-railway	Railway	Non-railway	
JR Central	1977.9	7949	112,000,000	1,095,996,854	8,894,051	774,860,283	5,298,063	321,136	324,411,423	65,171,749
Nagoya Railroad (Meitetsu)	533.3	4296	74,357,000	84,345,933	47,237,282	74,482,603	40,765,327	9,863,330	6,471,955	7,968,714
Kinki Nippon Railway (Kintetsu)	594.1(317.9)	9906	92,741,000	182,749,985	48,110,219	159,430,986	41,800,190	23,318,999	6,310,029	11,531,450
Nagoya Transportation Bureau	78.2	3132	-	64,577,429	15,625,115	68,763,562	38,465,383	-4,186,133	-22,840,268	-37,017,983
Shizuoka Railway	11	118	1,800,000	1,509,194	21,791,287	1,473,982	20,148,590	35,212	1,642,697	1,290,602
Oigawa Railway	65	169	212,200	725,060	100,469	873,316	75,877	-148,256	24,592	-139,129
Tenryu Hamanako Railway	67.7	82	630,000	527,647	0	619,012	0	-91,365	0	-85,512
Enshu Railway	17.8	121	3,800,000	1,740,039	26,437,943	1,489,746	24,100,524	250,293	2,337,419	2,178,117
Toyohashi Railway	23.4	124	200,250	1,540,464	3,766,740	1,387,212	4,219,680	153,252	-452,940	-416,086
Aichi Loop Railway	45.3	157	2,985,500	2,023,149	19,704	1,987,192	30,956	35,957	-11,252	31,523
Tokai Transport	11.2	15	295,000	187,131	2,172,257	336,083	1,920,999	-148,952	251,258	104,640
Tokadai New Transit	7.4	48	3,000,000	229,196	0	523,579	0	-294,383	0	-288,123
Sangi Railway	27.6	133	400,000	1,425,467	3,264,348	1,453,208	3,198,492	-27,741	65,856	47,349
Ise Railway	22.3	41	360,000	596,730	29,063	595,912	14,579	818	14,484	7,473
Akechi Railway	25.1	28	200,000	137,264	0	161,313	0	-24,049	0	-11,067
Tarumi Railway	34.5	54	150,000	348,819	0	389,511	0	-40,692	0	-28,907
Nagaragawa Railway	72.1	70	400,000	385,564	806	480,126	66	-94,562	740	-93,525

Passenger Volume and Density by Railway Company

		1992	1993	1994	1995	1996	1997	1998	1999	2000
JR Central	No. of Passengers (1,000)	603,197	518,142	511,113	515,842	519,105	511,232	501,630	496,514	497,347
	Passenger Density*1	70,685	70,403	67,522	68,197	70,036	69,844	67,043	65,971	67,422
Nagoya Railroad (Meitetsu)	Volume	399,284	399,182	392,547	389,913	379,841	365,141	357,907	349,659	343,561
	Density	37,426	37,555	37,153	36,783	35,953	34,672	34,048	33,596	33,023
Kinki Nippon Railway (Kintetsu)	Volume	802,266	797,424	790,506	788,663	770,228	742,717	718,225	696,535	679,722
	Density	70,460	70,186	70,324	69,600	68,038	65,516	63,531	61,868	60,768
Kintetsu in Nagoya and Mie areas	Volume	163,407	161,197	146,019	156,767	150,859	142,553	137,816	134,241	131,518
	Density	37,691	37,337	37,563	36,268	34,956	33,231	31,975	31,218	30,953
Nagoya Transportation Bureau	Volume	363,629	366,642	376,787	381,418	379,118	377,500	375,175	369,372	366,886
	Density	88,609	89,924	83,571	84,898	85,695	85,712	85,637	84,654	83,206
Shizuoka Railway	Volume	14,540	14,442	14,402	13,913	13,972	13,422	12,984	12,498	11,867
	Density	17,321	17,403	17,583	17,026	17,091	16,435	15,959	15,505	14,864
Oigawa Railway	Volume	1,577	1,523	1,441	1,421	1,391	1,249	1,149	1,159	1,123
	Density	1,439	1,367	1,288	1,275	1,234	72,636**2	1,017	1,045	1,009
Tenryu Hamanako Railway	Volume	2,276	2,279	2,260	2,212	2,271	2,171	2,132	2,078	2,063
	Density	1,117	1,106	1,097	1,054	1,126	12,108**3	12,113**4	1,002	1,013
Enshu Railway	Volume	9,762	9,771	9,746	9,669	9,727	9,522	9,529	9,359	9,456
	Density	11,417	11,489	11,552	11,313	11,314	10,891	10,949	10,780	11,022
Toyohashi Railway	Volume	11,195	11,242	11,166	11,095	11,047	10,703	10,583	10,384	10,371
	Density	6,625	6,643	6,635	6,562	6,649	6,441	7,096	6,289	6,326
Aichi Loop Railway	Volume	7,119	7,316	7,348	7,516	7,619	7,440	7,551	7,414	7,511
	Density	4,675	4,861	4,934	5,052	5,178	5,032	5,138	5,021	5,152
Tokai Transport	Volume	125	356	374	391	388	368	375	358	353
	Density	184	434	460	471	464	453	460	444	454
Tokadai New Transit	Volume	1,014	923	913	1,011	1,048	959	930	869	826
	Density	1,994	1,910	1,868	2,063	2,153	1,950	1,895	1,773	1,679
Sangi Railway	Volume	3,972	3,917	3,758	3,619	3,566	3,290	3,292	3,189	3,184
	Density	3,285	3,232	3,119	3,017	3,010	2,807	2,809	2,714	2,687
Ise Railway	Volume	1,236	1,299	1,289	1,312	1,454	1,407	1,387	1,394	1,388
	Density	2,862	2,994	2,905	2,954	3,286	3,212	3,138	3,151	3,062
Akechi Railway	Volume	806	779	763	710	689	638	638	617	598
	Density	1,091	1,054	823	958	934	855	872	831	809
Tarumi Railway	Volume	1,014	983	968	1,042	1,037	951	885	797	757
	Density	1,096	1,088	1,041	1,104	1,143	1,051	965	882	843
Nagaragawa Railway	Volume	1,804	1,768	1,756	1,712	1,661	1,491	1,373	1,460	1,417
	Density	860	813	823	833	776	748	690	710	727

*1 Passenger Density=Daily passenger-km/route-km
 *2 Figure in source document; value adjusted by Miki, 3422
 *3 Figure in source document; value adjusted by Miki, 1000
 *4 Figure in source document; value adjusted by Miki, 982

Tokaido Shinkansen Ridership (million)

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Non-pass holders	100	110	114	125	128	125	124	119	123	124	124	119	117	119	121
Commuter pass holders	2	2	3	5	6	7	8	9	10	10	11	11	11	11	11

Source: JR Central web site (<http://www.jr-central.co.jp>)



Series 700 *Nozomi* running between Kakegawa and Shizuoka. The fast *Nozomi* shinkansen services between Tokyo and Osaka compete very effectively with short-haul air services over the same route. (*Transportation News*)

up to 270 km/h. The Series 300 trains run so much faster because of their very low centre of gravity and lighter weight. At first, *Nozomi* services operated only in the early morning and late at night but they began running throughout the day at 1-hour intervals in 1993. Since 2001, they have operated at intervals of about 30 minutes, and even more frequently in the holiday seasons when passenger numbers are especially high. As the frequency of *Nozomi* services increased, other shinkansen services had to speed up to remain competitive. The first Series 0 trains known so well as the 'bullet train' and manufactured from 1964 until 1986 were unsuitable for the faster

speeds and were all retired from the Tokaido Shinkansen by 1999. (JR West still uses some Series 0 trains on its San'yo Shinkansen.) The Series 100 trains built between 1985 and 1991 are also being gradually withdrawn from service because of limitations and will be fully retired by 2003. In the meantime, newer rolling stock has been developed for *Nozomi* services. Series 500 trains were introduced in 1998, and Series 700 trains in 1999. In summer 2002, JR Central and JR West announced they would jointly develop a new generation of rolling stock with tilting bodies and capable of increased speeds through curves. One driving force for faster services has

been the need to stay competitive with airlines. A Tokyo–Osaka flight takes slightly less than 1 hour in the air but travel to and from airports plus boarding/disembarking procedures increase the total time to almost exactly the same as the shinkansen. This explains why the drive for a competitive edge is focused on fares and passenger convenience. Deregulation of the domestic air industry enabled airlines to slash fares, raising their competitive position against the shinkansen in the last few years. The standard fare for a Tokyo–Osaka flight is considerably more than the shinkansen fare, but various discounts bring some airfares to about the same level. In fact,

early morning and late-evening flights, and flights reserved at least 21 days in advance may be cheaper than the shinkansen. In addition, Japan's two major airlines—Japan Airline System Corporation (formed by a 2002 merger between Japan Airlines (JAL) and Japan Air System (JAS)) and All Nippon Airways (ANA)—have introduced a common online reservation system permitting access from mobile phones. The railways have been slower to introduce an online reservation system and discounted fares. JR Central launched such a system and discounts in 2001 but only for customers using a JR Central credit card. Competition between the two transport modes is intense, but at the moment the shinkansen enjoys more than 80% the Tokyo–Osaka market.

One major plan for future improvements is the opening of a new shinkansen station in Shinagawa in late 2003. The new station, which is billed as the second Tokyo terminal for the Tokaido Shinkansen, will permit an increase in services from the current maximum of about 11 each hour to 15 using more *Nozomi* services.

Other lines

The most important intercity services on conventional tracks radiate from Nagoya and cities in Shizuoka Prefecture and offer connections to shinkansen stations. Tilting-body *Shinano* (place name) Series 383 limited expresses run on JR Central's Chuo Line from Nagoya to Nagano

(Nagano Prefecture). Many sections are very curved but the tilting-body design permits relatively high speeds to be maintained.

Shizuoka Prefecture is linked to southern Nagano Prefecture by JR Central's Iida Line, and to Yamanashi Prefecture by JR Central's Minobu Line. These lines offer *Inaji* (place name) and *Fujikawa* (river name) limited express services, respectively. Both lines run in river valleys with many curves, making high speeds impossible and reducing convenience levels.

The *Shirasagi* (White Heron) limited express links Nagoya to the Hokuriku region in the north. It runs on the Tokaido main line from Nagoya to Maibara and then switches onto the Hokuriku main line belonging to JR West. The *Kaetsu* (place name) limited express links Osaka to the Hokuriku region and also passes through Maibara, offering a popular travel option for passengers from Nagoya. The *Hida* (place name) limited express links Nagoya and Toyama stations running on the Tokaido main line (JR central) and on the Takayama Line (partly owned by JR Central and JR West). The Takayama Line is single track and non-electrified with many sharp curves, making it unsuitable for high-speed operations. JR Central raised speeds on in 1989 by introducing Series *Kiha* 85 DMUs, but even these high-performance diesel railcars have their limits. Many passengers go no further than the Hida district of northern Gifu Prefecture, and

few travel on to Toyama. Most of the line runs parallel to an expressway, making competition from express buses another problem.

Passengers travelling southwest from Nagoya to Mie and Wakayama prefectures are more likely to choose Kinki Nippon Railway Co., Ltd. (Kintetsu) than JR Central because Kintetsu has an express network, while local JR track was rarely upgraded by the debt-ridden JNR. Typifying the service gap, even the Showa Emperor (1901–89) used Kintetsu's services in preference to JNR when visiting the region. However, in 1990, JR Central grew its market share by introducing *Mie* (place name) rapid services, costing no more than local services. Kintetsu trains run on electrified double tracks but JR Central makes up the performance difference by using powerful locomotives. JR Central's *Nanki* (place name) limited expresses run to on the Kisei Line (partly owned by JR Central and JR West) to Wakayama Prefecture in the south. This single-track non-electrified line is unsuitable for high-speed operations so it is served by the same high-performance Series *Kiha* 85 stock used on the Takayama Line. However, passenger levels are not increasing.

Ise Railway—a third-sector private operator—has an interest in JR Central's *Mie* and *Nanki* services. Ise Railway's line was formerly JNR's loss-making Ise Line, but it was transferred in 1987 to Ise Railway a public–private partnership between local municipal governments and businesses. The line offers a shortcut to the Kii Peninsula, so JR Central trains continue to use it. *Mie*, *Nanki* and other JR Central trains carry very few passengers on the line compared to passenger numbers for the entire network, but they are a valuable source of income for Ise Railway, which has a large interest in ridership trends on JR trains using its line and is making infrastructure improvements to raise speed.

Passenger Journeys from Three Largest Metropolises

	Public transport in Kyoto–Osaka–Kobe	Private vehicles in Kyoto–Osaka–Kobe	Public transport in Tokyo metropolis	Private vehicles in Tokyo metropolis	Public transport in Nagoya district	Private vehicles in Nagoya district
FY 1955	2,934,115	–	5,142,218	–	787,555	–
FY 1965	3,857,353	–	10,632,997	–	1,759,571	–
FY 1975	6,117,752	1,857,502	12,800,288	3,074,487	1,682,561	1,402,537
FY 1985	6,158,121	2,744,711	13,968,575	4,730,955	1,568,032	2,213,383
FY 1990	6,625,233	3,676,595	15,816,514	6,935,870	1,658,772	2,977,824
FY 1995	6,516,997	4,069,295	16,112,452	7,928,258	1,572,481	3,319,602

Source: *Toshi kotsu nempo*, applicable fiscal years

Urban Transport in Nagoya District

Tokaido main line (JR Central) and Meitetsu Nagoya Line

Nagoya and its satellite cities make up the Nagoya district. The 116.4 km of the Tokaido main line in this district is entirely within JR Central's zone of operations from Toyohashi (Aichi Prefecture) in the east through Nagoya to Ogaki (Gifu Prefecture) in the west. Major satellite cities along the eastern section of the line include Toyohashi, Gamagori, Okazaki, Anjo, Kariya and Obu. Cities on the western section include Ichinomiya, Gifu and Ogaki. There are two main ridership patterns—between Nagoya and these cities, and between cities other than Nagoya.

Private automobiles play a larger role than public transport in the Nagoya district. The opposite is true in Greater Tokyo and the Kyoto–Osaka–Kobe conurbation. Another reason why the two main operators in the Nagoya district are intensely competitive is because JR Central's section of the Tokaido main line and Meitetsu's Nagoya Line run parallel to each other in the Toyohashi–Nagoya–Gifu corridor where ridership is comparatively high.

Before the Tokaido Shinkansen opened in 1964, the Tokaido main line was Japan's most important east–west trunk line. To reach higher speeds in the late 1800s, the Tokaido main-line tracks were laid as straight as possible, so some stations are situated away from the city centres. A good example is Okazaki Station in Aichi Prefecture, where the station is about 4 km from the city centre. Local people say that the station was constructed away from the city to curb the influx of undesirable characters and prevent fires caused by sparks from locomotives. This explanation probably has no basis in fact and is more likely folklore attempting to explain geography.



JR Central's Series 313 for the Tokaido main line (top) and Meitetsu's Series 1000 for the Nagoya Line. JR Central and Meitetsu compete with each other by offering fast high-quality services on these two parallel lines in the Nagoya district. (Photos: M. Miki)

Because Nagoya had no loop line, all lines tended to converge on Nagoya Station. To reduce congestion, the new and important Kanayama Station was opened in 1989 to serve JR Central's Tokaido and Chuo main lines, Meitetsu's Nagoya Line, and Nagoya Transportation Bureau's Meijo subway line.

The 99.8-km Nagoya Line is Meitetsu's

most important line and runs from Shin Gifu Station through Shin Nagoya Station to Toyohashi Station. Meitetsu operates a network of conventional railway lines, tramlines, and a monorail. The company's roots go back to 1898 when Nagoya Electric Railway began operating in the city. Ownership of its urban track was later transferred to Nagoya City Tram.

The origin of Meitetsu's current suburban lines can be traced back to suburban track constructed around 1910. Track for today's Nagoya Line was first built by Meiki Railway west of Nagoya, and by Aichi Electric Railway east of the city. The two companies merged in 1935 and the two Nagoya terminals were joined in 1944 to make a single line from Shin Gifu to Toyohashi. The overhead catenary on the two line sections was energized to the same voltage in 1948 to permit through operations.

Unlike JR's Tokaido main line, Meitetsu's Nagoya Line was constructed to serve local traffic, so the track was laid through or close to the centres of many of Nagoya's satellite cities. East of Nagoya, the tracks of its predecessor, Aichi Electric Railway, were generally laid adjacent to the old Tokaido highway. In Okazaki, Meitetsu's Higashi Okazaki Station is in the heart of the city, with government, financial and educational institutions all nearby. Consequently, rail passengers between Okazaki and Nagoya take Meitetsu's Nagoya Line. Conversely, Kariya City is located some distance from Meitetsu's Nagoya Line (Kariya Station is on its branch line) but on JR Central's Tokaido main line, so Nagoya-Kariya rail passengers naturally choose JR Central. As a result, in some parts of the district, the two companies share the market and coexist well.

Meitetsu has introduced rolling stock with unusual designs, notably *Panorama Car* trains. It also operates high-speed trains that do not require an express surcharge,

and reserved-seating limited express trains. JR Central began operating new rapid service trains after privatization, without charging extra for the higher speed, making some fares on Meitetsu's limited expresses comparatively more expensive because of reservation surcharges. To deal with this challenge, Meitetsu introduced new limited-express *Panorama Super* trains in 1988, boosted maximum speed on the Nagoya Line to 120 km/h in 1990, and eliminated the reservation surcharge by making all seats non-reserved except in the two last cars at the Toyohashi end.

Other intercity lines

JR Central's Chuo main lines through Nagano Prefecture is an important transit route in the densely populated area near Nagoya. The approx. 80-km section from Nagoya to Nakatsugawa has attracted more commuters and students over the last few years. This prompted JR Central to introduce two fully-reserved trains in 1999—the *Central Liner* running at 1-hour intervals mainly between rush hours, and the *Home Liner* offering limited-express type cars for the morning and evening rush hours. Commuter travel to and from Nagoya on JR Central's non-electrified Taketoyo Line is also increasing, so the company raised speeds in December 1999 by introducing faster diesel railcars with superior performance through curves.

Meitetsu's many lines carry commuters from the suburbs to central Nagoya. Feeder lines for its Nagoya Line include

the Inuyama, Tsushima, Tokoname, Mikawa and Nishio lines. (Its Seto Line from Sakaemachi to Owari Seto is not linked to the company's other lines.) Housing projects have sprung up along these lines over the last few years, boosting commuter numbers. Meitetsu trains do not terminate at Shin Nagoya Station in the city centre but continue on to the suburbs. The station has just two sets of track and three platforms, so train routes are complex during the morning and evening rush hours, creating confusion for some passengers.

These suburban lines carry many leisure travellers at weekends. The Inuyama and Hiromi lines pass through a scenic area called the Nihon Line, and provide access to cultural attractions such as two open-air museums—Meijimura Museum (Meiji period architecture), and Little World (folklore). Seaside resorts are accessed via the Tokoname, Kowa, Chita and Nishio lines. All these suburban lines offer links to Nagoya, and have limited-express services with mostly reserved seating. Before WWII, Meitetsu also started catering to tourists with through services from Shin Nagoya Station to Gero and Takayama stations on JR Central's part of the Takayama Line. Unfortunately, the *Kita Alps* (North Alps) express through services were abandoned in 2001.

Aichi Loop Railway Company was established as a public-private partnership to construct a suburban loop line around Nagoya. The loop is still not fully complete and measures 45.3 km. It consists of the previous Okata Line from Okazaki to Shin Toyota (acquired from JR Central), and an extension constructed by the railway company from Shin Toyota to Kozoji. The line is electrified (1500 V) and links the Tokaido and Chuo main lines, bypassing the city centre.

Another line forming part of a loop is the non-electrified 11.7-km Johoku Line between Kachigawa (Chuo main line) and Biwajima (Tokaido main line). The Johoku

Congestion Rates of Subway Lines in Nagoya

	During 1-hour peak	Daily average
Higashiyama Line (Nagoya-Fushimi)	189	85
Meijo Line (Kanayama-Higashi Betsuin)	162	61
Tsurumai Line (Kawana-Gokiso)	161	51
No. 4 Line (Nishi Takakura-Kanayama)	79	33
Sakura-dori Line (Kokusai Center-Marunouchi)	134	42

Source: *Toshi kotsu nempo*, 2001
 Note: Surveyed sections in parentheses

Line is unique because its track facilities are owned by JR Central but its trains are operated by Tokai Transport, a 100% financed JR Central subsidiary.

Nagoya's suburbs have mushroomed since the 1970s and new transportation systems have been constructed to connect the suburbs to existing railway lines. One system linking Tokadai New Town (in Komaki City, northwest of Nagoya) to Meitetsu's Komaki Line is the 7.4-km Tokadai Line (Komakihara–Tokadai Higashi) opened in 1991. Another, the Yutorito Line opened in 2001, is Japan's first guided bus system. Dual-mode vehicles run on dedicated tracks between Ozone (Chuo main line) and Obata-ryokuchi, then on ordinary roads from Moriyama ward in northeastern Nagoya to Kozoji and the Seto district.

The old Tokaido highway dating from early feudal days led to Atsuta (Aichi Prefecture) and then travellers would take a *shichiri-no-watashi* boat across Ise Bay to Kuwana. From Kuwana the highway passed through Yokkaichi and Seki (all in Mie Prefecture) to Kusatsu (Shiga Prefecture) and on to Kyoto the old capital. Today's National Route 1 follows the same route. But this route was ignored when the first line (now the Tokaido main line) was constructed in the late 1800s. Instead and in order to offer a better link to the northern Hokuriku region, the track was laid from Nagoya through Gifu and Maibara to Kusatsu, meaning that Mie Prefecture lost its function as a main transport corridor.

The private Kwansei Railway built track in the old highway corridor ignored by the Tokaido main line. With later extensions, the Kansai main line and local private railways provided tracks running from Nagoya to Minatomachi (today's JR West's JR Namba Station in central Osaka). The company operated fast services competing with the Tokaido main line. However, Kwansei Railway was nationalized in 1907 and the Kansai main

line subsequently offered limited-express services using diesel railcars between Nagoya and Osaka for some years. Today, the line only has local services. The downgrading increased after the 1987 privatization and division of JNR led to separate JR Central and JR West operations with the regional boundary at Kameyama. Due to the area it serves, JR Central focuses on transport in the Nagoya district. Its section of the Kansai main line passes close to the Ise Bay coast and its main purpose is to link Nagoya with nearby population centres, such as Kuwana, Yokkaichi, Suzuka and Kameyama. A line operated by Kinki Nippon Railway Co., Ltd. (Kintetsu) parallels JR Central's track between Kuwana and Yokkaichi and JR Central has coped with the competition by introducing *Mie* rapid-service trains.

Kintetsu's network measures 591.4 km, the longest of any private railway in Japan. Its operations focus primarily on the Kinki region (Osaka, Kyoto, Nara, etc.), so we will examine it more closely in a later article and look only at its operations in the western Tokai region this time.

In most regions of Japan, lines of the six JR's form the backbone of the rail network with private lines playing only a supplementary role. Mie and Nara prefectures are one of the exceptions where Kintetsu lines form the main arteries and JR Central lines merely offer support. In these two prefectures, most rail and bus services are provided by Kintetsu and its affiliates—only a few other companies and JR Central take the remaining small share. Kintetsu achieved this strong position in Mie and Nara because its many branch lines and bus routes connect to Kintetsu Lines and this determines the passenger traffic patterns.

Kintetsu's most important line in the western Tokai region is the 78.8-km Nagoya Line. It runs from Ise Nakagawa to Nagoya City, passing through the major cities of Mie Prefecture—Kuwana, Yokkaichi and Tsu—each located some

distance apart. In other metropolitan areas of Japan, major private railways generally carry commuters to and from the city centre but this is not the case with Nagoya Line because passenger destinations are likely to be a city along the way to central Nagoya. For this reason, all train sets and even rush-hour expresses on the Nagoya Line have a maximum of 6 carriages, unlike Kintetsu's Nara and Osaka lines, where 10-car train sets carry commuters to Osaka.

Urban transit

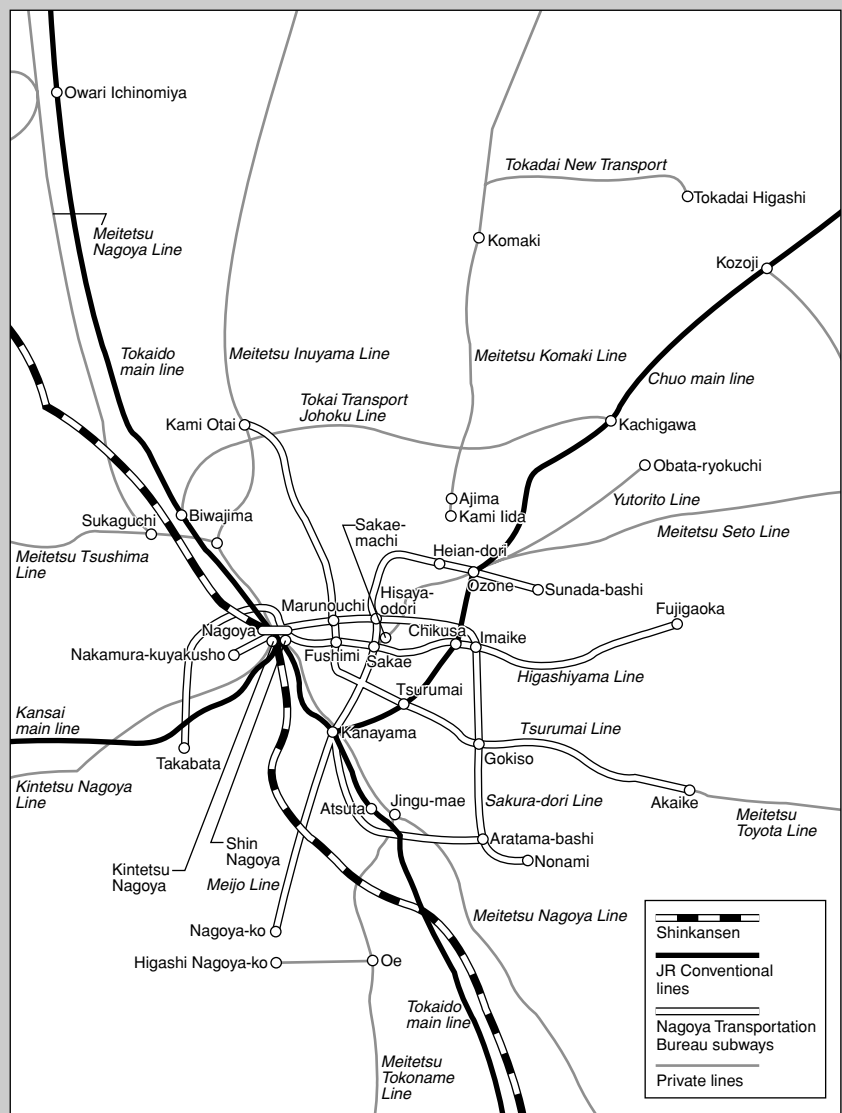
Nagoya City's first transit system began in 1898 as an electric tram line operated by Nagoya Electric Railway. The system was purchased by the city in 1922. At its peak, the tram network totalled 106 km of lines, but all had been abandoned by 1974.

As motor vehicle traffic increased and the suburbs grew, subway lines were constructed to replace the trams. The first subway line, which opened in 1957, traversed part of central Nagoya, from Nagoya Station to Sakaemachi (now called Sakae Station). This early line had a track gauge of 1435 mm, and a third rail for power (600 Vdc). However, most subsequent subways were built to the 1067-mm gauge using an overhead 1500-V catenary to permit through operations with Meitetsu on each other's tracks. The *Yurika* card providing access to the subway system and all city-operated buses appeared in 1998.

The east–west Higashiyama Line (Line No. 1) and the north–south Meijo Line (Line No. 2) were built in the 1950s and 1960s, and use a third-rail system for power. Today, rush-hour trains operate at intervals of 2 to 3 minutes in the city centre. The Tsurumai Line (Line No. 3) offers through services to and from Meitetsu's Toyota and Inuyama lines, so it has an overhead catenary. The Sakura-dori Line (Line No. 6) also uses a catenary and changed to one-man operation in 1994.

Line No. 4 is being planned as an inner-

Railway Lines in Nagoya Area



city underground loop line; one section is the existing Meijo Line between Ozone and Kanayama. Part of the line is already in operation and an extension is under construction. Another 3.3-km extension is also being constructed from Ajima to Heian-dori to connect with Kami Iida Station on Meitetsu's Komaki Line. It is scheduled for completion this spring and will greatly improve connections to

stations on Meitetsu's Komaki Line. Meitetsu faces strong competition from JR and is keen to attract more passengers by improving services. It is doing this by partnering with the municipal subway to provide through services on both systems, thereby offering direct connections from the suburbs to downtown. Partnering with the municipal subway, which was built primarily during Japan's economic boom

years, began in 1979 when Meitetsu constructed the Toyota Line from Akaike to Umetsubo and linked it to the Tsurumai subway line. This permitted through services connecting the subway and Toyota City. In 1993, the Tsurumai Line was extended in the opposite direction to Kami Otai Station on Meitetsu's Inuyama Line, permitting through services to Inuyama.

Local Transport Systems

Outside Nagoya

Ridership on Meitetsu lines close to the centre of Nagoya is high, but sections in some outlying areas are not profitable. Other private railways operating a large network face the same situation. Until the 1970s, Meitetsu ran short trains on these unprofitable sections, but in 1984 it began rationalizing operations on its Yaotsu Line in Gifu Prefecture and Mikawa Line (from Sanage to Nishi Nakagane, and later, from Hekinan to Kirayoshida) with new energy-efficient diesel railcars. In this regard, Meitetsu began promoting rationalization earlier than the public-private partnerships that took over former JNR branch lines. However, Meitetsu closed its Yaotsu Line in 2001 because of increased competition from motor vehicles and an anticipated drop in passenger levels caused by falling birth rates and a shrinking population base.

Meitetsu also operates rail systems (including a tram system) in Gifu Prefecture. Meitetsu's tram system in Gifu City is called Gifu Urban Tram Lines. Trams on some of these lines also ran on railway tracks of the Ibi Line. Their appearance is reminiscent of the inter-urban electric trams of earlier days and contrasts with the long modern train sets arriving at Shin Gifu Station. The two types of rolling stock share the station and can be seen side-by-side because the

Minomachi tramline offers through connections to Meitetsu's Kakamigahara Line. The trams run on the Kakamigahara Line until Tagami Station, then switch to the Tagami tramline, and then to the Minomachi tram line. The catenary for Gifu Urban Tram Lines and the Minomachi tram line is 600 V while that for the Kakamigahara Line is 1500 V, meaning that the trams support dual-voltage operation. This unique transportation system lost money in outlying areas, forcing closure of the Minomachi Line section from Shin Seki to Mino in 1999 and closure of the Yaotsu Line and the Tanigumi, Ibi (between Kurono and Hon Ibi) and Takehana lines in 2001.

Toyohashi Railway operates two different rail systems—the Atsumi Line from Toyohashi City to Tahara Town, and a tram system in Toyohashi City. The operations of the Atsumi Line were merged with those of Meitetsu during WWII, but became part of the operations of Toyohashi Railway—the operator of the Toyohashi tram system—in 1954. From the 1960s, land along the Atsumi Line was developed for housing and the increase in commuting workers and students gave the line a greater role in transportation in the Toyohashi area. The urban tram network began shrinking around this time and continued shrinking until the 1970s. However, in 1982, a 0.6-km extension was built from Ihara to Undo Koen-mae. Although trams had been dying out in Japan, this development helped spur renewed interest.

In the latter 1990s, the former Ministry of Construction (now ministry of Land, Infrastructure and Transport), which oversaw tram-related projects, decided to provide government assistance for tram operators. The Toyohashi Railway was the first tram operator in Japan to benefit from the subsidies. The project involved moving the tram stop for Toyohashi Station closer to the station entrance and the



Series *Kiha* 30 on Meitetsu's Mikawa Line. Both JR Central and Meitetsu have a number of uneconomic lines some distance from Nagoya. Meitetsu uses rail buses to serve the end of the poorly used Mikawa Line. (S. Takashima)



Toyohashi Railway's Series 7300 (left) and Series 1800 local trains at Rozu Station on Atsumi Line (M. Miki)

project was completed in 1998. Kintetsu's Nagoya Line has the Yoro, Hokusei, Utsube, Hachioji, Suzuka and Yunoyama branch lines. Most of them were constructed as light railways from around 1910 to 1925. The Hokusei, Utsube and Hachioji lines use the rare 762-mm gauge.

Land alongside the Suzuka Line has been developed for housing, but the other lines have few passengers. The 20.4-km section of the Hokusei Line from Nishi Kuwana to Ageki is losing a lot of money and Kintetsu planned to close it. However, local residents objected and Sangi Railway, a



Oigawa Railway's Class DB1 locomotive and carriages on Igawa Line. The 25.5-km line on the northern section of the Oigawa Railway contains many curves with journey time of 1 h 45 minutes. Its rolling stock is smaller than traditional ones with width of 1.8 m. (S. Takashima)

company with strong links to the local community, is taking it over this spring. Sangi Railway currently operates a line from Tomita (Kintetsu and JR Central both have stations there) to Nishi Fujiwara. It is one of the few private railway companies in Mie Prefecture not capitalized by Kintetsu. The line began as an ambitious plan in the 1920s to establish a rail link between Mie and Gifu prefectures. The plan was promoted by Onoda Cement (now Taiheiyo Cement Corp.) and Asano Cement, and their capital was used to push construction ahead. The line was never extended to Gifu Prefecture. Asano Cement eventually pulled out of the project, but Taiheiyo Cement still plays a large role in transport operations and capitalization. From the late 1960s, land alongside the tracks was developed as housing for people in Yokkaichi City and the operator laid track to Kintetsu's Tomita Station in 1970 to improve passenger convenience. Over the last few years, the company has been further improving its infrastructure to offer easier transfers to Kintetsu trains.

Various small private railways in Shizuoka Prefecture

Shizuoka Railway operates 10.8 km of track with one terminus in Shizuoka City, the capital of Shizuoka Prefecture. The company owned almost 100 km of track in the prefecture until the 1960s, but

closed sections that had become unprofitable because of greater public dependency on cars. It then invested heavily in the remaining track where the population density is higher. The company's main business is now bus transport.

Enshu Railway provides transit services in Hamamatsu, Shizuoka's second largest city. Like Shizuoka Railway, it used to have a large amount of track but now concentrates its efforts on a far smaller infrastructure and its main business is bus transport.

These two companies own modern equipment and operate frequent services, and in this sense they are similar to many urban railways. However, their train sets have no more than two cars, so they are much smaller than rail operators in the Nagoya district.

Gakunan Railway operates 9.2 km of line in Fuji City in the eastern part of the prefecture. The region began developing into an industrial zone during WWII and this development continued after the war, with a focus on papermaking. The railway was opened in 1949 to transport freight. It also carries passengers, but this business is limited.

The track operated by Tenryu Hamanako Railway was opened by the government railways in 1935 as the Futamata Line. It was closed in 1987 because of accumulated debts and then taken over

by investors from the prefectural and local governments and private corporations. The population density along the track is low and the operations face severe challenges. The company has found that local high-school students who are too young to drive are a valuable revenue source.

Oigawa Railway is unlike any other carrier in the region. Its southern terminus is at the small Kanaya Station on the Tokaido main line in the middle part of southern Shizuoka Prefecture. Its line follows the Oigawa River north and a steam-hauled train caters to tourists on the southern 39.5-km section from Kanaya to Senzu. The service was launched in 1976—a first for heritage railways in Japan (see *JRTR* 31, pp. 30–32). The northern 25.5-km track section from Senzu to Ikawa was originally built as part of a dam construction project. The rail tunnels are small and the track curves are sharp, so very small trains are used but the natural beauty of the area draws tourists. Part of the route was changed in 1990, resulting in the steepest gradients in Japan of up to 90‰. These sections are famous for their Abt rack-and-pinion system.

Public-private rail partnerships in Gifu Prefecture

In the 1980s and early 1990s, around the time JNR was privatized and divided into the JRs, many unprofitable former JNR lines were abandoned. In many cases, local governments and companies jointly invested in new companies that took over the operations of the abandoned lines. Some of the new companies even began construction projects that had been frozen during JNR's time. This type of public-private third-sector partnership was not unknown previously, but at that time only corporations taking over JNR or JR operations were called third-sector participants.

The Gifu Prefectural government

supported the establishment of a number of public-private rail partnerships—Kamioka Railway and Tarumi Railway in 1984; Akechi Railway in 1985; and Nagaragawa Railway in 1986. Kamioka Railway's operations will be discussed in a future article on operators in the Hokuriku region.

Here we look at the other three companies. Tarumi Railway took over JNR's Tarumi Line, a 23.6-km section from Ogaki to Komi that branches off the Tokaido Line at Ogaki. Nearby cement works provided a steady source of freight revenues and the company used this profitable base to restart a frozen construction project, finishing a 10.9-km section from Komi to Tarumi in 1989.

Tarumi is famous for its cherry blossoms and the company has been successful in attracting tourists to the area. Trains are crowded during the spring cherry blossom season and JR Central also operates through services on the tracks at that time. Akechi Railway took over the 25.1-km Akechi Line that branches off from the JR Central's Chuo main line at Ena. The other terminus at Akechi is an historical town that attracts tourists. However, the journey from Nagoya is 2 hours each way, so ridership is low and local passengers are declining in number. The company is trying to attract passengers in various novel ways, including on-board meals cooked to famous local recipes.

Nagaragawa Railway took over JNR's 72.1-km Etsuminan Line branching from the Takayama Line at Mino Ota. Years earlier, there had been plans to extend the line to another line in Fukui Prefecture,



Series *Haimo* 180 on third-sector Tarumi Railway. In 1984, JNR handed over its loss-making Tarumi Line to the local government and businesses along the line. Despite difficult conditions, the railway continues to operate as a third-sector company by offering novel services that attract many tourists to the area. (S. Takashima)

creating a north-south route across the mountains but construction on both lines was stopped before reaching the prefectural boundary. The northern Etsumihoku Line is currently operated by JR West. Even if the two lines were linked in the future there would probably be very little increase in demand and no change in profits. Buses now link the two lines. Nagaragawa Railway's line passes through many old towns but few residents use the train. The company is trying to attract passengers back by operating tourist trains, taking advantage of the beautiful scenery offered by the Nagara River running parallel to the track. ■

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