

# JR East's Niitsu Rolling Stock Manufacturing Factory —Building Tokyo Commuter Trains for 10 Years

## Introduction

With the October 1994 opening of the Niitsu Rolling Stock Manufacturing Factory (NRSMF) in Niigata Prefecture, JR East became the first Japanese railway operator to start building its own rolling stock from scratch since railways first reached Japan in 1872. In the following 10 years, the works has developed to handle every stage in the rolling stock life cycle from planning through design, production, maintenance, operation, scrapping, and recycling.

The large factory covers an area of 15 hectares near Niitsu about 15 km from Niigata City some 300 km north of Tokyo. The production systems were designed from the start to permit efficient manufacturing of nearly every basic component of EMUs, including the carriage bodies and bogies, from scratch. The dedicated and experienced engineering staff of 400 use state-of-the-art technologies to build about 250 carriages each year, completing the 1000th car in November 2000. In addition to obtaining ISO 9001 certification in 1998 and 2000, the works demonstrated its serious commitment to concerns over environmental management when it received ISO 14001 certification in 1999. By following these



Aerial view of JR East's Niitsu Rolling Stock Manufacturing Factory

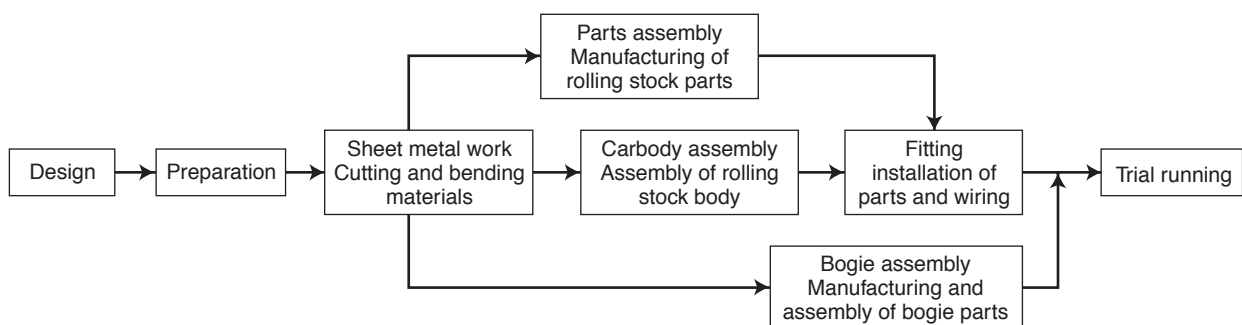
(JR East)

good management and environmental practices, the employees of this large works foster good local and global corporate relations through community services such as tree planting, open factory days, and acceptance of overseas engineers and academics for the purpose of technology transfers.







## Production System

Figure 1 shows the basic flow of rolling-stock production at the works. In the first design stage, experienced design engineers harness the power of fully integrated three dimensional (3D) computer aided design (CAD) systems and

Figure 1 Flow of Rolling Stock Production



**Table 1 Carriages Manufactured by NRSMF**

Series (units)	209	E217	E231	209 – 500	209 – 950	1000
						
<b>JR East</b>						
Keihin Tohoku Line	420					
Yokosuka Line; Sobu (rapid) Line		266				
Chuo main line; Sobu (local) Line			370	170	5	
Yamanote Line			572			
Joban (rapid) Line			265			
Tokaido main line			185			
<b>Sagami Railway</b>						19

standard CAD to maximize design efficiency and build-in quality and safety from the earliest stages. The CAD data is then moved over an optical network to about 1000 of the latest numerically controlled (NC) machines on the shop floor where the basic parts are made. This use of digital data right from planning through to final assembly helps guarantee quality at every stage while assuring safety and eliminating waste. Large NC metal benders turn the sheet-metal extrusions

into the basic carriage body components, which are then moved to the welding, assembly and fitting areas where they are assembled and fitted with other parts to complete the carriage. Assembly uses a combination of both NC robot welders and skilled engineers to finish the cars. For example, bogies built from raw materials are largely welded by robots and can be machined throughout the night, achieving high accuracy with great cost and time efficiency. Other parts, such as

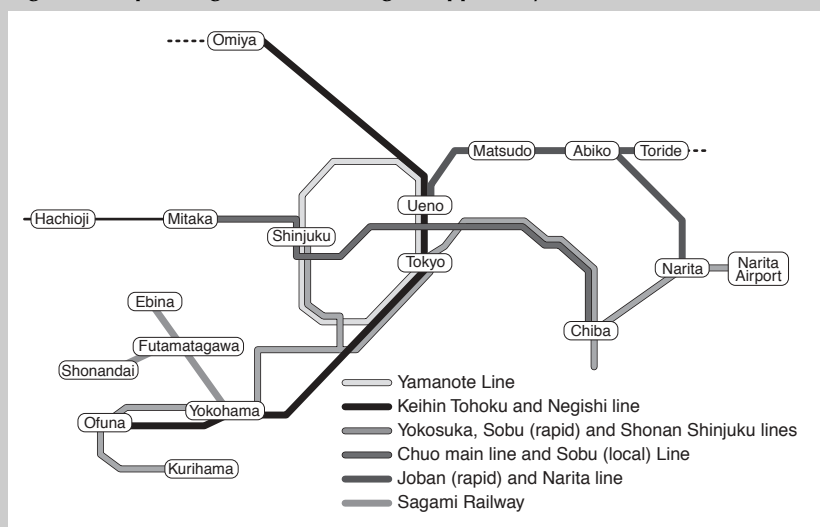
the floor plate, are welded by unmanned operation using in-house developed NC robots. When the carriage is nearing completion, the in-carriage equipment, such as the IT systems, piping, underfloor equipment, etc., are fitted, and the finished car then proceeds to running trials in the factory and on the nearby main line.

### Tokyo Commuter EMUs

Since opening in 1994, NRSMF has delivered 2272 carriages (at September 2004) both to JR East and to the private Sagami Railway Co. Ltd. (Table 1) and all are in service in and around the Tokyo Metropolitan Area (Fig. 2).

The latest series is the E231 which was designed as JR East's standard EMU for urban and local commuter transport to help ease congestion, especially on the Yamanote Line where it runs in 11-car train sets at very close headway with operating speeds of 120 km/h. The wide carriage body design with some fold-up seats during the rush hours and 6-door cars (two in each train set) give passengers more standing room and help passenger flows on and off trains. Advanced onboard systems include the popular in-carriage Visual Information System (VIS),

**Figure 2 Operating Lines of Carriages Supplied by NRSMF**





Newest Series E231 EMU on Yamanote Line

(JR East)

providing passengers with information about station location, time to next station, weather, advertising, etc.

Drivers also use the advanced Train Information System (TIMS) for acceleration and braking, etc., an automatic guidance system, and a VVVF-based power control system, etc., to keep operations on timetable despite very close headways.

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### Rolling Stock R&D

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In addition to being JR East's primary rolling stock production facility, NRSMF is at the forefront of R&D into new manufacturing technologies. It uses the



NC Machines cut and bend sheet metal for car bodies.

(JR East)



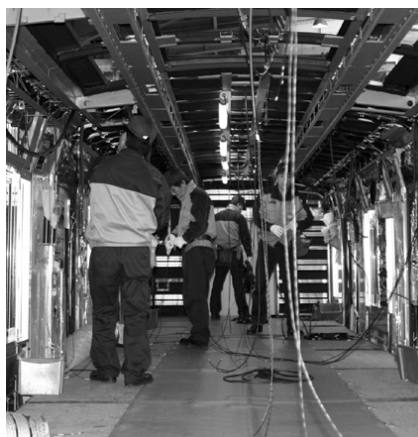
Parts are assembled into panels (for roofs, floors, etc.), which are then assembled into car bodies.

(JR East)



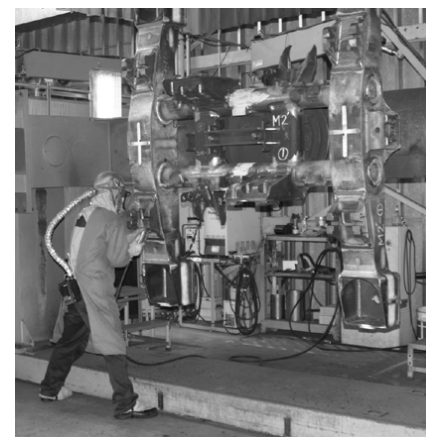
Parts such as pipes and wiring are manufactured based on NC data.

(JR East)



Installation of wiring, pipes, and other equipment is done on assembly lines.

(JR East)



Many types of welding robots are used to continue unmanned operation throughout the night.

(JR East)



company optical network to exchange CAD and other data with JR East divisions, including the various branch and operations offices, the Tokyo General Rolling Stock Center, the Nagano General Rolling Stock Center, and other carriage manufacturers. New ideas about self-developed NC machines and production processes are exchanged with other engineers both inside and outside the company to ensure that the works stays at the forefront of technological advances so it can continue creating new value for its customers. One example is the automatic floor-plate welding robot, which makes carriage assembly much more efficient. Another example is the NC machining device for dressed sheets that both eased the complex and tedious work of machining dressed sheets for car interiors but also achieved high efficiency through its unmanned operation as well as high quality.

### Continuing Development

Based on the 'Do not stop enlightening yourself.' motto of the first JR East Chairman, the late Mr Yamashita, NRSMF attaches great importance to making the shop a good place to work by encouraging employees to participate in small-group activities aimed at developing their skills, proposing new ideas related to improving production, and contributing to their local communities through social activities, etc. The works expects to continue playing a leading role in development of next-generation rolling stock both for JR East and other domestic operators but also for overseas operators who are looking to improve the efficiency of their aging rolling stock or who are building new urban lines. ■

### Acknowledgment

This article is based on information received by JRTR from NRSMF.



Many people visit NRSMF during factory open days.

(JR East)



Visitors can tour new rolling stock during open days.

(JR East)



NRSMF employees plant bulbs along roads as part of community service.

(JR East)