Note: In Section 9.2, many figures are cited from Chapter 1.

Table 1 Worldwide Standards of scale and gauge treated generally as N-gauge or N-scale.

Fig.9-1 This tin plate Bing model, produced in 1910 as a gift[1] and 1912 for general sale, is regarded as the earliest N-gauge size model. There are color variations of the passenger cars in red, green, and blue in addition to the most popular color, brown. The model was prepared only for display.

Fig.9-2 Early train models by "Tootsietoy" were made in 1921[3] as push toys. Primitively shaped streamlined railcars and various colored steam trains were typical examples of these early models.

Fig.9-3 "Dinky Toys" also made train models in these early stages. Shown at the front is a streamlined railcar from French Dinky, behind it is a model in the last color scheme of the streamline steam train in England, a production holdover from the prewar era.

Fig.9-4 Tootsietoy and Dinky Toys models had rolling wheels, as they were push toys for children.

Fig.9-5 In 1947, "Micro trains" in Sweden produced kits of a Hudson 4-6-4 steam locomotive and a heavy weight passenger car. The name "HOO gauge" was given to the scale - slightly larger than N-scale and with a gauge of 10mm. (Model Railroader, Mar., 1956)

Fig.9-6 The contents of the heavy weight passenger car kit were enough to be regarded as a railroad model. The body was made out of injection molded plastic, and the trucks were composed of die cast parts. The massage "World's Smallest Model Railroad Equipment" can be seen on the box. The production year of 1947 is printed on the instruction sheet.

Table 9-2 Classification of Lone Star railroad models produced by the manufacturer "Die Casting Machine Tools" in England.

Fig.9-7 "Lone Star Locos" were push toys with an 8mm gauge entering the market in 1957. The Locos covered a variety of components including tracks and structures. In spite of the toy-like appearance, Lone Star Locos had an important role in the development of N-gauge models due to their influence on the development of electric models in 1960.

Fig.9-8 Lone Star Locos used hook couplers. Car windows were solid and not designed as cut-outs - evidence of the products' old age. Some of the models pictured here were employed again following redesigns of their couplers as well as their wheels to fit 9mm tracks to be a series of electric models.

Fig.9-9 For the original production of the Locos, paper boxes with a standard picture were used. They were replaced later by the blister packages for productions which were imported also to Japan.

Fig.9-10 Lone Star Locos had various structures which were made of die cast with the exception of trees, telegraph poles, and fences. Among these structures, the semaphore signals operated mechanically were well designed. These structures continued to be used after moving over to electric models.

Fig.9-11 In 1959, display models under "Minitrix (Schiebetrix)" was released by Trix in Germany. These models had detailed bodies in 1/180 scale made of die cast, while the metal wheels had no flanges. The blue passenger cars were released later.

Fig.9-12 In 1961, a small steam locomotive T3 and a two-axle passenger car with open decks were added. These models had been sold under the name of "Minitrix". The name was used also for the electric model version by the addition of a term "Electric" in 1964, when the steam locomotive T3 was motorized, becoming the first "N-gauge" powered model from Trix. Because the electric model was developed based on the previous non-operating model, the scale of the boiler seems to be smaller than 1/160.

Fig.9-13 Beautiful Minitrix catalogs were prepared to promote their collection of display models. The existence of three different catalogs has been confirmed so far.

Fig.9-14 In 1960, Lone Star Locos changed its standards to evolve into "Treble-O-Lectric" models with a scale of 1/152 and a gauge of 9mm. This model is widely regarded as the first N-gauge model in the world despite its toy-like appearance. The picture shows the cover of British magazine "Railway Modeler", Nov., 1960 in which the release of the Lone Star electric model was introduced.

Fig.9-15 The drive unit in the Treble-O-Lectric did not use gears. Transmission of power from the motor as well as spin reduction were performed simultaneously by rubber belts that were wound between the motor's axle and the larger diameter wheel shafts.

Fig.9-16 The Baldwin 0-8-0 steam locomotive contains a drive unit using rubber belts in the long separated tender.

Fig.9-17 The British D-5000 and D-5900 diesel locomotives were based off the Treble-O-Lectric. They had larger

bodies than Lone Star Locos to contain the drive units. The bodies, which were made of die-cast in the manufacturer's tradition, were also used as weights.

Fig.9-18 Most freight cars and passenger cars from Lone Star Locos were converted to Treble-O-Lectric by modifying the wheel gauge and couplers. The size of the tank car was slightly smaller than OOO scale, i.e., 1/152, while the size of passenger car was well balanced with the locomotives.

Fig.9-19 In the latter half of the production, the number of items produced for north American prototypes was increased. The F7 diesel locomotives has a large variety of paint schemes for different road names, including the most popular paint scheme of Union Pacific. However, the stability of drive units with geared mechanisms designed by Arnold was superior to those units using rubber bands, and the production of Treble-O-Lectric engines was limited only to a period of about five years.

Fig.9-20 The track system allowed Treble-O-Lectric to be regarded as the first example of N-gauge in the world. Despite the larger pitch of the sleepers, the gauge is exactly 9mm. Tracks for electric switching with large solenoid coils and high-grade electric transformers were also available.

Fig.9-21 A tunnel and a group of houses under the name Gulliver Country were added to the layout structures which continued production after the Locos ceased.

Fig.9-22 Lone Star, a famous brand of miniature cars, released a large variety of cars in N-gauge including a fire engine and a trailer truck for the Treble-O-Lectric system. Additionally, buses in red and green colors were produced.

Fig.9-23 Seven train sets of Treble-O-Lectric were prepared. The photo shows an example of the standard set (EL-51). There was also a deluxe set including structures.

Fig.9-24 It can be seen from the models in the catalog of Treble-O-Lectric that the Lone Star targeted the U.S. market. Eventually items from Treble-O-Lectric would number more than 130.

Fig.9-25 The first model by Arnold in West Germany was the German V200 diesel locomotive. A series of early models sold with under the name "rapido 200" had a scale of 1/200 which were smaller than the size of N-gauge. The earliest models produced in 1960 were equipped with silver plates on the side of trucks and an underframe without any imprinted lettering.

Fig.9-26 The geared drive unit of these Arnold rapido 200 units provides stable operation even more than 50 years after its production. The drive unit was used in the building of locomotives until the mid-1960s. The original unit has a silver sticker indicating the maximum applied voltage of 14V instead of a red sticker indicating 12V for the latter production. From 1962, the drive unit had black plates on the sides of the trucks and the underframe was lettered. There were also the models in the transition period where either of the changes could be observed.

Fig.9-27 In 1962, the scale was changed from 1/200 to 1/160, and today's standard of N-gauge was established. The photo shows the comparison between the model (right, item number: #0201) before the change of the standard and the model (left, #0202) after the change. There is a significant difference in the cross section of the bodies. The new series was called "rapido," a name retained even after the term "N" became popular in the mid-1960s. "Rapido 200" models were sold alongside the newer "rapido" trains for several years.

Fig.9-28 Passenger cars under the designation of "standard series" in the rapido 200 line were equipped with unpainted plastic bodies with a small cross section and a length that measured to less than 1/200 scale, mounted on an underframe and trucks which were much larger than 1/200. There were many variations in molded colors both with and without lettering on the underframe. The early Arnold models for both of rapido 200 and rapido were inserted in a simple paper package with a transparent plastic cover. A similar style of the package was adopted by Sekisui Kinzoku for its early models.

Fig.9-29 The first model released in 1960 was train set with layout. The substrate of the layout is made of expanded polystyrene sized 50cm×100cm. The tunnel portal was made of tin plate, where the picture of piled red bricks was printed beautifully using the technology and the experience that Arnold had accumulated through the years before their entry into model railroading. The track radius was reduced to 200mm which was 2/3 of the value adopted by Treble-O-Lectric. (Photo by NEKO publishing)

Fig.9-30 The track used in the layout was made from a bent and blackened thin iron plate. This technique was often observed in tin toys. The gauge of the track was 9.5mm instead of 9mm. The track beds and sleepers were printed on thick paper sheets which doubled as electric insulation. The track switch had no frog and the surface of the paper served also as a flange way for wheels.

Fig.9-31 The production of German bogie freight cars manufactured originally as a group of rapido 200 continued with the improvement of trucks and couplers even after the change in the standard of scale from 1/200 to 1/160. The Lettering on the bier tank cars such as Hackerbräu in München was reproduced through the use of decals.

Fig.9-32 In 1961, the systematization of model trains by Arnold began with the introduction of new tracks. In the early train sets, a transformer or a battery box was included.

Fig.9-33 An original transformer of rapido 200 operated via a power input of 220 Volts AC.

Fig.9-34 The first catalog of Arnold rapido 200, consisting of 12 pages including the cover, was printed in black and white with a color printed cover.

Fig.9-35 Reflecting a large U.S. market for model railroading, many U.S prototype models were produced in the early days of N-gauge. The photo shows some early diesel locomotives. Three models from the left are the Baldwin type locomotive with a plastic body by rapido 200; a model in 1961, NH (New Haven) in 1961/1962, UP (Union Pacific) in 1963. Two models from the right are GE (General Electric)/ EMD (Electro- Motive Division) F9 with a die cast body produced after the change of standards; B&O (Baltimore & Ohio) in 1963 and SF (Santa Fe) in 1964. The yellow lines of the Santa Fe War Bonnet paint scheme were reproduced by thin strips of paper. Despite the difference in the targeted scales between the two locomotives before and after the change of standards, we do not feel incompatibility in the width of their bodies.

Fig.9-36 Freight cars of U.S. prototypes, produced originally as models in rapido 200, were converted and modified to be used as models of "N-Scale" (rapido). Many variations in different color schemes of road names were made available. On the original models, small rectangular holes for the attachment of a floor plate can be seen.

Fig.9-37 In 1961, a new track system was developed. The compact train set "Channel Master", composed of a Baldwin diesel locomotive and freight cars, a loop of track and a battery pack, was released in 1962. The picture of vacuum tube on the box emphasized the value of the models by reflecting the state-of-art technology at that time, like televisions. The popularization of the small model by the construction of the layout was intended from the early stage.

Fig.9-38 A set of trains exported to the U.S. containing an F9 diesel and German standard passenger cars in the Baltimore & Ohio color scheme - models from before and after the change of scale, respectively.

Fig.9-39 The difference in size between the locomotive and the passenger cars was quite large, while the underframe of the passenger cars has a size comparable to the locomotive. The original Arnold-type coupler has a thin rod extending upward for coupling with the hook coupler of rapido 200. In the photo, the passenger car built to the old standards seems to ask the locomotive not to forsake it.

Fig.9-40 In the cover page of this Arnold 1962/1963 catalog, all models at that time including those of trial products were seen on the layout. Instead of "rapido 200", already the brand name "rapido" was seen on the cover and was used hereafter for a long time. However, the description about the change of the standards was not included yet in the catalog.

Fig.9-41 In the catalog from 1963/1964, the standards of "rapido" as being 1/160 scale and with a gauge of 9mm were described in the top page.

Fig.9-42 The early steam locomotives by Arnold; from right to left, the original model of BR66 in 1963, the original model of BR89-7 in 1963/1964 and a tank locomotive for export to the U.S. (item number: #0222S) with an underframe from a later production using some of the original parts. The bodies of all steam locomotives were made of die-cast metal.

Fig.9-43 Early electric locomotives by Arnold; from right to left, DB (Deutsche Bundesbahn) in West Germany/ E69 in 1964, SBB (Schweizerische Bundesbahnen) CFF(Chemins de Fer Fédéraux suisses) FFS (Ferrovie Federali Svizzere) in Switzerland/ Re4/4-I in 1963 and DB/ $E10^{-12}$ in 1964. All locomotives were equipped with non-moving plastic pantographs. Arnold-type couplers were mounted to all of them, although there were also a small number of models of the Re4/4-I with tin hook couplers produced in 1962. The bodies of the locomotives were made of die-cast metal except the plastic body of the E69.

Fig.9-44 Examples of passenger cars just after the change of standards; two axle passenger cars with window frames made of tin plate and die-cast underframe and trucks released in 1963, passenger cars with bogie trucks made of die-cast metal including an Italian FS (Ferrovie dello Stato) variation in red brown.

Fig.9-45 The photo shows a display model (early Minitrix, Schiebetrix) of a T3 and a motorized model with a modified body. The motorized model became the first Trix N-gauge model in Germany released in 1964 under the name of "Minitrix Electric" – a name to distinguish these powered models from the display models under "Minitrix". The front windows of the cab were not yet opened in these models. The intension to produce international models was declared by printing of many nations' flags on the side of the paper box.

Fig.9-46 The steam locomotive T3, two-axle passenger cars and two-axle freight cars produced in 1964 only, had original couplers similar to Baker couplers in HO-scale. The hook parts at the front of the T3 were omitted originally because of the necessity to pass above the lead rails of a switch. The sets of passenger and freight trains were also prepared.

Fig.9-47 The transition and development of the Minitrix T3; from right to left, a Schiebetrix in 1960, an original motorized model of Minitrix Electric in 1964, models with the same body without front windows in the cab but with

Arnold-type couplers (not shown), a colorful train set with pictures of flowers in 1973, and a final model with front windows in the cab. There were also two models of KPEV (Königlich Preußische Eisenbahn-Verwaltung in Germany in the past) in olive color, and a model in light green color included in a starter set.

Fig.9-48 In 1964, Piko in East Germany produced a DR (Deutsche Reichsbahn) East German V180 diesel locomotive as an N-gauge model equipped with original couplers without hooks. There were two variations of the original V180 model with grey and silver roofs. A train set with two-axle freight cars, tracks and a battery controller was also provided.

Fig. 9-49 The tracks by Piko were composed of bent steel plates, where solid thin rods were inserted into one of rails for assembly in the same manner as tin toys. The gauge was exactly 9mm.

Fig.9-50 In 1964, one year before the release of N-gauge by Sekisui Kinzoku, the "SONY Microtrain", was produced by SONY in Japan as a trial. Because of the scale and the gauge adopted by the SONY Microtrain, we can say that it could be the first N-gauge in Japan. Only 200 sets were produced and delivered to dealers handling SONY's electric appliances, but none were released to the market. The set were composed of a JNR ED75 alternative-current electric locomotive, JNR SUHA43 passenger cars, an oval of track, spikes, a layout mat made of paper, a re-railer, and an instruction manual. The models were well-designed using existing German models available at that time as a template.

Fig.9-51 The ED75's body is made from a metal plate and a separated plastic roof. The method to manufacture a body shell from thin plate had never before been attempted by any manufacturers in N-gauge at that time. The drive unit was installed in the bottom of the body and adopted a simplified mechanism to drive the wheels. As a result of this design, a large empty volume was left in the body. The empty space implied the potential of the locomotive to incorporate a built-in control unit, the type of which would only have been capable by the manufacturer. The model was produced as a trial only, however there was still a finished original sample model for mass production made. As shown in the photo, the original model has hand rails at the sides of cab door, and convex relief pattern around the bases of hand rail are visible. The relief pattern is different from those commonly seen in models where the handrails themselves are reproduced by relief patterns.

Fig.9-52 The SONY Microtrain transformer has a unique round shape and is painted red. A red lamp on the transformer is illuminated only in the case of short circuit. The maximum voltage and current supplied are 12V and 1A. The name of the transformer is MT-2, although there was never any known example of an MT-1.

Fig.9-53 The switch for the Sony Microtrain had long been regarded as an item that was planned only. However, an sample switch was finally found and the size and shape coincides exactly with the illustration of its profile on the layout mat. The long vertical lever implies the use of an electric magnet for switching.

Fig.9-54 The instruction manual for the SONY Microtrain consisted of printed information across two pages in B5 format.

Fig.9-55 A set of *Yume-no-Cho-Tokkyu* ("Super express in a dream") was developed and released during the time period of 1963 to 1964 under the brand name of "TOMY" by TOMIYAMA in Japan. The set was sold only in toy shops and had no relation to the "TOMY Nine Scale" released later as N-gauge models. The drive unit and couplers were similar to those of the Treble-O-Lectric. On this model, a prototype of an experimental formation B of Type 1000 "Shinkansen" train was selected reflecting the years of its production. The prototype, manufactured according to technical data for the development of the famous Shinkansen train JNR Series 0, had such features as three separated front windows and also the prototypical shape of the windows on the side of body. The model set was sold at a price of 2,450 JPY and included an oval of track and a transformer "to be connected to the line of light in a room" in addition to the three train cars with plastic bodies. The Shinkansen model by Tomy seems to occupy the intermediate position between a toy and the N-gauge model.

Fig.9-56 The timeline for the development of early models by Sekisui Kinzoku in 1965-1972. (Prepared by Haruhiko Ohta)

Table 9-3 A Comparison of standards between the manufacturers who began the production of small electric train models in the early period.

Fig.9-57 The original production Arnold BR66 and a Lone Star Baldwin locomotive (Fig.9-15) were current steam locomotive models when Yuji Kato started to design the JNR C50 steam locomotive with a separated tender in 1963. The BR66 was released just after the change of scale from 1/200 to 1/160. To operate on curves of an R1 (192mm) minimum radius according to Arnold's new standards, the second driving wheel became flangeless. The model shows high mechanical toughness in operation even after more than 50 years has passed since its production.

Fig.9-58 The early models of JNR Series 103 electric commuter cars were designed to be molded in color (without paint). As a result, in later productions of yellow, orange and light green models the bodies were painted because of the plastic's notable transparency, while only un-painted bodies were produced for blue color. The bodies without and with paint are shown in the front and rear of the photo, respectively. The transparency of the body walls can clearly be observed especially for the un-painted body in orange color.

Fig.9-59 The bodies in light green color both with and without paint are shown in the front and rear of the photo. The transparency of the unpainted body in light green is less clear than that of the orange color but is more pronounced compared to the blue color.

Fig.9-60 Only one truck was powered in early models of MOHA103(M) and KUMOHA103(M). The motor and surrounding mechanism were different between the original production (shown at the front of the photo) and the later production (back).

Fig.9-61 When the rear of the floor board from the original production (shown at the front in the picture) and the later production (back) are compared, the later production has two unused empty holes. A large screw seen in the latter production was used for fixing a new "Midget motor" developed by Sekisui Kinzoku.

Fig.9-62 The picture shows variations of early paper boxes (except those for freight cars of Japanese prototypes). A thin transparent plastic cover was used for JNR C50, OHA31 and Series 103 electric cars in the original production, which was changed to a thick transparent sliding frame for EF70 and Series 20 sleeping cars in their original production.

Fig.9-63 The variations of medium-sized paper box.
(a) The medium-sized paper box in the original style was lettered "SEKISUI 9" in blue characters and "SEKISUI N" in black characters on the white and red side surfaces (cf., the left edge in Fig.9-62), respectively. The early track system was illustrated without item numbers on the back surface.
(b) On the medium-sized paper box made later for domestic use, the color of the "SEKISUI N" lettering was changed from black to blue on the red side surface (cf., the second from the left in Fig.9-62). The early track system was illustrated with item numbers on the back surface.
(c) On the medium-sized paper box made later for export use, compared the domestic version, the lettering "SEKISUI 9" was changed to "Con-Cor 9" on the white side surface (cf., the third from the left in Fig.9-62). Freight cars of U.S. prototypes were illustrated with a message for sales promotion.
(d) The medium-sized paper box in the final style for domestic use had letterings of "関水金属 N (Sekisui Kinzoku N) in blue characters and "SEKISUI KINZOKU" in white characters on the white and red side surfaces (cf., the forth from the left edge in Fig.9-62), respectively. Freight cars of U.S. prototypes were illustrated as on the export use versions, eliminating the promotional wording for U.S. customers.
(e) On the medium-sized paper box in the final style for export use, compared to the final domestic version, freight cars of U.S. prototypes were illustrated along with a message for sales promotion, similar to the previous export box. For domestic use, the same export version boxes were frequently used along with attached stickers for the correction of the original characters on the white side surfaces. The large and extra-large paper boxes in Fig.9-62 were used for the smooth-side passenger cars and the J3a steam locomotive, respectively.

Fig.9-64 The contents of the first catalog distributed in 1967 are shown on pages 172-173. The second catalog published in 1971 was composed of a total 24 pages including covers in A5 format. The price was 150 JPY. The third catalog in 1973 had the same cover page, but the total number of pages was increased from 24 to 32 while maintaining the same price.

Fig.9-65 The left photo is the first book of layout planning published in 1971. It was composed of 32 total pages including the covers in A5 format. The price was 150JPY. The design of the track arrangements were proposed based on the new track system released by Sekisui Kinzoku. In the second layout planning book, shown as an enlarged edition in 1972 in the right of the photo, information about the track switches, control panels and structures such as bridges provided by ATLAS were added while maintaining the same price.

Fig.9-66 An instruction manual written in Japanese was included with the original production models of JNR C50 and OHA31. The explanation entitled by "How to use 9mm-gauge railroad models" was described in 1965 by Kigei Publishing Co., Ltd., the publisher of the model railroading magazine TMS in Japan, which continued from just after the war into the present day.

Fig.9-67 The instruction manual for models exported to the U.S. were prepared by Kumata Co., Ltd., the exporter in Japan. Products manufactured by Sekisui Kinzoku were distributed by Con-Cor in the U.S. It is noteworthy that the terminology "OOO/ N-gauge" was employed in the U.S. in spite of the name "9mm-gauge" used in Japan.

Fig.9-68 The rapid increase of export models by Sekisui Kinzoku at that time can be seen in the advertisement printed in color on the back cover of TMS, No.256, Oct., 1969. The increased number of items and the existence of various color schemes for different road names are shown. (Cooperated by Kigei Publishing)

Fig.9-69 Some export models were available also in Japan. The photo shows a train set composed of a Santa Fe PA-1 locomotive and freight cars which are inserted in the large tray of expanded polystyrene with a transparent plastic slide cover. The price of the set was 7000JPY.

Fig.9-70 Lone Star's electric Treble-O-Lectric models were equipped with large Baker-type couplers. Because the couplers were fixed to the underframe for short models and could not swing laterally, the frame of the coupler had to be quite large. After the Treble-O-Lectric, which was regarded as the first N-gauge electric model in the world, was discontinued in the mid-1960s, the couplers found continued use on Lone Star's later push models.

Fig.9-71 Because of the large size of their couplers, coupling and uncoupling between Treble-O-Lectric models was easy and smooth.

Fig.9-72 Arnold rapido 200 produced after 1960 had tin hook couplers, until 1962 when the models of new standards came out. The coupling between the hook couplers was smooth because the base of the coupler was equipped with a centering mechanism.

Fig.9-73 The well-known Arnold-type coupler was first adopted by the original BR66 steam locomotive produced in 1963 by Arnold. The coupler was different from the usual Arnold-type coupler widely used today. It had a rod extending upwards for coupling with the existing rapido 200 hook couplers. There are many models with early Arnold-type couplers without the rod because the removal of the rod was recommended in the included instruction sheet for those users who did not use it.

Fig.9-74 By using the rod of the early Arnold-type coupler, the coupling of the 1960 release V200 with tin hook couplers and the 1963 release V200 with early Arnold-type couplers was made possible. The red color of the original production V200 was darker than the color in the later production.

Fig.9-75 The appearance of the tin hook coupler was simple, and it used a leaf spring assembly in the floor plate for centering. The tin coupler adopted by SONY Microtrain was similar to the hook coupler by Arnold except that the hook angle was reversed.

Fig.9-76 Original couplers were adopted by Minitrix Electric models in 1964. A T3 steam locomotive and passenger and freight cars from the original production were equipped with these early couplers. They functioned in a manner similar to the Baker-type coupler.

Fig.9-77 Piko in East Germany started to produce N-gauge models in 1964. These Piko models used original couplers similar to the Baker-type for a long time just like the loop couplers by Lima in Italy. The photo shows a CSD (Československé Státní Dráhy) Czechoslovakia/ T449 diesel locomotive and SNCF (Société Nationale des Chemins de fer Français) in France/ BB9200. The hook parts were removed from the coupler attached to the locomotives, and only the frames were used.

Fig.9-78 Early couplers made of tin plate were attached to many freight cars by Piko. There were two variations in the width of the coupler.

Fig.9-79 The appearance of the freight train coupled with these early Piko couplers is excellent.

Fig.9-80 Passenger cars by Herbert Stein in East Germany, which was unified eventually with Piko, were equipped with couplers of a unique shape. The function was the same as that of the Baker-type coupler, and coupling with early Piko couplers and early Minitrix Electric couplers was possible. Because the hook parts were made of plastic, the couplers required care not to be broken. There were three different passenger cars by Herbert Stein that used these early couplers. However, the item number was unified to 5730 independent of the shape of the model.

Fig.9-81 The coupling of the Herbert Stein passenger cars looks excellent thanks to the detailed deck molding.

Fig.9-82 Lima in Italy started production of N-gauge models in 1966. Loop couplers similar to those used in HO-scale models were used on these early N-gauge models. Because they were utilized for so long, these loop couplers are some of the most commonly found on products prior to coupler standardization.

Fig.9-83 The connected appearance of loop couplers is excellent as they closely resemble the couplers of prototypes widely used in Europe. However, due to the small size in N-gauge, loop couplers had issues with reliability and attempts at automatic coupling would frequently fail.

Fig.9-84 Tibidabo in Italy produced N-gauge models from the mid-1960s. These models had loop couplers compatible with those made by Lima, although the coupling distance between Tibidabo models was smaller.

Fig.9-85 The picture shows an Italian FS (Ferrovie dello Stato) E626 electric locomotive by Tibidabo. Only two locomotives, including the FS/ 626 steam engine, were produced by Tibidabo. These locomotives were equipped only with hook parts to reproduce prototype coupler, requiring the use of a small elliptical ring to couple two locomotives together.

Fig.9-86 Aurora was a brand that handled European models in the U.S. These were Mexican models with NMRA-type couplers released under the name of "Rail Masters". The coupler was made of plastic and used the flexibility of the thin arm to provide a centering motion.

Fig.9-87 Coupling between Aurora's Mexican models and early Sekisui models is possible.

Fig.9-88 Models of the NOHAB (Nydqvist & Holm AB in Sweden) diesel locomotive as made by Piko in East Germany; from left to right, SNCB (Société Nationale des Chemins de fer Belges) in Belgium/ BR204, MAV(Magyar Államvasutak) in Hungary/ M61, DSB (Danske Statsbaner) in Netherlands/ MY1100.

Fig.9-89 The CSD (Československé Státní Dráhy) train in Czechoslovakia consisted of articulated double decker passenger cars pulled by a DR (Deutsche Reichsbahn) in East Germany/ BR65 steam locomotive. These double decker passenger cars were available as a set of two or four cars including their variation of DR in the same color. Furthermore, two variations in DR with different letterings were produced, "DR" and "DEUTSCHE REICHSBAHN". There were also green-colored variations of the steam locomotive DR/ BR55 with a separated tender, SNCF (Société Nationale des Chemins de fer Français) in France and SNCB.

Fig.9-90 The electric locomotive CSD/ S699 pulls passenger cars in East European countries. The electric locomotives had other Soviet variations of SZD (Sovetskie Zheleznye Dorogi) in three different colors; cream/brown, cream/blue and cream/red. There were also variations of DR, CSD and DSB for the passenger cars, which were slightly smaller than other N-gauge models.

Fig.9-91 SZD passenger cars in three different colors made by Piko.

Fig.9-92 Fictitious variations of NS (Nederlandse Spoorwegen) in Netherlands and DB (Deutsche Bundesbahn) in West Germany were observed in the SNCF BB9200 (cf., Fig.9-77).

Fig.9-93 Fictitious TEE passenger cars using the model of the SZD included a dining car with a MITROPA logo mark and an original non-existent sleeping car.

Fig.9-94 Prior to their unification into Piko, there were a variety of two-axle passenger cars produced by small manufactures. These models came in various different colors and/or materials. Because most of them were assembled by glue using fine parts, it is difficult today to find a passenger car in good condition.

Fig.9-95 Two-axle passenger cars that had extremely long wheel bases used a unique design where the wheels would rotate side-to-side with the trucks.

Fig.9-96 Unique prototypes such as the DR/ VT4.12 diesel car was selected to be produced in model form by Piko. A set of M(with motor) + T(without motor, trailer) as well as a single item of T were available.

Fig.9-97 N-gauge color catalogs by Piko written in German and Russian languages was published in 1976. A description of Piko's N-gauge models released at an exhibition in Leipzig during the autumn of 1964 was included in the introduction.

Fig.9-98 Ibertren in Spain began the production of N-gauge items in 1973 with the manufacture of three-rail track to be used with direct-current operation. On the original production, the track included a bed made of iron plate with printed ballast. Between the rails there was an array of projecting vertical metal plates instead of sleepers on which the power collecting shoe located under the trucks of locomotive would rest. In later productions, the track was composed of rails and sleepers, with an array of raised vertical metal plates for power supply attached to the individual sleepers located between the rails.

Fig.9-99 A sled-like power collecting shoe was attached to the truck of a locomotive in a series of "3N" dedicated for three-rail tracks. In 1982, most locomotives were renewed to be compatible with the more common two-line system of "2N". The photo shows examples of 3N locomotives; a small steam locomotive with a separated tender (Item number: #013) available only in 3N, a diesel locomotive in RENFE (Red Nacional de los Ferrocarriles Españoles in Spain) color (#016), and an Alstom electric locomotive in TEE color (#015).

Fig.9-100 Switches on a 3N system have a unique structure to avoid short circuits. On the original production switch, the height of the discrete vertical metal plates was gradually increased for the power collecting shoe in order to prevent it from touching the lead rails. On the later production switch, the plate for the power supply located between the rails was raised for the shoe to pass over the lead rails.

Fig.9-101 Many photos of early models in N-gauge by manufactures all across the world were included in the revised edition of "Modellbahn in Spur N" published in 1990 by Alba Publikation in Germany (ISBN: 3-87094-563-X), which described the history of manufacturers and depicted their N-gauge models. The book's contents were completely revised in 1999, although it is not so difficult to obtain the older edition of this book today.