

## Estimating Production Dates for Dietzgen Micromatic and Microglide Log Log Duplex Slide Rules

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The Eugene Dietzgen Company was founded in 1885 as a manufacturer and supplier of drafting and surveying equipment. Dietzgen began to manufacture slide rules in the early years of the twentieth century. However, they did not offer log-log duplex rules until 1945 [1], despite these having proved hugely popular in the USA since their introduction by Keuffel and Esser in 1913.

For the next 11 years, Dietzgen produced log-log duplex rules that were almost exact copies of the equivalent K&E models. In a previous paper [1], I developed a dating system based on serial numbers for the two generations of slide rules made during this period. Additional data collected over the last two years have confirmed the original findings.

The third and fourth generations of log-log duplex slide rules were introduced in 1956 and 1959 respectively. I first developed a dating system for these rules in 2009 [2], but

further research has shown there to be significant errors in the predicted manufacturing dates. This paper is based on further research and attempts to correct those errors.

### Micromatic Duplex Slide Rules

With the Micromatic series, Dietzgen ceased to imitate K&E and introduced duplex slide rules of innovative and unique design. Wooden cored rules are subject to swelling and shrinkage due to changes in the ambient temperature and humidity. Frequent adjustment might be necessary to ensure that the slide moves freely. The Micromatic design attempted to solve this problem by having a floating shorter stator rail held against the slide by specially shaped leaf springs located in pockets at each end.

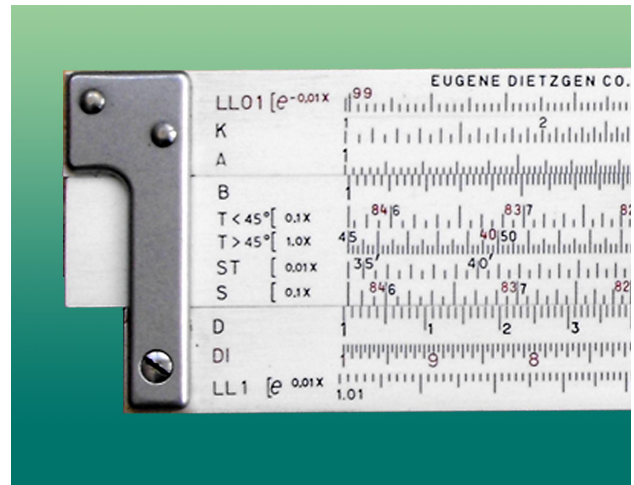
The mechanism is shown in Figure 1. Two cylindrical



FIGURE 1.  
Micromatic mechanism

bushes, each slightly longer than the thickness of the stator rail, are clamped firmly between the stator end brackets by screws on each side. Oversize holes in the rail allow it to move relative to the bushes. Leaf springs press the stator rail toward the slide and also to the left. A small screw is located at the right hand end of the rail and bears on the bush at that end. Turning this screw moves the rail to the right or left, so facilitating accurate alignment of the scales on the stator rails.

The Micromatic range consisted of three slide rules, the N1731, the N1732 and the N1725. They are larger than their predecessors, with the width of the slide increased by 2 mm to accommodate an extra scale on each face. The outer edges of their stators have an inlaid strip of plastic, similar to the one introduced by K&E in 1954.



**FIGURE 2.**  
N1731 Micromatic

**N1731 Micromatic**

The trigonometric scales are divided in degrees and minutes.

The N1731 is quite rare and I know of only four examples.

There are two distinct serial number series:

- a) 402061, 402113
- b) 171867, 172143

Serial numbers in series (a) followed on from those used on the 1731, which preceded the N1731. The highest known serial number for a model 1731 is 401534. N1731 serial numbers possibly started at 402000. Series (a) serial numbers were probably used before those in series (b).

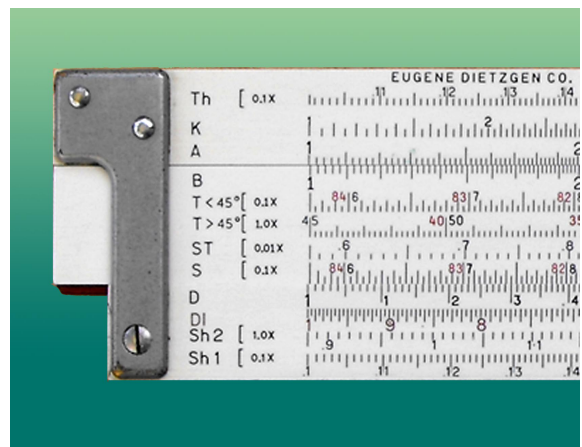
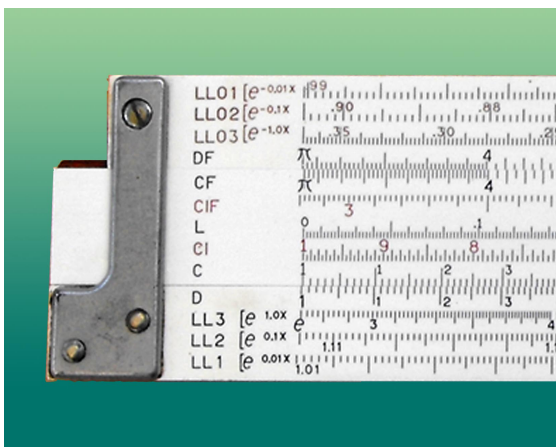
**N1732 Micromatic**

The N1732 Micromatic has the same scale set as the N1731 but the trigonometric scales are divided decimally. It is quite common, and I have collected data on 41 examples. All examples have serial numbers and at least four different series appear to have been used:

- a) 580380-589935 (18)

- b) 001794 and 013779 (2)
- c) 067660-089807 (15)
- d) 180866-184238 (6)

Series (c) may actually be two or more series. 58##### serial numbers (a) followed on from those used on an earlier Dietzgen duplex rule, the 1732, and rules carrying these numbers were probably made before the others. The highest known serial number for a model 1732 is 576440 and it is possible that N1732 serial numbers started at 580000. Rules with serial numbers in series (a), (b) and (c) all have all-metal cursor frames except for 088238, which has a metal framed cursor with white plastic ends. The three lower serial numbers in series (d) have cursors with white plastic ends, whereas the two higher serial numbers have cursors with black plastic ends. Black plastic cursor end bars were fitted on all later Dietzgen high-end duplex rules, with white bars being retained on only the lower cost N1733. Consequently, N1732's with 18##### serial numbers were made after those with series (b) and (c) serial numbers. N1732 serial number 182670 is known to have been bought in 1959.



**FIGURE 3.**  
N1725 Micromatic Front and Rear

### N1725 Micromatic

The N1725 Micromatic uses the same stator and slide as the N1732 but is a vector rule with hyperbolic scales.

I have data on 14 examples. There appear to be six groups of serial numbers:

- a) 115567 – 120707 (2)
- b) 011738
- c) 071004 - 078648 (3)
- d) 081479 – 083555 (5)
- e) 093896
- f) 170012 – 172620 (2)

Series (a) probably followed on from serial numbers used on the model 1725, which the N1725 replaced.

All examples seen to date have metal framed cursors with fabricated metal ends marked with the patent number.

### Dating the N1731, N1732 and N1725 Micromatic Slide Rules

The date of introduction of the three Micromatic models, the N1731, N1732 and N1725 has been given as “some-time between 1956 and early 1959” [3]. A patent application covering several variants of the Micromatic mechanism was filed on 12 January 1956. US patent number 2,956,743 covering the Micromatic mechanism was not granted until 18 October 1960 and all Micromatic slide rules are marked ‘PAT’S PEND’.

The three slide rules are featured in Dietzgen catalogs for 1955 (17<sup>th</sup> edition), 1956 (22D), 1957 (22D price list) and 1959 (22D). Strangely, none of these catalogs mention the Micromatic design and the illustrations appear to show duplex rules of conventional construction. The Dietzgen self teaching manual for the N1732 and the N1733 has a copyright date of 1956. It has a title page illustration of the front face of an N1732 which is apparently of conventional construction, with no Micromatic labelling. The earliest Dietzgen advertisement for Micromatic slide rules that I have seen is from the 17 September 1956 edition of ‘Time’ magazine. A 1955 Dietzgen advertisement, also in ‘Time’, shows a second generation slide rule that preceded the Micromatic range. A retailer’s packing slip for N1732 serial number 589935 is dated 16 August 1957, implying that about 10,000 examples had been made by this date. The annual production of the original first generation model 1732 (1945 to 1953) was 10,000 units [1].

The weight of evidence thus points to the Micromatic slide rules having been introduced in the second half of 1956. As we shall see, the N1731, N1732 and N1725 Micromatic rules were replaced by the N1731, 1734 and N1725 Microglide models respectively, in September 1959. With the information currently available, I am unable to propose an accurate dating system based on serial numbers for these slide rules. This is not a serious problem, as they were in production for only three years.

The demise of the Micromatic rules after only three years

was probably due to high production costs resulting in a slim profit margin. The number of examples surviving to the present day in full working order is testament to sound design together with high quality materials and manufacture.

### N1733

The N1733 was introduced at the same time as the Micromatic series. It is essentially an economy version of the N1732, with the same dimensions and scale set but is of conventional construction and has no plastic covering or inlay on the outer edges of the stator. Production of the N1733 continued until Dietzgen stopped manufacturing slide rules.

Whilst it was neither a Micromatic nor a Microglide, it was a contemporary of both and, as we shall see, shared a serial number series with the Microglides. It would therefore be wrong to omit the N1733.

The N1733 sold for \$24.00 in 1957, when the retail price of the N1732 Micromatic was \$26.50. A K&E 4081-3 cost \$25.50. All prices included a leather case.

61 examples are known with three different serial number series used:

- a) B518185 – B520827 (6)
- b) 007079 – 122362 (40)
- c) 170679 – 187976 (15)

Series (a) is a continuation of the serial numbers used on the 1733 and was most probably used first. Series (c) is probably the same as the later series used on the N1732 (d) and N1725 (f) Micromatic models and, as will be seen, was used before series (b). Dating of the N1733 will be considered with the Microglide slide rules.

### Relative Numbers

At this stage, it will prove useful to introduce a new concept: the principle of relative numbers. This assumes that, for two or more models of slide rules made between the same dates, the total numbers of each model in my database will be in the same ratio as the total numbers of each model manufactured. Two Dietzgen first generation rules, the 1732 Decitrig Log Log and 1735 Vector Log Log were used to test the principle, as I have the most reliable and comprehensive data for these models. 1732’s with serial numbers and all 1735’s were made from 1946 to 1953. My database lists 194 1732’s with serial numbers and 38 1735’s, so that 83.6% are 1732’s. The maximum known serial numbers indicate that 76,440 1732’s and 12,872 1735’s were manufactured, so that 85.6% of the total were 1732’s. These two figures are remarkably close and demonstrate that the principle is sound.

Data taken from eBay sales records can also be used. For the years 2000 to 2010, eBay sales of the 1732 and 1735 were 62 and 15 respectively [4]. The figure for the 1732 represents 80.5% of the total, which is somewhat lower than the previous estimates. It must be appreciated that the data collection process for eBay sales is automatic and prone to error as sellers’ listings are often vague or inaccurate, with, for

example, N1732's being listed as 1732's and *vice versa*, Micromatic or Microglide being left out or the model number omitted entirely. In addition, the lower the sample size, the greater the potential for errors.

### Microglide Slide Rules

The replacements for the Micromatic rules featured the new Microglide construction, with Teflon-lined slide grooves on the stator (Figure 6).



**FIGURE 4.**  
Teflon Inserts in the Microglide duplex.

The range comprised three models, the 1734, which replaced the N1732, the N1731 and the N1725.

#### Production Period

The Microglide slide rules first appear in the 1960 edition of Dietzgen's catalog 22D. The first self teaching manual to list the 1734 was published in 1959. The earliest known press advertisement for the Microglide range is from the 14 September 1959 edition of Time magazine, and this is generally accepted as the date that they were introduced [3].

Along with the N1733, the Microglides were the last slide rules made by Dietzgen. It is not known with certainty when Dietzgen stopped making slide rules. A 1972 price list includes only the bamboo cored B1734 and B1725 supplied by Ricoh of Japan. However, I feel that 1971 was too early for Dietzgen to have abandoned slide rule manufacture and have therefore assumed a date of the end of 1972. This may also be considered to be early, as many manufacturers continued making slide rules well into the 1970's. Dietzgen, however, were a progressive company who were not afraid to embrace new technology, which is probably why they, unlike many others, survived the end of the slide rule era. Joseph Dietzgen, son of the founder, was advocating what was later to be known as computer aided design (CAD) in 1968 [5]. Dietzgen were advertising their own desk top 'electronic slide rules' as superior to the conventional variety in 1973. 1972 was

also the year that the HP-35, the first scientific pocket calculator, was introduced. The HP-35 sold 100,000 units in its first year.

#### N1731 Microglide

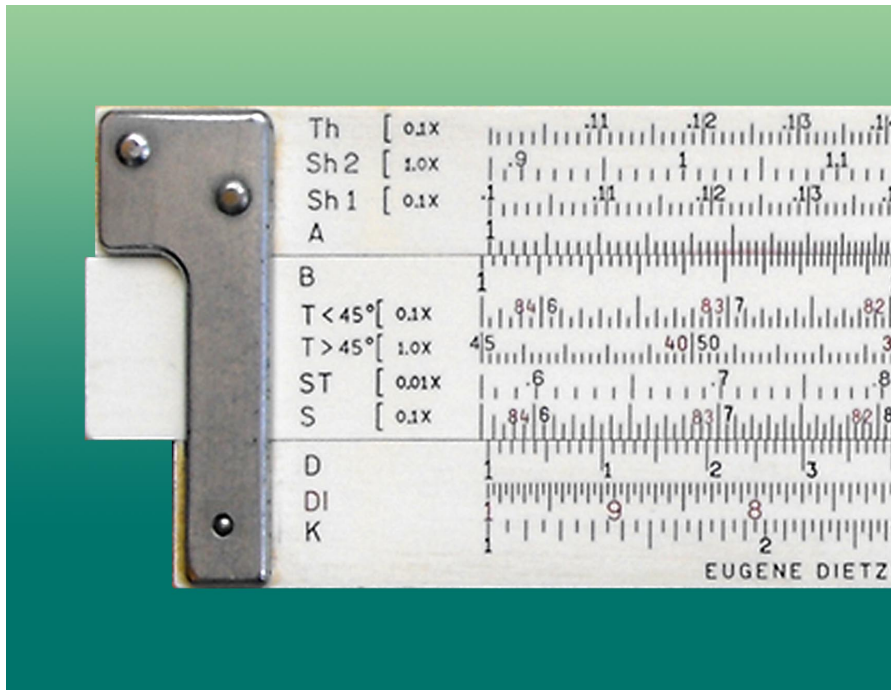
The N1731 Microglide replaced the N1731 Micromatic and has the same scale set.

I know of four example, but have serial numbers for only two of them (006567 and 006339).

#### 1734 Microglide

The 1734 replaced the N1732 Micromatic and used the same scale set.

I have data on 159 examples. Serial numbers run from 000307 to 151009 (140 examples) and then from 190200 to 198621 (19 examples). The large gap suggests that there are two separate series. Purchase dates of 1960 for serial numbers 1903096 (original owner) and 191249 (date stamp in case) and 'several years before 1968' for 197732 (original owner's widow, rule bought in US Army PX in Germany) show that the 19#### serial numbers are indeed a separate series and that they were used before the others. My original 2009 dating system for the 1734 [5] was therefore incorrect. A revised system will be presented below.



**FIGURE 5.**  
N1725 Microglide Rear

**N1725 Microglide**

The N1725 Micromatic vector replaced the N1725 Micromatic and has the same scales, but these are arranged differently on the rear face. 47 examples are known. Serial numbers run from 004292 to 130959 and their distribution suggests that they are from a single series.

**Dietzgen Model Numbers**

Dietzgen model numbers can be confusing. The number was randomly retained or changed when a replacement model was introduced. Table 1 summarises the model numbers used for Dietzgen third and fourth generation log-log duplex slide rules.

**TABLE 1.**  
Summary of Production Dates.

Type	Model No.	1956 to 1959	1919-1972
Trig	N1731	Decitrig	Microglide
Decitrig	N1732	Micromatic	
Decitrig	1734		Microglide
Vector	N1725	Micromatic	Microglide
Decitrig	N1733	Conventional	Conventional

**Dietzgen Production Numbers**

It is difficult to find detailed information on slide rule production volumes. Dieter von Jezierski [6] states that Dietzgen had 7% of the US quality slide rule market in the late 1960's, while Post had 20% and Pickett had 23%. It is inferred that K&E had the remaining 50%, but this ignores imports. I be-

lieve that K&E's share would have been closer to 40%.

K&E used a common set of serial numbers for their slide rules. Numbers ran from 000001 to 999999 and then rolled over to 000001. The latest published information gives roll-over dates of 1956 and 1968 [7], implying that one million slide rules were made in 12 years, an annual average of 83333 units. This gives Dietzgen average annual slide rule sales of

around 14600 units.

In the 1960's, Post's best selling slide rule by far was the 1460 Versalog. A new serial number series was used for the 1460 each year from 1957. The maximum known serial numbers from each series can therefore be used to estimate production figures. Annual production from 1957 to 1967 averaged 34600 units [8]. Other popular Post slide rules were the 1450 Versatrig, the 1461 and the 1451. I have shown that eBay sales over a fixed period can be used with the relative numbers principle. Sales from 2000 to 2010 (8) were

1460: 774, 1450: 47, 1461: 101, 1451: 4.

The 1460 sales represent 83.6% of the total. Applying the relative numbers principle, average annual sales for the four Post rules totalled 41,400. This gives Dietzgen average annual slide rule sales of 14,500 in the 1960's.

**Serial Numbers**

Until recently, I had assumed that the three Dietzgen Microglide slide rules and the N1733 each had a separate serial number series [5]. Using the maximum known serial numbers from the last series used on each of the 1734, N1725 and N1733 gives a total production total of at least:

$$150,000+131,000+123,000=404,000$$

This is an annual average of over 31000 units for four models, over double the figures estimated above, which, in addition to the four slide rules considered here, include other Dietzgen-made rules and rules sourced from Ricoh, Faber Castell, Ecobra and Fuji and sold under the Dietzgen name. I have therefore concluded that a single common serial number series running from zero to approximately 151,000 was used for most of the production life of the three Microglide slide rules and the N1733.

Early 1734's had a unique serial number series running from 190000 to 198621, giving a total of 8,621 units, which I have rounded up to 9,000. About 151,000 slide rules with common series serial numbers were made. To find the number of 1734's, we must again resort to the relative numbers principle. The numbers of slide rules with common series serial numbers in my database are:

1734:140 N1725:47 N1731:2 N1733:40

1734's constitute 60.6% of the total. The actual number of 1734's made with common series serial numbers was there-

fore  $0.6 \times 151,000 = 90,600$  units. To this figure must be added the 9,000 rules with 19#### serial numbers, giving a total of 99,600 units. The average annual production of 1734's was therefore  $99,600/13.25 = 7,517$  units.

**Dating**

The 9,000 known 1734's with 19#### serial numbers represent 1.2 years' or slightly less than 14.5 months' production. It will give a simpler dating system and introduce little if any error if we assume that the common serial number series was introduced on all four rules at the beginning of 1961. All known examples of the Microglide N1731 and N1725 have common series serial numbers. This implies that these two models were not manufactured before 1961. The average annual production for all four rules totalled  $151,000/12 = 12,584$ . I have rounded this figure up to 12,600. If, to this figure, we add 2,000 units to include the re-branded imported rules, the total of 14,600 agrees closely with the estimates for Dietzgen's annual slide rule sales.

When attempting to equate serial numbers to production dates, I considered two possibilities. I assumed that either the annual production numbers remained constant or that numbers were initially fairly constant until around 1965, but then began to fall at an increasing rate from then on. The first option is simplest, but the second option is possibly more realistic. I used a relationship of the form.

$$P_n = P_o - b \cdot t^c \tag{1}$$

Where  $P_n$  is the number of rules produced in year n,  $P_o$  is the number produced in year zero (1961), b and c are constants. I have no data to support this relationship, other than it is the simplest form that 'looks right'.

For twelve consecutive years, the average value of the above expression is given by:

$$\frac{1}{11} \int_1^{11} (P_o - b \cdot t^c) dt = 12,600 \tag{2}$$

$$\text{Hence } P_o = 12,600 + \frac{b \cdot 11^c}{(c+1)} \tag{3}$$

Taking  $c=2$  and  $b=50$  gives  $P_o = 14,600$ , a reasonable output for 1961 when the imported duplex rules from Ricoh and Faber Castell had not yet been added to the Dietzgen range.

**TABLE 2.**  
**Microglide (and N1733) Manufacturing Dates for Common Serial Numbers**

Date Year	Constant Production	Serial Numbers	Falling Production	Serial Numbers
1961	12600	000001 to 012600	14617	000001 to 014617
1962	12600	012601 to 025200	14567	014618 to 029185
1963	12600	025201 to 037800	14417	029186 to 043603
1964	12600	037801 to 050400	14167	057772 to 071589
1965	12600	050401 to 063000	13817	057772 to 071589

Table 2 shows the annual production figures from 1961 to 1972 obtained for both a constant production rate and using equation (1) together with the serial number range for each year.

1734's with 19#### serial numbers were made between September 1959 and December 1960. Production of the N1733 during this period would have totalled 2,330, using the relative numbers principle. Consequently, N1733's with serial numbers in the range 185670 to 188000 were made between September 1959 and December 1960. The lowest serial number corresponds reasonably well with the highest known N1732 serial number of 184238.

All known examples of the N1725 Microglide and the N1731 Microglide have common series serial numbers. These

models were therefore not introduced until the beginning of 1961.

### Verification

The majority of slide rules reach the collectors' market via estate sales. Very few rules are actually sold by the original owner or his family, so original purchase dates are generally not known. However, I have the original purchase dates for eleven Microglide and N1733 rules. These are listed in Table 3 along with the estimated dates of manufacture taken from Table 2. There is surprisingly little difference between the dates predicted by assuming a constant or a falling rate of production. The latter gives slightly better dates.

**TABLE 3.**  
**Purchase Dates and Estimated Manufacturing Dates**

Serial Number	Model	Purchased	Constant rate	Falling rate
004529	N1725	1961	1961	1961
004845	N1725	1961	1961	1961
011034	N1733	1962	1961	1961
021958	1734	1963	1962	1962
033302	N1725	1963±1	1963	1963
041225	N1725	≤1966	1964	1963
070807	N1725	1966	1966	1965
078574	1734	1966/67	1967	1966
081239	N1725	1968	1967	1966
104387	N1725	1967 approx	1969	1968
130959	N1725	1970 approx	1971	1970

### Conclusions

Dietzgen were late entrants into the high end duplex slide rule market in the USA. Starting in 1945, they clearly set out to compete with K&E with a range of slide rules which were almost clones of their K&E equivalents. Cursors and even slides are interchangeable, although it is unlikely that scales will line up exactly. From 1956, Dietzgen began to make duplex rules of innovative design which were at least the equals of any from other manufacturers. However, Dietzgen never enjoyed the success of K&E, Post and Pickett. Their slide rule sales never exceeded about one sixth of those of K&E. The reasons for this are not known. Dietzgen made slide rules of high quality, which matched that of any of the competition. After 1956, their scale designs and innovations in construction made their slide rules superior to those from K&E, with the possible exception of the Decilon, which was introduced in 1962. Dietzgen obviously regarded the slide rule market as important, introducing new ranges of metal (from ECOBRA), plastic (from Faber Castell) and bamboo (from Ricoh) rules to compete more effectively. However, one wonders why Dietzgen persisted. Annual sales never exceeded about 15000 units. This represents no more than

\$300,000 at 1960's retail prices and a likely profit of less than \$50,000, equivalent to \$350,000 in 2010.

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