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## Introduction

This TI publication describes the scale-division formats and markings (including styles) for  $\mu$ R100T,  $\mu$ R180T and  $\mu$ R100F recorders.

## 1. SCALE TYPES AND DIMENSIONS

### 1.1 Available Types

Table 1.1

	$\mu$ R100T		$\mu$ R180T		$\mu$ R100F
	Pen Model	Dot-printing Model	Pen Model	Dot-printing Model	
Single graduation; single marking	○	○	○	○	○
Single graduation; double marking	—	○	—	○	—
Single graduation; triple marking	—	○	—	○	—
Double graduation; double marking	—	○	—	○	—
Double graduation; triple marking	—	○	—	○	—
Triple graduation; triple marking	—	○	—	○	—

### 1.2 Types and Dimensions

The various scalings and positioning relationship for scale divisions, numerical values, unit symbols, etc., are described below for each type of scale available.

#### 1.2.1 $\mu$ R100T

- (1) Single graduation, single marking

For the 1-pen model

Unit: mm

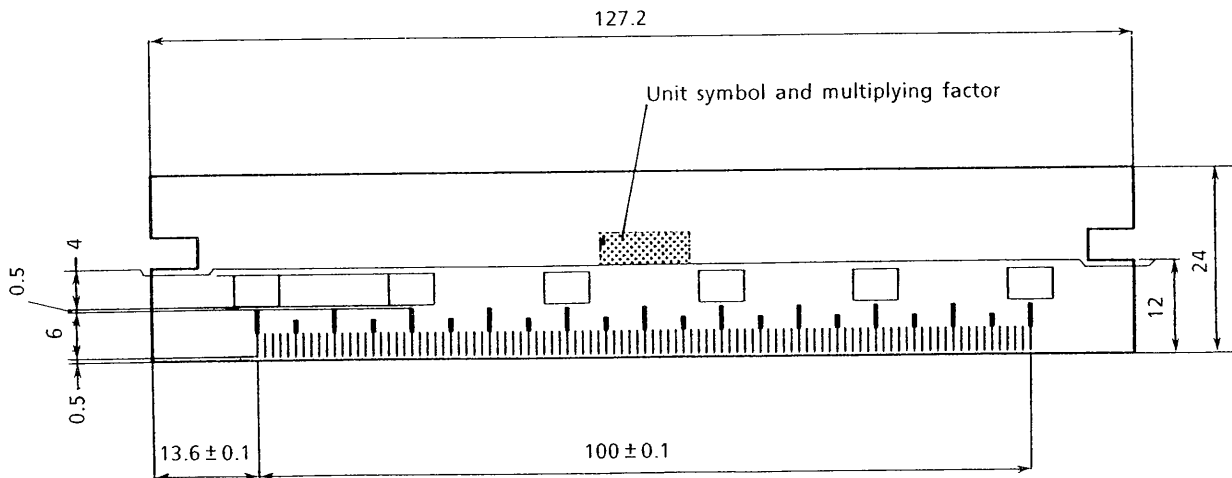


Figure 1.1

For the 2- and 3-pen models

Unit: mm

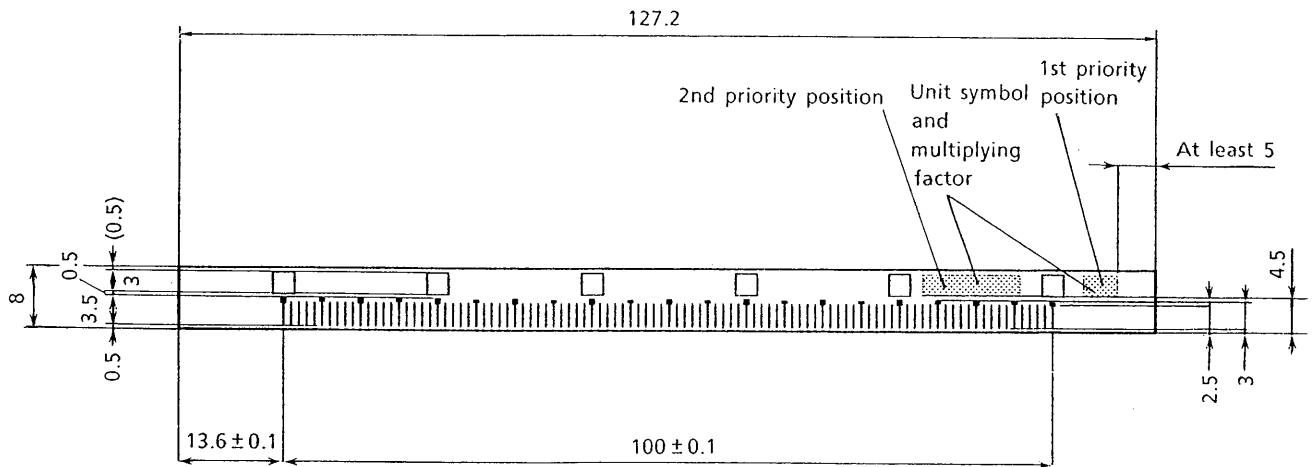


Figure 1.2

For the dot-printing model

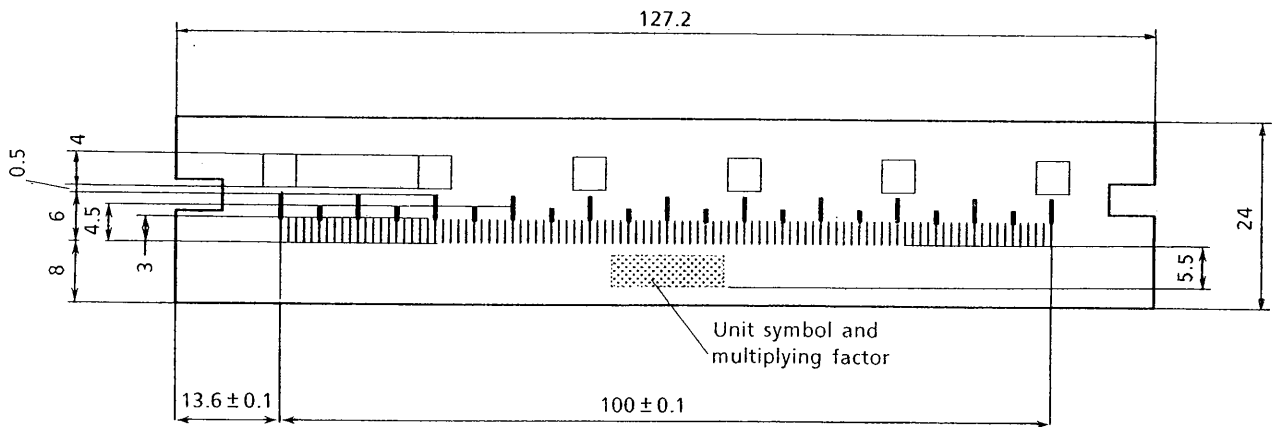


Figure 1.3

(2) Single graduation, double marking (For the dot-printing model)

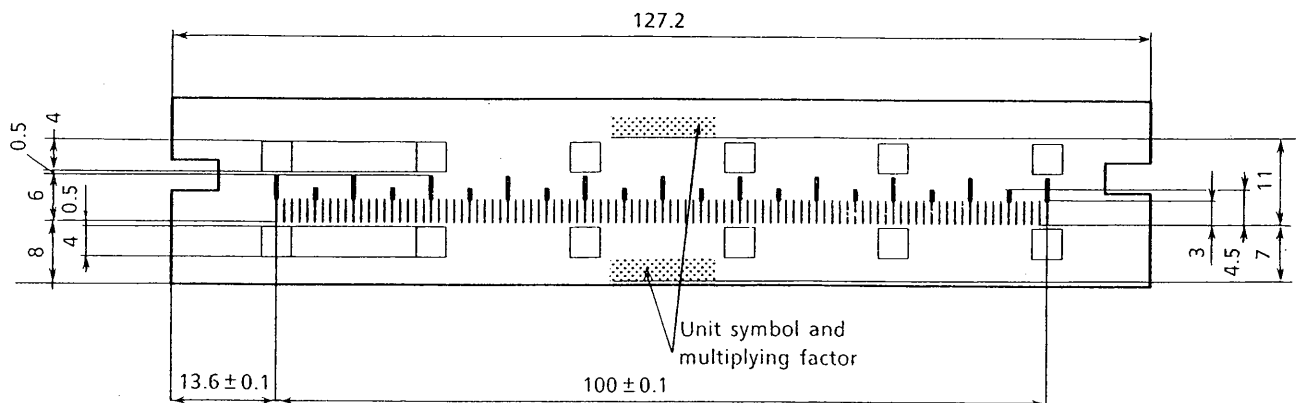


Figure 1.4

(3) Single graduation, triple marking (For the dot-printing model)

Unit: mm

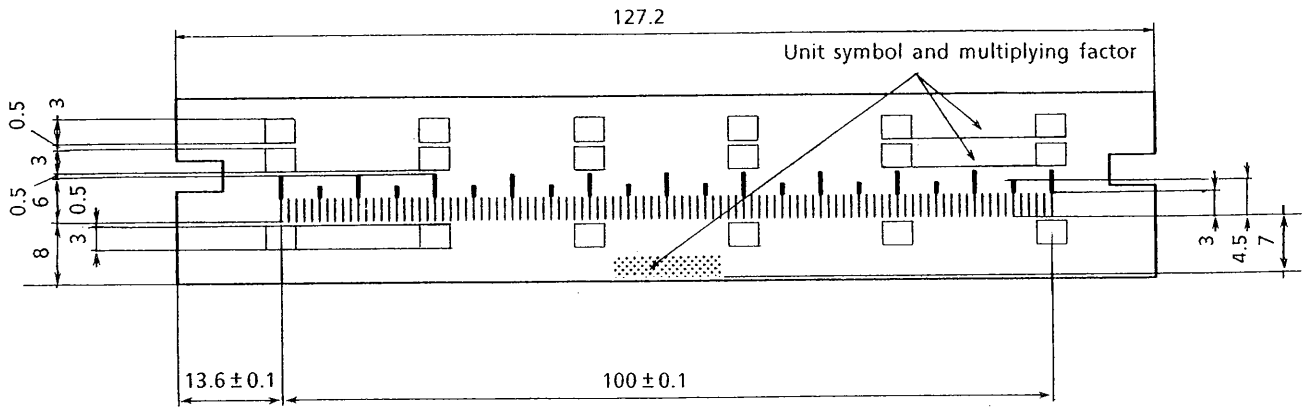


Figure 1.5

(4) Double graduation, double marking (For the dot-printing model)

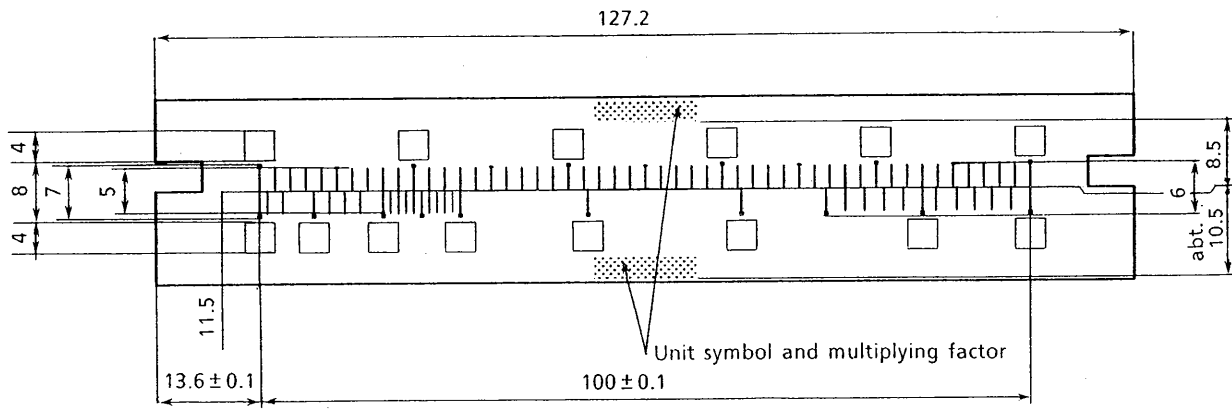


Figure 1.6

(5) Double graduation, triple marking (For the dot-printing model)

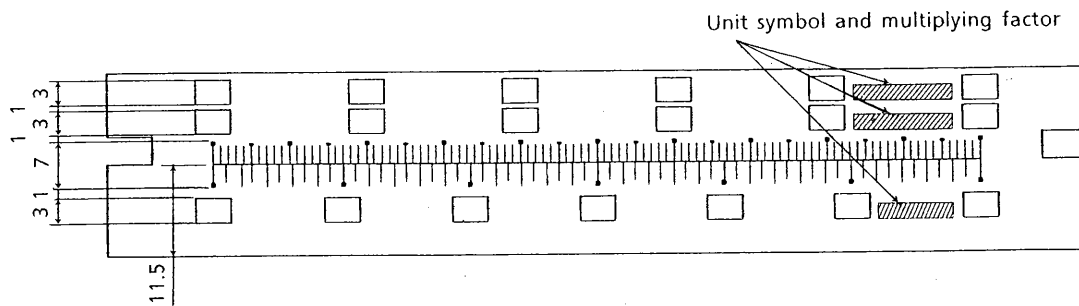


Figure 1.7

(6) Triple graduation, triple marking (For the dot-printing model)

Unit: mm

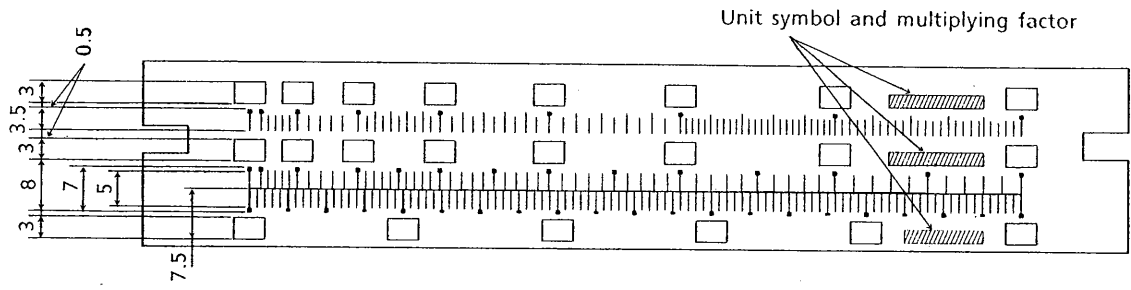


Figure 1.8

1.2.2  $\mu$ R180T

- (1) Single graduation, single marking  
For the 1-pen model

Unit: mm

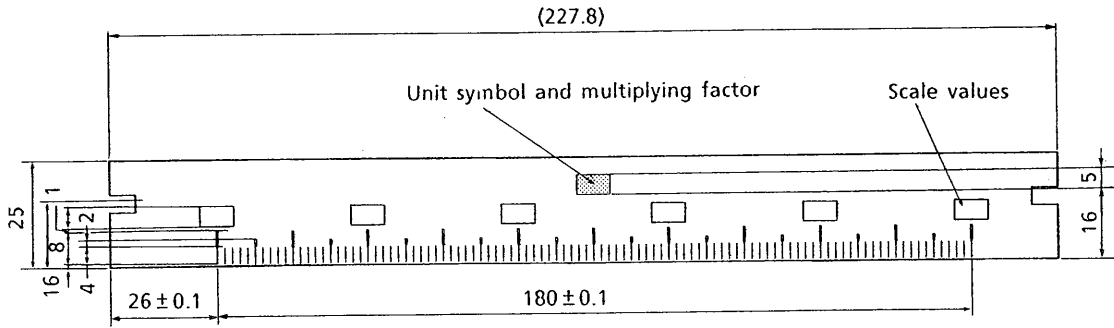


Figure 1.9

For the 2- and 3-pen models

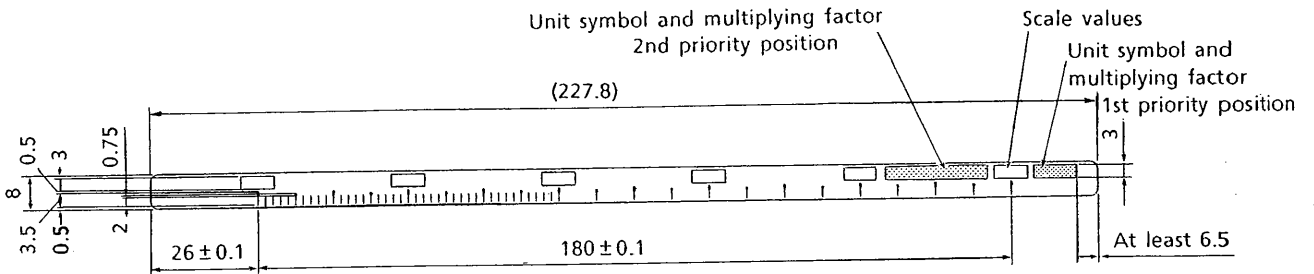


Figure 1.10

For the dot-printing model

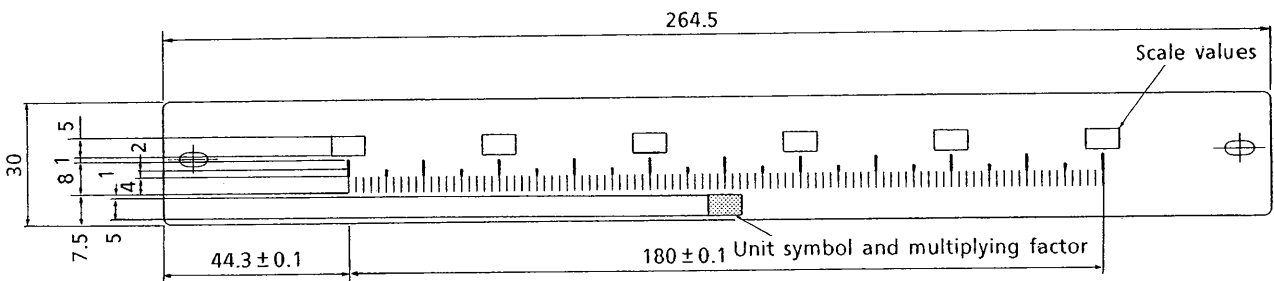


Figure 1.11

(2) Single graduation, double marking (For the dot-printing model)

Unit: mm

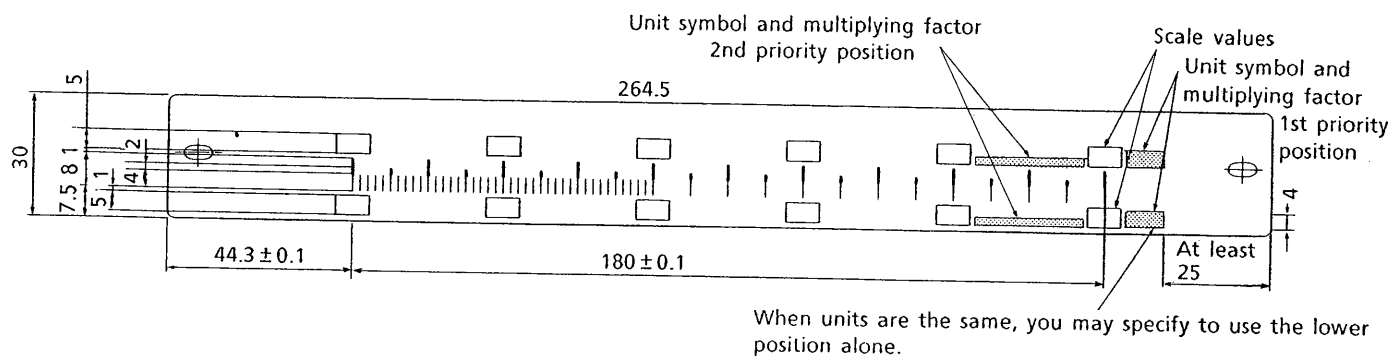


Figure 1.12

(3) Single graduation, triple marking (For the dot-printing model)

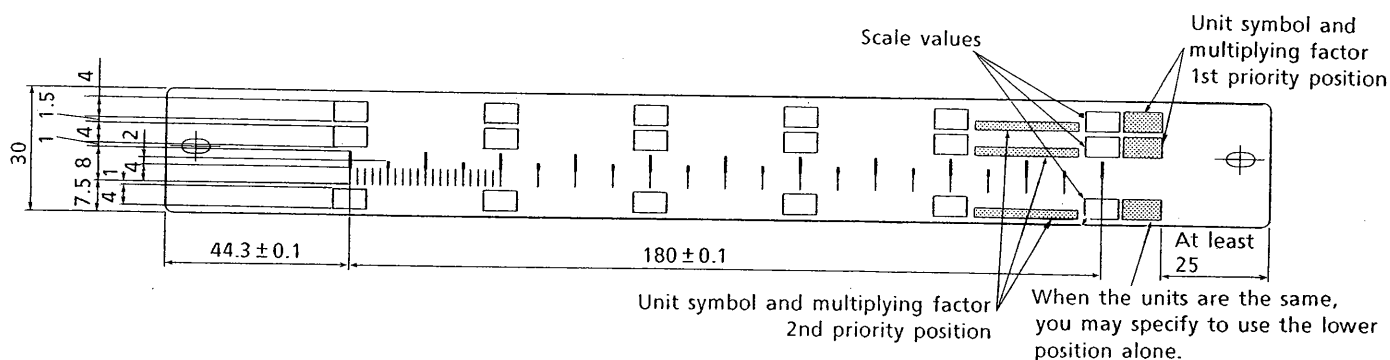


Figure 1.13

(4) Double graduation, double marking (For the dot-printing model)

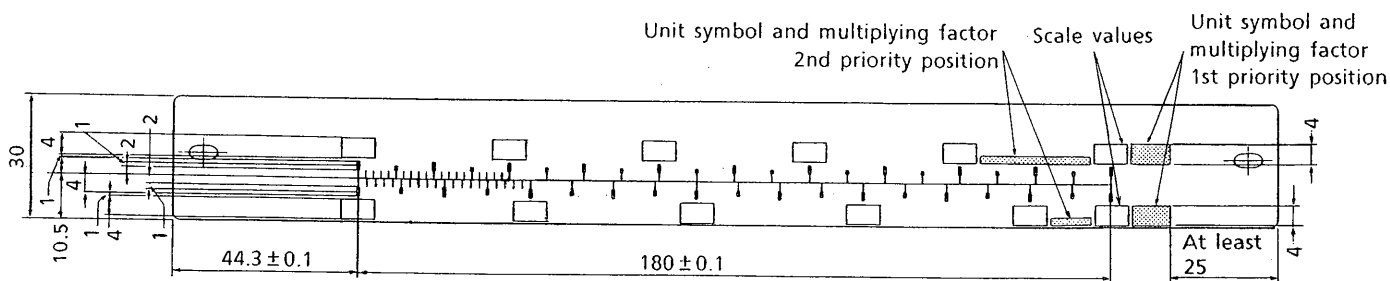


Figure 1.14



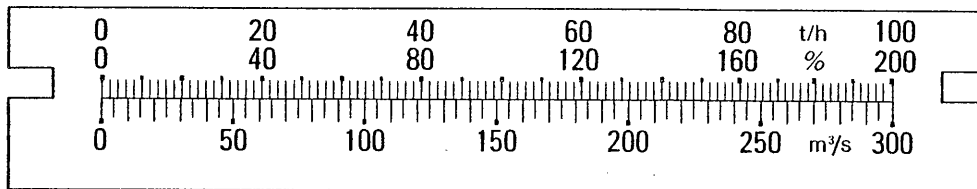


## 2. SCALE PLATE ITEMS AND MARKING POSITIONS

### 2.1 Scale Marking Positions

When there is no marking position designated on single graduation or multi graduation multi-marking scale plates, the marking positions correspond to those written from the top to bottom rows on the specification sheet.

Example: Double graduation, triple marking



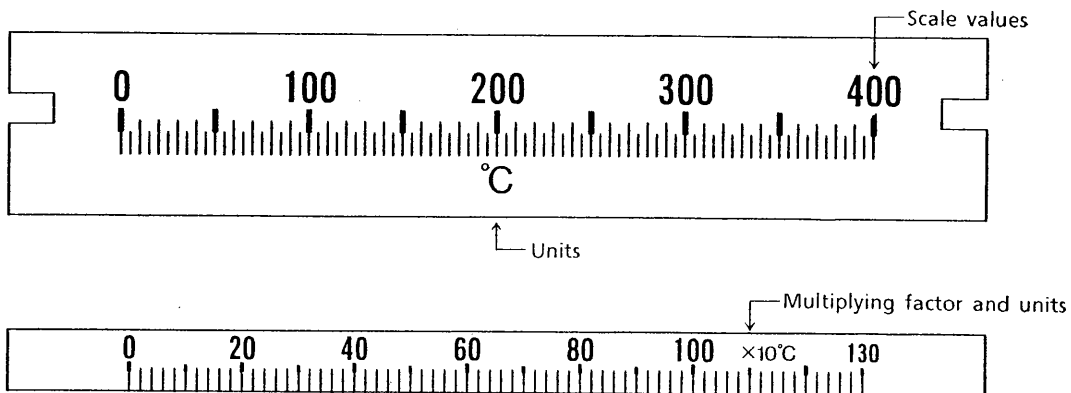
### 2.2 Scale Plate Items

As a rule, scale plate items consists of the following:

(TOKUCHU scales and those specified by the customer, are specified separately)

- (1) Scale graduation
- (2) Scale values and sign
- (3) Multiplying factor and unit (Multiplying factor is entered only when used. Example:  $\times 10$  kg)

Note: As a rule, no model number, instrument class, trade mark, chart number, scale plate part number, or input type is included on the scale plate.



### 3. SCALE

#### 3.1 Scale Division Formats and Limitations to the Number of Divisions

##### 3.1.1 Scale Division Formats

As a rule, 3 formats of scale divisions are available: A, B, and C.

- Format A

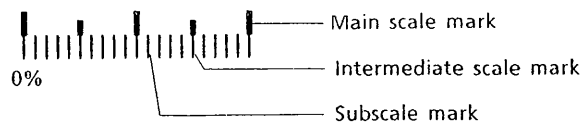


Figure 3.1

**Definition :** Each section between two main scale marks is divided into 10 parts; an intermediate scale mark is placed in the middle and subscale marks denote the other divisions.

**Application :** When one scale division (the difference between two main scale marks) corresponds to 1 or 2, or  $1$  or  $2 \times 10^n$  ( $n = \text{integer}$ ).

- Format B

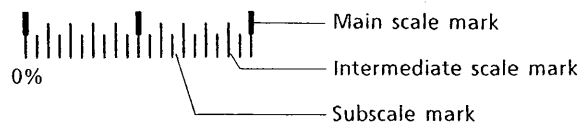


Figure 3.2

**Definition :** Each section between two main scale marks is divided into 10 parts; intermediate scale and subscale marks alternate to denote these divisions between the main scale marks.

**Application :** When one scale division (the difference between two main scale marks) corresponds to 5 or  $5 \times 10^n$  ( $n = \text{integer}$ ).

- Format C

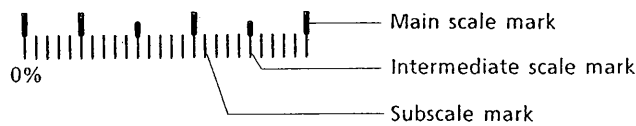


Figure 3.3

**Definition :** Deformed Format A

When the intermediate scale mark in format A is placed at the 0% position and set to the main scale mark.

**Application :** Same as format A.

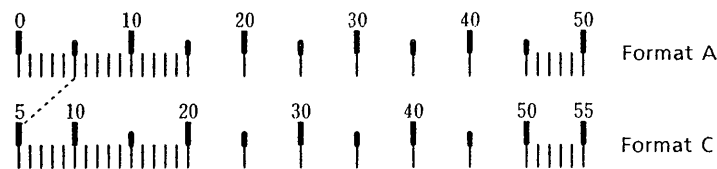


Figure 3.4

##### 3.1.2 Limitations to the Number of Divisions

(Uniform divisions allowed by automatic writing)

Table 3.1

	Standard	Non-standard (TOKUCHU)
$\mu$ R100T $\mu$ R100F	Up to 100 equal divisions (Spacing: 1 mm)	Up to 120 equal divisions (Spacing: 0.8 mm)
$\mu$ R180T	Up to 120 equal divisions (Spacing: 1.5 mm)	Up to 150 equal divisions (Spacing: 1.2 mm)

\* As a rule, for smaller spacing than these, on both uniform and non-uniform scales (such as characteristic scales) the spacing is determined by the division format.

### 3.2 Scale Mark Forms and Dimensions

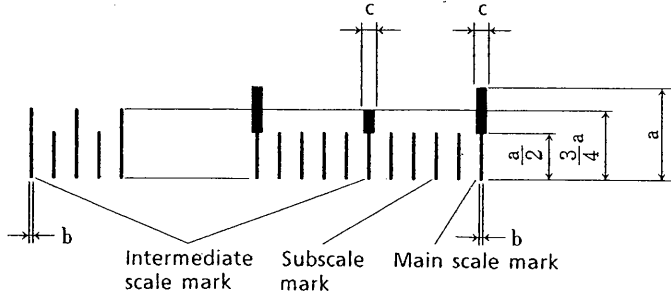


Figure 3.5

μR100T

Table 3.2

Unit: mm

		For Single Graduation		For Multiple Graduation	
		Scale Spacing : At least 1	Scale Spacing : Less than 1	Scale Spacing : At least 1	Scale Spacing : Less than 1
1-pen model	a	6.0	6.0	—	—
	b	0.3	0.3	—	—
	c	0.8	0.8	—	—
2- and 3-pen models	a	3.5	3.5	—	—
	b	0.3	0.3	—	—
	c	0.8	0.8	—	—
Dot-printing model	a	6.0	6.0	3.5	3.5
	b	0.3	0.3	0.3	0.3
	c	0.8	0.8	0.8	0.8

μR180T

Table 3.3

Unit: mm

		For Single Graduation		For Multiple Graduation	
		Scale Spacing : At least 1.5	Scale Spacing : Less than 1.5	Scale Spacing : At least 1.5	Scale Spacing : Less than 1.5
1-pen model	a	8.0	8.0	—	—
	b	0.4	0.3	—	—
	c	1.0	0.8	—	—
2- and 3-pen models	a	3.5	3.5	—	—
	b	0.4	0.3	—	—
	c	1.0	0.8	—	—
Dot-printing model	a	8.0	8.0	4.0	4.0
	b	0.4	0.3	0.4	0.3
	c	1.0	0.8	1.0	0.8

μR100F

Table 3.4

Unit: mm

		For Single Graduation	
		Scale Spacing : At least 1	Scale Spacing : Less than 1
1- to 4-pen models	a	3.5	3.5
	b	0.3	0.3
	c	0.8	0.8

\* As a rule, the base line on a multiple graduation is the same as the b dimension

## 4. MARKING

Markings used for items (2) and (3) in section 2.2 are defined as follows:

### 4.1 Style (Note: Basic style is in accordance with YES101.02.)

- (1) Scale values : YOKOGAWA HELVETICA (MC)  
 (2) Units : YOKOGAWA-HELVETICA (M)  
 (3) Multiplying factor : YOKOGAWA-HELVETICA (M)  
 (4) Other TOKUCHU characters : YOKOGAWA-HELVETICA (M)

### 4.2 Size

As a rule, Tables 4.1, 4.2, and 4.3 show the heights of letters used for marking. The sizes are in accordance with YES101.02 for the signs used with numerical values (+, -, ±, =, and ÷), exponents and suffixes, exponent and suffix positions and symbols expressing fractions.

Table 4.1 Unit: mm

	Style	YOKOGAWA HELVETICA (MC)		YOKOGAWA HELVETICA (M)		
		Scale Type	Scale Values		Unit	Multiplying factor
			Capital	Small (Fraction)		
1-pen model	Single graduation, single marking	4	3	4	3	
2- and 3-pen pen models	Single graduation, single marking	3	2	2.5	2	
Dot-printing model	Single graduation, single marking	4	3	4	3	
	Single graduation, double marking	4	3	2	2	
	Single graduation, triple marking	3	2	2	2	
	Double graduation, double marking	4	3	2	2	
	Double graduation, triple marking	3	2	2	2	
	Triple graduation, triple marking	3	2	2	2	

Table 4.2 Unit: mm

	Style	YOKOGAWA HELVETICA (MC)		YOKOGAWA HELVETICA (M)		
		Scale Type	Scale Values		Unit	Multiplying factor
			Capital	Small (Fraction)		
1-pen model	Single graduation, single marking	5	4	4	4	
2- and 3-pen pen models	Single graduation, single marking	3	2	2.5	2.5	
Dot-printing model	Single graduation, single marking	5	4	4	3	
	Single graduation, double marking	5	4	4	3	
	Single graduation, triple marking	4	3	4	3	
	Double graduation, double marking	4	3	4	3	
	Double graduation, triple marking	4	3	4	3	
	Triple graduation, triple marking	4	3	4	3	

PR100F Table 4.3 Unit: mm

	Style	YOKOGAWA HELVETICA (MC)		YOKOGAWA HELVETICA (M)	
	Scale Type	Scale Values		Unit	Multiplying factor
		Capital	Small (Fraction)		
1- to 4-pen pen model	Single graduation, single marking	3	2	2.5	2

### 4.3 Marking Positions and Basic Principles

(1) Positioning (See Figures 1.1 to 1.17.)

(2) Basic principles

(a) Scale values, signs, symbols, etc.

Generally, scale values are found on all main scale marks. However, if they cannot be entered due to a lack of space or are not visible due to their complexity, they may be omitted.

(b) Units

Generally, all units are included and correspond to the scale value position. Frame height is based on upper-case letters. (See Figures 1.1 to 1.17.)

(c) Multiplying factor

As a rule, this is entered just before the unit.

(d) Others

As a rule, when a parameter name is included as a TOKUCHU item, it is entered using YOKOGAWA-HELVETICA (M) before the multiplying factor and unit.

### 4.4 Printing Colors

Unless otherwise specified, black is used for all printing. (Colors other than black: TOKUCHU)

### 4.5 Treatment

After the scale is completed, it is spray-painted with a clear lacquer to prevent peeling.

## 5. DETERMINING THE NUMBER OF SCALE DIVISIONS AND SCALE FORMS

Refer to the flowchart below for the following cases:

- To determine the number of scale divisions and the scale dividing method (form) specified by the customer.
- To determine format for multiple-graduation, multiple-marking scales,

Example

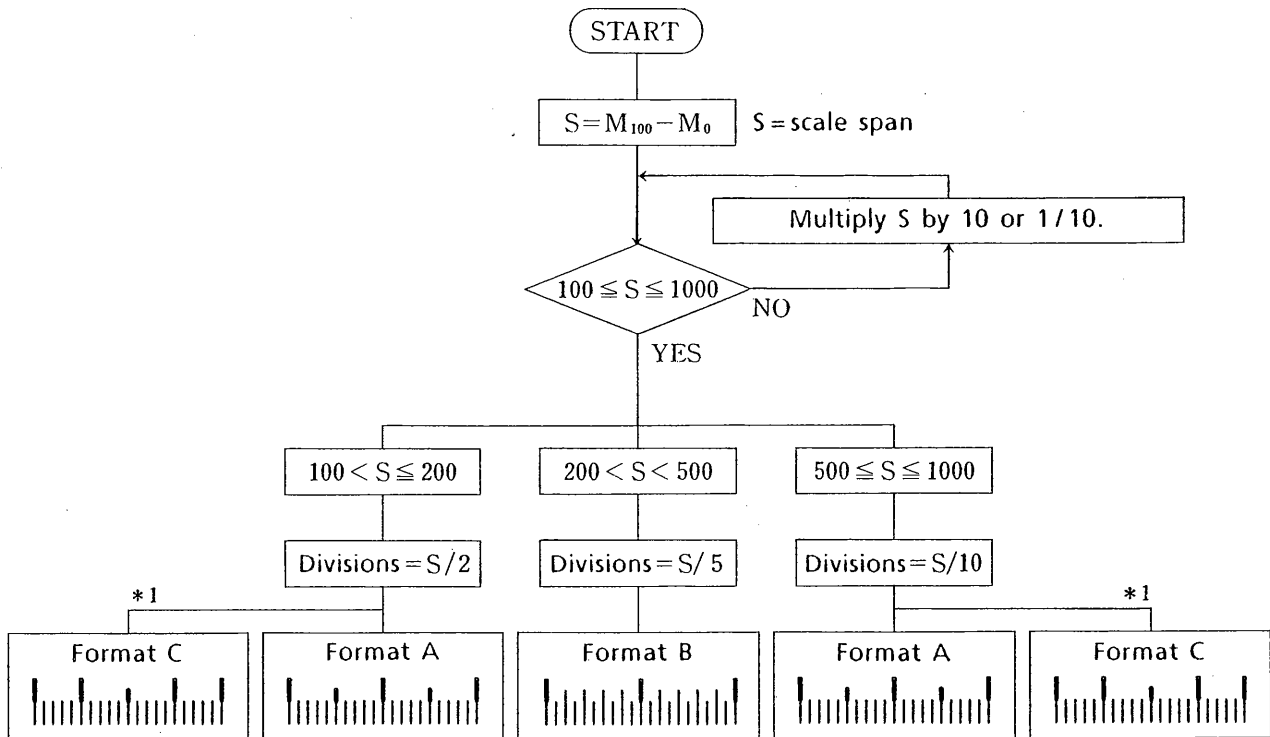
Q : Is 0 to 75 and 0 to 150 single-graduation, double marking or double-graduation, double marking.

A : Single-graduation, double-marking. (Confirm this using flowcharts 5.1 and 5.2.)

Determine the number of scale divisions and the scale form by entering the numbers into the following flowchart.

### 5.1 $\mu$ R100T and $\mu$ R100F Flowchart

Assume that the scale specified by the customer is  $M_0$  to  $M_{100}$ . (In this case, the factor and unit are unrelated.)

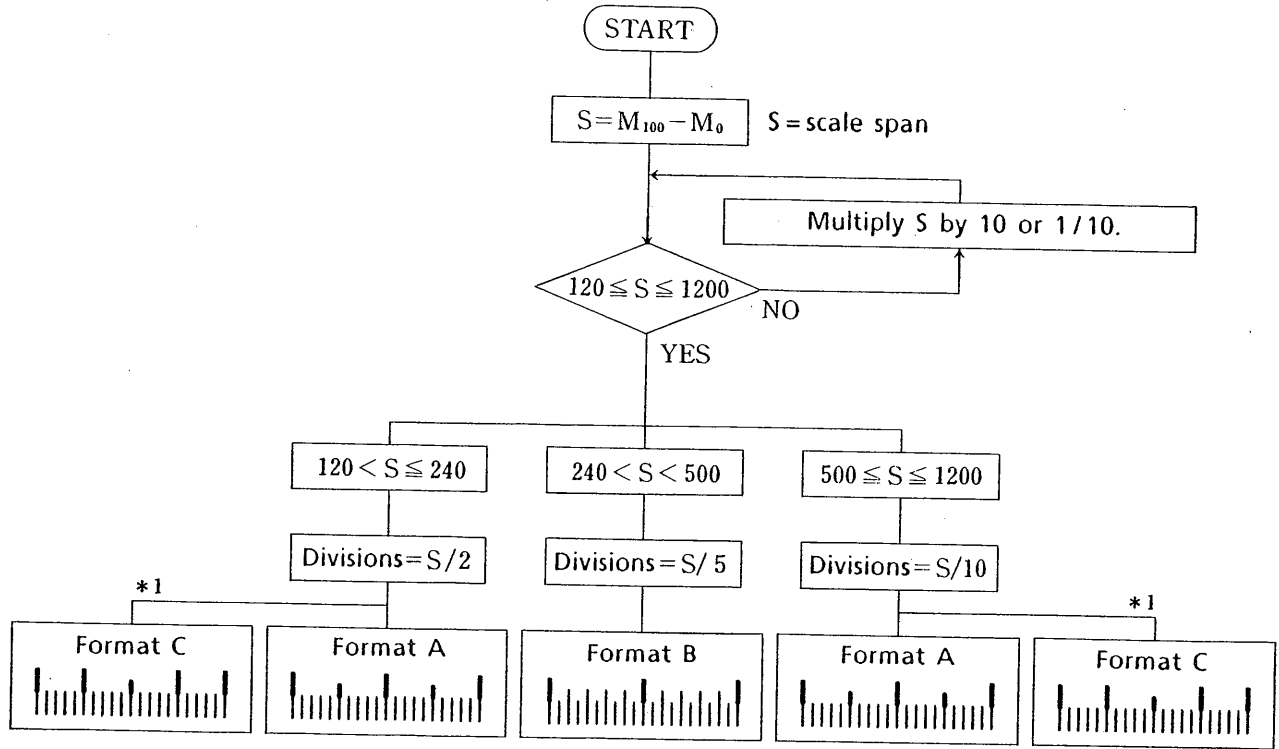


\*1 Deformed Format A

An intermediate scale mark in type A is placed in the 0% position and is changed to a main scale mark. (See the item on type C in section 3.1.)

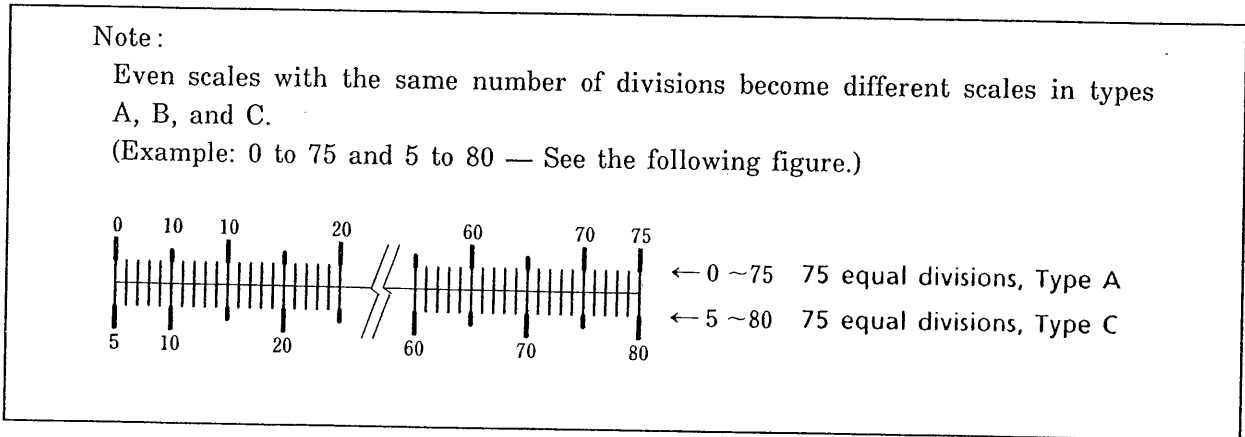
### 5.2 $\mu$ R180T Flowchart

Assume that the scale specified by the customer is  $M_0$  to  $M_{100}$ . (In this case, the factor and unit are unrelated.)



**\*1 Deformed Format A**

An intermediate scale mark in format A is placed in the 0% position and is changed to a main scale mark. (See the item on format C in section 3.1.)



## 6. ORDERING JUST THE SCALE PLATE

Scale plates which can be ordered in accordance with the procedures described herein are limited to uniform and logarithm scales. (Logarithm scales are available upto 6 digits for the  $\mu$ R100T and  $\mu$ R100F, and 8 digits for the  $\mu$ R180T.)

They should be ordered from the Parts Center.

### [1] Items to be specified when ordering :

1. Add /SC□□ after the part number (Scale plate specification code)
2. Scale values, units and type, (either uniform or logarithm).
3. Model & product codes of recorder using the scale

### [2] Scale plate specification codes

Table 6.1

	Specification	$\mu$ R100T		$\mu$ R180T		$\mu$ R100F		
		Applicable Model	Part Number + Specification Code	Applicable Model	Part Number + Specification Code	Applicable Model	Part Number + Specification Code	
1-pen model	Single graduation, single marking	4216	B9588DS/SC1A	4271	B9590NU/SC1A	1- to 4-pen models	4351	B9388DR/SC1A
2- and 3-pen models	Single graduation, single marking	4262 4263	B9588DR/SC1A	4272 4273	B9590NV/SC1A		4352 4353 4354	
Dot-printing model	Single graduation, single marking	4266	B9588DS/SC11	4276 4277	B9591GL/SC11		/	
	Single graduation, double marking		B9588DS/SC12		B9591GL/SC12			
	Single graduation, triple marking		B9588DS/SC13		B9591GL/SL13			
	Double graduation, double marking		B9588DS/SC22		B9591GL/SC22			
	Double graduation, triple marking		B9588DS/SC23		B9591GL/SC23			
	Triple graduation, triple marking		B9588DS/SC33		B9591GL/SC33			

### [3] Price

For prices, refer to the following price lists:

- $\mu$ R100T : PS4D3B1  
 $\mu$ R180T : PS4H2B1  
 $\mu$ R100F : PS4D4B1

### [4] Order example ( $\mu$ R100T dot-printing model example)

For equal divisions, double graduation, triple marking scale plate :

1. B9588DS/SC23
2. 0 to 500°C UNIF  
-20 to 30°C UNIF  
0 to 100kg/cm<sup>2</sup> UNIF
3. Used for 4266

For Logarithm, single graduation, double marking :

1. B9588DS/SC12
2. 10<sup>1</sup> to 10<sup>7</sup> cpm      6 digit Logarithm  
10<sup>-3</sup> to 10<sup>3</sup>              6 digit Logarithm
3. Used for 4266



## 7. SCALE PLATE EXAMPLES

- (1) Scale plate examples for the  $\mu R180T$  are described on the following pages. (See Diagrams 1 to 22.)
- (2) The following diagrams show the relationship between the division formats, the number of divisions and scale values using single-graduation, single marking as an example. A multiple-graduation, multiple-marking scale is also manufactured in accordance with the above.

Example: When the scale is 0 to 150°C / 0 to 300°C, this is dependent on whether single-graduation, double-marking or double-graduation, double-marking is used:

0 to 150°C ... See Diagram 9.

number of divisions : 75 equal divisions

Division form : type A

0 to 300°C ... See Diagram 5.

number of divisions : 60 equal divisions

Division form : type B

Therefore, 0 to 150°C/0 to 300 °C - Double-graduation, double-marking.

- (3) Scale values written in small letters correspond to the small sizes indicated in Section 4.2, Tables 4.1 to 4.3.
- (4) Scale values in Diagrams 1 to 19 are examples only and are by no means meant to be inclusive.

For other scale values, see section 5, DETERMINING THE NUMBER OF SCALE DIVISIONS AND SCALE FORMATS, (p. 14).

## APPENDIX OF SCALE FORMAT DIAGRAMS

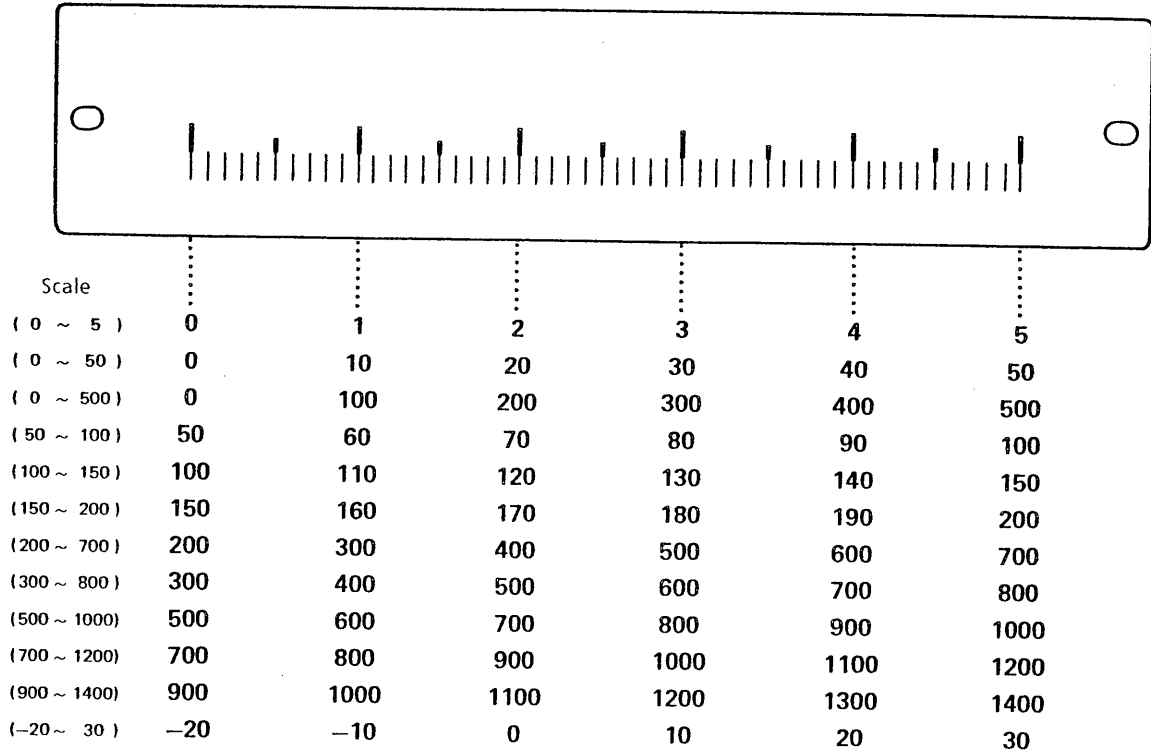


Diagram 1. 50 Equal Divisions, Format A

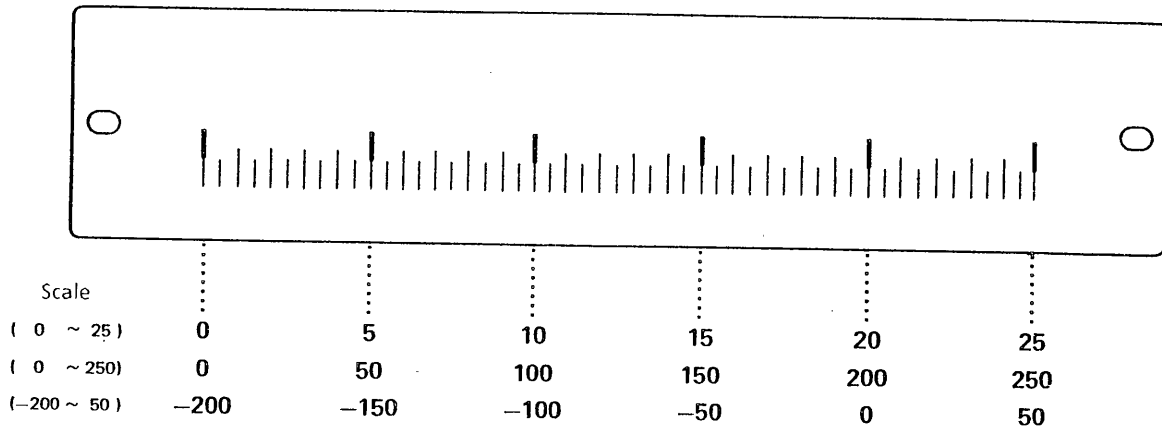
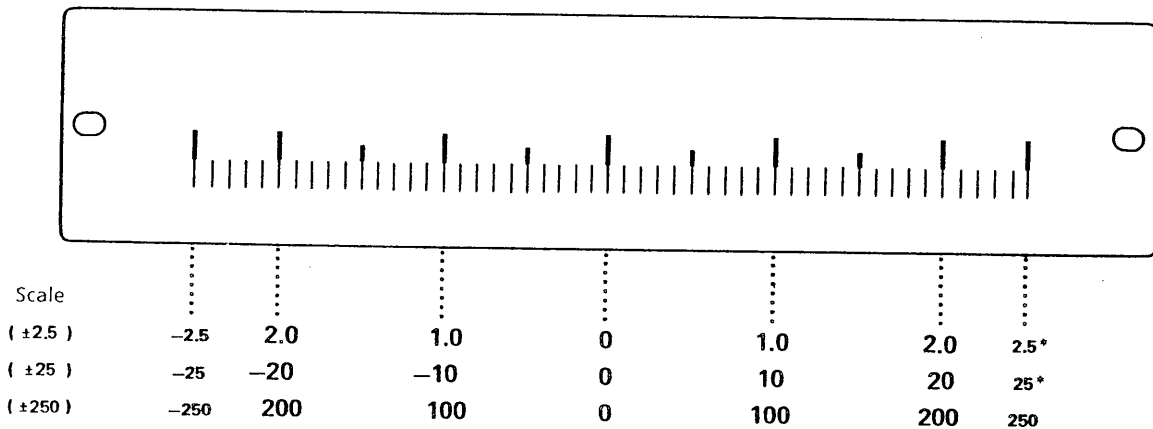
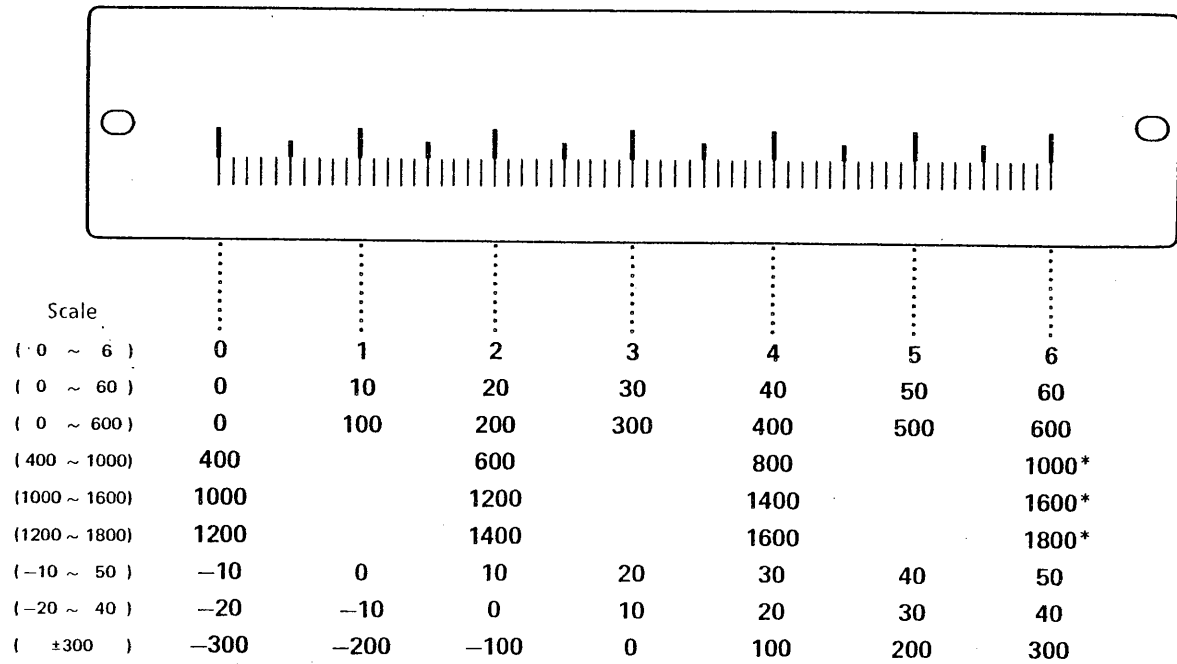


Diagram 2. 50 Equal Divisions, Format B



\* Scale marks at 0% and 100% use the main scale marks, but small letters are used for the values in positions where main scale marks would normally not be used. The same holds true below.

Diagram 3. 50 Equal Divisions, Format C



\* When the number of divisions is more than 60 and the maximum number of digits is 4, every other value is omitted. The same holds true below.

Diagram 4. 60 Equal Divisions, Format A

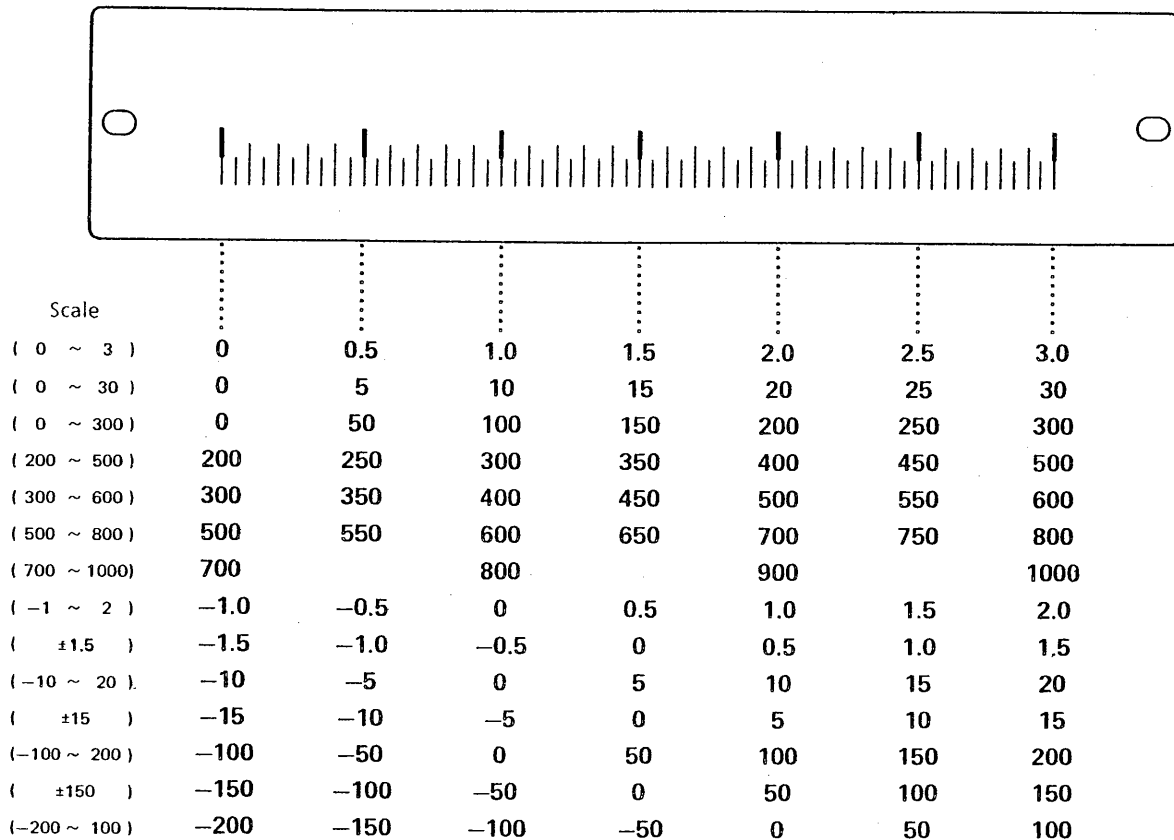


Diagram 5. 60 Equal Divisions, Format B

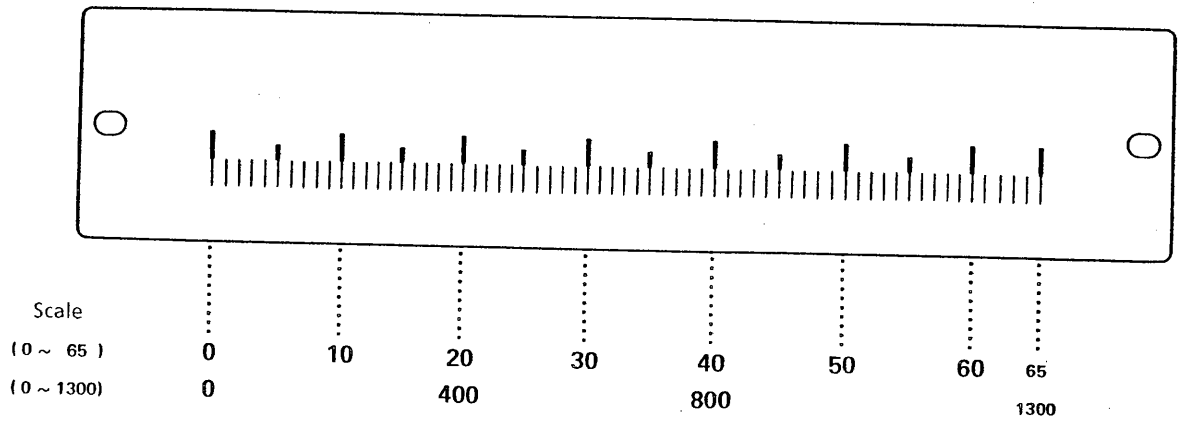
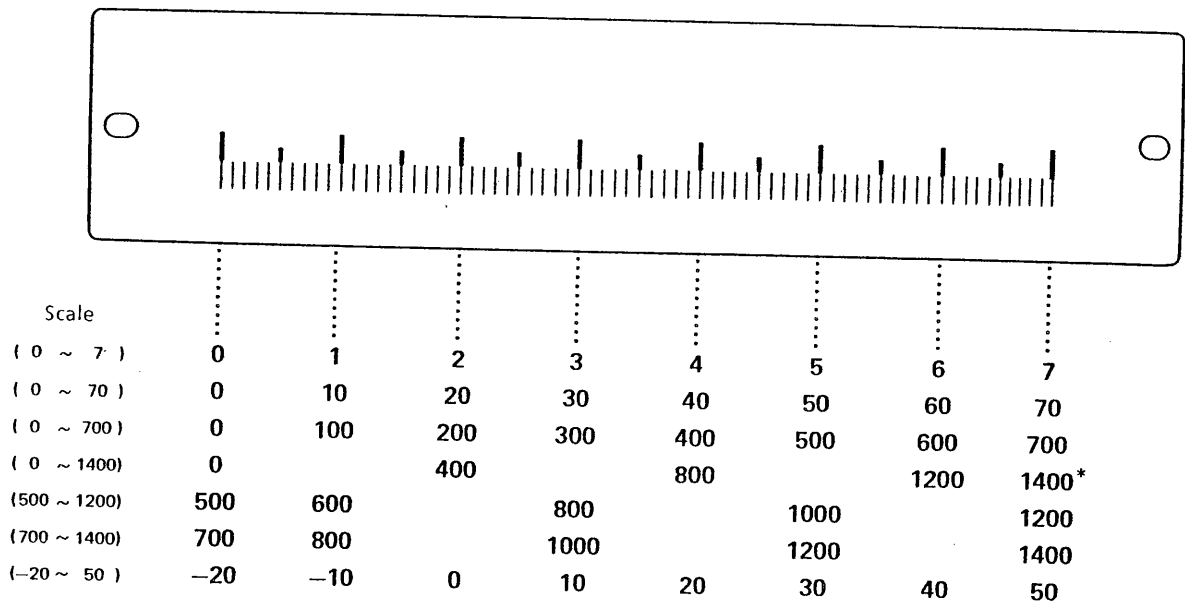


Diagram 6. 65 Equal Divisions, Format A



\* For the scale value at this 100% position, large letters are used since there is enough room.

Diagram 7. 70 Equal Divisions, Format A

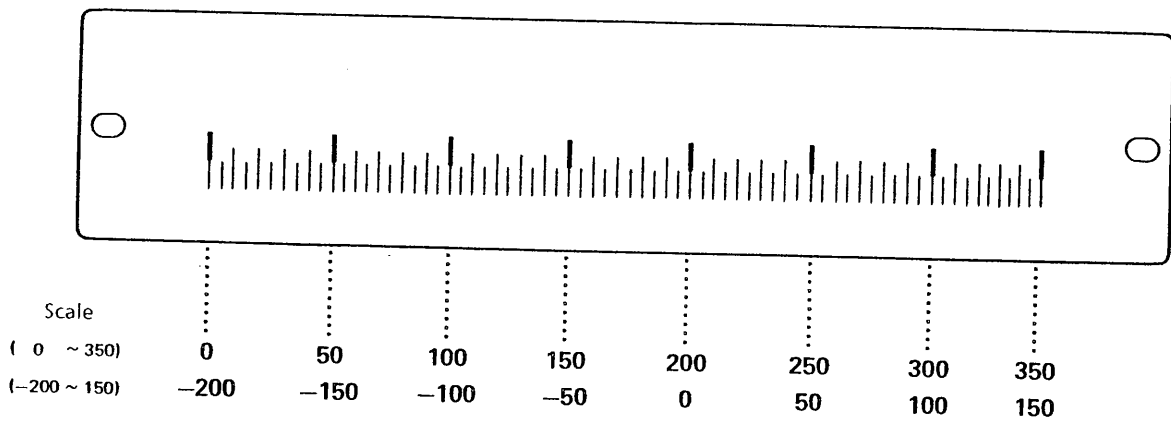
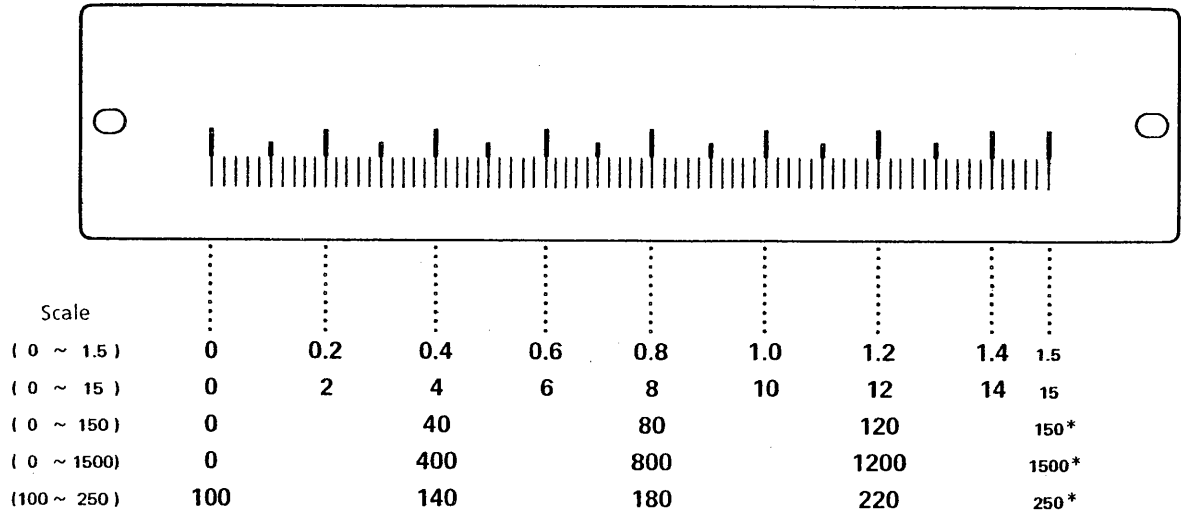


Diagram 8. 70 Equal Divisions, Format B



\* When the number of equal divisions is more than 75, and the maximum number of digits is 3, every other value is omitted. The same holds true below. Also, for scale values at the 100% position, small letters are used for the same reason mentioned in Diagram 3.

Diagram 9. 75 Equal Divisions, Format A

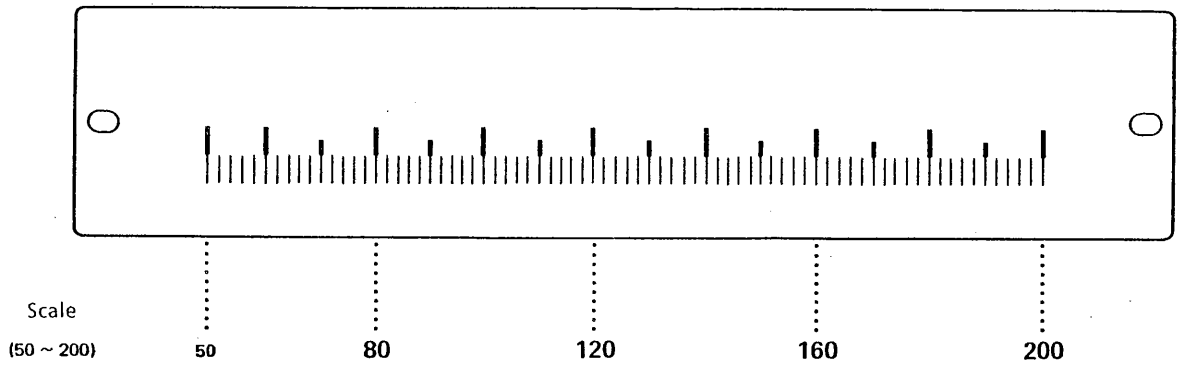
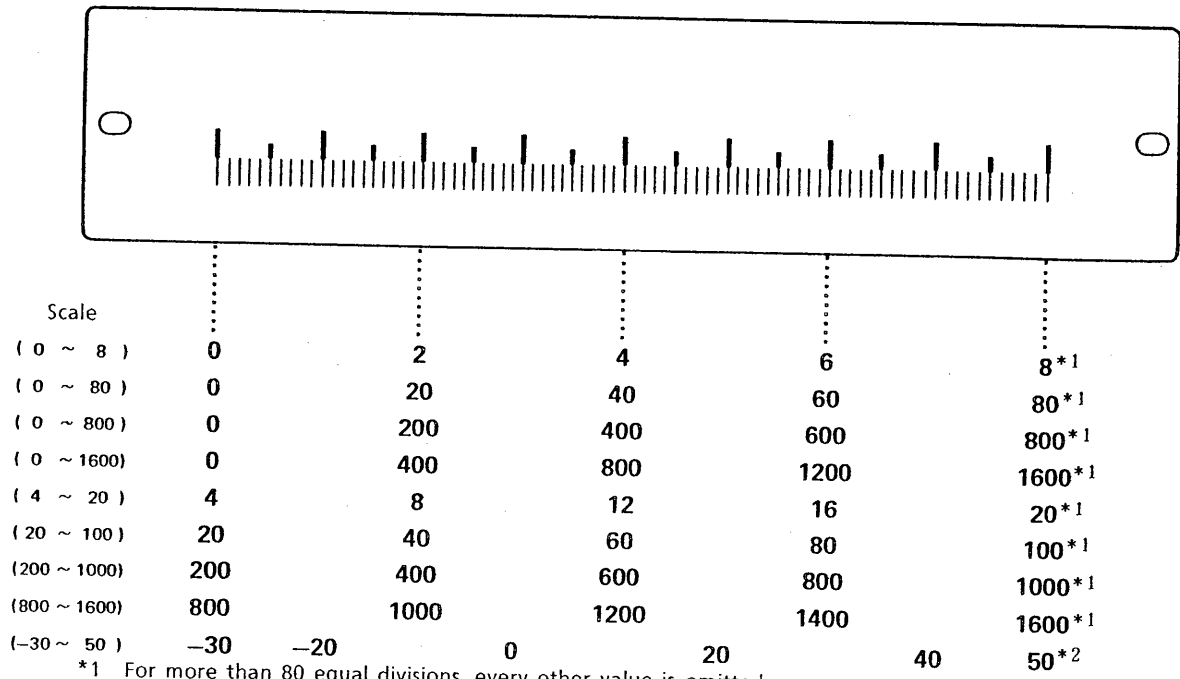


Diagram 10. 75 Equal Divisions, Format C



\*1 For more than 80 equal divisions, every other value is omitted.  
 \*2 For the ± scale, the scale values are entered starting at 0. Scale values are always entered at the 0% and 100% positions, regardless of intermittent omissions. When the scale values at the 0% and 100% positions fall on original main scale marks, and there is enough room, large letters are used. The same holds true below.

Diagram 11. 80 Equal Divisions, Format A

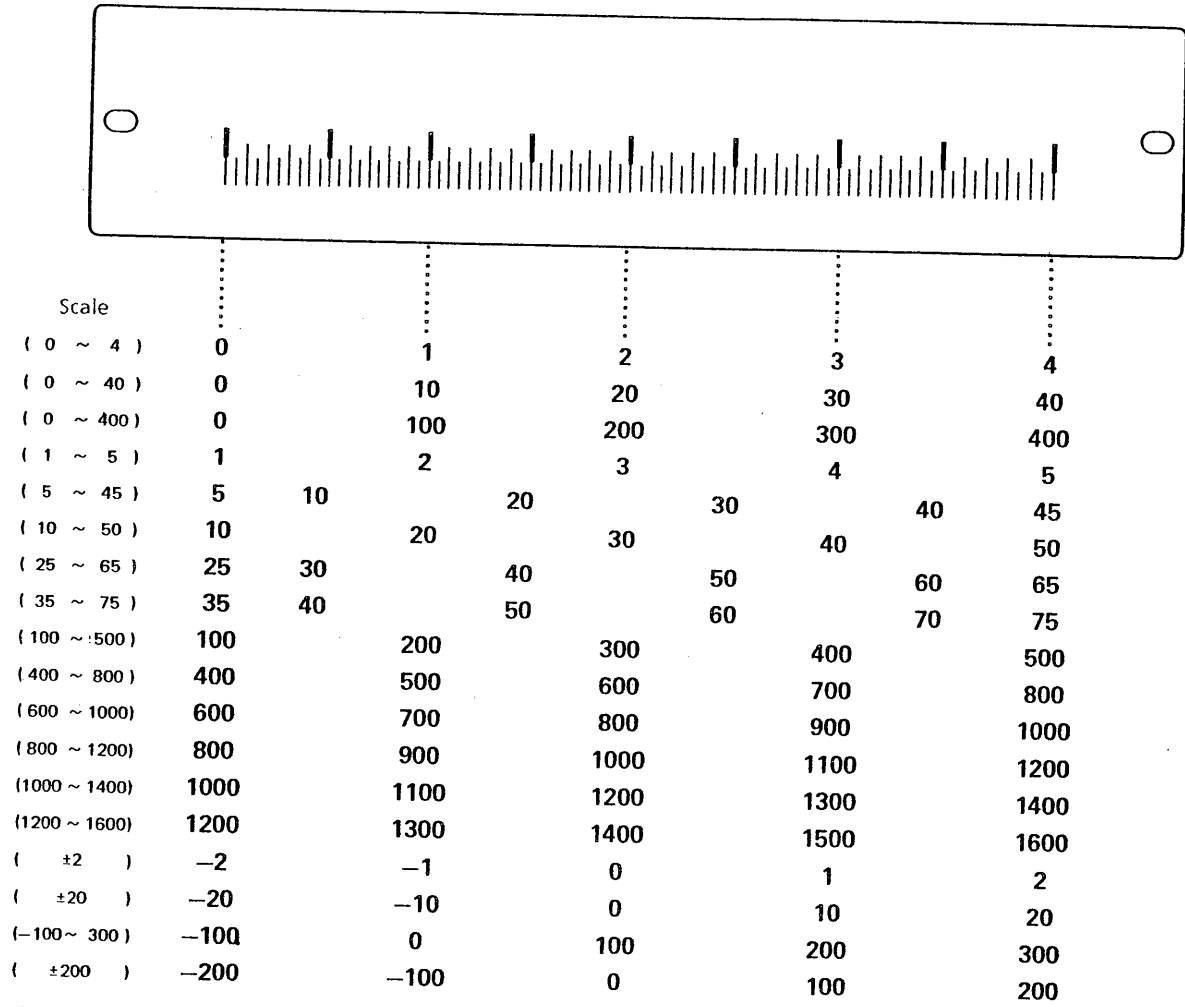
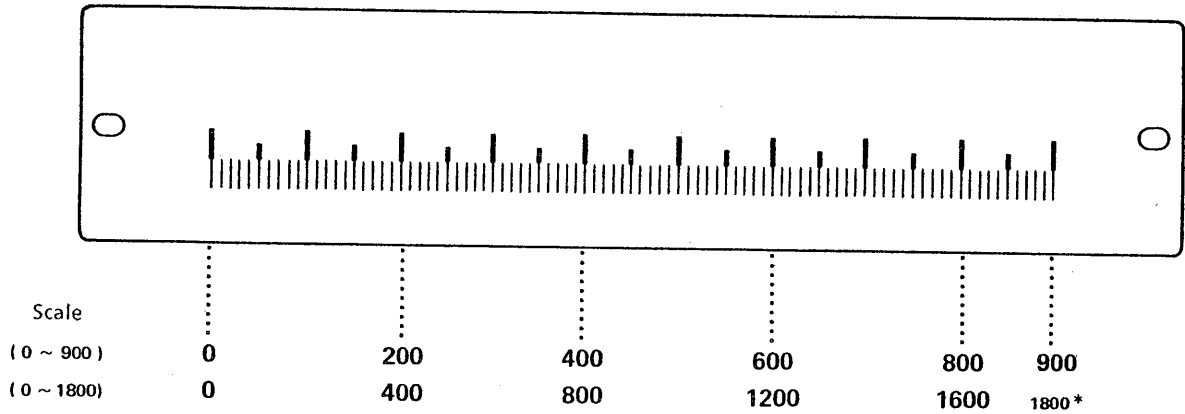


Diagram 12. 80 Equal Divisions, Format B



\* Large letters cannot be entered for the scale values at the 100% position; thus, small letters are used (the same continues here on out).

Diagram 13. 90 Equal Divisions, Format A

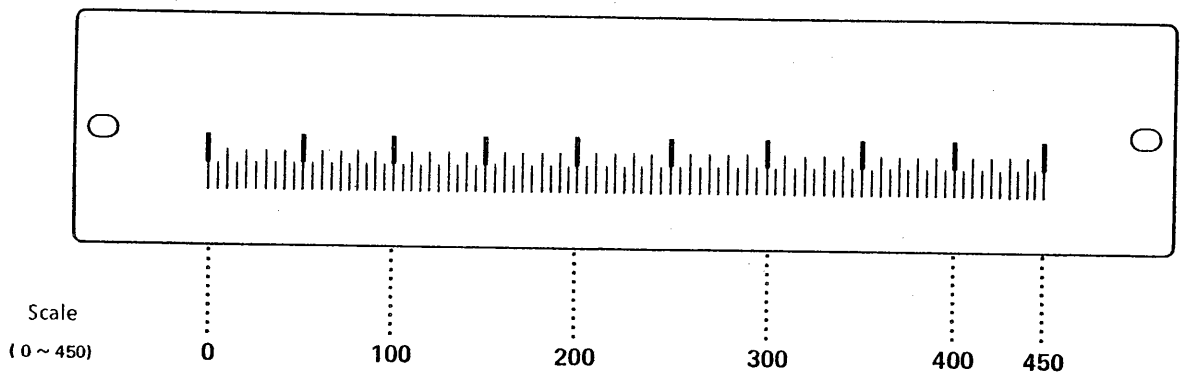


Diagram 14. 90 Equal Divisions, Format B

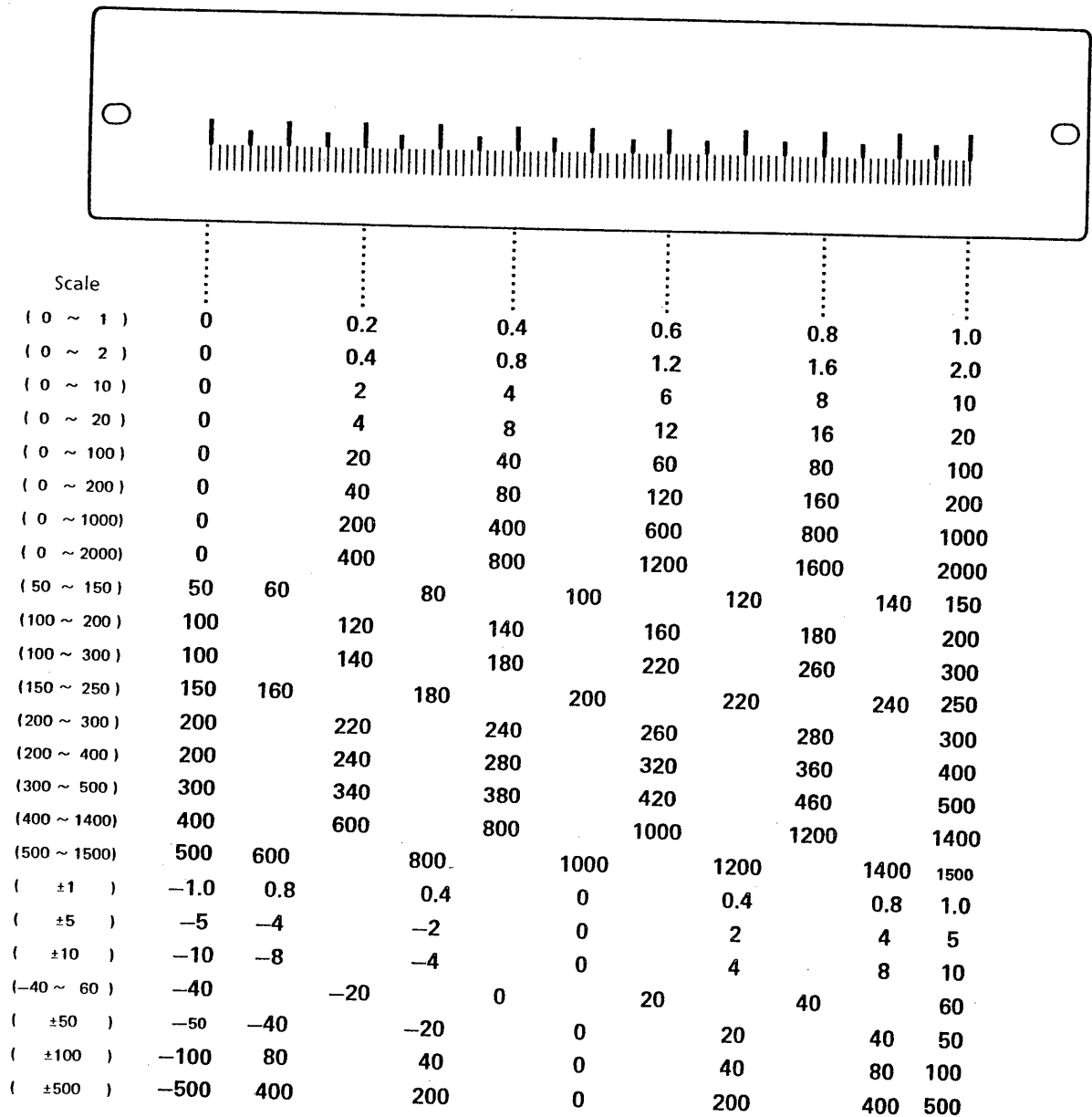


Diagram 15. 100 Equal Divisions, Format A

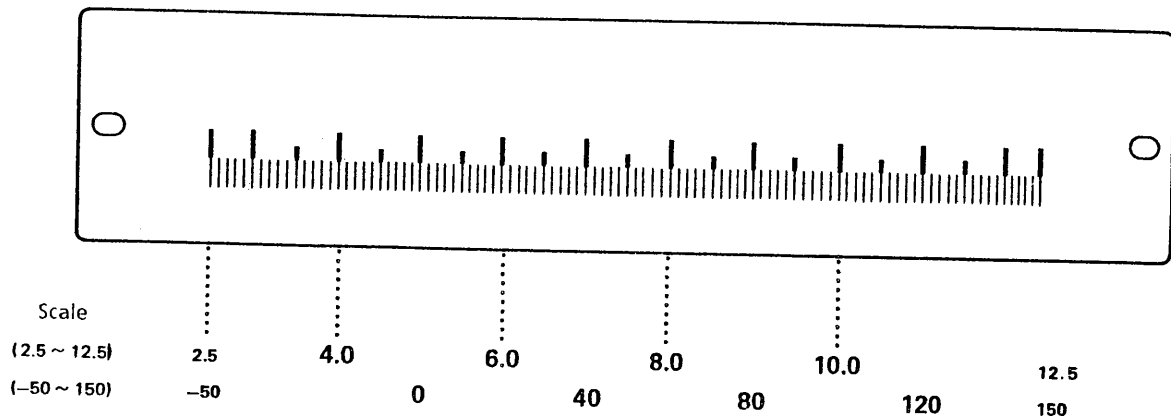


Diagram 16. 100 Equal Divisions, Format C



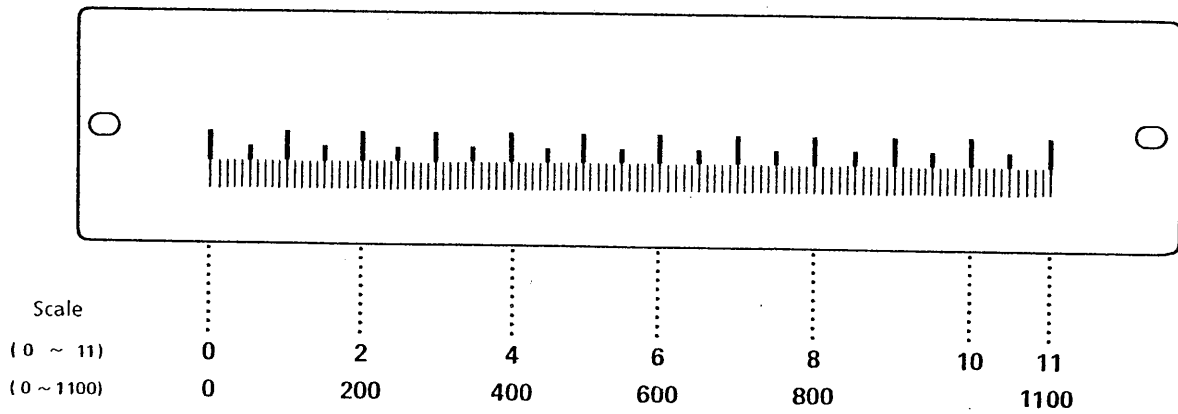


Diagram 17. 110 Equal Divisions, Format A (Tokuchu for  $\mu$ R100T and  $\mu$ R100F)

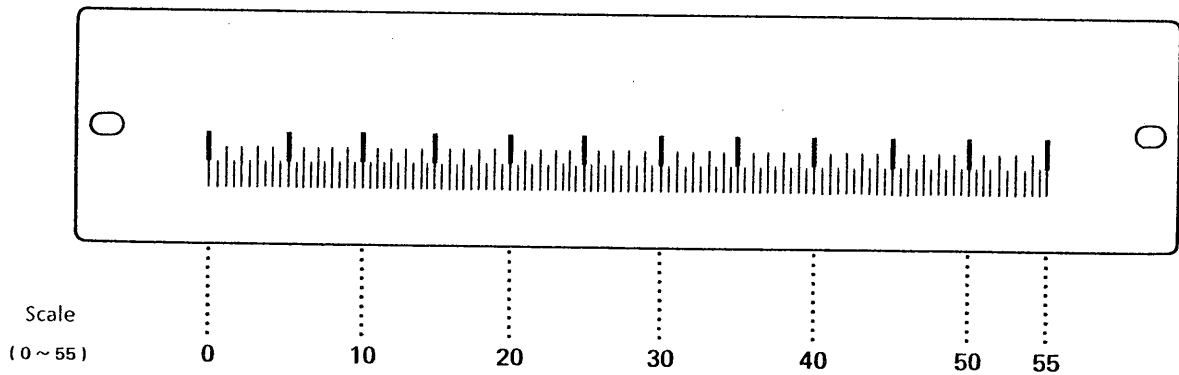
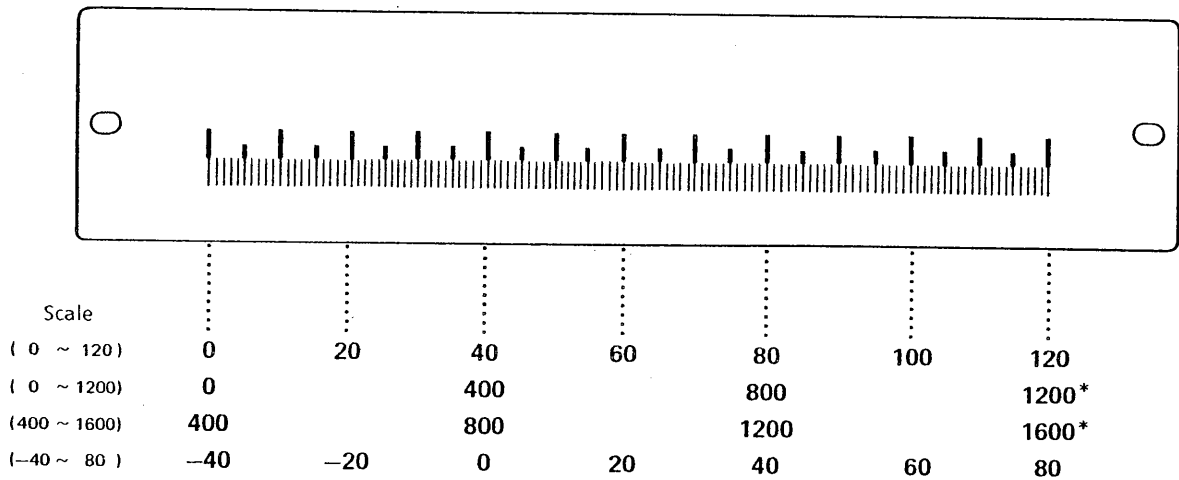


Diagram 18. 110 Equal Divisions, Format B (Tokuchu for  $\mu$ R100T and  $\mu$ R100F)



\* When the number of divisions is more than 120 and the maximum number of digits is 4, the scale value is only written on every fourth mark.

Diagram 19. 120 Equal Divisions, Format A (Tokuchu for  $\mu$ R100T and  $\mu$ R100F)

## APPENDIX OF LOGARITHM SCALES

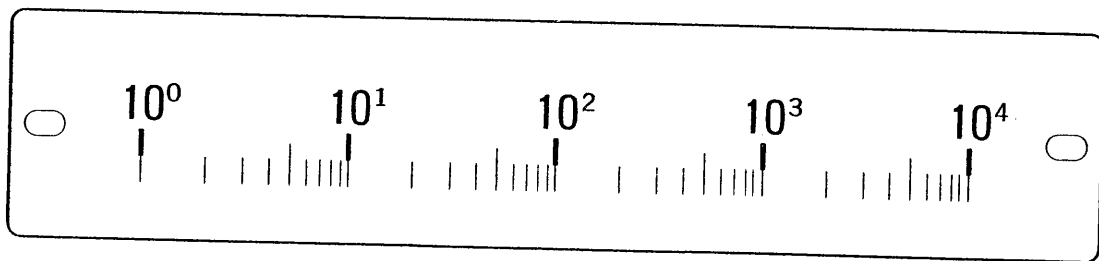


Diagram 20. 4-digit logarithm scale

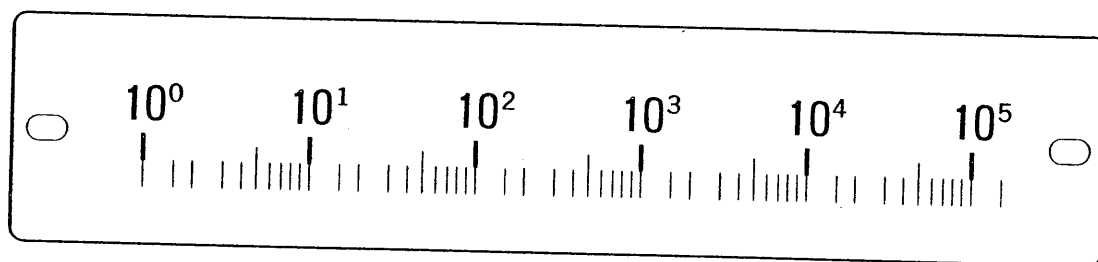


Diagram 21. 5-digit logarithm scale

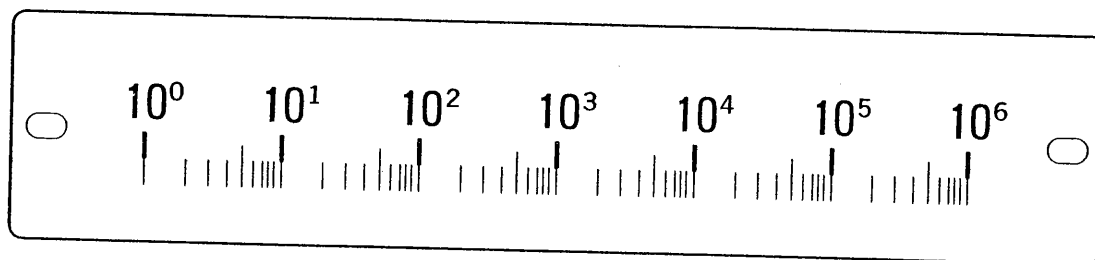


Diagram 22. 6-digit logarithm scale