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Introduction

This TI publication describes the scale-division formats and markings (including styles) for µRS1000, µRS1800 recorders.

1. SCALE TYPES AND DIMENSIONS

1.1 Available Types

	µRS1000		µRS1800	
	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 Scale Types and Dimensions

The scale types and the locations of their markings, such as, scale digits and units, are shown in the figures below according to the model of μ RS1000/ μ RS1800.

1.2.1 For μ RS1000

- (1) For μ RS1000 PEN model (single graduation; single marking)

Unit: mm

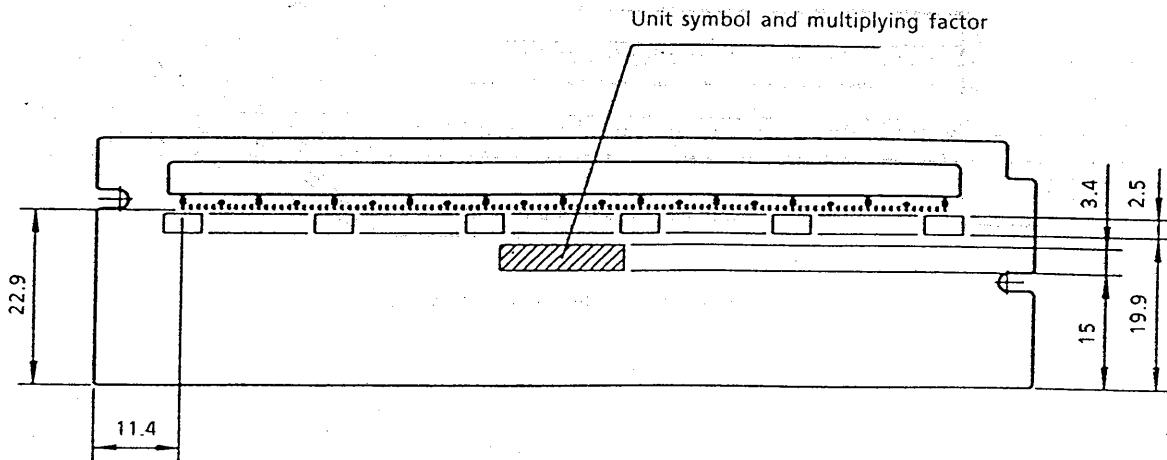


Figure 1.1 Scale for 1-PEN Model

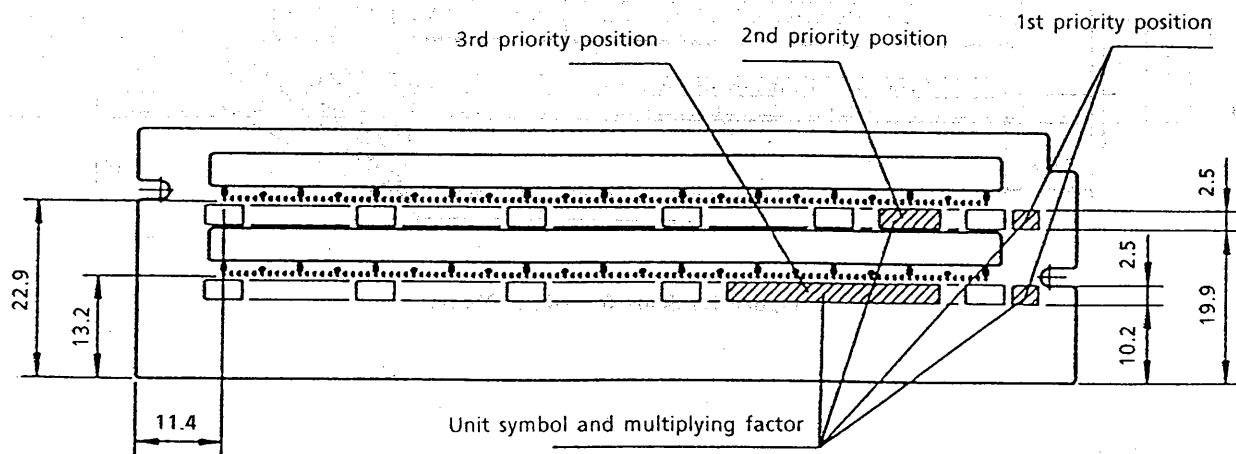


Figure 1.2 Scale for 2-PEN Model

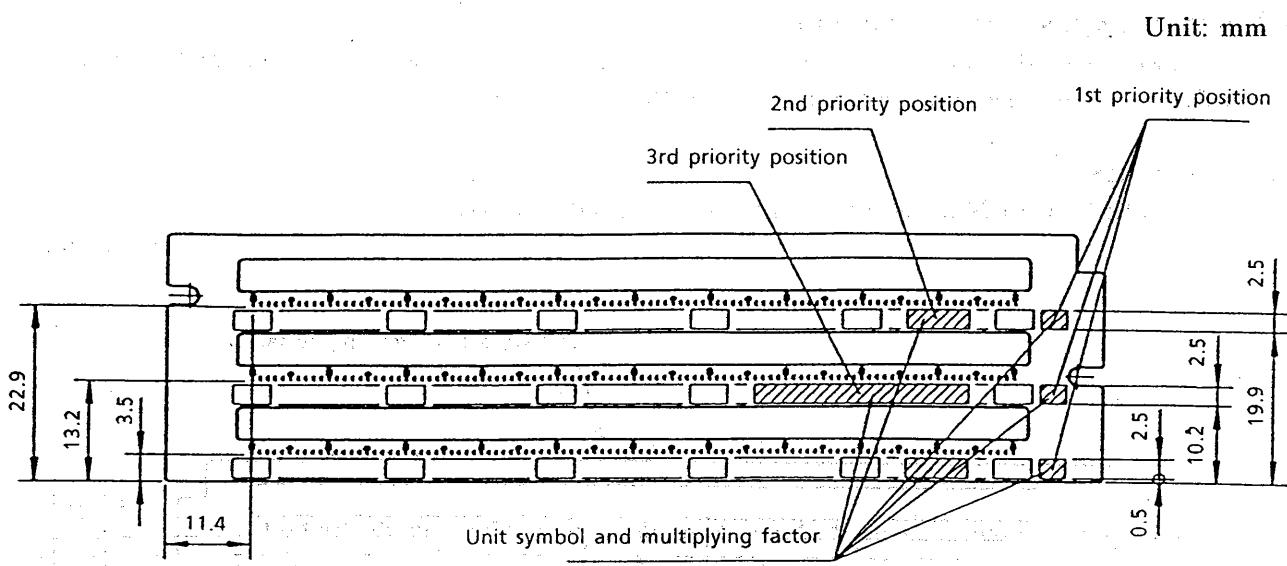


Figure 1.3 Scale for 3-PEN Model

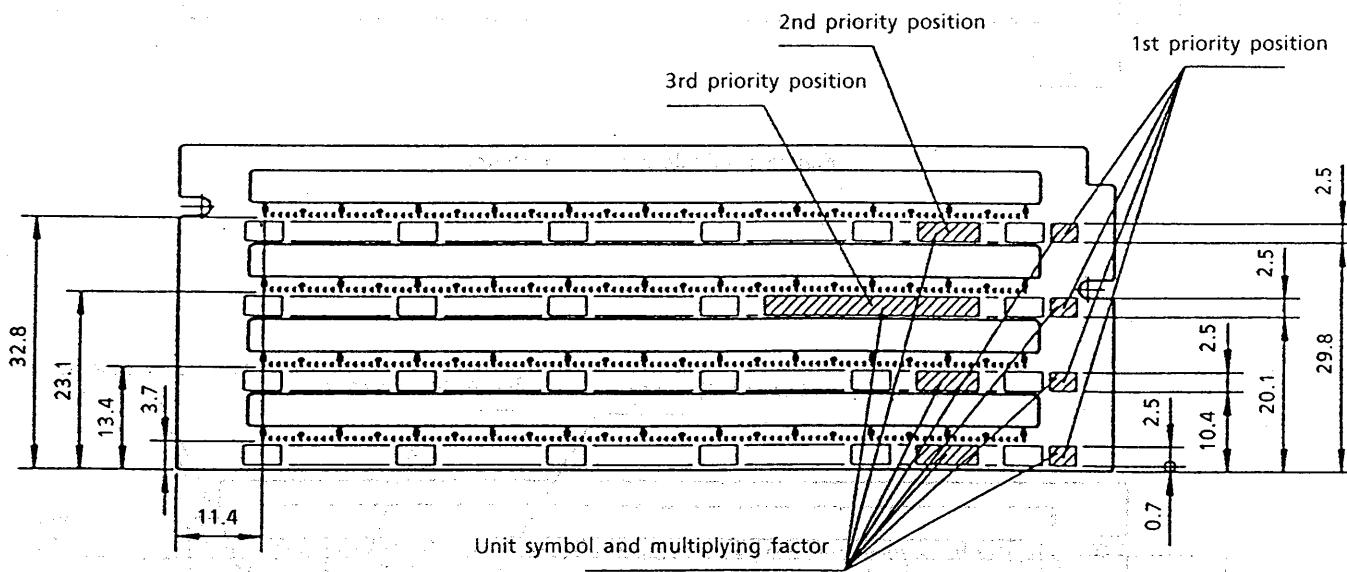


Figure 1.4 Scale for 4-PEN Model

(2) For μRS1000 DOT-printing model

Unit: mm

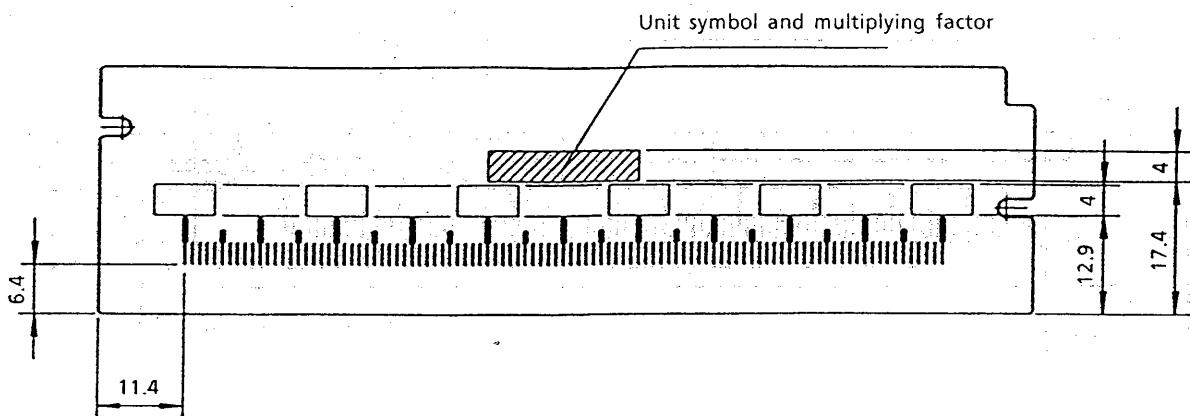


Figure 1.5 Single Graduation; Single Marking

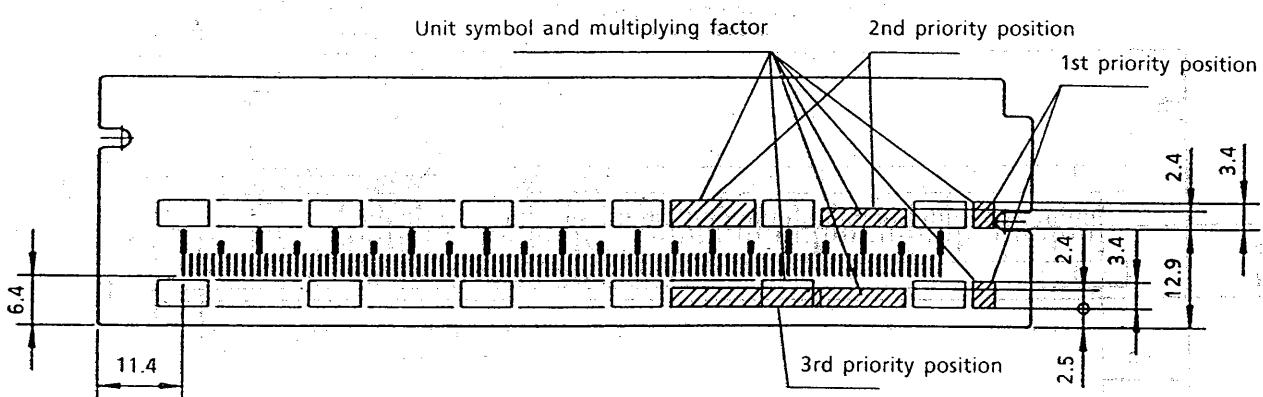


Figure 1.6 Single Graduation; Double Marking

Unit: mm

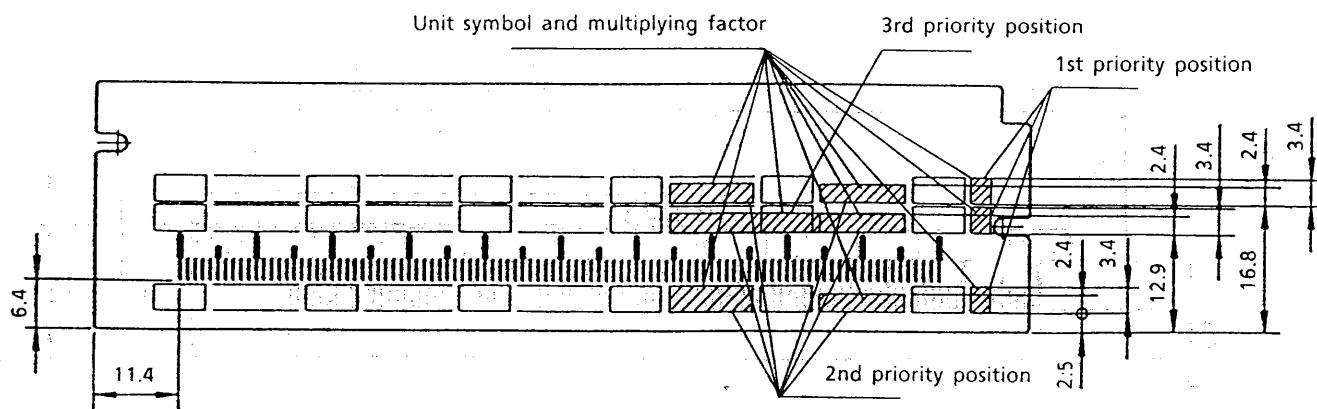


Figure 1.7 Single Graduation; Triple Marking

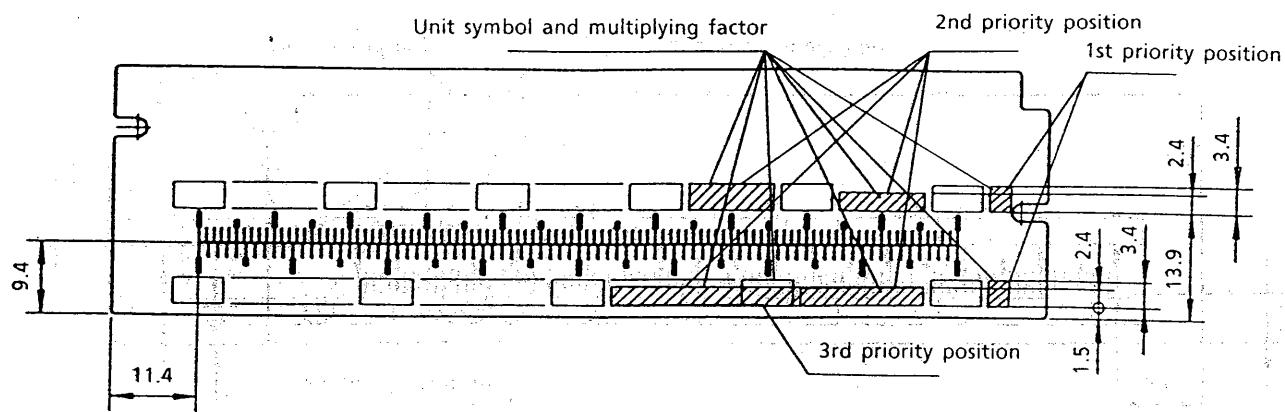


Figure 1.8 Double Graduation; Double Marking

Unit: mm

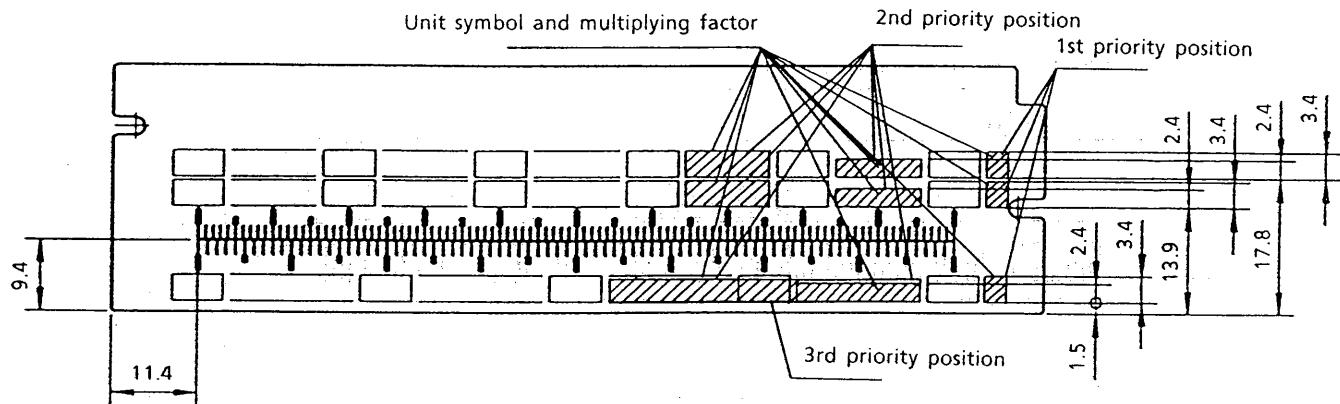


Figure 1.9 Double Graduation; Triple Marking

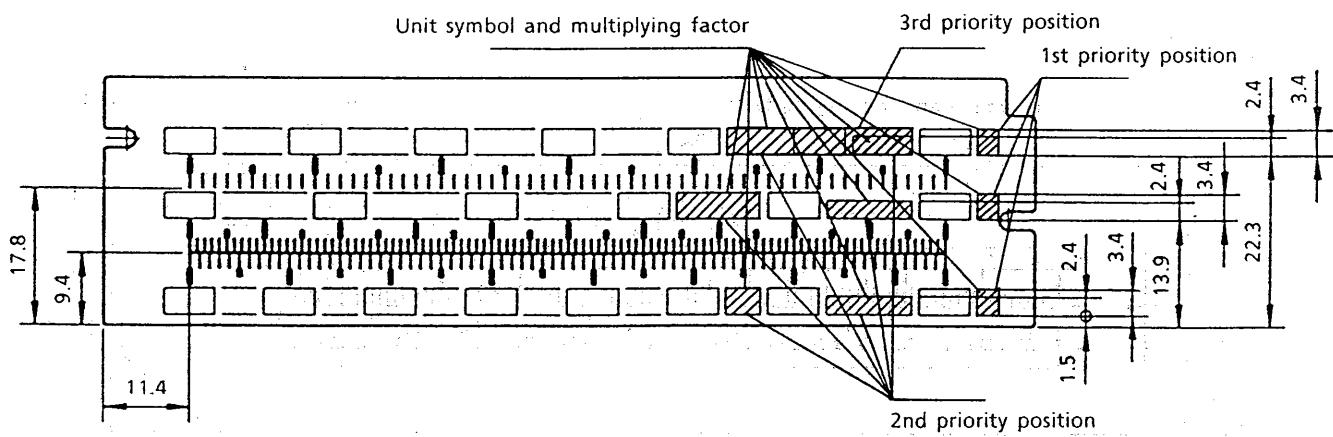


Figure 1.10 Triple Graduation; Triple Marking

1.2.2 For μRS1800

- (1) For μRS1800 PEN model (single graduation; single marking)

Unit: mm

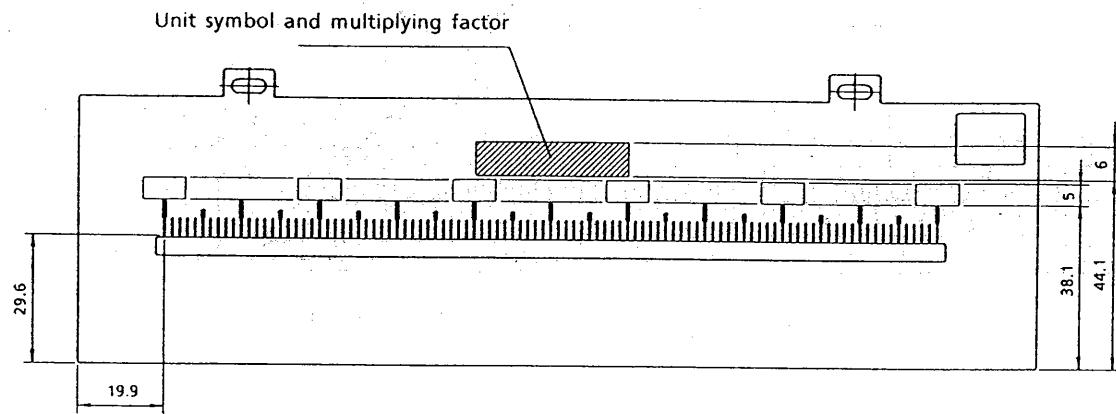


Figure 1.11 Scale for 1-PEN Model

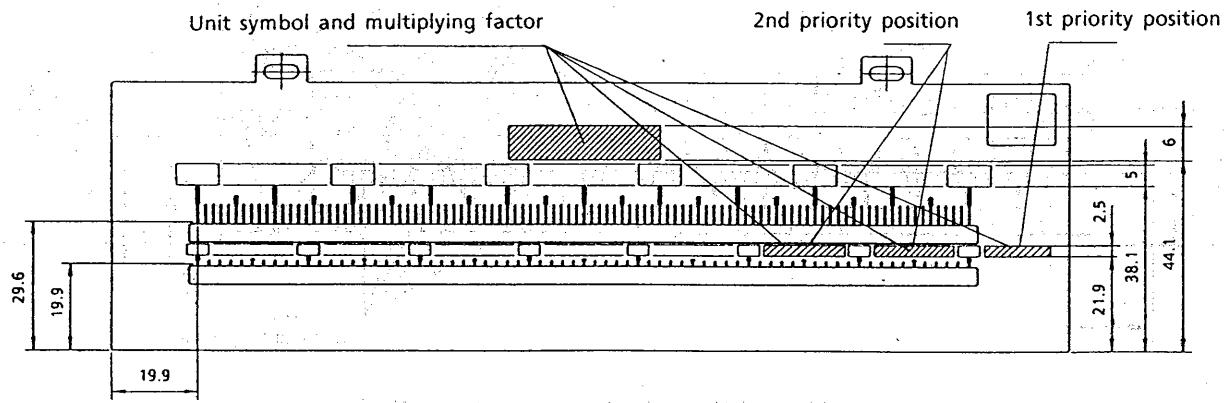


Figure 1.12 Scale for 2-PEN Model

Unit: mm

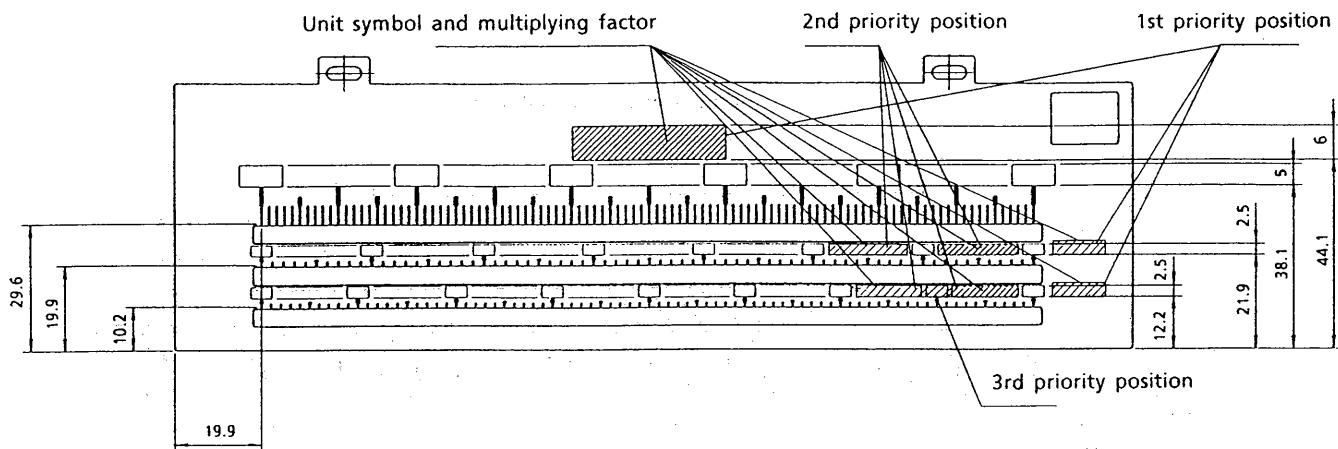


Figure 1.13 Scale for 3-PEN Model

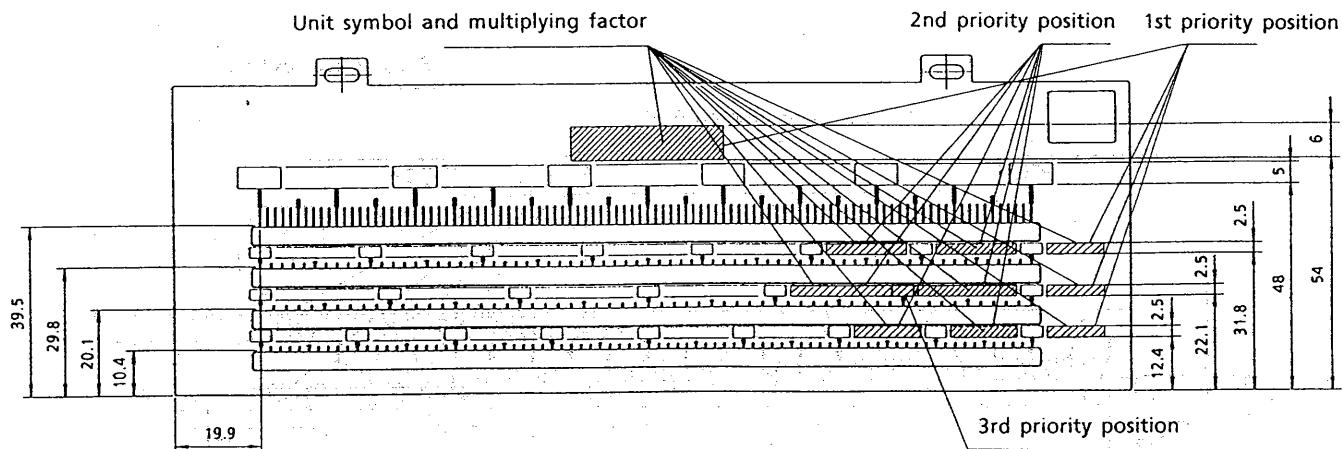


Figure 1.14 Scale for 4-PEN Model

TI 4D6B1C 01E

(2) For μRS1800 DOT-printing model

Unit: mm

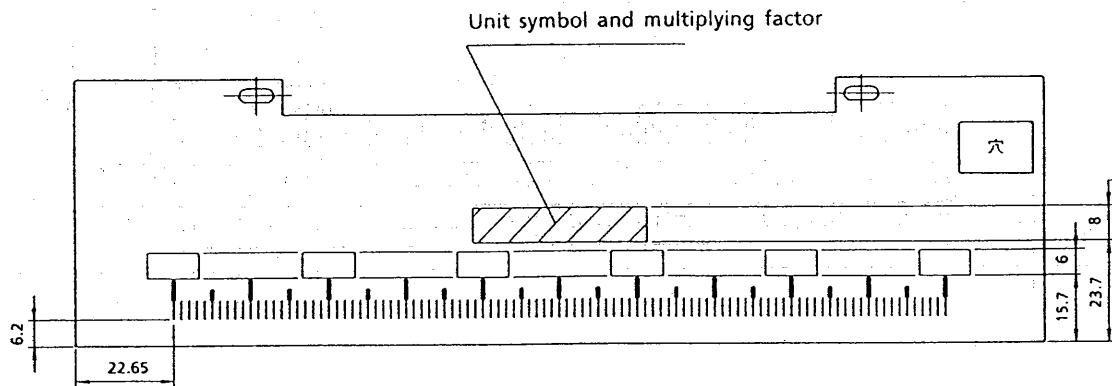


Figure 1.15 Single Graduation; Single Marking

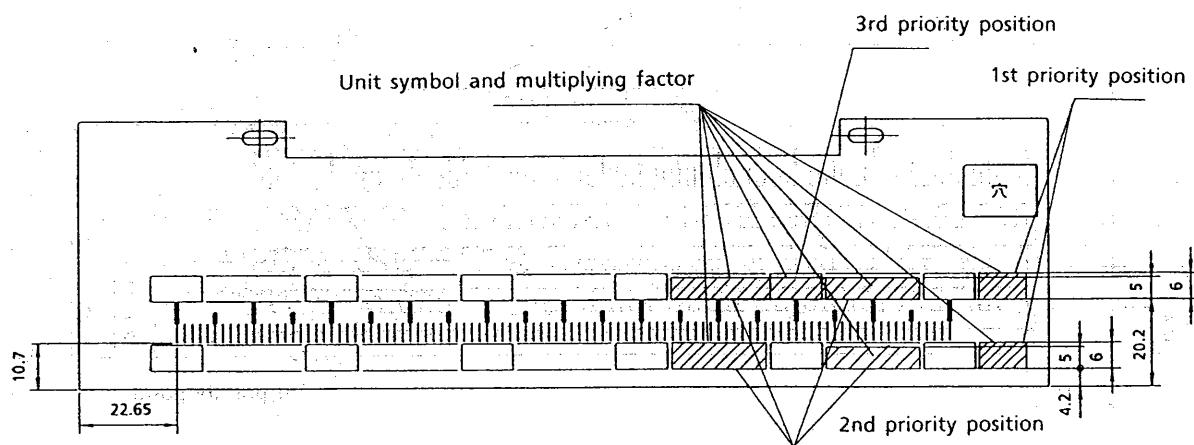


Figure 1.16 Single Graduation; Double Marking

Unit: mm

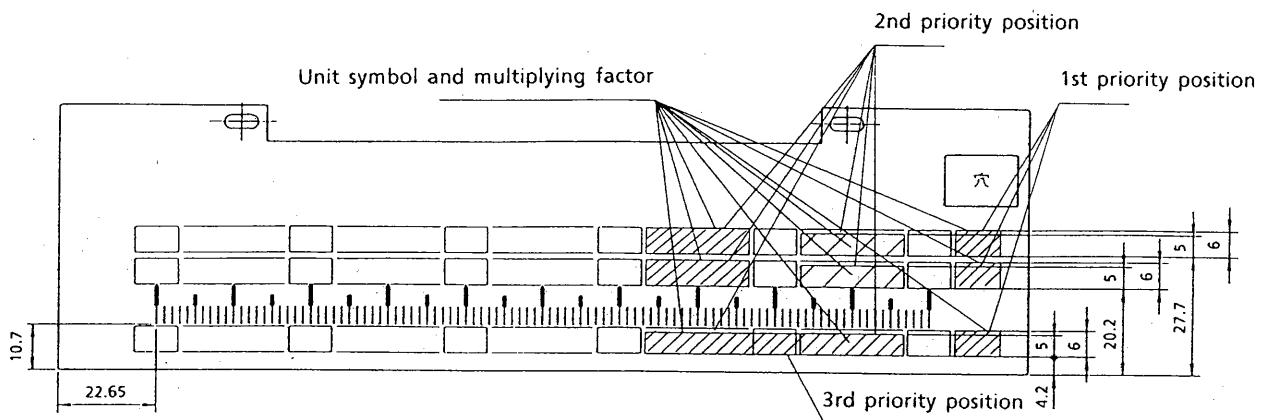


Figure 1.17 Single Graduation; Triple Marking

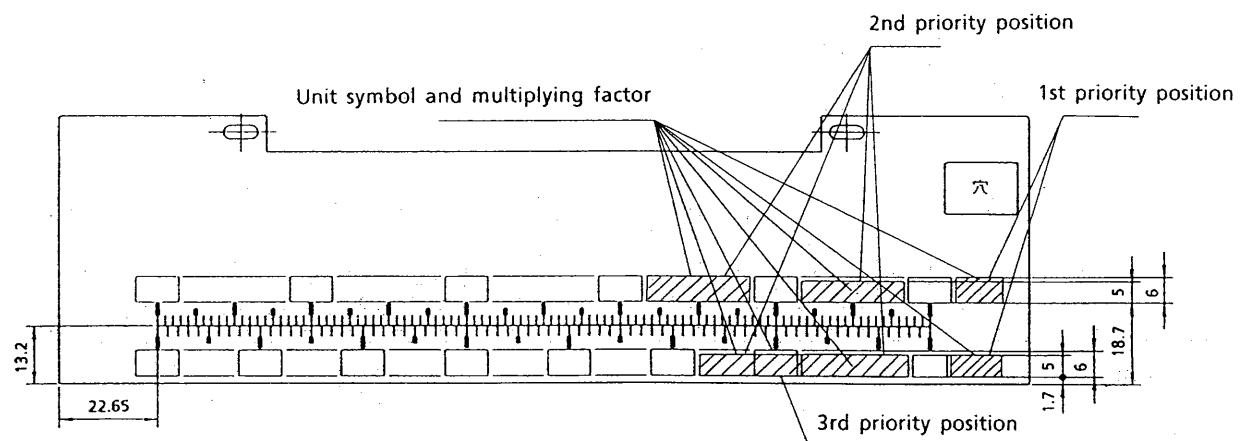


Figure 1.18 Double Graduation; Double Marking

Unit: mm

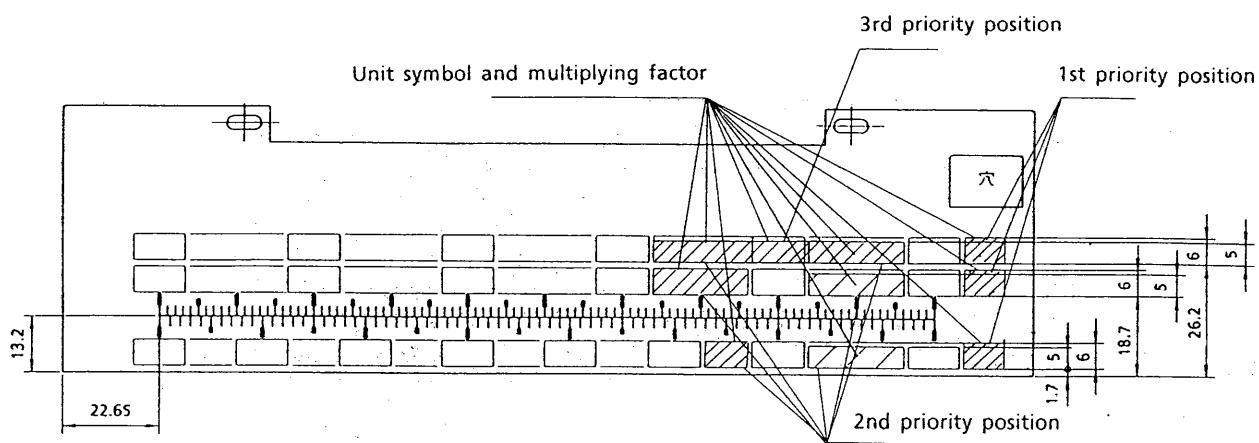


Figure 1.19 Double Graduation; Triple Marking

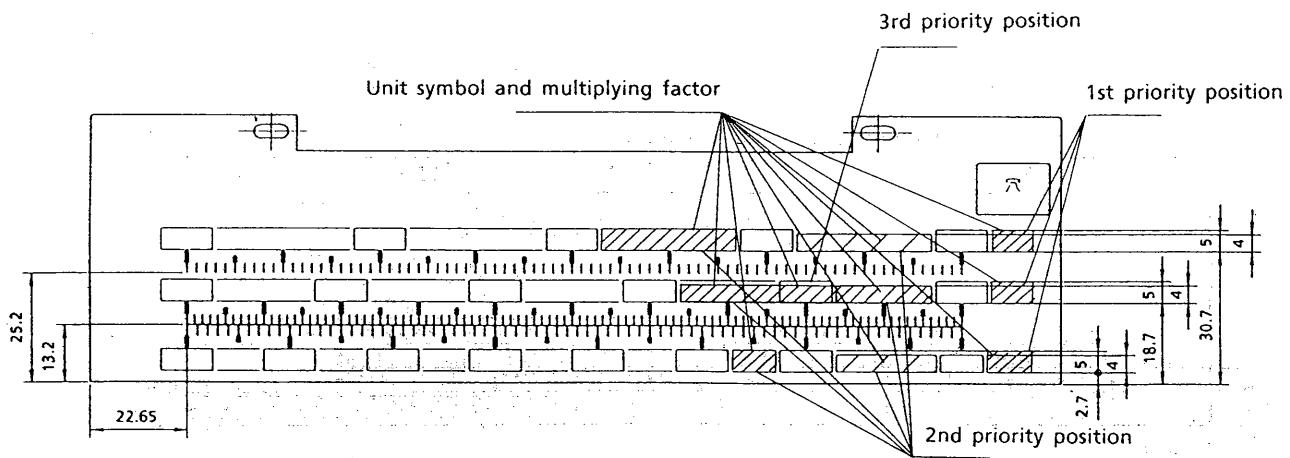


Figure 1.20 Triple Graduation; Triple Marking

2. SCALE PLATE ITEMS AND MARKING POSITIONS

2.1 Scale Plate Items

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

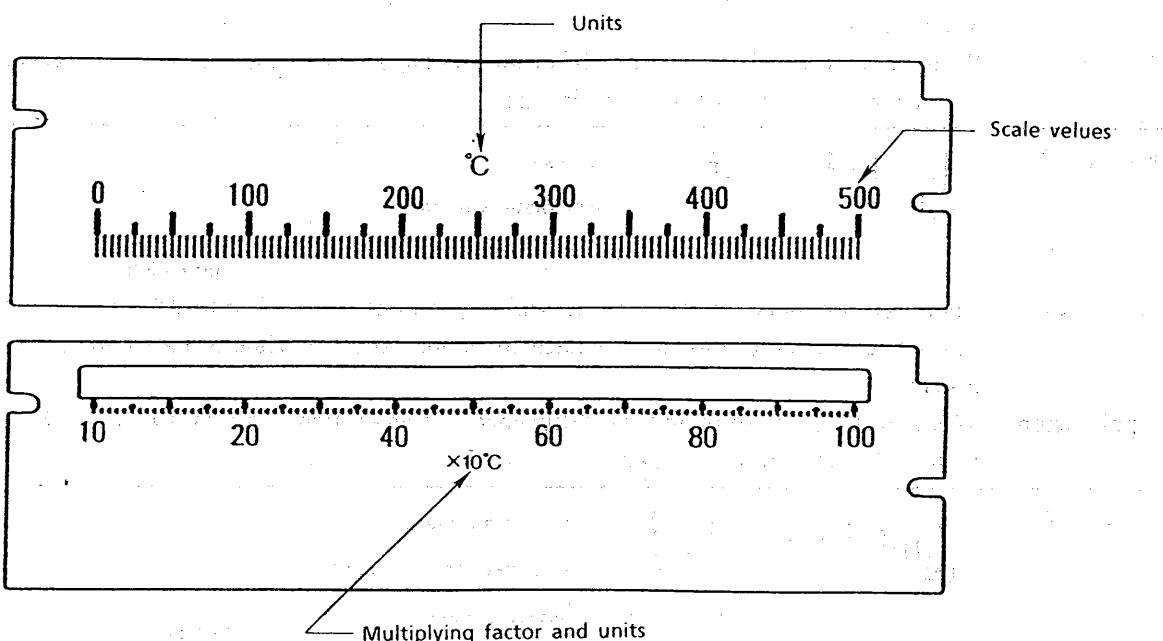
(TOKUCHU scales and those specified by the customer, are specified separately)

(1) Scale graduation

(2) Scale values and sign

(3) Multiplying factor and unit (Multiplying factor is entered only when used. Example: $\times 10$ kg)

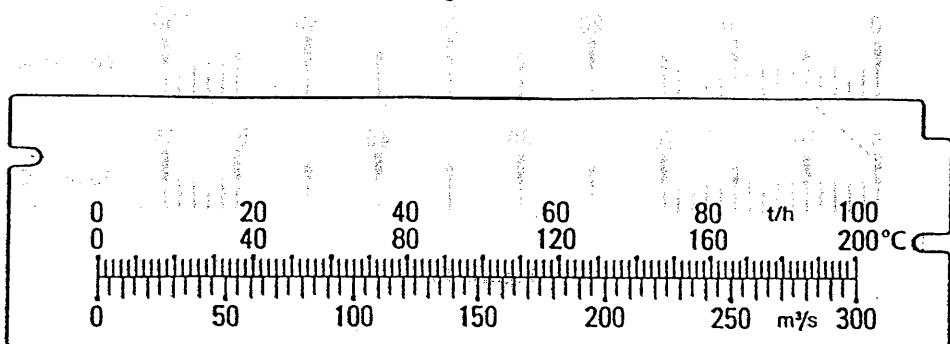
Note: As a rule, no model number, instrument class, trade mark, chart number, scale plate part number, or input type is included on the scale plate.



2.2 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.

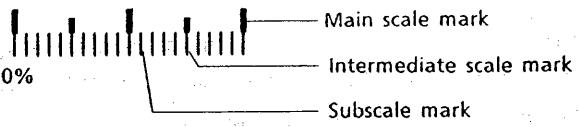
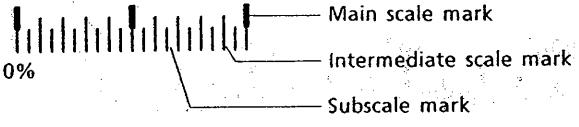
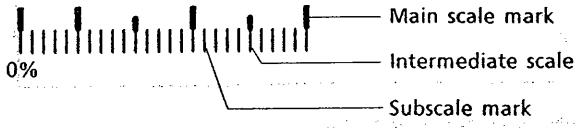
Example: Double graduation, triple marking



3. SCALE DIVISION FORMATS AND LIMITATIONS TO THE NUMBER OF DIVISIONS

3.1 Scale Division Formats

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

Format A  <p>Main scale mark Intermediate scale mark Subscale mark</p>	Figure 3.1
<p>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.</p> <p>Application : When one scale division (the difference between two main scale marks) corresponds to 1 or 2, or 1 or 2×10^n ($n = \text{integer}$).</p>	
Format B  <p>Main scale mark Intermediate scale mark Subscale mark</p>	Figure 3.2
<p>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.</p> <p>Application : When one scale division (the difference between two main scale marks) corresponds to 5 or 5×10^n ($n = \text{integer}$).</p>	
Format C  <p>Main scale mark Intermediate scale mark Subscale mark</p>	Figure 3.3
<p>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.</p> <p>Application : Same as format A.</p>	

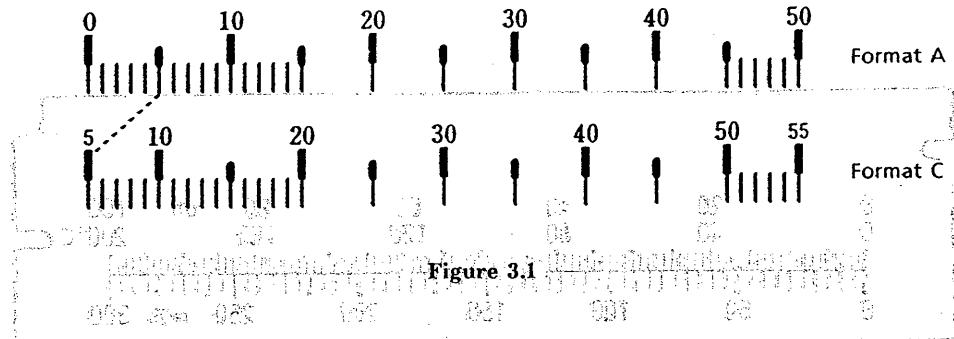


Figure 3.1

3.2 Limitations to the Number of Divisions (Uniform divisions allowed by automatic writing)

	Standard	Non-standard (TOKUCHU)
μ RS1000	Up to 100 equal divisions (Spacing: 1 mm)	Up to 120 equal divisions (Spacing: 0.8 mm)
μ RS1800	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.

3.3 Scale Mark Forms and Dimensions (Uniform divisions allowed by automatic writing)

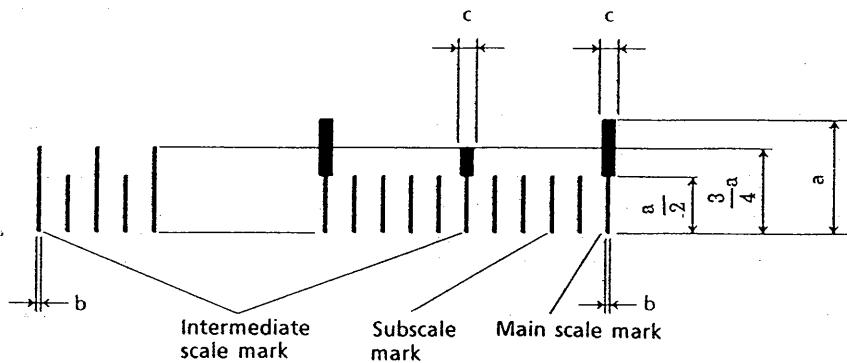


Figure 3.2

3.4 Scale Graduating

- (1) The distance between the 0% and 100% points on a scale is 100 mm for the μ RS1000, and 180 mm for the μ RS1800. This distance is graduated equally or based on a logarithm of 4, 5, 6, 7, or 8 digits.
- (2) Scale graduation accuracy is ± 0.1 mm.

3.5 Scale Mark Forms and Dimensions

μ RS1000

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	1.5	1.5	—	—
	b	0.3	0.3	—	—
	c	0.8	0.8	—	—
2- to 4-pen models	a	1.5	1.5	—	—
	b	0.3	0.3	—	—
	c	0.8	0.8	—	—
Dot-printing model	a	6.0	6.0	4.0	4.0
	b	0.3	0.3	0.3	0.3
	c	0.8	0.8	0.8	0.8

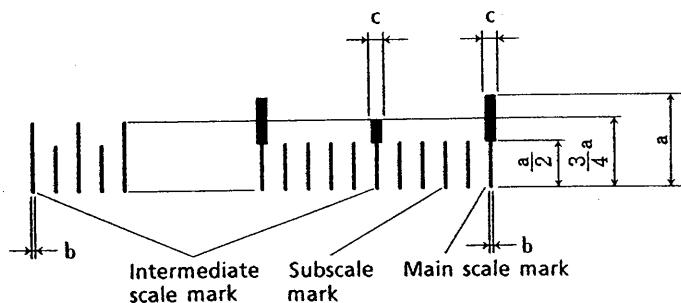
※ Base line 0.3 mm (multi graduation)

μ RS1800

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	0.3	0.3	—	—
	c	0.8	0.8	—	—
2- to 4-pen models	a	1.5	1.5	—	—
	b	0.3	0.3	—	—
	c	0.8	0.8	—	—
Dot-printing model	a	9.0	9.0	5.0	5.0
	b	0.4	0.3	0.4	0.3
	c	1.0	0.8	1.0	0.8

※ Base line 0.4 mm (multi graduation)



4. MARKING

Markings used for items (2) and (3) in section 2.1 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 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.

μRS1000

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	2.5	2	4	3
2- and 4-pen pen models	Single graduation, single marking	2.5	2	2	2
Dot-printing model	Single graduation, single marking	4	3	4	3
	Single graduation, double marking	3.4	2.5	2.5	2.5
	Single graduation, triple marking	3.4	2.5	2.5	2.5
	Double graduation, double marking	3.4	2.5	2.5	2.5
	Double graduation, triple marking	3.4	2.5	2.5	2.5
	Triple graduation, triple marking	3.4	2.5	2.5	2.5

μRS1800

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	6	5
2- and 4-pen pen models	Single graduation, single marking	2.5	2	2.5	2
Dot-printing model	Single graduation, single marking	6	5	8	6
	Single graduation, double marking	6	5	5	4
	Single graduation, triple marking	6	5	5	4
	Double graduation, double marking	6	5	5	4
	Double graduation, triple marking	6	5	5	4
	Triple graduation, triple marking	5	4	4	3

4.3 Marking Positions and Basic Principles

(1) Positioning (See Figures 1.1 to 1.20.)

(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.

(Scale values are available up to 3 digits for the μ RS1000 and 4 digits for the μ RS1800)

(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.

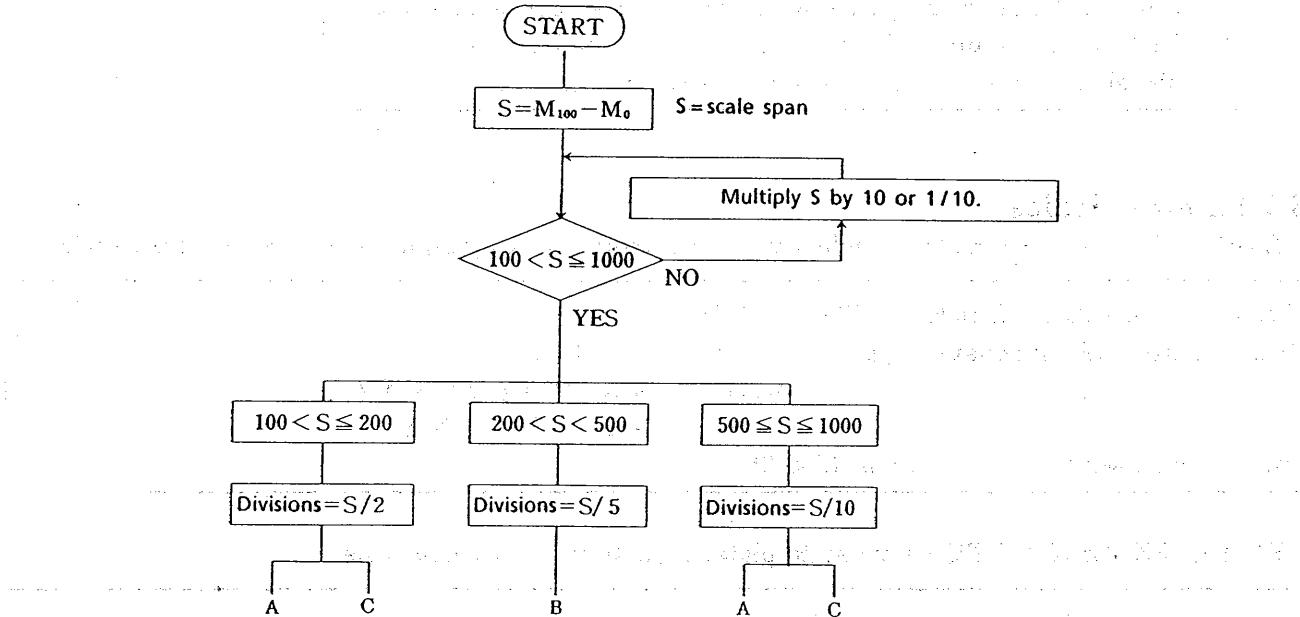
5. DETERMINING THE NUMBER OF SCALE DIVISIONS

Refer to the flowchart below for the following cases:

- To determine the number of scale divisions specified by the customer. Determine the number of scale divisions by entering the numbers into the following flowchart.

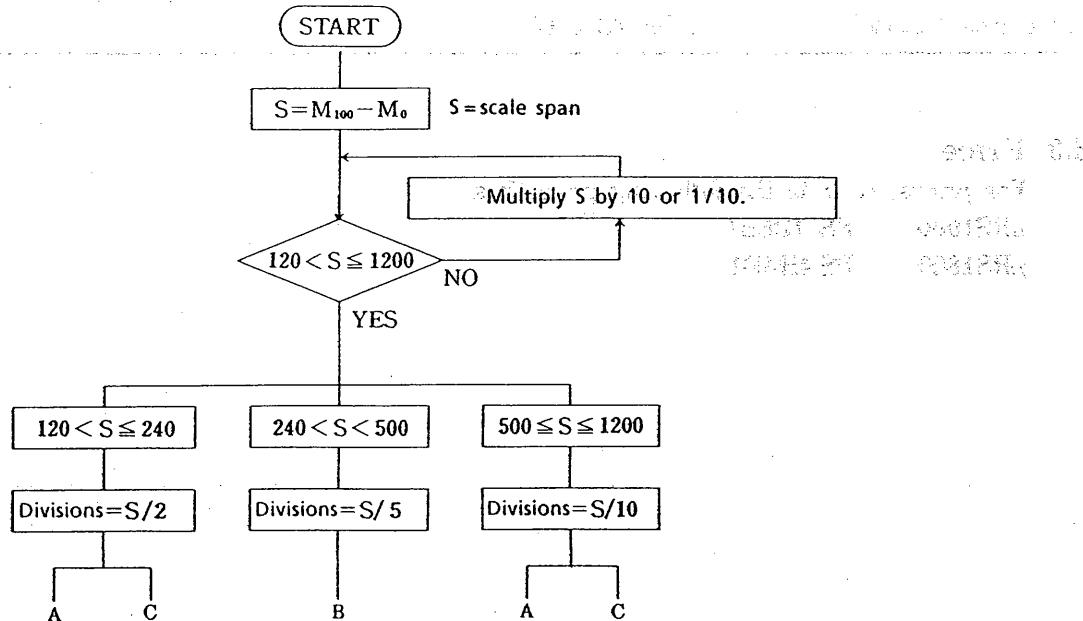
5.1 μRS1000 Flowchart

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



5.2 μRS1800 Flowchart

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



* For both the μRS1000 and μRS1800, the graduation type, A, B, or C, is determined according to the number of scale divisions.

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 μ RS1000, and 8 digits for the μ RS1800.)

They should be ordered from the Parts Center.

6.1 Items to Be Specified

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

6.2 Sample Scales

(μ RS1000: DOT-printing model: double graduation, triple marking scale plate: uniform type scale)

Scale plate specification code : B9930LH / SC23

Scale values, unit, graduation type	Upper : 0 to 100C° UNIF
	Middle : 0 to 500 kg/cm ³ UNIF
	Lower : -20 to 30C° UNIF

Instrument model : For 4365 06

(μ RS1800: PEN model: 3-PEN type scale plate: logarithmic graduated scale)

Scale plate specification code : B9931CL / SC33

Scale values, unit, graduation type	1ch : 10^1 to 10^7 cpm	6-digit logarithmic graduations
	2ch : 10^{-4} to 1^{04}	8-digit logarithmic graduations
	3ch : 10^{-3} to 1^{03}	6-digit logarithmic graduations

Instrument model : For 4375 03

6.3 Price

For prices, refer to the following price lists.

μ RS1000 : PS 4D6B1

μ RS1800 : PS 4H4B1

6.4 Scale Plate Specification Codes

μRS1000	Specification	Applicable Model	Part Number + Specification Code
1 PEN model	1 pen scale plate	4365 01	B9930DD/SC11
2 PEN model	2 pen scale plate	4365 02	B9930DE/SC22
3 PEN model	3 pen scale plate	4365 03	B9930DF/SC33
4 PEN model	4 pen scale plate	4365 04	B9930DG/SC44
Dot-printing model	Single graduation, single marking	4365 06	B9930LH/SC11
	Single graduation, double marking		B9930LH/SC12
	Single graduation, triple marking		B9930LH/SC13
	Double graduation, double marking		B9930LH/SC22
	Double graduation, triple marking		B9930LH/SC23
	Triple graduation, triple marking		B9930LH/SC33

μRS1800	Specification	Applicable Model	Part Number + Specification Code
1 PEN model	1 pen scale plate	4375 01	B9931CH/SC11
2 PEN model	2 pen scale plate	4375 02	B9931CJ/SC22
3 PEN model	3 pen scale plate	4375 03	B9931CK/SC33
4 PEN model	4 pen scale plate	4375 04	B9931CL/SC44
Dot-printing model	Single graduation, single marking	4375 06	B9931MC/SC11
	Single graduation, double marking		B9931MC/SC12
	Single graduation, triple marking		B9931MC/SC13
	Double graduation, double marking	4375 18	B9931MC/SC22
	Double graduation, triple marking		B9931MC/SC23
	Triple graduation, triple marking	4375 24	B9931MC/SC33

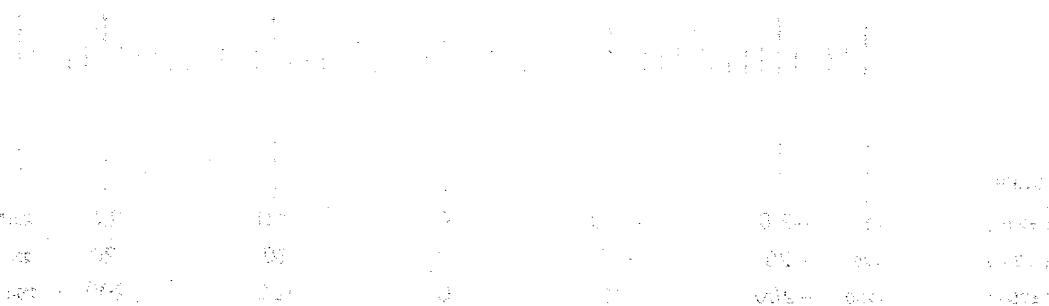
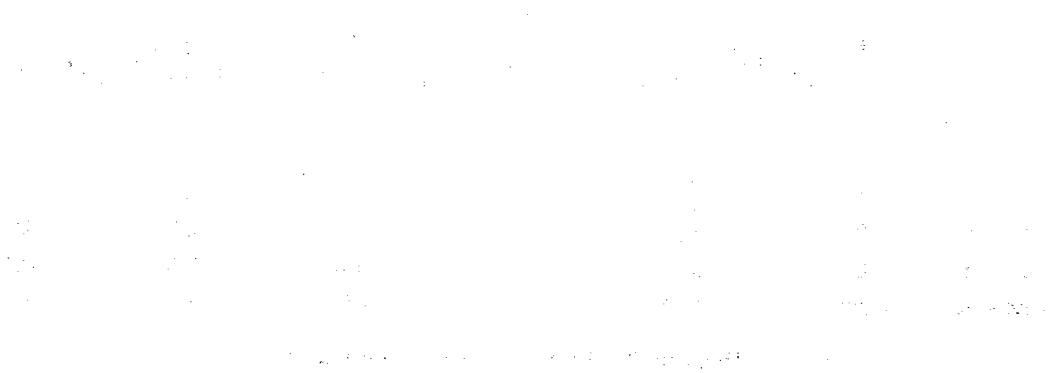
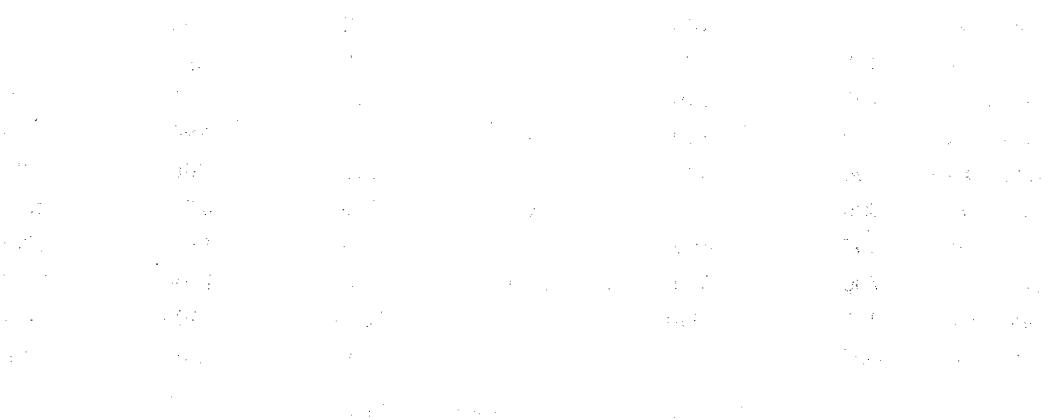
6.5 Scale Blank Specification Codes

μRS1000	Specification	Applicable Model	Part Number
1 PEN model	1 pen scale plate	4365 01	B9930DH
2 PEN model	2 pen scale plate	4365 02	B9930DJ
3 PEN model	3 pen scale plate	4365 03	B9930DK
4 PEN model	4 pen scale plate	4365 04	B9930DL
Dot-printing model	Single graduation, single marking	4365 06	B9930LJ
	Single graduation, double marking		
	Single graduation, triple marking		
	Double graduation, double marking		
	Double graduation, triple marking		
	Triple graduation, triple marking		

μRS1800	Specification	Applicable Model	Part Number
1 PEN model	1 pen scale plate	4375 01	B9931CM
2 PEN model	2 pen scale plate	4375 02	B9931CN
3 PEN model	3 pen scale plate	4375 03	B9931CP
4 PEN model	4 pen scale plate	4375 04	B9931CQ
Dot-printing model	Single graduation, single marking	4375 06	B9931MD
	Single graduation, double marking		
	Single graduation, triple marking		
	Double graduation, double marking		
	Double graduation, triple marking		
	Triple graduation, triple marking		

7. SCALE PLATE EXAMPLES

- (1) Scale plate examples for the μ RS1800 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.
- (3) Scale values written in small letters correspond to the small sizes indicated in Section 4.2.
- (4) Scale values in Diagrams 1 to 19 are examples only and are by no means meant to be inclusive.



These examples are not to scale and are not intended to represent any specific scale plate. They are provided as a guide to help you understand the basic principles of scale plate design.

APPENDIX OF SCALE FORMAT DIAGRAMS

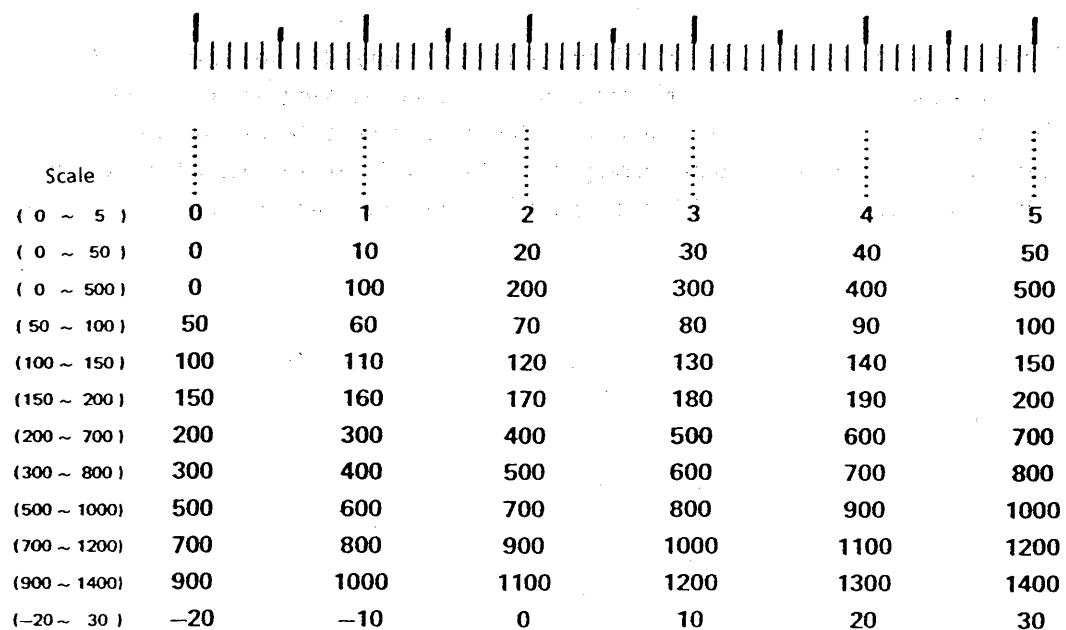


Diagram 1. 50 Equal Divisions, Format A

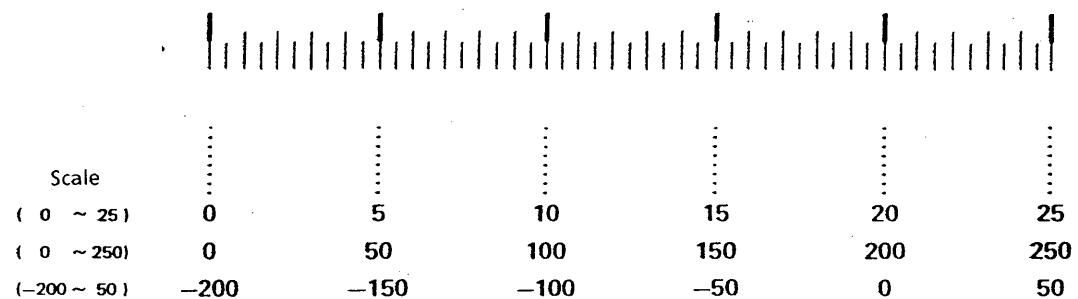
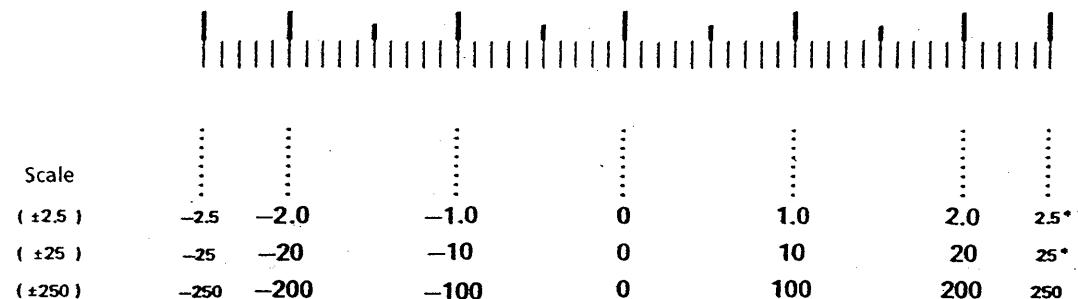


Diagram 2. 50 Equal Divisions, Format B



* 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



Scale							
(0 ~ 6)	0	1	2	3	4	5	6
(0 ~ 60)	0	10	20	30	40	50	60
(0 ~ 600)	0	100	200	300	400	500	600
(400 ~ 1000)	400		600		800		1000*
(1000 ~ 1600)	1000		1200		1400		1600*
(1200 ~ 1800)	1200		1400		1600		1800*
(-10 ~ 50)	-10	0	10	20	30	40	50
(-20 ~ 40)	-20	-10	0	10	20	30	40
(±300)	-300	-200	-100	0	100	200	300

* 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



Scale							
(0 ~ 3)	0	0.5	1.0	1.5	2.0	2.5	3.0
(0 ~ 30)	0	5	10	15	20	25	30
(0 ~ 300)	0	50	100	150	200	250	300
(200 ~ 500)	200	250	300	350	400	450	500
(300 ~ 600)	300	350	400	450	500	550	600
(500 ~ 800)	500	550	600	650	700	750	800
(700 ~ 1000)	700		800		900		1000
(-1 ~ 2)	-1.0	-0.5	0	0.5	1.0	1.5	2.0
(±1.5)	-1.5	-1.0	-0.5	0	0.5	1.0	1.5
(-10 ~ 20)	-10	-5	0	5	10	15	20
(±15)	-15	-10	-5	0	5	10	15
(-100 ~ 200)	-100	-50	0	50	100	150	200
(±150)	-150	-100	-50	0	50	100	150
(-200 ~ 100)	-200	-150	-100	-50	0	50	100

Diagram 5.60 Equal Divisions, Format B



Scale	0	10	20	30	40	50	60	65
(0 ~ 65)	0							
(0 ~ 1300)	0		400		800		1200	1300

Diagram 6. 65 Equal Divisions, Format A



Scale	0	1	2	3	4	5	6	7
(0 ~ 7)	0	1	2	3	4	5	6	7
(0 ~ 70)	0	10	20	30	40	50	60	70
(0 ~ 700)	0	100	200	300	400	500	600	700
(0 ~ 1400)	0		400		800		1200	1400*
(500 ~ 1200)	500	600		800		1000		1200
(700 ~ 1400)	700	800		1000		1200		1400
(-20 ~ 50)	-20	-10	0	10	20	30	40	50

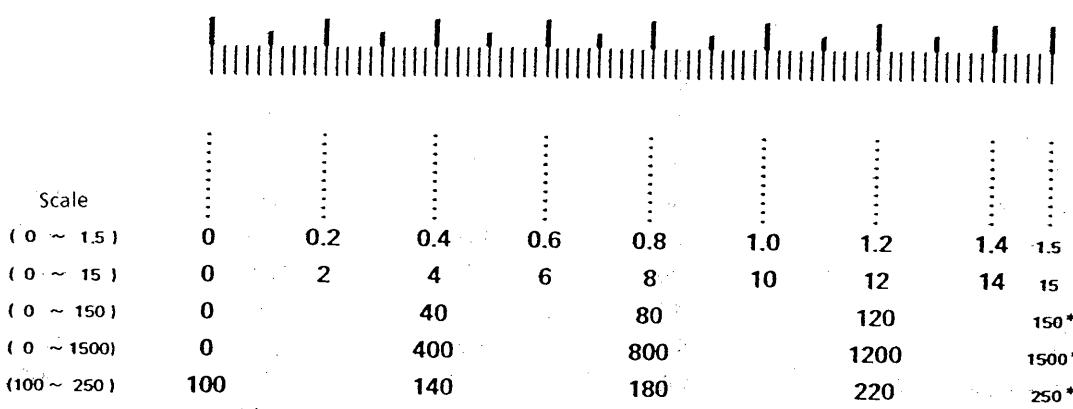
* For the scale value at this 100% position, large letters are used since there is enough room.

Diagram 7. 70 Equal Divisions, Format A



Scale	0	50	100	150	200	250	300	350
(0 ~ 350)	0	50	100	150	200	250	300	350
(-200 ~ 150)	-200	-150	-100	-50	0	50	100	150

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



Scale						
(0 ~ 8)	0	2	4	6	8 *1	
(0 ~ 80)	0	20	40	60	80 *1	
(0 ~ 800)	0	200	400	600	800 *1	
(0 ~ 1600)	0	400	800	1200	1600 *1	
(4 ~ 20)	4	8	12	16	20 *1	
(20 ~ 100)	20	40	60	80	100 *1	
(200 ~ 1000)	200	400	600	800	1000 *1	
(800 ~ 1600)	800	1000	1200	1400	1600 *1	
(-30 ~ 50)	-30	-20	0	20	40	50 *2

*1 For more than 80 equal divisions, every other value is omitted.

*2 For the \pm 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



Scale						
(0 ~ 4)	0	1	2	3	4	
(0 ~ 40)	0	10	20	30	40	
(0 ~ 400)	0	100	200	300	400	
(1 ~ 5)	1	2	3	4	5	
(5 ~ 45)	5	10	20	30	40	45 *
(10 ~ 50)	10	20	30	40	50	
(25 ~ 65)	25	30	40	50	60	65
(35 ~ 75)	35	40	50	60	70	75
(100 ~ 500)	100	200	300	400	500	
(400 ~ 800)	400	500	600	700	800	
(600 ~ 1000)	600	700	800	900	1000	
(800 ~ 1200)	800	900	1000	1100	1200	
(1000 ~ 1400)	1000	1100	1200	1300	1400	
(1200 ~ 1600)	1200	1300	1400	1500	1600	
(± 2)	-2	-1	0	1	2	
(± 20)	-20	-10	0	10	20	
(-100 ~ 300)	-100	0	100	200	300	
(± 200)	-200	-100	0	100	200	

Diagram 12. 80 Equal Divisions, Format B

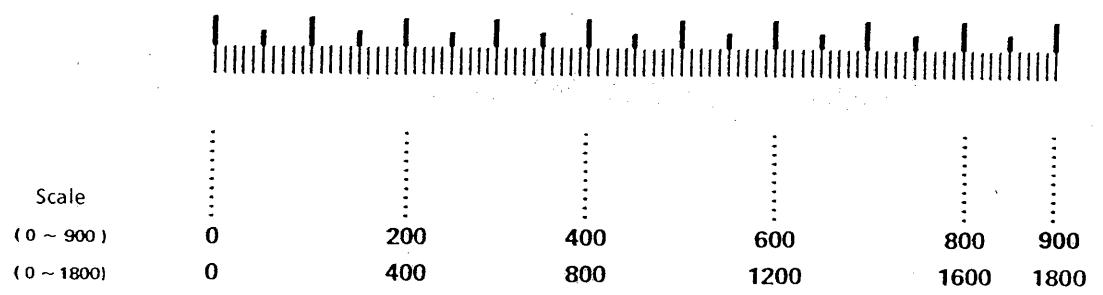


Diagram 13. 90 Equal Divisions, Format A

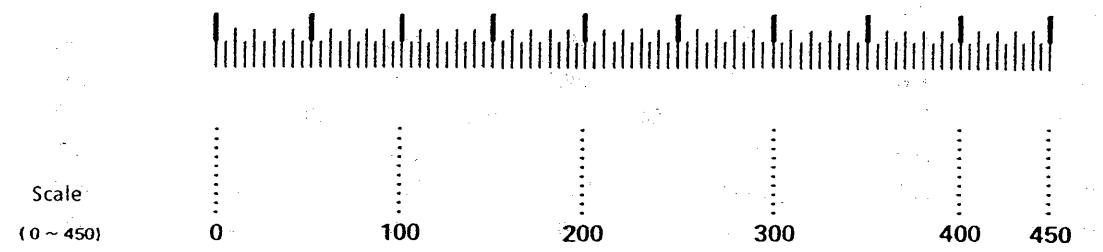


Diagram 14. 90 Equal Divisions, Format B



Scale	0	0.2	0.4	0.6	0.8	1.0	
(0 ~ 1)	0	0.2	0.4	0.6	0.8	1.0	
(0 ~ 2)	0	0.4	0.8	1.2	1.6	2.0	
(0 ~ 10)	0	2	4	6	8	10	
(0 ~ 20)	0	4	8	12	16	20	
(0 ~ 100)	0	20	40	60	80	100	
(0 ~ 200)	0	40	80	120	160	200	
(0 ~ 1000)	0	200	400	600	800	1000	
(0 ~ 2000)	0	400	800	1200	1600	2000	
(50 ~ 150)	50	60	80	100	120	140	150*
(100 ~ 200)	100	120	140	160	180	200	
(100 ~ 300)	100	140	180	220	260	300	
(150 ~ 250)	150	160	180	200	220	240	250
(200 ~ 300)	200	220	240	260	280	300	
(200 ~ 400)	200	240	280	320	360	400	
(300 ~ 500)	300	340	380	420	460	500	
(400 ~ 1400)	400	600	800	1000	1200	1400	
(500 ~ 1500)	500	600	800	1000	1200	1400	1500
(±1)	-1.0	-0.8	-0.4	0	0.4	0.8	1.0
(±5)	-5	-4	-2	0	2	4	5
(±10)	-10	-8	-4	0	4	8	10
(-40 ~ 60)	-40	-20	0	20	40	60	
(±50)	-50	-40	-20	0	20	40	50
(±100)	-100	-80	-40	0	40	80	100
(±500)	-500	-400	-200	0	200	400	500

Diagram 15. 100 Equal Divisions, Format A



Scale	2.5	4.0	6.0	8.0	10.0	12.5	
(2.5 ~ 12.5)	2.5	4.0	6.0	8.0	10.0		
(-50 ~ 150)	-50	-40	0	40	80	120	150

Diagram 16. 100 Equal Divisions, Format C

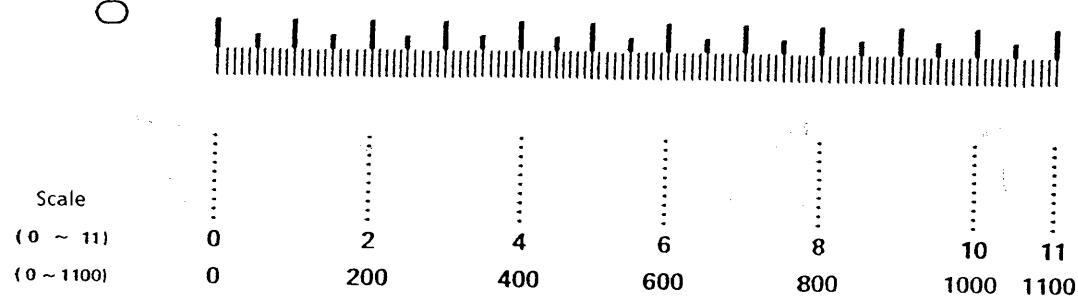


Diagram 17. 110 Equal Divisions, Format A

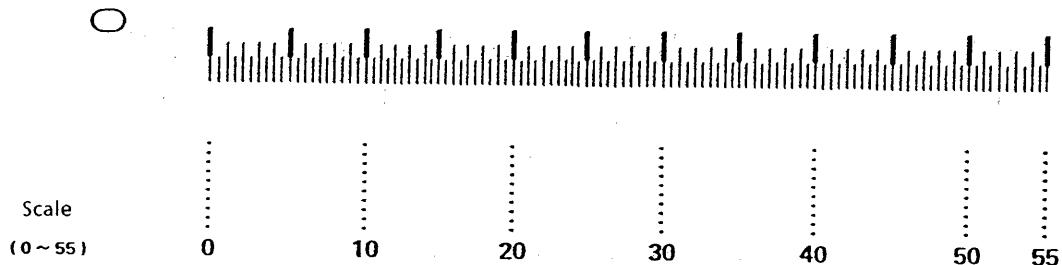
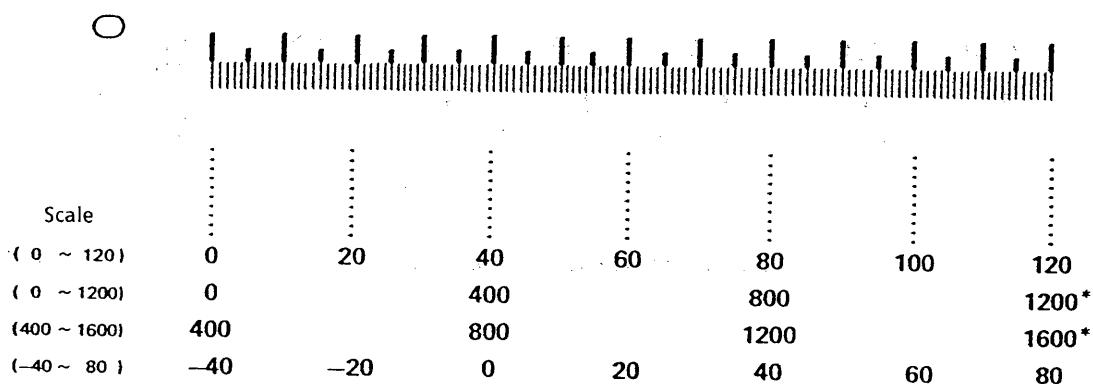


Diagram 18. 110 Equal Divisions, Format B



* 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

APPENDIX OF LOGARITHM SCALES



Diagram 20. 4-digit logarithm scale

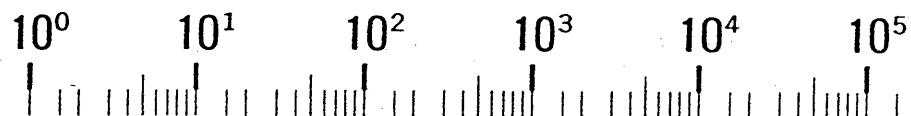


Diagram 21. 5-digit logarithm scale



Diagram 22. 6-digit logarithm scale