SHARP

ELECTRONIC DESK CALCULATOR

WITH

IC

COMPET-22

MODEL CS-22C

INSTRUCTION MANUAL

CONTENTS

INTRODUCTION

Sharp's amazing CS-22C electronic desk calculator using ICs (Integrated Circuits) marks another major advance in modern business methods. Years of pioneering research and resourcefulness in electronic engineering has enabled Sharp to develop an exceptionally remarkable desk calculator with a memory register.

The CS-22C is thoroughly reliable and carries out complicated calculations with amazing speed and efficiency. This booklet has been prepared to give current users and prospective buyers a detailed understanding of the scope and breadth of the machine's operation.

FEATURES

*** Superior MOS-ICs**

83 MOS-ICs(Metal Oxide Semiconductor Integrated Circuits), 75 transistors and 348 diodes drastically reduce the number of working parts, increase dependability.

*** Memory register**

Stores intermediate answers for continued calculation....enables extremely complicated and diverse calculations, such as sum of products, calculations by constant, etc.

*** Compact**

Thanks to 83 ICs, the CS-22C is amazingly compact and light.

*** Round off device**

Setting the Round off dial conveniently counts fractions over 1/2 as one, rounds off others.

*** Overflow error check lamp**

When the results of multiplication and calculation by memory exceeds 14 digits, the red Error lamp turns on.

*** Memory indicator**

When the memory entry is registered, the red Memory lamp turns on.

*** Double-set protection keys**

Eliminate error, speed up operation...no more worry about doublesetting keys.

*** Clear display panel**

Snap reading with advanced electronic numerical indicators. The provided hood prevents annoying glares caused by light reflecting off the display panel.

*** Simplified exponent calculation**

*** Optional "Memorizer"**

Sharp's dial unit "Memorizer 10" CSA-10 or automatic programer "Memorizer 30 & 60" CSA-11 & 12 can be easily connected for simplified diverse calculation by constant.

*** Sophisticated space-age styling**

Lightweight and noiseless, easy-to-carry the CS-22C enhances modern office decors, upgrades working areas, increases efficiency.

SPECIFICATIONS

Power source:	AC 100/110/120 or 200/220/240V, 50-60 c/s
Capacity:	14 digits, 6 digit decimals Addition & Subtraction: 14 digits ± 14 digits = 14 digits Multiplication: Total digits of multiplier and multiplicand: up to 14 digits (rounding off possible) Division: 13 digits ÷ 13 digits = 14 digits − divisor digits (rounding off possible)
Decimal point:	Automatic
Sign indication:	Minus indication lamp in the case of Negative
Calculations:	Four arithmetical operations, product ± product with individual products, quotient ± quotient with individual quotients, successive multiplication and division, multiplicand ± multiplicand with individual products, dividend ± dividend with individual quotient, multiplication and division by constant, exponent calculation, mixed calculation, etc.
Calculation speed:	Addition & subtraction 0.05sec Multiplication 0.4sec Division 0.4sec
ICs:	83
Memory register:	1
Transistors:	75
Diodes:	348
Diode arrays:	17
Clock frequency:	50KC
Temperature:	0℃−40℃(32°F−104°F)
Power consumption:	12W
Dimensions:	294mm wide, 117mm high, 317mm deep(11 5/8″×4 5/8″×12 1/2″)
Weight:	4kg (8.8lbs.)

KEY DESIGNATION

[6] Tabulation & Round off dial (0~6)
Specifies decimal places. Set red figure for rounding off. Set black figure for discarding.

[K] Constant key
Used for carrying out calculations by constant. Push to lock the key. Push again to unlock the key.

[CE] Entry clear key
Clears figures mistakenly set.

[C] Clear key
Clears all the cotents except memory register.

[0]-[9] Numeral keys

[•] Decimal point key

[RC] Recall key
Exchanges the contents of No. 1 register (on the display panel) with those of No.2 register.

[×] Multiplication key
Orders multiplication. The key lamp turns on when the key is touched.

[=] Equal key
Derives sum, product, and quotient.

[÷] Division key
Orders division. The key lamp turns on when the key is touched.

[=] Red equal key
Orders subtraction. Also used for setting negative figures.

[MR] Memory recall key
Summons the stored contents in the memory on the display panel.

[M+] Memory plus key
Adds displayed figures to the stored contents in the memory. No change in the display panel

[M-] Memory minus key
Subtracts displayed figures from the stored contents in the memory. (No change in the display panel)

[CM] Clear memory key
Clears the contents in the memory only.

[E] Overflow error lamp
[M] Memory indicator
[−] Minus sign indicator

HINTS

1. As highly sensitive ICs, transistors and diodes are used, avoid placing the unit in hot, dusty or humid locations.
2. Be sure to turn off the unit before disconnecting the power cord.
3. Do not jolt or drop the unit.
4. Do not stand it on its side or turn it over.
5. Do not place articles on top of the unit.
6. When cleaning the cabinet, use the enclosed cloth. Do not use a wet cloth or any organic solutions such as kerosene or benzine.
7. When not in use, keep the unit covered.

OPERATION

Connect power cord to an electric outlet, and turn the unit on.
When the unit is turned on, [M] and [E] lamps turn on. Clear the calculator in the following order.

1. Touch [C] key. [E] lamp goes out.
2. Touch [CM] key. [M] lamp goes out.

1. Addition and Subtraction

* Sum, Difference: Up to 14 6 digit decimals
* Note: Set larger Tabulation dial number black than the required decimal digits.

Ex.1-1 123+456+789=1368

Steps:

	Operation	Results	Note
1	[0]	0	Tabulation dial
2	123	123	
3	[=]	123	
4	456	456	
5	[=]	579	
6	789	789	
7	[=]	1368	Sum

Ex.1-2 0.12+0.3584+0.235=0.7134

Steps:

	Operation	Results	Note
1	[4]	0	Tabulation dial
2	[•] 12	0.12	
3	[=]	0.1200	
4	[•] 3584	0.3584	
5	[=]	0.4784	
6	[•] 235	0.235	
7	[=]	0.7134	Sum

Ex.1-3 35.62−0.53−40.15=−5.06

Steps:

	Operation	Results	Note
1	[2]	0	Tabulation dial
2	35 [•] 62	35.62	
3	[=]	35.62	
4	[•] 53	0.53	
5	Red [=]	35.09	
6	40 [•] 15	40.15	
7	Red [=]	−5.06	Minus lamp on

Ex.1-4 462−146−29+212=499

Steps.

	Operation	Results	Note
1	[0]	0	Tabulation dial
2	462	462	
3	[=]	462	
4	146	146	
5	Red [=]	316	
6	29	29	
7	Red [=]	287	
8	212	212	
9	[=]	499	Ans.

Note: 1 Use [=] key for addition. Use red [=] key for subtraction.

2 In the case of negative results, minus − lamp turns on.

2. Multiplication and Successive multiplication.

* Total digits of multiplier and multiplicand:Up to 14 digits 6 digit decimals

* Product: Up to 14 digits(6 digit decimals)
* Rounding off possible

Note:Set the larger Tabulation dial number(black)than the required decimal digits.

Ex.2-1 $1.1 \times 2.2 = 2.42$

Steps.

	Operation	Results	Note
1	[2]	0	Tabulation dial
2	1 [•] 1	1.1	
3	[×]	0	[×] lamp on
4	2 [•] 2	2.2	
5	[=]	2.42	[×] lamp off,Product

Ex.2-2 $2.2 \times 3.3 \times 4.4 \times 5.5 = 175.692$

Steps.

	Operation	Results	Note
1	[4]	0	Tabulation Dial
2	2 [•] 2	2.2	
3	[×]	0	[×] lamp on
4	3 [•] 3	3.3	
5	[=]	7.26	[×] lamp off product
6	[×]	0	[×] lamp on
7	4 [•] 4	4.4	
8	[=]	31.9440	[×] lamp off
9	[×]	0	[×] lamp on
10	5 [•] 5	5.5	
11	[=]	175.6920	[×] lamp off product

Note: 1 When the decimal digits of the product are smaller than the specified Tabulation dial number, the decimal point is automatically positioned. When the decimal digits of the product are larger than the specified Tabulation dial number, the dial prescribes the decimal digits.

2) When [×] key is touched, the key lamp turns on indicating that multiplication order is registered.

3) For further continued Successive Multiplication, touch the [×] key repeatedly and proceed the calculations.

3. Division and Successive division

* Dividend: Up to 13 digits(6 digit decimals)
* Divisor: Up to 12 digits(6 digit decimals)
* Quotient: 14 digits−divisor digits(6 digit decimals)
* Rounding off possible

Note: Set the Tabulation dial number(black)larger than the required decimal digits.

Ex.3-1 436.524÷2=218.262

Steps:

	Operation	Results	Note
1	[4]	0	Tabulation dial
2	436 [•] 524	436.524	
3	[÷]	0	[÷] lamp on
4	2	2	
5	[=]	218.2620	[÷] lamp off (quotient)

Ex.3-2 256÷12÷0.56=38.095237

Steps:

	Operation	Results	Note
1	[6]		
2	256	256	Tabulation dial
3	[÷]	0	[÷] lamp on
4	12	12	
5	[=]	21.333333	[÷] lamp off
6	[÷]	0	[÷] lamp on
7	[•] 56	0.56	
8	[=]	38.095237	[÷] lamp off(quotient)

Note: 1) When [÷] key is touched, the key lamp turns on indicating that the division order is registered.

2) For further continued Successive Division, touch [÷] key repeatedly to proceed the calculations.

4. Multiplication and Division check

* Capacity: Same as for Multiplication and Division.

After Multiplication Division is carried out, touch the [RC] key and recall the multiplicand dividend to check the product quotient

Multiplication check

Ex.4-1 1.23 · 98.7 =121.401 to be checked

multiplicand multiplier

	Operation	Results	Note
1		121.401	product)
2	[÷]	121.401	Tabulation dial
3	[×]	98.7	(multiplier)
4	[÷]	98.7	[÷] lamp on
5	[=]	1.2300	[÷] lamp off (multiplicand)

Division check

Ex.4-2 300 ÷ 5 =60(to be checked)

(dividend) (divisor)

	Operation	Results	Note
1		60	(quotient)
2	[0]	60	Tabulation dial
3	[RC]	5	(divisor)
4	[×]	5	[×] lamp on
5	[=]	300	[×] lamp off(dividend)

5. Rounding off (Multiplication and Division)

* Capacity: Same as for Multiplication and Division

Ex.5-1 Rounding off to the 5th decimal place(Multiplication) 0.14285×7=0.99995

Steps:

	Operation	Results	Note
1	Red [4]	0	Round off dial
2	[•] 14285	0.14285	
3	[×]	0	[×] lamp on
4	7	7	
5	[=]	1.0000	[×] lamp off(rounded off)

Ex.5-2 Rounding off to the 5th decimal place(Division) 5÷9=0.55555.....

Steps:

	Operation	Results	Note
1	Red [4]	0	Round off dial
2	5	5	
3	[÷]	0	[÷] lamp on
4	9	9	
5	[=]	0.5556	[÷] lamp off rounded off

Note: When rounding off be sure to set red number of the Tabulation dial.

6. Negative multiplication and division

* Capacity: Same as for multiplication and division

Ex.6-1 23×45×(−67)=−69345

Steps:

	Operation	Results	Note
1	[0]	0	Tabulation dial
2	23	23	
3	[×]	0	[×] lamp on
4	45	45	
5	[=]	1035	[×] lamp off
6	[×]	0	[×] lamp on
7	67	67	
8	Red [=]	−69345	[×] lamp off(product), minus lamp on

Ex.6-2 $-78\times(-9.6)=748.80$

Steps:

	Operation	Results	Note
1	[2]	0	Tabulation dial
2	78	78	
3	Red [=]	−78.00	minus lamp on
4	[×]	0	[×] lamp on
5	9 [•] 6	9.6	
6	Red [=]	748.80	[×] lamp off(product),minus lamp off

Ex.6-3 $56.55\div(-7.3)=-7.746575$

Steps:

	Operation	Results	Note
1	[6]	0	Tabulation dial
2	56 [•] 55	56.55	
3	[÷]	0	[÷] lamp on
4	7 [•] 3	7.3	
5	Red [=]	−7.746575	[÷] lamp off(quotient),minus lamp off

Ex.6-4 $-87.2\div(-6.33)=13.77567140$

Steps:

	Operation	Results	Note
1	[6]	0	Tabulation dial
2	87 [•] 2	87.2	
3	Red [=]	−87.200000	Minus lamp on
4	[÷]	0	[÷] lamp on
5	6 [•] 33	6.33	
6	Red [=]	13.775671	[÷] lamp off(quotient)

7. Sum Difference of products and Individual products

＊Capacity: Same as for multiplication

Ex.7-1 $(123\times0.55+43\times0.76)=100.33$

Steps:

	Operation	Results	Note
1	[÷][=]	0	Clears No.1 register & memory
2	[÷]	0	Tabulation dial
3	123	123	
4	[×]	0	[×] lamp on
5	[•] 55	0.55	
6	[+]	67.65	[×] lamp off, (product), [M] lamp on
7	43	43	
8	[×]	0	[×] lamp on
9	[•] 76	0.76	
10	[M−]	32.63	[×] lamp off(Product)
11	[MR]	100.33	Sum of products

Ex.7-2 (12.3×9.8)−(2.3×4.32)=110.6040

Steps:

	Operation	Results	Note
1	[C] [CM]	0	Clears No.1 register & memory
2	[4]	0	Tabulation dial
3	12 [•] 3	12.3	
4	[×]	0	[×] lamp on
5	9 [•] 8	9.8	
6	[M+]	120.5400	[×] lamp off,(product), [M] lamp on
7	2 [•] 3	2.3	
8	[×]	0	[×] lamp on
9	4 [•] 32	4.32	
10	[M−]	9.9360	[×] lamp off(product)
11	[MR]	110.6040	Difference of products

Ex.7-3 (46.9×3.51)+(83.4×7.2)−(65.3×4.73 =456.2300

Steps:

	Operation	Results	Note
1	[C] [CM]	0	Clears No.1 register & memory
2	[4]	0	Tabulation dial
3	46 [•] 9	46.9	
4	[×]	0	[×] lamp on
5	3 [•] 51	3.51	
6	[M+]	164.6190	[×] lamp off, product, [M] lamp on
7	83 [•] 4	83.4	
8	[×]	0	[×] lamp on
9	7 [•] 2	7.2	
10	[M−]	600.4800	[×] lamp off (product)
11	65 [•] 3	65.3	
12	[×]	0	[×] lamp on
13	4 [•] 73	4.73	
14	[M−]	308.8690	[×] lamp off (product)
15	[MR]	456.2300	Ans.

Note: 1) Touch [C] and [CM] keys simultaneously to clear all the contents in the calculator.
2) Touch [M+] for Sum of products. Touch [M−] for Difference of products.
3) For further continued Sum(Difference) of products, repeat the operation.

8. Sum(Difference) of Quotients and individual Quotients

* Capacity: Same as for Division.

Ex.8-1 (1288÷23)+(0.86÷4)=56.2150

Steps:

	Operation	Results	Note
1	C CM	0	Clears No.1 register & memory
2	4	0	Tabulation dial
3	1288	1288	
4	÷	0	÷ lamp on
5	23	23	
6	M−	56.0000	÷ lamp off (quotient), M lamp on
7	• 86	0.86	
8	÷	0	÷ lamp on
9	4	4	
10	M+	0.2150	÷ lamp off(quotient)
11	MR	56.2150	Sum of quotients

Ex.8-2 (11.502÷2.7)−(0.96÷5)=4.0680

Steps:

	Operation	Results	Note
1	C CM	0	Clears No.1 register & memory
2	4	0	Tabulation dial
3	11 •502	11.502	
4	÷	0	÷ lamp on
5	2 •7	2.7	
6	M+	4.2600	÷ lamp off (quotient), M lamp on
7	•96	0.96	
8	÷	0	÷ lamp on
9	5	5	
10	M−	0.1920	÷ lamp off(quotient)
11	MR	4.0680	Difference of quotients

Ex.8-3 568÷4 − 0.586÷2 − 35.8÷9.308 =138.4469

Steps:

	Operation	Results	Note
1	C CM	0	Clears No.1 register & memory
2	4	0	
3	568	568	
4	÷	0	÷ lamp on
5	4	4	
6	M+	142.0000	÷ lamp off quotient), M lamp on
7	•586	0.586	
8	÷	0	÷ lamp on
9	2	2	

10	M+	0.2930	÷ lamp off(quotient)
11	35 • 8	35.8	
12	÷	0	÷ lamp on
13	9 • 308	9.308	
14	M−	3.8461	÷ lamp off,(quotient)
15	MR	138.4469	Sum of quotients

9. Product(Quotient) of Sums(Differences) and individual Sums(Differences)

*Capacity: Same as for Multiplication or Division.

Ex.9-1 (35+186)×(8+47)=12155

Steps

	Operation	Results	Note
1	C CM	0	Clears No.1 register & memory
2	0	0	Tabulation dial
3	35	35	
4	=	35	
5	186	186	
6	=	221	
7	M+	221	M lamp on
8	C	0	
9	8	8	
10	=	8	
11	47	47	
12	=	55	
13	×	0	× lamp on
14	(	221	
15	=	12155	× lamp off product of sums

Ex.9-2 286−35 × 86−55 =7781

Steps:

	Operation	Results	Note
1	C CM	0	Clears No.1 resister & memory
2	0	0	
3	286	286	
4	=	286	
5	35	35	
6	Red =	251	
7	M+	251	M lamp on
8	C	0	
9	86	86	
10	=	86	

11	55	55	
12	Red [=]	31	
13	[×]	0	[×] lamp on
14	[MR]	251	
15	[=]	7781	[×] lamp off (product of differences)

10. Multiplication and Division by Constant

* Capacity: Same as for Multiplication or Division
* Constant: Multiplier or Divisor

Ex.10-1 1 11.11×99.99=1110.8889
2 33.33×99.99=3332.6667
3 44.44×99.99=4443.5556

Steps:

	Operation	Results	Note
1	[K]	0	Constant key
2	[4]	0	Tabulation dial
3	11 [•] 11	11.11	
4	[×]	0	[×] lamp on
5	99 [•] 99	99.99	
6	[=]	1110.8889	Product
7	33 [•] 33	33.33	
8	[=]	3332.6667	Product
9	44 [•] 44	44.44	
10	[=]	4443.5556	Product

Note: While the [K] key is locked, [×] lamp is always lighted.

Ex.10-2 1. 11.11÷77.77=0.142857
2 33.33÷77.77=0.428571
3 44.44÷77.77=0.571428

Steps:

	Operation	Results	Note
1	[K][•]	0	Constant key
2	[4][÷]	0	Tabulation dial
3	11 [÷] 11	11.11	
4	[÷]	0	[÷] lamp on
5	77 [•] 77	77.77	
6	[=]	0.142857	Quotient
7	33 [•] 33	33.33	
8	[=]	0.428571	Quotient
9	44 [•] 44	44.44	
10	[=]	0.571428	Quotient

Note: While the [K] key is locked, [÷] lamp is always lighted.

11. Exponent calculation

* Capacity: Up to 14 digits(6 digit decimals)

Ex.12 $3^2=9$ $3^3=27$ $3^4=81$

Steps:

	Operation	Results	Note
1	[K]	0	Constant key
2	[0]	0	Tabulation dial
3	3	3	
4	[×]	0	[×] lamp on
5	[=]	9	Ans.
6	[=]	27	Ans.
7	[=]	81	Ans.

Note: Repeat the operation for further continued exponent calcuration.

12. Square root extraction

Express the approximate expression of $\sqrt{R}$ as follows:

$$\sqrt{R} \fallingdotseq (N+R) \times S$$

Steps: (See attached table on page 20

1. Take 3 digits from the figures counting from the left.
   Determine N, which is the nearest value in the square root table.
2. Divide R into groups of two digits each from the decimal point. When the highest group consists of one digit, determine S from row 1N in the table. When it consists of two digits, determine S from row 10N of the table.
3. Calculate (N+R)×S.

Ex. $\sqrt{53987}$

1. Determine N=542 with the aid of the square root table.
2. Then determine that S=214768 from the row 1N.
3. Calculate (54200+53987)×214768.

Steps:

Order	Operation	Results	Note
1	[0]	0	Tabulation dial
2	54200	54200	
3	[=]	54200	
4	53987	53987	
5	[=]	108187	
6	[×]	0	[×] lamp on
7	214768	214768	
8	[=]	23235105616	Ans. [×] lamp off

Note: The position of the decimal point is decided by dividing R into groups of two digits each counting from the decimal point.

Taking $\sqrt{53987}$, for example, 53987 is divided into three groups (5 | 39 | 87) counting from the left. The answer is 232.351.

13. Mixed calculation

* Capacity: Same as for Addition, Subtraction, Multiplication and Division.

Ex.13 $\dfrac{(5+12)\times 0.2+48-16}{4}=8.85$

Note: Be sure to unlock the [K] key.

Steps:

	Operation	Results	Note
1	Red [4]	0	Round off dial
2	5	5	
3	[=]	5.0000	
4	12	12	
5	[=]	17.0000	
6	[×]	0	[×] lamp on
7	[•] [2]	0.2	
8	[=]	3.4000	[×] lamp off
9	48	48	
10	[=]	51.400	
11	16	16	
12	Red [=]	35.4000	
13	[÷]	0	[÷] lamp on
14	4	4	
15	[=]	8.8500	[÷] lamp off (ans.)

14. Ratio calculation

* An advertising budget of 170,760 is distributed among branch offices according to their respective sales.

Branches	Sales	Amount
A	4,275,320	※(85,506,40)
B	2,363,680	※(47,273,60)
C	964,710	※(19,294,20)
D	934,290	※(18,685,80)
	*(8,538,000)	170,760,00

(Figures in the parentheses are calculated)

Steps

	Operation	Results	Note
1	[C] [CM]	0	
2	[2]	0	Tabulation dial
3	4275320	4275320	
4	[=]	4275320.00	
5	2363680	2363680	
6	[=]	6639000.00	
7	964710	964710	
8	[=]	7603710.00	
9	934290	934290	
10	[=]	※8538000.00	
11	[÷]	0	[÷] lamp on
12	170760	170760	
13	[=]	8538000.00	
14	[=]	0.02	[÷] lamp off
15	[K]	0.02	Constant key
16	[×]		[×] lamp on
17	4275320	4275320	
18	[RC]	0.02	
19	[M+]	※ 85506.40	Ans., [M] lamp on
20	2363680	2363680	
21	[M+]	※ 47273.60	Ans.
22	964710	964710	
23	[M+]	※ 19294.20	Ans.
24	934290	934290	
25	[M+]	※ 18685.80	Ans.
26	[MR]	170760.00	Total amount

15. Percentage calculation

Percentage of branches sales to total sales are calculated.

Branches	Sales	Percentage to total sales (%)
A	4,869,785	※ (0.49)
B	536,948	※ (0.05)
C	2,863,276	※ (0.29)
D	1,659,876	※ (0.17)
n	※ (9,929,885)	(1.00)

(Figures in the parentheses are calculated

Steps:

Order	Operation	Results	Note
1	[C] [CM]	0	
2	[K]	0	Round off dial
3	4869785	4869785	
4	[=]	4869785.00	
5	536948	536948	
6	[=]	5406733.00	
7	2863276	2863276	
8	[=]	8270009.00	
9	1659876	1659876	
10	[=]	※ 9929885.00	(Total sales)
11	[K]	9929885.00	
12	[÷]	0	[÷] lamp on
13	4869785	4869785	
14	[-]	9929885.00	
15	[M-]	÷ A 0.49	[M-] lamp on
16	536948	536948	
17	[M-]	÷ B 0.05	
18	2863276	2863276	
19	[M-]	※ C 0.29	
20	1659876	1659876	
21	[M-]	※ D 0.17	
22	[MR]	1.00	

16. Correcting mistakes

A. Numeral correction (Use [CE] key.) (0~9, [•] keys)

Ex. 123×556 (mistake) 456 (correct)

Steps: Touch keys [CE] 456 in order.

Note: When [CF] key is touched, 556 is cleared and 456 is set anew.

B. Function key correction ([÷], [×] keys)

Function key correction is possible in multiplication and division as follows:

A [×] [÷] B [=]
A [×] B [÷] [=] } ..... in these cases A ÷ B will be performed instead of A x B.

SQUARE ROOT TABLE

N	S		N	S		N	S		N	S	
	1 N	10N		1 N	10N		1 N	10N		1 N	10N
1.00	.500000	.158114	1.30	.438529	.138675	1.60	.395285	.125000	2.00	.353553	.111803
1.02	.495074	.156556	1.32	.435194	.137620	1.62	.392837	.124226	2.03	.350931	.110974
1.04	.490290	.155043	1.34	.431934	.136590	1.64	.390434	.123466	2.06	.348367	.110163
1.06	.485643	.153574	1.36	.428746	.135582	1.66	.388076	.122721	2.09	.345857	.109370
1.08	.481125	.152145	1.38	.425628	.134595	1.68	.385763	.121989	2.12	.343401	.108593
1.10	.476731	.150756				1.70	.383482	.121268	2.15	.340997	.107833
1.12	.472456	.149404	1.40	.422577	.133631	1.73	.380143	.120212	2.18	.338643	.107088
1.14	.468293	.148087	1.42	.419591	.132686	1.76	.376889	.119183	2.21	.336336	.106359
1.16	.464238	.146805	1.44	.416667	.131762	1.79	.373718	.118180	2.24	.334077	.105644
1.18	.460287	.145556	1.46	.413803	.130856				2.27	.331862	.104944
			1.48	.410997	.129969	1.82	.370625	.117202	2.30	.329690	.104257
1.20	.456435	.144338	1.50	.408248	.129099	1.85	.367606	.116248	2.33	.327561	.103584
1.22	.452679	.143150	1.52	.405554	.128247	1.88	.364662	.115316	2.36	.325472	.102923
1.24	.449013	.141990	1.54	.402911	.127412	1.91	.361787	.114407	2.40	.322749	.102062
1.26	.445435	.140859	1.56	.400320	.126592	1.94	.358979	.113519	2.44	.320092	.101222
1.28	.441942	.139754	1.58	.397779	.125789	1.97	.356235	.112651	2.48	.317500	.100402

N	S		N	S		N	S		N	S	
	1 N	1 0 N		1 N	1 0 N		1 N	1 0 N		1 N	1 0 N
2.52	.314970	.0996024	3.65	.261712	.0827606	5.28	.217597	.0688102	7.60	.181369	.0573539
2.56	.312500	.0988212	3.70	.269938	.0821995	5.35	.216169	.0683586	7.70	.180187	.0569803
2.60	.310087	.0980581	3.75	.258199	.0816497	5.42	.214768	.0679157	7.80	.179029	.0566139
2.64	.307729	.0973124	3.80	.256495	.0811107	5.50	.213201	.0674200	7.90	.177892	.0562544
2.68	.305424	.0965834	3.86	.254493	.0804778	5.58	.211667	.0669349			
2.72	.303170	.0958706	3.92	.252538	.0798596	5.66	.210166	.0664602	8.00	.176777	.0559017
			3.98	.250627	.0792553	5.74	.208696	.0659955	8.11	.175574	.0555213
2.76	.300965	.0951734				5.82	.207257	.0655403	8.22	.174395	.0551486
2.80	.298807	.0944911	4.04	.248759	.0786646	5.90	.205847	.0650945	8.33	.173240	.0547832
2.84	.296695	.0938233	4.10	.246932	.0780869	5.98	.204465	.0646576	8.44	.172107	.0544250
2.88	.294628	.0931695	4.16	.245145	.0775217				8.55	.170996	.0540738
2.92	.292603	.0925292	4.22	.243396	.0769686	6.06	.203111	.0642294	8.66	.169907	.0537293
2.96	.290619	.0919018	4.28	.241684	.0764272	6.14	.201784	.0638096	8.77	.168838	.0533913
			4.34	.240008	.0758971	6.22	.200482	.0633979	8.88	.167789	.0530595
3.00	.288675	.0912871	4.40	.238366	.0753778	6.31	.199047	.0629441			
3.04	.286770	.0906845	4.46	.236757	.0748691	6.40	.197642	.0625000	9.00	.166667	.0527046
3.08	.284901	.0900937				6.49	.196267	.0620651	9.12	.165567	.0523567
3.12	.283069	.0895144	4.52	.235180	.0743705	6.58	.194920	.0616392	9.24	.164488	.0520156
3.16	.231272	.0889460	4.58	.233635	.0738818	6.67	.193601	.0612219	9.36	.163430	.0516811
3.20	.279508	.0883883	4.65	.231869	.0733236	6.76	.192308	.0608130	9.48	.162392	.0513530
3.25	.277350	.0877058	4.72	.230144	.0727778	6.85	.191040	.0604122	9.61	.161290	.0510045
3.30	.275241	.0870388	4.79	.228456	.0722441	6.94	.189798	.0600192	9.74	.160210	.0506630
3.35	.273179	.0863868	4.86	.226805	.0717219				9.84	.159152	.0503282
3.40	.271163	.0857493	4.93	.225189	.0712109	7.03	.188579	.0596338			
3.45	.269191	.0851257				7.12	.187383	.0592557			
			5.00	.223607	.0707107	7.21	.186210	.0588847	10.00	.158114	.0500000
3.50	.267261	.0845154	5.07	.222058	.0702208	7.30	.185058	.0585206			
3.55	.265372	.0839181	5.14	.220541	.0697410	7.40	.183804	.0581238			
3.60	.263523	.0833333	5.21	.219054	.0692710	7.50	.182574	.0577350			

HAYAKAWA ELECTRIC CO., LTD.

OSAKA, JAPAN

PRINTED IN JAPAN