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Power Resistors	IC9033	3-4
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Punched Steel Grid Resistors	IC9141	3-12
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RESISTORS

Type IC9033—U/L Recognized

WHERE TO USE

IC9033 resistors are wire- or ribbon-wound units which can be built in the relatively high ohmic ratings required for low-horsepower motors as well as high-capacity ratings required for larger motors. They are ideal for use in voltage dropping or synchronous motor field discharge applications.

APPLICATION

Use IC9033 resistors on any ac or dc power or control circuit. The resistors are corrosion-resistant and will withstand considerable shock without damage. They can be mounted on traveling cranes, portable equipment and other structures subject to vibration.

RESISTANCE TOLERANCE

Listed IC9033 resistors are manufactured to a resistance tolerance of plus or minus 10 percent.

COEFFICIENT OF RESISTIVITY

For most applications the coefficient of resistivity has a negligible effect upon selection of a resistor and the factor can be ignored.

BASIS OF RATING

Resistors are rated in accordance with NEMA and IEEE standards. Wattage ratings are based upon operation in free air at altitudes 6000 feet and below and at a temperature rise not to exceed 375 C or 675 F in a 40 C ambient.

RESISTOR SELECTION

Selection of the proper IC9033 resistors for a given application requires several steps:

1. Determine resistance in ohms.
2. Determine the power in watts to be dissipated by the resistor.
3. Determine the proper size resistor—length 2, 3, 4 or 5—based on volts, current, ohms, watts, altitude, grouping, circuit conditions.
4. Select the most suitable unit and the desired mounting.

STEP 1. Determine Resistance in Ohms

a. The resistance can be determined by Ohm's Law

$$R \text{ in ohms} = \frac{E \text{ in volts}}{I \text{ in amperes}}$$

b. This formula can be used to determine the required current if the voltage and resistance are known.

$$I = \frac{E}{R}$$

c. In addition, $E = IR$

STEP 2. Determine Power in Watts to be Dissipated

Power can be determined from several formulas all of which derive from Ohm's Law

a. When resistance and current are known,

$$P \text{ in watts} = I^2R$$

b. When resistance and voltage are known,

$$P \text{ in watts} = \frac{E_2}{R}$$

c. When current and voltage across the resistor are known,

$$P = EI$$

In all cases, current is in amperes and voltage is in volts.

STEP 3. Determine proper size resistor based on volts, current, ohms, watts, altitude, grouping, circuit conditions.

a. Previous steps have assumed that resistor is a single resistor to be used within its voltage rating, applied at sea level, with power applied continuously and located in free air at 40 C. The following discusses how to take into account variations of these factors.

b. 1) IC9033 resistor units are designed for a maximum of 600 volts between terminals. For higher voltages connect two or more units in series so voltage drop across any one resistor unit is 600 volts or less.

2) Voltage between resistor terminal and ground should not exceed 250 volts. Where resistors are applied above 250 volts, the resistor units should be mounted on insulated supports. See page 3-9 for individual insulated supports and special 1000-volt units. See pages 3-10 through 3-13 for resistors mounted in boxes.

c. Altitude
For applications at altitudes up to 6000 feet, the listed ratings are applicable. Between 6000 and 15000 feet derate to 75-percent of the standard watt ratings, or derate to 86-percent of the current rating.

d. Ambient Temperature
For ambient temperatures above 40 C, derate resistors to approximately 90% for 50 C ambient, 80% for 80 C and 70% for 100 C of full load watts.

Fig. 1. IC9033A smooth-wound resistor units are wire-wound with a protective coating over the wire.

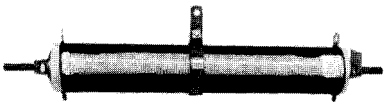


Fig. 2. IC9033E smooth-wound resistor with slider to provide a variable resistance.

Fig. 3. IC9033B wire-wound resistor units are wire-wound with spot-welded fixed taps. An adjustable terminal is available for variable resistance.

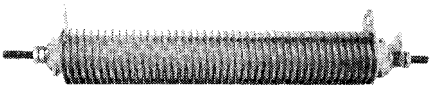


Fig. 4. IC9033 C or F ribbon-wound resistor units are edgewise ribbon-wound with spot-welded fixed taps. Adjustable terminals are available for the IC9033C units only.

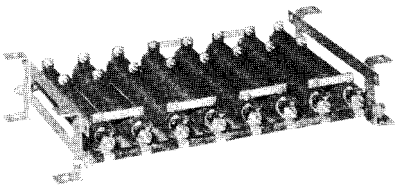


Fig. 5. IC9133 assembled, wired resistor boxes are furnished suitable for stacking or for installation in mounting racks.

IC9133 resistor boxes are IC9033 resistors mounted, wired or unwired, in a frame. A IC9133 box can be made up of a single type of IC9033 units or a mixture of different type units of the same length.

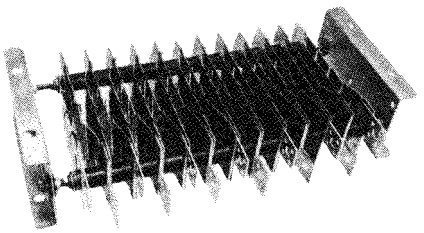


Fig. 6. IC9141 resistors are boxes of stainless-steel punched-grids. They will withstand severe vibration and are resistant to most atmospheric contaminants.

IC9141 resistors are furnished in boxes suitable for stacking or for installation in mounting racks. They are suitable for mounting outdoors with a protective enclosure.

IC9033 Old Resistor Nomenclature

CROSS REFERENCE INFORMATION

Units without taps:
For units with no taps (ex: IC9033B5D13), select replacement from table below and price from tables on following pages. Use IC9033B5F3.

Units with taps:
If old unit had taps (ex: IC9033B5D13BG), determine number of taps and spacing from Table 3 (ex: BG=2 taps @ 1/7th spacing), locate the no tap unit below, refer to appropriate table on following pages and select unit that most nearly meets requirement of old resistor. Use IC9033B5G4. Where number of taps exceeds taps available, use highest number available.

Nomenclature (Example)

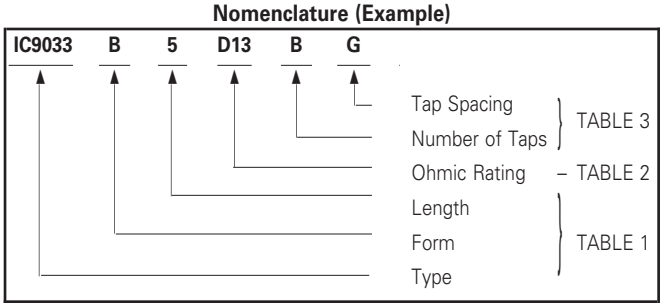


TABLE 1—Form and Length

A2, B2, C2, F2	Refer to page 3-4 with data from TABLE 2 and 3
A3, B3, C3, F3	Refer to page 3–4 with data from TABLE 2 and 3
A4, B4, C4, F4	Refer to page 3–5 with data from TABLE 2 and 3
A5, B5, C5, F5	Refer to page 3–6 with data from TABLE 2 and 3

TABLE 2—Ohmic Rating

A-	Multiply by	0.001
B-	Multiply by	.01
C-	Multiply by	.1
D-	Multiply by	1.0
E-	Multiply by	10.0
F-	Multiply by	100.0

EXAMPLE:
D13 = 13 × 1 or 13 ohms

TABLE 3—Taps and Spacing

1st Letter (Number of Taps)

Number of Taps	Suffix Letter	Number of Taps	Suffix Letter	Number of Taps	Suffix Letter
1	A	8	H	15	R
2	B	9	J	16	S
3	C	10	K	17	T
4	D	11	L	18	V
5	E	12	M	19	W
6	F	13	N		
7	G	14	P		

2nd Letter (Spacing of Taps)

Fractional Spacing	Suffix Letter	Fractional Spacing	Suffix Letter	Fractional Spacing	Suffix Letter
1/2	B	1/9	J	1/16	S
1/3	C	1/10	K	1/17	T
1/4	D	1/11	L	1/18	V
1/5	E	1/12	M	1/19	W
1/6	F	1/13	N	1/20	X
1/7	G	1/14	P		
1/8	H	1/15	R		

OLD NUMBER	NEW NUMBER	OLD NUMBER	NEW NUMBER	OLD NUMBER	NEW NUMBER	OLD NUMBER	NEW NUMBER	OLD NUMBER	NEW NUMBER
IC9033A2C80	IC9033A2H7	IC9033A4E24	IC9033A4K1	IC9033B4C35	IC9033B4E7	IC9033E2C80	IC9033E2R1	IC9033E4E24	IC9033E4S4
IC9033A2D10	IC9033A2H8	IC9033A4E30	IC9033A4K2	IC9033B4C43	IC9033B4E8	IC9033E2D10	IC9033E2R2	IC9033E4E30	IC9033E4S5
IC9033A2D12	IC9033A2H9	IC9033A4E38	IC9033A4K3	IC9033B4C54	IC9033B4E9	IC9033E2D12	IC9033E2R3	IC9033E4E38	IC9033E4S6
IC9033A2D16	IC9033A2J1	IC9033A4E48	IC9033A4K4	IC9033B4C67	IC9033B4F1	IC9033E2D16	IC9033E2R4	IC9033E4E48	IC9033E4S7
IC9033A2D20	IC9033A2J2	IC9033A4E61	IC9033A4K5	IC9033B4C85	IC9033B4F2	IC9033E2D20	IC9033E2R5	IC9033E4E61	IC9033E4S8
IC9033A2D22	IC9033A2J3	IC9033A5D21	IC9033A5H7	IC9033B4D11	IC9033B4F3	IC9033E2D22	IC9033E2R6	IC9033E5D21	IC9033E5R1
IC9033A2D28	IC9033A2J4	IC9033A5D26	IC9033A5H8	IC9033B4D13	IC9033B4F4	IC9033E2D28	IC9033E2R7	IC9033E5D26	IC9033E5R2
IC9033A2D36	IC9033A2J5	IC9033A5D33	IC9033A5H9	IC9033B5C22	IC9033B5E4	IC9033E2D36	IC9033E2R8	IC9033E5D33	IC9033E5R3
IC9033A2D45	IC9033A2J6	IC9033A5D42	IC9033A5J1	IC9033B5C28	IC9033B5E5	IC9033E2D45	IC9033E2R9	IC9033E5D42	IC9033E5R4
IC9033A2D56	IC9033A2J7	IC9033A5D53	IC9033A5J2	IC9033B5C35	IC9033B5E6	IC9033E2D56	IC9033E2S1	IC9033E5D53	IC9033E5R5
IC9033A2D72	IC9033A2J8	IC9033A5D60	IC9033A5J3	IC9033B5C45	IC9033B5E7	IC9033E2D72	IC9033E2S2	IC9033E5D60	IC9033E5R6
IC9033A2D90	IC9033A2J9	IC9033A5D76	IC9033A5J4	IC9033B5C54	IC9033B5E8	IC9033E2D90	IC9033E2S3	IC9033E5D76	IC9033E5R7
IC9033A2E11	IC9033A2K1	IC9033A5D96	IC9033A5J5	IC9033B5C68	IC9033B5E9	IC9033E2E11	IC9033E2S4	IC9033E5D96	IC9033E5R8
IC9033A2E14	IC9033A2K2	IC9033A5E12	IC9033A5J6	IC9033B5C85	IC9033B5F1	IC9033E2E14	IC9033E2S5	IC9033E5E12	IC9033E5R9
IC9033A2E18	IC9033A2K3	IC9033A5E15	IC9033A5J7	IC9033B5D11	IC9033B5F2	IC9033E2E18	IC9033E2S6	IC9033E5E15	IC9033E5S1
IC9033A2E23	IC9033A2K4	IC9033A5E19	IC9033A5J8	IC9033B5D13	IC9033B5F3	IC9033E2E23	IC9033E2S7	IC9033E5E19	IC9033E5S2
IC9033A2E29	IC9033A2K5	IC9033A5E24	IC9033A5J9	IC9033B5D17	IC9033B5F4	IC9033E2E29	IC9033E2S8	IC9033E5E24	IC9033E5S3
IC9033A3D12	IC9033A3H7	IC9033A5E31	IC9033A5K1			IC9033E3D12	IC9033E3R1	IC9033E5E31	IC9033E5S4
IC9033A3D15	IC9033A3H8	IC9033A5E39	IC9033A5K2	IC9033C2B18	IC9033C2C1	IC9033E3D15	IC9033E3R2	IC9033E5E39	IC9033E5S5
IC9033A3D19	IC9033A3H9	IC9033A5E49	IC9033A5K3	IC9033C2B22	IC9033C2C2	IC9033E3D19	IC9033E3R3	IC9033E5E49	IC9033E5S6
IC9033A3D24	IC9033A3J1	IC9033A5E61	IC9033A5K4	IC9033C2B25	IC9033C2C3	IC9033E3D24	IC9033E3R4	IC9033E5E61	IC9033E5S7
IC9033A3D31	IC9033A3J2	IC9033A5E78	IC9033A5K5	IC9033C2B33	IC9033C2C4	IC9033E3D31	IC9033E3R5	IC9033E5E78	IC9033E5S8
IC9033A3D35	IC9033A3J3			IC9033C2B42	IC9033C2C5	IC9033E3D35	IC9033E3R6		
IC9033A3D44	IC9033A3J4	IC9033B2B84	IC9033B2E4	IC9033C2B54	IC9033C2C6	IC9033E3D44	IC9033E3R7	IC9033F2A49	IC9033F2A1
IC9033A3D56	IC9033A3J5	IC9033B2C11	IC9033B2E5	IC9033C2B70	IC9033C2C7	IC9033E3D56	IC9033E3R8	IC9033F2A61	IC9033F2A2
IC9033A3D71	IC9033A3J6	IC9033B2C13	IC9033B2E6	IC9033C3B28	IC9033C3C1	IC9033E3D71	IC9033E3R9	IC9033F2A79	IC9033F2A3
IC9033A3D88	IC9033A3J7	IC9033B2C17	IC9033B2E7	IC9033C3B35	IC9033C3C2	IC9033E3D88	IC9033E3S1	IC9033F2A99	IC9033F2A4
IC9033A3E11	IC9033A3J8	IC9033B2C21	IC9033B2E8	IC9033C3B40	IC9033C3C3	IC9033E3E11	IC9033E3S2	IC9033F2B13	IC9033F2A5
IC9033A3E14	IC9033A3J9	IC9033B2C26	IC9033B2E9	IC9033C3B52	IC9033C3C4	IC9033E3E14	IC9033E3S3	IC9033F2B16	IC9033F2A6
IC9033A3E18	IC9033A3K1	IC9033B2C32	IC9033B2F1	IC9033C3B67	IC9033C3C5	IC9033E3E18	IC9033E3S4	IC9033F3A75	IC9033F3A1
IC9033A3E22	IC9033A3K2	IC9033B2C40	IC9033B2F2	IC9033C3B85	IC9033C3C6	IC9033E3E22	IC9033E3S5	IC9033F3A94	IC9033F3A2
IC9033A3E28	IC9033A3K3	IC9033B2C51	IC9033B2F3	IC9033C3C11	IC9033C3C7	IC9033E3E28	IC9033E3S6	IC9033F3B12	IC9033F3A3
IC9033A3E35	IC9033A3K4	IC9033B2C64	IC9033B2F4	IC9033C4B40	IC9033C4C1	IC9033E3E35	IC9033E3S7	IC9033F3B15	IC9033F3A4
IC9033A3E45	IC9033A3K5	IC9033B3C13	IC9033B3E4	IC9033C3B47	IC9033C4C2	IC9033E3E45	IC9033E3S8	IC9033F3B19	IC9033F3A5
IC9033A4D17	IC9033A4H7	IC9033B3C16	IC9033B3E5	IC9033C4B55	IC9033C4C3	IC9033E4D17	IC9033E4R1	IC9033F3B24	IC9033F3A6
IC9033A4D21	IC9033A4H8	IC9033B3C21	IC9033B3E6	IC9033C4B70	IC9033C4C4	IC9033E4D21	IC9033E4R2	IC9033F4B10	IC9033F4A1
IC9033A4D25	IC9033A4H9	IC9033B3C26	IC9033B3E7	IC9033C4B90	IC9033C4C5	IC9033E4D26	IC9033E4R3	IC9033F4B13	IC9033F4A2
IC9033A4D33	IC9033A4J1	IC9033B3C32	IC9033B3E8	IC9033C4C12	IC9033C4C6	IC9033E4D33	IC9033E4R4	IC9033F4B16	IC9033F4A3
IC9033A4D42	IC9033A4J2	IC9033B3C40	IC9033B3E9	IC9033C4C15	IC9033C4C7	IC9033E4D42	IC9033E4R5	IC9033F4B21	IC9033F4A4
IC9033A4D48	IC9033A4J3	IC9033B3C50	IC9033B3F1	IC9033C5B50	IC9033C5C1	IC9033E4D48	IC9033E4R6	IC9033F4B26	IC9033F4A5
IC9033A4D60	IC9033A4J4	IC9033B3C62	IC9033B3F2	IC9033C5B60	IC9033C5C2	IC9033E4D60	IC9033E4R7	IC9033F4B33	IC9033F4A6
IC9033A4D76	IC9033A4J5	IC9033B3C79	IC9033B3F3	IC9033C5B70	IC9033C5C3	IC9033E4D76	IC9033E4R8	IC9033F5B13	IC9033F5A1
IC9033A4D96	IC9033A4J6	IC9033B3D10	IC9033B3F4	IC9033C5B90	IC9033C5C4	IC9033E4D96	IC9033E4R9	IC9033F5B16	IC9033F5A2
IC9033A4E12	IC9033A4J7	IC9033B4C18	IC9033B4E4	IC9033C5C12	IC9033C5C5	IC9033E4E12	IC9033E4S1	IC9033F5B21	IC9033F5A3
IC9033A4E15	IC9033A4J8	IC9033B4C22	IC9033B4E5	IC9033C5C15	IC9033C5C6	IC9033E4E15	IC9033E4S2	IC9033F5B26	IC9033F5A4
IC9033A4E19	IC9033A4J9	IC9033B4C28	IC9033B4E6	IC9033C5C19	IC9033C5C7	IC9033E4E19	IC9033E4S3	IC9033F5B34	IC9033F5A5
								IC9033F5B42	IC9033F5A6

NOTE: Resistor units referenced in this table do not have taps. Refer to sheets 3-4 through 3-6 for tapped units.

Type IC9033—Fixed Resistance

Length 2

Wattage range: *280–440 watts;* **Ampere Range:** *0.25–96 amps;* **Resistance range:** *0.049–4500 ohms.*

Amperes	Ohms	IC9033 Form No Taps	IC9033 Form 3 Taps ¼ Spacing	Amperes	Ohms	IC9033 Form No Taps	IC9033 Form 3 Taps ¼ Spacing
96.0	0.049	**F2A1**	**F2U1**-Obsolete	7.3	5.1	**B2F3**	**B2W4**-Obsolete
86.0	.061	**F2A2**	**F2U2**-Obsolete	6.5	6.4	**B2F4**	**B2W5**-Obsolete
76.0	.079	**F2A3**	**F2U3**-Obsolete	6.0	8.0	**A2H7**-Obsolete	**A2W6**
68.0	.099	**F2A4**	**F2U4**-Obsolete	5.4	10.0	**A2H8**-Obsolete	**A2W7**
60.0	.13	**F2A5**	**F2U5**-Obsolete	4.8	12.0	**A2H9**-Obsolete	**A2W8**
54.0	.16	**F2A6**	**F2U6**-Obsolete	4.3	16.0	**A2J1**-Obsolete	**A2W9**
50.0	.18	**C2C1**	**C2U7**-Obsolete	3.8	20.0	**A2J2**-Obsolete	**A2X1**
45.0	.22	**C2C2**	**C2U8**-Obsolete	3.6	22.0	**A2J3**-Obsolete	**A2X2**
42.0	.25	**C2C3**	**C2U9**-Obsolete	3.2	28.0	**A2J4**-Obsolete	**A2X3**
36.0	.33	**C2C4**	**C2V1**-Obsolete	2.8	36.0	**A2J5**-Obsolete	**A2X4**
32.0	.42	**C2C5**	**C2V2**-Obsolete	2.5	45.0	**A2J6**-Obsolete	**A2X5**
29.0	.54	**C2C6**	**C2V3**-Obsolete	2.2	56.0	**A2J7**-Obsolete	**A2X6**
25.0	.70	**C2C7**	**C2V4**-Obsolete	1.97	72.0	**A2J8**-Obsolete	**A2X7**
17.8	.84	**B2E4**	**B2V5**-Obsolete	1.75	90.0	**A2J9**-Obsolete	**A2X8**
15.8	1.1	**B2E5**	**B2V6**-Obsolete	1.55	110.0	**A2K1**-Obsolete	**A2X9**
14.1	1.3	**B2E6**	**B2V7**-Obsolete	1.4	140.0	**A2K2**-Obsolete	**A2Y1**
12.7	1.7	**B2E7**	**B2V8**-Obsolete	1.25	180.0	**A2K3**-Obsolete	**A2Y2**
11.5	2.1	**B2E8**	**B2V9**-Obsolete	1.1	230.0	**A2K4**-Obsolete	**A2Y3**
10.3	2.6	**B2E9**	**B2W1**-Obsolete	1.0	290.0	**A2K5**-Obsolete	**A2Y4**
9.2	3.2	**B2F1**	**B2W2**-Obsolete	.53	1000.0	**A2K6**-Obsolete	**A2Y5**
8.2	4.0	**B2F2**	**B2W3**-Obsolete	.37	2000.0	**A2K7**-Obsolete	**A2Y6**
				.25	4500.0	**A2K8**-Obsolete	**A2Y7**

For CATALOG NUMBERS NOT FOUND, see page 3-3

Length 3

Wattage range: *425–700 watts;* **Ampere range:** *1.0–96 amps;* **Resistance range:** *0.075–450 ohms.*

Amperes	Ohms	IC9033 Form No Taps	IC9033 Form 5 Taps ⅛ Spacing	IC9033 Form 5 Taps 1/10 Spacing	IC9033 Form 9 Taps 1/10 spacing
96.0	0.075	**F3A1**	**F3U1**-Obsolete	...	...
86.0	.094	**F3A2**	**F3U2**-Obsolete	...	...
76.0	.12	**F3A3**	**F3U3**-Obsolete	...	...
68.0	.15	**F3A4**	**F3U4**-Obsolete	...	...
60.0	.19	**F3A5**	**F3U5**-Obsolete	...	...
54.0	.24	**F3A6**	**F3U6**-Obsolete	...	...
50.0	.28	**C3C1**	**C3U7**-Obsolete	...	...
45.0	.35	**C3C2**	**C3U8**-Obsolete	...	...
42.0	.40	**C3C3**	**C3U9**-Obsolete	...	...
36.0	.52	**C3C4**	**C3V1**-Obsolete	...	...
32.0	.67	**C3C5**	**C3V2**-Obsolete	...	...
29.0	.85	**C3C6**	**C3V3**-Obsolete	...	...
25.0	1.1	**C3C7**	**C3V4**-Obsolete	...	...
17.8	1.3	**B3E4**	...	**B3F5**	**B3G6**-Obsolete
15.8	1.6	**B3E5**	...	**B3F6**	**B3G7**-Obsolete
14.1	2.1	**B3E6**	...	**B3F7**	**B3G8**-Obsolete
12.7	2.6	**B3E7**	...	**B3F8**	**B3G9**-Obsolete
11.5	3.2	**B3E8**	...	**B3F9**	**B3H1**-Obsolete
10.3	4.0	**B3E9**	...	**B3G1**	**B3H2**-Obsolete
9.2	5.0	**B3F1**	...	**B3G2**	**B3H3**-Obsolete
8.2	6.2	**B3F2**	...	**B3G3**	**B3H4**-Obsolete
7.3	7.9	**B3F3**	...	**B3G4**	**B3H5**-Obsolete
6.5	10	**B3F4**	...	**B3G5**	**B3H6**-Obsolete
6.0	12	**A3H7**	...	**A3L1**	**A3N4**-Obsolete
5.4	15	**A3H8**	...	**A3L2**	**A3N5**-Obsolete
4.8	19	**A3H9**	...	**A3L3**	**A3N6**-Obsolete
4.3	24	**A3J1**	...	**A3L4**	**A3N7**-Obsolete
3.8	31	**A3J2**	...	**A3L5**	**A3N8**-Obsolete
3.6	35	**A3J3**	...	**A3L6**	**A3N9**-Obsolete
3.2	44	**A3J4**	...	**A3L7**	**A3P1**-Obsolete
2.8	56	**A3J5**	...	**A3L8**	**A3P2**-Obsolete
2.5	71	**A3J6**	...	**A3L9**	**A3P3**-Obsolete
2.2	88	**A3J7**	...	**A3M1**	**A3P4**-Obsolete
1.97	110	**A3J8**	...	**A3M2**	**A3P5**-Obsolete
1.75	140	**A3J9**	...	**A3M3**	**A3P6**-Obsolete
1.55	180	**A3K1**	...	**A3M4**	**A3P7**-Obsolete
1.4	220	**A3K2**	...	**A3M5**	**A3P8**-Obsolete
1.25	280	**A3K3**	...	**A3M6**	**A3P9**-Obsolete
1.1	350	**A3K4**	...	**A3M7**	**A3Q1**-Obsolete
1.0	450	**A3K5**	...	**A3M8**	**A3Q2**-Obsolete

For CATALOG NUMBERS NOT FOUND, see page 3-3

Type IC9033—Fixed Resistance

Length 4

Wattage range: *600–950 watts;* ***Ampere range:*** *1.0–96 amps;* ***Resistance range:*** *0.10–610 ohms.*

Amperes	Ohms	IC9033 Form No Taps	IC9033 Form 4 Taps ⅛ Spacing	IC9033 Form 7 Taps ⅛ Spacing	IC9033 Form 5 Taps 1/10 Spacing	IC9033 Form 9 Taps 1/10 Spacing
96.0	0.10	**F4A1**	**F4U1**	**F4U7**-Obsolete	. . .	. . .
86.0	.13	**F4A2**	**F4U2**	**F4U8**-Obsolete	. . .	. . .
76.0	.16	**F4A3**	**F4U3**	**F4U9**-Obsolete	. . .	. . .
68.0	.21	**F4A4**	**F4U4**	**F4V1**-Obsolete	. . .	. . .
60.0	.26	**F4A5**	**F4U5**	**F4V2**-Obsolete	. . .	. . .
54.0	.33	**F4A6**	**F4U6**	**F4V3**-Obsolete	. . .	. . .
50.0	.40	**C4C1**	. . .	. . .	**C4C8**	**C4D6**-Obsolete
45.0	.47	**C4C2**	. . .	. . .	**C4C9**	**C4D7**-Obsolete
42.0	.55	**C4C3**	. . .	. . .	**C4D1**	**C4D8**-Obsolete
36.0	.70	**C4C4**	. . .	. . .	**C4D2**	**C4D9**-Obsolete
32.0	.90	**C4C5**	. . .	. . .	**C4D3**	**C4E1**-Obsolete
29.0	1.2	**C4C6**	. . .	. . .	**C4D4**	**C4E2**-Obsolete
25.0	1.5	**C4C7**	. . .	. . .	**C4D5**	**C4E3**-Obsolete
17.8	1.8	**B4E4**	. . .	. . .	**B4F5**	**B4G6**-Obsolete
15.8	2.2	**B4E5**	. . .	. . .	**B4F6**	**B4G7**-Obsolete
14.1	2.8	**B4E6**	. . .	. . .	**B4F7**	**B4G8**-Obsolete
12.7	3.5	**B4E7**	. . .	. . .	**B4F8**	**B4G9**-Obsolete
11.5	4.3	**B4E8**	. . .	. . .	**B4F9**	**B4H1**-Obsolete
10.3	5.4	**B4E9**	. . .	. . .	**B4G1**	**B4H2**-Obsolete
9.2	6.7	**B4F1**	. . .	. . .	**B4G2**	**B4H3**-Obsolete
8.2	8.5	**B4F2**	. . .	. . .	**B4G3**	**B4H4**-Obsolete
7.3	11	**B4F3**	. . .	. . .	**B4G4**	**B4H5**-Obsolete
6.5	13	**B4F4**	. . .	. . .	**B4G5**	**B4H6**-Obsolete
6.0	17	**A4H7**	. . .	. . .	**A4L1**	**A4N4**-Obsolete
5.4	21	**A4H8**	. . .	. . .	**A4L2**	**A4N5**-Obsolete
4.8	26	**A4H9**	. . .	. . .	**A4L3**	**A4N6**-Obsolete
4.3	33	**A4J1**	. . .	. . .	**A4L4**	**A4N7**-Obsolete
3.8	42	**A4J2**	. . .	. . .	**A4L5**	**A4N8**-Obsolete
3.6	48	**A4J3**	. . .	. . .	**A4L6**	**A4N9**-Obsolete
3.2	60	**A4J4**	. . .	. . .	**A4L7**	**A4P1**-Obsolete
2.8	76	**A4J5**	. . .	. . .	**A4L8**	**A4P2**-Obsolete
2.5	96	**A4J6**	. . .	. . .	**A4L9**	**A4P3**-Obsolete
2.2	120	**A4J7**	. . .	. . .	**A4M1**	**A4P4**-Obsolete
1.97	150	**A4J8**	. . .	. . .	**A4M2**	**A4P5**-Obsolete
1.75	190	**A4J9**	. . .	. . .	**A4M3**	**A4P6**-Obsolete
1.55	240	**A4K1**	. . .	. . .	**A4M4**	**A4P7**-Obsolete
1.4	300	**A4K2**	. . .	. . .	**A4M5**	**A4P8**-Obsolete
1.25	380	**A4K3**	. . .	. . .	**A4M6**	**A4P9**-Obsolete
1.1	480	**A4K4**	. . .	. . .	**A4M7**	**A4Q1**-Obsolete
1.0	610	**A4K5**	. . .	. . .	**A4M8**	**A4Q2**-Obsolete

For CATALOG NUMBERS NOT FOUND, see page 3-3

HOW TO ORDER: Order by complete IC number. EXAMPLE: IC9033F4A1.

DIMENSIONS: Refer to page 3-8.

ADJUSTABLE TERMINALS

MOUNTING FEET: Refer to page 3-9.

TERMINALS

IC9033 Form	Adjustable Terminal	Dimensions See Fig. No.
A	Not available	. . .
B	Cat. No. 5980055G1	7
C	Cat. No. 5928940G1	8
F	Not available	. . .
E	Cat. No. 5758413G1	18

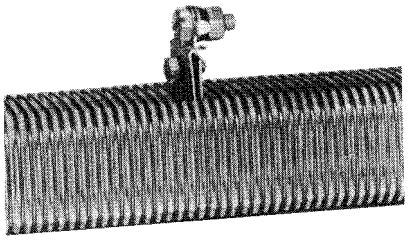


Fig. 7. IC9033B unit with adjustable tap

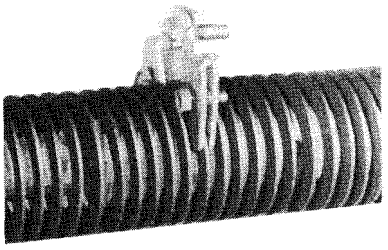


Fig. 8. IC9033C unit with adjustable tap

Type IC9033—Fixed Resistance

Length 5

Wattage range: *750-1220 watts;* **Ampere range:** *1.0-96 amps;* **Resistance range:** *0.13-780 ohms.*

Amperes	Ohms	IC9033 Form No Taps	IC9033 Form 5 Taps 1/10 Spacing	IC9033 Form 9 Taps 1/10 Spacing
96	0.13	**F5A1**	**F5A7**-Obsolete	**F5B4**
86	.16	**F5A2**	**F5A8**-Obsolete	**F5B5**
76	.21	**F5A3**	**F5A9**-Obsolete	**F5B6**
68	.26	**F5A4**	**F5B1**-Obsolete	**F5B7**
60	.34	**F5A5**	**F5B2**-Obsolete	**F5B8**
54	.42	**F5A6**	**F5B3**-Obsolete	**F5B9**
50	.50	**C5C1**	**C5C8**-Obsolete	**C5D6**
45	.60	**C5C2**	**C5C9**-Obsolete	**C5D7**
42	.70	**C5C3**	**C5D1**-Obsolete	**C5D8**
36	.90	**C5C4**	**C5D2**-Obsolete	**C5D9**
32	1.2	**C5C5**	**C5D3**-Obsolete	**C5E1**
29	1.5	**C5C6**	**C5D4**-Obsolete	**C5E2**
25	1.9	**C5C7**	**C5D5**-Obsolete	**C5E3**
17.8	2.2	**B5E4**	**B5F5**-Obsolete	**B5G6**
15.8	2.8	**B5E5**	**B5F6**-Obsolete	**B5G7**
14.1	3.5	**B5E6**	**B5F7**-Obsolete	**B5G8**
12.7	4.5	**B5E7**	**B5F8**-Obsolete	**B5G9**
11.5	5.4	**B5E8**	**B5F9**-Obsolete	**B5H1**
10.3	6.8	**B5E9**	**B5G1**-Obsolete	**B5H2**
9.2	8.5	**B5F1**	**B5G2**-Obsolete	**B5H3**
8.2	11	**B5F2**	**B5G3**-Obsolete	**B5H4**
7.3	13	**B5F3**	**B5G4**-Obsolete	**B5H5**
6.5	17	**B5F4**	**B5G5**-Obsolete	**B5H6**
6.0	21	**A5H7**	**A5L1**-Obsolete	**A5N4**
5.4	26	**A5H8**	**A5L2**-Obsolete	**A5N5**
4.8	33	**A5H9**	**A5L3**-Obsolete	**A5N6**
4.3	42	**A5J1**	**A5L4**-Obsolete	**A5N7**
3.8	53	**A5J2**	**A5L5**-Obsolete	**A5N8**
3.6	60	**A5J3**	**A5L6**-Obsolete	**A5N9**
3.2	76	**A5J4**	**A5L7**-Obsolete	**A5P1**
2.8	96	**A5J5**	**A5L8**-Obsolete	**A5P2**
2.5	120	**A5J6**	**A5L9**-Obsolete	**A5P3**
2.2	150	**A5J7**	**A5M1**-Obsolete	**A5P4**
1.97	190	**A5J8**	**A5M2**-Obsolete	**A5P5**
1.75	240	**A5J9**	**A5M3**-Obsolete	**A5P6**
1.55	310	**A5K1**	**A5M4**-Obsolete	**A5P7**
1.4	390	**A5K2**	**A5M5**-Obsolete	**A5P8**
1.25	490	**A5K3**	**A5M6**-Obsolete	**A5P9**
1.1	610	**A5K4**	**A5M7**-Obsolete	**A5Q1**
1.0	780	**A5K5**	**A5M8**-Obsolete	**A5Q2**

For CATALOG NUMBERS NOT FOUND, see page 3-3

HOW TO ORDER: Order by complete IC number. EXAMPLE: IC9033F5A1.

DIMENSIONS: Refer to page 3-8

ADJUSTABLE TERMINALS: Refer to page 3-5.

MOUNTING FEET: Refer to page 3-9.

Fig. 9. IC9033A smooth-wound unit

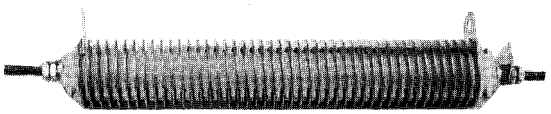


Fig. 10. IC9033C or F ribbon-wound unit

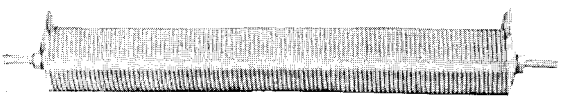


Fig. 11. IC9033B wire-wound unit

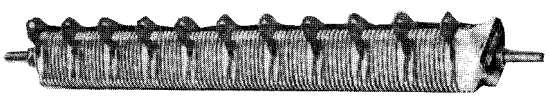


Fig. 12. IC9033B unit with taps

Type IC9033—Adjustable Resistance (Smooth-wound with slider)

Lengths 2 thru 5

Wattage range: *100-605 watts;* ***Ampere range:*** *0.22-5.4 amps;* ***Resistance range:*** *8.0-4500 ohms.*

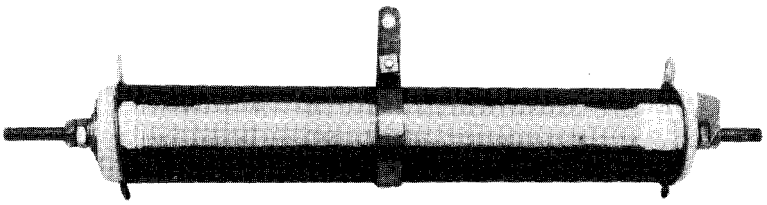


Fig. 13. IC9033E adjustable unit.

Amperes	Length 2	
	Ohms	IC9033 Form
5.4	8.0	**E2R1**-Obsolete
4.8	10.0	**E2R2**
4.3	12.0	**E2R3**
3.8	16.0	**E2R4**-Obsolete
3.4	20.0	**E2R5**
3.2	22.0	**E2R6**
2.8	28.0	**E2R7**
2.5	36.0	**E2R8**-Obsolete
2.2	45.0	**E2R9**
2.0	56.0	**E2S1**
1.8	72.0	**E2S2**-Obsolete
1.6	90.0	**E2S3**-Obsolete
1.4	110.0	**E2S4**
1.25	140.0	**E2S5**
1.1	180.0	**E2S6**
1.0	230.0	**E2S7**-Obsolete
0.9	290.0	**E2S8**-Obsolete
.44	1000.0	**E2S9**-Obsolete
.31	2000.0	**E2T1**-Obsolete
.22	4500.0	**E2T2**-Obsolete

Amperes	Length 3	
	Ohms	IC9033 Form
5.4	12.0	**E3R1**-Obsolete
4.8	15.0	**E3R2**
4.3	19.0	**E3R3**
3.8	24.0	**E3R4**-Obsolete
3.4	31.0	**E3R5**
3.2	35.0	**E3R6**
2.8	44.0	**E3R7**
2.5	56.0	**E3R8**-Obsolete
2.2	71.0	**E3R9**
2.0	88.0	**E3S1**
1.8	110.0	**E3S2**-Obsolete
1.6	140.0	**E3S3**-Obsolete
1.4	180.0	**E3S4**
1.25	220.0	**E3S5**
1.1	280.0	**E3S6**
1.0	350.0	**E3S7**-Obsolete
0.9	450.0	**E3S8**-Obsolete
.44	. . .	. . .
.31	. . .	. . .
.22	. . .	. . .

Amperes	Length 4	
	Ohms	IC9033 Form
5.4	17.0	**E4R1**-Obsolete
4.8	21.0	**E4R2**
4.3	26.0	**E4R3**
3.8	33.0	**E4R4**-Obsolete
3.4	42.0	**E4R5**
3.2	48.0	**E4R6**
2.8	60.0	**E4R7**
2.5	76.0	**E4R8**-Obsolete
2.2	96.0	**E4R9**
2.0	120.0	**E4S1**
1.8	150.0	**E4S2**-Obsolete
1.6	190.0	**E4S3**-Obsolete
1.4	240.0	**E4S4**
1.25	300.0	**E4S5**
1.1	380.0	**E4S6**
1.0	480.0	**E4S7**-Obsolete
0.9	610.0	**E4S8**-Obsolete
.44	. . .	. . .
.31	. . .	. . .
.22	. . .	. . .

Amperes	Length 5	
	Ohms	IC9033 Form
5.4	21.0	**E5R1**-Obsolete
4.8	26.0	**E5R2**
4.3	33.0	**E5R3**
3.8	42.0	**E5R4**-Obsolete
3.4	53.0	**E5R5**
3.2	60.0	**E5R6**
2.8	76.0	**E5R7**
2.5	96.0	**E5R8**-Obsolete
2.2	120.0	**E5R9**
2.0	150.0	**E5S1**
1.8	190.0	**E5S2**-Obsolete
1.6	240.0	**E5S3**-Obsolete
1.4	310.0	**E5S4**
1.25	390.0	**E5S5**
1.1	490.0	**E5S6**
1.0	610.0	**E5S7**-Obsolete
0.9	780.0	**E5S8**-Obsolete
.44	. . .	. . .
.31	. . .	. . .
.22	. . .	. . .

For CATALOG NUMBERS NOT FOUND, see page 3-3

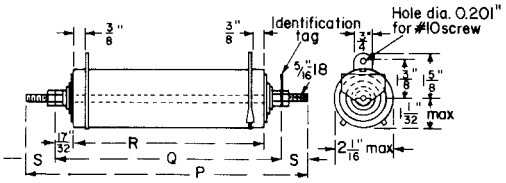
HOW TO ORDER: Order by complete IC number. EXAMPLE: IC9033E4R1.

DIMENSIONS: Refer to page 3-8.

MOUNTING FEET: Refer to page 3-9.

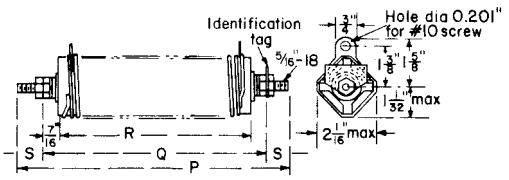
Type IC9033

DIMENSIONS (For Estimating Only)



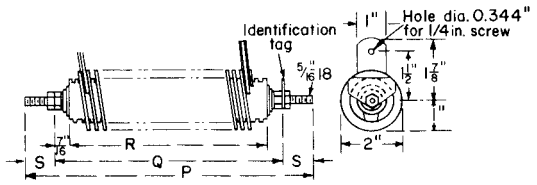
IC9033 Form	Length	Approximate Dimensions in Inches				Approx Shipping Wt in Lb
		P	Q	R	S	
A2	2	9 3/8	7 1/16	6	1 5/32	2
A3	3	12 3/8	10 1/16	9	1 5/32	3
A4	4	15 3/8	13 1/16	12	1 5/32	4
A5	5	18 3/8	16 1/16	15	1 5/32	5

Fig. 14. IC9033A smooth-wound units



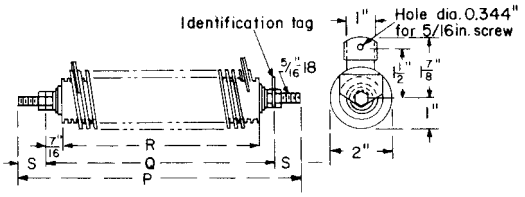
IC9033 Form	Length	Approximate Dimensions in Inches				Approx Shipping Wt in Lb
		P	Q	R	S	
B2	2	9 3/8	7	6 1/8	1 3/16	1
B3	3	12 3/8	10	9 1/8	1 3/16	2
B4	4	15 3/8	13	12 1/8	1 3/16	3
B5	5	18 3/8	16	15 1/8	1 3/16	4

Fig. 15. IC9033B open-wound units



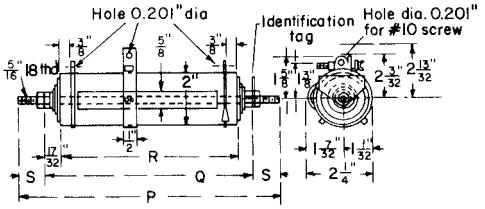
IC9033 Form	Length	Approximate Dimensions in Inches				Approx Shipping Wt in Lb
		P	Q	R	S	
C2	2	9 3/8	7	6 1/8	1 3/16	2
C3	3	12 3/8	10	9 1/8	1 3/16	3
C4	4	15 3/8	13	12 1/8	1 3/16	4
C5	5	18 3/8	16	15 1/8	1 3/16	5

Fig. 16. IC9033C edgewise-wound units



IC9033 Form	Length	Approximate Dimensions in Inches				Approx Shipping Wt in Lb
		P	Q	R	S	
F2	2	9 3/8	7	6 1/8	1 3/16	2
F3	3	12 3/8	10	9 1/8	1 3/16	3
F4	4	15 3/8	13	12 1/8	1 3/16	4
F5	5	18 3/8	16	15 1/8	1 3/16	5

Fig. 17. IC9033F edgewise-wound units



IC9033 Form	Length	Approximate Dimensions in Inches				Approx Shipping Wt in Lb
		P	Q	R	S	
E2	2	9 3/8	7 1/16	6	1 5/32	2
E3	3	12 3/8	10 1/16	9	1 5/32	3
E4	4	15 3/8	13 1/16	12	1 5/32	4
E5	5	18 3/8	16 1/16	15	1 5/32	5

Fig. 18. IC9033E smooth-wound units with slider

MOUNTING FEET

Mounting feet are available for use with any form of IC9033 resistor. From 1 to 4 units may be mounted. Mounting feet should be mounted on a vertical surface with the units horizontal.

Number of Resistor Sticks	Catalog Number
1	**Qty 2 of 8079695P1**
2	**Qty 2 of 8079696P1**
3	**Qty 2 of 8079697P1**
4	**Qty 2 of 8079698P1**

Fig. 19. IC9033-B4 unit with mounting feet on insulators

APPLICATIONS-Above 250 volts

1. 600 volts (maximum)

Where standard IC9033 resistors (pages 3-4 to 3-7) are applied above 250 volts, the individual units should be mounted on insulated supports. These insulated supports may be mounting frames as listed on page 3-10, Table 1, or mounting feet with insulators (see Fig. 19).

Insulator Kit for Mounting Feet

Catalog No. 273A4676G1. **GO-13A** each, quantity two required. (Price applicable only when purchased with resistor and mounting feet.)

2. 1000 volts (maximum)

There is a special form of the IC9033 unit rated 1000 volts (maximum). This special form includes necessary insulation at each end of the unit to give 1000-volt (maximum) creepage between terminal and tie-rod (throughbolt). This 1000-volt form is available for IC9033 Forms A and E (all lengths) and IC9033 Forms B, C and F (lengths 4 and 5 only). These 1000-volt forms may be ordered by inserting the letter "Z" after the length in the IC9033 catalog number.

EXAMPLE: IC9033 A 2 Z H7

- H7 — 6 amps, 8 ohms, no taps
- Z — 1000 volts
- 2 — Length
- A — Form

MOUNTING FEET DIMENSIONS (For Estimating Only)

No. of Units	1	2	3	4
Cat. No. 2 Per Assm.	8079695P1	8079696P1	8079697P1	8079698P1
A Dimension Length:				
2	8 3/4	8 3/4	8 3/4	8 3/4
3	11 3/4	11 3/4	11 3/4	11 3/4
4	14 3/4	14 3/4	14 3/4	14 3/4
5	17 3/4	17 3/4	17 3/4	17 3/4
B Dimension	3	5 11/16	8 3/8	11 1/16
C Dimension	3/32	3/32	1/8	3/16
D Dimension	1	1	1 1/2	1 1/2

600 Volt Insulator Adds 1 3/8" to "B" Dimension.

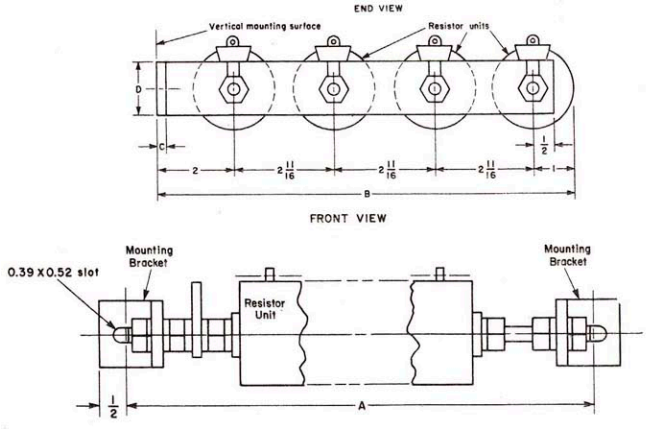


Fig. 20. Mounting-feet dimensions

RESISTORS

Type IC9133, IC9135, & IC9136 Resistor Assemblies

CATEGORY I Unassembled Boxes (600 volts maximum)

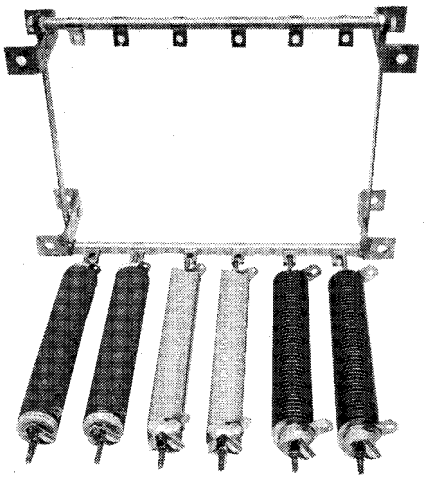


Fig. 21. IC9033 units and mounting frame

APPLICATION

Mounting frames and enclosures are available for mounting IC9033 units, per Table 1. Select IC9033 units from pages 3-4 to 3-7. Units of different length can not be mixed in the frame.

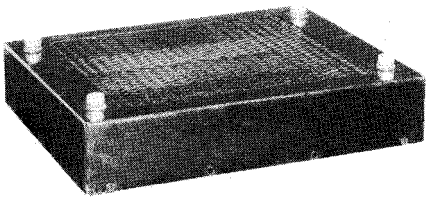
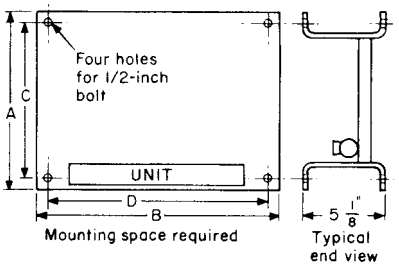


Fig. 22. Top cover for indoor service

DIMENSIONS (For Estimating Only)

Mounting-dimension Notes

Note 1. For indoor enclosure add 1⅛ inch to height dimension of stack and approximately 1½ inch to length and width.



Part No.	Dimensions in Inches			
	A	B	C	D
4	5 7/8	9 1/2	2 3/8	8
5	8 11/16	9 1/2	5 3/16	8
6	11 1/2	9 1/2	8	8
7	5 7/8	12 1/2	2 3/8	11
8	8 11/16	12 1/2	5 3/16	11
9	11 1/2	12 1/2	8	11
10	5 7/8	15 1/2	2 3/8	14
11	8 11/16	15 1/2	5 3/16	14
12	11 1/2	15 1/2	8	14
13	5 7/8	18 1/2	2 3/8	17
14	8 11/16	18 1/2	5 3/16	17
15	11 1/2	18 1/2	8	17
16	14 5/16	6 1/2	10 13/16	5
17	17 1/8	6 1/2	13 5/8	5
18	19 15/16	6 1/2	16 7/16	5
19	15 1/16	15 11/16	13 9/16	11 5/8
20	26 1/2	15 11/16	25	11 5/8
21	15 1/16	18 11/16	13 9/16	14 5/8
22	26 1/2	18 11/16	25	14 5/8
23	20 11/16	15 11/16	19 3/16	11 5/8
24	20 11/16	18 11/16	19 3/16	14 5/8

Fig. 23. Mounting dimensions

Table 1—Indoor Enclosure for Resistor Assemblies

Length of Resistor	Max Number in Box	Mounting Frame*		Indoor Enclosure†	
		Catalog Number	Dimensions Fig. 23	Steel Top Cover Catalog Number	Steel Side Cover Set Catalog Number
Length 2	1	**5749268G1**	Pt 4	...	...
	2	**5749268G2**	Pt 5	...	...
	3	**5749268G3**	Pt 6	...	...
Length 3	1	**5749268G1**	Pt 7	...	...
	2	**5749268G2**	Pt 8	...	...
	3	**5749268G3**	Pt 9	...	...
Length 4	1	**5749268G1**	Pt 10	**225B441G1**	...
	2	**5749268G2**	Pt 11	**225B441G3**	...
	3	**5749268G3**	Pt 12	**225B441G5**	...
	4	**5119692G1**	Pt 19	**5119681G1**	**225B436G1**
	5	**225B400G1**	Pt 23	**5119681G2**	**225B436G2**
	6	**225B400G1**	Pt 23	**5119681G2**	**225B436G2**
	7	**5119693G1**	Pt 20	**5119681G3**	**225B436G3**
	8	**5119693G1**	Pt 20	**5119681G3**	**225B436G3**
Length 5	1	**5749268G1**	Pt 13	**225B441G2**	...
	2	**5749268G2**	Pt 14	**225B441G4**	...
	3	**5749268G3**	Pt 15	**225B441G6**	...
	4	**5119694G1**	Pt 21	**5119681G4**	**225B436G4**
	5	**225B401G1**	Pt 24	**5119681G5**	**225B436G5**
	6	**225B401G1**	Pt 24	**5119681G5**	**225B436G5**
	7	**5119695G1**	Pt 22	**5119681G6**	**225B436G6**
	8	**5119695G1**	Pt 22	**5119681G6**	**225B436G6**

* 600 volts maximum insulation class.

† For indoor service, one top cover is required to enclose the top box in a stack and one side-cover set is required for each additional box in the stack. Painted-steel top cover is perforated, side cover is solid (refer to Fig. 22). These enclosures are open at bottom to allow for proper ventilation.

Catalog Number Terminology

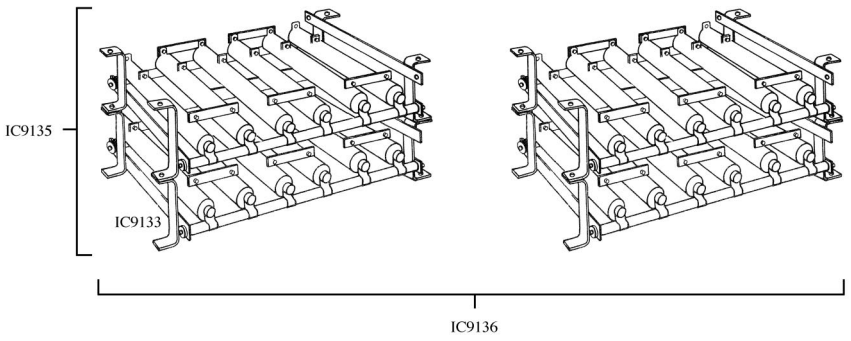


Fig. 24. IC9133—single box, IC9135—single stack of boxes, IC9136—multiple stacks of boxes

Stacking Limitations

For a continuous-duty resistor, a maximum of three boxes can be stacked without affecting resistor rating. For a short-time-rated resistor a maximum of six boxes can be stacked. Higher stacking restricts ventilation and necessitates derating.

HOW TO ORDER

Order IC9033 units of same length per rating required from pages 3-4 to 3-7, mounting frames and enclosures (if desired) by catalog numbers from Table 1 (indoor enclosure) or Table 2 (outdoor enclosure, page 3-11).

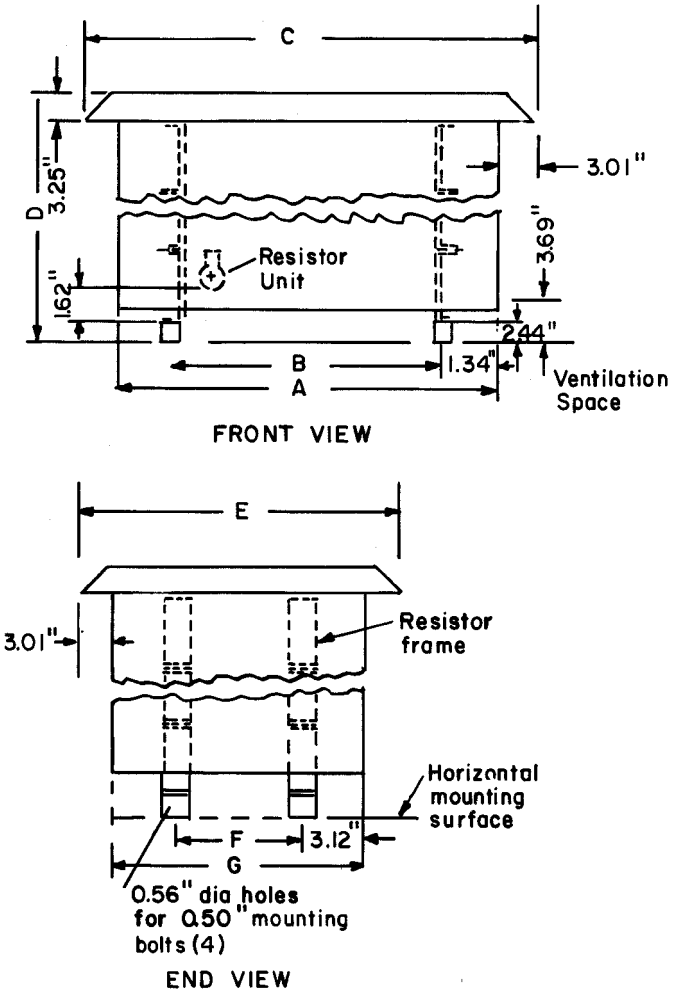
Type IC9133, IC9135, & IC9136 Resistor Assemblies

CATEGORY I (Cont'd)

Table 2—Outdoor Weatherproof Enclosures for Resistor Assemblies

Enclosure Cat. No.		Dimensions Fig. 25, Part No.		Mounting Frame Size	Number of Boxes per Enclosure	Enclosure Cat. No.		Dimensions Fig. 25, Part No.		Mounting Frame Size	Number of Boxes per Enclosure
111C8695 (length 4 units)	116C7178 (length 5 units)	Length 4	Length 5			111C8695 (length 4 units)	116C7178 (length 5 units)	Length 4	Length 5		
Group No. 1		1	19	4 units	1	**Group No. 10**		10	28	6 units	4
2		2	20	4 units	2	**11**		11	29	6 units	5
3		3	21	4 units	3	**12**		12	30	6 units	6
4		4	22	4 units	4	**13**		13	31	8 units	1
5		5	23	4 units	5	**14**		14	32	8 units	2
6		6	24	4 units	6	**15**		15	33	8 units	3
7		7	25	6 units	1	**16**		16	34	8 units	4
8		8	26	6 units	2	**17**		17	35	8 units	5
9		9	27	6 units	3	**18**		18	36	8 units	6

DIMENSIONS (For Estimating Only)



Part No.		Dimensions in Inches			
		A	B	C	D
1	19	16.24	13.56	22.25	10.81
2	20	16.24	13.56	22.25	15.94
3	21	16.24	13.56	22.25	21.06
4	22	16.24	13.56	22.25	26.19
5	23	16.24	13.56	22.25	31.31
6	24	16.24	13.56	22.25	36.44
7	25	21.86	19.18	27.88	10.81
8	26	21.86	19.18	27.88	15.94
9	27	21.86	19.18	27.88	21.06
10	28	21.86	19.18	27.88	26.19
11	29	21.86	19.18	27.88	31.31
12	30	21.86	19.18	27.88	36.44
13	31	27.68	25.00	33.70	10.81
14	32	27.68	25.00	33.70	15.94
15	33	27.68	25.00	33.70	21.06
16	34	27.68	25.00	33.70	26.19
17	35	27.68	25.00	33.70	31.31
18	36	27.68	25.00	33.70	36.44

Part No.	Dimensions in Inches		
	E	F	G
1-18	23.89	11.63	17.87
19-36	26.89	14.63	20.87

Fig. 25

Stainless-steel Grid Resistors—IC9141

NOT suitable for outdoor use without enclosure.

IC9141 punched-grid resistors consist of stainless-steel grids mounted in boxes suitable for stacking. Resistors are corrosion-resistant and nonbreakable. They can be installed either indoor, or with an outdoor enclosure in outdoor locations. They are designed to withstand shock and vibration of cranes and similar machinery.

GE punched-grid resistors allow for expansion of the resistor element by uniquely slotting the end frame to allow the resistor element to expand. These punched-grid resistors are for use in production of metal and minerals, and for transportation service.

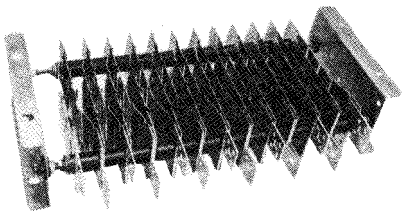


Fig. 37. IC9141 Resistor box

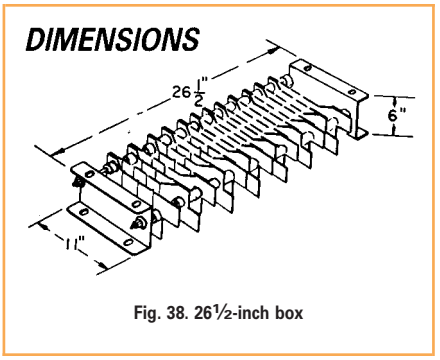


Fig. 38. 26½-inch box

Basis of Rating

Current and temperature-rise ratings based on operation of a single box located 6 inches above floor. Resistance increase at 375 C rise is approximately 6%.

HOW TO ORDER

Order by complete IC number and state modifications required. (EXAMPLE: Qty 3 IC9141A001A210 resistor boxes assembled in 3-box mounting rack.)

Adding Suffix "T" to IC catalog number picks up 2 standard terminals with mounting hardware in a bag tied to the box at no additional charge. EXAMPLE: IC9141A001A103T.

Additional terminal kits are available and may be ordered as separate item on same order with resistor boxes, as follows: (Quantity 2 terminals per kit).

Kit Cat. No.	Applicable Box Nos.
273A2152G1	All except 4A1
273A2152G2	4A1 only

Max Volts Insulation	Continuous Rating Amp (375 C Rise)	Ohms per Box at 25 C	Number of Taps (Including end terminals)	IC9141 Form	Box Number	Approx Weight in Lb	Indoor Steel Enclosure	
							Top and Side Cover Set	Side Cover Set
							Catalog Number	Catalog Number
600	25	10.0	10	**A001A210‡**	10	25	**125A6089G1**	**125A6089G2**
	31	6.6	10	**A001A209**	9	28	**125A6089G1**	**125A6089G2**
	40	4.1	10	**A001A208**	8	33	**125A6089G1**	**125A6089G2**
	50	2.6	10	**A001A207**	7	30	**125A6089G1**	**125A6089G2**
	60	1.8	9	**A001A206**	6	34	**125A6089G1**	**125A6089G2**
	74	1.2	9	**A001A205**	5	42	**125A6089G1**	**125A6089G2**
	96	0.65	13	**A001A104**	4	33	**125A6089G1**	**125A6089G2**
	123	0.40	13	**A001A103**	3	42	**125A6089G1**	**125A6089G2**
	155	0.25	13	**A001A102**	2	38	**125A6089G1**	**125A6089G2**
	194	0.16	12	**A001A101**	1	45	**125A6089G1**	**125A6089G2**
	244	0.10	13	**A002A103**	2A3	42	**125A6089G1**	**125A6089G2**
	312	0.062	13	**A002A102**	2A2	38	**125A6089G1**	**125A6089G2**
	378	0.043	13	**A002A101**	2A1	48	**125A6089G1**	**125A6089G2**
	490	0.025	7	**A004A103**	4A3	42	**125A6089G1**	**125A6089G2**
	626	0.016	7	**A004A102**	4A2	38	**125A6089G1**	**125A6089G2**
	756	0.011	7	**A004A101**	4A1	48	**125A6089G1**	**125A6089G2**
1500	25	10.0	10	**B001A210‡**	10	25	**125A6089G1**	**125A6089G2**
	31	6.6	10	**B001A209**	9	28	**125A6089G1**	**125A6089G2**
	40	4.1	10	**B001A208**	8	33	**125A6089G1**	**125A6089G2**
	50	2.6	10	**B001A207**	7	30	**125A6089G1**	**125A6089G2**
	60	1.8	9	**B001A206**	6	34	**125A6089G1**	**125A6089G2**
	74	1.2	9	**B001A205**	5	42	**125A6089G1**	**125A6089G2**
	96	0.65	13	**B001A104**	4	33	**125A6089G1**	**125A6089G2**
	123	0.40	13	**B001A103**	3	42	**125A6089G1**	**125A6089G2**
	155	0.25	13	**B001A102**	2	38	**125A6089G1**	**125A6089G2**
	194	0.16	12	**B001A101**	1	45	**125A6089G1**	**125A6089G2**
	244	0.10	13	**B002A103**	2A3	42	**125A6089G1**	**125A6089G2**
	312	0.062	13	**B002A102**	2A2	38	**125A6089G1**	**125A6089G2**
	378	0.043	13	**B002A101**	2A1	48	**125A6089G1**	**125A6089G2**
	490	0.025	7	**B004A103**	4A3	42	**125A6089G1**	**125A6089G2**
	626	0.016	7	**B004A102**	4A2	38	**125A6089G1**	**125A6089G2**
	756	0.011	7	**B004A101**	4A1	48	**125A6089G1**	**125A6089G2**

‡ These boxes not suitable for high vibration or high-inrush current surges.

Stainless-steel Grid Resistors—IC9141

MODIFICATIONS AND RATINGS

Covers

To enclose IC9141 boxes one top and side cover set is required to enclose the top box in a stack and one side cover set is required for each additional box. Mounting hardware is included.

Stacking Limitations

For a continuous-duty resistor, a maximum of three boxes can be stacked without affecting resistor rating. For a short-time-rated resistor a maximum of six boxes can be stacked. Higher stacking restricts ventilation and necessitates underating.

Box Number

Box number appears in a large red circle on nameplate to facilitate identification.

MOUNTING RACK CONSTRUCTION (IC9145, IC9146)

Racks are open, self-supporting structures and can be ordered for 2 to 9 boxes (See Stacking Limitations above). For intermittent duty, resistor boxes in racks can be stacked 9 high. See Figs. 43–46, p. 3-18 for dimensions.

DIMENSIONS

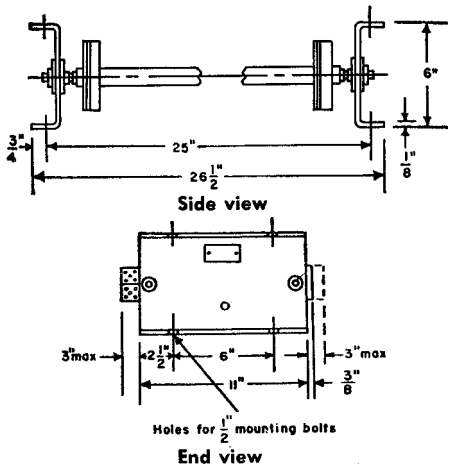


Fig. 39. IC9141 grid resistor box

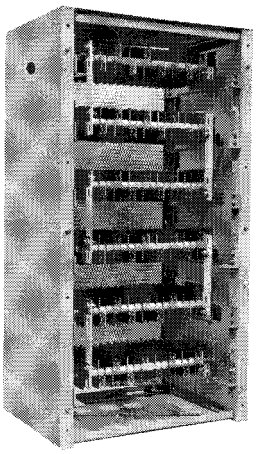


Fig. 40. Six boxes of IC9141 resistors mounted and wired in a rack (IC9145)

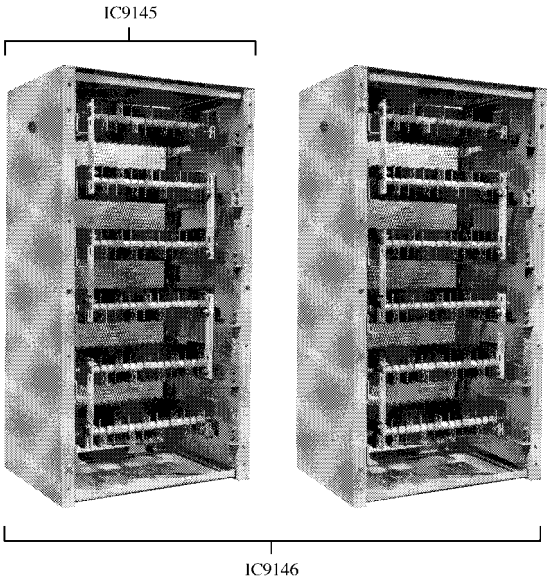


Fig. 41. IC9145—single enclosure, IC9146—multiple enclosures

TABLE 11—Short-time and NEMA Class Ratings

IC9141 Form A or B	Short-time Ratings—Amperes 375 C Rise											NEMA Class Ratings—Amperes 375 C Rise					
	Time On										Time Off	NEMA Class 110 Series	NEMA Class 130 Series	NEMA Class 140 Series	NEMA Class 150 Series	NEMA Class 160 Series	NEMA Class 170 Series
	1 Sec *	3 Sec *	5 Sec	10 Sec	30 Sec	1 Min	2 Min	3 Min	5 Min	10 Min	Min						
001A210	. . .	. . .	. . .	. . .	. . .	32	29	28	27	26	10	45	40	38	36	35	35
001A209	. . .	. . .	100	75	50	40	36	34	33	32	10	83	70	64	56	50	43
001A208	310	210	160	120	75	60	52	48	45	42	10	135	100	87	72	64	54
001A207	320	215	200	140	95	75	65	60	56	54	10	170	125	110	90	80	68
001A206	490	330	270	190	120	95	80	75	70	65	10	204	151	131	108	96	82
001A205	590	475	400	280	170	130	110	100	90	85	15	250	185	162	132	117	100
001A104	690	550	450	350	210	160	130	120	110	100	15	291	222	196	167	148	129
001A103	1080	765	700	500	300	230	190	170	160	150	15	371	283	250	212	189	164
001A102	1100	850	800	550	310	250	200	180	170	160	15	470	358	317	268	239	208
001A101	1690	1200	1200	800	450	330	270	250	230	210	15	586	447	395	335	299	260
002A103	2160	1530	1400	1000	600	460	380	340	320	300	15	742	566	500	424	378	328
002A102	2200	1700	1600	1100	620	500	400	360	340	320	15	940	716	634	536	478	416
002A101	3380	2240	2400	1600	900	660	540	500	460	420	15	1172	894	790	670	598	520
004A103	4300	3000	2800	2000	1200	920	760	680	640	600	15	1148	1132	1000	848	756	656
004A102	4400	3400	3200	2200	1240	1000	800	720	680	640	15	1880	1432	1268	1072	956	832
004A101	5100	4800	4800	3200	1800	1320	1080	1000	920	840	15	2344	1788	1580	1340	1196	1054

* 1- and 3-second ratings based on approximately 460 C rise, maximum value without damage, single shot then cool to ambient.

Stainless-steel Grid Resistors—IC9141

RATINGS (Cont'd)

Table 12—Ohms Per Division

Box Size	IC9141 Form A or B	Number of Divisions	Ohms per Divisions (See Note)	Connections Fig. 42 Diagram No.
26½-inch	**001A210**	8,1	1.16, 0.58	1
	001A209	8,1	.76, .38	1
	001A208	8,1	.48, .24	1
	001A207	8,1	.304, .152	1
	001A206	8	.224	10
	001A205	8	.144	10
	001A104	12	.054	3
	001A103	12	.034	3
	001A102	12	.020	3
	001A101	11	.014	2
	002A103	12	.0083	5
	002A102	12	.005	5
	002A101	12	.0035	5
	004A103	6	.0042	4
	004A102	6	.0025	4
	004A101	6	.0018	4

NOTE: Two values indicate different ohmic values for different divisions. EXAMPLE: IC9141A001A210 has 8 divisions rated 1.16 ohms and 1 division rated 0.58 ohms.

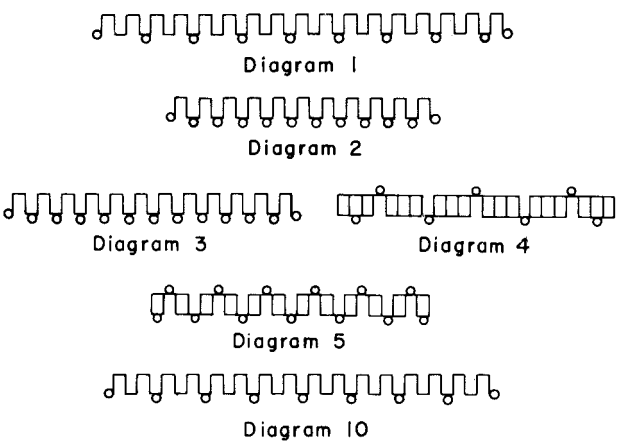


Fig. 42. Internal box connections

Enclosures for Catalogue Numbers IC9145, IC9146

DIMENSIONS

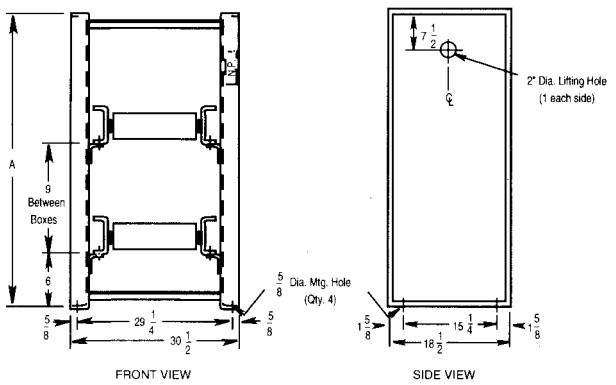


Fig. 43. Mounting rack for IC9141 resistor boxes

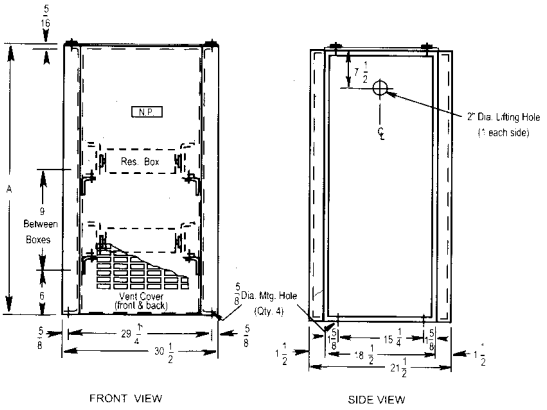


Fig. 44. Mounting rack for IC9141 resistor boxes with perforated metal covers front and back

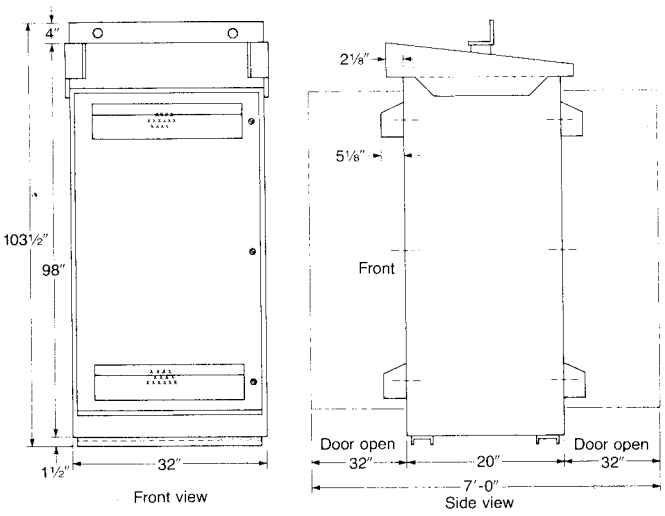
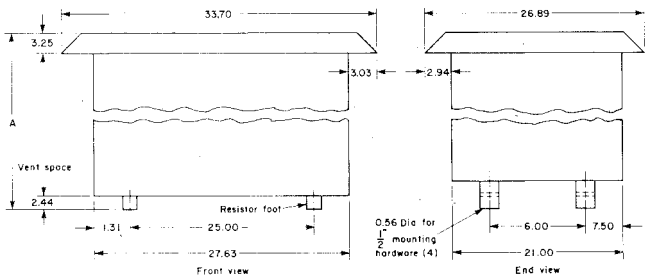


Fig. 45. GE Type 3R outdoor enclosure



Number of IC9141 Boxes for Enclosure	Catalog Number of Enclosure 202B5523 Group	Outline 202B5524	
		Part Number	"A" Dimension (In inches)
1	1	1	11.62
2	2	2	19.62
3	3	3	27.62
4	4	4	35.62
5	5	5	43.62
6	6	6	51.62

NOTE: For access to resistors, the enclosure must be lifted off of the resistor boxes.

Fig. 46. Outdoor slideover weatherproof enclosure

RESISTORS

NEMA Standards

The following is a NEMA recommended guide to specifying or designing, resistors for ac and dc motor controllers. The classifications apply to the accelerating portion or application of a resistor as defined previously. The recommendations are those found suitable for the average installation. It is recognized the adjustments in classification occasionally must be made.

Application	NEMA Class
Blowers	
Centrifugal	133 or 93
Constant Pressure	135 or 95
Brick Plants	
Augers	135
Conveyors	135
Dry Pans	135
Pug Mills	135
By-product Coke Plants	
Door Machine	153
Leveler Ram	153
Pusher Bar	153
Valve Reversing Machines	153
Cement Mills	
Conveyors	135
Crushers	145
Elevators	135
Rotary Dryers	145 or 95
Grinders and Pulverizers	135
Kilns	135 or 95
Coal and Ore Bridges	
Bridge	153
Closing	162
Holding	162
Trolley	162 or 163
Coal Mines	
Car Hauls	162
Conveyors	135 or 155
Cutters	135
Crushers	145
Fans	134 or 95
Hoists	
Slope	172
Vertical	162
Jigs	135
Picking Tables	135
Rotary Car Dumpers	153
Shaker Screens	135
Compressors	
Constant Speed	135
Varying Speed	
Centrifugal	93
Plunger Type	95
Concrete Mixers	135
***Cranes—Service Classes A, B and C**	
Hoist	152 or 153
Bridge or Trolley with	
Sleeve Bearings	152
Roller Bearings	152
***Cranes—Service Class D**	
Hoist	162 or 163
Bridge or Trolley with	
Sleeve Bearings	163
Roller Bearings	162
Flour Mills	
Line Shafting	135
Food Plants	
Butter Churns	135
Dough Mixers	135
Hoists	
Winch	153
Mine Slope	172
Mine Vertical	162
Contractor's Hoists	152
Larry Cars	153
Lift Bridges	152
Machine Tools	
Bending Rolls	163 or 164
Boring Mills	135
Bulldozers	135
Drills	115
Gear Cutters	115
Grinders	135
Hobbing Machines	115
Lathes	115
Milling Machines	115
Presses	135
Punches	135
Saws	115
Shapers	115
Metal Mining	
Ball, Rod and Tube Mills	135
Car Dumpers—Rotary	153
Converters—Copper	154
Conveyors	135
Crushers	145
Tilting Furnace	153
Paper Mills	
Beaters	135
Calenders	154 or 92
Chippers	145
Pipeworking	
Cutting and Threading	135
Expanding and Flanging	135 or 95
Power Plants	
Clinker Grinders	135
Coal Crushers	135
Conveyors	
Belt	135
Screw	135
Pulverized Fuel Feeders	135
Pulverizers	
Ball Type	135
Centrifugal	134
Stokers	135 or 93
Pumps	
Centrifugal	134 or 93
Plunger	135 or 95
Rubber Mills	
Banbury	135
Calendars	155
Crackers	135
Mixing Mills	135
Washers	135
Steel Mills	
Accumulators	153
Casting Machines—Pig	153
Charging Machines	
Bridge	153 or 163
Peel	153 or 163
Trolley	153 or 163
Coiling Machines	135
Converters—Metal	154
Conveyors	135 or 155
Cranes—Service Class F	
Crushers	145
Furnace Doors	155
Gas Valves	155
Gas Washers	155
Hot Metal Mixers	163
Ingot Buggy	153
Kickoff	153
Levelers	153
Manipulator Fingers	153 or 163
Pickling Machine	153
Pilers—Slab	153
Racks	153
Reelers	135
Saws—Hot or Cold	155
Screw Downs	153 or 163
Shears	155
Shuffle Bars	155
Side Guards	153 or 163
Sizing Rolls	155
Slab Buggy	155
Soaking Pit Covers	155
Straighteners	153
Tables	
Approach	153
Lift	153 or 163
Main Roll	153 or 163
Roll	153
Shear Approach	153 or 163
Transfer	153
Tilting Furnace	153
Wire Stranding Machine	153
Woodworking Plants	
Boring Machines	115
Lathe	115
Mortiser	115
Moulder	115
Planers	115
Power Trimmer and Mitre	115
Sanders	115
Saws	115
Shapers	115
Shingle Machine	115

* For definition of crane service classes refer to CMAA (Crane Manufacturers Association of America) Publication No. 70, Specification for Electric Overhead Travel Cranes. Revised 1988

NOTE: Where application gives two classes, the heavier class is furnished unless otherwise specified.

Type IC8070

WHERE TO USE

Speed control of dc motors. Use rheostat to control field excitation.

Power-factor control of synchronous motors. Use rheostat to control field excitation.

Voltage control of generators and exciters. Use rheostat to control field excitation.

Adjustment of voltage in control circuits. Use rheostat to vary impressed voltage.

Speed control of wound-rotor motors. Use rheostat to vary resistance in motor secondary; not over 15 horsepower.

APPLICATIONS

A rheostat is a resistor provided with a ready means for varying its resistance. The usual application of rheostats is in the field circuits of motors or generators for the control of speed or voltage, or in control circuits. For most applications the size of the rheostat is determined by the characteristics of the load it must control. Other applications require a certain number of steps which determine the rheostat size.

GE rheostats are designed from no-taper to maximum-taper. The rheostat listing in this guide represents a portion of what is available from the GE Company. It has been found by experience that a 6-to-1 taper between the high-resistance end and the zero-resistance end obtains satisfactory control of motors and generators as well as other applications for average installations. By a 6-to-1 taper it is meant that the last step of resistance has six times the resistance of the first step.

NO-TAPER RHEOSTATS

No-taper rheostats (*i.e.,* resistance per step throughout the rheostat is uniform) have the same current rating throughout the rheostat. This is obtained by using similar resistor elements through the entire range of rheostat; hence, the current rating at one end of the rheostat is the same as the current rating at the opposite end.

TAPERED RHEOSTATS

On many applications the current-carrying capacity of the rheostat does not need to be uniform from one end to the other. For example, when controlling the voltage of a generator by field control, the field current at the lower desired voltage is less than the field current at the higher voltage. (On these rheostats the resistance elements are tapered; that is, the resistance per step and the current carrying capacity are not uniform, but are designed for a particular application.) When the rheostat is in the minimum resistance position, it must carry the maximum current of the circuit. However, as resistance is inserted in the circuit the succeeding resistor element does not have to carry as much current as the preceding resistor element previously carried.

In a tapered rheostat, increasingly smaller diameter elements are used as resistance is turned in. The ohms per element increases as the current capacity decreases but the wattage value remains equal since $P = I^2R$. Since any given area of a rheostat has the same wattage-dissipating capacity, greater utilization of the rheostat is obtained if tapered resistor elements are used.

CLASS RATING

It is GE practice to assign a class rating to all rheostats. The class rating consists of a group of digits identifying the ohmic value, maximum amperes, minimum amperes and circuit volts. A class rating of 250-2.1-.66-250 identifies a rheostat rated 250 ohms, 2.1 amp with resistance out, .66 amp with resistance in and for use in 250-volt circuit.

WATTAGE RATING

GE rheostats have the following wattage rating together with the number of divisions indicated:

Size of Rheostat Plate	Single-plate Watt Rating at No-taper Rheostat	Number of Divisions	Degrees of Rotation
6 in.	350	27	324
9 in.	675	52	324
12 in.	1100	70	324

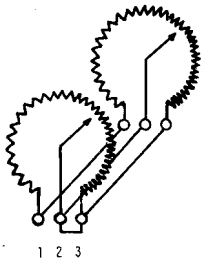


Fig. 50. Tapered rheostat. Resistance increases in CW direction. (Taper #01 6:1 and #03 maximum taper)

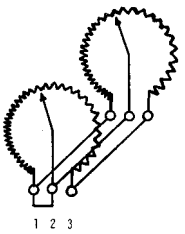


Fig. 51. Tapered rheostat. Resistance increases in CCW direction. (Taper #02 6:1 and #04 maximum taper)

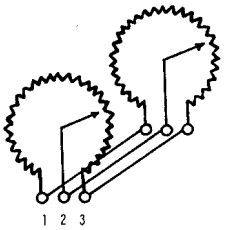


Fig. 52. No-taper rheostat. Resistance increases in CW or CCW direction. (05 no taper)

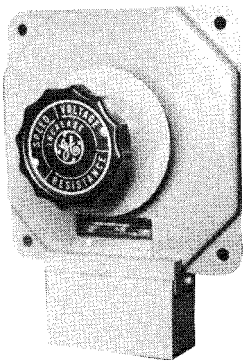


Fig. 53. IC8070 enclosed rheostat

HOW TO ORDER

Order by complete catalog number (EXAMPLE: IC8070EA101AA256) determined from pages 3-26, 3-27 or from old rheostat. Specify desired modifications and accessories from page 3-23 and order as separate item.

DIMENSIONS

Refer to page 3-24.

REFERENCES:		
Instructions		GEI100013
Renewal Parts	IC8070EA	GEF-3646
Renewal Parts	IC8070EB	GEF-3644
Renewal Parts	IC8070EC	GEF-3645

General Information

NOMENCLATURE

IC8070 E A 1 01 AA256

- IC8070 — Type
- E — Form
- A — Size of Plates
- 1 — Number of plates
- 01 — Taper and direction of rotation
- AA256 — Suffix

Type—As listed in price table.

Form

E—Standard commercial form

Size of plates

A—6-inch plate with 27 divisions
B—9-inch plate with 52 divisions
C—12-inch plate with 70 divisions

Taper and Direction of Rotation

01 6 to 1 taper, resistance turned in, in CW rotation
02 6 to 1 taper, resistance turned in, in CCW rotation
03 Maximum taper, resistance turned in, in CW rotation
04 Maximum taper, resistance turned in, in CCW rotation
05 No taper, resistance turned in, in CW or CCW rotation

Suffix

Indicates rheostat connection and details of rating. Suffix does not affect rheostat price.

MODIFICATIONS AND ACCESSORIES (Items shipped separately)

Description§	Catalog Number *
Back-of-board Mounting Mechanism (For 1-4 plates)	
Mechanism only	**9350861G1**
Mechanism with pointer and CW numbered dial	**9350861G3**
Mechanism with pointer and CCW numbered dial	**9350861G4**
Floor-mounting Supports (Required for rheostats of more than 4 plates)	
For sprocket operation (removable sprocket)	
—9-inch plates	**9736330G1**
—12-inch plates	**9736330G2**
For hand-wheel operation	
—9-inch plates	**5749401G1**
—12-inch plates	**5749401G2**
Adaptor for Benchboard Mounting	
For 9-inch plates	**9736343G1**
For 12-inch plates	**9736343G2**
Handwheel mechanism	**9327300G1**
Shaft Extension (For 6-inch, 9-inch, or 12-inch plates)	
10-inch	**9397654G1**
20-inch	**9397654G2**
Interlocks—One NO and One NC at Each End of Travel	
For 6-inch plate rheostat	**9653797G4**
For 9-inch plate rheostat	**9653797G5**
For 12-inch plate rheostat	**9653797G6**

§ For complete descriptions and dimensions refer to pages 3-23, 3-24.
* Order as separate item for customer assembly with rheostat.

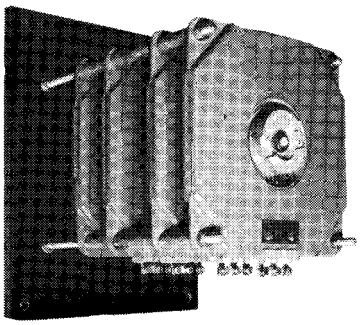


Fig. 54. Rheostat mounted back-of-board

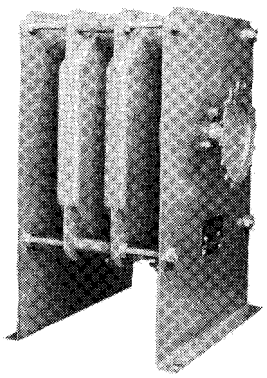


Fig. 55. Floor-mounted rheostat with sprocket wheel for chain operation

FLOOR-MOUNTING SUPPORT

(Required for more than four plates)

Nine- and 12-inch plate rheostats can be mounted on floor supports in which the rheostat is operated by a handwheel or remotely by a chain and sprocket mechanism. (See Fig. 55)

Types and Accessories

DIMENSIONS

Type	Plate Size in Inches	Dimensions in Inches						
		A				B and C	D	E and F
		Number of Plates						
		1	2	3	4			
FRONT-OF-BOARD MOUNTING—See Fig. 57								
IC8070	6 9 12	5 23/32 6 19/32 6 19/32	7 31/32 9 3/16 9 3/16	10 7/32 11 25/32 11 25/32	12 15/32 14 3/8 14 3/8	6 5/16 9 1/8 12 1/8	2 1/2 4 4	5 3/8 7 3/4 10 1/2
BACK-OF-BOARD MOUNTING—See. Fig. 58								
IC8070	6 9 12	5 15/32 5 27/32 5 27/32	7 23/32 8 5/16 8 5/16	9 31/32 10 29/32 10 29/32	12 7/32 13 1/2 13 1/2	6 5/16 9 1/8 12 1/8	2 23/22 3 3/32 3 3/32	5 3/8 7 3/4 10 1/2

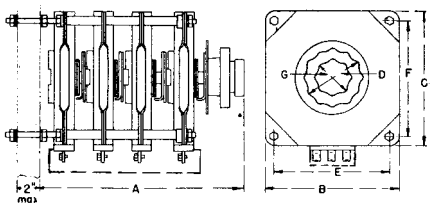


Fig. 57. Dimensions of front-of-board mounted rheostats

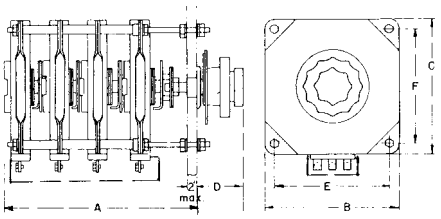


Fig. 58. Dimensions of back-of-board mounted rheostats

Number of Plates	Plate Size	Dimensions in Inches						
		A	B	C	D	E	F	G
1	9 in.	6 1/8	6 7/8	7 3/4	9 1/8	11/16	8 3/4	13 5/16
2		9 1/8	9 7/8					
3		11 3/4	12 1/2					
4		14 3/8	15 1/8					
1	12 in.	6 1/8	6 7/8	10 1/2	12 1/8	13/16	10 1/4	16 5/16
2		9 1/8	9 7/8					
3		11 3/4	12 1/2					
4		14 3/8	15 1/8					

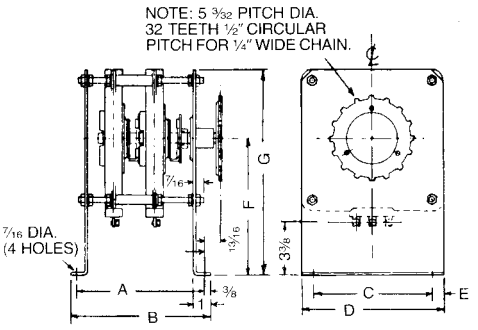


Fig. 59. Dimensions of plate rheostat mounted with Catalog 9736330G1 floor support and sprocket wheel (7-in. handwheel is furnished for hand operation)

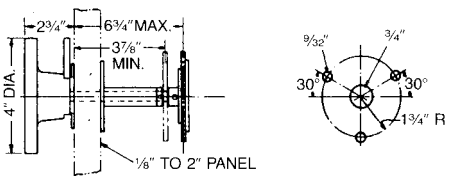


Fig. 60. Dimensions of chain-operating mechanism

RESISTORS

Index

IC NUMBERS

IC/DS Numbers*	Description	Page	IC/DS Numbers*	Description	Page
IC8000E,F	See IC8070E page 3-16		IC9033C4	Length 4 resistor	3-5
IC8005,75	Obsolete-use IC8070 form		IC9033C5	Length 5 resistor	3-6
IC8006,76	Obsolete-use IC8070 form		IC9033E2	Length 2 resistor	3-7
IC8070E	Plate rheostat	3-16	IC9033E3	Length 3 resistor	3-7
IC8492 other	Obsolete		IC9033E4	Length 4 resistor	3-7
IC9033A1,B1,C1,E1	See length 2 same type		IC9033E5	Length 5 resistor	3-7
IC9033A2	Length 2 resistor	3-4	IC9033F2	Length 2 resistor	3-4
IC9033A3	Length 3 resistor	3-4	IC9033F3	Length 3 resistor	3-4
IC9033A4	Length 4 resistor	3-5	IC9033F4	Length 4 resistor	3-5
IC9033A5	Length 5 resistor	3-6	IC9033F5	Length 5 resistor	3-6
IC9033B2	Length 2 resistor	3-4	IC9133, 35, 36	Resistor asm. (See catalog number)	3-10
IC9033B3	Length 3 resistor	3-4	IC9141A001B,002B,004B	See IC9141A per rating required	
IC9033B4	Length 4 resistor	3-5	IC9141A, B	Punched steel grid resistor	3-12
IC9033B5	Length 5 resistor	3-6	IC9143	See IC9141A per rating required	
IC9033C2	Length 2 resistor	3-4	IC9145, 46	Punched grid resistor asm.	3-13
IC9033C3	Length 3 resistor	3-4			

* IC and DS numbers are synonymous

CATALOG NUMBERS

Catalog Numbers	Description	Page	Catalog Numbers	Description	Page
111C8695	Outdoor enclosure	3-11	5119693	Mounting frame	3-10
116C7178	Outdoor enclosure	3-11	5119694	Mounting frame	3-10
125A6089	Top and side cover set	3-12	5119695	Mounting frame	3-10
1928116	See IC9141A per rating required		5149679	Connection straps	3-13
225B400	Mounting frame	3-10	5749268	Mounting frame	3-10
225B401	Mounting frame	3-10	5749401	Floor-mounting supports	3-17
225B436	Steel side cover set	3-10	5758413	Adjustable terminal	3-5
225B441	Steel top cover	3-10	5928940	Adjustable terminal	3-5
225X832	Obsolete		5980055	Adjustable terminal	3-5
227X292	Obsolete		8079695,6,7,8	Mounting feet	3-9
227X297	Obsolete		9350861	Back of board mechanism	3-17
233X832	Obsolete		9397654	Shaft extension	3-17
273A2152	Terminal assembly for IC9141	3-12	9653797	Interlocks	3-17
273A4676	Insulator kit for mounting feet	3-9	9736330	Floor-mounting supports	3-17
305A5877	(Obsolete, use 8079695,6,7,8)	3-9	9736343	Adaptor for benchboard mounting	3-17
5119681	Steel top cover	3-10	979B810	Obsolete	
5119692	Mounting frame	3-10			