



# Resistors

## Type E Edgewound Ac and Dc Applications

The Type E Edgewound resistor is a light-weight, heavy-duty unit having a non-corrodible resistance element. The resistance element is edgewound in the form of a helix on a segmented ceramic core assembled on a heat treated steel bar.

The resistance element will retain its mechanical and electrical properties both during and after repeated heating and cooling. All metal parts are either plated with or fabricated of corrosion-resistant material for overall corrosion protection. The rated temperature rise for all units is 375°C above a 40°C ambient temperature which conforms to NEMA standards for industrial control. However, under certain conditions, operation at temperatures approaching 600°C is possible without appreciable change in resistance value or without any change in mechanical properties.

Type E resistor units are available in four nominal lengths: 11, 14, 17 and 20 inches, all having the same diameter. This range of lengths together with the variety of resistance provide single unit resistors with ohmic values ranging from .051 to 8.6 ohms and current ratings from 11 to 104 amperes. Table 1 gives general characteristics for each unit size.

For mounting units in open end frame refer to Page 7.

Table 1

Unit Length	Resistance Range, Ohms	Current Range Amperes	Heat Dis. Watts Per Unit <sup>①</sup>
11	.051 to 4.3	11 to 104	520
14	.069 to 5.7	11 to 104	690
17	.085 to 7.1	11 to 104	859
20	.10 to 8.6	11 to 104	1040

<sup>①</sup> Approximate only

## Type W Wirewound Ac and Dc Service

The Type W wirewound resistor is a heavy-duty unit with a non-corrodible wire resistance element. They are ideal for applications requiring relatively high circuit resistance and



Edgewound Resistor

Wirewound Resistor

medium to low current ratings. The resistance element is wound on an insulated steel tube, and is held in place by a silicate paste which hardens when heat-cured. With this type construction, Type W resistor units will withstand most operational abuses and are highly resistant to corrosion. They are rated for a temperature rise of 375°C above a 40°C ambient.

Type W units are available in the following nominal lengths: 11, 14, 17 and 20 inches with the same diameter for all units. With this range of lengths, single unit resistors are available with ohmic values ranging from 4 to 500 ohms and current ratings from 0.92 to 11.8 amperes. General characteristics for each unit size are listed in Table 2.

For mounting units in open end frame refer to Page 7.

Table 2

Unit Length, Inches	Resistance Range, Ohms	Current Range, Amperes	Heat Dis./Watts Per Unit <sup>①</sup>
11	4.0 to 500	.92 to 10.3	426
14	5.0 to 500	1.1 to 10.8	575
17	5.0 to 500	1.2 to 12.0	700
20	6.4 to 500	1.3 to 11.8	900

<sup>①</sup> Approximate only

## Open End Frames

Open end frames are available for mounting types E and W resistor units. Up to 32 units of the same length can be mounted in a single frame. Assemblies requiring more than 32 units can be obtained by grouping frames of similar units. When multiple assemblies are used, free passage of air through the overall assembly must be provided. If additional space is required between resistor units or horizontal rows, standard open end frames can be used and specific rows omitted. Twelve frames are available for each resistor unit length in the configuration shown on Page 6.

Mounting resistor units in end frames is an easy job: the slotted ends of the resistor mounting rod rest on the threaded tie rod assembly, between ceramic spacers, and are held in place by individual locking plates. Locking nuts secure the resistors in the tie rod assembly and fasten the assembly to the open, steel end frames. The result is a sturdy self-supporting assembly that occupies a rectangular space, allows good heat dissipation and is easy to mount, connect and maintain. In open end frames, the resistor units are insulated for 600 volt rms.

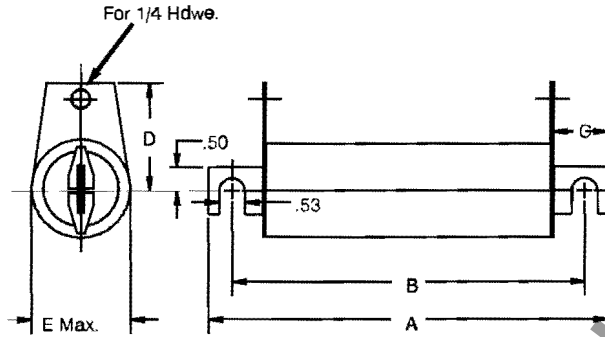
## Terminals

Types E and W resistor units are provided with terminals at each end of the unit. On type E edgewound units, the terminals are welded to the resistance element. Type W wirewound unit terminals are band clamps which grip several turns of the wire element. Additional adjustable terminals can be added to either type unit.

Industrial Power Resistors

Type "E" Resistor Unit

Figure 1

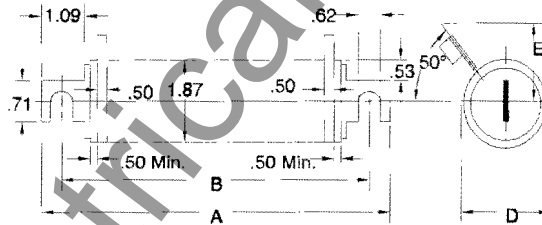


Unit Size	Dimensions						
	A	B	C	D		E	
				①	②	①	②
11	11	10	1 1/16	2 1/8	2 5/16	1 3/4	2 1/8
14	14	13	1 3/32	2 1/8	2 5/16	1 3/4	2 1/8
17 1/4	17 1/4	16 1/4	1 1/4	2 1/8	2 5/16	1 3/4	2 1/8
20 1/4	20 1/4	19 1/4	1 1/4	2 1/8	2 5/16	1 3/4	2 1/8

- ① 11-18 Amps continuous.
- ② 23-104 Amps continuous.

Type "W" Resistor Unit

Figure 2



Unit Size	A	B	C	D		E	OHMS Range
11	11	10	6 1/2	2 5/32	2 9/16	4 to 10	
				2 3/32	2 7/16	12.5 to 500	
14	14	13	10 1/2	2 5/32	2 9/16	5 to 12.5	
				2 3/32	2 7/16	16 to 500	
17 1/4	17 1/4	16 1/4	13 3/4	2 5/32	2 9/16	5 to 16	
				2 3/32	2 7/16	20 to 500	
20 1/4	20 1/4	19 1/4	16 3/4	2 5/32	2 9/16	6.4 to 20	
				2 3/32	2 7/16	25 to 500	



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Type E Edgewound												
Cont. Amps 375°C Rise	11 Inch Unit			14 Inch Unit			17 Inch Unit			26 Inch Unit		
	Ohms	Catalog Number	Style Number	Ohm	Catalog Number	Style Number	Ohms	Catalog Number	Style Number	Ohms	Catalog Number	Style Number
104	.051	R11SED051	2112A13G01	.069	R14SED069	2112A14G01	.085	R17SED085	2112A15G01	.10	R20SED100	2112A16G01
95	.063	R11SED063	2112A13G02	.084	R14SED084	2112A14G02	.105	R17SED105	2112A15G02	.13	R20SED130	2112A16G02
87	.078	R11SED078	2112A13G03	.105	R14SED105	2112A14G03	.130	R17SED130	2112A15G03	.16	R20SED160	2112A16G03
80	.095	R11SED095	2112A13G04	.130	R14SED130	2112A14G04	.165	R17SED165	2112A15G04	.20	R20SED200	2112A16G04
69	.12	R11SED120	2112A13G05	.16	R14SED160	2112A14G05	.200	R17SED200	2112A15G05	.24	R20SED240	2112A16G05
65	.14	R11SED140	2112A13G06	.19	R14SED190	2112A14G06	.24	R17SED240	2112A15G06	.29	R20SED290	2112A16G06
60	.16	R11SED160	2085A24G07	.22	R14SED220	2085A25G07	.27	R17SED270	2085A26G07	.32	R20SED320	2085A27G07
54	.20	R11SED200	2085A24G08	.27	R14SED270	2085A25G08	.34	R17SED340	2085A26G08	.40	R20SED400	2085A27G08
47	.25	R11SED250	2085A24G09	.34	R14SED340	2085A25G09	.42	R17SED420	2085A26G09	.51	R20SED510	2085A27G09
44	.31	R11SED310	2085A24G10	.42	R14SED420	2085A25G10	.52	R17SED520	2085A26G10	.63	R20SED630	2085A27G10
39	.40	R11SED400	2085A24G12	.53	R14SED530	2085A25G12	.66	R17SED660	2085A26G12	.80	R20SED800	2085A27G12
35	.50	R11SED500	2085A24G13	.67	R14SED670	2085A25G13	.84	R17SED840	2085A26G13	1.00	R20SE1D00	2085A27G13
31	.62	R11SED620	2085A24G14	.84	R14SED840	2085A25G14	1.05	R17SE1D05	2085A26G14	1.26	R20SE1D26	2085A27G14
28	.78	R11SED780	2085A24G15	1.05	R14SE1D05	2085A25G15	1.3	R17SE1D30	2085A26G15	1.58	R20SE1D58	2085A27G15
26	.94	R11SED940	2085A24G16	1.30	R14SE1D30	2085A25G16	1.6	R17SE1D60	2085A26G16	1.95	R20SE1D95	2085A27G16
23	1.15	R11SE1D15	2085A24G17	1.56	R14SE1D55	2085A25G17	1.95	R17SE1D95	2085A26G17	2.34	R20SE2034	2085A27G17
18	1.4	R11SE1D40	2085A24G18	2.0	R14SE2D00	2085A25G18	2.5	R17SE2D50	2085A26G18	3.0	R20SE3D00	2085A27G18
16	1.8	R11SE1D80	2085A24G19	2.4	R14SE2D40	2085A25G19	3.0	R17SE3D00	2085A26G19	3.5	R20SE3D50	2085A27G19
15	2.3	R11SE2D30	2085A24G21	2.8	R14SE2D80	2085A25G20	3.5	R17SE3D50	2085A26G20	4.3	R20SE4D30	2085A27G20
13.5	2.8	R11SE2D80	2085A24G22	3.8	R14SE3D80	2085A25G22	4.8	R17SE4D80	2085A26G22	5.7	R20SE5D70	2085A27G22
12.7	3.2	R11SE3D20	2085A24G23	4.3	R14SE4D30	2085A25G23	5.4	R17SE5D40	2085A26G23	6.5	R20SE6D50	2085A27G23
12	3.8	R11SE3D80	2085A24G24	5.1	R14SE5D10	2085A25G24	6.4	R17SE6D40	2085A26G24	7.6	R20SE7D60	2085A27G24
11	4.3	R11SE4D30	2085A24G26	5.7	R14SE5D70	2085A25G26	7.1	R17SE7D10	2085A26G26	8.6	R20SE8D60	2085A27G26

Type W Wirewound												
Ohms	11 Inch Unit			14 Inch Unit			17 Inch Unit			20 Inch Unit		
	Amps ①	Catalog Number	Style Number	Amps ①	Catalog Number	Style Number	Amps ①	Catalog Number	Style Number	Amps ①	Catalog Number	Style Number
4	10.3	R11SW4D00	04D5194G01	.....	.....	.....	.....	.....	.....	.....	.....	.....
5	9.2	R11SW5D00	04D5194G02	10.8	R14SW5D00	47D0146G01	12.0	R17SW5D00	04D7908G01	.....	.....	.....
6.4	8.2	R11SW6D40	04D5194G03	9.5	R14SW6D40	47D0146G02	10.6	R17SW6D40	04D7908G02	11.8	R20SW6D40	55D0500G01
8	7.3	R11SW8D00	04D5194G04	8.5	R14SW8D00	47D0146G03	9.4	R17SW8D00	04D7908G03	10.6	R20SW8D00	55D0500G02
10	6.6	R11SW10D0	04D5194G05	7.6	R14SW10D0	47D0146G04	8.5	R17SW10D0	04D7908G04	9.4	R20SW10D0	55D0500G03
12.5	5.8	R11SW12D5	04D5194G06	6.7	R14SW12D5	47D0146G05	7.5	R17SW12D5	04D7908G05	8.0	R20SW12D5	55D0500G04
16	5.2	R11SW16D0	04D5194G07	6.0	R14SW16D0	47D0146G06	6.7	R17SW16D0	04D7908G06	7.4	R20SW16D0	55D0500G05
20	4.6	R11SW20D0	04D5194G08	5.4	R14SW20D0	47D0146G07	6.0	R17SW20D0	04D7908G07	6.7	R20SW20D0	55D0500G06
25	4.1	R11SW25D0	04D5194G09	4.8	R14SW25D0	47D0146G08	5.3	R17SW25D0	04D7908G08	5.95	R20SW25D0	55D0500G07
32	3.7	R11SW32D0	04D5194G10	4.3	R14SW32D0	47D0146G09	4.8	R17SW32D0	04D7908G09	5.3	R20SW32D0	55D0500G08
40	3.3	R11SW40D0	04D5194G11	3.8	R14SW40D0	47D0146G10	4.2	R17SW40D0	04D7908G10	4.7	R20SW40D0	55D0500G09
50	2.9	R11SW50D0	04D5194G12	3.4	R14SW50D0	47D0146G11	3.8	R17SW50D0	04D7908G11	4.2	R20SW50D0	55D0500G10
64	2.6	R11SW64D0	04D5194G13	3.0	R14SW64D0	47D0146G12	3.4	R17SW64D0	04D7908G12	3.7	R20SW64D0	55D0500G11
80	2.4	R11SW80D0	04D5194G14	2.7	R14SW80D0	47D0146G13	3.0	R17SW80D0	04D7908G13	3.4	R20SW80D0	55D0500G12
100	2.1	R11SW100D	04D5194G15	2.4	R14SW100D	47D0146G14	2.7	R17SW100D	04D7908G14	3.0	R20SW100D	55D0500G13
125	1.9	R11SW125D	04D5194G16	2.2	R14SW125D	47D0146G15	2.4	R17SW125D	04D7908G15	2.7	R20SW125D	55D0500G14
160	1.7	R11SW160D	04D5194G17	1.9	R14SW160D	47D0146G16	2.1	R17SW160D	04D7908G16	2.4	R20SW160D	55D0500G15
200	1.5	R11SW200D	04D5194G18	1.7	R14SW200D	47D0146G17	1.9	R17SW200D	04D7908G17	2.1	R20SW200D	55D0500G16
250	1.3	R11SW250D	04D5194G19	1.5	R14SW250D	47D0146G18	1.7	R17SW250D	04D7908G18	1.9	R20SW250D	55D0500G17
320	1.2	R11SW320D	04D5194G20	1.3	R14SW320D	47D0146G19	1.5	R17SW320D	04D7908G19	1.7	R20SW320D	55D0500G18
400	1.0	R11SW400D	04D5194G21	1.2	R14SW400D	47D0146G20	1.3	R17SW400D	04D7908G20	1.5	R20SW400D	55D0500G19
500	.92	R11SW500D	04D5194G22	1.1	R14SW500D	47D0146G21	1.2	R17SW500D	04D7908G21	1.3	R20SW500D	55D0500G20

① Continuous based on 375°C rise.



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Style Number Conversion Data

Old Style	New Style	Catalog Number	Old Style	New Style	Catalog Number	Old Style	New Style	Catalog Number
508 235	04D7908G04	R17SW10D0	883 199	47D0146G13	R14SW80D0	899 097	55D0500G16	R20SW200D
508 237	04D7908G07	R17SW20D0	883 200	47D0146G14	R14SW100D	899 098	55D0500G17	R20SW250D
508 240	04D7908G11	R17SW50D0	883 201	47D0146G15	R14SW125D	899 099	55D0500G18	R20SW320D
508 242	04D7908G14	R17SW100D	883 202	47D0146G16	R14SW160D	899 100	55D0500G19	R20SW400D
590 985	04D7908G20	R17SW400D	883 203	47D0146G17	R14SW200D	899 101	55D0500G20	R20SW500D
883 152	04D7908G01	R17SW5D00	883 204	47D0146G18	R14SW250D	889 102	Ⓢ	Ⓢ
883 153	04D7908G02	R17SW6D40	883 205	47D0146G19	R14SW320D	889 103	Ⓢ	Ⓢ
883 154	04D7908G03	R17SW8D00	883 206	47D0146G20	R14SW400D	889 104	Ⓢ	Ⓢ
883 155	04D7908G05	R17SW12D5	883 207	47D0146G21	R14SW500D	889 105	Ⓢ	Ⓢ
883 156	04D7908G06	R17SW16D0	883 208	Ⓢ	Ⓢ	889 106	Ⓢ	Ⓢ
883 157	04D7908G08	R17SW25D0	883 209	Ⓢ	Ⓢ	899 107	Ⓢ	Ⓢ
883 158	04D7908G09	R17SW32D0	883 210	Ⓢ	Ⓢ	899 108	Ⓢ	Ⓢ
883 159	04D7908G10	R17SW40D0	883 211	Ⓢ	Ⓢ	899 109	Ⓢ	Ⓢ
883 160	04D7908G12	R17SW64D0	883 212	Ⓢ	Ⓢ	899 110	Ⓢ	Ⓢ
883 161	04D7908G13	R17SW80D0	883 213	Ⓢ	Ⓢ	899 142	2085A25G18	R14SE2D00
883 162	04D7908G15	R17SW125D	883 214	Ⓢ	Ⓢ	899 144	2085A25G22	R14SE3D80
883 163	04D7908G16	R17SW160D	883 220	2112A13G02	R11SED063	899 145	2085A25G23	R14SE4D30
883 164	04D7908G17	R17SW200D	883 221	2112A13G03	R11SED078	1038 305	2085A24G08	R11SED200
883 165	04D7908G18	R17SW250D	883 222	2112A13G04	R11SED095	1038 485	2085A26G15	R17SE1D30
883 166	04D7908G19	R17SW320D	883 223	2112A13G06	R11SED140	1081 621	2085A26G16	R17SE1D60
883 167	04D7908G21	R17SW500D	883 230	2085A24G14	R11SED620	1081 630	2112A14G03	R14SED105
883 168	Ⓢ	Ⓢ	883 234	2085A24G18	R11SE1D40	1081 631	2112A14G04	R14SED130
883 169	Ⓢ	Ⓢ	883 235	2085A24G19	R11SE1D80	1133 300	2112A14G01	R14SED069
883 170	Ⓢ	Ⓢ	883 237	2085A24G22	R11SE2D80	1133 301	2112A14G02	R14SED084
883 171	Ⓢ	Ⓢ	883 238	2085A24G23	R11SE3D20	1133 302	2112A14G05	R14SED160
883 172	Ⓢ	Ⓢ	899 082	55D0500G01	R20SW6D40	1133 303	2112A14G06	R14SED190
883 173	Ⓢ	Ⓢ	899 083	55D0500G02	R20SW8D00	1133 311	2112A15G01	R17SED085
883 174	Ⓢ	Ⓢ	899 084	55D0500G03	R20SW10D0	1133 312	2112A15G02	R17SED105
883 187	47D0146G01	R14SW5D00	899 085	55D0500G04	R20SW12D5	1133 313	2112A15G03	R17SED130
883 188	47D0146G02	R14SW6D40	899 086	55D0500G05	R20SW16D0	1133 314	2112A15G04	R17SED165
883 189	47D0146G03	R14SW8D00	899 087	55D0500G06	R20SW30D0	1133 315	2112A15G05	R17SED200
883 190	47D0146G04	R14SW10D0	899 088	55D0500G07	R20SW25D0	1133 316	2112A15G06	R17SED240
883 191	47D0146G05	R14SW12D5	899 089	55D0500G08	R20SW32D0	1133 324	2085A26G17	R17SE1D95
883 192	47D0146G06	R14SW16D0	899 090	55D0500G09	R20SW40D0	1154 104	2085A25G07	R14SED220
883 193	47D0146G07	R14SW20D0	899 091	55D0500G10	R20SW50D0	1154 105	2085A25G08	R14SED270
883 194	47D0146G08	R14SW25D0	899 092	55D0500G11	R20SW64D0	1154 106	2085A25G09	R14SED340
883 195	47D0146G09	R14SW32D0	899 093	55D0500G12	R20SW80D0	1154 108	2085A25G10	R14SED420
883 196	47D0146G10	R14SW40D0	899 094	55D0500G13	R20SW100D	1154 109	2085A25G12	R14SED530
883 197	47D0146G11	R14SW50D0	899 095	55D0500G14	R20SW125D	1154 110	2085A25G13	R14SED670
883 198	47D0146G12	R14SW64D0	899 096	55D0500G15	R20SW160D	1154 111	2085A25G14	R14SED840

Ⓢ No longer available, contact your nearest Westinghouse Sales Office.





**Industrial Power Resistors**

**Style Number Conversion Data**

Old Style	New Style	Catalog Number	Old Style	New Style	Catalog Number	Old Style	New Style	Catalog Number
1154 112	2085A25G15	R14SE1D05	1239 017	04D5194G18	R11SW200D	1249 122	2085A27G19	R20SE3D50
1154 113	2085A25G16	R14SE1D30	1239 018	04D5194G19	R11SW250D	1249 123	2085A27G20	R20SE4D30
1154 114	2085A25G17	R14SE1D55	1239 019	04D5194G20	R11SW320D	1249 125	2085A27G22	R20SE5D70
1154 115	2085A26G07	R17SED270	1239 020	04D5194G21	R11SW400D	1249 126	2085A27G23	R20SE6D50
1154 116	2085A26G08	R17SED340	1239 021	04D5194G22	R11SW500D	1249 127	2085A27G24	R20SE7D60
1154 117	2085A26G09	R17SED420	1239 022	①	①	1249 129	2085A27G26	R20SE8D60
1154 119	2085A26G10	R17SED520	1239 023	①	①			
1154 120	2085A26G12	R17SED660	1239 024	①	①			
1154 121	2085A26G13	R17SED840	1239 025	①	①			
1154 122	2085A26G14	R17SE1D05	1239 026	①	①			
1169 053	2085A26G26	R17SE7D10	1239 027	①	①			
1169 056	2085A24G13	R11SED500	1239 100	2085A25G19	R14SE2D40			
1169 059	2085A26G19	R17SE3D00	1239 101	2085A25G20	R14SE2D80			
1169 060	2085A25G26	R14SE5D70	1239 102	2085A25G24	R14SE5D10			
1183 688	2085A26G20	R17SE3D50	1239 108	2085A26G18	R17SE2D50			
1183 695	2085A26G23	R17SE5D40	1239 109	2085A26G24	R17SE6D40			
1189 128	2085A27G12	R20SED800	1239 115	2085A24G07	R11SED160			
1216 707	2085A24G09	R11SED250	1239 116	2085A24G12	R11SED400			
1216 708	2085A24G10	R11SED310	1239 117	2085A24G15	R11SED780			
1216 709	2085A24G16	R11SED940	1239 118	2085A24G21	R11SE2D30			
1216 710	2085A24G17	R11SE1D15	1239 119	2085A24G24	R11SE3D80			
1216 739	2112A13G01	R11SED051	1239 120	2085A24G26	R11SE4D30			
1216 744	2112A13G05	R11SED120	1239 121	2085A26G22	R17SE4D80			
1239 000	04D5194G01	R11SW4D00	1249 100	2112A16G01	R20SED100			
1239 001	04D5194G02	R11SW5D00	1249 101	2112A16G02	R20SED130			
1239 002	04D5194G03	R11SW6D40	1249 102	2112A16G03	R20SED160			
1239 003	04D5194G04	R11SW8D00	1249 103	2112A16G04	R20SED200			
1239 004	04D5194G05	R11SW10D0	1249 104	2112A16G05	R20SED240			
1239 005	04D5194G06	R11SW12D5	1249 105	2112A16G06	R20SED290			
1239 006	04D5194G07	R11SW16D0	1249 106	2085A27G07	R20SED320			
1239 007	04D5194G08	R11SW20D0	1249 108	2085A27G08	R20SED400			
1239 008	04D5194G09	R11SW25D0	1249 110	2085A27G09	R20SED510			
1239 009	04D5194G10	R11SW32D0	1249 112	2085A27G10	R20SED630			
1239 010	04D5194G11	R11SW40D0	1249 128	2085A27G12	R20SED800			
1239 011	04D5194G12	R11SW50D0	1249 115	2085A27G13	R20SE1D00			
1239 012	04D5194G13	R11SW64D0	1249 117	2085A27G14	R20SE1D26			
1239 013	04D5194G14	R11SW80D0	1249 118	2085A27G15	R20SE1D58			
1239 014	04D5194G15	R11SW100D	1249 119	2085A27G16	R20SE1D95			
1239 015	04D5194G16	R11SW125D	1249 120	2085A27G17	R20SE2D34			
1239 016	04D5194G17	R11SW160D	1249 121	2085A27G18	R20SE3D00			

① No longer available, contact your nearest Westinghouse Sales Office.



**Industrial Power Resistors**

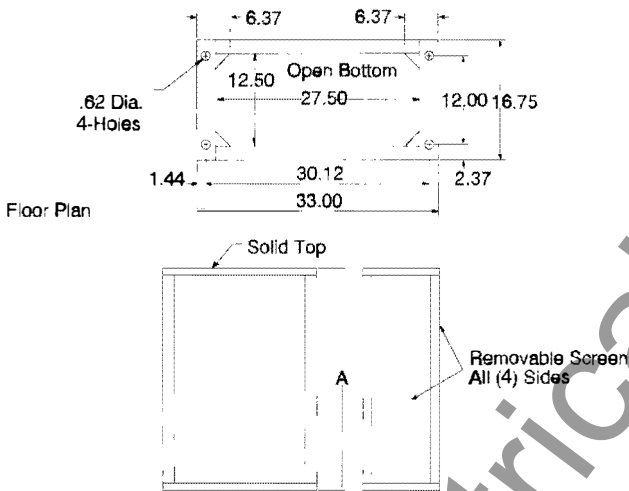
**Type LG Resistors, Unit Frames UL Listed**  
**Description**

The type LG punched grid resistor is a rugged, non-breakable, heavy duty type resistor. Grids are designed to provide the longest possible current path and the maximum area for heat dissipation, thus resulting in greater capacity per grid and per frame.

Steel mounting rods are completely insulated by a single piece tubular sleeve of insulating material. The insulating spacers between grids are then assembled over the insulating sleeve. Grids are made of a corrosion-resistant chromium alloy steel which gives a negligible resistance change between cold start and normal operating temperatures.

**Ventilated Indoor Enclosure Available for LG Resistor Frames**

Group	Enclosure S# Ref.	A
01	216A881G06	48
02	216A881G07	64
03	216A881G08	76
04	216A881G09	90



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**Industrial Power Resistors**

**Style Number Crossover Index**

Old Style Number	New Style Number	Unit Frame Size
1776 145	44A6400G01	18
1776 146	44A6400G02	18
1776 147	44A6400G03	18
1776 148	44A6401G03	18
1776 149	44A6403G01	18
1776 150	44A6403G02	18
1776 155	44A6403G03	18
1776 156	44A6405G01	18
1776 157	44A6405G02	18
1776 158	44A6405G03	18
1776 159	44A6406G03	18
1776 160	44A6407G01	18
1776 161	44A6407G02	18
1776 162	44A6407G03	18
1776 163	44A6408G01	26
1776 164	44A6408G02	26
1776 165	44A6408G03	26
1776 166	44A6409G03	26
1776 167	44A6410G01	26
1776 168	44A6410G02	26
1776 169	44A6410G03	26
1776 170	44A6412G03	26
1776 179	44A6413G01	26
1776 180	44A6413G02	26
1776 181	44A6413G03	26
1776 182	44A6414G01	26
1776 183	44A6414G02	26
1776 184	44A6414G03	26
1776 185	44A6415G03	26
1777 564	44A6401G01	18
1777 565	44A6401G02	18
1777 566	44A6402G01	18
1777 567	44A6402G02	18
1777 568	44A6402G03	18
1777 569	44A6404G01	18
1777 570	44A6404G02	18
1777 571	44A6404G03	18
1777 572	44A6406G01	18
1777 573	44A6406G02	18
1777 574	44A6409G01	26
1777 575	44A6409G02	26
1777 576	44A6411G01	26
1777 577	44A6411G02	26
1777 578	44A6411G03	26
1777 579	44A6412G01	26
1777 580	44A6412G02	26
1777 581	44A6415G01	26
1777 582	44A6415G02	26

**Ordering Information**

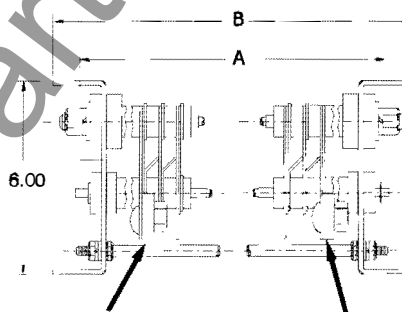
Order by style number.

**Dimensions**

In inches: Not to be used for construction purposes unless approved.

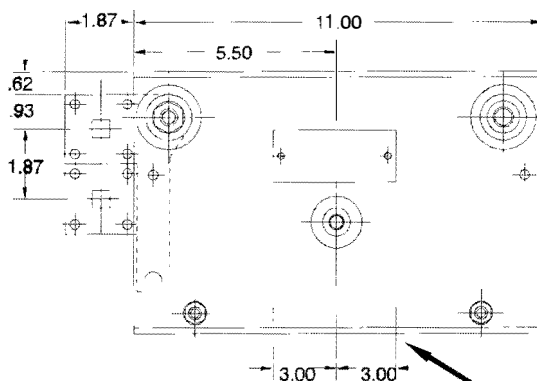
**18 and 26 1/2 Inch Type LG Frames**

Frame Size	Dimensions, Inches	
	A	B
18"	16 1/2	18
26 1/2"	25	26 1/2



Frame mounts 2 removable terminal caps which can be relocated and mounted on any terminal.

Right lower bottom terminal; all other terminals mounted alternately.



4 (5/8 x 7/8)



Industrial Power Resistors

Total Ohms	Style Number Ⓜ	Cont. Amps <sup>Ⓜ</sup>	Total No. of Grids	Ohms Per Grid	No. of Steps	Grids Per Step	Wt. Lbs.
<b>18" Unit Frame</b>							
.146	44A6400G01	160	14	.0104	7	2	29
.187	44A6401G01	145	18	.0104	9	2	30
.196	44A6400G02	140	14	.014	7	2	26
.274	44A6400G03	118	14	.0196	7	2	23
.280	44A6401G02	127	20	.014	10	2	31
.39	44A6401G03	107	20	.0195	10	2	26
.51	44A6403G01	94	20	.0254	10	2	29
.64	44A6403G02	84	20	.0318	10	2	26
.71	44A6402G01	83	28	.0254	7	4	35
.89	44A6402G02	74	28	.0318	7	4	31
.93	44A6403G03	70	20	.0462	10	2	23
1.39	44A6402G03	61	30	.0462	7	4&6 <sup>Ⓜ</sup>	27
1.56	44A6405G01	54	20	.078	10	2	25
2.18	44A6405G02	45	20	.109	10	2	22
2.34	44A6404G01	47	30	.078	7	4&6 <sup>Ⓜ</sup>	30
3.1	44A6405G03	38	20	.155	10	2	20
3.3	44A6404G02	40	30	.109	7	4&6 <sup>Ⓜ</sup>	27
4.0	44A6407G01	33	20	.20	10	2	22
4.7	44A6404G03	33	30	.155	7	4&6 <sup>Ⓜ</sup>	23
6.0	44A6406G01	29	30	.20	7	4&6 <sup>Ⓜ</sup>	25
6.0	44A6407G02	27	20	.30	10	2	19
8.0	44A6407G03	23	20	.40	10	2	18
9.0	44A6406G02	24	30	.30	7	4&6 <sup>Ⓜ</sup>	22
12.8	44A6406G03	20	32	.40	8	4	20
<b>26½" Unit Frames</b>							
.250	44A6408G01	160	24	.0104	12	2	45
.33	44A6409G01	145	32	.0104	16	2	54
.34	44A6408G02	140	24	.014	12	2	39
.45	44A6409G02	127	32	.014	16	2	45
.51	44A6408G03	118	26	.0196	13	2	35
.67	44A6409G03	107	34	.0196	17	2	39
.81	44A6410G01	94	32	.0254	16	2	43
1.1	44A6410G02	84	34	.0318	17	2	39
1.17	44A6411G01	83	46	.0254	11	4&6 <sup>Ⓜ</sup>	53
1.53	44A6411G02	74	48	.0318	12	4	47
1.6	44A6410G03	70	34	.0462	17	2	33
2.31	44A6411G03	61	50	.0462	12	4&6 <sup>Ⓜ</sup>	39
2.67	44A6413G01	54	34	.078	17	2	37
3.7	44A6413G02	45	34	.109	17	2	32
3.9	44A6412G01	47	50	.078	12	4&6 <sup>Ⓜ</sup>	50
5.5	44A6412G02	40	50	.109	12	4&6 <sup>Ⓜ</sup>	38
5.6	44A6413G03	38	36	.155	18	2	29
6.8	44A6414G01	33	34	.20	17	2	31
8.1	44A6412G03	33	52	.155	13	4	33
10.0	44A6415G01	29	50	.20	12	4&6 <sup>Ⓜ</sup>	36
10.2	44A6414G02	27	34	.30	17	2	27
14.4	44A6414G03	23	36	.40	18	2	26
15.6	44A6415G02	24	52	.30	13	4	31
20.3	44A6415G03	20	52	.40	13	4	28

Ⓜ Based on 375°C rise.

Ⓜ More than two terminal clamps including hardware per frame - add \$8.00 per tap. Supplied only when ordered with unit frames.

Ⓜ Six grids in last step only.



**Industrial Power Resistors**

Total Ohms	Ampere Rating <sup>①</sup> For AC and DC Applications											Cont. KW Rating <sup>①</sup>
	Continuous	Class 170	Class 160	Class 150	Class 140	Class 130	Class 110	60 Sec.	30 Sec.	15 Sec.	10 Sec.	
<b>18 Inch Unit Frames</b>												
.146	160	225	270	300	350	400	560	365	510	715	870	3.74
.187	145	195	240	270	320	360	500	365	510	715	870	3.93
.196	140	195	230	260	310	350	490	270	385	515	630	3.84
.274	118	165	195	220	260	295	415	200	275	340	420	3.84
.280	127	170	205	230	280	315	445	270	385	515	630	4.52
.39	107	142	175	200	235	265	275	200	275	340	420	4.49
.51	94	125	155	175	215	235	330	190	265	380	465	4.51
.64	84	110	137	155	185	210	295	153	220	305	370	4.48
.71	83	100	132	150	185	208	290	190	265	380	465	4.89
.89	74	100	118	132	163	185	260	153	220	305	370	4.87
.93	70	93	115	127	155	174	245	105	145	208	255	4.53
1.39	61	83	98	110	135	153	215	105	145	208	255	5.17
1.56	54	72	88	100	120	135	190	90	128	180	220	4.55
2.18	45	61	75	82	100	112	157	65	92	130	158	4.41
2.34	47	64	75	85	103	117	165	90	128	180	220	5.17
3.1	38	50	62	70	83	95	133	45	65	91	110	4.48
3.3	40	54	64	72	88	100	140	65	92	130	158	5.23
4.0	33	45	55	60	72	82	115	45	63	90	110	4.46
4.7	33	45	54	60	72	82	115	45	65	91	110	5.06
6.0	29	40	47	52	63	72	103	45	63	90	110	5.06
6.0	27	36	45	50	59	67	94	32	45	65	75	4.37
8.0	23	31	39	42	48	57	80	23	32	45	52	4.23
9.0	24	32	38	43	52	60	84	32	45	65	75	5.18
12.8	20	28	33	36	44	50	70	23	32	45	52	5.12
<b>26½ Inch Unit Frames</b>												
.250	160	225	270	300	350	400	560	365	510	715	870	6.40
.33	145	195	240	270	320	360	500	365	510	715	870	7.00
.34	140	195	230	260	310	350	490	270	385	515	630	6.59
.45	127	170	205	230	280	315	445	270	385	515	630	7.26
.51	118	165	195	220	260	295	415	200	275	340	420	7.10
.67	107	142	175	200	235	265	275	200	275	340	420	7.64
.81	94	125	155	175	215	235	330	190	265	380	465	7.17
1.08	84	110	137	155	185	210	295	153	220	305	370	7.62
1.17	83	100	132	150	185	208	290	190	265	380	465	8.06
1.53	74	100	118	132	163	185	260	153	220	305	370	8.38
1.57	70	93	115	127	155	175	245	105	145	208	255	7.69
2.31	61	83	98	110	135	153	215	105	145	208	255	8.60
2.67	54	72	88	100	120	135	190	90	128	180	220	7.79
3.7	45	61	75	82	100	112	157	65	92	130	158	7.49
3.9	47	64	75	85	103	117	165	90	128	180	220	8.62
5.5	40	54	64	72	88	100	140	65	92	130	158	8.72
5.6	38	50	62	70	83	95	133	45	65	91	110	8.04
6.8	33	45	55	60	72	82	115	45	63	90	110	7.41
8.1	33	45	54	60	72	82	115	45	65	91	110	8.77
10.0	29	40	47	52	63	72	103	45	63	90	110	8.41
10.2	27	36	45	50	59	67	94	32	45	65	75	7.44
14.4	23	31	39	42	48	57	80	23	32	45	52	7.62
15.6	24	32	38	43	52	60	84	32	45	65	75	8.99
20.8	20	28	33	36	44	50	70	23	32	45	52	8.32

① Based on 375°C rise.



## Neutral Grounding Resistors, Edgewound Type

### Application

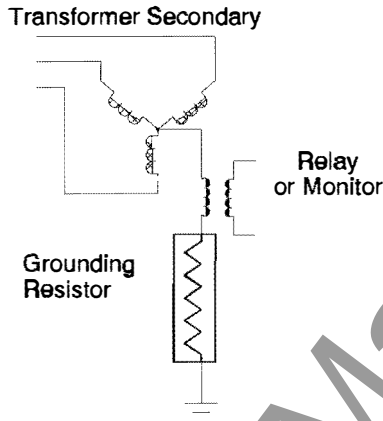
Grounding Resistors using edgewound stainless steel tubes are used for several purposes in industrial and distribution systems including:

1. To provide isolation of circuits underground fault conditions.
2. To limit over voltages on equipment underground fault conditions.
3. To limit ground fault current and therefore fault damage.

The method of selection is based on OHM's law -  $E = IR$  - where  $E$  is the neutral voltage,  $I$  is the desired maximum ground fault current and  $R$  is the ohmic value of the grounding resistor.  $E$  is obtained by dividing the line to line voltage by  $\sqrt{3}$ .  $I$  is a value of current decided upon by the specifying engineer and is large enough to provide sufficient current for protective relaying but small enough to limit fault damage.  $R$  is then the value obtained from the formula  $E = IR$ .

Another factor to consider is the time rating. Time ratings of ground resistors are as prescribed by IEEE Standard 32-1972 which range from 10 seconds to continuous. These time ratings refer to the time which the resistor can carry rated currents without exceeding its temperature rating. Selection of a time rating is based on allowing enough time for the protective relays to operate or to allow for an orderly shutdown if the system is monitored instead of relayed.

Temperature ratings are based on 760°C rise for resistors rated up through one minute, 610°C for extended time and 385°C for continuous ratings. Extended time is defined by IEEE as a rating where maximum temperature rise will not be required for more than an average of 90 days per year. This extended time rating also applies to resistors specified for mine duty, as the Federal Register states that the rating shall meet the extended time rating set forth in IEEE Std. #32-1972.



### Options

Options available include stands, provisions for current transformers, current transformer, stand off insulators, entrance bushings and terminal lugs. A resistor with frame covers is used when it is desired to exclude the possible entry of birds, rodents or other animals from the resistor. The safety enclosure is used for personnel safety and completely encloses the resistor, and live parts.

The resistor stand is another option which can be used to provide personnel safety by elevating the resistor out of reach of personnel. A safety enclosure can be used in conjunction with the stand to provide additional safety.

### Features

Westinghouse grounding resistors will handle all ranges of current capacities, times of operation and ohmic values to suite individual needs. They are designed, manufactured and tested under strict control and in conformance with IEEE 32-1972 standards for neutral grounding devices. Standard factory tests include overpotential tests for the resistor element, ohmic value, and circuit continuity plus a rigorous inspection of the inner electrical terminal connections. All grounding resistors are completely interconnected at the factory eliminating complicated wiring installations.

The resistor element consists of an edgewound helix strap wound around a ceramic core on a longitudinal steel bar. The resistor element is made from a special high resistance stainless steel. It is suitable for both indoor and outdoor service and requires no further protection from atmospheric conditions.

Elements are individually supported at each end by glazed ceramic insulators in such a manner that permits expansion of the supporting bar when subjected to the high operating temperatures. The ceramic insulators are designed for 5kV service.

Resistor elements are electrically joined by stainless steel connectors welded to the stainless steel terminals to provide a positive electrical path. From neutral connection point to ground connectors, all electrical circuitry is welded. This helps to assure continuity regardless of atmospheric or thermal conditions. Resistor elements are connected in series or series parallel to provide an ohmic value of resistance to meet individual system requirements.

The standard frame assembly and safety enclosure for edgewound resistor units is constructed of corrosion resistant hot dip galvanized angle. All members are assembled using outdoor hardware. The assembly is therefore impervious to corrosion encountered under normal atmospheric conditions and of sufficient strength to withstand severe mechanical stress.

Resistor frames and safety enclosures may be supplied in aluminum - contact factory.

The frame is modular facilitating flexibility of design and quick delivery when required.

Porcelain base insulators are of pin and cap type and used on all applications of 4160 rated volts or higher. Insulators are used for both outdoor and indoor units and conform to ANSI Std. C29-8.



**Neutral Grounding Resistors, Edgewound Type**

**High voltage**

Edgewound Indoor or Outdoor Grounding Resistor

**1385 Volts Line to Neutral (2400 Volt System)**

Amperes	Open Ground Resistor		Ground Resistor with Covers ② Mounted on Frame		Ground Resistor with Safety Enclosure		Ground Resistor with Safety Enclosure for Mounting on Power Transformer	
	Style Number	Page 21 Assembly Number	Style Number	Page 21 Assembly Number	Style Number	Page 23 Assembly Number	Style Number	PG 23 & 24 Assembly Number
<b>10 Second Rating 760°C Rise①</b>								
2000	2201A14G01	11	2201A14G02	12B	2201A14G03	26	2201A14G04	26
1500	2201A13G01	2A	2201A13G02	3C	2201A13G03	21	2201A13G04	21
1200	2201A12G01	11	2201A12G02	12B	2201A12G03	26	2201A12G04	26
1000	2201A11G01	11	2201A11G02	12B	2201A11G03	26	2201A11G04	26
900	2201A10G01	1	2201A10G02	2B	2201A10G03	21	2201A10G04	21
800	2201A09G01	1A	2201A09G02	2C	2201A09G03	21	2201A09G04	21
600	2201A08G01	1A	2201A08G02	2C	2201A08G03	21	2201A08G04	21
500	2201A07G01	1A	2201A07G02	1A	2201A07G03	21	2201A07G04	21
400	2201A06G01	1	2201A06G02	1	2201A06G03	21	2201A06G04	21
300	2201A05G01	1	2201A05G02	1	2201A05G03	21	2201A05G04	21
200	2201A04G01	1	2201A04G02	1	2201A04G03	21	2201A04G04	21
150	2201A03G01	1	2201A03G02	1	2201A03G03	21	2201A03G04	21
100	2201A02G01	1A	2201A02G02	1A	2201A02G03	21	2201A02G04	21
50	2201A01G01	1	2201A01G02	1	2201A01G03	21	2201A01G04	21
<b>Extended Time Rating 610°C Rise</b>								
100	2201A83G01	16A	2201A83G02	16A	2201A83G03	28	2201A83G04	28
50	2201A82G01	13A	2201A82G02	13A	2201A82G03	27	2201A82G04	27
25	2201A81G01	2	2201A81G02	2	2201A81G03	21	2201A81G04	21
<b>Continuous Time Rating 385°C Rise</b>								
25	2201A19G01	4	2201A19G02	4	2201A19G03	22	2201A19G04	22
10	2201A18G01	2A	2201A18G02	2A	2201A18G03	21	2201A18G04	21
5	2201A17G01	4A	2201A17G02	4A	2201A17G03	22	2201A17G04	22

**Selection Data Required**

The following information is required to properly select a grounding resistor:

1. Application
2. Electrical Characteristics
  - Ohms
  - Amperes
  - Rated Volts
  - Time in Seconds
  - System Volts
3. Type of grounding resistors, including any deviation from IEEE standard.

① Other time ratings, refer to factory.

② Screens on top and bottom, solid sides.



**Neutral Grounding Resistors, Edgewound Type**

**High Voltage**

Edgewound Indoor or Outdoor Grounding Resistor

**2400 Volts Line to Neutral (4160 Volt System)**

Amperes	Open Ground Resistor		Ground Resistor with Covers ② Mounted on Frames		Ground Resistor with Safety Enclosure		Ground Resistor with Safety Enclosure for Mounting on Power Transformer	
	Style Number	Page 21 Assembly Number	Style Number	Page 21 Assembly Number	Style Number	Page 23 Assembly Number	Style Number	PG 23 & 24 Assembly Number
<b>10 Second Rating 760°C Rise①</b>								
2000	2201A33G01	12	2201A33G02	13B	2201A33G03	26	2201A33G04	26
1500	2201A32G01	12A	2201A32G02	13C	2201A32G03	26	2201A32G04	26
1200	2201A31G01	2	2201A31G02	3B	2201A31G03	21	2201A31G04	21
1000	2201A30G01	2A	2201A30G02	3C	2201A30G03	21	2201A30G04	21
900	2201A29G01	2A	2201A29G02	3C	2201A29G03	21	2201A29G04	21
800	2201A28G01	2A	2201A28G02	3C	2201A28G03	21	2201A28G04	21
600	2201A27G01	11A	2201A27G02	12C	2201A27G03	26	2201A27G04	26
500	2201A26G01	2	2201A26G02	2	2201A26G03	21	2201A26G04	21
400	2201A25G01	2	2201A25G02	2	2201A25G03	21	2201A25G04	21
300	2201A24G01	2A	2201A24G02	2A	2201A24G03	21	2201A24G04	21
200	2201A23G01	2A	2201A23G02	2A	2201A23G03	21	2201A23G04	21
150	2201A22G01	1A	2201A22G02	1A	2201A22G03	21	2201A22G04	21
100	2201A21G01	11A	2201A21G02	11A	2201A21G03	26	2201A21G04	26
50	2201A20G01	2	2201A20G02	2	2201A20G03	21	2201A20G04	21
<b>Extended Time Rating 610°C Rise</b>								
100	2201A87G01	18	2201A87G02	18	2201A87G03	29	2201A87G04	29
50	2201A86G01	15A	2201A86G02	15A	2201A86G03	28	2201A86G04	28
25	2201A85G01	12A	2201A85G02	12A	2201A85G03	26	2201A85G04	26
<b>Continuous Time Rating 385°C Rise</b>								
25	2201A39G01	15	2201A39G02	15	2201A39G03	28	2201A39G04	28
10	2201A38G01	4	2201A38G02	4	2201A38G03	22	2201A38G04	22
5	2201A37G01	14	2201A37G02	14	2201A37G03	27	2201A37G04	27

**Selection Data Required**

The following information is required to properly select a grounding resistor:

1. Application
2. Electrical Characteristics
  - Ohms
  - Amperes
  - Rated Volts
  - Time in Seconds
  - System Volts
3. Type of grounding resistors, including any deviation from IEEE standard.

① Other time ratings, refer to factory.  
 ② Screens on top and bottom, solid sides.



**Neutral Grounding Resistors, Edgewound Type**

**High Voltage**

Edgewound Indoor or Outdoor Grounding Resistor

**4160 Volts Line to Neutral (7200 Volt System)**

Amperes	Open Ground Resistor		Ground Resistor with Covers ② Mounted on Frames		Ground Resistor with Safety Enclosure		Ground Resistor with Safety Enclosure for Mounting on Power Transformer	
	Style Number	Page 21 Assembly Number	Style Number	Page 21 Assembly Number	Style Number	Page 23 Assembly Number	Style Number	PG 23 & 24 Assembly Number
<b>10 Second Rating 760°C Rise①</b>								
2000	2201A53G01	13	2201A53G02	14B	2201A53G03	27	2201A53G04	27
1500	2201A52G01	13A	2201A52G02	14C	2201A52G03	27	2201A52G04	27
1200	2201A51G01	13	2201A51G02	14B	2201A51G03	27	2201A51G04	27
1000	2201A50G01	12A	2201A50G02	13C	2201A50G03	26	2201A50G04	26
900	2201A49G01	13	2201A49G02	14B	2201A49G03	27	2201A49G04	27
800	2201A48G01	12A	2201A48G02	13C	2201A48G03	26	2201A48G04	26
600	2201A47G01	12A	2201A47G02	13C	2201A47G03	26	2201A47G04	26
500	2201A46G01	12A	2201A46G02	12A	2201A46G03	26	2201A46G04	26
400	2201A45G01	12A	2201A45G02	12A	2201A45G03	26	2201A45G04	26
300	2201A44G01	12	2201A44G02	12	2201A44G03	26	2201A44G04	26
200	2201A43G01	12	2201A43G02	12	2201A43G03	26	2201A43G04	26
150	2201A42G01	2	2201A42G02	2A	2201A42G03	21	2201A42G04	21
100	2201A41G01	2A	2201A41G02	2A	2201A41G03	21	2201A41G04	21
50	2201A40G01	12	2201A40G02	12	2201A40G03	26	2201A40G04	26
<b>Extended Time Rating 610°C Rise</b>								
100	2201A91G01	17 X 2 ③	2201A91G02	17 X 2 ③	2201A91G03	28 X 2 ③	2201A91G04	28 X 2 ③
50	2201A90G01	17	2201A90G02	17	2201A90G03	28	2201A90G04	28
25	2201A89G01	14	2201A89G02	14	2201A89G03	27	2201A89G04	27

**Selection Data Required**

The following information is required to properly select a grounding resistor:

1. Application
2. Electrical Characteristics
  - Ohms
  - Amperes
  - Rated Volts
  - Time in Seconds
  - System Volts
3. Type of grounding resistors, including any deviation from IEEE standard.

① Other time ratings, refer to factory.

② Screens on top and bottom, solid sides.

③ First number refers to assembly number; second to quantity of the assembly used.



**Neutral Grounding Resistors, Edgewound Type**

**High Voltage**

Edgewound Indoor or Outdoor Grounding Resistor

**8000 Volts Line to Neutral (13900 Volt System)**

Amperes	Open Ground Resistor		Ground Resistor with Covers ② Mounted on Frames		Ground Resistor with Safety Enclosure		Ground Resistor with Safety Enclosure for Mounting on Power Transformer	
	Style Number	Page 22 Assembly Number	Style Number	Page 22 Assembly Number	Style Number	Page 23 Assembly Number	Style Number	PG 23 & 24 Assembly Number
<b>10 Second Rating 760°C Rise①</b>								
2000	2201A73G01	216A	2201A73G02	218A	2201A73G03	29	2201A73G04	29
1500	2201A72G01	215	2201A72G02	217	2201A72G03	29	2201A72G04	29
1200	2201A71G01	214	2201A71G02	216	2201A71G03	28	2201A71G04	28
1000	2201A70G01	214	2201A70G02	216	2201A70G03	28	2201A70G04	28
900	2201A69G01	214	2201A69G02	216	2201A69G03	28	2201A69G04	28
800	2201A68G01	205A	2201A68G02	207A	2201A68G03	24	2201A68G04	24
600	2201A67G01	205A	2201A67G02	207A	2201A67G03	24	2201A67G04	24
500	2201A66G01	214A	2201A66G02	214A	2201A66G03	28	2201A66G04	28
400	2201A65G01	214	2201A65G02	214	2201A65G03	28	2201A65G04	28
300	2201A64G01	213A	2201A64G02	213A	2201A64G03	28	2201A64G04	28
200	2201A63G01	214A	2201A63G02	214A	2201A63G03	28	2201A63G04	28
150	2201A62G01	212	2201A62G02	212	2201A62G03	28	2201A62G04	28
100	2201A61G01	204	2201A61G02	204	2201A61G03	23	2201A61G04	23
50	2201A60G01	214	2201A60G02	214	2201A60G03	28	2201A60G04	28
<b>Extended Time Rating 610°C Rise</b>								
	Style Number	Page 21 ④ Assembly Number	Style Number	Page 21 ④ Assembly Number	Style Number	Page 23 Assembly Number	Style Number	PG 23 & 24 Assembly Number
100	2201A99G01	18 X 4 ③	2201A99G02	18 X 4 ③	2201A99G03	30 X 4 ③	2201A99G04	30 X 4 ③
50	2201A98G01	17 X 2 ③	2201A98G02	17 X 2 ③	2201A98G03	29 X 2 ③	2201A98G04	29 X 2 ③
25	2201A97G01	14 X 2 ③	2201A97G02	14 X 2 ③	2201A97G03	28 X 2 ③	2201A97G04	28 X 2 ③

**Selection Data Required**

The following information is required to properly select a grounding resistor:

1. Application
2. Electrical Characteristics
  - Ohms
  - Amperes
  - Rated Volts
  - Time in Seconds
  - System Volts
3. Type of grounding resistors, including any deviation from IEEE standard.
4. Except base insulator 15KV 10 inch high.

① Other time ratings, refer to factory.

② Screens on top and bottom, solid sides.

③ First number refers to assembly number; second to quantity of the assembly used.

④ Plus 15kV base insulators 10 inches high.



**Neutral Grounding Resistors, Edgewound Type**

**Low Voltage**

Edgewound Type ①, 385°C and 610°C Rise

Amperes at 385°C Temperature Rise Continuous <sup>2</sup>															
170	154	132	120	102	88	80	74	66	51	44	37	29	24	15	10
Amperes at 610°C Temperature Rise Extended Time <sup>2</sup>															
220	200	170	154	130	115	100	95	85	65	56	47	37	31	19	13
Ohms Resistance <sup>3</sup>															
....	....	....	....	.24	.30	.39	.47	.60	.96	1.20	1.90	3.00	4.40	8.40	18.00
.127	.16	.20	.26	....	....	....	....	....	1.44	1.80	2.80	4.50	6.60	12.60	27.00
....	....	....	....	.48	.60	.78	.94	1.20	1.92	2.40	3.80	6.00	8.80	16.80	36.00
....	....	....	....	....	....	....	....	....	2.40	3.00	4.70	7.50	11.00	21.00	45.00
.25	.32	.40	.52	.72	.90	1.15	1.47	1.80	2.88	3.60	5.70	9.00	13.20	25.00	54.00
....	....	....	....	.96	1.20	1.57	1.89	2.40	3.85	4.80	7.55	12.00	17.50	33.50	72.00
....	....	....	....	....	....	....	....	....	4.80	6.00	9.40	15.00	22.00	42.00	90.00
.51	.64	.80	1.08	1.43	1.80	2.33	2.80	3.60	5.80	7.20	11.30	18.00	27.10	50.00	108.00
....	....	....	....	....	....	....	....	....	6.75	8.40	14.20	21.00	30.70	59.00	....
....	....	....	....	1.91	2.40	3.12	3.75	4.80	7.70	9.60	15.10	24.00	35.00	67.00	....
.77	.95	1.20	1.62	....	....	....	....	....	8.70	10.80	16.90	27.00	40.00	....	....
....	....	....	....	2.38	3.00	3.90	4.70	6.00	9.60	12.00	18.80	30.00	....	....	....
....	....	....	....	....	....	....	....	....	10.60	13.20	20.70	33.00	....	....	....
1.02	1.28	1.60	2.15	2.87	3.60	4.70	5.66	7.20	11.60	14.70	22.70	36.00	....	....	....
....	....	....	....	....	....	....	....	....	12.50	15.60	24.50	....	....	....	....
....	....	....	....	3.35	4.20	5.45	6.60	8.40	13.50	16.80	26.30	....	....	....	....
1.27	1.60	2.00	2.70	....	....	....	....	....	14.40	18.00	28.30	....	....	....	....
....	....	....	....	3.82	4.80	6.25	7.50	9.50	15.40	19.20	....	....	....	....	....
....	....	....	....	....	....	....	....	....	16.40	20.30	....	....	....	....	....
1.52	1.90	2.40	3.24	4.30	5.40	7.00	8.45	10.80	17.40	21.70	....	....	....	....	....
....	....	....	....	....	....	....	....	....	18.20	22.80	....	....	....	....	....
....	....	....	....	4.77	6.00	7.80	9.40	12.00	19.20	....	....	....	....	....	....
1.78	2.22	2.80	3.77	....	....	....	....	....	20.00	....	....	....	....	....	....
....	....	....	....	5.25	6.60	8.50	10.30	13.20	21.20	....	....	....	....	....	....
2.08	2.55	3.20	4.30	5.75	7.20	9.35	11.30	14.40	....	....	....	....	....	....	....
....	....	....	....	6.20	7.80	10.10	12.20	15.40	....	....	....	....	....	....	....
2.28	2.87	3.60	4.85	....	....	....	....	....	....	....	....	....	....	....	....
....	....	....	....	6.70	8.40	10.80	13.20	....	....	....	....	....	....	....	....
2.55	3.20	4.00	5.40	7.20	9.00	11.50	14.00	....	....	....	....	....	....	....	....
....	....	....	....	7.70	9.60	13.10	....	....	....	....	....	....	....	....	....
2.80	3.50	4.40	5.90	....	....	....	....	....	....	....	....	....	....	....	....
....	....	....	....	8.20	10.20	....	....	....	....	....	....	....	....	....	....
3.05	3.82	4.80	6.46	8.60	10.80	....	....	....	....	....	....	....	....	....	....

1 Resistor selection is made on basis of ohms and amperes with voltage being a secondary factor. For resistors rated approximately 1385 volts and higher refer to Page 15.  
 2 For 10 second and 60 second rating prices refer to factory.  
 3 Standard tolerance is ± 10%.

**277 Volts Line to Neutral (480 Volt System)**

Continuous Time Rating 385°C Rise								
Amperes	Open Ground Resistor		Ground Resistor with Covers Mounted on Frame		Ground Resistor with Galvanized Screen Safety Enclosure		Grounding Resistor with Safety Enclosure for Mounting on Power Transformer	
	Style Number	Page 21 Assembly Number	Style Number	Page 21 Assembly Number	Style Number	Page 23 Assembly Number	Style Number	Page 23 & 24 Assembly Number
25	2203A33G01	1	2203A33G02	1	2203A33G03	21	2203A33G04	21
10	2203A30G01	1A	2203A30G02	1A	2203A30G03	21	2203A30G04	21
5	2201A76G01	1A	2201A76G02	1A	2201A76G03	21	2201A76G04	21



**Neutral Grounding Resistors, Edgewound Type**

**Modifications and Options**

**A. Grounding Resistor Stands** (Galvanized steel construction with corrosion resistant finish)

Stand Height (Inches)	Style No. of Stand for Resistor Without Safety Enclosure	Style No. of Stand for Resistor With Safety Enclosure
48	1975D25G02	1975D25G01
90	1975D26G02	1975D26G01

For other stand heights, refer to factory

**B. Provisions for mounting CT on the resistor, stand or transformer mounting.**

On stand or transformer mounting 5KV, 8.7KV, and 15KV.

Style No.
3570C79H01
On Grounding Resistor 5KV, 8.7KV, and 15KV
2203A29G01

**C. Stand Off Insulators for Neutral Lead Support or Bus Insulator**

KV Rating	Style Number
7.5KV	2068A96H01
15 KV	2068A96H02

**D. Entrance Bushing for Safety Enclosures**

KV Rating	Current Rating	Stud Style	Style Number
5 KV	300A	1/2-13	2068A94G02
7.5 KV	400A	3/4-16	2199A22H01
7.5 KV	800A	1-14	2199A22H02
15 KV	400A	3/4-16	2199A22H03
15 KV	800A	1-14	2199A22H04

**E. Terminal Lug**

Wire Size Acceptance	Style Number
#1/0 - 500 MCM	2119A76H01

**F. Insulated Terminal ("Spark Plug")**

1/8" x 2" CU Style No. 2068A94G04

Two (2) required per grounding resistor

**G. Current Transformers**

Ratio	Voltage		
	5KV	8.7KV	15KV
25/5	9956D39H05	7524A11G05	7524A12G05
50/5	9956D39H08	7524A11G08	7524A12G08
200/5	9956D39H13	7524A11G12	7524A12G12
400/5	9956D39H16	7524A11G14	7524A12G14
600/5	9956D39H18	7524A11G15	7524A12G15

**Order Entry Guide:**

When entering the general order the following format must be used:

**Example:**

**Item 1** Neutral Grounding Resistor Consisting of:  
 1 S#2201A25G03 Ground Resistor  
 2 S#2119A76H01 Terminal  
 1 S#2068A94G02 5KV Entrance Bushing

**Example:**

**Item 1** Neutral Grounding Resistor Consisting of:  
 1 S#2201A25G04 Ground Resistor  
 2 S#2119A76H01 Terminal  
 1 S#2068A94G02 5KV Entrance Bushing  
 1 S#9917D10H05 CT  
 1 S#3570C79H01 CT Mounting

Note: Style number references are critical for quick shipment.

**Selection Data Required**

The following information is required to properly select a grounding resistor:

1. Application
2. Electrical Characteristics  
 Ohms  
 Amperes  
 Rated Volts  
 Time, In Seconds  
 System Volts
3. Type of grounding resistors including any deviation from IEEE standard.



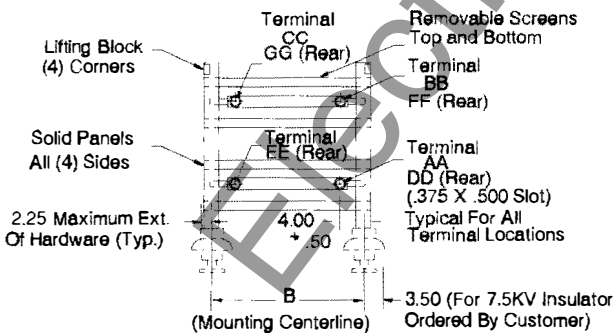
**Neutral Grounding Resistors, Edgewound Type**

**Dimensions in inches** (Do Not Use for Construction Purposes Unless Certified)

Indoor and Outdoor, 1380-4160 Volts (Line to Neutral), 2400-7200 Volts (System), 277 Volts (Line to Neutral) 480 Volts (System)

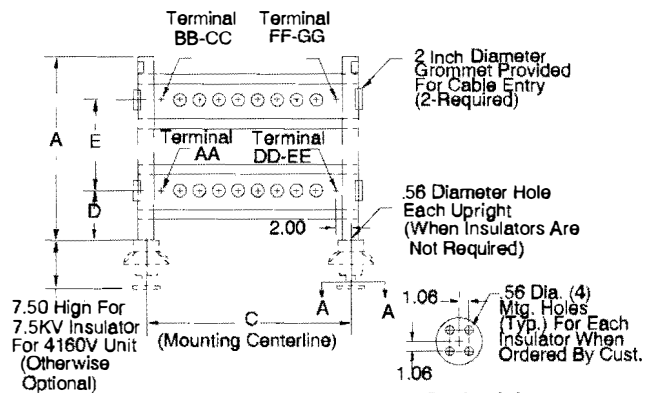
Assembly	Terminal Location	Approx. Wt. Lbs.	A	B	C	D	E
1	AA-DD	200	14.50	25.00	30.00	7.50	Not Used
1A	AA-EE	200	14.50	25.00	30.00	7.50	Not Used
2	AA-BB	280	21.50	25.00	30.00	7.50	7.00
2A	AA-CC	280	21.50	25.00	30.00	7.50	7.00
2B	AA-DD	280	21.50	25.00	30.00	7.50	Not Used
2C	AA-EE	280	21.50	25.00	30.00	7.50	Not Used
3	AA-FF	360	28.50	25.00	30.00	7.50	14.00
3A	AA-GG	360	28.50	25.00	30.00	7.50	14.00
3B	AA-BB	360	28.50	25.00	30.00	7.50	14.00
3C	AA-CC	360	28.50	25.00	30.00	7.50	14.00
4	AA-BB	440	35.50	25.00	30.00	7.50	21.00
4A	AA-CC	440	35.50	25.00	30.00	7.50	21.00
4B	AA-FF	440	35.50	25.00	30.00	7.50	21.00
4C	AA-GG	440	35.50	25.00	30.00	7.50	21.00
5	AA-FF	530	42.50	25.00	30.00	7.50	28.00
5A	AA-GG	530	42.50	25.00	30.00	7.50	28.00
6	AA-BB	610	49.50	25.00	30.00	7.50	35.00
6A	AA-CC	610	49.50	25.00	30.00	7.50	35.00
7	AA-FF	690	56.50	25.00	30.00	7.50	42.00
7A	AA-GG	690	56.50	25.00	30.00	7.50	42.00
8	AA-BB	770	70.50	25.00	30.00	7.50	56.00
8A	AA-CC	770	70.50	25.00	30.00	7.50	56.00
9	AA-FF	850	70.50	25.00	30.00	7.50	56.00
9A	AA-GG	850	70.50	25.00	30.00	7.50	56.00

Assembly	Terminal Location	Approx. Wt. Lbs.	A	B	C	D	E
11	AA-DD	250	14.50	25.00	42.00	7.50	Not Used
11A	AA-EE	250	14.50	25.00	42.00	7.50	Not Used
12	AA-BB	370	21.50	25.00	42.00	7.50	7.00
12A	AA-CC	370	21.50	25.00	42.00	7.50	7.00
12B	AA-DD	370	21.50	25.00	42.00	7.50	Not Used
12C	AA-EE	370	21.50	25.00	42.00	7.50	Not Used
13	AA-FF	490	28.50	25.00	42.00	7.50	14.00
13A	AA-GG	490	28.50	25.00	42.00	7.50	14.00
13B	AA-BB	490	28.50	25.00	42.00	7.50	14.00
13C	AA-CC	490	28.50	25.00	42.00	7.50	14.00
14	AA-BB	610	35.50	25.00	42.00	7.50	21.00
14A	AA-CC	610	35.50	25.00	42.00	7.50	21.00
14B	AA-FF	610	35.50	25.00	42.00	7.50	21.00
14C	AA-GG	610	35.50	25.00	42.00	7.50	21.00
15	AA-FF	730	42.50	25.00	42.00	7.50	28.00
15A	AA-GG	730	42.50	25.00	42.00	7.50	28.00
16	AA-BB	850	49.50	25.00	42.00	7.50	35.00
16A	AA-CC	850	49.50	25.00	42.00	7.50	35.00
17	AA-FF	970	56.50	25.00	42.00	7.50	42.00
17A	AA-GG	970	56.50	25.00	42.00	7.50	42.00
18	AA-BB	1050	70.50	25.00	42.00	7.50	56.00
18A	AA-CC	1050	70.50	25.00	42.00	7.50	56.00
19	AA-FF	1130	70.50	25.00	42.00	7.50	56.00
19A	AA-GG	1130	70.50	25.00	42.00	7.50	56.00



**Front View**

Note: All Extended Time Ratings  
Solid Panels On All (4) Sides



**Side View**

**Section A-A**



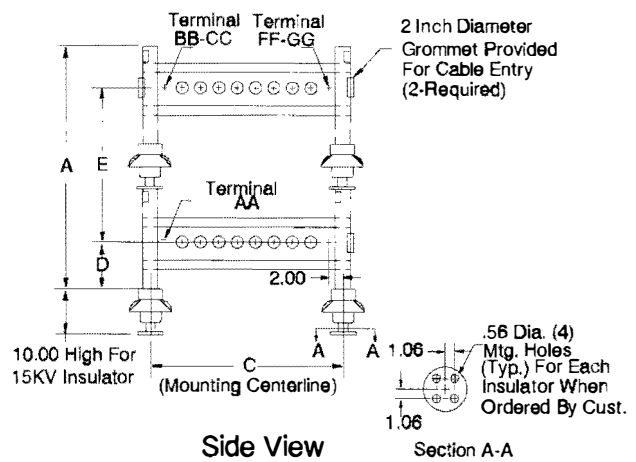
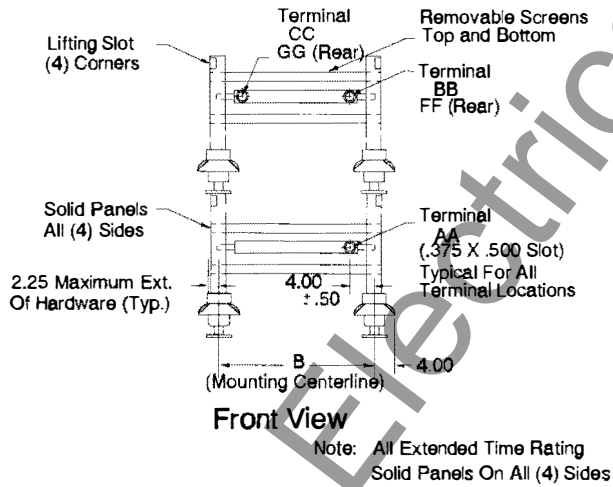
**Neutral Grounding Resistors, Edgewound Type**

Dimensions in inches (Do Not Use for Construction Purposes Unless Certified)

Indoor and Outdoor, 8000 Volts (Line to Neutral), 13900 Volts (System)

Assembly	Terminal Location	Approx. Wt. Lbs.	A	B	C	D	E
202	AA-BB	400	37.00	25.00	30.00	7.50	22.50
202A	AA-CC	400	37.00	25.00	30.00	7.50	22.50
203	AA-FF	480	44.00	25.00	30.00	7.50	29.50
203A	AA-GG	480	44.00	25.00	30.00	7.50	29.50
204	AA-BB	560	51.00	25.00	30.00	7.50	36.50
204A	AA-CC	560	51.00	25.00	30.00	7.50	36.50
205	AA-FF	640	58.00	25.00	30.00	7.50	43.50
205A	AA-GG	640	58.00	25.00	30.00	7.50	43.50
206	AA-BB	720	65.00	25.00	30.00	7.50	50.50
206A	AA-CC	720	65.00	25.00	30.00	7.50	50.50
207	AA-FF	800	72.00	25.00	30.00	7.50	57.50
207A	AA-GG	800	72.00	25.00	30.00	7.50	57.50
208	AA-BB	880	79.00	25.00	30.00	7.50	64.50
208A	AA-CC	880	79.00	25.00	30.00	7.50	64.50
209	AA-FF	960	86.00	25.00	30.00	7.50	71.50
209A	AA-GG	960	86.00	25.00	30.00	7.50	71.50

Assembly	Terminal Location	Approx. Wt. Lbs.	A	B	C	D	E
212	AA-BB	500	37.00	25.00	42.00	7.50	22.50
212A	AA-CC	500	37.00	25.00	42.00	7.50	22.50
213	AA-FF	620	44.00	25.00	42.00	7.50	29.50
213A	AA-GG	620	44.00	25.00	42.00	7.50	29.50
214	AA-BB	740	51.00	25.00	42.00	7.50	36.50
214A	AA-CC	740	51.00	25.00	42.00	7.50	36.50
215	AA-FF	860	58.00	25.00	42.00	7.50	43.50
215A	AA-GG	860	58.00	25.00	42.00	7.50	43.50
216	AA-BB	980	65.00	25.00	42.00	7.50	50.50
216A	AA-CC	980	65.00	25.00	42.00	7.50	50.50
217	AA-FF	1100	72.00	25.00	42.00	7.50	57.50
217A	AA-GG	1100	72.00	25.00	42.00	7.50	57.50
218	AA-BB	1220	79.00	25.00	42.00	7.50	64.50
218A	AA-CC	1220	79.00	25.00	42.00	7.50	64.50
219	AA-FF	1340	86.00	25.00	42.00	7.50	71.50
219A	AA-GG	1340	86.00	25.00	42.00	7.50	71.50

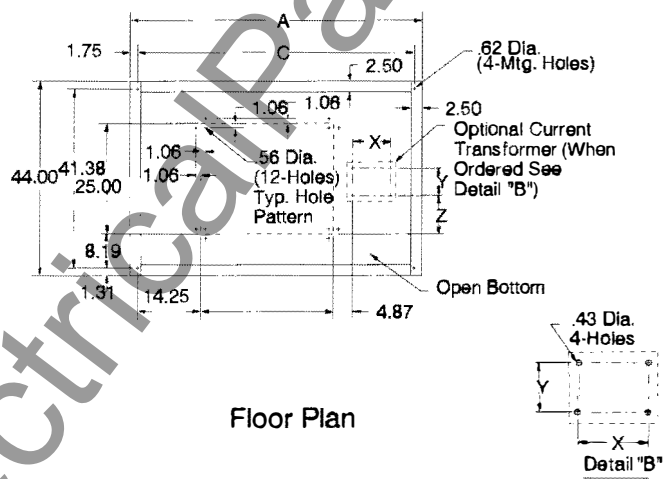
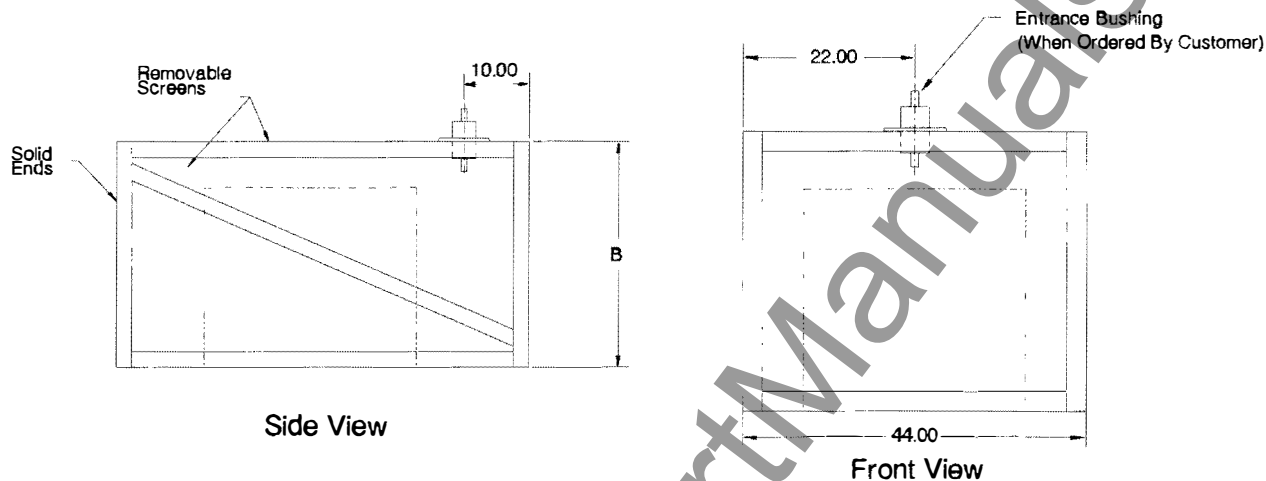




**Neutral Grounding Resistors, Edgewound Type**

Dimensions in Inches (Do Not Use for Construction Purposes Unless Certified)

Indoor and Outdoor, 277-8000 Volts (Line to Neutral), 480-13800 Volts (System)



**Safety Enclosure**

Assembly	A	B	C	① Approx. Wt. Lbs.
21	66	36	62.50	170
22	66	50	62.50	200
23	66	72	62.50	310
24	66	86	62.50	340
25	66	100	62.50	370
26	78	36	74.50	180
27	78	50	74.50	210
28	78	72	74.50	330
29	78	86	74.50	360
30	78	100	74.50	390

**Entrance Bushing**

Size	H	Stud
5.0 Kv	5	1/2 - 13
7.5 Kv	10	3/4 - 16
7.5 Kv	10	1 - 14
15.0 Kv	12 3/16	3/4 - 16
15.0 Kv	12 3/16	1 - 14

**Current Transformer**

C.T.	X	Y	Z
5.0 Kv	3.75	5.75	9.62
7.5 Kv	8.5	6.25	9.375
15.0 Kv	8.5	10	7.5

① Approximate weight is for screened enclosure only. For resistor weight see Pages 21 and 22.

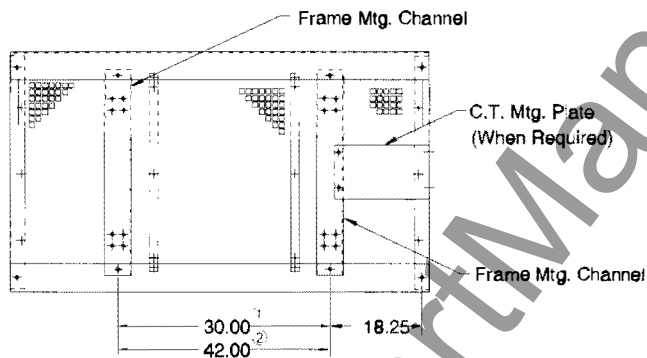


**Neutral Grounding Resistors, Edgewound Type**

**Dimensions in inches** (Do Not Use for Construction Purposes Unless Certified)

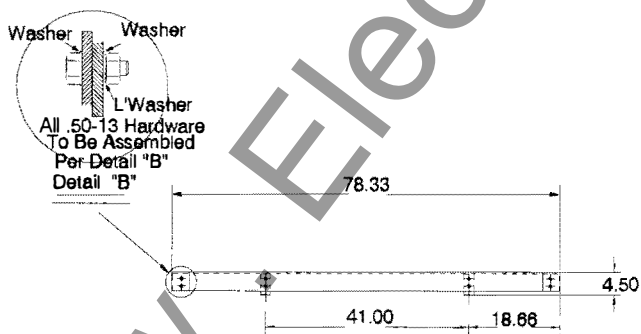
Indoor and Outdoor, 277-8000 Volts (Line to Neutral), 480-13800 Volts (System)

Transformer Mounting Base (Use Only With Safety Enclosure)

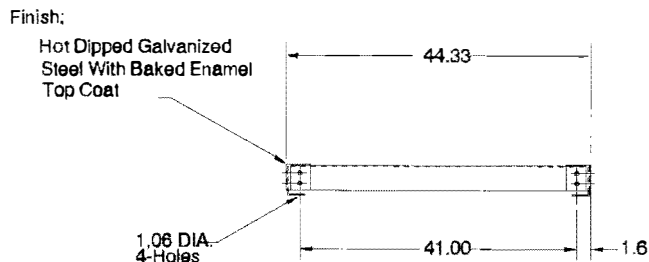


Top View

- ① For Assembly 1 to 9A and 202 to 209A.
- ② For Assembly 11 to 19A and 212 to 219A.



Side View



Front View



**Neutral Grounding Resistors, Edgewound Type**

Dimensions in inches (Do Not Use for Construction Purposes Unless Certified)

Indoor and Outdoor, 277-8000 Volts (Line to Neutral), 480-13800 Volts (System)

48-Inch High Galvanized Steel Stand - Field Assembly

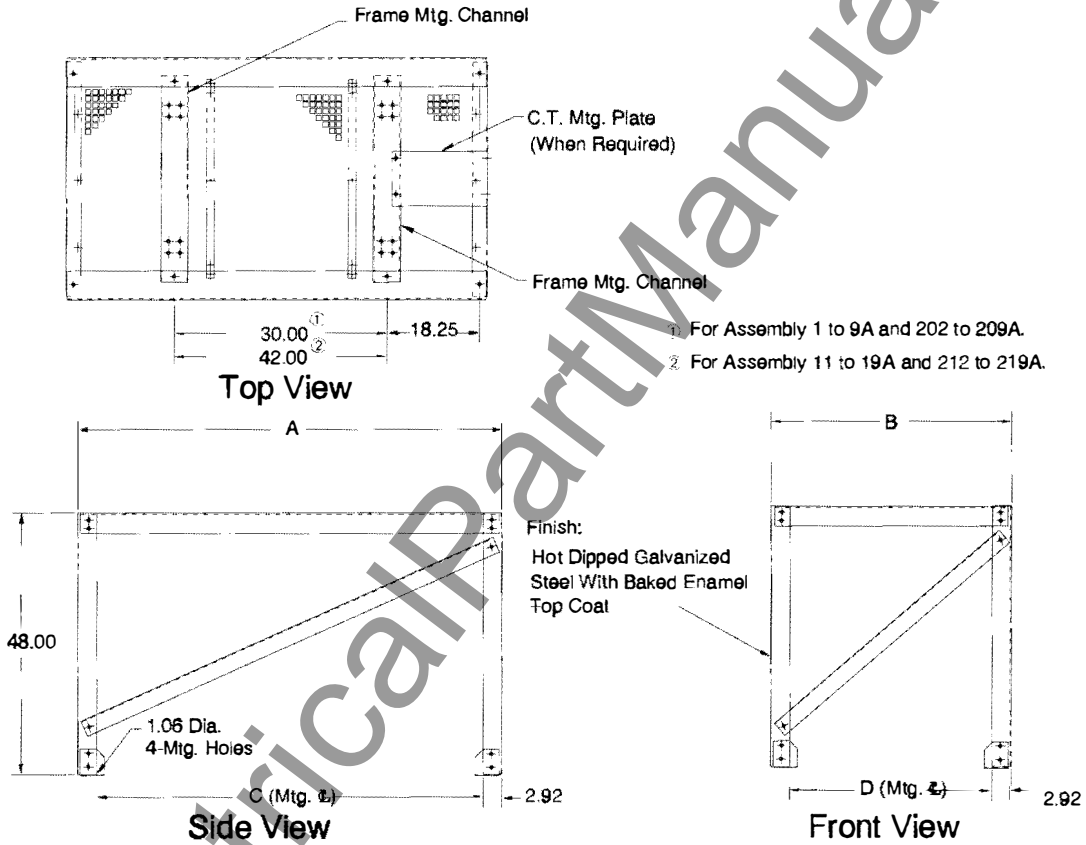


Table 1

Grounding Resistor	A	B	C	D	Maximum Design Load	Maximum Wind Velocity
With Safety Enclosure	78.33	44.33	72.50	38.50	1500 Lbs.	90 Mph
Without Safety Enclosure	47.33	30.33	41.50	24.50	1200 Lbs.	90 Mph



**Neutral Grounding Resistors, Edgewound Type**

Dimensions in inches (Do Not Use for Construction Purposes Unless Certified)

Indoor and Outdoor, 277-8000 Volts (Line to Neutral), 480-13800 Volts (System)

90-Inch High Galvanized Steel Stand - Field Assembly

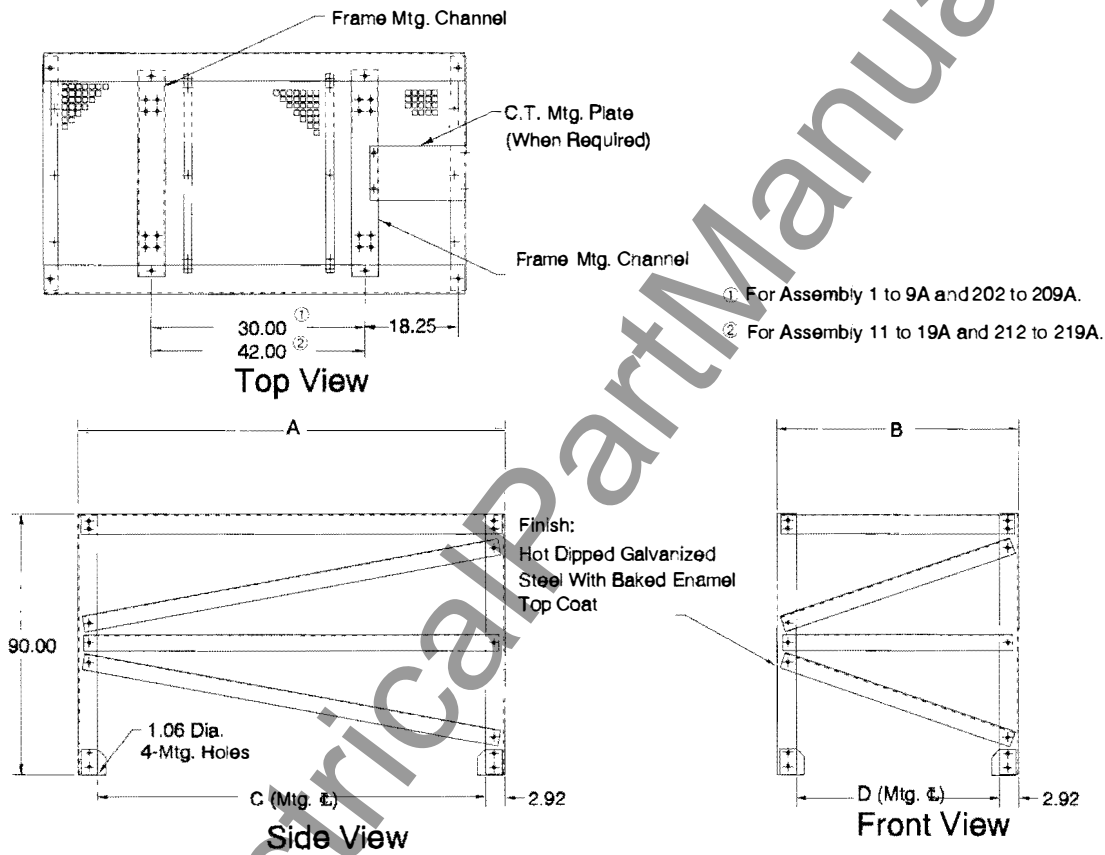


Table No. 1

Grounding Resistor	A	B	C	D	Maximum Design Load	Maximum Wind Velocity
With Safety Enclosure	78.33	44.33	72.50	38.50	1500 Lbs.	90 Mph
Without Safety Enclosure	47.33	30.33	41.50	24.50	1200 Lbs.	90 Mph



Notes:

www.ElectricalPartManuals.com



**Notes:**

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