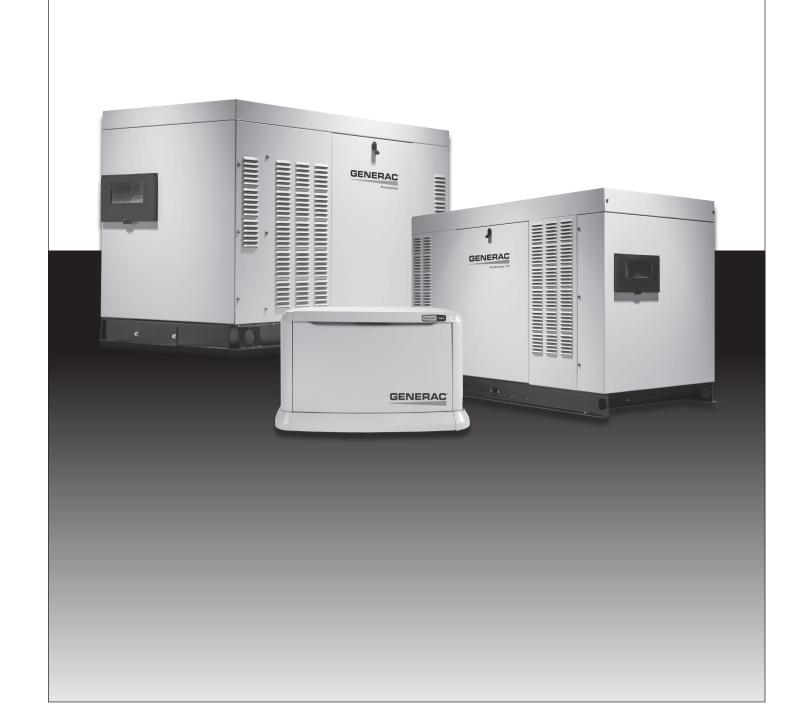


Generator Sizing Guide



IMPORTANT NOTICE:

This booklet is designed to familiarize estimators and installers with proper sizing guidelines for residential and commercial generators. The information is not comprehensive, nor does it replace or supercede any material contained in any of the written documents shipped with the equipment. This booklet should only be used in conjunction with the Owner's Manual, Installation Manual and other technical documents shipped with each product. Always read all accompanying documentation carefully before attempting to install any generator, transfer switch or related equipment.

HOW TO USE THIS BOOKLET:

Within this booklet, you will find electrical load information, plus an outline of generator surge capability, fuel pipe sizing, liquid propane tank sizing, and UPS / generator compatibility. The worksheet pages can be removed from the book and photocopied to create additional Onsite Estimating Sheets for use with individual jobs.

SAFETY INFORMATION:

Proper sizing of the generator is crucial to the success of any installation and requires a good working knowledge of electricity and its characteristics, as well as the varying requirements of the electrical equipment comprising the load. When analyzing the electrical load, consult the manufacturer's nameplate on each major appliance or piece of equipment to determine its starting and running requirements in terms of watts, amps and voltage. When choosing the generator output for commercial or industrial applications, select a rating that is approximately 20 to 25% higher than the peak load (for example, if the load is about 40 kilowatts, select a 50 kW genset). A higher rated generator will operate comfortably at approximately 80% of its full capacity and will provide a margin of flexibility if the load increases in the future.

For safety reasons, Generac recommends that the backup power system be installed, serviced and repaired by a Generac Authorized Service Dealer or a competent, qualified electrician or installation technician who is familiar with applicable codes, standards and regulations.

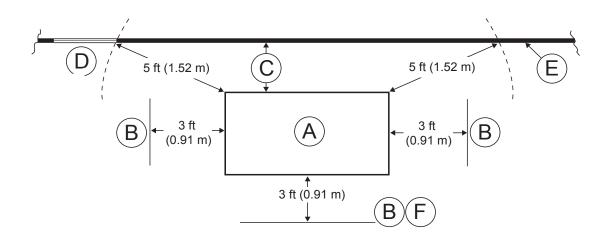
It is essential to comply with all regulations established by the Occupational Safety & Health Administration (OSHA) and strict adherence to all local, state and national codes is mandatory. Before selecting a generator, check for municipal ordinances that may dictate requirements regarding placement of the unit (setback from building and/or lot line), electrical wiring, gas piping, fuel storage (for liquid propane or diesel tanks), sound and exhaust emissions.

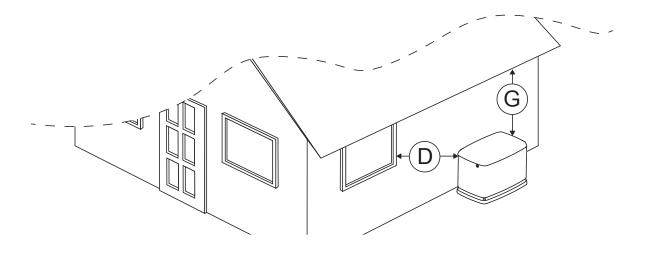
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PLACEMENT DIAGRAM — AIR-COOLED GENERATORS





ID	Description	Comments
Α	Top of generator	
В	Front and end clearance	Minimum clear distances cannot include shrubs, bushes, or trees.
С	Rear clearance	18 in (45.7 cm) minimum clearance per NFPA testing, labeling, and listing, unless state or local codes dictate otherwise.
D	Windows and openings	No operable windows, doors, or openings in the wall are permitted within 5 ft (1.52 m) from any point of the generator.
E	Existing wall	One-hour fire rated walls allow closer placement of the generator set without approved enclosure. Confirm before installation.
F	Removable fence	Removable fence panels for servicing cannot be placed less than 3 ft (0.91 m) in front of the generator.
G	Overhead clearance	5 ft (1.52 m) minimum distance from any structure, overhang, or projections from the wall. DO NOT install under wooden decks or structures unless this distance is maintained.

MOTOR LOAD REFERENCE

AC & Heat Pumps

Running Load

Starting Load

Description	Нр	Running kW	Amps @ 240V 1Ø	Amps @ 208V 3Ø	Amps @ 240V 3Ø	Amps @ 480V 3Ø	LR Amps @ 240V 10	LR Amps @ 208V 3Ø	LR Amps @ 240V 3Ø	LR Amps @ 480V 3Ø
1 Ton (12,000 BTU)	1	1	5	3	3	1	33	22	19	10
2 Ton (24,000 BTU)	2	2	10	7	6	3	67	44	38	19
3 Ton (36,000 BTU)	3	3	15	10	8	4	100	67	58	29
4 Ton (48,000 BTU)	4	4	20	13	11	6	117	78	67	34
5 Ton (60,000 BTU)	5	5	25	16	14	7	145	97	84	42
7.5 Ton (85,000 BTU)	7.5	7.5	37	24	21	11	219	146	126	63
10 Ton* (120,000 BTU)	5 Hp (x2)	10	49	33	28	14	145	97	84	42
10 Ton (120,000 BTU)	10 Hp	10	49	33	28	14	250	167	144	72
15 Ton* (180,000 BTU)	7.5 Hp (x2)	15	74	49	42	21	219	146	126	63
15 Ton (180,000 BTU)	15 Hp	15	74	49	42	21	375	250	217	108
20 Ton* (240,000 BTU)	10 Hp (x2)	20	98	65	57	28	250	167	144	72
20 Ton (240,000 BTU)	20 Hp	20	n/a	65	57	28	500	333	289	144
25 Ton (300,000 BTU)	25	25	n/a	82	71	35	625	416	361	180
30 Ton* (360,000 BTU)	15 Hp (x2)	30	n/a	98	85	42	375	250	217	108
30 Ton (360,000 BTU)	30 Hp	30	n/a	98	85	42	750	500	433	217
40 Ton* (480,000 BTU)	20 Hp (x2)	40	n/a	131	113	57	500	333	289	144
40 Ton (480,000 BTU)	40 Hp	40	n/a	131	113	57	1000	666	577	289
50 Ton* (480,000 BTU)	25 Hp (x2)	50	n/a	163	142	71	625	416	361	180
50 Ton (480,000 BTU)	50 Hp	50	n/a	163	142	71	1250	833	722	361

 $[\]ensuremath{^{\star}}$ For Multiple motor configurations, sequence starting is assumed.

Air Conditioning

1 hp per 1 ton

 $1\ ton = 12{,}000\ BTUs$

General Residential

Running Load

Starting Load

			–				
Description	Нр	Running kW	Amps @ 120V 1Ø	Amps @ 240V 1Ø	Starting kW	LR Amps @ 120V 1Ø	LR Amps @ 240V 1Ø
Refrigerator pump, sump, furnace, garage opener	0.5	0.5	4.9	2.5	1.5	25	13
Freezer, washer, septic grinder	0.75	0.75	7.4	3.7	2.3	38	19
General 1 Hp	1	1	9.8	4.9	3	50	25
Well & septic lift pump	2	2	19.6	9.8	6	100	50



NON-MOTOR LOAD REFERENCE

Residential

		Running Load*	
Description	kW	Amps at 120V 1ø	Amps at 240V 1ø
Electric heat per 1000 ft ²	12	n/a	50
Heat pump elements per 1000 ft ²	7	n/a	29
Dryer	5.5	n/a	23
Hot tub	10	n/a	50
Range oven/Stove top per burner	8	n/a	30
Electric hot water	4.5	n/a	19
General lighting and receptacles per 1000 ft ²	3	24.9	n/a
Blow dryer	1.25	10.4	n/a
Dishwasher	1.5	12.5	n/a
Microwave	1	8.3	n/a
Toasters	1	8.3	n/a
Home Entertainment Center	1	8.3	n/a
Computer	1	8.3	n/a
Kitchen	1.5	12.5	n/a
Laundry	1.5	12.5	n/a

^{*}Always check data plate for actual running amps.

Commercial

Please refer to equipment data plate and/or billing history for commercial details.

SURGE CAPABILITY

Generac Air-cooled Generators

		(F		Output mps) LP/	NG			ırge Capal 0% Voltag	
Size (kW)	RPM	240V 1Ø	208V 3Ø	240V 3Ø	480V 3Ø	240V 1Ø	208V 3Ø	240V 3Ø	480V 3Ø
7.5	3600	31/25	n/a	n/a	n/a	62	n/a	n/a	n/a
9	3600	38/33	n/a	n/a	n/a	70	n/a	n/a	n/a
11	3600	45/42	n/a	n/a	n/a	92	n/a	n/a	n/a
15 ECO	Varible	63/63	n/a	n/a	n/a	200	n/a	n/a	n/a
16	3600	66/66	n/a	n/a	n/a	130	n/a	n/a	n/a
20	3600	83/75	n/a	n/a	n/a	185	n/a	n/a	n/a
20 SYN	Varible	83/75	n/a	n/a	n/a	200	n/a	n/a	n/a
22	3600	92/81	n/a	n/a	n/a	210	n/a	n/a	n/a
20 kW - 3 Phase	3600	n/a	69/59	n/a	n/a	n/a	112	n/a	n/a

Maximum power decreases about 3.5 percent for each 1,000 feet (304.8 meters) above sea level; and also will decrease about 1 percent for each 6 °C (10 °F) above 16 °C (60 °F)

Generac Liquid-cooled Generators

				Output nps) LP/NG			rge Capab)% Voltage		
Size (kW)	RPM	240V 1Ø	208V 3Ø	240V 3Ø	480V 3Ø	240V 1Ø	208V 3Ø	240V 3Ø	480V 3Ø
RG 22	1800	92/92	76/76	66/66	n/a	135	92	80	n/a
RG 25	3600	104/104	87/87	75/75	n/a	170	130	112	n/a
RG 27	1800	113/104	94/87	81/75	n/a	170	120	103	n/a
RG 30	3600	125/125	104/104	90/90	n/a	180	155	134	n/a
RG 32	1800	133/133	111/111	96/96	48/48	180	210	182	87
RG 36	3600	150/146	125/121	108/105	54/53	240	130	115	60
RG 38	1800	158/158	132/132	114/114	57/57	180	210	182	87
RG 45	3600	188/188	156/156	135/135	68/68	240	130	115	60
RG 48	1800	200/200	167/167	144/144	72/72	195	218	189	87
RG 60	3600	250/250	208/208	180/180	90/90	320	210	182	91
QT 70	1800	292/267	242/232	210/201	105/101	356	471	408	201
QT 80	3600	333/333	278/278	240/240	120/120	435	466	404	175
QT 100	2300	417/371	347/326	300/282	150/141	413	452	392	261
QT 130	2970	542/488	451/423	390/367	195/183	648	885	767	390
QT 150	3600	625/625	520/493	451/427	225/214	1214	1334	1156	624

Temperature Deration:

3% for every 10 °C above 25 °C or 1.65% for every 10 °F above 77 °F

Altitude Deration (22, 25, 27, 30, 45,48, 70,100,130 & 150): 1% for every 100 m above 183 m or 3% for every 1000 ft above 600 ft

Altitude Deration (32,36,38, 60, & 80 kW):

1% for every 100 m above 915 m or 3% for every 1000 ft above 3000 ft



TABLE 3A

SURGE CAPABILITY

Generac Protector Series Generators (diesel)

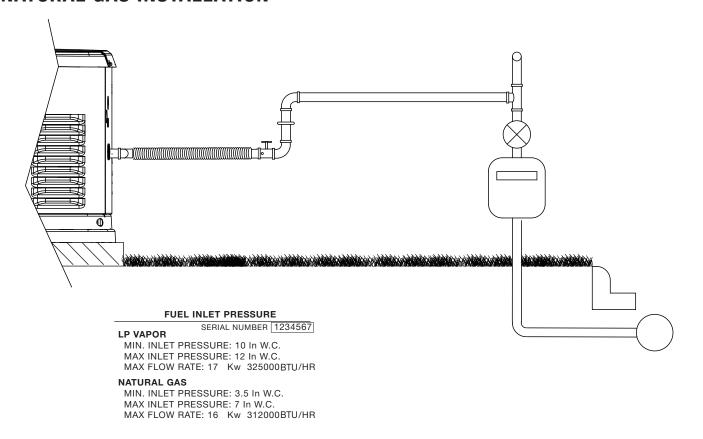
	Rated Output (Running Amps)									
Size (kW)	240V 1 PH	208V 3 PH	240V 3 PH	480V 3 PH						
15	62	52	45	n/a						
20	83	69	60	n/a						
30	125	104	90	45						
48/50	200	173	150	75						

Maximum Su	Maximum Surge Capability (LR Amps @ 30% Voltage Dip)								
240V 1 PH	208V 3 PH	240V 3 PH	480V 3 PH						
129	90	78	n/a						
211	143	124	n/a						
168	144	125	64						
189	218	189	87						

Fuel Consumption

Size (kW)	% of Rated Load	Gal/Hr	L/Hr	Total Capacity (Gal/L)	Usable Capacity (Gal/L)			
	25%	0.51	1.93					
15	50%	0.79	2.99	34 Gallons	32 Gallons			
10	75%	1.14	4.31	128.7 Liters	121.1 Liters			
	100%	1.48	5.58					
	25%	0.67	2.6					
20	50%	1.05	3.97	34 Gallons	32 Gallons			
20	75%	1.52	5.32	128.7 Liters	121.1 Liters			
	100%	1.98	7.48					
	25%	0.92	3.5					
00	50%	1.45	5.5	62 Gallons	57 Gallons			
30	75%	1.96	7.4	234.7 Liters	215.8 Liters			
	100%	2.74	10.4					
	25%	1.35	5.11					
48/50	50%	2.15	8.14	62 Gallons	57 Gallons			
40/00	75%	3.06	11.58	234.7 Liters	215.8 Liters			
	100%	3.98	15.07					

NATURAL GAS INSTALLATION



FUEL PIPE SIZING NATURAL GAS

TABLE 4

Natural Gas 5" to 7" of Water Column

(½" Pressure Drop) (Table values are maximum pipe run in feet.)

5"-7" 7-22 kW 5"-14" RG22-60 kW 11"-14" 70-150 kW

	Pipe Size (inches)										
kW	0.5"	0.75"	1"	1.25"	1.5"	2"	2.5"	3"			
7-9	10	60	200	750							
11		30	100	450							
15-20		10	35	140	300						
20-3Ph.		10	35	140	300						
22-RG 22		10	30	115	250						
25 & 30			10	60	125	450					
27			20	100	200	700					
32			20	100	200	700					
36				30	60	220					
38			10	70	150	500					
45				10	60	200	450				
48				10	60	200	450				
60				20	40	150	350	1000			
70				10	30	100	200	700			
80				10	20	75	170	475			
100				10	20	75	170	475			
130					10	40	90	250			
150					10	30	70	200			

TABLE 4B

Natural Gas 3.5" to 4.9" of Water Column

(Table values are maximum pipe run in feet.)

	Pipe Size (in)								
kW	0.75"	1"	1.25"	1.5"					
7–9	20	60	175						
11		30	125	200					
15–16		10	60	125					
20-22		10	60	125					
20-3 Ph.		10	60	125					

Natural Gas

1 cubic foot = 1,000 BTU

1 therm = 100,000 BTU

Gas consumption = 13,000-16,000 BTU per kW/hr

Pressure

1 inch mercury = 13.61 inches water column

1 inch Water Column = 0.036 psi

3.5-14 inches water column = 0.126 psi to 0.50 psi

Note

- Pipe sizing is based on 0.5" H₂O pressure drop.
- Please verify adequate service and meter sizing.
- Tables based on black pipe.

Note: Size the fuel pipe to the sizing charts or to local codes. When installing other than Sch. 40 black pipe, please refer to the manufactures sizing charts. The air-cooled generator is not a constant flow appliance, the fuel pipe was sized large enough to supply at least 100% of the generator BTU/hr rating.



LP VAPOR INSTALLATION

FUEL INLET PRESSURE

SERIAL NUMBER 1234567

LP VAPOR

MIN. INLET PRESSURE: 10 In W.C.
MAX INLET PRESSURE: 12 In W.C.
MAX FLOW RATE: 17 Kw 325000BTU/HR

NATURAL GAS

MIN. INLET PRESSURE: 3.5 In W.C. MAX INLET PRESSURE: 7 In W.C.

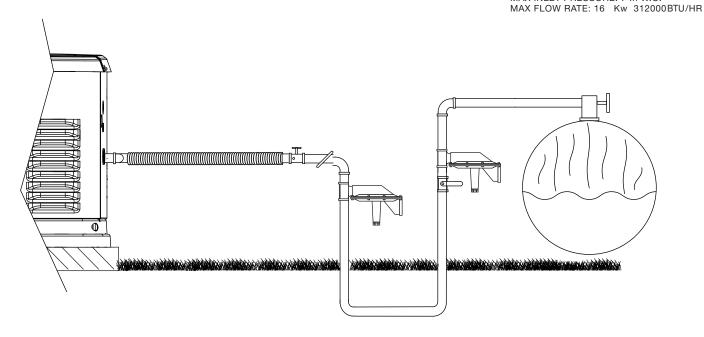


TABLE 5 FUEL PIPE SIZING LP VAPOR

	Pipe Size (inches)							
kW	0.5"	0.75"	1"	1.25"	1.5"	2"	2.5"	3"
7-9	35	175	600					
11	15	80	350					
15-16		40	175	550				
20-3 Ph.		20	100	400				
20-22		20	80	350				
RG 22		20	150	450				
25 & 30		10	40	200				
27		20	90	375	700			
32		10	60	280	550			
36			20	100	250	650		
38		10	40	250	450			
45			20	100	250	650		
48			20	100	250	650		
60			10	60	170	550		
70			10	40	100	350	700	
80				30	80	300	600	
100				20	60	275	550	
130				10	30	150	325	800
150				10	20	100	250	600

LP Vapor (LPV) 10" to 12" of Water Column

($\frac{1}{2}$ " Pressure Drop) (Table values are maximum pipe run in feet.)

ΙP

LPG: 8.55 ft³/lb., 4.24 lbs./gal., 2500 btu/ft³ LPG: 36.3 ft³ = 1 gal.

Pressure

1 inch mercury = 13.61 inches water column

1 inch Water Column = 0.036 psi

11-14 inches water column = 0.396 psi to 0.50 psi

Note:

- Pipe sizing is based on 0.5" H_2O pressure drop.
- Please verify adequate service and meter sizing.
- Tables based on black pipe.

Note: Size the fuel pipe to the sizing charts or to local codes. When installing other than Sch. 40 black pipe, please refer to the manufactures sizing charts. The air-cooled generator is not a constant flow appliance, the fuel pipe was sized large enough to supply at least 100% of the generator BTU/hr rating.

LP VAPOR (LPV) TANK SIZING Vapor Withdrawal

		_ · I· ·				
Tank Capacity Total (Gal.)	Tank Capacity Useable (Gal.)	Minimum Temp (°F)	Tank Capacity (btu/hr.)	Length (Inches)	Diameter (Inches)	Overall Ht. (Inches)
120	72	40 20 0	246,240 164,160 82,080	57	24	33
150	90	40 20 0	293,760 195,840 97,920	68	24	33
250	150	40 20 0	507,600 338,400 169,200	94	30	39
325	195	40 20 0	642,600 428,400 214,200	119	30	39
500	300	40 20 0	792,540 528,360 264,180	119	37	46
850	510	40 20 0	1,217,700 811,800 405,900	165	41	50
1000	600	40 20 0	1,416,960 944,640 472,320	192	41	50

TABLE 7 GENERATOR FUEL CONSUMPTION

Generator kW Rating		1	el Consump 100% BTU		Fuel Consumption at 50% BTU/HR		
LP Vapor	or Nat. Gas	LP Va	apor	Nat. Gas	LP Va	por	Nat. Gas
LP Vapui		BTU/HR	GAL/HR	BTU/HR	BTU/HR	GAL/HR	BTU/HR
7.5	6	115,000	1.26	117,000	90,000	1	85,000
9	8	125,000	1.37	121,000	79,000	0.87	90,000
11	10	179,000	1.97	159,000	107,000	1.18	111,000
15 ECO	EC0	261,000	2.87	281,000	120,000	1.32	134,000
16	16	267,000	2.94	309,000	229,000	2.52	218,000
20	18	324,000	3.56	301,000	216,000	2.38	204,000
20-3Ph.	17-3Ph.	324,000	3.56	307,000	217,000	2.39	219,000
20 VSCF	18 VSCF	311,000	3.42	285,000	149,000	1.64	174,000
22	19.5	355,000	3.87	327,000	230,000	2.56	228,000
RG22	22	309,000	3.4	316,000	191,000	2.1	190,000
RG25	25	427,000	4.7	430,000	300,000	3.3	297,000
RG27	25	354,000	3.9	359,000	191,000	2.1	197,000
RG30	30	491,000	5.4	492,000	318,000	3.5	320,000
RG32	32	418,000	4.6	375,000	246,000	2.7	226,000
RG36	36	726,000	8	730,000	382,000	4.2	380,000
RG38	38	472,000	5.2	437,000	264,000	2.9	255,000
RG45	45	726,000	8	730,000	382,000	4.2	380,000
RG48	48	723,000	7.96	756,000	376,000	4.14	392,000
RG60	60	817,000	9	862,000	454,000	5	483,000
QT70	67	1,028,000	11.4	1,020,000	496,000	5.46	500,000
QT80	80	1,163,000	12.8	1,253,000	603,000	6.7	785,000
QT100	94	1,268,000	14	1,260,000	718,000	7.9	713,000
QT130	122	1,798,000	19.8	1,786,000	933,000	10.3	927,000
QT150	142	2,080,000	22.9	2,061,000	1,080,000	11.9	1,070,000

Gas Required for Common Appliances

APPLIANCE	Approximate Input BTU / Hr
Warm Air Furnace Single Family Multifamily, per unit	60,000–120,000 40,000–60,000
Hydronic Boiler, Space Heating Single Family Multifamily, per unit	80,000–140,000 50,000–80,000
Hydronic Boiler, Space and Water Heating Single Family Multifamily, per unit	100,000–200,000 50,000–100,000
Range, Free Standing, Domestic Built-In Oven or Broiler Unit, Domestic Built-In Top Unit, Domestic	50,000–90,000 14,000–16,000 40,000–85,000
Water Heater, Automatic Storage, 30 to 40 gal. Tank Water Heater, Automatic Storage, 50 gal. Tank Water Healer, Automatic Storage, Instantaneous	25,000–50,000 30,000–55,000
2.5 GPM 3 GPM 4 GPM Water Heater, Domestic, Circulating or Side-Arm	115,000–125,000 125,000–150,000 155,000–200,000
Refrigerator Clothes Dryer, Type 1 (Domestic) Gas Fireplace Direct Vent Gas log Barbecue Gas light	1,500–2,000 18,000–22,000 20,000–90,000 35,000–90,000 40,000–80,000 1,400–2,800

Note: Tank BTU capacity and generator run times based upon maintaining a minimum tank fuel level of 20%. Tanks are typically filled to 80% full.

Note: Typical fuel consumption based on a generator 100% loaded.

Equivalent Straight Lenghts in Feet of Sch. 40 Pipe
Fittings and Valves

Pipe Size	45° Elbow	90° Elbow	Tee Fitting	Shut Off Valve			
1/2"	0.73	1.55	3.1	0.36			
3/4"	0.96	2.06	4.12	0.48			
1"	1.22	2.62	5.24	0.61			
1 1⁄4"	1.61	3.45	6.9	0.81			
1 ½"	1.88	4.02	8.04	0.94			
2"	2.41	5.17	10.3	1.21			
2 ½"	2.88	6.16	12.3	1.44			
3"	3.58	12.6	15.3	1.79			

Operating Cost Per Hour					
=					
NG Therms/HR x Cost of NG Therm					



UPS — **GENERATOR COMPATIBILITY**

Passive (also referenced as standby or off-line) and Line-Interactive

These technologies are most common for personal workstations and point of sale applications. They are typically single phase equipment with size ranges of 350 VA–2000 VA for passive and 500 VA to 5000 VA for line-interactive.

Passive UPS's are the simplest type. Under normal conditions AC power passes straight through to the UPS load. When the input power supply goes outside of specifications, the UPS transfers the load from input power to the internal DC to AC power inverter. Passive UPS's do not correct for voltage or frequency deviations under "normal" operation.

Line-interactive is similar to the passive technology except it has circuitry that attempts to correct for standard voltage deviations. Frequency deviations under "normal" power operation are not corrected.

Equipment Notes:

These devices tend to be electrically / harmonically very noisy. A single small UPS is not a significant concern, but applications with multiple UPS's can be problematic.

Passive UPS technology typically has normal tolerances of 10–25% on voltage and 3 hertz on frequency. Minuteman UPS input tolerance is closer to 10–36%. If the input source goes outside of these tolerances, the UPS will switch onto the UPS battery source. Some line-interactive units may have frequency tolerances factory set to 0.5 hertz. These units will need to have their frequency tolerance increased to a minimum of 2 hertz. Minuteman UPS products are close to 5 hertz and not 0.5 hertz.

Generator Sizing Recommendation:

Limit the total UPS loading to 15%-20% of the generator capacity.

Double-Conversion (also referenced as on-line)

This technology is most common for critical load applications. Double-conversion UPS's constantly rectify AC to DC and then invert the DC back into AC. This configuration results in an output that corrects for voltage and frequency deviations.

There are single and three phase models covering small through large applications. Most UPS applications larger than 5000 VA use double conversion technology. This approach is also the preferred technology for generator applications.

Equipment Notes:

Double-conversion UPS's that are single phase or unfiltered three phase models tend to create a significant level of electrical/ harmonic noise. This is illustrated by harmonic current distortions that are greater than 35%. Minuteman UPS products could have current distortion of 8%. When three phase models are supplied with harmonic filters (current distortion less than 10%), this concern is no longer an issue.

Generator Sizing Recommendation:

Single phase models: limit the total UPS loading to 25% of the generator capacity.

Single phase Minuteman UPS models: limit the total UPS loading to 50% of the generator capacity.

Three phase models without filters (current distortion > 30%): limit the UPS loading to 35% of the generator capacity.

Three phase models with filters (current distortion < 10%): limit the UPS loading to 80% of the generator capacity.

UPS Information

2 x kVA rating for a filtered system

3-5 x kVA rating for an unfiltered system

Supplier(s)	Passive (Standby)	Line-Interactive	Double-Conversion
Minuteman UPS	Enspire	Enterprise Plus	Endeavor
APC	Back-UPS Series	Smart-UPS Series	Symmetra Series
Liebert	PowerSure PST & PSP	PowerSure PSA & PSI	UPStation & Nfinity
Powerware	3000 series	5000 series	9000 series

Note: Ferrups and Delta-Conversion UPS technologies not included in discussion

UPS- GENERATOR COMPATIBILITY SIZING EXAMPLES

- UPS systems create electrical or harmonic noise, and this harmonic noise has to be taken into consideration when sizing a generator.
- The generator alternator has to be sized large enough to accept the Total UPS Load from the connected UPS systems.
- Undersizing the generator can cause damage to the UPS equipment, connected equipment, and/or generator.

The sizing formula for UPS systems is the following:

Number of Systems X VA Rating X Harmonic Multiplier X Generator Multiplier = Minimum Alternator Size

Single phase generator backing up 3, 2500 VA Line-Interactive UPS Systems with a Harmonic Multiplier of 3

Number of UPS Systems	3
VA Rating	2500
Harmonic Multiplier	3
Total UPS Load	22,500 VA
Generator Multiplier	4
Minimum Generator Alternator Size	*90,000 VA

(25% of the generator capacity)

3 Phase generator backing up 4, 10000 VA Double Conversion UPS Systems with a Harmonic Multiplier of 2

Number of UPS Systems	4
VA Rating	10000
Harmonic Multiplier	2
Total UPS Load	80,000 VA
Generator Multiplier	1.25
Minimum Generator Alternator Size	100,000 VA

(80% of the generator capacity)

Sizing Notes:

- Always contact the UPS manufacturer when in doubt of the Harmonic Multiplier for the UPS system.
- · Always use the full VA rating of the UPS system for sizing calculations
- Limit Total UPS loading on single phase generators to 25% of the generators capacity
- Limit Total UPS loading on 3 phase generators to 80% of the generators capacity

^{*}Note: Depending on any voltage and frequency adjustments with the UPS system, generator range is 80-100 kW

TYPICAL GENERATOR/TRANSFER SWITCH COMBINATIONS

Current Model - Evolution	Current Switch model #	Description	Prior Models (5/10-3/13)	Prior Switch Model # (*see note)
volution models / transfe	r switches and prior models	s / transfer switches listed CAN be used together.		, , ,
		9 kW Air-Cooled Generator - Aluminum		
	RXG10EZA1	10 Circuit Pre-wired Switch		RTS10EZA1
T 000	RXG16EZA3	100 amp 16 Circuit Switch NEMA 3R		
7029	RXSC100A3	100 amp Normal Smart Switch	6245	RTSX100A3
7030	RTSE100A3CSA	100 amp CSA Service Rated Switch	6237	RTSE100A3CSA
7030	RXG24SHA1	100 amp 24 Space Service Rated Smart Switch	0237	
	RXG42SHA1	200 amp 42 Space Service Rated Smart Switch		
	RXSW200A3F	200 amp Service Rated Smart Switch with 8 Space Panel Board		
		11 kW Air-Cooled Generator - Aluminum		
	RXG12EZA1	12 Circuit Pre-wired Switch		RTS10EZA1
	RXG16EZA3	100 amp 16 Circuit Switch NEMA 3R		
	RXSC100A3	100 amp Normal Smart Switch	6720	RTSX100A3
7031	RXSW100A3	100 amp Service Rated Smart Switch	1	RTSR100A3
	RXSW150A3	150 amp Service Rated Smart Switch	6437	RTSR150A3
7032	RXSC200A3	200 amp Normal Smart Switch	0-101	RTSR200A3
	RXSW200A3	200 amp Service Rated Smart Switch	6438	RTSR200A3
7033	RXG24SHA1	100 amp 24 Space Service Rated Smart Switch		5449
				5454
	RXG42SHA1 RXSW200A3F	200 amp 42 Space Service Rated Smart Switch		
		200 amp Service Rated Smart Switch with 8 Space Panel Board		5448
	RTSE100A3CSA	100 amp CSA Service Rated Switch		RTSE100A3CSA
	RTSE200A3CSA	200 amp CSA Service Rated Switch		RTSE200A3CSA
		15 kW EcoGen Air-Cooled Generator - Aluminum		
7034	RTSB200A3	200 amp Service Rated Smart Switch	6103	
	RTSI200A3	200 amp Normal Smart Switch		
	1110120010	<u>'</u>		
		16/16 kW Air-Cooled Generator - Aluminum		
	RXG16EZA1	16 Circuit Pre-wired Switch		RTS16E2A1
	RXG16EZA3	100 amp 16 Circuit Switch NEMA 3R		
7035	RXSC100A3	100 amp Normal Smart Switch	6721	RTSX100A3
	RXSW100A3	100 amp Service Rated Smart Switch	•	RTSR100A3
7036	RXSW150A3	150 amp Service Rated Smart Switch	6461	RTSR150A3
	RXSC200A3	200 amp Normal Smart Switch		RTSX200A3
7037	RXSW200A3	200 amp Service Rated Smart Switch	6462	RTSR200A3
	RXG24SHA1	100 amp 24 Space Service Rated Smart Switch		5449
	RXG42SHA1	200 amp 42 Space Service Rated Smart Switch	6721	5454
	RXSW200A3F	200 amp Service Rated Smart Switch with 8 Space Panel Board		5448
	RTSE100A3CSA RTSE200A3CSA	100 amp CSA Service Rated Switch 200 amp CSA Service Rated Switch		RTSE100A3CSA RTSE200A3CSA
	THOLLOGICOCIC			11102200710007
7040	DTODOGGAG	20 kW Synergy Air-Cooled Generator - Aluminum	6055	
7041	RTSB200A3	200 amp Service Rated Smart Switch	6098	
	RTSI200A3	200 amp Normal Smart Switch		
		20 kW Air-Cooled Generator - Aluminum		
	RXG16EZA3	100 amp 16 Circuit Switch NEMA 3R		
				RTSX100A3
	RXG16EZA3	100 amp 16 Circuit Switch NEMA 3R		RTSX100A3 RTSR100A3
	RXG16EZA3 RXSC100A3	100 amp 16 Circuit Switch NEMA 3R 100 amp Normal Smart Switch		
7038	RXG16EZA3 RXSC100A3 RXSW100A3 RXSW150A3	100 amp 16 Circuit Switch NEMA 3R 100 amp Normal Smart Switch 100 amp Service Rated Smart Switch	6730	RTSR100A3
	RXG16EZA3 RXSC100A3 RXSW100A3 RXSW150A3 RXSC200A3	100 amp 16 Circuit Switch NEMA 3R 100 amp Normal Smart Switch 100 amp Service Rated Smart Switch 150 amp Service Rated Smart Switch 200 amp Normal Smart Switch		RTSR100A3 RTSR150A3 RTSX200A3
7038 7039	RXG16EZA3 RXSC100A3 RXSW100A3 RXSW150A3 RXSC200A3 RXSW200A3	100 amp 16 Circuit Switch NEMA 3R 100 amp Normal Smart Switch 100 amp Service Rated Smart Switch 150 amp Service Rated Smart Switch 200 amp Normal Smart Switch 200 amp Service Rated Smart Switch	6730 6729	RTSR100A3 RTSR150A3 RTSX200A3 RTSR200A3
	RXG16EZA3 RXSC100A3 RXSW100A3 RXSW150A3 RXSC200A3 RXSW200A3 RXG24SHA1	100 amp 16 Circuit Switch NEMA 3R 100 amp Normal Smart Switch 100 amp Service Rated Smart Switch 150 amp Service Rated Smart Switch 200 amp Normal Smart Switch 200 amp Service Rated Smart Switch 100 amp 24 Space Service Rated Smart Switch		RTSR100A3 RTSR150A3 RTSX200A3 RTSR200A3 5449
	RXG16EZA3 RXSC100A3 RXSW100A3 RXSW150A3 RXSC200A3 RXSW200A3 RXG24SHA1 RXG42SHA1	100 amp 16 Circuit Switch NEMA 3R 100 amp Normal Smart Switch 100 amp Service Rated Smart Switch 150 amp Service Rated Smart Switch 200 amp Normal Smart Switch 200 amp Service Rated Smart Switch 100 amp 24 Space Service Rated Smart Switch 200 amp 42 Space Service Rated Smart Switch		RTSR100A3 RTSR150A3 RTSX200A3 RTSR200A3 5449 5454
	RXG16EZA3 RXSC100A3 RXSW100A3 RXSW150A3 RXSC200A3 RXSW200A3 RXG24SHA1 RXG42SHA1 RXSW200A3F	100 amp 16 Circuit Switch NEMA 3R 100 amp Normal Smart Switch 100 amp Service Rated Smart Switch 150 amp Service Rated Smart Switch 200 amp Normal Smart Switch 200 amp Service Rated Smart Switch 100 amp 24 Space Service Rated Smart Switch 200 amp 42 Space Service Rated Smart Switch 200 amp Service Rated Smart Switch 200 amp Service Rated Smart Switch		RTSR100A3 RTSR150A3 RTSX200A3 RTSR200A3 5449 5454 5448
	RXG16EZA3 RXSC100A3 RXSW100A3 RXSW150A3 RXSC200A3 RXSW200A3 RXG24SHA1 RXG42SHA1 RXSW200A3F RTSE100A3CSA	100 amp 16 Circuit Switch NEMA 3R 100 amp Normal Smart Switch 100 amp Service Rated Smart Switch 150 amp Service Rated Smart Switch 200 amp Normal Smart Switch 200 amp Service Rated Smart Switch 100 amp 24 Space Service Rated Smart Switch 200 amp 42 Space Service Rated Smart Switch 200 amp Service Rated Smart Switch 200 amp Service Rated Smart Switch with 8 Space Panel Board 100 amp CSA Service Rated Switch		RTSR100A3 RTSR150A3 RTSR200A3 RTSR200A3 5449 5454 5448 RTSE100A3CSA
	RXG16EZA3 RXSC100A3 RXSW100A3 RXSW150A3 RXSC200A3 RXSW200A3 RXG24SHA1 RXG42SHA1 RXSW200A3F	100 amp 16 Circuit Switch NEMA 3R 100 amp Normal Smart Switch 100 amp Service Rated Smart Switch 150 amp Service Rated Smart Switch 200 amp Normal Smart Switch 200 amp Service Rated Smart Switch 100 amp 24 Space Service Rated Smart Switch 200 amp 42 Space Service Rated Smart Switch 200 amp Service Rated Smart Switch 200 amp Service Rated Smart Switch 200 amp CSA Service Rated Switch 200 amp CSA Service Rated Switch		RTSR100A3 RTSR150A3 RTSR200A3 RTSR200A3 S449 5454 5448 RTSE100A3CSA
	RXG16EZA3 RXSC100A3 RXSW100A3 RXSW150A3 RXSC200A3 RXSW200A3 RXG24SHA1 RXG42SHA1 RXSW200A3F RTSE100A3CSA RTSE200A3CSA	100 amp 16 Circuit Switch NEMA 3R 100 amp Normal Smart Switch 100 amp Service Rated Smart Switch 150 amp Service Rated Smart Switch 200 amp Normal Smart Switch 200 amp Service Rated Smart Switch 100 amp 24 Space Service Rated Smart Switch 200 amp 42 Space Service Rated Smart Switch 200 amp Service Rated Smart Switch 200 amp Service Rated Smart Switch 200 amp CSA Service Rated Switch with 8 Space Panel Board 100 amp CSA Service Rated Switch 200 amp CSA Service Rated Switch		RTSR100A3 RTSR150A3 RTSR200A3 RTSR200A3 S449 5454 5448 RTSE100A3CSA
	RXG16EZA3 RXSC100A3 RXSW100A3 RXSW150A3 RXSC200A3 RXSC200A3 RXSW240A3 RXG24SHA1 RXG42SHA1 RXSW200A3F RTSE100A3CSA RTSE200A3CSA	100 amp 16 Circuit Switch NEMA 3R 100 amp Normal Smart Switch 100 amp Service Rated Smart Switch 150 amp Service Rated Smart Switch 200 amp Normal Smart Switch 200 amp Service Rated Smart Switch 100 amp Service Rated Smart Switch 100 amp 24 Space Service Rated Smart Switch 200 amp 42 Space Service Rated Smart Switch 200 amp Service Rated Smart Switch 200 amp Service Rated Smart Switch with 8 Space Panel Board 100 amp CSA Service Rated Switch 200 amp CSA Service Rated Switch 200 amp CSA Service Rated Switch		RTSR100A3 RTSR150A3 RTSS200A3 RTSR200A3 S5449 S454 5448 RTSE100A3CS/
	RXG16EZA3 RXSC100A3 RXSW100A3 RXSW150A3 RXSC200A3 RXSC200A3 RXSW24SHA1 RXG42SHA1 RXSW200A3F RTSE100A3CSA RTSE200A3CSA RTSE200A3CSA	100 amp 16 Circuit Switch NEMA 3R 100 amp Normal Smart Switch 100 amp Service Rated Smart Switch 150 amp Service Rated Smart Switch 200 amp Normal Smart Switch 200 amp Service Rated Smart Switch 100 amp 24 Space Service Rated Smart Switch 200 amp 42 Space Service Rated Smart Switch 200 amp Service Rated Smart Switch 200 amp Service Rated Smart Switch 200 amp CSA Service Rated Switch with 8 Space Panel Board 100 amp CSA Service Rated Switch 200 amp Normal Smart Switch NEMA 3R 100 amp Normal Smart Switch		RTSR100A3 RTSR150A3 RTSS200A3 RTSR200A3 S449 S454 5448 RTSE100A3CS/ RTSE200A3CS/
	RXG16EZA3 RXSC100A3 RXSW100A3 RXSW150A3 RXSC200A3 RXSC200A3 RXG24SHA1 RXG42SHA1 RXSW200A3F RTSE100A3CSA RTSE200A3CSA RTSE200A3CSA RXSC100A3 RXSC100A3 RXSC100A3	100 amp 16 Circuit Switch NEMA 3R 100 amp Normal Smart Switch 100 amp Service Rated Smart Switch 150 amp Service Rated Smart Switch 200 amp Normal Smart Switch 200 amp Service Rated Smart Switch 100 amp 24 Space Service Rated Smart Switch 200 amp 42 Space Service Rated Smart Switch 200 amp Service Rated Smart Switch 200 amp Service Rated Smart Switch with 8 Space Panel Board 100 amp CSA Service Rated Switch 200 amp CSA Service Rated Switch 200 amp CSA Service Rated Switch 100 amp 16 Circuit Switch NEMA 3R 100 amp Normal Smart Switch 100 amp Service Rated Smart Switch		RTSR100A3 RTSR150A3 RTSS200A3 RTSR200A3 S5449 S454 5448 RTSE100A3CS/ RTSE200A3CS/
7039	RXG16EZA3 RXSC100A3 RXSW100A3 RXSW150A3 RXSC200A3 RXSC200A3 RXSG24SHA1 RXG42SHA1 RXSW200A3F RTSE100A3CSA RTSE200A3CSA RTSE200A3CSA RXSC100A3 RXSC100A3 RXSW100A3 RXSW100A3	100 amp 16 Circuit Switch NEMA 3R 100 amp Normal Smart Switch 100 amp Service Rated Smart Switch 150 amp Service Rated Smart Switch 200 amp Normal Smart Switch 200 amp Service Rated Smart Switch 100 amp Service Rated Smart Switch 100 amp 24 Space Service Rated Smart Switch 200 amp 42 Space Service Rated Smart Switch 200 amp Service Rated Smart Switch with 8 Space Panel Board 100 amp CSA Service Rated Switch 200 amp CSA Service Rated Switch 200 amp CSA Service Rated Switch 200 amp CSA Service Rated Switch 100 amp 16 Circuit Switch NEMA 3R 100 amp Normal Smart Switch 100 amp Service Rated Smart Switch 150 amp Service Rated Smart Switch	6729	RTSR100A3 RTSR150A3 RTSS200A3 RTSR200A3 S449 S454 5448 RTSE100A3CS/ RTSE200A3CS/ RTSR100A3 RTSR100A3 RTSR100A3 RTSR100A3
	RXG16EZA3 RXSC100A3 RXSW100A3 RXSW150A3 RXSC200A3 RXSC200A3 RXSW24SHA1 RXG42SHA1 RXSW200A3F RTSE100A3CSA RTSE200A3CSA RXSC100A3 RXSC100A3 RXSW150A3 RXSW150A3 RXSW150A3 RXSC200A3	100 amp 16 Circuit Switch NEMA 3R 100 amp Normal Smart Switch 100 amp Service Rated Smart Switch 150 amp Service Rated Smart Switch 200 amp Normal Smart Switch 200 amp Service Rated Smart Switch 100 amp 24 Space Service Rated Smart Switch 200 amp 42 Space Service Rated Smart Switch 200 amp Service Rated Smart Switch 200 amp Service Rated Smart Switch 200 amp CSA Service Rated Switch 100 amp 16 Circuit Switch NEMA 3R 100 amp Normal Smart Switch 100 amp Service Rated Smart Switch 100 amp Service Rated Smart Switch 200 amp Normal Smart Switch 200 amp Normal Smart Switch		RTSR100A3 RTSR150A3 RTSS200A3 RTSR200A3 S449 S454 5448 RTSE100A3CSA RTSE200A3CSA RTSR100A3 RTSR100A3 RTSR100A3 RTSR150A3 RTSR150A3 RTSR200A3CSA
7039	RXG16EZA3 RXSC100A3 RXSW100A3 RXSW150A3 RXSC200A3 RXSC200A3 RXSG24SHA1 RXG42SHA1 RXSW200A3F RTSE100A3CSA RTSE200A3CSA RTSE200A3CSA RXSC100A3 RXSC100A3 RXSW100A3 RXSW100A3	100 amp 16 Circuit Switch NEMA 3R 100 amp Normal Smart Switch 100 amp Service Rated Smart Switch 150 amp Service Rated Smart Switch 200 amp Normal Smart Switch 200 amp Service Rated Smart Switch 100 amp Service Rated Smart Switch 100 amp 24 Space Service Rated Smart Switch 200 amp 42 Space Service Rated Smart Switch 200 amp Service Rated Smart Switch with 8 Space Panel Board 100 amp CSA Service Rated Switch 200 amp CSA Service Rated Switch 200 amp CSA Service Rated Switch 200 amp CSA Service Rated Switch 100 amp 16 Circuit Switch NEMA 3R 100 amp Normal Smart Switch 100 amp Service Rated Smart Switch 150 amp Service Rated Smart Switch	6729 6552	RTSR100A3 RTSR150A3 RTSS200A3 RTSR200A3 S449 S454 5448 RTSE100A3CSA RTSE200A3CSA RTSR100A3 RTSR100A3 RTSR100A3 RTSR150A3
7039	RXG16EZA3 RXSC100A3 RXSW100A3 RXSW150A3 RXSC200A3 RXSC200A3 RXSW24SHA1 RXG42SHA1 RXSW200A3F RTSE100A3CSA RTSE200A3CSA RXSC100A3 RXSC100A3 RXSW150A3 RXSW150A3 RXSW150A3 RXSC200A3	100 amp 16 Circuit Switch NEMA 3R 100 amp Normal Smart Switch 100 amp Service Rated Smart Switch 150 amp Service Rated Smart Switch 200 amp Normal Smart Switch 200 amp Service Rated Smart Switch 100 amp 24 Space Service Rated Smart Switch 200 amp 42 Space Service Rated Smart Switch 200 amp Service Rated Smart Switch 200 amp Service Rated Smart Switch 200 amp CSA Service Rated Switch 100 amp 16 Circuit Switch NEMA 3R 100 amp Normal Smart Switch 100 amp Service Rated Smart Switch 100 amp Service Rated Smart Switch 200 amp Normal Smart Switch 200 amp Normal Smart Switch	6729	RTSR100A3 RTSR150A3 RTSS200A3 RTSR200A3 S449 S454 5448 RTSE100A3CSA RTSE200A3CSA RTSR100A3 RTSR100A3 RTSR100A3 RTSR150A3 RTSR150A3 RTSR200A3CSA
7039	RXG16EZA3 RXSC100A3 RXSW100A3 RXSW150A3 RXSC200A3 RXSC200A3 RXSC24SHA1 RXG24SHA1 RXSW200A3F RTSE100A3CSA RTSE200A3CSA RXSC100A3 RXSW100A3 RXSW150A3 RXSW150A3 RXSW100A3 RXSW150A3 RXSW200A3 RXSW200A3 RXSW200A3 RXSW200A3 RXSW200A3 RXSW200A3	100 amp 16 Circuit Switch NEMA 3R 100 amp Normal Smart Switch 100 amp Service Rated Smart Switch 150 amp Service Rated Smart Switch 200 amp Normal Smart Switch 200 amp Service Rated Smart Switch 100 amp 24 Space Service Rated Smart Switch 200 amp 42 Space Service Rated Smart Switch 200 amp Service Rated Smart Switch 200 amp Service Rated Smart Switch with 8 Space Panel Board 100 amp CSA Service Rated Switch 200 amp CSA Service Rated Switch 200 amp CSA Service Rated Switch 200 amp 16 Circuit Switch NEMA 3R 100 amp Normal Smart Switch 100 amp Service Rated Smart Switch 200 amp Service Rated Smart Switch 200 amp Normal Smart Switch 200 amp Normal Smart Switch 200 amp Normal Smart Switch	6729 6552	RTSR100A3 RTSR150A3 RTSR200A3 RTSR200A3 S449 S454 S448 RTSE100A3CSA RTSE200A3CSA RTSR100A3 RTSR100A3 RTSR100A3 RTSR100A3 RTSR150A3 RTSR200A3 RTSR200A3
7039	RXG16EZA3 RXSC100A3 RXSW100A3 RXSW150A3 RXSC200A3 RXSC200A3 RXG24SHA1 RXG42SHA1 RXSW200A3F RTSE100A3CSA RTSE200A3CSA RXSC100A3 RXSC100A3 RXSW150A3 RXSW150A3 RXSW150A3 RXSW200A3	100 amp 16 Circuit Switch NEMA 3R 100 amp Normal Smart Switch 100 amp Service Rated Smart Switch 150 amp Service Rated Smart Switch 200 amp Normal Smart Switch 200 amp Service Rated Smart Switch 100 amp 24 Space Service Rated Smart Switch 200 amp 42 Space Service Rated Smart Switch 200 amp Service Rated Smart Switch 200 amp Service Rated Smart Switch with 8 Space Panel Board 100 amp CSA Service Rated Switch 200 amp CSA Service Rated Switch 200 amp CSA Service Rated Switch 200 amp CSA Service Rated Switch 100 amp 16 Circuit Switch NEMA 3R 100 amp Normal Smart Switch 100 amp Service Rated Smart Switch 100 amp Service Rated Smart Switch 200 amp Normal Smart Switch 200 amp Normal Smart Switch 200 amp Service Rated Smart Switch 200 amp Service Rated Smart Switch 200 amp 24 Space Service Rated Smart Switch 200 amp 42 Space Service Rated Smart Switch	6729 6552	RTSR100A3 RTSR150A3 RTSR200A3 RTSR200A3 S449 5454 5448 RTSE100A3CSA RTSE200A3CSA RTSR200A3 RTSR100A3 RTSR100A3 RTSR100A3 RTSR150A3 RTSR200A3 RTSR200A3 S449
7039	RXG16EZA3 RXSC100A3 RXSW100A3 RXSW150A3 RXSW200A3 RXSW200A3 RXG24SHA1 RXG42SHA1 RXSW200A3F RTSE100A3CSA RTSE200A3CSA RXSC100A3 RXSW100A3 RXSW150A3 RXSW100A3 RXSW150A3 RXSW10A3 RXSW150A3 RXSW150A3 RXSW200A3 RXSW200A3 RXSW200A3 RXSW200A3 RXSW200A3 RXSW200A3 RXSW200A3 RXG24SHA1 RXG42SHA1	100 amp 16 Circuit Switch NEMA 3R 100 amp Normal Smart Switch 100 amp Service Rated Smart Switch 150 amp Service Rated Smart Switch 200 amp Normal Smart Switch 200 amp Service Rated Smart Switch 100 amp 24 Space Service Rated Smart Switch 200 amp 42 Space Service Rated Smart Switch 200 amp Service Rated Smart Switch 200 amp Service Rated Smart Switch with 8 Space Panel Board 100 amp CSA Service Rated Switch 200 amp CSA Service Rated Switch 200 amp CSA Service Rated Switch 200 amp CSA Service Rated Switch 100 amp 16 Circuit Switch NEMA 3R 100 amp Normal Smart Switch 100 amp Service Rated Smart Switch 100 amp Service Rated Smart Switch 200 amp Normal Smart Switch 200 amp Normal Smart Switch 200 amp Service Rated Smart Switch 200 amp Service Rated Smart Switch	6729 6552	RTSR100A3 RTSR150A3 RTSR200A3 RTSR200A3 S449 S454 S448 RTSE100A3CSA RTSE200A3CSA RTSR100A3 RTSR100A3 RTSR100A3 RTSR150A3 RTSR200A3 RTSR200A3 S449 S454

TYPICAL GENERATOR/TRANSFER SWITCH COMBINATIONS

Current Model - Evolution	Current Switch model #	Description	Prior Models (5/10-3/13)	Prior Switch Model # (*see note)
Evolution models / transfe	er switches and prior mod	lels / transfer switches listed CAN be used together.		
		20 kW Air-Cooled Generator - Aluminum - 120/208V		
	RXSW100G3	100 amp 120/208V 3-phase Service Rated Switch		
7077	RXSW200G3	200 amp 120/208V 3-phase Service Rated Switch		
	RTS 100-200	100-200 Normal 3-phase Switch		
		22 kW Liquid-Cooled Generator 1-phase - Aluminum		
		25 kW Liquid-Cooled Generator 1-phase - Aluminum		
		27 kW Liquid-Cooled Generator 1-phase - Aluminum		
		30 kW Liquid-Cooled Generator 1-phase - Aluminum		
	RXSC100A3	100 amp Normal Smart Switch*		RTSX100A3
RG02224ANAX	RXSW100A3	100 amp Service Rated Smart Switch*	QT02224ANAN	RTSR100A3
RG02516ANAX	RXSW150A3	150 amp Service Rated Smart Switch	QT02516ANSN	RTSR150A3
RG02724ANAX	RXSC200A3	200 amp Normal Smart Switch	QT02724ANAN	RTSX200A3
RG03016ANAX	RXSW200A3	200 amp Service Rated Smart Switch	QT03016ANSN	RTSR200A3
	5449	GenReady Load Center NEMA 1		5449
	5454	GenReady Load Center NEMA 3R		5454
	5448	Basic GenReady Load Center	-	5448
	RTSE100A3CSA RTSE200A3CSA	100 amp CSA Service Rated Switch 200 amp CSA Service Rated Switch		RTSE100A3CSA RTSE200A3CSA
	K15EZUUA3USA	200 amp CSA Service Rated Switch		K15EZUUA3USA
		36 kW Liquid-Cooled Generator - Aluminum		
	RXSC100A3	100 amp Normal Smart Switch*	QT03624ANAN	RTSX100A3
	RXSW100A3	100 amp Service Rated Smart Switch*		RTSR100A3
RG03624ANAX	RXSW150A3	150 amp Service Rated Smart Switch		RTSR150A3
	RXSC200A3	200 amp Normal Smart Switch		RTSX200A3
	RXSW200A3	200 amp Service Rated Smart Switch		RTSR200A3
	RTSE100A3CSA	100 amp CSA Service Rated Switch		RTSE100A3CS/
	RTSE200A3CSA	200 amp CSA Service Rated Switch		RTSE200A3CSA
		45 kW Liquid-Cooled Generator - Aluminum		
RG04524ANAX	RXSC200A3	200 amp Normal Smart Switch	QT04524ANSN	RTSX200A3
1100-102-17-117-00	RXSW200A3	200 amp Service Rated Smart Switch	Q10-102-1/AITOIT	RTSR200A3
	RTSE200A3CSA	200 amp CSA Service Rated Switch		RTSE200A3CSA
		48 kW Liquid-Cooled Generator - Aluminum		
	RXSC100A3	100 amp Normal Smart Switch*		RTSX100A3
	RXSW100A3	100 amp Service Rated Smart Switch*		RSSD100A3
RG04842ANAX	RXSC200A3	200 amp Normal Smart Switch	QT04842ANAN	RTSX200A3
TIGOTOTEATAA	RXSW200A3	200 amp Service Rated Smart Switch	. GIOTOTZANAN	RTSR200A3
	RTSE100A3CSA	100 amp CSA Service Rated Switch		RTSE100A3CSA
	RTSE200A3CSA	200 amp CSA Service Rated Switch		RTSE200A3CSA
	RXSC400A3	400 amp Normal Smart Switch		RTSE200A3CSA
		60 kW Liquid-Cooled Generator -		
RG06024ANAX*	RXSC100A3	100 amp Normal Smart Switch*	1	RTSX100A3
This model available	RXSW100A3	100 amp Service Rated Smart Switch	OTOGOO4ANON	RTSR100A3
in Aluminum;	RXSC200A3	200 amp Normal Smart Switch*	QT06024ANSN	RTSX200A3
Natural Gas or LP	RXSW200A3	200 amp Service Rated Smart Switch*]	RTSR200A3
	RXSC400A3	400 amp Normal Smart Switch		RTSX400A3
RTS 100-	200 amn*	22–48 kW Liquid-Cooled Generator - 3Ø service rated	100-20	0 amp*
RTS 100-		22–60 kW Liquid-Cooled Generator - 3Ø options	ļ—————————————————————————————————————	0 amp*
	800 amp*	70–150 kW Liquid-Cooled Generator - 1 & 3Ø options	100–800 amp*	

^{*} See NEC Article 240.21(B)

NEC (700, 701, 702) Comparison

NEC Comparison Table to be used as a general guideline in determining the proper generator for specific applications. Refer to architectural documents for final selection.

		Article 700 - Emergency	Article 701 - Standby	Article 702 - Optional Standby
	Scope	Life safety	Legally required critical support (fire fighting, health hazards, etc)	Protect property & facilities
	Equipment Approval	For Emergency / (UL2200)	For Intended Use / (UL2200)	For Intended Use / (UL2200) / Not in 2008
	Witness Testing (on-sight)	At install & periodically	At install	None
l gu	Periodic Testing	Yes	Yes	None
Testing	Battery Maintenance	Yes	Yes	None
Pe	Maintenance Records	Yes	Yes	None
	Load Testing	Yes	Yes	None
	Capacity	All Loads	All loads intended to operate at one time	All loads intended to operate at one time
	Other Standby Loads Allowed	Yes with load shedding	Yes with load shedding	Yes with load management
	Peak Shaving Allowed	Yes	Yes	Yes
	Automatic	Yes	Yes	No
Transfer Switch	Equipment Approval	For Emergency / (UL1008)	For Standby / (UL1008)	Optional standby / (UL1008)
Fransfer Switch	Means to Permit Bypass	Yes	No	No
ાં કુ 1	Elect. Operated - Mech. Held	Yes	No	No
	Max. Fault Current Capable	Yes	Yes	Yes
×	Malfunction	Yes / Standard common alarm	Yes / Standard common alarm	Yes / Standard common alarm
Signals (Audible & Visual)	Carrying Load	Yes / Displayed at ATS	Yes / Displayed at ATS	Yes / Displayed at Generator
gng dib	Battery Charger Failed	Yes	Yes	No
Aŭ Ši	Ground Fault Indication	Yes (480V & 1000A)	No	No
	NFPA 110 Signaling	Yes / Optional annunciator	Yes / Optional annunciator	No
Signs	At service	Yes / Type & location	Yes / Type & location	Yes / Type & location
Sig	At neutral to ground bonding	Yes (if remote)	Yes (if remote)	Yes (if remote)
	Wiring kept independent	Yes	No	No
	Fire protection (ref 700-9d)	Yes (1000 persons or 75' building)	No	No
	Maximum power outage	10 sec	60 sec	N/A
	Retransfer delay	15 min setting	15 min setting	No
	Automatic starting	Yes	Yes	No
	On-site fuel requirements	See NFPA 110	See NFPA 110	None
	Battery charger	Yes	Yes	No
	Ground Fault	Indication Only	No	No

Electrical Formulas

TO FIND	KNOWN VALUES	1-PHASE	3-PHASE
KILOWATTS (kW)	Volts, Current, Power Factor	<u>E x l</u> 1000	<u>E x I x 1.73 x PF</u> 1000
KVA	Volts, Current	<u>E x l</u> 1000	<u>E x l x 1.73</u> 1000
AMPERES	kW, Volts, Power Factor	<u>kW x 1000</u> E	<u>kW x 1000</u> E x 1.73 x PF
WATTS	Volts, Amps, Power Factor	Volts x Amps	E x l x 1.73 x PF
NO. OF ROTOR POLES	Frequency, RPM	<u>2 x 60 x Frequency</u> RPM	2 x 60 x frequency RPM
FREQUENCY	RPM, No. of Rotor Poles	RPM x Poles 2 x 60	RPM x Poles 2 x 60
RPM	Frequency, No. of Rotor Poles	2 x 60 x Frequency Rotor Poles	2 x 60 x Frequency Rotor Poles
kW (required for Motor)	Motor Horsepower, Efficiency	<u>HP x 0.746</u> Efficiency	<u>HP x 0.746</u> Efficiency
RESISTANCE	Volts, Amperes	Ē	<u>E</u> –
VOLTS	Ohms, Amperes	I x R	I x R
AMPERES	Ohms, Volts	<u>E</u> R	<u>E</u> R

E = VOLTS I = AMPERES

R = RESISTANCE (OHMS)

PF = POWER FACTOR

NOTES		

U.S. WEIGHTS AND MEASURES LINEAR MEASURE INCH 2.540 CENTIMETERS = 3.048 DECIMETERS 12 INCHES **FOOT** = 9.144 DECIMETERS 3 FFFT YARD = 5.5 YARDS ROD **5.029 METERS** = = 1 FURLONG = 2.018 HECTOMETERS 40 RODS = FURLONGS = 1 MILE 1.609 KILOMETERS = **MILE MEASUREMENTS** STATUTE MILE 5,280 FEET SCOTS MILE 5,952 = FEET IRISH MILE 6,720 **FEET** = 1 RUSSIAN VERST = 3,504 FEFT ITALIAN MILE 4,401 FEET = 1 SPANISH MILE 15.084 OTHER LINEAR MEASUREMENTS 1 LINK = 7.92 INCHES 1 FATHOM = 6 FEET 1 FURLONG = 10 CHAINS HAND = 4 INCHES SPAN = 9 INCHES CHAIN = 22 YARDS CHAINS 1 CABLE = 608 **SQUARE MEASURE** 144 SQUARE INCHES SQUARE FOOT SQUARE FEET SQUARE YARD 301/4 SQUARE YARDS SQUARE ROD 40 RODS = ROOD ACRE ROODS = 640 **ACRES** = SQUARE MILE SQUARE MILE SECTION = 36 SECTIONS = 1 TOWNSHIP **CUBIC OR SOLID MEASURE** CU. FOOT 1728 CU. INCHES CU. YARD 27 CU. FEET 7.48 CU. FOOT **GALLONS** GALLON (WATER) 8.34 LBS. CU. INCHES OF WATER GALLON (U.S.) 231 GALLON (IMPERIAL) = CU. INCHES OF WATER METRIC SYSTEM

CUBIC MEASURE:

(THE UNIT IS THE METER = 39.37 INCHES)

1 CU. CENTIMETER = 1000 CU. MILLIMETERS = 0.06102 CU. IN. 1 CU. DECIMETER = 1000 CU. CENTIMETERS = 61.02374 CU. IN. 1 CU. METER = 1000 CU. DECIMETERS = 35.31467 CU. FT. = 1.30795 CU. YDS. = 1 STERE

1 CU. CENTIMETER (WATER) = 1 GRAM

1000 CU. CENTIMETERS (WATER) = 1 LITER = 1 KILOGRAM 1 CU. METER (1000 LITERS) = 1 METRIC TON

MEASURES OF WEIGHT:

(THE UNIT IS THE GRAM = 0.035274 OUNCES)

MILLIGRAM = = = CENTIGRAM = 10 MILLIGRAMS = 0.015432 GRAINS 0.15432 GRAINS DECIGRAM = 10 CENTIGRAMS = 1.5432 GRAINS GRAM = 10 DECIGRAMS = DEKAGRAM = 10 GRAMS = 15.4323 GRAINS 5.6438 DRAMS HECTOGRAM = 10 DEKAGRAMS = 3.5274 OUNCES KILOGRAM = 10 HECTOGRAMS = 2.2046223 POUNDS MYRIAGRAM = 10 KILOGRAMS = 22.046223 POUNDS = 10 MYRIAGRAMS = 1.986412 CWT. QUINTAL METRIC TON = 10 QUINTAL = 2204.6226 / 21849 POUNDS

GRAM = 0.56438 DRAMS 1 DRAM = 1.77186 GRAMS

= 27.3438 GRAINS 1 METRIC TON = 2,204.6223 POUNDS

MEASURES OF CAPACITY:

(THE UNIT IS THE LITER = 1.0567 LIQUID QUARTS)

1 CENTILITER = 10 MILLILITERS = 0.338 FLUID OUNCES DECILITER = 10 CENTILITERS = 3.38 FLUID OUNCES LITER = 10 DECILITERS = 33.8 DEKALITER = 10 LITERS = 0.28 FLUID OUNCES DEKALITER = 10 LITERS = 0.284 BUSHEL HECTOLITER = 10 DEKALITERS = 2.84 BUSHEL BUSHELS 1 KILOLITER = 10 HECTOLITERS = 264.2

NOTE: $\frac{\text{KILOMETERS}}{8} \times 5 = \text{MILES} \quad \text{or} \quad \frac{\text{MILES}}{5} \times 8 = \text{KILOMETERS}$

GALLONS

METRIC SYSTEM

PREFIXES:

A. MEGA = 1.000.000 0.1 = 1,000 F. CENTI B. KILO 0.01 = C. HECTO = 100 G. MILLI = 0.001 D. DEKA 0.000001

LINEAR MEASURE:

(THE UNIT IS THE METER = 39.37 INCHES)
1 CENTIMETER = 10 MILLIMETERS = 0 0.3937011 IN. DECIMETER = 10 CENTIMETERS 3 9370113 INS 1.0936143 YDS. = 10 DECIMETERS 3.2808429 FT. DEKAMETER = 10 METERS HECTOMETER = 10 DEKAMETERS 10.936143 YDS. = = 109.36143 YDS. KILOMETER = 10 HECTOMETERS 0.62137 MILE

1 MYRIAMETER = 10.000 METERS

SQUARE MEASURE:

(THE UNIT IS THE SQUARE METER = 1549.9969 SQ. INCHES)

SQ. CENTIMETER = 100 SQ. MILLIMETERS = 0.1550 SQ. IN.
SQ. DECIMETER = 100 SQ. CENTIMETERS = 15.550 SQ. INS.
SQ. DECIMETER = 100 SQ. CENTIMETERS = 15.750 SQ. INS. = 100 SQ. DECIMETERS = 10.7639 SQ. FT. SQ. METER 1 SQ. DEKAMETER = 100 SQ. METERS 1 SQ. HECTOMETER = 100 SQ. DEKAMETERS = 119.60

1 SQ. KILOMETER = 100 SQ. HECTOMETERS

(THE UNIT IS THE "ARE" = 100 SQ. METERS)

CENTIARE = 10 MILLIARES = DECIARE = 10 CENTIARES = 10.7643 SQ. FT. 11.96033 SQ. YDS. 119.6033 SQ. YDS. = 10 DECIARES = 119.6033 = 10 ARES DEKARE 0.247110 ACRES = = 10 DEKARES **HEKTARE** = 2.471098 ACRES 1 SQ. KILOMETER = 100 HEKTARES = 0.38611 SQ. MILE

CUBIC MEASURE:

(THE UNIT IS THE "STERE" = 61,025.38659 CU. INS.)
1 DECISTERE = 10 CENTISTERES = 3.531562 CU. FT. = 10 DECISTERES = 1.307986 CU. YDS.

1 DEKASTERE = 13.07986 CU. YDS.

METRIC DESIGNATOR AND TRADE SIZES

METRIC DESIGNATOR

16 21 27 35 41 53 63 78 91 103 129 155 3/4 1 11/4 11/2 2 21/2 3 31/2 4 1/2 5

TRADE SIZE

U.S. WEIGHTS & MEASURES / METRIC EQUIVALENT CHART

	ln.	Ft.	Yd.	Mile	Mm	Cm	M	Km
1 Inch =	1	.0833	.0278	1.578x10 ⁻⁵	25.4	2.54	.0254	2.54x10 ⁻⁵
1 Foot =	12	1	.333	1.894x10 ⁻¹	304.8	30.48	.3048	3.048x10 ⁻⁴
1 Yard =	36	3	1	5.6818 x10 ⁻¹	914.4	91.44	.9144	9.144x10 ⁻⁴
1 Mile =	63,360	5,280	1,760	1	1,609,344	160,934.4	1,609.344	1.609344
1 mm =	.03937	.0032808	1.0936x10 ⁻³	6.2137x10 ⁻⁷	I	0.1	0.001	0.000001
1 cm =	.3937	.0328084	.0109361	6.2137x10-6	10	1	0.01	0.00001
1 m =	39.37	3.28084	1.09361	6.2137x10 ⁻¹	1000	100	1	0.001
1 km =	39,370	3,280.84	1,093.61	0.62137	1,000,000	100,000	1,000	1

Km = Kilometer In. = Inches Fl. = Foot Yd. = Yard Mi. = Mile Mm = Millimeter Cm = Centimeter M = Meter

EXPLANATION OF SCIENTIFIC NOTATION:

Scientific Notation is simply a way of expressing very large or very small numbers in a more compact format. Any number can be expressed as a number between 1 & 10, multiplied by a power of 10 (which indicates the correct position of the decimal point in the original number). Numbers greater than 10 have positive powers of 10, and numbers less than 1 have negative powers of 10.

Example: $186,000 = 1.86 \times 10^5$ $0.000524 = 5.24 \times 10^{-4}$

USEFUL CONVERSIONS / EQUIVALENTS

To determine circular mil of a conductor:

ROUND CONDUCTORCM = (Diameter in mils)²

BUS BARCM = Width (mils) x Thickness (mils)

0.7854

NOTES: 1 Millimeter = 39.37 Mils 1 Cir. Millimeter = 1550 Cir. Mils

1 Sq. Millimeter = 1974 Cir. Mils



Selected Girt	buil Luau G	aicuid	สเบเ				
Contractor			Email _				
Phone			Fax				
Job Name							does not meet the necessary for the following applications: Fire Pumps
VOLTAGE 12	20/240 1 ø 🗌 120	0/208 3 Ø Vapor (Ll	□ 1		7/480 3 Ø	NFPA 20 NFPA 99	Emergency Systems Fire Pumps Healthcare Emergency Systems
ELEC. SERVICE		p 🗆 20		□ 300 Amp □ 4	00 Amp	Reference Related Codes NEC 225	• Codes and Standards: Branch Circuits and Feeders
Before installation contact log Generac recommends contact LOADS: Look for heavy building Use the following for sizing	cting local authorities pri loads such as refrigeration	or to installa n, air conditio	ation. oning, pump	•	ry.	NEC 240 NEC 250 NEC 445 NEC 700	Overcurrent Protection Grounding Generators Emergency Systems
TABLE 8	Motor Load Tabl	e (refer t	to Table 1	1)		NEC 701 NEC 702	Legally Required Standby Optional Standby
Device	НР	RA	LRA	kW Running (= HP)	Starting kW ¹	NFPA 37	Installation & Use of Stationary Engines
						NFPA 54 NFPA 58	National Fuel Gas Code LP Gas Code
						ICC	Fuel Gas Code
						To Calculate k\	N
						120 V 1ø Ar	mps x 120/1000 = kW
							mps x 240/1000 = kW
							mps x 208 x 1.732 x PF) /1000 = kW
						+	mps x 240 x 1.732 x PF) /1000 = kW
							mps x 480 x 1.732 x PF) /1000 = kW

TABLE 9	Non-Motor Load Table (refer to Table 2)							
Device		Amps	kW					

Transfer Switch Availability

RXSW – 100, 150, 200, 300 and 400 Amp service rated

RTSN – 100–800 3ø and 600–800 1ø Amp

RXSC – 100, 200, 400, 600, 800 Amp

GenReady – 100–200 Amp service panel

RTS and GenReady switches only work with the Evolution or Nexes Controller.

RECOMMENDED GENERATOR SIZE _____

Refer to Generator Sizing Instructions on other side of this sheet.

Install Notes:

- 1. Consult manual for installation recommendations.
- 2. Consult local authority having jurisdiction for local requirements.

¹ See Table 430.7(B) for staring kVA per HP for motor loads.

PF is application power factor (worst case 1.0) Typical application power factor is 0.95.



Generator Sizing Instructions:

There is not a single correct sizing solution. Following are several methods that, when mixed with good judgement, should result in an appropriately sized generator. Remember to consider load growth, seasonality, and effects of starting motors.

As municipalities and states adopt the new 2017 NEC Electrical Code, there may be new sizing requirements, spelled out in the code book, which the installation technician must follow. Always check with the local inspection department to confirm which code cycle will affect your install.

Never add Amps when sizing a generator. Convert Amps to kW and add kW to determine the required generator size. Power factors for various motor loads vary widely. Adding Amps without properly accounting for the power factor and/or mixing voltages will result in improperly sizing the generator.

When motors start, they create a current surge that step loads the generator and creates a voltage dip. After selecting a generator, reference the generator's surge capability using table 3. Verify that voltage dip is adequate for the application. Most commercial applications should be limited to about 15% voltage dip and residential applications should be limited to a 30% voltage dip.

Some applications utilize an uninterruptible power supply (UPS) to back up critical loads. Please read sizing guide for this load type.

Measurement Method 220.87 Exception NEC 2017

Connect a recording ammeter or power meter that is capable of measuring the maximum peak kW demand continuously over a minimum 30 day period. The maximum kW demand shall be taken while the building is occupied and shall include the larger of the heating or cooling loads. The peak kW demand shall be multiplied by 125%.

Peak kW demand

X 125% =

Calculated kW demand

Size the generator to the next standard size and verify UPS and motor load compatibility.

Determining Existing Loads/Billing History Method 220.87 NEC 2017

Many customers have a utility rate structure that has a peak demand charge. Using a year's worth of electric bills, size the generator 25% larger than the largest peak demand.

Verify motor and UPS load compatibility. Peak Demand =

Load Summation Method

- 1) Enter running kW for all motor loads (except the largest) expected to run during peak load levels into table 8. Refer to table 1 for typical motor load sizes and electrical requirements.
- 2) Enter kW for all non-motor loads expected to run during peak load levels into table 9. Refer to table 2 for typical residential loads and rules of thumb.
- 3) Add the running motor load kW, non-motor load kW, and the starting kW of the largest motor load.

Motor load running total (minus largest motor):		kW (ref. table 8)
Non-motor load total:		kW (ref. table 9)
Starting load from largest cycling motor:		kW (ref. table 8)
Total electrical loads:	=	kW

Select generator:

Commercial (add 20 to 25% to total kW) Residential (add 10 to 20% to total kW)

- 4) Confirm that voltage dip is within acceptable limits by comparing motor LRA to generator surge capability (see table #3).
- 5) Confirm UPS compatibility (see page 11).

System Capacity – Load Calculation

If the local municipality or state you are in has adopted the 2017 NEC Code, you may be required to use this step. Article 702 of the 2017 NEC includes a new requirement for sizing (702.4). If no other method for sizing is acceptable, sizing of the generator shall be made in accordance with Article 220 of the NEC. The system capacity estimating sheet will guide you through this process.

SMM Load Control Module

702.4 (B) (2) (a) NEC 2017

The SMM Load Control Module is a 50 amp contact housed in a NEMA 3R enclosure for indoor and outdoor installation applications. Through the use of the SMM Modules in conjunction with any of the 100-600 amp Smart Switches, household or business loads can be intelligently managed enabling the use of a smaller, more efficient generator system. Up to four SMM Modules can be used with a single switch.

Project Layout

Ball Park Estimates (Do not use for final sizing)

Estimate based on 60% service size: (commercial)

240 Volts, 1 Ø:	Amps x .15 =	 ΚW
208 Volts, 3 Ø:	Amps x .22 =	 kW
240 Volts, 3 Ø:	Amps x .25 =	 kW
480 Volts, 3 Ø:	Amps x .50 =	 kW

Estimate based on 40% service size: (residential)

240 Volts, 1 Ø:	_ Amps x $.10 =$	 kW
208 Volts, 3 Ø:	_ Amps x .15 =	kW
240 Volts, 3 Ø:	_ Amps x .17 =	kW
480 Volts. 3 Ø:	Amps x $.34 =$	kW

Estimate based on square footage

Fast food, convenience stores, kW = 50 kW + 10 watts/sq. ft.restaurants, grocery stores Other commercial applications kW = 30 kW + 5 watts/sq. ft.

Estimated kW = ___

Amps to kW Rule of Thumb (assumes .8 pf)

Square footage = _____

For 480 volt systems Amps = kW x 1.5For 208 volt systems $Amps = kW \times 3.5$ For 240 volt 3 Ø systems $Amps = kW \times 3$ For 240 volt 1 Ø systems $Amps = kW \times 4$

System Capacity – Load Calculator



DIRECTIONS FOR NEC 2017, ARTICLE 220,	
220.80 Optional Feeder and Service Load Calculations (RESIDENTIAL)	NEC REFERENCE
SECTION CAN BE USED FOR DWELLING UNITS	220.82 (A)
Served by a single feeder conductor (generator)	
• 120/240 volt or 208Y/120 volt service	
Ampacity of 100 amps or greater The advantaged lead will be at the great that a distribution in the second section of a distribution	
The calcultated load will be the result of adding	200 00 (P)
 220.82 (B) General Loads, and 220.82 (C) Heating and Air-Conditioning Load 	220.82 (B) 220.82 (C)
• 220.62 (G) Heating and Air-Conditioning Load	220.02 (O)
GENERAL LOADS	220.82 (B)
General Lighting and General-Use Receptacles	` '
Calculate at 3 VA per square foot	220.82 (B) (1)
 Use exterior dimensions of the home to calculate square footage – do not include of 	pen
porches, garages, or unused or unfinished spaces not adaptable for future use.	
Add 20-amp small appliance & laundry circuits @ 1500 VA each	220.82 (B) (2)
Calculate the following loads at 100% of nameplate rating	220.82 (B) (3)
Appliances fastened in place, permanently connected or located on a specific circuit	220.82 (B) (3) a
Ranges, wall-mounted ovens, counter-mounted cooking units	220.82 (B) (3) b
Clothes dryers not connected to the laundry branch circuit	220.82 (B) (3) c
Water heaters	220.82 (B) (3) d
Permanently connected motors not included in Heat & Air-Conditioning Load section	
HEATING & AIR-CONDITIONING LOADS	220.82 (C)
Include the largest of the following six selections (kVA load) in calculation	200 00 (0) (1)
Air Conditioning and Cooling	220.82 (C) (1)
• 100% of nameplate rating	000 00 (0) (0)
Heat Pumps Without Supplemental Electric Heating	220.82 (C) (2)
100% of nameplate rating Heat Pumps With Supplemental Electric Heating	220.82 (C) (2)
100% of nameplate rating of the heat pump compressor*	220.82 (C) (3)
65% of nameplate rating of the fleat pump compressor 65% of nameplate rating of supplemental electric heating equipment	
If compressor & supplemental heat cannot run at the same time	
do not include the compressor	
Electric Space Heating	
Less than 4 separately controlled units @ 65% of nameplate rating	220.82 (C) (4)
• 4 or more separately controlled units @ 40% of nameplate rating	220.82 (C) (5)
40% of nameplate rating if 4 or more separately controlled units	
Electric Thermal Storage (or system where the load is expected to be	220.82 (C) (6)
continuous at nameplate rating	
• 100% of nameplate rating	
Systems of this type cannot be calculated under any other section of 220.82 (C).	
LOAD CALCULATIONS	
General Lighting Load	3 VA x ft²
Small Appliance & Laundry Circuits	+ 1500 VA per circuit
General Appliances & Motors (100% rated load)	+ <u>Total general appliances</u>
Sum of all General Loads	= Total General Load (VA)
APPLY DEMAND FACTORS	
– First 10 kVA @ 100%	= 10,000 VA
- Remainder of General Loads @ 40%	(Total VA - 10,000) x .40
UT17 (A C C C C C C C C C C C C C C C C C C	= Calculated General Load (VA)
• HEAT / A-C LOAD @ 100%	Largest Heat or A-C Load (VA) = TOTAL CALCULATED LOAD

Converting VA TO kW (Single-phase applications with 1.0 power factor only) 1 kVA = 1 kW

220.54



Works	sheet — NEC 2017, 220 Pa	art IV			
Contractor	,	Email			
Phone		Fax			
Job Name					
Date	Location				
Voltage (Circle)	240V -1Ø				
Fuel	100.4	NG	LPV		<u> </u>
Elec. Service	100 Amp	200 Amp	400 Amp	Oth	ner T
NET SQUARE FOOTAGE					Loads (kW)
GENERAL LOADS	Qty	Rating (Load)	Factor	Loads (VA)	(VA ÷ 1,000)
General Lighting and General Use Receptacles		3 VA/ft ²	100%		
Branch Circuits (1500 VA/ft²)					
Small Appliance Circuits (20 Amp)		1500	100%		
Laundry Circuits		1500	100%		
Fixed Appliances		Full Curre	nt Rating		
Well			100%		
Sump Pump			100%		
Freezer			100%		
Microwave (Not counter-top model)			100%		
Disposal			100%		
Dishwasher			100%	1	İ
Range			100%		
Wall-Mounted Oven			100%	1	
Counter-Mounted Cooking Surface			100%	1	
Water Heater			100%	1	
Clothes Dryer			100%	 	
Garage Door Opener			100%	1	
Septic Grinder			100%	 	
			100%	 	-
Other (list)			100%	-	
				+	
			100%	 	
			100%		
			100%		
		ļ	100%	ļ	
			100%		
			100%		
			100%		
			100%		
Total General Loads				VA	kW
HEAT / A-C LOAD					
A-C / Cooling Equipment			100%		
Heat Pump					
Compressor (if not included as A-C)			100%		
Supplemental Electric Heat			65%		
Electric Space Heating					
Less than 4 separately controlled units			65%		
4 or more separately controlled units			40%		
System With Continuous Nameplate Load			100%		
Largest Heat / A-C Load (VA) VA kW					İ
GENERAL LOADS					
• 1st 10 kW of General Loads 100% kW			100%	kW	
Remaining General Loads (kW) 40% kW CALCULATED CENERAL LOAD (kW) kW			40%	kW	1.44.1
CALCULATED GENERAL LOAD (kW) kW					kW
LARGEST HEAT / A-C LOAD 100% kW kW					kW
TOTAL CALCULATED LOAD (Net General Loads + Heat/A-C Load)					kW



Selected Circu	it Load Ga	licula	tor				
Contractor			Email _				
Phone		ا	Fax				
Job Name Date 120/2	Locati 40 1Ø 🗆 120/	on '208_3 ø	1			requirements NEC 695 NEC 700 NFPA 20 NFPA 99	•
TYPE ☐ Natur ELEC. SERVICE ☐ 100 AI ☐ 600 AI	mp 🔲 150 Amp		•	□ 300 Amp □	☐ 400 Amp	Reference Related Codes	Codes and Standards:
Before installation contact local ju Generac recommends contacting LOADS: Look for heavy building loads Use the following for sizing at	local authorities prior s such as refrigeration,	to installate air condition nerator kV	tion. ning, pump V.	os or UPS systems.	ay vary.	NEC 225 NEC 240 NEC 250 NEC 445 NEC 700 NEC 701 NEC 702	Branch Circuits and Feeders Overcurrent Protection Grounding Generators Emergency Systems Legally Required Standby Optional Standby
Device	НР	RA	LRA	kW Running (=	HP) Starting kW	NFPA 37 NFPA 54 NFPA 58	Installation & Use of Stationary Engines National Fuel Gas Code LP Gas Code
						ICC	Fuel Gas Code
						To Calculate k\	V
						120 V 1ø Ar	mps x 120/1000 = kW
						240 V 1ø Ar	mps x 240/1000 = kW
						208 V 3ø (A	mps x 208 x 1.732 x PF) /1000 = kW
						240 V 3ø (A	mps x 240 x 1.732 x PF) /1000 = kW
						480 V 3ø (A	mps x 480 x 1.732 x PF) /1000 = kW
¹ See Table 430.7(B) for staring	kVA per HP for motor	r loads.		-	<u> </u>		power factor (worst case 1.0)

TABLE 9	Non-Motor Load Table (refer to Table 2)					
Device		Amps	kW			

Transfer Switch Availability

RXSW – 100, 150, 200, 300 and 400 Amp service rated

RTSN – 100–800 3ø and 600–800 1ø Amp

RXSC – 100, 200, 400, 600, 800 Amp

GenReady – 100–200 Amp service panel

RTS and GenReady switches only work with the Evolution or Nexes Controller.

RECOMMENDED GENERATOR SIZE _____

Refer to Generator Sizing Instructions on other side of this sheet.

Install Notes:

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Peak kW demand X 125% = Calculated kW demand

Size the generator to the next standard size and verify UPS and motor load compatibility.

Determining Existing Loads/Billing History Method 220.87 NEC 2017

Many customers have a utility rate structure that has a peak demand charge. Using a year's worth of electric bills, size the generator 25% larger than the largest peak demand.

Verify motor and UPS load compatibility. Peak Demand = _____

Load Summation Method

- Enter running kW for all motor loads (except the largest) expected to run during peak load levels into table 8. Refer to table 1 for typical motor load sizes and electrical requirements.
- Enter kW for all non-motor loads expected to run during peak load levels into table 9. Refer to table 2 for typical residential loads and rules of thumb.
- Add the running motor load kW, non-motor load kW, and the starting kW of the largest motor load

Motor load running total (minus largest motor):	kW (re	f. table 8
Non-motor load total:	kW (re	f. table 9
Starting load from largest cycling motor:	kW (re	f. table 8
Total electrical loads:	= kW	

Select generator: Commercial (add 20 to 25% to total kW)
Residential (add 10 to 20% to total kW)

- 4) Confirm that voltage dip is within acceptable limits by comparing motor LRA to generator surge capability (see table #3).
- 5) Confirm UPS compatibility (see page 11).

System Capacity – Load Calculation

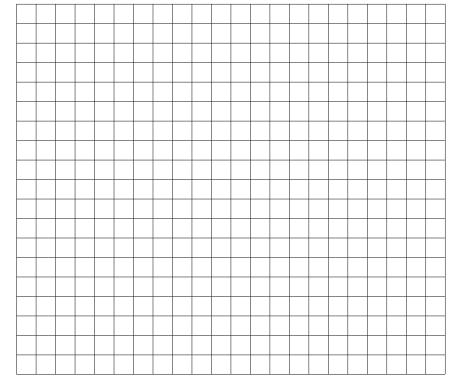
If the local municipality or state you are in has adopted the 2017 NEC Code, you may be required to use this step. Article 702 of the 2017 NEC includes a new requirement for sizing (702.4). If no other method for sizing is acceptable, sizing of the generator shall be made in accordance with Article 220 of the NEC. The system capacity estimating sheet will guide you through this process.

SMM Load Control Module

702.4 (B) (2) (a) NEC 2017

The SMM Load Control Module is a 50 amp contact housed in a NEMA 3R enclosure for indoor and outdoor installation applications. Through the use of the SMM Modules in conjunction with any of the 100–600 amp Smart Switches, household or business loads can be intelligently managed enabling the use of a smaller, more efficient generator system. Up to four SMM Modules can be used with a single switch.

Project Layout



Ball Park Estimates (Do not use for final sizing)

Estimate based on 60% service size: (commercial)

240 Volts, 1 Ø:	Amps x .15 =	 ΚW
208 Volts, 3 Ø:	Amps x .22 =	 kW
240 Volts, 3 Ø:	Amps x .25 =	 kW
480 Volts, 3 Ø:	Amps x .50 =	 kW

Estimate based on 40% service size: (residential)

240 Volts, 1 Ø:	_ Amps x $.10 =$	 kW
208 Volts, 3 Ø:	_ Amps x .15 =	 kW
240 Volts, 3 Ø:	_ Amps x .17 =	kW
480 Volts, 3 Ø:	Amps x $.34 =$	kW

Estimate based on square footage

Fast food, convenience stores, restaurants, grocery stores $kW = 50 \; kW + 10 \; watts/sq. \; ft.$ Other commercial applications $kW = 30 \; kW + 5 \; watts/sq. \; ft.$

Estimated kW = ____

Amps to kW Rule of Thumb (assumes .8 pf)

Square footage = _____

For 480 volt systems Amps = kW x 1.5 For 208 volt systems Amps = kW x 3.5 For 240 volt 3 \emptyset systems Amps = kW x 3 For 240 volt 1 \emptyset systems Amps = kW x 4

System Capacity – Load Calculator



DIRECTIONS FOR NEC 2017, ARTICLE 220,	
220.80 Optional Feeder and Service Load Calculations (RESIDENTIAL)	NEC REFERENCE
SECTION CAN BE USED FOR DWELLING UNITS	220.82 (A)
Served by a single feeder conductor (generator)	
• 120/240 volt or 208Y/120 volt service	
Ampacity of 100 amps or greater The advantaged lead will be at the great that a distribution in the second section of a distribution	
The calcultated load will be the result of adding	200 00 (P)
 220.82 (B) General Loads, and 220.82 (C) Heating and Air-Conditioning Load 	220.82 (B) 220.82 (C)
• 220.62 (G) Heating and Air-Conditioning Load	220.02 (O)
GENERAL LOADS	220.82 (B)
General Lighting and General-Use Receptacles	` '
Calculate at 3 VA per square foot	220.82 (B) (1)
 Use exterior dimensions of the home to calculate square footage – do not include of 	pen
porches, garages, or unused or unfinished spaces not adaptable for future use.	
Add 20-amp small appliance & laundry circuits @ 1500 VA each	220.82 (B) (2)
Calculate the following loads at 100% of nameplate rating	220.82 (B) (3)
Appliances fastened in place, permanently connected or located on a specific circuit	220.82 (B) (3) a
Ranges, wall-mounted ovens, counter-mounted cooking units	220.82 (B) (3) b
Clothes dryers not connected to the laundry branch circuit	220.82 (B) (3) c
Water heaters	220.82 (B) (3) d
Permanently connected motors not included in Heat & Air-Conditioning Load section	
HEATING & AIR-CONDITIONING LOADS	220.82 (C)
Include the largest of the following six selections (kVA load) in calculation	200 00 (0) (1)
Air Conditioning and Cooling	220.82 (C) (1)
• 100% of nameplate rating	000 00 (0) (0)
Heat Pumps Without Supplemental Electric Heating	220.82 (C) (2)
100% of nameplate rating Heat Pumps With Supplemental Electric Heating	220 82 (C) (2)
100% of nameplate rating of the heat pump compressor*	220.82 (C) (3)
65% of nameplate rating of the fleat pump compressor 65% of nameplate rating of supplemental electric heating equipment	
If compressor & supplemental heat cannot run at the same time	
do not include the compressor	
Electric Space Heating	
Less than 4 separately controlled units @ 65% of nameplate rating	220.82 (C) (4)
• 4 or more separately controlled units @ 40% of nameplate rating	220.82 (C) (5)
40% of nameplate rating if 4 or more separately controlled units	
Electric Thermal Storage (or system where the load is expected to be	220.82 (C) (6)
continuous at nameplate rating	
• 100% of nameplate rating	
Systems of this type cannot be calculated under any other section of 220.82 (C).	
LOAD CALCULATIONS	
General Lighting Load	3 VA x ft²
Small Appliance & Laundry Circuits	+ 1500 VA per circuit
General Appliances & Motors (100% rated load)	+ <u>Total general appliances</u>
Sum of all General Loads	= Total General Load (VA)
APPLY DEMAND FACTORS	
– First 10 kVA @ 100%	= 10,000 VA
- Remainder of General Loads @ 40%	(Total VA - 10,000) x .40
W717 / A A A A A A A A A A A A A A A A A A	= Calculated General Load (VA)
• HEAT / A-C LOAD @ 100%	Largest Heat or A-C Load (VA) = TOTAL CALCULATED LOAD

Converting VA TO kW (Single-phase applications with 1.0 power factor only) 1 kVA = 1 kW

220.54

Worksheet — NEC 2017, 220 Part IV							
Contractor		Email					
Phone		Fax					
Job Name							
Date	Location						
Voltage (Circle)	240V -1Ø						
Fuel		NG	LPV				
Elec. Service	100 Amp	200 Amp	400 Amp	Ot	her		
NET SQUARE FOOTAGE					1 (1140)		
GENERAL LOADS	Qty	Rating (Load)	Factor	Loads (VA)	Loads (kW) (VA ÷ 1,000)		
General Lighting and General Use Receptacles		3 VA/ft ²	100%				
Branch Circuits (1500 VA/ft²)							
Small Appliance Circuits (20 Amp)		1500	100%				
Laundry Circuits		1500	100%				
Fixed Appliances		Full Curre	nt Rating				
Well			100%				
Sump Pump			100%				
Freezer		 	100%	 	 		
Microwave (Not counter-top model)		 	100%				
Disposal		†	100%				
Dishwasher		+	100%	+	+		
			100%	+	 		
Range		 			-		
Wall-Mounted Oven			100%				
Counter-Mounted Cooking Surface			100%				
Water Heater		<u> </u>	100%				
Clothes Dryer			100%				
Garage Door Opener			100%				
Septic Grinder			100%				
Other (list)			100%				
			100%				
			100%				
			100%				
			100%				
		<u> </u>	100%				
		+	100%				
		 	100%				
		 	100%				
		ļ	100%				
Total General Loads				VA	kW		
HEAT / A-C LOAD		,		,			
A-C / Cooling Equipment			100%				
Heat Pump							
Compressor (if not included as A-C)			100%				
Supplemental Electric Heat			65%				
Electric Space Heating							
Less than 4 separately controlled units			65%				
4 or more separately controlled units			40%				
System With Continuous Nameplate Load			100%				
Largest Heat / A-C Load (VA) VA kW		<u> </u>					
GENERAL LOADS							
			1000/	LAAZ			
1st 10 kW of General Loads 100% kW Paradicina Community and (100) 480% kW			100%	<u>kW</u>			
• Remaining General Loads (kW) 40% kW			40%	kW			
CALCULATED GENERAL LOAD (kW) kW					kW		
LARGEST HEAT / A-C LOAD 100% kW kW					kW		
TOTAL CALCULATED LOAD (Net General Loads + Heat/A-C Load)					kW		



Selected Circui	t Load Gal	culator			
Contractor		Email			
Phone		Fax			
Date	Location 0 1Ø	n 08		277/480 3 Ø	The QT Series does not meet the necessary requirements for the following applications: NEC 695 Fire Pumps
Before installation contact local juri Generac recommends contacting to LOADS: Look for heavy building loads: Use the following for sizing and	sdiction to confirm all ocal authorities prior to such as refrigeration, air	requirements a o installation. r conditioning, pu rator kW.	imps or UPS systems.	ary.	NEC 225 Branch Circuits and Feeders NEC 240 Overcurrent Protection NEC 250 Grounding NEC 445 Generators NEC 700 Emergency Systems NEC 701 Legally Required Standby NEC 702 Optional Standby
Device	HP	RA LR	A kW Running (= HI	P) Starting kW ¹	
					To Calculate kW
					120 V 1ø Amps x 120/1000 = kW
1					240 V 1ø Amps x 240/1000 = kW
1					208 V 3ø (Amps x 208 x 1.732 x PF) /1000 = kW
1					240 V 3ø (Amps x 240 x 1.732 x PF) /1000 = kW
1					480 V 3ø (Amps x 480 x 1.732 x PF) /1000 = kW
¹ See Table 430.7(B) for staring k	VA ner HP for motor lo	nads	'		PF is application power factor (worst case 1.0) Typical application power factor is 0.95

TABLE 9	Non-Motor Load Table (refer to Table 2)					
Device		Amps	kW			

Transfer Switch Availability

RXSW – 100, 150, 200, 300 and 400 Amp service rated

RTSN – 100–800 3ø and 600–800 1ø Amp

RXSC – 100, 200, 400, 600, 800 Amp

GenReady – 100–200 Amp service panel

RTS and GenReady switches only work with the Evolution or Nexes Controller.

RECOMMENDED GENERATOR SIZE _____

Refer to Generator Sizing Instructions on other side of this sheet.

Install Notes:

- 1. Consult manual for installation recommendations.
- 2. Consult local authority having jurisdiction for local requirements.



Generator Sizing Instructions:

There is not a single correct sizing solution. Following are several methods that, when mixed with good judgement, should result in an appropriately sized generator. Remember to consider load growth, seasonality, and effects of starting motors.

As municipalities and states adopt the new 2017 NEC Electrical Code, there may be new sizing requirements, spelled out in the code book, which the installation technician must follow. Always check with the local inspection department to confirm which code cycle will affect your install.

Never add Amps when sizing a generator. Convert Amps to kW and add kW to determine the required generator size. Power factors for various motor loads vary widely. Adding Amps without properly accounting for the power factor and/or mixing voltages will result in improperly sizing the generator.

When motors start, they create a current surge that step loads the generator and creates a voltage dip. After selecting a generator, reference the generator's surge capability using **table 3**. Verify that voltage dip is adequate for the application. Most commercial applications should be limited to about 15% voltage dip and residential applications should be limited to a 30% voltage dip.

Some applications utilize an uninterruptible power supply (UPS) to back up critical loads. Please read sizing guide for this load type.

Measurement Method 220.87 Exception NEC 2017

Connect a recording ammeter or power meter that is capable of measuring the maximum peak kW demand continuously over a minimum 30 day period. The maximum kW demand shall be taken while the building is occupied and shall include the larger of the heating or cooling loads. The peak kW demand shall be multiplied by 125%.

Peak kW demand X 125% = Calculated kW demand

Size the generator to the next standard size and verify UPS and motor load compatibility.

Determining Existing Loads/Billing History Method 220.87 NEC 2017

Many customers have a utility rate structure that has a peak demand charge. Using a year's worth of electric bills, size the generator 25% larger than the largest peak demand.

Verify motor and UPS load compatibility. Peak Demand = _____

Load Summation Method

- Enter running kW for all motor loads (except the largest) expected to run during peak load levels into table 8. Refer to table 1 for typical motor load sizes and electrical requirements.
- Enter kW for all non-motor loads expected to run during peak load levels into table 9. Refer to table 2 for typical residential loads and rules of thumb.
- Add the running motor load kW, non-motor load kW, and the starting kW of the largest motor load

Motor load running total (minus largest motor):		kW (ref. table 8)
Non-motor load total:		kW (ref. table 9)
Starting load from largest cycling motor:		kW (ref. table 8)
Total electrical loads:	=	kW

Select generator: Commercial (add 20 to 25% to total kW)
Residential (add 10 to 20% to total kW)

- 4) Confirm that voltage dip is within acceptable limits by comparing motor LRA to generator surge capability (see table #3).
- 5) Confirm UPS compatibility (see page 11).

System Capacity - Load Calculation

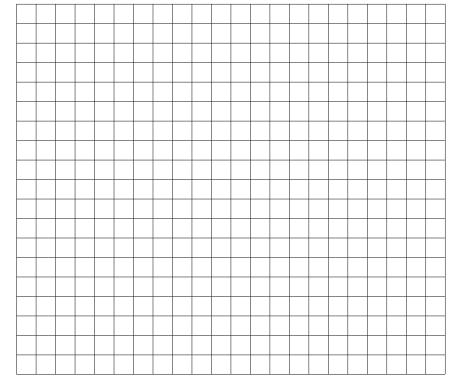
If the local municipality or state you are in has adopted the 2017 NEC Code, you may be required to use this step. Article 702 of the 2017 NEC includes a new requirement for sizing (702.4). If no other method for sizing is acceptable, sizing of the generator shall be made in accordance with Article 220 of the NEC. The system capacity estimating sheet will guide you through this process.

SMM Load Control Module

702.4 (B) (2) (a) NEC 2017

The SMM Load Control Module is a 50 amp contact housed in a NEMA 3R enclosure for indoor and outdoor installation applications. Through the use of the SMM Modules in conjunction with any of the 100–600 amp Smart Switches, household or business loads can be intelligently managed enabling the use of a smaller, more efficient generator system. Up to four SMM Modules can be used with a single switch.

Project Layout



Ball Park Estimates (Do not use for final sizing)

Estimate based on 60% service size: (commercial)

240 Volts, 1 Ø:	Amps x .15 =	 ΚW
208 Volts, 3 Ø:	Amps x .22 =	 kW
240 Volts, 3 Ø:	Amps x .25 =	 kW
480 Volts, 3 Ø:	Amps x .50 =	 kW

Estimate based on 40% service size: (residential)

240 Volts, 1 Ø:	_ Amps x $.10 =$	 kW
208 Volts, 3 Ø:	_ Amps x .15 =	 kW
240 Volts, 3 Ø:	_ Amps x .17 =	kW
480 Volts, 3 Ø:	Amps x $.34 =$	kW

Estimate based on square footage

Square footage = _____ Estimated kW = ___

Fast food, convenience stores, restaurants, grocery stores	kW = 50 kW + 10 watts/sq. f
Other commercial applications	kW = 30 kW + 5 watts/sq. ft.

Amps to kW Rule of Thumb (assumes .8 pf)

For 480 volt systems	Amps = kW x 1.5
For 208 volt systems	$Amps = kW \times 3.5$
For 240 volt 3 Ø systems	$Amps = kW \times 3$
For 240 volt 1 Ø systems	Amps = kW x 4

System Capacity – Load Calculator



DIRECTIONS FOR NEC 2017, ARTICLE 220, I		
220.80 Optional Feeder and Service Load Calculations (RESIDENTIAL)	NEC REFE	RENCE
SECTION CAN BE USED FOR DWELLING UNITS	2	220.82 (A)
Served by a single feeder conductor (generator)		
• 120/240 volt or 208Y/120 volt service		
Ampacity of 100 amps or greater The color total load will be the great that addition.		
The calcultated load will be the result of adding		000 00 (D)
• 220.82 (B) General Loads, and		220.82 (B)
220.82 (C) Heating and Air-Conditioning Load	2	220.82 (C)
GENERAL LOADS	2	220.82 (B)
General Lighting and General-Use Receptacles		
Calculate at 3 VA per square foot	220.	.82 (B) (1)
Use exterior dimensions of the home to calculate square footage – do not include op		() ()
porches, garages, or unused or unfinished spaces not adaptable for future use.		
	200	00 (D) (0)
Add 20-amp small appliance & laundry circuits @ 1500 VA each		.82 (B) (2)
Calculate the following loads at 100% of nameplate rating		.82 (B) (3)
Appliances fastened in place, permanently connected or located on a specific circuit Page 1997 Page 2997 Pag		2 (B) (3) a
Ranges, wall-mounted ovens, counter-mounted cooking units Outlier description of the least the least to be a		2 (B) (3) b
Clothes dryers not connected to the laundry branch circuit		2 (B) (3) c
Water heaters Pormonantly connected maters not included in Lloct & Air Conditioning Load costion.		2 (B) (3) d
Permanently connected motors not included in Heat & Air-Conditioning Load section HEATING & AIR-CONDITIONING LOADS		.82 (B) (4)
Include the largest of the following six selections (kVA load) in calculation	2	220.82 (C)
Air Conditioning and Cooling	220	82 (C) (1)
100% of nameplate rating	220.	02 (0) (1)
Heat Pumps Without Supplemental Electric Heating	220	82 (C) (2)
• 100% of nameplate rating	220.	02 (0) (2)
Heat Pumps With Supplemental Electric Heating	220.	82 (C) (3)
100% of nameplate rating of the heat pump compressor*		0_ (0) (0)
65% of nameplate rating of supplemental electric heating equipment		
- If compressor & supplemental heat cannot run at the same time		
do not include the compressor		
Electric Space Heating		
Less than 4 separately controlled units @ 65% of nameplate rating	220.	82 (C) (4)
4 or more separately controlled units @ 40% of nameplate rating		82 (C) (5)
40% of nameplate rating if 4 or more separately controlled units		
Electric Thermal Storage (or system where the load is expected to be	220.	82 (C) (6)
continuous at nameplate rating		
• 100% of nameplate rating		
Systems of this type cannot be calculated under any other section of 220.82 (C).		
LOAD CALCULATIONS		
General Lighting Load	3 VA x ft²	
Small Appliance & Laundry Circuits	+ 1500 VA per circuit	
General Appliances & Motors (100% rated load)	+ Total general appliances	
Sum of all General Loads	= Total General Load (VA)	
APPLY DEMAND FACTORS		
– First 10 kVA @ 100%	= 10,000 VA	
- Remainder of General Loads @ 40%	(Total VA - 10,000) x .40	
LIEAT (A OLIOAD O 1000)	= Calculated General Load (VA)	
• HEAT / A-C LOAD @ 100%	Largest Heat or A-C Load (VA)TOTAL CALCULATED LOAD	

Converting VA TO kW (Single-phase applications with 1.0 power factor only) 1 kVA = 1 kW

220.54

Worksheet — NEC	2017, 220 Pa	art IV			
Contractor		Email			
Phone		Fax			
Job Name					
Date	Location				
Voltage (Circle)	240V -1Ø				
Fuel		NG	LPV		
Elec. Service	100 Amp	200 Amp	400 Amp	Ot	her
NET SQUARE FOOTAGE					1 (1140)
GENERAL LOADS	Qty	Rating (Load)	Factor	Loads (VA)	Loads (kW) (VA ÷ 1,000)
General Lighting and General Use Receptacles		3 VA/ft ²	100%		
Branch Circuits (1500 VA/ft²)					
Small Appliance Circuits (20 Amp)		1500	100%		
Laundry Circuits		1500	100%		
Fixed Appliances		Full Curre	nt Rating		
Well			100%		
Sump Pump			100%		
Freezer		 	100%	 	
Microwave (Not counter-top model)		 	100%		
Disposal		†	100%		
Dishwasher		+	100%	+	+
			100%	+	
Range		 			-
Wall-Mounted Oven			100%		
Counter-Mounted Cooking Surface			100%		
Water Heater		<u> </u>	100%		
Clothes Dryer			100%		
Garage Door Opener			100%		
Septic Grinder			100%		
Other (list)			100%		
			100%		
			100%		
			100%		
			100%		
			100%		
		+	100%		
		 	100%		
		 	100%		
		ļ	100%		
Total General Loads				VA	kW
HEAT / A-C LOAD		,		,	
A-C / Cooling Equipment			100%		
Heat Pump					
Compressor (if not included as A-C)			100%		
Supplemental Electric Heat			65%		
Electric Space Heating					
Less than 4 separately controlled units			65%		
4 or more separately controlled units			40%		
System With Continuous Nameplate Load			100%		
Largest Heat / A-C Load (VA) VA kW		<u> </u>			
GENERAL LOADS					
			1000/	LAAZ	
1st 10 kW of General Loads 100% kW Paradicina Community and (100) 480% kW			100%	<u>kW</u>	
• Remaining General Loads (kW) 40% kW			40%	kW	
CALCULATED GENERAL LOAD (kW) kW					kW
LARGEST HEAT / A-C LOAD 100% kW kW					kW
TOTAL CALCULATED LOAD (Net General Loads + Heat/A-C Load)					kW



ociootoa onoait	Loud ot	alouit	atoi					
Contractor			Email _					
Phone			Fax					
Job Name							requirement	es does not meet the necessary is for the following applications:
Date	Locat	tion					NEC 70	
VOLTAGE 120/240 TYPE Natural G				120/240 3Ø 🗆	277	7/480 3 Ø	NFPA 20 NFPA 99 NFPA 1	•
ELEC. SERVICE	☐ 150 Am _l	p 🗆 20	00 Amp	☐ 300 Amp [□ 40	00 Amp		es and Standards:
Before installation contact local jurisdi Generac recommends contacting local LOADS: Look for heavy building loads such Use the following for sizing and de	authorities prio n as refrigeration	o r to install , air conditio	ation. oning, pump		ay var	у.	NEC 229 NEC 240 NEC 250 NEC 449 NEC 700	O Overcurrent Protection O Grounding Generators O Emergency Systems
TABLE 8 Motor	Load Table	e (refer t	to Table 1	1)			NEC 702	2 Optional Standby
Device	HP	RA	LRA	kW Running (=	= HP)	Starting kW ¹	NFPA 37	7 Installation & Use of Stationary Engines
							NFPA 54 NFPA 58	
							ICC	Fuel Gas Code
							To Calculate	Amps x 120/1000 = kW
								Amps x 240/1000 = kW
								(Amps x 208 x 1.732 x PF) /1000 = kW
								(Amps x 240 x 1.732 x PF) /1000 = kW
							480 V 3ø	(Amps x 480 x 1.732 x PF) /1000 = kW
							DE in application	n nower factor (worst case 1.0)

TABLE 9	Non-Motor Load Table (refer to Table 2)				
Device		Amps	kW		

Transfer Switch Availability

RXSW – 100, 150, 200, 300 and 400 Amp service rated

RTSN – 100–800 3ø and 600–800 1ø Amp

RXSC – 100, 200, 400, 600, 800 Amp

GenReady – 100–200 Amp service panel

RTS and GenReady switches only work with the Evolution or Nexes Controller.

RECOMMENDED GENERATOR SIZE _____

Refer to Generator Sizing Instructions on other side of this sheet.

Install Notes:

- 1. Consult manual for installation recommendations.
- 2. Consult local authority having jurisdiction for local requirements.

¹ See Table 430.7(B) for staring kVA per HP for motor loads.

PF is application power factor (worst case 1.0) Typical application power factor is 0.95.



Generator Sizing Instructions:

There is not a single correct sizing solution. Following are several methods that, when mixed with good judgement, should result in an appropriately sized generator. Remember to consider load growth, seasonality, and effects of starting motors.

As municipalities and states adopt the new 2017 NEC Electrical Code, there may be new sizing requirements, spelled out in the code book, which the installation technician must follow. Always check with the local inspection department to confirm which code cycle will affect your install.

Never add Amps when sizing a generator. Convert Amps to kW and add kW to determine the required generator size. Power factors for various motor loads vary widely. Adding Amps without properly accounting for the power factor and/or mixing voltages will result in improperly sizing the generator.

When motors start, they create a current surge that step loads the generator and creates a voltage dip. After selecting a generator, reference the generator's surge capability using **table 3**. Verify that voltage dip is adequate for the application. Most commercial applications should be limited to about 15% voltage dip and residential applications should be limited to a 30% voltage dip.

Some applications utilize an uninterruptible power supply (UPS) to back up critical loads. Please read sizing guide for this load type.

Measurement Method 220.87 Exception NEC 2017

Connect a recording ammeter or power meter that is capable of measuring the maximum peak kW demand continuously over a minimum 30 day period. The maximum kW demand shall be taken while the building is occupied and shall include the larger of the heating or cooling loads. The peak kW demand shall be multiplied by 125%.

Peak kW demand

X 125% =

Calculated kW demand

Size the generator to the next standard size and verify UPS and motor load compatibility.

Determining Existing Loads/Billing History Method 220.87 NEC 2017

Many customers have a utility rate structure that has a peak demand charge. Using a year's worth of electric bills, size the generator 25% larger than the largest peak demand.

Verify motor and UPS load compatibility.

Load Summation Method

- Enter running kW for all motor loads (except the largest) expected to run during peak load levels into table 8. Refer to table 1 for typical motor load sizes and electrical requirements.
- Enter kW for all non-motor loads expected to run during peak load levels into table 9. Refer to table 2 for typical residential loads and rules of thumb.
- Add the running motor load kW, non-motor load kW, and the starting kW of the largest motor load.

Motor load running total (minus largest motor):		kW (ref. table 8)
Non-motor load total:		kW (ref. table 9)
Starting load from largest cycling motor:		kW (ref. table 8)
Total electrical loads:	=	kW

Select generator: Commercial (add 20 to 25% to total kW)

Residential (add 10 to 20% to total kW)

- 4) Confirm that voltage dip is within acceptable limits by comparing motor LRA to generator surge capability (see table #3).
- 5) Confirm UPS compatibility (see page 11).

System Capacity – Load Calculation

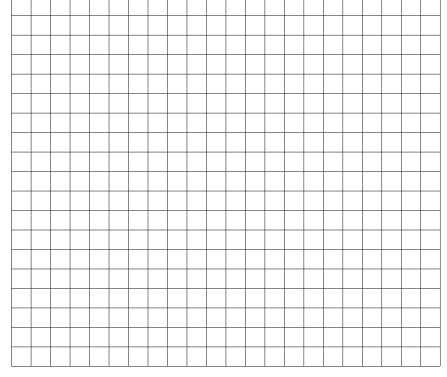
If the local municipality or state you are in has adopted the 2017 NEC Code, you may be required to use this step. Article 702 of the 2017 NEC includes a new requirement for sizing (702.4). If no other method for sizing is acceptable, sizing of the generator shall be made in accordance with Article 220 of the NEC. The system capacity estimating sheet will guide you through this process.

SMM Load Control Module

702.4 (B) (2) (a) NEC 2017

The SMM Load Control Module is a 50 amp contact housed in a NEMA 3R enclosure for indoor and outdoor installation applications. Through the use of the SMM Modules in conjunction with any of the 100–600 amp Smart Switches, household or business loads can be intelligently managed enabling the use of a smaller, more efficient generator system. Up to four SMM Modules can be used with a single switch.

Project Layout



Ball Park Estimates (Do not use for final sizing)

Estimate based on 60% service size: (commercial)

240 Volts, 1 Ø:	Amps x .15 =	 kW
208 Volts, 3 Ø:	Amps x .22 =	 kW
240 Volts, 3 Ø:	Amps x .25 =	 kW
480 Volts, 3 Ø:	Amps $x.50 =$	 kW

Estimate based on 40% service size: (residential)

240 Volts, 1 Ø:	_ Amps x $.10 =$	 kW
208 Volts, 3 Ø:	_ Amps x .15 =	kW
240 Volts, 3 Ø:	_ Amps x .17 =	kW
480 Volts. 3 Ø:	Amps x $.34 =$	kW

Estimate based on square footage

Fast food, convenience stores, restaurants, grocery stores $kW = 50 \; kW + 10 \; watts/sq. \; ft.$ Other commercial applications $kW = 30 \; kW + 5 \; watts/sq. \; ft.$

Estimated kW = ____

Amps to kW Rule of Thumb (assumes .8 pf)

Square footage = _____

For 480 volt systems Amps = $kW \times 1.5$ For 208 volt systems Amps = $kW \times 3.5$ For 240 volt 3 Ø systems Amps = $kW \times 3$ For 240 volt 1 Ø systems Amps = $kW \times 4$

System Capacity – Load Calculator



DIRECTIONS FOR NEC 2017, ARTICLE 220, P		IEO DEEEDENOS
220.80 Optional Feeder and Service Load Calculations (RESIDENTIAL)		NEC REFERENCE
SECTION CAN BE USED FOR DWELLING UNITS		220.82 (A
 Served by a single feeder conductor (generator) 120/240 volt or 208Y/120 volt service 		
Ampacity of 100 amps or greater The calcultated load will be the result of adding		
• 220.82 (B) General Loads, and		220.82 (B
• 220.82 (C) Heating and Air-Conditioning Load		220.82 (C)
220.02 (O) Hoading and Air Soriditioning Load		220.02 (0)
GENERAL LOADS		220.82 (B
General Lighting and General-Use Receptacles		
Calculate at 3 VA per square foot		220.82 (B) (1
• Use exterior dimensions of the home to calculate square footage – do not include open	en	
porches, garages, or unused or unfinished spaces not adaptable for future use.		
Add 20-amp small appliance & laundry circuits @ 1500 VA each		220.82 (B) (2
Calculate the following loads at 100% of nameplate rating		220.82 (B) (3
Appliances fastened in place, permanently connected or located on a specific circuit		220.82 (B) (3) a
Ranges, wall-mounted ovens, counter-mounted cooking units		220.82 (B) (3) b
Clothes dryers not connected to the laundry branch circuit		220.82 (B) (3) (
Water heaters		220.82 (B) (3) d
Permanently connected motors not included in Heat & Air-Conditioning Load section		220.82 (B) (4
HEATING & AIR-CONDITIONING LOADS		220.82 (C
Include the largest of the following six selections (kVA load) in calculation		
Air Conditioning and Cooling		220.82 (C) (1
• 100% of nameplate rating		
Heat Pumps Without Supplemental Electric Heating		220.82 (C) (2
• 100% of nameplate rating		
Heat Pumps With Supplemental Electric Heating		220.82 (C) (3
 100% of nameplate rating of the heat pump compressor* 		
 65% of nameplate rating of supplemental electric heating equipment 		
 If compressor & supplemental heat cannot run at the same time 		
do not include the compressor		
Electric Space Heating		
 Less than 4 separately controlled units @ 65% of nameplate rating 		220.82 (C) (4
 4 or more separately controlled units @ 40% of nameplate rating 		220.82 (C) (5
 40% of nameplate rating if 4 or more separately controlled units 		
Electric Thermal Storage (or system where the load is expected to be		220.82 (C) (6
continuous at nameplate rating • 100% of nameplate rating		
Systems of this type cannot be calculated under any other section of 220.82 (C).		
LOAD CALCULATIONS		
General Lighting Load	3 VA x ft²	
Small Appliance & Laundry Circuits	+ 1500 VA per circuit	
General Appliances & Motors (100% rated load)	+ Total general appliances	
• Sum of all General Loads	= Total General Load (VA)	
APPLY DEMAND FACTORS		
- First 10 kVA @ 100%	= 10,000 VA	
- Remainder of General Loads @ 40%	(Total VA - 10,000) x .40	
• HEAT / A-C LOAD @ 100%	= Calculated General Load (VA) <u>Largest Heat or A-C Load (VA)</u> = TOTAL CALCULATED LOAD	

Converting VA TO kW (Single-phase applications with 1.0 power factor only) 1 kVA = 1 kW

220.54

Worksheet — NEC	2017, 220 Pa	art IV			
Contractor		Email			
Phone		Fax			
Job Name					
Date	Location				
Voltage (Circle)	240V -1Ø				
Fuel		NG	LPV		
Elec. Service	100 Amp	200 Amp	400 Amp	Ot	her
NET SQUARE FOOTAGE					1 (1140)
GENERAL LOADS	Qty	Rating (Load)	Factor	Loads (VA)	Loads (kW) (VA ÷ 1,000)
General Lighting and General Use Receptacles		3 VA/ft ²	100%		
Branch Circuits (1500 VA/ft²)					
Small Appliance Circuits (20 Amp)		1500	100%		
Laundry Circuits		1500	100%		
Fixed Appliances		Full Curre	nt Rating		
Well			100%		
Sump Pump			100%		
Freezer		 	100%	 	
Microwave (Not counter-top model)		 	100%		
Disposal		†	100%		
Dishwasher		+	100%	+	+
			100%	+	
Range		 			-
Wall-Mounted Oven			100%		
Counter-Mounted Cooking Surface			100%		
Water Heater		<u> </u>	100%		
Clothes Dryer			100%		
Garage Door Opener			100%		
Septic Grinder			100%		
Other (list)			100%		
			100%		
			100%		
			100%		
			100%		
			100%		
		+	100%		
		 	100%		
		 	100%		
		ļ	100%		
Total General Loads				VA	kW
HEAT / A-C LOAD		,		,	
A-C / Cooling Equipment			100%		
Heat Pump					
Compressor (if not included as A-C)			100%		
Supplemental Electric Heat			65%		
Electric Space Heating					
Less than 4 separately controlled units			65%		
4 or more separately controlled units			40%		
System With Continuous Nameplate Load			100%		
Largest Heat / A-C Load (VA) VA kW		<u> </u>			
GENERAL LOADS					
			1000/	LAAZ	
1st 10 kW of General Loads 100% kW Paradicina Community and (100) 480% kW			100%	<u>kW</u>	
• Remaining General Loads (kW) 40% kW			40%	kW	
CALCULATED GENERAL LOAD (kW) kW					kW
LARGEST HEAT / A-C LOAD 100% kW kW					kW
TOTAL CALCULATED LOAD (Net General Loads + Heat/A-C Load)					kW



Selected CI	rcuit Lo	aa Ga	aicul	ator				
Contractor				Email _				
Phone				Fax				
Job Name							The QT Serie requirements NEC 695	s does not meet the necessary s for the following applications: Fire Pumps
Date		Locat	tion				NEC 700	Emergency Systems
		☐ 120			120/240 3 Ø 🗆 2	277/480 3 Ø	NFPA 20 NFPA 99 NFPA 11	· · · · · · · · · · · · · · · · · · ·
ELEC. SERVICE ☐ 100 Amp ☐ 150 Amp ☐ 200 Amp ☐ 300 Amp ☐ 400 Amp ☐ 600 Amp ☐ 0ther						400 Amp	Reference Codes Related Codes and Standards: NEC 225 Branch Circuits and Feeders NEC 240 Overcurrent Protection NEC 250 Grounding NEC 445 Generators NEC 700 Emergency Systems NEC 701 Legally Required Standby	
Before installation contact local jurisdiction to confirm all requirements are met. Jurisdictions may vary. Generac recommends contacting local authorities prior to installation. LOADS: Look for heavy building loads such as refrigeration, air conditioning, pumps or UPS systems. Use the following for sizing and determining generator kW.						ary.		
TABLE 8	Motor Lo	ad Table	e (refer	to Table 1	1)		NEC 702	Optional Standby
Device		HP	RA	LRA	kW Running (= H	P) Starting kW ¹	NFPA 37	Stationary Engines
							NFPA 54 NFPA 58	
							ICC	Fuel Gas Code
							To Calculate	kW
							 	Amps x 120/1000 = kW
								Amps x 240/1000 = kW
							 	(Amps x 208 x 1.732 x PF) /1000 = kW
								(Amps x 240 x 1.732 x PF) $/1000 = kW$
							480 V 3ø	(Amps x 480 x 1.732 x PF) /1000 = kW

PF is application power factor (worst case 1.0) Typical application power factor is 0.95.

TABLE 9	Non-Motor Load Table (refer to Table 2)		
Device		Amps	kW

Transfer Switch Availability

RXSW – 100, 150, 200, 300 and 400 Amp service rated

RTSN - 100-800 3ø and 600-800 1ø Amp

RXSC – 100, 200, 400, 600, 800 Amp

GenReady - 100-200 Amp service panel

RTS and GenReady switches only work with the Evolution or Nexes Controller.

RECOMMENDED GENERATOR SIZE _____

Refer to Generator Sizing Instructions on other side of this sheet.

Install Notes:

- 1. Consult manual for installation recommendations.
- 2. Consult local authority having jurisdiction for local requirements.

¹ See Table 430.7(B) for staring kVA per HP for motor loads.



Generator Sizing Instructions:

There is not a single correct sizing solution. Following are several methods that, when mixed with good judgement, should result in an appropriately sized generator. Remember to consider load growth, seasonality, and effects of starting motors.

As municipalities and states adopt the new 2017 NEC Electrical Code, there may be new sizing requirements, spelled out in the code book, which the installation technician must follow. Always check with the local inspection department to confirm which code cycle will affect your install.

Never add Amps when sizing a generator. Convert Amps to kW and add kW to determine the required generator size. Power factors for various motor loads vary widely. Adding Amps without properly accounting for the power factor and/or mixing voltages will result in improperly sizing the generator.

When motors start, they create a current surge that step loads the generator and creates a voltage dip. After selecting a generator, reference the generator's surge capability using **table 3**. Verify that voltage dip is adequate for the application. Most commercial applications should be limited to about 15% voltage dip and residential applications should be limited to a 30% voltage dip.

Some applications utilize an uninterruptible power supply (UPS) to back up critical loads. Please read sizing guide for this load type.

Measurement Method 220.87 Exception NEC 2017

Connect a recording ammeter or power meter that is capable of measuring the maximum peak kW demand continuously over a minimum 30 day period. The maximum kW demand shall be taken while the building is occupied and shall include the larger of the heating or cooling loads. The peak kW demand shall be multiplied by 125%.

Peak kW demand

X 125% =

Calculated kW demand

Size the generator to the next standard size and verify UPS and motor load compatibility.

Determining Existing Loads/Billing History Method 220.87 NEC 2017

Many customers have a utility rate structure that has a peak demand charge. Using a year's worth of electric bills, size the generator 25% larger than the largest peak demand.

Verify motor and UPS load compatibility.

Peak	Demand	=		

Load Summation Method

- Enter running kW for all motor loads (except the largest) expected to run during peak load levels into table 8. Refer to table 1 for typical motor load sizes and electrical requirements.
- Enter kW for all non-motor loads expected to run during peak load levels into table 9. Refer to table 2 for typical residential loads and rules of thumb.
- Add the running motor load kW, non-motor load kW, and the starting kW of the largest motor load.

Motor load running total (minus largest motor):		kW (ref. table 8)
Non-motor load total:		kW (ref. table 9)
Starting load from largest cycling motor:		kW (ref. table 8)
Total electrical loads:	=	kW

Select generator: Commercial (add 20 to 25% to total kW)

Residential (add 10 to 20% to total kW)

- 4) Confirm that voltage dip is within acceptable limits by comparing motor LRA to generator surge capability (see table #3).
- 5) Confirm UPS compatibility (see page 11).

System Capacity – Load Calculation

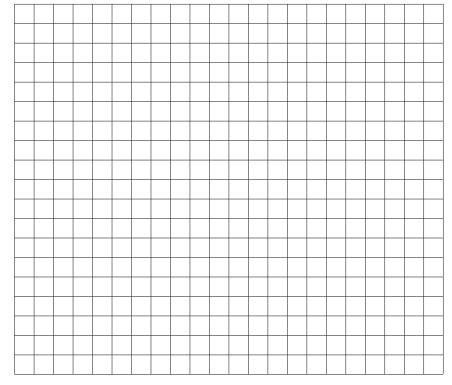
If the local municipality or state you are in has adopted the 2017 NEC Code, you may be required to use this step. Article 702 of the 2017 NEC includes a new requirement for sizing (702.4). If no other method for sizing is acceptable, sizing of the generator shall be made in accordance with Article 220 of the NEC. The system capacity estimating sheet will quide you through this process.

SMM Load Control Module

702.4 (B) (2) (a) NEC 2017

The SMM Load Control Module is a 50 amp contact housed in a NEMA 3R enclosure for indoor and outdoor installation applications. Through the use of the SMM Modules in conjunction with any of the 100–600 amp Smart Switches, household or business loads can be intelligently managed enabling the use of a smaller, more efficient generator system. Up to four SMM Modules can be used with a single switch.

Project Layout



Ball Park Estimates (Do not use for final sizing)

Estimate based on 60% service size: (commercial)

240 Volts, 1 Ø:	Amps x $.15 =$	 kW
208 Volts, 3 Ø:	Amps x .22 =	 kW
240 Volts, 3 Ø:	Amps x .25 =	 kW
480 Volts, 3 Ø:	Amps $x.50 =$	 kW

Estimate based on 40% service size: (residential)

240 Volts, 1 Ø:	_ Amps x $.10 =$	 kW
208 Volts, 3 Ø:	_ Amps x .15 =	 kW
240 Volts, 3 Ø:	_ Amps x .17 =	kW
480 Volts, 3 Ø:	Amps x $.34 =$	kW

Estimate based on square footage

Fast food, convenience stores, restaurants, grocery stores	kW = 50 kW + 10 watts/sq. f
Other commercial applications	kW = 30 kW + 5 watts/sq. ft.

Amps to kW Rule of Thumb (assumes .8 pf)

	(
For 480 volt systems	Amps = kW x 1.5
For 208 volt systems	$Amps = kW \times 3.5$
For 240 volt 3 Ø systems	$Amps = kW \times 3$
For 240 volt 1 Ø systems	$Amps = kW \times 4$

Square footage = _____ Estimated kW = ___

System Capacity – Load Calculator



DIRECTIONS FOR NEC 2017, ARTICLE 220, F	PART IV	NEO DEFENDA
220.80 Optional Feeder and Service Load Calculations (RESIDENTIAL)		NEC REFERENCE
SECTION CAN BE USED FOR DWELLING UNITS		220.82 (A
 Served by a single feeder conductor (generator) 120/240 volt or 208Y/120 volt service 		
Ampacity of 100 amps or greater		
The calcultated load will be the result of adding		
• 220.82 (B) General Loads, and		220.82 (B
• 220.82 (C) Heating and Air-Conditioning Load		220.82 (C
223.32 (8) Floating and Air Containing 2344		220.02 (0
GENERAL LOADS		220.82 (B
General Lighting and General-Use Receptacles		
Calculate at 3 VA per square foot		220.82 (B) (1
 Use exterior dimensions of the home to calculate square footage – do not include op- 	en	
porches, garages, or unused or unfinished spaces not adaptable for future use.		
 Add 20-amp small appliance & laundry circuits @ 1500 VA each 		220.82 (B) (2
Calculate the following loads at 100% of nameplate rating		220.82 (B) (3
 Appliances fastened in place, permanently connected or located on a specific circuit 		220.82 (B) (3)
 Ranges, wall-mounted ovens, counter-mounted cooking units 		220.82 (B) (3)
 Clothes dryers not connected to the laundry branch circuit 		220.82 (B) (3)
Water heaters		220.82 (B) (3)
Permanently connected motors not included in Heat & Air-Conditioning Load section		220.82 (B) (4
HEATING & AIR-CONDITIONING LOADS		220.82 (C
Include the largest of the following six selections (kVA load) in calculation		
Air Conditioning and Cooling		220.82 (C) (1
• 100% of nameplate rating		000 00 (0) (0
Heat Pumps Without Supplemental Electric Heating		220.82 (C) (2
• 100% of nameplate rating		220 92 (C) (2
Heat Pumps With Supplemental Electric Heating • 100% of nameplate rating of the heat pump compressor*		220.82 (C) (3
65% of nameplate rating of supplemental electric heating equipment		
If compressor & supplemental heat cannot run at the same time		
do not include the compressor		
Electric Space Heating		
Less than 4 separately controlled units @ 65% of nameplate rating		220.82 (C) (4
4 or more separately controlled units @ 40% of nameplate rating		220.82 (C) (5
40% of nameplate rating if 4 or more separately controlled units		220.02 (0) (0
Electric Thermal Storage (or system where the load is expected to be		220.82 (C) (6
continuous at nameplate rating		220.02 (0) (0
• 100% of nameplate rating		
• Systems of this type cannot be calculated under any other section of 220.82 (C).		
LOAD CALCULATIONS		
General Lighting Load	3 VA x ft²	
Small Appliance & Laundry Circuits Operand Appliance & Makeyer (4000) retail lead?	+ 1500 VA per circuit	
General Appliances & Motors (100% rated load) Sum of all Congret Loads	+ Total General appliances	
Sum of all General Loads ARRIVED FACTORS	= Total General Load (VA)	
APPLY DEMAND FACTORS	10.000.1/1	
- First 10 kVA @ 100%	= 10,000 VA	
- Remainder of General Loads @ 40%	(Total VA - 10,000) x .40	
· HEAT / A C L OAD @ 1009/	= Calculated General Load (VA)	
• HEAT / A-C LOAD @ 100%	Largest Heat or A-C Load (VA)TOTAL CALCULATED LOAD	

Converting VA TO kW (Single-phase applications with 1.0 power factor only) 1 kVA = 1 kW

220.54

Worksheet — NEC 2017, 220 Part IV									
Contractor		Email							
Phone		Fax							
Job Name									
Date	Location								
Voltage (Circle)	240V -1Ø								
Fuel		NG	LPV						
Elec. Service	100 Amp	200 Amp	400 Amp	Ot	her				
NET SQUARE FOOTAGE					1 (1140)				
GENERAL LOADS	Qty	Rating (Load)	Factor	Loads (VA)	Loads (kW) (VA ÷ 1,000)				
General Lighting and General Use Receptacles		3 VA/ft ²	100%						
Branch Circuits (1500 VA/ft²)									
Small Appliance Circuits (20 Amp)		1500	100%						
Laundry Circuits		1500	100%						
Fixed Appliances		Full Curre	nt Rating						
Well			100%						
Sump Pump			100%						
Freezer		 	100%	 	 				
Microwave (Not counter-top model)		 	100%						
Disposal		†	100%						
Dishwasher		+	100%	+	+				
			100%	+	 				
Range		 			-				
Wall-Mounted Oven			100%						
Counter-Mounted Cooking Surface			100%						
Water Heater		<u> </u>	100%		ļ				
Clothes Dryer			100%						
Garage Door Opener			100%						
Septic Grinder			100%						
Other (list)			100%						
			100%						
			100%						
			100%						
			100%						
		<u> </u>	100%						
		+	100%						
		 	100%						
		 	100%						
		ļ	100%						
Total General Loads				VA	kW				
HEAT / A-C LOAD		,		,					
A-C / Cooling Equipment			100%						
Heat Pump									
Compressor (if not included as A-C)			100%						
Supplemental Electric Heat			65%						
Electric Space Heating									
Less than 4 separately controlled units			65%						
4 or more separately controlled units			40%						
System With Continuous Nameplate Load			100%						
Largest Heat / A-C Load (VA) VA kW		<u> </u>							
GENERAL LOADS									
			1000/	LAAZ					
1st 10 kW of General Loads 100% kW Paradicina Community and (100) 480% kW			100%	<u>kW</u>					
• Remaining General Loads (kW) 40% kW			40%	kW					
CALCULATED GENERAL LOAD (kW) kW					kW				
LARGEST HEAT / A-C LOAD 100% kW kW					kW				
TOTAL CALCULATED LOAD (Net General Loads + Heat/A-C Load)					kW				

Selected Circuit Load Calculator



Selected Circuit i	Luau Ga	aiGuid	สเบเ					
Contractor			Email _					
Phone			Fax					
Job Name							s does not meet the necessary for the following applications: Fire Pumps Emergency Systems Fire Pumps Healthcare Emergency Systems Codes S and Standards: Branch Circuits and Feeders Overcurrent Protection Grounding Generators	
TABLE 8 Motor	Load Table	e (refer t	to Table 1)		NEC 700 NEC 701 NEC 702	Emergency Systems Legally Required Standby Optional Standby	
Device	HP	RA	LRA	kW Running (= HP)	Starting kW ¹	NFPA 37	Installation & Use of Stationary Engines	
						NFPA 54 NFPA 58 ICC	National Fuel Gas Code LP Gas Code Fuel Gas Code	
						To Calculate k	wW	
						120 V 1ø A	Amps x 120/1000 = kW	
						240 V 1ø A	Amps x 240/1000 = kW	
						 	Amps x 208 x 1.732 x PF) /1000 = kW	
						<u> </u>	Amps x 240 x 1.732 x PF) /1000 = kW	
						480 V 3ø (/	Amps x 480 x 1.732 x PF) /1000 = kW	

TABLE 9	Non-Motor Load Table (refer to Table 2)					
Device		Amps	kW			

Transfer Switch Availability

RXSW – 100, 150, 200, 300 and 400 Amp service rated

RTSN - 100-800 3ø and 600-800 1ø Amp

RXSC – 100, 200, 400, 600, 800 Amp

GenReady – 100–200 Amp service panel

RTS and GenReady switches only work with the Evolution or Nexes Controller.

RECOMMENDED GENERATOR SIZE _____

Refer to Generator Sizing Instructions on other side of this sheet.

Install Notes:

- 1. Consult manual for installation recommendations.
- 2. Consult local authority having jurisdiction for local requirements.

¹ See Table 430.7(B) for staring kVA per HP for motor loads.

PF is application power factor (worst case 1.0) Typical application power factor is 0.95.

Selected Circuit Load Calculator



Generator Sizing Instructions:

There is not a single correct sizing solution. Following are several methods that, when mixed with good judgement, should result in an appropriately sized generator. Remember to consider load growth, seasonality, and effects of starting motors.

As municipalities and states adopt the new 2017 NEC Electrical Code, there may be new sizing requirements, spelled out in the code book, which the installation technician must follow. Always check with the local inspection department to confirm which code cycle will affect your install.

Never add Amps when sizing a generator. Convert Amps to kW and add kW to determine the required generator size. Power factors for various motor loads vary widely. Adding Amps without properly accounting for the power factor and/or mixing voltages will result in improperly sizing the generator.

When motors start, they create a current surge that step loads the generator and creates a voltage dip. After selecting a generator, reference the generator's surge capability using table 3. Verify that voltage dip is adequate for the application. Most commercial applications should be limited to about 15% voltage dip and residential applications should be limited to a 30% voltage dip.

Some applications utilize an uninterruptible power supply (UPS) to back up critical loads. Please read sizing guide for this load type.

Measurement Method 220.87 Exception NEC 2017

Connect a recording ammeter or power meter that is capable of measuring the maximum peak kW demand continuously over a minimum 30 day period. The maximum kW demand shall be taken while the building is occupied and shall include the larger of the heating or cooling loads. The peak kW demand shall be multiplied by 125%.

Peak kW demand

X 125% =

Calculated kW demand

Size the generator to the next standard size and verify UPS and motor load compatibility.

Determining Existing Loads/Billing History Method 220.87 NEC 2017

Many customers have a utility rate structure that has a peak demand charge. Using a year's worth of electric bills, size the generator 25% larger than the largest peak demand.

Verify motor and UPS load compatibility. Peak Demand =

Load Summation Method

- 1) Enter running kW for all motor loads (except the largest) expected to run during peak load levels into table 8. Refer to table 1 for typical motor load sizes and electrical requirements.
- 2) Enter kW for all non-motor loads expected to run during peak load levels into table 9. Refer to table 2 for typical residential loads and rules of thumb.
- 3) Add the running motor load kW, non-motor load kW, and the starting kW of the largest motor load.

Motor load running total (minus largest motor):		kW (ref. table 8)
Non-motor load total:		kW (ref. table 9)
Starting load from largest cycling motor:		kW (ref. table 8)
Total electrical loads:	=	kW

Select generator: Commercial (add 20 to 25% to total kW)

Residential (add 10 to 20% to total kW)

- 4) Confirm that voltage dip is within acceptable limits by comparing motor LRA to generator surge capability (see table #3).
- 5) Confirm UPS compatibility (see page 11).

System Capacity – Load Calculation

If the local municipality or state you are in has adopted the 2017 NEC Code, you may be required to use this step. Article 702 of the 2017 NEC includes a new requirement for sizing (702.4). If no other method for sizing is acceptable, sizing of the generator shall be made in accordance with Article 220 of the NEC. The system capacity estimating sheet will guide you through this process.

SMM Load Control Module

702.4 (B) (2) (a) NEC 2017

The SMM Load Control Module is a 50 amp contact housed in a NEMA 3R enclosure for indoor and outdoor installation applications. Through the use of the SMM Modules in conjunction with any of the 100-600 amp Smart Switches, household or business loads can be intelligently managed enabling the use of a smaller, more efficient generator system. Up to four SMM Modules can be used with a single switch.

Project Layout

Ball Park Estimates (Do not use for final sizing)

Estimate based on 60% service size: (commercial)

240 Volts, 1 Ø:	Amps x $.15 =$	 kW
208 Volts, 3 Ø:	Amps x .22 =	kW
240 Volts, 3 Ø:	Amps x .25 =	 kW
480 Volts, 3 Ø:	Amps $x.50 =$	 kW

Estimate based on 40% service size: (residential)

240 Volts, 1 Ø:	_ Amps x $.10 =$	 kW
208 Volts, 3 Ø:	_ Amps x .15 =	kW
240 Volts, 3 Ø:	_ Amps x .17 =	kW
480 Volts. 3 Ø:	Amps x $.34 =$	kW

Estimate based on square footage

Fast food, convenience stores, kW = 50 kW + 10 watts/sq. ft.restaurants, grocery stores Other commercial applications kW = 30 kW + 5 watts/sq. ft.

Estimated kW = ___

Amps to kW Rule of Thumb (assumes .8 pf)

Square footage = _____

For 480 volt systems $Amps = kW \times 1.5$ For 208 volt systems $Amps = kW \times 3.5$ For 240 volt 3 Ø systems $Amps = kW \times 3$ For 240 volt 1 Ø systems $Amps = kW \times 4$

System Capacity – Load Calculator



DIRECTIONS FOR NEC 2017, ARTICLE 220, P		IEO DEEEDENOS
220.80 Optional Feeder and Service Load Calculations (RESIDENTIAL)		NEC REFERENCE
SECTION CAN BE USED FOR DWELLING UNITS		220.82 (A
 Served by a single feeder conductor (generator) 120/240 volt or 208Y/120 volt service 		
Ampacity of 100 amps or greater The calcultated load will be the result of adding		
• 220.82 (B) General Loads, and		220.82 (B
• 220.82 (C) Heating and Air-Conditioning Load		220.82 (C
220.02 (O) Hoading and Air Soriditioning Load		220.02 (0)
GENERAL LOADS		220.82 (B
General Lighting and General-Use Receptacles		
Calculate at 3 VA per square foot		220.82 (B) (1
• Use exterior dimensions of the home to calculate square footage – do not include open	en	
porches, garages, or unused or unfinished spaces not adaptable for future use.		
Add 20-amp small appliance & laundry circuits @ 1500 VA each		220.82 (B) (2
Calculate the following loads at 100% of nameplate rating		220.82 (B) (3
Appliances fastened in place, permanently connected or located on a specific circuit		220.82 (B) (3) a
Ranges, wall-mounted ovens, counter-mounted cooking units		220.82 (B) (3) b
Clothes dryers not connected to the laundry branch circuit		220.82 (B) (3) (
Water heaters		220.82 (B) (3) d
Permanently connected motors not included in Heat & Air-Conditioning Load section		220.82 (B) (4
HEATING & AIR-CONDITIONING LOADS		220.82 (C
Include the largest of the following six selections (kVA load) in calculation		
Air Conditioning and Cooling		220.82 (C) (1
• 100% of nameplate rating		
Heat Pumps Without Supplemental Electric Heating		220.82 (C) (2
• 100% of nameplate rating		
Heat Pumps With Supplemental Electric Heating		220.82 (C) (3
 100% of nameplate rating of the heat pump compressor* 		
 65% of nameplate rating of supplemental electric heating equipment 		
 If compressor & supplemental heat cannot run at the same time 		
do not include the compressor		
Electric Space Heating		
 Less than 4 separately controlled units @ 65% of nameplate rating 		220.82 (C) (4
 4 or more separately controlled units @ 40% of nameplate rating 		220.82 (C) (5
 40% of nameplate rating if 4 or more separately controlled units 		
Electric Thermal Storage (or system where the load is expected to be		220.82 (C) (6
continuous at nameplate rating • 100% of nameplate rating		
Systems of this type cannot be calculated under any other section of 220.82 (C).		
LOAD CALCULATIONS		
General Lighting Load	3 VA x ft²	
Small Appliance & Laundry Circuits	+ 1500 VA per circuit	
General Appliances & Motors (100% rated load)	+ Total general appliances	
• Sum of all General Loads	= Total General Load (VA)	
APPLY DEMAND FACTORS		
- First 10 kVA @ 100%	= 10,000 VA	
- Remainder of General Loads @ 40%	(Total VA - 10,000) x .40	
• HEAT / A-C LOAD @ 100%	= Calculated General Load (VA) <u>Largest Heat or A-C Load (VA)</u> = TOTAL CALCULATED LOAD	

Converting VA TO kW (Single-phase applications with 1.0 power factor only) 1 kVA = 1 kW

220.54

Worksheet — NEC 2017, 220 Part IV									
Contractor		Email							
Phone		Fax							
Job Name									
Date	Location								
Voltage (Circle)	240V -1Ø								
Fuel		NG	LPV						
Elec. Service	100 Amp	200 Amp	400 Amp	Ot	her				
NET SQUARE FOOTAGE					1 (1140)				
GENERAL LOADS	Qty	Rating (Load)	Factor	Loads (VA)	Loads (kW) (VA ÷ 1,000)				
General Lighting and General Use Receptacles		3 VA/ft ²	100%						
Branch Circuits (1500 VA/ft²)									
Small Appliance Circuits (20 Amp)		1500	100%						
Laundry Circuits		1500	100%						
Fixed Appliances		Full Curre	nt Rating						
Well			100%						
Sump Pump			100%						
Freezer		 	100%	 	 				
Microwave (Not counter-top model)		 	100%						
Disposal		†	100%						
Dishwasher		+	100%	+	+				
			100%	+	 				
Range		 			-				
Wall-Mounted Oven			100%						
Counter-Mounted Cooking Surface			100%						
Water Heater		<u> </u>	100%		ļ				
Clothes Dryer			100%						
Garage Door Opener			100%						
Septic Grinder			100%						
Other (list)			100%						
			100%						
			100%						
			100%						
			100%						
		<u> </u>	100%						
		+	100%						
		 	100%						
		 	100%						
		ļ	100%						
Total General Loads				VA	kW				
HEAT / A-C LOAD		,		,					
A-C / Cooling Equipment			100%						
Heat Pump									
Compressor (if not included as A-C)			100%						
Supplemental Electric Heat			65%						
Electric Space Heating									
Less than 4 separately controlled units			65%						
4 or more separately controlled units			40%						
System With Continuous Nameplate Load			100%						
Largest Heat / A-C Load (VA) VA kW		<u> </u>							
GENERAL LOADS									
			1000/	LAAZ					
1st 10 kW of General Loads 100% kW Paradicina Community and (100) 480% kW			100%	<u>kW</u>					
• Remaining General Loads (kW) 40% kW			40%	kW					
CALCULATED GENERAL LOAD (kW) kW					kW				
LARGEST HEAT / A-C LOAD 100% kW kW					kW				
TOTAL CALCULATED LOAD (Net General Loads + Heat/A-C Load)					kW				



and Feeders

Selected Circuit	Load Ga	aicuia	itor			
Contractor			Email			
Phone			Fax			ns does not meet the necessary
Job Name					requirements	for the following applications: Fire Pumps
Date	Locat	tion			NEC 700	•
VOLTAGE ☐ 120/240 TYPE ☐ Natural G		/208 3 Ø Vapor (Li		20/240 3Ø 277/480 3Ø	NFPA 20 NFPA 99 NFPA 110	Fire Pumps Healthcare Emergency Systems
ELEC. SERVICE		p 🗌 20	0 Amp	☐ 300 Amp ☐ 400 Amp		and Standards:
Before installation contact local jurisd Generac recommends contacting loca LOADS: Look for heavy building loads suc Use the following for sizing and co	I authorities prioch as refrigeration	r to installa , air conditio	ntion. ning, pump		NEC 225 NEC 240 NEC 250 NEC 445 NEC 700 NEC 701	Branch Circuits and Feeder Overcurrent Protection Grounding Generators Emergency Systems
TABLE 8 Motor	Load Table	e (refer t	o Table 1)	NEC 701 NEC 702	Legally Required Standby Optional Standby
Device	HP	RA	LRA	kW Running (= HP) Starting kW ¹	NFPA 37	Installation & Use of Stationary Engines
					NFPA 54	National Fuel Gas Code
					NFPA 58 ICC	LP Gas Code Fuel Gas Code

Typical application power factor is 0.95.

Amps x 120/1000 = kW

Amps x 240/1000 = kW

(Amps x 208 x 1.732 x PF) / 1000 = kW

TABLE 9	Non-Motor Load Table (refer to Table 2)						
Device		Amps	kW				

Transfer Switch Availability

RXSW – 100, 150, 200, 300 and 400 Amp service rated

To Calculate kW 120 V 1ø

240 V 1ø

208 V 3ø

RTSN - 100-800 3ø and 600-800 1ø Amp

RXSC – 100, 200, 400, 600, 800 Amp

GenReady – 100–200 Amp service panel

RTS and GenReady switches only work with the Evolution or Nexes Controller.

RECOMMENDED GENERATOR SIZE ______ Refer to Generator Sizing Instructions on other side of this sheet.

Install Notes:

- 1. Consult manual for installation recommendations.
- 2. Consult local authority having jurisdiction for local requirements.

¹ See Table 430.7(B) for staring kVA per HP for motor loads.

²⁴⁰ V 3ø (Amps x 240 x 1.732 x PF) / 1000 = kW480 V 3ø (Amps x 480 x 1.732 x PF) /1000 = kWPF is application power factor (worst case 1.0)

Selected Circuit Load Calculator



Generator Sizing Instructions:

There is not a single correct sizing solution. Following are several methods that, when mixed with good judgement, should result in an appropriately sized generator. Remember to consider load growth, seasonality, and effects of starting motors.

As municipalities and states adopt the new 2017 NEC Electrical Code, there may be new sizing requirements, spelled out in the code book, which the installation technician must follow. Always check with the local inspection department to confirm which code cycle will affect your install.

Never add Amps when sizing a generator. Convert Amps to kW and add kW to determine the required generator size. Power factors for various motor loads vary widely. Adding Amps without properly accounting for the power factor and/or mixing voltages will result in improperly sizing the generator.

When motors start, they create a current surge that step loads the generator and creates a voltage dip. After selecting a generator, reference the generator's surge capability using **table 3**. Verify that voltage dip is adequate for the application. Most commercial applications should be limited to about 15% voltage dip and residential applications should be limited to a 30% voltage dip.

Some applications utilize an uninterruptible power supply (UPS) to back up critical loads. Please read sizing guide for this load type.

Measurement Method 220.87 Exception NEC 2017

Connect a recording ammeter or power meter that is capable of measuring the maximum peak kW demand continuously over a minimum 30 day period. The maximum kW demand shall be taken while the building is occupied and shall include the larger of the heating or cooling loads. The peak kW demand shall be multiplied by 125%.

Peak kW demand

X 125% =

Calculated kW demand

Size the generator to the next standard size and verify UPS and motor load compatibility.

Determining Existing Loads/Billing History Method 220.87 NEC 2017

Many customers have a utility rate structure that has a peak demand charge. Using a year's worth of electric bills, size the generator 25% larger than the largest peak demand.

Verify motor and UPS load compatibility. Peak Demand = ___

Load Summation Method

- Enter running kW for all motor loads (except the largest) expected to run during peak load levels into table 8. Refer to table 1 for typical motor load sizes and electrical requirements.
- Enter kW for all non-motor loads expected to run during peak load levels into table 9. Refer to table 2 for typical residential loads and rules of thumb.
- Add the running motor load kW, non-motor load kW, and the starting kW of the largest motor load.

Motor load running total (minus largest motor):		kW (ref. table 8)
Non-motor load total:		kW (ref. table 9)
Starting load from largest cycling motor:		kW (ref. table 8)
Total electrical loads:	=	kW

Select generator: Commercial (add 20 to 25% to total kW)
Residential (add 10 to 20% to total kW)

4) Confirm that voltage dip is within acceptable limits by comparing motor LRA to generator surge capability (see table #3).

5) Confirm UPS compatibility (see page 11).

System Capacity – Load Calculation

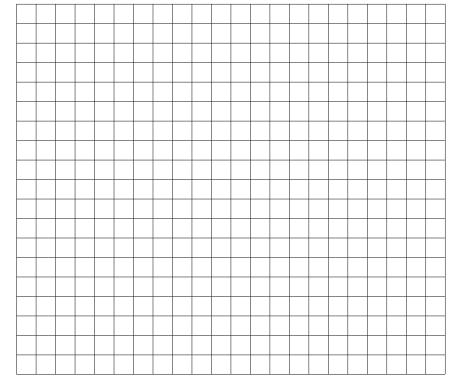
If the local municipality or state you are in has adopted the 2017 NEC Code, you may be required to use this step. Article 702 of the 2017 NEC includes a new requirement for sizing (702.4). If no other method for sizing is acceptable, sizing of the generator shall be made in accordance with Article 220 of the NEC. The system capacity estimating sheet will guide you through this process.

SMM Load Control Module

702.4 (B) (2) (a) NEC 2017

The SMM Load Control Module is a 50 amp contact housed in a NEMA 3R enclosure for indoor and outdoor installation applications. Through the use of the SMM Modules in conjunction with any of the 100–600 amp Smart Switches, household or business loads can be intelligently managed enabling the use of a smaller, more efficient generator system. Up to four SMM Modules can be used with a single switch.

Project Layout



Ball Park Estimates (Do not use for final sizing)

Estimate based on 60% service size: (commercial)

240 Volts, 1 Ø:	Amps x $.15 =$	 kW
208 Volts, 3 Ø:	Amps x .22 =	kW
240 Volts, 3 Ø:	Amps x .25 =	 kW
480 Volts, 3 Ø:	Amps $x.50 =$	 kW

Estimate based on 40% service size: (residential)

240 Volts, 1 Ø:	Amps x $.10 = $	kW
208 Volts, 3 Ø:	Amps x .15 = _	kW
240 Volts, 3 Ø:	Amps x .17 = _	kW
480 Volts, 3 Ø:	Amps x $.34 =$	kW

Estimate based on square footage

Fast food, convenience stores, restaurants, grocery stores $kW = 50 \; kW + 10 \; watts/sq. \; ft.$ Other commercial applications $kW = 30 \; kW + 5 \; watts/sq. \; ft.$

Estimated kW = ____

Amps to kW Rule of Thumb (assumes .8 pf)

Square footage = _____

For 480 volt systems Amps = kW x 1.5 For 208 volt systems Amps = kW x 3.5 For 240 volt 3 \emptyset systems Amps = kW x 3 For 240 volt 1 \emptyset systems Amps = kW x 4

System Capacity – Load Calculator



	PART IV	NEC DEEEDENCE
220.80 Optional Feeder and Service Load Calculations (RESIDENTIAL)		NEC REFERENCE
SECTION CAN BE USED FOR DWELLING UNITS		220.82 (A)
Served by a single feeder conductor (generator)		
• 120/240 volt or 208Y/120 volt service		
Ampacity of 100 amps or greater The color had a load will be the great to find discrete.		
The calcultated load will be the result of adding		000 00 (P)
 220.82 (B) General Loads, and 220.82 (C) Heating and Air-Conditioning Load 		220.82 (B) 220.82 (C)
• 220.62 (G) Heating and Air-Conditioning Load		220.02 (0)
GENERAL LOADS		220.82 (B)
General Lighting and General-Use Receptacles		
Calculate at 3 VA per square foot		220.82 (B) (1)
• Use exterior dimensions of the home to calculate square footage – do not include ope	en	
porches, garages, or unused or unfinished spaces not adaptable for future use.		
Add 20-amp small appliance & laundry circuits @ 1500 VA each		220.82 (B) (2)
Calculate the following loads at 100% of nameplate rating		220.82 (B) (3)
· Appliances fastened in place, permanently connected or located on a specific circuit		220.82 (B) (3) a
 Ranges, wall-mounted ovens, counter-mounted cooking units 		220.82 (B) (3) b
 Clothes dryers not connected to the laundry branch circuit 		220.82 (B) (3) c
Water heaters		220.82 (B) (3) d
 Permanently connected motors not included in Heat & Air-Conditioning Load section 		220.82 (B) (4)
HEATING & AIR-CONDITIONING LOADS		220.82 (C)
Include the largest of the following six selections (kVA load) in calculation		
Air Conditioning and Cooling		220.82 (C) (1)
• 100% of nameplate rating		will be seen to be
Heat Pumps Without Supplemental Electric Heating		220.82 (C) (2)
• 100% of nameplate rating		
Heat Pumps With Supplemental Electric Heating		220.82 (C) (3)
• 100% of nameplate rating of the heat pump compressor*		
65% of nameplate rating of supplemental electric heating equipment		
If compressor & supplemental heat cannot run at the same time		
do not include the compressor		
Electric Space Heating		220 82 (C) (4)
 Less than 4 separately controlled units @ 65% of nameplate rating 4 or more separately controlled units @ 40% of nameplate rating 		220.82 (C) (4) 220.82 (C) (5)
• 40% of nameplate rating if 4 or more separately controlled units		220.62 (0) (3)
Electric Thermal Storage (or system where the load is expected to be		220.82 (C) (6)
continuous at nameplate rating		220.02 (0) (0)
• 100% of nameplate rating		
Systems of this type cannot be calculated under any other section of 220.82 (C).		
LOAD CALCULATIONS		
General Lighting Load	3 VA x ft²	
Small Appliance & Laundry Circuits	+ 1500 VA per circuit	
General Appliances & Motors (100% rated load)	+ <u>Total general appliances</u>	
Sum of all General Loads	= Total General Load (VA)	
APPLY DEMAND FACTORS		
– First 10 kVA @ 100%	= 10,000 VA	
- Remainder of General Loads @ 40%	(Total VA - 10,000) x .40	
	Coloulated Congrel Load (VA)	I
• HEAT / A-C LOAD @ 100%	= Calculated General Load (VA) <u>Largest Heat or A-C Load (VA)</u>	

Converting VA TO kW (Single-phase applications with 1.0 power factor only) 1 kVA = 1 kW

220.54

Contractor Email September Sept	Worksheet — NE	C 2017, 220 Pa	art IV			
John Name	Contractor		Email			
Date			Fax			
Voltage (Circle) 240V - 10						
File No. Per No. Per No.						
Elec. Service 100 Amp 200 Amp 400 Amp Other		240V -1Ø				
MET SQUARE FOOTAGE						
City		100 Amp	200 Amp	400 Amp	Ot	her
Common Common	NET SQUARE FOOTAGE					1 (1140)
Branch Circuits (1500 WATR)		Qty			Loads (VA)	(VA ÷ 1,000)
Small Appliance Circuits (20 Amp)			3 VA/ft ²	100%		
Laundry Circuits	<u> </u>					
Fuel Appliances	Small Appliance Circuits (20 Amp)		1500	100%		
Mell	Laundry Circuits		1500	100%		
Sump Pump	Fixed Appliances		Full Curre	ent Rating		
Freezer 100%	Well		İ	100%		
Freezer 100%	Sump Pump			100%		
Microwave (Not counter-top model)					 	
Dishvasher 100%						
Dishwasher 100% 1						
Range			+		+	+
Wall-Mounted Oven 100% Counter-Mounted Cooking Surface 100% Counter-Mounted Surface Counter-Mo					+	
Counter-Mounted Cooking Surface	-					-
Water Heater						
Clothes Dryer						
Septic Grinder						ļ
Septic Grinder 100%	-					
Other (list) 100%						
100% 100%	Septic Grinder			100%		
100% 100%	Other (list)			100%		
100% 100%			İ	100%		
100% 100%				100%		
100% 100%				100%		
100% 100%			1			
100% 100%						
100% 100%			<u> </u>			
100% 100% 100%			1			
Total General Loads			1			
Total General Loads						
HEAT / A-C LOAD				100%		
A-C / Cooling Equipment		<u> </u>			VA	kW
Heat Pump • Compressor (if not included as A-C) • Supplemental Electric Heat Electric Space Heating • Less than 4 separately controlled units • 4 or more separately controlled units System With Continuous Nameplate Load Largest Heat / A-C Load (VA) VA kW GENERAL LOADS • 1st 10 kW of General Loads 100% kW • Remaining General Loads (kW) 40% kW CALCULATED GENERAL LOAD (kW) kW LARGEST HEAT / A-C LOAD 100% kW kW	· · · · · · · · · · · · · · · · · · ·	,			, , , , , , , , , , , , , , , , , , , ,	
Compressor (if not included as A-C) Supplemental Electric Heat Supplemental Electric Heat Electric Space Heating Less than 4 separately controlled units 40 more separately controlled units 40% System With Continuous Nameplate Load Largest Heat / A-C Load (VA) VA kW GENERAL LOADS 1st 10 kW of General Loads 100% kW Remaining General Loads (kW) 40% kW CALCULATED GENERAL LOAD (kW) kW LARGEST HEAT / A-C LOAD 100% kW kW KW				100%		
Supplemental Electric Heat Electric Space Heating Less than 4 separately controlled units 40% 4 or more separately controlled units System With Continuous Nameplate Load Largest Heat / A-C Load (VA) VA kW GENERAL LOADS 100% 100% WW Remaining General Loads 100% kW Remaining General Loads (kW) 40% kW CALCULATED GENERAL LOAD (kW) kW KW LARGEST HEAT / A-C LOAD 100% kW kW KW KW	·					
Electric Space Heating • Less than 4 separately controlled units • 4 or more separately controlled units System With Continuous Nameplate Load Largest Heat / A-C Load (VA) VA kW GENERAL LOADS • 1st 10 kW of General Loads 100% kW • Remaining General Loads (kW) 40% kW CALCULATED GENERAL LOAD (kW) kW LARGEST HEAT / A-C LOAD 100% kW kW kW						
Less than 4 separately controlled units 4 or more separately controlled units 4 or more separately controlled units System With Continuous Nameplate Load Largest Heat / A-C Load (VA) VA kW GENERAL LOADS 100% 100% KW Remaining General Loads 100% kW Remaining General Loads (kW) 40% kW CALCULATED GENERAL LOAD (kW) kW LARGEST HEAT / A-C LOAD 100% kW kW KW	Supplemental Electric Heat			65%		
4 or more separately controlled units System With Continuous Nameplate Load 100% Largest Heat / A-C Load (VA) VA kW GENERAL LOADS 100% 100% kW Remaining General Loads 100% kW CALCULATED GENERAL LOAD (kW) kW LARGEST HEAT / A-C LOAD 100% kW kW kW	Electric Space Heating					
4 or more separately controlled units System With Continuous Nameplate Load Largest Heat / A-C Load (VA) VA kW GENERAL LOADS 100% 100% kW Remaining General Loads 100% kW Remaining General Loads (kW) 40% kW CALCULATED GENERAL LOAD (kW) kW LARGEST HEAT / A-C LOAD 100% kW kW kW	Less than 4 separately controlled units			65%		
System With Continuous Nameplate Load	4 or more separately controlled units			40%		
Largest Heat / A-C Load (VA) VA kW	· · ·			100%		
GENERAL LOADS • 1st 10 kW of General Loads 100% kW 100% kW • Remaining General Loads (kW) 40% kW 40% kW CALCULATED GENERAL LOAD (kW) kW kW LARGEST HEAT / A-C LOAD 100% kW kW kW			<u> </u>			
• 1st 10 kW of General Loads 100% kW • Remaining General Loads (kW) 40% kW CALCULATED GENERAL LOAD (kW) kW LARGEST HEAT / A-C LOAD 100% kW kW	· · ·					
• Remaining General Loads (kW) 40% kW 40% kW CALCULATED GENERAL LOAD (kW) kW kW LARGEST HEAT / A-C LOAD 100% kW kW kW				1000/	LAAZ	
CALCULATED GENERAL LOAD (kW) kW LARGEST HEAT / A-C LOAD 100% kW kW kW						
LARGEST HEAT / A-C LOAD 100% kW kW				40%	kW	
	` '					
TOTAL CALCULATED LOAD (Net General Loads + Heat/A-C Load) kW	LARGEST HEAT / A-C LOAD 100% kW kW					kW
	TOTAL CALCULATED LOAD (Net General Loads + Heat/A-C Load)					kW

NOTES

