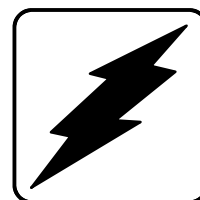


Service Parts

Industrial Generator Sets



Models:

200REOZP

See Group 701—Literature for
Engine and Accessory Parts Catalogs

See TP-6009 for Controller Parts



KOHLER[®]
POWER SYSTEMS

Specification Series 192

TP-6048 8/99

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Introduction

This manual lists service replacement parts for 200 kW generator sets.

At the time of print this manual applied to the generator set specification (spec) numbers listed in the Specification Number Index. On occasion this manual may apply to specs not listed in the Specification Number Index.

Information in this publication represents data available at the time of print. Kohler Co. reserves the right to change this publication and the products represented without notice and without any obligation or liability whatsoever.

This manual includes the following main sections:

Table of Contents. Lists the sections of the manual.

Introduction (and other information sections). Contains introductory material about part numbers, illustrations, and hardware.

Index. Lists the generator set specs and groups.

Group Parts Lists. List the part numbers of parts in the groups.

Kit Sections. List modules and accessories and their parts.

Appendices. Include Abbreviations, Common Hardware Application Guidelines, General Torque Specifications, Common Hardware Identification, and Common Hardware List.

xin:004:002

Numbering System Significance

This manual uses the following numbering systems:

Specification Number. A six-digit number with a PA-prefix. The Specification Number Index does not show the prefix. Spec numbers break down into groups.

Group Number. A unique number representing a parts group needed to assemble a generator set function. For example, Group 101 is the Air Intake group.

Variation or Module Number. A group might have several variations. Each variation performs the same function with different parts lists. For example, a 50 Hz generator alternator and 60 Hz generator alternator both perform the same function, however, with different parts. Each difference requires a group variation or module number.

Part Number. The part number identifies an individual assembly, subassembly, component, or accessory kit.

xin:004:003

Illustrations

Illustrations (or exploded-view drawings) best representing the widest range of variations accompany most groups in this manual. Illustrations do not depict all details and may not show all parts. Do not use illustrations for assembly or disassembly instructions.

How to Find Part Numbers

Use the following steps to locate a service replacement part.

1. Locate the generator set nameplate to **identify the generator set spec number**.
2. Locate a second generator set nameplate listing accessories to **identify installed modules**. On some models the accessory nameplate is mounted inside the generator junction box.
3. **Turn to the Specification Number Index**. The first column lists the generator set spec numbers. The headings identify the groups of parts that make up the generator set.
4. **Identify the group** most likely to include the service part number.
5. **Find the group variation number** at the intersection of the spec number row and the group column. Note the variation number.
6. **Page forward to locate the group** identified in step 4 or find the appropriate page in the Table of Contents.
7. **Find the part on the illustration** and note the item number of the part or **find the part description in the parts list**.
8. Select **the part number that corresponds to your group variation**. The first column lists the illustration item number. Find the variation identified in the Specification Number Index or the module number found on the generator set nameplate in the appropriate column on the right side of the parts list table. Find the quantity used at the intersection of the item number row and the variation column. A blank space at the intersection means the variation/module does not use that part number.

xin:004:005

Hardware References

Many common hardware items do not appear in parts manuals or will appear as common hardware entries. A common hardware entry lists the size of the hardware. For example, an item that appears as "Hardware, 3/8-16" in the text means that the piece is 3/8-16 size. Obtain common hardware locally or, if contacting the factory, use the Common Hardware List in the appendix to identify the common hardware part number and specifications. See Common Hardware Application Guidelines in the appendix for mating hardware instructions.

Some hardware items require a specific size or some other characteristic. In that case, use the part number listed in the text.

When replacing hardware, do not substitute inferior grade hardware. Replacement hardware grade should be equal to or better than the grade of the manufacturer's original hardware. Use the Common Hardware List in the appendix to identify the common hardware hardness.

xin:004:006

Specification Number Index

Group Title	<i>Air Intake</i>	<i>Fuel System</i>	<i>Cooling System</i>	<i>Engine</i>	<i>Nameplates and Decals</i>	<i>Oil Pressure Switch</i>	<i>Skid and Plant Mounting</i>	<i>Temperature Switch</i>	<i>Starter</i>	<i>Alternator</i>	<i>Generator and Mounting</i>	<i>Controller and Mounting</i>	<i>Literature</i>
Group No.	101	103	104	105	107	108	109	110	112	113	201	301	701
Spec No.	VARIATION NUMBER												

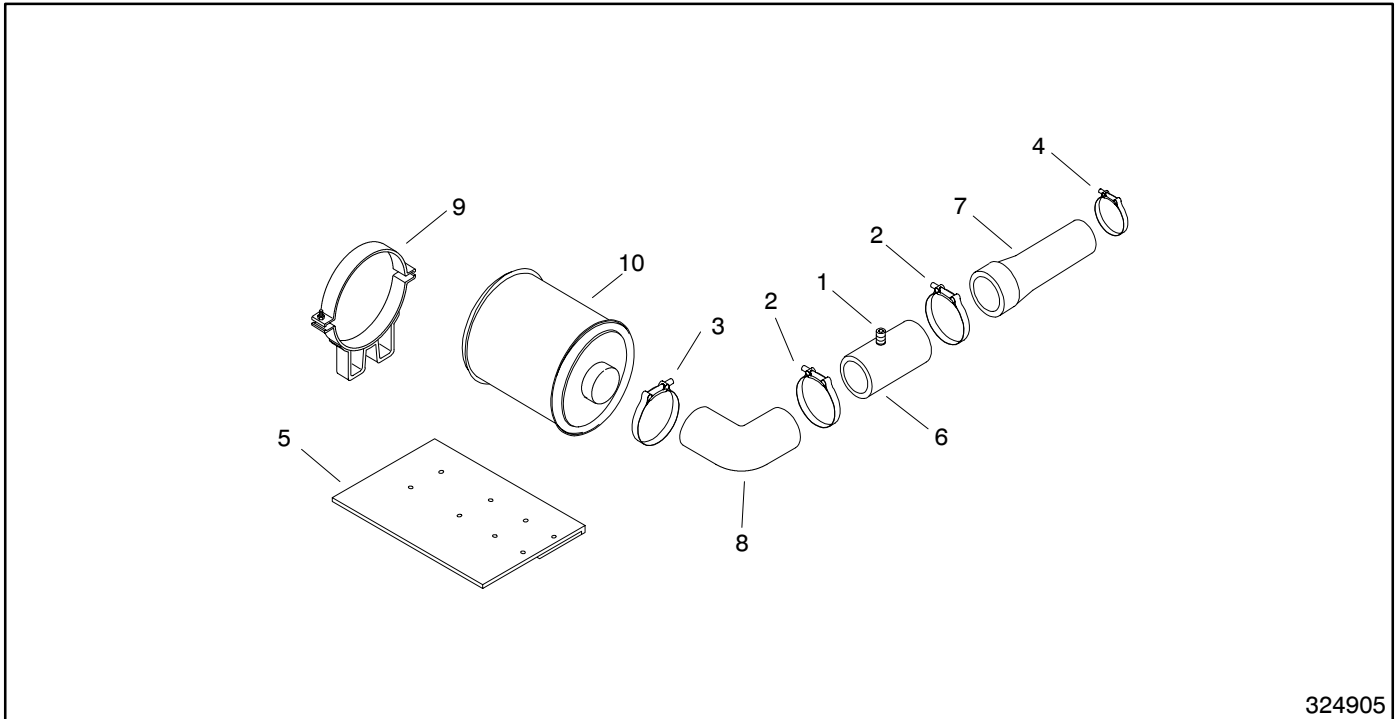
200REOZP													
192926	*	—	*	11	38	—	*	—	—	—	*	‡	18

* Configured group. Refer to the generator set nameplate for the module number. Turn to the respective group on the following pages for parts breakdowns.

‡ Configured group. Refer to the generator set nameplate for the module number. See controller parts catalog TP-6009 for controller parts lists.

— Not applicable.

Group 101: Air Intake

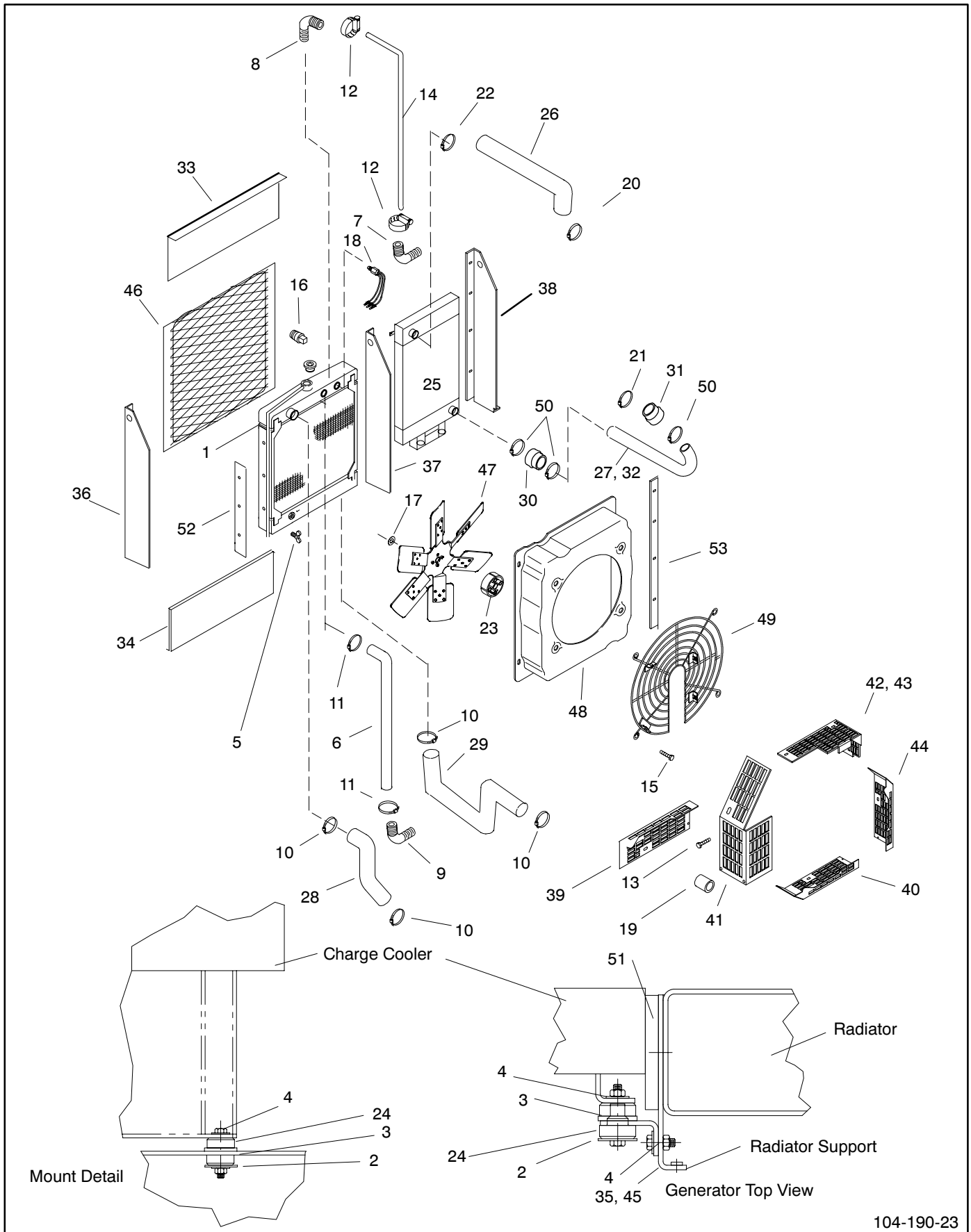


324905

Item	Part Number	Description	Quantity		
			Module Number		
			324905	324965	324966*
1	X-75-1	Plug, pipe 1/8	1	1	1
2	254344	Clamp, hose, 5.43/5.74 in.	2	2	2
3	254013	Clamp, hose, 6.56/6.87 in.	1	1	1
4	274545	Clamp, hose, 4.31/4.62 in.	1	1	1
5	324882	Bracket, air cleaner	1	1	1
6	324953	Tube	1	1	1
7	324970	Hose, air intake	1		
7	324969	Hose, air intake		1	1
8	343217	Hose, elbow, 90°, molded, 6 in. ID	1	1	1
9	343218	Clamp	2		
9	254012	Band, mounting		2	2
10	343219	Air cleaner, industrial	1		
10	A-343258	Air cleaner, industrial (includes item 11)		1	1
11	343259	Element, air cleaner (heavy-duty)		1	1
12	254010	Cap, rain		1	

* Heavy-duty air cleaner module.

Group 104: Cooling System



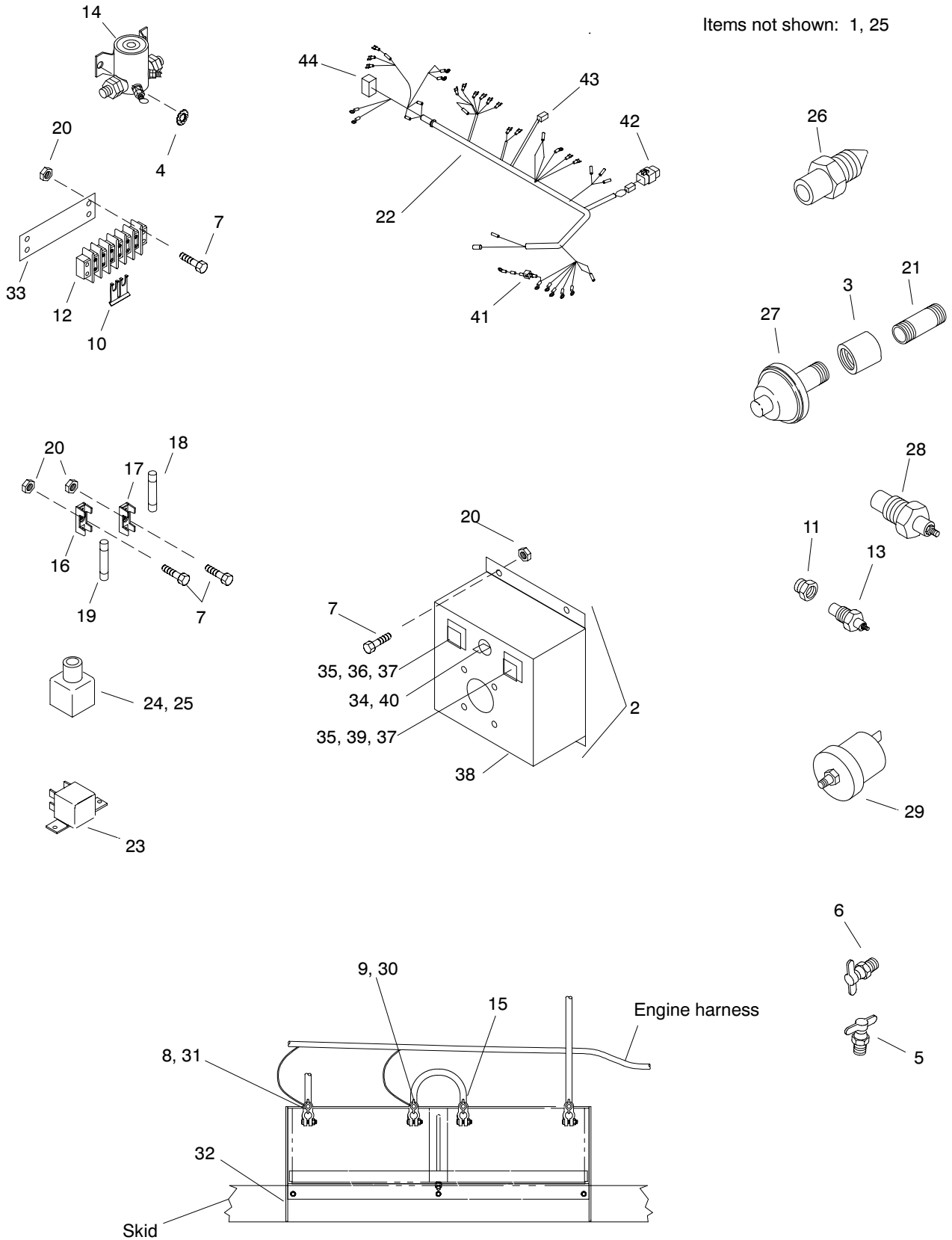
104-190-23

Group 104: Cooling System

Item	Part Number	Description	Quantity	
			Module Number 324907	324928
1	A-343033	Radiator assembly	1	1
2	X-25-143	Washer, plain, .32 ID x 1.5 in. OD	4	4
3	X-25-144	Washer, plain, .781 ID x 1.5 in. OD	4	4
4	X-25-75	Washer, plain, .344 ID x .875 in. OD	6	6
5	X-256-3	Valve, drain, 1/4 in. NPT	1	1
6	X-356-33	Hose, radiator, straight, 1 in. ID	1	1
7	X-391-1	Fitting, hose connector 90°	1	1
8	X-391-20	Fitting, hose connector 90°	1	1
9	X-391-24	Fitting, hose connector 90°	1	1
10	X-426-2	Clamp, hose, 2.31/3.25 in.	4	4
11	X-426-8	Clamp, hose, .81/1.75 in.	2	2
12	X-426-9	Clamp, hose, .25/.70 in.	2	2
13	X-6216-1	Screw, Phillips hex crimpite	14	14
14	X-6359-9	Hose, rubber, straight, .25 in. ID	1	1
15	X-6365-1	Insert, threaded, 5/16-18 in.	6	6
16	X-75-54	Plug, pipe—brass	1	1
17	X-801-3	Washer, hardened, .406 ID x .812 in. OD	6	6
18	254832	Sensor, low fluid	1	1
19	265693	Spacer, .357 ID x .625 OD x 1.062 in.	2	
19	X-400-199	Spacer, .375 ID x .75 OD x .56 in.		2
20	274824	Clamp, hose, 3.68/4 in.	1	1
21	279604	Clamp, hose, 2.43/2.75 in.	1	1
22	291542	Clamp, hose, 3.25/3.56 in.	1	1
23	324318	Spacer, fan, 5 in.	1	1
24	324433	Vibromount	4	4
25	324873	Cooler, charge air	1	1
26	324874	Hose, charge cooler	1	1
27	324875	Tube, charge cooler	1	1
28	324876	Hose, radiator	1	1
29	324877	Hose, radiator	1	1
30	324878	Hose, hump	1	1
31	324879	Hose, step	1	1
32	324880	Bracket, mounting	1	1
33	324883	Guard, radiator (top)	1	1
34	324888	Guard, radiator (bottom)	1	1
35	324896	Bracket, mounting	2	2
36	324897	Support, radiator	1	1
37	324898	Support, radiator	1	1
38	324899	Support, charge cooler	1	1
39	324914	Guard, belt (front)	1	1
40	324915	Guard, belt (bottom)	1	1
41	324916	Guard, belt (RS middle)	1	1
42	324917	Guard, belt (RS top)	1	1
43	324918	Guard, belt (top)	1	1
44	324919	Guard, belt (LS)	1	1
45	324960	Bracket, charge cooler	1	1
46	343014	Guard, radiator	1	1
47	343027	Fan, pusher	1	1
48	343054	Shroud, fan	1	1
49	343062	Guard, wire fan	1	1
50	343175	Clamp, hose, 3.06/3.38 in.	3	3
51	343193	Insulation, acoustic, 46 x 4.40 in.	1	1
52	343288	Spacer, radiator	2	2
53	343422	Bracket, fan shroud	2	2

Group 105: Engine

Items not shown: 1, 25



Top view of battery rack

105-184-11

Group 105: Engine

Item	Part Number	Description	Quantity
			Variation Number 11
1	A-324904	Engine assembly	1
2	A-343591	Box assembly, engine light (includes items 34-40)	1
3	X-216-24	Coupling, pipe, 1/8 x 1 3/16 in.	1
4	X-22-12	Washer, lock, .262 ID x .743 in. OD	2
5	X-256-3	Valve, drain, 1/4 in. NPT	1
6	X-256-5	Valve, drain	1
7	X-51-11	Screw, cross recess round head machine	11
8	X-545-15	Lead, battery cable, 36 in.	1
9	X-545-24	Lead, battery cable, 28 in.	1
10	X-6073-2	Jumper	2
11	153659	Bushing, reducing, 1/2 x 3/4 in. NPT	1
12	246114	Terminal block	1
13	268298	Sender, water temperature	1
14	268371	Relay	1
15	280133	Lead, battery cable, 8.5 in.	1
16	X-6129-7	Fuse block	1
17	X-6129-8	Fuse block	1
18	X-6134-13	Fuse, 30 A, 250 V	1
19	X-6134-14	Fuse, 5 A, 250 V	1
20	X-70-12	Nut, hex machine screw, 8-32	11
21	289055	Nipple, pipe, 1/8 x 1 1/2 in.	1
22	324913	Harness, engine wiring (includes items 41-44)	1
23	324951	Relay	1
24	324952	Bracket, mtg. (b.a.p.s.)	1
25	324954	Sensor, barometric air	1
26	324955	Sensor, air temperature	1
27	328309	Switch assembly, pressure	1
28	336923	Switch, high temperature shutoff	1
29	343473	Sender, oil pressure	1
30	345039	Terminal, battery	2
31	345056	Terminal, battery	2
32	354352	Rack, battery	1
33	354483	Strip, marker	1
34	151511	Ring, lock switch	1
35	264513	Lamp	2
36	295972	Lens	1
37	297977	Socket	2
38	343590	Box, silkscreened	1
39	343593	Lens, yellow	1
40	354151	Switch, toggle, 2-pole	1
41	233959	Diode, 6 A	4
42	295145	Connector, 24-position	1
43	324934	Connector kit	1
44	324935	Connector kit, 60 pin EMC155	1

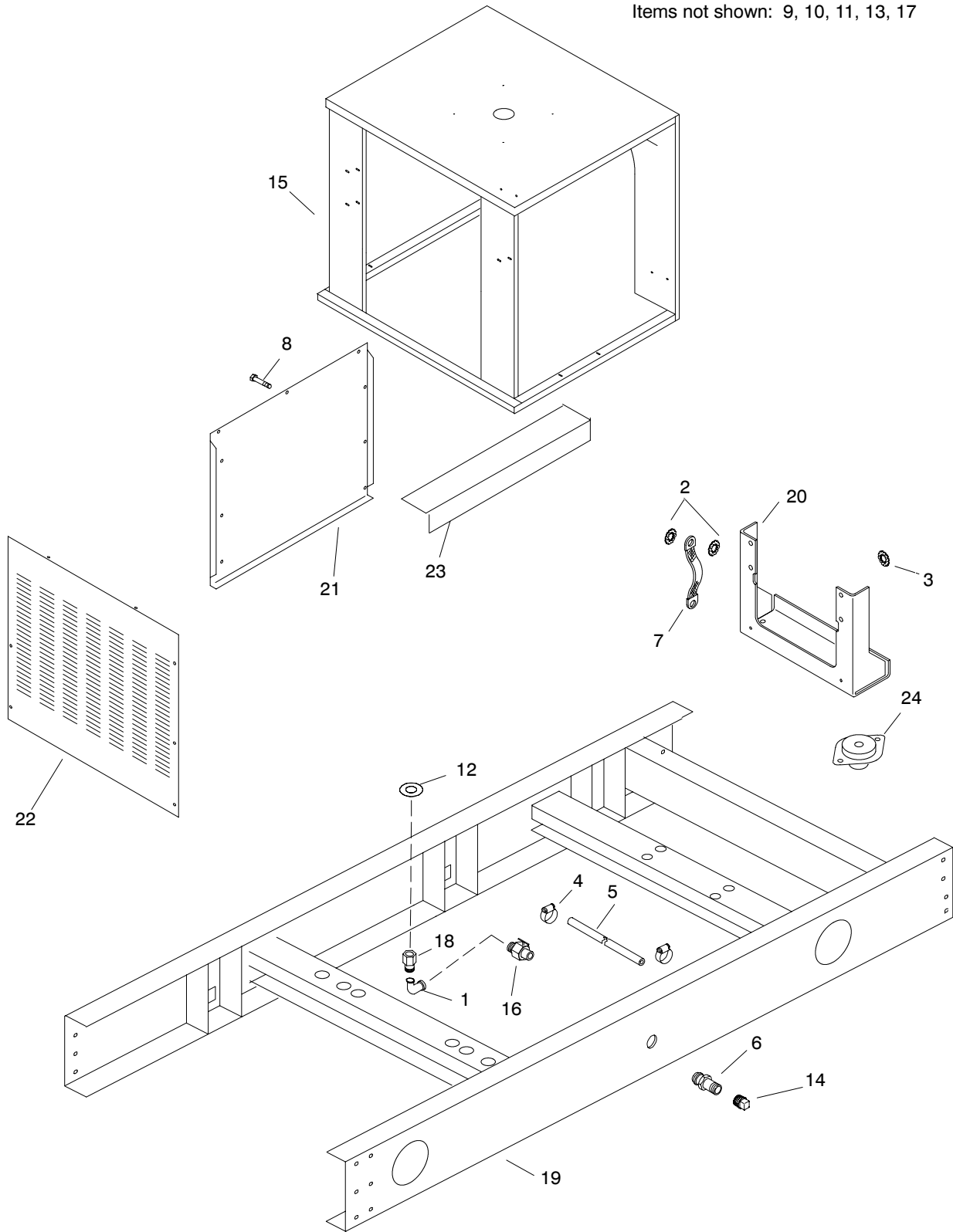
Notes

Group 107: Nameplates and Decals

Item	Part Number	Description	Quantity
			Variation Number 38
1	X-6275-3	Logo, Kohler	1
2	224233	Decal, 1-800 number	1
3	238402	Decal	1
4	249808	Decal, warning	1
5	249809	Decal, Caution Hot Engine	1
6	249810	Decal, warning	1
7	254454	Insulation, packing foam	2
8	257437	Decal, warning	1
9	257438	Decal, danger	3
10	257441	Decal, warning	1
11	258815	Decal, warning	1
12	259365	Decal	1
13	327004	Nameplate	1

Group 109: Skid and Plant Mounting

Items not shown: 9, 10, 11, 13, 17

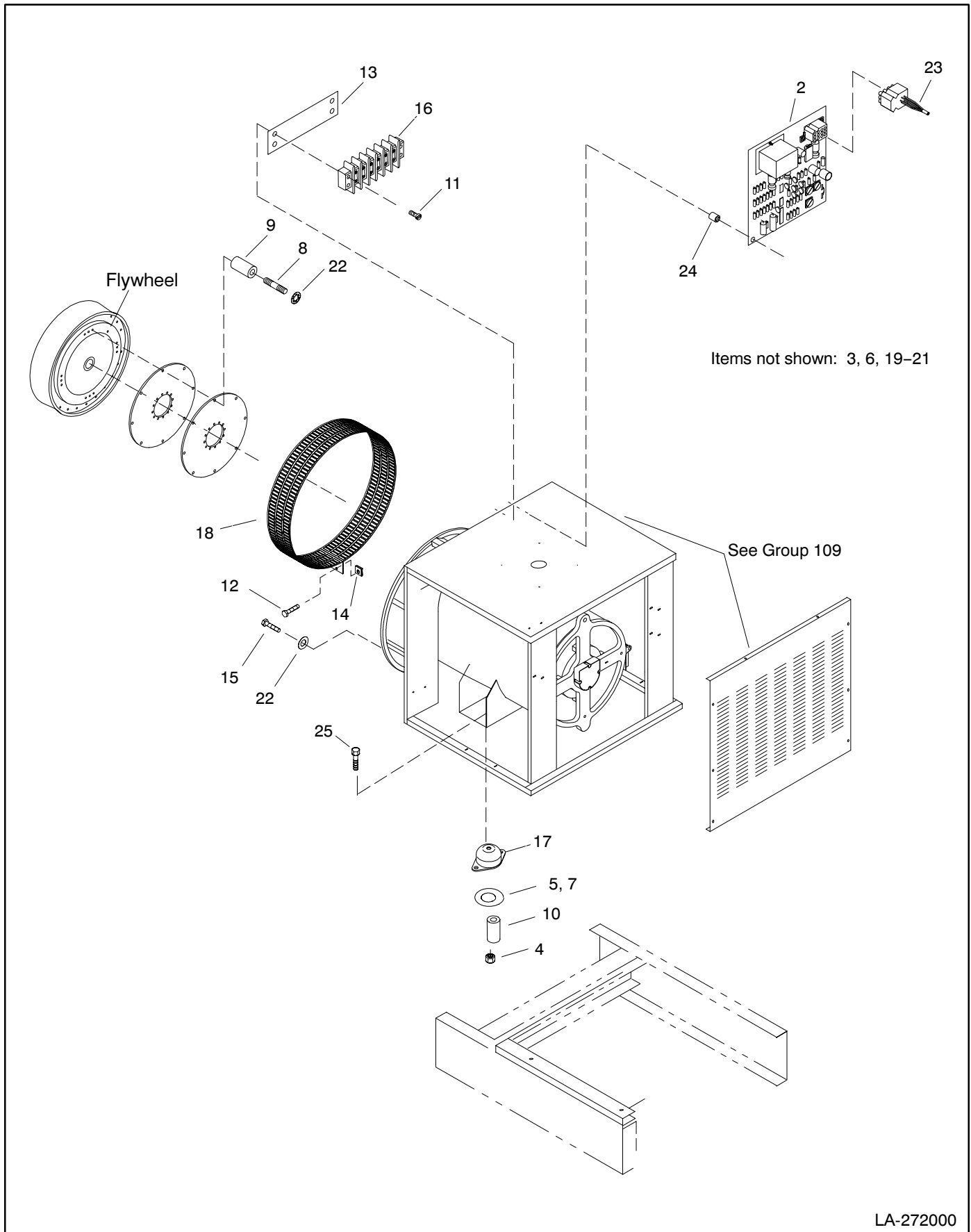


109-190-13

Group 109: Skid and Plant Mounting

Item	Part Number	Description	Quantity
			Module Number 324906
1	X-211-1	Fitting, elbow, street, 1/2 in.	1
2	X-22-16	Washer, lock, .326 ID x .883 in. OD	3
3	X-22-17	Washer, lock, .782 ID x 1.233 in. OD	4
4	X-426-3	Clamp, hose, .56/1.06 in.	2
5	X-577-34	Hose, rubber, straight, .62 in. ID	1
6	X-582-1	Coupling, hose	1
7	X-6046-6	Strap, ground	1
8	X-6216-1	Screw, Phillips hex crimplite	12
9	X-6232-3	Decal, stripes (not shown)	1
10	X-6232-6	Decal, stripe (not shown)	2
11	X-6246-1	Decal, Kohler Power Systems (not shown)	2
12	X-6278-5	Washer, nylon, 1 ID x 1.25 OD x .062 in	1
13	X-6298-15	Decal, 200 (not shown)	2
14	X-75-3	Plug, pipe, 1/2	1
15	222844	Box, junction	1
16	272701	Valve, oil drain	1
17	273739	Decal (not shown)	2
18	324720	Adapter, bushing	1
19	324881	Skid	1
20	324903	Bracket, mounting	1
21	336001-BLK	Cover, side	2
22	336004-BLK	Cover, rear	1
23	336085	Bracket, junction box	2
24	336813	Vibromount	2

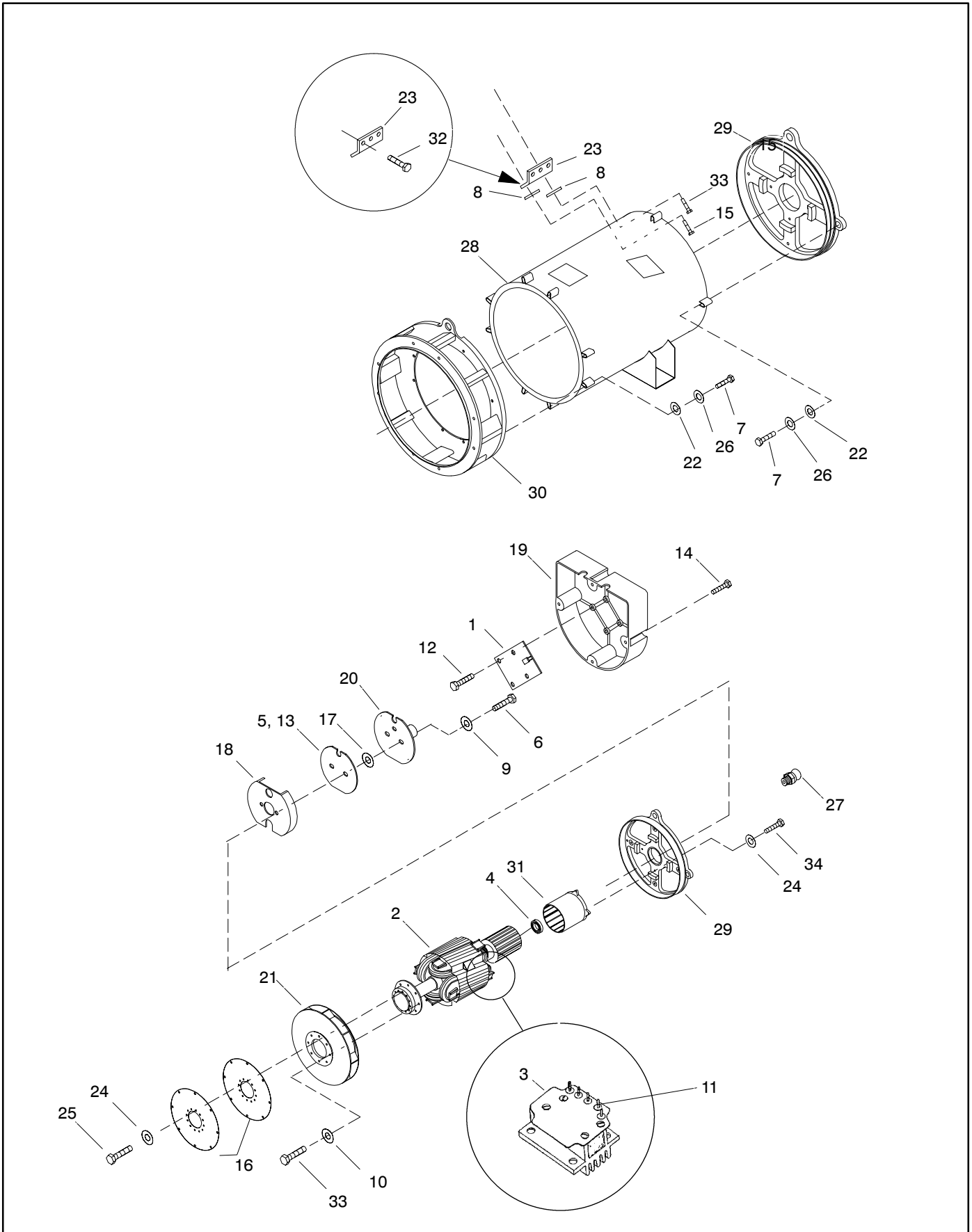
Group 201: Generator and Mounting



Group 201: Generator and Mounting

Item	Part Number	Description	Quantity			
			Module Number			
			324908	324920	324921	324922
1	A-347218	Alternator assembly (see items 1–34 on following pages)	1			
1	A-347120	Alternator assembly		1		
1	A-365221	Alternator assembly			1	
1	A-365234	Alternator assembly				1
2	A-354653	PCB assembly, V/Hz regulator, FRII	1	1	1	1
3	X-101-15	Nut, hex elastic stop, 5/8–11 (not shown)	2	2	2	2
4	X-101-23	Nut, hex elastic stop, 1/2–13	2	2	2	2
5	X-25-103	Washer, plain, .531 ID x 2.75 in. OD	2	2	2	2
6	X-25-112	Washer, plain (not shown)	2	2	2	2
7	X-25-30	Washer, plain, .562 ID x 1.25 in. OD	2	2	2	2
8	X-352-63	Stud, 3/8–16 x 4 in.	8	8	8	8
9	X-400-132	Spacer, .406 ID x .625 OD x 2.531 in	8	8	8	8
10	X-400-197	Spacer, .532 ID x .75 OD x 2.88 in.	2	2	2	2
11	X-51-11	Screw, cross recess round head machine	2	2	2	2
12	X-67-125	Screw, hex washer, thread-forming	4	4	4	4
13	255080	Marker, strip	1	1	1	1
14	257442	Clip, speed	4	4	4	4
15	270158	Screw, cylinder head, 3/8–1 x 1 1/2	12	12	12	12
16	295314	Terminal block	1	1	1	1
17	324393	Vibromount	2	2	2	2
18	347268	Guard, generator fan	2	2	2	2
19	X-750-14	Marker, wire (not shown)	1	1	1	1
20	X-750-15	Marker, wire (not shown)	1	1	1	1
21	X-750-16	Marker, wire (not shown)	1	1	1	1
22	X-801-3	Washer, hardened, .406 ID x .812 in. OD	20	20	20	20
23	354118	Wiring harness, CT harness, FRII	1	1	1	1
24	360459	Standoff, circuit board	4	4	4	4
25	X-129-30	Screw, hex head	2	2	2	2

Group 201: Generator and Mounting



Group 201: Generator and Mounting

Item	Part Number	Description	Quantity			
			Module Number			
			324908	324920	324921	324922
1	A-257099	PCB assembly, LED, FRII	1	1	1	1
2	A-347191	Rotor assembly—230kW	1	1		
2	A-365222	Rotor assembly			1	1
3	A-354299	Heatsink	1	1	1	1
4	X-758-9	Bearing, ball	1	1	1	1
5	B-292902	PCB assembly, photo receiver	1	1	1	1
6	X-117-5	Screw, hex head machine	2	2	2	2
7	X-129-25	Screw, hex head machine	12	12	12	12
8	X-22-46	Washer, lock, .391 ID x .975 in. OD	2	2	2	2
9	X-22-9	Washer, lock, .20 ID x .373 in. OD	2	2	2	2
10	X-25-93	Washer, plain, .406 ID x .75 in. OD	8	8	8	8
11	X-431-25	Terminal, fast-on, female, 18–22 AWG	4	4	4	4
12	X-6071-1	Screw, Phillips pan head, thread-forming	4	4	4	4
13	X-6093-8	Sleeve	2	2	2	2
14	X-67-133	Screw, hex washer, thread-forming	3	3	3	3
15	X-791-6	Screw, hex head machine	1	1	1	1
16	222881	Lamination, armature drive	4	4	4	4
17	243321	Washer, insulating, .195 ID x .5 in. OD	2	2	2	2
18	257077	Actuator, magnetic cup	1	1	1	1
19	257258	Cover, FR LED circuit board	1	1	1	1
20	257850	Insulator	1	1	1	1
21	257855	Fan, generator	1	1	1	1
22	257951	Washer, special, .562 ID x 1.13 in. OD	12	12	12	12
23	257978	Bus	1	1		
23	257979	Connector			1	1
24	X-801-3	Washer, hardened, .406 ID x .812 in. OD	16	16	16	16
25	270158	Screw, cylinder head, 3/8–16 x 1 1/2	12	12	12	12
26	290945	Washer, hardened, .531 ID x 1.06 in. OD	12	12	12	12
27	347119	Fitting, grease	1	1	1	1
28	347197	Stator assembly—220 kW	1			
28	347203	Stator assembly—220 kW		1		
28	347199	Stator assembly—300 kW			1	
28	347205	Stator assembly—300 kW				1
29	347236	End bracket	1	1	1	1
30	347241	Adapter, generator	1	1	1	1
31	347707	Exciter field assembly	1	1	1	1
32	X-6238-5	Screw, hex head	3	3	6	6
33	X-6238-11	Screw, hex head	9	9	9	9
34	X-6238-17	Screw, hex head	4	4	4	4

Group 701: Literature

Item	Part Number	Description	Quantity
			Variation Number 18
1	TP-5583	S/M FRII 20-300 kW Industrial	1
2	TP-5700	I/M Industrial	1
3	TP-5707	P/C Industrial Accessory Diesel	1
4	TP-5711	P/C DDC Series 40	1
5	TP-5717	W/D 20-180ROZP; 80/100/200REOZP	1
6	TP-5750	O/M 20-2000 kW	1
7	TP-5843	S/M DDC 60 Series	1
8	TP-5829	O/M DEC340 Controller	1
9	TP-6009	P/C Controllers	1
10	TP-6030	S/M DDC 40E 200 kW	1
11	TP-6031	O/M DDC 40E 200 kW	1
12	TP-6048	P/C 200REOZP	1

Controller Kits

See Parts Catalog TP-6009 for 7-Light, 16-Light, and Decision-Maker™ 340 controller parts.

Cooling System Kits

Block Heater, 110-120 V, 1800 W	324910
Block Heater, 190-280/220-240 V, 2000 W	324911
Duct Flange, radiator	324924

Optional Kits

See Parts Catalog TP-5707 for parts lists of optional kits.

Paint and Miscellaneous Parts

Generator Paint, Kohler® Cream Beige (spray can)	221338
Generator Paint, Kohler® Cream Beige (gallon can)	221337

Cooling System Kits

Qty.	Description	Part No.
Block Heater 324910		
1	Fitting, tee, pipe, 1/4 in.	A-110
1	Fitting, tee, pipe, 1/2 in.	X-203-13
1	Nipple, pipe, 1/2 x 1 1/2 in.	X-209-5
1	Nipple, pipe, 1/4 x 7/8 in.	X-220-5
1	Hose, molded, .62 in ID (2.33 ft.)	X-312-35
1	Hose, molded, .62 in ID (4.067 ft.)	X-312-36
1	Fitting, hose connector, 90°	X-391-2
6	Clamp, hose, .5/1 in.	X-426-10
1	Coupling, hose	X-582-1
1	Coupling, hose	X-582-22
1	Tag, hang	279047
1	Plug, freeze	324094
1	Heater, block, 120 volt	324930
1	Bracket, block heater mounting	326219

Block Heater 324911		
1	Fitting, tee, pipe, 1/4 in.	A-110
1	Fitting, tee, pipe, 1/2 in.	X-203-13
1	Nipple, pipe, 1/2 x 1 1/2 in.	X-209-5
1	Nipple, pipe, 1/4 x 7/8 in.	X-220-5
1	Hose, molded, .62 in ID (2.33 ft.)	X-312-35
1	Hose, molded, .62 in ID (4.067 ft.)	X-312-36
1	Fitting, hose connector, 90°	X-391-2
6	Clamp, hose, .5/1 in.	X-426-10
1	Coupling, hose	X-582-1
1	Coupling, hose	X-582-22
1	Tag, hang	279047
1	Plug, freeze	324094
1	Heater, block, 240 volt	324931
1	Bracket, block heater mounting	326219

Qty.	Description	Part No.
Duct Flange, radiator 324924		
8	Rivet, pop	X-781-11
2	Frame, air duct (top/bottom)	324971
2	Frame, air duct (sides)	324972

Appendix A. Abbreviations

The following list contains abbreviations that may appear in this publication.

A, amp	ampere	CG	center of gravity	F	Fahrenheit, female
ABDC	after bottom dead center	CID	cubic inch displacement	fglass.	fiberglass
AC	alternating current	CL	centerline	FHM	flat head machine (screw)
A/D	analog to digital	cm	centimeter	fl. oz.	fluid ounce
ADC	analog to digital converter	cmm	cubic meters per minute	flex.	flexible
adj.	adjust, adjustment	CMOS	complementary metal oxide substrate (semiconductor)	freq.	frequency
ADV	advertising dimensional drawing			FS	full scale
AHWT	anticipatory high water temperature	cogen.	cogeneration	ft.	foot, feet
AISI	American Iron and Steel Institute	COM	communications (port)	ft. lbs.	foot pounds (torque)
ALOP	anticipatory low oil pressure	conn.	connection	ft./min.	feet per minute
alt.	alternator	cont.	continued	g	gram
Al	aluminum	CPVC	chlorinated polyvinyl chloride	ga.	gauge (meters, wire size)
ANSI	American National Standards Institute (formerly American Standards Association, ASA)	crit.	critical	gal.	gallon
		CRT	cathode ray tube	gen.	generator
		CSA	Canadian Standards Association	genset	generator set
		CT	current transformer	GFI	ground fault interrupter
AO	anticipatory only	Cu	copper	gnd.	ground
API	American Petroleum Institute	cu. in.	cubic inch	gov.	governor
approx.	approximate, approximately	cw.	clockwise	gph	gallons per hour
AR	as required, as requested	CWC	city water-cooled	gpm	gallons per minute
AS	as supplied, as stated, as suggested	cyl.	cylinder	gr.	grade, gross
ASE	American Society of Engineers	D/A	digital to analog	gr. wt.	gross weight
ASME	American Society of Mechanical Engineers	DAC	digital to analog converter	H x W x D	height by width by depth
assy.	assembly	dB	decibel	HC	hex cap
ASTM	American Society for Testing Materials	dBA	decibel (A weighted)	HCHT	high cylinder head temperature
		DC	direct current	HD	heavy duty
ATDC	after top dead center	DCR	direct current resistance	HET	high exhaust temperature
ATS	automatic transfer switch	deg., °	degree	hex	hexagon
auto.	automatic	dept.	department	Hg	mercury (element)
aux.	auxiliary	dia.	diameter	HH	hex head
A/V	audio/visual	DI/EO	dual inlet/end outlet	HHC	hex head cap
avg.	average	DIN	Deutsches Institut fur Normung e. V. (also Deutsche Industrie Normenausschuss)	HP	horsepower
AVR	automatic voltage regulator			hr.	hour
AWG	American Wire Gauge	DIP	dual inline package	HS	heat shrink
AWM	appliance wiring material	DPDT	double-pole, double-throw	hsg.	housing
bat.	battery	DPST	double-pole, single-throw	HVAC	heating, ventilation, and air conditioning
BBDC	before bottom dead center	DS	disconnect switch	HWT	high water temperature
BC	battery charger, battery charging	DVR	digital voltage regulator	Hz	hertz (cycles per second)
		E, emer.	emergency (power source)	IC	integrated circuit
BCA	battery charging alternator	EDI	electronic data interchange	ID	inside diameter, identification
BCI	Battery Council International	EFR	emergency frequency relay	IEC	International Electrotechnical Commission
BDC	before dead center	e.g.	for example (<i>exempli gratia</i>)	IEEE	Institute of Electrical and Electronics Engineers
BHP	brake horsepower	EG	electronic governor		
blk.	black (paint color), block (engine)	EGSA	Electrical Generating Systems Association	IMS	improved motor starting
				in.	inch
blk. htr.	block heater	EIA	Electronic Industries Association	in. H ₂ O	inches of water
BMEP	brake mean effective pressure	El/EO	end inlet/end outlet	in. Hg	inches of mercury
bps	bits per second	EMI	electromagnetic interference	in. lbs.	inch pounds
br.	brass	emiss.	emission	Inc.	incorporated
BTDC	before top dead center	eng.	engine	ind.	industrial
Btu	British thermal unit	EPA	Environmental Protection Agency	int.	internal
Btu/min.	British thermal units per minute			int./ext.	internal/external
C	Celsius, centigrade	EPS	emergency power system	I/O	input/output
cal.	calorie	ER	emergency relay	IP	iron pipe
CARB	California Air Resources Board	ES	engineering special, engineered special	ISO	International Organization for Standardization
CB	circuit breaker			J	joule
cc	cubic centimeter	ESD	electrostatic discharge	JIS	Japanese Industry Standard
CCA	cold cranking amps	est.	estimated	k	kilo (1000)
ccw.	counterclockwise	E-Stop	emergency stop	K	kelvin
CEC	Canadian Electrical Code	etc.	et cetera (and so forth)	kA	kiloampere
cfh	cubic feet per hour	exh.	exhaust	KB	kilobyte (2 ¹⁰ bytes)
cfm	cubic feet per minute	ext.	external	kg	kilogram

kg/cm ²	kilograms per square centimeter	mW	milliwatt	rnd.	round
kgm	kilogram-meter	μF	microfarad	ROM	read only memory
kg/m ³	kilograms per cubic meter	N, norm.	normal (power source)	rot.	rotate, rotating
kHz	kilohertz	NA	not available, not applicable	rpm	revolutions per minute
kJ	kilojoule	nat. gas	natural gas	RS	right side
km	kilometer	NBS	National Bureau of Standards	RTV	room temperature vulcanization
kOhm, kΩ	kilo-ohm	NC	normally closed	SAE	Society of Automotive Engineers
kPa	kilopascal	NEC	National Electrical Code	scfm	standard cubic feet per minute
kph	kilometers per hour	NEMA	National Electrical Manufacturers Association	SCR	silicon controlled rectifier
kV	kilovolt	NFPA	National Fire Protection Association	s, sec.	second
kVA	kilovolt ampere	Nm	newton meter	SI	<i>Systeme international d'unites</i> , International System of Units
kVAR	kilovolt ampere reactive	NO	normally open	SI/EO	side in/end out
kW	kilowatt	no., nos.	number, numbers	sil.	silencer
kWh	kilowatt-hour	NPS	National Pipe, Straight	SN	serial number
kWm	kilowatt mechanical	NPSC	National Pipe, Straight-coupling	SPDT	single-pole, double-throw
L	liter	NPT	National Standard taper pipe thread per general use	SPST	single-pole, single-throw
LAN	local area network	NPTF	National Pipe, Taper-Fine	spec, specs	specification(s)
L x W x H	length by width by height	NR	not required, normal relay	sq.	square
lb.	pound	ns	nanosecond	sq. cm	square centimeter
lbm/ft ³	pounds mass per cubic feet	O/C	overcrank	sq. in.	square inch
LCB	line circuit breaker	OD	outside diameter	SS	stainless steel
LCD	liquid crystal display	OEM	original equipment manufacturer	std.	standard
ld. shd.	load shed	O/F	overfrequency	stl.	steel
LED	light emitting diode	opt.	option, optional	tach.	tachometer
Lph	liters per hour	O/S	oversize, overspeed	TD	time delay
Lpm	liters per minute	OSHA	Occupational Safety and Health Administration	TDC	top dead center
LOP	low oil pressure	O/V	overvoltage	TDEC	time delay engine cooldown
LP	liquefied petroleum	oz.	ounce	TDEN	time delay emergency to normal
LPG	liquefied petroleum gas	p., pp.	page, pages	TDES	time delay engine start
LS	left side	PA	packed accessory	TDNE	time delay normal to emergency
L _{wa}	sound power level, A weighted	PC	personal computer	TDOE	time delay off to emergency
LWL	low water level	PCB	printed circuit board	TDON	time delay off to normal
LWT	low water temperature	pF	picofarad	temp.	temperature
m	meter, milli (1/1000)	PF	power factor	term.	terminal
M	mega (10 ⁶ when used with SI units), male	ph.	phase	TIF	telephone influence factor
m ³	cubic meter	PHC	Phillips head crimplite (screw)	TIR	total indicator reading
m ³ /min.	cubic meters per minute	PHH	Phillips hex head (screw)	tol.	tolerance
mA	milliampere	PHM	pan head machine (screw)	turbo.	turbocharger
man.	manual	PLC	programmable logic control	typ.	typical (same in multiple locations)
max.	maximum	PMG	permanent magnet generator	U/F	underfrequency
MB	megabyte (2 ²⁰ bytes)	pot	potentiometer, potential	UHF	ultrahigh frequency
MCM	one thousand circular mils	ppm	parts per million	UL	Underwriter's Laboratories, Inc.
meggar	megohmmeter	PROM	programmable read only memory	UNC	unified coarse thread (was NC)
MHz	megahertz	psi	pounds per square inch	UNF	unified fine thread (was NF)
mi.	mile	pt.	pint	univ.	universal
mil	one one-thousandth of an inch	PTC	positive temperature coefficient	U/S	undersize, underspeed
min.	minimum, minute	PTO	power takeoff	UV	ultraviolet
misc.	miscellaneous	PVC	polyvinyl chloride	U/V	undervoltage
MJ	megajoule	qt.	quart	V	volt
mJ	millijoule	qty.	quantity	VAC	volts alternating current
mm	millimeter	R	replacement (emergency) power source	VAR	voltampere reactive
mOhm, mΩ	milliohm	rad.	radiator, radius	VDC	volts direct current
MOhm, MΩ	megohm	RAM	random access memory	VFD	vacuum fluorescent display
MOV	metal oxide varistor	RDO	relay driver output	VGA	video graphics adapter
MPa	megapascal	ref.	reference	VHF	very high frequency
mpg	miles per gallon	rem.	remote	W	watt
mph	miles per hour	RFI	radio frequency interference	WCR	withstand and closing rating
MS	military standard	RH	round head	w/	with
m/sec.	meters per second	RHM	round head machine (screw)	w/o	without
MTBF	mean time between failure	rly.	relay	wt.	weight
MTBO	mean time between overhauls	rms	root mean square	xfrm	transformer
mtg.	mounting				
MW	megawatt				

Appendix B. Common Hardware Application Guidelines

Use the information below and on the following pages to identify proper fastening techniques when no specific reference for reassembly is made.

Bolt/Screw Length: When bolt/screw length is not given, use Figure 1 as a guide. As a general rule, a minimum length of one thread beyond the nut and a maximum length of 1/2 the bolt/screw diameter beyond the nut is the preferred method.

Washers and Nuts: Use split lock washers as a bolt locking device where specified. Use SAE flat washers with whiz nuts, spiralock nuts, or standard nuts and preloading (torque) of the bolt in all other applications.

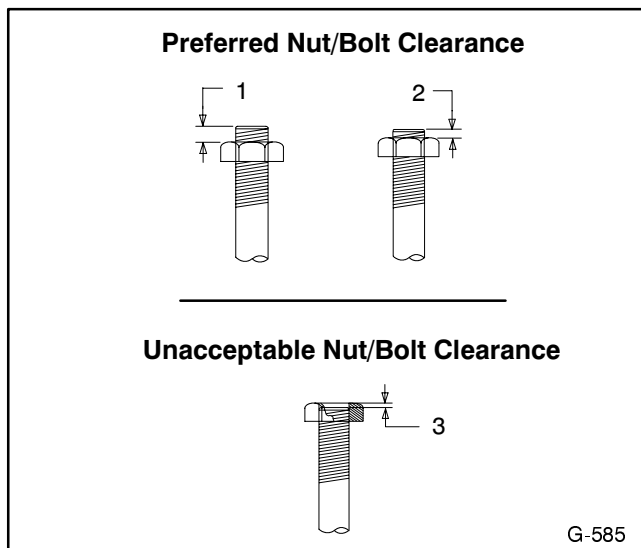
See General Torque Specifications and other torque specifications in the service literature.

Steps for common hardware application:

1. Determine entry hole type: round or slotted.
2. Determine exit hole type: fixed female thread (weld nut), round, or slotted.

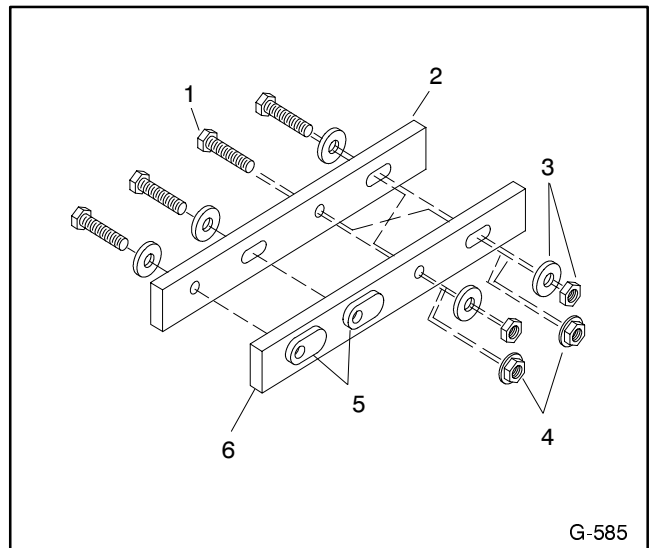
For round and slotted exit holes, determine if hardware is greater than 1/2 inch in diameter, or 1/2 inch in diameter or less. Hardware that is *greater than 1/2 inch* in diameter takes a standard nut and SAE washer. Hardware *1/2 inch or less* in diameter can take a properly torqued whiz nut or spiralock nut. See the diagram below.

3. Follow these SAE washer rules after determining exit hole type:
 - a. Always use a washer between hardware and a slot.
 - b. Always use a washer under a nut (see 2 above for exception).
 - c. Use a washer under a bolt when the female thread is fixed (weld nut).
4. Refer to the diagram below, which depicts the preceding hardware configuration possibilities.



1. 1/2 of Bolt Diameter
2. Min. 1 Full Thread Beyond Top of Nut
3. Below Top of Nut

Figure 1. Acceptable Bolt Lengths



1. Cap screw
2. Entry hole types
3. Standard nut and SAE washer
4. Whiz nut or spiralock: up to 1/2" dia. hardware
5. Weld nuts: above 1/2" dia. hardware
6. Exit hole types

Figure 2. Acceptable Hardware Combinations

Appendix C. General Torque Specifications

Use the following torque specifications when service literature instructions give no specific torque values. The charts list values for new plated, zinc phosphate, or

oiled threads. Increase values by 15% for nonplated threads. All torque values are +0%/-10%.















American Standard Fasteners Torque Specifications












Size	Torque Measurement	Assembled into Cast Iron or Steel			Assembled into Aluminum
		Grade 2	Grade 5	Grade 8	Grade 2 or 5
8-32	in. lbs. (Nm)	16 (1.8)	20 (2.3)	—	16 (1.8)
10-24	in. lbs. (Nm)	26 (2.9)	32 (3.6)	—	26 (2.9)
10-32	in. lbs. (Nm)	26 (2.9)	32 (3.6)	—	26 (2.9)
1/4-20	in. lbs. (Nm)	60 (6.8)	96 (10.8)	132 (14.9)	60 (6.8)
1/4-28	in. lbs. (Nm)	72 (8.1)	108 (12.2)	144 (16.3)	72 (8.1)
5/16-18	in. lbs. (Nm)	120 (13.6)	192 (21.7)	264 (29.8)	120 (13.6)
5/16-24	in. lbs. (Nm)	132 (14.9)	204 (23.1)	288 (32.5)	132 (14.9)
3/8-16	ft. lbs. (Nm)	18 (24)	28 (38)	39 (53)	18 (24)
3/8-24	ft. lbs. (Nm)	20 (27)	31 (42)	44 (60)	20 (27)
7/16-14	ft. lbs. (Nm)	29 (39)	44 (60)	63 (85)	—
7/16-20	ft. lbs. (Nm)	32 (43)	50 (68)	70 (95)	—
1/2-13	ft. lbs. (Nm)	44 (60)	68 (92)	96 (130)	—
1/2-20	ft. lbs. (Nm)	49 (66)	76 (103)	108 (146)	—
9/16-12	ft. lbs. (Nm)	60 (81)	98 (133)	138 (187)	—
9/16-18	ft. lbs. (Nm)	67 (91)	109 (148)	154 (209)	—
5/8-11	ft. lbs. (Nm)	83 (113)	135 (183)	191 (259)	—
5/8-18	ft. lbs. (Nm)	94 (128)	153 (208)	216 (293)	—
3/4-10	ft. lbs. (Nm)	147 (199)	240 (325)	338 (458)	—
3/4-16	ft. lbs. (Nm)	164 (222)	268 (363)	378 (513)	—
1-8	ft. lbs. (Nm)	191 (259)	532 (721)	818 (1109)	—
1-12	ft. lbs. (Nm)	209 (283)	582 (789)	895 (1214)	—






Metric Fasteners Torque Specifications, Measured in ft. lbs. (Nm)

Size (mm)	Assembled into Cast Iron or Steel			Assembled into Aluminum
	Grade 5.8	Grade 8.8	Grade 10.9	Grade 5.8 or 8.8
M6 x 1.00	4 (5.6)	7 (9.9)	10 (14)	4 (5.6)
M8 x 1.25	10 (13.6)	18 (25)	26 (35)	10 (13.6)
M8 x 1.00	16 (21)	18 (25)	26 (35)	16 (21)
M10 x 1.50	20 (27)	35 (49)	50 (68)	20 (27)
M10 x 1.25	29 (39)	35 (49)	50 (68)	29 (39)
M12 x 1.75	35 (47)	61 (83)	86 (117)	—
M12 x 1.50	48 (65)	65 (88)	92 (125)	—
M14 x 2.00	55 (74)	97 (132)	136 (185)	—
M14 x 1.50	74 (100)	103 (140)	142 (192)	—
M16 x 2.00	85 (115)	148 (200)	210 (285)	—
M16 x 1.50	104 (141)	155 (210)	218 (295)	—
M18 x 2.50	114 (155)	203 (275)	288 (390)	—
M18 x 1.50	145 (196)	225 (305)	315 (425)	—

Appendix D. Common Hardware Identification

Screw/Bolts/Studs	
Head Styles	
Hex Head or Machine Head	
Hex Head or Machine Head with Washer	
Flat Head (FHM)	
Round Head (RHM)	
Pan Head	
Hex Socket Head Cap or Allen™ Head Cap	
Hex Socket Head or Allen™ Head Shoulder Bolt	
Sheet Metal Screw	
Stud	
Drive Styles	
Hex	
Hex and Slotted	
Phillips®	
Slotted	
Hex Socket	

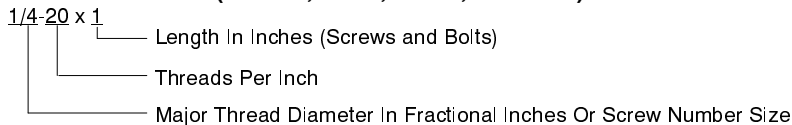
Nuts	
Nut Styles	
Hex Head	
Lock or Elastic	
Square	
Cap or Acorn	
Wing	
Washers	
Washer Styles	
Plain	
Split Lock or Spring	
Spring or Wave	
External Tooth Lock	
Internal Tooth Lock	
Internal-External Tooth Lock	

Hardness Grades	
American Standard	
Grade 2	
Grade 5	
Grade 8	
Grade 8/9 (Hex Socket Head)	
Metric	
Number stamped on hardware; 5.8 shown	

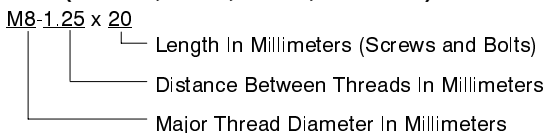
Allen™ head screw is a trademark of Holo-Krome Co.
Phillips® screw is a registered trademark of Phillips Screw Company.

Sample Dimensions

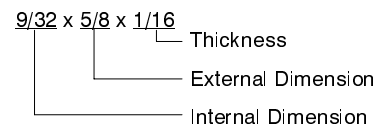
American Standard (Screws, Bolts, Studs, and Nuts)



Metric (Screws, Bolts, Studs, and Nuts)



Plain Washers



Lock Washers



Appendix E. Common Hardware List

The Common Hardware List lists part numbers and dimensions for common hardware items.

American Standard

Part No.	Dimensions	Part No.	Dimensions	Part No.	Dimensions	Type
Hex Head Bolts (Grade 5)						
X-465-17	1/4-20 x .38	X-6238-14	3/8-24 x .75	X-6009-1	1-8	Standard
X-465-6	1/4-20 x .50	X-6238-16	3/8-24 x 1.25	X-6210-3	6-32	Whiz
X-465-2	1/4-20 x .62	X-6238-21	3/8-24 x 4.00	X-6210-4	8-32	Whiz
X-465-16	1/4-20 x .75	X-6238-22	3/8-24 x 4.50	X-6210-5	10-24	Whiz
X-465-18	1/4-20 x .88	X-6024-5	7/16-14 x .75	X-6210-1	10-32	Whiz
X-465-7	1/4-20 x 1.00	X-6024-2	7/16-14 x 1.00	X-6210-2	1/4-20	Spiralock
X-465-8	1/4-20 x 1.25	X-6024-8	7/16-14 x 1.25	X-6210-6	1/4-28	Spiralock
X-465-9	1/4-20 x 1.50	X-6024-3	7/16-14 x 1.50	X-6210-7	5/16-18	Spiralock
X-465-10	1/4-20 x 1.75	X-6024-4	7/16-14 x 2.00	X-6210-8	5/16-24	Spiralock
X-465-11	1/4-20 x 2.00	X-6024-11	7/16-14 x 2.75	X-6210-9	3/8-16	Spiralock
X-465-12	1/4-20 x 2.25	X-6024-12	7/16-14 x 6.50	X-6210-10	3/8-24	Spiralock
X-465-14	1/4-20 x 2.75	X-129-15	1/2-13 x .75	X-6210-11	7/16-14	Spiralock
X-465-21	1/4-20 x 5.00	X-129-17	1/2-13 x 1.00	X-6210-12	1/2-13	Spiralock
X-465-25	1/4-28 x .38	X-129-18	1/2-13 x 1.25	X-6210-15	7/16-20	Spiralock
X-465-20	1/4-28 x 1.00	X-129-19	1/2-13 x 1.50	X-6210-14		Spiralock
X-125-33	5/16-18 x .50	X-129-20	1/2-13 x 1.75	X-85-3	5/8-11	Standard
X-125-23	5/16-18 x .62	X-129-21	1/2-13 x 2.00	X-88-12	3/4-10	Standard
X-125-3	5/16-18 x .75	X-129-22	1/2-13 x 2.25	X-89-2	1/2-20	Standard
X-125-31	5/16-18 x .88	X-129-23	1/2-13 x 2.50			
X-125-5	5/16-18 x 1.00	X-129-24	1/2-13 x 2.75			
X-125-24	5/16-18 x 1.25	X-129-25	1/2-13 x 3.00			
X-125-34	5/16-18 x 1.50	X-129-27	1/2-13 x 3.50			
X-125-25	5/16-18 x 1.75	X-129-29	1/2-13 x 4.00			
X-125-26	5/16-18 x 2.00	X-129-30	1/2-13 x 4.50			
230578	5/16-18 x 2.25	X-463-9	1/2-13 x 5.50			
X-125-29	5/16-18 x 2.50	X-129-44	1/2-13 x 6.00			
X-125-27	5/16-18 x 2.75	X-129-51	1/2-20 x .75			
X-125-28	5/16-18 x 3.00	X-129-45	1/2-20 x 1.25			
X-125-22	5/16-18 x 4.50	X-129-52	1/2-20 x 1.50			
X-125-32	5/16-18 x 5.00	X-6021-3	5/8-11 x 1.00			
X-125-35	5/16-18 x 5.50	X-6021-4	5/8-11 x 1.25			
X-125-36	5/16-18 x 6.00	X-6021-2	5/8-11 x 1.50			
X-125-40	5/16-18 x 6.50	X-6021-1	5/8-11 x 1.75			
X-125-43	5/16-24 x 1.75	273049	5/8-11 x 2.00			
X-125-44	5/16-24 x 2.50	X-6021-5	5/8-11 x 2.25			
X-125-30	5/16-24 x .75	X-6021-6	5/8-11 x 2.50			
X-125-39	5/16-24 x 2.00	X-6021-7	5/8-11 x 2.75			
X-125-38	5/16-24 x 2.75	X-6021-12	5/8-11 x 3.75			
X-6238-2	3/8-16 x .62	X-6021-11	5/8-11 x 4.50			
X-6238-10	3/8-16 x .75	X-6021-10	5/8-11 x 6.00			
X-6238-3	3/8-16 x .88	X-6021-9	5/8-18 x 2.50			
X-6238-11	3/8-16 x 1.00	X-6239-1	3/4-10 x 1.00			
X-6238-4	3/8-16 x 1.25	X-6239-8	3/4-10 x 1.25			
X-6238-5	3/8-16 x 1.50	X-6239-2	3/4-10 x 1.50			
X-6238-1	3/8-16 x 1.75	X-6239-3	3/4-10 x 2.00			
X-6238-6	3/8-16 x 2.00	X-6239-4	3/4-10 x 2.50			
X-6238-17	3/8-16 x 2.25	X-6239-5	3/4-10 x 3.00			
X-6238-7	3/8-16 x 2.50	X-6239-6	3/4-10 x 3.50			
X-6238-8	3/8-16 x 2.75	X-792-1	1-8 x 2.25			
X-6238-9	3/8-16 x 3.00	X-792-5	1-8 x 3.00			
X-6238-19	3/8-16 x 3.25	X-792-8	1-8 x 5.00			
X-6238-12	3/8-16 x 3.50					
X-6238-20	3/8-16 x 3.75					
X-6238-13	3/8-16 x 4.50					
X-6238-18	3/8-16 x 5.50					
X-6238-25	3/8-16 x 6.50					

Washers

Part No.	ID	OD	Thick.	Bolt/ Screw
X-25-46	.125	.250	.022	#4
X-25-9	.156	.375	.049	#6
X-25-48	.188	.438	.049	#8
X-25-36	.219	.500	.049	#10
X-25-40	.281	.625	.065	1/4
X-25-85	.344	.687	.065	5/16
X-25-37	.406	.812	.065	3/8
X-25-34	.469	.922	.065	7/16
X-25-26	.531	1.062	.095	1/2
X-25-15	.656	1.312	.095	5/8
X-25-29	.812	1.469	.134	3/4
X-25-127	1.062	2.000	.134	1

Metric

Hex head bolts are hardness grade 8.8 unless noted.

Part No.	Dimensions	Part No.	Dimensions	Part No.	Dimensions	Type		
Hex Head Bolts (partial thread)			Hex Head Bolts (full thread)			Hex Nuts		
M931-06040-60	M6-1.00 x 40	M933-04006-60	M4-0.70 x 6	M934-03-50	M3-0.50	Standard		
M931-06055-60	M6-1.00 x 55	M933-05050-60	M5-0.80 x 50	M934-04-50	M4-0.70	Standard		
M931-06060-60	M6-1.00 x 60	M933-06010-60	M6-1.00 x 10	M934-05-50	M5-0.80	Standard		
M931-06070-60	M6-1.00 x 70	M933-06014-60	M6-1.00 x 14	M982-05-80	M5-0.80	Elastic Stop		
M931-06075-60	M6-1.00 x 75	M933-06016-60	M6-1.00 x 16	M6923-06-80	M6-1.00	Spiralock		
M931-06090-60	M6-1.00 x 90	M933-06020-60	M6-1.00 x 20	M934-06-64	M6-1.00	Std. (green)		
M931-08035-60	M8-1.25 x 35	M933-06025-60	M6-1.00 x 25	M982-06-80	M6-1.00	Elastic Stop		
M931-08040-60	M8-1.25 x 40	M933-06040-60	M6-1.00 x 40	M6923-08-80	M8-1.25	Spiralock		
M931-08040-82	M8-1.25 x 40*	M933-06050-60	M6-1.00 x 50	M934-08-60	M8-1.25	Standard		
M931-08045-60	M8-1.25 x 45	M933-08016-60	M8-1.25 x 16	M982-08-80	M8-1.25	Elastic Stop		
M931-08050-60	M8-1.25 x 50	M933-08020-60	M8-1.25 x 20	M6923-10-80	M10-1.50	Spiralock		
M931-08055-82	M8-1.25 x 55*	M933-08025-60	M8-1.25 x 25	M982-10-80	M10-1.50	Elastic Stop		
M931-08060-60	M8-1.25 x 60	M933-08030-60	M8-1.25 x 30	M6923-12-80	M12-1.75	Spiralock		
M931-08070-60	M8-1.25 x 70	M933-10012-60	M10-1.50 x 12	M982-12-80	M12-1.75	Elastic Stop		
M931-08070-82	M8-1.25 x 70*	M961-10020-60	M10-1.25 x 20	M982-14-80	M14-2.00	Elastic Stop		
M931-08075-60	M8-1.25 x 75	M933-10020-60	M10-1.50 x 20	M6923-16-80	M16-2.00	Spiralock		
M931-08080-60	M8-1.25 x 80	M933-10025-60	M10-1.50 x 25	M982-16-80	M16-2.00	Elastic Stop		
M931-08090-60	M8-1.25 x 90	M933-10030-60	M10-1.50 x 30	M982-18-80	M18-2.50	Elastic Stop		
M931-08095-60	M8-1.25 x 95	M933-10030-82	M10-1.50 x 30*	M934-20-80	M20-2.50	Standard		
M931-08100-60	M8-1.25 x 100	M961-10035-60	M10-1.25 x 35	M982-20-80	M20-2.50	Elastic Stop		
M931-10040-60	M10-1.50 x 40	M933-10035-60	M10-1.50 x 35	M934-22-80	M22-2.50	Standard		
M931-10045-60	M10-1.50 x 45	M933-12016-60	M12-1.75 x 16	M982-22-80	M22-2.50	Elastic Stop		
M931-10050-60	M10-1.50 x 50	M933-12020-60	M12-1.75 x 20	M934-24-80	M24-3.00	Standard		
M931-10055-60	M10-1.50 x 55	M933-12025-60	M12-1.75 x 25	M982-24-80	M24-3.00	Elastic Stop		
M931-10060-60	M10-1.50 x 60	M933-12025-82	M12-1.75 x 25*	Washers				
M931-10065-60	M10-1.50 x 65	M933-12030-60	M12-1.75 x 30	Part No.	ID	OD	Bolt/ Thick. Screw	
M931-10070-60	M10-1.50 x 70	M933-12040-60	M12-1.75 x 40	M125A-03-80	3.2	7.0	0.5 M3	
M931-10080-60	M10-1.50 x 80	M933-12040-82	M12-1.75 x 40*	M125A-04-80	4.3	9.0	0.8 M4	
M931-10090-60	M10-1.50 x 90	M961-14025-60	M14-1.50 x 25	M125A-05-80	5.3	10.0	1.0 M5	
M931-10100-60	M10-1.50 x 100	M933-14025-60	M14-2.00 x 25	M125A-06-80	6.4	12.0	1.6 M6	
M931-12045-60	M12-1.75 x 45	M961-16025-60	M16-1.50 x 25	M125A-08-80	8.4	16.0	1.6 M8	
M931-12050-60	M12-1.75 x 50	M933-16025-60	M16-2.00 x 25	M125A-10-80	10.5	20.0	2.0 M10	
M931-12055-60	M12-1.75 x 55	M933-16030-82	M16-2.00 x 30*	M125A-12-80	13.0	24.0	2.5 M12	
M931-12060-60	M12-1.75 x 60	M933-16035-60	M16-2.00 x 35	M125A-14-80	15.0	28.0	2.5 M14	
M931-12065-60	M12-1.75 x 65	M933-16040-60	M16-2.00 x 40	M125A-16-80	17.0	30.0	3.0 M16	
M931-12080-60	M12-1.75 x 80	M933-16050-60	M16-2.00 x 50	M125A-18-80	19.0	34.0	3.0 M18	
M931-12090-60	M12-1.75 x 90	M933-16050-82	M16-2.00 x 50*	M125A-20-80	21.0	37.0	3.0 M20	
M931-12100-60	M12-1.75 x 100	M933-16060-60	M16-2.00 x 60	M125A-24-80	25.0	44.0	4.0 M24	
M931-12110-60	M12-1.75 x 110	M933-18050-60	M18-2.50 x 50	Pan Head Machine Screws				
M931-16090-60	M16-2.00 x 90	M933-18060-60	M18-2.50 x 60	M7985A-03010-20	M3-0.50 x 10			
M931-20065-60	M20-2.50 x 65	Flat Head Machine Screws						
M931-20120-60	M20-2.50 x 120	M7985A-03012-20	M3-0.50 x 12	M7985A-04020-20	M4-0.70 x 20			
M931-20160-60	M20-2.50 x 160	M7985A-04020-20	M4-0.70 x 20	M7985A-05010-20	M5-0.80 x 10			
M931-22090-60	M22-2.50 x 90	M7985A-05012-20	M5-0.80 x 12	M965A-05016-20	M5-0.80 x 16			
M931-22120-60	M22-2.50 x 120							
M931-22160-60	M22-2.50 x 160							
M931-24090-60	M24-3.00 x 90							
M931-24120-60	M24-3.00 x 120							
M931-24160-60	M24-3.00 x 160							

* This metric hex bolt's hardness is grade 10.9.

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