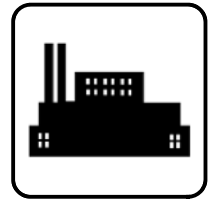


Service Parts

Industrial Generator Sets



Model:

25CCL

30CCL

36CCL

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Introduction

This manual lists service replacement parts for Kohler Power Systems generator sets. See front cover for list of models.

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.

Specification Number 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.

Numbering System Significance

This manual uses the following numbering systems:

Specification Number. The product identification number located on the generator set nameplate. Specification 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 a 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.

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.

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.

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.

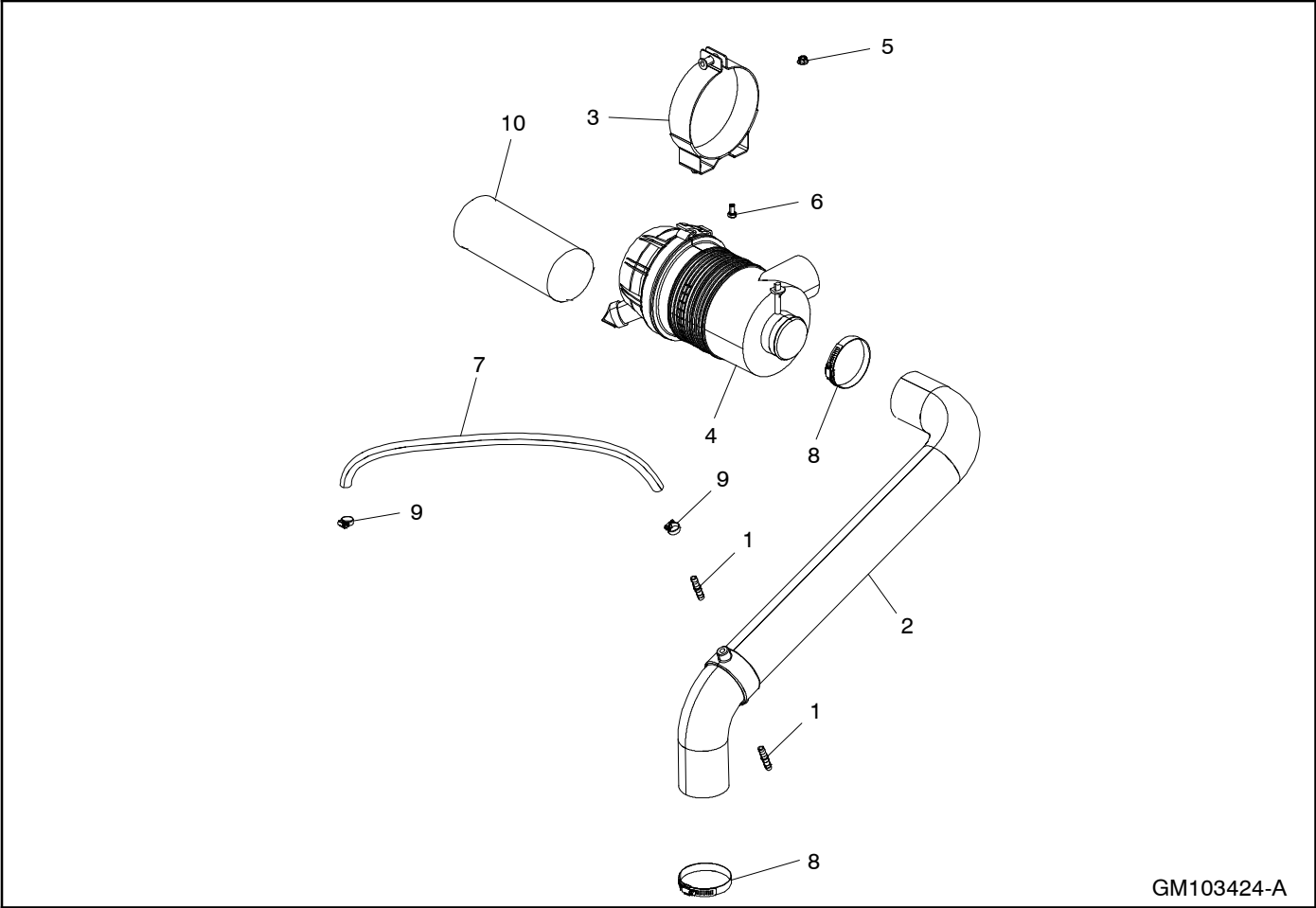
Specification Number Index

	Variation		
	Model/Specification number		
	25CCL	30CCL	36CCL
Group Description	GM103423-GA2	GM103423-GA1	GM103423-GA3
Air Intake	GM103424-GR1	GM103424-GR1	GM103424-GR1
Cooling System	GM104732-GR1	GM104732-GR1	GM104732-GR1
Engine	GM103422-GR1	GM103422-GR1	GM103422-GR1
Nameplate and Decals	GM103425-GR1	GM103425-GR1	GM103425-GR1
Skid and Plant Mounting	GM91038-GR3	GM91038-GR3	GM91038-GR3
Alternator and Mounting	*	*	*
Control and Harness	*	*	*
Circuit Breaker and Mounting	*	*	*
Sound Shield Enclosure	*	*	*
Literature	701-184-560	701-184-561	701-184-562

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

Air Intake

GM103424-GR1

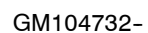


GM103424-A

Item	Part Number	Description	Quantity
1	344754	Connector, Hose	2
2	GM103427	Hose, Air Intake	1
3	GM14200	Mount, Air Cleaner (6.76 in. ID)	1
4	GM90280	Air Cleaner Assy.	1
5	M6923-08-80	Nut, Hex 8 mm	2
6	M933-08016-60	Screw, Hex Cap	2
7	X-386-110	Hose, Fuel and Oil	1
8	X-426-1	Clamp, Hose, 2.81/3.75 in.	2
9	X-426-9	Clamp, Hose, .25/.70 in.	2
10	GM90281	Element, Air Cleaner	1

Notes

GM104732-GR1



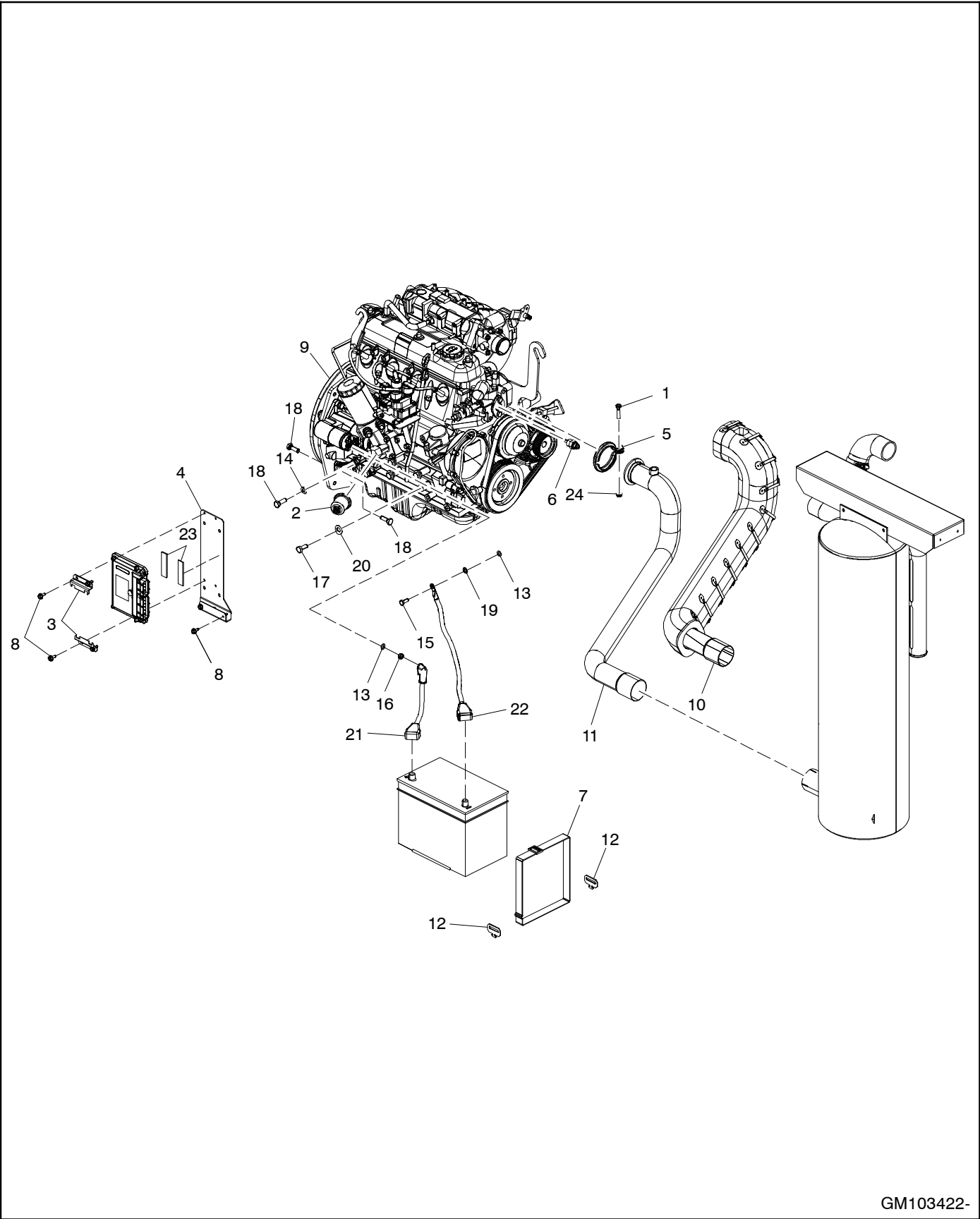
Cooling System

GM104732-GR1

Item	Part Number	Description	Quantity
2	19000-08075	Foam, Gasket Seal (530 mm Long)	1
3	19000-08076	Foam, Gasket Seal (750 mm Long)	1
5	19010-08112	Foam Tape (545 mm Long)	2
7	19010-08118	Foam Tape (527 mm Long)	1
8	X-6352-13	Grommet, U-Channel	1
10	278788	Valve, Drain (3/8 in. NPTF)	1
11	GM103146	Fan, 14 in. 12 VDC Axial Motor	3
12	GM103967	Panel, Bulkhead	1
13	GM103968	Shroud, Radiator	1
14	GM47692	Bottle, Overflow	1
15	GM66270	Sensor, Low Coolant Level	1
16	GM78761-1	Screw, Sheet Metal M6 x 1.0 x 16 mm	37
17	GM82973	Mount, Radiator Upper	1
18	GM82979-1	Insulation, Acoustic Foam	2
19	GM82979-2	Insulation, Acoustic	1
20	GM83755	Shroud, Radiator Front	1
21	GM83762	Bracket, Lower Radiator	1
22	GM85643	Mount, Radiator Lower	1
23	M125A-06-80	Washer, Plain 6.4 ID x 12 OD	4
24	M125A-08-80	Washer, Plain 8.4 ID x 16 OD	4
25	M931-08040-60	Screw, Hex Cap	2
26	M933-06020-60	Screw, Hex Cap	4
27	M982-06-80	Nut, Hex Elastic Stop, 6 mm	4
28	M982-08-80	Nut, Hex Elastic Stop, 8 mm	2
29	X-284-31	Grommet, Round	3
30	X-284-7	Grommet, Round	1
31	X-386-142	Line, Flex Fuel	1
32	X-426-9	Clamp, Hose, .25/.70 in.	2
33	X-6047-31	Channel, "U"	1
34	GM78761-1	Screw, Sheet Metal M6 x 1.0 x 16 mm	1
35	GM90237	Hose, Upper Radiator	1
36	GM90238	Hose, Lower Radiator	1
37	GM91302	Radiator	1
38	GM91498	Hose, Oil Cooler	1
39	GM91499	Hose, Oil Cooler	1
40	GM92384	Tube, Turbo	1
41	GM93389	Adapter, JIC Reducer	2
42	GM95671	Hose, Charge Air Cooler	2
43	GM95687	Tube, CAC Cooler With Port	1
44	GM95704	Charge Air Cooler	1
45	GM97007	Hose, Hump (2 in. ID)	1
46	M125A-06-80	Washer, Plain 6.4 ID x 12 OD	1
47	M125A-08-80	Washer, Plain 8.4 ID x 16 OD	2
48	M6921-08020-60	Screw, Hex Flange M8 x 20	2
49	M6923-08-80	Nut, Hex 8 mm	4
50	M931-08055-60	Screw, Hex Cap	2
51	M933-06020-60	Screw, Hex Cap	1
52	X-20-1	Washer, Lock, .259 ID x .489 in. OD	1
53	X-400-260	Spacer	2
54	X-426-16	Clamp, Hose, 1.81/2.75 in.	11
55	X-426-19	Clamp, Hose, 1/2 in.	1
56	X-672-40	Clamp, Insulated	1
57	X-6380-11	Hose, Charged Air Cooler	1

Engine

GM103422-GR1



GM103422-

Engine

GM103422-GR1

Item	Part Number	Description	Quantity
1	336851	Screw, Hex Head Machine, Special Thread	1
2	GM102100	Sender, Oil Pressure	1
3	GM102521	Bracket, ECM	2
4	GM103655	Bracket, ECM Mounting	1
5	GM22535	Clamp, Exhaust (3.34 in.)	1
6	GM39458	Sender, Temperature	1
7	GM61432	Strap, Poly Battery	1
8	GM78761-1	Screw, Sheet Metal M6 x 1.0 x 16 mm	6
9	GM88249	Engine, Gaseous Fuel, Turbo, 2.2L, CCL	1
10	GM92079	Blanket, Exhaust	1
11	GM95022	Pipe, Exhaust	1
12	GM96290	Bracket, T-Slot, Strap	2
13	M125A-08-80	Washer, Plain 8.4 ID x 16.0 OD	2
14	M125A-10-80	Washer, Plain 10.5 ID x 20.0 OD	4
15	M933-08020-60	Screw, Hex Cap	1
16	M934-08-60	Nut, Hex	1
17	M961-10025-82	Screw, Hex Cap	8
18	M961-10030-60	Screw, Hex Cap	8
19	X-22-10	Washer, Lock	1
20	X-25-26	Washer, Plain, .531 ID x 1.062 in. OD	8
21	X-545-246	Cable, Battery	1
22	X-545-247	Cable, Battery	1
23	X-6031-12	Insulation, Adh. Backed Foam	2
24	X-6210-7	Nut, Flange Spiralock, 5/16-18	1

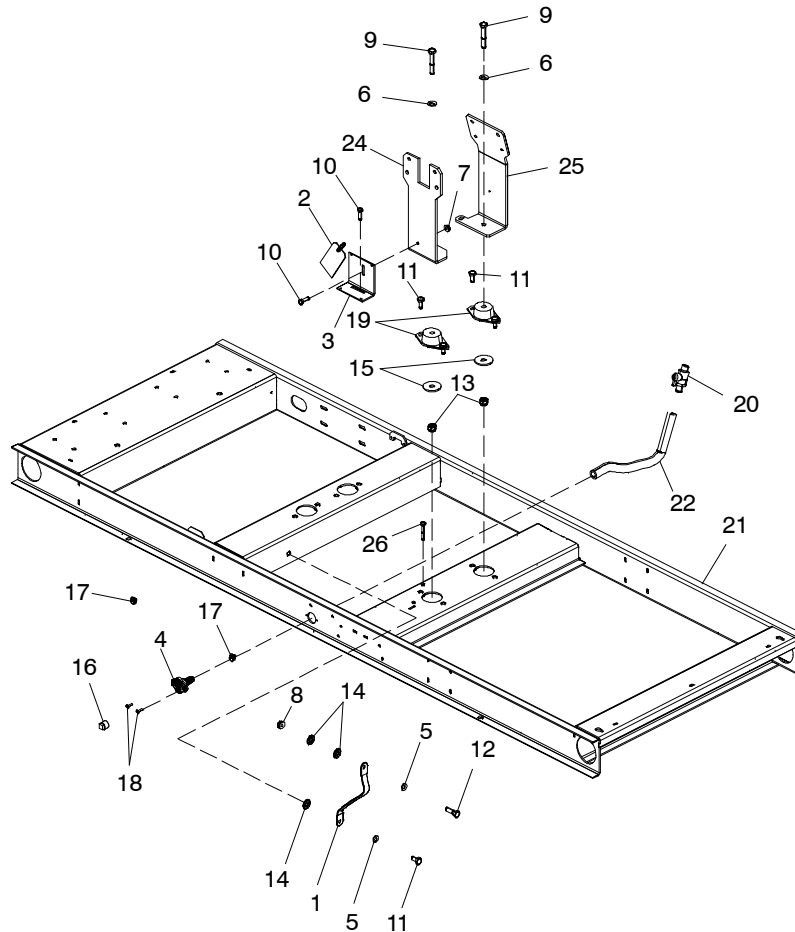
Nameplate and Decals

GM103425-GR1 Not illustrated

Item	Part Number	Description	Quantity
1	249808	Decal, Warning Rotating Parts	2
2	249809	Decal, Caution Hot Engine	5
3	249810	Decal, Warning Hot Coolant	1
4	257438	Decal, Danger Moving Rotor	1
5	257441	Decal, Warning Lifting Eye	1
6	258815	Decal, Warning Voltage Backfeed	1
7	273780	Decal, Warning Explosion	1
8	GM15299	Decal, Rainproof Enclosure	1
9	GM15301	Decal, Power Breaker	1
10	GM20577	Decal, Fuel Type	1
11	GM62217	Nameplate, 5 in. Tall, Blank	2
12	X-6275-3	Logo, Kohler	3

Skid and Mounting

GM91038-GR3

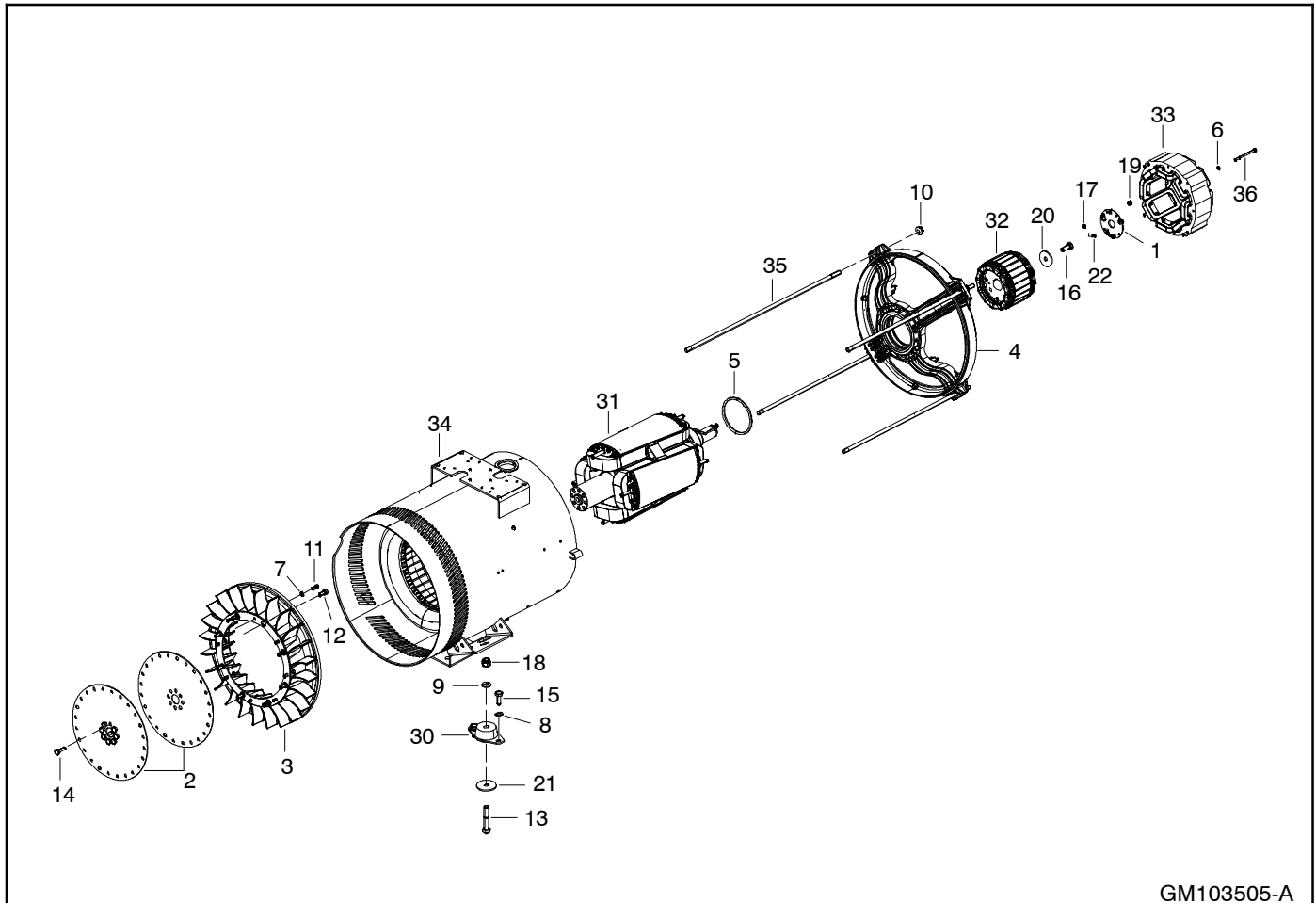


GM91038-E

Item	Part Number	Description	Quantity
1	290418	Strap, Ground	1
2	GM28552	Tag, Hang Shipping Brkt	1
3	GM51689	Bracket, Shipping	1
4	GM59015	Fitting, Bulkhead Drain	1
5	M125A-10-80	Washer, Plain 10.5 ID x 20 OD	2
6	M125A-12-80	Washer, Plain	2
7	M6923-08-80	Nut, Hex 8 mm	1
8	M6923-10-80	Nut, Hex 10 mm	1
9	M931-12065-60	Screw, Hex Cap	2
10	M933-08025-60	Screw, Hex Cap	2
11	M933-10020-60	Screw, Hex Cap	5
12	M933-10035-60	Screw, Hex Cap	1
13	M982-12-80	Nut, Hex Elastic Stop	2
14	X-22-15	Washer, Lock	3
15	X-25-140	Washer, Plain, .531 ID x 2 in. OD	2
16	X-75-58	Plug, Pipe	1
17	X-426-10	Clamp, Hose, .5/1 in.	2
18	X-781-22	Rivet, Pop, .187 in.	2
19	276476	Vibromount	2
20	GM93089	Valve, Oil Drain	1
21	GM103428	Skid	1
22	X-577-5	Hose, Rubber	1
24	GM87458	Foot, Engine R.H.	1
25	GM87459	Foot, Engine L.H.	1
26	M931-08045-60	Screw, Hex Cap	1

Alternator and Mounting

GM103505-, 25-36CCL



GM103505-A

Alternator and Mounting

GM103505-

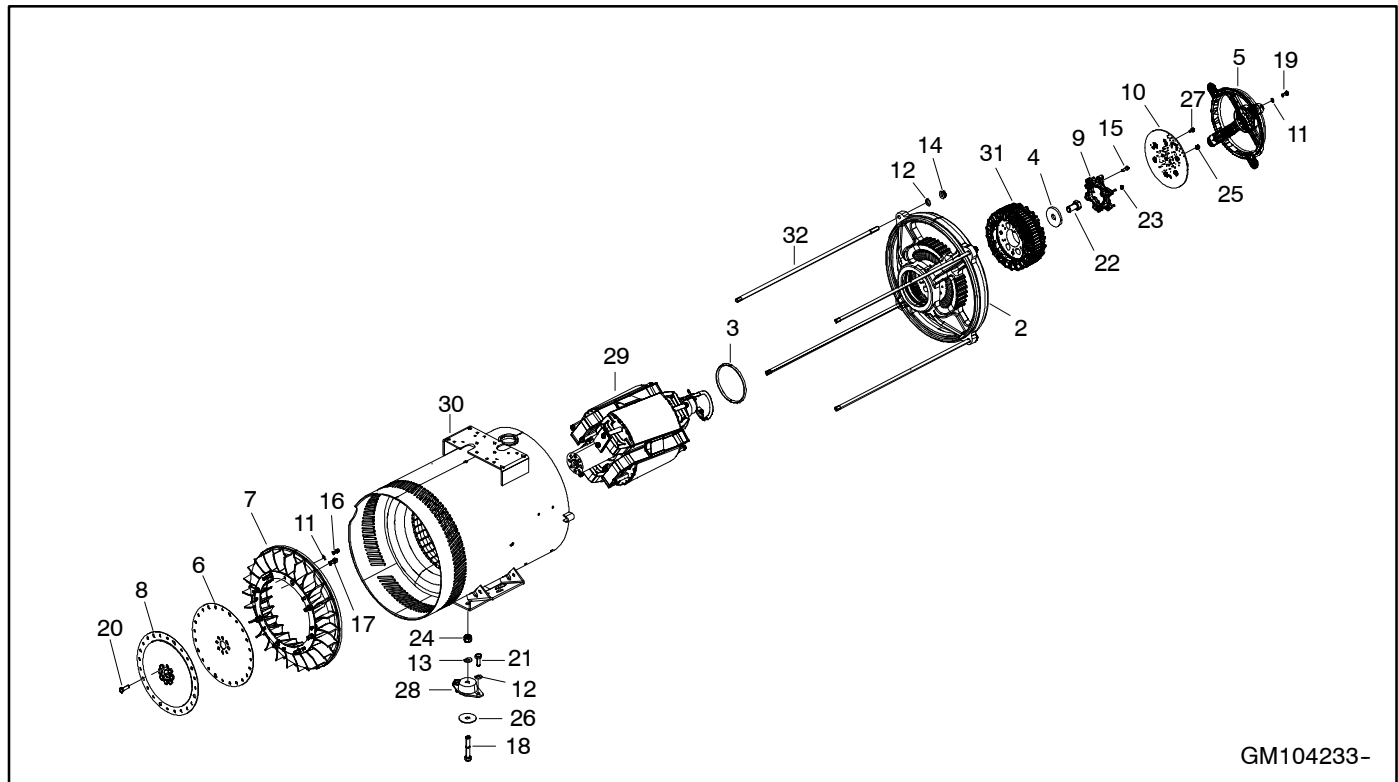
Item	Part Number	Description	Quantity
1	GM103747	PCB Assembly, Rotating Diode Board	1
2	GM87122	Disc, Drive (4D Backplate)	2
3	GM87123	Fan, Alternator (4D/4E Kohler Diesel)	1
4	GM87126	Bracket, End (4D/4E)	1
5	GM87132	O-Ring	1
6	M125A-05-80	Washer, Plain	4
7	M125A-06-80	Washer, Plain 6.4 ID X 12 OD	8
8	M125A-10-80	Washer, Plain 10.5 ID X 20 OD	4
9	M125A-12-80	Washer, Plain	2
10	M6923-10-80	Nut, Hex 10 mm	4
11	M912-06016-60	Screw, Socket Head Cap	8
12	M912-08020-92	Screw, Socket Head Cap	8
13	M931-12065-60	Screw, Hex Cap	2
14	M933-08025-82	Screw, Hex Cap	8
15	M933-10025-60	Screw, Hex Cap	4
16	M933-10025-82	Screw, Hex Cap	1
17	M934-04-SS	Nut, Hex	2
18	M982-12-80	Nut, Hex Elastic Stop	2
19	M985-04-SS	Nut, Hex Elastic Stop	5
20	X-25-129	Washer, Plain, .384 ID x 1.628 in. OD	1
21	X-25-140	Washer, Plain, .531 ID x 2 in. OD	2
22	X-283-3	Terminal, Ring, Male, 16-14 Awg	3
30	324073	Vibromount	2
31	GC87121-5	Rotor Assy, 4D8.3 Backplate	1
32	GC105514	Exciter Armature Assy.	1
33	GC87131	Exciter Field Assembly (57 mm)	1
34	See Chart	Stator Assy.	1
35	GM87134-5	Stud, M10-1.5 x 560 mm	4
36	M931-05070-60	Screw, Hex Cap	4

Use this table to identify part numbers of items 33, 36.

Module No.	Description	Part Number
		Item 34, Stator Assy.
GM103505-MA4	4D8.3 2.2L GW	GC90416-5
GM103505-MA5	4E8.3 2.2L GW	GC90418-5
GM103505-MA6	4D8.3 600V 2.2L GW	GC90417-5

Alternator and Mounting, continued

GM104233-, 30-36CCL



GM104233-

Item	Part Number	Description	Qty
2	GM101367-1	Bracket Assy, End (4P7X-4P10X)	1
3	GM103201	O-Ring 110.49 x 5.33 BUNA-N 70	1
4	GM70070	Washer, FRX Exciter Mtg.	1
5	GM74218	Holder Assy, Led Optic Board	1
6	GM87122	Disc, Drive (4D Backplate)	1
7	GM87123-1	Fan, Alternator (4D/4E Kohler Diesel)	1
8	GM89972	Disc, Drive (Lomb Backplate)	1
9	GM98936	Spacer, Enhanced FRX Activator	1
10	GM98939-1	PCB Assy, FRX Actuator	1
11	M125A-06-80	Washer, Plain 6.4 ID x 12 OD	12
12	M125A-10-80	Washer, Plain 10.5 ID x 20 OD	8
13	M125A-12-80	Washer, Plain	2
14	M6923-10-80	Nut, Hex 10 mm	4
15	M7500CE-05020-85	Screw, Metric Thread Forming Inst	6
16	M912-06016-60	Screw, Socket Head Cap	8
17	M912-08020-92	Screw, Socket Head Cap	8
18	M931-12065-60	Screw, Hex Cap	2
19	M933-06016-60	Screw, Hex Cap	4
20	M933-08025-82	Screw, Hex Cap	8
21	M933-10025-60	Screw, Hex Cap	4
22	M933-16030-82	Screw, Hex Cap	1
23	M934-04-SS	Nut, Hex	5
24	M982-12-80	Nut, Hex Elastic Stop	2
25	M985-04-SS	Nut, Hex Elastic Stop	5
26	X-25-140	Washer, Plain, .531 ID x 2 in. OD	2
27	X-6071-8	Screw, Hex Washer Head	1
28	324073	Vibromount	2
29	GC101369-1	Rotor Assy, Mar 4P7BX/4Q7BX	1
30	See Table	Backplate Stator Assy	1
31	GC70064-2	Exciter Armature, SCR (25 mm)	1
32	GM87134-8	Stud, M10-1.5 x 590 mm	4

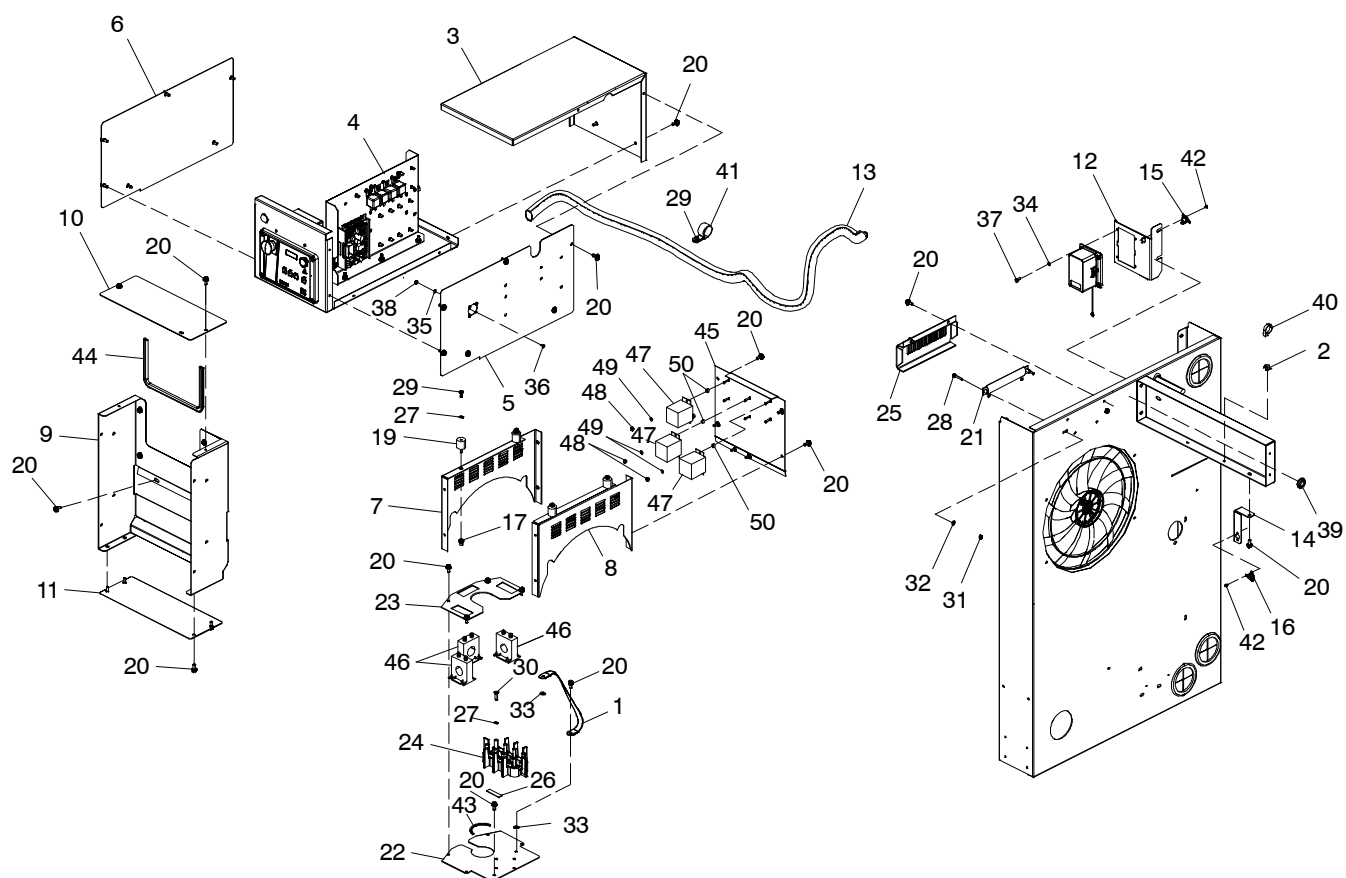
Use this table to identify part numbers of item 30.

Part No.	Description	Part Number
		Item 30, Stator Assy.
GM104233-MA1	25/30 CCL 4P7BX (3 PH)	GC104198-1
GM104233-MA2	25/30 CCL 4Q7BX (1 PH)	GC104199-1

Notes

Control and Harness

GM103512-, 25-36CCL



Item not shown: 18

GM103512-C

Control and Harness

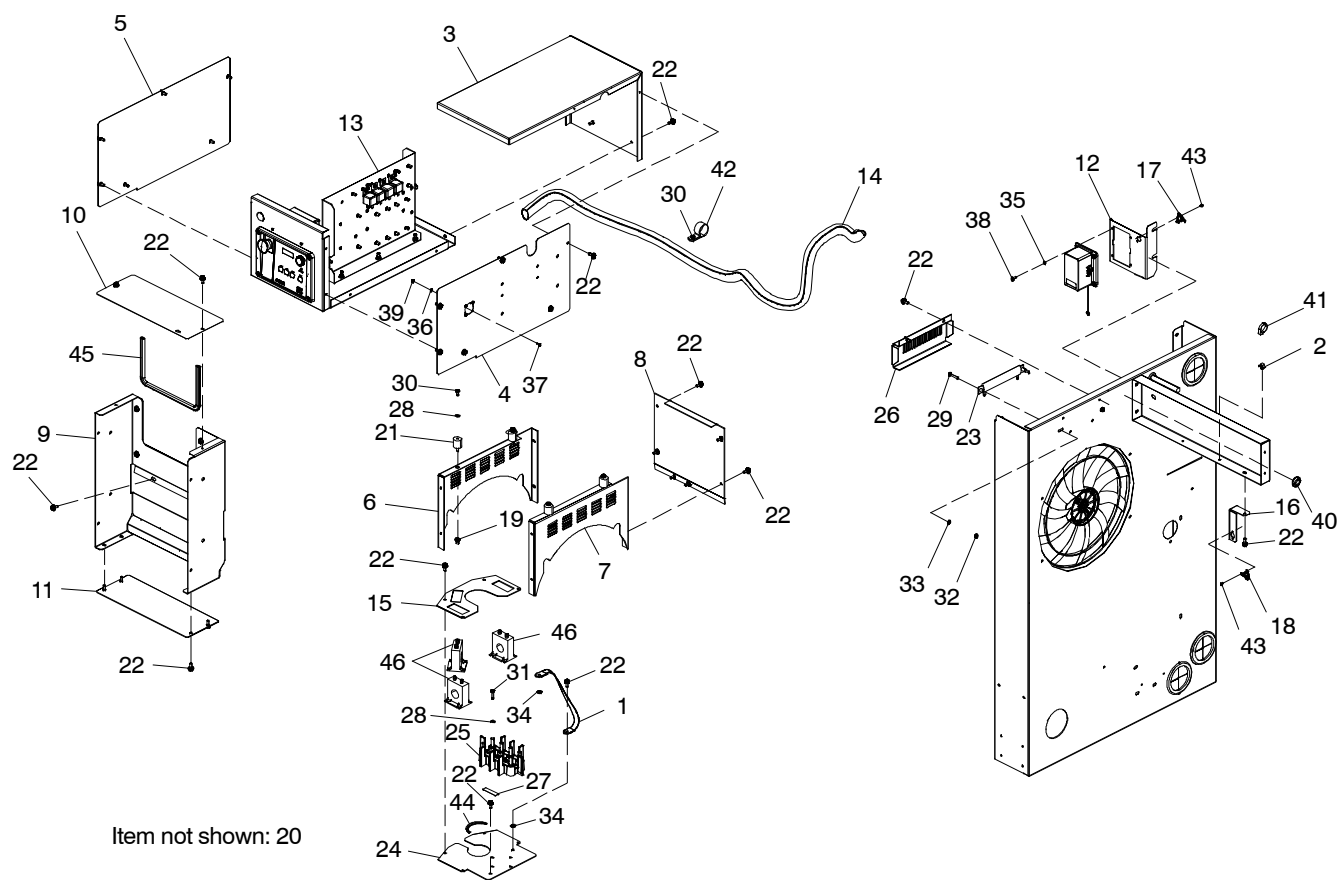
GM103512-			
Item	Part Number	Description	Quantity
1	277839	Ground Strap	1
2	361567	Base, Tie Wrap Snapin	1
3	GM103525	Panel, J-Box Top	1
4	GM103543	Controller Assembly	1
5	GM103567	Panel, J-Box Side LH	1
6	GM103568	Panel, J-Box Side RH	1
7	GM103572	Panel, Junction Box LH	1
8	GM103573	Panel, Junction Box RH	1
9	GM103578	Box, Breaker	1
10	GM103603	Plate, Breaker Box, Top	1
11	GM103607	Plate, Breaker Box, Bottom	1
12	GM103737	Bracket, Fuse Box	1
13	GM104498	Harness, Genset 25-30 CCL 4D	1
14	GM105022	Bracket, Thermal Switch	1
15	GM105516	Thermostat, Snap Action Disc	1
16	GM105517	Thermostat, Snap Action Disc	1
17	GM11040-7	Insert, Threaded M6-1.0	4
18	GM17424	Harness, Wiring C.T.	1
19	GM38784-3	Vibromount, Controller	4
20	GM78761-1	Screw, Sheet Metal M6 x 1.0 x 16 mm	41
21	GM83895	Resistor	1
22	GM88285	Bracket, CT Mounting	1
23	GM88287	Bracket, CT Mounting	1
24	GM90316	Terminal Block 4D ALT	1
25	GM92902	Guard, Resistor	1
26	GM93705	Decal, Torque Rating	1
27	M125A-06-80	Washer, Plain 6.4 ID x 12 OD	6
28	M7985A-05030-20	Screw, Pan Head Machine	2
29	M933-06010-60	Screw, Hex Cap	5
30	M933-06020-60	Screw, Hex Cap	2
31	M934-05-50	Nut, Hex 5 mm	2
32	X-22-11	Washer, Lock	2
33	X-22-5	Washer, Lock	2
34	X-22-9	Washer, Lock	4
35	X-25-9	Washer, Plain, .156 ID x .375 in. OD	4
36	X-49-40	Screw, Machine	4
37	X-50-1	Screw, Machine	4
38	X-74-6	Nut, Hex Machine Screw, 4-40	4
39	X-284-7	Grommet, Round	1
40	X-468-1	Cable Tie	1
41	X-672-20	Clamp, Insulated, 1.25 in.	1
42	X-793-3	Rivet, Pop, .125 in.	4
43	X-6033-17	Grommet, U Channel	1
44	X-6047-14	Channel, U	1
45	See Chart	Panel, J-Box Back	1
46	See Chart	Transformer, Current	-
47	See Chart	Transformer, Potential	3
48	See Chart	Nut, Hex 4 mm	6
49	See Chart	Washer, Lock	6
50	See Chart	Spacer, .209 ID x .375 OD x .219 in.	6

Use this table to identify part numbers of items 45-50.

Module No.	Part Number					
	Item 45	Item 46 (Qty.)	Item 47	Item 48	Item 49	Item 50
GM103512-MA1	GM103576	GM16252 (3)	-	-	-	-
GM103512-MA2	GM103577	GM16252 (3)	258990	M934-04-50	X-22-7	X-400-192
GM103512-MA3	GM103576	GM16252 (2)	-	-	-	-

Control and Harness, continued

GM104390-, 30-36CCL



GM104390-C

Control and Harness, continued

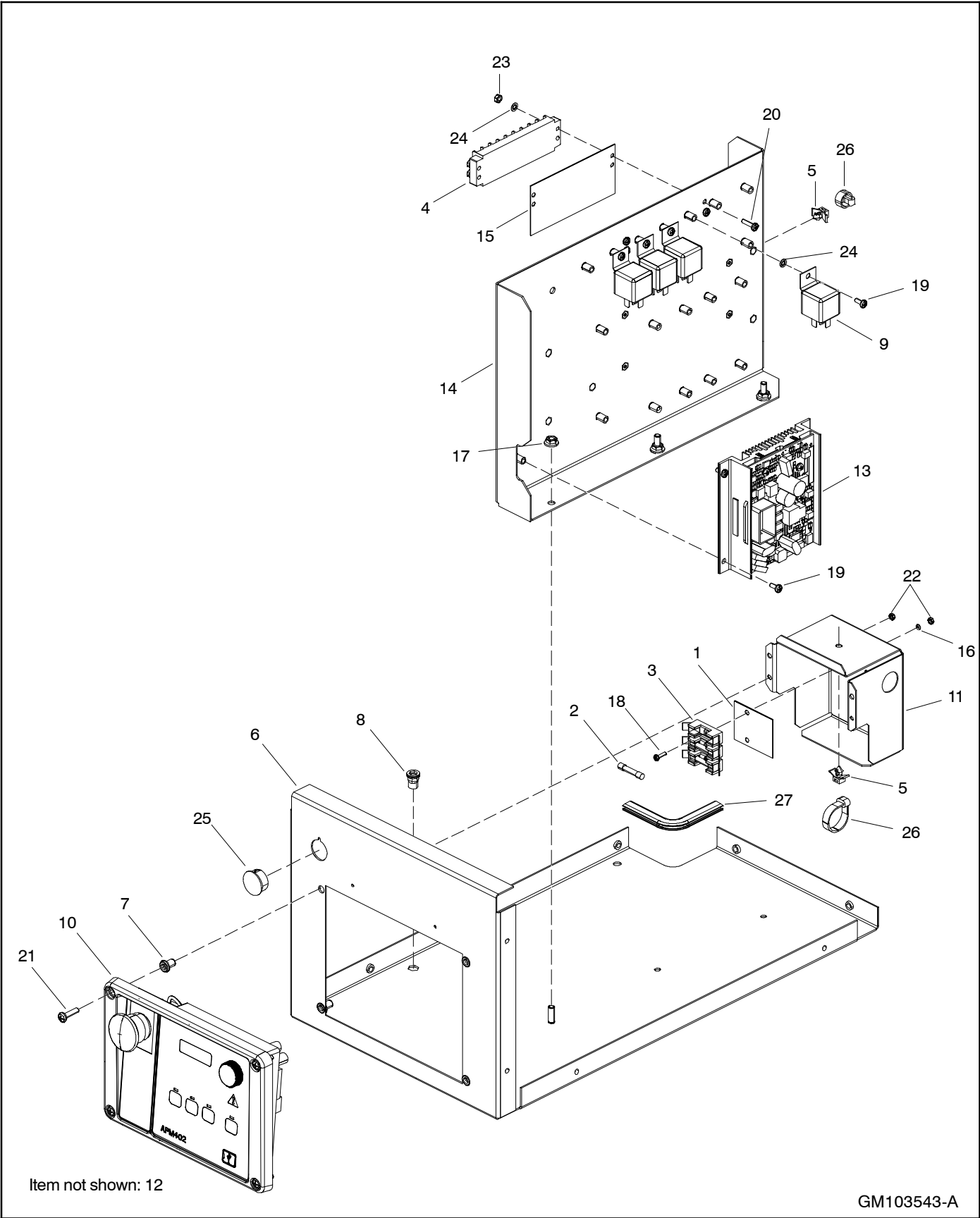
GM104390-			
Item	Part Number	Description	Quantity
1	277839	Ground Strap	1
2	361567	Base, Tie Wrap Snapin	1
3	GM103525	Panel, J-Box Top	1
4	GM103567	Panel, J-Box Side LH	1
5	GM103568	Panel, J-Box Side RH	1
6	GM103572	Panel, Junction Box LH	1
7	GM103573	Panel, Junction Box RH	1
8	GM103576	Panel, J-Box Back	1
9	GM103578	Box, Breaker	1
10	GM103603	Plate, Breaker Box, Top	1
11	GM103607	Plate, Breaker Box, Bottom	1
12	GM103737	Bracket, Fuse Box	1
13	GM104452	Controller Assembly	1
14	GM104499	Harness, Genset 25-30 CCL 4P	1
15	GM104514	Plate, CT Mounting	1
16	GM105022	Bracket, Thermal Switch	1
17	GM105516	Thermostat, Snap Action Disc	1
18	GM105517	Thermostat, Snap Action Disc	1
19	GM11040-7	Insert, Threaded M6-1.0	4
20	GM17424	Harness, Wiring C.T.	1
21	GM38784-3	Vibromount, Controller	4
22	GM78761-1	Screw, Sheet Metal M6 x 1.0 x 16 mm	41
23	GM83895	Resistor	1
24	GM88285	Bracket, CT Mounting	1
25	GM90316	Terminal Block 4D ALT	1
26	GM92902	Guard, Resistor	1
27	GM93705	Decal, Torque Rating	1
28	M125A-06-80	Washer, Plain 6.4 ID x 12 OD	6
29	M7985A-05030-20	Screw, Pan Head Machine	2
30	M933-06010-60	Screw, Hex Cap	5
31	M933-06020-60	Screw, Hex Cap	2
32	M934-05-50	Nut, Hex 5 mm	2
33	X-22-11	Washer, Lock	2
34	X-22-5	Washer, Lock	2
35	X-22-9	Washer, Lock	4
36	X-25-9	Washer, Plain, .156 ID x .375 in. OD	4
37	X-49-40	Screw, Machine	4
38	X-50-1	Screw, Machine	4
39	X-74-6	Nut, Hex Machine Screw, 4-40	4
40	X-284-7	Grommet, Round	1
41	X-468-1	Cable Tie	1
42	X-672-20	Clamp, Insulated, 1.25 in.	1
43	X-793-3	Rivet, Pop, .125 in.	4
44	X-6033-17	Grommet, U Channel	1
45	X-6047-14	Channel, U	1
46	See Chart	Transformer, Current	-

Use this table to identify part numbers of item 46.

Module No.	Part Number
	Item 46 (Qty.)
GM104390-MA1	GM16252 (3)
GM104390-MA2	GM16252 (2)

Controller

GM103543, 25-36CCL



GM103543-A

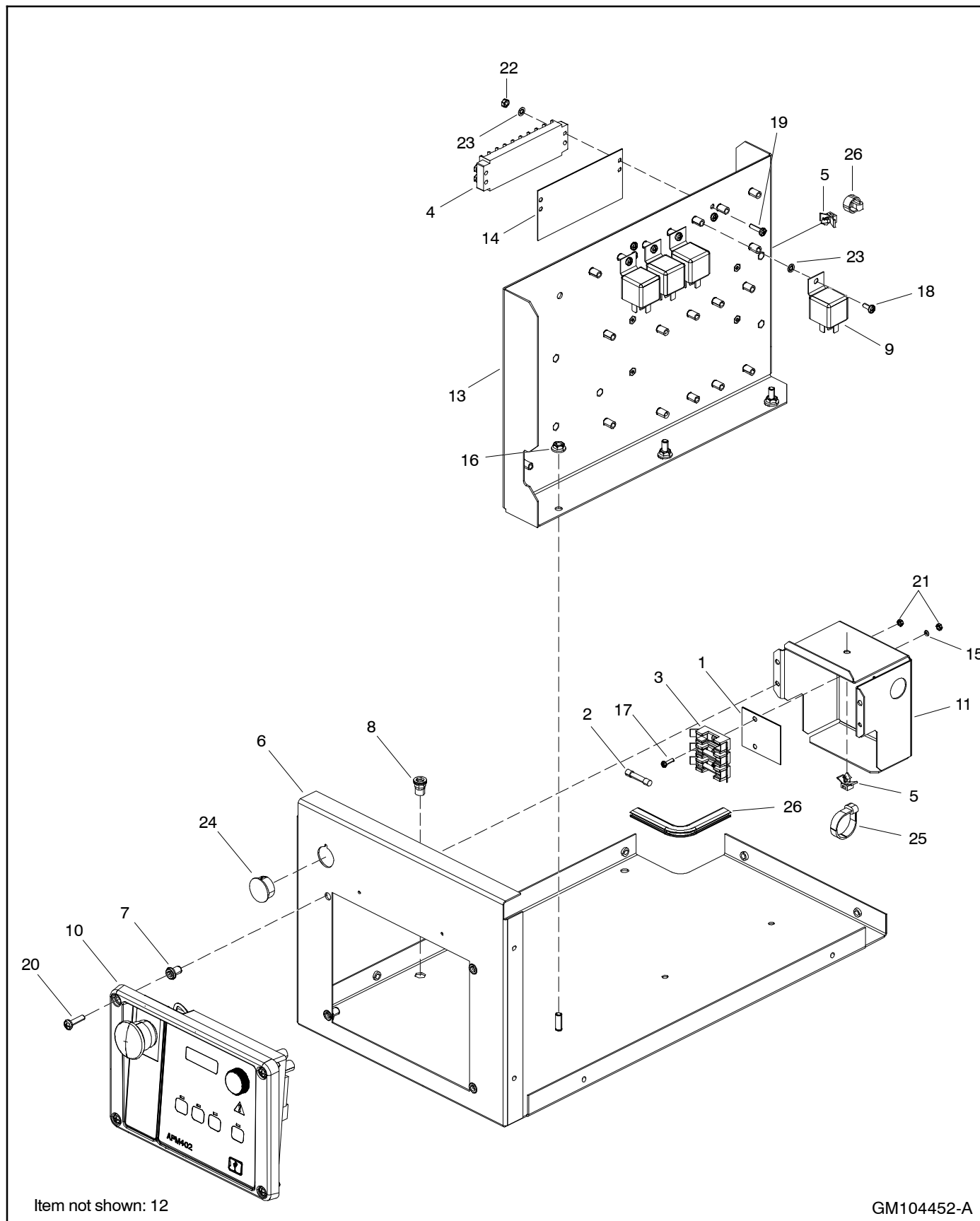
Controller

GM103543

Item	Part Number	Description	Quantity
1	225179	Strip, Marker	1
2	291207	Fuse, 1.5 A, 250 V	3
3	292821	Fuse Holder	1
4	295313	Terminal Block	1
5	361567	Base, Tie Wrap Snapin	2
6	GM103544	Panel, Controller Mounting	1
7	GM11040-6	Insert, Threaded M5-0.8	4
8	GM11040-7	Insert, Threaded M6-1.0	2
9	GM49746	Relay, 12 VDC	4
10	GM65741-2	Controller Assy, APM402	1
11	GM71802	Cover, Controller	1
12	GM77888	Harness, A/C APM402	1
13	GM88453	Assy, 4D Activator Board	1
14	GM88998	Bracket, Mounting (Options)	1
15	GM90344	Strip Marker	1
16	M125A-03-80	Washer, Plain	2
17	M6923-06-80	Nut, Hex 6 mm	3
18	M7985A-03012-20	Screw, Pan Head M3 x 12	2
19	M7985A-04010-20	Screw, Pan Head Machine	8
20	M7985A-04016-20	Screw, Pan Head Machine	4
21	M7985A-05020-20	Screw, Pan Head Machine	4
22	M934-03-50	Nut, Hex 3 mm	4
23	M934-04-50	Nut, Hex 4 mm	4
24	X-22-7	Washer, Lock	8
25	X-301-29	Plug, Button	1
26	X-468-1	Cable Tie	2
27	X-6047-45	Channel, U	1

Controller, continued

GM104452, 30-36CCL



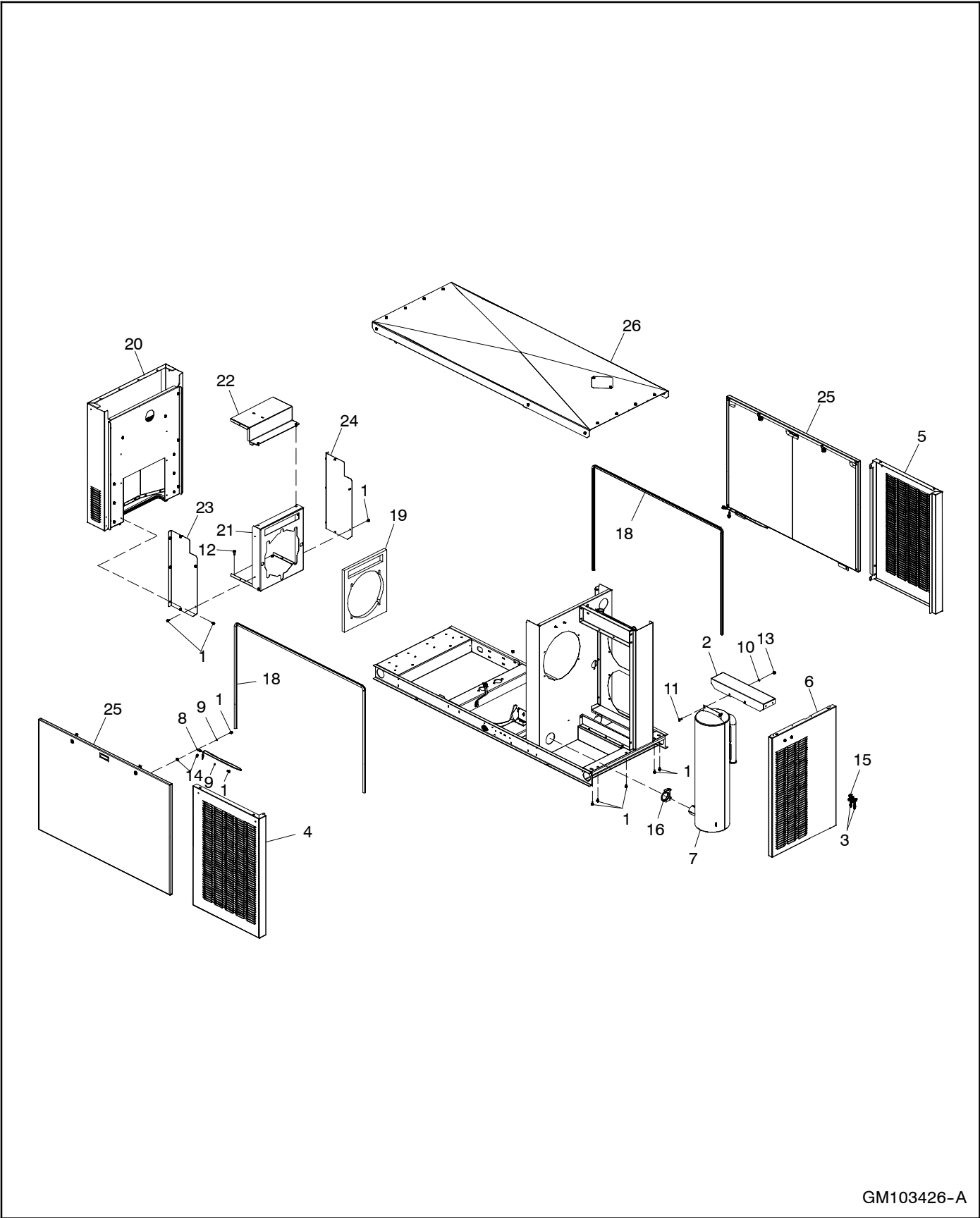
Controller, continued

GM104452

Item	Part Number	Description	Quantity
1	225179	Strip, Marker	1
2	291207	Fuse, 1.5 A, 250 V	3
3	292821	Fuse Holder	1
4	295313	Terminal Block	1
5	361567	Base, Tie Wrap Snapin	2
6	GM103544	Panel, Controller Mounting	1
7	GM11040-6	Insert, Threaded M5-0.8	4
8	GM11040-7	Insert, Threaded M6-1.0	2
9	GM49746	Relay, 12 VDC	4
10	GM65741-2	Controller Assy, APM402	1
11	GM71802	Cover, Controller	1
12	GM77888	Harness, A/C APM402	1
13	GM88998	Bracket, Mounting (Options)	1
14	GM90344	Strip Marker	1
15	M125A-03-80	Washer, Plain	2
16	M6923-06-80	Nut, Hex 6 mm	3
17	M7985A-03012-20	Screw, Pan Head M3 x 12	2
18	M7985A-04010-20	Screw, Pan Head Machine	4
19	M7985A-04016-20	Screw, Pan Head Machine	4
20	M7985A-05020-20	Screw, Pan Head Machine	4
21	M934-03-50	Nut, Hex 3 mm	4
22	M934-04-50	Nut, Hex 4 mm	4
23	X-22-7	Washer, Lock	8
24	X-301-29	Plug, Button	1
25	X-468-1	Cable Tie	2
26	X-6047-45	Channel, U	1

Sound Shield Enclosure

GM103426-



GM103426-A

Sound Shield Enclosure

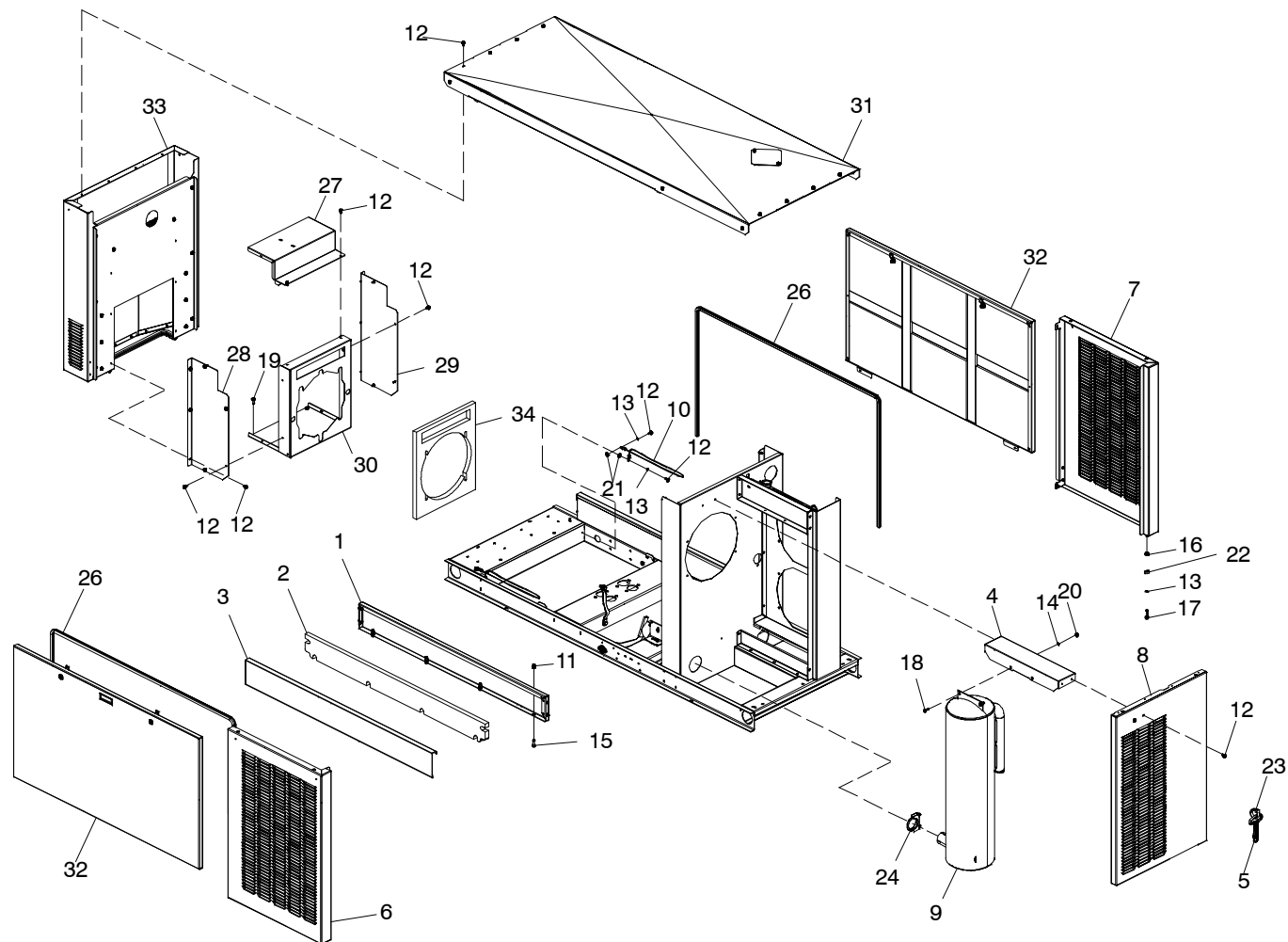
Item	Part Number	Description	Quantity
1	GM78761-1	Screw, Sheet Metal M6 x 1.0 x 16 mm	53
2	GM82880	Bracket, Exhaust Mounting	1
3	GM82922	Tool, Latch Opening	2
4	GM88395	Panel, Enclosure Front (RH)	1
5	GM88396	Panel, Enclosure Front (LH)	1
6	GM88397	Panel, Front Enclosure	1
7	GM88560	Silencer	1
8	LK-1036-1515	Lead, Ground	2
9	M125A-06-80	Washer, Plain 6.4 ID x 12.0 OD	4
10	M125A-08-80	Washer, Plain 8.4 ID x 16.0 OD	2
11	M933-08020-60	Screw, Hex Cap	2
12	M933-10020-60	Screw, Hex Cap	2
13	M982-08-80	Nut, Hex Elastic Stop, 8 mm	2
14	X-22-12	Washer, Lock	4
15	X-468-1	Cable Tie	1
16	X-722-2	Clamp, Muffler, 2.62 in.	1
18	25493-00006	Seal, Push-on Trim	2
19	GM103545	Foam, Acoustic	1
20	GM103610	Panel Asm, Enclosure (Rear)	1
21	See Chart	Panel, Rear Air Duct	1
22	GM104279	Panel, Rear Air Duct Top	1
23	GM104280	Panel, Rear Air Duct Side RH	1
24	GM104281	Panel, Rear Air Duct Side LH	1
25	GM85141	Panel, Access Assy, Enclosure	2
26	GM96246	Cross Bent Roof Sub Assy, Enclosure	1

Use this table to identify part numbers of item 21.

Module No.	Model No.	Part Number
		Item 21
GM103426-MA1	25-36CCL	GM104284
GM103426-MA2	30-36CCL	GM104278

Sound Shield Enclosure, continued

GM105943-



GM105943-

Sound Shield Enclosure, continued

Item	Part Number	Description	Quantity
1	GM103804	Panel, Enclosure Sill	2
2	GM103889	Foam, Acoustic, Windload RCLB	2
3	GM104593	Panel, Cover	2
4	GM82880	Bracket, Exhaust Mounting	1
5	GM82922	Tool, Latch Opening	2
6	GM88395	Panel, Enclosure Front (RH)	1
7	GM88396	Panel, Enclosure Front (LH)	1
8	GM88397	Panel, Front Enclosure	1
9	GM88560	Silencer	1
10	LK-1036-1515	Lead, Ground	2
11	GM11040-9	Insert, Threaded M8-1.25	8
12	GM78761-1	Screw, Sheet Metal M6 x 1.0 x 16 mm	59
13	M125A-06-80	Washer, Plain 6.4 ID x 12.0 OD	6
14	M125A-08-80	Washer, Plain 8.4 ID x 16 OD	2
15	M6921-08030-60	Screw, Hex Flange (M8-1.25 x 30 mm)	8
16	M6923-06-80	Nut, Hex 6 mm	2
17	M933-06025-82	Screw, Hex Cap	2
18	M933-08020-60	Screw, Hex Cap	2
19	M933-10020-60	Screw, Hex Cap	2
20	M982-08-80	Nut, Hex Elastic Stop, 8 mm	2
21	X-22-12	Washer, Lock	4
22	X-400-74	Spacer, .344 ID x .625 OD x .25 in.	2
23	X-468-1	Cable Tie	1
24	X-722-2	Clamp, Muffler, 2.62 In.	1
26	25493-00006	Seal, Push-On Trim	2
27	GM104279	Panel, Rear Air Duct Top	1
28	GM104280	Panel, Rear Air Duct Side RH	1
29	GM104281	Panel, Rear Air Duct Side LH	1
30	See chart	Panel, Rear Air Duct	1
31	GM96246	Cross Bent Roof Sub Assy, Enclosure	1
32	GM103706-1	Door, Windload RCLB	2
33	GM103610	Panel Asm, Enclosure (Rear)	1
34	GM103545	Foam, Acoustic	1

Use this table to identify part numbers of item 30.

Module No.	Model No.	Part Number
		Item 30
GM105943-MA1	25-36CCL	GM104284
GM105943-MA2	30-36CCL	GM104278

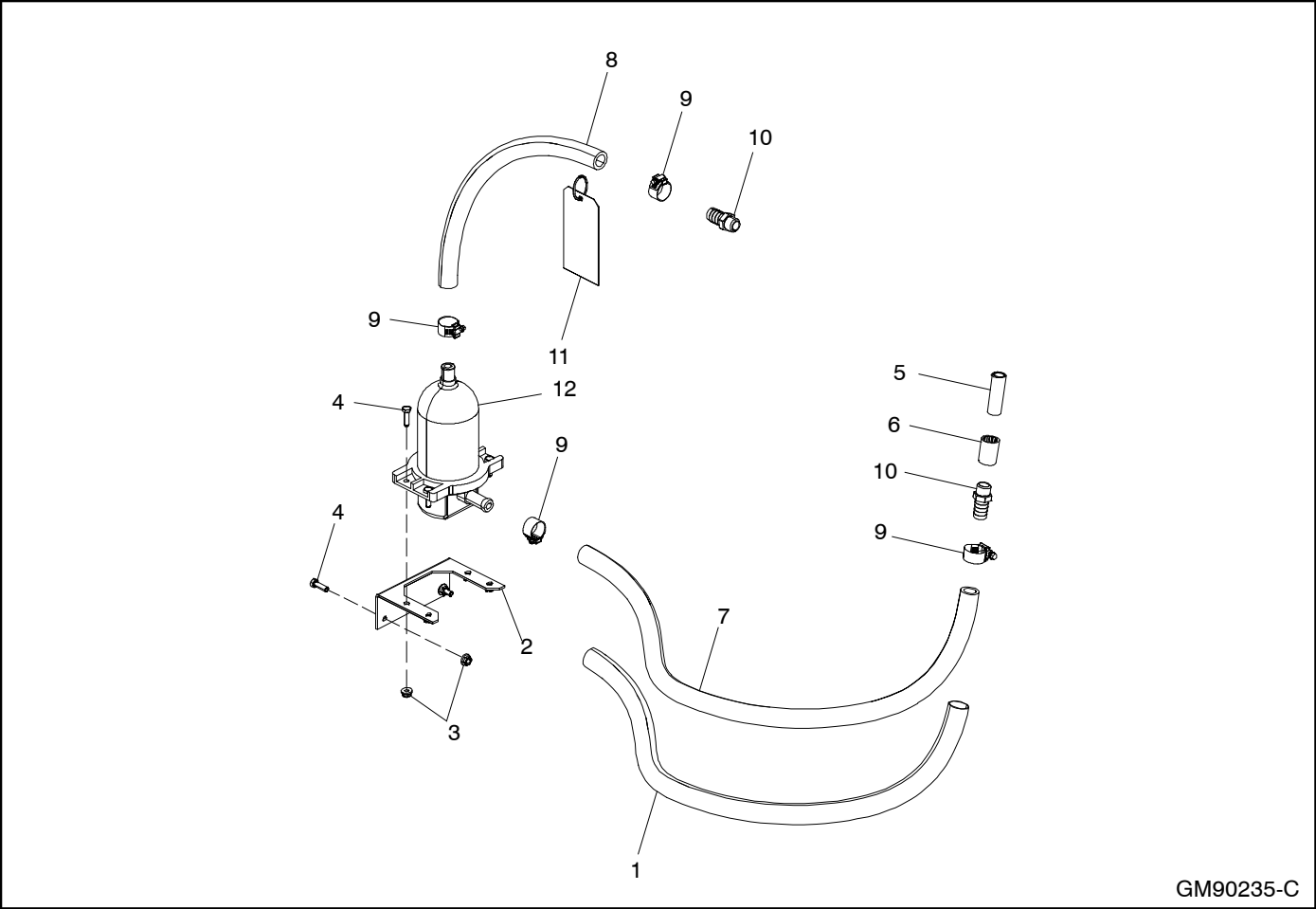
Literature

Not illustrated

Item	Part Number	Description	Quantity		
			Variation		
			560	561	562
1	G4-274	S/S 25CCL Gas, Industrial	1	-	-
2	G4-275	S/S 30CCL Gas, Industrial	-	1	-
3	G4-283	S/S 36CCL Gas, Industrial	-	-	1
4	TP-6356	S/M Controllers, 20-3250 kW, Ind.	1	1	1
5	TP-6694	O/M APM402/Dec3000 Controller	1	1	1
6	TP-7120	P/C 25/30/36CCL, Industrial	1	1	1
7	TP-6783	S/M 20-200, Fst Rspnse X (Fr-X) Altr, Ind	-	1	1
8	TP-6878	S/M 10-40 kW with 4D/4E Alternators	1	1	1
9	TP-6901	O/M Engine KG2204/T 2.2L LPG/NG	1	1	1
10	TP-6902	S/M Kohler KG2204/T 2.2L LPG/NG, Engine	1	1	1
11	TP-6903	S/M KG2204/T 2.2L LPG/NG Diagnostic	1	1	1
12	TP-6904	P/C Engine KG2204/T 2.2L LPG/NG	1	1	1
13	TP-6975	Warranty, CARB/EPA Sore 2-Yr 2.2L/6.2L	1	1	1
14	TP-7119	I/M 25/30/36CCL, Industrial	1	1	1
15	TP-7123	Warranty 5 Year Stationary Standby Ind.	1	1	1

Block Heater

GM90235-



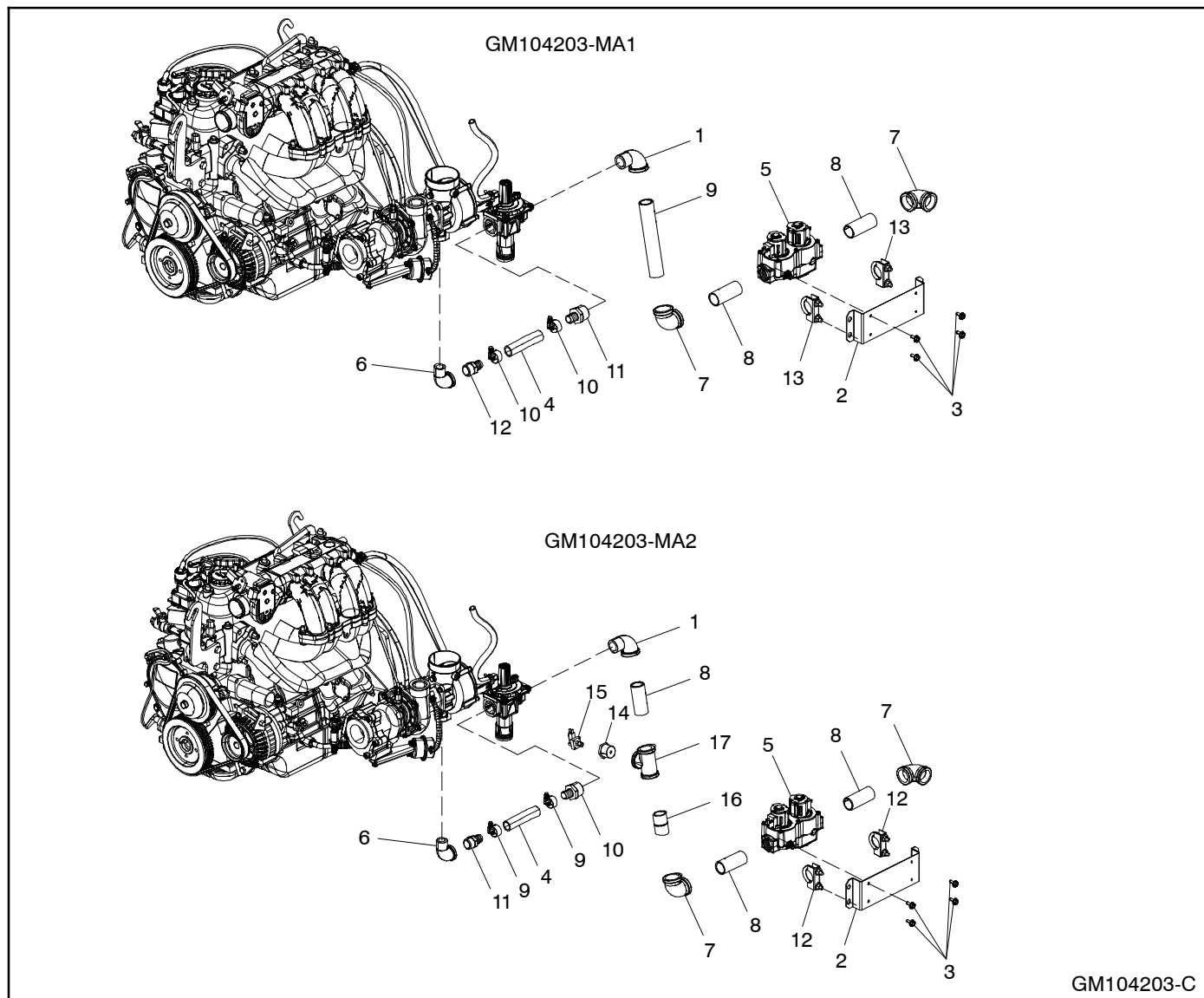
Item	Part Number	Description	Quantity
1	GM100208	Shield, Heat	1
2	GM78546	Bracket, Block Heater Mtg.	1
3	M6923-06-80	Nut, Hex 6 mm	6
4	M933-06020-60	Screw, Hex Cap	6
5	X-204-6	Pipe, Nipple (3/8 in. NPT X 2 in.)	1
6	X-216-23	Coupling, Pipe (3/8 in. NPSC)	1
7	X-312-35	Hose, .63 ID	1
8	X-312-54	Hose, .63 ID	1
9	X-426-12	Clamp, Hose, .69/1.25 in.	4
10	X-582-2	Connector, Hose + Vibra Seal	2
11	279047	Tag, Hang	1
12	See Chart	Heater, Block	1

Use this table to identify part numbers of item 12.

Module No.	Description	Part Number
		Item 12
GM90235-KP1	Heater, Block (120V, 500W)	GM95436
GM90235-KP1	Heater, Block (240V, 500W)	GM95437

Fuel System

GM104203-



GM104203-C

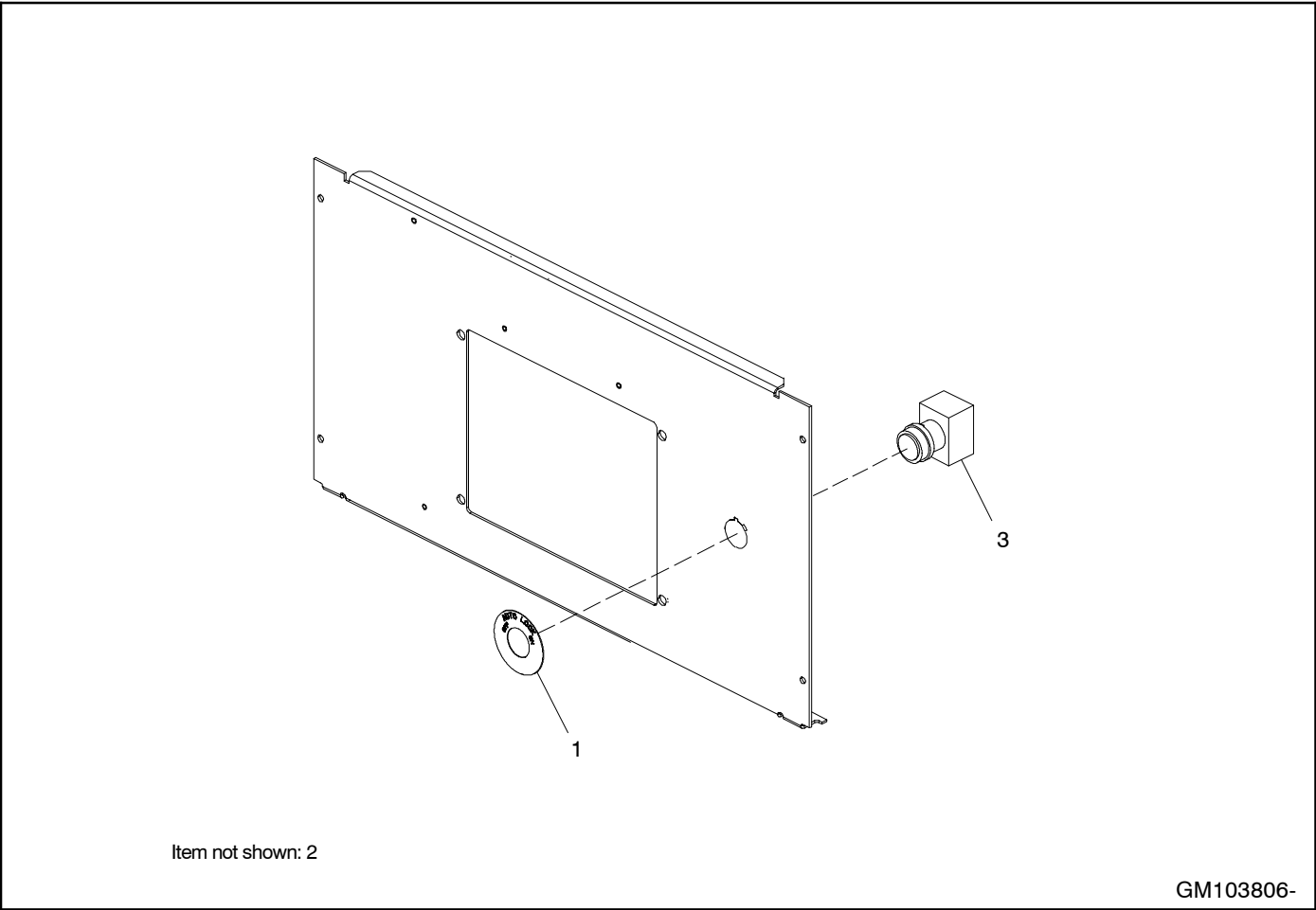
Item	Part Number	Description	Quantity
1	151385	Elbow, Street (90° x 1 in. NPTF)	1
2	GM78545	Bracket, Fuel Solenoid	1
3	GM78761-1	Screw, Sheet Metal M6 x 1.0 x 16 mm	4
4	GM95614	Hose, Fuel Line	1
5	GM96976	Valve, Dual Solenoid	1
6	SA-472	Elbow, Street	1
7	X-215-15	Elbow, Pipe (90° x 1 in. NPT)	2
8	See Chart	Pipe, Nipple (1 in. NPT x 3 in.)	-
9	X-218-9	Pipe (1 in. NPT x 6.50 in.)	1
10	X-426-12	Clamp, Hose, .69/1.25 in.	2
11	X-582-15	Connector, Hose + Vibra Seal	1
12	X-582-8	Connector, Hose + Vibra Seal	1
13	X-722-8	Clamp, Muffler, 1.37 in.	2
14	See Chart	Bushing, Reducing (1/8 x 1 in, NPT)	1
15	See Chart	Switch, Pressure 4.5 in. H2O	1
16	See Chart	Pipe (1 in. NPT x 2 in.)	1
17	See Chart	Tee, Pipe (1 x 1 x 1 NPT)	1

Use this table to identify part numbers of items 8, 14-17.

Module No.	Part Number				
	Item 8 (Qty.)	Item 14	Item 15	Item 16	Item 17
GM104203-MA1	X-218-22 (2)	-	-	-	-
GM104203-MA2	X-218-22 (3)	AC-1459	GM70537	K-122	X-203-28

Manual Key Switch

GM103806-KA1



Item	Part Number	Description	Quantity
1	GM103075	Decal, Auto Lock On/Off	1
2	GM103433	Harness, Keyswitch Dec 3000	1
3	GM103805	Switch, Key, 2 Position	1

Miscellaneous Kits

Qty.	Description	Part No.
Kit, Heater, Oil Pan 150W 120V		GM93357-KP1
1	Heater, Oil Pan	GM93424
1	TT Oil Pan Heater, Res/Coml	TT-1633
Kit, Heater, Oil Pan 150W, 240V		GM93357-KP2
1	Heater, Oil Pan	GM93486
1	TT Oil Pan Heater, Res/Coml	TT-1633
Dry Contact, 15 Relay		GM89315-KA1
1	Cable, Patch, 3 Ft. RJ-45	357477
1	Diagram, DEC 3000 Accy Interconnection	GM78246
1	PCB Assy, 15 Relay Dry Contact w/ Com	GM84063
1	Harness, 15 Relay Brd. Power	GM95582
4	Screw, Pan Head Machined	M7985A-04010-20
4	Washer, Lock .172 ID x .333 in. OD	X-22-7
Flexible Fuel Lines		GM13706-KA4
1	Pipe (1 in. NPT x 1.5 in.)	X-218-24
2	Cable tie	X-468-4
1	Fuel Line, Flexible (1.00 in. ID x 18 in.)	X-504-21
Battery, 1/12V, Wet		256985
Battery Charger, 6A		GM96391-KA1
1	Battery Charger 12V, 6A	GM96383
2	Nut, Hex 6 mm	M6923-06-80
2	Screw, Pan Head Machine	M7985A-06020-20
1	Battery Charger, 6 Amp, Industrial	TT-1702
Battery Charger, 10A		GM94447-KA1
1	Decision Maker Industrial Battery Charger	GM87448
4	Nut, Hex 6 mm	M6923-06-80
4	Screw, Hex Cap	M933-06025-60
Battery Heater, 120V, 65W		GM104703-KA1
1	Heater, Battery Wrap 120V, 65W	GM104699
2	Cable Tie	X-468-1
Gen. Heater, 120/240V, 85W		GM79104-KA2
2	Heater, Strip 120V/85W	GM85733
4	Washer, Plain	M125A-05-80
4	Screw, M5 x 14 mm	M933-05014-60
2 Input/5 Output Module		GM89315-KA4
1	Cable, Patch, 3 Ft. RJ-45	357477
1	PCB Assy, CAN Remote I/O	GM64494
1	Diagram, DEC 3000 Accy Interconnection	GM78246
4	Screw, Pan Head Machined	M7985A-04010-20
4	Washer, Lock .172 ID x .333 in. OD	X-22-7
Run Relay, 12V		GM89315-KA3
1	Relay	248362
1	Harness, Run Relay	GM75854
1	Diagram, DEC 3000 Accy Interconnection	GM78246
1	Diagram, Accessory Interconnection	GM78247
2	Screw, Pan Head Machined	M7985A-04010-20
2	Washer, Lock .172 ID x .333 in. OD	X-22-7
Manual Speed Adjust		GM85971-KA1
1	Software, Man. Spd Adjust Program	GM85972-AA1

Appendix A Abbreviations

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

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

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

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, spirallock nuts, or standard nuts and preloading (torque) of the bolt in all other applications.

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

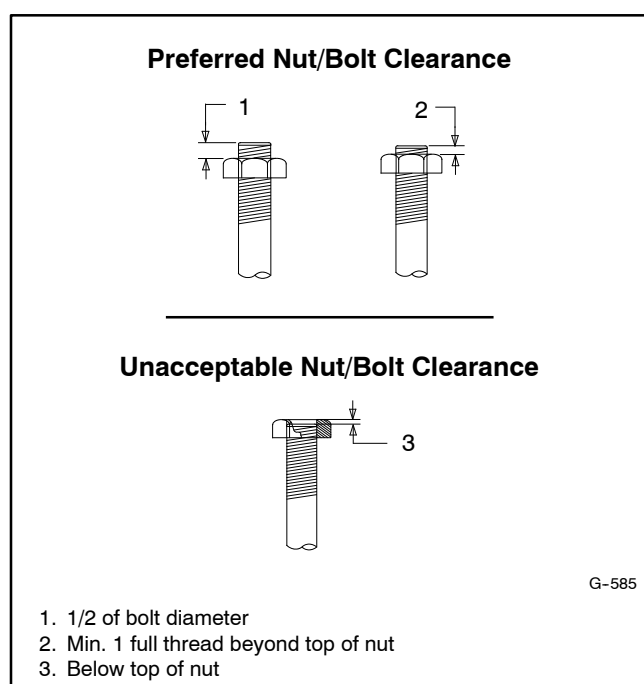


Figure 1 Acceptable Bolt Lengths

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 spirallock nut. See Figure 2.

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 Figure 2, which depicts the preceding hardware configuration possibilities.

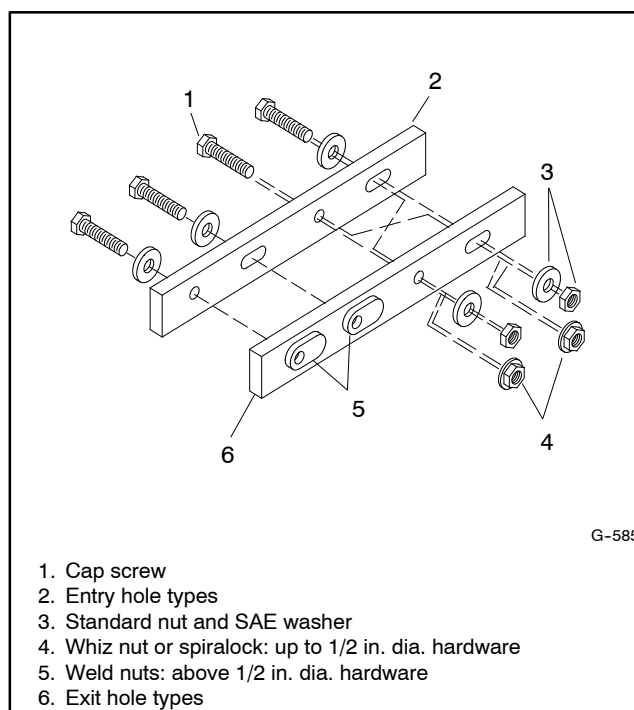


Figure 2 Acceptable Hardware Combinations

Appendix C General Torque Specifications

American Standard Fasteners Torque Specifications					
Size	Torque Measurement	Assembled into Cast Iron or Steel			Assembled into Aluminum Grade 2 or 5
		Grade 2	Grade 5	Grade 8	
8-32	Nm (in. lb.)	1.8 (16)	2.3 (20)	—	See Note 3
10-24	Nm (in. lb.)	2.9 (26)	3.6 (32)	—	
10-32	Nm (in. lb.)	2.9 (26)	3.6 (32)	—	
1/4-20	Nm (in. lb.)	6.8 (60)	10.8 (96)	14.9 (132)	
1/4-28	Nm (in. lb.)	8.1 (72)	12.2 (108)	16.3 (144)	
5/16-18	Nm (in. lb.)	13.6 (120)	21.7 (192)	29.8 (264)	
5/16-24	Nm (in. lb.)	14.9 (132)	23.1 (204)	32.5 (288)	
3/8-16	Nm (ft. lb.)	24.0 (18)	38.0 (28)	53.0 (39)	
3/8-24	Nm (ft. lb.)	27.0 (20)	42.0 (31)	60.0 (44)	
7/16-14	Nm (ft. lb.)	39.0 (29)	60.0 (44)	85.0 (63)	
7/16-20	Nm (ft. lb.)	43.0 (32)	68.0 (50)	95.0 (70)	
1/2-13	Nm (ft. lb.)	60.0 (44)	92.0 (68)	130.0 (96)	
1/2-20	Nm (ft. lb.)	66.0 (49)	103.0 (76)	146.0 (108)	
9/16-12	Nm (ft. lb.)	81.0 (60)	133.0 (98)	187.0 (138)	
9/16-18	Nm (ft. lb.)	91.0 (67)	148.0 (109)	209.0 (154)	
5/8-11	Nm (ft. lb.)	113.0 (83)	183.0 (135)	259.0 (191)	
5/8-18	Nm (ft. lb.)	128.0 (94)	208.0 (153)	293.0 (216)	
3/4-10	Nm (ft. lb.)	199.0 (147)	325.0 (240)	458.0 (338)	
3/4-16	Nm (ft. lb.)	222.0 (164)	363.0 (268)	513.0 (378)	
1-8	Nm (ft. lb.)	259.0 (191)	721.0 (532)	1109.0 (818)	
1-12	Nm (ft. lb.)	283.0 (209)	789.0 (582)	1214.0 (895)	

Metric Fasteners Torque Specifications, Measured in Nm (ft. lb.)				
Size (mm)	Assembled into Cast Iron or Steel			Assembled into Aluminum Grade 5.8 or 8.8
	Grade 5.8	Grade 8.8	Grade 10.9	
M6 x 1.00	6.2 (4.6)	9.5 (7)	13.6 (10)	See Note 3
M8 x 1.25	15.0 (11)	23.0 (17)	33.0 (24)	
M8 x 1.00	16.0 (11)	24.0 (18)	34.0 (25)	
M10 x 1.50	30.0 (22)	45.0 (34)	65.0 (48)	
M10 x 1.25	31.0 (23)	47.0 (35)	68.0 (50)	
M12 x 1.75	53.0 (39)	80.0 (59)	115.0 (85)	
M12 x 1.50	56.0 (41)	85.0 (63)	122.0 (90)	
M14 x 2.00	83.0 (61)	126.0 (93)	180.0 (133)	
M14 x 1.50	87.0 (64)	133.0 (98)	190.0 (140)	
M16 x 2.00	127.0 (94)	194.0 (143)	278.0 (205)	
M16 x 1.50	132.0 (97)	201.0 (148)	287.0 (212)	
M18 x 2.50	179.0 (132)	273.0 (201)	390.0 (288)	
M18 x 1.50	189.0 (140)	289.0 (213)	413.0 (305)	

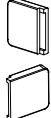
Notes:

1. The torque values above are general guidelines. Always use the torque values specified in the service manuals and/or assembly drawings when they differ from the above torque values.
2. The torque values above are based on new plated threads. Increase torque values by 15% if non-plated threads are used.
3. Hardware threaded into aluminum must have either two diameters of thread engagement or a 30% or more reduction in the torque to prevent stripped threads.
4. Torque values are calculated as equivalent stress loading on American hardware with an approximate preload of 90% of the yield strength and a friction coefficient of 0.125.

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	

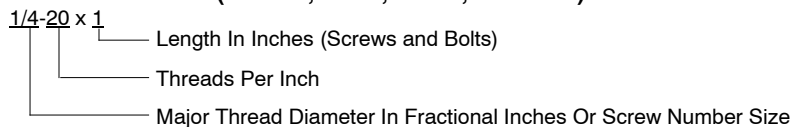
Hardness Grades	
American Standard	
Grade 2	
Grade 5	
Grade 8	
Grade 8/9 (Hex Socket Head)	
Metric	
Number stamped on hardware; 5.8 shown	
Hose Clamp Covers	
Black, EPDM rubber used on worm gear clamps	

Allen™ head screw is a trademark of Holo-Krome Co.

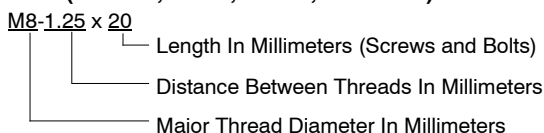
Phillips® screw is a registered trademark of Phillips Screw Company.

Sample Dimensions

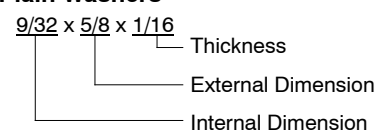
American Standard (Screws, Bolts, Studs, and Nuts)



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)		Hex Head Bolts, cont.		Hex Nuts		
X-465-17	1/4-20 x .38	X-6238-14	3/8-24 x .75			
X-465-6	1/4-20 x .50	X-6238-16	3/8-24 x 1.25	X-6009-1	1-8	Standard
X-465-2	1/4-20 x .62	X-6238-21	3/8-24 x 4.00	X-6210-3	6-32	Whiz
X-465-16	1/4-20 x .75	X-6238-22	3/8-24 x 4.50	X-6210-4	8-32	Whiz
X-465-18	1/4-20 x .88			X-6210-5	10-24	Whiz
X-465-7	1/4-20 x 1.00	X-6024-5	7/16-14 x .75	X-6210-1	10-32	Whiz
X-465-8	1/4-20 x 1.25	X-6024-2	7/16-14 x 1.00			
X-465-9	1/4-20 x 1.50	X-6024-8	7/16-14 x 1.25	X-6210-2	1/4-20	Spiralock
X-465-10	1/4-20 x 1.75	X-6024-3	7/16-14 x 1.50	X-6210-6	1/4-28	Spiralock
X-465-11	1/4-20 x 2.00	X-6024-4	7/16-14 x 2.00	X-6210-7	5/16-18	Spiralock
X-465-12	1/4-20 x 2.25	X-6024-11	7/16-14 x 2.75	X-6210-8	5/16-24	Spiralock
X-465-14	1/4-20 x 2.75	X-6024-12	7/16-14 x 6.50	X-6210-9	3/8-16	Spiralock
X-465-21	1/4-20 x 5.00	X-129-15	1/2-13 x .75	X-6210-10	3/8-24	Spiralock
X-465-25	1/4-28 x .38	X-129-17	1/2-13 x 1.00	X-6210-11	7/16-14	Spiralock
X-465-20	1/4-28 x 1.00	X-129-18	1/2-13 x 1.25	X-6210-12	1/2-13	Spiralock
		X-129-19	1/2-13 x 1.50	X-6210-15	7/16-20	Spiralock
X-125-33	5/16-18 x .50	X-129-20	1/2-13 x 1.75	X-6210-14	1/2-20	Spiralock
X-125-23	5/16-18 x .62	X-129-21	1/2-13 x 2.00			
X-125-3	5/16-18 x .75	X-129-22	1/2-13 x 2.25	X-85-3	5/8-11	Standard
X-125-31	5/16-18 x .88	X-129-23	1/2-13 x 2.50	X-88-12	3/4-10	Standard
X-125-5	5/16-18 x 1.00	X-129-24	1/2-13 x 2.75	X-89-2	1/2-20	Standard
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-125-28	5/16-18 x 3.00	X-129-51	1/2-20 x .75			
X-125-22	5/16-18 x 4.50	X-129-45	1/2-20 x 1.25			
X-125-32	5/16-18 x 5.00	X-129-52	1/2-20 x 1.50			
X-125-35	5/16-18 x 5.50					
X-125-36	5/16-18 x 6.00	X-6021-3	5/8-11 x 1.00			
X-125-40	5/16-18 x 6.50	X-6021-4	5/8-11 x 1.25			
		X-6021-2	5/8-11 x 1.50			
X-125-43	5/16-24 x 1.75	X-6021-1	5/8-11 x 1.75			
X-125-44	5/16-24 x 2.50	273049	5/8-11 x 2.00			
X-125-30	5/16-24 x .75	X-6021-5	5/8-11 x 2.25			
X-125-39	5/16-24 x 2.00	X-6021-6	5/8-11 x 2.50			
X-125-38	5/16-24 x 2.75	X-6021-7	5/8-11 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-6238-11	3/8-16 x 1.00	X-6021-9	5/8-18 x 2.50			
X-6238-4	3/8-16 x 1.25					
X-6238-5	3/8-16 x 1.50	X-6239-1	3/4-10 x 1.00			
X-6238-1	3/8-16 x 1.75	X-6239-8	3/4-10 x 1.25			
X-6238-6	3/8-16 x 2.00	X-6239-2	3/4-10 x 1.50			
X-6238-17	3/8-16 x 2.25	X-6239-3	3/4-10 x 2.00			
X-6238-7	3/8-16 x 2.50	X-6239-4	3/4-10 x 2.50			
X-6238-8	3/8-16 x 2.75	X-6239-5	3/4-10 x 3.00			

Metric

Hex head bolts are hardness grade 8.8 unless noted.

Part No. Dimensions Hex Head Bolts (Partial Thread)

M931-05055-60	M5-0.80 x 55
M931-06040-60	M6-1.00 x 40
M931-06055-60	M6-1.00 x 55
M931-06060-60	M6-1.00 x 60
M931-06060-SS	M6-1.00 x 60
M931-06070-60	M6-1.00 x 70
M931-06070-SS	M6-1.00 x 70
M931-06075-60	M6-1.00 x 75
M931-06090-60	M6-1.00 x 90
M931-06145-60	M6-1.00 x 145
M931-06150-60	M6-1.00 x 150
M931-08035-60	M8-1.25 x 35
M931-08040-60	M8-1.25 x 40
M931-08045-60	M8-1.25 x 45
M931-08050-60	M8-1.25 x 50
M931-08055-60	M8-1.25 x 55
M931-08055-82	M8-1.25 x 55*
M931-08060-60	M8-1.25 x 60
M931-08070-60	M8-1.25 x 70
M931-08070-82	M8-1.25 x 70*
M931-08075-60	M8-1.25 x 75
M931-08080-60	M8-1.25 x 80
M931-08090-60	M8-1.25 x 90
M931-08095-60	M8-1.25 x 95
M931-08100-60	M8-1.25 x 100
M931-08110-60	M8-1.25 x 110
M931-08120-60	M8-1.25 x 120
M931-08130-60	M8-1.25 x 130
M931-08140-60	M8-1.25 x 140
M931-08150-60	M8-1.25 x 150
M931-08200-60	M8-1.25 x 200
M931-10040-82	M10-1.25 x 40*
M931-10040-60	M10-1.50 x 40
M931-10045-60	M10-1.50 x 45
M931-10050-60	M10-1.50 x 50
M931-10050-82	M10-1.25 x 50*
M931-10055-60	M10-1.50 x 55
M931-10060-60	M10-1.50 x 60
M931-10065-60	M10-1.50 x 65
M931-10070-60	M10-1.50 x 70
M931-10080-60	M10-1.50 x 80
M931-10080-82	M10-1.25 x 80*
M931-10090-60	M10-1.50 x 90
M931-10090-82	M10-1.50 x 90*
M931-10100-60	M10-1.50 x 100
M931-10110-60	M10-1.50 x 110
M931-10120-60	M10-1.50 x 120
M931-10130-60	M10-1.50 x 130
M931-10140-60	M10-1.50 x 140
M931-10180-60	M10-1.50 x 180
M931-10235-60	M10-1.50 x 235
M931-10260-60	M10-1.50 x 260
M960-10330-60	M10-1.25 x 330
M931-12045-60	M12-1.75 x 45
M960-12050-60	M12-1.25 x 50
M960-12050-82	M12-1.25 x 50*
M931-12050-60	M12-1.75 x 50
M931-12050-82	M12-1.75 x 50*
M931-12055-60	M12-1.75 x 55
M931-12060-60	M12-1.75 x 60
M931-12060-82	M12-1.75 x 60*
M931-12065-60	M12-1.75 x 65
M931-12075-60	M12-1.75 x 75
M931-12080-60	M12-1.75 x 80
M931-12090-60	M12-1.75 x 90
M931-12100-60	M12-1.75 x 100
M931-12110-60	M12-1.75 x 110

Part No. Dimensions Hex Head Bolts (Partial Thread), continued

M960-16090-60	M16-1.50 x 90
M931-16090-60	M16-2.00 x 90
M931-16100-60	M16-2.00 x 100
M931-16100-82	M16-2.00 x 100*
M931-16120-60	M16-2.00 x 120
M931-16150-60	M16-2.00 x 150
M931-20065-60	M20-2.50 x 65
M931-20090-60	M20-2.50 x 90
M931-20100-60	M20-2.50 x 100
M931-20120-60	M20-2.50 x 120
M931-20140-60	M20-2.50 x 140
M931-20160-60	M20-2.50 x 160
M931-22090-60	M22-2.50 x 90
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
M931-24200-60	M24-3.00 x 200

Hex Head Bolts (Full Thread)

M933-04006-60	M4-0.70 x 6
M933-05030-60	M5-0.80 x 30
M933-05035-60	M5-0.80 x 35
M933-05050-60	M5-0.80 x 50
M933-06010-60	M6-1.00 x 10
M933-06012-60	M6-1.00 x 12
M933-06014-60	M6-1.00 x 14
M933-06016-60	M6-1.00 x 16
M933-06020-60	M6-1.00 x 20
M933-06025-60	M6-1.00 x 25
M933-06030-60	M6-1.00 x 30
M933-06040-60	M6-1.00 x 40
M933-06050-60	M6-1.00 x 50
M933-07025-60	M7-1.00 x 25
M933-08010-60	M8-1.25 x 10
M933-08012-60	M8-1.25 x 12
M933-08016-60	M8-1.25 x 16
M933-08020-60	M8-1.25 x 20
M933-08025-60	M8-1.25 x 25
M933-08030-60	M8-1.25 x 30
M933-08030-82	M8-1.25 x 30*
M933-10012-60	M10-1.50 x 12
M961-10020-60	M10-1.25 x 20
M933-10020-60	M10-1.50 x 20
M933-10025-60	M10-1.50 x 25
M961-10025-60	M10-1.25 x 25
M933-10025-82	M10-1.50 x 25*
M961-10030-60	M10-1.25 x 30
M933-10030-60	M10-1.50 x 30
M933-10030-82	M10-1.50 x 30*
M961-10035-60	M10-1.25 x 35
M933-10035-60	M10-1.50 x 35
M933-10035-82	M10-1.50 x 35*
M961-10040-60	M10-1.25 x 40

Part No. Dimensions Hex Head Bolts (Full Thread), continued

M933-12016-60	M12-1.75 x 16
M933-12020-60	M12-1.75 x 20
M961-12020-60F	M12-1.50 x 20
M933-12025-60	M12-1.75 x 25
M933-12025-82	M12-1.75 x 25*
M961-12030-60	M12-1.25 x 30
M933-12030-82	M12-1.75 x 30*
M961-12030-82F	M12-1.50 x 30*
M933-12030-60	M12-1.75 x 30
M933-12035-60	M12-1.75 x 35
M961-12040-82	M12-1.25 x 40*
M933-12040-60	M12-1.75 x 40
M933-12040-82	M12-1.75 x 40*
M961-14025-60	M14-1.50 x 25
M933-14025-60	M14-2.00 x 25
M961-14050-82	M14-1.50 x 50*
M961-16025-60	M16-1.50 x 25
M933-16025-60	M16-2.00 x 25
M961-16030-82	M16-1.50 x 30*
M933-16030-82	M16-2.00 x 30*
M933-16035-60	M16-2.00 x 35
M961-16040-60	M16-1.50 x 40
M933-16040-60	M16-2.00 x 40
M961-16045-82	M16-1.50 x 45*
M933-16045-82	M16-2.00 x 45*
M933-16050-60	M16-2.00 x 50
M933-16050-82	M16-2.00 x 50*
M933-16060-60	M16-2.00 x 60
M933-16070-60	M16-2.00 x 70
M933-18035-60	M18-2.50 x 35
M933-18050-60	M18-2.50 x 50
M933-18060-60	M18-2.50 x 60
M933-20050-60	M20-2.50 x 50
M933-20055-60	M20-2.50 x 55
M933-24060-60	M24-3.00 x 60
M933-24065-60	M24-3.00 x 65
M933-24070-60	M24-3.00 x 70

Pan Head Machine Screws

M7985A-03010-20	M3-0.50 x 10
M7985A-03012-20	M3-0.50 x 12
M7985A-04010-20	M4-0.70 x 10
M7985A-04016-20	M4-0.70 x 16
M7985A-04020-20	M4-0.70 x 20
M7985A-04050-20	M4-0.70 x 50
M7985A-04100-20	M4-0.70 x 100
M7985A-05010-20	M5-0.80 x 10
M7985A-05012-20	M5-0.80 x 12
M7985A-05016-20	M5-0.80 x 16
M7985A-05020-20	M5-0.80 x 20
M7985A-05025-20	M5-0.80 x 25
M7985A-05030-20	M5-0.80 x 30
M7985A-05080-20	M5-0.80 x 80
M7985A-05100-20	M5-0.80 x 100
M7985A-06100-20	M6-1.00 x 100

Flat Head Machine Screws

M965A-04012-SS	M4-0.70 x 12
M965A-05012-SS	M5-0.80 x 12
M965A-05016-20	M5-0.80 x 16
M965A-06012-20	M6-1.00 x 12

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

Metric, continued

Part No.	Dimensions	Type
Hex Nuts		
M934-03-50	M3-0.50	Standard
M934-04-50	M4-0.70	Standard
M934-04-B	M4-0.70	Brass
M934-05-50	M5-0.80	Standard
M934-06-60	M6-1.00	Standard
M934-06-64	M6-1.00	Std. (green)
M6923-06-80	M6-1.00	Spiralock
M982-06-80	M6-1.00	Elastic Stop
M934-08-60	M8-1.25	Standard
M6923-08-80	M8-1.25	Spiralock
M982-08-80	M8-1.25	Elastic Stop
M934-10-60	M10-1.50	Standard
M934-10-60F	M10-1.25	Standard
M6923-10-80	M10-1.50	Spiralock
M6923-10-62	M10-1.50	Spiralock†
M982-10-80	M10-1.50	Elastic Stop
M934-12-60	M12-1.75	Standard
M934-12-60F	M12-1.25	Standard
M6923-12-80	M12-1.75	Spiralock
M982-12-80	M12-1.75	Elastic Stop
M982-14-60	M14-2.00	Elastic Stop
M6923-16-80	M16-2.00	Spiralock
M982-16-80	M16-2.00	Elastic Stop
M934-18-80	M18-2.5	Standard
M982-18-60	M18-2.50	Elastic Stop
M934-20-80	M20-2.50	Standard
M982-20-80	M20-2.50	Elastic Stop
M934-22-60	M22-2.50	Standard
M934-24-80	M24-3.00	Standard
M982-24-60	M24-3.00	Elastic Stop
M934-30-80	M30-3.50	Standard

Washers

Part No.	ID	OD	Thick.	Bolt/ Screw
M125A-03-80	3.2	7.0	0.5	M3
M125A-04-80	4.3	9.0	0.8	M4
M125A-05-80	5.3	10.0	1.0	M5
M125A-06-80	6.4	12.0	1.6	M6
M125A-08-80	8.4	16.0	1.6	M8
M125A-10-80	10.5	20.0	2.0	M10
M125A-12-80	13.0	24.0	2.5	M12
M125A-14-80	15.0	28.0	2.5	M14
M125A-16-80	17.0	30.0	3.0	M16
M125A-18-80	19.0	34.0	3.0	M18
M125A-20-80	21.0	37.0	3.0	M20
M125A-24-80	25.0	44.0	4.0	M24

† This metric hex nut's hardness is grade 8.

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