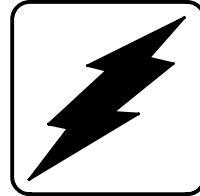


# Service Parts

## Generator Set Controllers



Model:

# Decision-Maker<sup>®</sup> 550 Controller

Junction Box Panel-Mounted

**KOHLER**<sup>®</sup>  
POWER SYSTEMS

**ISO 9001**  
**KOHLER**  
POWER SYSTEMS  
NATIONALLY REGISTERED

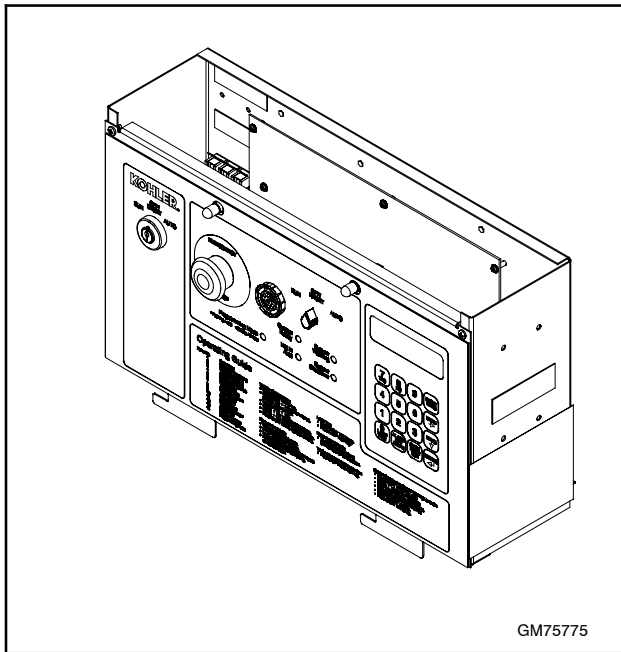
TP-6780 5/12b

# Table of Contents

Table of Contents .....	2
Section 1 Introduction .....	3
Numbering System Significance .....	3
How to Find Part Numbers .....	3
Hardware References .....	3
Section 2: Controller Module Parts, 20-150 kW .....	4
4PX/4QX Alternators (GM77388-, GM77543-, GM80190-) .....	4
Section 3: Controller Module Parts, 180 kW .....	6
4M, 1 Phase Alternators (GM78707-) .....	6
Section 4: Controller Module Parts, 230-300 kW .....	8
4UA Alternators (GM75789-) .....	8
Section 5: Controller Module Parts, 350-2250 kW .....	10
GM75797- .....	10
Section 6: Controller Module Parts, 1250-2250 kW, 3300/4160V .....	12
GM80629- .....	12
Section 7: Controller Module Parts, 2500-3250 kW .....	14
Pedestal/Remote Mounted (GM81703-) .....	14
Section 8: Controller Assembly Parts .....	16
Section 9: Controller Assembly Parts (Pedestal) .....	18
Appendix A Abbreviations .....	20
Appendix B Common Hardware Application Guidelines .....	22
Appendix C General Torque Specifications .....	23
Appendix D Common Hardware Identification .....	24
Appendix E Common Hardware List .....	25
Index .....	28

# Section 1 Introduction

This manual lists service replacement parts for Decision-Maker® 550 controllers. See Figure 1 for controller identification.



**Figure 1** Decision-Maker® 550 Controller

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.

**Module Parts Lists.** Lists modules and their parts.

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

**Index.** Lists part numbers and page number of modules listed in this manual.

## Numbering System Significance

This manual uses the following numbering systems:

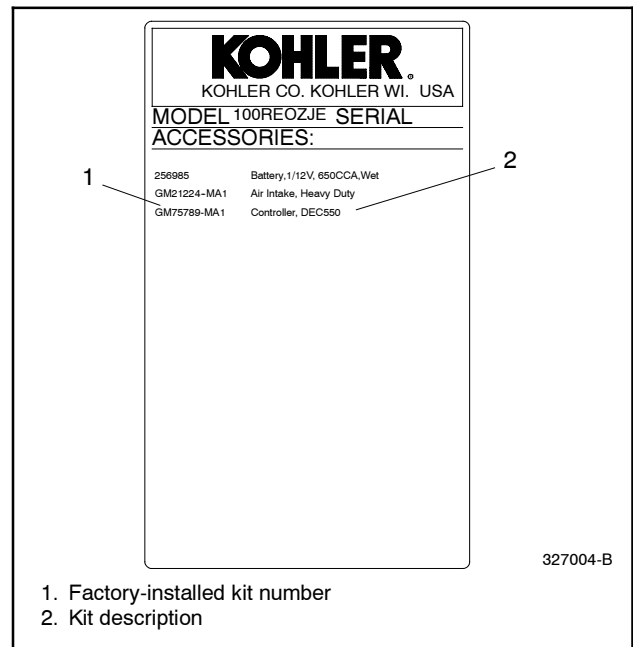
**Module Number.** A product identification number located on the generator set nameplate. Each module in this manual performs the same function with different parts lists. For example, a 12 volt controller and a 24 volt controller both perform the same function; however, with different parts. Each difference requires a module number.

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

## How to Find Part Numbers

The controller module contains the controller assembly, controller mounting hardware, transformers, wiring harnesses, and other related parts. Follow the steps below to identify controller group service part numbers.

1. Locate the generator set nameplate listing accessories to **identify an optional installed controller module number**. On some models this nameplate is mounted inside the generator junction box. See Figure 2 for an example of the nameplate.
2. **Use the Index at the back of the manual** to locate the module identified in step 1.
3. **Find the part on the illustration** and note the item number of the part or **find the part description in the parts list**.



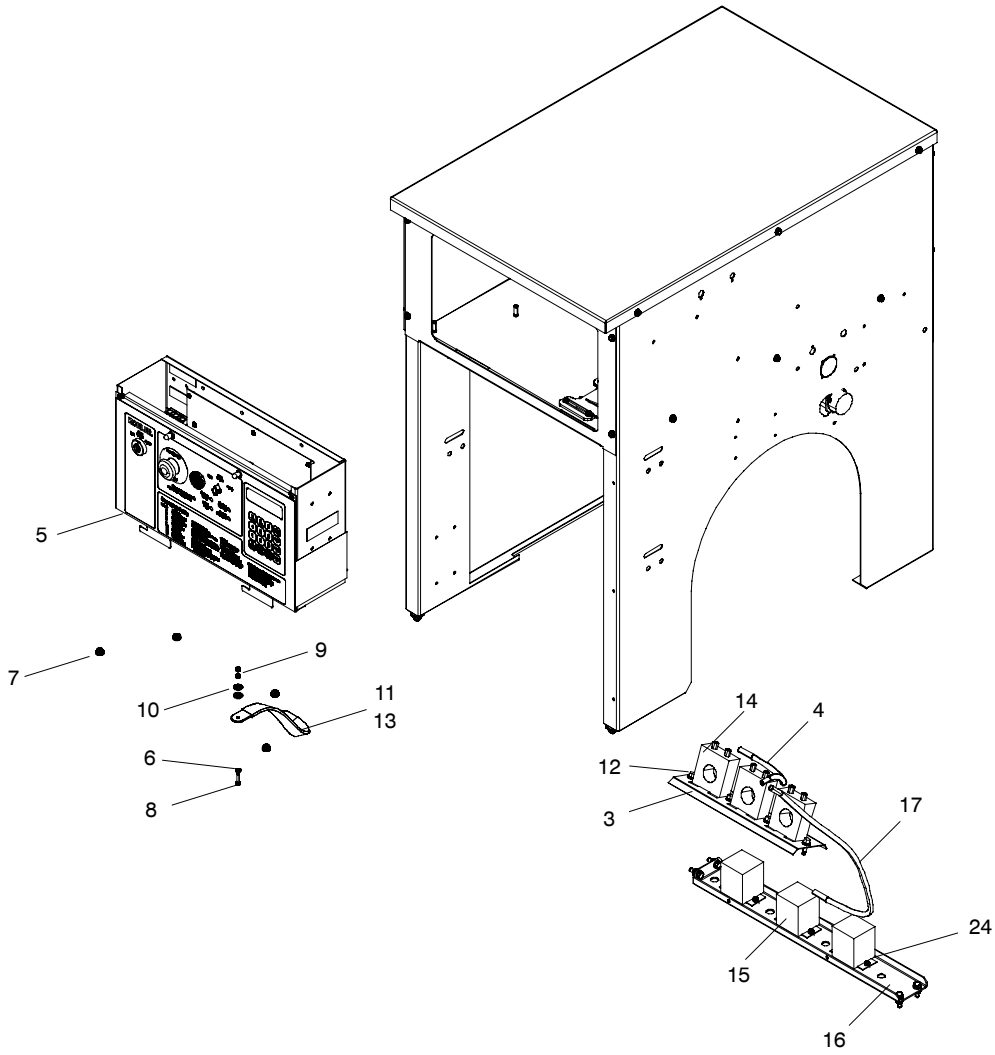
**Figure 2** Generator Accessory Nameplate

## Hardware References

Many common hardware items do not appear in parts manuals. 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.

# Section 2: Controller Module Parts, 20-150 kW

4PX/4QX Alternators (GM77388-, GM77543-, GM80190-)



GM77388\_C

## Section 2: Controller Module Parts, 20-150 kW

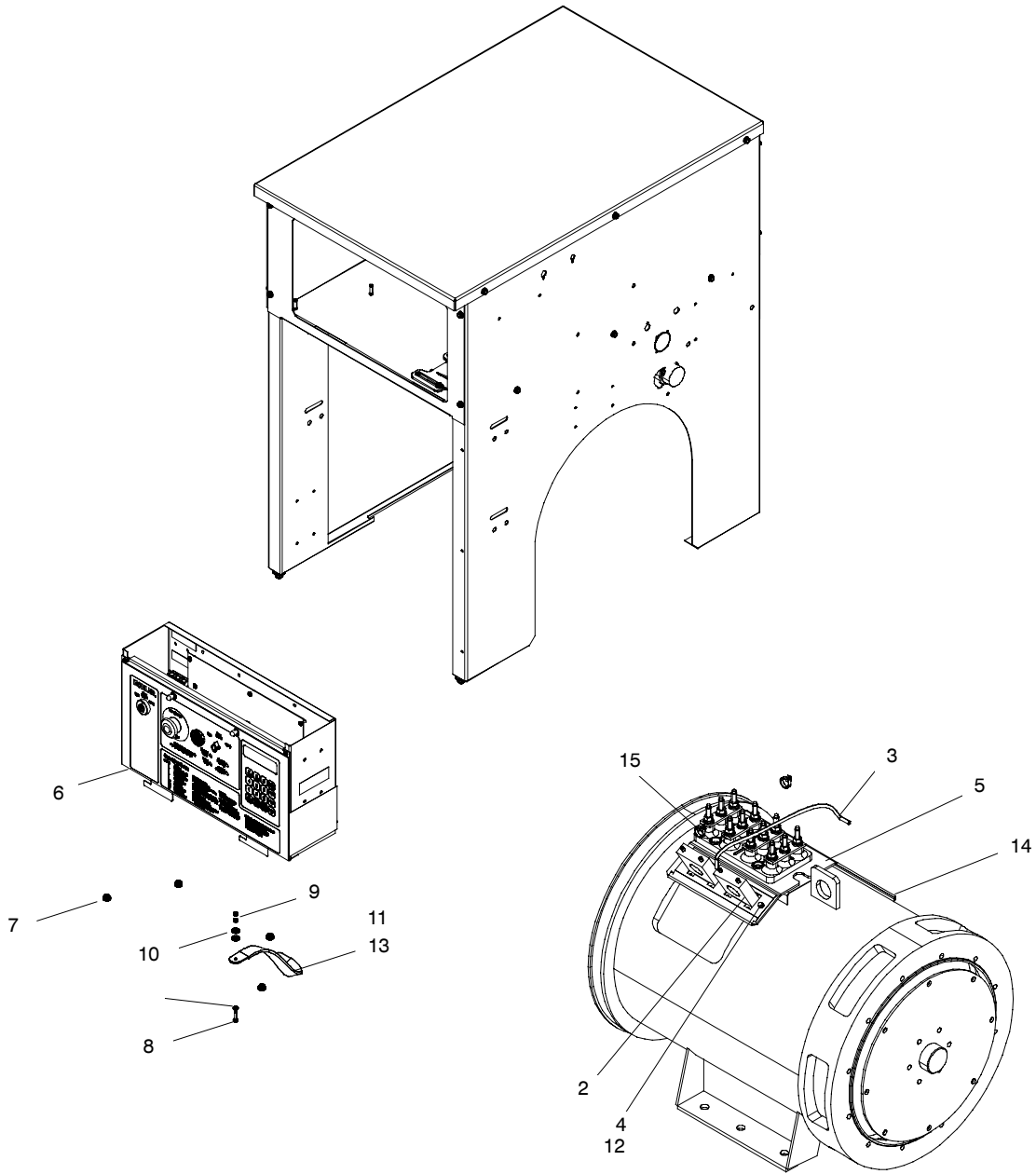
Kit No.	Part Number						
	Item 3 Bracket, CT mounting	Item 5 Controller Assy.	Item 14 Current Transformer	Item 15 Transformer, Potential	Item 16 Bracket, PT mounting	Item 17 Harness, wiring	Item 24 Spacer
GM77388-MA1	276417	GM75775-3*	GM16248 (3)	258990 (3)	GM58692	GM59009	X-400-145 (6)
GM77388-MA2	276417	GM75775-3*	GM16249 (3)	258990 (3)	GM58692	GM59009	X-400-145 (6)
GM77388-MA3	276417	GM75775-3*	GM16251 (3)	-	-	-	-
GM77388-MA4	276417	GM75775-3*	GM16252 (2)	-	-	-	-
GM77388-MA5	276417	GM75775-3*	GM16252 (3)	-	-	-	-
GM77388-MA6	276417	GM75775-3*	GM16254 (2)	-	-	-	-
GM77388-MA7	276417	GM75775-3*	GM16254 (3)	-	-	-	-
GM77388-MA8	276417	GM75775-3*	GM16255 (2)	-	-	-	-
GM77388-MA9	276417	GM75775-3*	GM16255 (3)	-	-	-	-
GM77543-MA1	276417	GM75775-3*	GM16252 (3)	258990 (3)	GM35175	GM59010	X-400-145 (6)
GM77543-MA2	299966	GM75775-3*	GM16258 (2)	-	-	-	-
GM77543-MA3	276417	GM75775-3*	GM16257 (3)	-	-	-	-
GM77543-MA4	299966	GM75775-3*	GM16258 (3)	-	-	-	-
GM77543-MA5	299966	GM75775-3*	GM24898 (3)	-	-	-	-
GM77543-MA6	276417	GM75775-3*	GM16257 (2)	-	-	-	-
GM77543-MA7	299966	GM75775-3*	GM16259 (2)	-	-	-	-
GM80190-MA1	276417	GM75775-4*	GM16251 (3)	258990 (3)	GM35175	GM59010	X-400-145 (6)
GM80190-MA2	276417	GM75775-4*	GM16252 (3)	258990 (3)	GM35175	GM59010	X-400-145 (6)
GM80190-MA3	276417	GM75775-4*	GM16254 (3)	258990 (3)	GM35175	GM59010	X-400-145 (6)
GM80190-MA4	276417	GM75775-4*	GM16257 (2)	-	-	-	-
GM80190-MA5	299966	GM75775-4*	GM16258 (2)	-	-	-	-
GM80190-MA6	299966	GM75775-4*	GM16259 (2)	-	-	-	-
GM80190-MA7	276417	GM75775-4*	GM16257 (3)	-	-	-	-
GM80190-MA8	299966	GM75775-4*	GM16258 (3)	-	-	-	-
GM80190-MA9	299966	GM75775-4*	GM24898 (3)	-	-	-	-
GM80190-MA10	276417	GM75775-4*	GM16252 (3)	258990 (3)	GM35175	GM59009	X-400-145 (6)

\* See Controller Assembly Parts on page 16 for parts list.

Common Parts			
Item	Part Number	Description	Qty.
4	GM17424	Harness, Wiring Current Transformer	1
6	M125A-04-80	Washer, Plain	1
7	M6923-06-80	Nut, Hex 6mm	4
8	M7985A-04020-20	Screw, pan head machine	1
9	M934-04-50	Nut, Hex 4mm	2
10	X-22-50	Washer, lock, .20 ID x .595 in.OD	2
11	X-696-5	Tubing, Vinyl	1
12	X-794-1	Screw, hex wshr hd, drill 1/4-14 x 5/8	4
13	X-6046-2	Strap, ground (32 in.)	1
-	-	Panel, Controller Face (See Generator Set Parts Manual)	1
-	-	Junction Box (See Generator Set Parts Manual)	1

# Section 3: Controller Module Parts, 180 kW

4M, 1 Phase Alternators (GM78707-)



GM78707-A

## Section 3: Controller Module Parts, 180 kW

	Part Number	
	Item 2 Current Transformer	Item 5 Bracket, CT Mounting
<b>Kit No.</b>		
GM78707-MA1	GM16262 (2)	GM75520

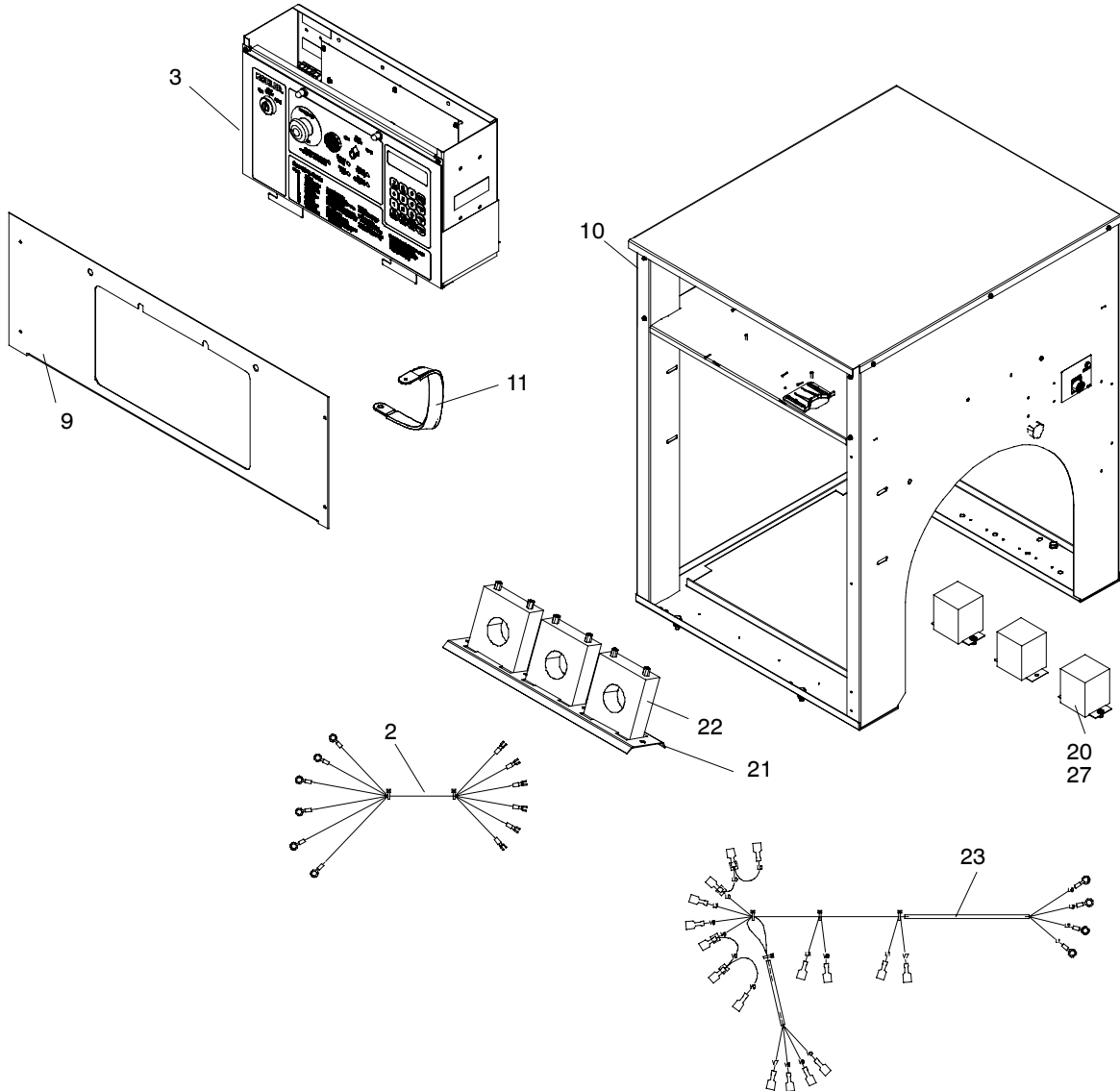
### Parts List

Item	Part Number	Description	Qty.
3	GM75506	Harness, Wiring Current Transformer	1
4	GM75519	Bracket, CT support	1
6	GM75775-4*	Controller Assy, Kohler DEC550,24V	1
7	M6923-06-80	Nut, Hex 6mm	4
8	M7985A-04020-20	Screw, pan head machine	1
9	M934-04-50	Nut, Hex 4mm	2
10	X-22-50	Washer, lock, .20 ID x .595 in.OD	2
11	X-696-5	Tubing, Vinyl	1
12	X-794-1	Screw, hex wshr hd, drill 1/4-14 x 5/8	4
13	X-6046-2	Strap, ground (32 in.)	1
14	X-6047-33	Channel, U	1
15	X-6238-4	Bolt, hex cap	4
	-	Panel, Controller Face (See Generator Set Parts Manual)	1
	-	Junction Box (See Generator Set Parts Manual)	1

\* See Controller Assembly Parts on page 16 for parts list.

# Section 4: Controller Module Parts, 230-300 kW

4UA Alternators GM75789-



GM75789\_D



## Section 4: Controller Module Parts, 230-300 kW

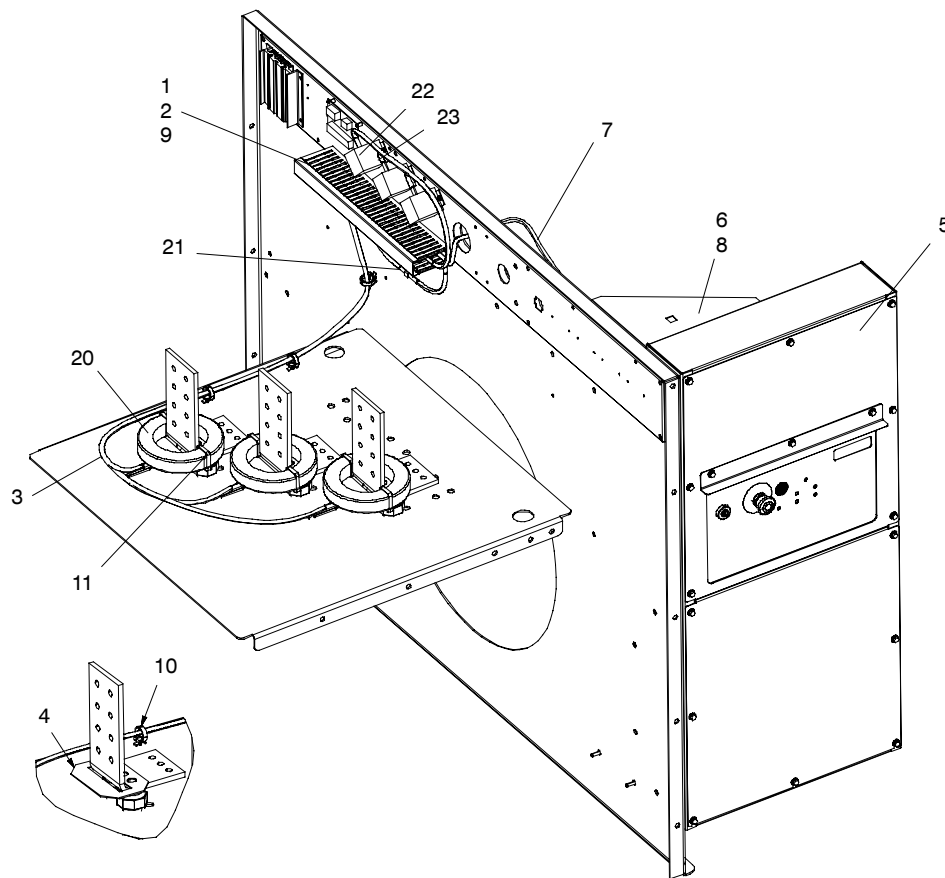
Kit No.	Part Number				
	Item 20 Transformer, Potential	Item 21 Bracket, CT Mounting	Item 22 Current Transformer	Item 23 Wiring Harness	Item 27 Spacer
GM75789-MA1	258990 (3)	276417	GM16257 (3)	GM75860	X-400-145 (6)
GM75789-MA2	-	299966	GM24898 (3)	-	-
GM75789-MA3	-	299966	GM66775 (3)	-	-
GM75789-MA4	-	299966	GM24898 (2)	-	-

Common Parts			
Item	Part Number	Description	Qty.
2	GM17424	Harness, Wiring C.T., 230-300	1
3	GM75775-4	Controller Assy., DEC550, 24V*	1
9	-	Panel, Controller Face (See Generator Set Parts Manual)	1
10	-	Junction Box (See Generator Set Parts Manual)	1
11	X-6046-2	Strap, ground (32 in.)	1

\* See Controller Assembly Parts on page 16 for parts list.

# Section 5: Controller Module Parts, 350-2250 kW

GM75797-



GM75797\_C

## Section 5: Controller Module Parts, 350-2250 kW

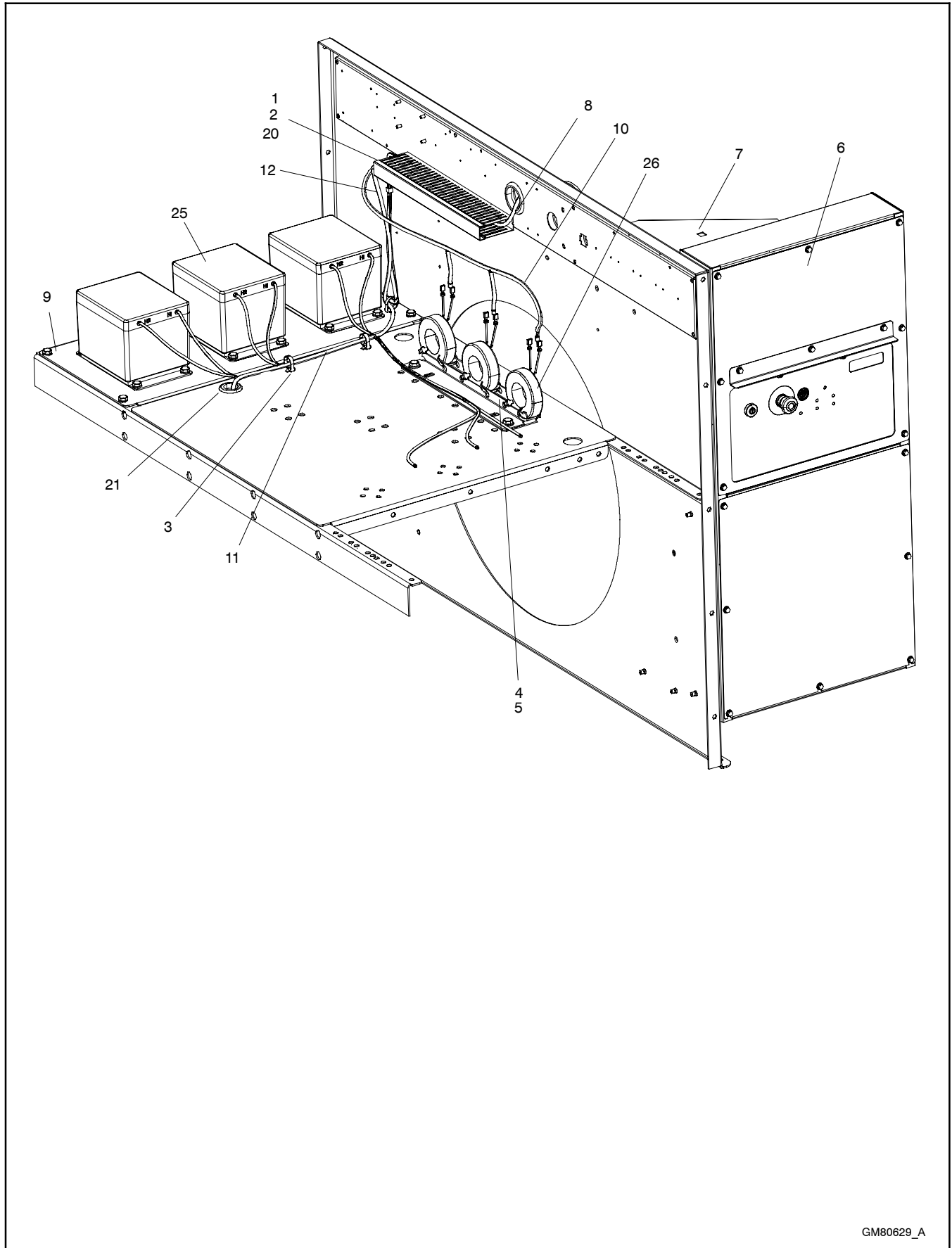
Kit No.	Part Number			
	Item 20 Current Transformer	Item 21 Harness, V-Tap	Item 22 Potential Transformer	Item 23 Screw
GM75797-MA1	GM16269	GM77974	258990	X-67-59
GM75797-MA2	GM16260	GM77974	258990	X-67-59
GM75797-MA3	GM16265	GM78060	-	-
GM75797-MA4	GM16266	GM78060	-	-
GM75797-MA5	GM16267	GM78060	-	-
GM75797-MA6	GM16268	GM78060	-	-
GM75797-MA7	GM30579	GM78060	-	-
GM75797-MA8	GM16263	GM77974	258990	X-67-59
GM75797-MA9	GM16265	GM77974	258990	X-67-59
GM75797-MA10	GM16266	GM77974	258990	X-67-59
GM75797-MA11	GM16260	GM77974	276578	X-67-59
GM75797-MA12	GM16263	GM77974	276578	X-67-59
GM75797-MA13	GM16265	GM77974	276578	X-67-59
GM75797-MA14	GM16266	GM77974	276578	X-67-59
GM75797-MA15	GM16267	GM77974	276578	X-67-59
GM75797-MA16	GM16268	GM77974	276578	X-67-59
GM75797-MA17	GM16267	GM77974	258990	X-67-59

Common Parts			
Item	Part Number	Description	Qty.
1	29758-01030	Duct, Wire	1.4
2	29759-00010	Cover, Wire Duct	1.4
3	GM11501	Harness, CT	1
4	GM75902	Support, CT	3
5	GM76122-2*	Controller Assy, DEC550	1
6	GM77907	Brace, Pedestal	2
7	GM77972	Harness, AC	1
8	M6921-06016-60	Screw, Hex Flnge M6x16mm fly thrd js500	8
9	X-67-59	Screw, hex washer, thread-forming	2
10	X-468-1	Cable Tie	3
11	X-468-4	Cable Tie	6

\* See Controller Assembly Parts on page 18 for parts list.

# Section 6: Controller Module Parts, 1250-2250 kW, 3300/4160V

GM80629-



GM80629\_A

## Section 6: Controller Module Parts, 1250-2250 kW, 3300/4160V

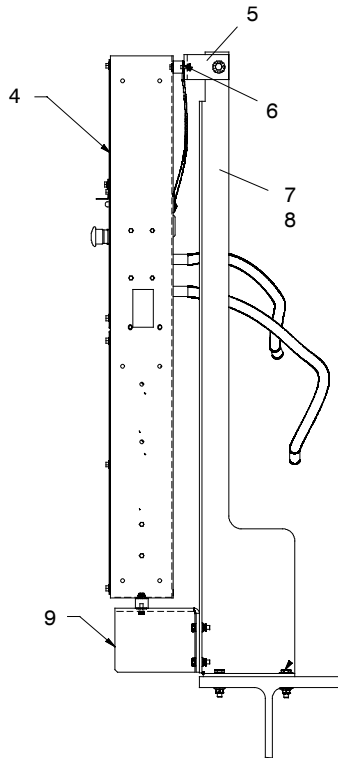
Kit No.	Part Number
	Item 26 Current transformer
GM80629-MA1	GM17249
GM80629-MA2	GM17250
GM80629-MA3	GM60264

Common Parts			
Item	Part Number	Description	Qty.
1	29758 01030	Wiring Duct, Narrow Slot 1" x 3" White	1.4
2	29759 00010	Wiring Duct Cover, 1" Wide White	1.4
3	361567	Base, tie wrap snapin	4
4	365620	Bracket, CT Mounting	1
5	365621	Bracket, CT Mounting	1
6	GM76122-2*	Controller Assy, Dec550 24V	1
7	GM77907	Bracket, Pedestal	2
8	GM77972	Harness, A/C	1
9	GM78483	Panel, PT	1
10	GM81342	Harness, Wiring Current Transformer	1
11	GM81343	Harness,PT Wiring Medium Voltage Primary	1
12	GM81344	Harness, PT Wiring Med Voltage Secondary	1
20	X-67-59	Screw, hex washer, thread-forming	2
21	X-284-2	Grommet, round	1
22	X-431-52	Terminal, fast-on, female, 14-16 AWG	6
25	X-6121-55	Transformer, 1905 V, 110 V	3

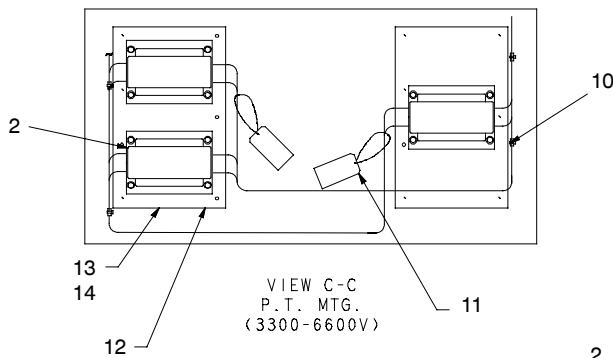
\* See Controller Assembly Parts on page 18 for parts list.

# Section 7: Controller Module Parts, 2500-3250 kW

Pedestal/Remote Mounted (GM81703-)

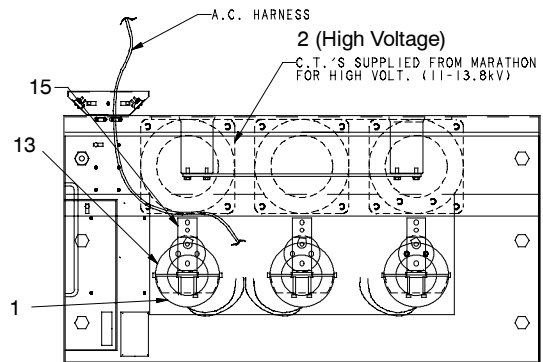


Skid Mounted Controller Shown

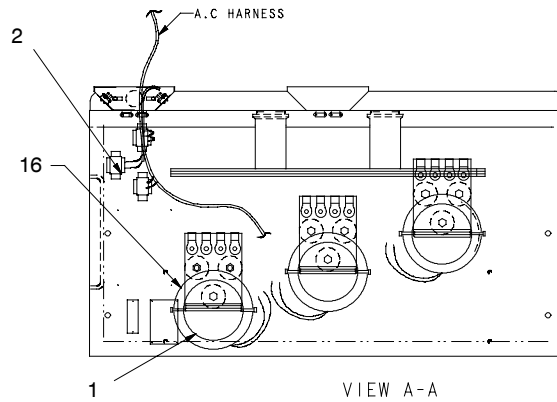


VIEW C-C  
P.T. MTG.  
(3300-6600V)

Items not shown: 3



VIEW B-B  
C.T. MTG.  
(3300-13.8kV)



GM81703\_B

## Section 7: Controller Module Parts, 2500-3250 kW

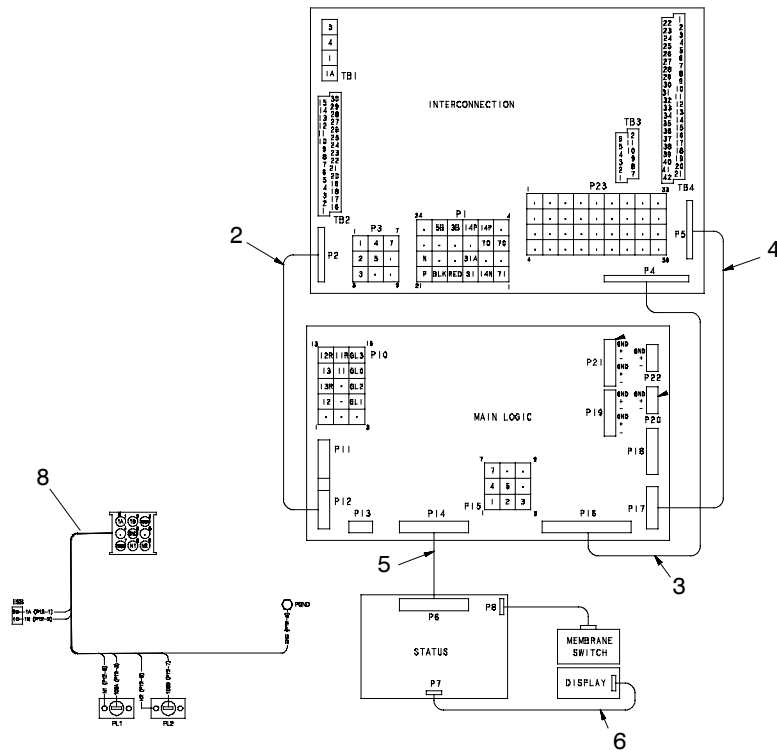
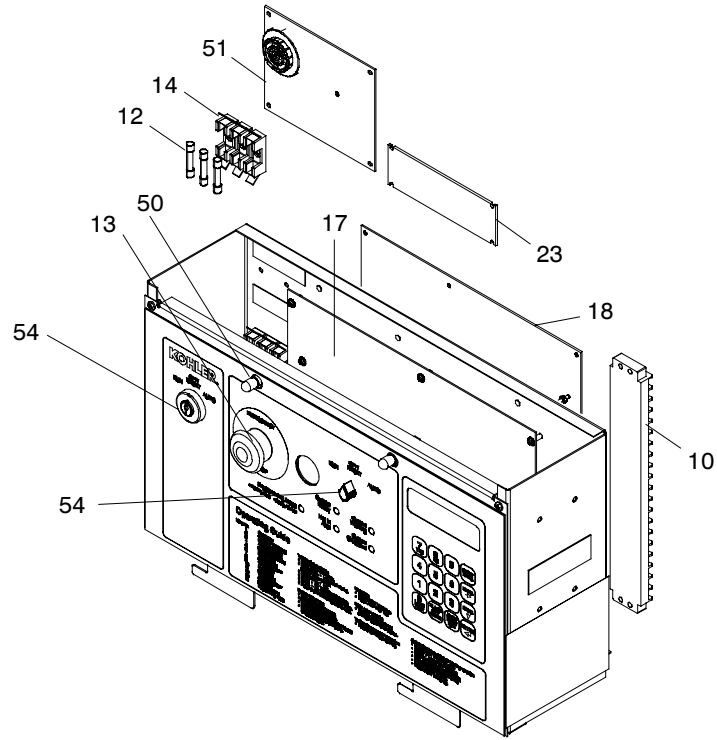
Module	Description	Item/Part Number		
		1 Current Transformer	2 Potential Transformer	3 Remote Harness
GM81703-MA1	Skid mtd, 480 V	GM40042	276578	N/A
GM81703-MA2	Skid mtd, 600 V	GM40049	258990	N/A
GM81703-MA3	Skid mtd, 4160 V, 3300 V	GM30104	X-6121-55	N/A
GM81703-MA4	Skid mtd, 11-13.80 kV	N/A	N/A	N/A
GM81703-MA5	Skid mtd, 380 V	GM47501	276578	N/A
GM81703-MA6	Skid mtd, 6600 V	GM30580	X-6121-111	N/A
GM81703-MA7	Remote mtd, 480 V	GM40042	276578	GM79929
GM81703-MA8	Remote mtd, 600 V	GM40049	258990	GM79929
GM81703-MA9	Remote mtd, 4160 V, 3300 V	GM30104	X-6121-55	GM79929
GM81703-MA10	Remote mtd, 11-13.80 kW	N/A	N/A	GM79929
GM81703-MA11	Remote mtd, 380 V	GM47501	276578	GM79929
GM81703-MA12	Remote mtd, 6600 V	GM30580	X-6121-111	GM79929
GM81703-MA13	Skid mtd, 480 V	GM40041	276578	N/A
GM81703-MA14	Remote mtd, 480 V	GM40041	276578	GM79929

### Common Parts

Item	Part Number	Description	Qty.
4	GM76122-2*	Controller Assy, Dec550 24V	1
5	GM81699	Bracket, Controller Top	1
6	GM38784-2	Vibromount, Controller	4
7	GM81697	Bracket, Controller Mtg. LS	1
8	GM81698	Bracket, Controller Mtg. RS	1
9	GM81700	Bracket, Controller, Bottom	1
10	GM40078	Harness, PT Wiring Med. Voltage Primary	1
11	GM11913	Tag, Instruction	2
12	X-400-228	Spacer, .344 ID x .625 OD x 1.141 in.	6
13	GM40028	Plate, P.T. Mounting	2
14	292834	Vibromount	8
15	GM82002	Bus, Load	3
16	GM40043	Support, CT	3

\* See Controller Assembly Parts on page 18 for parts list.

# Section 8: Controller Assembly Parts



GM75775

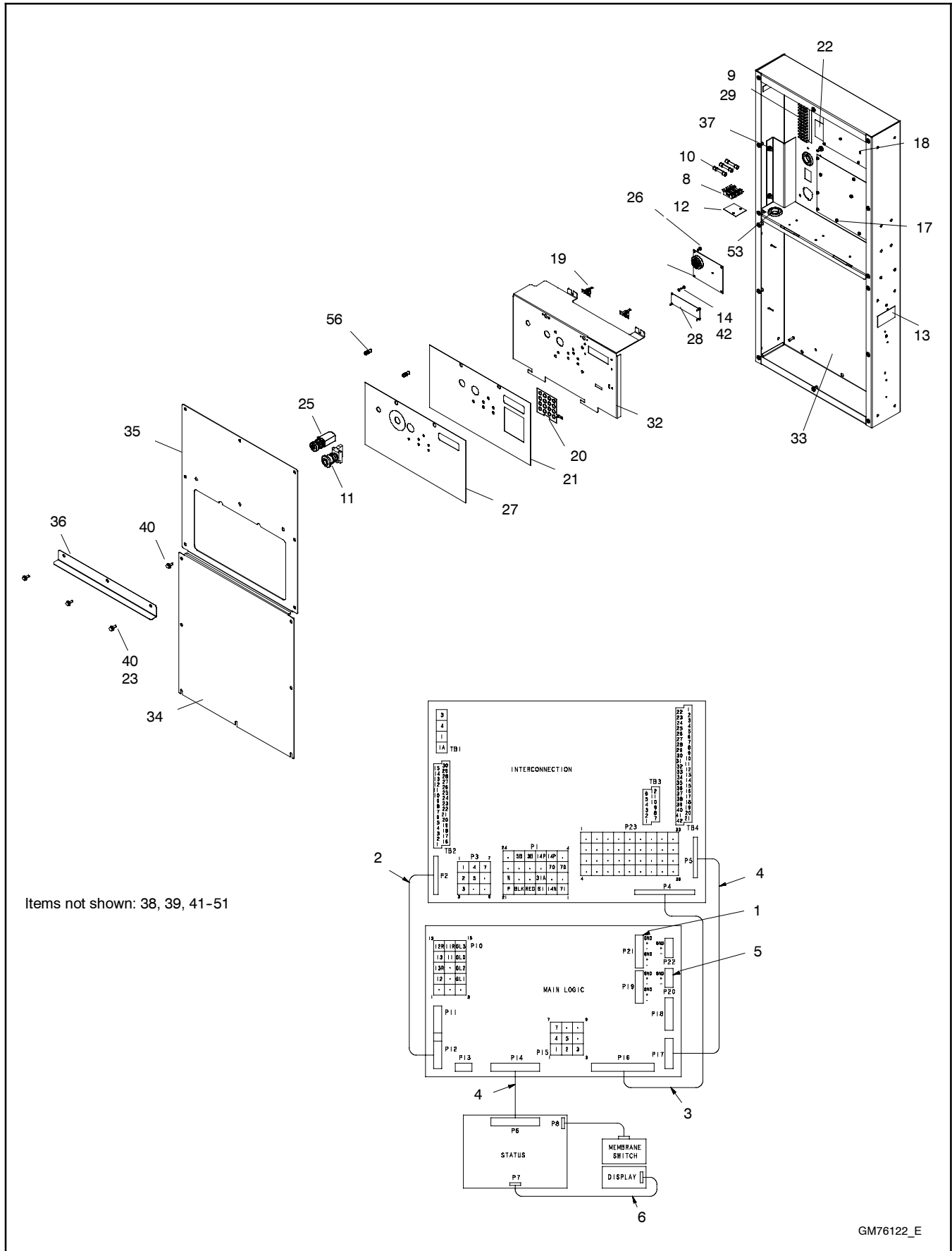


## Section 8: Controller Assembly Parts

### Controller Part Numbers

Item	Description	Part Number			
		Controller Without Keyswitch		Controller With Keyswitch	
		12 V	24 V	12 V	24 V
-	Controller assembly	GM75775-1	GM75775-2	GM75775-3	GM75775-4
2	Cable, ribbon, 24-position (P12 on main logic to P2 on interconnection)	GM10118	GM10118	GM10118	GM10118
3	Cable, ribbon, 40-position (P16 on main logic to P4 on interconnection)	GM10119	GM10119	GM10119	GM10119
4	Cable, ribbon, 34-position (P17 on main logic to P5 on interconnection)	GM10120	GM10120	GM10120	GM10120
5	Cable, ribbon, 34-position (display board to P14 on main logic board)	GM10120	GM10120	GM10120	GM10120
6	Cable, ribbon, 16-position (CN1 on display panel to display board)	GM10124	GM10124	GM10124	GM10124
8	Harness, cotroller front panel	GM78717	GM78717	GM78717	GM78717
10	Terminal block	273769	273769	273769	273769
12	Fuse, 1.5 A, 250 V (3)	291207	291207	291207	291207
13	Switch, emergency stop pushbutton	292364	292364	292364	292364
14	Holder, fuse	292821	292821	292821	292821
17	Circuit board, main logic	GM70535	GM70535	GM70535	GM70535
18	Circuit board, interconnection	B-365487	B-365487	B-365487	B-365487
23	Panel, display (kit-service only)	GM13616	GM13616	GM13616	GM13616
50	Lamp, panel (2)	255126	283420	255126	283420
51	Circuit board, display (board with alarm horn)	A-365485	A-365485	GM17398	GM17398
54	Knob, rotary switch	GM10125	GM10125	-	-
54	Switch, key	-	-	GM17397	GM17397

# Section 9: Controller Assembly Parts (Pedestal)



GM76122\_E

## Section 9: Controller Assembly Parts (Pedestal)

<b>Controller Part Numbers</b>			
Item	Part Number	Description	Qty.
	GM76122-1	Controller Assy, Dec550 12V (includes items 1-57)	1
	GM76122-2	Controller Assy, Dec550 24V (includes items 1-57)	1
1	294619	Connector, plug, 6-position	1
2	GM10118	Cable, Ribbon, 24 Position, P2-P12	1
3	GM10119	Cable, Ribbon, 40 Position, P4-P16	1
4	GM10120	Cable, Ribbon, 34 Position, P5-P17	2
5	GM10124	Cable, Ribbon, 16 Position, P7-Display	1
6	GM11496	Connector, Plug, 3-Position	1
8	225179	Strip, marker	1
9	273769	Terminal block	1
10	291207	Fuse, 1.5 A, 250 V	3
11	292364	Switch, emergency stop pushbutton	1
12	292821	Fuse holder	1
13	294520	Decal, danger, high voltage	1
14	322575	Washer, fiber, .12 ID x .25in.OD	4
17	B-361590	PCB Assy, DEC550 Main Logic	1
18	B-365487	PCB Assy., DEC550 Interconnection	1
19	GM10126	Socket, Light	2
20	GM10188	Switch, Membrane	1
21	GM10191	Spacer, Membrane Switch	1
22	GM10285	Decal	1
23	GM11040-7	Insert, Threaded (M6 x 1.0 Hex)	3
25	GM17397	Switch, Key Selector	1
26	GM17398	PCB Assy,DEC550 Display Board	1
27	GM19822	Decal, Decision-Maker 550	1
28	GM41780	Display, Vacuum Fluorescent	1
29	GM75602	Strip, Marker	1
32	GM76126	Panel, Controller	1
33	GM81354	Enclosure Assy.	1
34	GM76128	Cover, Controller Bottom	1
35	GM78102	Cover, Controller Top	1
36	GM76130	Guard, Lamp	1
37	GM76194	Cover, Wire	1
38	M125A-03-80	Washer, Plain #3 Screw Size	1
39	M125A-05-80	Washer, Plain	1
40	M6921-06016-60	Screw, Hex Flnge M6x16mm fly thrd js500	17
41	M6923-06-80	Nut, Hex 6mm	11
42	M7985A-03012-20	Screw, pan head M3 X 12	15
44	M7985A-04010-20	Screw, Pan Head Machined	12
45	M7985A-04016-20	Screw, Pan Head Machine	5
46	M7985A-05020-20	Screw, Pan Head Machine	1
47	M934-03-50	Nut, Hex 3mm	9
48	M934-05-50	Nut, Hex 5mm	1
49	X-22-12	Washer, lock, .262 ID x .743 in. OD	2
50	X-22-24	Washer, lock, .119 ID x .263 in. OD	4
51	X-22-6	Washer, lock, .146 ID x .285 in. OD	35
52	X-22-7	Washer, lock, .172 ID x .333 in. OD	17
53	X-284-3	Grommet, round	2
55	X-6046-12	Strap, Ground	1
56	255126	Lamp, 14.4 V, 1.7 W (12V controller)	2
56	283420	Lamp, 28 V, 4.8 W (24V controller)	2

# Appendix A Abbreviations

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

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

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

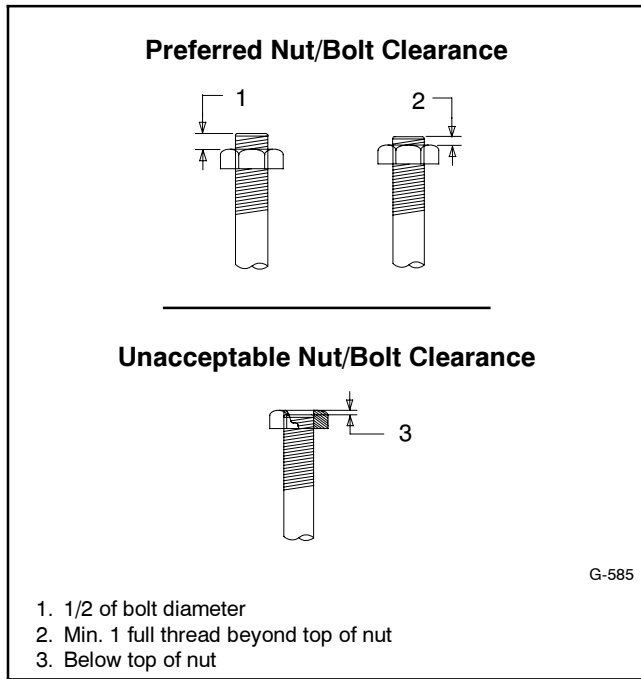
# Appendix B Common Hardware Application Guidelines

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.



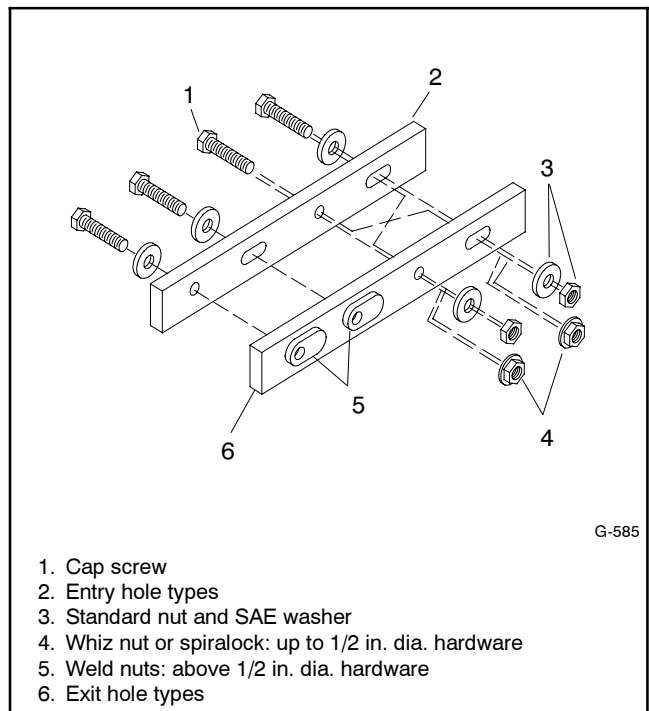
**Figure 1** Acceptable Bolt Lengths

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)	

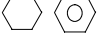




**Notes:**

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	

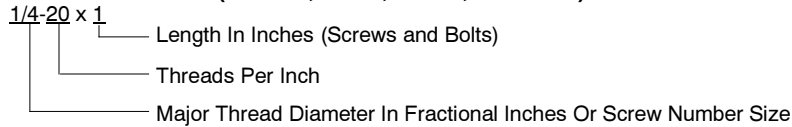
Hardness Grades	
American Standard	
Grade 2	
Grade 5	
Grade 8	
Grade 8/9 (Hex Socket Head)	
Metric	
Number stamped on hardware; 5.8 shown	

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

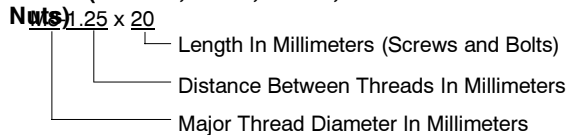
Phillips® screw is a registered trademark of Phillips Screw Company.

## Sample Dimensions

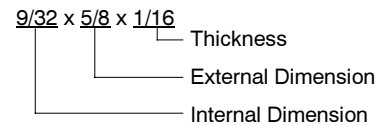
### American Standard (Screws, Bolts, Studs, and Nuts)



### 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		
<b>Hex Head Bolts (Grade 5)</b>								
X-465-17	1/4-20 x .38	X-6238-14	3/8-24 x .75	<b>Hex Nuts</b>				
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-6210-10	3/8-24	Spiralock		
X-465-25	1/4-28 x .38	X-129-15	1/2-13 x .75	X-6210-11	7/16-14	Spiralock		
X-465-20	1/4-28 x 1.00	X-129-17	1/2-13 x 1.00	X-6210-12	1/2-13	Spiralock		
		X-129-18	1/2-13 x 1.25	X-6210-15	7/16-20	Spiralock		
X-125-33	5/16-18 x .50	X-129-19	1/2-13 x 1.50	X-6210-14	1/2-20	Spiralock		
X-125-23	5/16-18 x .62	X-129-20	1/2-13 x 1.75					
X-125-3	5/16-18 x .75	X-129-21	1/2-13 x 2.00	X-85-3	5/8-11	Standard		
X-125-31	5/16-18 x .88	X-129-22	1/2-13 x 2.25	X-88-12	3/4-10	Standard		
X-125-5	5/16-18 x 1.00	X-129-23	1/2-13 x 2.50	X-89-2	1/2-20	Standard		
X-125-24	5/16-18 x 1.25	X-129-24	1/2-13 x 2.75					
X-125-34	5/16-18 x 1.50	X-129-25	1/2-13 x 3.00	<b>Washers</b>				
X-125-25	5/16-18 x 1.75	X-129-27	1/2-13 x 3.50	<b>Part No.</b>	<b>ID</b>	<b>OD</b>	<b>Thick.</b>	<b>Bolt/ Screw</b>
X-125-26	5/16-18 x 2.00	X-129-29	1/2-13 x 4.00	X-25-46	.125	.250	.022	#4
230578	5/16-18 x 2.25	X-129-30	1/2-13 x 4.50	X-25-9	.156	.375	.049	#6
X-125-29	5/16-18 x 2.50	X-463-9	1/2-13 x 5.50	X-25-48	.188	.438	.049	#8
X-125-27	5/16-18 x 2.75	X-129-44	1/2-13 x 6.00	X-25-36	.219	.500	.049	#10
X-125-28	5/16-18 x 3.00			X-25-40	.281	.625	.065	1/4
X-125-22	5/16-18 x 4.50	X-129-51	1/2-20 x .75	X-25-85	.344	.687	.065	5/16
X-125-32	5/16-18 x 5.00	X-129-45	1/2-20 x 1.25	X-25-37	.406	.812	.065	3/8
X-125-35	5/16-18 x 5.50	X-129-52	1/2-20 x 1.50	X-25-34	.469	.922	.065	7/16
X-125-36	5/16-18 x 6.00			X-25-26	.531	1.062	.095	1/2
X-125-40	5/16-18 x 6.50	X-6021-3	5/8-11 x 1.00	X-25-15	.656	1.312	.095	5/8
		X-6021-4	5/8-11 x 1.25	X-25-29	.812	1.469	.134	3/4
X-125-43	5/16-24 x 1.75	X-6021-2	5/8-11 x 1.50	X-25-127	1.062	2.000	.134	1
X-125-44	5/16-24 x 2.50	X-6021-1	5/8-11 x 1.75					
X-125-30	5/16-24 x .75	273049	5/8-11 x 2.00					
X-125-39	5/16-24 x 2.00	X-6021-5	5/8-11 x 2.25					
X-125-38	5/16-24 x 2.75	X-6021-6	5/8-11 x 2.50					
		X-6021-7	5/8-11 x 2.75					
X-6238-2	3/8-16 x .62	X-6021-12	5/8-11 x 3.75					
X-6238-10	3/8-16 x .75	X-6021-11	5/8-11 x 4.50					
X-6238-3	3/8-16 x .88	X-6021-10	5/8-11 x 6.00					
X-6238-11	3/8-16 x 1.00							
X-6238-4	3/8-16 x 1.25	X-6021-9	5/8-18 x 2.50					
X-6238-5	3/8-16 x 1.50							
X-6238-1	3/8-16 x 1.75	X-6239-1	3/4-10 x 1.00					
X-6238-6	3/8-16 x 2.00	X-6239-8	3/4-10 x 1.25					
X-6238-17	3/8-16 x 2.25	X-6239-2	3/4-10 x 1.50					
X-6238-7	3/8-16 x 2.50	X-6239-3	3/4-10 x 2.00					
X-6238-8	3/8-16 x 2.75	X-6239-4	3/4-10 x 2.50					
X-6238-9	3/8-16 x 3.00	X-6239-5	3/4-10 x 3.00					
X-6238-19	3/8-16 x 3.25	X-6239-6	3/4-10 x 3.50					
X-6238-12	3/8-16 x 3.50							
X-6238-20	3/8-16 x 3.75	X-792-1	1-8 x 2.25					
X-6238-13	3/8-16 x 4.50	X-792-5	1-8 x 3.00					
X-6238-18	3/8-16 x 5.50	X-792-8	1-8 x 5.00					
X-6238-25	3/8-16 x 6.50							

## Metric

Hex head bolts are hardness grade 8.8 unless noted.

<b>Part No.</b>	<b>Dimensions</b>	<b>Part No.</b>	<b>Dimensions</b>	<b>Part No.</b>	<b>Dimensions</b>
<b>Hex Head Bolts (Partial Thread)</b>		<b>Hex Head Bolts (Partial Thread), continued</b>		<b>Hex Head Bolts (Full Thread), continued</b>	
M931-05055-60	M5-0.80 x 55	M960-16090-60	M16-1.50 x 90	M933-12016-60	M12-1.75 x 16
M931-06040-60	M6-1.00 x 40	M931-16090-60	M16-2.00 x 90	M933-12020-60	M12-1.75 x 20
M931-06055-60	M6-1.00 x 55	M931-16100-60	M16-2.00 x 100	M961-12020-60F	M12-1.50 x 20
M931-06060-60	M6-1.00 x 60	M931-16100-82	M16-2.00 x 100*	M933-12025-60	M12-1.75 x 25
M931-06070-60	M6-1.00 x 70	M931-16120-60	M16-2.00 x 120	M933-12025-82	M12-1.75 x 25*
M931-06070-SS	M6-1.00 x 70	M931-16150-60	M16-2.00 x 150	M961-12030-60	M12-1.25 x 30
M931-06075-60	M6-1.00 x 75			M933-12030-82	M12-1.75 x 30*
M931-06090-60	M6-1.00 x 90	M931-20065-60	M20-2.50 x 65	M961-12030-82F	M12-1.50 x 30*
M931-06145-60	M6-1.00 x 145	M931-20090-60	M20-2.50 x 90	M933-12030-60	M12-1.75 x 30
M931-06150-60	M6-1.00 x 150	M931-20100-60	M20-2.50 x 100	M933-12035-60	M12-1.75 x 35
		M931-20120-60	M20-2.50 x 120	M961-12040-82	M12-1.25 x 40*
M931-08035-60	M8-1.25 x 35	M931-20140-60	M20-2.50 x 140	M933-12040-60	M12-1.75 x 40
M931-08040-60	M8-1.25 x 40	M931-20160-60	M20-2.50 x 160	M933-12040-82	M12-1.75 x 40*
M931-08045-60	M8-1.25 x 45				
M931-08050-60	M8-1.25 x 50	M931-22090-60	M22-2.50 x 90	M961-14025-60	M14-1.50 x 25
M931-08055-60	M8-1.25 x 55	M931-22120-60	M22-2.50 x 120	M933-14025-60	M14-2.00 x 25
M931-08055-82	M8-1.25 x 55*	M931-22160-60	M22-2.50 x 160	M961-14050-82	M14-1.50 x 50*
M931-08060-60	M8-1.25 x 60				
M931-08070-60	M8-1.25 x 70	M931-24090-60	M24-3.00 x 90	M961-16025-60	M16-1.50 x 25
M931-08070-82	M8-1.25 x 70*	M931-24120-60	M24-3.00 x 120	M933-16025-60	M16-2.00 x 25
M931-08075-60	M8-1.25 x 75	M931-24160-60	M24-3.00 x 160	M961-16030-82	M16-1.50 x 30*
M931-08080-60	M8-1.25 x 80	M931-24200-60	M24-3.00 x 200	M933-16030-82	M16-2.00 x 30*
M931-08090-60	M8-1.25 x 90			M933-16035-60	M16-2.00 x 35
M931-08095-60	M8-1.25 x 95	<b>Hex Head Bolts (Full Thread)</b>		M961-16040-60	M16-1.50 x 40
M931-08100-60	M8-1.25 x 100	M933-04006-60	M4-0.70 x 6	M933-16040-60	M16-2.00 x 40
M931-08110-60	M8-1.25 x 110			M961-16045-82	M16-1.50 x 45*
M931-08120-60	M8-1.25 x 120	M933-05030-60	M5-0.80 x 30	M933-16045-82	M16-2.00 x 45*
M931-08130-60	M8-1.25 x 130	M933-05035-60	M5-0.80 x 35	M933-16050-60	M16-2.00 x 50
M931-08140-60	M8-1.25 x 140	M933-05050-60	M5-0.80 x 50	M933-16050-82	M16-2.00 x 50*
M931-08150-60	M8-1.25 x 150			M933-16060-60	M16-2.00 x 60
M931-08200-60	M8-1.25 x 200	M933-06010-60	M6-1.00 x 10	M933-16070-60	M16-2.00 x 70
		M933-06012-60	M6-1.00 x 12		
M931-10040-82	M10-1.25 x 40*	M933-06014-60	M6-1.00 x 14	M933-18035-60	M18-2.50 x 35
M931-10040-60	M10-1.50 x 40	M933-06016-60	M6-1.00 x 16	M933-18050-60	M18-2.50 x 50
M931-10045-60	M10-1.50 x 45	M933-06020-60	M6-1.00 x 20	M933-18060-60	M18-2.50 x 60
M931-10050-60	M10-1.50 x 50	M933-06025-60	M6-1.00 x 25		
M931-10050-82	M10-1.25 x 50*	M933-06030-60	M6-1.00 x 30	M933-20050-60	M20-2.50 x 50
M931-10055-60	M10-1.50 x 55	M933-06040-60	M6-1.00 x 40	M933-20055-60	M20-2.50 x 55
M931-10060-60	M10-1.50 x 60	M933-06050-60	M6-1.00 x 50		
M931-10065-60	M10-1.50 x 65			M933-24060-60	M24-3.00 x 60
M931-10070-60	M10-1.50 x 70	M933-07025-60	M7-1.00 x 25	M933-24065-60	M24-3.00 x 65
M931-10080-60	M10-1.50 x 80			M933-24070-60	M24-3.00 x 70
M931-10080-82	M10-1.25 x 80*	M933-08010-60	M8-1.25 x 10		
M931-10090-60	M10-1.50 x 90	M933-08012-60	M8-1.25 x 12	<b>Pan Head Machine Screws</b>	
M931-10090-82	M10-1.50 x 90*	M933-08016-60	M8-1.25 x 16	M7985A-03010-20	M3-0.50 x 10
M931-10100-60	M10-1.50 x 100	M933-08020-60	M8-1.25 x 20	M7985A-03012-20	M3-0.50 x 12
M931-10110-60	M10-1.50 x 110	M933-08025-60	M8-1.25 x 25		
M931-10120-60	M10-1.50 x 120	M933-08030-60	M8-1.25 x 30	M7985A-04010-20	M4-0.70 x 10
M931-10130-60	M10-1.50 x 130	M933-08030-82	M8-1.25 x 30*	M7985A-04016-20	M4-0.70 x 16
M931-10140-60	M10-1.50 x 140			M7985A-04020-20	M4-0.70 x 20
M931-10180-60	M10-1.50 x 180	M933-10012-60	M10-1.50 x 12	M7985A-04050-20	M4-0.70 x 50
M931-10235-60	M10-1.50 x 235	M961-10020-60	M10-1.25 x 20	M7985A-04100-20	M4-0.70 x 100
M931-10260-60	M10-1.50 x 260	M933-10020-60	M10-1.50 x 20		
M960-10330-60	M10-1.25 x 330	M933-10025-60	M10-1.50 x 25	M7985A-05010-20	M5-0.80 x 10
		M961-10025-60	M10-1.25 x 25	M7985A-05012-20	M5-0.80 x 12
M931-12045-60	M12-1.75 x 45	M933-10025-82	M10-1.50 x 25*	M7985A-05016-20	M5-0.80 x 16
M960-12050-60	M12-1.25 x 50	M961-10030-60	M10-1.25 x 30	M7985A-05020-20	M5-0.80 x 20
M960-12050-82	M12-1.25 x 50*	M933-10030-60	M10-1.50 x 30	M7985A-05025-20	M5-0.80 x 25
M931-12050-60	M12-1.75 x 50	M933-10030-82	M10-1.50 x 30*	M7985A-05030-20	M5-0.80 x 30
M931-12050-82	M12-1.75 x 50*	M961-10035-60	M10-1.25 x 35	M7985A-05080-20	M5-0.80 x 80
M931-12055-60	M12-1.75 x 55	M933-10035-60	M10-1.50 x 35	M7985A-05100-20	M5-0.80 x 100
M931-12060-60	M12-1.75 x 60	M933-10035-82	M10-1.50 x 35*		
M931-12060-82	M12-1.75 x 60*	M961-10040-60	M10-1.25 x 40	M7985A-06100-20	M6-1.00 x 100
M931-12065-60	M12-1.75 x 65				
M931-12075-60	M12-1.75 x 75			<b>Flat Head Machine Screws</b>	
M931-12080-60	M12-1.75 x 80			M965A-04012-SS	M4-0.70 x 12
M931-12090-60	M12-1.75 x 90				
M931-12100-60	M12-1.75 x 100			M965A-05012-SS	M5-0.80 x 12
M931-12110-60	M12-1.75 x 110			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
<b>Hex Nuts</b>		
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	Spirallock
M982-06-80	M6-1.00	Elastic Stop
M934-08-60	M8-1.25	Standard
M6923-08-80	M8-1.25	Spirallock
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	Spirallock
M6923-10-62	M10-1.50	Spirallock†
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	Spirallock
M982-12-80	M12-1.75	Elastic Stop
M982-14-60	M14-2.00	Elastic Stop
M6923-16-80	M16-2.00	Spirallock
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.

# Index

Listed below are part numbers and page numbers of modules listed in this manual. Italicized numbers refer to the page numbers on which modules appear.

GM75789-MA1, <i>9</i>	GM75797-MA6, <i>11</i>	GM77543-MA5, <i>5</i>	GM81703-MA10, <i>15</i>
GM75789-MA2, <i>9</i>	GM75797-MA7, <i>11</i>	GM77543-MA6, <i>5</i>	GM81703-MA11, <i>15</i>
GM75789-MA3, <i>9</i>	GM75797-MA8, <i>11</i>	GM78707-MA1, <i>7</i>	GM81703-MA12, <i>15</i>
GM75789-MA4, <i>9</i>	GM75797-MA9, <i>11</i>	GM80190-MA1, <i>5</i>	GM81703-MA13, <i>15</i>
GM75797-MA1, <i>11</i>	GM77388-MA1, <i>5</i>	GM80190-MA10, <i>5</i>	GM81703-MA14, <i>15</i>
GM75797-MA10, <i>11</i>	GM77388-MA2, <i>5</i>	GM80190-MA2, <i>5</i>	GM81703-MA2, <i>15</i>
GM75797-MA11, <i>11</i>	GM77388-MA3, <i>5</i>	GM80190-MA3, <i>5</i>	GM81703-MA3, <i>15</i>
GM75797-MA12, <i>11</i>	GM77388-MA4, <i>5</i>	GM80190-MA4, <i>5</i>	GM81703-MA4, <i>15</i>
GM75797-MA13, <i>11</i>	GM77388-MA5, <i>5</i>	GM80190-MA5, <i>5</i>	GM81703-MA5, <i>15</i>
GM75797-MA14, <i>11</i>	GM77388-MA6, <i>5</i>	GM80190-MA6, <i>5</i>	GM81703-MA6, <i>15</i>
GM75797-MA15, <i>11</i>	GM77388-MA7, <i>5</i>	GM80190-MA7, <i>5</i>	GM81703-MA7, <i>15</i>
GM75797-MA16, <i>11</i>	GM77388-MA8, <i>5</i>	GM80190-MA8, <i>5</i>	GM81703-MA8, <i>15</i>
GM75797-MA17, <i>11</i>	GM77388-MA9, <i>5</i>	GM80190-MA9, <i>5</i>	GM81703-MA9, <i>15</i>
GM75797-MA2, <i>11</i>	GM77543-MA1, <i>5</i>	GM80629-MA1, <i>13</i>	
GM75797-MA3, <i>11</i>	GM77543-MA2, <i>5</i>	GM80629-MA2, <i>13</i>	
GM75797-MA4, <i>11</i>	GM77543-MA3, <i>5</i>	GM80629-MA3, <i>13</i>	
GM75797-MA5, <i>11</i>	GM77543-MA4, <i>5</i>	GM81703-MA1, <i>15</i>	







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