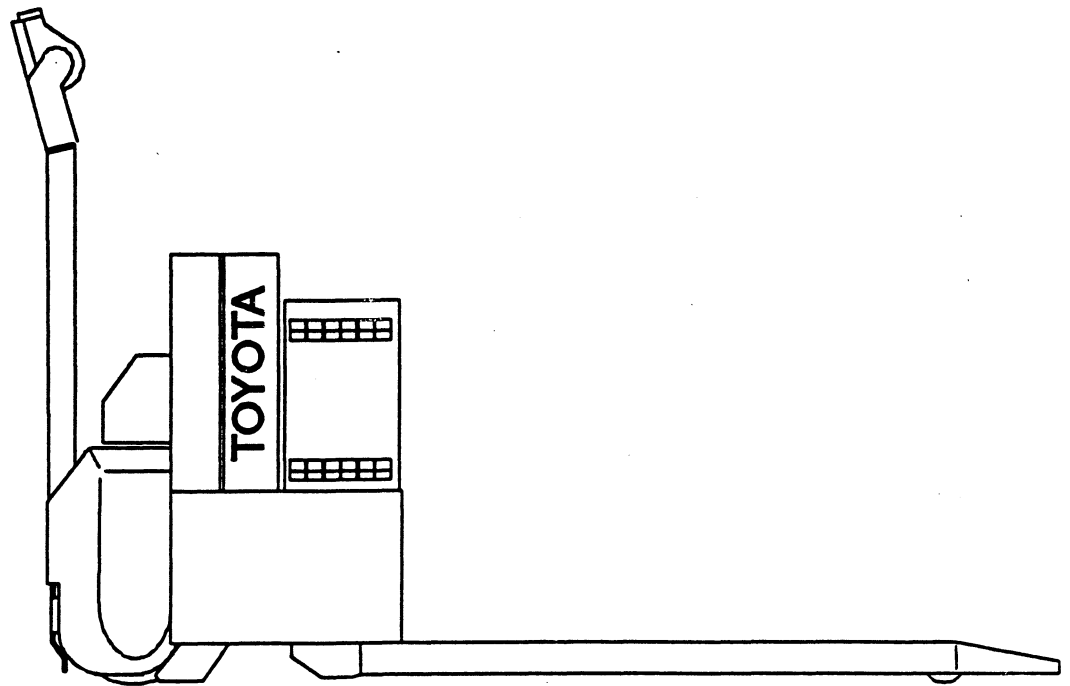


---

# Service and Parts Manual

## TOYOTA



---

**Model**  
**6HBW20**

**Serial No.**  
**10011 and Up**

**Date: 10/01/95**

---

<b>Table of Contents</b>	<b>Page</b>
General Information . . . . .	1
General Maintenance Instructions . . . . .	1
Maintenance Practices . . . . .	1
Specifications . . . . .	<b>2</b>
Hydraulic . . . . .	2
Component Identification . . . . .	3
Standard Torque Data For Bolts . . . . .	6
Conversion Table . . . . .	7
Decals . . . . .	8
Decimal Equivalent Chart . . . . .	10
Planned Maintenance (PM) . . . . .	11
Inspection Form . . . . .	11
FM Schedule and Procedure . . . . .	11
Daily Inspection . . . . .	11
Monthly FM Service (or 100 Hrs.) . . . . .	12
Semiannual Service (or 500 Hrs.) . . . . .	12
Annual FM Service (or 1000 Hrs.) . . . . .	12
Lubrication Points . . . . .	13
Fill Points . . . . .	14
PM Chart . . . . .	15
Lubrication Equivalency Chart . . . . .	16
Scheduled Maintenance . . . . .	17
Batteries . . . . .	17
Battery Cleaning . . . . .	<b>17</b>
Electrolyte Process . . . . .	17
Battery Cleaning Procedure . . . . .	17
Battery Electrical Leakage To Frame Test . . . . .	18
Battery Charging . . . . .	18
Charging Process . . . . .	18
Hydrometer Use . . . . .	19
Procedure . . . . .	19
Voltage Check . . . . .	19
Adding Water To Battery . . . . .	20
Guidelines . . . . .	20
Battery History Record . . . . .	20
Motors . . . . .	21
Motor Cleaning . . . . .	21
Brush Care . . . . .	22
Maintenance Schedule . . . . .	22
Motor Maintenance Inspection Chart . . . . .	22
Brush Replacement . . . . .	24
Motor Overheating . . . . .	25
Motor Test for Open Circuit . . . . .	26
Motor Open Circuit Test Procedure . . . . .	26
Short Circuit Test - Motors . . . . .	27
Short Circuit Test . . . . .	27
Armature Shorts . . . . .	27
Motor Grounds Test . . . . .	28
Grounds - General . . . . .	28

	<b>Page</b>
Hydraulic . . . . .	29
Oil Selection . . . . .	29
Changing Reservoir Fluid . . . . .	29
Power Section . . . . .	30
Special Tools . . . . .	30
Flush Grease Fitting Adapter . . . . .	30
Battery-Pak Lifter . . . . .	30
Bearing Installation Tool . . . . .	30
Control Head Unit . . . . .	31
Removal and Installation . . . . .	31
Head Unit Removal . . . . .	31
Cold Storage Requirements . . . . .	31
Control Handle Removal . . . . .	32
Travel Control Switches . . . . .	33
Horn, <b>Lift/Lower</b> Switches . . . . .	33
Load Wheel . . . . .	34
Repair and Replacement . . . . .	34
Pull Rod Bushings Removal and Replacement . . . . .	35
Carrier Frame Linkage and Bushings . . . . .	35
Drive Wheel . . . . .	36
Removal . . . . .	36
Installation . . . . .	37
Drive Unit . . . . .	38
Removal . . . . .	38
Installation . . . . .	39
Axle Seal Removal . . . . .	40
Installation . . . . .	40
Drive Unit Assembly . . . . .	41
Drive Unit . . . . .	42
Disassembly . . . . .	42
Assembly . . . . .	43
Drive Motor . . . . .	44
Removal . . . . .	44
Drive Motor Brush Replacement . . . . .	44
Drive Motor Disassembly . . . . .	44
Installation . . . . .	45
Controller Assembly . . . . .	47
Throttle Potentiometer Setting . . . . .	47
Example . . . . .	47
Battery Replacement . . . . .	48
Battery Wiring Hookup . . . . .	49
Brake . . . . .	50
Brake Adjustment . . . . .	50
Brake <b>Interlock</b> Switch . . . . .	51
Brake Linkage Removal . . . . .	51
Brake Linkage Installation . . . . .	51
Brake Shoe Removal and Installation . . . . .	52

**<https://www.ebooklibonline.com>**

Hello dear friend!

Thank you very much for reading.

Enter the link into your browser.

The full manual is available for immediate download.

**<https://www.ebooklibonline.com>**

<b>Table of Contents</b>	<b>Page</b>
<b>Lift/Lower</b> . . . . .	<b>53</b>
Description . . . . .	<b>53</b>
<b>Theory of Operation</b> . . . . .	<b>53</b>
Lift . . . . .	53
Hydraulic . . . . .	<b>53</b>
Electrical . . . . .	<b>54</b>
Control Circuits . . . . .	54
Power Wiring . . . . .	54
Lower . . . . .	55
Hydraulic and Electrical . . . . .	55
Equipment Recommended for Normal Servicing . . . . .	56
Pump and Motor . . . . .	57
Removal and Installation . . . . .	57
Pump Motor Brush Removal . . . . .	57
Relief Valve . . . . .	59
Removing Solenoid Valve . . . . .	59
Installing Solenoid Valve . . . . .	59
Removing Pump and Motor Assembly . . . . .	59
Removing Reservoir . . . . .	59
Removing the Pump . . . . .	59
<b>Installing the Pump</b> . . . . .	<b>60</b>
<b>Installing the Reservoir</b> . . . . .	<b>60</b>
Check Valve . . . . .	60
Cylinder Assembly Removal Installation . . . . .	60
Cylinder Removal . . . . .	60
Hydraulic Cylinder . . . . .	<b>69</b>
Cylinder Disassembly . . . . .	61
Inspection . . . . .	61
Cylinder Assembly . . . . .	62
Cylinder Installation . . . . .	63
Lift Limit Switch . . . . .	63
Troubleshooting . . . . .	64
No Lift . . . . .	64
Forks Do Not Lower . . . . .	66
Forks Will Not Hold Load . . . . .	66
<b>Traction System</b> . . . . .	<b>67</b>
Transistor Control (Motor Controller) . . . . .	67
Current Limiting . . . . .	68
Low Voltage Cutback . . . . .	68
Thermal Protection . . . . .	68
Runaway Protection . . . . .	69
Static Return to Neutral Protection . . . . .	69
Plugging . . . . .	69
Controller Keyswitch Input . . . . .	69
Controller Thumbwheel Throttle Inputs . . . . .	69
"Emergency Reverse" Plug Breaking Inhibit . . . . .	69
Traction System Adjustments . . . . .	70
Adjustment Panel . . . . .	70
Potentiometer Adjustments . . . . .	70
Theory . . . . .	71
Preparing to Travel . . . . .	71

<b>Table of Contents</b>	<b>Page</b>
Directional/Speed Control Forward . . . . .	72
Directional/Speed Control Reverse . . . . .	73
Emergency Reverse . . . . .	74
<b>Contact</b> Tip/Bar Replacement . . . . .	75
Troubleshooting . . . . .	76
Vehicle is dead _ nothing operates . . . . .	76
No travel _ horn and lift/lower operates OK . . . . .	76
No forward travel _ forward <b>contact</b> does not energize . . . . .	77
No forward travel _ forward <b>contact</b> closed . . . . .	78
No reverse travel _ reverse <b>contact</b> does not energize, forward travel operates . . . . .	79
No reverse travel _ reverse <b>contact</b> closed . . . . .	80
No Emergency Reverse . . . . .	81
Troubleshooting . . . . .	82
Wiring <b>Inspection</b> Procedure . . . . .	84
Miscellaneous Troubleshooting . . . . .	85
Battery Charger . . . . .	86
Electrical Testing . . . . .	86
Equipment Required . . . . .	86
Instrudions . . . . .	86
Acceptable Charge Values . . . . .	86
Open Circuit Voltage Test . . . . .	87
Short Circuit Amperage Test . . . . .	87
Testing Components . . . . .	88
Diodes . . . . .	88
Capacitor . . . . .	88
Timer . . . . .	89
Overcharging Problems . . . . .	89
Charger and Battery not Properly Matched . . . . .	89
Defective Battery or Poor DC Connection . . . . .	89
Battery Charts . . . . .	90
Controller . . . . .	91
Description . . . . .	91
Low Current . . . . .	93
High Current . . . . .	94
Adjustment Panel . . . . .	94
Manually Adjustable Potentiometers . . . . .	94
Programmer Connector . . . . .	94
<b>Status LED</b> . . . . .	94
Power Wiring . . . . .	95
Control Wiring . . . . .	95
0-5k $\Omega$ Throttle ("Type 3") . . . . .	96
Plug Current in Over-Temperature . . . . .	96.1
High Speed Parameter . . . . .	96.1
Ramp Shap Parameter . . . . .	96.1
Initial Check . . . . .	97
Programming and Adjustment . . . . .	99
Programming . . . . .	99
Manual Adjustments . . . . .	100
Current Limit Setting . . . . .	100
Plug Current Adjustment . . . . .	101
Acceleration Adjustment . . . . .	101

---

<b>Table of Contents</b>	<b>Page</b>
Maintenance . . . . .	102
Safety . . . . .	102
Cleaning . . . . .	102
Diagnostic History . . . . .	102
Diagnostics and Troubleshooting . . . . .	103
LED Diagnostics . . . . .	103
Programmer Diagnostics . . . . .	104
Programmer Operation . . . . .	106
Operating Modes . . . . .	108
Peace-of-mind Programming . . . . .	111
Programmer Self Test . . . . .	111
Programmer Menus . . . . .	112
Diagnostics and Special Diagnostics 'Menu' . . . . .	113
Appendix . . . . .	114
Hydraulic Schematic . . . . .	114
Electrical Schematic . . . . .	115
Motor Controller Specifications . . . . .	116
Glossary . . . . .	117
Alphabetical Index . . . . .	123

<b>Figure</b>	<b>Title</b>	<b>Page</b>
1	Component Identification . . . . .	3
2	Component Identification (Cont'd.) . . . . .	4
3	Component Identification (Cont'd.) . . . . .	5
4	Standard Torque Data for Bolts . . . . .	6
5	Standard Decal Placement . . . . .	8
6	Bilingual Decal Placement . . . . .	9
7	Decimal Equivalent Chart . . . . .	10
8	Lubrication Points . . . . .	13
9	Hydraulic Fill Points . . . . .	14
10	Example of Cleaning Motor . . . . .	21
11	Measuring Brush Spring Tension . . . . .	23
12	Minimum Brush Lengths . . . . .	24
13	Motor Terminals and Circuits . . . . .	26
14	Flush Grease Fitting Adaptor . . . . .	30
15	Battery-Pack Lifter . . . . .	30
16	<b>Bearing/Sealing</b> Ring Installation Tool . . . . .	30
17	Control Head Unit . . . . .	31
18	Control Handle Removal . . . . .	32
19	Control Head - Exploded View . . . . .	33
20	Load Wheel . . . . .	34
21	Disassembly of Lower Link . . . . .	35
22	Drive Tire Removal . . . . .	36
23	Tire Hub Removal . . . . .	36
24	Wheel Hub Installation . . . . .	37
25	Drive Tire Installation . . . . .	37
26	Removing Drive Unit . . . . .	38
27	Drive Unit Installation . . . . .	39
28	Replacing Axle Seal . . . . .	40
29	Drive Unit Assembly . . . . .	41
30	Cover Removed . . . . .	42
31	Gear Removal . . . . .	42
32	Brake Lever Placement . . . . .	45
33	Battery Replacement Showing One Top Battery Swiveled Toward Forks . . . . .	48
34	Battery Wiring Hookup . . . . .	49
35	Brake Lever Adjustment . . . . .	50
36	Brake Interlock Switch . . . . .	51
37	Hydraulic Schematic - Lift . . . . .	53
38	Electrical Schematic - Lift Mode . . . . .	54
39	Hydraulic Schematic - Lower . . . . .	55
40	Electrical Schematic - Lower Mode . . . . .	55
41	Hydraulic Motor, Pump, and Reservoir . . . . .	57
42	Lift Cylinder - Exploded View . . . . .	61
43	Lift Limit Switch . . . . .	63
44	Control System (Simplified) . . . . .	67
45	Motor Current Chart . . . . .	69
46	Adjustment Panel . . . . .	70
47	Travel Direction Reference . . . . .	71
48	Electrical Schematic - Forward . . . . .	72
49	Electrical Schematic - Reverse . . . . .	73
50	Electrical Schematic - Emergency Reverse . . . . .	74
51	Contactor - Exploded View . . . . .	75
52	Programmer and Motor Controller . . . . .	91
53	Motor Controller Connector . . . . .	93
54	Motor Controller . . . . .	94
55	Adjustment Panel . . . . .	94

---

<b>Figure</b>	<b>Title</b>	<b>Page</b>
56	16 Pin Connector . . . . .	95
57	SK Throttle (Type 3) . . . . .	96
57.1	Active Throttle . . . . .	96.1
57.2	Active Throttle . . . . .	96.2
57.3	Active Throttle . . . . .	96.2
58	Manual Adjustments . . . . .	100
59	LED Diagnostics . . . . .	103
60	Programmer . . . . .	106
61	Hydraulic Schematic . . . . .	114
62	Electrical Schematic . . . . .	115

<b>Tool List</b>	<b>Description</b>
00590-04661-71	Diagnostic Service Tool (Programmer)
00590-04667-71	Pin Extractor
00590-04668-71	Pin Extractor
00590-04669-71	Pin Extractor
00590-04670-71	Pin Extractor
00590-04671-71	Crimping Tool
00590-04672-71	Extraction Tool
00590-04673-71	Model 1141 <b>FasTest</b> Accessory
00590-04674-71	Model 1142 Tester
00590-04675-71	Curtis Battery Book One
00590-04676-71	<b>Bearing/Sealing</b> Ring Installation Tool
00590-04677-71	Battery Pack Lifter

## General Information

## General Maintenance Instructions

Industrial vehicles may become hazardous if adequate maintenance is neglected. Only trained technicians, using approved procedures, in adequate maintenance facilities should work on this or any other industrial vehicle.

## Maintenance Practices

1. Follow a scheduled lubrication, maintenance, and inspection schedule.
2. Only qualified, authorized technicians are permitted to inspect, maintain, **adjust**, and repair this vehicle.

**⚠ CAUTION**

REMOVE RINGS, WATCHES, AND ALL JEWELRY BEFORE DOING ANY WORK ON VEHICLE.

3. Before working on vehicle:
  - a. Lower load handling mechanism completely to the floor.
  - b. All controls must be in neutral.
  - c. Release any trapped pressure in hydraulic systems.
  - d. Block the wheels to prevent movement of the vehicle.
  - e. Disconnect battery connector
  - f. Elevate drive tire off floor.

**⚠ WARNING**

USE EXTREME CARE WHENEVER THE VEHICLE IS JACKED UP FOR ANY REASON. KEEP HANDS AND FEET CLEAR FROM BENEATH VEHICLE WHILE JACKING. USE JACK STANDS OR SOLID BLOCKS TO SUPPORT VEHICLE - DO NOT RELY ON JACKS.

- g. Before working on load handler, support to prevent movement.
4. After working on vehicle, test all controls and functions to assure proper operation.
5. Work in a clean, dry, well ventilated area.
6. Avoid fire hazards. Have adequate fire fighting equipment in the maintenance area.
7. **DO NOT** use open flame or sparking devices around the battery. The gasses given off by the battery are highly explosive.
8. Use extreme caution when using flammable cleaning solutions.

More information pertaining to operating and maintenance procedures may be obtained from:

American National Standards Institute  
1430 Broadway  
New York, NY 10018

Ask for ANSI B56.1 - 1988

## General Information

## Specifications

<b>Model:</b>	6HBW20
<b>Battery Voltage:</b>	24
<b>Wheel:</b>	
<b>Drive:</b>	10.5 x 5" Rubber
<b>Load:</b>	3.25 x 5" Polyurethane (2)
Install load wheels with at least 1 shim on each side and a maximum of 1/16" (1.58mm) end play.	

Transmission	
<b>Fluid: Standard Use</b>	80W-90W
<b>Cold Storage</b>	"DEXTRON II" ATF
<b>Fluid Capacity:</b>	0.8 Quart (0.75 liter)
<b>Torque Requirement:</b>	Torque drive tire retaining nut to 250 FT./LBS. (350Nm) (While rotating drive tire)
Torque pivot bearing retaining nut to Zero (0) end play on pivot bearings while pivoting transmission.	

## Hydraulic

Lift/Lower System	
<b>Fluid: Standard Use</b>	10W-40W
<b>Cold Storage</b>	"Dextron II" ATF
<b>Reservoir Capacity:</b>	1 Quart (0.9 liters)
<b>Relief Valve Setting:</b>	2600 psi ± 50 psi (177 Bar ± 3.4 bar)

General Information

Component Identification

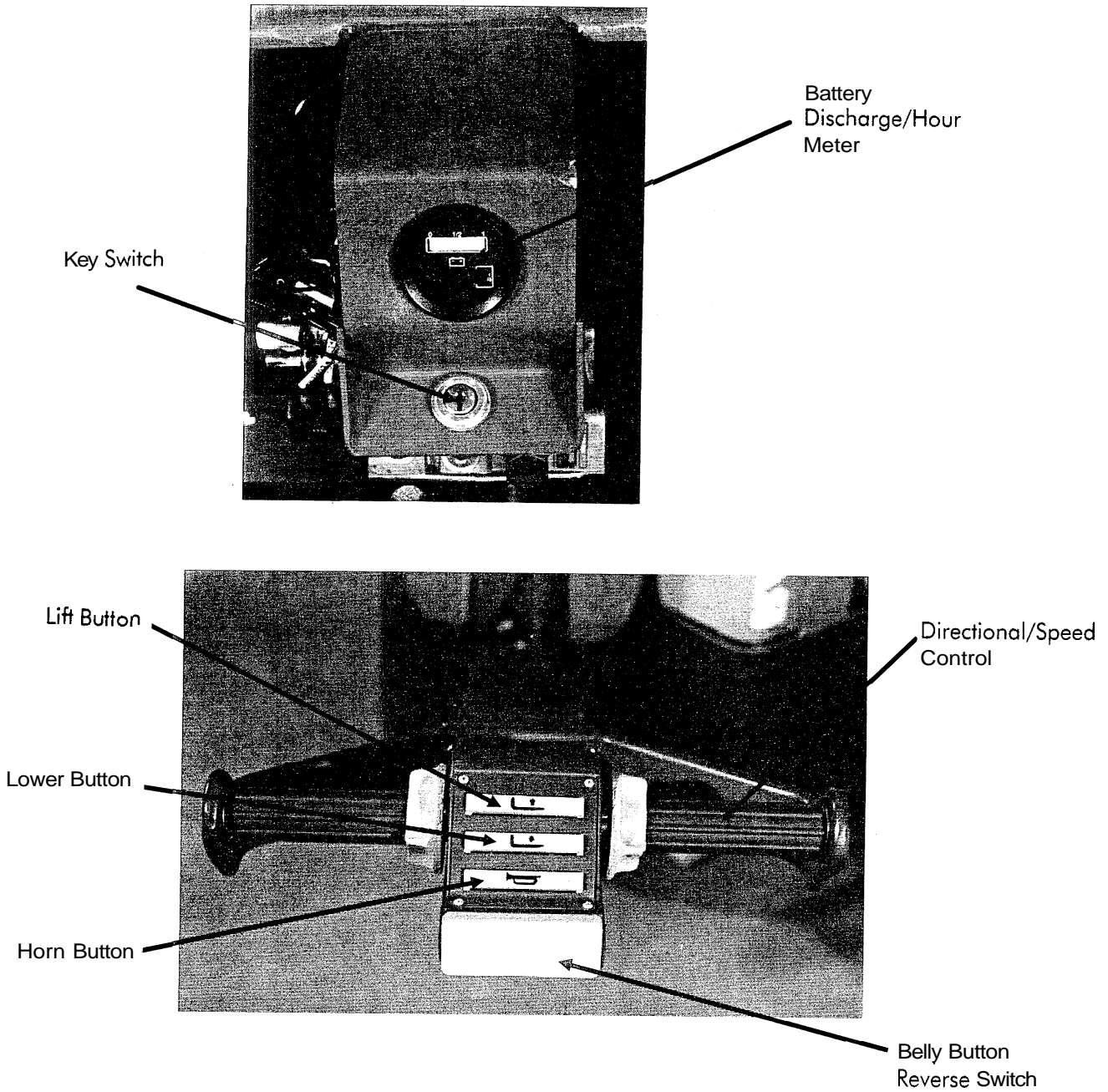


Figure 63 Component Identification

General Information

Component Identification (Cont'd.)

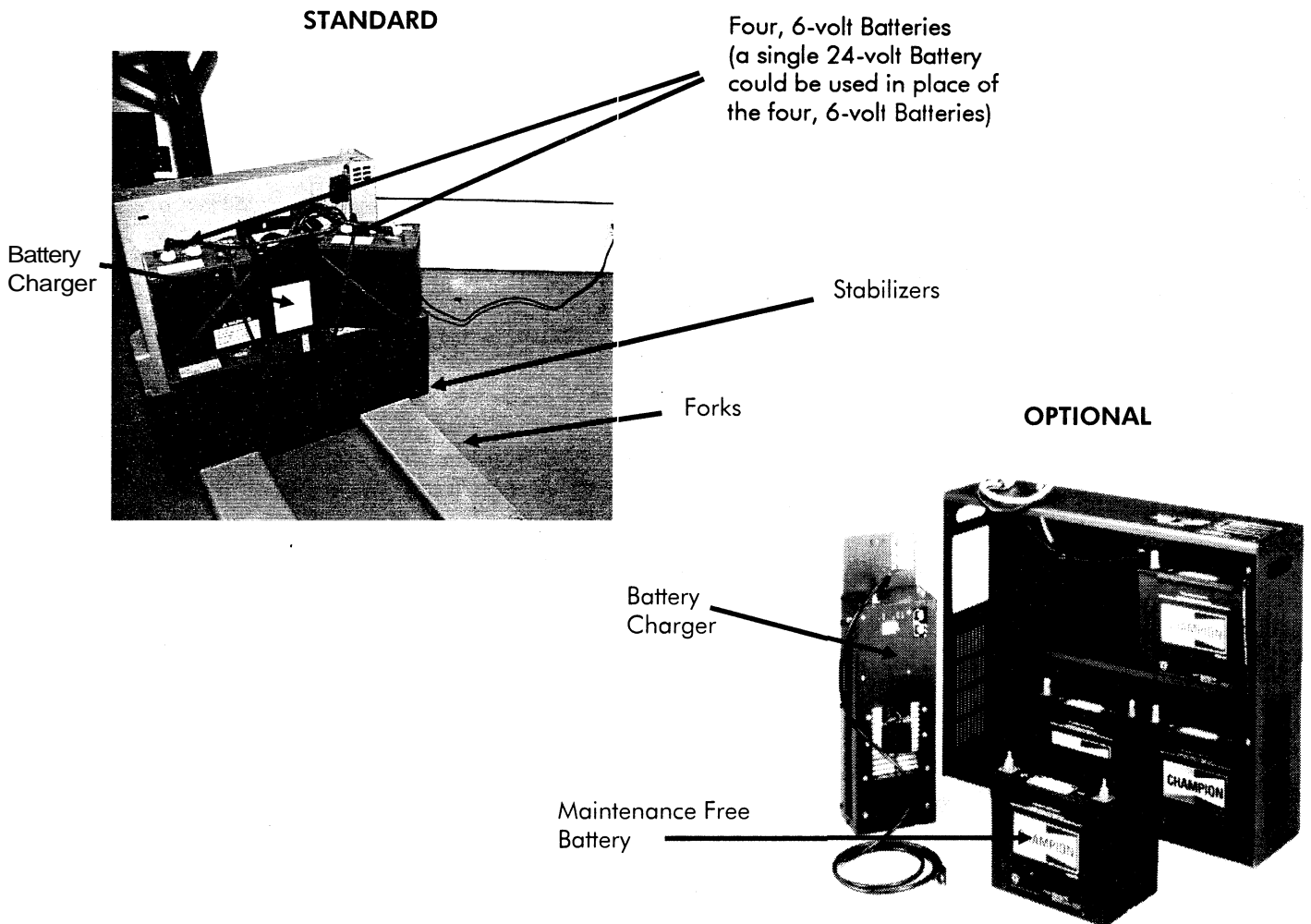
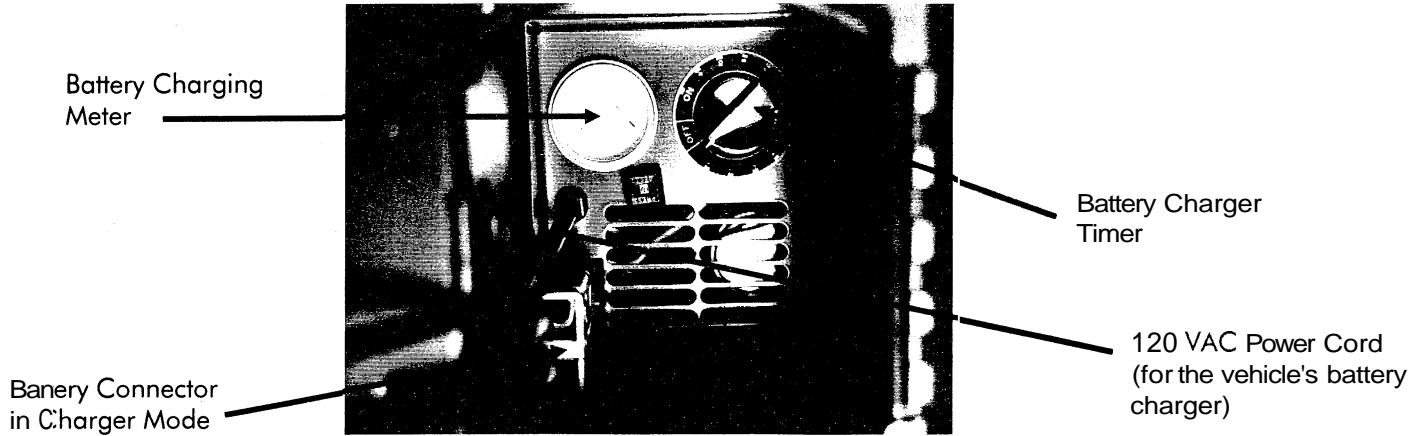


Figure 64 Component Identification (Cont'd.)

General Information

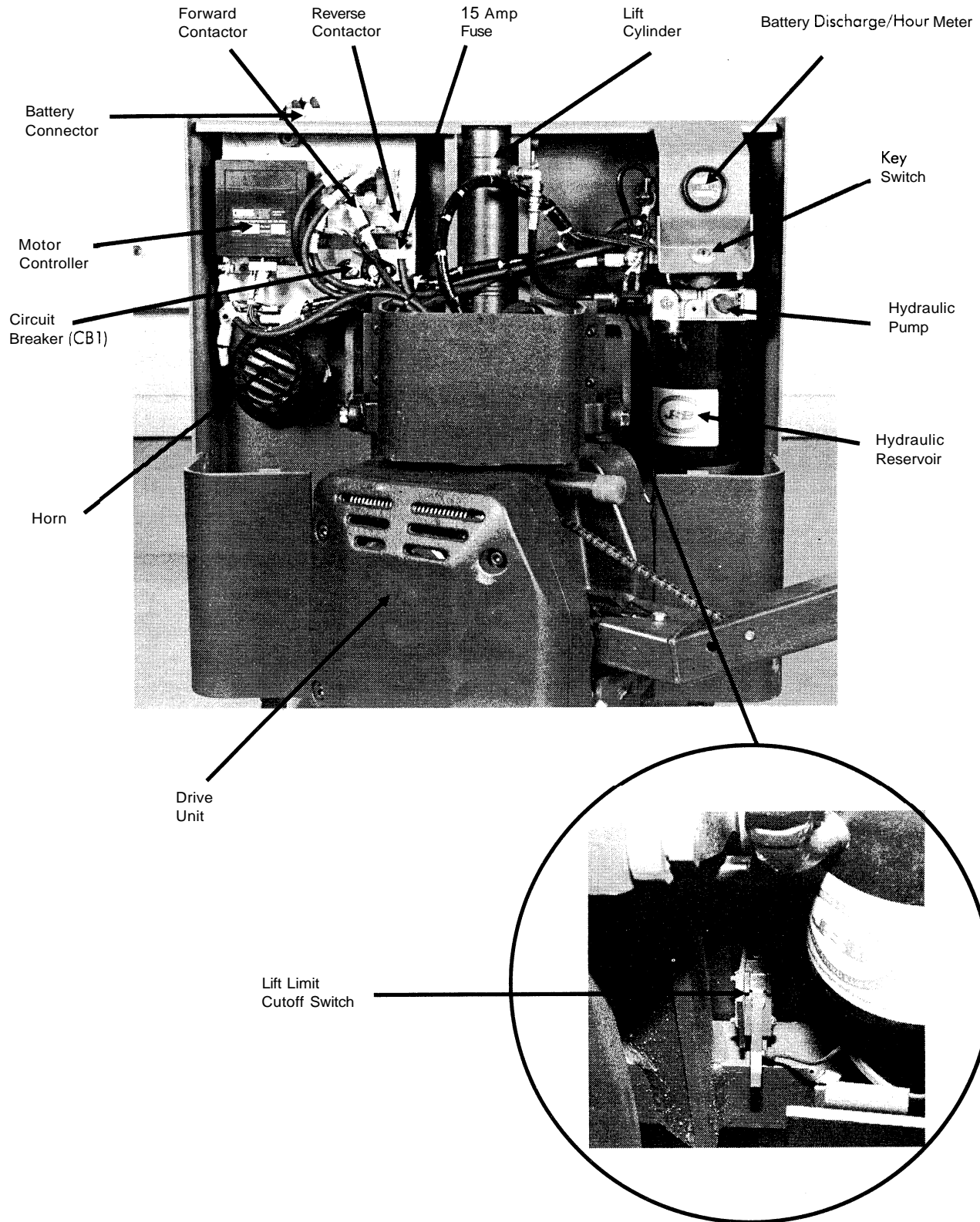


Figure 65 Component Identification (Cont'd.)

General Information

Standard Torque  
Data For Bolts



GRADE IDENTIFICATION MARKING	NONE					
	SAE Grade 2 Bolts Tightening Torque Dry      Lub.		SAE Grade 5 Bolts Tightening Torque Dry      Lub.		SAE Grade 8 Bolts Tightening Torque Dry      Lub.	
SIZE	in. lb.	in. lb.	in. lb.	in. lb.	in. lb.	in. lb.
4-40	5	4	8	6	12	9
4-48	6	5	9	7	13	10
6-32	10	8	16	12	23	17
6-40	12	9	18	13	25	19
8-32	19	14	30	22	41	31
8-36	20	15	31	23	43	32
10-24	27	21	43	32	60	45
10-32	31	23	49	38	68	51
1/4-20	66	49	96	75	144	108
1/4-28	76	56	120	86	168	120
	ft. lb.	ft. lb.	ft. lb.	ft. lb.	ft. lb.	ft. lb.
5/16-18	11	8	17	13	25	18
5/16-24	12	9	19	14	25	20
3/8-16	20	15	30	23	45	35
3/8-24	23	17	35	25	50	35
7/16-14	30	24	50	35	70	55
7/16-20	35	25	55	40	80	60
1/2-13	50	35	75	55	110	80
1/2-20	55	40	90	65	120	90
9/16-12	70	55	110	80	150	110
9/16-18	80	60	120	90	170	130
5/8-11	100	75	150	110	220	170
5/8-18	110	85	170	130	240	180
3/4-10	175	130	260	200	380	280
3/4-16	195	145	300	220	420	320
7/8-9	165	125	430	320	600	460
7/8-14	185	140	470	350	660	500
1-8	250	190	640	480	900	680
1-12	270	200	700	530	1000	740
1 1/8-7	350	270	800	600	1280	960
1 1/8-12	400	300	880	660	1440	1080
1 1/4-7	500	380	1120	840	1820	1360
1 1/4-12	550	420	1240	920	2000	1500
1 3/8-6	660	490	1460	1100	2380	1780
1 3/8-12	740	560	1680	1260	2720	2040
1 1/2-6	870	650	1940	1460	3160	2360
1 1/2-12	980	730	2200	1640	3560	2660

Figure 66 Standard Torque Data for Bolts



**Suggest:**

**For more complete manuals. Please go to the home page.**

**<https://www.ebooklibonline.com>**

**If the above button click is invalid. Please download this document first, and then click the above link to download the complete manual.**

**Thank you so much for reading**

## General Information

## Conversion Table

To Convert...	Multiply by...
Inches to Millimeters	25.4
Inches to Centimeters	2.54
Feet to Meters	0.305
Yards to Meters	0.914
Miles to Kilometers	1.609
Millimeters to Inches	0.039
Centimeters to Inches	0.394
Meters to Feet	3.281
Meters to Yards	1.094
Kilometers to Miles	0.621
Square inches to Square Centimeters	6.452
Square Feet to Square Meters	0.093
Square Yards to Square Meters	0.836
Square Centimeters to Square Inches	0.155
Square Meters to Square Feet	10.155
Square Meters to Square Yards	1.196
Fahrenheit to Celsius	$(^{\circ}\text{F} - 32) \div 1.8$
Celsius to Fahrenheit	$(^{\circ}\text{C} \times 1.8) + 32$
PSI to Pascals (Pa)	6894.757
PSI to Bar	PSI $\div$ 14.7

General Information

Decals

The following pages show proper mounting and location of decals.

NOTE: See the Parts Manual for decal description and ordering information.

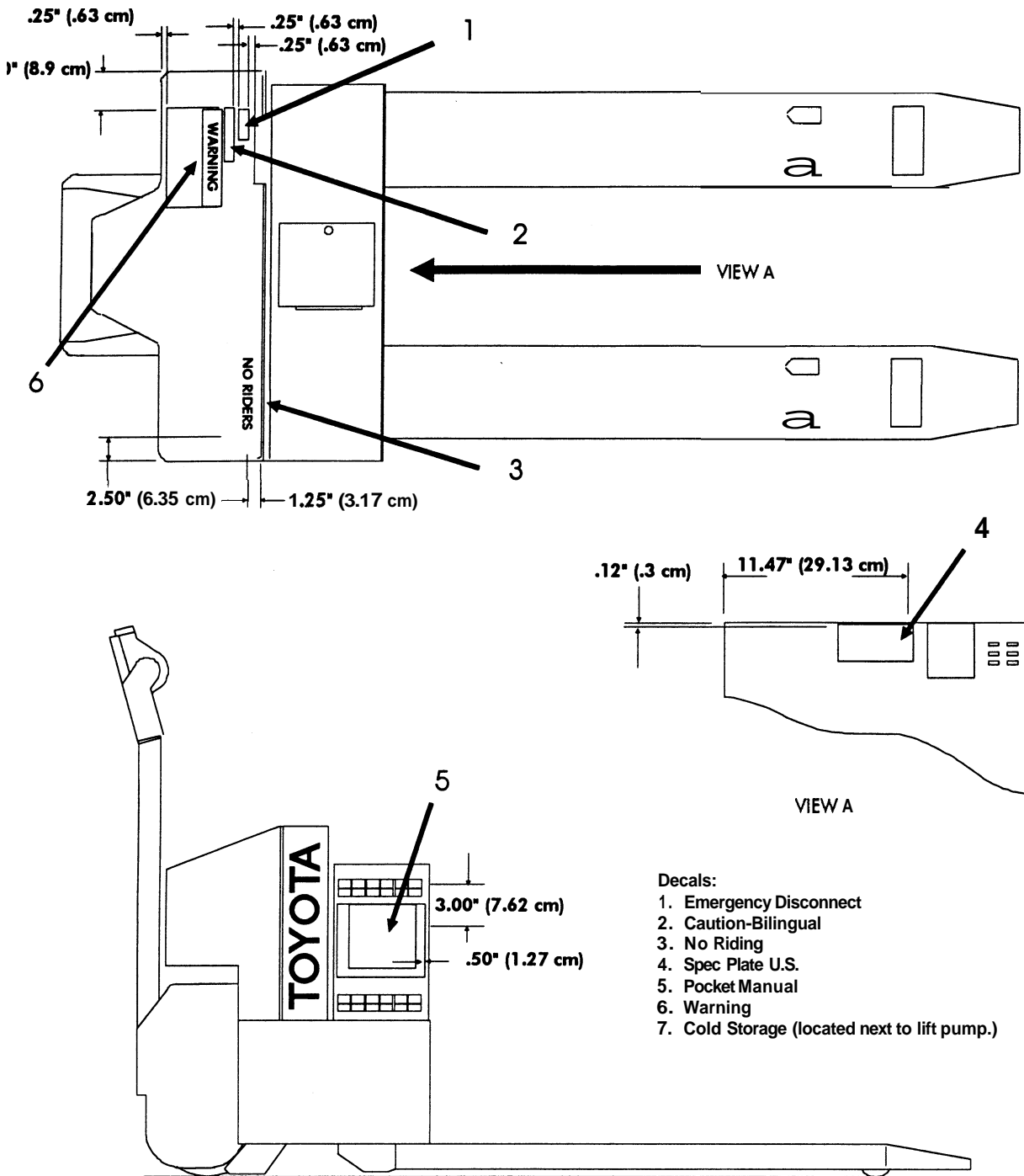


Figure 61 Standard Decal Placement

**<https://www.ebooklibonline.com>**

Hello dear friend!

Thank you very much for reading.

Enter the link into your browser.

The full manual is available for immediate download.

**<https://www.ebooklibonline.com>**