



# **PARTS MANUAL**

## **1548 Haul Unit System**

**Haul Unit S/N: F6000F**

**Publication No. 050167A**

Rev No. 220505

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**SERVICE • RELIABILITY • INNOVATION**



# Introduction

This parts manual contains assembly illustrations of the Akkerman 1548 Haul Unit System. The illustrations in this manual are intended to show typical construction of various parts. In some instances, the details of parts illustrated may not exactly represent their actual appearance, but will help to identify parts performing the same functions. Additional copies of this manual may be purchased from the Akkerman Aftermarket Support Department, or downloaded from the Akkerman web site at [www.akkerman.com](http://www.akkerman.com).

The 1548 Haul Unit System transports the spoils from the Tunnel Boring Machine back to the launch shaft. The typical Akkerman system is comprised of a haul unit, track and dirt bucket. Multiple-bucket train systems (utilizing the haul cart) are available to increase productivity on long tunnels or pushes.

The 1548 haul unit is electrically powered with a removable battery pack, and equipped with hydraulic disc brakes.

Dirt buckets are designed for maximum capacity based on the size of pipe or tunnel being installed. They are self-dumping when using a two-line crane or by attaching a stationary line.

The track sections are lightweight, yet sturdy. The tracks are quick to connect with a single bolt and wing nut. Storage racks are available for convenient shipping and handling.

## LOCATING PARTS

This parts manual is organized into 13 sections to help you locate parts information quickly. The first page of each section lists the assemblies within the section.

An Alphabetical Index, Section 12, is provided to help you find the page number of a specific assembly. If the part number is known, the Numerical Index, Section 13, can also be utilized to find the page number of the assembly.

## USE GENUINE AKKERMAN PARTS

The use of parts other than genuine Akkerman parts could affect the efficient performance of the Haul Unit. ALWAYS use genuine Akkerman parts.

## PARTS ORDERING

To order fast, accurate, and reliable parts service, call (800) 533-0386, (507) 567-2261, or fax (507) 567-2605, and provide the following information.

1. Model Number
2. Serial Number
3. Part Number, Description, and Quantity
4. Shipping Preference

## MEASUREMENTS

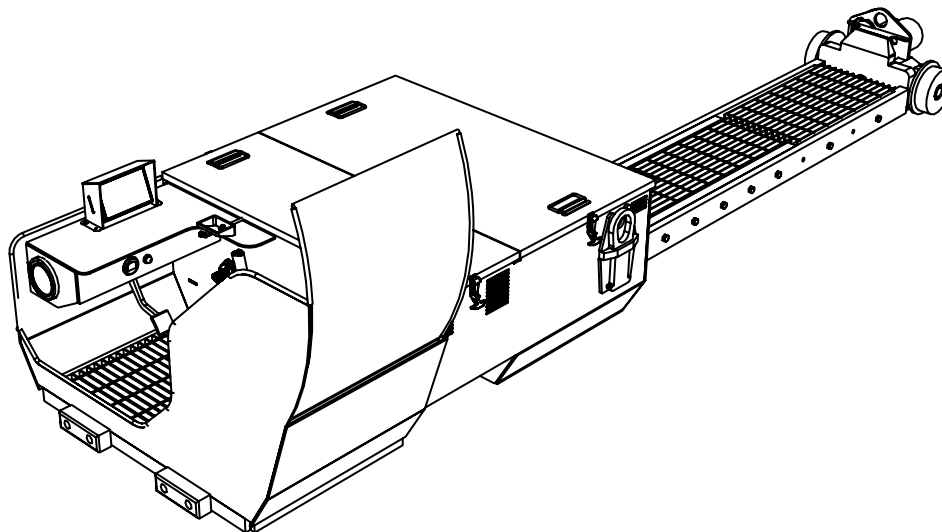
The unit of measure in this manual is in inches unless indicated otherwise.

## HARDWARE SPECIFICATION

All Akkerman products are assembled with SAE Grade 8 bolts, nuts, and washers. ALWAYS use matched fastener hardware when replacing or repairing the unit.

If you find any errors in this manual or have suggestions for improvement, please let us know. Email your comments via the Akkerman web site (Contact Us web page), or mail your suggestions to: Akkerman Inc., ATTN: Technical Publications, 58256 266th Street, Brownsdale, MN.

Akkerman Inc. reserves the right to improve its product without notice or obligation.



**1548 Haul Unit**

## **NOTES**



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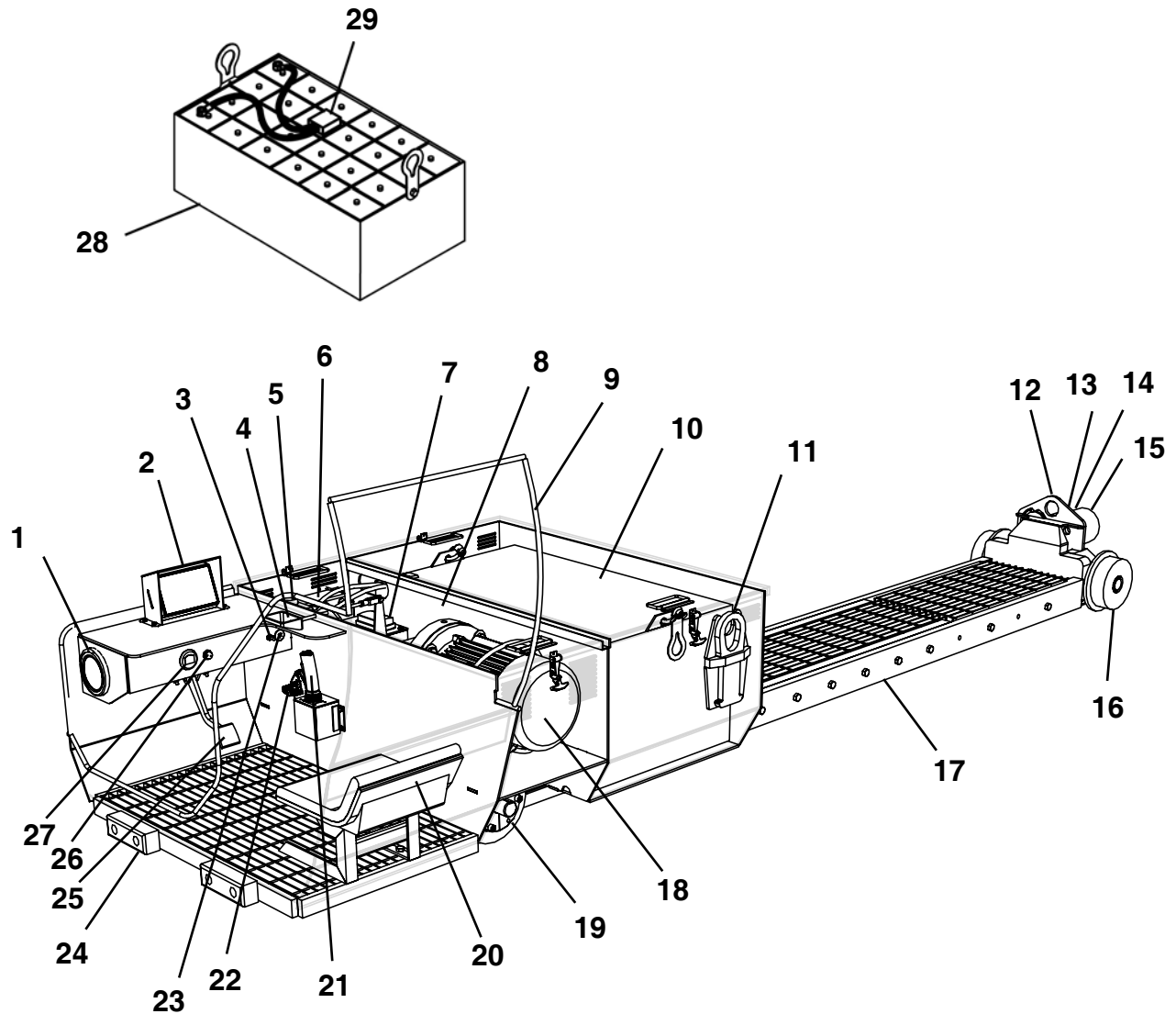
**NOTES**



# General Information

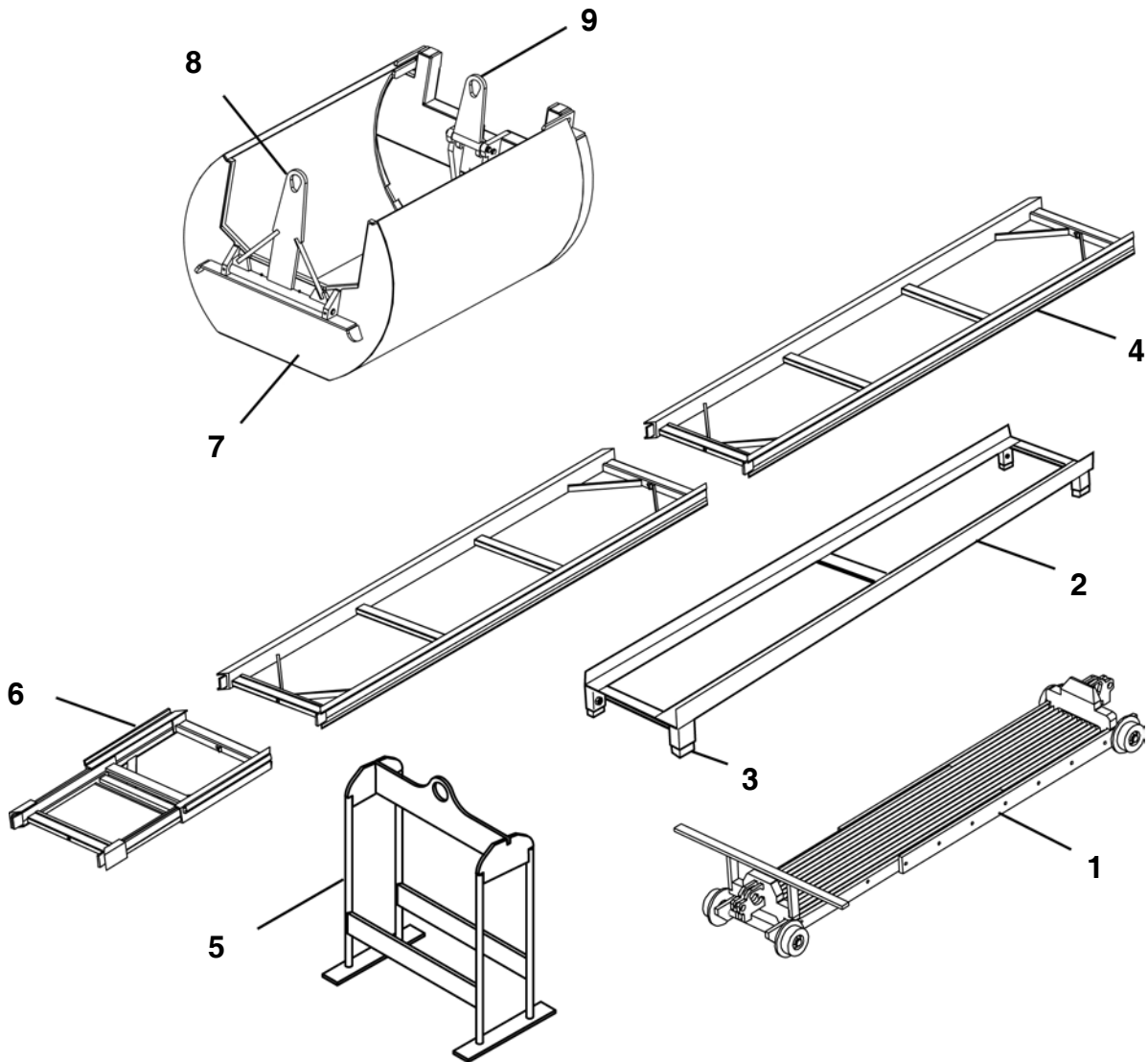
Terminology	
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## TERMINOLOGY - 1548 HAUL UNIT



- |                              |                                |                       |
|------------------------------|--------------------------------|-----------------------|
| 1. Light                     | 11. Lift Eye                   | 21. Joystick Control  |
| 2. Camera Monitor            | 12. Idler Assembly             | 22. Main Power Switch |
| 3. Motor Control Switch      | 13. Horn Assembly              | 23. Alarm             |
| 4. Park Brake                | 14. Beacon Light               | 24. Bumper            |
| 5. Hydraulic Brake Reservoir | 15. Light                      | 25. Brake Pedal       |
| 6. Motor Controller          | 16. Idler Wheel                | 26. Horn Button       |
| 7. Fuse Block                | 17. Frame Assembly             | 27. Battery Gauge     |
| 8. Drive Box Compartment     | 18. 15 HP Electric Drive Motor | 28. Battery Pack      |
| 9. Operator Shield           | 19. Drive Wheel                | 29. Battery Harness   |
| 10. Battery Compartment      | 20. Low Back Seat              |                       |

## TERMINOLOGY - DIRT BUCKET & TRACK



- |                  |                    |
|------------------|--------------------|
| 1. Haul Cart     | 6. Sliding Track   |
| 2. Track Riser   | 7. Dirt Bucket     |
| 3. Riser Bar     | 8. Bucket Lift Eye |
| 4. Track         | 9. Door Lift Eye   |
| 5. Track Carrier |                    |

## **NOTES**

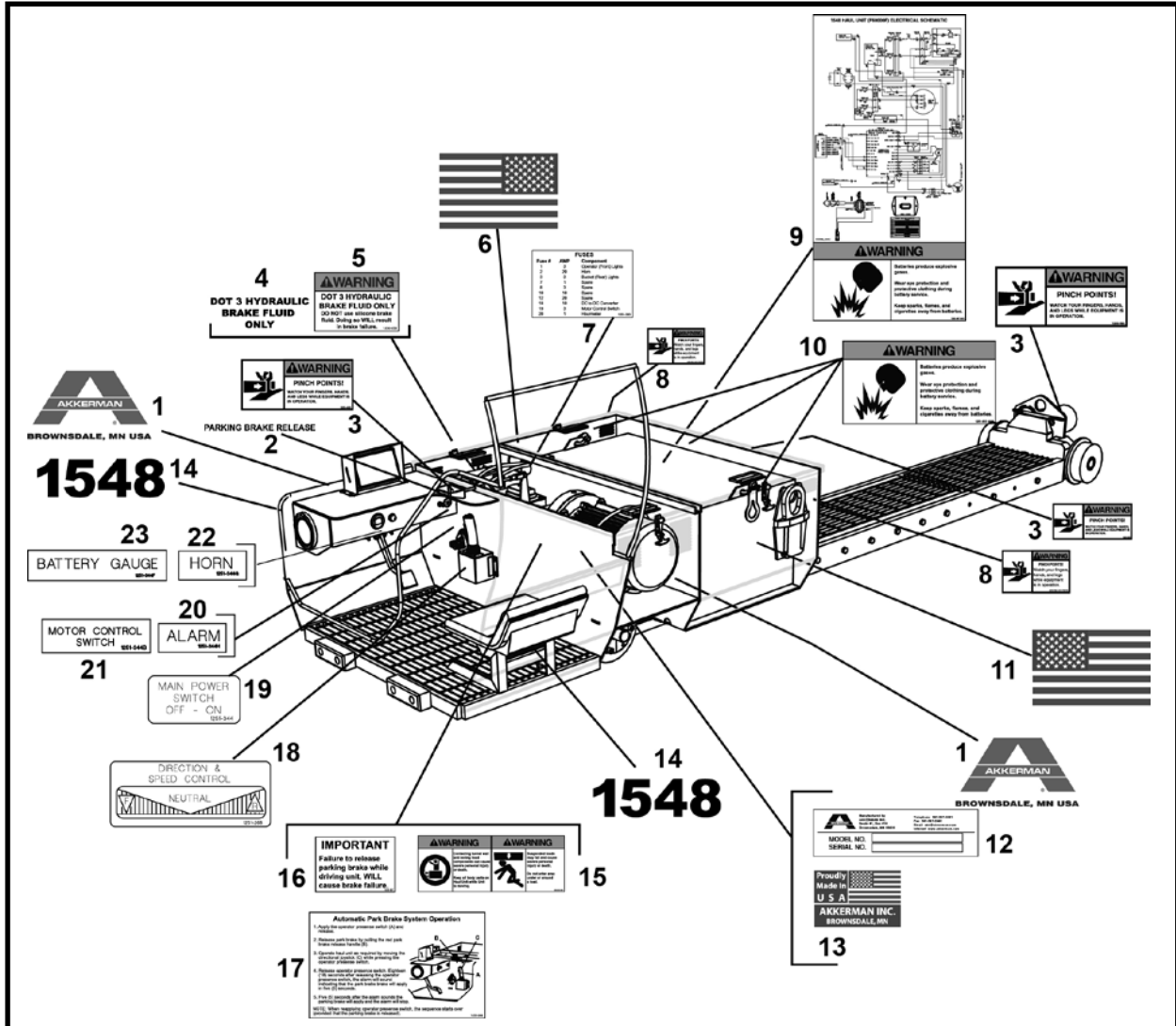


## Decals

1548 Haul Unit .....	2
Dirt Bucket .....	3

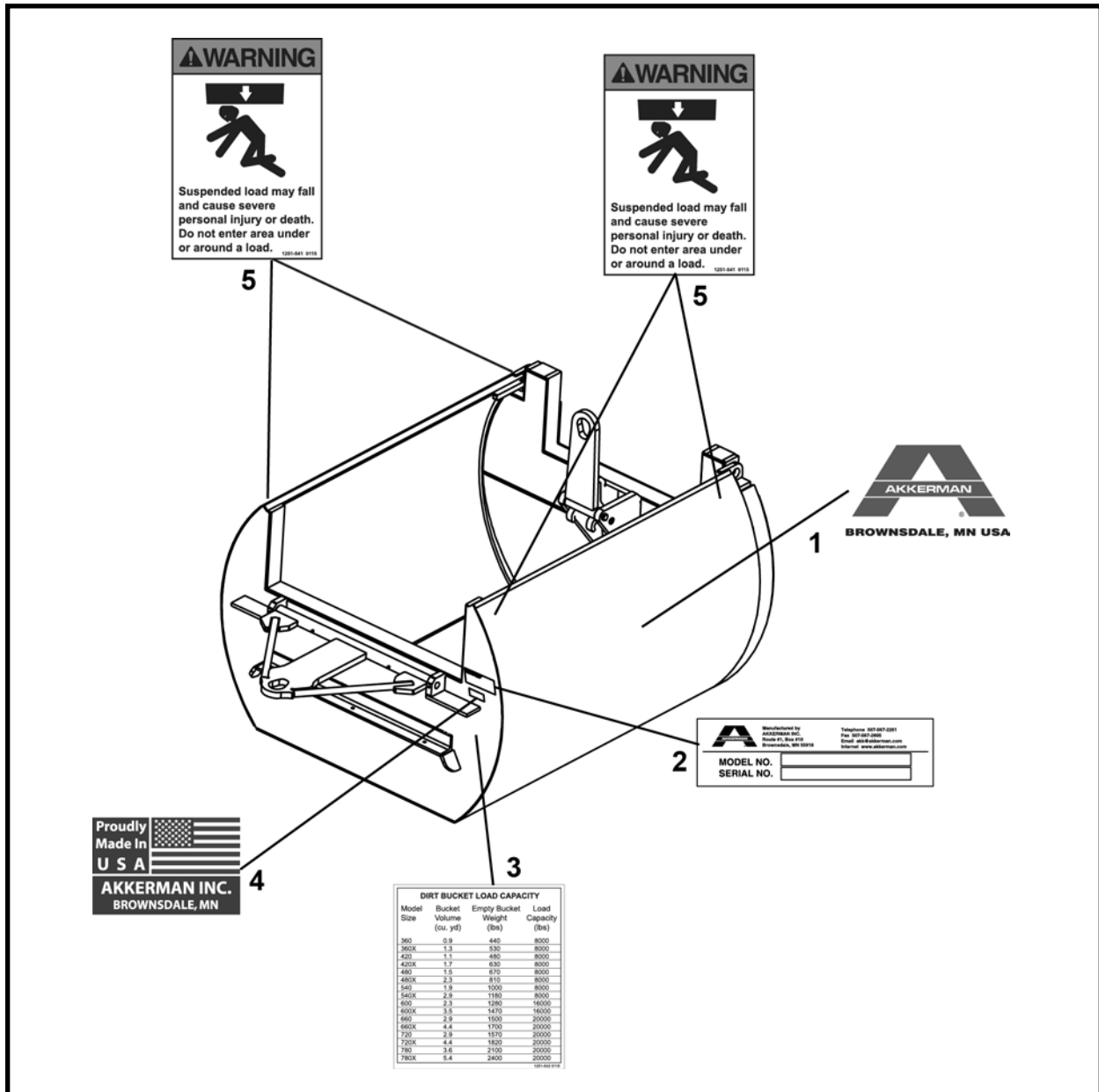
# 1548 HAUL UNIT DECALS

## SN F60000F



ITEM	QTY	PART NO.	DESCRIPTION
1	2	1251-246	DECAL, Akkerman, Large
2	1	1252-088A	DECAL, Parking Brake Release
3	3	1250-480	DECAL, Warning Pinch Points
4	1	1251-269H	DECAL, DOT 3 Brake Fluid
5	1	1250-258	DECAL, Warning, DOT 3 Hydraulic Brake Fluid
6	1	1251-324	DECAL, Flag, Small - Right
7	1	1251-303	DECAL, Fuses
8	2	1250-562	DECAL, Warning Pinch Points
9	1	1252-097	DECAL, Warning, Battery Gases, Schematic
10	3	1251-063	DECAL, Warning, Battery Gases (2 on battery lifts)
11	1	1250-558	DECAL, Flag, Small - Left
12	1	REF	PLATE, Serial Number
13	1	1250-544	DECAL, Made In USA
14	2	1251-266	DECAL, Model 1548
15	1	1250-550	DECAL, Warning, Tunnel Contact, Suspended Loads
16	1	1252-087	DECAL, Important Park Brake Release
17	1	1252-088	DECAL, Auto Park System Operation
18	1	1251-268A	DECAL, Direction & Speed Control
19	1	1251-344C	DECAL, Main Power Switch
20	1	1251-344H	DECAL, Alarm
21	1	1251-344B	DECAL, Motor Control Switch
22	1	1251-344G	DECAL, Horn
23	1	1251-344F	DECAL, Battery Gauge

# DIRT BUCKET DECALS



ITEM	QTY	PART NO.	DESCRIPTION
1	2	1251-245	DECAL, Akkerman, XLarge
2	1	REF	PLATE, Serial Number
3	1	1251-542	DECAL, Dirt Bucket Load Capacity
4	1	1250-544	DECAL, Made in USA
5	4	1251-541	DECAL, Warning, Overhead Load

## **NOTES**



## Structurals

### Haul Unit

1548 Haul Unit Assembly, F60000F .....	2
Frame Assembly, 060008A .....	3
Front Assembly, 060007A .....	4
Front Extension, 021779A .....	5
Drive Assembly, 0060006A .....	6
Gear Box Assembly, 021750A .....	8
Brake Assembly, 060005A .....	9
Low Seat Assembly, 022155A .....	10
24" Track Gage Kit, 021716A .....	11

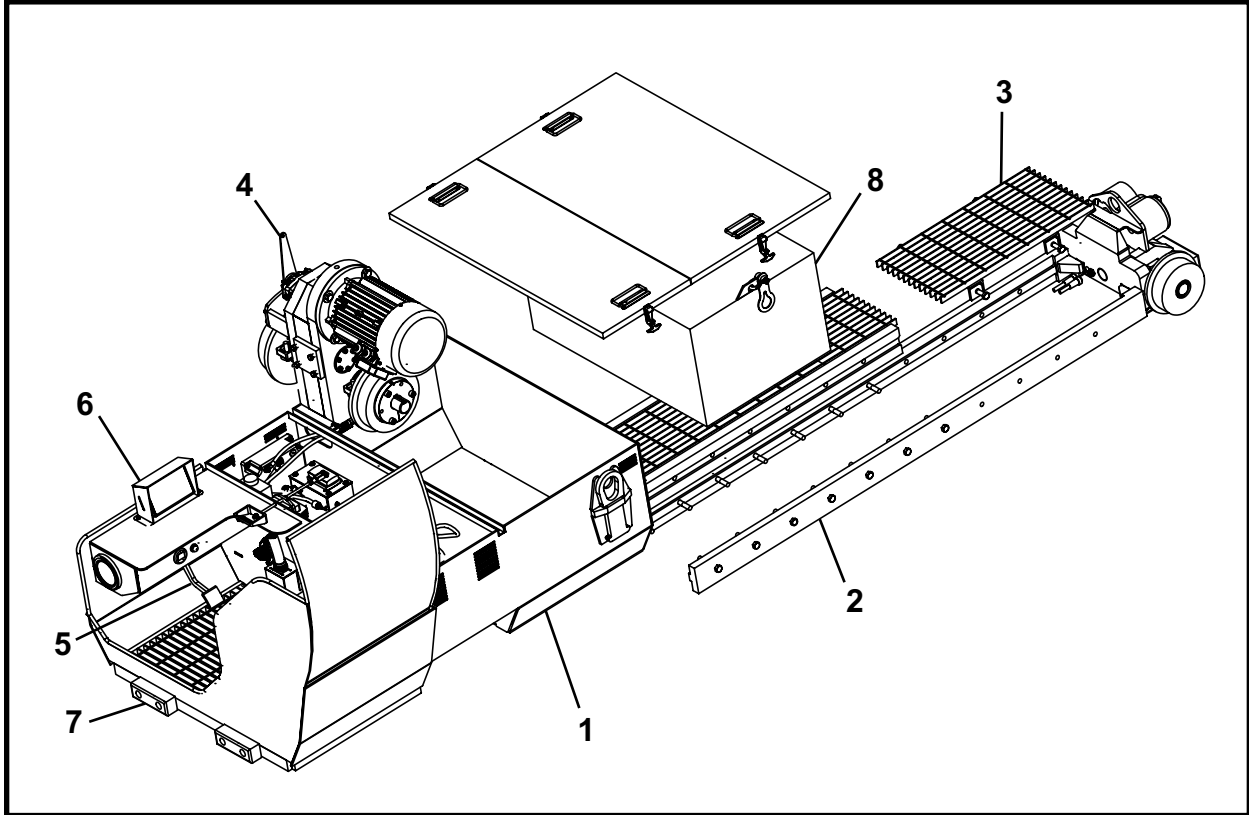
### Dirt Buckets

600/600X, F20750F00/F20700F00 .....	12
660, F10700F01 .....	13
720/720X, F08670F00/F08675F00 .....	14
780X, F19140F00 .....	15

### Track

Track (20 Gauge) .....	16
Slider Track (Ring Beam & Lagging), 022840A .....	17
Track Riser, F09900F00 .....	18
Track Carrier, F07270F00 .....	19

## 1548 HAUL UNIT ASSEMBLY, F6000F



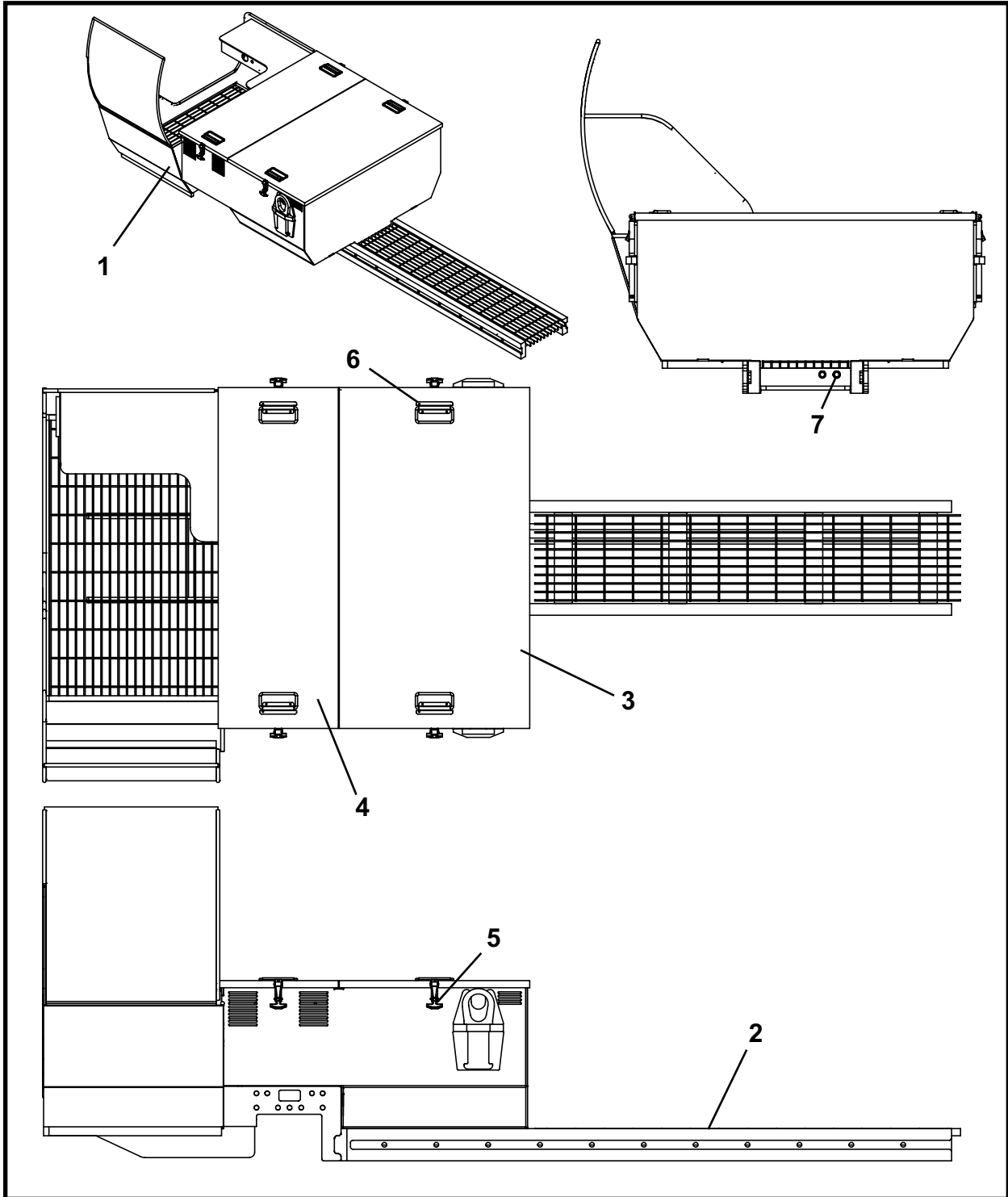
ITEM	QTY	PART NO.	DESCRIPTION
0	1	F6000F	1548 HAUL UNIT ASSEMBLY (Includes items 1 - 7)
1	1	060008A	ASSEMBLY, FRAME
2	1	060007A	ASSEMBLY, Front
3	1	021779A	EXTENSION, Front
4	1	060006A	ASSEMBLY, Drive
5	1	060005A	ASSEMBLY, Brake
6	1	060004A	ASSEMBLY, Electrical
7	1	022155A	ASSEMBLY, Low Seat
8	1	F0064-010	BATTERY PACK, 48 Volt 525 Amp (Includes items 8a - 8b)
8a	2	001235P00	LIFT EYE
8b	2	P0091-009	CLEVIS, 3/8
9.1**	***	F0310-1004	48V BATTERY CHARGER 240VAC 50 Hz
9.2**	***	F0310-1003	48V BATTERY CHARGER 240VAC 60 Hz
10*	***	021716A	KIT, 24" GAGE TRACK, 1548

\* Refer to this section for parts information.

\*\* Refer to Section 5, Electrical for parts information.

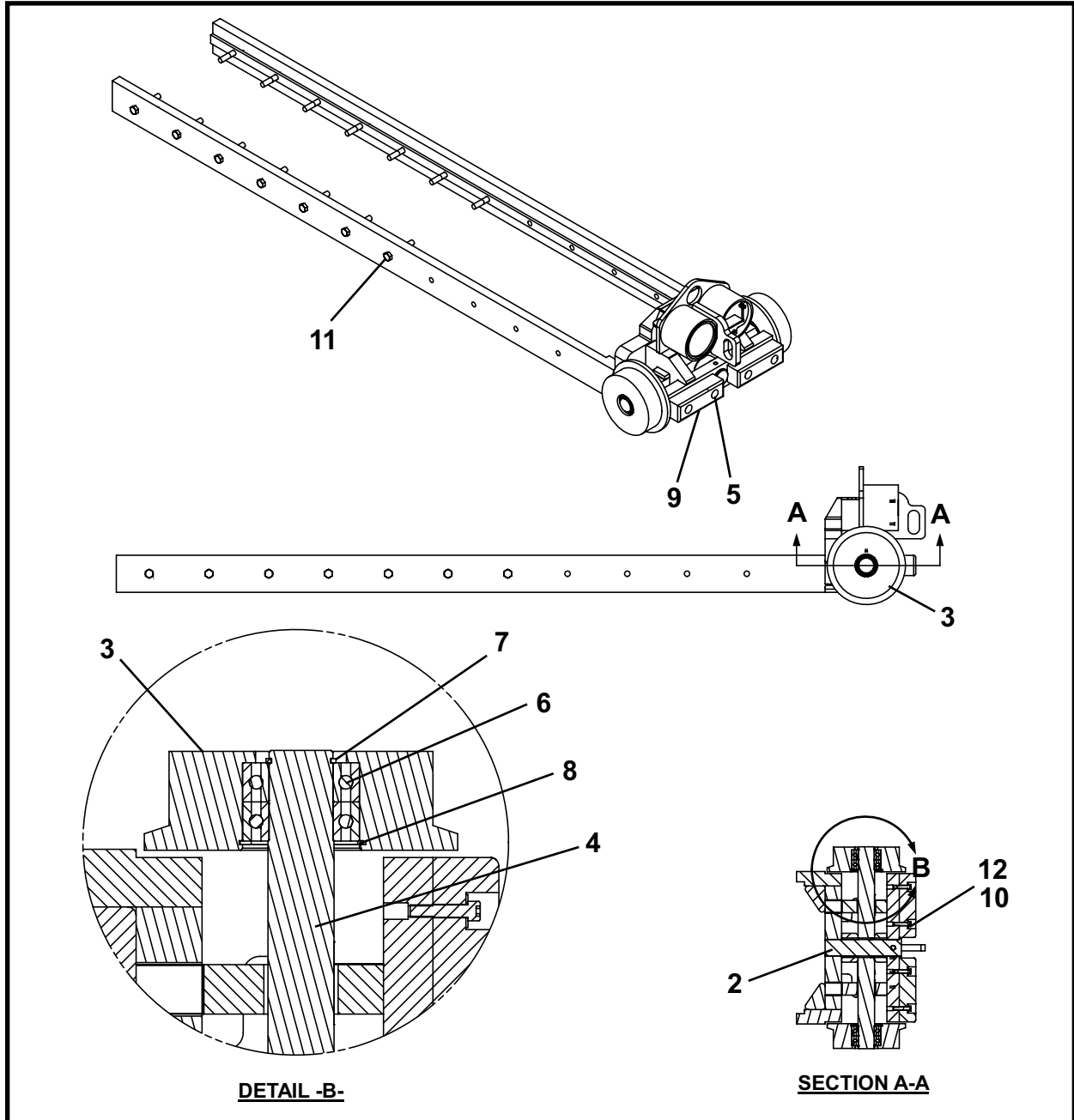
\*\*\* Optional

# FRAME ASSEMBLY, 060008A



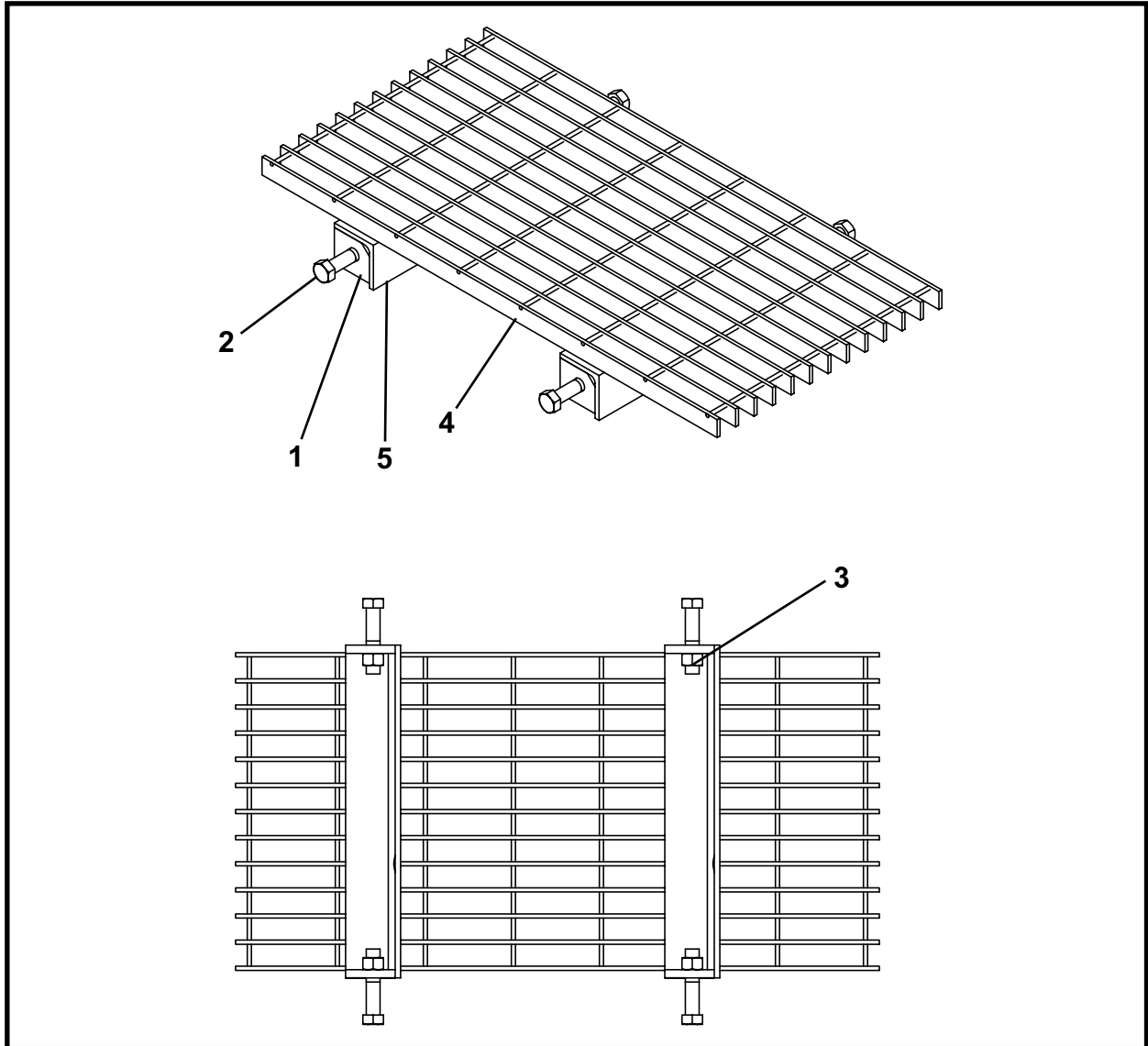
ITEM	QTY	PART NO.	DESCRIPTION
0	1	060008A	FRAME ASSEMBLY
1	1	060029A	FRAME
2	1	021727A	FRAME, Rear
3	1	021770P	LID, Battery
4	1	021771P	LID, Gearbox
5	4	P0059-031	FASTENER, Rubber Hood
6	4	P0059-022	HANDLE
7	1	022168P	PIPE, Conduit

# FRONT ASSEMBLY, 060007A



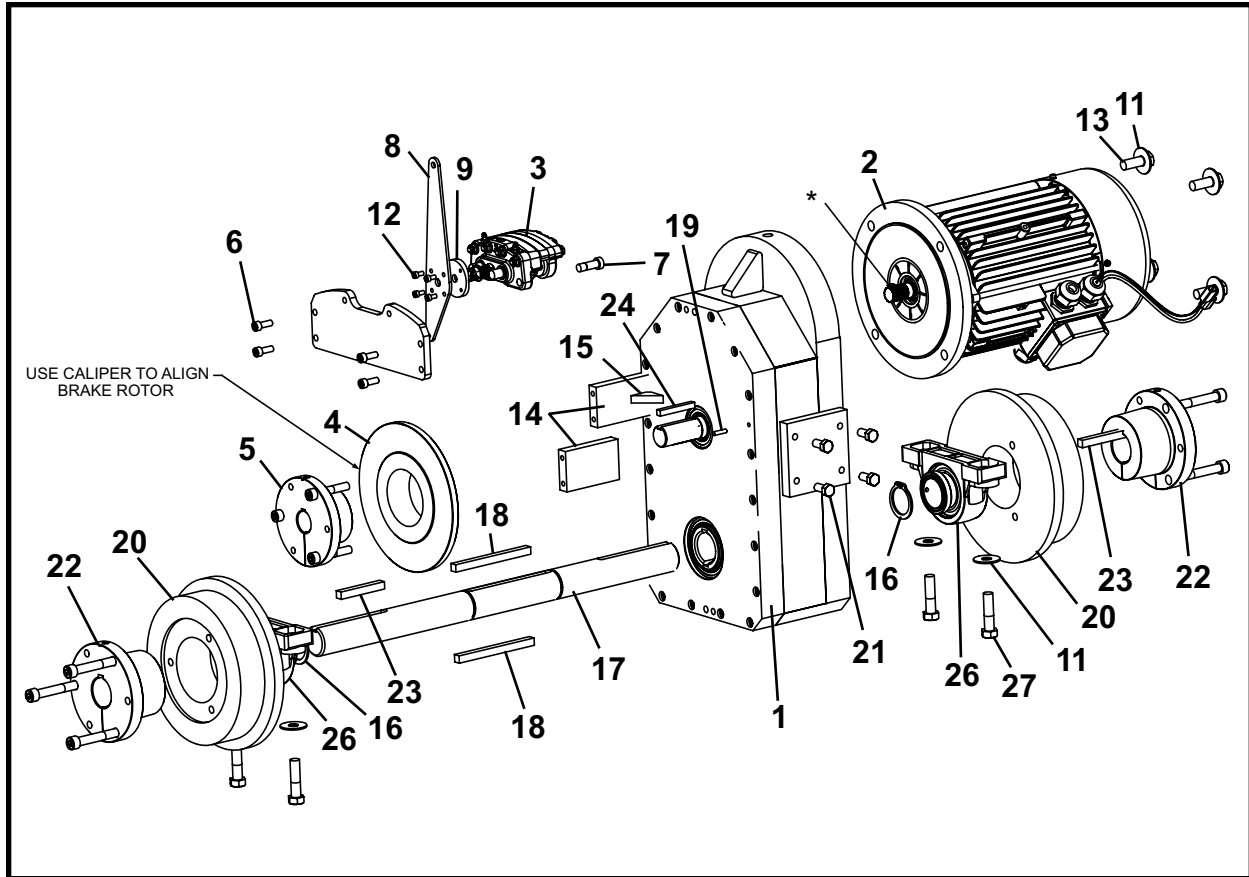
ITEM	QTY	PART NO.	DESCRIPTION
0	1	060007A	FRONT ASSEMBLY
1	1	060009A	EXTENSION, Frame
2	1	021703P	PIN, Front Axle Pivot
3	2	021711P	WHEEL, Idler
4	1	021712A	ASSEMBLY, Idler Axle 20 GA (Includes item 4a)
4a	1	P0063-003	FITTING, Grease 1/4-28 90 Degree
5	1	P0001-08-016	BOLT, Hex 1/2 UNC x 4
6	4	P0065-005	BEARING
7	2	P0077-054	SNAP RING
8	2	P0077-055	SNAP RING
9	2	P0253-133	GUARDS, Rubber
10	4	P0040-006	WASHER, Hardened Flat 3/8
11	14	P0001-10-016	BOLT, Hex 5/8 UNC x 4
12	4	P0031-06-007	SCREW, Socket Head Cap 3/8 UNC x 1.75

## FRONT EXTENSION, 021779A



ITEM	QTY	PART NO.	DESCRIPTION
0	1	021779A	WELD, FRONT EXTENSION, 1548
1	4	021715P	TAB, Mounting
2	4	P0001-10-012	BOLT, Hex 5/8 UNC x 3
3	4	P0003-10-000	NUT, Hex 5/8 UNC
4	1	021717P	GRATING, Removable
5	2	021714P	SUPPORT, Grate

## DRIVE ASSEMBLY, 060006A



ITEM	QTY	PART NO.	DESCRIPTION
0	1	060006A	DRIVE ASSEMBLY
1***	1	021750A	GEAR BOX ASSEMBLY
2****	1	021190A	DRIVE MOTOR ASSEMBLY
3	1	P0115-012	CALIPER, Brake
4	1	021768P	DISC, Brake
5	1	P0066-122	BUSHING
6	4	P0031-06-004	SCREW, Socket Head Cap 3/8 UNC x 1
7	2	P0030S-06-006	BOLT, Shoulder 1/2 x 3/8 x 1.5
8	1	060023P	PLATE, Brake Lever
9	1	P0115-016	CAM
10	1	021793A	MOUNT, Brake Caliper
11	8	P0040-010	WASHER, Hardened Flat 5/8
12	4	P0031-04-002	SCREW, Socket Head Cap 1/4 UNC x .5
13	4	P0001-10-007	BOLT, Hex 5/8 UNC x 1.75
14	2	NSS	BAR, Caliper Mount
15	2	NSS	GUSSET
16	2	P0077-056	SNAP RING
17	1	021769P	AXLE, Drive
18	2	021796P	KEY
19	2	NSS	PIN
20	2	021790P	WHEEL, Rear Drive
21	4	P0001-08-004	BOLT, Hex 1/2 UNC x 1
22	2	P0066-121	BUSHING
23	2	021794P	KEY
24	1	021788P	KEY

## DRIVE ASSEMBLY, 060006A

ITEM	QTY	PART NO.	DESCRIPTION
25**	5 QT	P0126-009	OIL, Synthetic Gear Case
26	2	P0065-062	BEARING
27	4	P0001-10-010	BOLT, Hex 5/8 UNC x 2.5

QT - Quart

NSS - Not Sold Separately

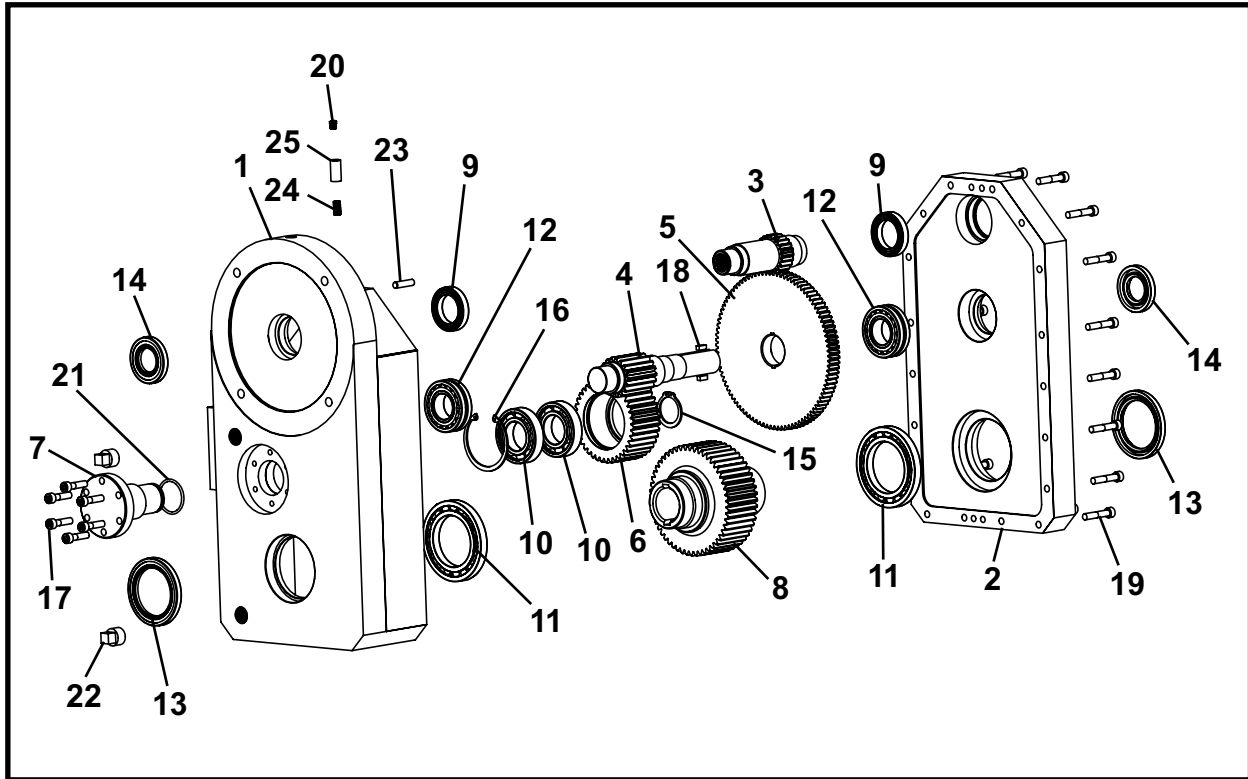
\* Lubricate input splines with anti-fretting grease.

\*\* Fill gear case with oil; level with fill hole.

\*\*\* Refer to this section for parts information.

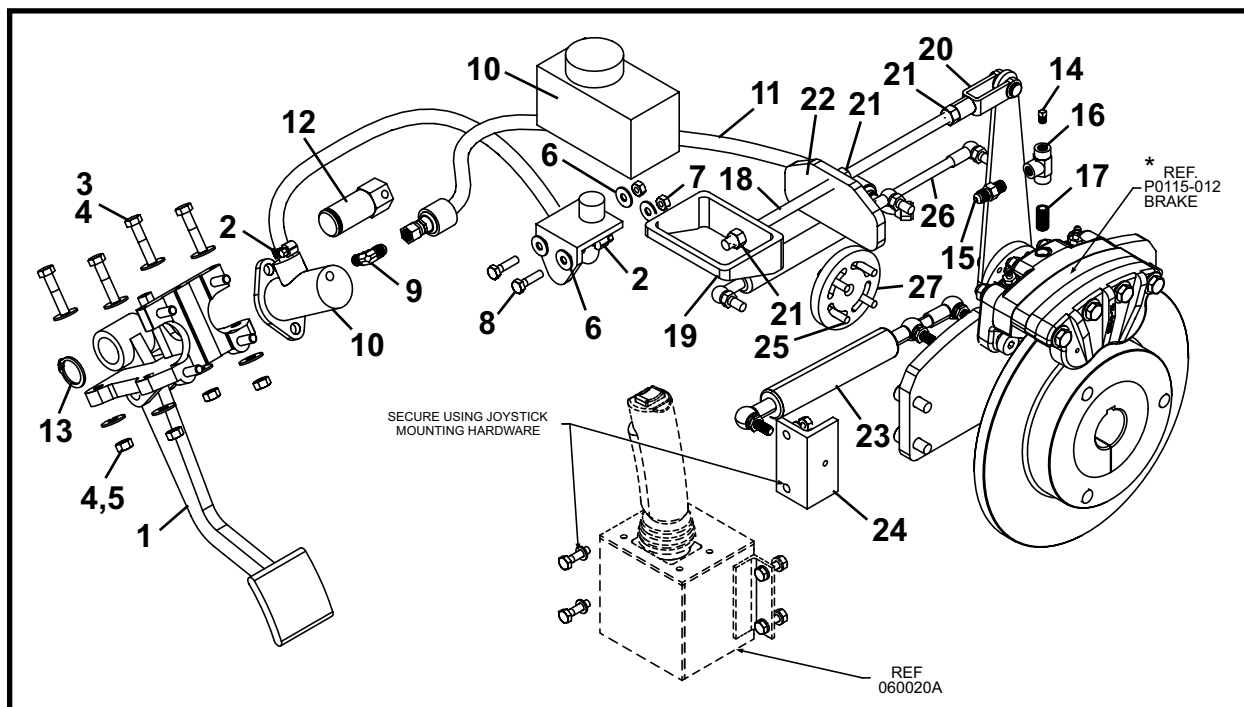
\*\*\*\* Refer to section 8, Motors for parts information.

## GEAR BOX ASSEMBLY, 021750A



ITEM	QTY	PART NO.	DESCRIPTION
0	1	021750A	ASSEMBLY, Gear Box
1	1	021751A	CASE, Gear
2	1	021752P	COVER, Gear Case
3	1	021753P	SHAFT, Input
4	1	021754P	SHAFT, Intermediate
5	1	021755P	GEAR
6	1	021756P	GEAR, Idler
7	1	021757P	PIN, Idler
8	1	021758P	GEAR, Output
9	2	P0065-276	BEARING
10	2	P0065-277	BEARING
11	2	P0065-278	BEARING
12	2	P0065-266	BEARING, Spherical Roller
13	2	P0080-041	SEAL
14	2	P0080-042	SEAL
15	1	P0077-061	RING, Snap
16	1	P0077-062	RING, Snap
17	6	P0031-06-006B	SCREW, Socket Head Cap 3/8 UNC x 1.5
18	2	021191P	KEY, 1/4 x 1/4
19	18	P0031-06-008	SCREW, Socket Head Cap 3/8 UNC x 2
20	1	P0063-012	FITTING, Grease 1/4 UNF
21	1	P0085-225	ORING
22	2	P0416-004	PLUG
23	2	021672P	ROD
24	1	P0402-000	NIPPLE, Close 1/8
25	1	P0400-000A	COUPLING, Forged 1/8

## BRAKE ASSEMBLY, 060005A

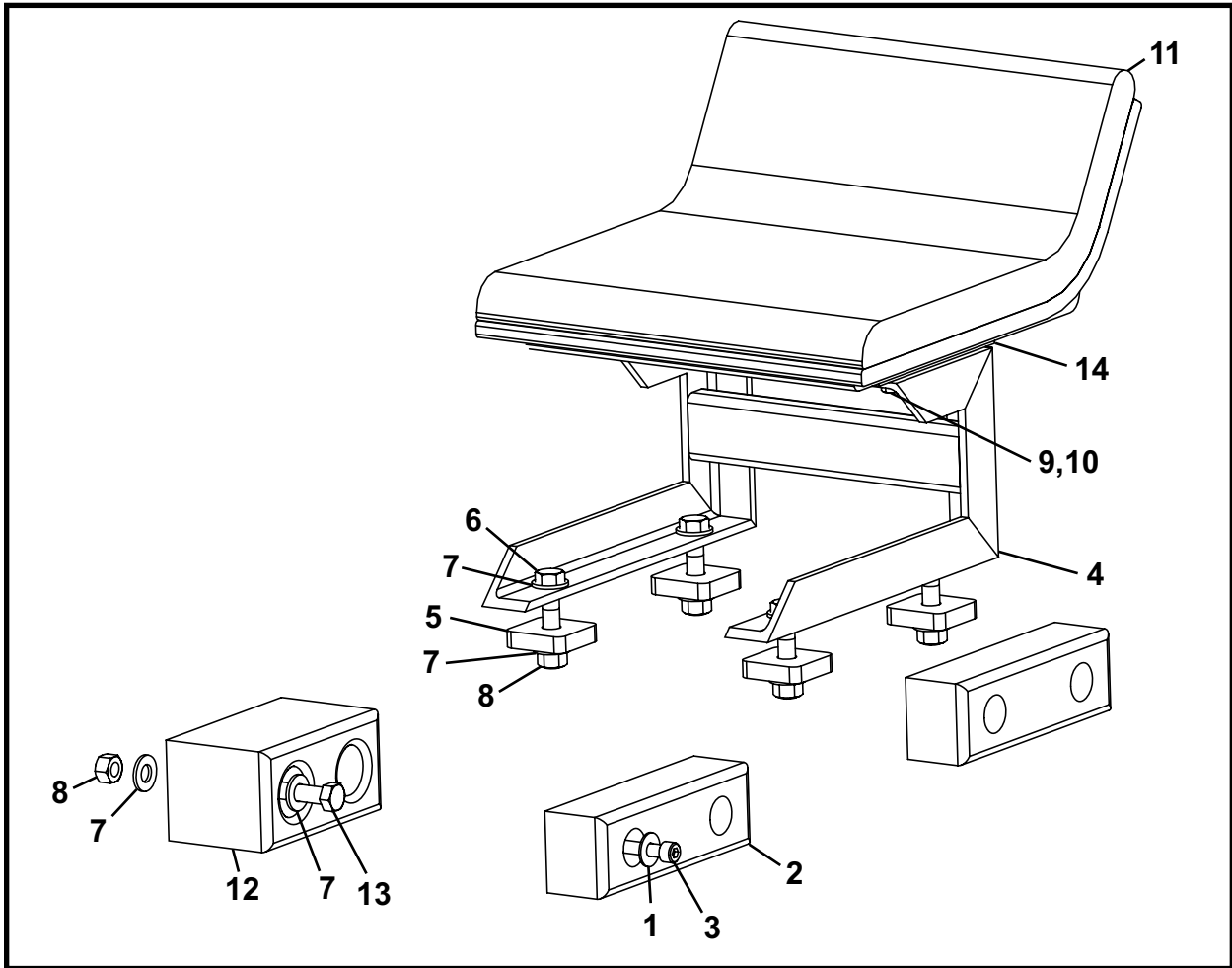


ITEM	QTY	PART NO.	DESCRIPTION
0	1	060005A	BRAKE ASSEMBLY
1	1	P0115-015	PEDAL, Brake
2	2	P0201-293	CLAMP, Radiator #2
3	4	P0001-05-006	BOLT, Hex 5/16 UNC x 1.5
4	8	P0040-005	WASHER, Hardened Flat 5/16
5	4	P0003-05-000	NUT, Hex 5/16
6	4	P0040-004	WASHER, Hardened Flat 1/4
7	2	P0003-04-000	NUT, Hex 1/4
8	2	P0001-04-004	BOLT, Hex 1/4 UNC x 1
9	1	P0300-418	FITTING, 04MJ-02MP90-FGD
10	1	P0115-014	KIT, Master Cylinder (Includes items 10a - 10c)
10a	1	-	Master Cylinder
10b	1	-	Bracket
10c**	1	-	Reservoir
11	1	A10404A-026	HOSE ASSEMBLY, 1/4 x 26
12	1	022112P	PIN, Brake Pivot
13	1	P0077-011	SNAP RING
14	1	P0416-000	PLUG, Square Head 1/8
15	1	P0300-363	FITTING, 04MJ-02MP
16	1	P0300-226	FITTING, 02FP-02FP-02FP
17	1	P0402-000	NIPPLE, Close 1/8
18	12	P0023-374	ROD, Threaded 3/8 UNF
19	1	060021P	HANDLE, Pull
20	1	P0024-001	YOKE WITH CLEVIS PIN
21	3	P0004-06-000	NUT, Hex 3/8 UNF
22	1	060022P	PLATE, Maglock
23	1	P0070-074	SPRING, Pulling Gas
24	1	060041P	MOUNT, Spring
25	4	P0031-04-004	SCREW, Socket Head Cap 1/4 UNC x 1
26	1	P0250-307	LIMITER, Stroke
27	1	060045P	NUT, Caliper Plate

\* Reference P0115-012 Brake Caliper; see Drive Assembly, 060006A in this section.

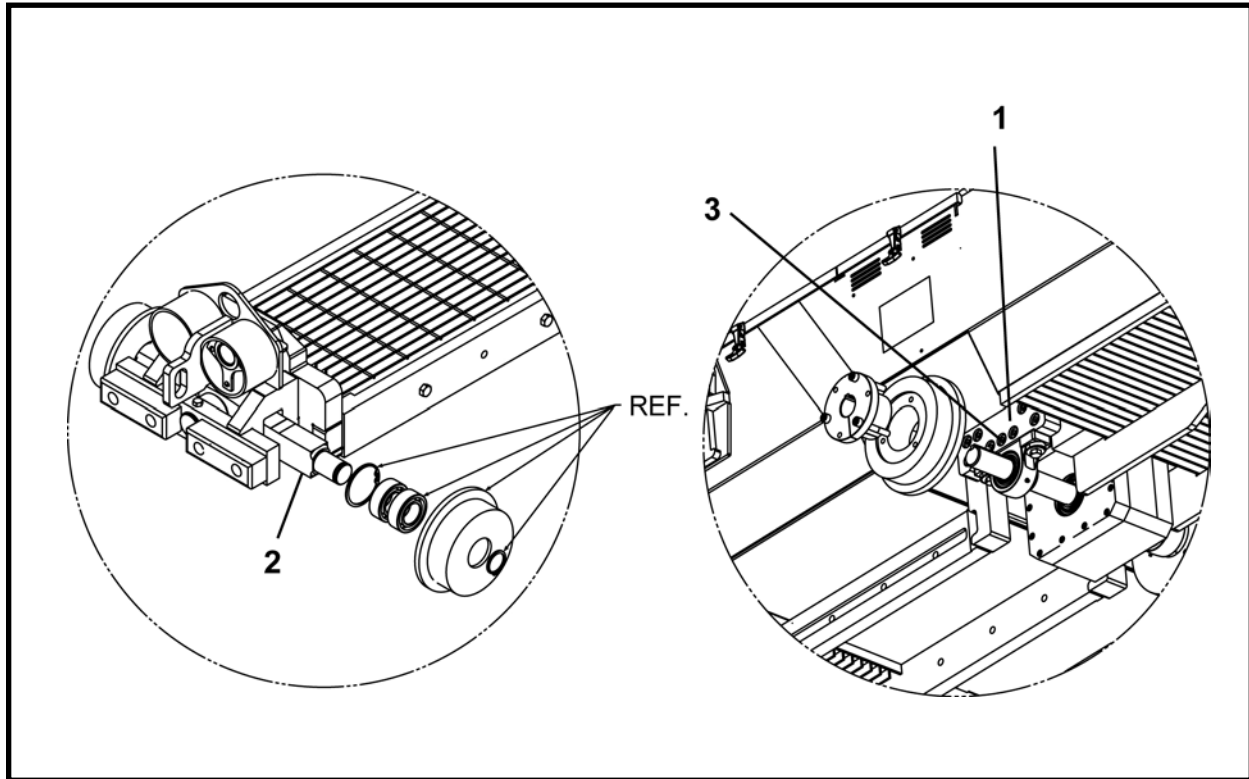
\*\* Use DOT 3 Brake Fluid, P0126-051

## LOW SEAT ASSEMBLY, 022155A



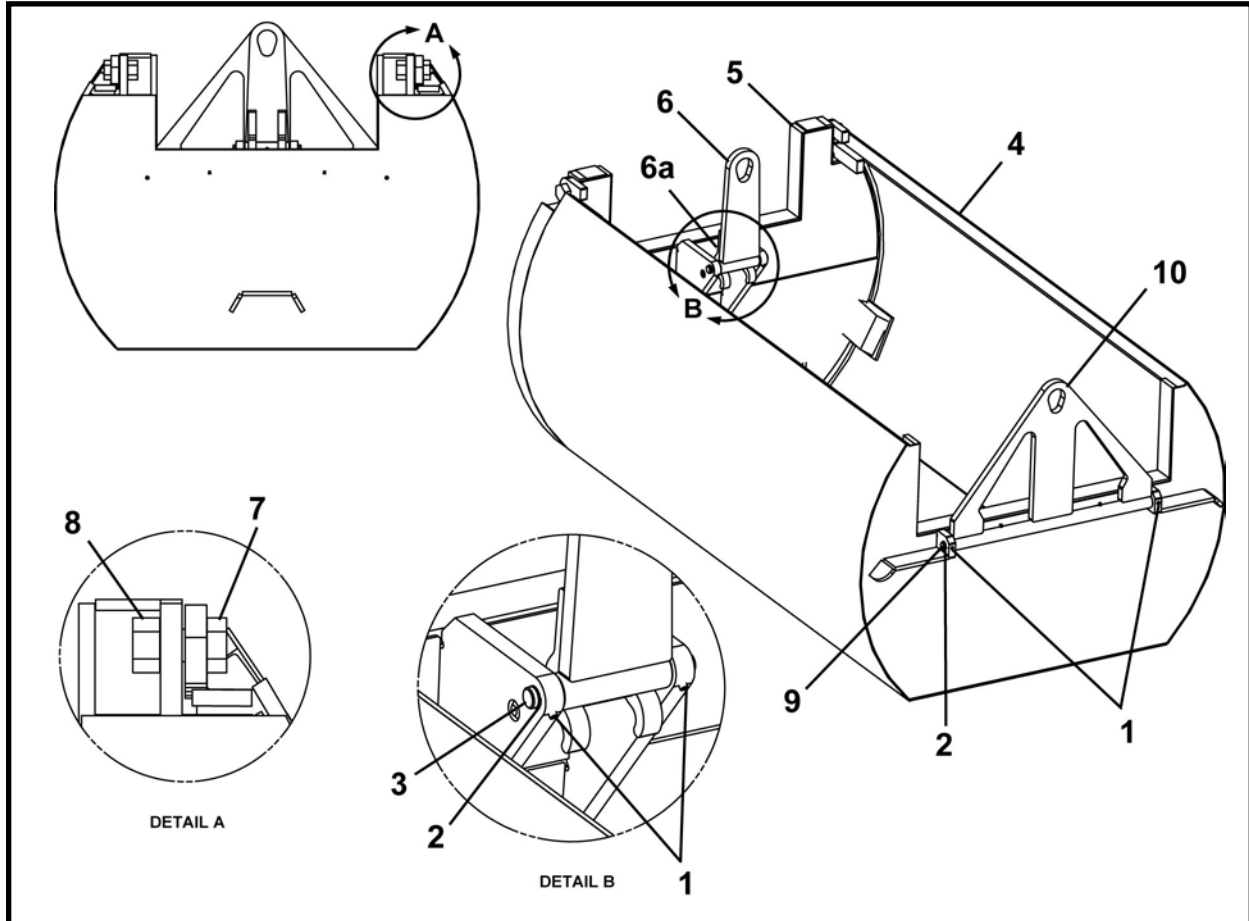
ITEM	QTY	PART NO.	DESCRIPTION
0	1	022155A	LOW SEAT ASSEMBLY
1	4	P0040-006	WASHER, Hardened Flat 3/8
2	2	P0253-133	GUARD, Rubber
3	4	P0031-06-007	SCREW, Socket Head Cap 3/8 UNC x 1.75
4	1	022154A	MOUNT, Seat
5	4	022174P	PLATE, Seat Retainer
6	4	P0001-08-010	BOLT, Hex 1/2 UNC x 2.5
7	12	P0040-008	WASHER, Hardened Flat 1/2
8	6	P0003-08-000	NUT, Hex UNC 1/2
9	4	P0001-05-004	BOLT, Hex 5/16 UNC x 1
10	4	P0040-005	WASHER, Hardened Flat 5/16
11	1	P0113-001	SEAT, Low Back
12	1	P0253-135	BUMPER, Rubber
13	2	P0001-08-014	BOLT, Hex 1/2 UNC x 3.5
14	2	009993P00	BAR, Boring Head Seat

## 24" TRACK GAGE KIT, 021716A



ITEM	QTY	PART NO.	DESCRIPTION
0	1	021716A	KIT, 24" Track Gage
1	2	021761P	BLOCK
2	1	021759A	ASSEMBLY, Idler Axle 24" GA
3	18	P0031-12-008	SCREW, Socket Head Cap 3/4 UNC x 2

**DIRT BUCKET**  
**600/600X**

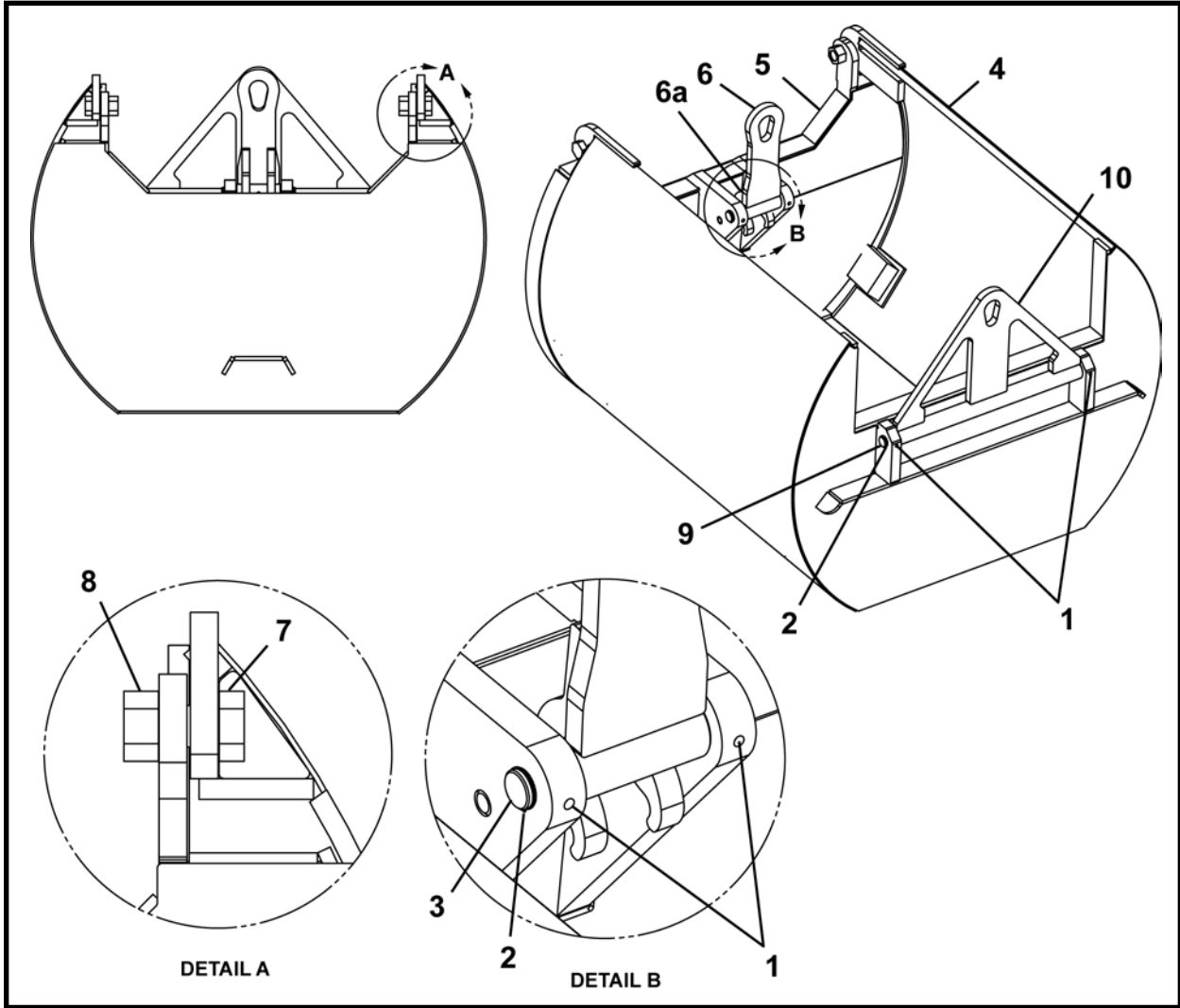


ITEM	QTY	PART NO.	DESCRIPTION
0.1	1	F20750F00	DIRT BUCKET, 600
0.2	1	F20700F00	DIRT BUCKET, 600X
1	4	P0032-003	SET SCREW, 3/8 UNC x 3/8
2	4	P0077-012	SNAP RING
3	1	009237P00	ROD
4.1	1	020752A00	WELDMENT, Bucket
4.2	1	020702A00	WELDMENT, Bucket
5	1	020701A00	DOOR
6	1	010708A00	LIFT EYE, Door (includes item 6a)
6a	1	P0063-001	FITTING, Grease 1/4 UNF
7	2	P0001-20-022	BOLT, Hex 1-1/2 -6 UNC x 5.5
8	2	P0003-24-000	NUT, Hex 1-1/2 UNC
9	1	007889P00	LIFT BAR HINGE PIN
10	1	020703A00	LIFT EYE, Front (includes item 10a)
10a	2	P0063-001	FITTING, Grease 1/4 UNF

NOTE: The 600 and 600X buckets are not to be used with 524 Haul Unit unless test fit to yoke and TBM.

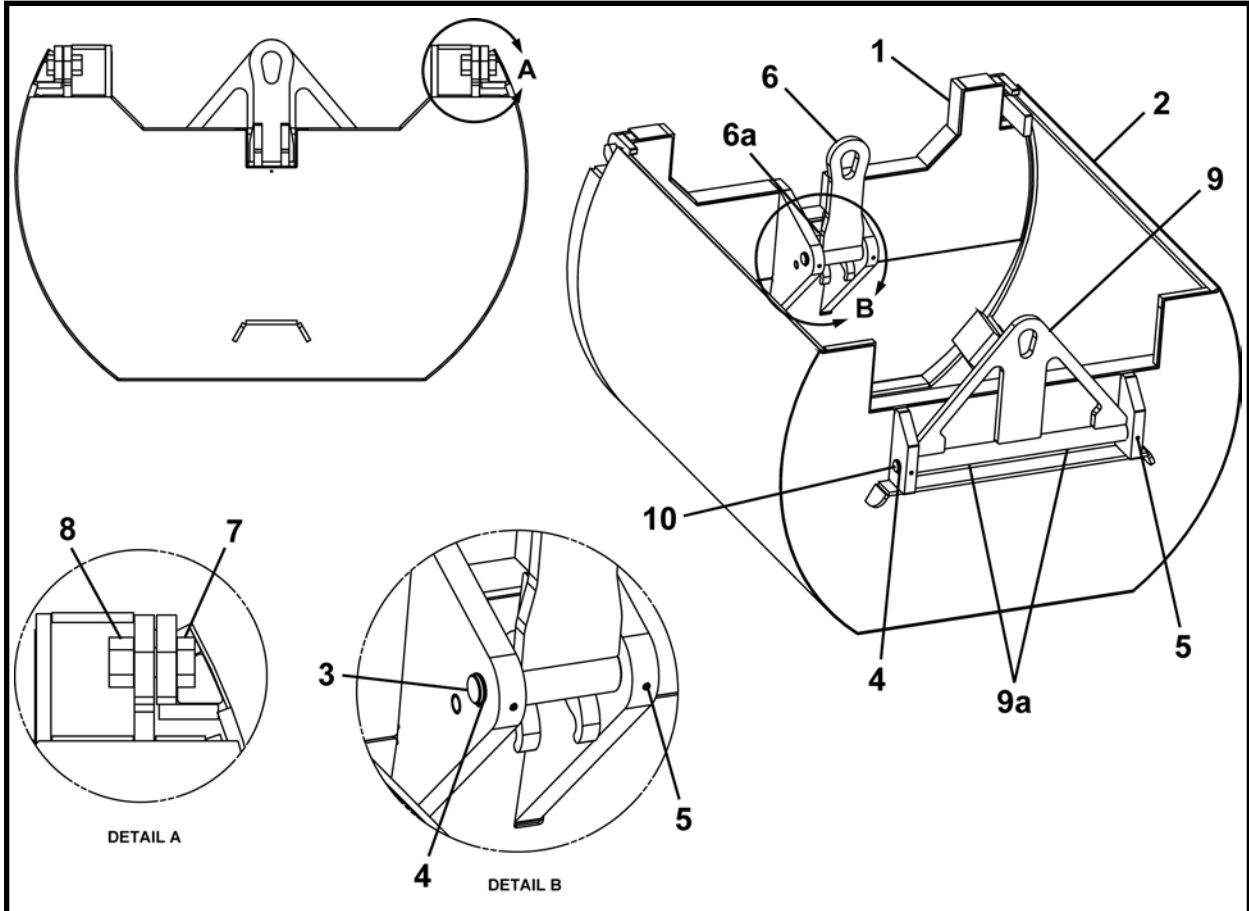
# DIRT BUCKET, F10700F01

660



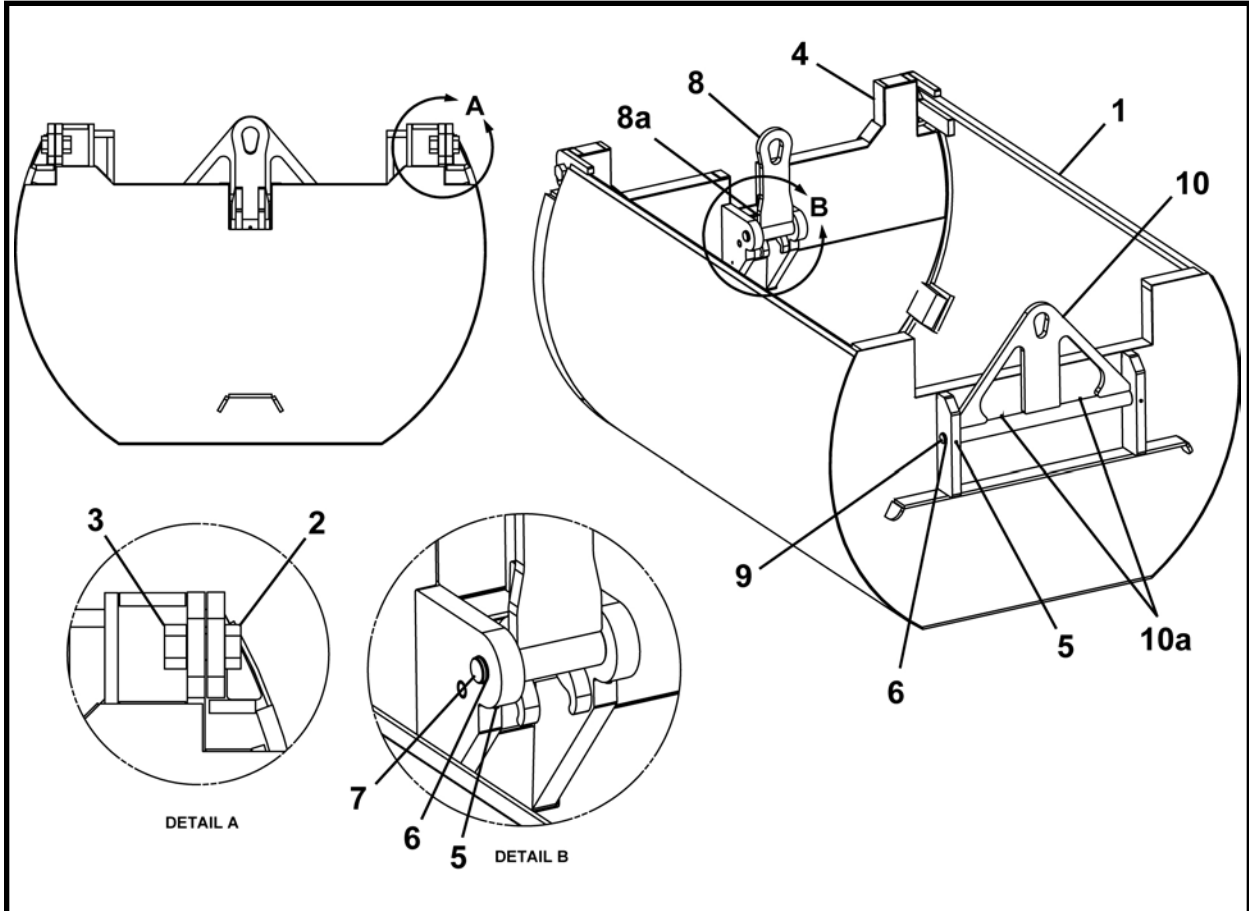
ITEM	QTY	PART NO.	DESCRIPTION
0	1	F10700F01	DIRT BUCKET, 660
1	2	P0032-003	SET SCREW, 3/8 UNC x .375
2	2	P0077-021	SNAP RING
3	1	014575P00	ROD
4	1	010715A01	WELDMENT, Dirt Bucket
5	1	010703A01	DOOR
6	1	014566A00	LIFT EYE, Door (includes item 6a)
6a	1	P0063-001	FITTING, Grease 1/4 UNF
7	2	P0001-20-022	BOLT, Hex 1-1/2 UNC x 5.5
8	2	P0003-24-000	NUT, Hex 1-1/2 UNC
9	1	014576P00	ROD
10	1	014567A00	LIFT EYE, Front (includes item 10a)
10a	2	P0063-001	FITTING, Grease 1/4 UNF

**DIRT BUCKET  
720/720X**



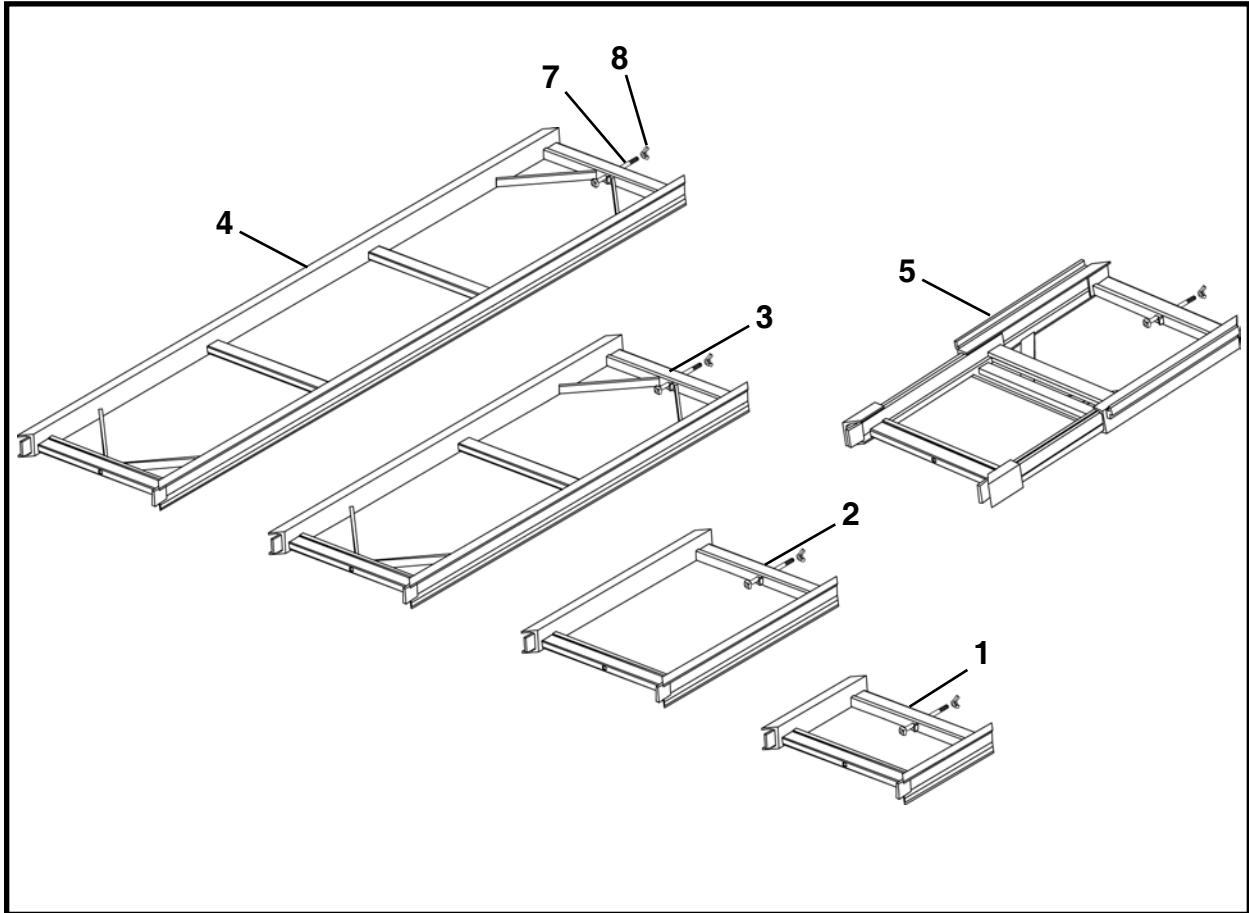
ITEM	QTY	PART NO.	DESCRIPTION
0.1	1	F08670F00	DIRT BUCKET, 720
0.2	1	F08675F00	DIRT BUCKET, 720X
1	1	007860A03	DOOR
2.1	1	008650A	WELDMENT, Bucket
2.2	1	008660A	WELDMENT, Bucket Ext
3	1	014575P00	LIFT BAR HINGE PIN
4	4	P0077-021	SNAP RING
5	4	P0032-003	SET SCREW, 3/8 UNC x .375
6	1	014566A00	LIFT EYE, Door (includes item 6a)
6a	1	P0063-001	FITTING, Grease 1/4 UNF
7	2	P0001-20-022	BOLT, Hex 1-1/2 UNC x 5.5
8	2	P0003-24-000	NUT, Hex 1-1/2 UNC
9	1	014567A00	LIFT EYE, Front (includes item 9a)
9a	2	P0063-001	FITTING, Grease 1/4 UNF
10	1	014576P00	PIN, Door Lift Eye

**DIRT BUCKET, F19140F00  
780X**



ITEM	QTY	PART NO.	DESCRIPTION
0	1	F19140F00	DIRT BUCKET, 780X
1	1	019138A01	WELDMENT, Bucket
2	2	P0001-20-022	BOLT, 1-1/2 UNC x 5.5
3	2	P0003-24-000	NUT, Hex 1-1/2 UNC
4	1	019136A01	DOOR
5	4	P0032-003	SET SCREW, 3/8 UNC x .375
6	4	P0077-021	SNAP RING
7	1	014575P00	PIN, Lift Eye Door
8	1	014566A00	LIFT EYE, Door (Includes item 8a)
8a	1	P0063-001	FITTING, Grease 1/4 UNF
9	1	014576P00	PIN, Lift Eye Door
10	1	014597A	LIFT EYE (Includes item 10a)
10a	2	P0063-001	FITTING, Grease 1/4 UNF

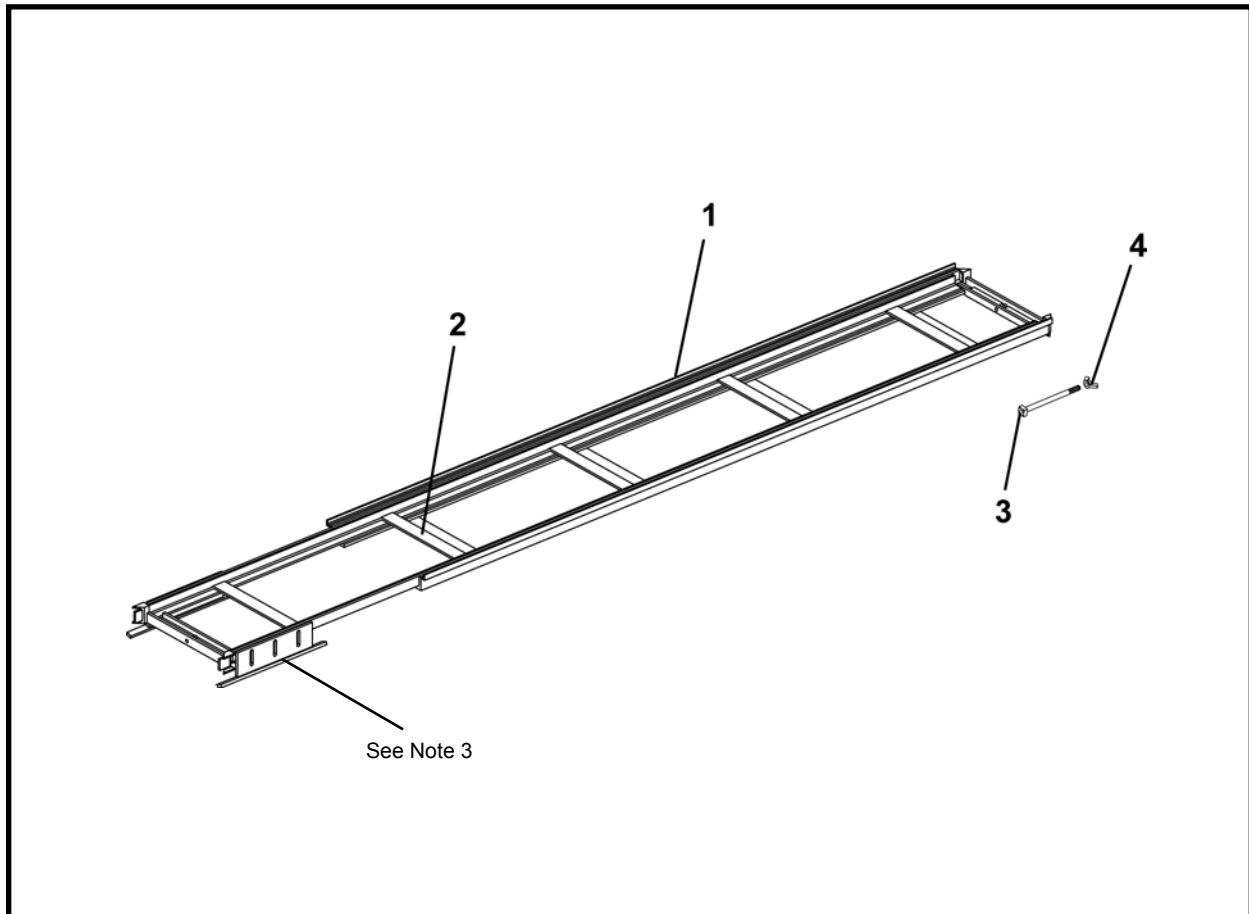
**TRACK  
(20 GAUGE)**



ITEM	QTY	PART NO.	DESCRIPTION
1	1	F07247F00	STARTER TRACK, 1 Foot
2	1	F07246F00	STARTER TRACK, 2 Foot
3	1	F07245F00	STARTER TRACK, 4 Foot
4	1	F07244F00	TRACK, 8 Foot
5	1	F12220F02	TRACK, Slider 13 in.
6	1	F17084F00	TRACK, Slider 36 in. (not shown)
7	A/N	007242A00	BOLT, Track
8	A/N	P0012-08-000	NUT, Wing 1/2 UNC

A/N - As Needed

**SLIDER TRACK (RING BEAM & LAGGING), 022840A  
(20 GAUGE)**



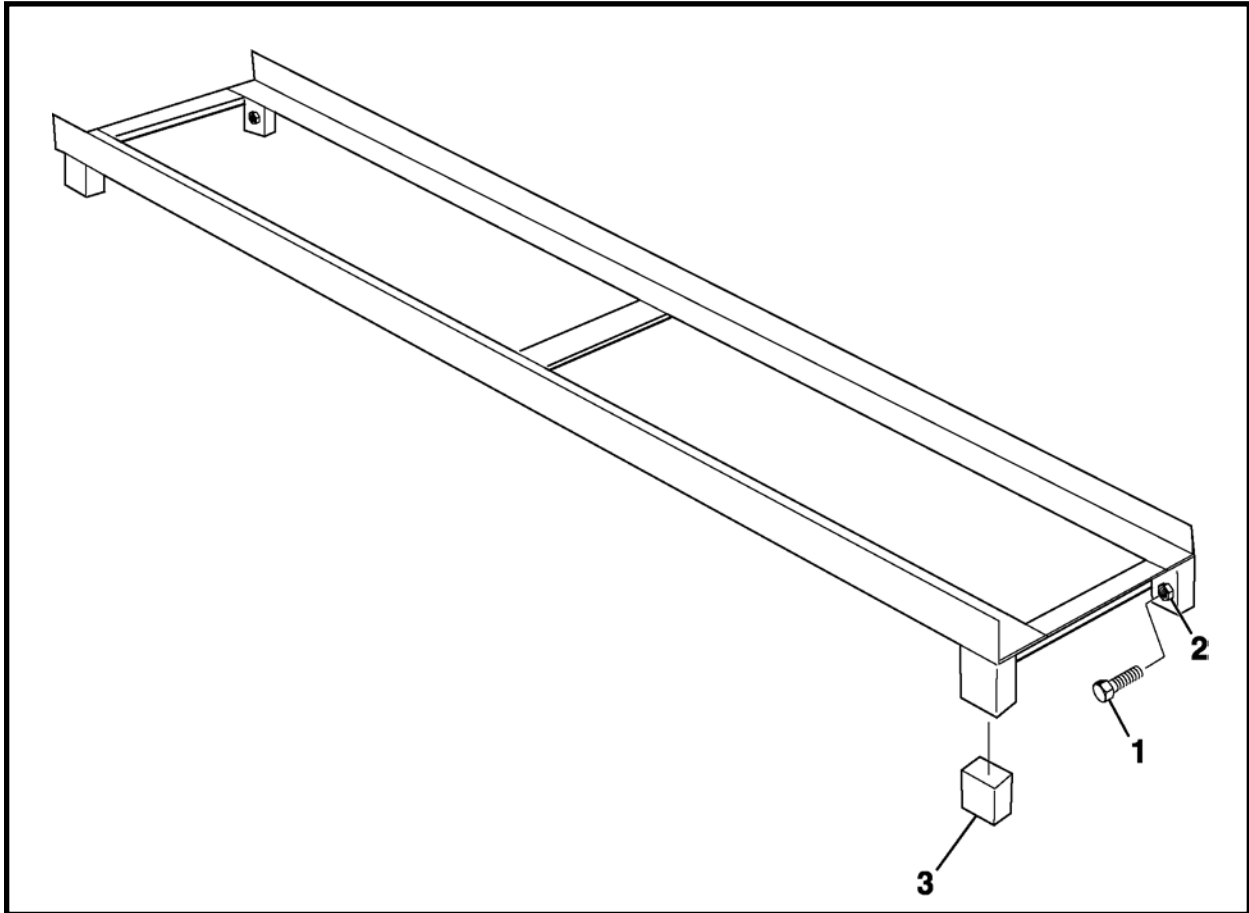
ITEM	QTY	PART NO.	DESCRIPTION
1	1	022840A	TRACK, Slider (Ring Beam & Lagging)
2	12	1250-480	DECAL, Warning, Pinch Points
3*	1	007242A00	BOLT, Track
4*	1	P0012-08-000	NUT, Wing 1/2 UNC

\* Not part of 022840A Slider Track.

**NOTE:**

1. Track approximately 260" long extended with 50" overlap between inner and outer track.
2. Track approximately 175" long when fully collapsed.
3. Runner height is sized for 660 TBM with 70" ID ring beam. Different ring beams will require different runner height. For more information, contact your Akkerman Aftermarket Support representative.

## TRACK RISER, F61043F

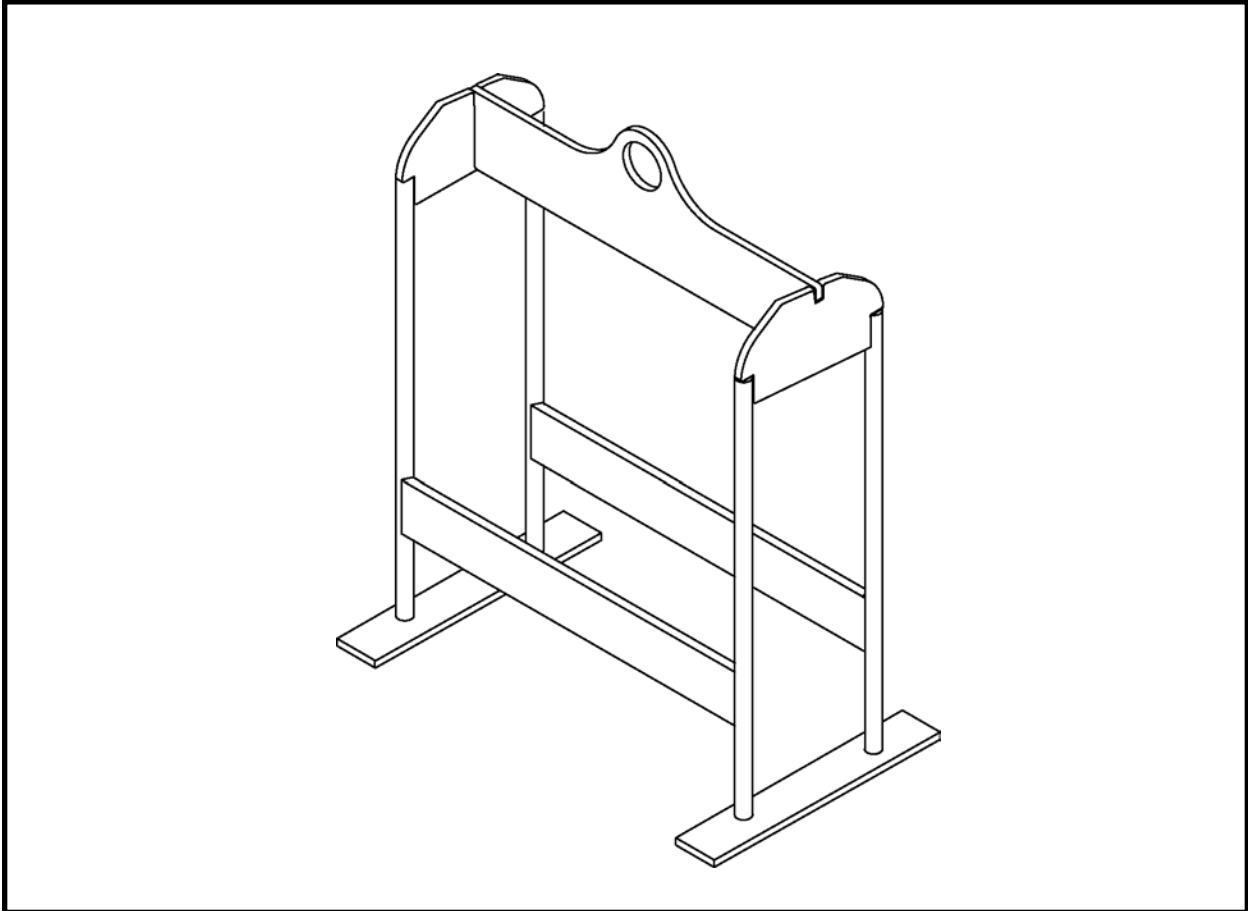


ITEM	QTY	PART NO.	DESCRIPTION
0	1	F61043F	TRACK RISER
1	4	P0001-06-003	BOLT, Hex 3/8 UNC x .75
2	4	P0003-06-000	NUT, Hex 3/8 UNC
3*	4	009901P01	BAR

\* The bar length is variable depending upon job setup.

This assembly replaces Track Riser Assembly, F09900F00.

# TRACK CARRIER, F07270F00



ITEM	QTY	PART NO.	DESCRIPTION
0	1	F07270F00	TRACK CARRIER

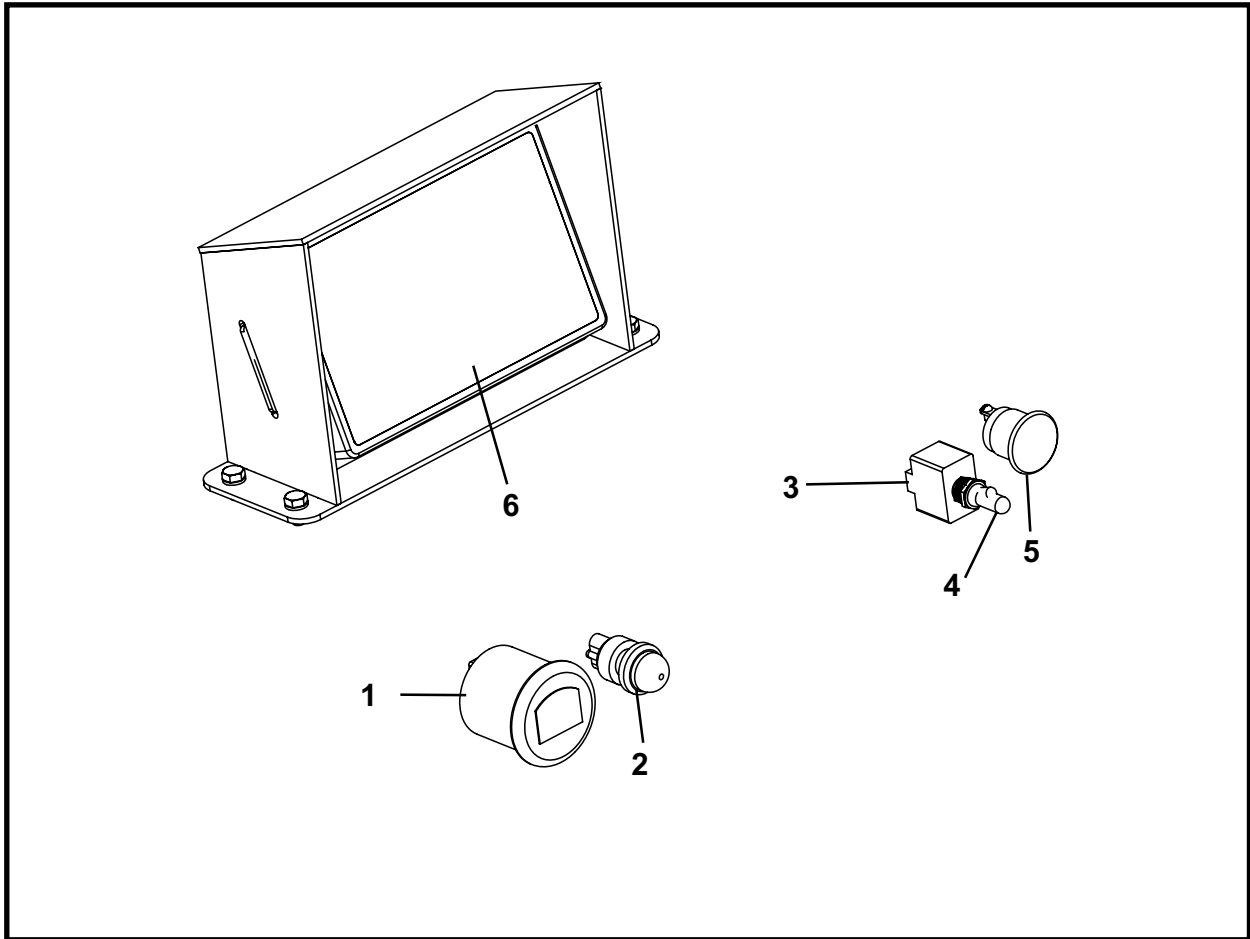
## **NOTES**



# Operator Controls

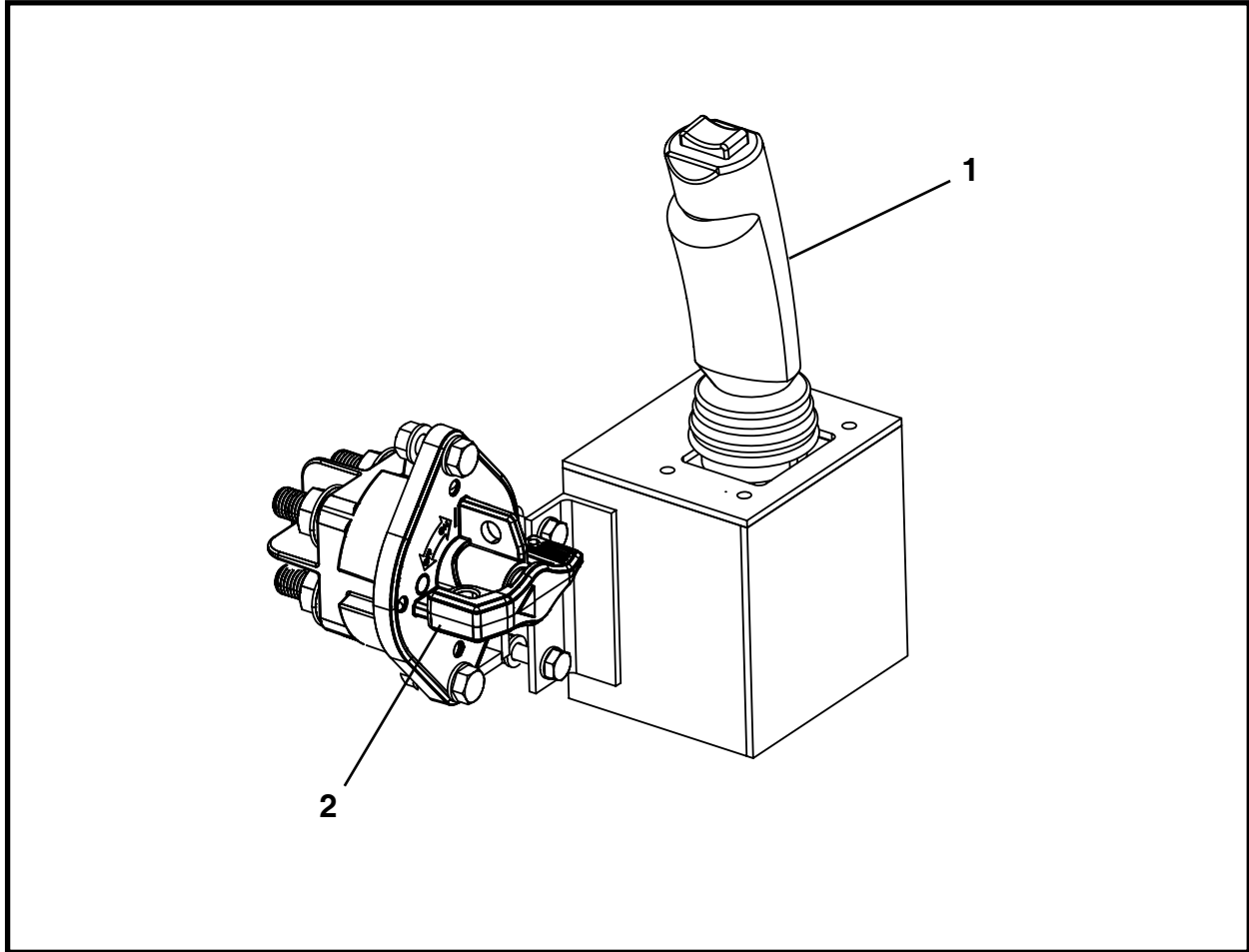
Dash Controls .....	2
Battery Lockout Switch & Joystick Controls .....	3

## OPERATOR CONTROLS DASH CONTROLS



ITEM	QTY	PART NO.	DESCRIPTION
1	1	P0251-580	GAUGE (Battery Gauge)
2	1	P0056-001	SWITCH With BOOT (Horn)
3	1	P0056-147	SWITCH Toggle (Motor Control Switch)
4	1	P0056-010	BOOT, Toggle
5	1	P0251-997	BUZZER (Alarm)
6	1	P0251-993	MONITOR, 7" LCD

## BATTERY LOCKOUT SWITCH & JOYSTICK CONTROLS



ITEM	QTY	PART NO.	DESCRIPTION
1*	1	060044A	JOYSTICK ASSEMBLY
2	1	P0251-996	SWITCH, Battery Lockout

\* Refer to section 5, Electrical for parts information.

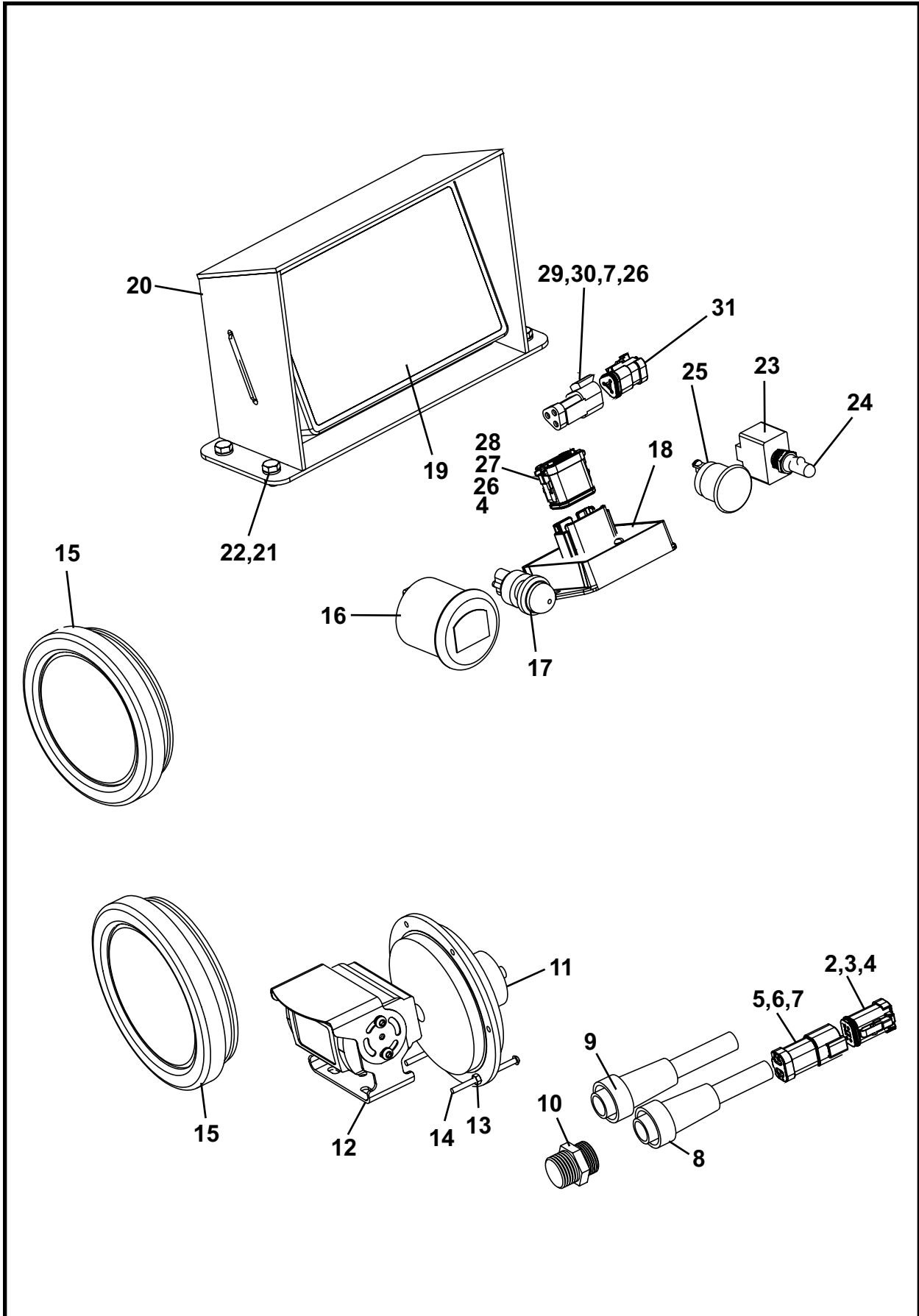
## **NOTES**



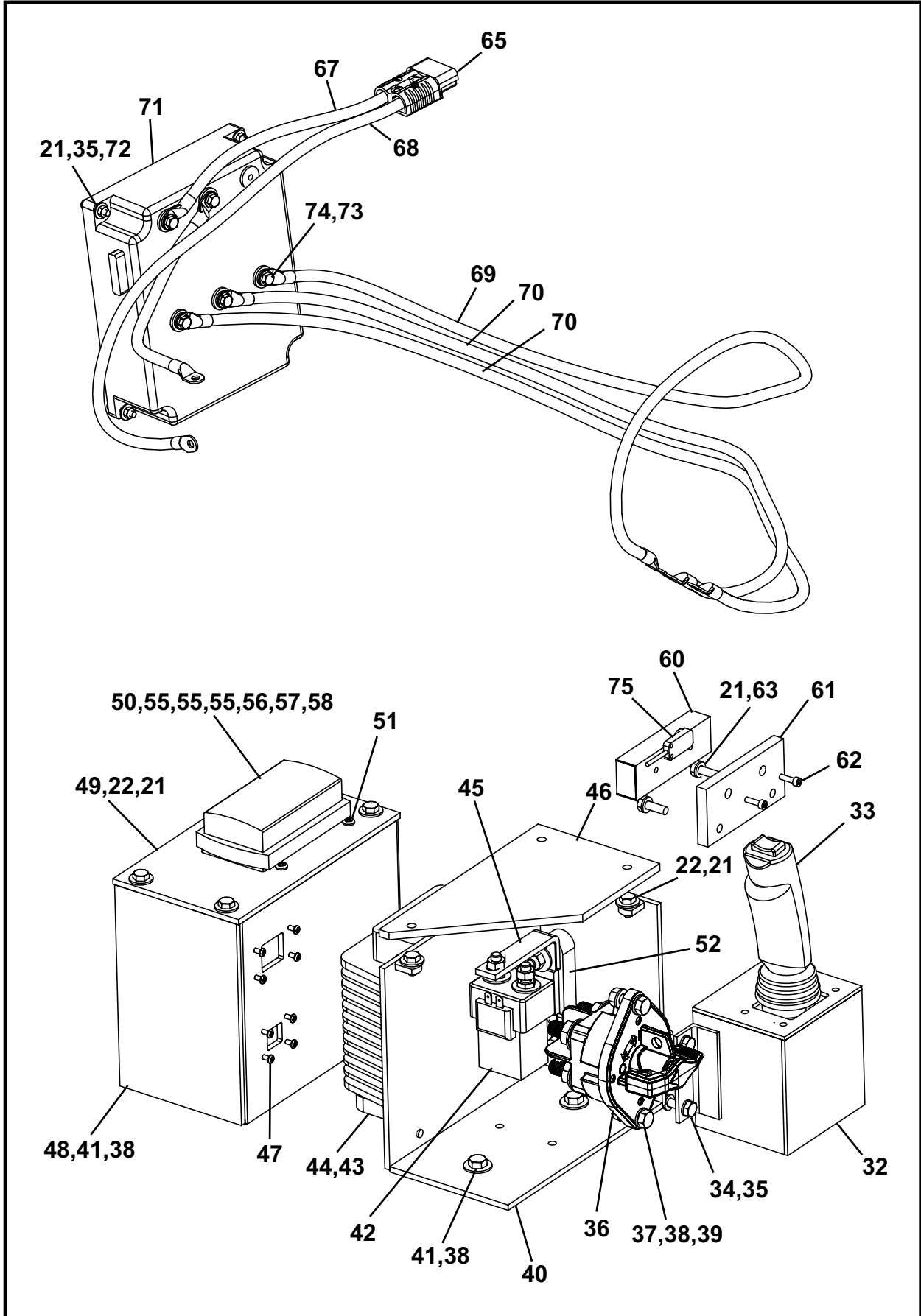
## Electrical

Electrical Assembly, 060004A .....	2
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1548 Harness Schematics, 060043A .....	8
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# ELECTRICAL ASSEMBLY, 060004A



# ELECTRICAL ASSEMBLY, 060004A



## ELECTRICAL ASSEMBLY, 060004A

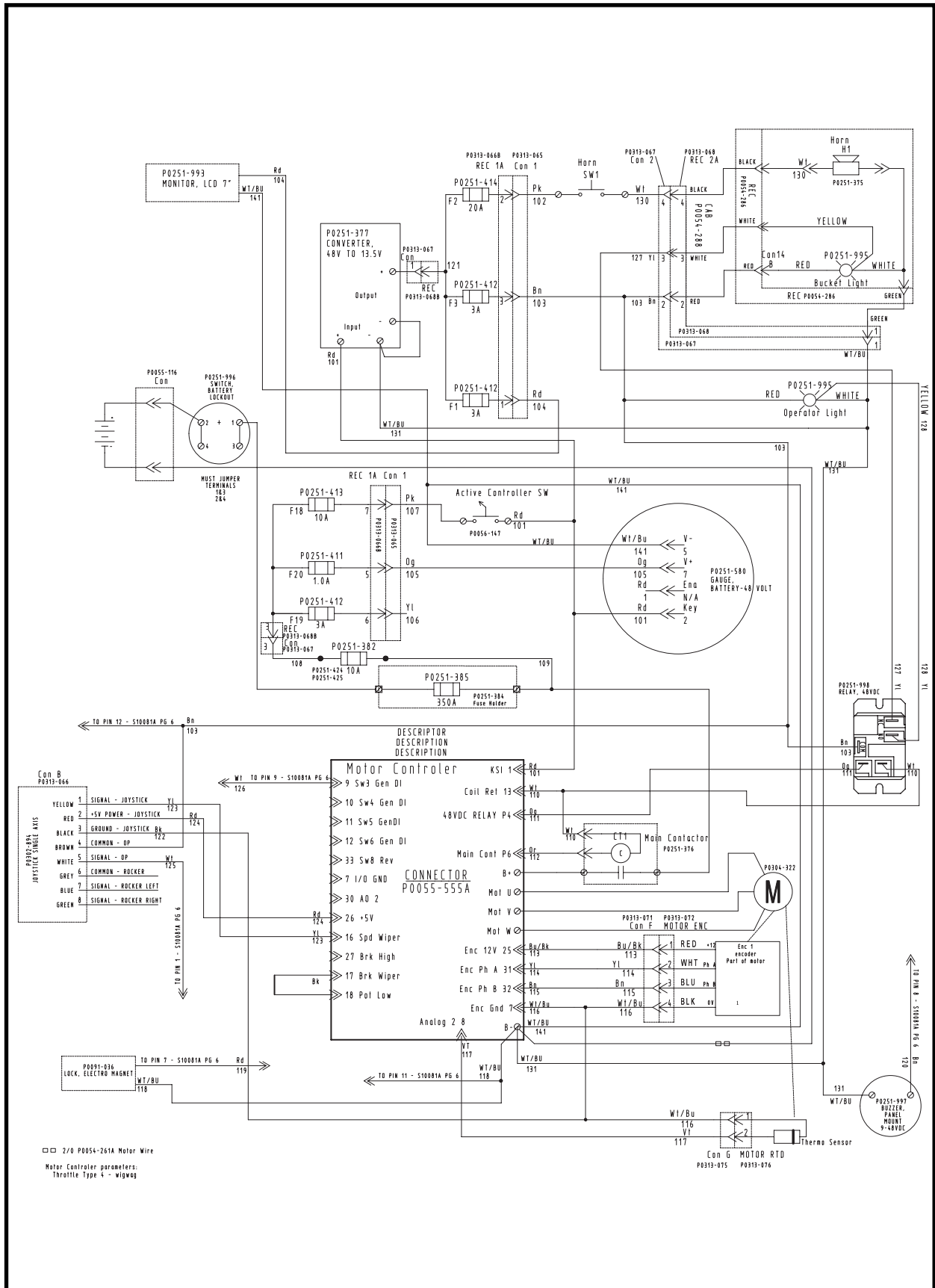
ITEM	QTY	PART NO.	DESCRIPTION
0	1	060004A	1548 ELECTRICAL ASSEMBLY
1*	1	060043A	ASSEMBLY, Harness
2	1	P0313-067	PLUG, DT 4 Way
3	1	P0313-067A	PLUG, Wedgelock DT 4 Way
4	12	P0313-008	SOCKET #16
5	1	P0313-068	RECEPTACLE, 4 WAY
6	1	P0313-068A	RECEPTACLE, 4 WAY
7	6	P0313-007	PINS #16
8	1	P0054-288	CABLE, 4 C 16 GA Mini M/F 12'
9	1	P0251-994	CABLE, Camera 5m
10	1	P0054-286	RECEPTACLE 4 C 16 GA Mini MAL 12"
11	1	P0251-375	HORN
12	1	P0251-992	CAMERA
13	4	P0003-03-000	NUT, Hex 6-32
14	2	P0020-63-029	SCREW, Truss Head 6-32 x 2
15	1	P0251-995	KIT, Light Dual, Red - White
16	1	P0251-580	GAUGE, Battery - 48 V
17	1	P0056-001	SWITCH WITH BOOT
18	1	S10081A	ASSEMBLY, IO Module
19	1	P0251-993	MONITOR, 7" LCD
20	1	060036A	MOUNT, Monitor
21	25	P0040-004	WASHER, Hardened Flat 1/4
22	11	P0001-04-002	BOLT, Hex 1/4 UNC x .5
23	1	P0056-147	SWITCH, Toggle
24	1	P0056-010	BOOT, Toggle Switch
25	1	P0251-997	BUZZER, 48VDC
26	5	P0313-016	PLUG, Sealing
27	1	P0313-086A	LOCK, Wedge
28	1	P0313-086	SPADE, 12 Pin
29	1	P0313-070	RECEPTACLE, 3 Way
30	1	P0313-070B	WEDGELOCK, Pin-Blue
31	1	P0313-121	RESISTOR, Can Termination
32	1	060020A	BOX, Joystick
33*	1	060044A	JOYSTICK ASSEMBLY
34	4	P0001-04-004	BOLT, Hex 1/4 UNC x 1
35	8	P0003-04-000	NUT, Hex 1/4 UNC
36	1	P0251-996	SWITCH, Battery Lockout
37	2	P0001-05-004	BOLT, Hex 5/16 UNC x 1
38	8	P0040-005	WASHER, Hardened Flat 5/16
39	2	P0003-05-000	NUT, Hex 5/16 UNC
40	1	022191A	BOX, Electrical
41	4	P0001-05-002	BOLT, Hex 5/16 UNC x .5
42	1	P0251-376	CONTACTOR
43	4	P0031-04-002	SCREW, Socket Head Cap 1/4 UNC x .5
44	1	P0251-377	CONVERTOR, 48V To 13.5V
45	2	022194P	BAR, Electrical Buss
46	1	022195P	GUARD, Electrical
47	8	P0020-63-023	SCREW, Truss Head 6-32 x .5
48	1	022166A	BOX, Fuse
49	1	022164P	LID, Fuse
50	1	P0251-416	HOLDER, Fuse 12 Position
51	4	P0017-10-324	SCREW, Machine 10-32 x .5
52	1	P0251-384	HOLDER, Fuse 350A 48V
53	1	P0251-385	FUSE 350A 48V

## ELECTRICAL ASSEMBLY, 060004A

ITEM	QTY	PART NO.	DESCRIPTION
54	2	P0251-411	FUSE, 1 A DC
55	3	P0251-412	FUSE, 3 A DC
56	3	P0251-413	FUSE, 10 A DC
57	2	P0251-414	FUSE, 20A DC
58	1	P0251-417	TOOL, Fuse Holder Removal
59	2	P0030-04-003	SCREW, Flat Head Cap 1/4 UNC x .75
60	1	P0091-036	LOCK, Mini Electro Magnetic
61	1	060042P	MOUNT, Maglock
62	2	PM04B-0.70-014	SCREW, Socket Head Cap M4x14 Stainless Steel
63	2	P0001-04-003	BOLT, Hex 1/4 UNC x .75
64	1	P0251-998	RELAY, 48VDC 20A
65	1	P0055-116	CONNECTOR, Gray
66	1	022173A	CABLE, 13.5 Long
67	1	022172A	CABLE, 30.75 Long
68	1	022171A	CABLE, 41.75 Long
69	1	022170A	CABLE, 60 Long
70	2	022169A	CABLE, 52 Long
71	1	P0304-364	CONTROL, Motor Speed
72	4	P0020-14-207	SCREW, Truss Head 1/4-20 x 1.5
73	5	P0046-024	WASHER, Belleville 8mm
74	5	PM08A-1.25-020	SCREW, Hex Cap 8mm x 1.25
75	1	P0250-306	SENSOR

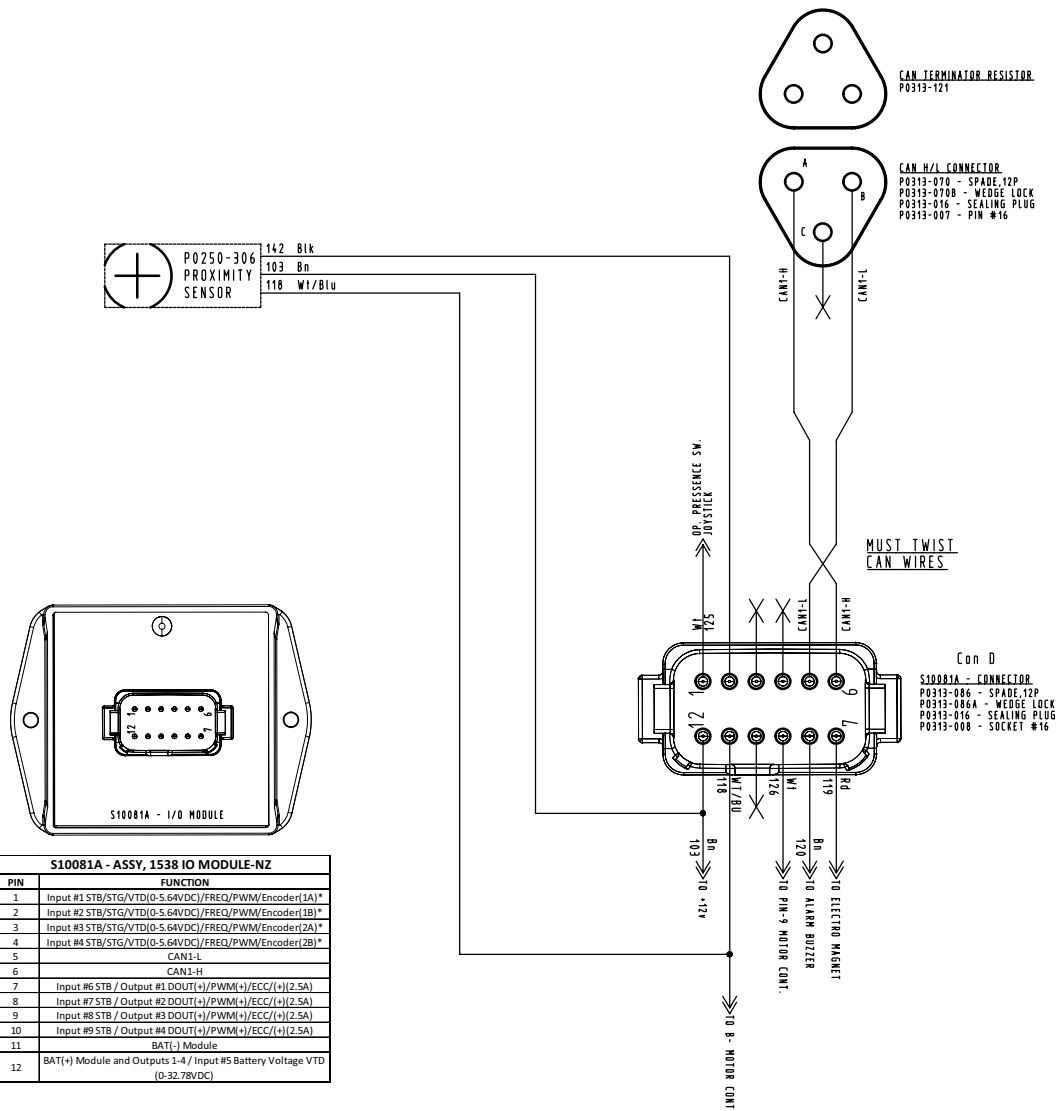
\* Refer to this section for parts information.

# ELECTRICAL SCHEMATIC, 060004A



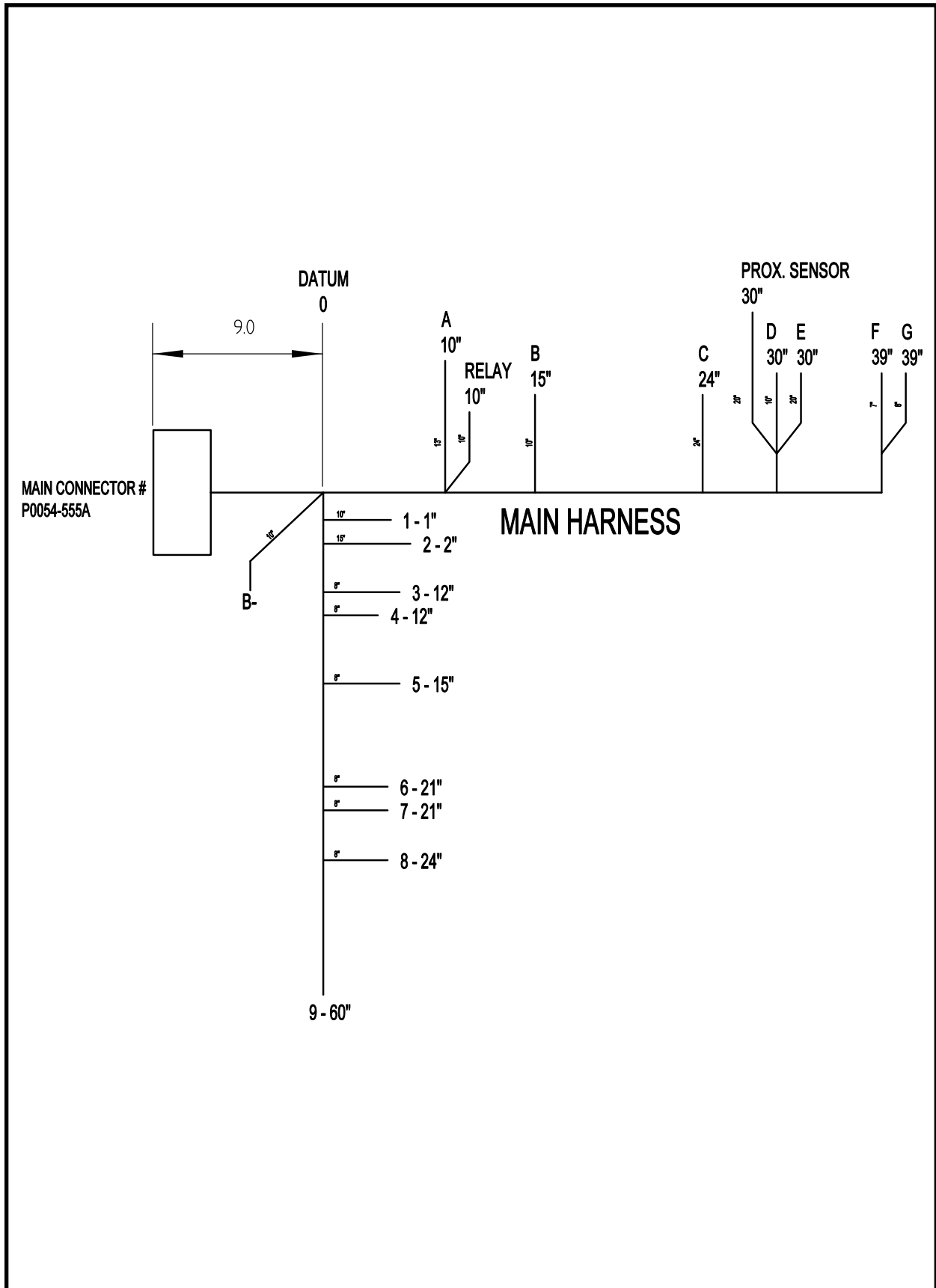
# ELECTRICAL SCHEMATIC, 060004A

WIRE NUMBER	DESCRIPTION	FROM LOCATION #1	TO LOCATION #2	WIRE COLOR/GAUGE
101	COM- KSI 1	KSI 1	Converter, Act. Cont. Sw, Batt Ga	Red 16 AWG
102	Horn Supply Circ	Fuse 1 (20A)	Horn Sw	Violet 16 AWG
103	COM-Lights, I/O Module, Joystick OP	Fuse 2 (3A)	Lights, 48v Relay, Joystick, I/O Module Con. Pin 12	Brown 16 AWG
104	Monitor PWR	Fuse 3 (3A)	Monitor PWR	Red 16 AWG
105	Battery Gauge PWR	Fuse 5 (1A)	Batt Gauge V+	Orange 16 AWG
106	<b>OPEN</b>	Fuse 6 (3A)		
107	Active Controller Supply Circ	Fuse 4 (10A)	Act. Cont. Sw	Yellow 16 AWG
108	Fuse Panel Supply	Fuse 7 (20A)	Fuse Panel	
109	Fuse Panel Supply	Fuse 8 (350A)	Fuse 7	
110	Coil Ret.	Motor Cont. Con. Pin 13	Main Contactor Coil, 48v Relay Coil	White 16 AWG
111	48v Relay Coil	Motor Cont. Con. Pin 3	48v Relay Coil	Orange 16 AWG
112	Main Contactor Coil	Motor Cont. Con. Pin 6	Main Contactor Coil	Orange 16 AWG
113	Encoder +12v	Motor Cont. Con. Pin 25	Con. D - Pin 1	Blue/Black 16 AWG
114	Encoder Phase A	Motor Cont. Con. Pin 31	Con. D - Pin 2	Yellow 16 AWG
115	Encoder Phase B	Motor Cont. Con. Pin 32	Con. D - Pin 3	Brown 16 AWG
116	Encoder Ground / 0v	Motor Cont. Con. Pin 33	Con. D - Pin 4, Con. E - Pin 1	White/Blue 16 AWG
117	Motor RTD Supply	Motor Cont. Con. Pin 8	Con. E - Pin 2	Violet 16 AWG
118	B - Common	Motor Cont. B -	I/O Module Con. - Pin 11, Elect. Mag	White/Blue 16 AWG
119	Electro Magnet +12v	Electro Magnet	I/O Module Con. - Pin 7	Red 16 AWG
120	Buzzer Signal	I/O Module Con. Pin 8	Buzzer	Brown 16 AWG
121	+12v Common	Converter	Fuse Panel	Blue/Black 16 AWG
122	Joystick Ground	Motor Cont. Con. Pin 17 & 18	Joystick	Black 16 AWG
123	Joystick Signal	Motor Cont. Con. Pin 16	Joystick	Yellow 16 AWG
124	Joystick +5v	Motor Cont. Con. Pin 15	Joystick	Red 16 AWG
125	Operator Pressence Switch Signal	I/O Module Con. Pin 1	Joystick	White 16 AWG
126	I/O Module Output	I/O Module Con. Pin 9	Motor Cont. Con. Pin 9	White 16 AWG
127	Bucket Light White Indicator	Con. 2 - Pin 3	48v Relay - NC	Yellow 16 AWG
128	Operator Light White Indicator	Operator Light	48v Relay - NO	Yellow 16 AWG
131	B - Common	Motor Cont. B -	Buzzer, Converter, Lights, Horn	White/Blue 16 AWG
141	B - Common	Motor Cont. Conn. B -	Batt Gauge V- & Monitor	White/Blue 16 AWG
142	Proximity Sensor Signal	Proximity Sensor	I/O Module Con. - Pin 2	Black 16 AWG

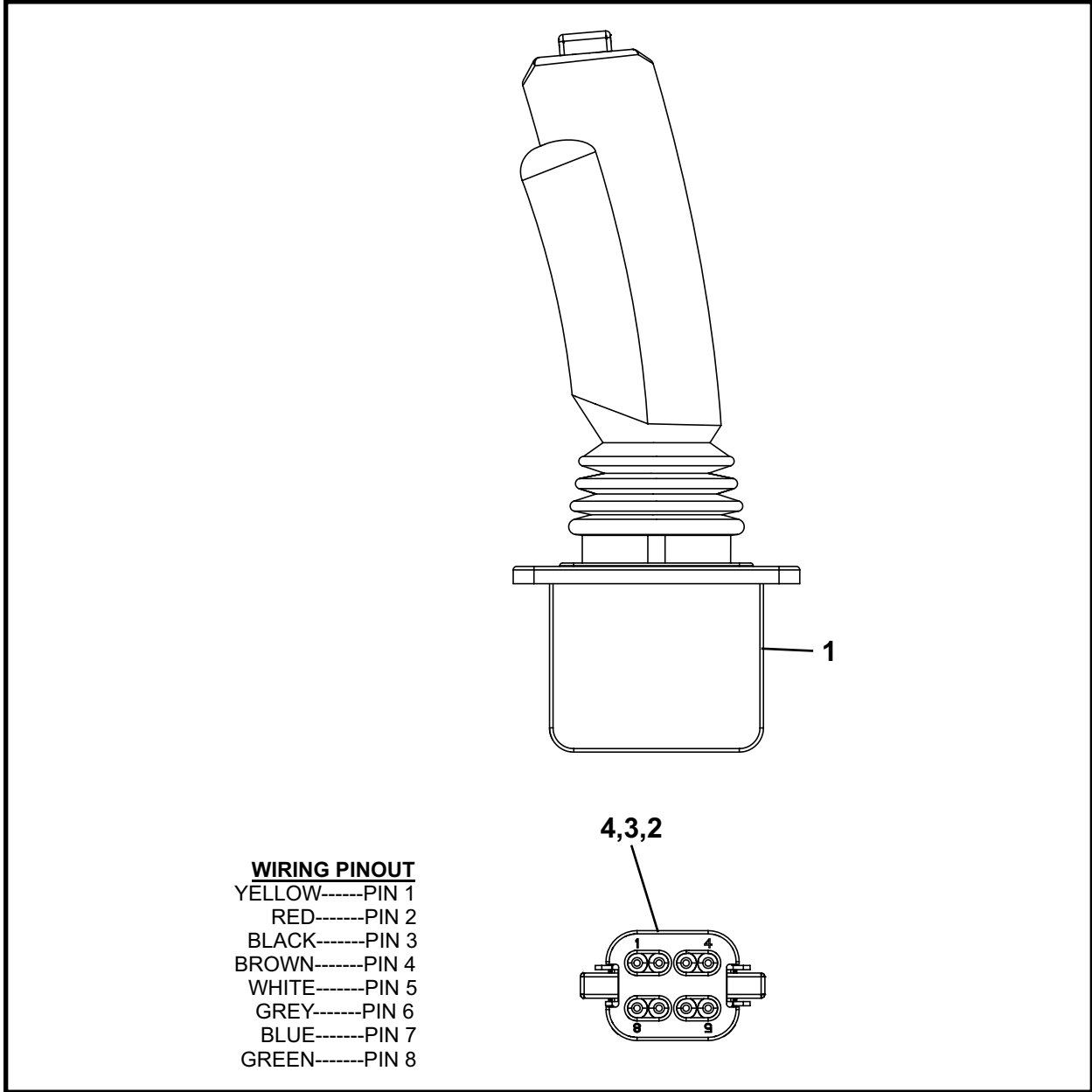




# 1548 HARNESS SCHEMATIC, 060043A

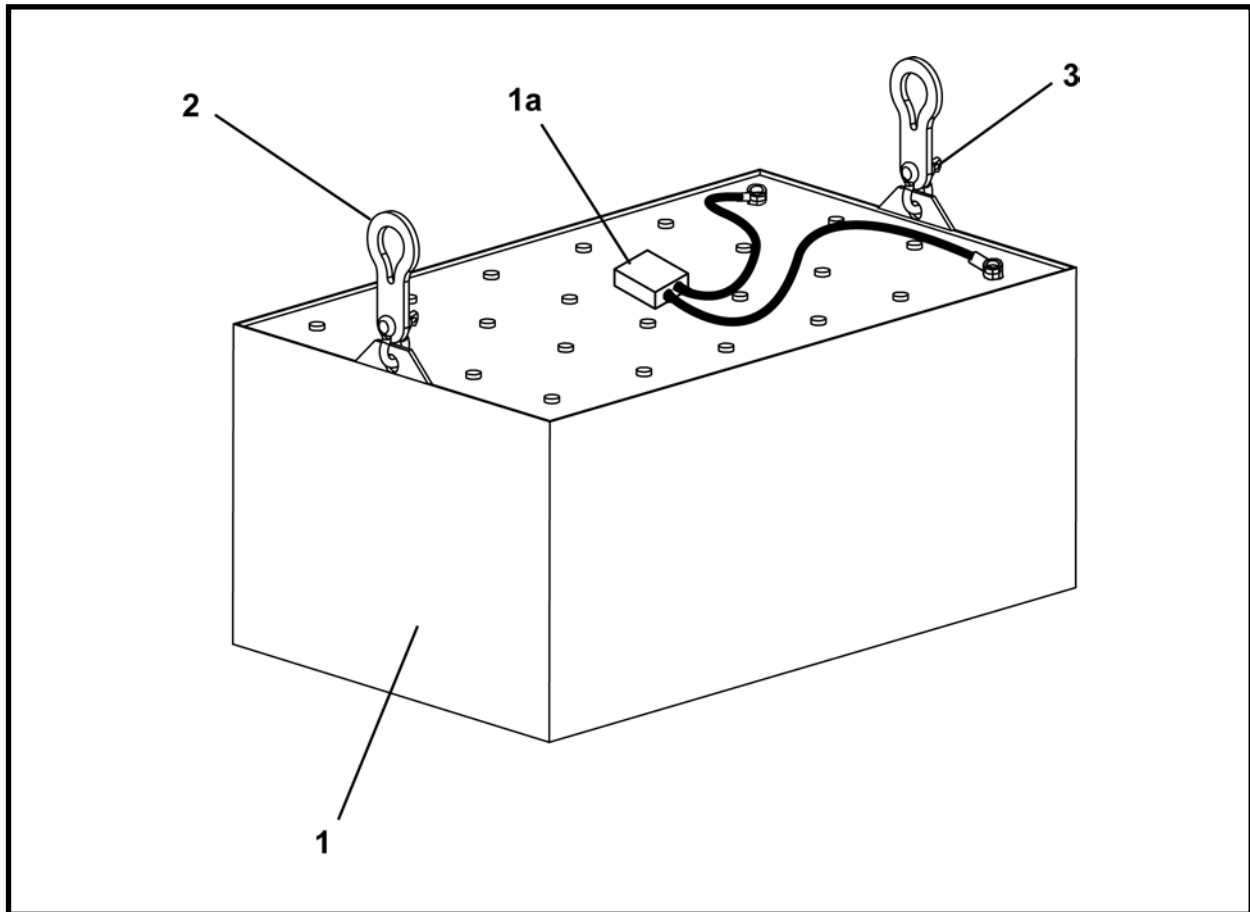


# JOYSTICK ASSEMBLY, 060044A



ITEM	QTY	PART NO.	DESCRIPTION
0	1	060044A	JOYSTICK ASSEMBLY
1	1	P0302-894	JOYSTICK, Single Axis
2	8	P0313-008	SOCKET #16
3	1	P0313-065A	WEDGELOCK, 8 Way Plug
4	1	P0313-065	PLUG, 8 Way DT 8 WAY

## BATTERY PACK, 48 VOLT DC, F0064-010



ITEM	QTY	PART NO.	DESCRIPTION
0	1	F0064-010	BATTERY PACK, 48 Volt DC
1	1	P0064-010	BATTERY PACK, 48Volt DC (Includes item 1a)
1a	1	P0055-116	CONNECTOR
2	2	001235P00	LIFT EYE
3	2	P0091-009	CLEVIS, 3/8, With 3/8 Pin

## BATTERY CHARGER, 48 VOLT DC



ITEM	QTY	PART NO.	DESCRIPTION
0.1	1	F0310-1004	BATTERY CHARGER, 48 Volt DC (240V/50 Hz)
0.2	1	F0310-1003	BATTERY CHARGER, 48 Volt DC (240V/60 Hz)
1	1	P0055-116	CONNECTOR

### NOTE:

1. The 240V 50 Hz charger (F0310-1004) can also be used to charge a 60 Hz system.
2. The 240V 60 Hz charger (F0310-1003) CANNOT be used to charge a 50 Hz system.



**OPERATING INSTRUCTIONS**

**Select-A-Charge Plus SCES, SCESX,  
Battery Chargers**

**For Industrial Use:** Designed for wet cell, and AGM lead acid batteries, also Lithium Ion batteries





Quick Charge Corp.  
800 658-2841  
e-mail [info@quickcharge.com](mailto:info@quickcharge.com)  
[www.quickcharge.com](http://www.quickcharge.com)  
Made in the U.S.A





**QUICK START GUIDE** READ ENTIRE INSTRUCTION MANUAL BEFORE OPERATING


1. This charger is battery driven. Nothing will happen if the charger is plugged into AC power and the charge leads are not connected to a battery. Programming is done with NO AC power. Observing polarity, connect the charger to batteries. The LED will flash red for about 30 seconds, then go out. The display will remain blank.

**Battery Type Setting**



2. Press the button  The battery type, and charger rating will display.  To change the battery type, press and hold the button, the display will flash. Press the button repeatedly to cycle through the selections. AGM, wet cell, or lithium batteries. (the charger must be preprogrammed at the factory for lithium batteries). Stop on the desired selection. When the display stops flashing and goes out, the selection is retained until changed.

**Profile Setting**

3. Press the button two times. The default charge profile is displayed.  In most cases, no change is needed here. Some battery manufactures require additional time for the last 20% of the cycle. **US Battery, NorthStar, Odyssey, Full River** are a few. To extend the cycle, press and hold the button until it flashes. Press the button again to select. When the display stops flashing and goes out, the selection is retained until changed. Using the extended cycle on batteries that do not require it will cause no harm. 


In cases where the charger is undersized to the battery, additional time may be needed to reach the last 20% of the cycle. In this case, with the "Charge Cycle" showing in the display, press the button two times to select . When the display stops flashing and goes out, the selection is retained until changed.

**Recycle Setting**


4. Press the button 3 times. The default recycle setting is displayed.  In this setting, the charger uses battery voltage to determine if a recycle is needed. If you would like to use time as a determinate, press and hold the button, the display will flash. Press the button repeatedly to cycle through the selections. Stop on the desired selection. When the display stops flashing and goes out, the selection is retained until changed. If time is used, it does not replace battery voltage monitor, it will recycle based on both settings. 

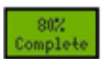
**Sample Displays During Charging**

**READ ENTIRE SAFETY, WIRING, PRE CHARGE, AND BATTERY CARE SECTIONS BEFORE PROCEEDING.**

1. After pre charge settings are made. Plug the charger into AC power that matches the requirements on the data sticker, and power the charger on. The display should read the charging volts and amps.  In this case the 24 volt 25 amp charger is putting out 24.2 amps at a battery voltage of 26.4. As the battery becomes charged, the voltage will rise, and the amps will fall.

2. Anytime during the charge cycle the  may be pushed.  is the total running time of the charge cycle.


 is the charging time spent below 80% complete. LED will be RED until 80%

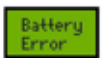
 The completion of the charge cycle. This is not to say that the batteries are 80% charged, but the cycle is 80% complete. The LED will turn yellow/orange.


 The energy returned to the battery. Can be compared to the amp hour rating of the battery to determine capacity, and battery health.

3. When the cycle is complete, the display will go out, and the LED will flash green. The charger is in monitor mode.  may be pushed anytime to review the completed cycle. Recycling the AC power will start a new cycle.

**Other Displays**

 At start up when batteries are severely discharged, the charger will start at a lower power until the batteries rise to a level safe enough for full output. This could take hours depending on the depth of discharge.

 At the end of the cycle minimum voltage levels were not met. Cycles repeatedly ending in this message probably means the batteries are at the end of their useful life. A charger too small for the batteries will also produce this message.

 There is a loose connection in the charge leads or battery connections.

To discontinue charging, switch the power off, and disconnect battery.

**EQUALIZATION:**

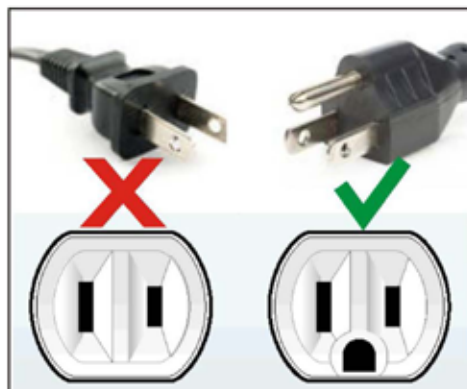
When using multiple batteries in a series string, cells become uneven during charge and discharge cycles. At least once a month perform two charge cycles back to back, this will give a chance for cells that are lagging behind to catch up, and is important to overall battery performance.

**! SAFETY INFORMATION AC WIRING:**

Before making AC connections, refer to the requirements on the charger ID label. If your charger is not equipped with an AC plug, *for example, a 230 volt charger*, have a qualified electrician install one.

To reduce the risk of fire, use this charger only on branch circuits that are protected by a circuit breaker or fuse, and that are adequate to carry the power drawn by the charger. All wiring should be in accordance with the National Electric Code, ANSI/NFPA 70, and all local codes and ordinances.

This battery charger must be grounded to reduce the risk of electric shock. 117 volt chargers are equipped with a grounding type plug, 230 volt chargers are shipped without a plug. Have a qualified electrician install a properly grounded 3 wire plug.

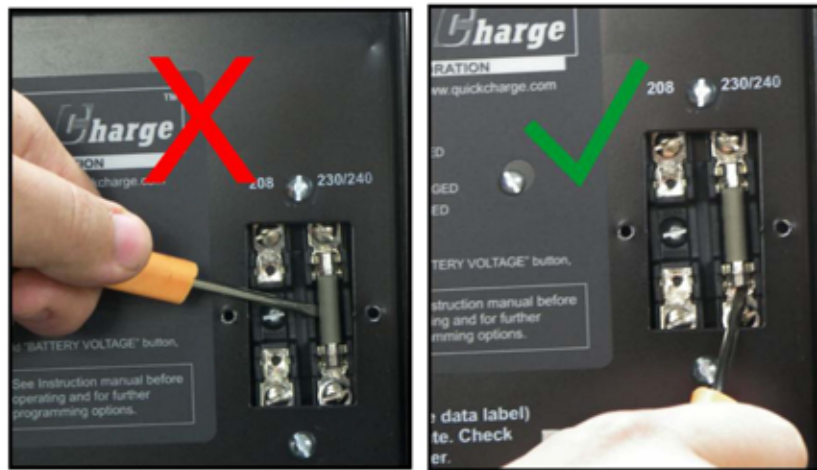


**DO NOT USE THIS CHARGER ON A TWO POLE  
UNGROUNDING OUTLET OR ATTEMPT TO BREAK OFF**

**THE GROUND PRONG FOR USE ON A RECEPTACLE OR EXTENSION CORD NOT HAVING A GROUND.**

If an extension cord must be used, make sure it is in good condition. Use a three conductor cord no smaller than the size being used on the charger, and keep it as short as possible. The use of an improper extension cord could result in a risk of a fire or electric shock. Locate all cords so that they will not be stepped on, tripped over, or otherwise subjected to damage or stress.

**FOR MODELS HAVING A CHANGEOVER FUSE FOR 208 or 230 VOLTS**



If your charger can accommodate 208 or 230/240 volt input, and has a cover plate, remove the two side screws. If necessary, remove the fuse as shown. Press it into other clip until it snaps in place. Replace plate. 120 volt models will be factory set and do not need to be changed.

**FOR MODELS HAVING A CHANGEOVER TAP FOR 208 or 230 VOLTS**

Lift cover over large screw heads and rotate to swing down



If your charger can accommodate 208 or 230/240 volt input, and has a cover plate, remove the top screw only and rotate the cover down. Note what stud the tap wire is connected to, 208 or 230/240. Now, check that your incoming power matches where the tap wire is. If it needs to be changed, hold the wire and pull it out slightly while removing the nut, keep the driver over the nut so it doesn't fall inside the case. If it does, you will need to remove the top cover of the cabinet, and the front panel to get to it. Place the wire over the correct stud and replace nut, then replace cover screw.



**OTHER SAFETY INFORMATION**

Do not use charger if it shows signs of physical stress, or if DC output leads or connector feel hot when used.

Do not disconnect the DC output clamps, or connector from the batteries when the charger is on. The resulting arcing could cause the batteries to explode.

Do not expose charger to rain.

The charger will become hot during use, provide adequate air flow around it. Do not place charger on cloth or vinyl seats, blankets, or around any other obstructive materials. Do not place charger against walls, allow 12" of space on all sides.



**BATTERY SAFETY & CARE INFORMATION**

Always wear protective eye shields and clothing when working with batteries. Batteries contain acids which can cause bodily harm. Do not put wrenches or other metal objects across the battery terminal or battery top. Arcing or explosion of the battery can result. Do not wear jewelry when working around batteries. Arcing can cause severe burns.

The tops of the batteries and battery hold downs must be kept clean and dry at all times to prevent excessive self discharge and flow of current between the battery post and frame.

With wet cell batteries, maintain the proper electrolyte level by adding water when necessary. Never allow the electrolyte level to fall below the top of the battery plates. Electrolyte levels fall during discharge and rise during charging. Therefore, **to prevent the overflow of electrolyte when charging, add water only after the batteries have been fully charged, or just enough to cover the plates if discharged.** Old batteries require more frequent additions of water than do new batteries.

Do not over discharge batteries. Excessive discharge can cause polarity reversal of individual cells resulting in complete battery failure. Re-charge batteries as soon as possible after a deep discharge, but not if they are warm, allow a cooling down period.

Provide adequate ventilation when charging batteries. Chargers can ignite flammable materials and vapors. Do not use near fuels, grain, dust, solvents, or other flammables.

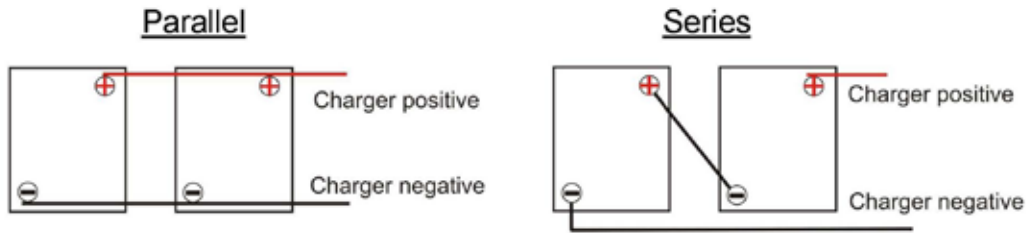
Do not charge batteries in excessively hot temperatures; wait till the cool of the evening.

#### **PRE CHARGE INFORMATION**

Before connecting the charger to the batteries, make sure the battery pack is of the same voltage rating of the charger. If you are unsure, count the number of cells on the battery pack and multiply by two. This figure should be the same as the DC voltage rating of the charger. (*see ratings label on charger*)

Make sure the AC cord, DC output leads, terminals, connectors, or clamps are all in good working condition. Do not use the charger if there are any signs of stress or damage, or if wires are cut or have damaged insulation. Using this charger with any of these symptoms could result in a fire, property damage, or personal injury. Have a qualified service person make the necessary repairs. Repairs should not be made by people who are not qualified.

Illustration of series and parallel battery connections:



When batteries are connected in Parallel the battery amp hour capacity is additive and the voltage remains the same.  
*Example:* two 180 amp hour 12 volt batteries would equal 12 volts and 360 amp hour capacity

When batteries are connected in Series the voltage is additive and the battery amp hour capacity remains the same.  
*Example:* two 180 amp hour 12 volt batteries would equal 24 volts and 180 amp hour capacity

**TROUBLESHOOTING**

Symptom	Cause	Corrective Action
When plugged into AC power and powered ON there is no display, and no LED.	Connected reverse to battery, or not connected to battery.  Break in DC cord, or connector.  Battery has no voltage.	Correct polarity, or connect to battery. On chargers having a black and white wire, white is positive.  Have a qualified person make repair.  Replace.
When connected to battery, and powered ON the display, and LED does not come on.	No AC power.  Blown fuse.	Check circuit.  Replace with one having The same ratings.  Check extension cord for breaks or damage.
When I put a volt meter across the output of the charger there is no power coming out	The charger must be connected to a battery to turn on.	Connect to battery.

Battery Charger Operating Instructions

<p>The batteries don't receive a full charge. On wet cells, the specific gravity will not rise to a full reading after the charge has completed.</p>	<p>The charger is too small for the battery.</p> <p>The charge profile is not set correctly.</p> <p>The cycle needs more time.</p> <p>The battery is defective.</p>	<p>Check that the charger's output is about 10% of the amp hour rating of the battery.</p> <p>Recheck the setting. If in doubt, contact us.</p> <p>Set gas/absorption to "Extended"</p> <p>Replace.</p>
<p>On start up, the LED flashes red and yellow. Display reads "Battery Error".</p>	<p>Battery voltage is higher than the charger rating.</p>	<p>Connect the charger to a battery(s) with the same voltage rating.</p>
<p>When powered up the LED is solid red with a yellow flash, and displaying "safe mode"</p>	<p>The battery is very low, and the charger is in a slow charge phase until the voltage rises to a safe level before full turn on.</p>	<p>Leave connected, it may take hours, but if the voltage rises even a little bit, it should recover, and turn the charger full on. <i>(Do not allow your batteries to deep discharge, it is the number one cause of premature battery failure.)</i></p>
<p>The charger blows it's fuse, or branch circuit fuse/circuit breaker as soon as it's switched on.</p>	<p>Charger is shorted.</p> <p>If charger has adjustable taps, it is on the wrong one.</p>	<p>Contact factory.</p>
<p>The charger blows the branch circuit fuse/circuit breaker a short while after being switched on.</p>	<p>The branch circuit is too small.</p> <p>If charger has adjustable taps, it is on the wrong one.</p>	<p>Relocate charger to a branch circuit with a heavier rating, or remove other loads on the circuit.</p>

Battery Charger Operating Instructions

Batteries use water, get hot, or smell.	One or more dead cells.	Replace batteries. If charging in a series string, it is best to replace all the batteries rather than mix new with old.
After a full charge, the batteries die quickly	The batteries are sulfated.	Sometimes batteries can be recovered. Leave the charger on for some hours, if the voltage falls and the current begins to rise, it is a good sign they can recover under normal charging.
The cycle ends showing "Battery Error" and red/yellow flashing LED.	An incomplete cycle. The batteries did not reach minimum voltage requirements, and the charger timed out.	The batteries are too big for the charger.  The batteries have defective cells, and cannot make minimum voltage. Replace.  NOTE: An occasional short cycle is not a problem. Just unplug the charger and plug back in to complete the cycle.

**QUICK CHARGE Select-A-Charge PLUS Battery Chargers  
“LIMITED WARRANTY”**

Quick Charge Corporation warrants this line of chargers for three (3) years from the date of purchase. After the warranty period, chargers returned to the factory for repair will be charged a minimum rate of \$35.00. Charger will be returned, freight and repair charges, C.O.D. unless other arrangements have been made. This warranty covers all defects in manufacture and performance, provided the unit is operated in compliance with manufacture's operating instructions.

For repairs to be made at the Quick Charge factory, a charger and/or component(s) should be sent, freight prepaid to Quick Charge at:

Quick Charge Corp.  
1032 S.W. 22nd St.  
Oklahoma City, OK. 73109

Quick Charge, will at it's option, repair or replace the charger or component in question. The repaired item will then be returned, freight prepaid by Quick Charge. This warranty is void if the charger or component have been altered, changed, or repaired by anyone not authorized by Quick Charge, or if the charger or component, have been subjected to misuse, negligence, or harsh environmental conditions. (Except those chargers designed for such conditions)

If returning the charger to the factory is not practical, replacement parts may be shipped to the customer for field repair at no charge. On parts such as circuit boards, the customer will be required to return the board suspected to be defective to Quick Charge, freight prepaid. If such defective parts are not returned, the customer will be invoiced for the repair parts. Field repairs are made at the user's own risk. "Authorization" by Quick Charge to repair refers to maintaining the warranty only. Quick Charge assumes no responsibility or liability for field servicing, and shall not be responsible for incurred travel or labor charges.

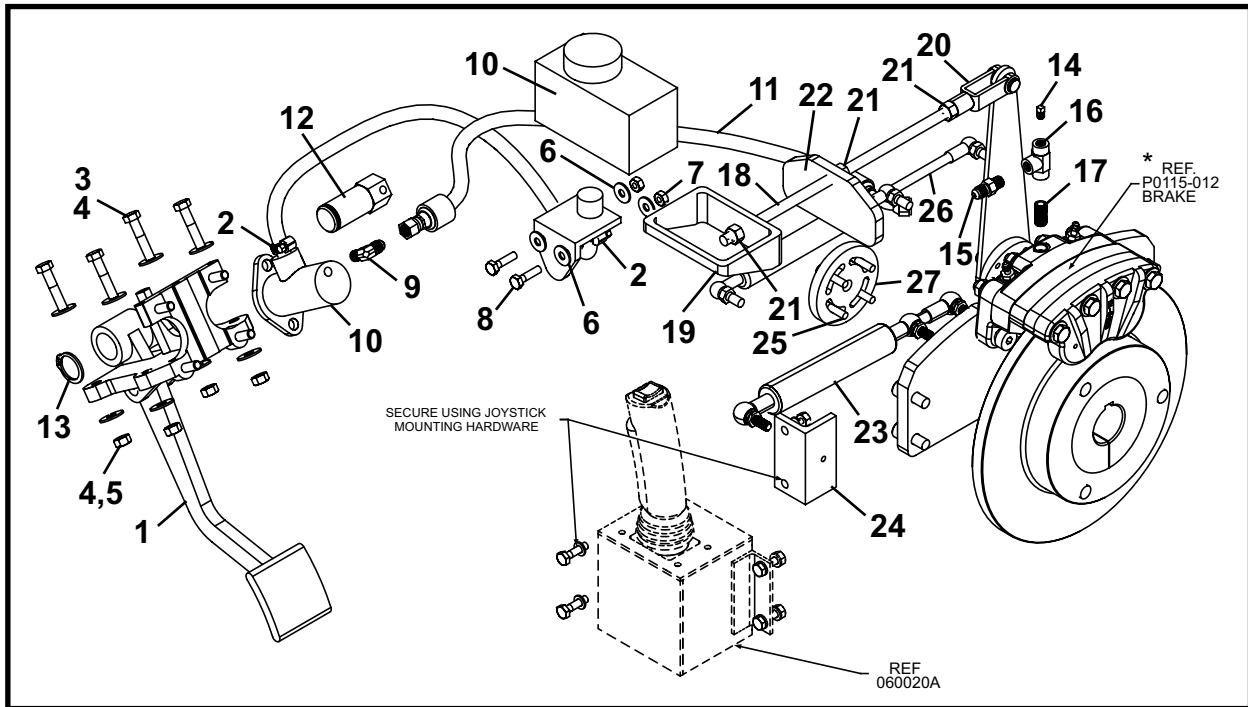
Quick Charge corporation shall not in any event be liable for the cost of any special, indirect or consequential damages to anyone, product or thing. This warranty is in lieu of all other warranties expressed or implied. Quick Charge neither assumes nor authorizes any representative or other person to assume for us any liability in connection with the sale of this product.



# Hydraulics

Brake Assembly, 060005A ..... 2

## BRAKE ASSEMBLY, 060005A



ITEM	QTY	PART NO.	DESCRIPTION
0	1	060005A	BRAKE ASSEMBLY
1	1	P0115-015	PEDAL, Brake
2	2	P0201-293	CLAMP, Radiator #2
3	4	P0001-05-006	BOLT, Hex 5/16 UNC x 1.5
4	8	P0040-005	WASHER, Hardened Flat 5/16
5	4	P0003-05-000	NUT, Hex 5/16
6	4	P0040-004	WASHER, Hardened Flat 1/4
7	2	P0003-04-000	NUT, Hex 1/4
8	2	P0001-04-004	BOLT, Hex 1/4 UNC x 1
9	1	P0300-418	FITTING, 04MJ-02MP90-FGD
10	1	P0115-014	KIT, Master Cylinder (Includes items 10a - 10c)
10a	1	-	Master Cylinder
10b	1	-	Bracket
10c**	1	-	Reservoir
11	1	A10404A-026	HOSE ASSEMBLY, 1/4 x 26
12	1	022112P	PIN, Brake Pivot
13	1	P0077-011	SNAP RING
14	1	P0416-000	PLUG, Square Head 1/8
15	1	P0300-363	FITTING, 04MJ-02MP
16	1	P0300-226	FITTING, 02FP-02FP-02FP
17	1	P0402-000	NIPPLE, Close 1/8
18	12	P0023-374	ROD, Threaded 3/8 UNF
19	1	060021P	HANDLE, Pull
20	1	P0024-001	YOKE WITH CLEVIS PIN
21	3	P0004-06-000	NUT, Hex 3/8 UNF
22	1	060022P	PLATE, Maglock
23	1	P0070-074	SPRING, Pulling Gas
24	1	060041P	MOUNT, Spring
25	4	P0031-04-004	SCREW, Socket Head Cap 1/4 UNC x 1
26	1	P0250-307	LIMITER, Stroke
27	1	060045P	NUT, Caliper Plate

\* Reference P0115-012 Brake Caliper; see Drive Assembly, 060006A in this section.

\*\* Use DOT 3 Brake Fluid, P0126-051



# Valves

Does not apply to this system

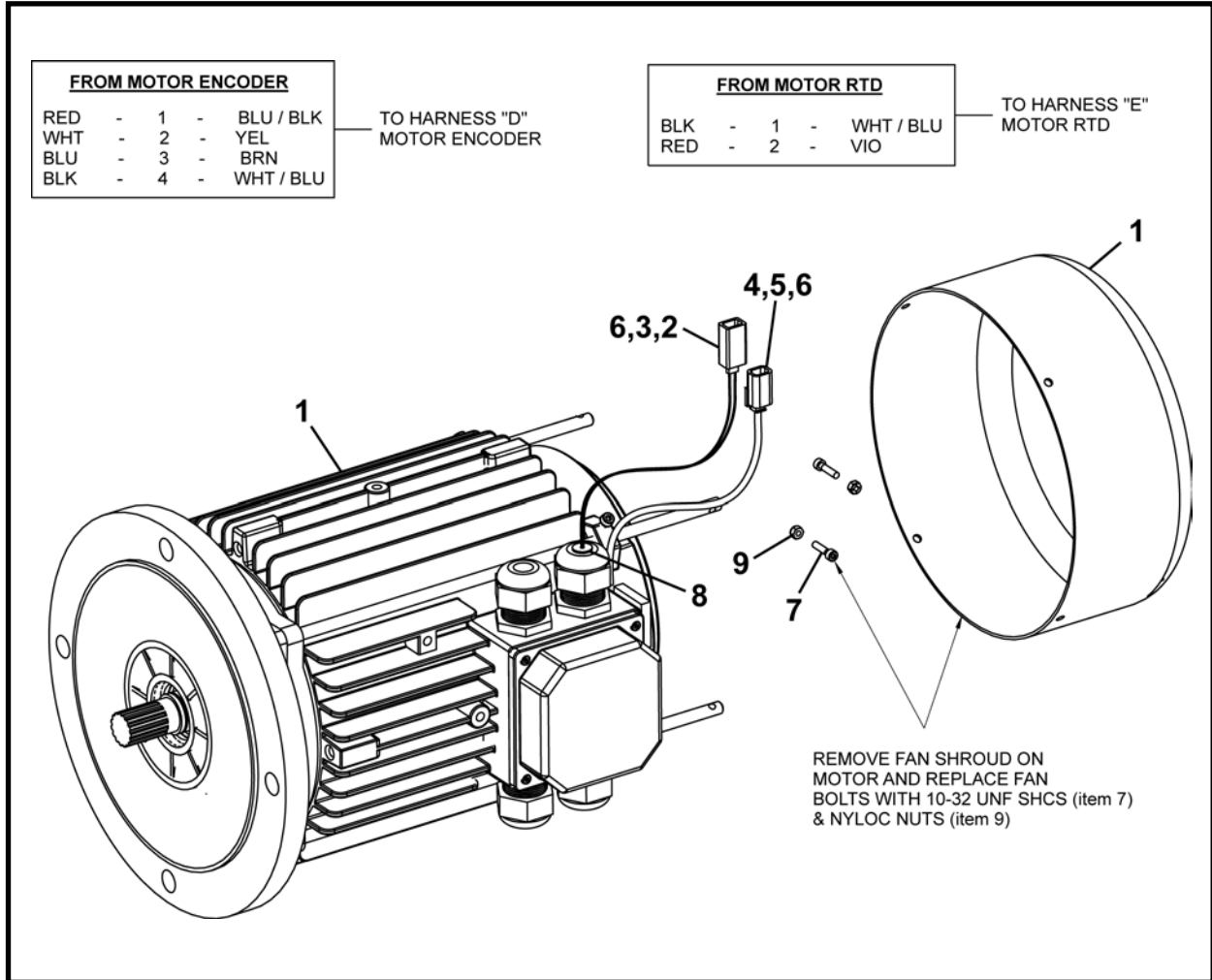
## **NOTES**



# Motors

Drive Motor Assembly, 021190A .....	2
Motor Controller LED Status Display & Fault Codes .....	4
Fault Codes for Curtis Motor Controller Model 1236SE-5 .....	5

# DRIVE MOTOR ASSEMBLY, 021190A



ITEM	QTY	PART NO.	DESCRIPTION
0	1	021190A	DRIVE MOTOR ASSEMBLY
1	1	P0304-322	MOTOR
2	1	P0313-076	RECEPTACLE
3	1	P0313-076A	RECEPTACLE
4	1	P0313-072	RECEPTACLE
5	1	P0313-072A	RECEPTACLE
6	6	P0313-078	PIN
7	2	P0031-02-003A	SCREW, Socket Head Cap 10-32 x .75
8	1	007064P	CORD GRIP, Wire
9	2	P0013-10.32-000	NUT, Nyloc 10-32

## **NOTES**

## MOTOR CONTROLLER LED STATUS DISPLAY & FAULT CODES

The motor controller (A) detects a wide variety of operating modes, faults or error conditions and is displayed on the two LED status lights (B).

The two LEDs have four different display modes indicating the type of information status (refer to LED Status Display Modes chart).

The pair of LED status lights built into the controller (one red, one yellow) produce flash codes displaying all the currently set faults in a repeating cycle. Each code consists of two digits. The red flashes once to indicate that the first digit of the code will follow; the yellow LED then flashes the appropriate number of times for the first digit. The red LED flashes twice to indicate that the second digit of the code will follow; the yellow LED flashes the appropriate number of times for the second digit.

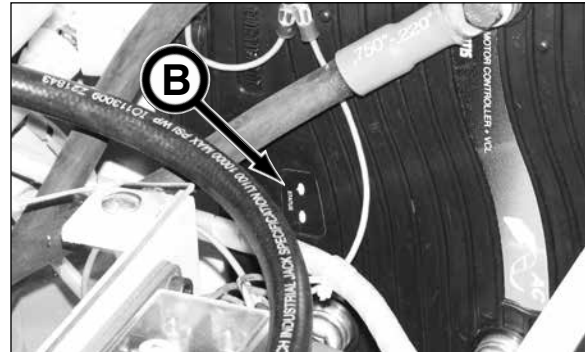
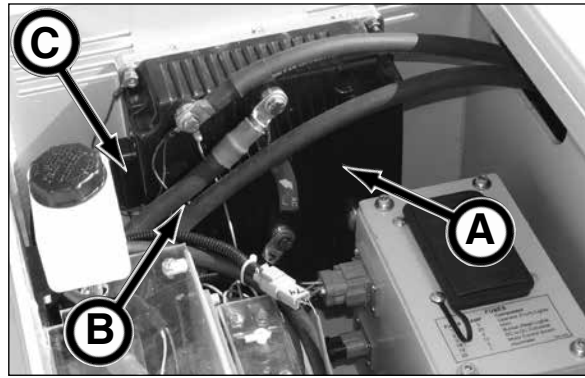
For example, Code 23 Battery Undervoltage: The controller's two LEDs will display this repeating pattern:

RED	YELLOW	RED	YELLOW
*	* *	* *	* * *
(first digit)	(2)	(second digit)	(3)

Whenever a fault is encountered and no wiring or haul unit issue can be found, shut off the motor control switch and the main power switch. Then turn the main power switch and motor control switch back on to see if the fault clears. If the fault does not clear, shut off motor control switch and main power switch, then remove the 35 pin connector (C). Check the connector for corrosion or damage, clean connector if necessary and reinstall. If the fault still does not clear, contact your Akkerman Aftermarket Support representative to identify the fault code and assist in troubleshooting your controller.

Refer to the Fault Codes For Curtis Motor Controller Model 1236SE on the next seven pages.

A handheld diagnostic tool (D) is available (Akkerman part no. P0304-324A) for a user-friendly method to troubleshoot the fault codes, particularly if there are multiple faults. The diagnostic tool is connected to the 4 pin molex plug behind the dash panel of the haul unit. Though most of the faults are cleared by cycling the main power off and on, a few faults can only be cleared with the use of the diagnostic tool.



Close Up of LED Status Lights

### LED Status Display Modes

Display	Status
Neither LED Illuminated	Controller is not powered or haul unit battery is dead.
Yellow LED Flashing	Normal Operation
Red LED on Solid	General software failure. Turn off motor control switch & main power switch, and then turn both switches on. If failure is still present, contact Akkerman Aftermarket Support representative.
Red LED and Yellow LED Flashing Alternately	Controller has detected a fault. 2-digit code flashed by yellow LED identifies the specific fault; one or two flashes by red LED indicate whether first or second code digit will follow by yellow LED.



## Fault Codes for Curtis Motor Controller Model 1236SE

### NOTICE

The Curtis controller fault codes are subject to change. For latest fault codes refer to:  
<https://faultcodes.curtisinstruments.com/list.php?mc=1236SE&action=Submit>

Code	Fault	Cause
12	Controller Overcurrent . Action: Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Full Brake.	1. External short of phase U,V, or W motor connections. 2. Motor parameters are mis-tuned. 3. Controller defective. 4. Speed encoder noise problems.
13	Current Sensor . Action: Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Full Brake.	1. Leakage to vehicle frame from phase U, V, or W (short in motor stator). 2. Controller defective.
14	Precharge Faulted . Action: Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Full/Brake.	1. See Monitor menu -> Battery: Capacitor Voltage. 2. External load on capacitor bank (B+ connection terminal) that prevents the capacitor bank from charging.
15	Controller Severe Undertemp . Action: Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Full Brake.	1. See Monitor menu -> Controller: Temperature. 2. Controller is operating in an extreme environment.
16	Controller Severe Overtemp . Action: Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Full Brake.	1. See Monitor menu -> Controller: Temperature. 2. Controller is operating in an extreme environment. 3. Excessive load on vehicle. 4. Improper mounting of Controller.
17	Severe B+ Undervoltage . Action: No drive torque.	1. Battery parameters are misadjusted. 2. Non-Controller system drain on battery. 3. Battery resistance too high. 4. Battery disconnected while driving. 5. See Monitor menu -> Battery: Capacitor Voltage. 6. Blown B+ fuse or main Contactor did not close.
17	Severe KSI Undervoltage . Action: No action.	1. See Monitor menu -> Battery: Key switch Voltage. 2. Non-Controller system drain on battery/ KSI circuit wiring. 3. KSI disconnected while driving. 4. Blown KSI fuse.
18	Severe B+ Over Voltage . Action: Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Full Brake.	1. See Monitor menu -> Battery: Capacitor Voltage. 2. Battery parameters are misadjusted. 3. Battery resistance too high for given regen current. 4. Battery disconnected while regen braking.
18	Severe KSI Over Voltage . Action: Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Full Brake.	1. Incorrect (to high) battery-voltage applied to KSI (pin 1). 2. See Monitor menu-> Battery: Key switch Voltage. Note: Prevents the Main Contactor closure if KSI is greater than the Severe Over Voltage limit.

Fault Codes for Curtis Motor Controller Model 1236SE

Code	Fault	Cause
22	Controller Overtemp Cutback . Action: Reduced drive and brake torque.	<ol style="list-style-type: none"> <li>1. See Monitor menu -&gt; Controller: Temperature.</li> <li>2. Controller is performance-limited at this temperature.</li> <li>3. Controller is operating in an extreme environment.</li> <li>4. Excessive load on vehicle.</li> <li>5. Improper mounting of Controller.</li> </ol>
23	B+ Undervoltage Cutback . Action: Reduced drive torque.	<ol style="list-style-type: none"> <li>1. Normal operation. Fault indicates the batteries need recharging. Controller is performance limited at this voltage.</li> <li>2. Battery parameters are misadjusted.</li> <li>3. Non-Controller system drain on battery.</li> <li>4. Battery resistance too high.</li> <li>5. Battery disconnected while driving.</li> <li>6. See Monitor menu -&gt; Battery: Capacitor Voltage.</li> <li>7. Blown B+ fuse or main Contactor did not close.</li> </ol>
24	B+ Overvoltage Cutback . Action: Reduced brake torque. Note: This is declared only when the Controller is running in regen.	<ol style="list-style-type: none"> <li>1. Normal operation. Fault shows that regen braking currents elevated the battery voltage during regen braking. Controller is performance limited at this voltage.</li> <li>2. Battery parameters are misadjusted.</li> <li>3. Battery resistance too high for given regen current.</li> <li>4. Battery disconnected while regen braking.</li> <li>5. See Monitor menu -&gt; Battery: Capacitor Voltage.</li> </ol>
25	+5V Supply . Action None, unless a action is programmed in VCL.	<ol style="list-style-type: none"> <li>1. External load impedance on the +5V supply (pin 26) is too low.</li> <li>2. See Monitor menu -&gt; outputs: 5 Volts and Ext Supply Current.</li> </ol>
26	Digital Out 6 Open/Short . Action: Digital Output 6 driver will not turn on.	<ol style="list-style-type: none"> <li>1. External load impedance on Digital Output 6 driver (pin 9) is too low.</li> </ol>
27	Digital Out 7 Open/Short . Action: Digital Output 7 driver will not turn on.	<ol style="list-style-type: none"> <li>1. External load impedance on Digital Output 7 driver (pin 20) is too low.</li> </ol>
28	Motor Temp Hot Cutback . Action: Reduced drive torque.	<ol style="list-style-type: none"> <li>1. Motor temperature is at or above the programmed Temperature Hot setting, and the current is being cut back.</li> <li>2. Motor Temperature Contactor Menu parameters are mis-tuned.</li> <li>3. See Monitor menu -&gt; Motor: Temperature and -&gt; Inputs: Analog 2.</li> <li>4. If the application doesn't use a motor thermistor, Temp Compensation and Temp Cutback should be programmed Off.</li> </ol>
29	Motor Temp Sensor . Action: MaxSpeed reduced (LOS, Limited Operating Strategy), and motor temperature cutback disabled.	<ol style="list-style-type: none"> <li>1. Motor thermistor is not connected properly.</li> <li>2. If the application doesn't use a motor thermistor, Motor Temp Sensor Enable should be programmed Off.</li> <li>3. See Monitor menu -&gt; Motor: Temperature and -&gt; Inputs: Analog 2.</li> </ol>
31	Coil1 Driver Open/Short . Action:ShutdownDriver1.	<ol style="list-style-type: none"> <li>1. Open or short on driver load.</li> <li>2. Dirty connector pins.</li> <li>3. Bad crimps or Faulty wiring.</li> </ol>

Fault Codes for Curtis Motor Controller Model 1236SE

Code	Fault	Cause
31	Main Open/Short . Action: Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Full Brake.	1. Open or short on driver load. 2. Dirty connector pins. 3. Bad crimps or Faulty wiring.
32	Coil2 Driver Open/Short . Action:ShutdownDriver2.	1. Open or short on driver load. 2. Dirty connector pins. 3. Bad crimps or Faulty wiring.
32	EMBrake Open/Short . Action: Shutdown EMBrake; Shutdown Throttle; Full Brake.	1. Open or short on driver load. 2. Dirty connector pins. 3. Bad crimps or Faulty wiring.
33	Coil3 Driver Open/Short . Action:ShutdownDriver3.	1. Open or short on driver load. 2. Dirty connector pins. 3. Bad crimps or Faulty wiring.
34	Coil4 Driver Open/Short . Action:ShutdownDriver4.	1. Open or short on driver load. 2. Dirty connector pins. 3. Bad crimps or Faulty wiring.
35	Proportional Driver Open/Short . Action: ShutdownProportional Driver.	1. Open or short on driver load. 2. Dirty connector pins. 3. Bad crimps or Faulty wiring.
36	Encoder . Action: Shutdown EMBrake; Motor disabled.	1. Motor encoder failure. 2. Bad crimps or Faulty wiring. 3. See Monitor menu -> Motor: Motor RPM.
36	Sin/Cos Sensor . Action: Shutdown EMBrake; Motor disabled.	1. Sin/Cos sensor failure. 2. Bad crimps or Faulty wiring. 3. See Monitor menu -> Motor: Motor RPM.
37	Motor Open . Action: Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Full/Brake.	1. Motor phase is open. 2. Bad crimps or Faulty wiring.
38	Main Contactor Welded . Action: Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Full Brake.	1. Main Contactor tips are welded closed. 2. Motor phase U or V is disconnected or open. 3. An alternate voltage path (such as an external Precharge resistor) is providing a current to the capacitor bank (B+ connection terminal).
39	Main Contactor Did Not Close . Action: Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Full Brake.	1. Main Contactor did not close. 2. Main Contactor tips are oxidized, burned, or not making good Contact.*. 3. External load on capacitor bank (B+ connection terminal) that prevents capacitor bank from charging. 4. Blown B+ fuse.
41	Throttle Wiper High . Action: Shutdown Throttle.	1. See Monitor menu -> Inputs: Throttle Pot. 2. Throttle pot wiper voltage too high.
42	Throttle Wiper Low . Action: Shutdown Throttle.	1. See Monitor menu -> Inputs: Throttle Pot. 2. Throttle pot wiper voltage too low.
43	Pot2 Wiper High . Action: Full/Brake.	1. See Monitor menu -> Inputs: Pot2 Raw. 2. Pot2 wiper voltage too high.
44	Pot2 Wiper Low . Action: Full/Brake.	1. See Monitor menu -> Inputs: Pot2 Raw. 2. Pot2 wiper voltage too low.

Fault Codes for Curtis Motor Controller Model 1236SE

Code	Fault	Cause
45	Pot Low Overcurrent . Action: Shutdown Throttle; Full Brake.	1. See Monitor menu -> Outputs: Pot Low. 2. Combined pot resistance connected to pot low is too low.
46	EEPROM . Action: Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Shutdown Interlock; ShutdownDriver1; ShutdownDriver2; ShutdownDriver3; ShutdownDriver4; ShutdownProportional Driver; Full Brake.	1. Failure to write to EEPROM memory. This can be caused by EEPROM memory writes initiated by VCL, by the CAN bus, by adjusting parameters with the programmer, or by loading new software into the Controller.
47	High Pedal Disable/Sequencing . Action: Shutdown Throttle.	1. KSI, interlock, direction, and throttle inputs applied in incorrect sequence. 2. Faulty wiring, crimps , or switches at KSI, interlock, direction, or throttle inputs. 3. See Monitor menu -> Inputs.
47	EMER Rev High Pedal Disable . Action: Shutdown Throttle; Shutdown EMBrake	4. Emergency Reverse operation has concluded, but the throttle, forward and reverse inputs, and interlock have not been returned to neutral.
49	Parameter Change . Action: Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Full Brake.	1. This is a safety Fault caused by a change in certain parameter settings so that the vehicle will not operate until KSI is cycled. For example, if a user changes the Throttle Type this Fault will appear and require cycling KSI before the vehicle can operate.
51	OEM Faults(See OEM documentation.)	1. These Faults can be defined by the Vehicle Manufacturer and are implemented in the application-specific VCL code. See Vehicle Manufacturer documentation.
52	OEM Faults(See OEM documentation.)	1. These Faults can be defined by the Vehicle Manufacturer and are implemented in the application-specific VCL code. See Vehicle Manufacturer documentation.
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57	OEM Faults(See OEM documentation.)	1. These Faults can be defined by the Vehicle Manufacturer and are implemented in the application-specific VCL code. See Vehicle Manufacturer documentation.

Fault Codes for Curtis Motor Controller Model 1236SE

Code	Fault	Cause
58	OEM Faults(See OEM documentation.)	1. These Faults can be defined by the Vehicle Manufacturer and are implemented in the application-specific VCL code. See Vehicle Manufacturer documentation.
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61	OEM Faults(See OEM documentation.)	1. These Faults can be defined by the Vehicle Manufacturer and are implemented in the application-specific VCL code. See Vehicle Manufacturer documentation.
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67	OEM Faults(See OEM documentation.)	1. These Faults can be defined by the Vehicle Manufacturer and are implemented in the application-specific VCL code. See Vehicle Manufacturer documentation.
68	VCL Run Time Error . Action: Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; ; ShutdownDriver1; ShutdownDriver2; ShutdownDriver3; ShutdownDriver4; ShutdownProportional Driver; Full Brake.	1. VCL code encountered a runtime VCL error. 2. See Monitor menu -> Controller: VCL Error Module and VCL Error. This error can then be compared to the runtime VCL module ID and error code definitions found in the specific OS system information file.
69	External Supply Out of Range . Action: None, unless a action is programmed in VCL.	1. External load on the 5V and 12V supplies draws either too much or too little current. 2. Fault Checking Menu parameters Ext Supply Max and Ext Supply Min are mis-tuned. 3. See Monitor menu -> Outputs: Ext Supply Current.

Fault Codes for Curtis Motor Controller Model 1236SE

Code	Fault	Cause
71	OS General . Action: Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; ; ShutdownDriver1; ShutdownDriver2; ShutdownDriver3; ShutdownDriver4; ShutdownProportional Driver; Full Brake.	1. Internal Controller Fault.
72	Proportional DriverO Timeout . Action: Shutdown Throttle; CAN NMT State set to Pre- operational.	1. Time between CAN PDO CAN message transmission rates received exceeded the PDO Timeout Period.
73	Stall Detected . Action: Shutdown EMBrake; Motor disabled; Controller Mode changed to LOS (Limited Operating Strategy).	1. Stalled motor. 2. Motor encoder failure. 3. Bad crimps or Faulty wiring. 4. Problems with power supply for the motor encoder. 5. See Monitor menu -> Motor: Motor RPM.
74	On Other Tractiontion Controller	1. Dual Drive Fault: see Dual Drive manual.
75	Dual Severe	1. Dual Drive Fault: see Dual Drive manual.
77	Supervisor . Action: Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Shutdown Interlock; ShutdownDriver1; ShutdownDriver2; ShutdownDriver3; ShutdownDriver4; ShutdownProportional Driver; Full/Brake.	1. The Supervisor has detected a mismatch in redundant readings. 2. Internal damage to Supervisor microprocessor. 3. Switch inputs allowed to be within upper and lower thresholds for over 100 milliseconds. (for recurring errors, check the switches for moisture).
78	Supervisor Incompatible . Action: Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; ; ShutdownDriver1; ShutdownDriver2; ShutdownDriver3; ShutdownDriver4; ShutdownProportional Driver; Full/Brake.	1. The main OS is not compatible with the Supervisor OS.
82	Bad Calibrations . Action: Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Full Brake.	1. Internal Controller Fault
83	Driver Supply . Action: Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Full Brake.	1. Internal Controller Fault in the voltage supply for the driver circuits.
87	Motor Characterization . Action: Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Full Brake.	1. Motor characterization failed during characterization process. See Monitor menu -> Controller: Motor Characterization Error for cause = sequencing error. Normally caused by turning off Motor Characterization Test Enable before running the test. 1 = encoder signal seen but step size not auto- detected; set up Encoder Steps manually". 2 = motor temp sensor Fault. 3 = motor temp hot cutback Fault. 4 = Controller overtemp cutback Fault". 5 = Controller undertemp cutback Fault. 6 = Under Voltage Cutback Fault. 7 = severe Over Voltage Fault". 8 = encoder signal not seen, or one or both channels missing. 9 = motor parameters out of characterization range. 20 = Sin/Cos sensor not found. 21 = phasing not detected". 22 = Sin/Cos sensor characterization failure. 23 = started characterization procedure while motor rotating."

Fault Codes for Curtis Motor Controller Model 1236SE

Code	Fault	Cause
88	Encoder Pulse Count . Action: Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; ; ShutdownDriver1; ShutdownDriver2; ShutdownDriver3; ShutdownDriver4; ShutdownProportional Driver; Full Brake.	1. Encoder Steps parameter does not match the actual motor encoder.
89	Motor Type . Action: Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Full/Brake.	2. The Motor_Type parameter value is out of range.
91	VCL/OS Mismatch . Action: Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; ; ShutdownDriver1; ShutdownDriver2; ShutdownDriver3; ShutdownDriver4; ShutdownProportional Driver; Full Brake.	1. The VCL software in the Controller does not match the OS software in the Controller.
92	EM Brake Faulted to Set . Action: Shutdown EMBrake; Shutdown Throttle. Position Hold is engaged when Interlock= On.	1. Vehicle movement sensed after the EM Brake has been commanded to set. 2. EM Brake will not hold the motor from rotating.
93	Encoder LOS (Limited Operating Strategy) . Action: Enter LOS Controller mode.	1. Limited Operating Strategy (LOS) Contactor mode has been activated, as a result of either an Encoder Fault (Code 36) or a Stall Detected Fault (Code 73). 2. Motor encoder failure. 3. Bad crimps or Faulty wiring. 4. Vehicle is stalled.
94	EMER Rev Timeout . Action: Shutdown EMBrake; Shutdown Throttle.	1. Emergency Reverse was activated and concluded because the EMR Timeout timer has expired. 2. The emergency reverse input is stuck On.
98	Illegal Model Number . Action: Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Full Brake.	1. Model_Number variable Contains illegal value. 2. Software and hardware do not match. 3. Controller defective.
99	Parameter Mismatch . Action: Shutdown Motor; Shutdown Main Contactor; Shutdown EMBrake; Shutdown Throttle; Full Brake.	1. Dual drive enabled on only one Controller. 2. Incorrect Position feedback type chosen for motor technology in use. 3. Dual drive is enabled in torque mode.

## **NOTES**



# Pumps

Does not apply to this system

**NOTES**



# Cylinders

Does not apply to this system

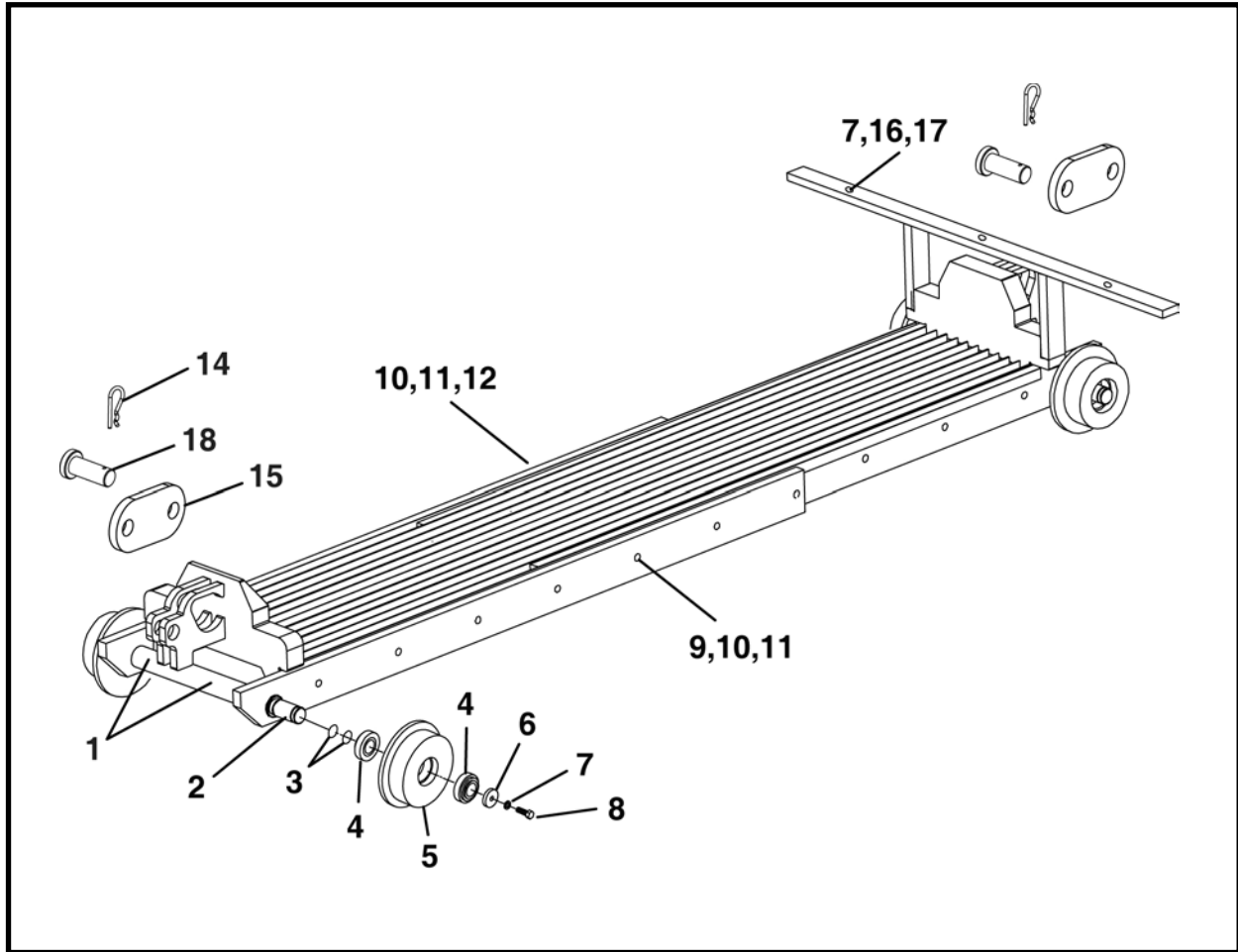
**NOTES**



# Miscellaneous

Haul Cart, F11266F00..... 2

## HAUL CART, F11266F00



ITEM	QTY	PART NO.	DESCRIPTION
0	1	F11266F00	HAUL CART
1	4	P0063-001	FITTING, Grease 1/4 UNF
2	2	011264P00	ROD, Drive
3	8	P0085-028	O-RING
4	8	P0065-004	BEARING
5	4	007677P00	WHEEL, Drive
6	4	005069P00	WASHER
7	9	P0045-008	WASHER, Lock 1/2
8	4	P0001-08-005	BOLT, 1/2 UNC x 1.25
9	6	P0001-10-014	BOLT, Hex 5/8 UNC x 3.50
10	14	P0046-010	WASHER, Hi-Collar Lock, 5/8
11	14	P0003-10-000	NUT, 5/8
12	6	P0001-10-011	BOLT, Hex 5/8 UNC x 2.75
13*	4	P0033-08-016	SCREW, Set 1/2 UNC x 1
14	2	P0090-004	PIN CLIP, 3/16
15	2	011488P00	LINK, Haul Cart Hitch
16	3	P0001-08-010	BOLT, Hex 1/2 UNC x 2.5
17	3	P0003-08-000	NUT, 1/2
18	2	011489P00	PIN, Hitch

\* Not Shown



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