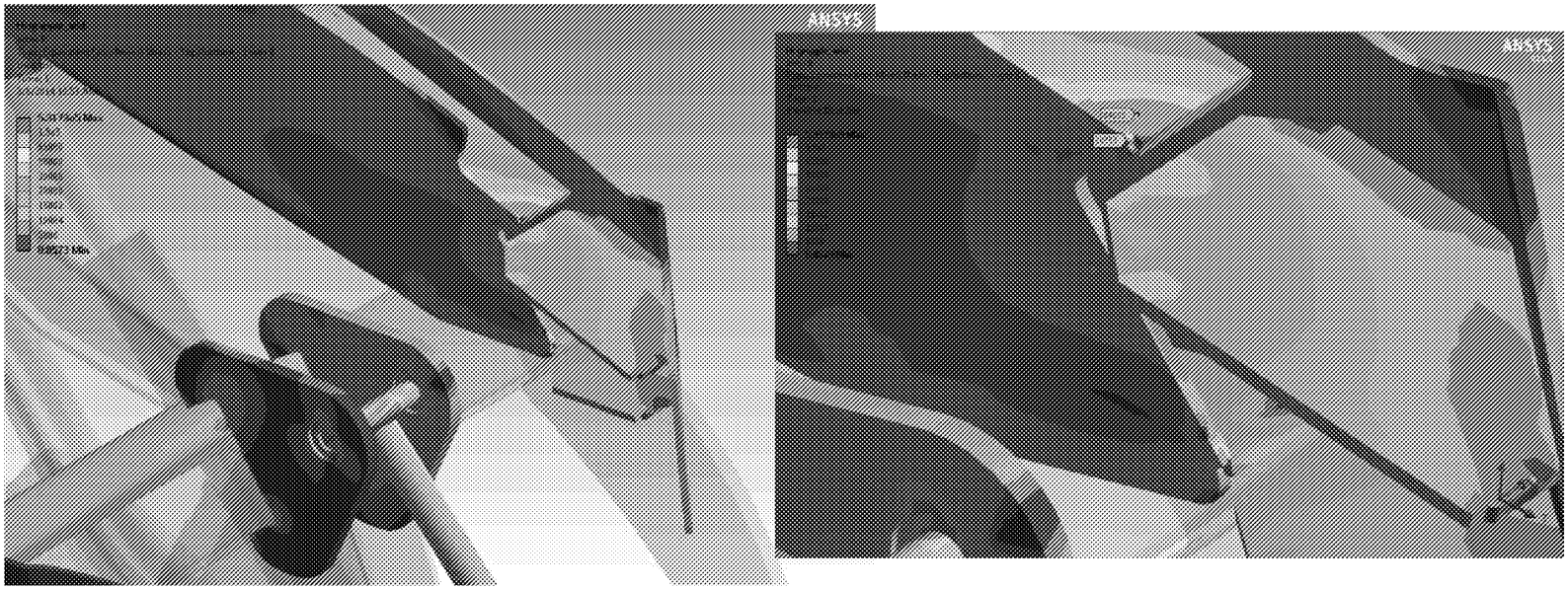
Yield Criteria (50 ksi)



- Offset Grapple, Middle Position



Top 85, ksi
Bottom, 21 ksi

... within Epsilon

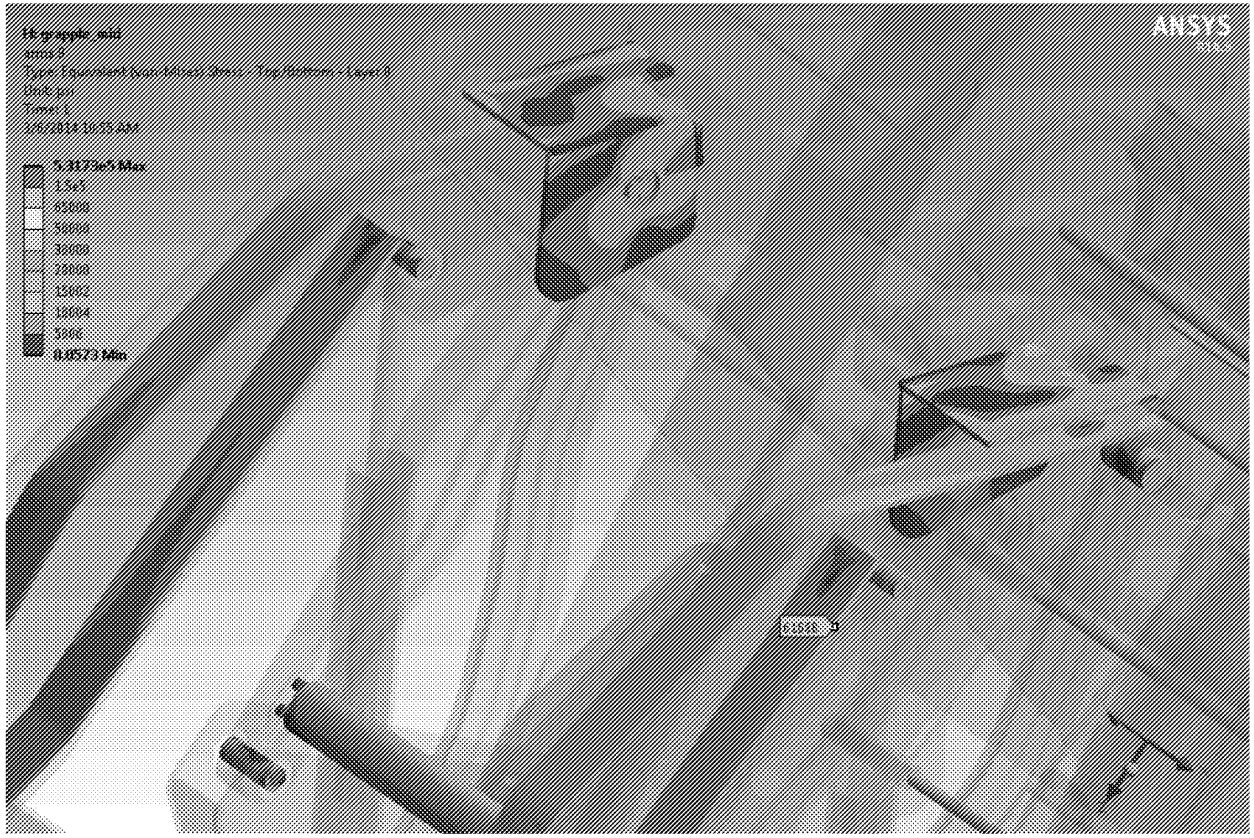
TORO-0000381.13/22

Ex. 2002
Page 614 of 915

Yield Criteria (50 ksi)



- Offset Grapple, Middle Position

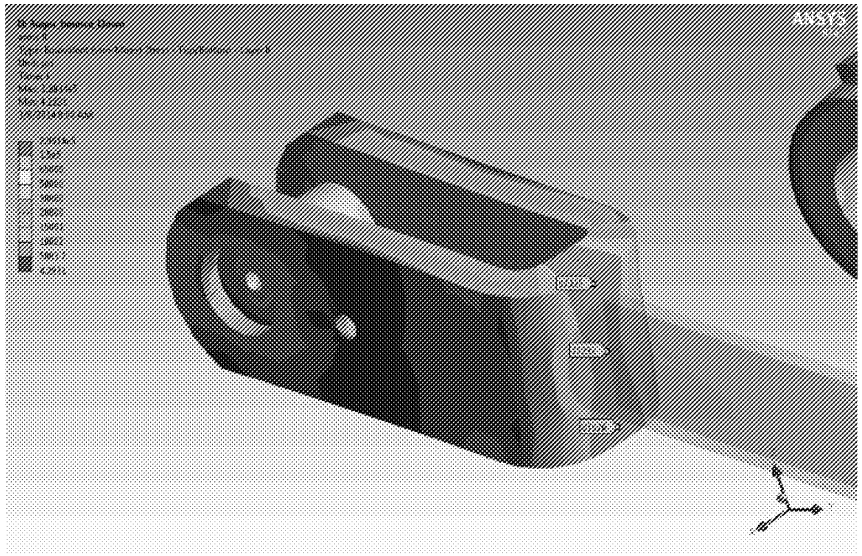


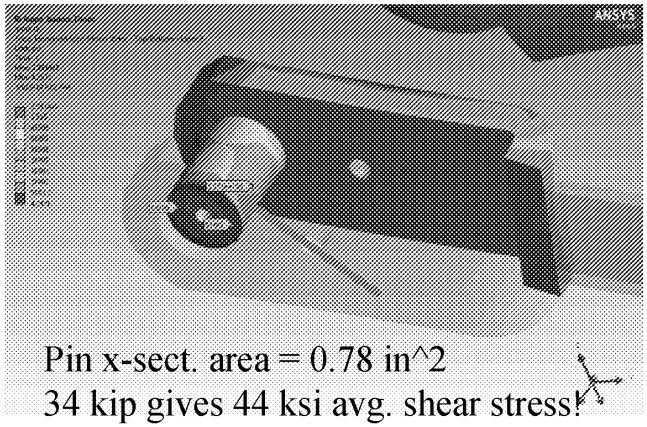
... within Epsilon

Yield Criteria (50 ksi)



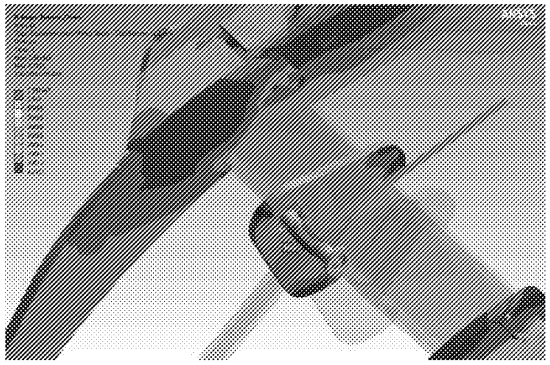
- Auger Bounce, Down Position
  - 34 Kip Bucket Piston Force





Pin x-sect. area = 0.78 in^2
34 kip gives 44 ksi avg. shear stress!

Pin x-sect. area = 0.59 in^2
34 kip gives 58 ksi avg. shear stress!



... within Epsilon

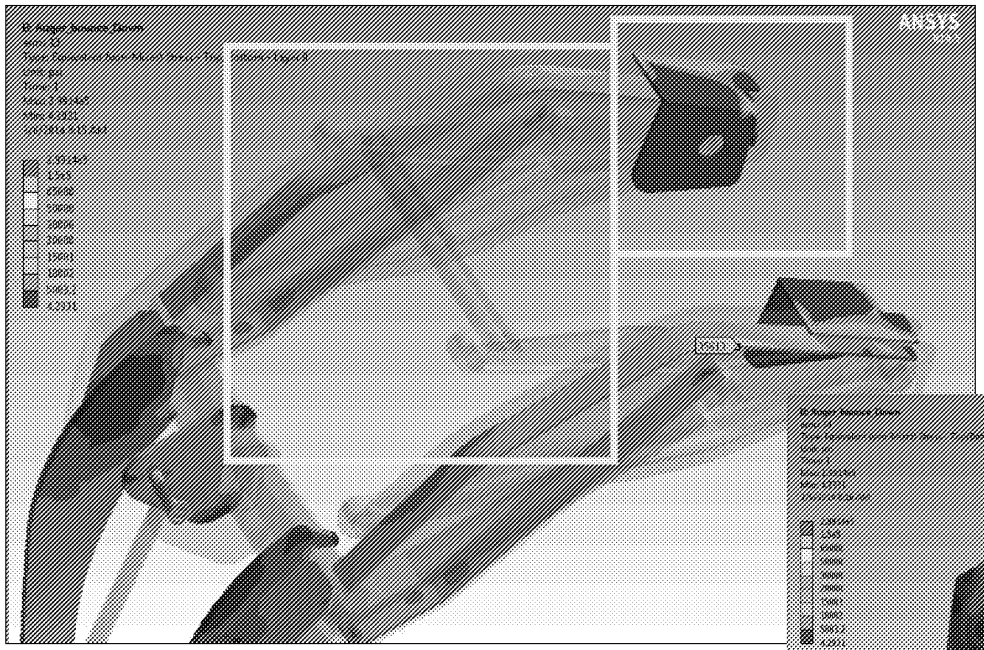
TORO-0000381.15/22

Ex. 2002
Page 616 of 915

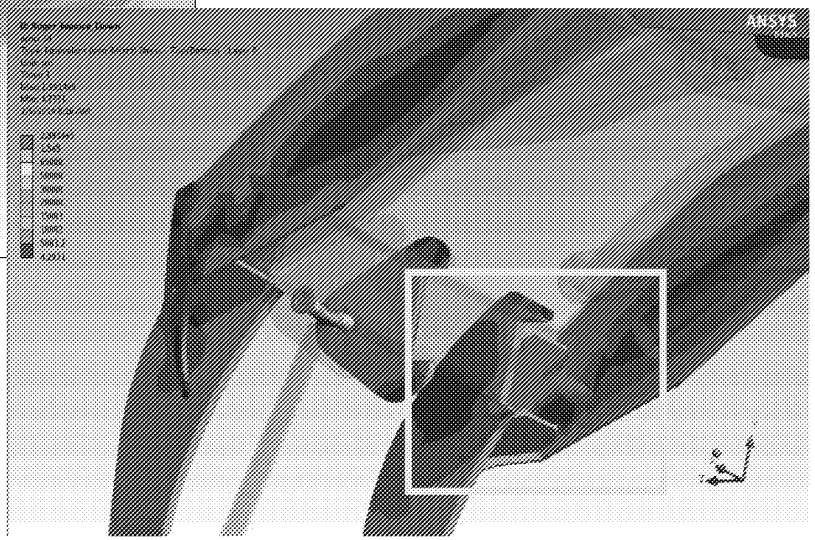
Yield Criteria (50 ksi)



- Auger Bounce, Down Position



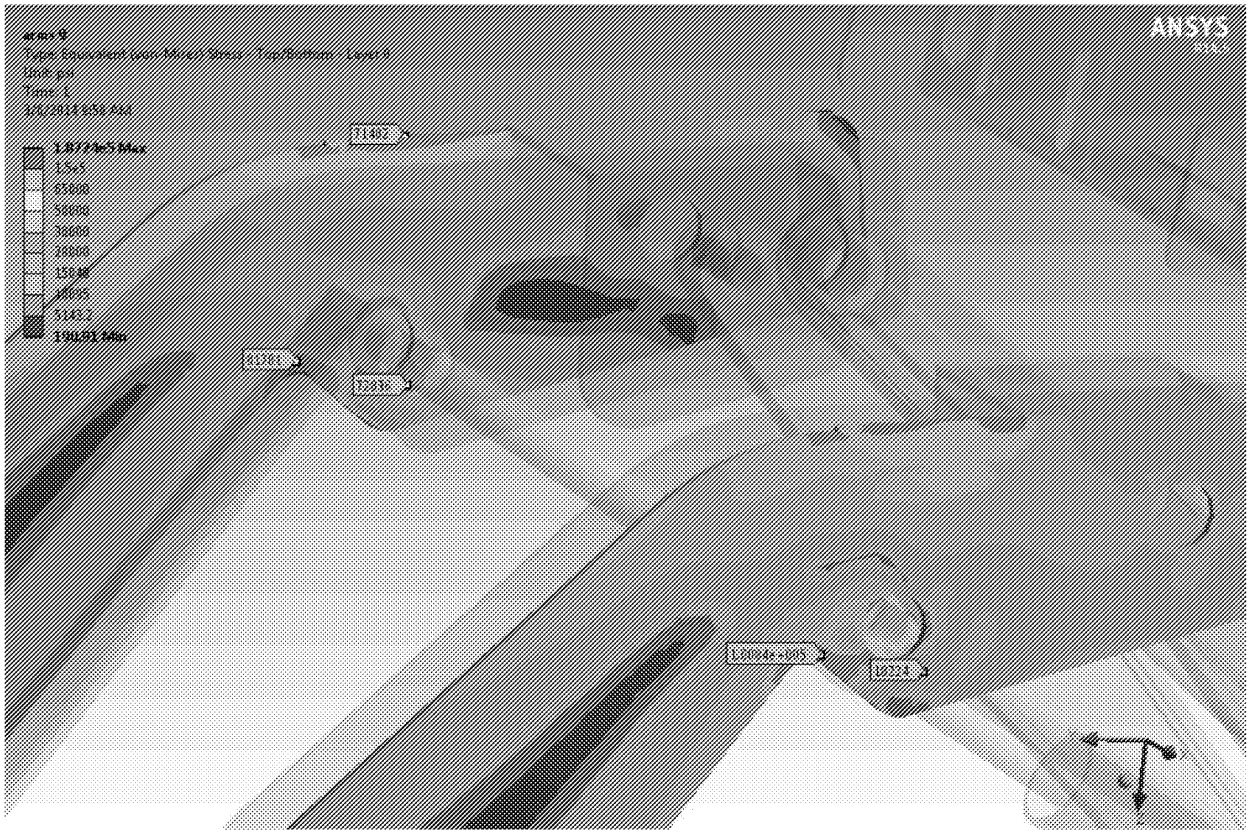
Looks good!



within Epsilon

Yield Criteria (50 ksi)

- Auger Bounce, high Position
  - Outboard Plates



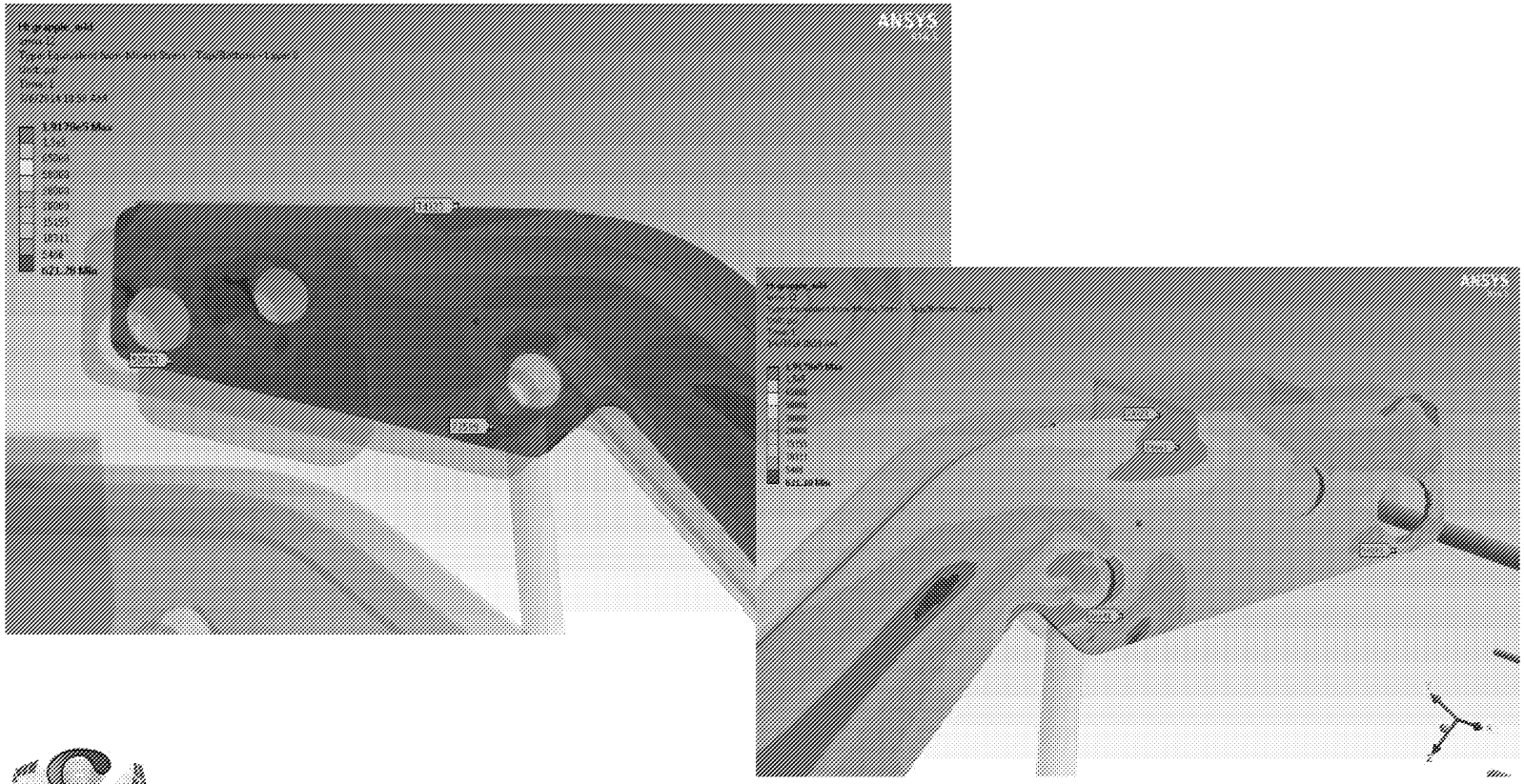
... within Epsilon

Ex. 2002
Page 618 of 915

Yield Criteria (50 ksi)



- Offset Grapple, Middle Position
  - Outboard Plates

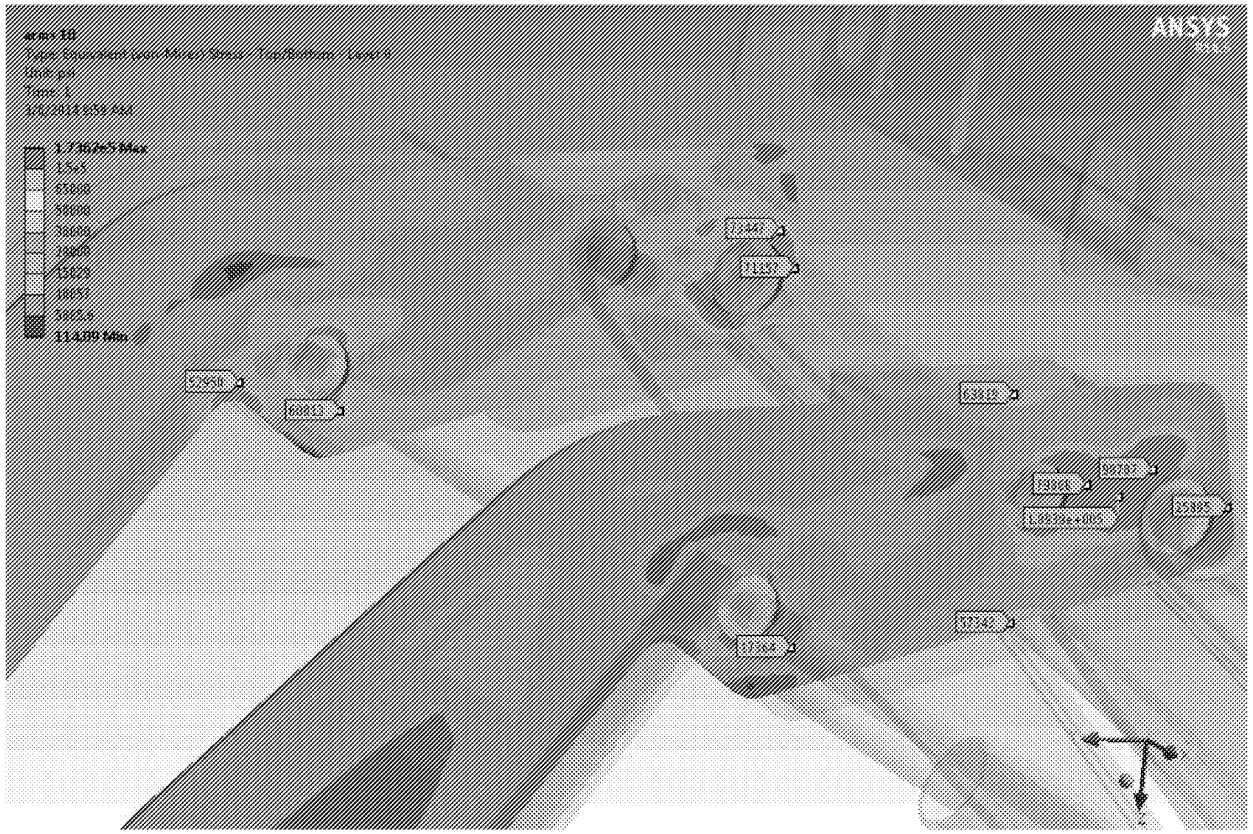


... within Epsilon

Ex. 2002
Page 619 of 915

Yield Criteria (50 ksi)

- Auger Bounce, High Position
  - inboard Plates



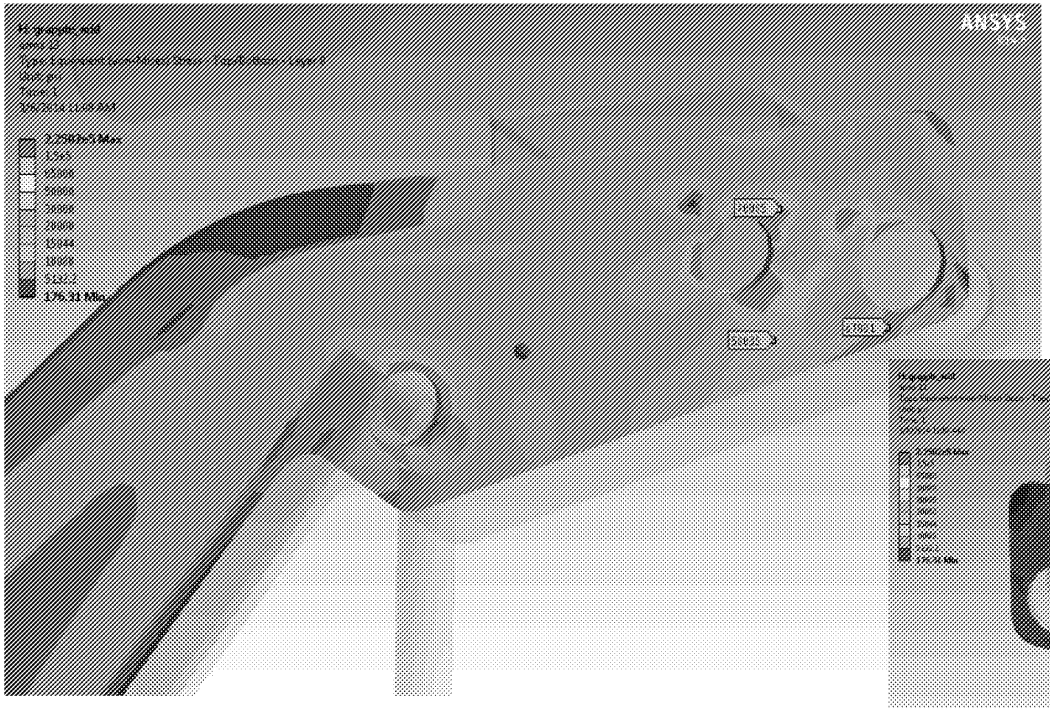
... within Epsilon

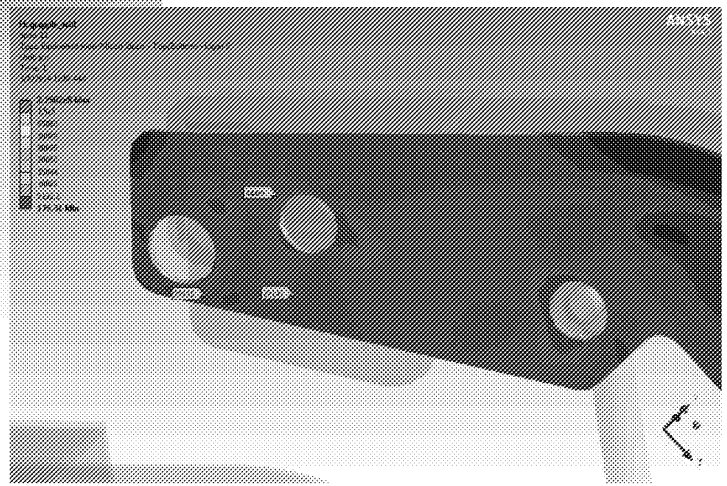
Ex. 2002
Page 620 of 915

Yield Criteria (50 ksi)



- Offset Grapple, Middle Position
  - inboard Plates





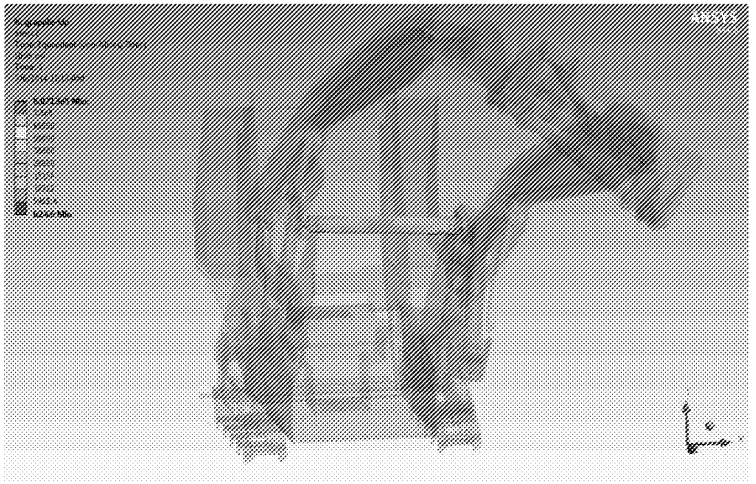
within Epsilon

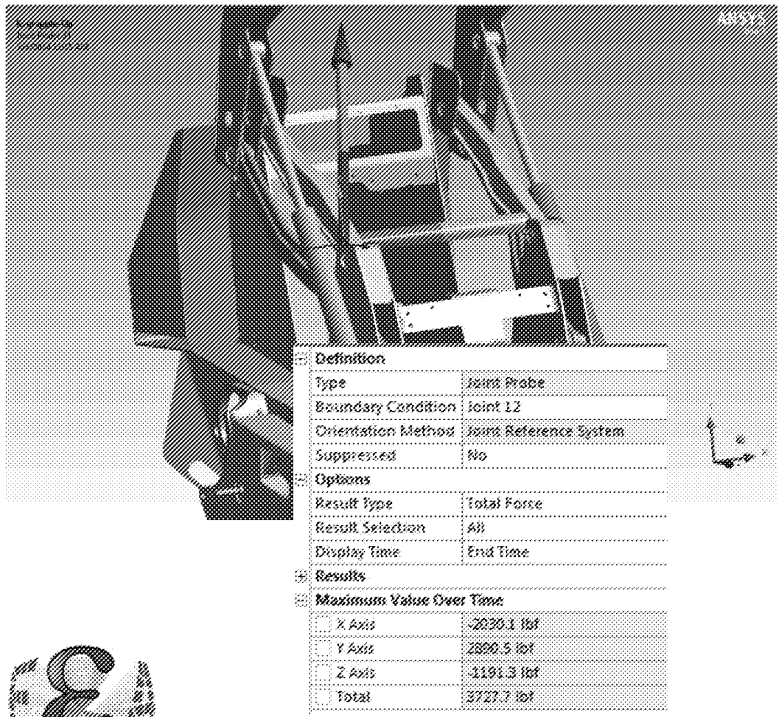
Ex. 2002
Page 621 of 915

Yield Criteria (50 ksi)

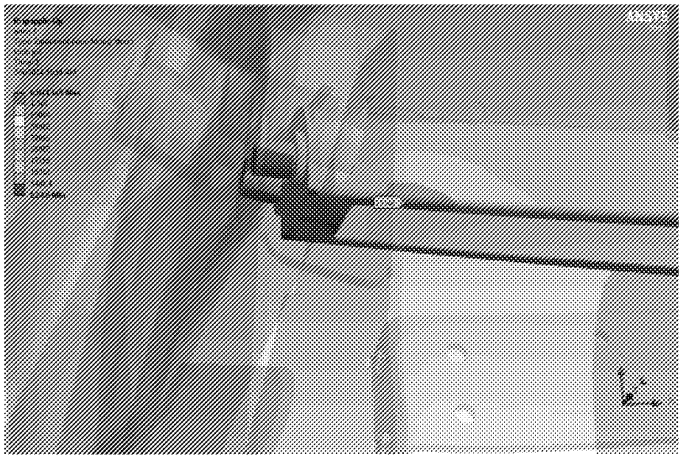


- Offset Grapple, High Position
  - Crossbar
  - 5X displacement scaling
  - No bolt-pretension modeled





Definition	
Type	Joint Probe
Boundary Condition	Joint 12
Orientation Method	Joint Reference System
Suppressed	No
Options	
Result Type	Total Force
Result Selection	All
Display Time	End Time
Results	
Maximum Value Over Time	
X Axis	-2030.1 lbf
Y Axis	2890.5 lbf
Z Axis	-1191.3 lbf
Total	3727.7 lbf



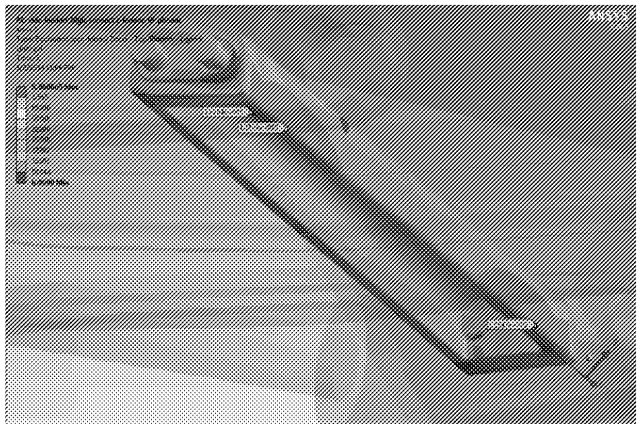
within Epsilon

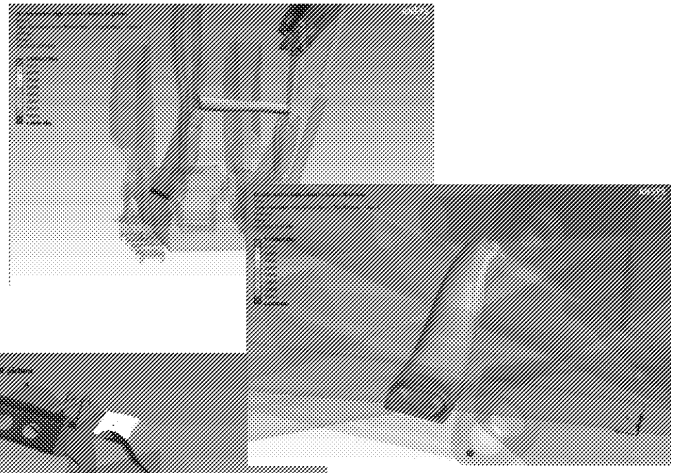
Ex. 2002
Page 622 of 915

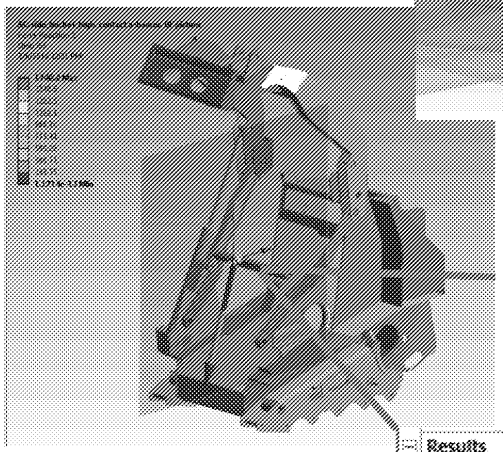
Yield Criteria (50 ksi)



- Side Impact, Bucket - High Position
  - Crossbar
  - 10X displacement scaling
  - No bolt-pretension modeled







Forces

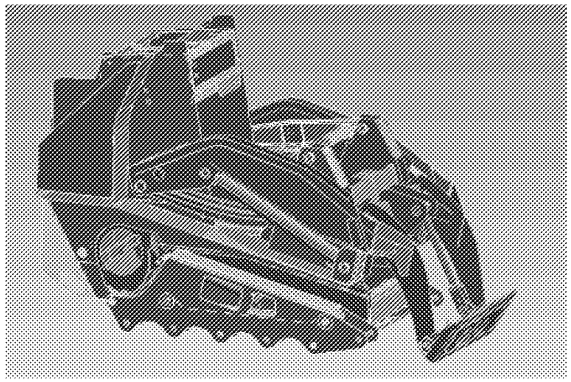
Results	
X Axis	-1407.6 lbf
Y Axis	-4075.3 lbf
Z Axis	1.9804 lbf
Total	4311.5 lbf

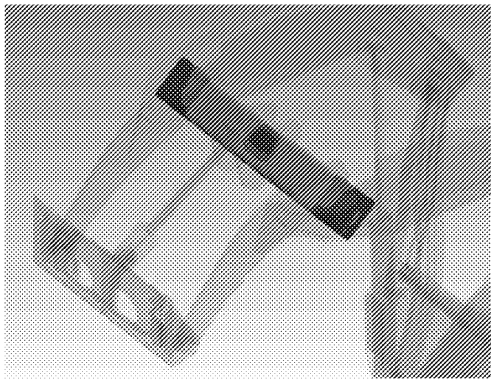
Moments

Results	
X Axis	19209 lbf·in
Y Axis	-6556.9 lbf·in
Z Axis	7072. lbf·in
Total	21494 lbf·in

... within Epsilon

TMAX Loader
Cab
03/05/2014

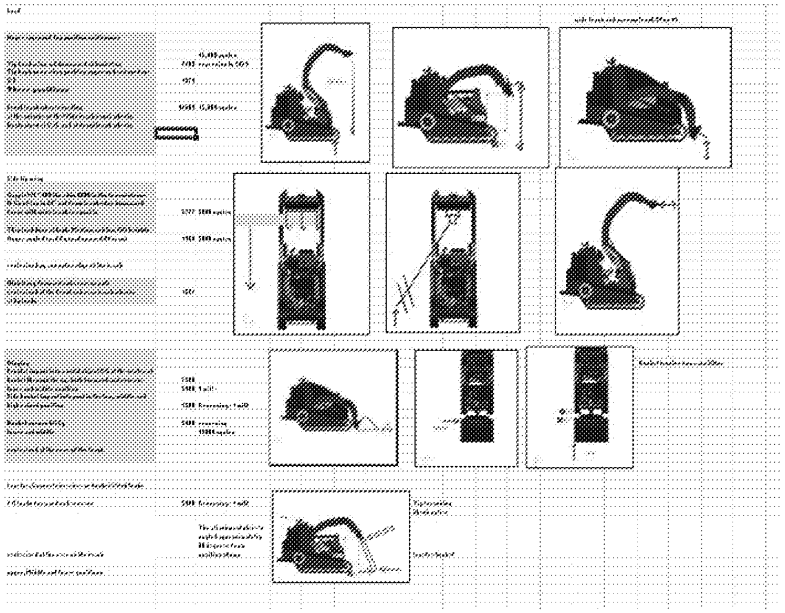


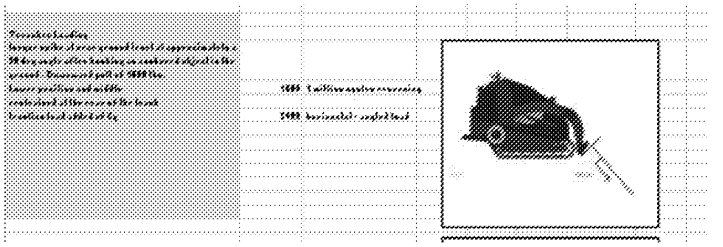


21 Load cases



- Uses defined loads (21 cases)
- High Position - Leveler Load now originates 32” below bucket
  - And 12” forward





... within Epsilon

Ex. 2002
Page 625 of 915

Summary



- See Excel sheets

		Case Label	Peak Tower Stress (ksi)	F.S	Cab Stress		Tracks		A
Low Cycle									
Auger Bounce	High	F	171	0.29	51	0.98	51	0.98	
	Med	U	123	0.41	77	0.65	41	1.22	
	Low	B	172	0.29	82	0.61	39	1.28	
Offset Grapple	High	K	92	0.54	97	0.52	56	0.89	
	Med	H	97	0.52	110	0.45	33	1.52	
	Low	O	124	0.40	95	0.53	35	1.43	
Auger kick-out / angle	High	L	63	0.79	32	1.56	24	2.08	
High Hang Fwd	High	G	42	1.19	25	2.00	13	3.85	
Side Bucket hit	High	AC	88	0.56	67	0.75	47	1.06	
	Med	AD	36	1.39	29	1.72	22	2.27	
	Low	AE	25	2.00	14	3.57	18	2.78	
Corner Bucket Hit	Med	AB	27	1.85	46	1.09	22	2.27	
	Low	AG	65	0.77	13	3.85	10	5.00	
High Cycle Fatigue Cases									
Leveler	High	N	51	0.98	50	0.98	50	0.98	
	Med	Y	52	0.97	21	0.91	13	1.48	
Trencher	Med	X	5	3.84	4	4.80	13	1.48	
	Low	S	5.7	3.37	6	3.20	12	1.60	
Digging	Med	V	36	0.53	42	0.46	37	0.52	
	Low	C	78	0.25	26	0.74	12	1.60	

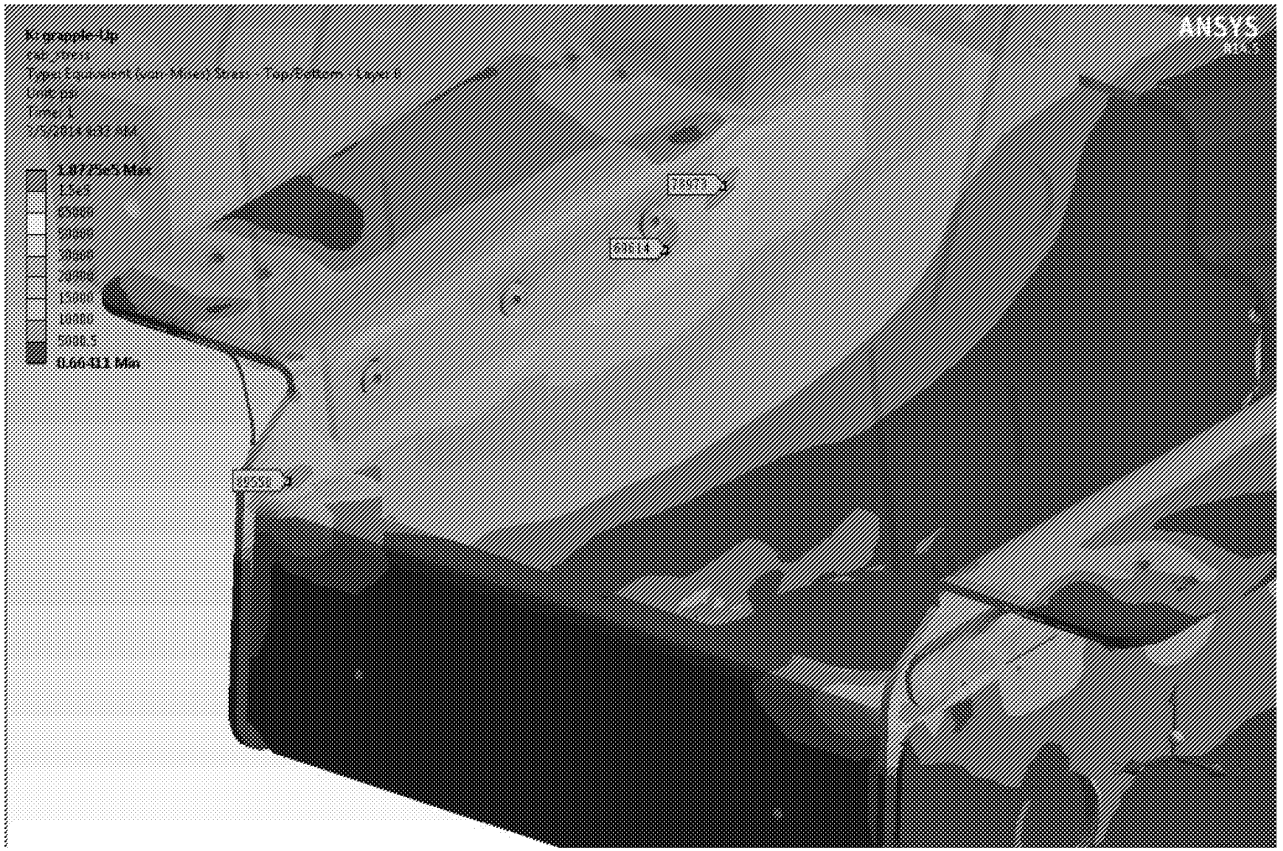
... within Epsilon

Ex. 2002
Page 626 of 915

Yield Criteria (50 ksi)



- Offset Grapple, High Position



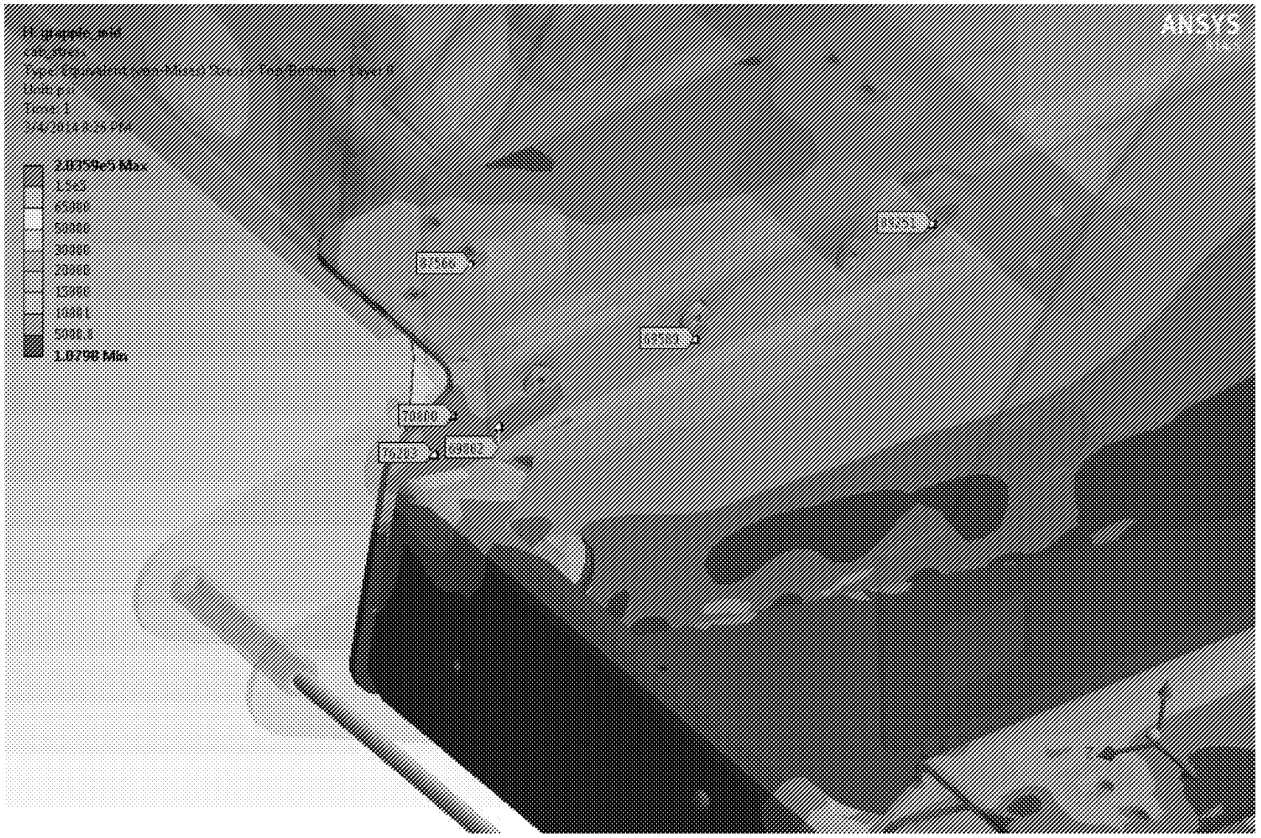
... within Epsilon

Ex. 2002
Page 627 of 915

Yield Criteria (50 ksi)



- Offset Grapple, Mid Position



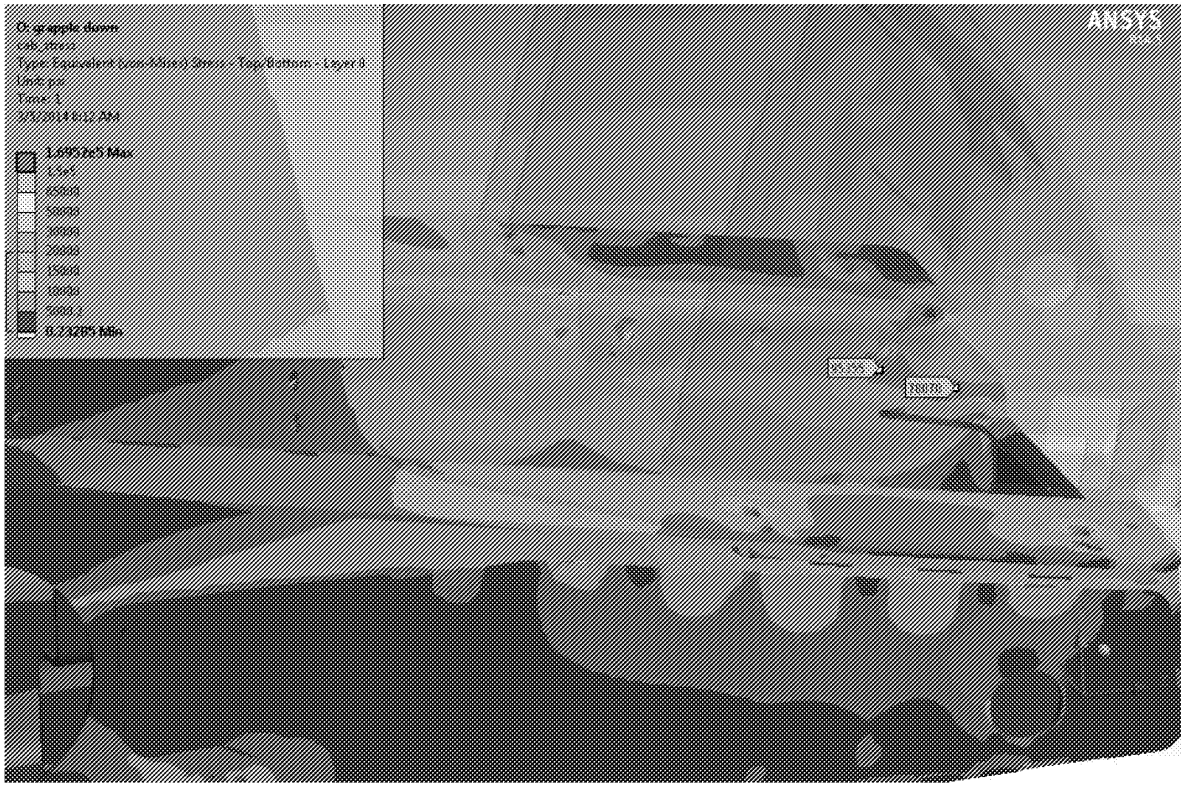
... within Epsilon

Ex. 2002
Page 628 of 915

Yield Criteria (50 ksi)



- Offset Grapple, Low Position



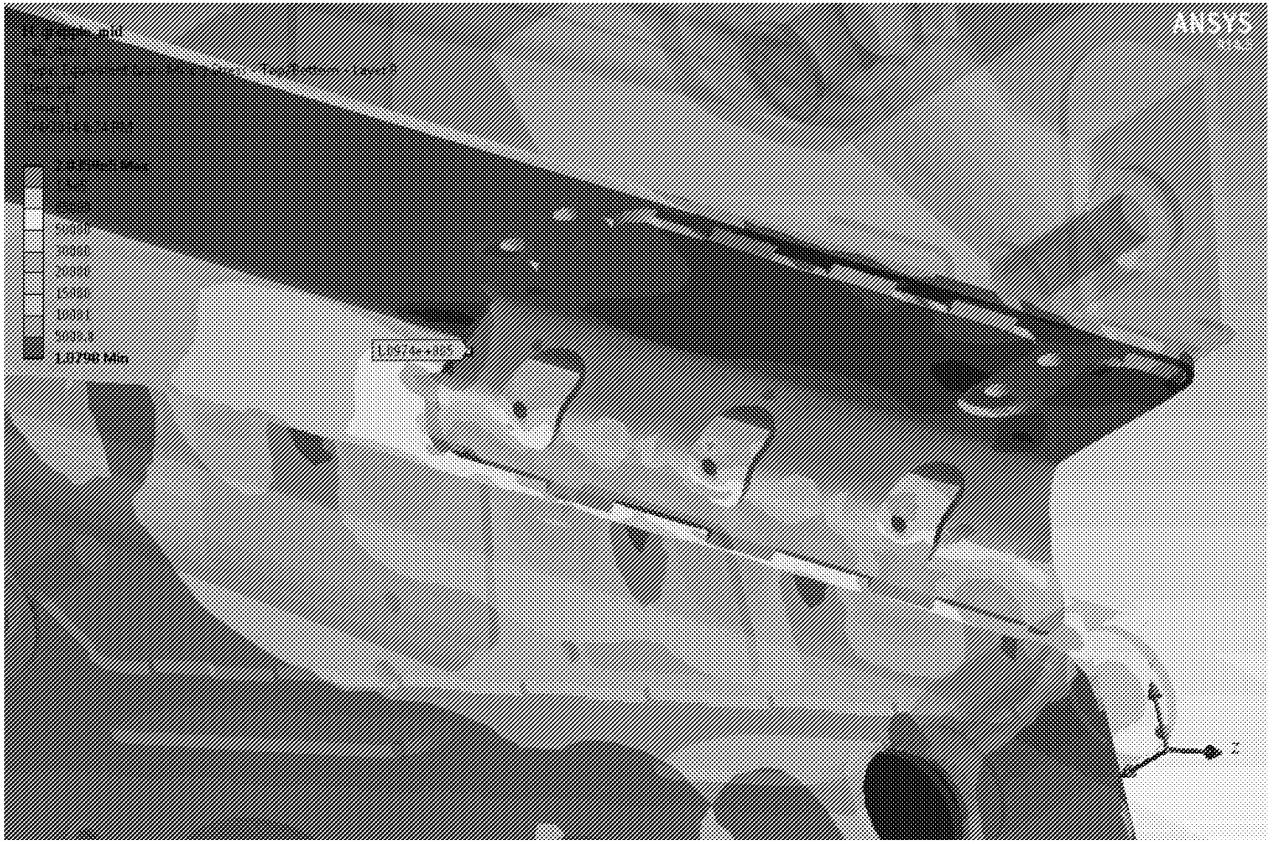
... within Epsilon

Ex. 2002
Page 629 of 915

Yield Criteria (50 ksi)



- Offset Grapple, Mid Position

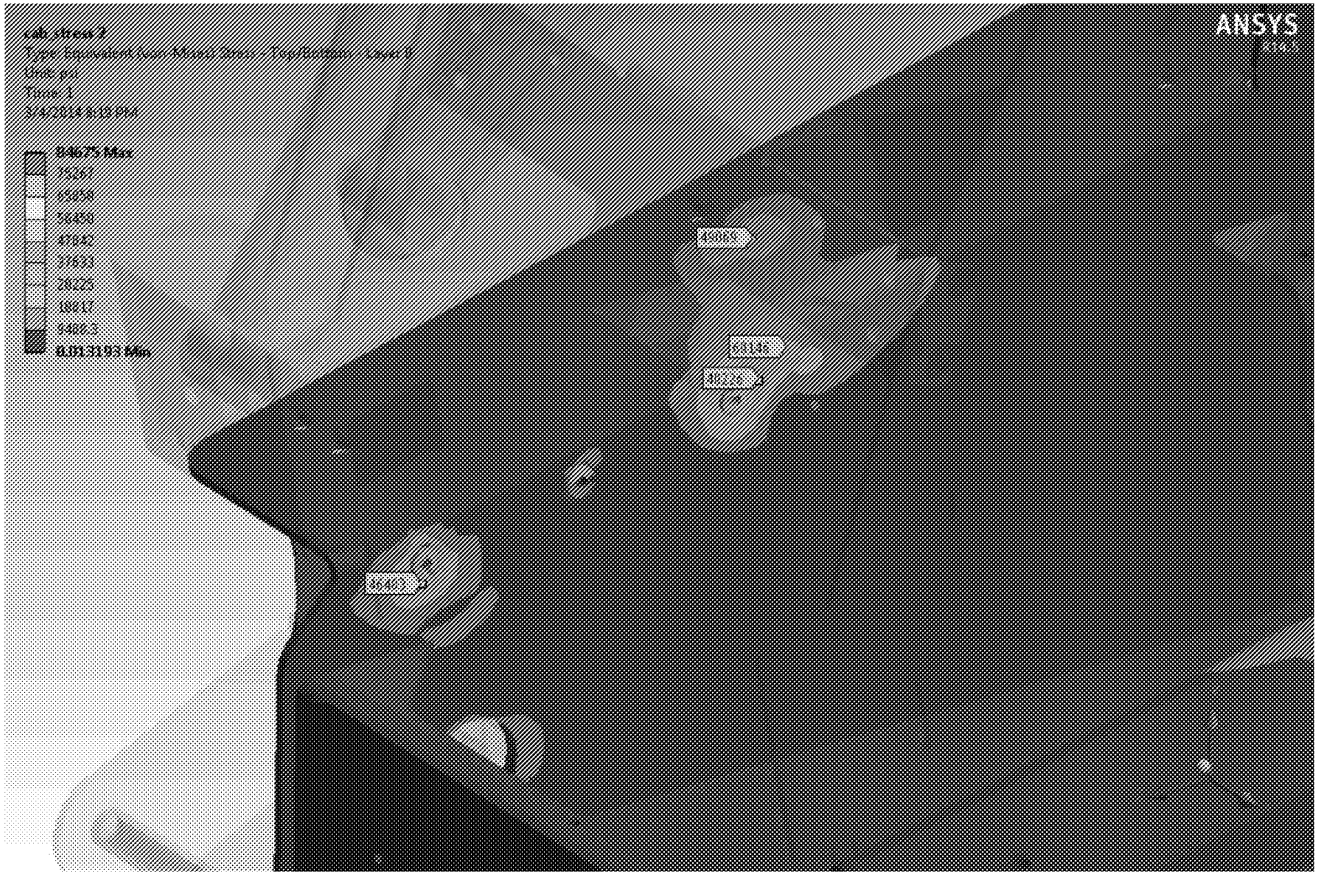


... within Epsilon

Fatigue Criteria (19 ksi?)



- Leveler, High Position is critical case



... within Epsilon

Ex. 2002
Page 631 of 915

Fatigue Criteria (19 ksi?)

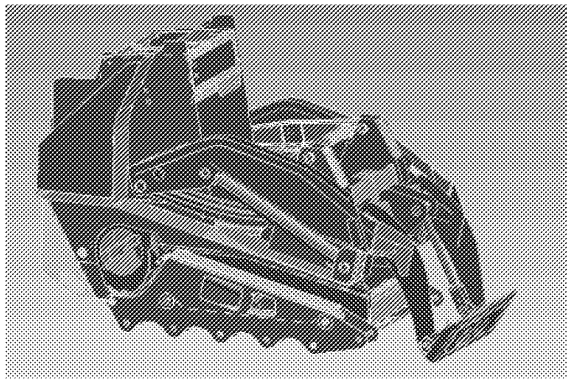


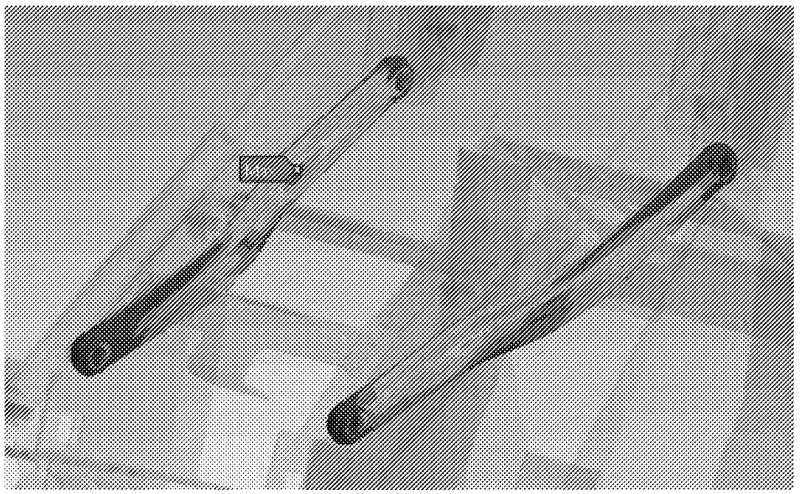
- Digging, Low is critical case



Ex. 2002
Page 632 of 915

TMAX Loader
Lower Arm Stresses
02/28/2014

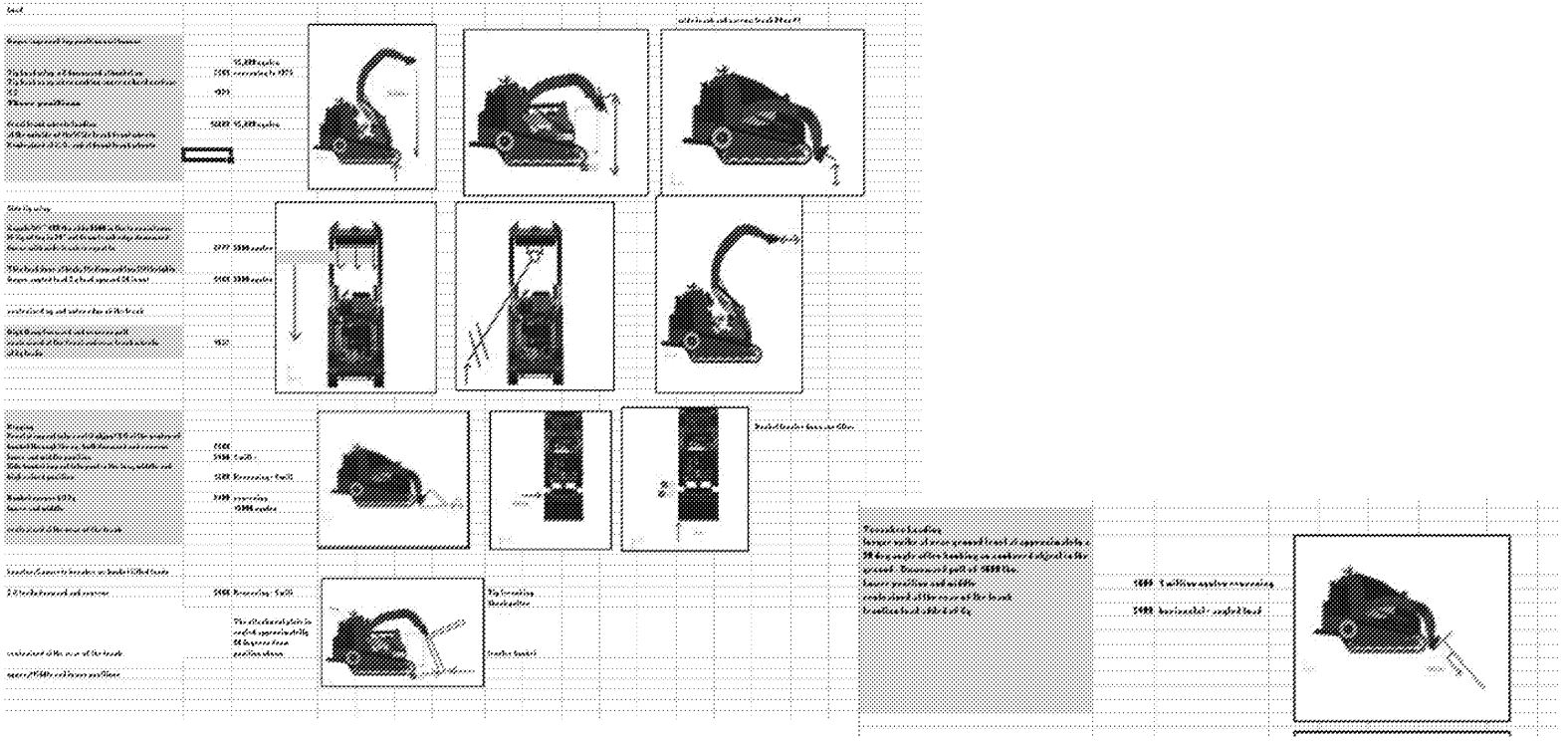




21 Load cases



- Uses defined loads (21 cases)



... within Epsilon

Ex. 2002
Page 634 of 915

Summary



- See Excel sheets

		Case Label	Peak Stress (ksi)	F.S	Axial Force (lbf)	Shear Load (lbf)	Moment (in	Moment (i	FX	FY	FZ	FX	FY	FZ	MX	MY	MX	MY	Theta
Low Cycle																			
Auger Bounce	High	F	149	0.30	38,913	-3888	3821	1212	18368	18757	0	21455	19778	-3889	583	529	3022	-2546	46.5
	Med	U	89	0.50			0	0											14.6
	Low	B	112	0.40	38,113	3680	-3510	-1779	17667	3382	0	21277	1310	3680	148	-427	-3647	-943	8.9
Offset Grapple	High	K	75.8	0.59	22,536	-3309	-2891	-1635	-11313	85	-3308	-7940	-19799	0	-2714	1693	-462	-721	46.5
	Med	M	58.7	0.75	21,562	2093	1866	2853	12193	-3501	2090	7283	8589	0	1575	588	148	1711	14.6
	Low	O	76.7	0.59	-	0	0	0											6.9
Auger kick-out / angle	High	L	36.4	1.24															
High Hang Fwd	High	G	48	1.05															
Side Bucket hit	High	AC	61.5	0.73	-	0	0	0											46.5
	Med	AD	8.3	5.26															
	Low	AE	11.1	4.05															
Corner Bucket Hit	Med	AB	9.8	4.59															
	Low	AG	45.8	0.98	-	0	0	0											6.9
High Cycle Fatigue Cases																			
Leveler	High	N	78.9	0.22	22,566	-2087	1966	869	7002	7328	0	10931	11577	-2087	120	241	1764	-1069	46.5
	Med	Y	34.4	0.49	11,404	-1025	-827	-284	4589	1681	0	6642	1236	-1025	0	-114	-378	73	14.6
Trencher	Med	X	1.5	11.33															
	Low	S	3.4	5.00															
Digging	Med	V	4.6	3.70															
	Low	C	51.4	0.33	18,358	-1788	-1729	-903	8590	1299	0	9692	903	-1788	-68	-202	-1761	-485	8.9

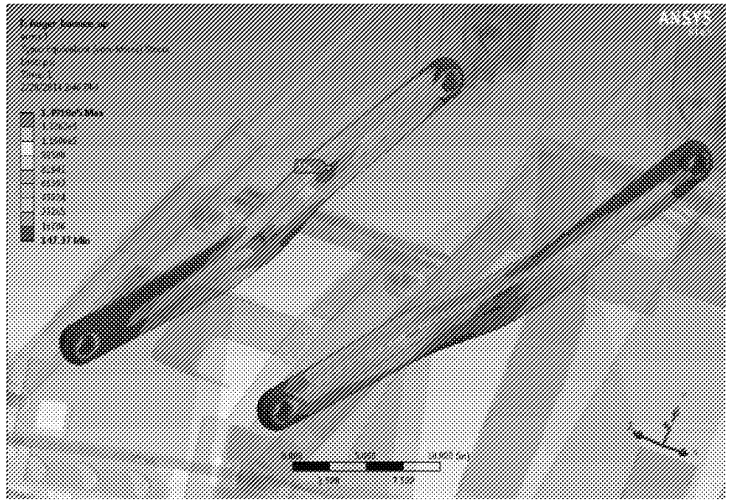
... within Epsilon

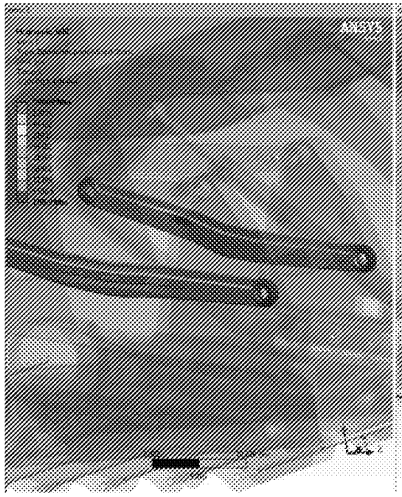
Ex. 2002
Page 635 of 915

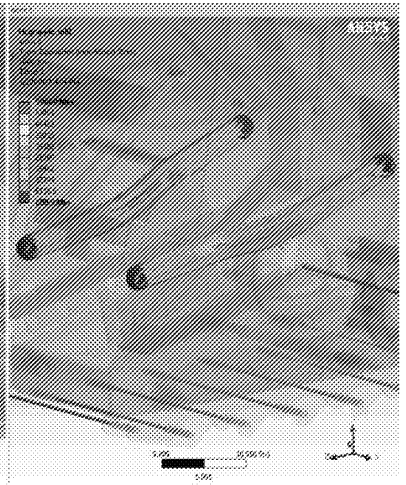
Yield Criteria (45 ksi)



- Auger Bounce, High is critical case
  - 149 ksi equivalent stress
  - 40 kip axial force
  - 4 kip shear force
  - 3900 in-lb longitudinal moment
- Offset Grapple Middle has highest moment (bending), 2900 in-lb







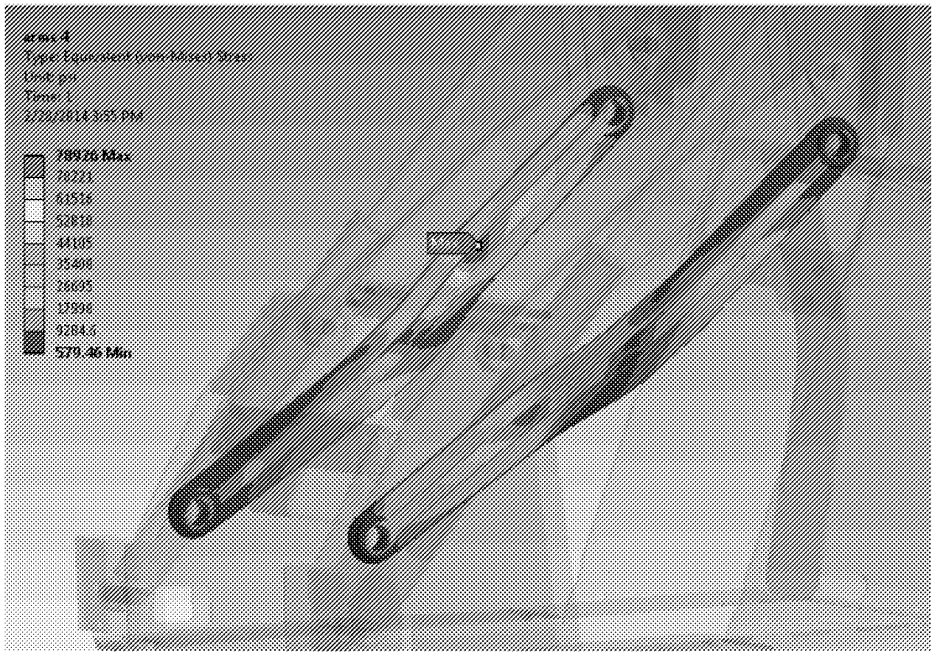
... within Epsilon

Ex. 2002
Page 636 of 915

Fatigue Criteria (17 ksi?)



- Leveler, High is critical case
  - 79 ksi equivalent stress
  - 14 kip axial force
  - 2.4 kip shear force
  - 1300 in-lb longitudinal moment
  - 2270 in-lb bending moment



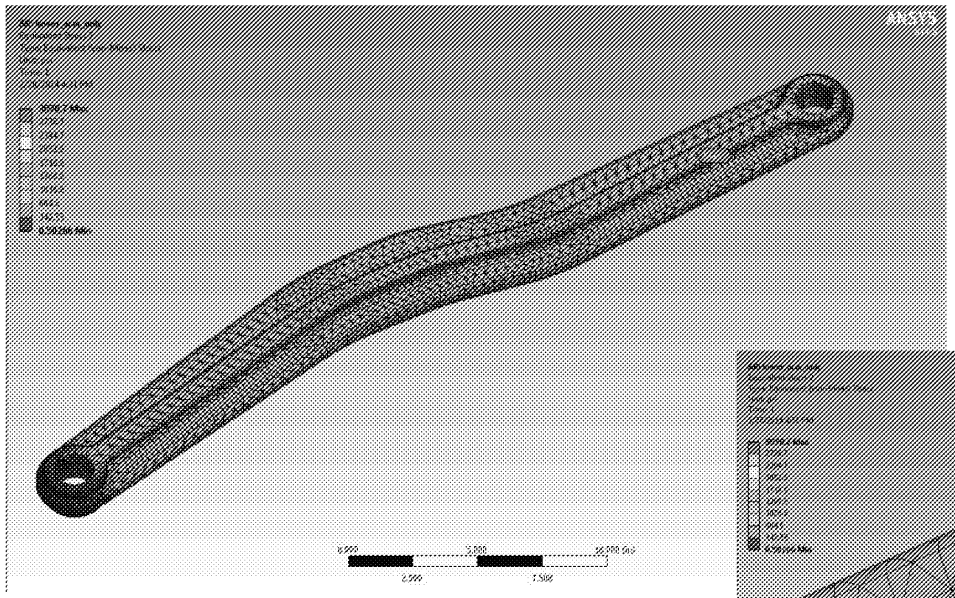
... within Epsilon

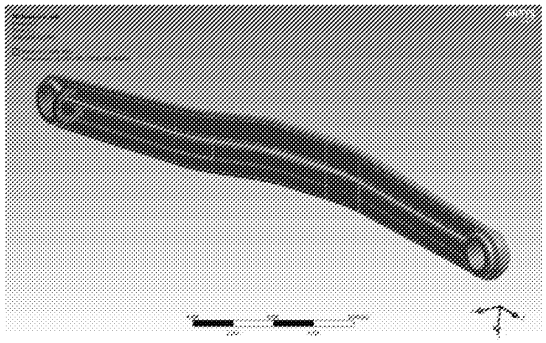
Ex. 2002
Page 637 of 915

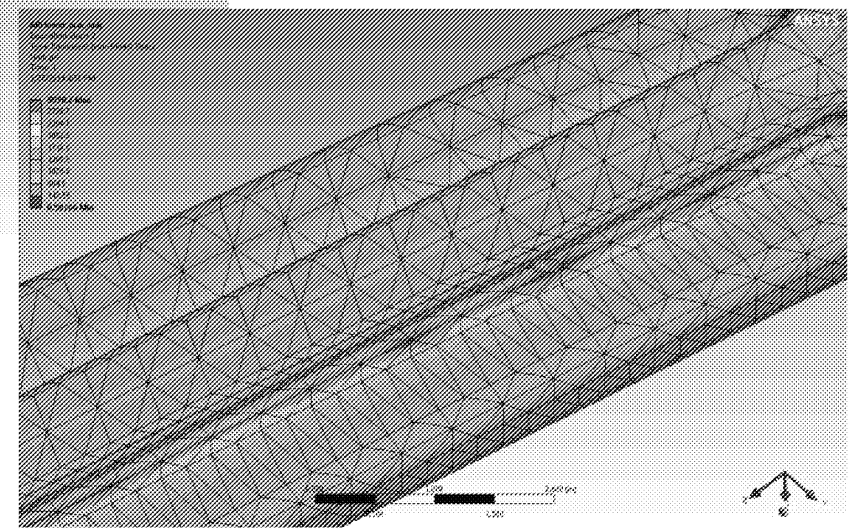
Baseline Stresses



- 1000 in-lb longitudinal moment







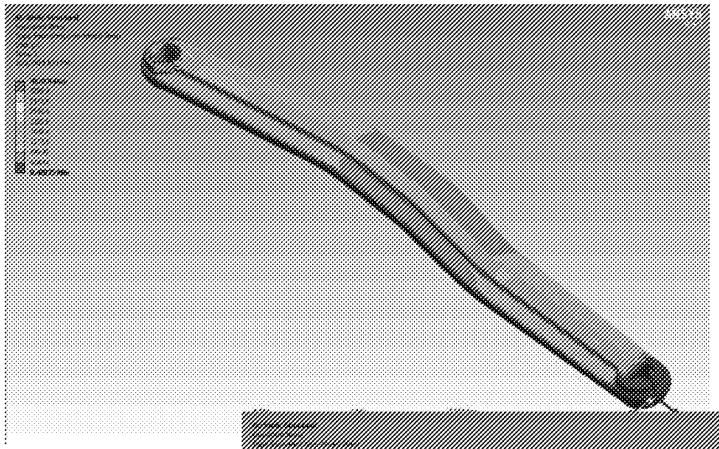
... within Epsilon

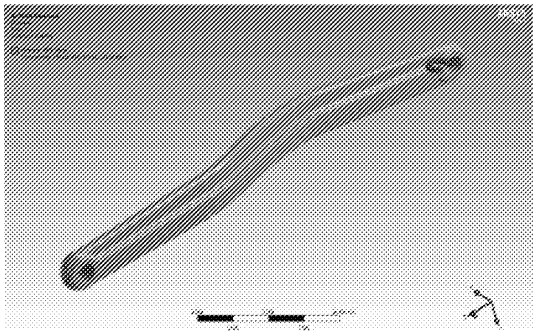
Ex. 2002
Page 638 of 915

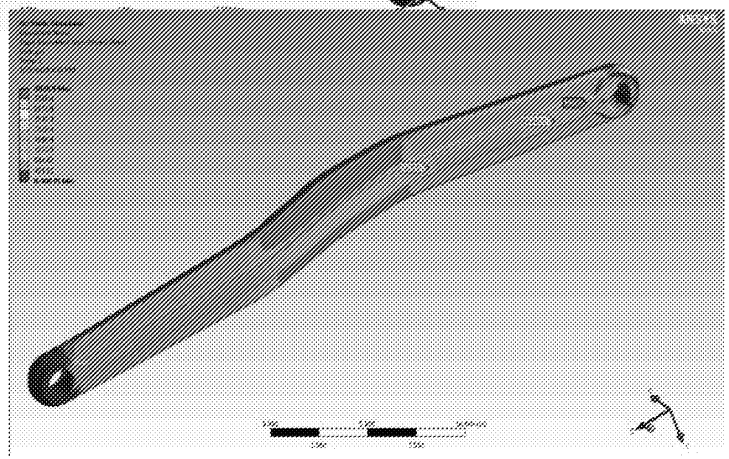
Baseline Stresses

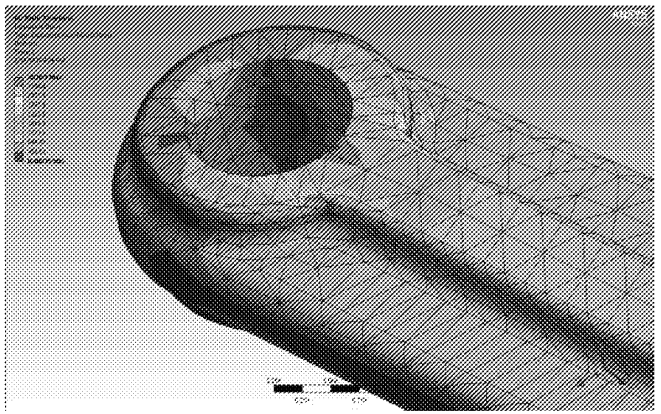


- 1000 in-lb bending moment









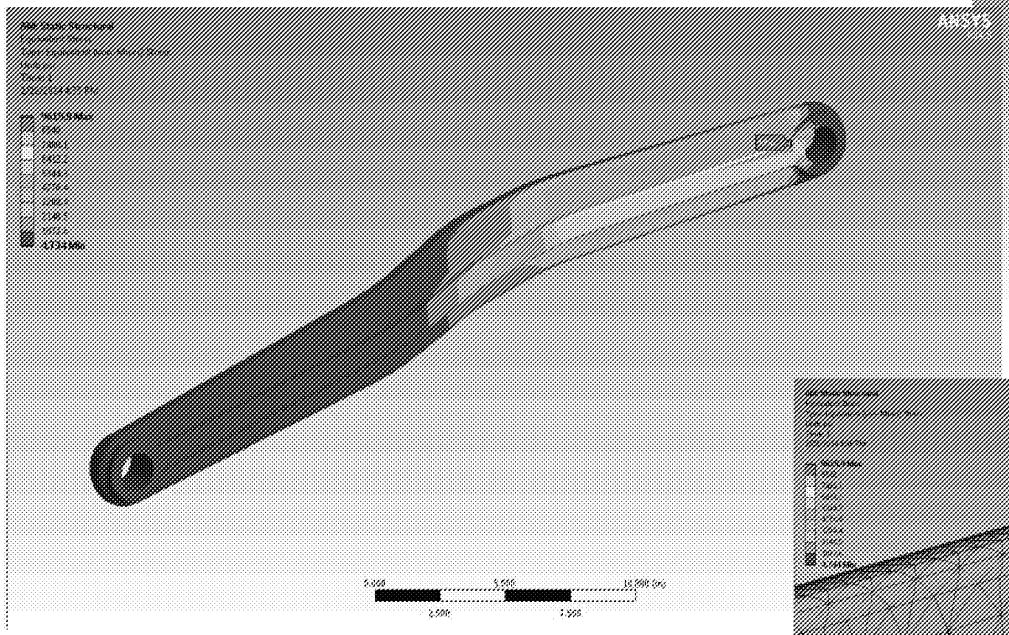
... within Epsilon

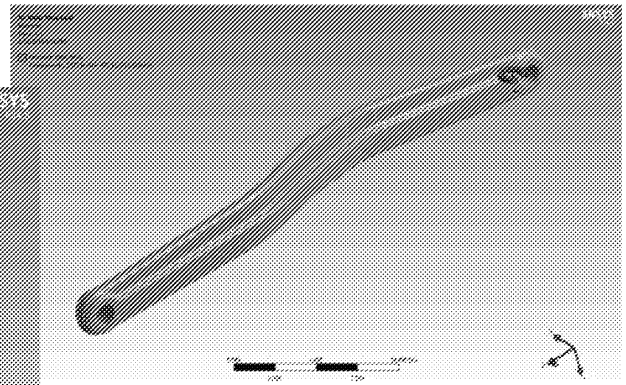
Ex. 2002
Page 639 of 915

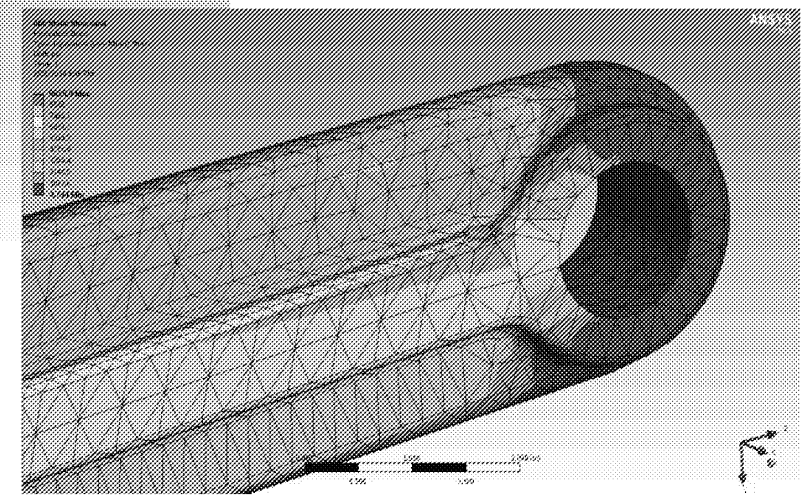
Baseline Stresses



- 1000 lbf axial



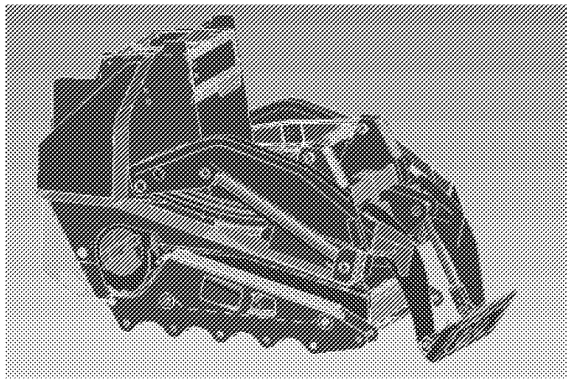


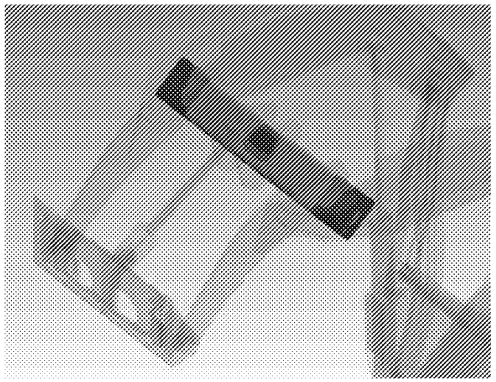


... within Epsilon

Ex. 2002
Page 640 of 915

TMAX Loader
Tower
03/04/2014

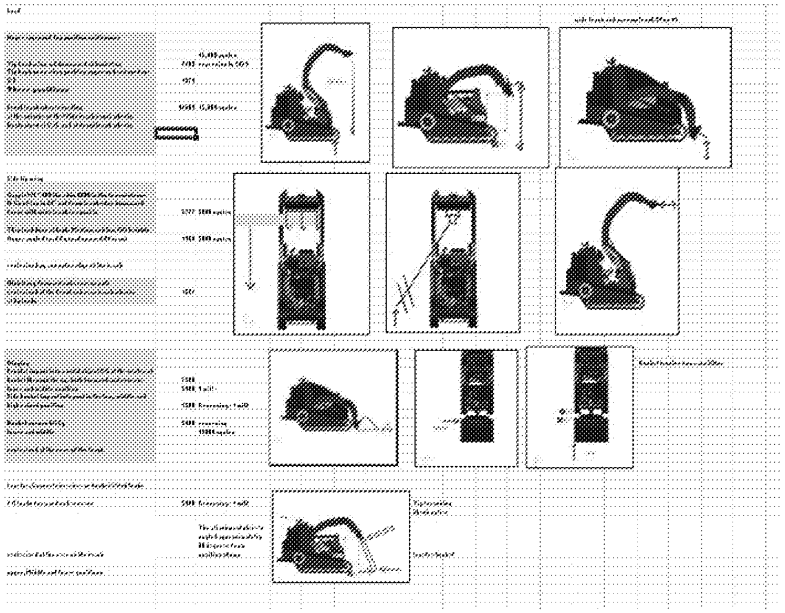


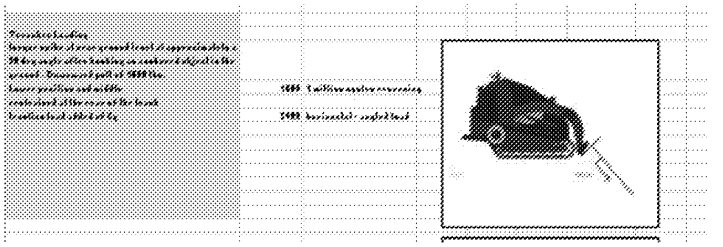


21 Load cases



- Uses defined loads (21 cases)
- High Position - Leveler Load now originates 32” below bucket
  - And 12” forward





... within Epsilon

Ex. 2002
Page 642 of 915

Summary



- See Excel sheets

		Case Label	Peak Stress (ksi)	F.S	A>
Low Cycle					
Auger Bounce	High	F	171	0.29	
	Med	U	123	0.41	
	Low	B	172	0.23	
Offset Grapple	High	K	92	0.54	
	Med	H	97	0.52	
	Low	O	124	0.40	
Auger kick-out / angle	High	L	63	0.79	
High Hang Fwd	High	G	42	1.19	
Side Bucket hit	High	AC	90	0.56	
	Med	AD	36	1.39	
	Low	AE	25	2.00	
Corner Bucket Hit	Med	AB	27	1.85	
	Low	AG	65	0.77	
High Cycle Fatigue Cases					
Leveler	High	N	51	0.38	
	Med	Y	52	0.37	
Trencher	Med	X	6	3.84	
	Low	S	5.7	3.37	
Digging	Med	V	36	0.53	
	Low	C	78	0.25	

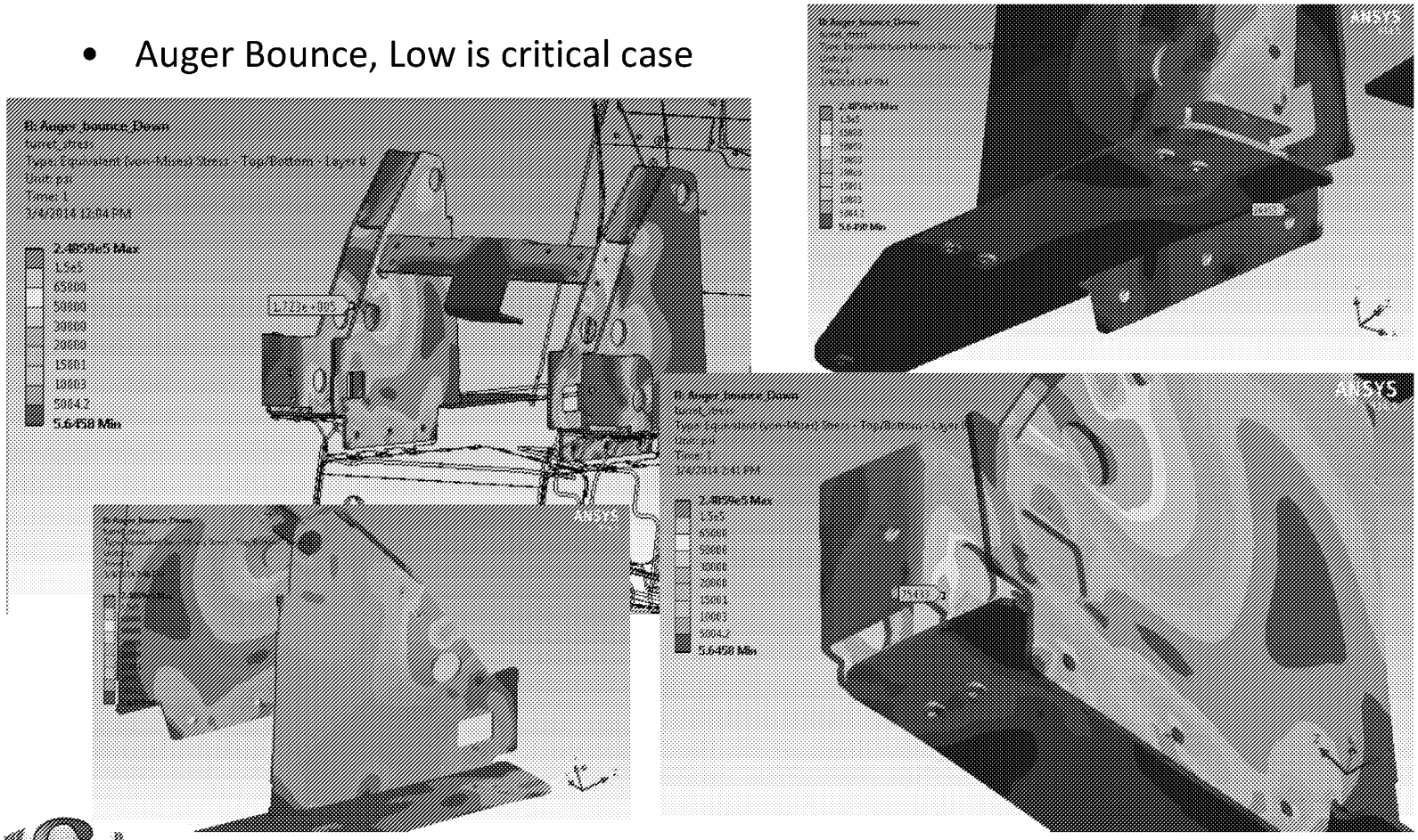
... within Epsilon

Ex. 2002
Page 643 of 915

Yield Criteria (50 ksi)



- Auger Bounce, Low is critical case

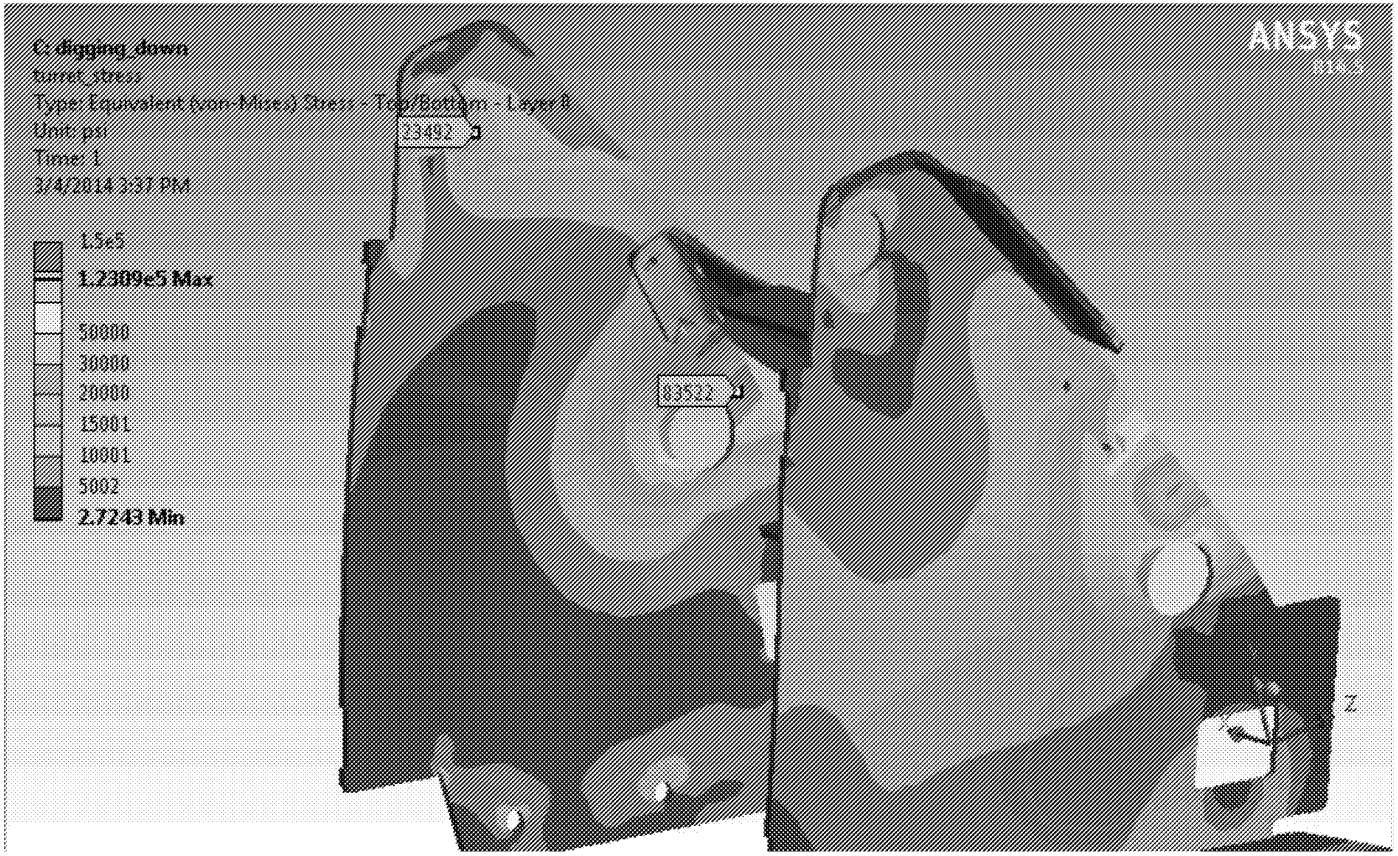


... within Epsilon

Fatigue Criteria (19 ksi?)



- Digging (low position) is fatigue critical case

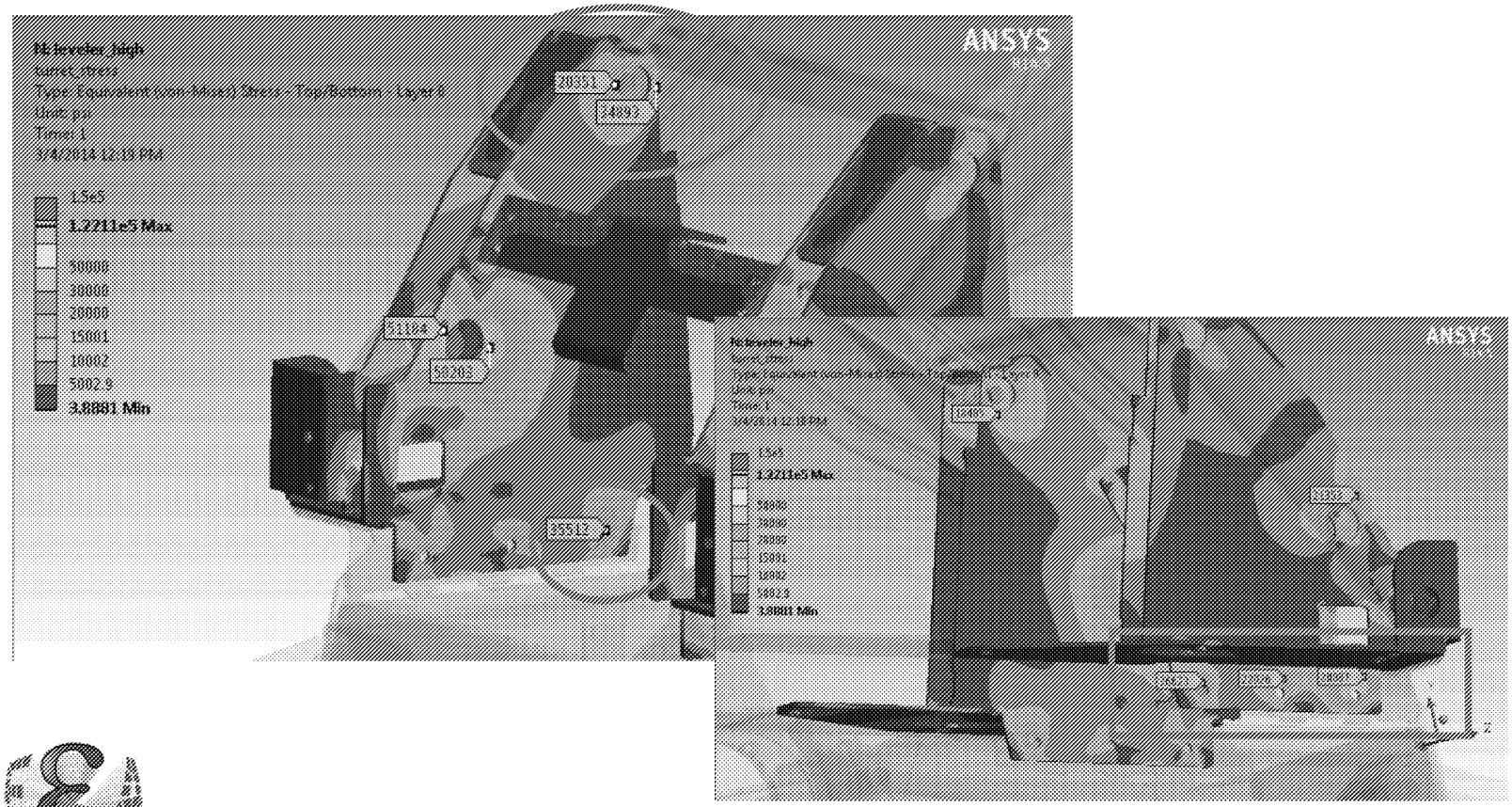


... within Epsilon

Fatigue Criteria (19 ksi?)



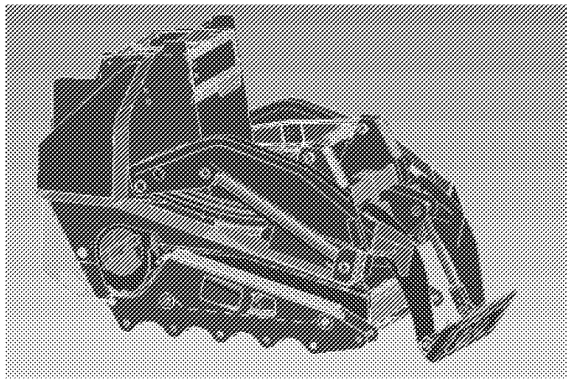
- Leveler (high position) is fatigue critical case
  Load originates 32” below bucket

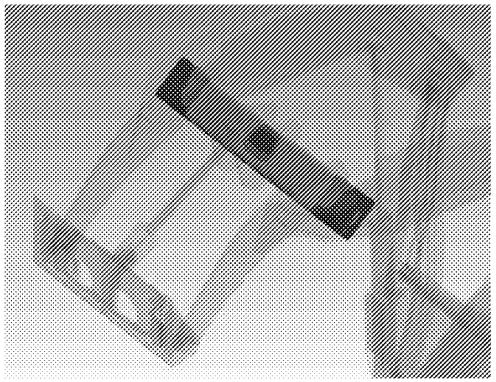


... within Epsilon

Ex. 2002
Page 646 of 915

TMAX Loader
Rectangular Torque Tube
03/03/2014

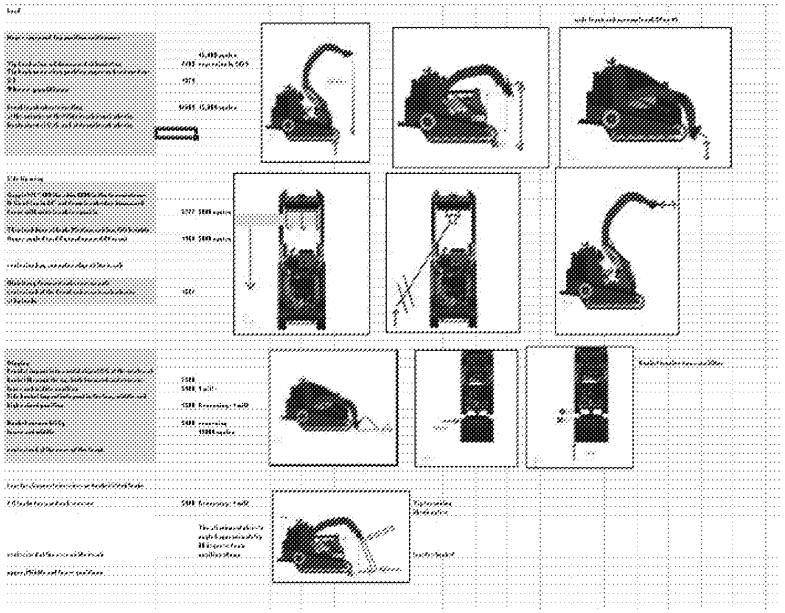


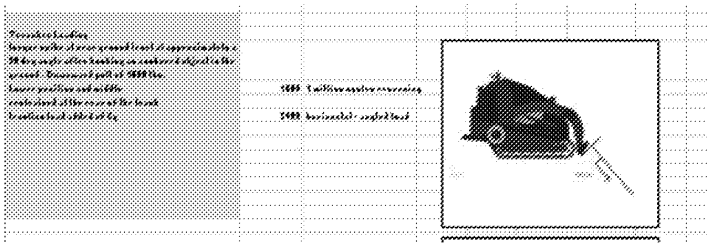


21 Load cases



- Uses defined loads (21 cases)
- High Position - Leveler Load now originates 32” below bucket
  - And 12” forward





... within Epsilon

Ex. 2002
Page 648 of 915

Summary



- See Excel sheets

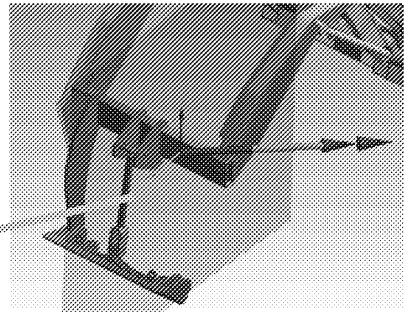
		Case Label	Peak Stress (ksi)	F.S	Axial Force (lbf)	Shear Load (lbf)	Torsional Moment (in-lb) MZ	Long Moment (in-lb) MY	Short Moment (in-lb) MX	FX	FY	FZ	MX	MY	MZ	Sig_MX	Sig_MY	Sig_MZ	Sig_axial	Sig_Shear	Total
Low Cycle																					
Auger Bounce	High	F	48	0.94																	
	Med	U	70	0.64																	
	Low	S	74	0.61	-1,026	16,977	97,810	-80,856	-14,276	-16,783	2,561	-1,026	-14,276	-80,856	97,810	6,904	21,410	19,072	-216	5,224	52,294
Offset Grapple	High	K	75	0.62																	
	Med	H	80	0.56																	
	Low	C	100	0.45	-1,188	9,174	180,000	-20,436	-5,736	-9,867	2,237	-1,188	-5,736	-20,436	180,000	2,606	5,411	39,036	-369	2,823	49,764
Auger kick-out / angle	High	L	11	4.09																	
High Hang Fwd	High	G	8	7.50																	
Side Bucket fill	High	AC	10	3.48																	
	Med	AD	11	4.09																	
	Low	AE	13	4.50																	
Corner Bucket Fill	Med	AB	5	9.00																	
	Low	AG	20	2.25																	
High Cycle Fatigue Cases																					
Leveler	High	X	90	0.19	-1,178	22,582	96,243	-426,000	-13,810	-22280	3427	-1178	-1.30E+04	-1.28E+05	9.62E+04	6,232	33,359	20,903	-362	6,350	67,122
	Med	Y	96	0.20																	
Trencher	Med	X	16	1.08																	
	Low	S	18.6	1.70																	
Digging	Med	V	12	1.42																	
	Low	C	11	1.55																	

... within Epsilon

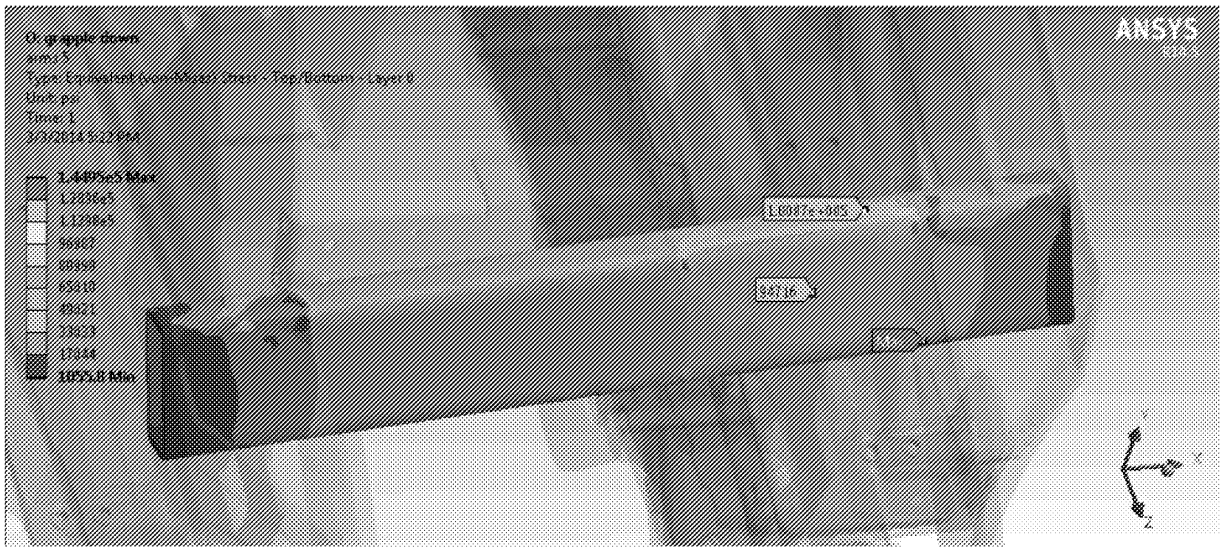
Yield Criteria (45 ksi)



- Offset Grapple, Low is critical case
  - 100 ksi equivalent stress
  - 1.2 kip axial force
  - 9 kip shear force
  - **180,000 in-lb torsional moment (MZ)**
  - 20,000 in-lb long moment (MY)
  - 5,800 in-lb short moment (MX)



Reference axes

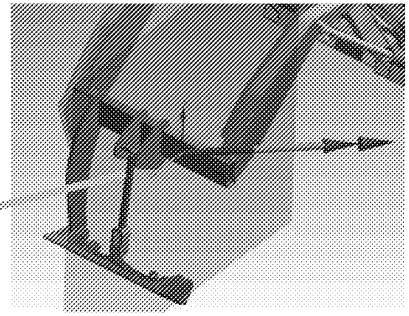


... within Epsilon

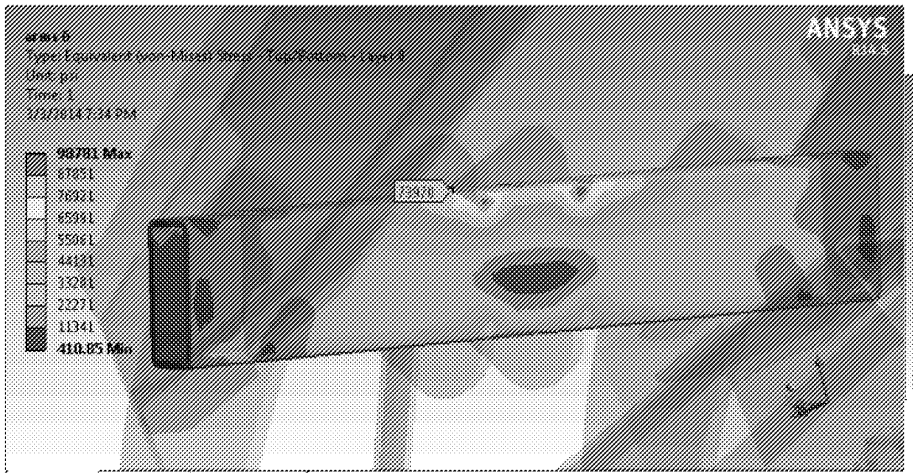
Yield Criteria (45 ksi)

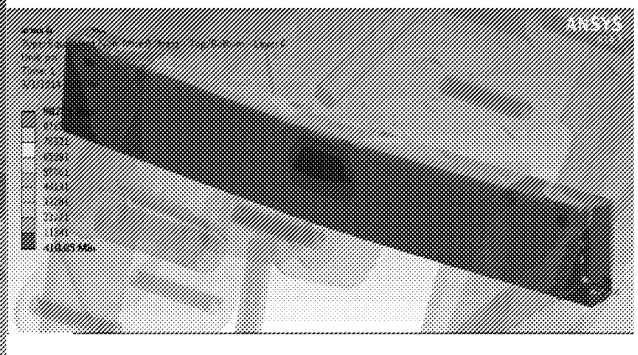


- Auger Bounce, Low is also high-stress case
  - 74 ksi equivalent stress
  - 1 kip axial force
  - 17 kip shear force
  - **87,800 in-lb torsional moment (MZ)**
  - **80,900 in-lb long moment (MY)**
  - 14,300 in-lb short moment (MX)



Reference axes



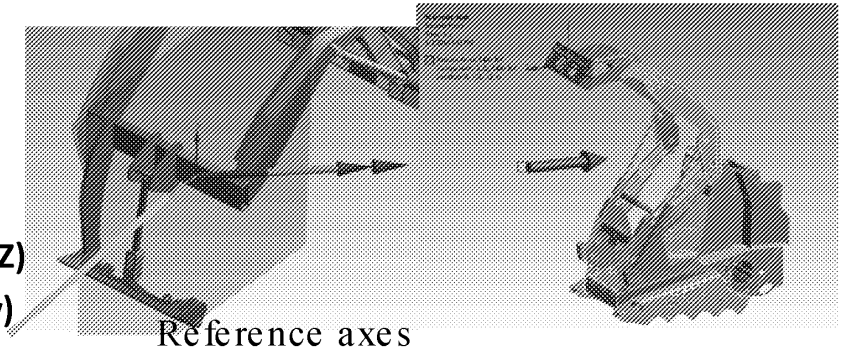


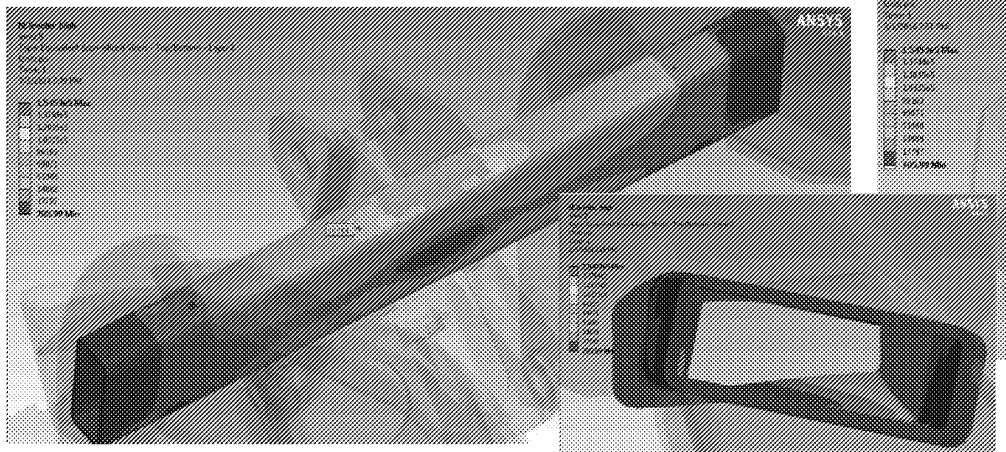
... within Epsilon

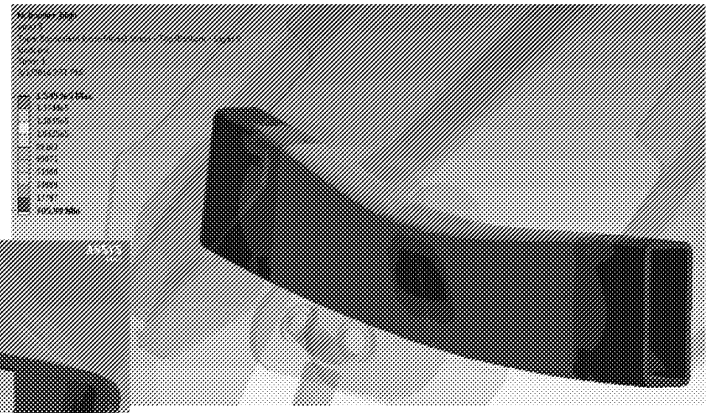
Fatigue Criteria (17 ksi?)



- Leveler, High is critical case
  - 90 ksi equivalent stress
  - 5 kip axial force
  - 24 kip shear force
  - **254,000 in-lb torsional moment (MZ)**
  - **271,000 in-lb bending moment (My)**
  - 22,000 in-lb bending moment (MX)
  - 45 kip bucket piston force

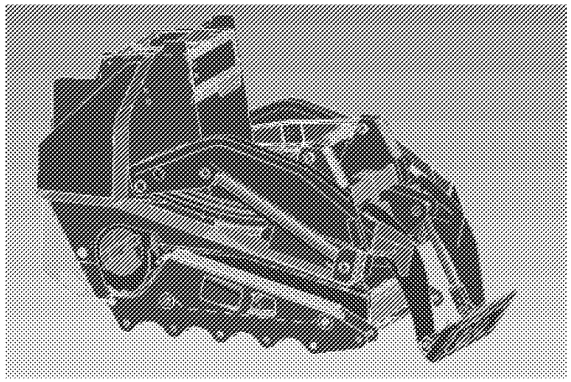


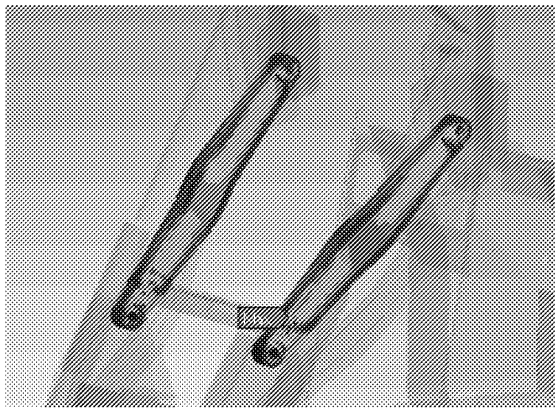




... within Epsilon

TMAX Loader
Upper Arm Stresses
02/27/2014

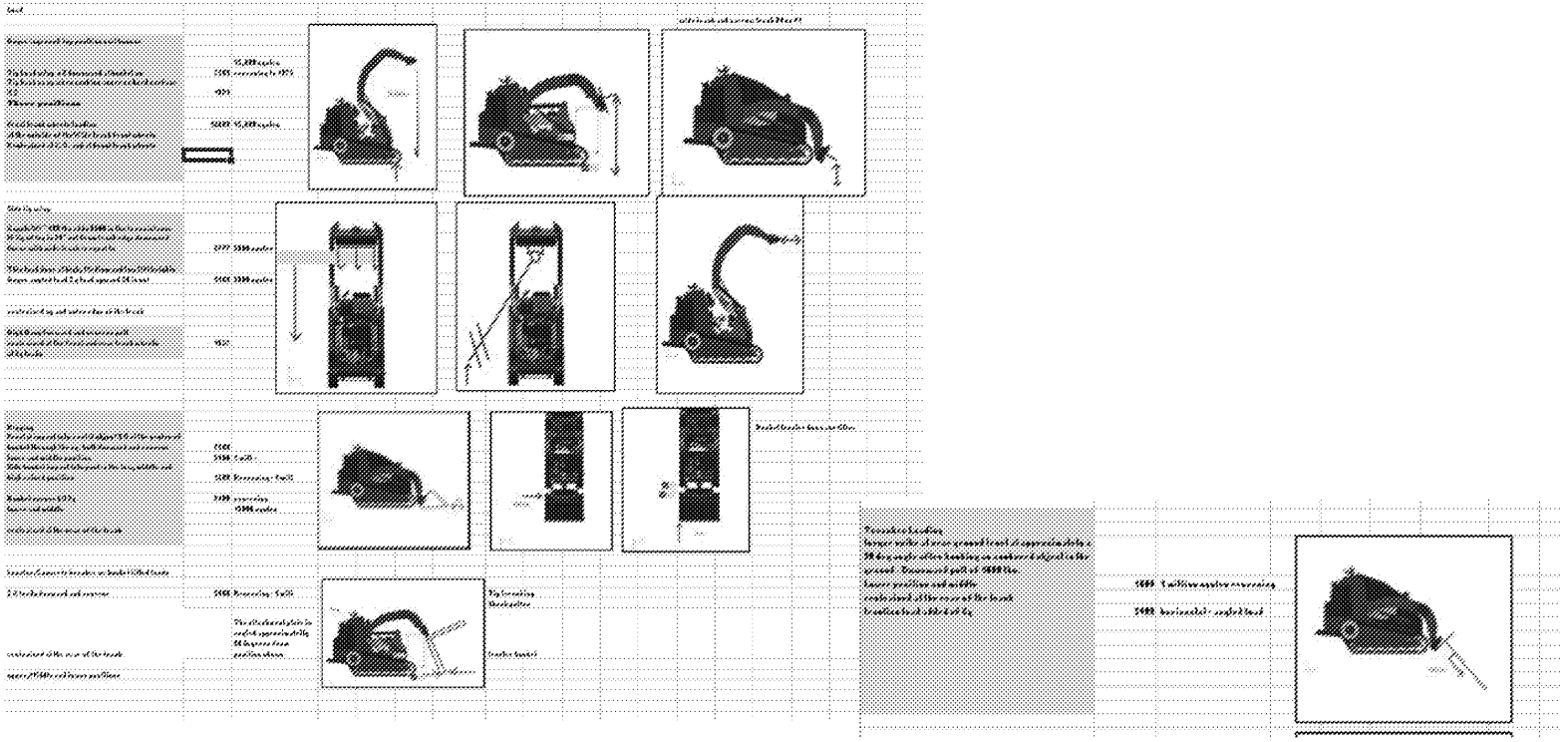




21 Load cases



- Uses defined loads (21 cases)



... within Epsilon

Ex. 2002
Page 654 of 915

Summary



- See Excel sheets

		Case Label	Peak Stress (ksi)	F.S.	Axial Force (lbf)	Shear Load (lbf)	Moment (in-lbf)	Moment (in-lbf)	FX	FY	FZ	FX	FY	FZ	MX	MY	MX	MY	Theta
Low Cycle																			
Auger Bounce	High	F	150	0.30	34,002	4208	1355	-2622	1543	-765	0	-26177	-23425	4208	-233.7	72.2	-755.6	-2868	46.5
	Med	U	68	0.66	-	0	0	0											14.6
	Low	B	65	0.69	16,438	2276	1275	-2370	761	470	0	-17118	2709	2276	130	46	852	-2551	6.9
Offset Grapple	High	K	125	0.36	21,336	3378	3144	951	18872	13904	3376	-2499	1557	0	2142	-1826	712	208	46.5
	Med	H	111	0.41	15,297	-2197	-6346	-379	-18077	-301	-2197	2184	-274	0	-4685	2286	-1552	-1054	14.6
	Low	O	110	0.41	-	0	0	0											6.9
Auger Kick-out / Angle	High	L	60.8	0.76	10,041	-1445	-651	-1002	-8505	-6607	-1445	966	-370	0	-1037	-42	-138	-176	46.5
High Hang Fwd	High	G	53.9	0.84	13,029	-1450	-989	889	-383	255	0	9794	9007	-1450	-22	-14	-17	1343	46.5
Side Bucket Hit	High	AC	111	0.41	13,859	1980	1156	5016	1769	-2182	0	-21683	-8417	1980	489	563	3835	2052	46.5
	Med	AD	82.1	1.40															
	Low	AE	10.8	4.17															
Corner Bucket Hit	Med	AB	93.4	1.35															
	Low	AA	27.6	1.83															6.9
High Cycle Fatigue Cases																			
Leveler	High	N	67.4	0.25	14,474	2432	-1299	-2286	965	-201	0	-21390	-10338	2432	-729	17	-1809	-635	46.5
	Med	Y	26.2	0.65	931	-5800	422	-82	537	37	-5802	-226	877	0	89	128	299	-314	14.6
Trencher	Med	X	2.4	7.08															
	Low	S	3.8	5.67															
Digging	Med	V	14.4	1.18															
	Low	C	29.3	0.58	7,481	921	177	-1782	232	247	0	-7643	1185	921	-5	-147	-23	-1384	6.9

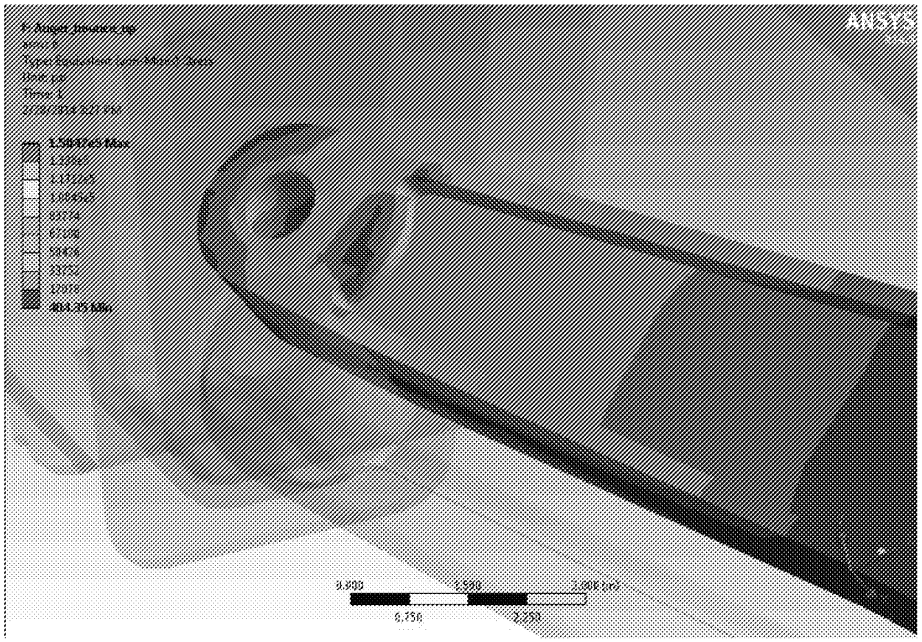
... within Epsilon

Ex. 2002
Page 655 of 915

Yield Criteria (45 ksi)



- Auger Bounce, High is critical case
  - 150 ksi equivalent stress
  - 34 kip axial force
  - 4 kip shear force
- Offset Grapple Middle has highest moment (longitudinal) ,6300 in-lb
- Side Bucket Hit, High gives larges moment (bending), 5000 in-lb

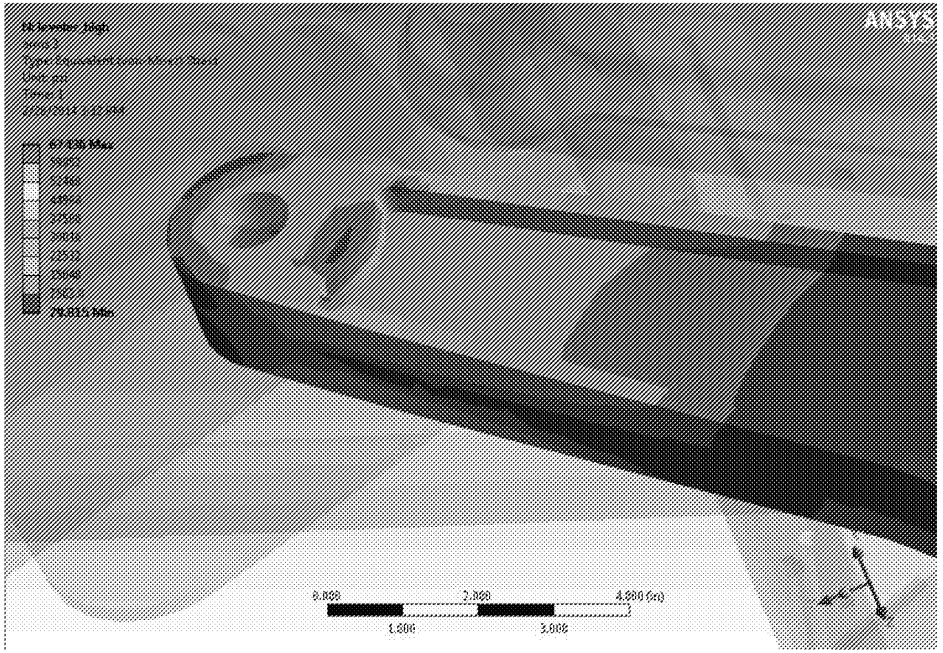


... within Epsilon

Fatigue Criteria (17 ksi?)



- Leveler, High is critical case
  - 67 ksi equivalent stress
  - 14 kip axial force
  - 2.4 kip shear force
  - 1300 in-lb longitudinal moment
  - 2270 in-lb bending moment

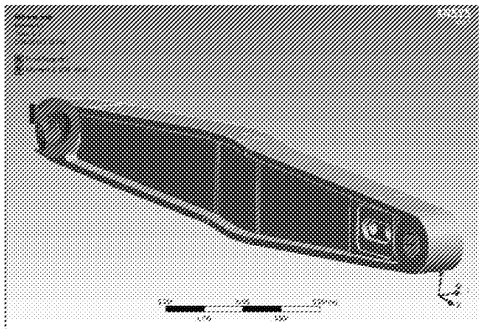


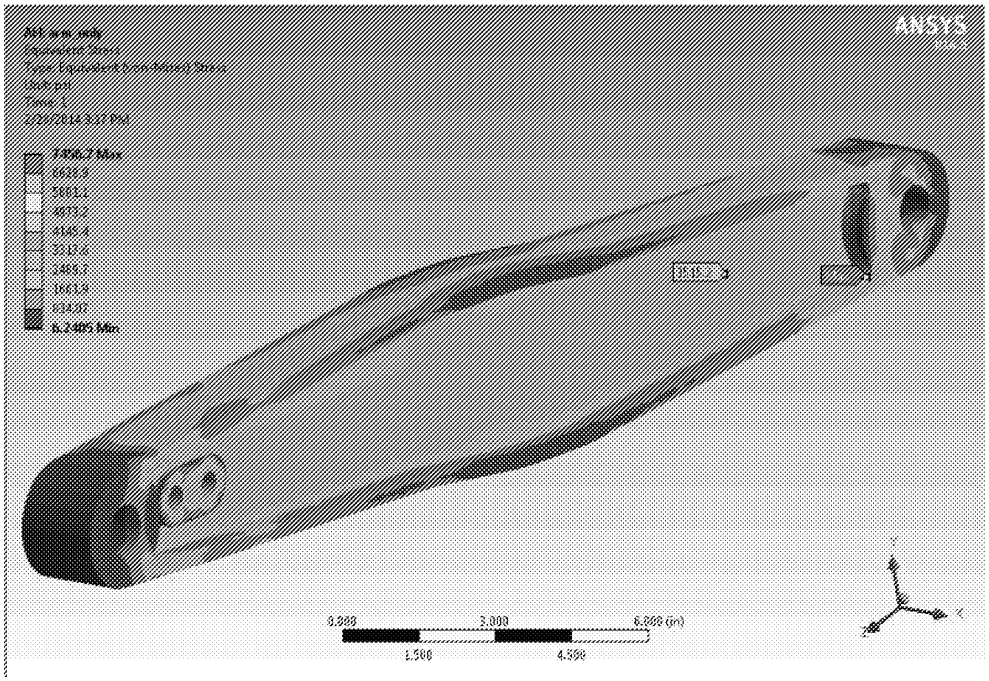
... within Epsilon

Baseline Stresses



- 1000 in-lb longitudinal moment



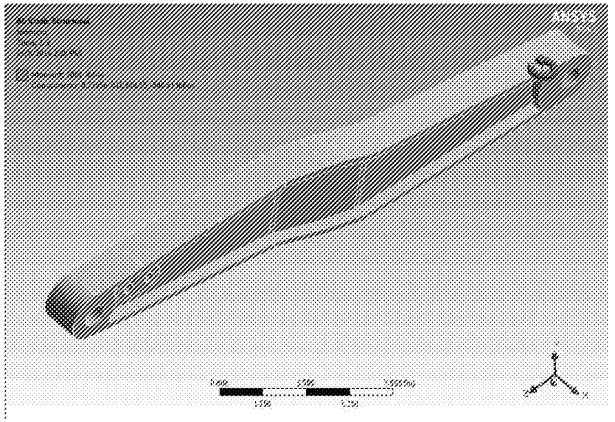


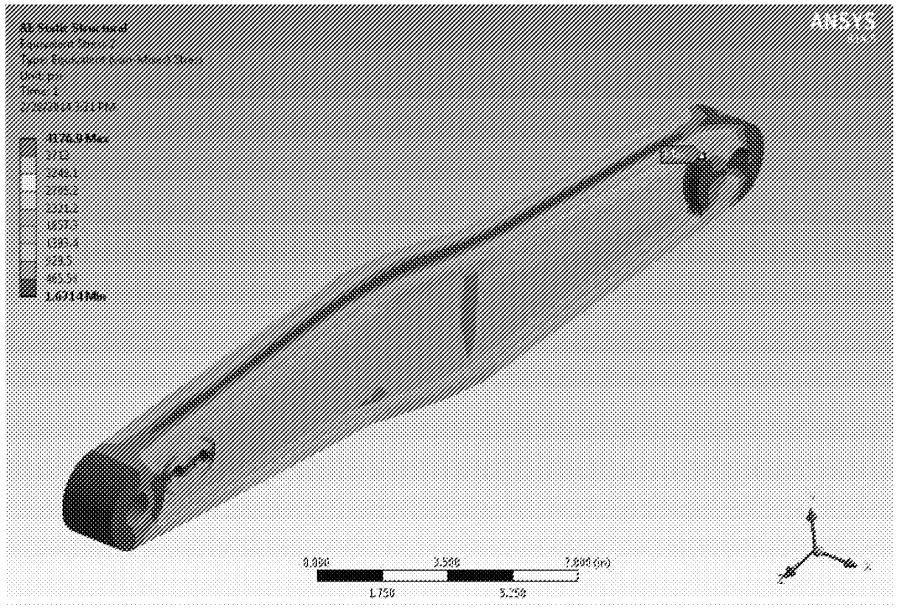
... within Epsilon

Baseline Stresses



- 1000 in-lb bending moment

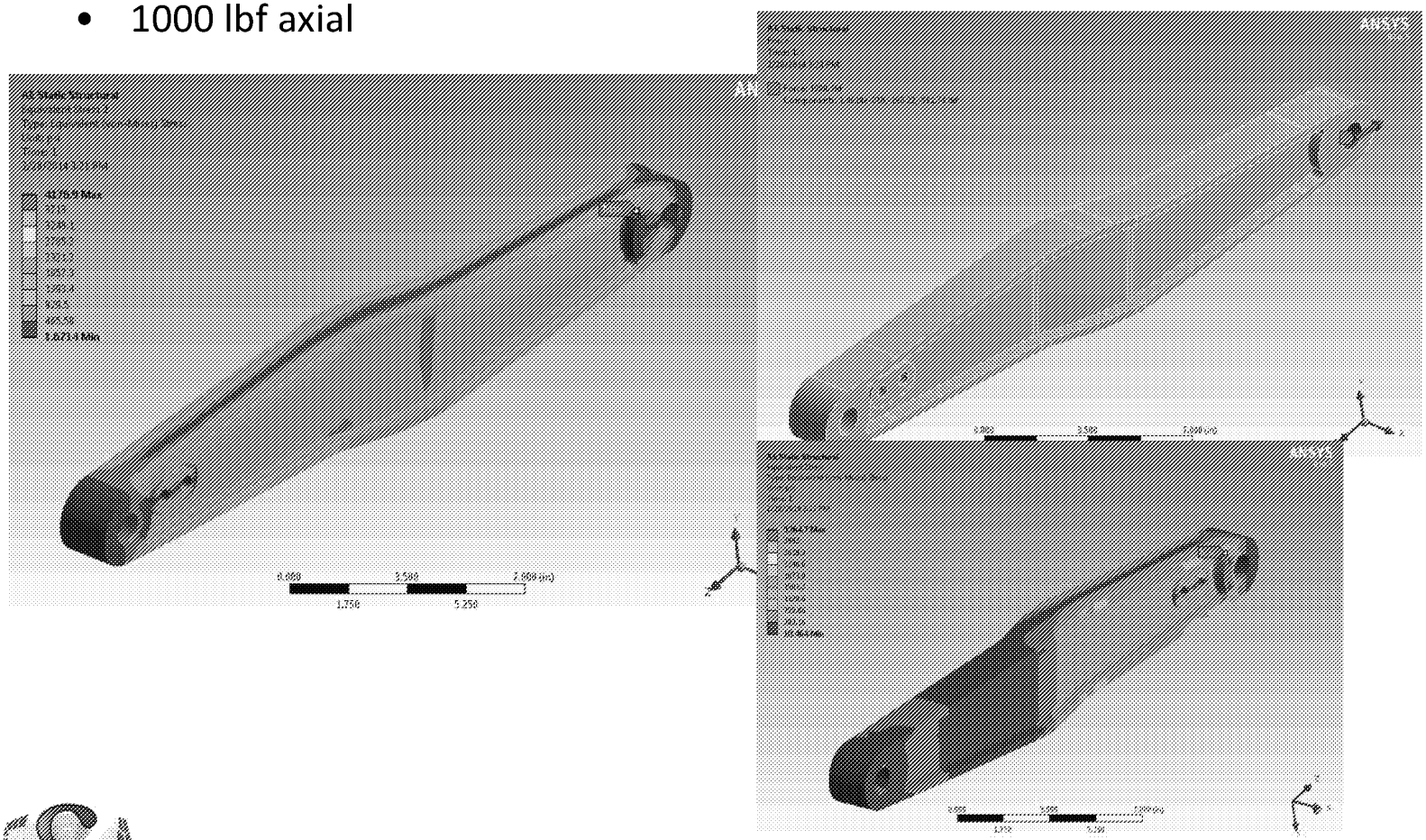




Baseline Stresses



- 1000 lbf axial



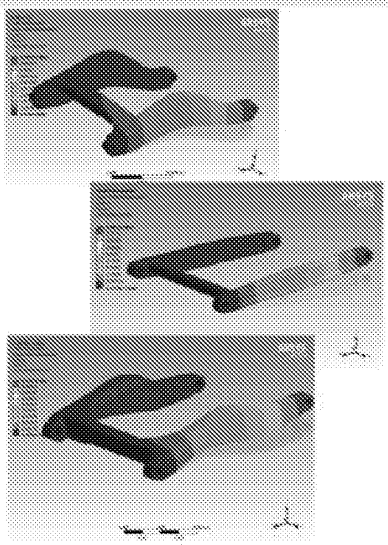
Ex. 2002
Page 660 of 915

W298 TX1000 UPDATE

12/15/14

Loader Arm Testing

- FEA has confirmed the upper link can flex to cause independent movement between the lift cylinders
- A fabricated single piece link was designed to exceed the 2.0 design (since this design does not have a racking problem)
- Proceeding with updating all machines with this design
- FEA on entire loader will be re-run with the new piece to confirm



W298 TX1000 UPDATE

12/15/14

Loader Arm Testing

Configuration	Case 1 Torsional Loading	Case 2 Torsional Loading per ANSI
3.0	0.847	1.355
2.0	0.049	0.051
4.0	0.077	0.089
3.0 Rev 2	0.245	0.248
4.0 Rev 2	0.046	0.048

W298 TX1000 UPDATE

12/15/14

Combined Flow Aux. system

- The lab unit was set up with a combined flow system and run with the auger (found to be acceptable)
- Gear pumps are in to update all 4.0 machines with combined flow pumps
- This also gives us a future "low flow" option feature if we want it by adding a diverter valve to the circuit
- Will still pursue a split flow system as backup, but combined is the "default" design at this point.

W298 TX1000 UPDATE

12/15/14

Engine Heat work

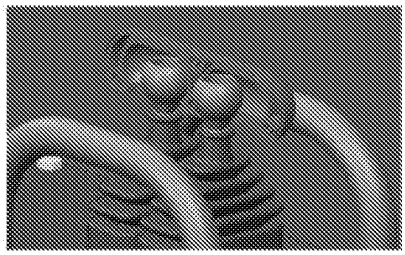
- After modifications to the rear radiator intake; heat runs were able to be completed
  - Water and oil cooling seems adequate but we are not expelling the heat from the machine
  - Need to find exit lanes for the air out the front of the machine (move air cleaner, open up hood louvres)

W298 TX1000 UPDATE

12/15/14

Controls

- Input received from Micron on shaping, fastening, and materials for control parts
  - Outer handle: glass infused nylon
  - Inner ball: delrin
- Longer handle printed to increase available rotation (on the field unit)
- REDACTED



W298 TX1000 UPDATE

12/15/14

Tomah Build / Releases

W298 Timing	1395 Refit Plan	Current / Actual	Notes
Weld tool releases (902)	n/a		
Other long lead releases (902)	n/a		
3.0 updates (rework frame, muffler, and hoses)	11/12/2014	11/20/2014	1st unit up and running. 2nd unit followed a few days later
508 hours completed (902)	n/a	n/a	The 0902 3.0 machine stopped at 334hrs due mainly to poor weather
Weld tool releases (1395)	11/5/2014	11/24/2015	Loader arm was the last major weldment released, still a full 15 wks from plot date. a few minor weldments (platform) are still unreleased as we design around them
Other long lead releases (1395)	12/5/2014	12/1/2014	Engine was released 12/1. Combined flow pump is not released but is already in Caterpillar's system and readily available
4.0 updates / 1395 refit	1/19/2015	1/19/2015	Current start date for the build is 1/12
Final releases	1/27/2015	1/27/2015	
Pilot Build	3/10/2015	3/19/2015	Date officially in the line 15 schedule
Production	4/28/2015	4/22/2015	Date officially in the line 15 schedule
Release to ship	5/5/2015	5/5/2015	
508 hours completed 1395	8/8/2015	8/8/2015	
1000 hours on engine	10/27/2015	10/27/2015	

W298 TX1000 UPDATE

12/15/14

Tomah Build / Releases

- 4.0 build
  - Releasing the last of the steel parts for the 4.0
  - Will begin some teardown work on the 3.0's this week (loader test unit, field unit?)
  - Most weldment parts are due in prior to Christmas, will depend on Woody's availability
  - Will need to tool handle parts from a rapid prototype vendor
  - Gabe will likely weld all of the new upper links for 4.0 updates

- Production
  - Stock Kubota engines will need to continue to be used until we finish Kubota's application approval, possibly up to and including first production
    - Stock engines already ordered for pilot
    - Will possibly run through a Kubota dealer to rework to our spec

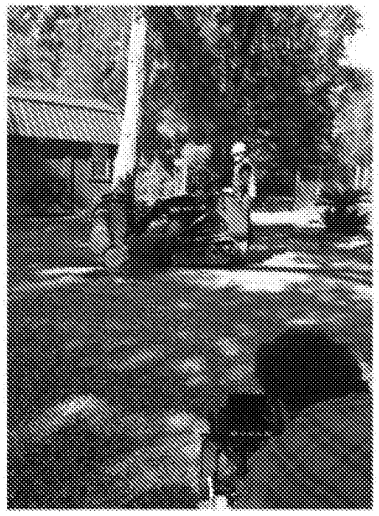

REDACTED

W298 TX1000 UPDATE

12/15/14

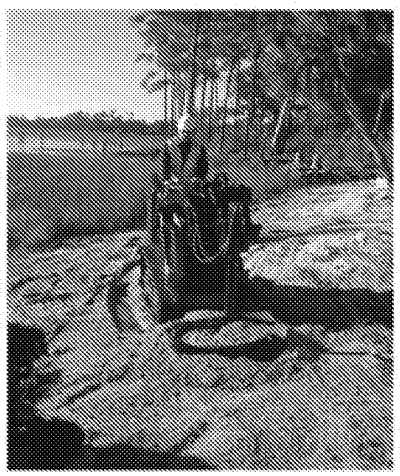
Photo/video shoot - Pensacola, FL





W298 TX1000 UPDATE

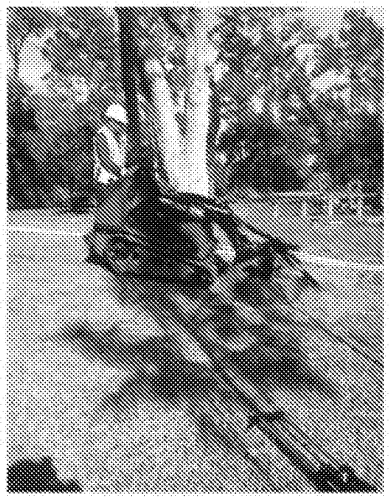
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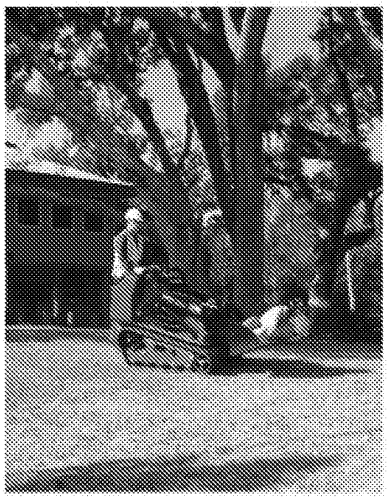




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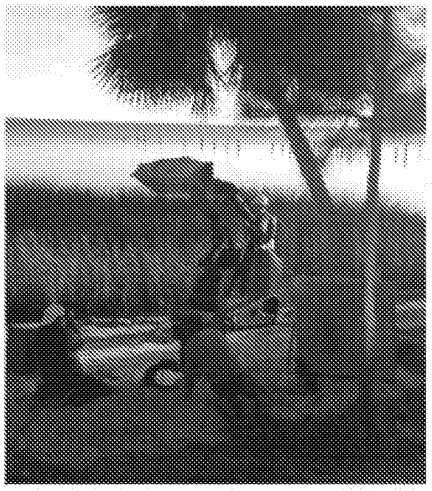
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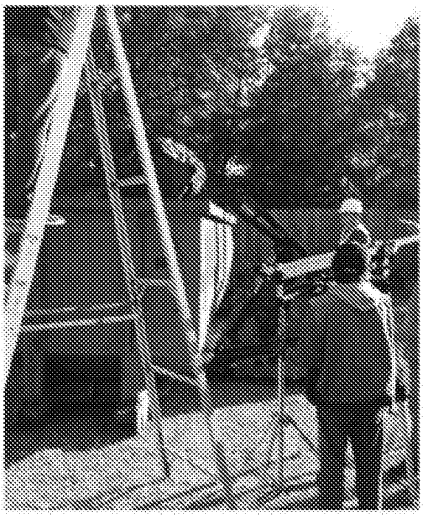
12/15/14

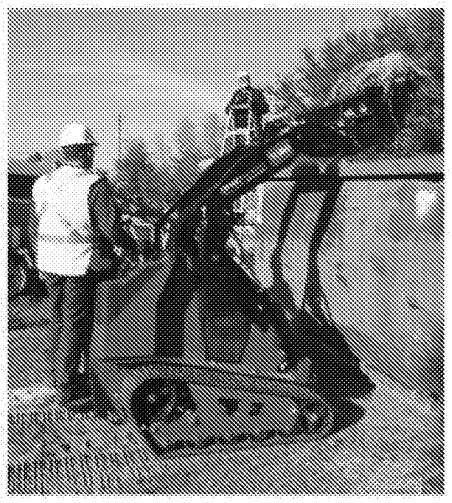




W298 TX1000 UPDATE

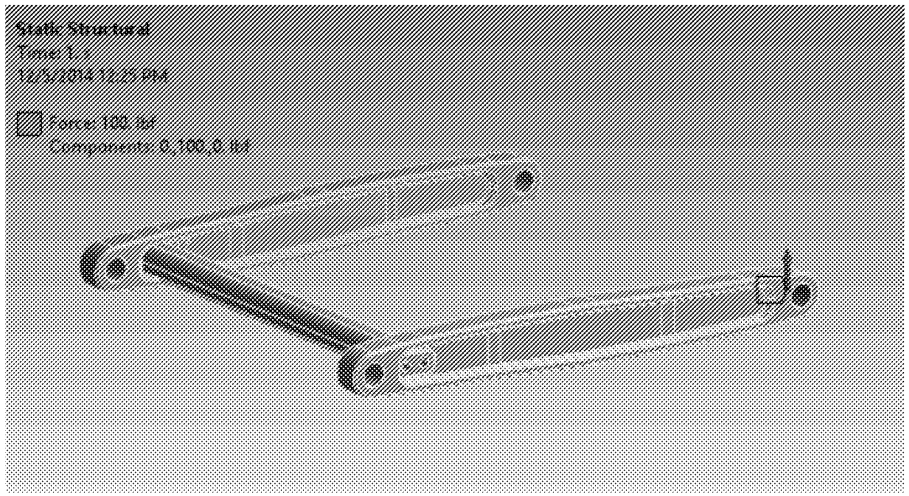
12/15/14



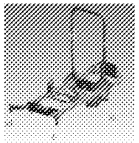


TX1000
Torque Tube

12/11/2014



Model



- Used geometry from upper_links_fea.asm.1
  - Last geometry, 4.0 Rev 2, will be updated

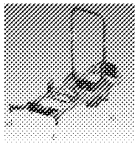
WINDCHILL/SWS/W298/UPPER_LINKS_FEA.ASM

3.0	2	130-5165OLD2	LINK-UPPER
	1	130-5192	SUPPORT-CROSS OVER (MACHI
2.0	1	125-3710	LINKS/CROSSOVER ASM (WELD
4.0	2	130-5165	LINK-UPPER (MACH)
	1	130-1132	SUPPORT-CROSSOVER, MACHIN
3.0 REV 2	2	130-5262	LOADER ARM LINK ASM (WELD
	1	130-5269	CROSSOVER ASM (WELDED)
4.0 REV 2	1	117-1874	UPPER LINK ASM, WELDED (FUTURE)

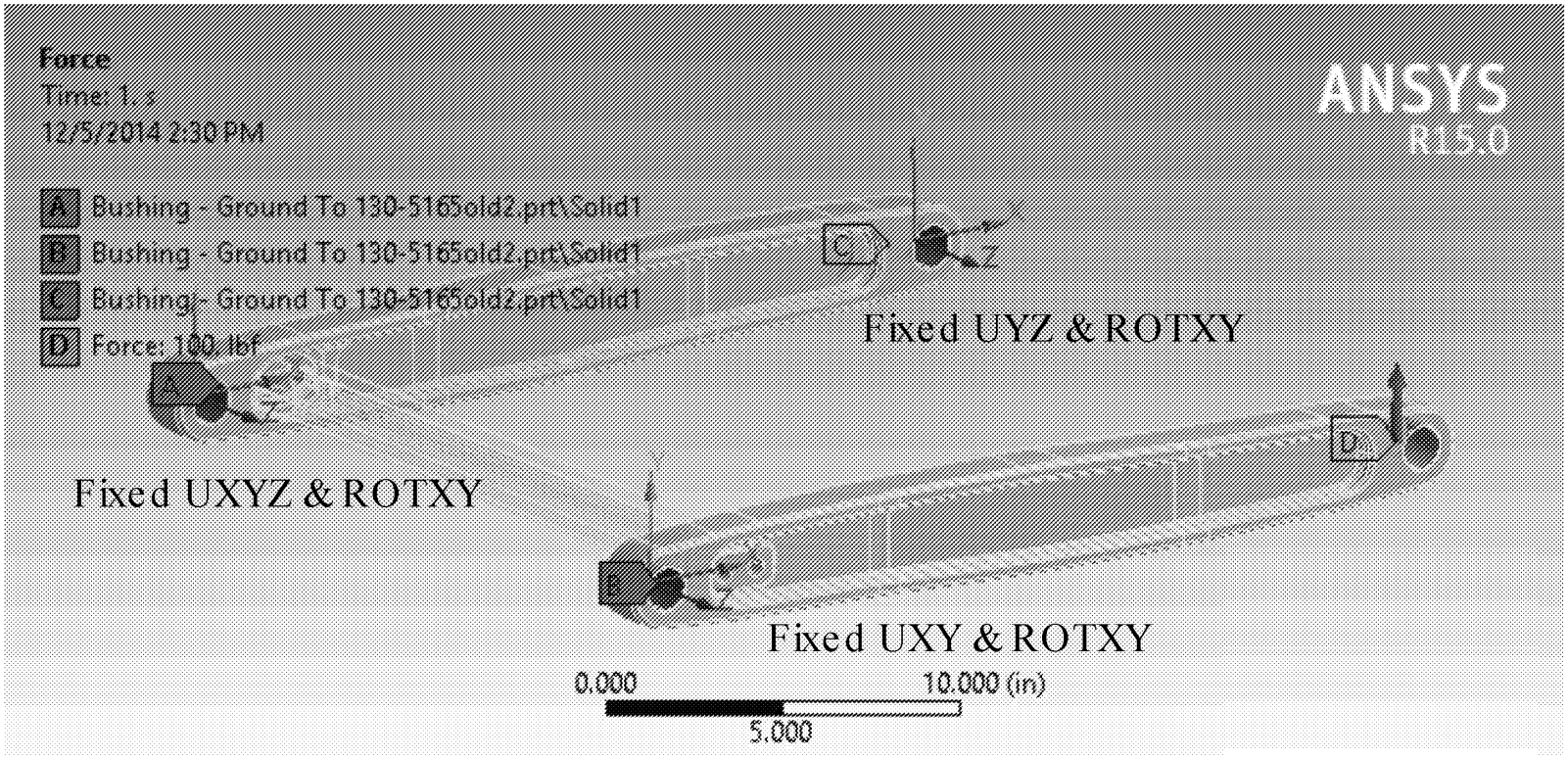
Received 12/10/2014

Ex. 2002
Page 675 of 915

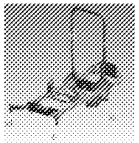
Torsional Loading



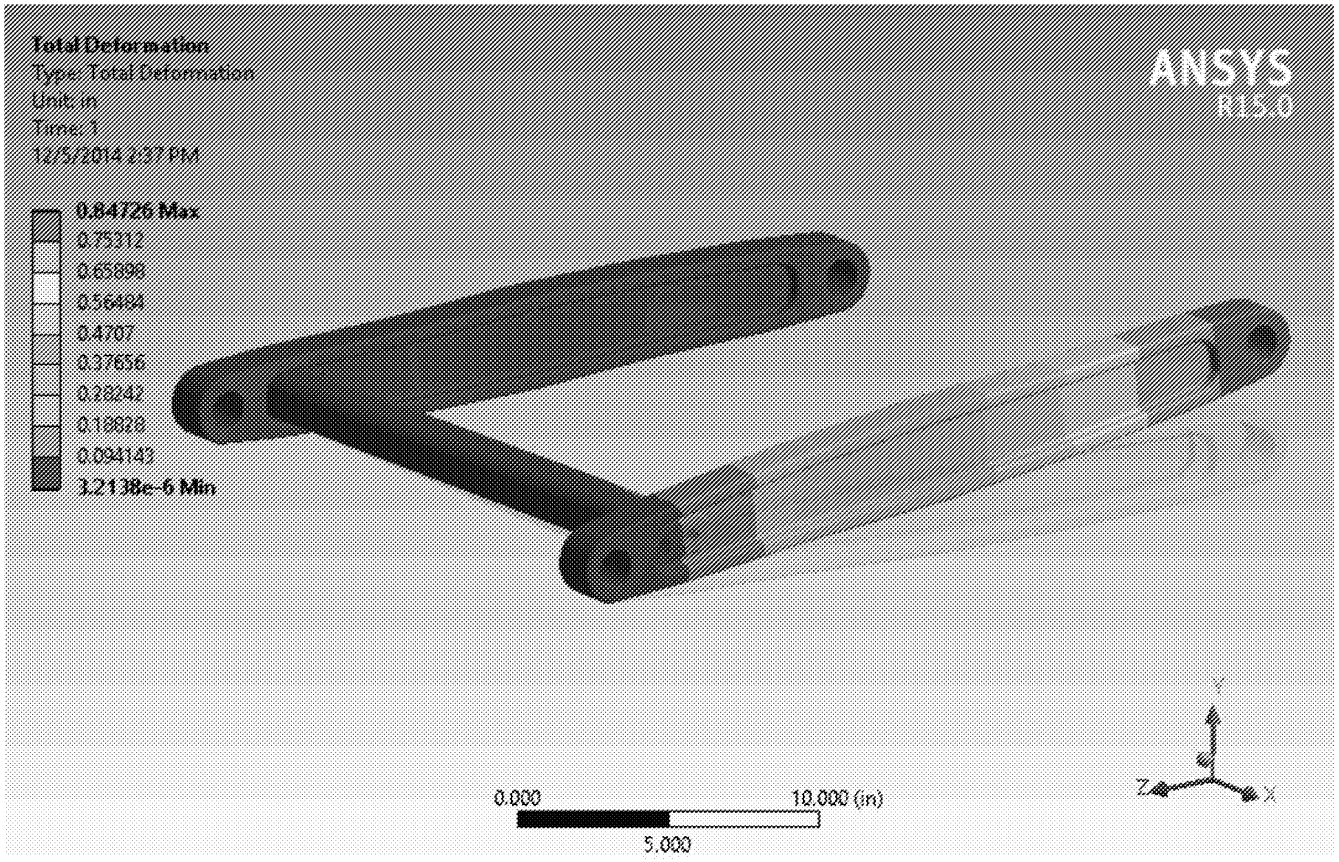
- 100 lb vertical force



Configuration 3.0

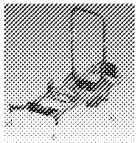


- Deflection (in)

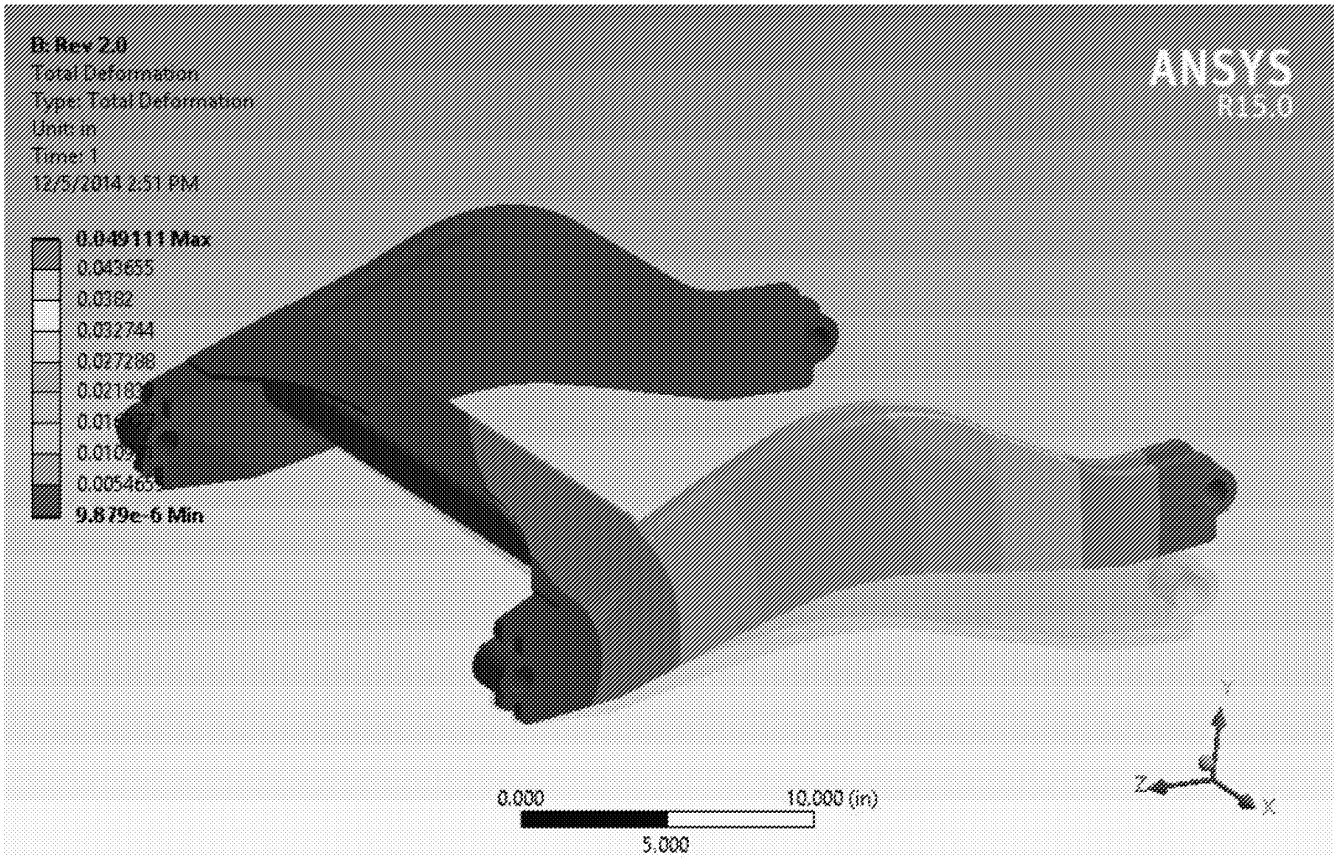


Ex. 2002
Page 677 of 915

Configuration 2.0

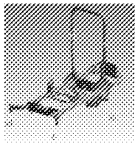


- Deflection (in)

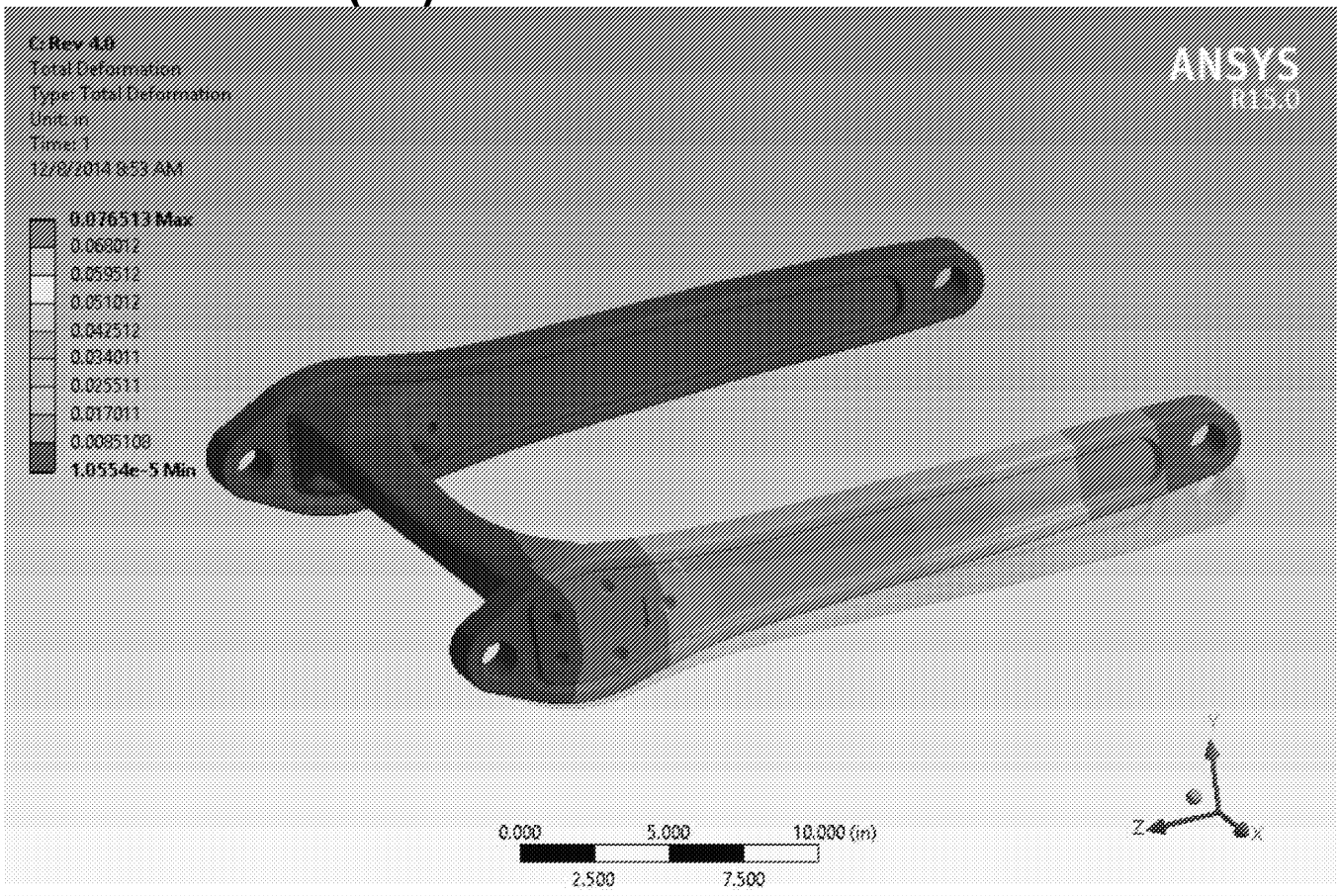


Ex. 2002
Page 678 of 915

Configuration 4.0

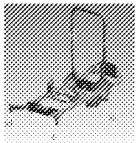


- Deflection (in)

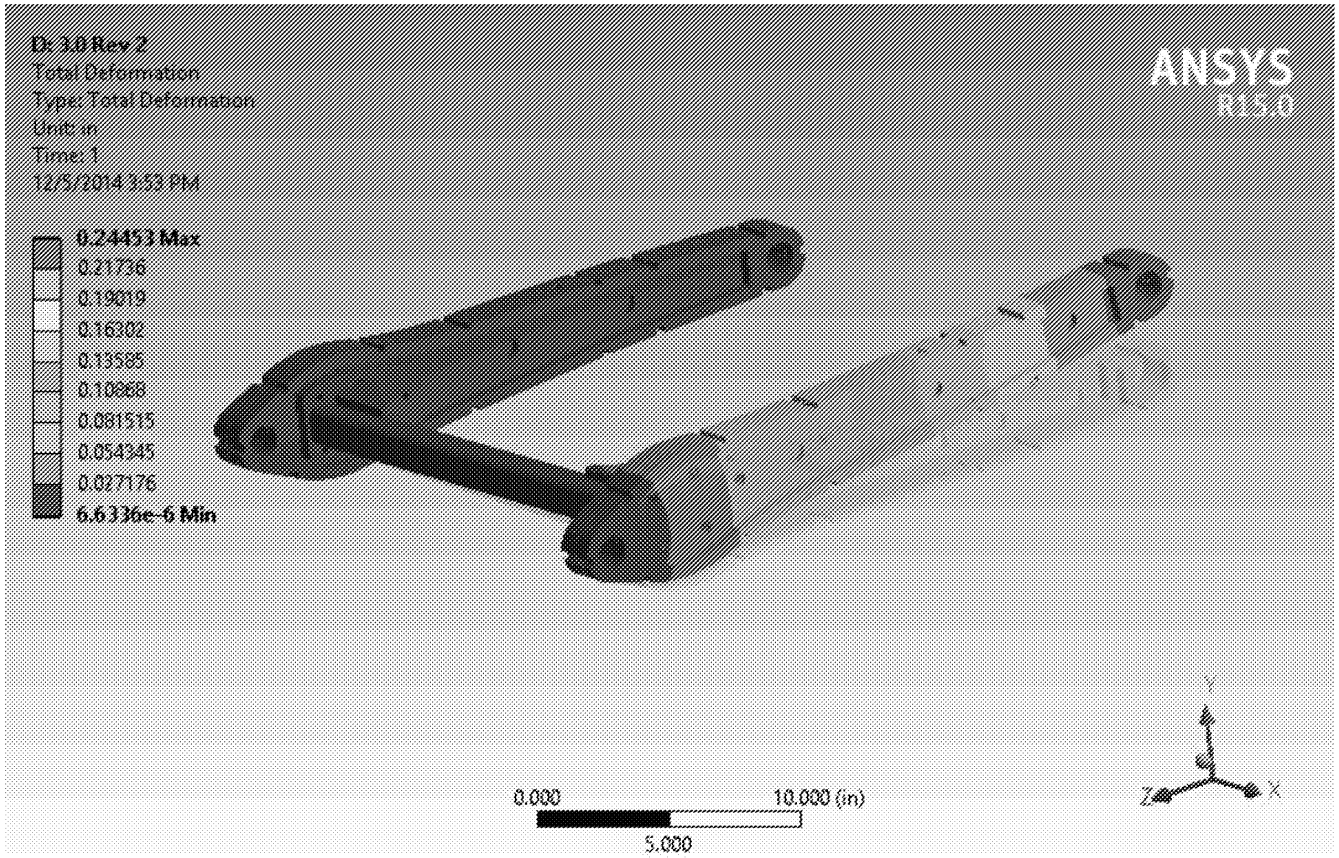


Ex. 2002
Page 679 of 915

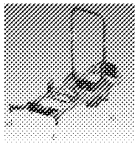
Configuration 3.0 Rev. 2



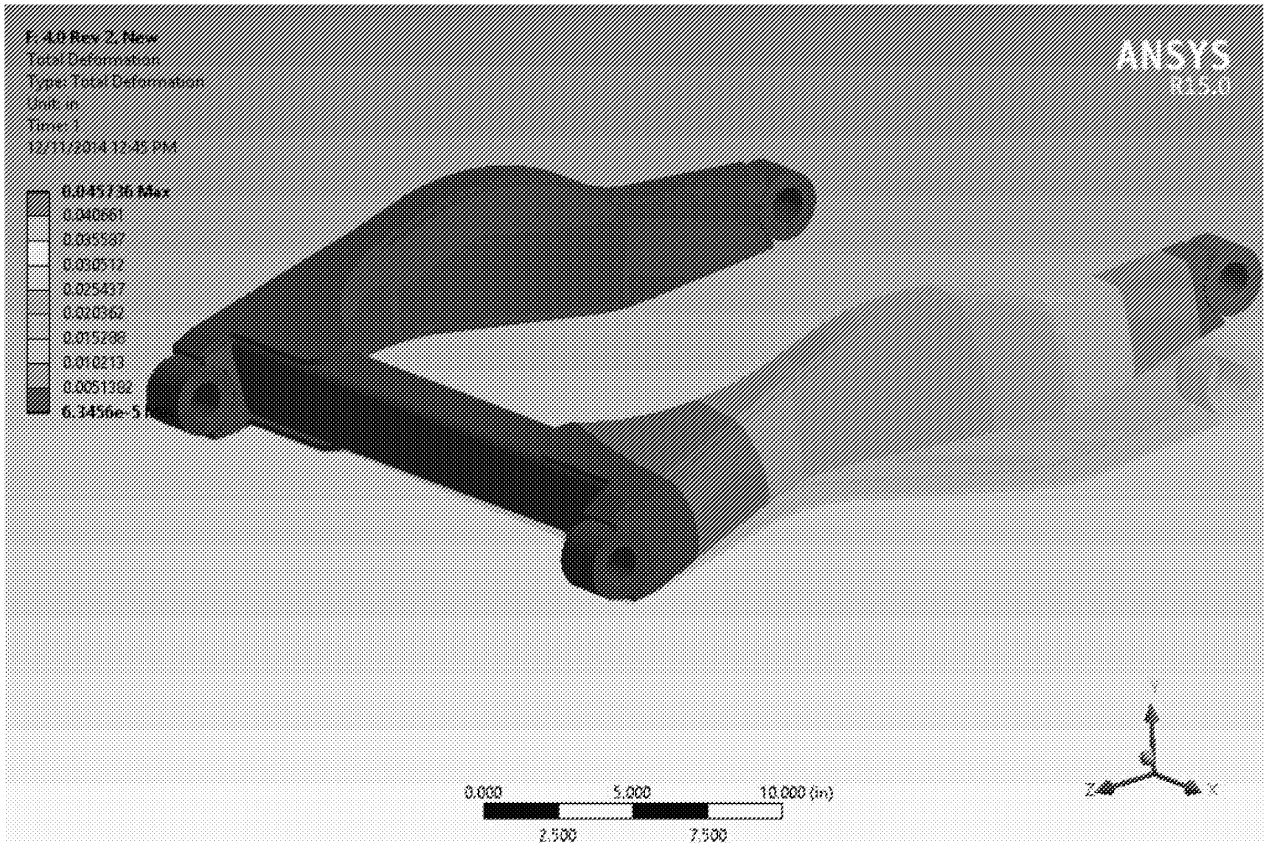
- Deflection (in)



Configuration 4.0 Rev. 2

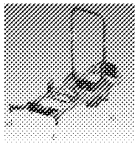


- Geometry received 12.11.2014
- Deflection (in)

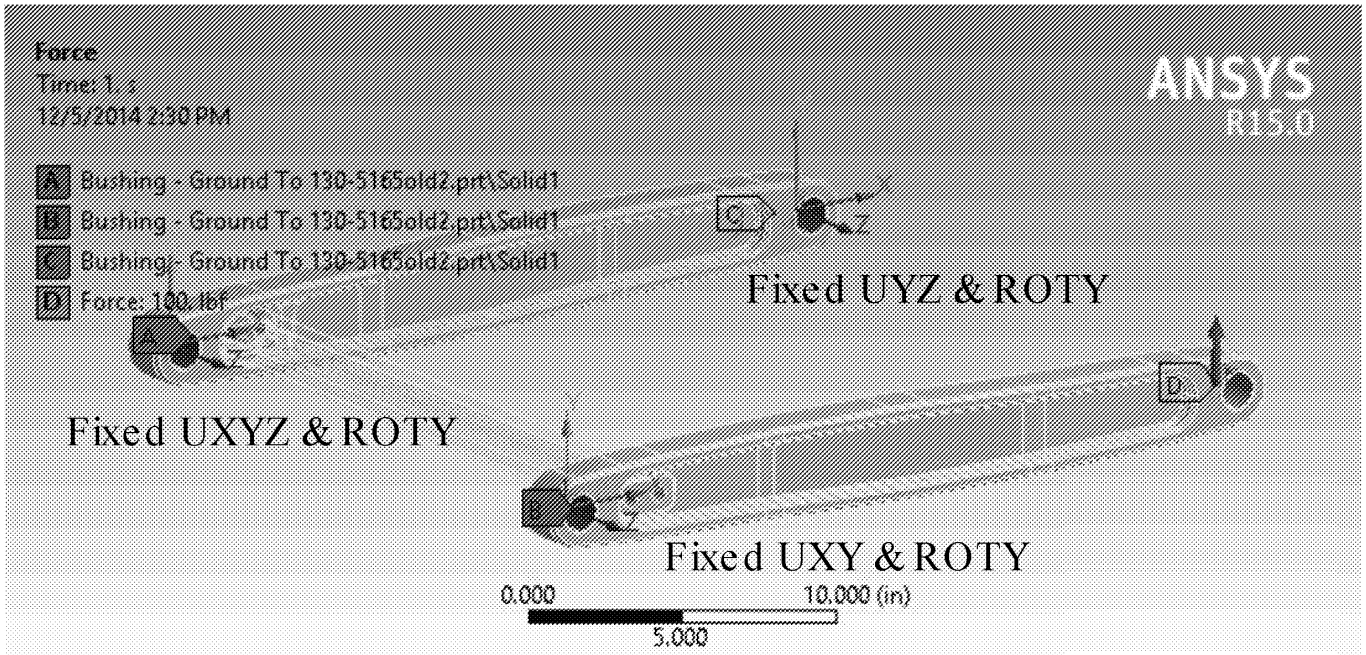


Ex. 2002
Page 681 of 915

2nd Case, Torsional Loading

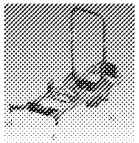


- Case with released ROTX (3 plcs.)
  - No pics included, but added to table of slide 10
  - 100 lb vertical force



Ex. 2002
Page 682 of 915

Summary



- Deflection (in)

Configuration	Case 1 Torsional Loading	Case 2 Torsional Loading (no ROTX)
3.0	0.847	1.355
2.0	0.049	0.051
4.0	0.077	0.089
3.0 Rev 2	0.245	0.248
4.0 Rev2	0.046	0.048

Ex. 2002
Page 683 of 915

2.0 Feasibility Entrance Gate Decision and Feedback

2.0 Feasibility Entrance Gate Approval Requirements

Use the calculation and matrix below to determine approval requirements.

Corporate Project Spending Approval Requirements (in Thousands)	
Project spend to date (including tooling) (in Thousands)	**$2**
Spend projected **to *complete the Feasibility Phase*** (including tooling) (in Thousands)	**$495**
(use this Total to determine approval level) (in Thousands) **Total**	**$497**

Corporate Project Approval Matrix: Total		
All Amounts	**Total ≥ $250k**	**Total ≥ $500k**
Division Managing Director/GM	Division Managing Director/GM	Division Managing Director/GM
	Group Vice President	Group Vice President
		Managing Director, Corporate Controller
		Vice President of Finance/CFO
		Chairman & Chief Executive Officer

2.0 Feasibility Entrance Gate Decision and Feedback

Decision Makers	Name	Ok As-Is	OK w/Changes Noted	STOP	Rework & Return	Signature	Date
Vice President, RLC	Michael Happe						
GM Siteworks Systems	Rick Rodier						
Division Controller	Brad Mlynar						
International Controller	Mike Hall						
Marketing Manager	Neil Borenstein						
Engineering Director	Joe Hager						
Manufacturing Director	Cabrini Brandl						
National Sales Manager	Butch Greeninger						
Customer Care / Service Director	Jack Hensley						
Engineering Tech Svcs Director	Greg Tonsager						
Marketing Director, International	Mike Brugh						

2.0 Feasibility Entrance Gate Decision and Feedback

Project Team			
Marketing Leader	Sean O'Halloran	**Quality Engineer**	Tony Niemczyk
Engineering Leader	John Azure	**NPD Sourcing Specialist**	Randy Huerkamp
Manufacturing	Doug Arch	**Customer Care**	Kevin Conney
Advanced Manufacturing Engineer	Andrew Berglund	**Test**	Dave Murray
Financial Analyst	Justin Huth		

TORO-0000764

Ex. 2002
Page 686 of 915

2.0 Feasibility Entrance Gate Decision and Feedback

Feedback

- [redacted]



Business and Project Strategy

Explain how this new product aligns with the business strategy and product category strategy. Describe how the market strategy will optimize the sales of this new product.

- Tracked Dingo units have been losing market share in the tracked utility loader segment. The Next Generation Dingo will create momentum for the product line and allow Toro re-gain significant market share.
- It is important to do the project now so that market share loss can be stopped and Toro can quickly gain share.
- The Next Generation Dingo project will improve upon a number of unit features so that Toro can meet, and exceed, competitors' specifications and become the #1 Compact Utility Loader of choice for contractors.

TORO-0000766

Ex. 2002
Page 688 of 915

Project Objective

Define the specific objective of the project. Describe the purpose of the project and identify the measures and timing of project success. Include a description any constraints or nonnegotiable parameters set for this project or product that must be achieve.

- Increase Toro market share in the compact utility loader category with the introduction of the Next Generation Dingo.
- Leverage the success and innovation of the Toro Tracked Dingo units and carryover the line's reputation for performance and durability to the Next Generation Dingo.

Plan for obtaining the Voice of the Customer

Explain in detail how you will collect the voice of the customer data for this product and market. Include the definition of the target customer, what is now known, what is unknown, which customers you will contact, how the customers will be chosen, how the customer information will be recorded, and the timing for the research.

- VOC activities planned during Feasibility Phase
  - Interview current loyal Tracked Dingo users in all regions and continue to gather feedback on current models
  - Gather additional contractor feedback on the newest/largest Vermeer and Ditch Witch models (in addition to other competitors)
  - Gather specific feedback on the Next Gen prototype units that will be built during the Feasibility Phase
    - 1 national account customer
    - 2 current customer accounts
      - Bobcat Enterprises of Cincinnati, OH
      - 1 additional account in the mid-Atlantic region
    - Feedback from select contractors in Mpls/St. Paul area
    - (Prototype build currently scheduled to be complete 7/29/13)

TORO-0000768

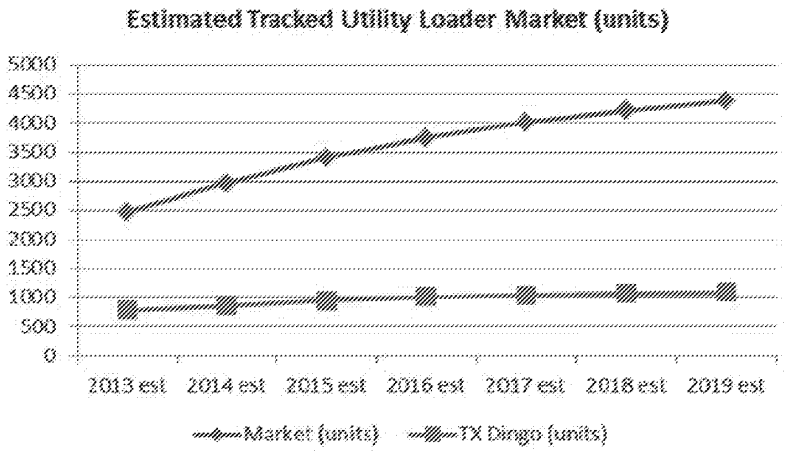
Ex. 2002
Page 690 of 915

Market Estimate

Estimate the total global market size, the segments and trends. Describe growth potential and significant factors influencing the market.

- AEM provides unit data for the number of Tracked Utility Loaders sold
  - 2006 was the peak year with REDACTED units sold (U.S.)
  - 2010 experienced the lowest number of units sold with REDACTED units (U.S.)
- Category growth will continue to outpace modest Tracked Dingo product line growth without the Next Generation Dingo

REDACTED



2.0 Feasibility Entrance Gate

W298: Next Gen TX

Details, 1 pgs

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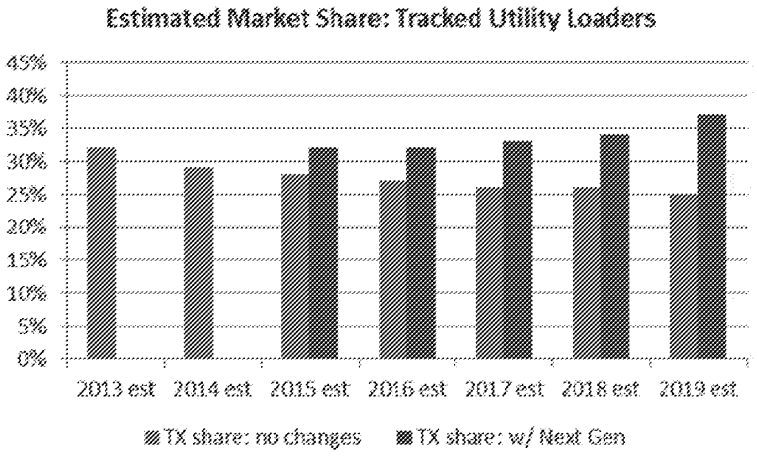
*Highlighting Added = CONFIDENTIAL ATTORNEYS' EYES ONLY

Market Estimate

Estimate the total global market size, the segments and trends. Describe growth potential and significant factors influencing the market.

- U.S. market share for Tracked Dingo units has dropped significantly since pre-2008 levels
- With availability in 2015, the Next Generation Dingo will result in increased market share and growth for the product line

REDACTED



Competitive Products and Services

vey the competitors and list the strengths and weaknesses of companies/brands and models that would pete with our current product and the new product. Consider services a customer may also choose as a chasing alternative.

- Ditch Witch and Vermeer are Toro's two largest competitors in this segment. Toro continues to lose sales to these competitors because they have specifications that the tracked Toro Dingo units cannot currently match. These key specifications are:
  - Hinge Pin Height, Dump Height, and Tipping Capacity
  - (see slide on next page for a listing of specifications)

Competitive Products and Services

vey the competitors and list the strengths and weaknesses of companies/brands and models that would pete with our current product and the new product. Consider services a customer may also choose as a chasing alternative.

- Lost market share is a direct result of the Tracked Dingo units being insufficient in 3 major specifications:
  - Hinge Pin Height, Dump Height, and Tipping Capacity
- The main competitors' largest units can lift more weight, lift more weight to a much greater height, and dump more weight at a much greater height

	Toro				Ditch Witch		Vermeer			
Specs	TX 427	TX 427 Wide Track	TX 525 Diesel	TX 525, Diesel Wide Track	DitchWitch SK750 (Diesel)	DitchWitch SK755 (Diesel)	Vermeer S450TX - Gas	Vermeer S450TX - Diesel	Vermeer S650TX - Diesel only	Vermeer S800TX - Diesel only
Unit weight without bucket (lbs)	1882	2075	1904	2001	2990	2890	2120	2300	2560	2950
Hinge pin height, max (inches)	65.8	65.8	65.8	65.8	81	81	72	72	80	84.6
Dump height, max - std. bucket (inches)	46.1	46.1	46.1	46.1	64	64				
Reach	21.8	21.8	21.8	21.8	17	17				
Tipping capacity (lbs)	1530	1530	1580	1580	2285	2285	1430	1430	1890	2400
Rated operating capacity - 35% of tipping capacity (lbs)	535	535	553	553	800	800	500	500	660	840
Engine Horsepower	27	27	25	25	24.8	32.8	27	24.8	24.8	35.1

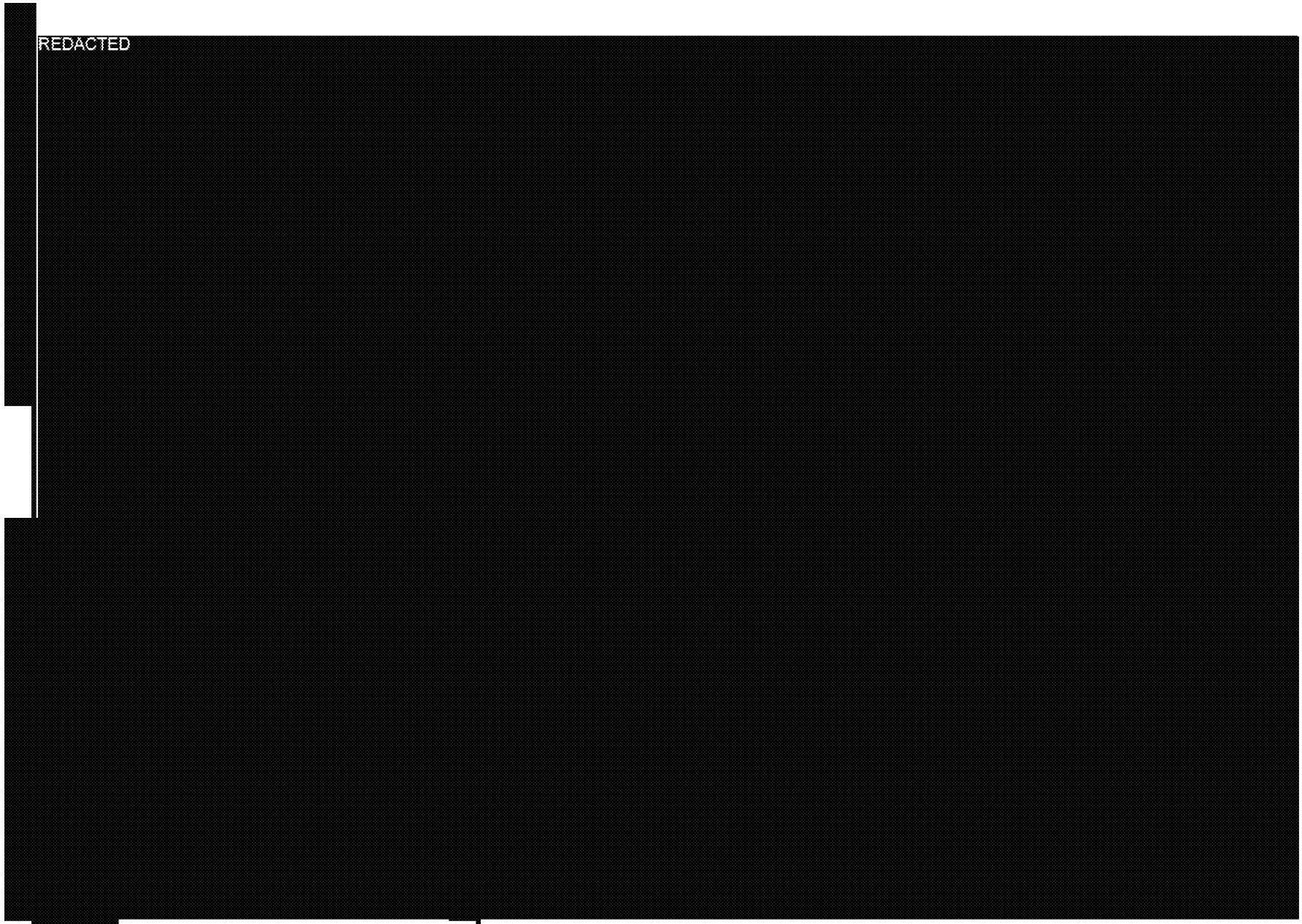
*Note that Vermeer does not currently list their dump height and reach information

Competitive Products and Services

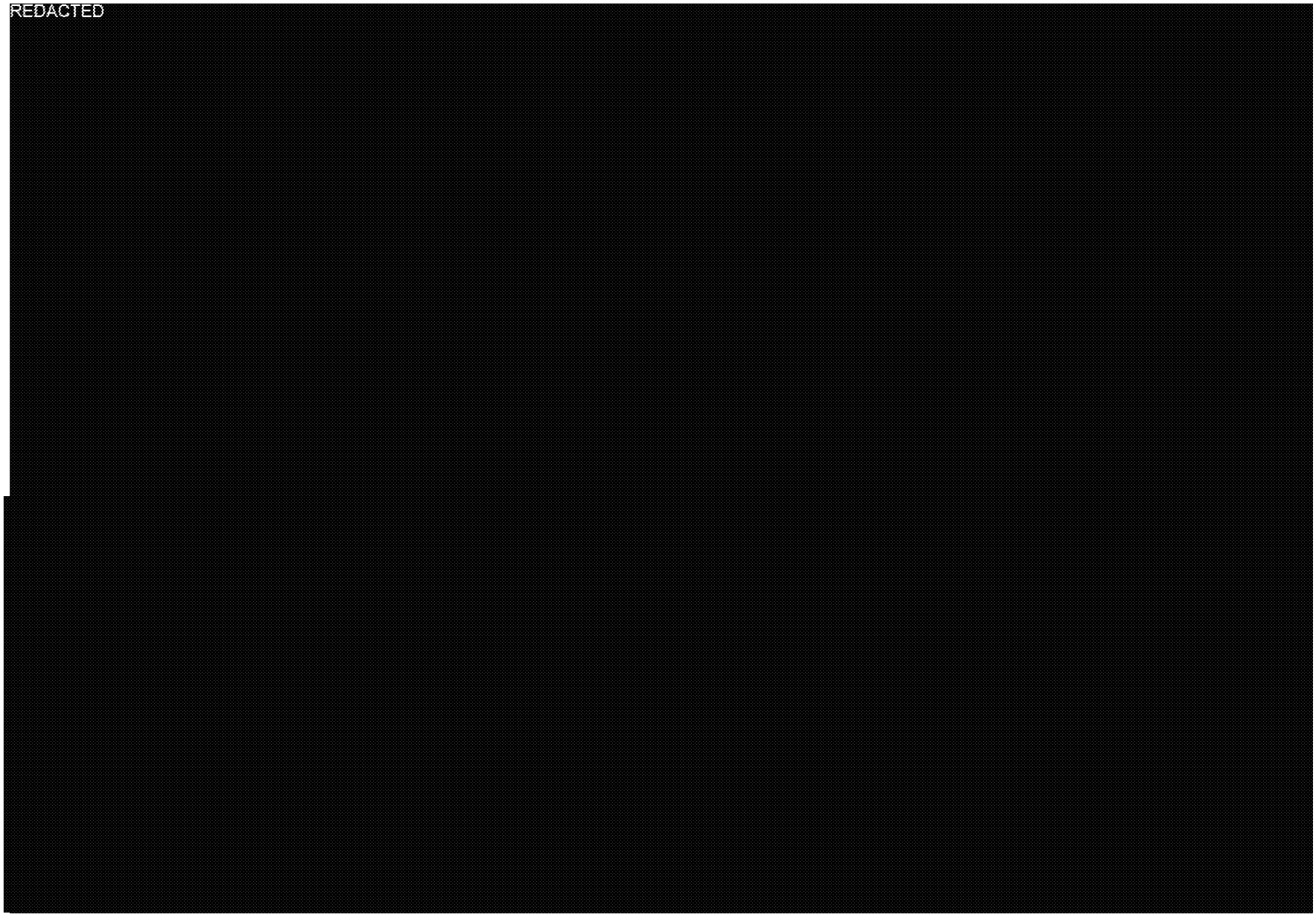
vey the competitors and list the strengths and weaknesses of companies/brands and models that would pete with our current product and the new product. Consider services a customer may also choose as a chasing alternative.

- Not being able to match or exceed these key specifications translates into some specific and very common current jobsite activities that the Toro Dingo cannot currently accomplish:
  - Dumping jobsite material into a 1 ton truck
    - Truck bed height is 41", plus 24" raised sides = 65", plus additional needed clearance room
    - Reach becomes important when dumping into a shallow truck bed
  - Dumping material into a dumpster
    - 72" dumpster height is very common

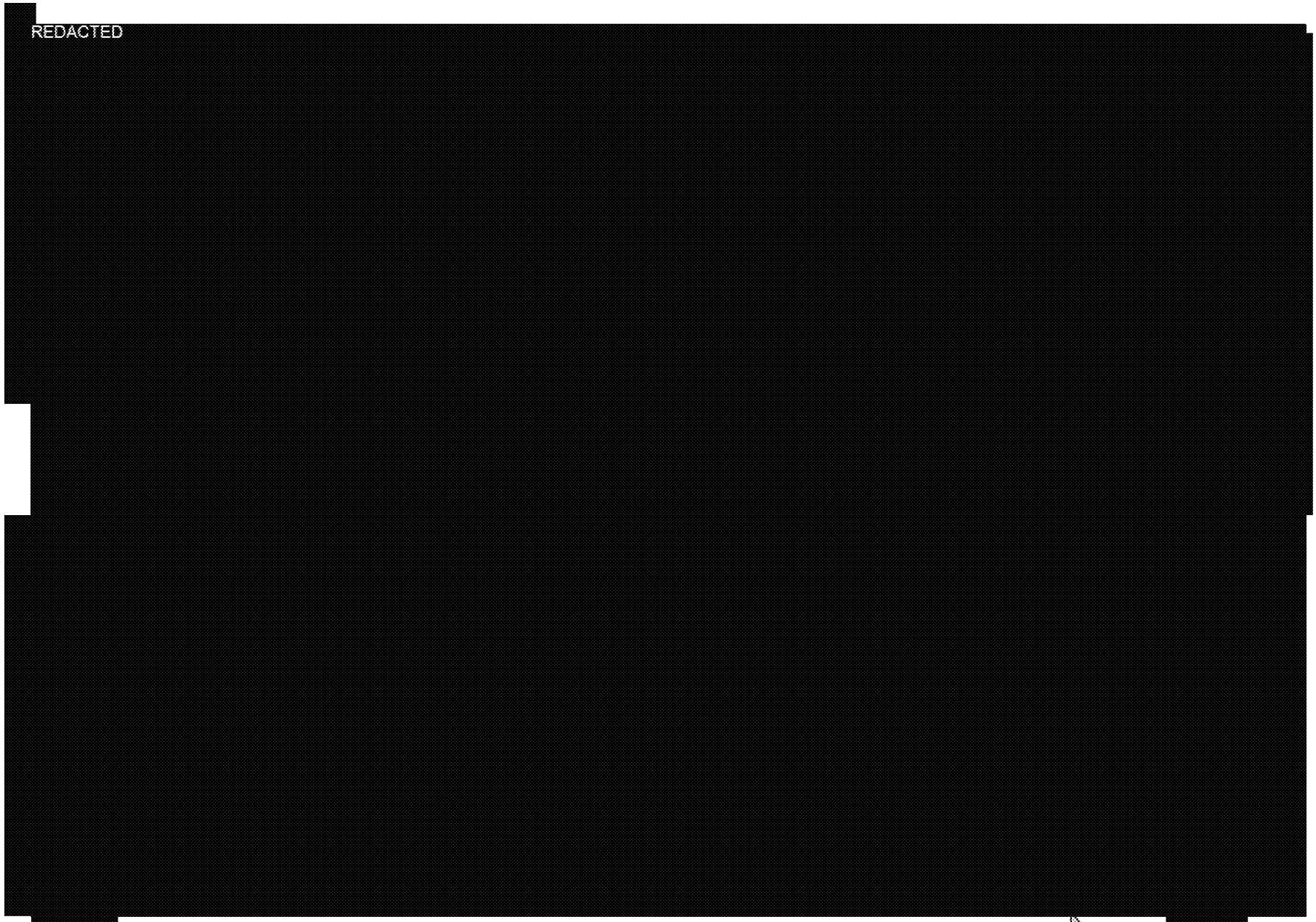
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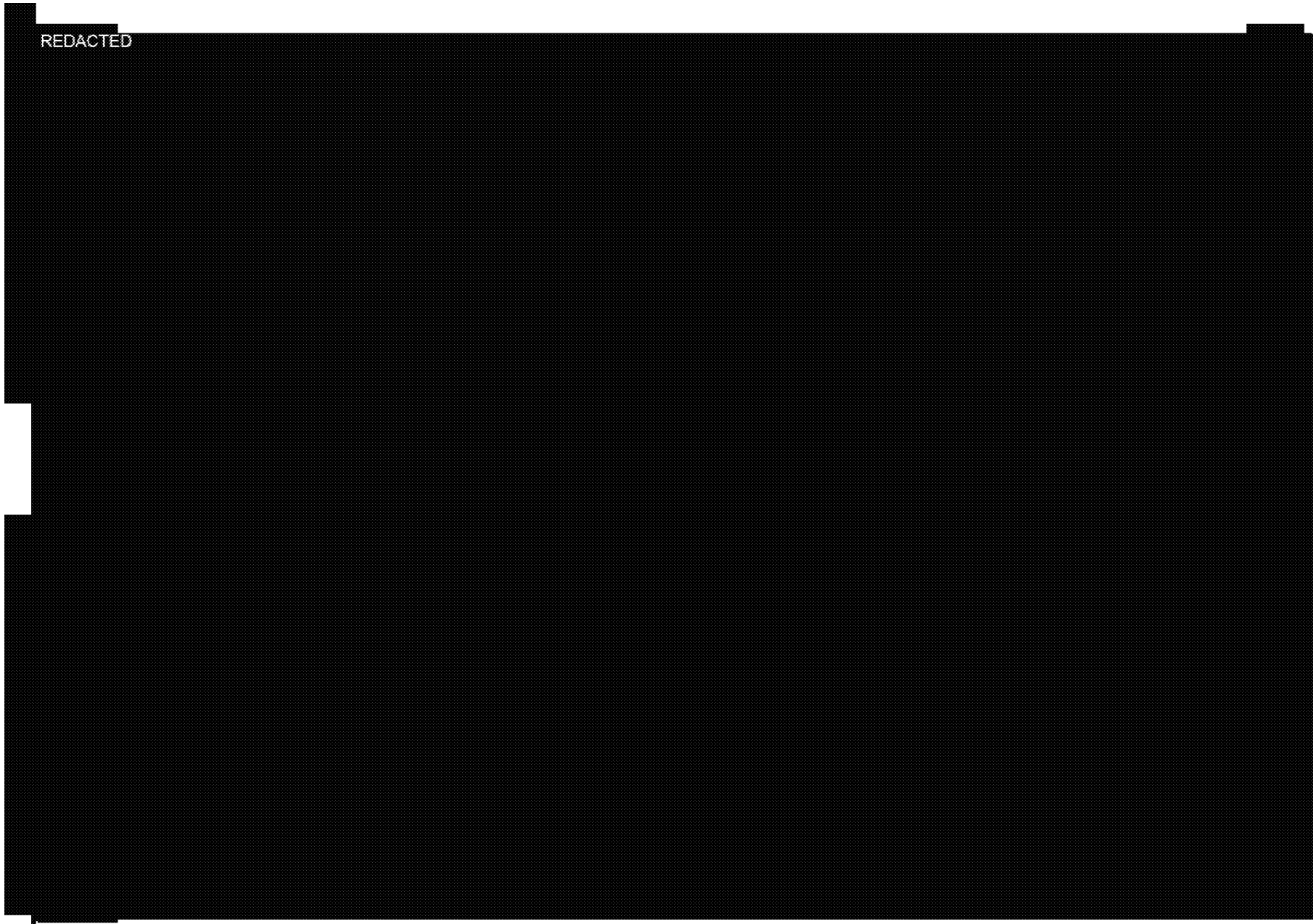


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CONFIDENTIAL - ATTORNEYS' EYES ONLY


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REDACTED

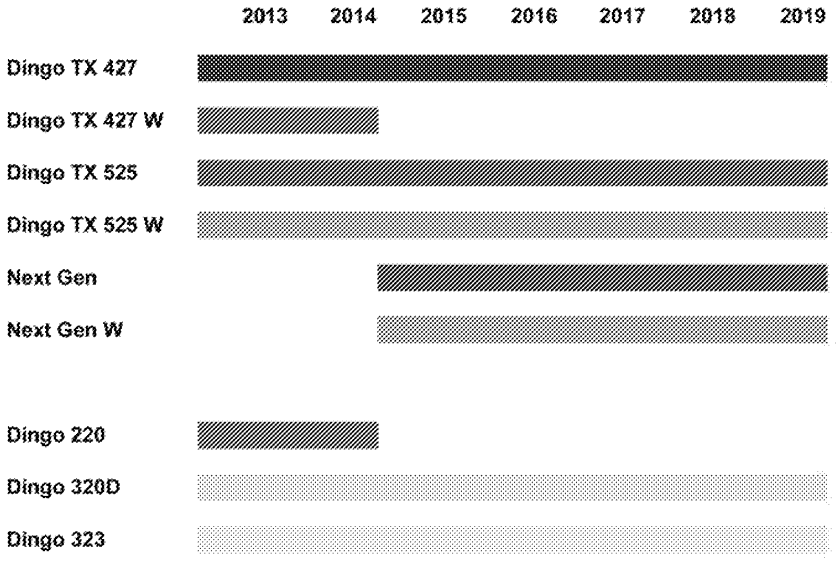


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Current Product Baseline

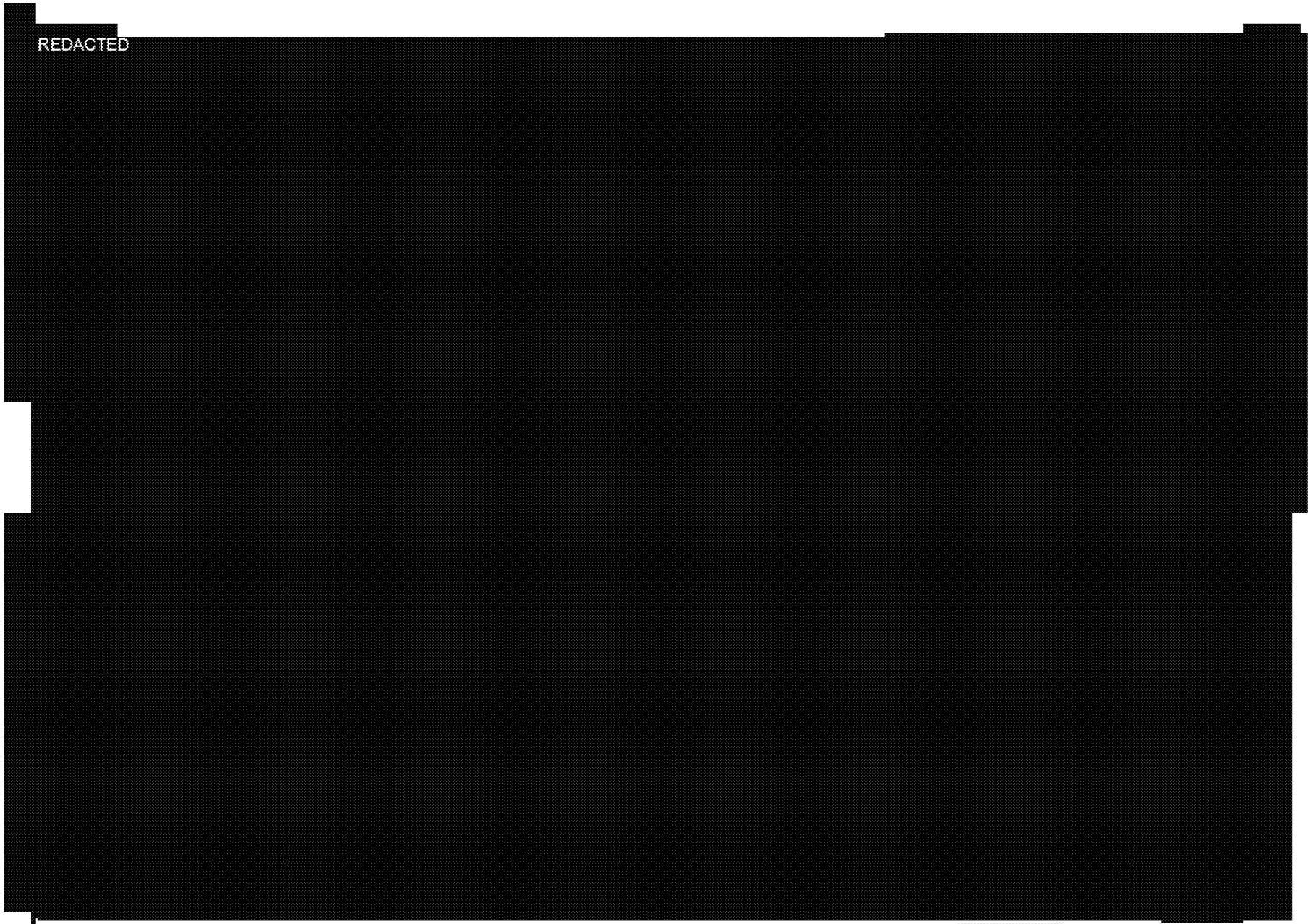
uate the current version the product we now sell. Establish a baseline by characterizing the total performance
e existing product. Sales, product cost, customer satisfaction, production performance, sourcing, warranty an
ice, and the product's performance specifications. Highlight the parameters which the new product must
ove.

- 2015 Tracked Dingo offering would be:
  - 427, 525, 525W, Next Gen, Next Gen W
  - When also looking at Wheeled Dingo units this would result in 7 total Dingo models with the Next Generation launch in 2015 (same number of models as before Next Generation launch)



TORO-0000779

Ex. 2002
Page 701 of 915



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Current Product Baseline

uate the current version the product we now sell. Establish a baseline by characterizing the total performance
e existing product. Sales, product cost, customer satisfaction, production performance, sourcing, warranty an
ice, and the product's performance specifications. Highlight the parameters which the new product must
ove.

TX Customer wish list (these will not nec. be incorporated into the design but have been accumulated from years of customer feedback):

- Lift height and capacity to match the competition
  - Retain the compact design of the Dingo
- Hi-drive track
- Low operator control forces
- Ride-on platform with improved ground clearance
- Improved Qtach geometry
  - Durability / cylinder advantage
  - Increase rollback and dump
- Improved visibility to the attachment
  - Should be able to see the bucket edge when digging / grading
- Faster ground speed / variable torque traction

Current Product Baseline

uate the current version the product we now sell. Establish a baseline by characterizing the total performance e existing product. Sales, product cost, customer satisfaction, production performance, sourcing, warranty an ice, and the product's performance specifications. Highlight the parameters which the new product must ove.

TX Customer wish list cont…:

- Easy cleanout radiator
  - We changed screens on the Diesel TX to help with this but radiators still become plugged and compacted with debris
- Lower frame cleanout
  - Mud accumulates in the frame an corrodes the traction fittings
- Loader tower cleanout (debris gets under the cylinders)
- Track tensioner improvements
  - Dirt and mud also infiltrate the tensioning system and cause it to seize
- Improved parking brake
  - We have continually fought with the durability and action of the parking brake
- Improved track lug life
  - This has improved over the years but we have another opportunity to reduce the edges that cut the lugs

TORO-0000782

Ex. 2002
Page 704 of 915

Current Product Baseline

uate the current version the product we now sell. Establish a baseline by characterizing the total perfo
e existing product. Sales, product cost, customer satisfaction, production performance, sourcing, warr
ice, and the product's performance specifications. Highlight the parameters which the new product mu
ove.

TX Customer wish list cont…:

- Track suspension
- Low flow aux. flow option for cylinder applications
- Load sensing auxiliary
- Loader lock that does not bend the lift cylinder rod when engaged
- Improved hydraulic and engine noise characteristics
- Improved batter access (diesels)
- Improved snow performance for the track system

TORO-0000783

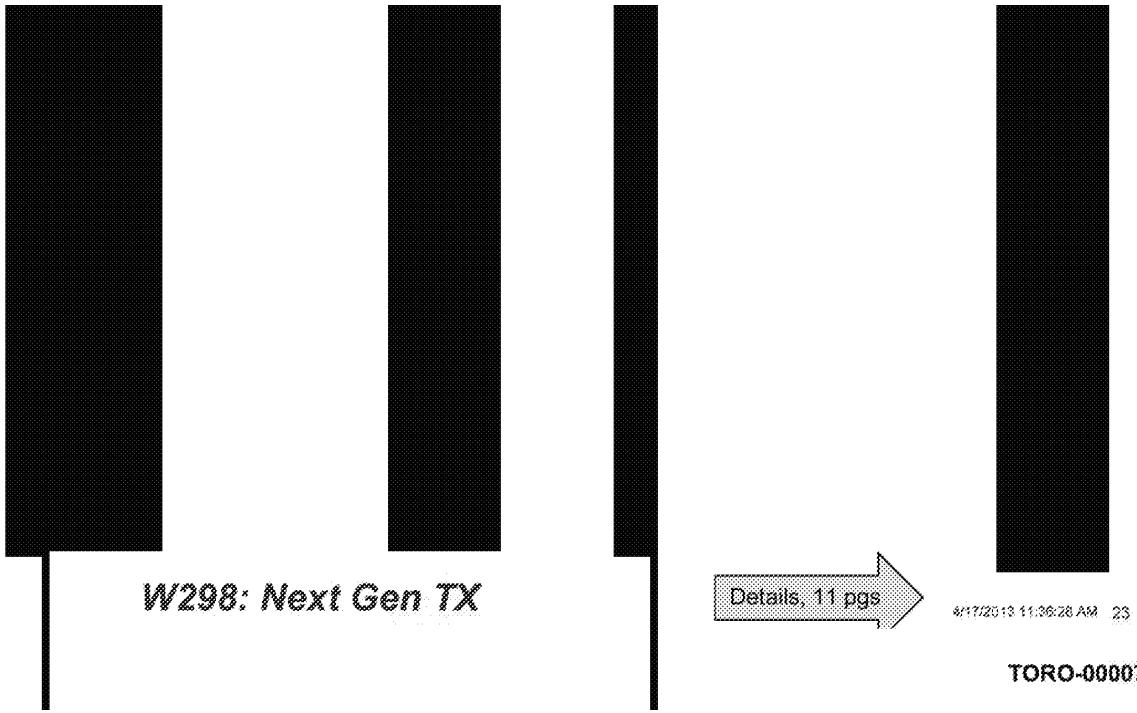
Ex. 2002
Page 705 of 915

Solution Alternatives

List possible product design ideas or service solutions. Do not let feasibility constraints limit you. For each solution or idea, note the benefits and limitations, from the customer perspective. Stretch for innovation.

Key specs and features to consider on the new TX design:

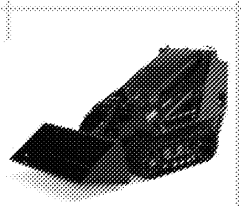
- Pin Height
- Lift Capacity
- Tracks
- Controls
- Engine
- Operator Zone

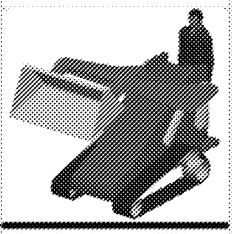


Solution Alternatives

List possible product design ideas or service solutions. Do not let feasibility constraints limit you. For each solution or idea, note the benefits and limitations, from the customer perspective. Stretch for innovation.

TX / Tmax Spec Comparison





	Part / Feature	DingoTX 525	Preliminary TMax
Loader			
	Style	Radial Lift	Vertical Lift
	Hinge Pin Height (inches)	65.8	81
	Dump Angle (degrees)	38	40-45
	Reach, Fully Raised (inches)	21.8	>21.8
Performance			
	Tip Capacity (lb)	1580	2285
	Operating Capacity (35%)	553	800
	Horsepower (hp)	25	25
	Ground speed (mph)	0-4.5 forward, 0-2 reverse	0-4.5 forward, 0-2 reverse (2-speed?)
Tracks			
	Style	Standard wrap	High Drive
	Wheel Base (inches)	31.1	34
	Ground Pressure (w/ out bucket or operator) (psi)	5.08	5.08
	Track Width (inches)	5.88	5.88

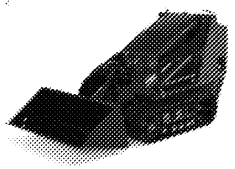
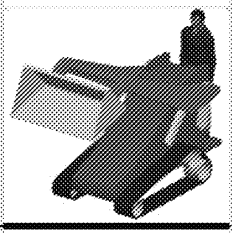
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Ex. 2002
Page 707 of 915

TORO-0000785

Solution Alternatives

List possible product design ideas or service solutions. Do not let feasibility constraints limit you. For each solution or idea, note the benefits and limitations, from the customer perspective. Stretch for innovation.

TX / Tmax Spec Comparison			
			
Weights and Dimensions			
	Overall Length with Bucket (inches)	92	<105
	Overall Width (inches)	33.7	33.7
	Overall height (inches)	46.1	<57
	Overall Weight without Bucket (lbs)	2001	2031
	Max. Ground Clearance (inches)	4.6	6-8
Hydraulics			
	Aux / Primary Pump (gpm)	13.8	13.8
	Loader / Secondary Pump (gpm)	5.5	5.5
	Drive Pumps (gpm)	16.9	16.9 - 21
	Drive Controls	Hydrostatic T-Bar	Tbar? - Electronic? - Piloted?
	Loader Controls	Joystick	Joystick
	Auxiliary Control	OPC Lever	Electronic, Capacitive?
Other Features			
	Platform	Optional fold-up	Standard fold-up

[redacted]

Solution Alternatives

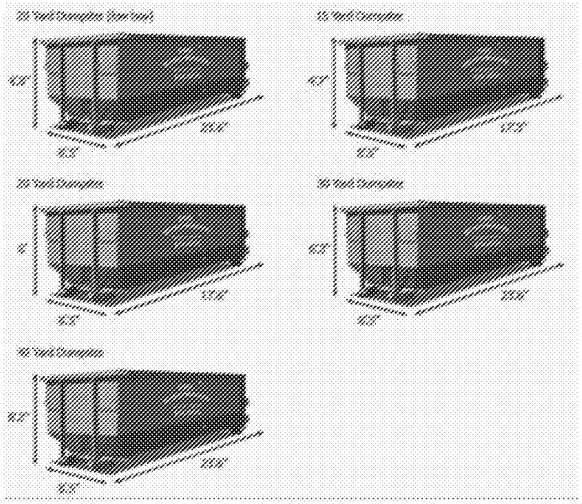
List possible product design ideas or service solutions. Do not let feasibility constraints limit you. For each solution or idea, note the benefits and limitations, from the customer perspective. Stretch for innovation.

Pin Height

•Requirement for pin height is fairly well established

- Dumping into a 1-ton truck (65" high bed sides)
- Dumping into a 30-yd dumpster (75-78 inches)

•Plan is to match DW pin height of 81 inches



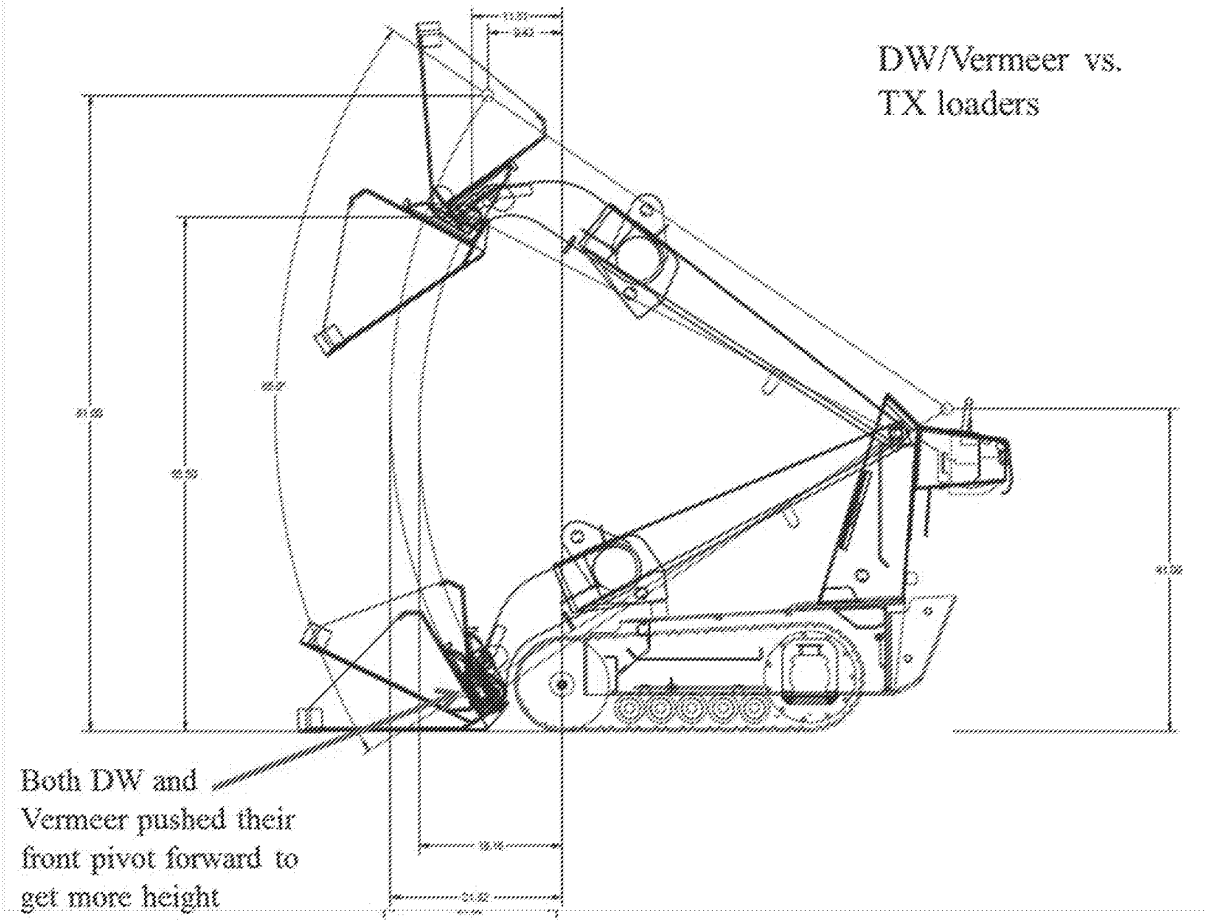
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Ex. 2002
Page 709 of 915

Solution Alternatives

List possible product design ideas or service solutions. Do not let feasibility constraints limit you. For each solution or idea, note the benefits and limitations, from the customer perspective. Stretch for innovation.

Pin Height



TORO-0000788

Ex. 2002
Page 710 of 915

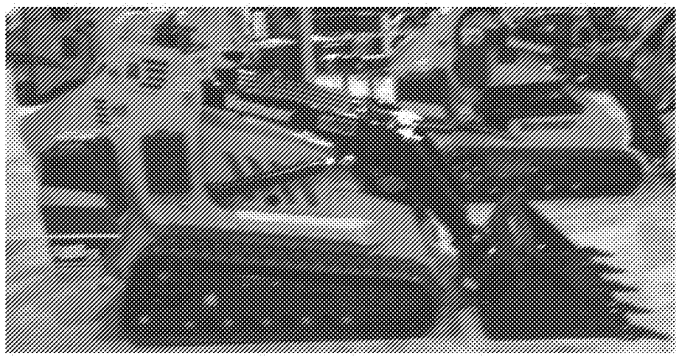
Solution Alternatives

List possible product design ideas or service solutions. Do not let feasibility constraints limit you. For each solution or idea, note the benefits and limitations, from the customer perspective. Stretch for innovation.

Lift Capacity

- We need to match the DW and Vermeer specs of 800 lbs (2286 lb tip)
- Loader geometry has a large impact on lift capacity
  - There are two methods to meet requirement
    - Retain radial lift loader arm and increase machine weight
      - DW and Vermeer machines are 2,900 lbs without a bucket
    - Use a vertical lift loader arm to keep the load consistently close to the machine





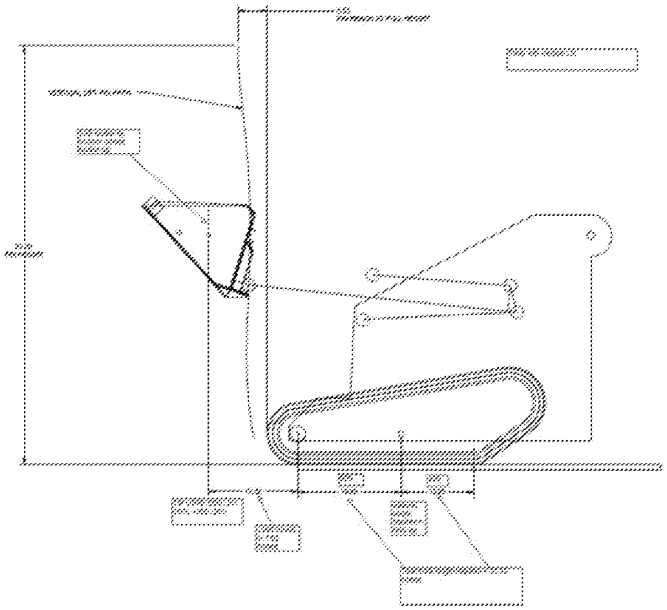
Solution Alternatives

List possible product design ideas or service solutions. Do not let feasibility constraints limit you. For each solution or idea, note the benefits and limitations, from the customer perspective. Stretch for innovation.

Lift Capacity

•We will investigate a vertical lift loader due to its advantages over a radial lift

- Achieve needed pin height with a more compact geometry
- Keeps the load consistently close to the machine while matching reach at full height
  - Lower machine weight is needed to lift the same amount
- Flat lift path will make the auger drive easier to use
- Improved dump and rollback angles

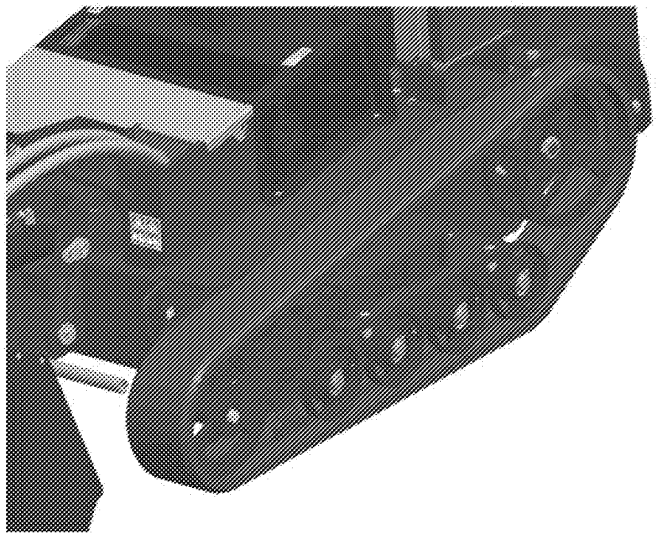


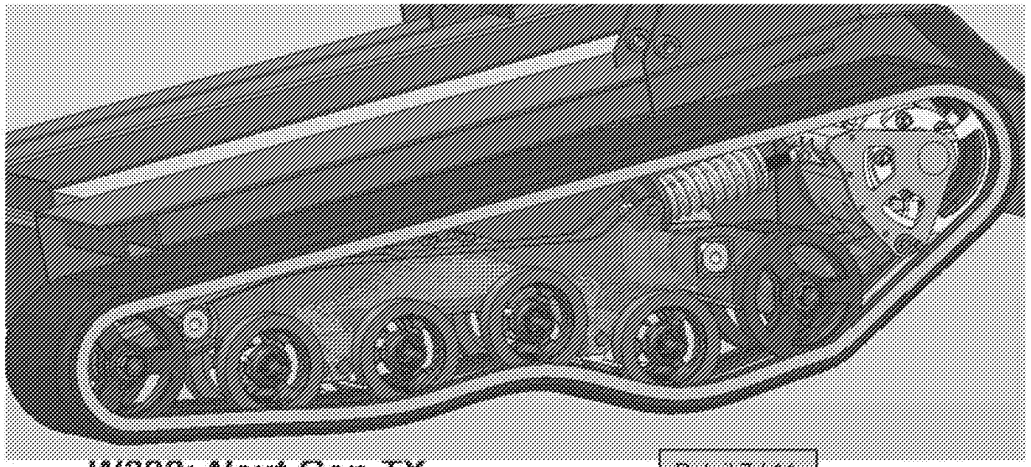
Solution Alternatives

List possible product design ideas or service solutions. Do not let feasibility constraints limit you. For each solution or idea, note the benefits and limitations, from the customer perspective. Stretch for innovation.

Tracks

- Hi-drive track improves
  - Wheelmotor loads
  - Curb jumping
  - Ground clearance
- Utilize learnings from the STX-38 track drive and the Atlas track drive designs
  - Detracking and tensioning work will be key





W298: Next Gen TX

Ex. 2002
Page 713 of 915

TORO-0000791

Solution Alternatives

List possible product design ideas or service solutions. Do not let feasibility constraints limit you. For each solution or idea, note the benefits and limitations, from the customer perspective. Stretch for innovation.

Tracks

- Retaining current ground pressure spec is affected by overall machine weight and track length
- Maximum machine weight to retain ground pressure with the STX-38 track is 2031 lbs

Narrow Track Ground Pressure				
	Track Width (in)	Track Length (in)	Weight, unit only (lbs)	Ground Pressure (PSI)
Current TX	5.88	31.50	1882	5.08
	5.88	35.15	2100	5.08
	5.88	39.34	2350	5.08
	5.88	43.52	2600	5.08
	5.88	47.71	2850	5.08
Ditch Witch SK750	7.00	43.00	2890	4.80

Wide Track Ground Pressure				
	Track Width (in)	Track Length (in)	Weight, unit only (lbs)	Ground Pressure (PSI)
Current TX	9.50	31.50	1990	3.32
	9.50	32.33	2150	3.50
	9.50	36.09	2400	3.50
	9.50	39.85	2650	3.50
	9.50	43.61	2900	3.50
Ditch Witch 755	9.00	43.00	2940	3.80
Vermeer 800	9.00	46.00	2950	3.56

Solution Alternatives

List possible product design ideas or service solutions. Do not let feasibility constraints limit you. For each solution or idea, note the benefits and limitations, from the customer perspective. Stretch for innovation.

Controls

•We will investigate control methods and styles in the 2.0 stage

•Considerations:

- Ease of use
- Control forces / control stroke
- Stand-on / ride-on / hang-on

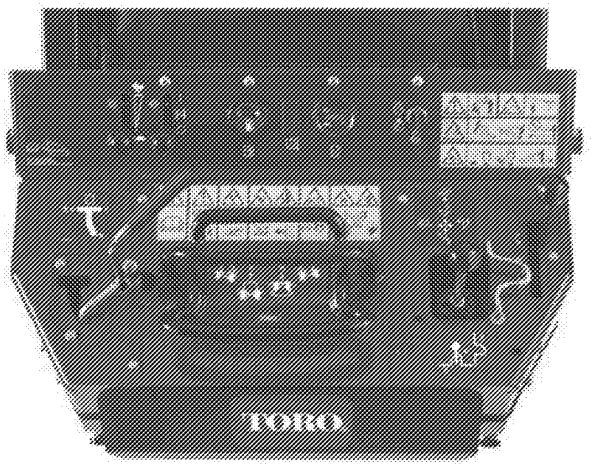
•Methods

- Manual (current)
- Pilot operated (DW and Vermeer)
- Electronic proportional

•Styles

- T-bar (current)
- Joystick (DW and Vermeer)
- Steering wheel
- Other?





TORO-0000793

Ex. 2002
Page 715 of 915

Solution Alternatives

List possible product design ideas or service solutions. Do not let feasibility constraints limit you. For each solution or idea, note the benefits and limitations, from the customer perspective. Stretch for innovation.

Engine

- Tier IV likely limits hp options to sub-25hp (current Kubota 902 engine)
- We will investigate higher diesel hp options in the 30-35 hp range for expense and size
  - Kohler
  - JCB
  - Yanmar
- We will also investigate high hp gas EFI engines (Kohler)

[redacted]

Solution Alternatives

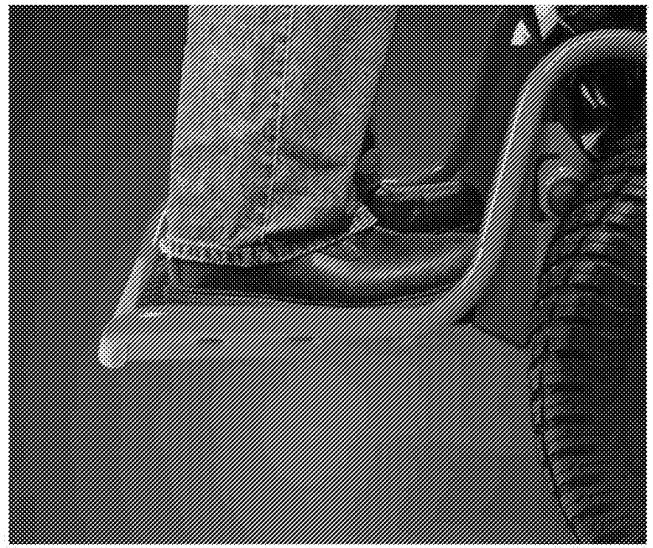
List possible product design ideas or service solutions. Do not let feasibility constraints limit you. For each solution or idea, note the benefits and limitations, from the customer perspective. Stretch for innovation.

Operator Zone

•Investigate a fold-up platform with improved ground clearance over the current TX (4-8 inches)

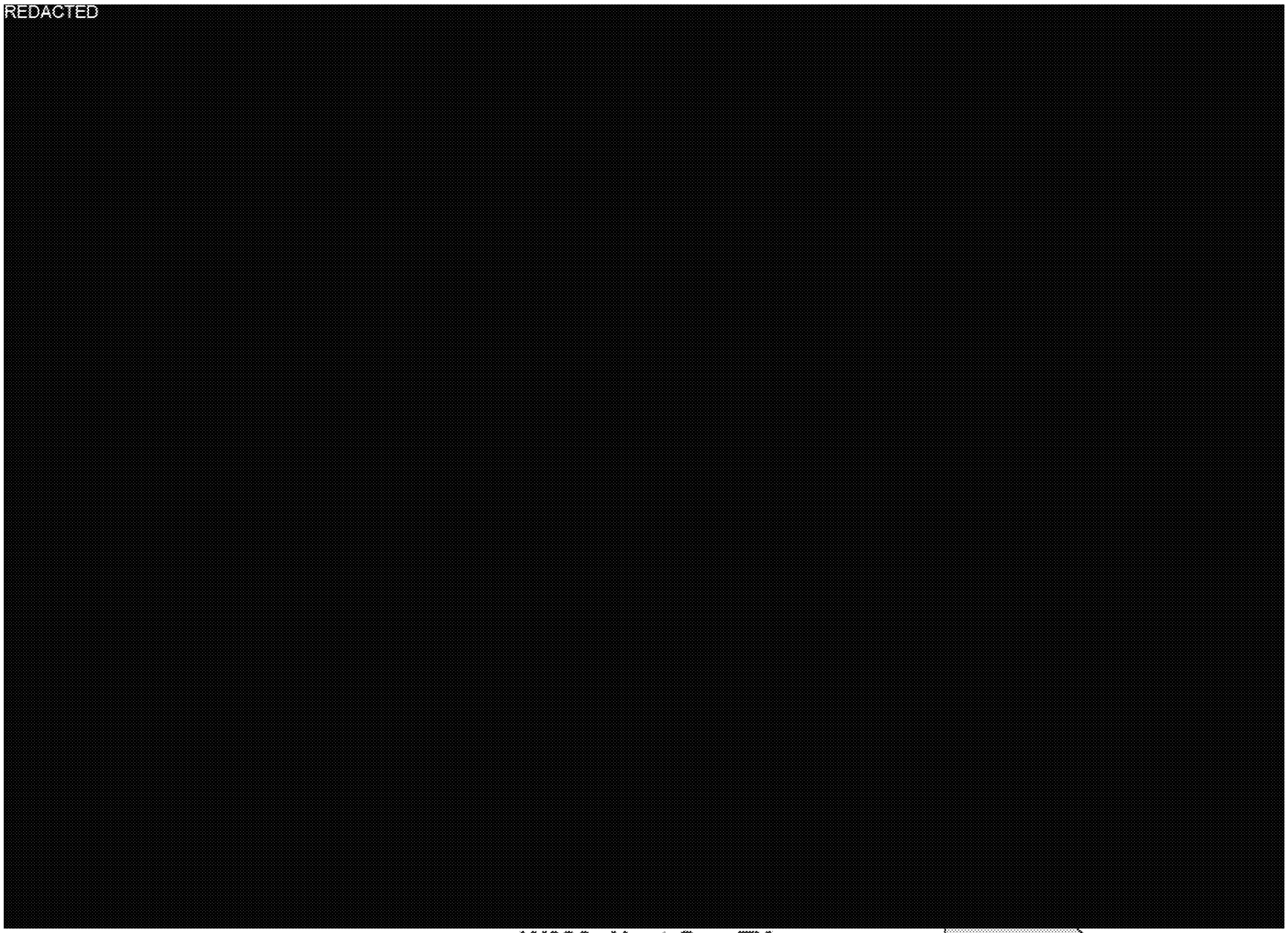
- Fold-up option makes the machine more compact for trailering
- Walk behind option makes the unit safer and easier to use in tight spaces and on grades

•A balance will have to be found between control height and platform ground clearance (adjustable control height?)

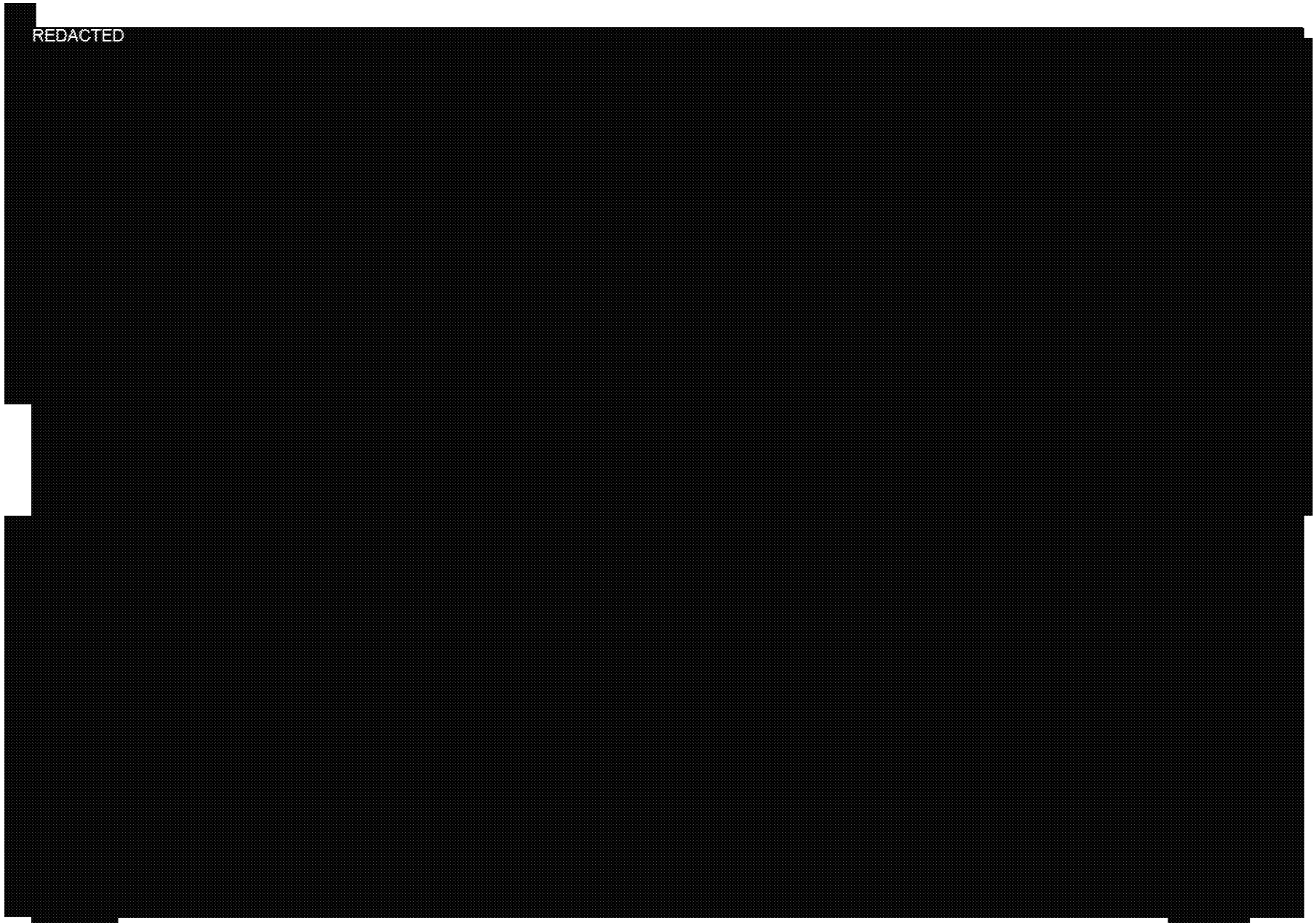


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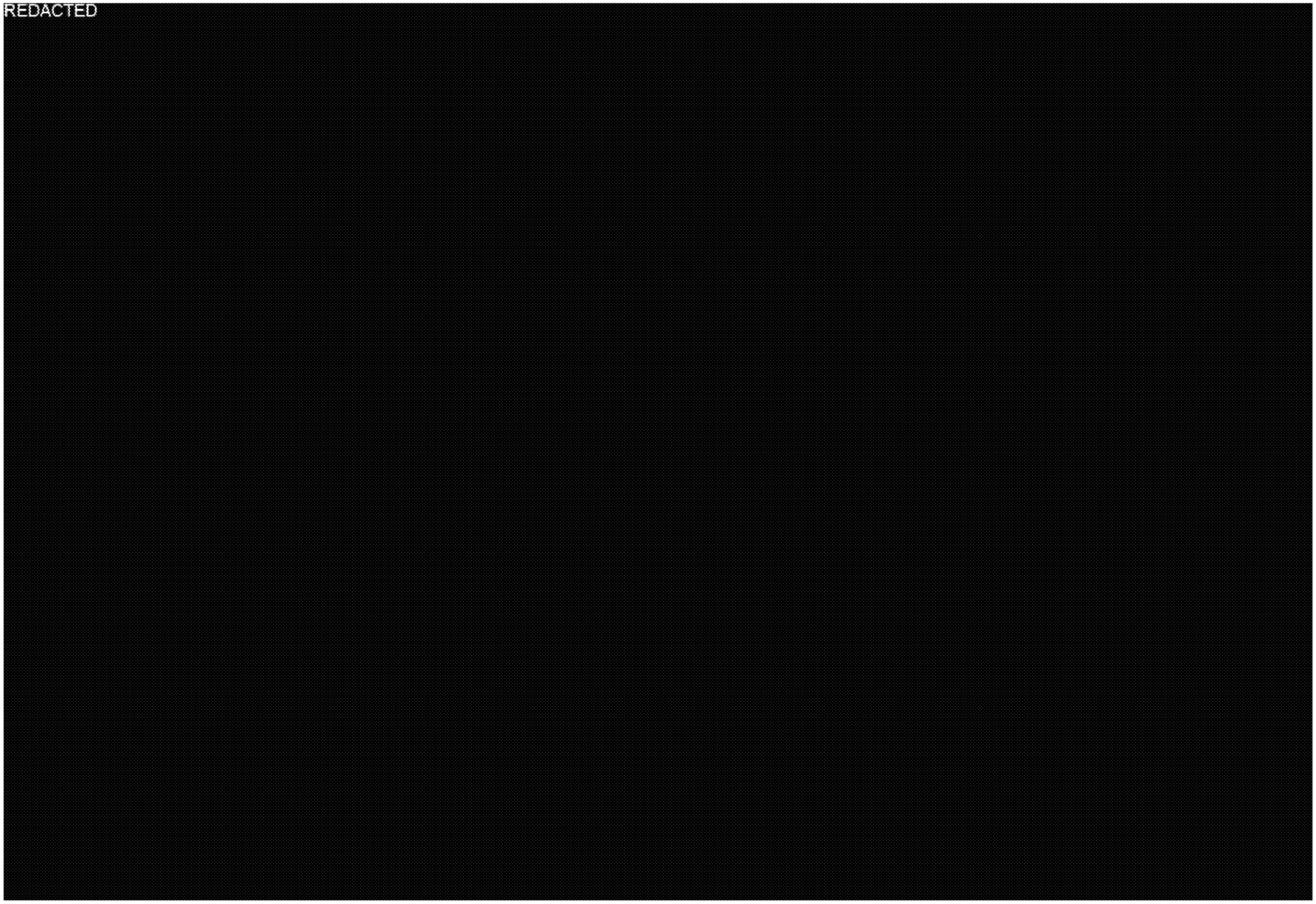
Ex. 2002
Page 717 of 915



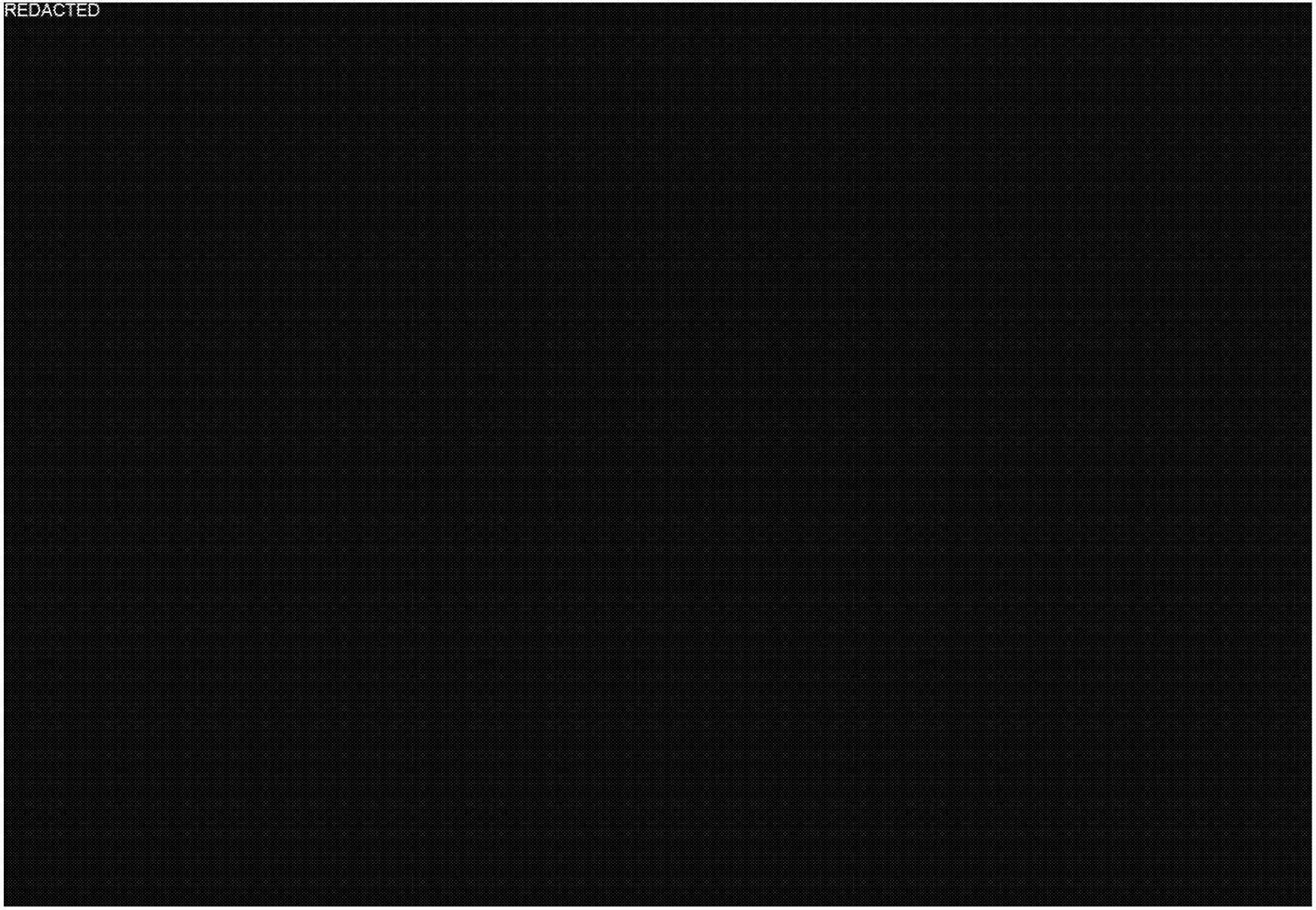
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Page 719 of 915



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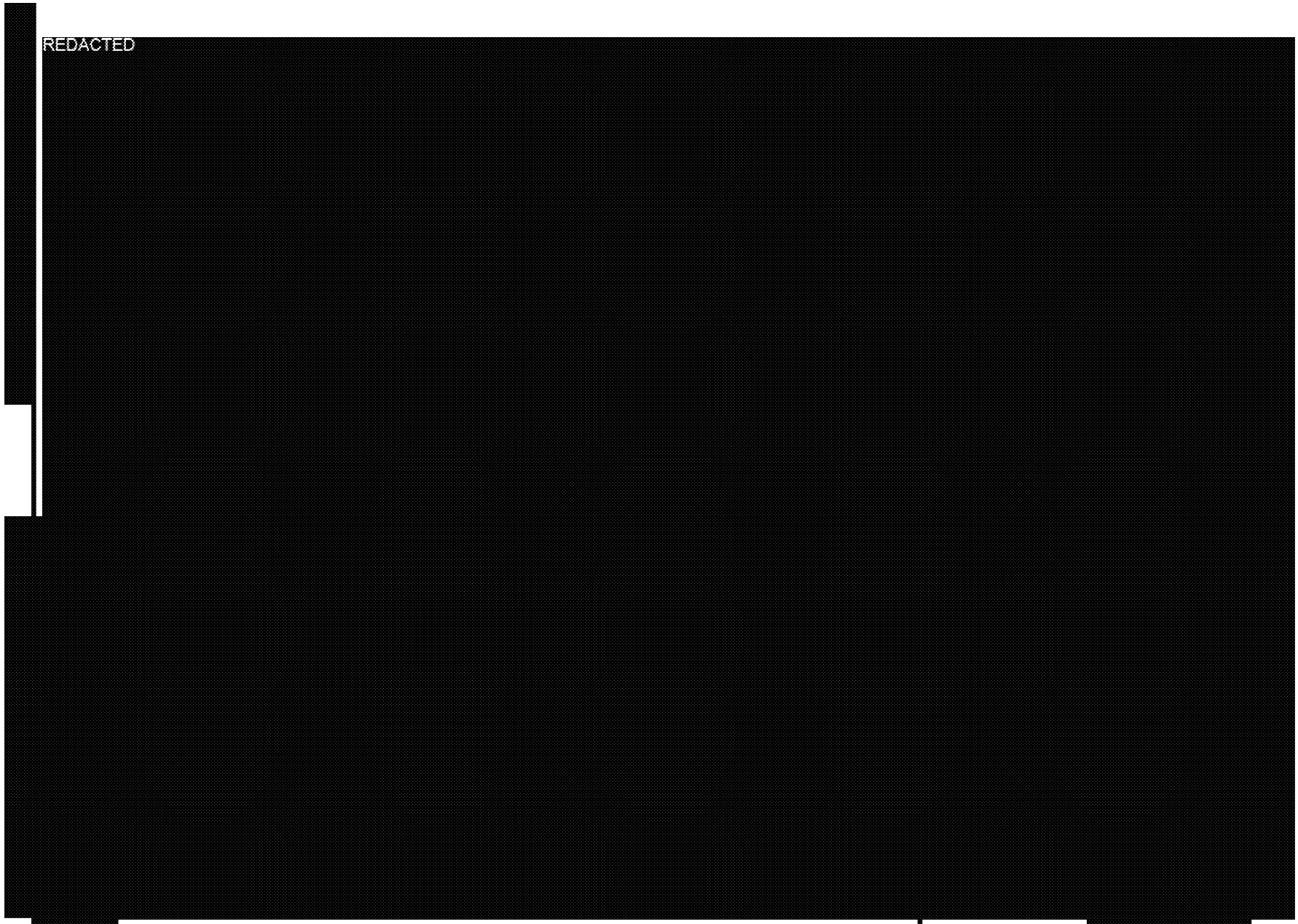
Ex. 2002
Page 722 of 915

Project Investment

Estimate the project investment by fiscal year and by phase. Update projections and actual at each Gate.

Project Investment by Phase

Dollars in Thousands ($,000)		Concept Phase	Feasibility Phase	Development Phase	Mid-Development Phase	Mfg Pilot Phase	Total	Comments
Funding	Original Estimate							
	Current Projection		497	995	218	192	1,902	
	Actual							
	Variance		497	995	218	192	1,902	
Funding	Original Estimate							
	Current Projection			125	125		250	
	Actual							
	Variance			125	125		250	
Funding	Original Estimate							
	Current Projection			100	100		200	
	Actual							
	Variance			100	100		200	
Funding	Original Estimate							
	Current Projection							
	Actual							
	Variance							
	Original Estimate							***Original Estimate***
	Current Projection		497	1,220	443	192	2,352	*Current Projection*
	Actual							***Actual to Date***
	Variance		497	1,220	443	192	2,352	***Variance***


REDACTED

Project Investment

Estimate the project investment by fiscal year and by phase. Update projections and actual at each Gate.

PJ2 F'13 PLAN SWS Core Group													
Project	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Totals
W258 - SWS R&D	$17,093	-$8,333	$4,167	$4,167	$7,251	$7,251	$7,251	$7,251	$7,251	$7,251	$7,251	$7,255	**$75,106**
W261 - Dingo TX DCI	$16,901	$24,807	$36,558	$35,386	$20,571	$19,286	$20,226	$19,538	$20,688	$21,068	$23,468	$21,538	**$280,076**
W263 - Admin Allocation	$8,893	$8,893	$8,893	$8,893	$8,893	$8,893	$8,893	$8,893	$8,893	$8,893	$8,893	$8,893	**$106,717**
W264 - International Allocation	-$22,917	-$22,917	-$22,917	-$22,917	-$22,917	-$22,917	-$22,917	-$22,917	-$22,917	-$22,917	-$22,917	-$22,917	**-$275,004**
W280 - SWS Cost Reduction	$476	$1,036	$1,429	$4,514	$0	$0	$0	$0	$0	$0	$0	$0	**$7,456**
W281 - Field Test Allocation	$1,548	$1,537	$1,537	$1,537	$1,537	$1,537	$1,537	$1,537	$1,537	$1,537	$1,537	$1,537	**$18,454**
W287 - 35hp STX/Other Large Machine	$48,321	$41,896	$30,877	$9,110	-$8,300	$0	$0	$0	$0	$0	$0	$0	**$121,905**
W293 - Atlas	$0	$0	$476	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$476**
W297 - Hold Backs	$0	$0	$0	$0	$8,375	$8,375	$8,375	$8,375	$8,375	$8,375	$8,375	$8,375	**$67,000**
W298 - Next Gen TX	$0	$737	$1,627	$6,693	$60,513	$98,496	$77,378	$76,737	$88,020	$79,934	$71,674	$59,822	**$621,631**
W299 - TRX-38 Trencher	$19,123	$864	$2,824	$11,052	$12,109	$2,634	$0	$0	$0	$3,991	$8,068	$10,541	**$71,206**
Totals	**$89,438**	**$48,520**	**$65,471**	**$58,435**	**$88,032**	**$123,555**	**$100,743**	**$99,415**	**$111,848**	**$108,152**	**$106,369**	**$95,044**	**$1,095,022**

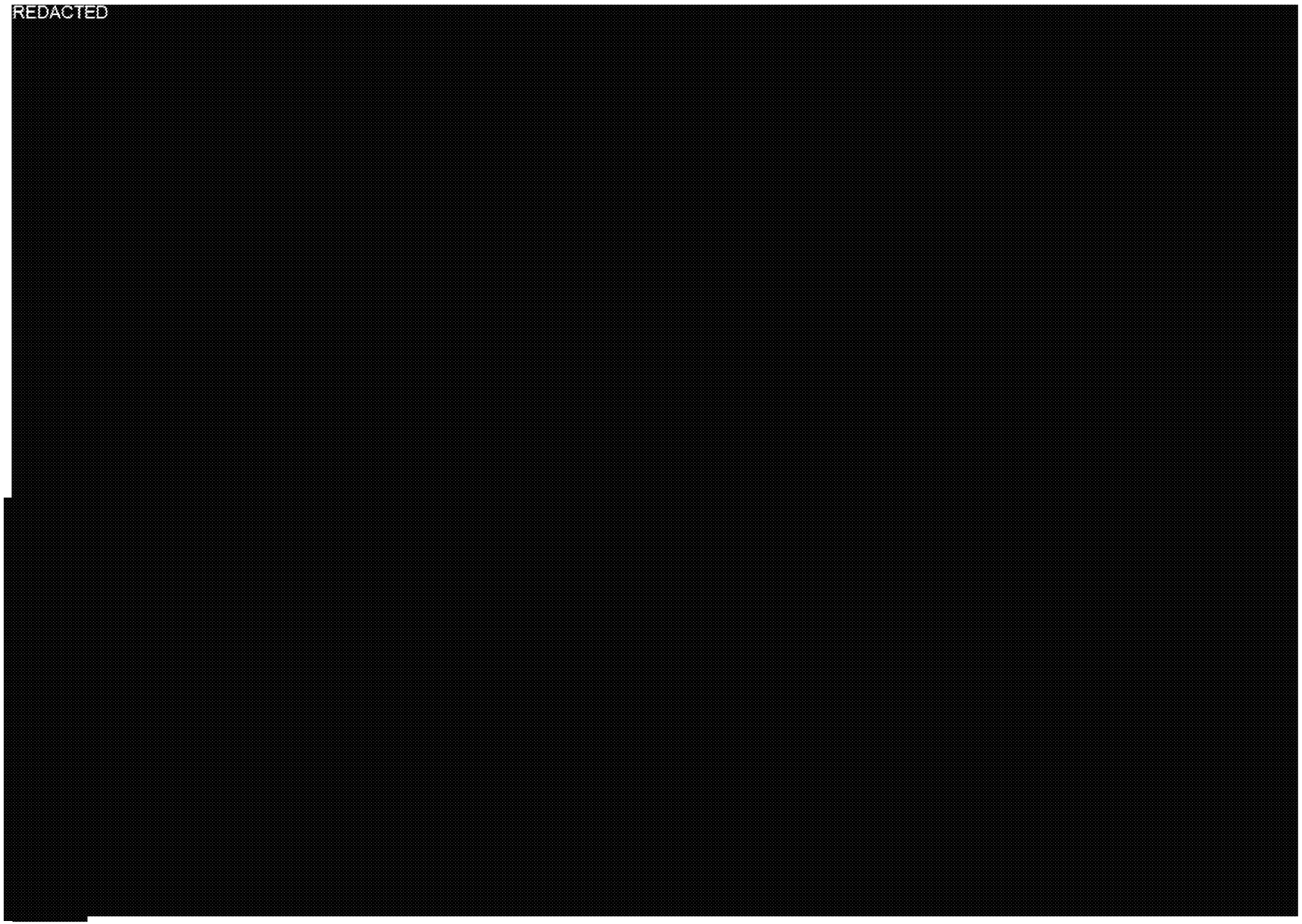
PJ2 Plan refocuses spending from Atlas and the Trencher project into project W298

Some spending is retained under W299 to rebuild the TRX38 and begin work at the end of the year

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TORO-0000803

Ex. 2002
Page 725 of 915



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Prototype Plan and Results

Describe the plan and the estimated schedule for prototypes to be built and tested. Report results of prototypes that have been built.

2.0 Stage (Build on 7/23/13)

- Build 3 prototypes
  - 2 narrow track units
  - 1 wide track unit
- Usage
  - 1 unit for lab work
  - 1 unit for field / performance work
  - 1 unit dedicated to VOC
- Units may have a mixture of engines (gas-diesel) depending on project direction

TORO-0000806

Ex. 2002
Page 728 of 915

Prototype Plan and Results

Describe the plan and the estimated schedule for prototypes to be built and tested. Report results of prototypes that have been built.

3.0 Stage (Prototypes built 3/18/14)

•Build 5 prototypes

- (1) for Lab
- (2) for Field
- (1) for Marketing
- (1) for Mfg

4.0 Stage (Updates after 500 hours on the 3.0)

•Any updates required (permanently tooled parts for example) will be fit onto the 3.0 machines after initial field testing is complete

Project Schedule and Milestones

List the milestones and dates that are critical to achieve the planned project schedule.

Milestone Dates	Plan	Actual	Comments
2.0 Approval	**3/11/13**		
2.0 Prototype Build Completed	**7/29/13**		Build 3 prototypes for qualification and VOC work
3.0 Signoff	**11/4/13**		Allows 12 weeks for VOC and qualification work
3.0 Prototype Build Completed	**3/18/14**		
Long Lead / Tooling Releases	**7/31/14**		
4.0 Signoff	**8/6/14**		
4.0 Updates	**9/3/14**		Bring units in for updates after 500 field hours
5.0 Signoff	**11/6/14**		
Pilot Build Completed	**11/19/14**		4.0 qualification completed by this date
Production	**1/15/15**		
Release to Ship	**1/29/15**		Product fully released and available for Rental Show

TORO-0000808

Ex. 2002
Page 730 of 915

Feasibility Phase Critical Actions

List the most critical actions the team needs to complete in the Feasibility Phase for this project to fully satisfy the stated project objectives.

Marketing

- Thoroughly investigate market share loss
  - As previously indicated, market share loss is a result of being out-spec'd by competitors
  - Competitor pricing is also affecting market share loss
    - Formal market research will be conducted during the Feasibility Phase to understand the importance of price in the purchase decisions of Ditch-Witch users (to what degree price is influencing purchase decisions), price elasticity, and the importance of product specs relative to price.
- Cost reduction efforts
  - Work with the team to ensure all Dingo TX BOM items are reviewed for cost reduction opportunities (cost reduction opportunities for current models and eventual Next Gen models)
    - Dingo TX BOMs are currently being reviewed
    - 1 current cost reduction opportunity: current wide drive track wheel cost is REDACTED
- Continue ROI analysis
- Prototype review and agreement on product specifications
  - Specifications to be based on VOC and internal results
- More detailed competitive analysis based on user feedback

Engineering

- Purchase a Vermeer 800 or DW 750 for competitive evaluations
- Finalize all key specs and design features
- Build three prototypes for VOC work and performance evaluations

*Highlighting Added = CONFIDENTIAL ATTORNEYS' EYES ONLY

TORO-0000809

Ex. 2002
Page 731 of 915

Feasibility Phase Critical Actions

List the most critical actions the team needs to complete in the Feasibility Phase for this project to fully satisfy the stated project objectives.

Engineering (continued)

- Begin preliminary qualification work on key new design areas
  - Lift capacity and other loader characteristics
  - Engine and hydraulic performance and cooling
  - Track performance and detracking
  - Operator controls
- Determine product and project costs for the 3.0 approval
- Review standards and develop a test plan for the 3.0 approval
- Investigate patent opportunities



Project Risks and Risk Management Plan

List the risks that may limit the project from achieving the goal. Consider all aspects including: marketing, competition, distribution, quality, performance, price, design, supply, etc. For each risk state the impact, the likelihood of occurring, the mitigation actions to prevent the occurrence and the contingency plan if it occurs.

Priority	Risk	Likely To Occur	Impact	Mitigation Actions	Contingency Actions
Rank	What is the issue that may impact the project?	High Medium Low	If it occurs how will it effect the project?	What are the actions being taken to prevent the occurrence or minimize the impact?	If the Risk does occur what actions will the team take?
1	Missing target costs due to expense of desired product features	High	Results in uncompetitive pricing or a product that does not meet customer requirements	Utilizing innovation like vertical lift to keep machine weight and corresponding costs down. Initiate DFMA activities as early in the design process as possible.	Compromise on product features to keep cost in balance

Ex. 2002
Page 733 of 915

Competitive Product Evaluation

Provide an objective and comprehensive evaluation of competitive products available to the customer, including our product that is now in the market. Consider the total product including: performance, quality, marketing message, serviceability, ease-of-operations, appearance, finish, packaging, availability, specification statements, etc.

Tracked CTL's	Toro NextGen W TX	Toro NextGen N TX	Toro 325W TX	Ditch Witch SK 750/755	Vermeer S650 TX	Vermeer S800 TX
Tipping capacity (lbs)	**3,070**	**2,857**	1,580	2,285	1,890	2,400
Rated operating capacity (35% of tip)	**1,075**	**1,000**	553	800	660	840
Hinge pin height (inches)	**81**	**81**	66	81	80	84.5
Horsepower (gross rating)	**24.8**	**24.8**	24.8	24.8 / 32.8	24.8	35.1
Max ground speed - forward (mph)	**4.7**	**4.7**	4.0	4.7	4.5	4.5
Max ground speed - reverse (mph)	**4.7**	**4.7**	2.0	4.7	4.5	4.5
Machine weight (lbs)	**2,633**	**2,450**	2,001	2,890	2,560	2,950

- Next Gen vertical lift loader arm design is a key differentiator
- Next Gen 1,000+ lb. rated operating capacity is unprecedented
  - Next Gen (wide) rated operating capacity is 28% greater than Vermeer's
- Next Gen units will weigh significantly less than Ditch Witch and Vermeer's largest units
  - Next Gen (wide) will weigh 317 lbs. less than Vermeer S800 TX
  - Doing more with a machine that has a lighter footprint

TORO-0000854

Ex. 2002
Page 734 of 915

Proposed Solution

Describe in detail the recommended solution that best meets the customer needs and the business needs. Identify the fundamental system and sub-system alternatives that must be considered, and state why this choice is preferred.

Key Features that innovate and "leapfrog" the competition

- Vertical lift loader design
  - Outperform the competition on lift capacity while retaining a smaller, more compact machine
  - 1000 lb operating capacity from a sub-2,500 lb machine
- Toro all-rubber track system
  - Retain the advantages of the Dingo track design vs. a Bridgestone track system
- Toro-designed operator controls
  - Eliminate the shortcomings of the competitive designs and retain Toro's leadership in control systems
- Toro designed electronic module
  - First introduction of "smarts" in the Dingo product line
  - Will integrate warning switches, automate the glow plug and provide interlock logic for the machine

Ex. 2002
Page 735 of 915

Project Risks and Risk Management Plan

List the risks that may limit the project from achieving the goal. Consider all aspects including: marketing, competition, distribution, quality, performance, price, design, supply, etc. For each risk state the impact, the likelihood of occurring, the mitigation actions to prevent the occurrence and the contingency plan if it occurs.

Priority	Risk	Likely To Occur	Impact	Mitigation Actions	Contingency Actions
Rank	What is the issue that may impact the project?	High Medium Low	If it occurs how will it effect the project?	What are the actions being taken to prevent the occurrence or minimize the impact?	If the Risk does occur what actions will the team take?
1	Missing target costs due to expense of desired product features	High	Results in uncompetitive pricing or a product that does not meet customer requirements	Utilize VOC feedback to decide which new features can be downgraded; Reduce machine weight; DFMA review of major components and systems	Revise specs and features to further reduce weight and cost
2	Loader arm complexity and durability results in failures	High	Increased weight, cost, and time to develop the arm	Iterative rounds of FEA in the 2.0 phase to address problem areas	Revise and reinforce loader design

TORO-0000894

Ex. 2002
Page 736 of 915

4.0 Mid-Development Entrance Gate Approval Requirements

All Amounts : Division Managing Director/GM

Decision Makers	Name	Ok As-Is	OK w/Changes Noted	STOP	Rework & Return	Signature	Date
General Manager, SWS	Rick Rodier						
Division Controller	Brad Mlynar						
Marketing Director	Neil Borenstein						
Engineering Director	Joe Hager						
Manufacturing Director	Cabrini Brandl						
Sales Director	Butch Greeninger						
Customer Care / Service Director	Jack Hensley						
Engineering Tech Svcs Director	Greg Tonsager						
Sr. Marketing Mgr, International	Michael Brugh						

TORO-0000929

Ex. 2002
Page 737 of 915

4.0 Mid-Development Entrance Gate Decision and Feedback

Project Team			
Marketing Leader	Sean O'Halloran	**Quality Engineer**	Tony Niemczyk
Engineering Leader	John Azure	**NPD Sourcing Specialist**	Randy Huerkamp
Manufacturing	Scott Vollmer	**Customer Care**	Kevin Conney
Advanced Manufacturing Engineer	Andrew Berglund	**Test**	Dave Murray

TORO-0000930

Ex. 2002
Page 738 of 915

4.0 Mid-Development Entrance Gate Decision and Feedback

Feedback

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TORO-0000931

Ex. 2002
Page 739 of 915

Scanned Copy of Prior Gate Approval and Feedback

W298 FEASIBILITY FEEDBACK

- Need 3.0 on project update at $500 ticket for this project

Happe - Next Gen TX 2.0 Feedback

- In addition to the market share gain, we need to see gross margin on the next Gen Diego slightly improved. It is important we drive the Core Syte product category ROI to double digit yield.
- Have a specific mkt share goal. #1 is nice but may not always equate to rising market share. We should consider 40% w/in-bracket utility leaders.
- VOC w/ non-Diego owners critical to achieving growth
- How do we define a new specification category if we can deliver significant innovation? We have to maintain meaningful differentiation so we don't lose a spec war in the future. What customer problems will we solve that no one else does or can? Wish list to drive incremental improvement; problems drive value
- Good quality results on current Diego — can't go backwards
- Contacts key area to investigate for differentiation ——> smarter, intuitive
- Price to market (street) value ——> should make sense to an upsell
- Target financial improvements: REDACTED
- Is there any part of NGTX project spending that is helpful for the Atlas product?
- Are there any Operational Targets: OSHA, Parts cost, [redacted] target spec, etc to consider?

Detail 2 / 2

2/20/2015 8:30:10 AM 4

4.0 Mid-Development Entrance Gate

W298: Next Gen TX

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TORO-0000932

Business and Project Strategy

Explain how this new product aligns with the business strategy and product category strategy. Describe how the market strategy will optimize the sales of this new product.

- Successfully expand the Dingo product line offering with the introduction of the TX 1000 Narrow Track and Wide Track units
  - Next Gen units will be additions to the existing TX line
  - Existing units have significant value, in both the dealer and rental channels
- Become #1 Compact Utility Loader of choice for contractors and Rental
  - Meet, and exceed, competitor specifications and incorporate key features
    - Greatest rated operating capacity (1000 and 1075 lbs) in the CUL category
    - 81" hinge pin height to clear 30 yard dumpsters and one ton truck with 24" sideboards
    - High drive track system
    - High max travel speed in forward (4.7 mph) and reverse (4.7 mph)
    - Intuitive and differentiated traction controls
- Re-establish Toro as the CUL market leader
  - Toro invented the category, and Toro is re-inventing the category through TX 1000 product innovation
    - Vertical lift loader arm design and traction controls

Business and Project Strategy

Explain how this new product aligns with the business strategy and product category strategy. Describe how the market strategy will optimize the sales of this new product.

- Grow market share
  - Toro tracked CUL share grew slightly in 2014 (31% through Nov); the strategy is to gain significant share
    - Obtain 38% market share in 2019 (as measured by AEM, units shipped)
- Protect margin and profit
  - TX 1000 units will feature lower margin than current TX products
  - Team has a cost reduction action list for TX 1000 items

Project Objective

Define the specific objective of the project. Describe the purpose of the project and identify the measures and timing of project success. Include a description any constraints or nonnegotiable parameters set for this project or product that must be achieve.

- Introduce Dingo TX 1000 models that:
  - are differentiated from competitor units
  - have key specs and capabilities that are greater than competitor units
  - better meet end-user product requirements, for both professional contractors and rental customers
- Increase Toro market share in the tracked compact utility loader category
  - Achieve 38% market share in 2019
- Project success will be measured by:
  - Successful launch and introduction at the ARA show - February 23-25
  - Securing orders for a minimum of 200 units before the end of March (in advance of anticipated June/July shipments)
  - Market share gain, 32.3% share by the end of 2015

TORO-0000935

Ex. 2002
Page 743 of 915

Customer Feedback

Identify customers from whom feedback was received. Explain in detail the specific feedback the customers provided. Describe the actions that will be taken to respond to the feedback.

- Customers provided traction controls feedback regarding:
  - Intuitiveness of controls and ease of operation
  - Control design and ergonomic preferences
  - Level of operator strain/fatigue
  - Machine responsiveness when changing direction
- Customers also provided input regarding
  - General impressions of the 3.0 units
  - (Most of these customers had previously reviewed the 2.0 machines)

Name	Company
Charlie Kraemer	Landscape Charlie
Bill Jorgensen	Landscapes by Lora
Evan Jorgensen	Landscapes by Lora
Jack Evans	Natural Elements Lawn and Landscape
Simon Huxtable	Patio Plus LLC, owner
Mike Hart	Beds and Borders Landscape and Design
Andrew Riegert	Natural Surroundings Landscape and Design
Cory Unterschuetz	Cities Edge Landscaping
Dean Bjorkstrand	Bjorsktrand, Inc. Landscaping
David Titus	Sunbelt Rentals
Jeff Reid	BlueLine Rental
John McVeigh	BlueLine Rental



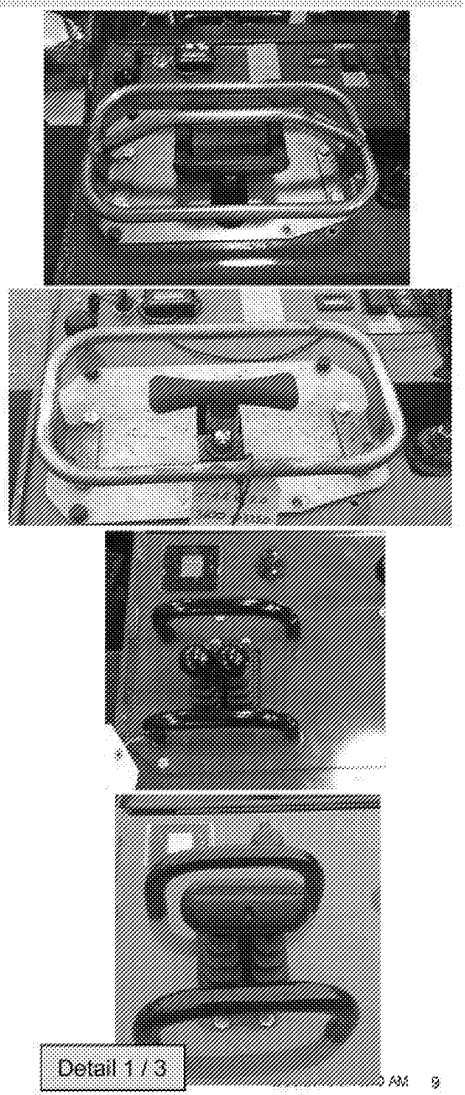
TORO-0000936

Ex. 2002
Page 744 of 915

Customer Feedback

Identify customers from whom feedback was received. Explain in detail the specific feedback the customers provided. Describe the actions that will be taken to respond to the feedback.

- #1 Shrunken-down TX control
  - Control was too large and too bulky
  - Reference bar did not sync up well with control
  - Not comfortable, difficult to operate
- #2 Dog-bone
  - Similar to Bobcat's style
  - Too much twisting required for basic movements
  - Not ideal for turning
  - Contributed to operator fatigue
- #3 Two-levers
  - Similar to Ditch Witch controls (viewed positively by DW owners)
  - Intuitive, easy, simple, effortless
  - Not ideal for tight turns, and difficult to go straight in reverse
- #4 TX 1000 traction controls
  - Intuitive, easy, effortless, simple
  - (Additional info on the next slide)



Ex. 2002
Page 745 of 915

Customer Feedback

Identify customers from whom feedback was received. Explain in detail the specific feedback the customers provided. Describe the actions that will be taken to respond to the feedback.

- TX 1000 traction controls
  - Final controls were a result of all input on previous control iterations
  - Control design is ideal for various requirements of ride-on CULs
    - Easily drive machine with one hand (preferred for ride-on units)
    - Ideal for turning, particularly tight spin turns
    - Ideal for driving backwards – easy to drive the unit in a straight line when needed
  - Control design/ergonomics
    - Effortless, simple, no strain
    - Can easily operate the unit without grasping the control
  - Reference bars
    - Positioned nicely in relation to control
    - Can use palm or fingertips on control while using reference bar for stability



TORO-0000938

Ex. 2002
Page 746 of 915

Customer Feedback

Identify customers from whom feedback was received. Explain in detail the specific feedback the customers provided. Describe the actions that will be taken to respond to the feedback.

- Additional customer input on initial 3.0 machines
  - Noted that machine felt underpowered with the D902
  - Unit easily stalled out
  - Unit seemed excessively strained
  - Unit was slower than preferred for most customers
- The subsequent change to the D1305 engine addressed and resolved the issues identified above







4.0 Mid-Development Entrance Gate

W298: Next Gen TX

Details, 1 pgs

2/26/2015 8:10:10 AM 12



4.0 Mid-Development Entrance Gate

W298: Next Gen TX

Detail 1 / 1

2/20/2015 8:10:10 AM 13

Prototype Plan and Results

Describe the plan and the estimated schedule for prototypes to be built and tested. Report results of prototypes that have been built.

- 3.0 Testing summary
  - Field Test Narrow Track went 82 hours in the field. Issues with track retention, loader arm strength lack of power and a muffler failure caused this testing to be stopped in early November.
  - Field Test Wide track went 224 hours in the field . Weather, engine power and loader arm strength were issues during Testing.
  - Initial Heat test was completed with the Kubota 1305.
  - Performance of the modified hydraulic system was evaluated with the auger drive and found to be acceptable

Prototype Plan and Results

Describe the plan and the estimated schedule for prototypes to be built and tested. Report results of prototypes that have been built.

- 4.0 testing planned
  - 4.0 testing is planned to be completed after first production
  - Two units to 500 hours. attempt to average 35 hours/week= 14.3 weeks start date of 2/16/15

Attempted	35 hrs/week	14.3 weeks	5/26/15
6 days/week	30 hrs/week	16.7 weeks	6/11/15
Normal plan	25 hrs/week	20 weeks	7/3/15

  - Heat test will be done with Kubota data points included and will be done with 50/50 mix per Kubota procedure. Normal Toro procedure is with water.
  - Lab durability test 1000 hours 10 weeks. 5/5/15
  - Lab component durability test of the traction controls using a dust box planned to evaluate production tooled parts

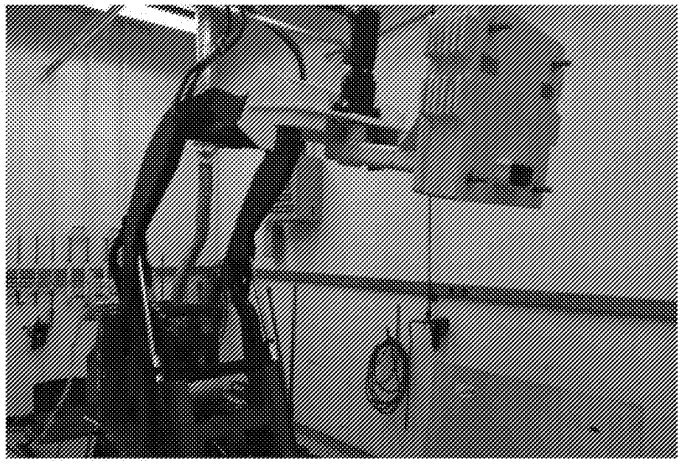
TORO-0000943

Ex. 2002
Page 751 of 915

Prototype Plan and Results

Describe the plan and the estimated schedule for prototypes to be built and tested. Report results of prototypes that have been built.

- Lab Loader arm cycle test to start this week, 50,000 cycles (4 weeks).



  - Stability, Tip capacity, Hot Surface, Sound and vibration testing to be done using pilot units or other non-test 4.0 prototypes when available.
  - Safety Testing per ISO 20474,EN 474, SAE 2752

TORO-0000944

Ex. 2002
Page 752 of 915

Prototype Plan and Results

Describe the plan and the estimated schedule for prototypes to be built and tested. Report results of prototypes that have been built.

- Attachment Performance evaluation- Dingo attachments to evaluate their effect on the traction unit and the effect of the increase lift and height on the attachment.
- New Bucket Stress evaluation
- Other testing that may be delayed until late in the 4.0 test schedule includes Fork and Leveler cycle testing with the heavier TX 1000 loading.

Prototype Plan and Results

Describe the plan and the estimated schedule for prototypes to be built and tested. Report results of prototypes that have been built.

5.0 Stage

- Two pilot preship units (1NT, 1 WT) tested to 100 hours
- Two production preship units tested to 50 hours

TORO-0000946

Ex. 2002
Page 754 of 915

Sourcing Plan and Readiness

Explain the sourcing plan for this product. Identify the critical components and the suppliers. Explain how and why they are selected. Describe their performance and ability to achieve the critical quality, delivery and cost t

Sourcing Plan and Readiness Project: W298 Next Gen TX - Tmax	01/05/2015	Stage Gate: 4.0 Mid-Development	Background Information
Critical Processes (Color code based on status) Green= On schedule to meet target, no problems foreseen Yellow=Some concerns about meeting target Red=Target not attainable at this time, action needed	Status	Comments (Critical concerns/Action plans)	Target
Application Reviews		Application Reviews are identified in the Advanced Quality Plan. The Advanced Quality Plan has not identified any Application Reviews to date.	Application reviews are identified by the Advanced Quality Plan.
New suppliers and justification		There are no new suppliers.	New suppliers are added per the New Supplier Add Process.
Sole sourced components		Sole sourced suppliers are REDACTED	Identify parts awarded to a supplier that would take more than one year to re-source
Single sourced components		Single sourced components are: REDACTED REDACTED	Identify parts awarded to a supplier that are hard tooled or proprietary which would be difficult to move or replace
Restricted / Probation Suppliers		REDACTED are Restricted Suppliers. The Sourcing Quality Engineer is working with each supplier to get their status back to approved.	It is Toro's policy to not offer any new business opportunities with those suppliers placed on Probation status and limit opportunities for those on Restrictive.
Cost savings / avoidance activities		No cost savings/avoidances identified at this time.	Report cost savings activities during the project.

Ex. 2002
Page 755 of 915

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TORO-0000947

Sourcing Plan and Readiness

Explain the sourcing plan for this product. Identify the critical components and the suppliers. Explain how and why they are selected. Describe their performance and ability to achieve the critical quality, delivery and cost t

Sourcing Plan and Readiness (Cont.) Project: W298 Next Gen TX - Tmax 01/05/2015		Stage Gate: 4.0 Mid-Development	Background Information
Critical Processes (Color code based on status) Green= On schedule to meet target, no problems forseen Yellow=Some concerns about meeting target Red=Target not attainable at this time, action needed	Status	Comments (Critical concerns/Action plans)	Target
Lead-time		There are no lead-time issues at this time.	Identify critical long lead-time new purchased parts. (i.e. tooled or global sourced)
Part Count		The total part count is supplied by the AME in the DFMA Plan and Metrics Slide	New part numbers and total part count.
Total Cost Model		There are no parts identified that need the total cost model used at this time.	Identify if and how many parts have used the Total Cost Model Process (TCM).
Supplier Capacity Constraints		No Capacity Constraints are known at this time.	Identify critical components that may have capacity constraints
Sourcing challenges or concerns		There are no sourcing concerns at this point.	Identify concerns that should be noted during the gate meeting

Ex. 2002
Page 756 of 915

Sourcing Plan and Readiness

Explain the sourcing plan for this product. Identify the critical components and the suppliers. Explain how and why they are selected. Describe their performance and ability to achieve the critical quality, delivery and cost targets.

Sourcing Plan and Readiness (Cont.) **Stage Gate: 4.0 Mid-Development**

Project: W298 Next Gen TX - Tmas Updated: 01/05/2015

Critical Suppliers

Company	*Part Description*	*SPE*	*PPM*	*Delivery*	*ASL Status*	*Comments*
REDACTED	Cylinder	80.5	3,675	25	Restricted	Grow
	Control Valves	64.18	6,999	25	Restricted	Maintain
	Gear Pump	85.5	1,918	25	Approved	Maintain
	Track	97.06	0	25	Approved	Grow
	Tandem Pump	100	0	25	Approved	Maintain
	Pump Mount Asm	71	5,748	25	Approved	Maintain
	Engine	100	0	25	Approved	Maintain
	Wheel Motor	86	2,669	25	Restricted	Maintain

Ex. 2002
Page 757 of 915

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Advanced Quality Plan

Summarize the status of the key components and suppliers for this product.

Quality Plan	Status	Plan
3.0 Machine Risk Assessment	Complete (Initial Risk Determined)	Key Components/Assemblies

	3.0	4.0	5.0
High	31	25	----
Moderate	35	33	----

Quality Plan	Status	Plan
Advanced Quality Plan	In Process (Due by Pilot)	Key Components/Assemblies •Engine •Lift system •Hydraulic Motors •Frame •Drive wheels •Hydraulic Pump •Muffler •Fuel Tank •Operator Controls •Tracks •Parking Brake
Application Reviews	In Process (Due by Prod)	12 Planned
Validation Audit Plan	In Process (Due by Release)	2 Pilot, 2 Production
Validation Pre-Ship Plan	In Process (Due by Release)	2 Pilot (100hr Min), 2 Prod (50hr Min)

TORO-0000950

Ex. 2002
Page 758 of 915

Production Plan and Readiness

Explain the plan for producing this product. Identify the production locations, why that location is the best choice, and how the ramp-up to production will occur. Describe the line changes and major equipment required.

Pilot Manufacturing Readiness Scorecard

Project: TX-1000 (22327,22328) **Updated:** Current Est. Pilot 3/17/15

Critical Processes (Color code based on status)		Status	Comments (Critical concerns/Action plans)	Background Information: Champion	Background Information: Target
Color Code	Green=On Schedule no concerns at this time				
	Yellow=Some concerns about meeting target				
	Red=Target not attainable at this time, action required				
Resources	Production time and resources scheduled for Pilot	Pilot run is currently scheduled on line 16 starting 3/17/15 - (5) wide and (3) narrow		Plant Manager	Resources identified and available for production and support operations three months before Pilot.
	Plan for first full production established	1st production is currently scheduled for 4/20/15 (40) wide, (10) narrow		Plant Manager	Complete before Pilot begins.
Component Tooling	All component tooling ordered	All tooling ordered		AME	Ordered per lead time requirements.
	Weld, die cast, stamping, and injection molded tooling built	Weld tooling in process - delivery will be close due to late releases		AME	Completed two weeks (per lead time) before Pilot.
	Weld, die cast, stamping and injection molded tooling qualified	not started yet		Plant M.E/AME	Part qualified on production equipment one week before Pilot.
Assy. Tooling Fixtures	Assembly tooling and fixtures ordered			Plant M.E.	Ordered per lead time requirements.
	Identified assembly tooling and fixtures built	Some complete, currently working on a loader arm assy tool		Plant M.E.	Completed and functional before Pilot begins.
Paint	Paint Review	in-process		Plant M.E.	Complete before Pilot begins.

Production Plan and Readiness

Explain the plan for producing this product. Identify the production locations, why that location is the best choice, and how the ramp-up to production will occur. Describe the line changes and major equipment required.

Pilot Manufacturing Readiness Scorecard

Project: TX-1000 (22327,22328) **Updated:** Current Est. Pilot 3/17/15

				Background Information	
Incoming Parts	Parts Availability	130-7732, P.O. revised 1/16, tooling 3/27, vendor is stating mid April. Casappa pumps are also a concern.		Materials Supervisor	Shortage meetings will verify all parts are available at the correct revision one week before Pilot.
Mfg. Processes	Completed production assembly process and visual aides	25% complete, waiting on drawings		Plant M.E.	Complete before Pilot begins.
	Critical torque requirements documented in assembly process, tools available	Waiting for specs.		Plant M.E.	Complete before Pilot begins.
	Safety Review and Training	In-process		Plant M.E.	Complete before Pilot begins.
	Manufacturing Inspection Plans			Plant Quality	Complete before Pilot begins.
Other requirements	Installation of Plant Capital Equipment	Complete		Plant ME	Operational for Pilot.
	Final Assembly notes and drawings complete. (includes packaging)	In-process, due date is 2/10/15		Eng. Project Lead/AME	Complete per the Pilot Standard 5 weeks.
	Testing			Test	Complete per the Test Plan prior to Pilot.
	Cost Rolls and Routings complete			Cost Est.	Complete before Pilot begins.
	Key Components received with certificate of conformance and approved			AQE	Received with parts.
	Certificate of Origin Documents			Sourcing	Received from each supplier before parts can be imported.

TORO-0000952

Ex. 2002
Page 760 of 915

Regulatory and Compliance Readiness

List all Agency, Regulatory and Compliance standards which the product must satisfy. Include both voluntary and mandatory requirements need for sales success in the target markets. Explain the current status of approval for each standard and note what remains to be completed, by when and by whom.



TORO-0000953

Ex. 2002
Page 761 of 915

Market Launch Plan and Readiness

List the tasks required for successful market launch. Identify actions as planned or completed. Address all relevant aspects, including programs, marketing communications, obsolete products, training, field service, inventory positioning, etc.

- TX 1000 product training and education
  - SWS Sales Meeting January 20-21, Lyndale
    - Completed full product review, and entire Sales team operated product
  - TRB/DOB distribution February 10
    - Full product summary and review, including pricing
    - First public disclosure
  - Dealer webcast February 10
    - Full product review for all SWS dealers
  - Rental Rep product training February 21-22, New Orleans
    - Product walk-around, features and benefits review, product demo
    - Goal is to familiarize Rental Reps with the product in advance of the ARA Show
  - Dealer Training April 13-15, Lyndale and Appleside
    - Full product review, marketing programs review, and demo at Appleside

Market Launch Plan and Readiness

List the tasks required for successful market launch. Identify actions as planned or completed. Address all relevant aspects, including programs, marketing communications, obsolete products, training, field service, inventory positioning, etc.

- TX 1000 Marketing and launch plan
  - Plans identified for both the Dealer and Rental channels

TX 1000 Launch Activities

Category	Activity	Status / date planned	Notes:
PM/Agency	Performance - TX 1000 PR and Messaging	In process	Performance Marketing: TX 1000 PR and Messaging work etc.
Photo/video	TX 1000 Studio photography	Complete	Photo editing
Photo/video	TX 1000 Video and still photography	Complete	TX 1000 and full Dingo line-up videos
Tradeshows	Booth assets - touch screen	In process	Interactive monitors
Tradeshows	Booth assets - product pedestal	In process	
Training	ARA Rep training	February	
Advertising	Rental Management - March issue	March	Full page ad, this issue highlights post-show news
Advertising	Compact Equipment - March issue	March	Full page ad, Compact Tool Carrier issue
Email blast	Post-ARA Rental store email blast	March	
TRBs/DOBs/Webcasts	TX 1000 educational info	February-June	Consistent educational info around TX 1000
Training	Commercial Dealer training	April	
Toro.com	Website updates	April/May	TX 1000 photography and video
Toro.com	Banner announcement	April/May	
Literature	Dingo TX 1000 sell sheet	In process	
Literature	updated Rental Guide	In process	Updated guide to include TX 1000 units
Literature	Full line Dingo brochure	April	Performance Marketing editing and formatting
Literature	Attachment guide brochure	April	
Direct mail	Rental direct mail	May	
Advertising	Lawn and Landscape - May issue	May	Full page ad, Mini-track loaders issue
Direct mail	Dealer direct mail	May	UCC list last 3 years, 3500 names.
Direct mail	Dealer direct mail	May	Toro Warranty Registration list last 5 years, 4000 names
Point of Sales	POS kits	May	Poster, counter mats, window cling
Advertising	Ad Slicks for Dealers	May	
Advertising	RER - June issue	June	Full page ad
Dealer Promos	Dealer Promotion Activities	Jul - Aug	Facilitate Dealer activities/events around TX 1000

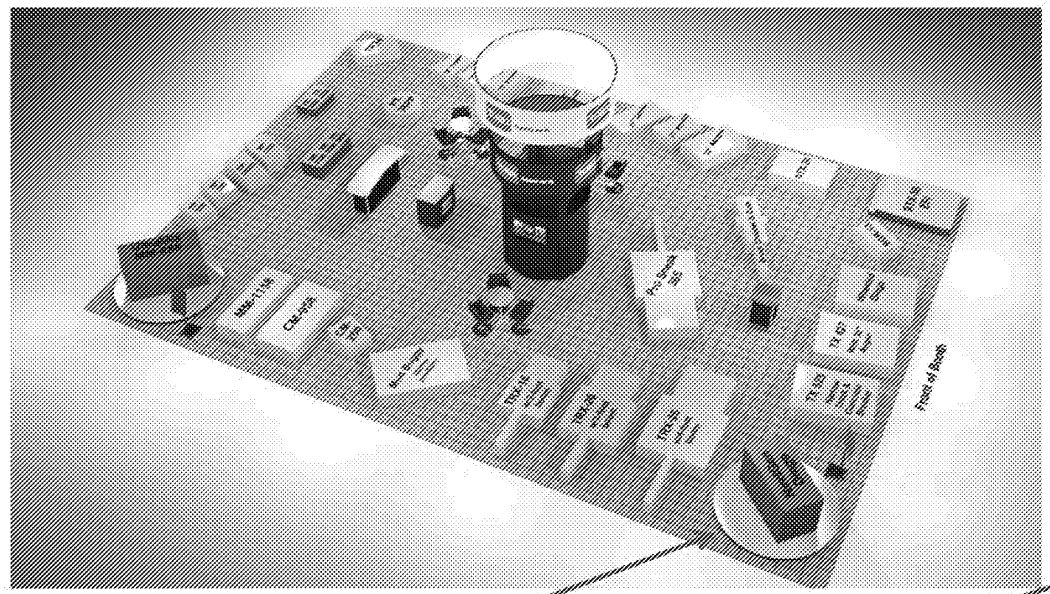
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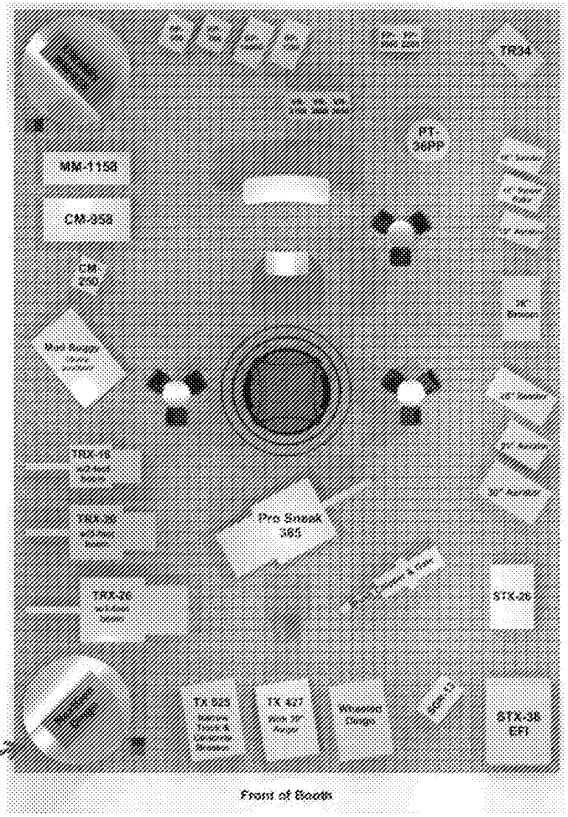
Ex. 2002
Page 763 of 915

Market Launch Plan and Readiness

List the tasks required for successful market launch. Identify actions as planned or completed. Address all relevant aspects, including programs, marketing communications, obsolete products, training, field service, inventory positioning, etc.

- ARA Show planning
  - Prominent TX 1000 display and signage at the Rental Show
  - New podium for TX 1000





4.0 Mid-Development Entrance Gate

W298: Next Gen TX

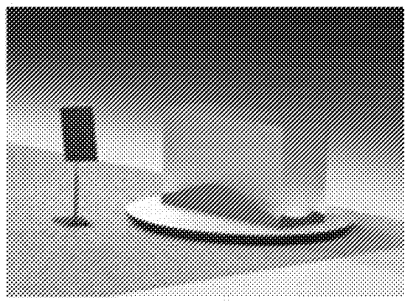
Detail 2 / 6

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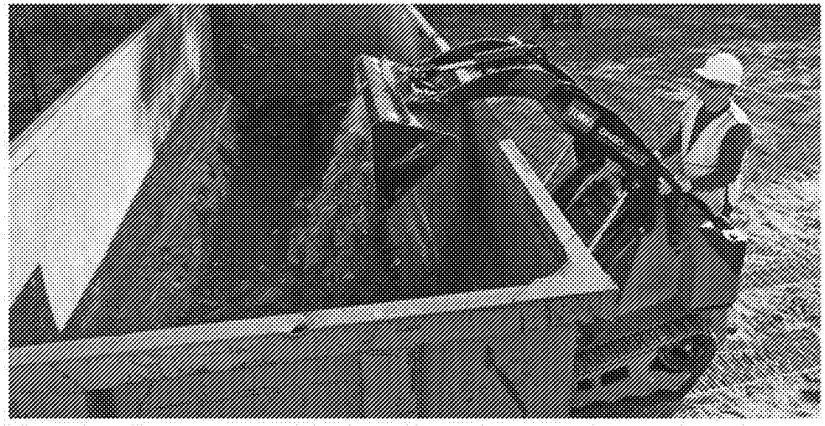
Market Launch Plan and Readiness

List the tasks required for successful market launch. Identify actions as planned or completed. Address all relevant aspects, including programs, marketing communications, obsolete products, training, field service, inventory positioning, etc.

- ARA Show planning
  - Project Siena display touch screens
    - Interactive monitors
    - Access to videos and photos, literature, specs
    - Link to pdf literature of new sell sheets
  - PR and Press Conference
    - Scheduled launch to the media







TORO-0000957

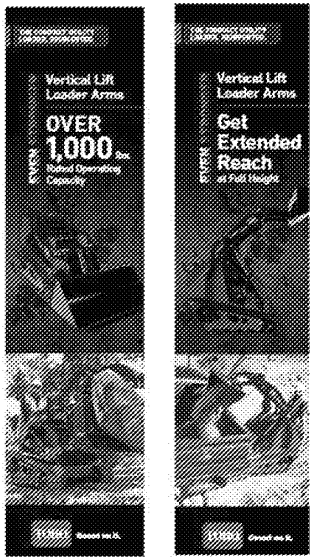
Ex. 2002
Page 765 of 915

Market Launch Plan and Readiness

List the tasks required for successful market launch. Identify actions as planned or completed. Address all relevant aspects, including programs, marketing communications, obsolete products, training, field service, inventory positioning, etc.

- ARA Show planning
  - 8' display tower (4-sided, 2ft wide) with graphics will be positioned near the TX 1000
  - Signage on product for key feature callouts







4.0 Mid-Development Entrance Gate

W298: Next Gen TX

Detail 4 / 6

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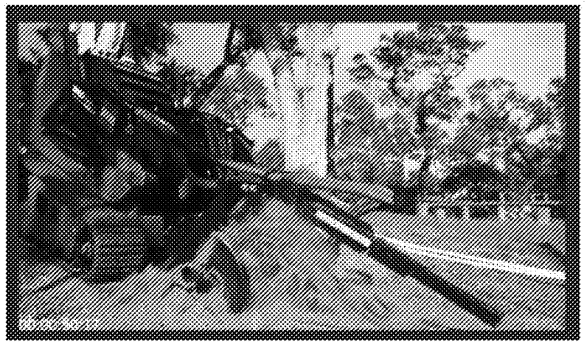
Ex. 2002
Page 766 of 915

Market Launch Plan and Readiness

List the tasks required for successful market launch. Identify actions as planned or completed. Address all relevant aspects, including programs, marketing communications, obsolete products, training, field service, inventory positioning, etc.

- ARA Show and launch planning
  - TX 1000 videos designed to engage viewers
    - Overview is 1 minute, feature videos are about 45 seconds each
    - TX 1000 videos will be utilized on Toro.com and YouTube
  - TX 1000 videos are complete
    - #1 Product overview
    - #2 Vertical Lift Loader Arms
    - #3 High Drive Track System
    - #4 Easy to Use
    - #5 Efficiency and Maintenance





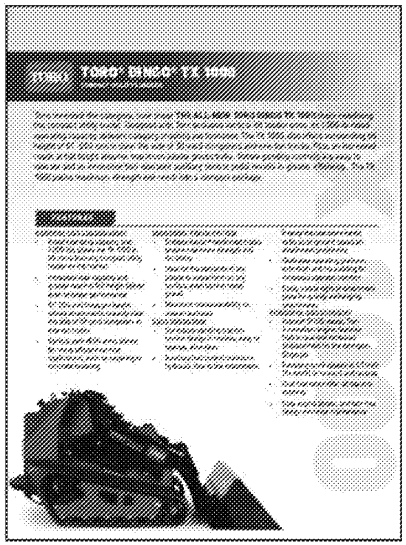
Ex. 2002
Page 767 of 915

TORO-0000959

Market Launch Plan and Readiness

List the tasks required for successful market launch. Identify actions as planned or completed. Address all relevant aspects, including programs, marketing communications, obsolete products, training, field service, inventory positioning, etc.

- Literature and creative
  - Artwork and copy for planned advertisements is finalized
  - Sell sheet is nearly complete
  - New catalog creation is in process







4.0 Mid-Development Entrance Gate

W298: Next Gen TX

Details, 4 pgs

2/23/2015 8:10:10 AM 33



4.0 Mid-Development Entrance Gate

W298: Next Gen TX

Detail 1 / 4

2/20/2015 8:18:18 AM 34



4.0 Mid-Development Entrance Gate

W298: Next Gen TX

Detail 2 / 4

2/20/2015 8:18:18 AM 35



4.0 Mid-Development Entrance Gate

W298: Next Gen TX

Detail 3 / 4

2/20/2015 8:18:18 AM 36



4.0 Mid-Development Entrance Gate

W298: Next Gen TX

Detail 4 / 4

2/20/2015 8:18:18 AM 37

Projected Annual Quantity

Project the annual quantity expected to be sold in the next five years, for each model, domestic and international. Note if presented in units or thousands of units. Values are considered estimates until the Development Gate is approved, when then become measures of performance.

Model / SKU#	Description	FY1	FY2	FY3	FY4	FY5
Domestic		2015	2016	2017	2018	2019
22327	Dingo TX 1000 Narrow Track	103	171	242	294	334
22328	Dingo TX 1000 Wide Track	216	456	517	578	636
	Total	**319**	**627**	**759**	**872**	**970**
International		2015	2016	2017	2018	2019
22327	Dingo TX 1000 Narrow Track	7	12	15	18	23
22328	Dingo TX 1000 Wide Track	18	25	29	35	41
	Total	**25**	**37**	**44**	**53**	**64**

Project Investment

Estimate the project investment by fiscal year and by phase. Update projections and actual at each Gate.

Project Investment by Phase

Dollars in Thousands ($,000.)		Concept Phase	Feasibility Phase	Development Phase	Mid-Development Phase	Mfg Pilot Phase	Total	Comments
Engineering	Original Estimate		665	849	145	118	1,777	
	Current Projection				189	114	**2,075**	
	Actual		665	1,107			1,772	
	Variance			258	44	(4)	298	
Tooling	Original Estimate			150	100	100	350	
	Current Projection			150	100	170	**420**	
	Actual							
	Variance					70	70	
Marketing	Original Estimate			50	75	75	200	
	Current Projection				100	50	**150**	
	Actual							
	Variance			(50)	25	(25)	(50)	
Other	Original Estimate							
	Current Projection							
	Actual							
	Variance							
Total	Original Estimate		665	1,049	320	293	2,327	***Original Estimate***
	Current Projection			150	389	334	2,645	*Current Projection*
	Actual		665	1,107			1,772	***Actual to Date***
	Variance			208	69	41	318	***Variance***

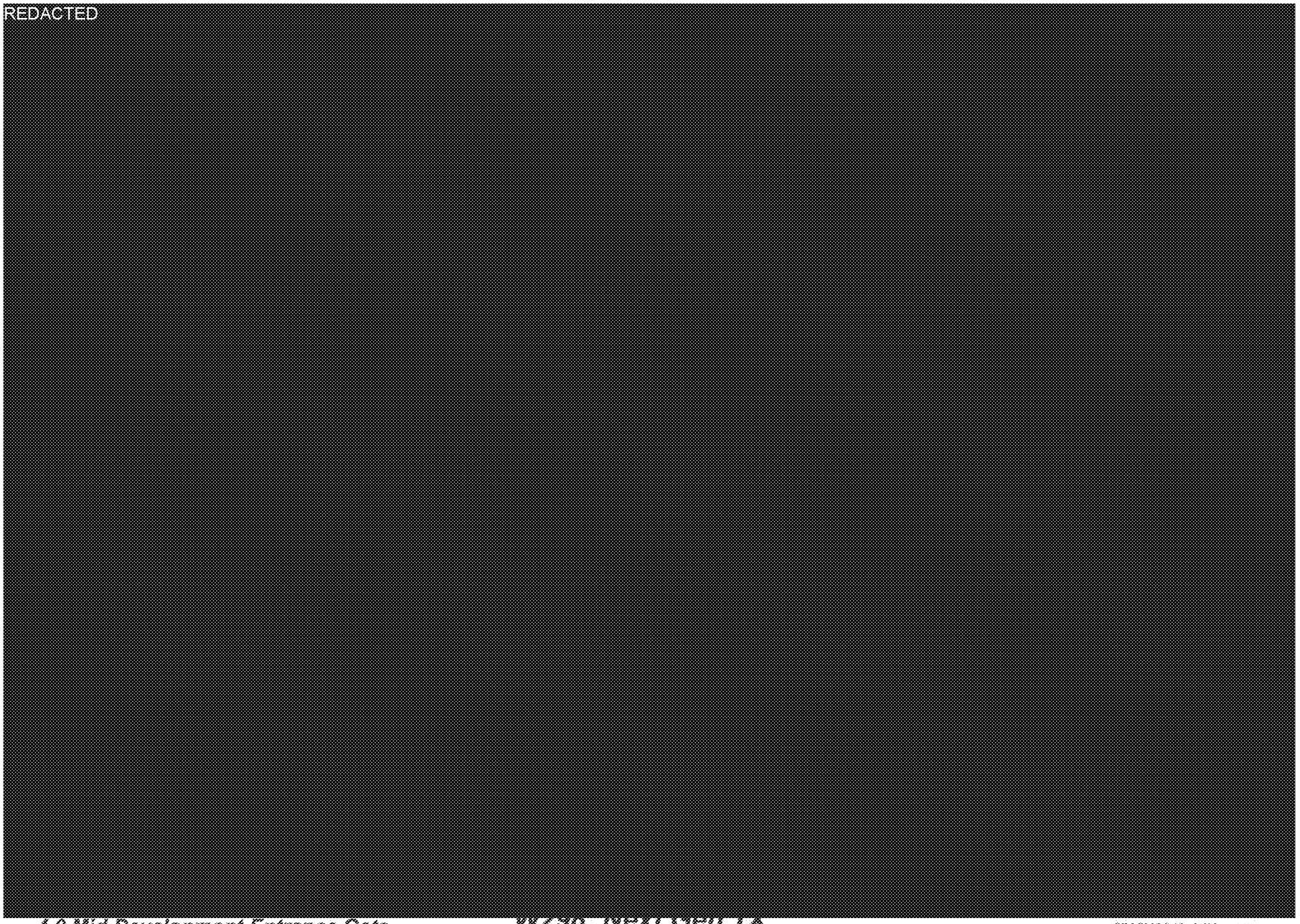
* Actual spending is through January 2014

Project Investment

Estimate the project investment by fiscal year and by phase. Update projections and actual at each Gate.

Dollars in Thousands	Project Investment by Fiscal Year					
Fiscal Year	*2013*	*2014*	*2015*	*2016*	*2017*	Total
Engineering	$ 512	$ 955	$ 608			**$ 2,075**
Tooling		$ 250	$ 170			**$ 420**
Marketing		$ -	$ 150			**$ 150**
Other						$ -
Total	**$ 512**	**$ 1,205**	**$ 928**	$ -	$ -	**$ 2,645**

*Added spending was mainly in 2015 because of the extension of the project due to the engine change


REDACTED
4.0 Mid-Development Entrance Gate
W298: Next Gen TX
2/20/2015 8:18:18 AM
41

Project Schedule and Milestones

List the milestones and dates that are critical to achieve the planned project schedule.

Milestone Dates	3.0 Plan	Actual / 4.0 Update	Comments
2.0 Approval	3/11/13	3/11/13	
2.0 Prototype Build Completed	10/7/13	10/7/13	
3.0 Signoff	2/17/14	2/17/14	
3.0 Prototype Build Completed	5/27/14	7/23/14	
3.5 Update	6/23/14	11/3/14	DR to change to D1305 engine
Long Lead / Tooling Releases	9/25/14	11/19/14	Major weldments and castings released here
4.0 Signoff	10/15/14	1/30/15	
4.0 Updates (build)	10/29/14	2/3/15	In process; all weldments now complete
5.0 Signoff	1/5/15	3/9/15	
Pilot Build Start	1/14/15	4/14/15	
Production Start	3/12/15	5/26/15	
Release to Ship	3/19/15	6/16/15	
500 hours complete on 4.0's	3/18/15	6/11/15	See Test Plan for details

Ex. 2002
Page 778 of 915

Mid-Development Phase Actions

List the most critical actions the team needs to complete in the Mid-Development Phase for this project to fully satisfy the stated project objectives.

Engineering

- Finish 4.0 build
- Finish final releases
- React to field and lab issues
- Complete Risk assessments
- Complete application reviews, including Kubota approval
- Marketing support for Rental Show
- Attachment work
  - 3 skus assigned for 2 new buckets and strengthened forks
    - Buckets samples are being welded now; more work is required on the forks
  - Backhoe will not initially be available for this unit without some kind of adapter kit

TORO-0000971

Ex. 2002
Page 779 of 915

Mid-Development Phase Actions

List the most critical actions the team needs to complete in the Mid-Development Phase for this project to fully satisfy the stated project objectives.

Marketing

- Successful debut at ARA (Rental) Show
- Complete effective demo product training and webcasts to our Channel partners
- Provide effective TX 1000 launch materials and effectively communicate the planned marketing activities to our Channel

Mid-Development Phase Actions

List the most critical actions the team needs to complete in the Mid-Development Phase for this project to fully satisfy the stated project objectives.

- Service
  - A service manual will be developed off a pilot unit or a marketing unit after ARA
  - Service schools will likely take place in the fall

TORO-0000973

Ex. 2002
Page 781 of 915

Project Risks and Risk Management Plan

List the risks that may limit the project from achieving the goal. Consider all aspects including: marketing, competition, distribution, quality, performance, price, design, supply, etc. For each risk state the impact, the likelihood of occurring, the mitigation actions to prevent the occurrence and the contingency plan if it occurs.

Priority	Risk	Likely To Occur	Impact	Mitigation Actions	Contingency Actions
Rank	What is the issue that may impact the project?	High Medium Low	If it occurs how will it effect the project?	What are the actions being taken to prevent the occurrence or minimize the impact?	If the Risk does occur what actions will the team take?
1	Lack of durability testing on new engine, loader, controls, and track changes	High	Unknown failure types and issues in the field	Loader arm cycle test; Control cycle test, expedited field testing; more visits to test site to monitor and jump on test issues	Review and address field issues
2	Loader arm complexity and durability results in failures	Med	Increased weight, cost, and time to develop the arm	Loader arm linkages revised for 4.0 and more iterative FEA completed; Aggressive loader cycle test in process	Revise and reinforce loader design

TORO-0000974

Ex. 2002
Page 782 of 915

Project Risks and Risk Management Plan

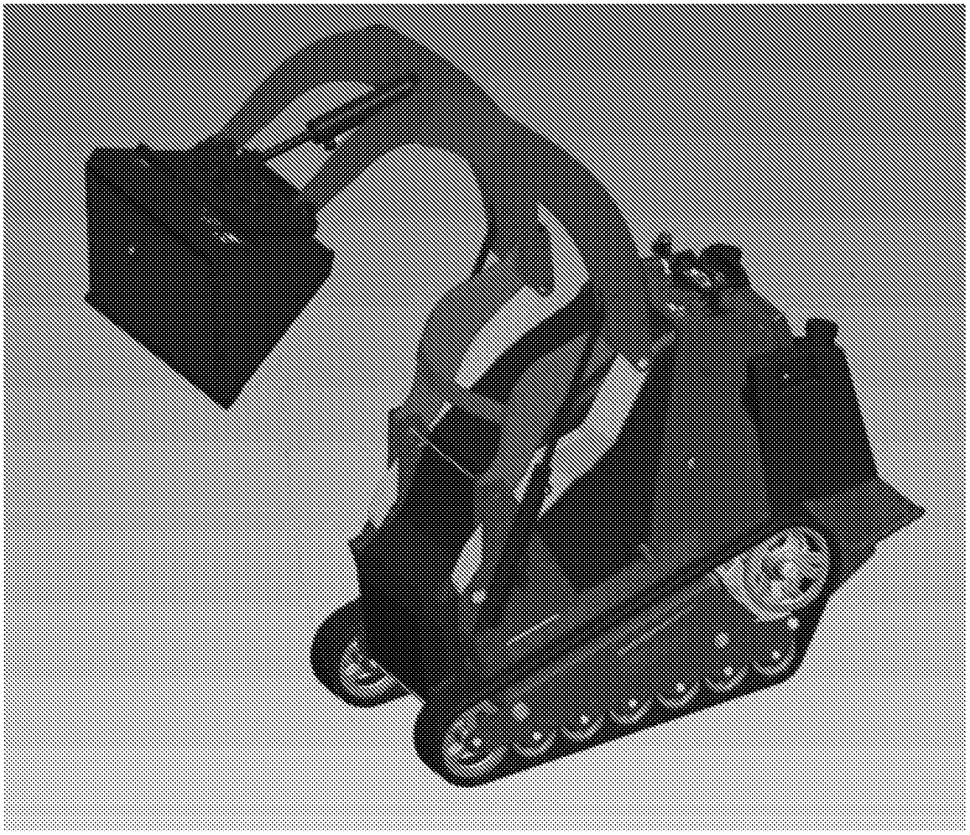
List the risks that may limit the project from achieving the goal. Consider all aspects including: marketing, competition, distribution, quality, performance, price, design, supply, etc. For each risk state the impact, the likelihood of occurring, the mitigation actions to prevent the occurrence and the contingency plan if it occurs.

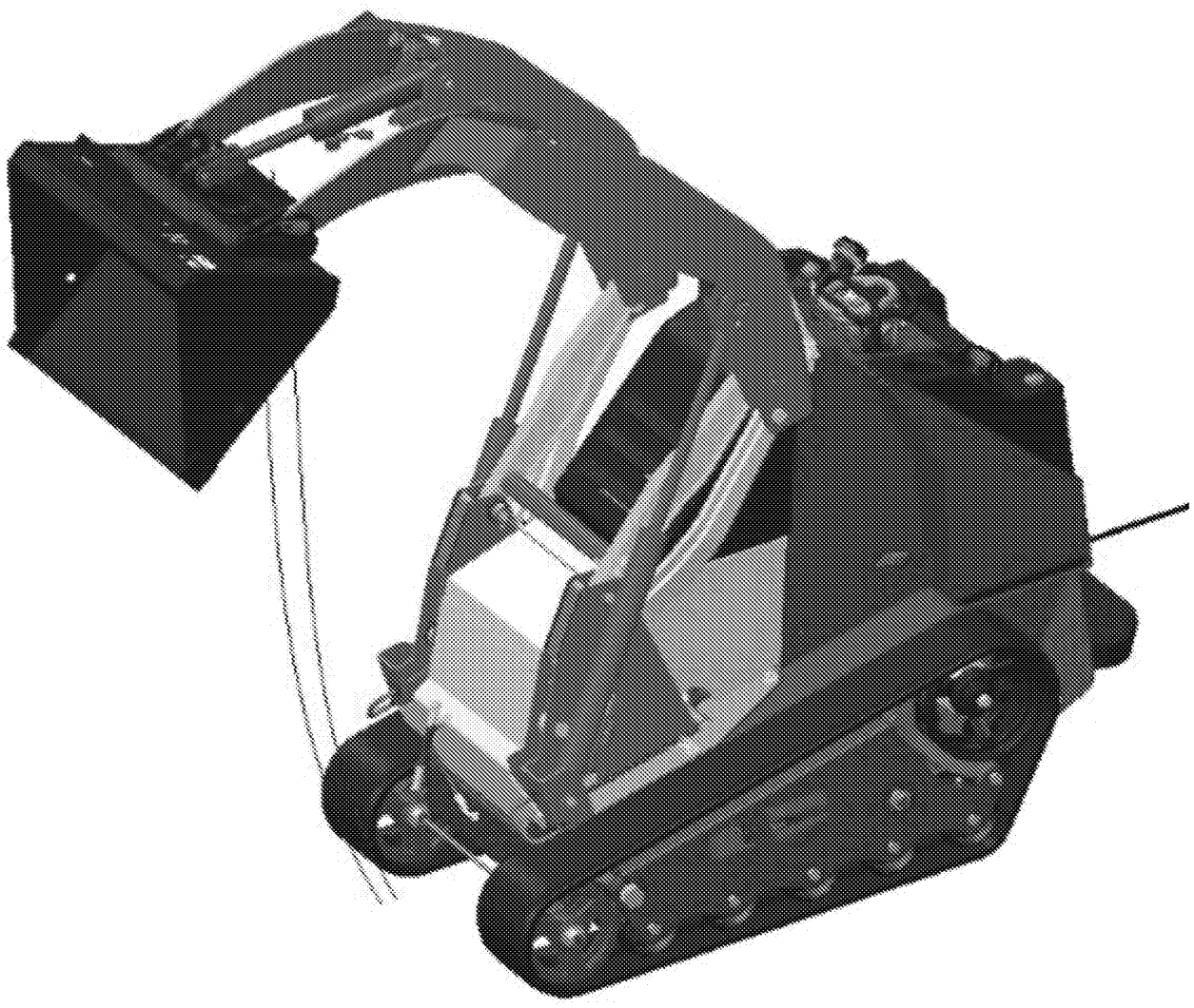
Priority	Risk	Likely To Occur	Impact	Mitigation Actions	Contingency Actions
Rank	What is the issue that may impact the project?	High Medium Low	If it occurs how will it effect the project?	What are the actions being taken to prevent the occurrence or minimize the impact?	If the Risk does occur what actions will the team take?
3	Late changes, releases, and modifications for the pilot	High	Delay pilot and production	Work with vendors to expedite parts as nec. – quickly react to Test issues	Modify and rework as nec. to achieve the production dates

Business and Project Strategy

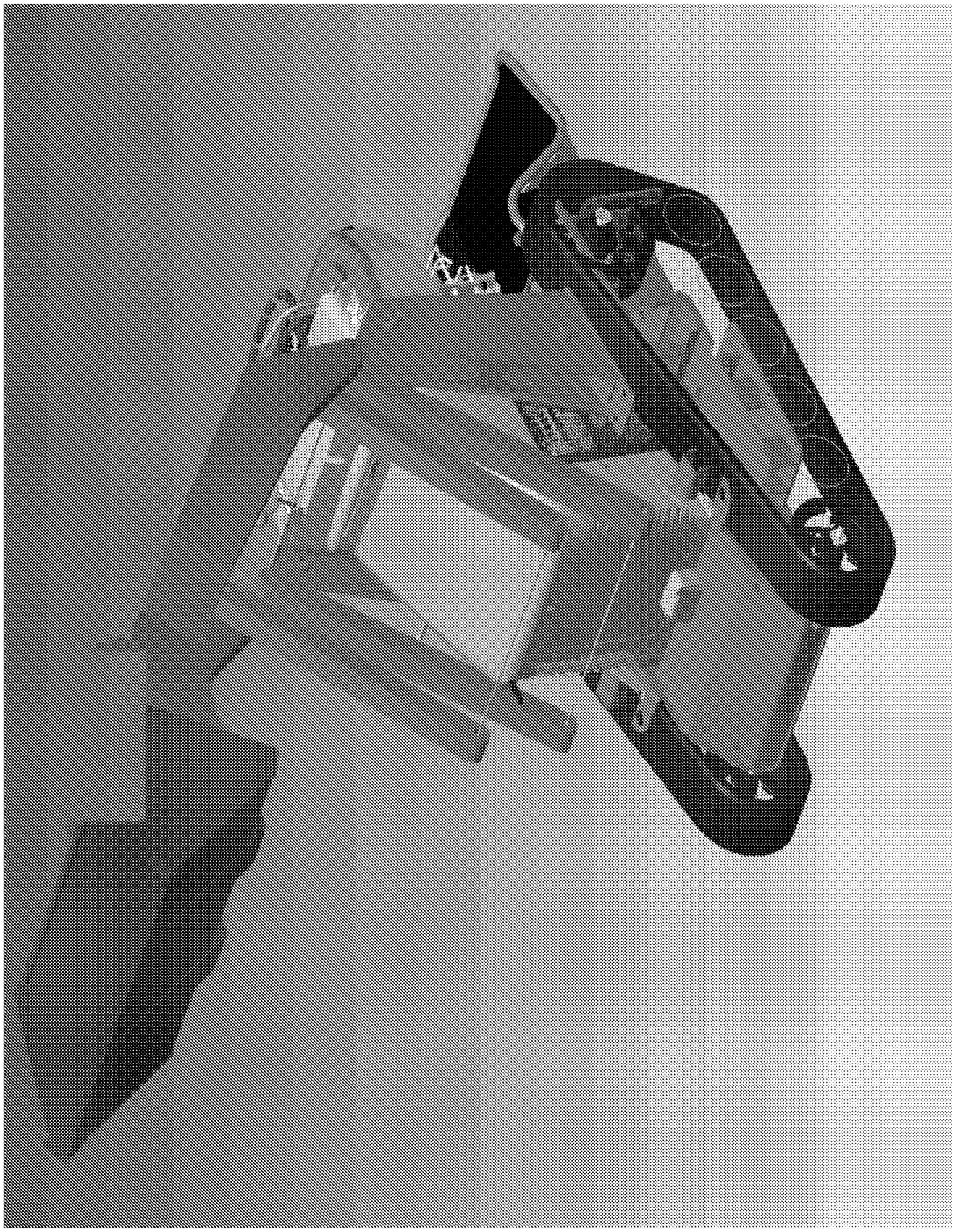
Explain how this new product aligns with the business strategy and product category strategy. Describe how the market strategy will optimize the sales of this new product.

- Successfully expand the Dingo product line offering with the introduction of the TX 1000 Narrow Track and Wide Track units
  - TX 1000 units were additions to the existing TX line
  - Existing 427, 525 and wheeled units have significant value, in both the dealer and rental channels
- Become the #1 Compact Utility Loader of choice for contractors and rental
  - Meet, and exceed, competitor specifications and incorporate key features
    - Greatest rated operating capacity (1000 and 1075 lbs) in the CUL category
    - 81" hinge pin height to clear 30 yard dumpsters and one ton truck with 24" sideboards
    - High drive track system
    - High max travel speed in forward (4.7 mph) and reverse (4.7 mph)
    - Intuitive and differentiated traction controls
- Re-establish Toro as the CUL market leader
  - Toro invented the category, and Toro has re-invented the category through TX 1000 product innovation
    - Vertical lift loader arm design and traction controls

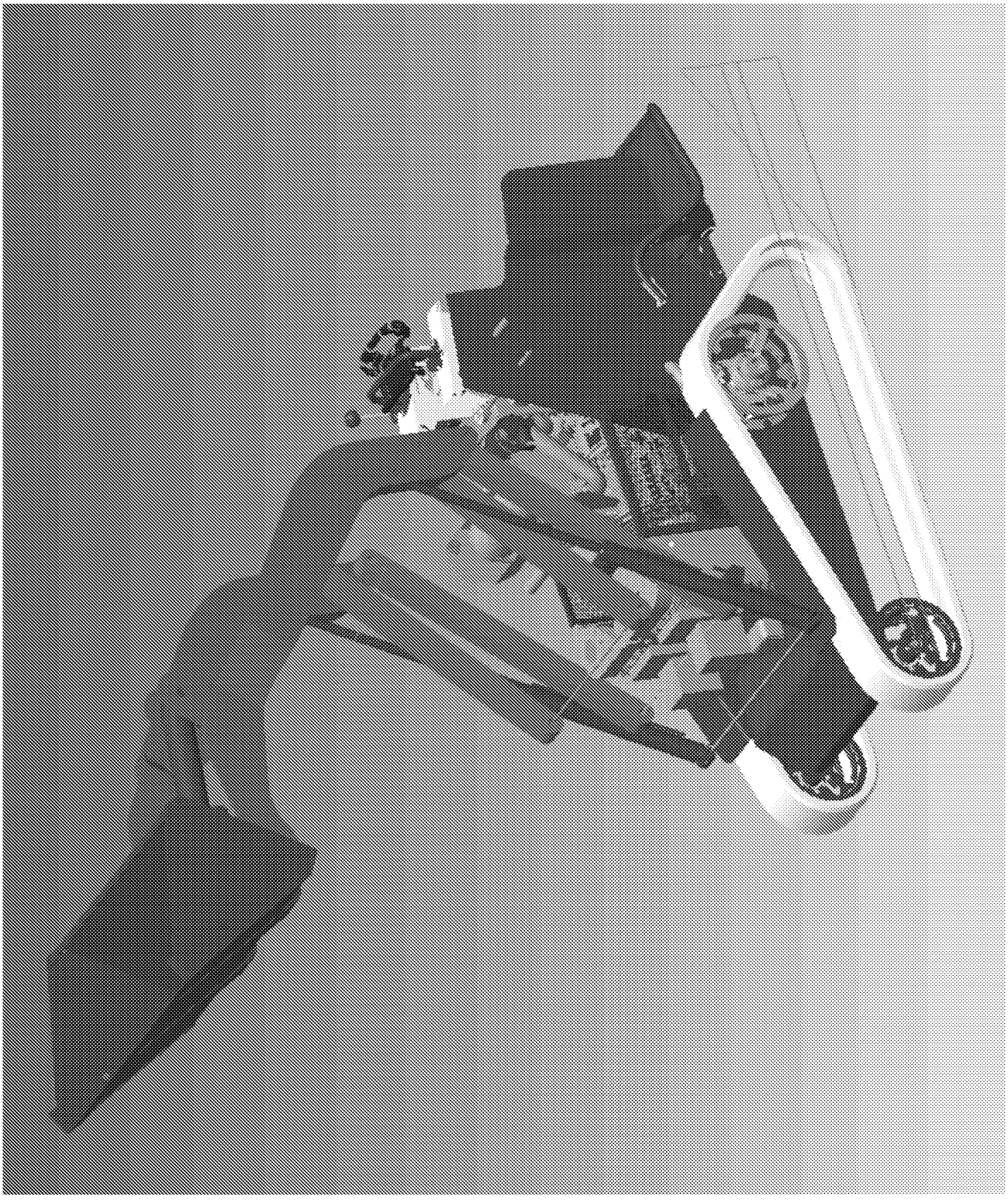


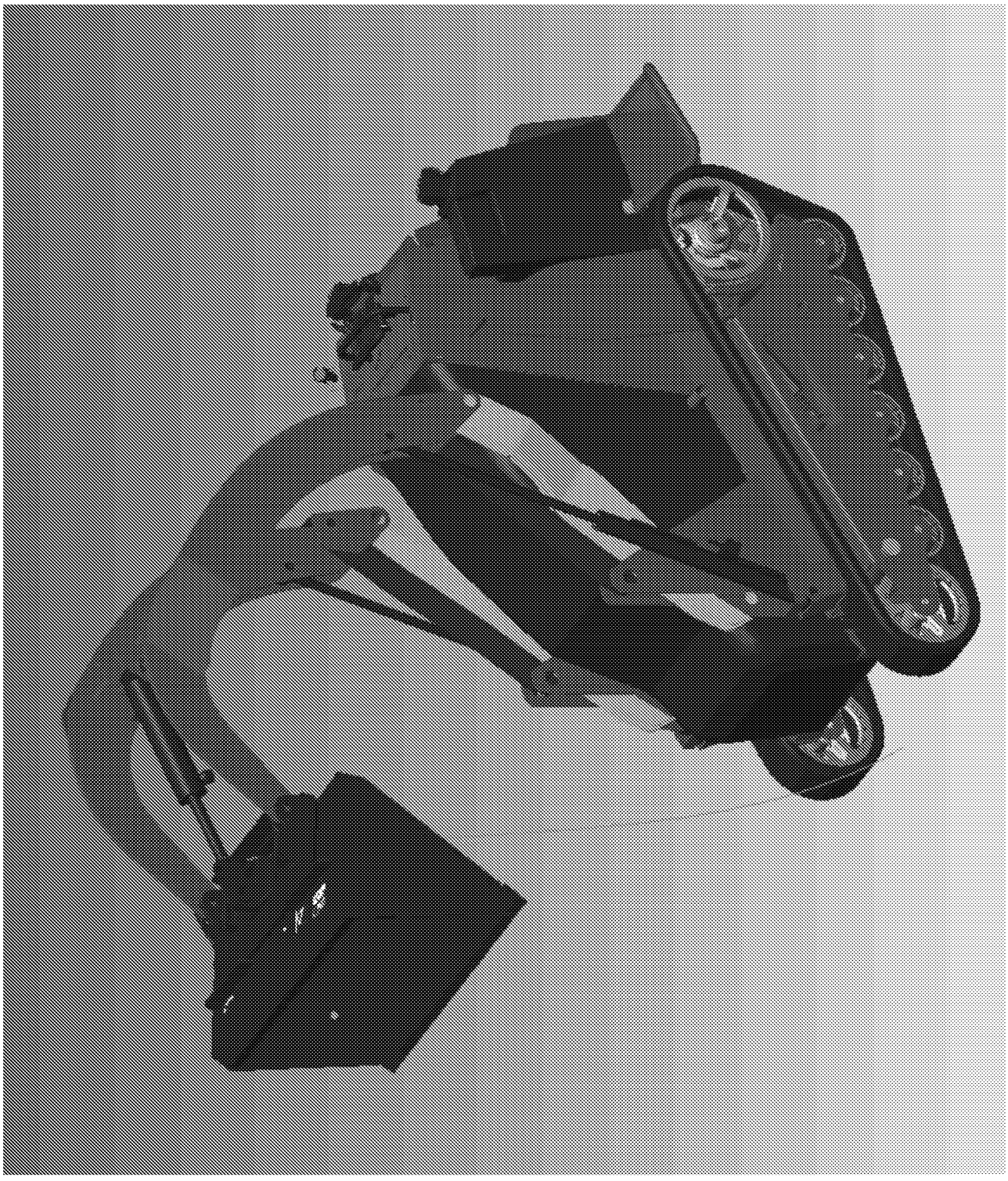


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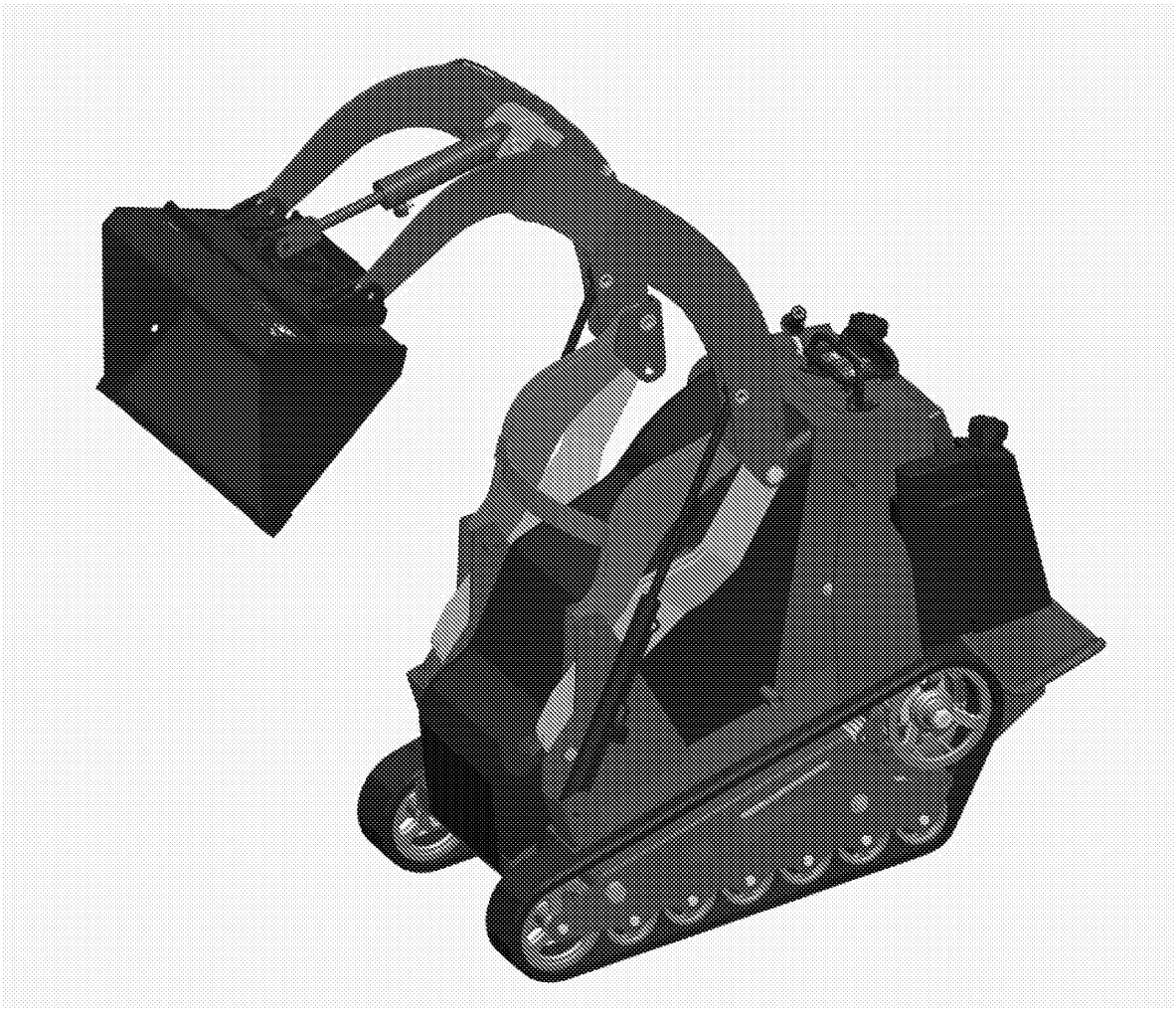


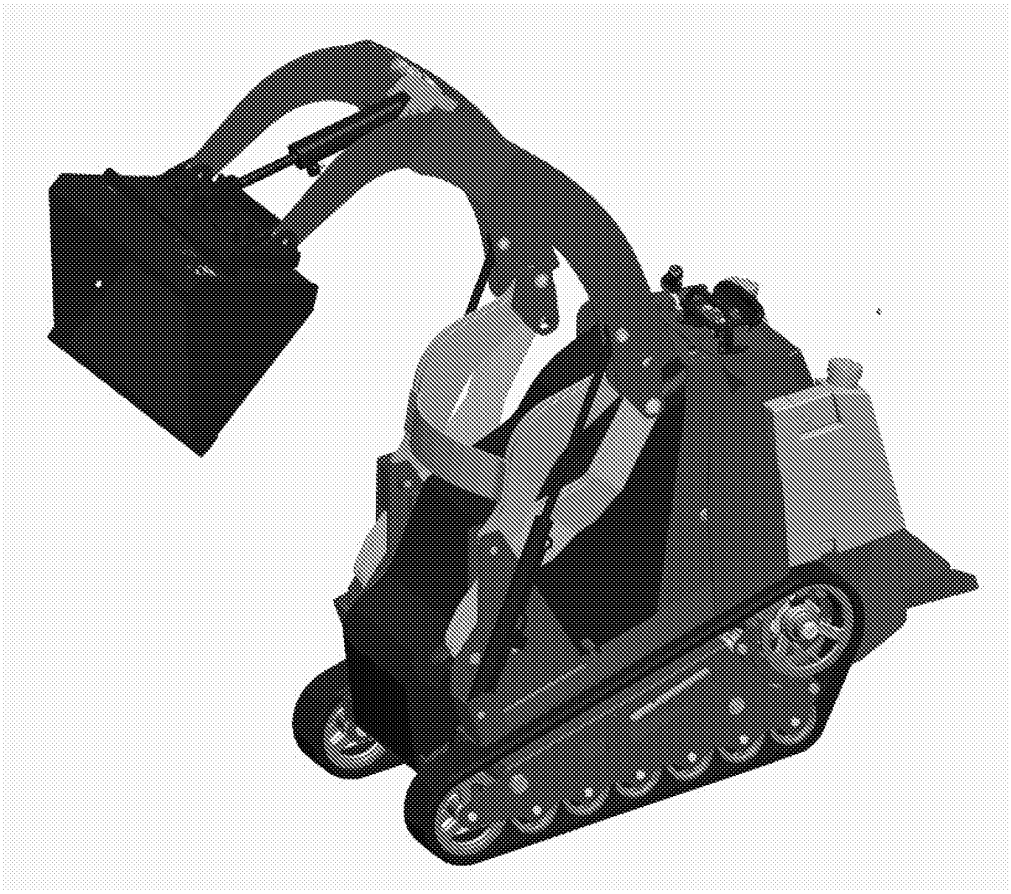
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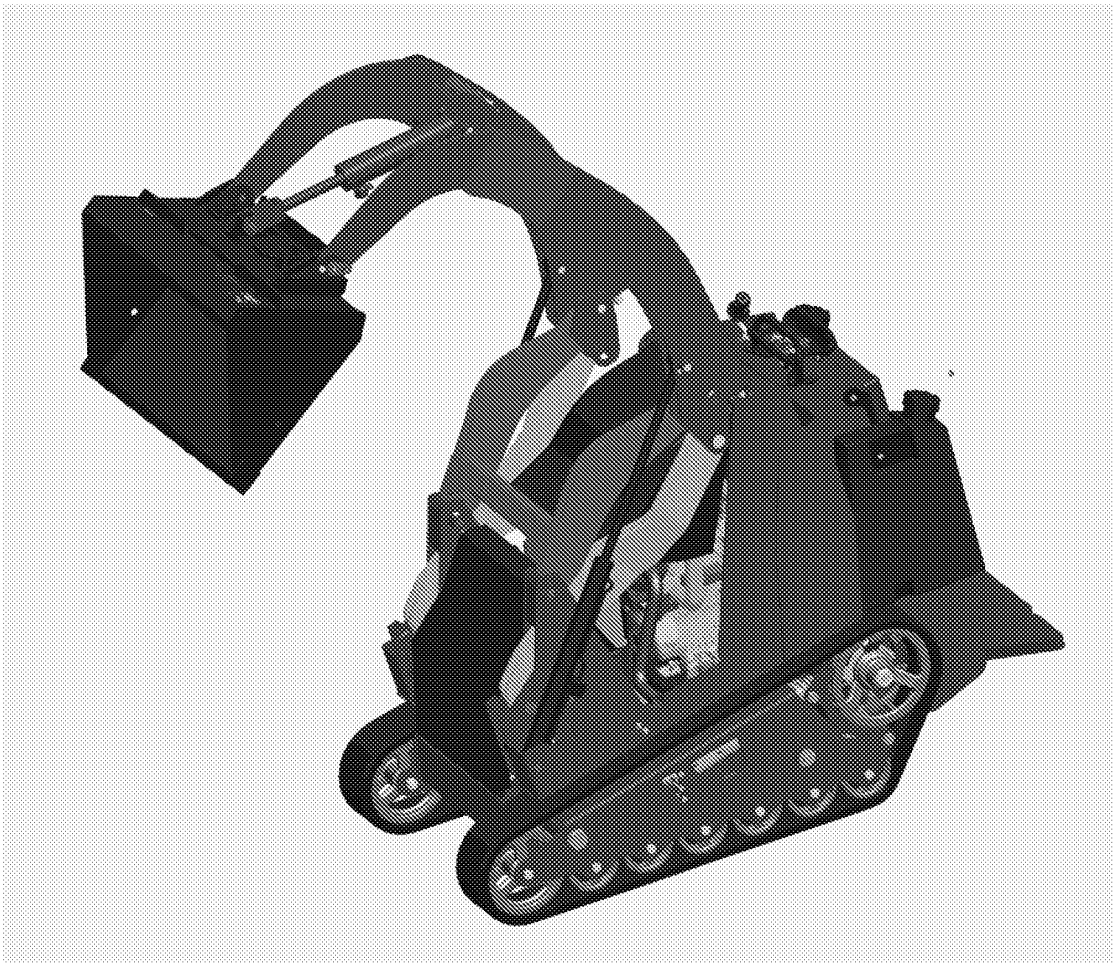


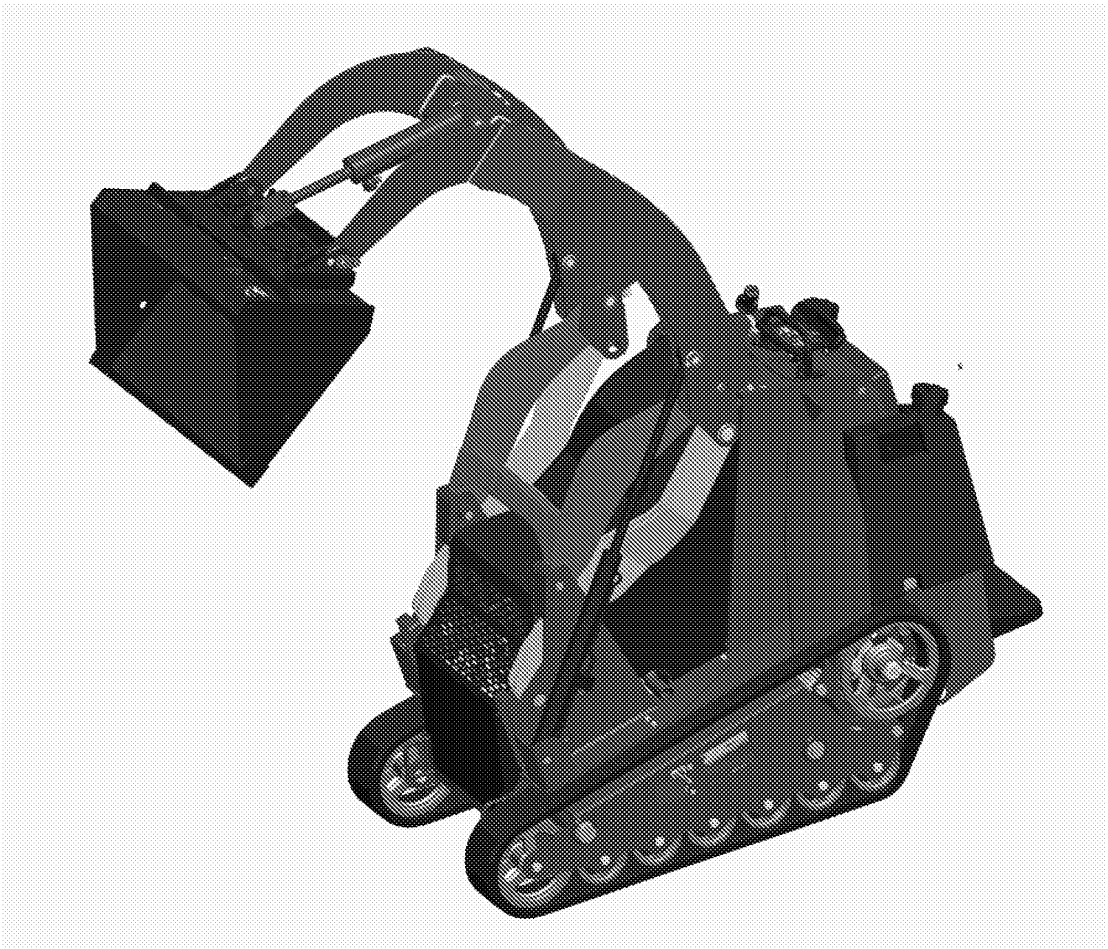


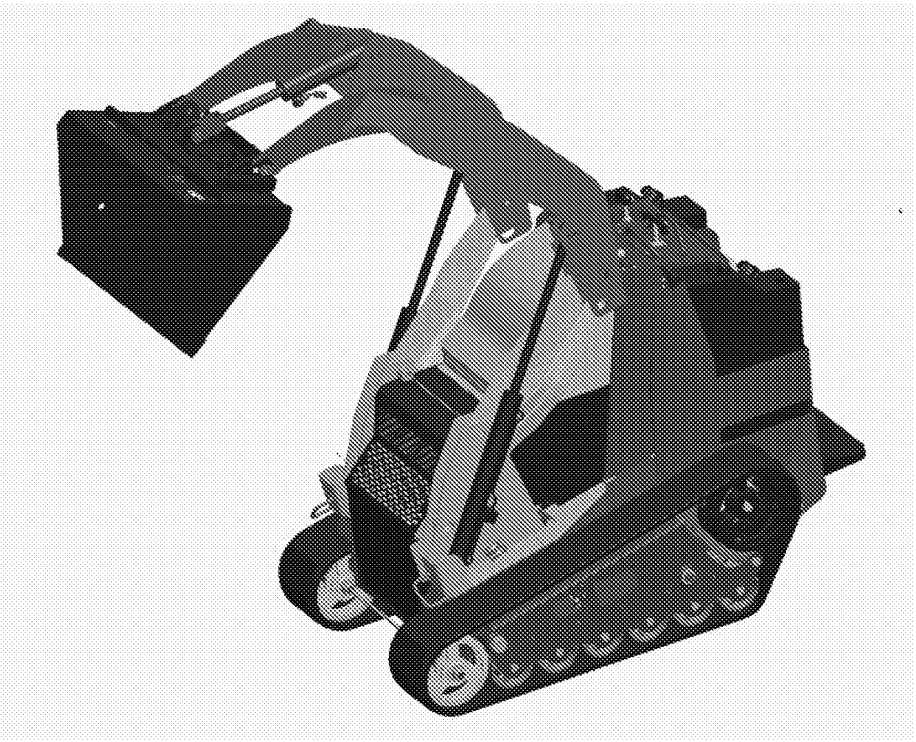
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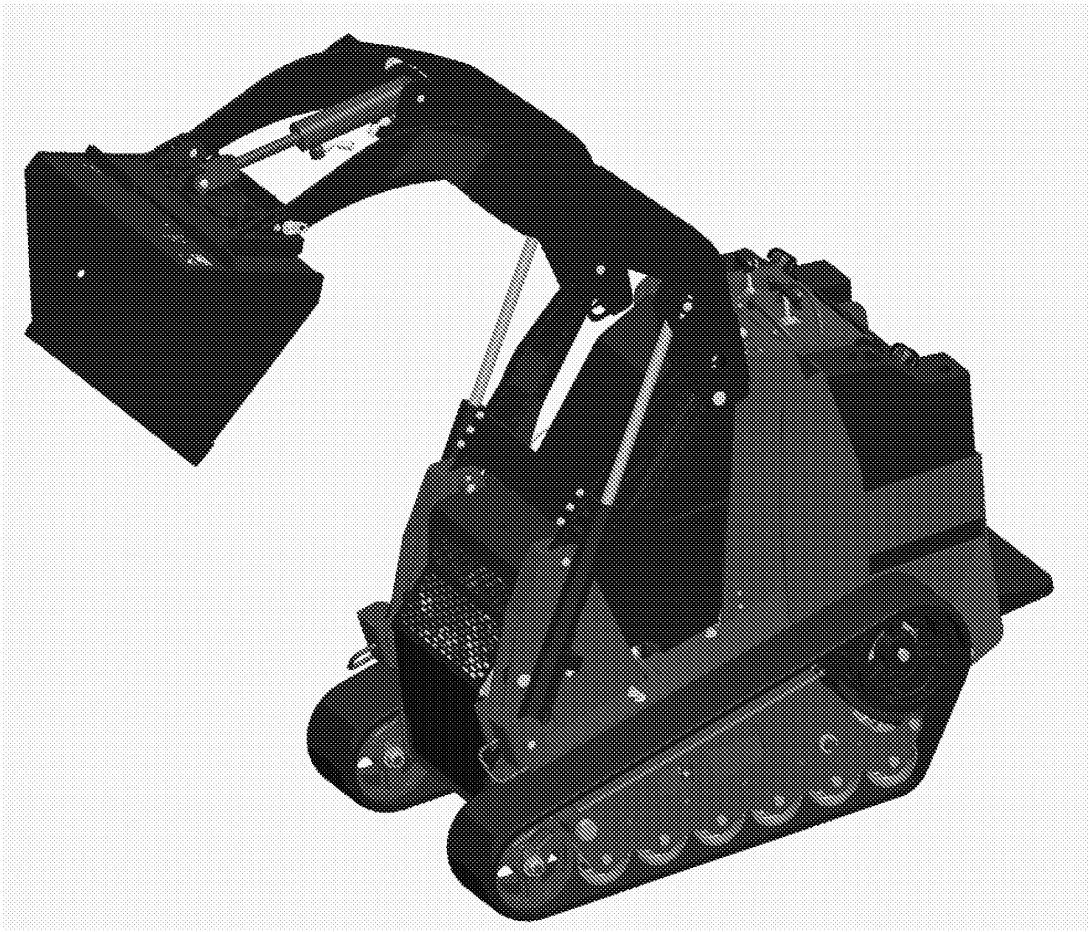


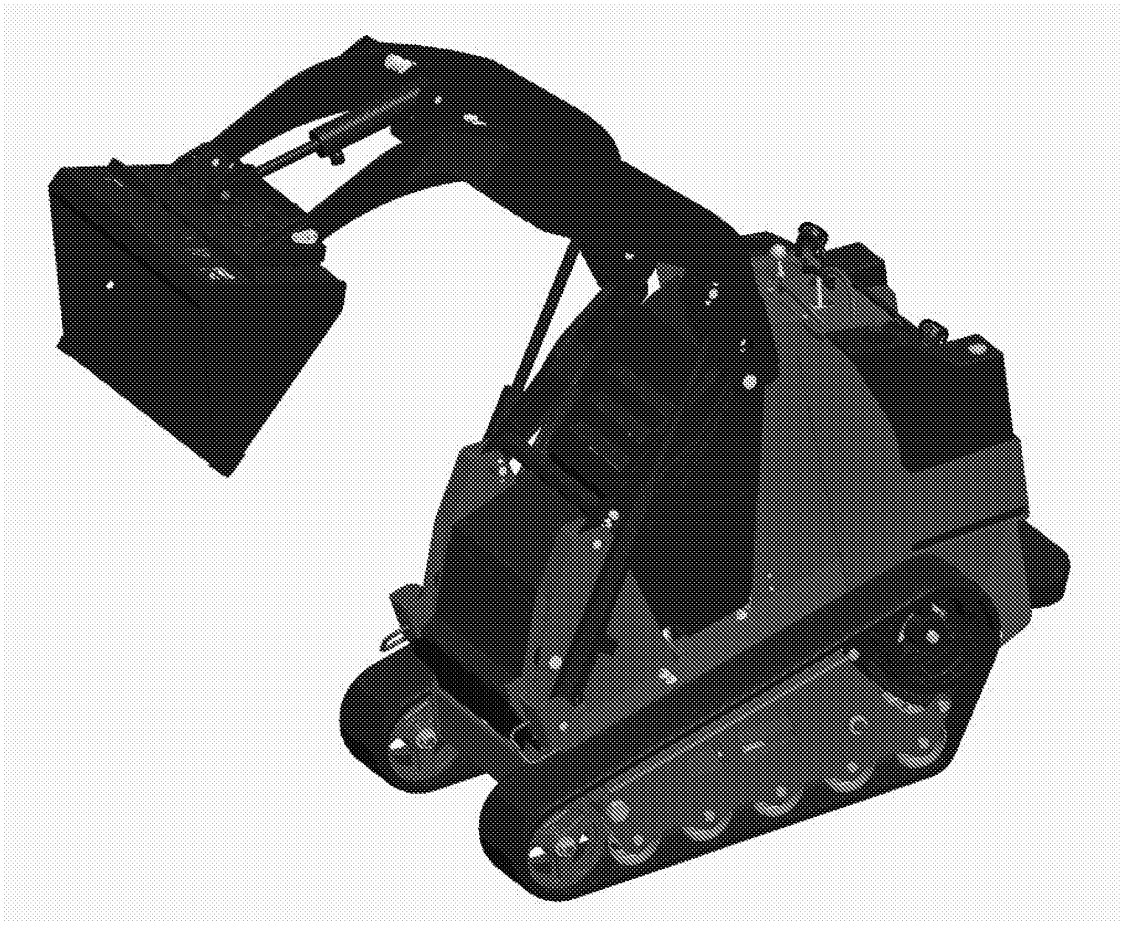


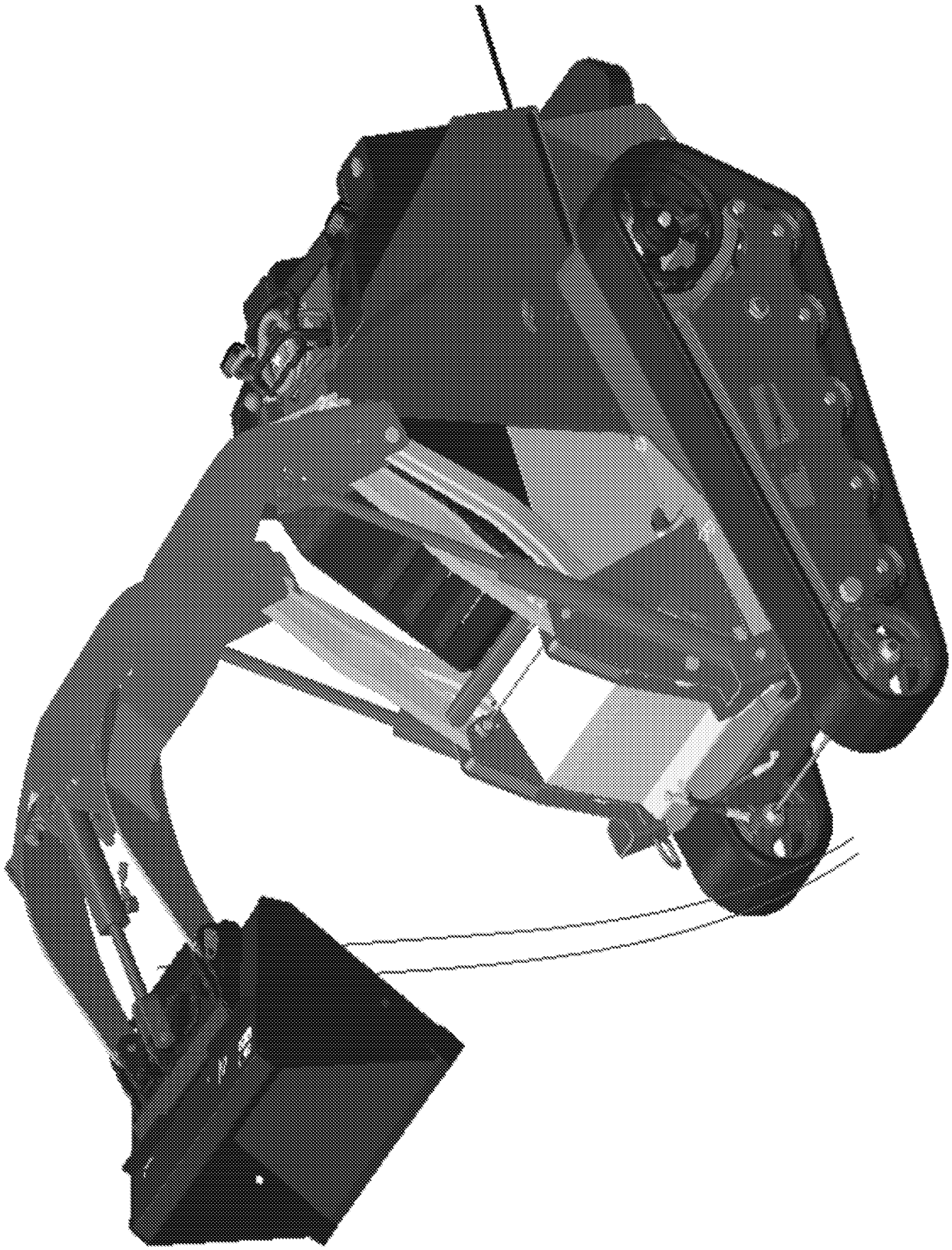




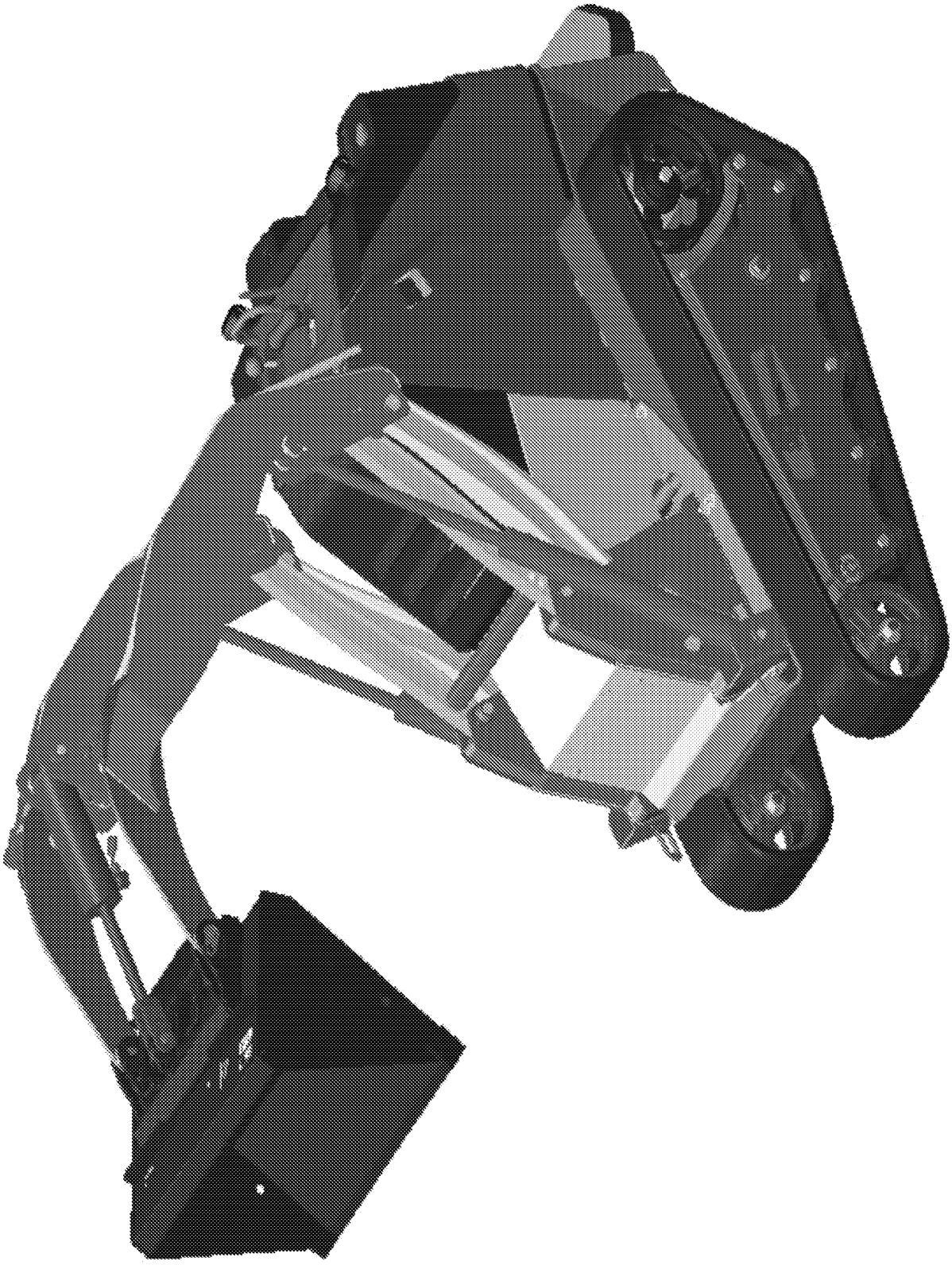




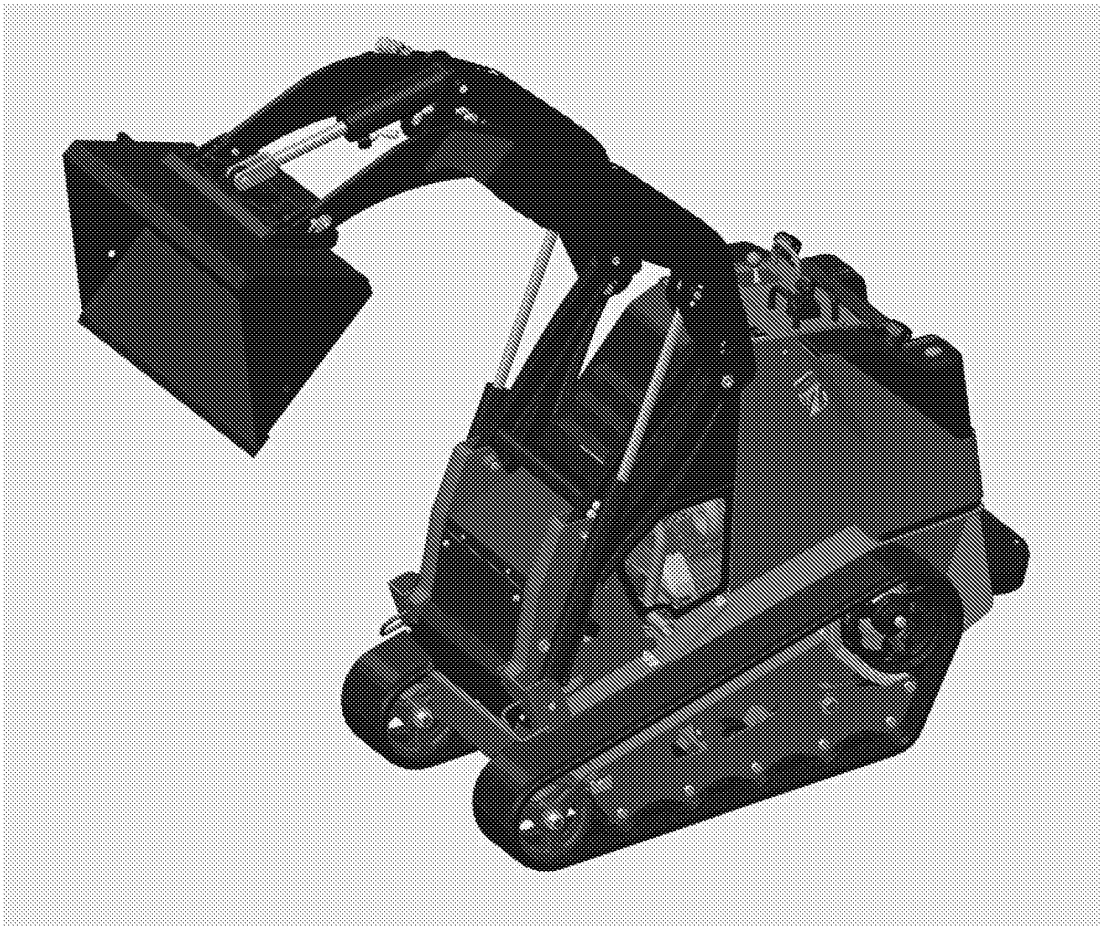


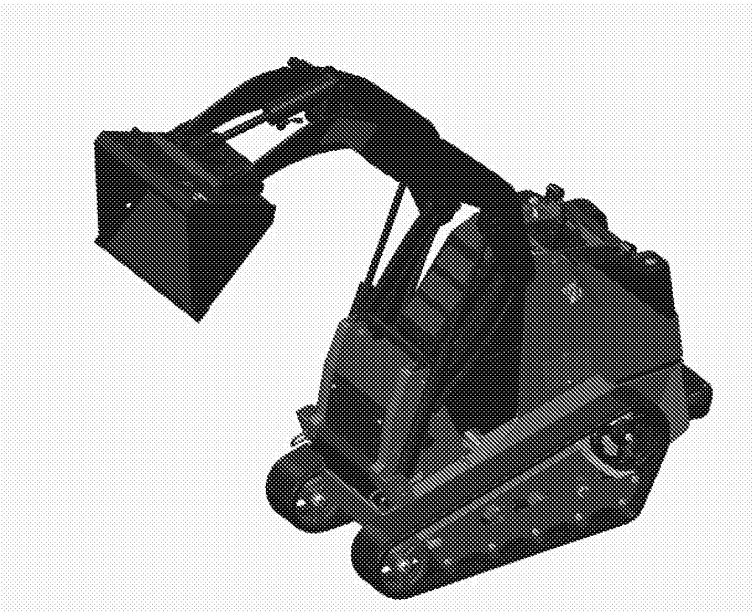


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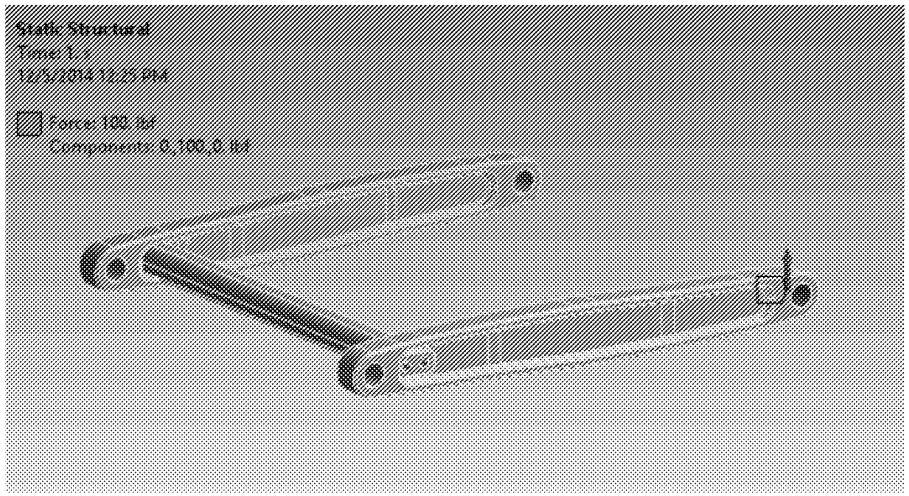
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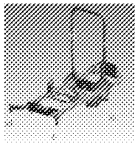


TX1000
Torque Tube

12/08/2014



Model



- Used geometry from upper_links_fea.asm.1
  - Last geometry, 4.0 Rev 2, will be updated

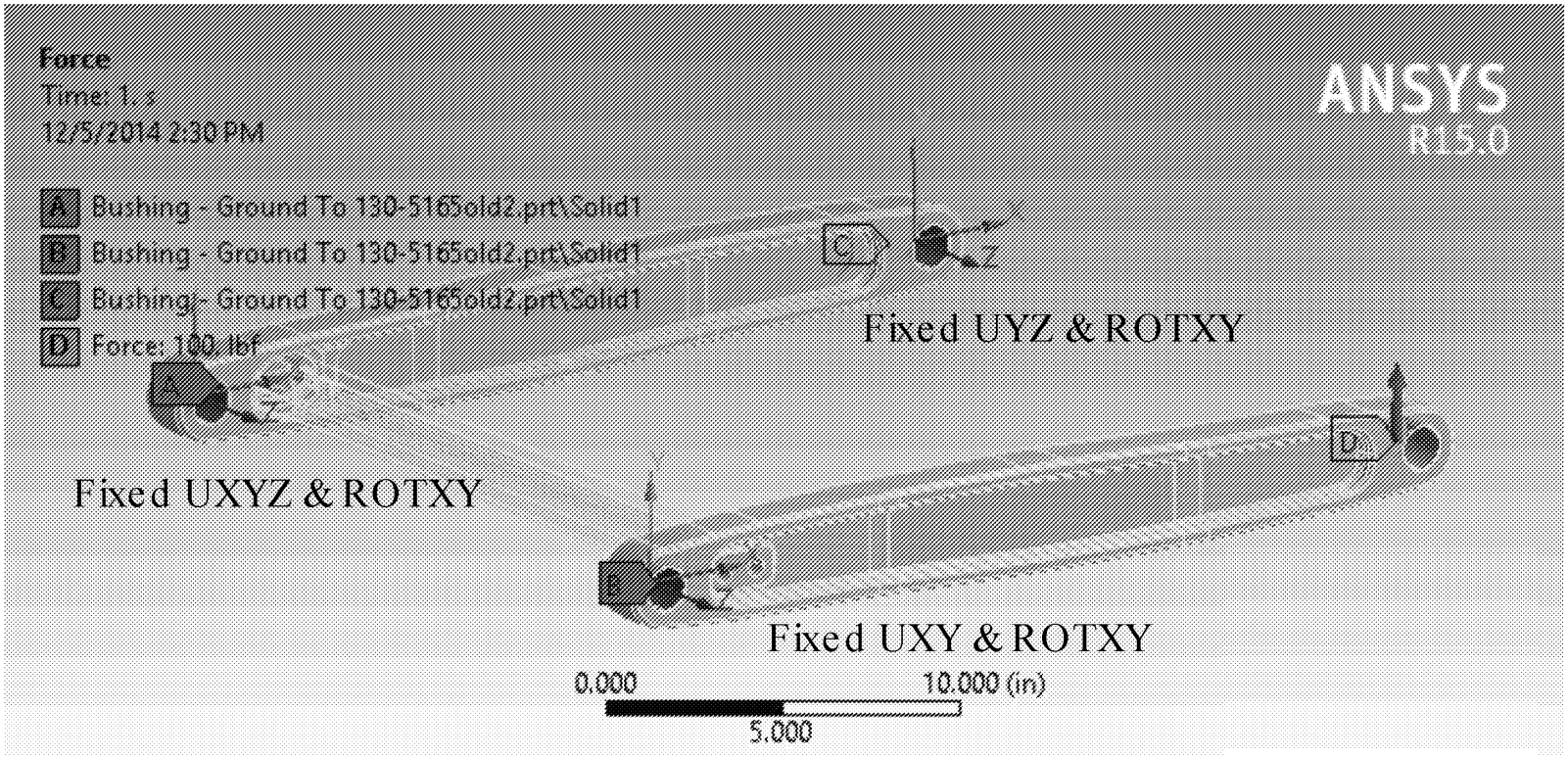
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3.0	2	130-5165OLD2	LINK-UPPER
	1	130-5192	SUPPORT-CROSS OVER (MACHI
2.0	1	125-3710	LINKS/CROSSOVER ASM (WELD
4.0	2	130-5165	LINK-UPPER (MACH)
	1	130-1132	SUPPORT-CROSSOVER, MACHIN
3.0 REV 2	2	130-5262	LOADER ARM LINK ASM (WELD
	1	130-5269	CROSSOVER ASM (WELDED)
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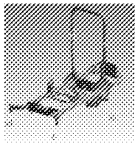
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Page 802 of 915

Torsional Loading

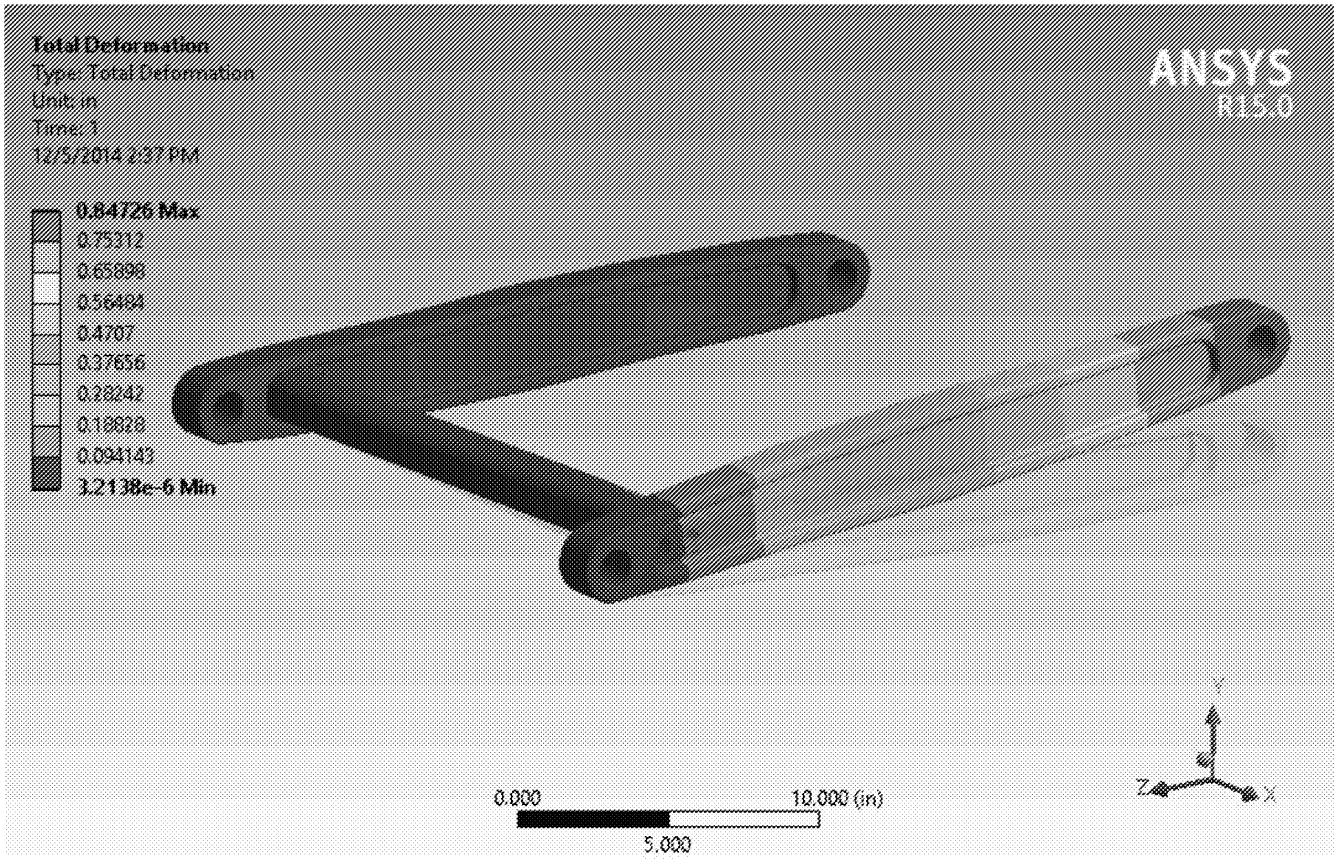
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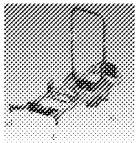
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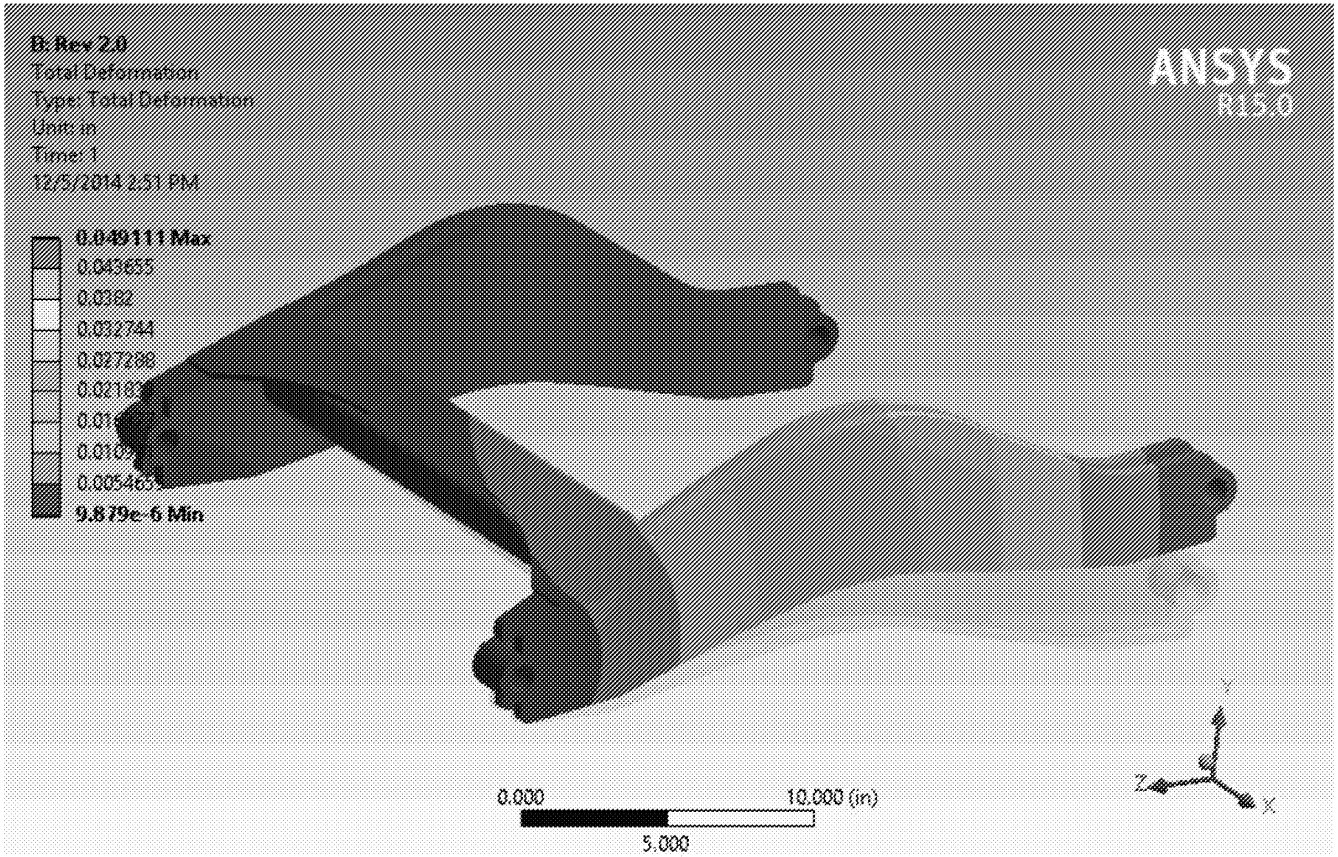
- Deflection (in)



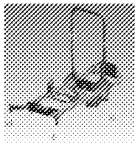
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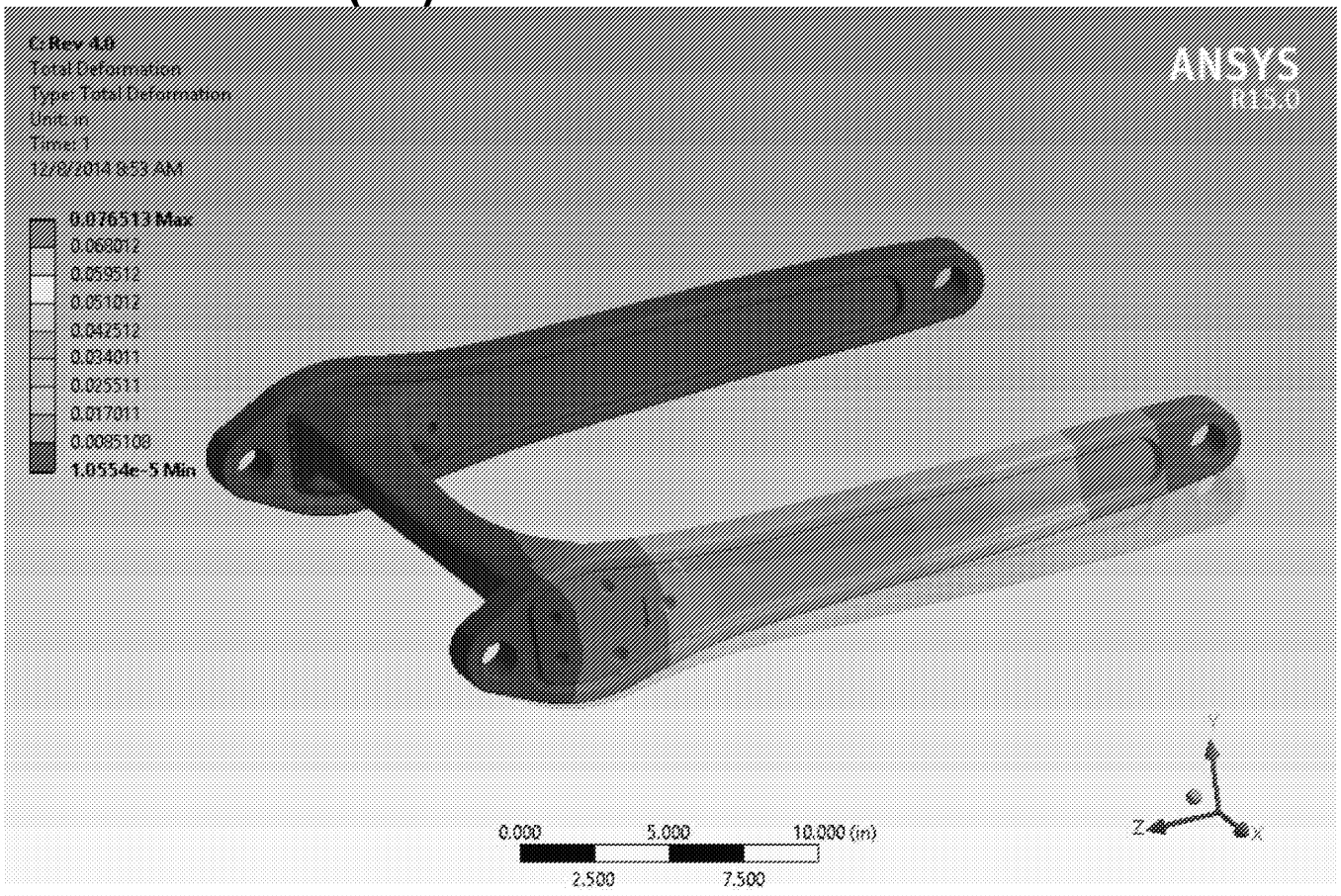
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Configuration 4.0

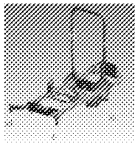


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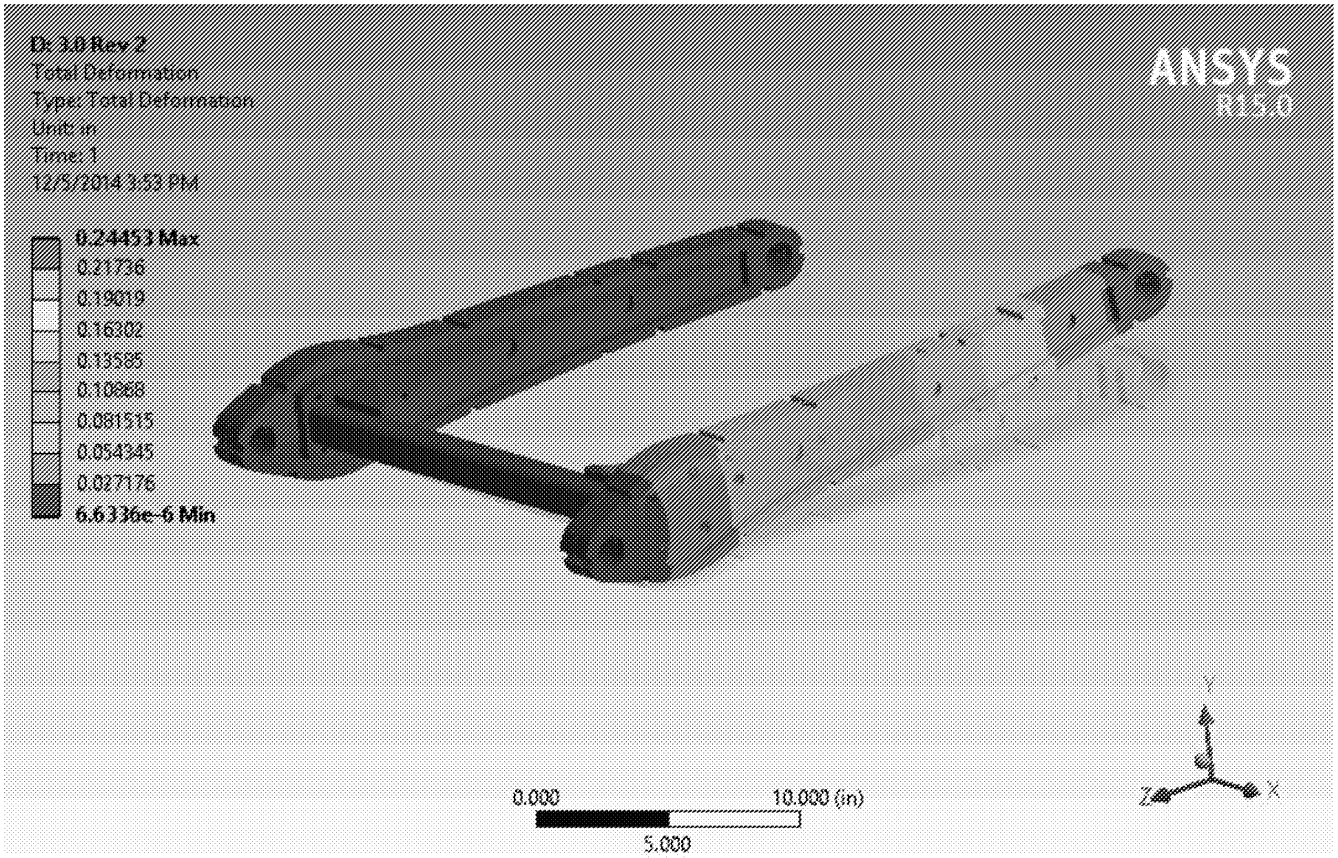


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Page 806 of 915

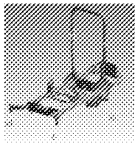
Configuration 3.0 Rev. 2



- Deflection (in)

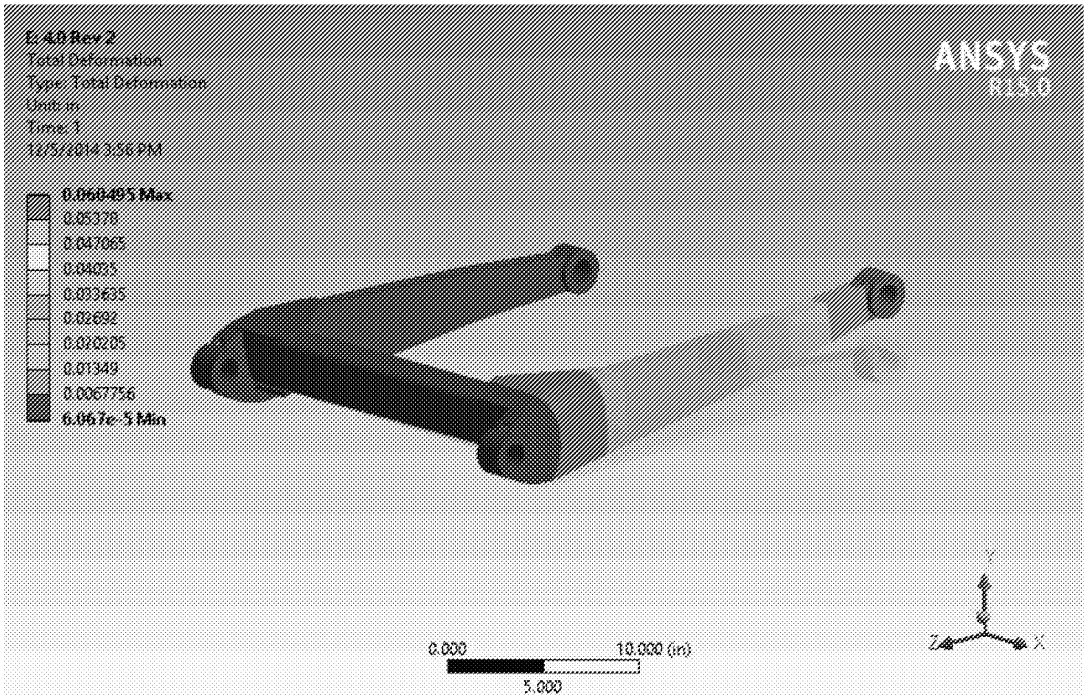


Configuration 4.0 Rev. 2

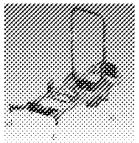


- Deflection (in)

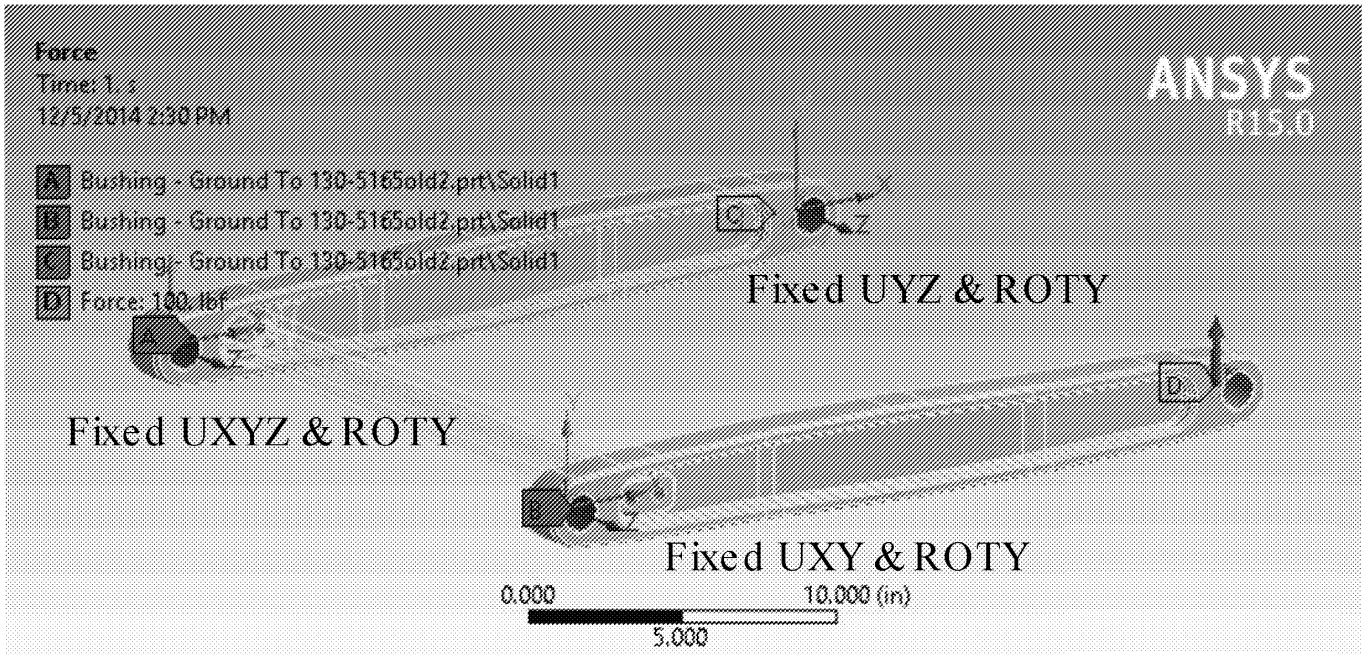
A revision to this configuration is expected, after which thippt will be udpated



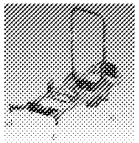
2nd Case, Torsional Loading



- Case with released ROTX (3 plcs.)
  - No pics included, but added to table of slide 10
  - 100 lb vertical force



Summary



- Deflection (in)

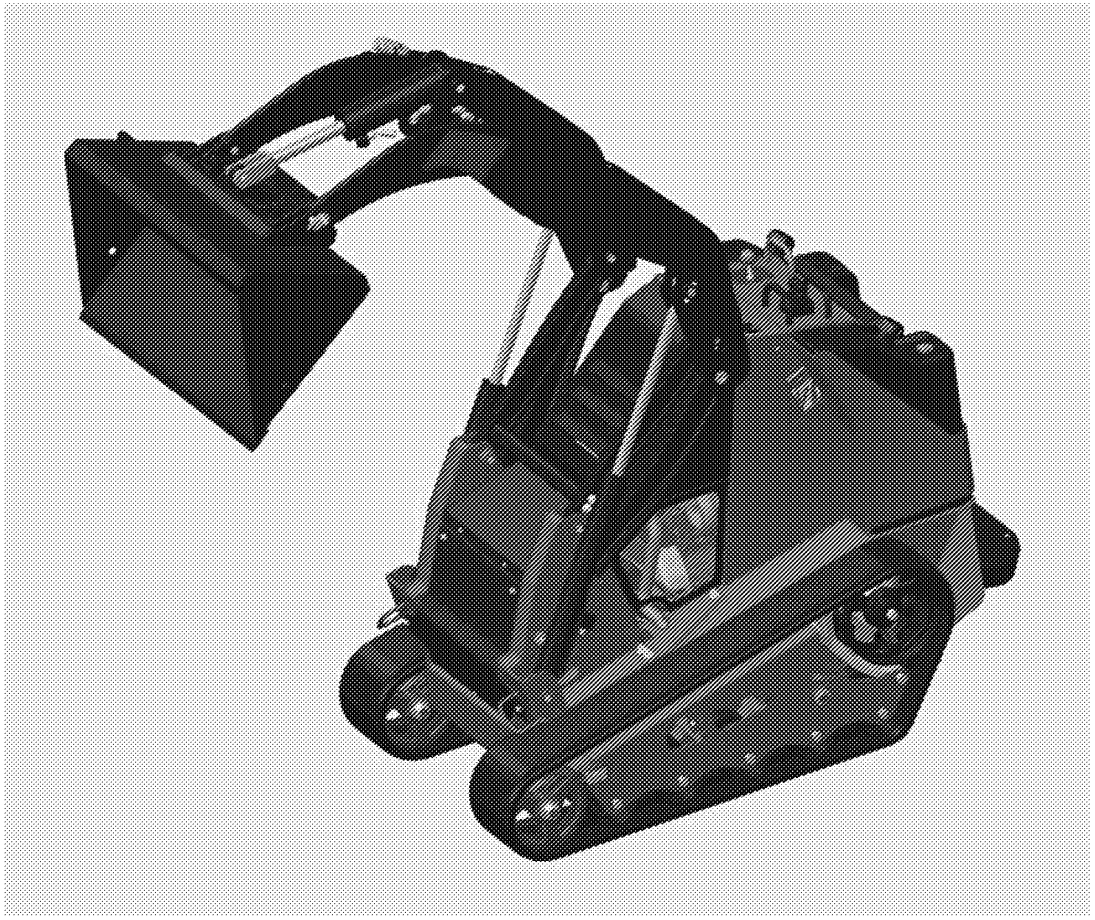
Configuration	Case 1 Torsional Loading	Case 2 Torsional Loading (no ROTN)
3.0	0.847	1.355
2.0	0.049	0.051
4.0	0.077	0.089
3.0 Rev 2	0.245	0.248
4.0 Rev 2*	0.060	0.062

*Revision to this design/results expected

Ex. 2002
Page 810 of 915

TORO Count on it.

W298 TMAX UPDATE



TORO-0003017.1/23

Ex. 2002
Page 811 of 915



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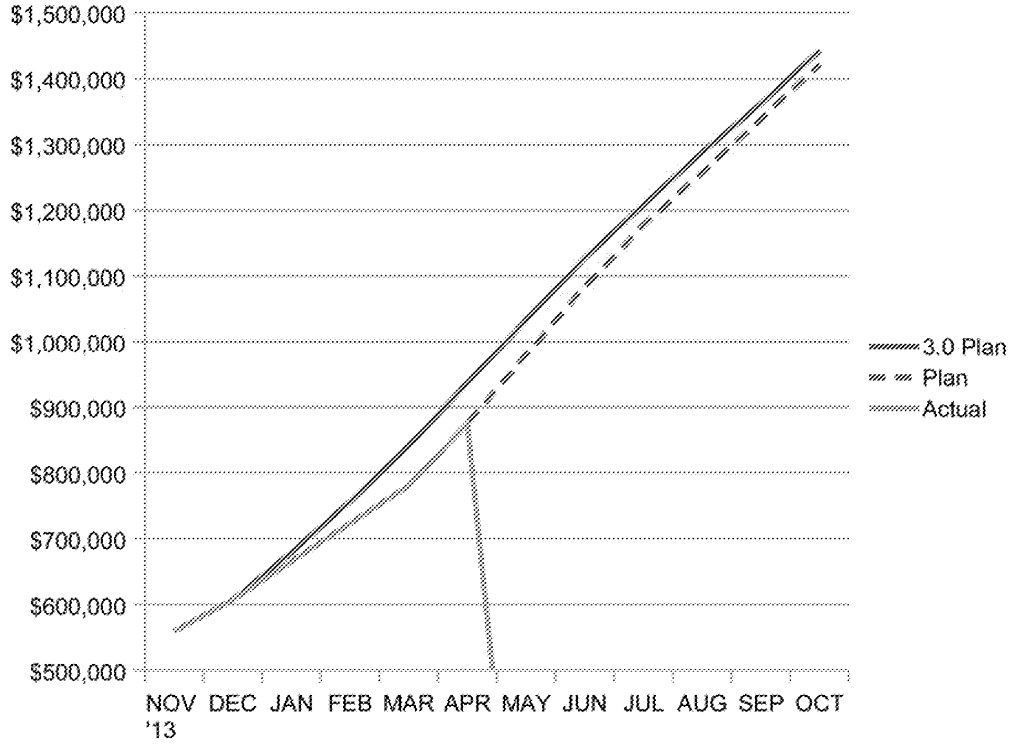
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TORO-0003017.3/23

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W298 TMAX UPDATE

Budget Update



- Spending is favorable YTD but will catch up as parts P.O.s ramp up
- Graph assumes using $10K from Holdback for Universal Engr.

[redacted]

REDACTED

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TORO-0003017.5/23

W298 TMAX UPDATE

Cost Updates

- Cost increases are mainly due to adding money back in to the loader arm and cylinders for durability after FEA results
- Cost decrease on the WT is mainly due to the drive wheel and track quote
- Still pursuing a major cost reduction on the WT bearing REDACTED REDACTED
- Cost risks:
  - Final control configuration will likely add cost back
  - Main loader castings, not all final quotes are in
  - Assembly and weld rates have not been reviewed since 3.0

*Highlighting Added = CONFIDENTIAL ATTORNEYS' EYES ONLY

TORO-0003017.6/23

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TORO-0003017.7/23

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TORO-0003017.8/23

W298 TMAX UPDATE

Test Updates – 2.0 machines

- Both machines were updated with heavier duty arms and lift cylinders (still 2.0 geometry)
- Duty cycle work with several attachments was completed at Riverside to verify FEA numbers and scaling
  - Trenching
  - Auger
  - Bucket
  - Leveler
  - Forks
  - Grapple



W298 TMAX UPDATE

Schedule Update

Milestone Dates	3.0 Plan	Update	Comments
3.0 Signoff	2/17/14	2/17/14	
3.0 Prototype Build Completed	5/27/14	6/19/14	Current date assuming tooled radiator lines and tanks
3.5 Update	6/23/14	7/28/14	Control decision after VOC of 3-4 designs
Long Lead / Tooling Releases	9/25/14	10/6/14	Assumes 16 wk lead time – Poclain pumps will be earlier
4.0 Signoff	10/15/14	11/7/14	
4.0 Updates	10/29/14	11/10/14	Complete 500 initial test hours and then update – Completely update Mktg unit for Sales matls
5.0 Signoff	1/5/15	1/12/15	
Pilot Build Completed	1/14/15	1/23/15	
Rental Show 2015		2/22/15	See Marketing plan if pilots are not available for ARA
Production	3/12/15	3/23/15	
Release to Ship	3/19/15	3/30/15	

W298 TMAX UPDATE

Schedule Issues – Getting back on track

Long lead items

- Radiator hoses could not be finalized until the radiator was finalized; these need to be tooled and held us up during the 2.0 build
  - Action Plan: Push Veyance to make hoses; temporarily use flex hoses
- Fuel tanks require long lead tooling; We did not want to finalize the design until we were satisfied with the shape and function
  - Action Plan: Run with temporary tanks until tooled tanks are available
- Loader castings – see next page

TORO-0003017.11/23

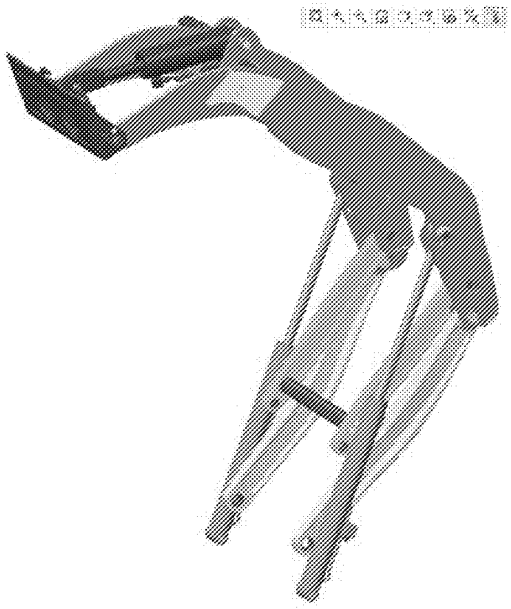
Ex. 2002
Page 821 of 915

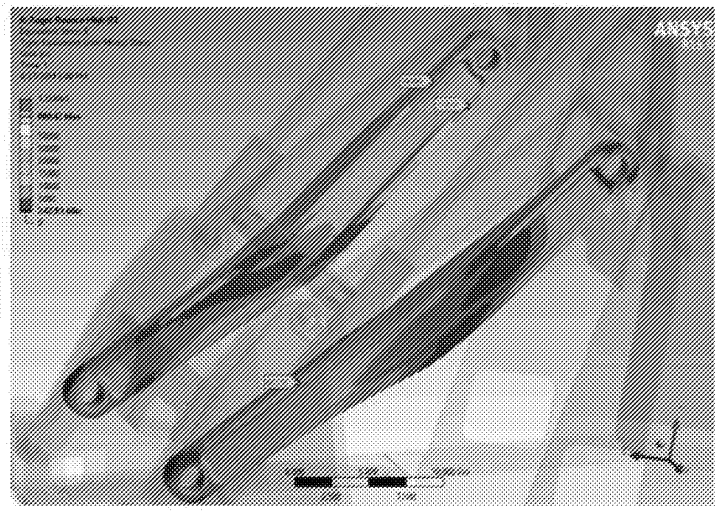
W298 TMAX UPDATE

Schedule Issues – Getting back on track

Ensuring durability

- Since the loader is a major durability concern, those parts were held until a 2nd iteration of FEA was completed and verified against field data
  - Action Plan: Castings have been upgraded based on FEA and sourced with Craft and are not going to be an availability issue





TORO-0003017.12/23

Ex. 2002
Page 822 of 915

W298 TMAX UPDATE

Controls

- Based on VOC, team has been challenged to come up with controls that are better suited for the Next Gen (controls that closely align with this larger, faster machine with dedicated platform)
- On Next Gen units the current TX-style controls are:
  - not ideal for operating with one hand – max efficiency requires controls be operated with one hand majority of the time
  - too big and bulky for the larger, higher speed machines on the market today
  - too cumbersome and time consuming when performing the significant number of tight turns that are required at today's jobsites, especially with higher speeds
  - best suited for walk behind units

TORO-0003017.13/23

Ex. 2002
Page 823 of 915

TORO Count on it.

W298 TMAX UPDATE

Schedule Issues – Getting back on track

Controls

- Implementing control ideas that work – We are still searching for an acceptable method of actuation and control shape
  - Action Plan:
    - Build with "default" two-lever design; the control area is designed so it can be easily switched out on the prototypes
    - Assign one design idea to Joe Knipp to finish out (Dogbone)
    - Utilize Universal Engineering for a 2nd design (Steering Wheel)
    - Complete VOC in June and July with a decision by the end of July
    - Assuming 14 weeks of testing prior to 4.0 update, controls will still have 350 hours on them before 4.0
    - Lab cycle testing of agreed-upon control system

TORO-0003017.14/23

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Page 824 of 915

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TORO-0003017.15/23

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REDACTED

TORO-0003017.16/23

CONFIDENTIAL - ATTORNEYS' EYES ONLY

REDACTED

TORO-0003017.17/23

CONFIDENTIAL - ATTORNEYS' EYES ONLY

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CONFIDENTIAL - ATTORNEYS' EYES ONLY

REDACTED

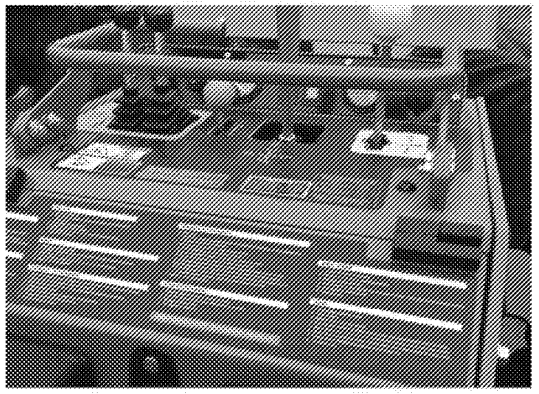
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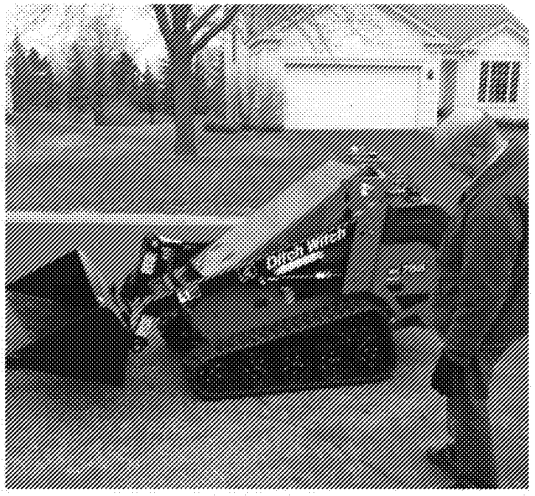
W298 TMAX UPDATE

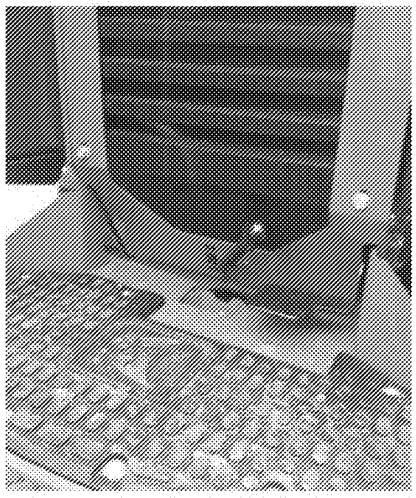
Ditch Witch VOC

- Consistently positive feedback on the controls
- High value placed on the platform and foot pedal
- Combination of increased specs and price is attractive to landscapers
- Track system does have its deficiencies









W298 TMAX UPDATE

Recent Competitive Actions

- How have competitors responded to Tier 4 Final?
  - Vermeer S800 TX now features a 40hp EFI engine (formerly a 35 hp diesel)
  - Reportedly, Ditch Witch is no longer manufacturing the SK 755 (featured 32.8 hp diesel engine), just the SK 750
  - The Ditch Witch SK 750 has the same lift capacity and lift height as the 755 but features a 24.8 diesel engine

TORO-0003017.21/23

Ex. 2002
Page 831 of 915

W298 TMAX UPDATE

Launch Planning

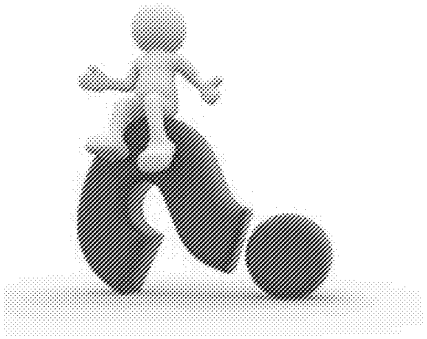
- Conducting regularly scheduled launch planning meetings
- Met with AV regarding timing of introduction, photography and video needs
- Held initial discussion with Performance Marketing regarding launch timing, launch communication ideas, and advertising plan
- June 5 meeting scheduled to discuss 2015 trade show assets and planning
- Launch will also focus on the entire family of Dingo products
  - No comparable breadth of product in the marketplace
  - All video, literature, and images of current TX and Wheeled Dingo product and attachments will also be updated
  - Updating of materials for current product will be done this summer (July 22-24)

TORO-0003017.22/23

Ex. 2002
Page 832 of 915

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Questions?

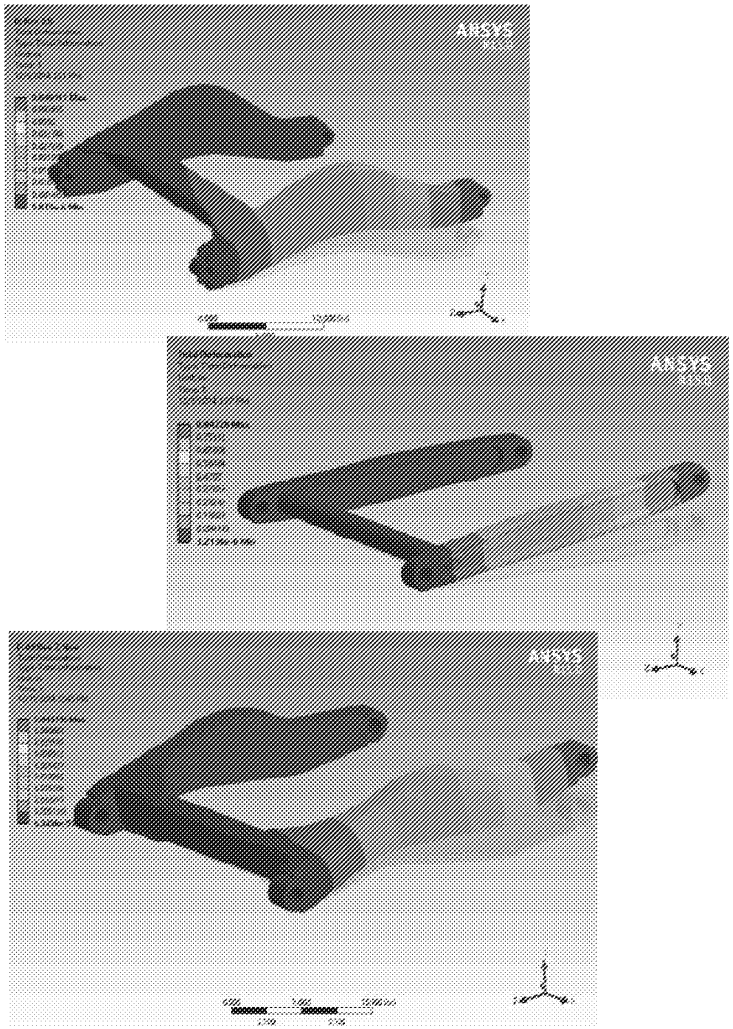


W298 TX1000 UPDATE

12/15/14

Loader Arm Testing

- FEA has confirmed the upper link can flex to cause independent movement between the lift cylinders
- A fabricated single piece link was designed to exceed the 2.0 design (since this design does not have a racking problem)
- Proceeding with updating all machines with this design
- FEA on entire loader will be re-run with the new piece to confirm



TORO-0003163

Ex. 2002
Page 834 of 915

W298 TX1000 UPDATE

12/15/14

Loader Arm Testing

Configuration	Case 1 Torsional Loading	Case 2 Torsional Loading (no ROTX)
3.0	0.847	1.355
2.0	0.049	0.051
4.0	0.077	0.089
3.0 Rev 2	0.245	0.248
4.0 Rev 2	0.046	0.048

TORO-0003164

Ex. 2002
Page 835 of 915

W298 TX1000 UPDATE

12/15/14

Combined Flow Aux. system

- The lab unit was set up with a combined flow system and run with the auger (found to be acceptable)
- Gear pumps are in to update all 4.0 machines with combined flow pumps
- This also gives us a future “low flow” option feature if we want it by adding a diverter valve to the circuit
- Will still pursue a split flow system as backup, but combined is the “default” design at this point.

Ex. 2002
Page 836 of 915

TORO-0003165

W298 TX1000 UPDATE

12/15/14

Engine Heat work

- After modifications to the rear radiator intake; heat runs were able to be completed
  - Water and oil cooling seems adequate but we are not expelling the heat from the machine
  - Need to find exit lanes for the air out the front of the machine (move air cleaner, open up hood louvres)

TORO-0003166

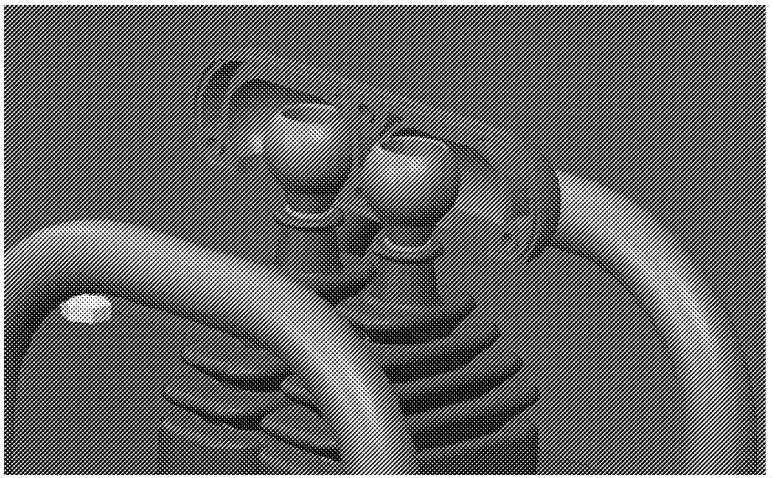
Ex. 2002
Page 837 of 915

W298 TX1000 UPDATE

12/15/14

Controls

- Input received from Micron on shaping, fastening, and materials for control parts
  - Outer handle: glass infused nylon
  - Inner ball: delrin
- Longer handle printed to increase available rotation (on the field unit)



REDACTED

TORO-0003167

Ex. 2002
Page 838 of 915

W298 TX1000 UPDATE

12/15/14

Tomah Build / Releases

W298 Tmax	1305 Refit Plan	Current / Actual	Notes
Weld tool releases (902)	n/a		
Other long lead releases (902)	n/a		
3.0 updates (rework frame, muffler, and hoses)	11/12/2014	11/20/2014	1st unit up and running; 2nd unit followed a few days later
500 hours completed (902)	n/a	n/a	The D902 3.0 machine stopped at 224hrs due mainly to poor weather
Weld tool releases (1305)	11/5/2014	11/24/2015	Loader arm was the last major weldment released; still a full 16 wks from pilot date; a few minor weldments (platform) are still unreleased as we design around them
Other long lead releases (1305)	12/5/2014	12/1/2014	Engine was released 12/1. Combined flow pump is not released but is already in Casappa's system and readily availble
4.0 updates / 1305 refit	1/15/2015	1/16/2015	Current start date for the build is 1/12
Final releases	1/27/2015	1/27/2015	
Pilot Build	3/10/2015	3/16/2015	Date officially in the line 15 schedule
Production	4/28/2015	4/22/2015	Date officially in the line 15 schedule
Release to ship	5/5/2015	5/5/2015	
500 hours completed 1305	6/9/2015	6/9/2015	
1000 hours on engine	10/27/2015	10/27/2015	

TORO-0003168

Ex. 2002
Page 839 of 915

W298 TX1000 UPDATE

12/15/14

Tomah Build / Releases

- 4.0 build
  - Releasing the last of the steel parts for the 4.0
  - Will begin some teardown work on the 3.0's this week (loader test unit, field unit?)
  - Most weldment parts are due in prior to Christmas, will depend on Woody's availability
  - Will need to tool handle parts from a rapid prototype vendor
  - Gabe will likely weld all of the new upper links for 4.0 updates

- Production
  - Stock Kubota engines will need to continue to be used until we finish Kubota's application approval, possibly up to and including first production
    - Stock engines already ordered for pilot
    - Will possibly rout through a Kubota dealer to rework to our spec

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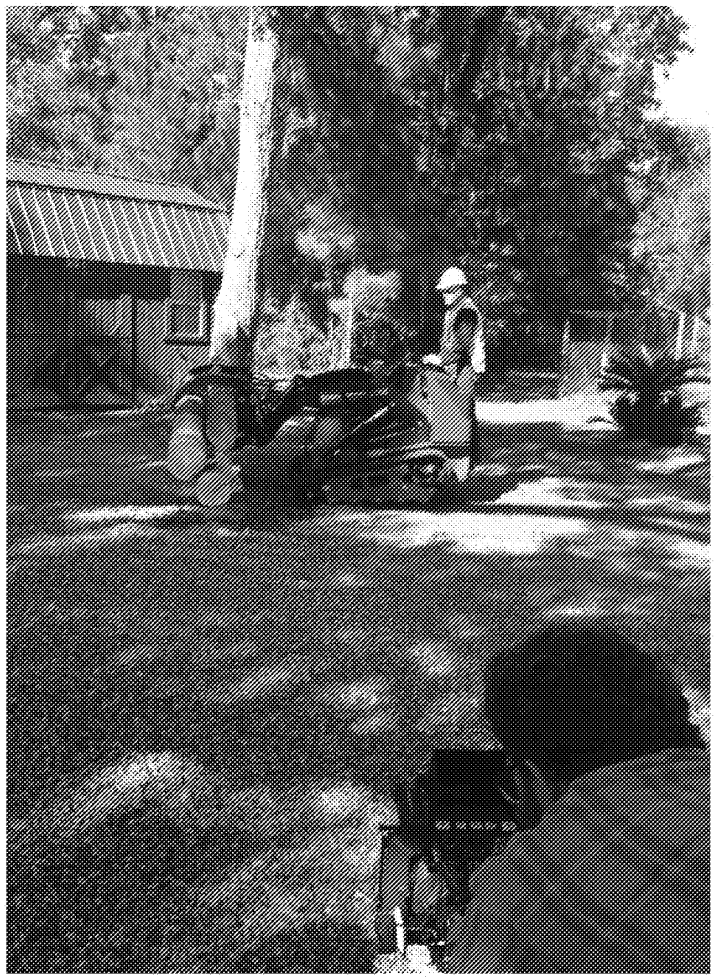
TORO-0003170

W298 TX1000 UPDATE

12/15/14

Photo/video shoot - Pensacola, FL





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W298 TX1000 UPDATE

12/15/14





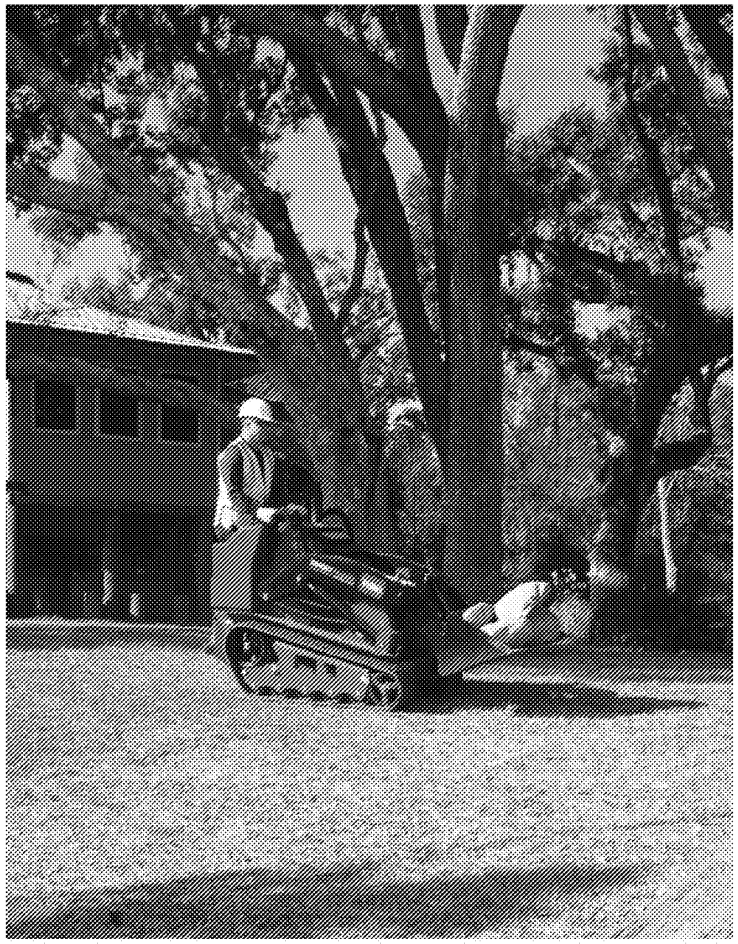
TORO-0003172

Ex. 2002
Page 843 of 915

W298 TX1000 UPDATE

12/15/14





TORO-0003173

Ex. 2002
Page 844 of 915

W298 TX1000 UPDATE

12/15/14



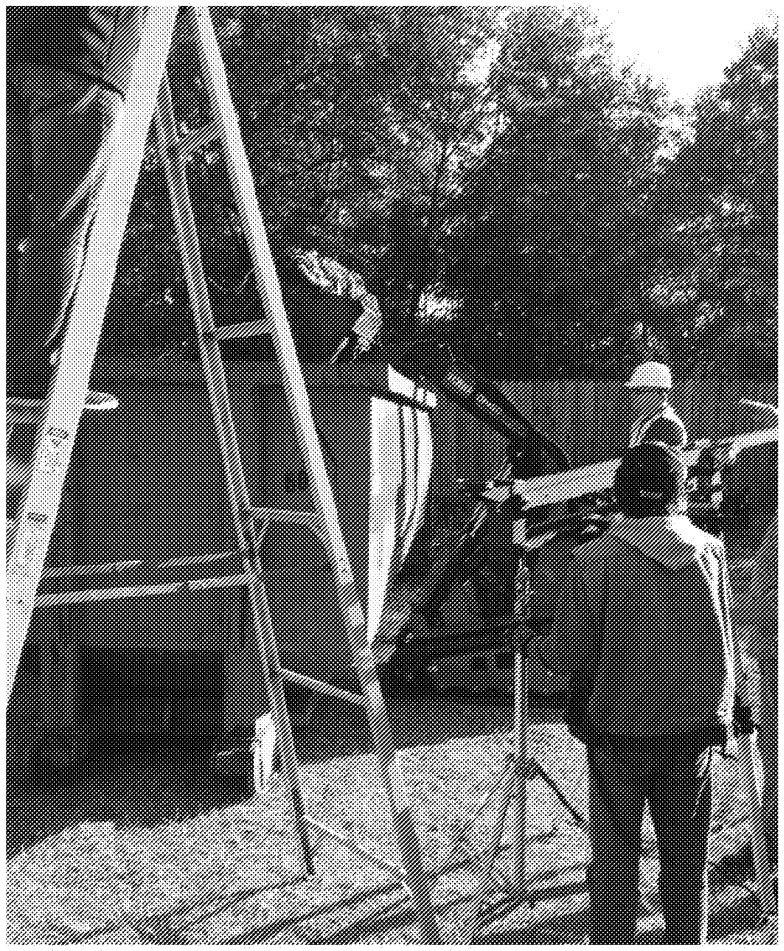


TORO-0003174

Ex. 2002
Page 845 of 915

W298 TX1000 UPDATE

12/15/14





TORO-0003175

Ex. 2002
Page 846 of 915

Exhibit 4

History of the Toro® Dingo® Compact Utility Loader

How Toro pioneered and revolutionized the compact utility loader marketplace

Feb 23, 2016 | Rental (/en/rental) Share

Download Images (https://cdn2.toro.com/en/-/media/Files/Newsroom/rental/2016/zip/02-23-2016-dingo-timeline-1b.ashx?la=en&hash=D60355E796F1

The story of how Toro invented and subsequently revolutionized the compact utility loader (CUL) marketplace in the United States begins in 1995. That is when the Dingo, an Australian-built, wheeled mini-skidsteer loader made its way to the United States. Its initial popularity in the U.S. proved that there was indeed a market for compact utility loaders and drew the attention of The Toro Company. While the Dingo unit was beginning to make a name for itself, Toro acquired the rights to the Dingo machine in the United States and began developing a 19-hp tracked unit that featured Toro's patented control system and a walk-behind design.

Due to the initial popularity of the product line, Toro expanded its operations and dedicated an entire division to the compact utility loader — the Toro Sitework Systems division. At the same time, manufacturing of the Dingo product line was moved to the company's facility in Tomah, Wisconsin.

The rest of the history of the Toro Dingo focuses on continuous improvement by listening to the wants and needs of the end user. In 2000, Toro introduced the TX 420, the first tracked, walk-behind Dingo machine. Two years later in 2002, the Dingo TX 425 was introduced to the marketplace, and proved to be an incredibly popular machine. In 2006, Toro provided yet another tracked Dingo model, the Dingo TX 525, which featured a higher rated operating capacity and a number of operator-centric upgrades.

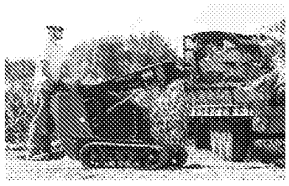
Since 2006, many other upgrades have been incorporated into the entire Dingo product line, effectively demonstrating Toro's commitment to innovation and continuous improvement. In 2015, Toro revolutionized the compact utility loader marketplace with the introduction of the strongest CUL on the market today, the Dingo TX 1000, which features a vertical lift loader arm design and a hinge pin height of 81 inches. With a rated operating capacity of 1,075 lbs. on the wide-track model, not only does the TX 1000 stand proudly in a class of its own, but also rivals the rated operating capacities of many skid steer loaders.

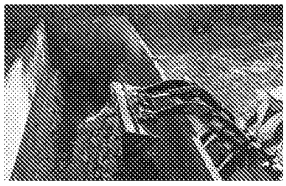
Now offering nine models of compact utility loaders, Toro prides itself on being able to offer the broadest range of compact utility loaders on the market today. It's been said that there is a Dingo unit for every application, and that still rings true today. From the wheeled 220 all the way up to the TX 1000 wide-track model, end users in the United States have been able to take advantage of the features and benefits of Toro's Dingo compact utility loaders for over 18 years.

"Innovation has always been a key driver not only for the Sitework Systems business, but for the entire company," says Rick Rodier, general manager of Toro Sitework Systems. "Frankly, it's engrained in our DNA as a company. In 1914, The Toro Company was born, and we have neverwavered from our focus to offer the most innovative, and highest-quality products across the industries we serve."
In less than two decades, the Sitework Systems division has gone from focusing solely on compact utility loaders to offering tree care and turf renovation equipment, including stump grinders and chippers; concrete, masonry and rental equipment, including mud buggies, power trowels, and mixers; and, underground equipment, including horizontal directional drills, riding and pedestrian trenchers and vibratory plows. The key to the success of the business has always hinged on the ability to innovate and deliver exactly what end-users need at the right time.

Now offering a number of products for construction, landscaping and rental industries, the Toro Sitework Systems business is dedicated now — more than ever — to continuing to provide the best solutions to channel partners and end users across the globe.
For more information about the Toro Dingo or other Toro products, visit www.toro.com (http://www.toro.com).







Luann Monahan | Rental & Underground | 952-887-7220 (tel:952-887-7220) | luann.monahan@toro.com (mailto:luann.monahan@toro.com)

About The Toro Company

The Toro Company (NYSE: TTC) is a leading worldwide provider of innovative solutions for the outdoor environment, including turf, snow and ground engaging equipment and irrigation and outdoor lighting solutions. With sales of $2.4 billion in fiscal 2015, Toro's global presence extends to more than 90 countries. Through constant innovation and caring relationships built on trust and integrity, Toro and its family of brands have built a legacy of excellence by helping customers care for golf courses, landscapes, sports fields, public green spaces, commercial and residential properties and agricultural fields. For more information, visit www.toro.com (http://www.toro.com).

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Exhibit 5

Form No. 3357-123 Rev B

TORO

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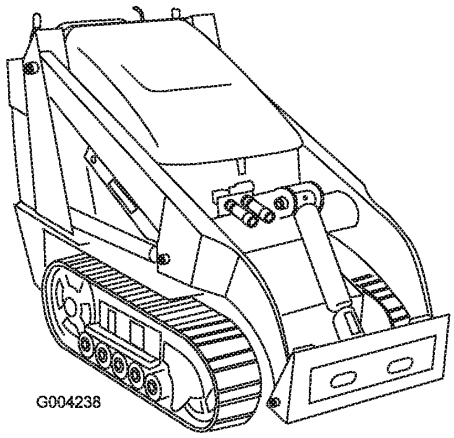
Operator's Manual

Dingo® TX 420 and TX 425 Compact Utility Loader

Model No. 22306—Serial No. 270000001 and Up

Model No. 22306G—Serial No. 270000001 and Up

Model No. 22307—Serial No. 270000001 and Up



Register at www.Toro.com.

Original Instructions (EN)

Warning

CALIFORNIA
Proposition 65 Warning

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

Because in some areas there are local, state, or federal regulations requiring that a spark arrester be used on the engine of this machine, a spark arrester is available as an option. If you require a spark arrestor, contact your Authorized Service Dealer.

Genuine Toro spark arresters are approved by the USDA Forestry Service.

Important: It is a violation of California Public Resource Code Section 4442 to use or operate the engine on any forest-covered, brush-covered, or grass-covered land without a spark arrester muffler maintained in working order, or the engine constricted, equipped, and maintained for the prevention of fire. Other states or federal areas may have similar laws.

This spark ignition system complies with Canadian ICES-002.

The enclosed *Engine Owner's Manual* is supplied for information regarding the US Environmental Protection Agency (EPA) and the California Emission Control Regulation of emission systems, maintenance, and warranty. Replacements may be ordered through the engine manufacturer.

Introduction

Read this information carefully to learn how to operate and maintain your product properly and to avoid injury and product damage. You are responsible for operating the product properly and safely.

You may contact Toro directly at www.Toro.com for product and accessory information, help finding a dealer, or to register your product.

Whenever you need service, genuine Toro parts, or additional information, contact an Authorized Service Dealer or Toro Customer Service and have the model and serial numbers of your product ready. The model and serial numbers are stamped into a plate mounted under the hood near the belt drive. Write the numbers in the space provided.

Model No. _____

Serial No. _____

This manual identifies potential hazards and has safety messages identified by the safety alert symbol (Figure 1), which signals a hazard that may cause serious injury or death if you do not follow the recommended precautions.



Figure 1

1. Safety alert symbol

This manual uses 2 other words to highlight information. **Important** calls attention to special mechanical information and **Note** emphasizes general information worthy of special attention.

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Bloomington, MN 55420

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Contents

Introduction 2
Safety 4
Safe Operating Practices 4
Slope Chart 7
Safety and Instructional Decals 8
Setup 11
1 Charging the Battery 11
2 Checking Fluid Levels 11
Product Overview 12
Controls 12
Specifications 15
Attachments/Accessories 15
Stability Data 16
Operation 17
Adding Fuel 17
Checking the Engine Oil Level 18
Checking the Hydraulic Fluid Level 18
Starting and Stopping the Engine 19
Stopping the Traction Unit 19
Moving a Non-functioning Traction Unit 19
Using the Cylinder Lock 20
Using Attachments 20
Securing the Traction Unit for Transport 22
Lifting the Traction Unit 22
Maintenance 23
Recommended Maintenance Schedule(s) 23
Premaintenance Procedures 24
Opening the Hood 24
Closing the Hood 24
Opening the Rear Access Cover 24
Closing the Rear Access Cover 25
Removing the Side Screens 25
Installing the Side Screens 25
Removing the Front Screen 25
Lubrication 26
Greasing the Traction Unit 26
Engine Maintenance 27
Servicing the Air Cleaner 27
Servicing the Engine Oil 28
Servicing the Spark Plugs 29
Fuel System Maintenance 30
Changing the Fuel Filter 30
Draining the Fuel Tank 30
Electrical System Maintenance 31
Servicing the Battery 31
Drive System Maintenance 32
Servicing the Tracks 32
Belt Maintenance 35
Inspecting/Replacing the Drive Belt 35
Controls System Maintenance 37
Adjusting the Traction Control Alignment 37
Adjusting the Traction Control Neutral Position 37
Adjusting the Tracking of the Traction Control, Full Forward Position 38
Hydraulic System Maintenance 39
Replacing the Hydraulic Filter 39
Changing the Hydraulic Fluid 39
Checking the Hydraulic Lines 40
Cleaning 41
Removing Debris from the Traction Unit 41
Cleaning the Chassis 41
Storage 43
Troubleshooting 44
Schematics 45

Safety

Improper use or maintenance by the operator or owner can result in injury. To reduce the potential for injury, comply with these safety instructions and always pay attention to the safety alert symbol ⚠, which means: *Caution*, *Warning*, or *Danger*—personal safety instruction. Failure to comply with the instruction may result in personal injury or death.

Safe Operating Practices

This product is capable of amputating hands and feet. Always follow all safety instructions to avoid serious injury or death.



Engine exhaust contains carbon monoxide, an odorless, deadly poison that can kill you.

Do not run the engine indoors or in an enclosed area.

Training

- Read the *Operator's Manual* and other training material. If the operator(s) or mechanic(s) can not read English, it is the owner's responsibility to explain this material to them.
- Become familiar with the safe operation of the equipment, operator controls, and safety signs.
- All operators and mechanics should be trained. The owner is responsible for training the users.
- Never let children or untrained people operate or service the equipment. Local regulations may restrict the age of the operator.
- The owner/user can prevent and is responsible for accidents or injuries occurring to himself or herself, other people or property.

Preparation

- Evaluate the terrain to determine what accessories and attachments are needed to properly and safely perform the job. Only use accessories and attachments approved by the manufacturer.
- Wear appropriate clothing including hard hat, safety glasses, long pants, safety shoes, and hearing protection. Long hair, loose clothing or jewelry may get tangled in moving parts.
- Inspect the area where the equipment is to be used and remove all objects such as rocks, toys, and wire which can be thrown by the machine.
- Use extra care when handling gasoline and other fuels. They are flammable and vapors are explosive.
  - Use only an approved container
  - Never remove the gas cap or add fuel with the engine running. Allow the engine to cool before refueling. Do not smoke.
  - Never refuel or drain the machine indoors.
- Check that the operator's presence controls, safety switches, and shields are attached and functioning properly. Do not operate unless they are functioning properly.

Operation

- Never run an engine in an enclosed area.
- Only operate in good light, keeping away from holes and hidden hazards.
- Be sure all drives are in neutral and parking brake is engaged before starting the engine. Only start the engine from the operator's position.
- Slow down and use extra care on hillsides. Be sure to travel in the recommended direction on hillsides. Turf conditions can affect the machine's stability.
- Slow down and use caution when making turns and when changing directions on slopes.
- Never operate with the guards not securely in place. Be sure all interlocks are attached, adjusted properly, and functioning property.
- Do not change the engine governor setting or overspeed the engine.
- Stop on level ground, lower implements, disengage the auxiliary hydraulics, engage parking brake, shut off the engine before leaving the operator's position for any reason.
- Keep hands and feet away from moving attachments.
- Look behind and down before backing up to be sure of a clear path.
- Never carry passengers and keep pets and bystanders away.
- Slow down and use caution when making turns and crossing roads and sidewalks.
- Do not operate the machine under the influence of alcohol or drugs.
- Use care when loading or unloading the machine into a trailer or truck.
- Use care when approaching blind corners, shrubs, trees, or other objects that may obscure vision.

- Read all attachment manuals.
- Ensure that the area is clear of other people before operating the traction unit. Stop the traction unit if anyone enters the area.
- Never leave a running traction unit unattended. Always lower the loader arms, stop the engine, set the parking brake, and remove the key before leaving.
- Do not exceed the rated operating capacity, as the traction unit may become unstable which may result in loss of control.
- Do not carry a load with the arms raised. Always carry loads close to the ground.
- Do not over-load the attachment and always keep the load level when raising the loader arms. Logs, boards, and other items could roll down the loader arms, injuring you.
- Never jerk the controls; use a steady motion.
- Watch for traffic when operating near or crossing roadways.
- Do not touch parts which may be hot from operation. Allow them to cool before attempting to maintain, adjust, or service.
- Check for overhead clearances (i.e. branches, doorways, electrical wires) before driving under any objects and do not contact them.
- Ensure that you operate the traction unit in areas where there are no obstacles in close proximity to the operator. Failure to maintain adequate distance from trees, walls, and other barriers may result in injury as the traction unit backs up during operation if the operator is not attentive to the surroundings. Only operate the unit in areas where there is sufficient clearance for the operator to safely maneuver the product.
- Before digging, have the area marked for underground utilities, and do not dig in marked areas.
- Locate the pinch point areas marked on the traction unit and attachments and keep hands and feet away from these areas.
- Before operating the traction unit with an attachment, ensure that the attachment is properly installed.

Slope Operation

Slopes are a major factor related to loss-of-control and tip-over accidents, which can result in severe injury or death. All slopes require extra caution.

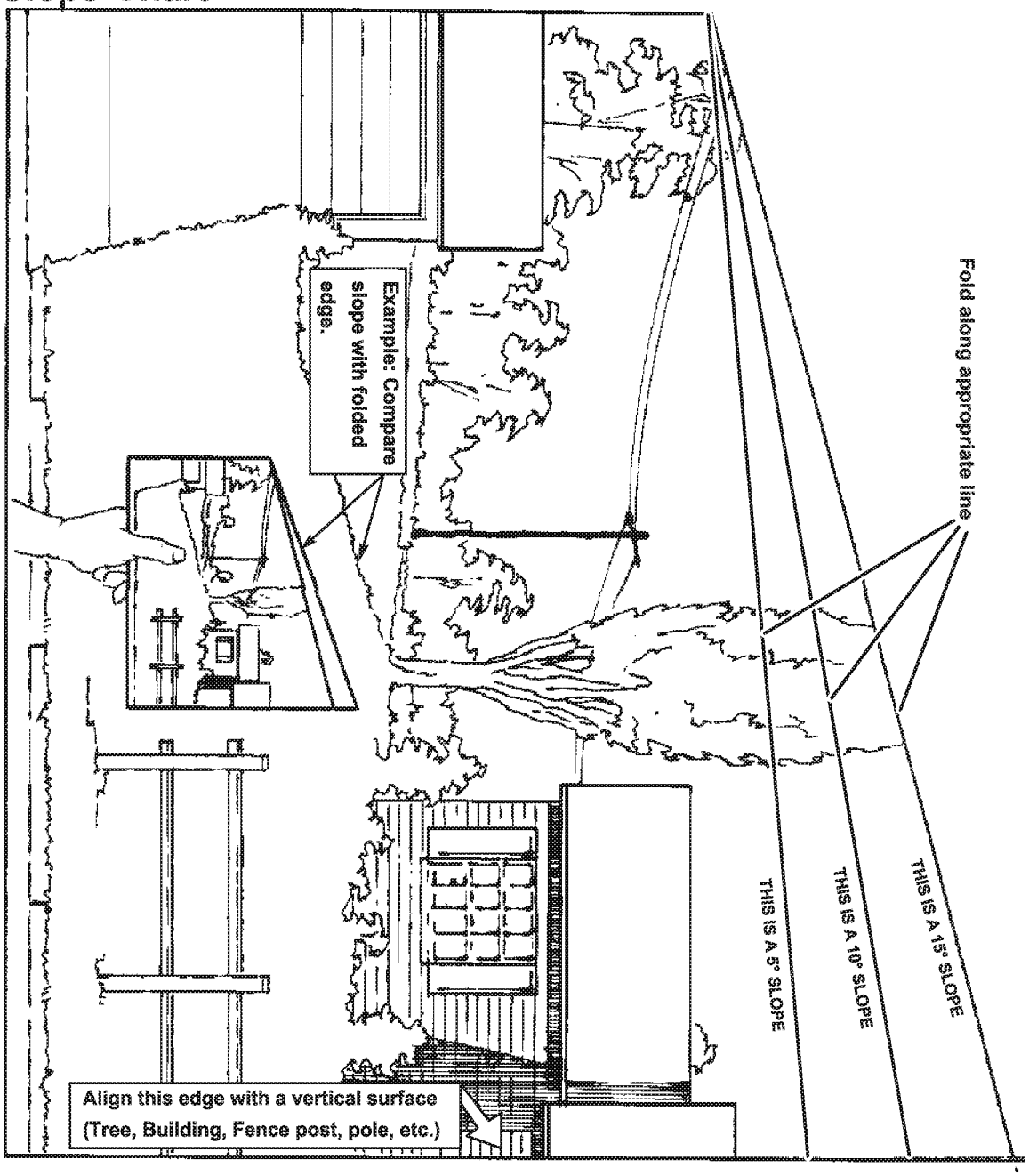
- Do not operate the traction unit on hillsides or slopes exceeding the angles recommended in the Stability Data section and those in the attachment *Operator's Manual.* See also the Slope Chart , page 7.
- **Operate up and down slopes with the heavy end of the traction unit uphill.** Weight distribution changes. An empty bucket will make the rear of the traction unit the heavy end, and a full bucket will make the front of the traction unit the heavy end. Most other attachments will make the front of traction unit the heavy end.
- Raising the loader arms on a slope will affect the stability of the machine. Whenever possible, keep the loader arms in the lowered position when on slopes.
- Removing an attachment on a slope will make the rear of the traction unit heavy. Refer to the Stability Data section to determine whether the attachment can be safely removed on the slope.
- Remove obstacles such as rocks, tree limbs, etc. from the work area. Watch for holes, ruts, or bumps, as uneven terrain could overturn the traction unit. Tall grass can hide obstacles.
- Use only Toro-approved attachments. Attachments can change the stability and the operating characteristics of the traction unit. Warranty may be voided if used with unapproved attachments.
- Keep all movements on slopes slow and gradual. Do not make sudden changes in speed or direction.
- Avoid starting or stopping on a slope. If the traction unit loses traction, proceed slowly, straight down the slope.
- Avoid turning on slopes. If you must turn, turn slowly and keep the heavy end of the traction unit uphill.
- Do not operate near drop-offs, ditches, or embankments. The traction unit could suddenly turn over if a track goes over the edge of a cliff or ditch, or if an edge caves in.
- Do not operate on wet grass. Reduced traction could cause sliding.
- Do not park the traction unit on a hillside or slope without lowering the attachment to the ground, setting the parking brake, and chocking the tracks.

Maintenance and Storage

- Disengage the auxiliary hydraulics, lower the attachment, set the parking brake, stop the engine, and remove the key. Wait for all movement to stop before adjusting, cleaning, or repairing.
- Clean debris from attachments, drives, mufflers, and engine to help prevent fires. Clean up oil or fuel spillage.

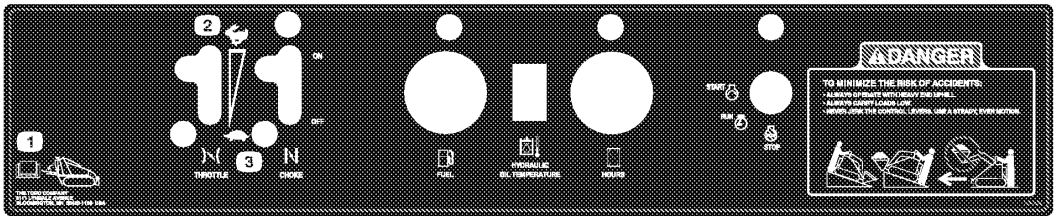
- Let the engine cool before storing and do not store near flame.
- Do not store fuel near flames or drain indoors.
- Park the machine on level ground. Never allow untrained personnel to service the machine.
- Use jack stands to support components when required.
- Carefully release pressure from components with stored energy.
- Disconnect the battery or remove the spark plug wires before making any repairs. Disconnect the negative terminal first and the positive last. Reconnect positive first and negative last.
- Keep hands and feet away from moving parts. If possible, do not make adjustments with the engine running.
- Charge batteries in an open well ventilated area, away from spark and flames. Unplug the charger before connecting or disconnecting it from the battery. Wear protective clothing and use insulated tools.
- Keep all parts in good working condition and all hardware tightened. Replace all worn or damaged decals.
- If any maintenance or repair requires the loader arms to be in the raised position, secure the arms in the raised position with the hydraulic cylinder lock.
- Secure the loader arm valve with the loader valve lock anytime you need to stop the machine with the loader arms raised.
- Keep nuts and bolts tight. Keep equipment in good condition.
- Never tamper with safety devices.
- Keep the traction unit free of grass, leaves, or other debris build-up. Clean up oil or fuel spillage. Allow the traction unit to cool before storing.
- Use extra care when handling gasoline and other fuels. They are flammable and vapors are explosive.
  - Use only an approved container.
  - Never remove the gas cap or add fuel when the engine is running. Allow the engine to cool before refueling. Do not smoke.
  - Never refuel the traction unit indoors.
  - Never store the traction unit or fuel container inside where there is an open flame, such as near a water heater or furnace.
  - Never fill a container while it is inside a vehicle, trunk, pick-up bed, or any surface other than the ground.
  - Keep container nozzle in contact with the tank during filling.
- Stop and inspect the equipment if you strike an object. Make any necessary repairs before restarting.
- Use only genuine Toro replacement parts to ensure that original standards are maintained.
- Battery acid is poisonous and can cause burns. Avoid contact with skin, eyes, and clothing. Protect your face, eyes, and clothing when working with a battery.
- Battery gases can explode. Keep cigarettes, sparks and flames away from the battery.
- Keep your body and hands away from pin hole leaks or nozzles that eject high pressure hydraulic fluid. Use cardboard or paper to find hydraulic leaks; never use your hands. Hydraulic fluid escaping under pressure can penetrate skin and cause injury requiring surgery within a few hours by a qualified surgeon or gangrene may result.

Slope Chart


Example: Compare slope with folded edge.
Fold along appropriate line
THIS IS A 5° SLOPE
THIS IS A 10° SLOPE
THIS IS A 15° SLOPE
Align this edge with a vertical surface
(Tree, Building, Fence post, pole, etc.)

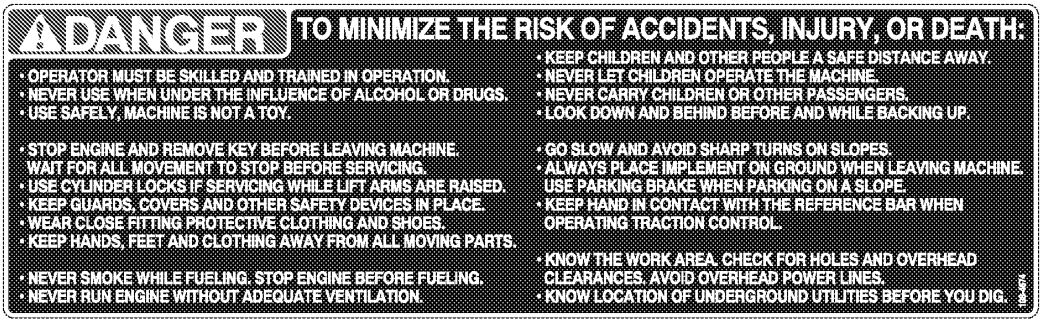
Safety and Instructional Decals

Safety decals and instructions are easily visible to the operator and are located near any area of potential danger. Replace any decal that is damaged or lost.

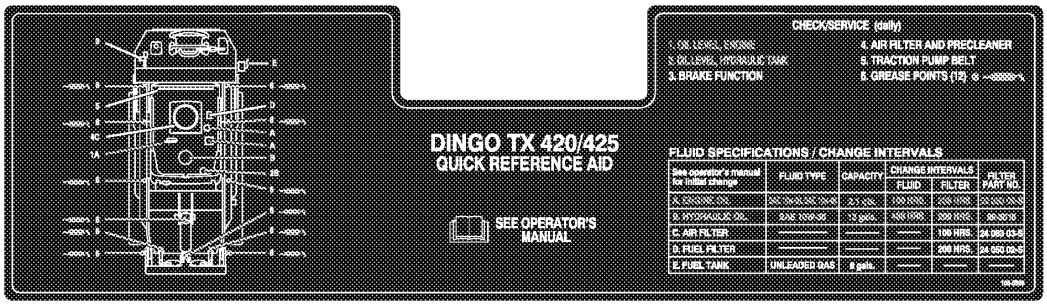


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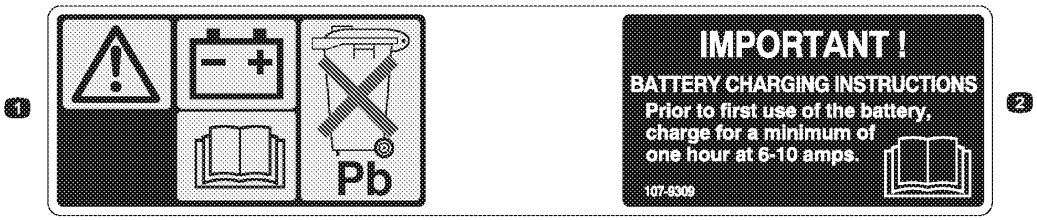
1. *Operator's Manual* location.
2. Fast
3. Slow



108-4674



108-5599



107-9309

1. Warning—read the *Operator's Manual* for information on charging the battery; contains lead; do not discard.
2. Read the *Operator's Manual*.



100-6101



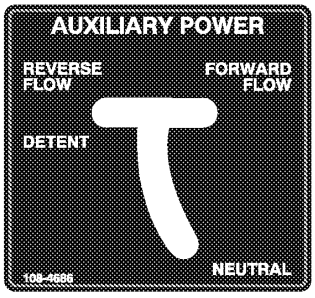
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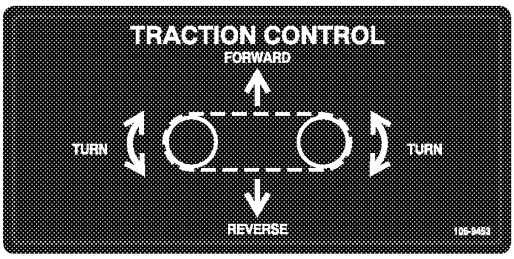
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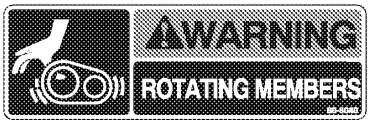
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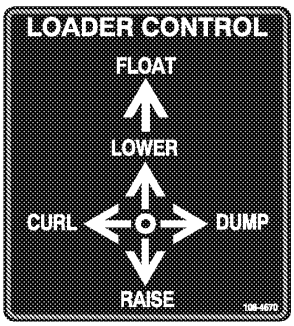
80-8040



105-8432



80-8290



108-4670



108-4671



93-9084

1. Lift point
2. Tie-down point

Setup

1

Charging the Battery

No Parts Required

Procedure

Warning

CALIFORNIA
Proposition 65 Warning

Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. Wash hands after handling.

1. Open the rear access cover.
2. Connect a charger to the battery (Figure 2) and charge it for a minimum of 1 hour at 6 to 10 amps. Do not overcharge the battery.

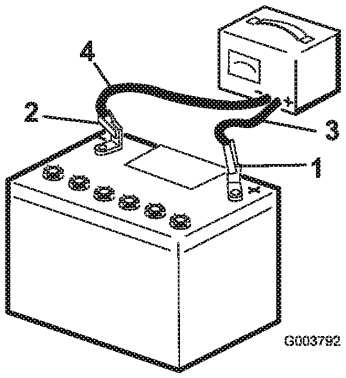


Figure 2

1. Positive post
2. Negative post
3. Charger red (+) wire
4. Charger black (—) wire

Charging the battery produces gasses that can explode.

Never smoke near the battery and keep sparks and flames away from battery.

3. When the battery is fully charged, unplug the charger from the electrical outlet, then disconnect the charger leads from the battery posts (Figure 2).
4. Close the rear access cover.

2

Checking Fluid Levels

No Parts Required

Procedure

Before starting the engine for the first time, check the engine oil and hydraulic fluid levels. Refer to Operation for more information.

Product Overview

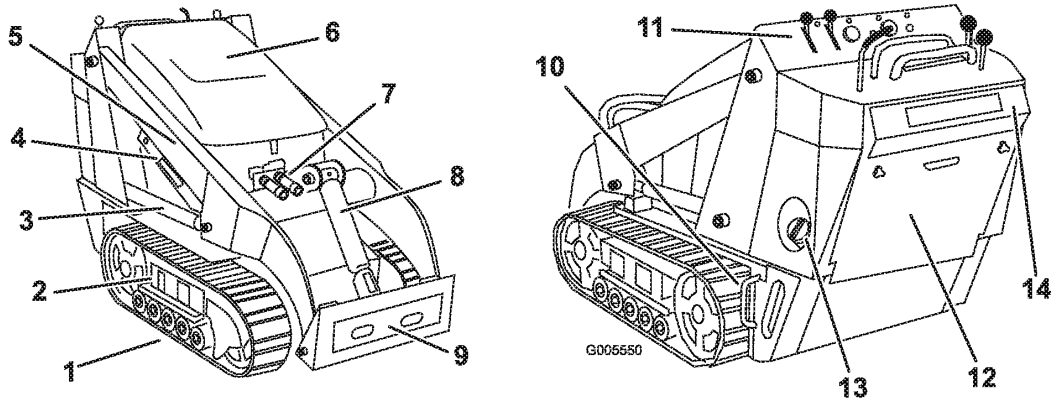


Figure 3

1. Track
2. Track adjustment chamber
3. Lift cylinder
4. Cylinder lock
5. Loader arms
6. Hood
7. Auxiliary hydraulic couplers
8. Tilt cylinder
9. Mount plate
10. Tie-down/lift loop
11. Control panel
12. Rear access cover
13. Fuel tank
14. Reverse safety plate

Controls

Become familiar with all the controls (Figure 4) before you start the engine and operate the traction unit.

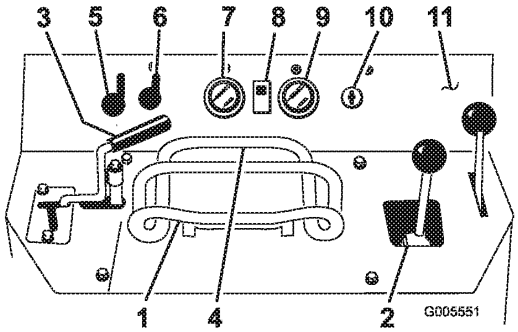


Figure 4

1. Traction control
2. Loader arm/attachment tilt lever
3. Auxiliary hydraulics lever
4. Reference bar
5. Throttle lever
6. Choke lever
7. Fuel gauge
8. Hydraulic oil temperature light
9. Hour meter/tachometer
10. Key switch
11. Parking brake lever

Key Switch

The key switch, used to start and stop the engine, has three positions: off, run, and start.

To start the engine, rotate the key to the start position. Release the key when engine starts and it will move automatically to the run position.

To stop the engine, rotate the key to the off position.

Throttle Lever

Move the control forward to increase the engine speed and rearward to decrease speed.

Choke Lever

Before starting a cold engine, move the choke lever forward. After the engine starts, regulate the choke to keep the engine running smoothly. As soon as possible, move the choke lever all the way rearward.

Note: A warm engine requires little or no choking.

Reference Bar

When driving the traction unit, use the reference bar as a handle and a leverage point for controlling the traction control and the auxiliary hydraulics lever. To ensure smooth, controlled operation, do not take both hands off of the reference bar while operating the traction unit.

Traction Control

To move forward, move the traction control forward. To move rearward, move the traction control rearward (Figure 5).

To turn, rotate the traction control in the desired direction (Figure 5).

The farther you move the traction control in any direction, the faster the traction unit will move in that direction.

To stop, release the traction control.

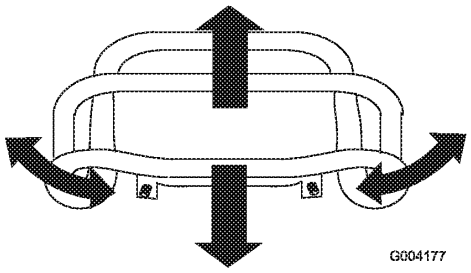


Figure 5

Loader Arm/Attachment Tilt Lever

To tilt the attachment forward, slowly move the lever to the right (Figure 6).

To tilt the attachment rearward, slowly move the lever to the left (Figure 6).

To lower the loader arms, slowly move the lever forward (Figure 6).

To raise the loader arms, slowly move the lever rearward (Figure 6).

You can also push the lever fully forward into a detent position (Figure 6) to release the loader arms so that the attachment rests on the ground. This allows attachments such as the leveler and the hydraulic blade to follow the contours of the ground (i.e., float) when grading.

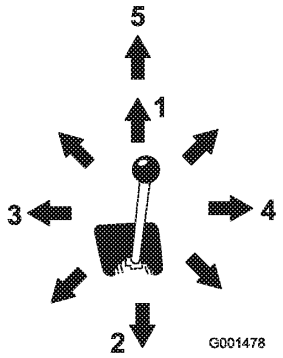


Figure 6

1. Lower the loader arms
2. Raise the loader arms
3. Tilt the attachment rearward
4. Tilt the attachment forward
5. Detent (Float) position

By moving the lever to an intermediate position (such as, forward and left), you can move the loader arms and tilt the attachment at the same time.

Auxiliary Hydraulics Lever

To operate a hydraulic attachment in the forward direction, rotate the auxiliary hydraulics lever rearward and pull it down to the reference bar (Figure 7, number 1).

To operate a hydraulic attachment in reverse direction, rotate the hydraulics lever rearward, then move it left into the upper slot (Figure 7, number 2).

If you release the lever while in the forward position, the lever will automatically return to the neutral position (Figure 7, number 3). If it is in the reverse position, it will remain there until you pull it out of the slot.

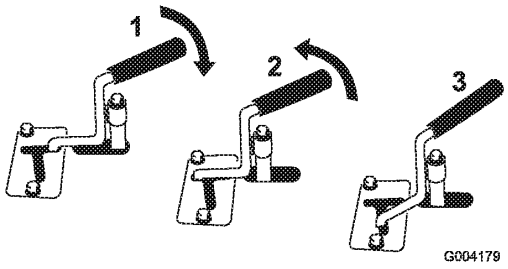


Figure 7

1. Forward flow hydraulics
2. Reverse flow hydraulics
3. Neutral

Parking Brake Lever

To set the parking brake, push the brake lever forward and to the left and then pull it rearward (Figure 8).

Note: The traction unit may roll slightly before the brakes engage in the drive sprocket.

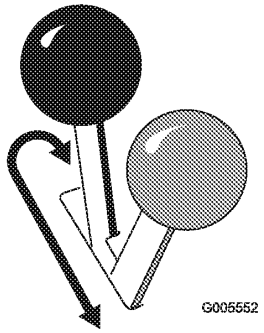


Figure 8

To release the brake, push the lever forward and then right, into the notch.

Fuel Gauge

This gauge measures the amount of fuel in the fuel tank.

Hydraulic Oil Temperature Light (Dingo TX 425 only)

If the hydraulic oil gets too hot, this light illuminates and an audible alarm sounds. If this happens, stop the engine and allow the traction unit to cool.

Hour Meter/Tachometer

When the engine is off, the hour meter/tachometer displays the number of hours of operation that have been logged on the traction unit. When the engine is running, it displays the speed of the engine in revolutions per minute (rpm).

After 50 hours and then every 100 hours thereafter (that is at 150, 250, 350, etc.) the screen displays CHG OIL to remind you to change the engine oil. After every 100 hours, the screen displays SVC to remind you to perform the other maintenance procedures based on a 100, 200, or 400 hour schedule. These reminders come on starting three hours prior to the service interval time and flash at regular intervals for six hours.

Specifications

Note: Specifications and design are subject to change without notice.

TX 420, Model 22306	
Width	34 inches (86 cm)
Length	71 inches (180 cm)
Height	46 inches (117 cm)
Weight	1880 lb (853 Kg)
Operating capacity	500 lb (227 Kg)
Tipping capacity	1480 lb (671 Kg)
Wheelbase	31.2 inches (79 cm)
Dump height (with narrow bucket)	47 inches (119 cm)
Reach—fully raised (with narrow bucket)	22 inches (55 cm)
Height to hinge pin (narrow bucket in highest position)	66 inches (168 cm)

TX 425, Model 22307	
Width	41 inches (104 cm)
Length	71 inches (180 cm)
Height	46 inches (117 cm)
Weight	2060 lb (935 Kg)
Operating capacity	500 lb (227 Kg)
Tipping capacity	1427 lb (647 Kg)
Wheelbase	31.2 inches (79 cm)
Dump height (with narrow bucket)	47 inches (119 cm)
Reach—fully raised (with narrow bucket)	22 inches (55 cm)
Height to hinge pin (narrow bucket in highest position)	66 inches (168 cm)

Attachments/Accessories

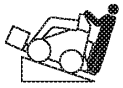
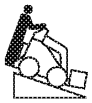
A selection of Toro approved attachments and accessories are available for use with the machine to enhance and expand its capabilities. Contact your Authorized Service Dealer or Distributor or go to www.Toro.com for a list of all approved attachments and accessories.

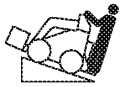
Important: Use only Toro approved attachments. Other attachments may create an unsafe operating environment or damage the traction unit.

Stability Data

The following tables list the maximum slope recommended for the traction unit in the positions listed in the tables. Slopes over the listed degree may cause the traction unit to become unstable. The data in the tables assume that the loader arms are fully lowered; raised arms may affect the stability.

In each attachment manual is a set of three stability ratings, one for each hill position. To determine the maximum slope you can traverse with the attachment installed, find the degree of slope that corresponds to the stability ratings of the attachment. Example: If the attachment installed on a TX 420 traction unit has a Front Uphill rating of B, a Rear Uphill rating of D, and a Side Uphill rating of C, then you could drive forward up a 20° slope, rearward up a 12° slope, or sideways on a 14° slope, as listed in the following table for the TX 420 traction unit.

TX 420, Model 22306			
	Maximum Recommended Slope when Operating with:		
Configuration	**Front Uphill** 	**Rear Uphill** 	**Side Uphill** 
Traction unit without attachment	11°	21°	19°
Traction unit with an attachment rated with one of the following stability ratings for each slope position:*			
A	25°	25°	20°
B	20°	20°	18°
C	17°	17°	14°
D	10°	12°	9°
E	5°	5°	5°

TX 425, Model 22307			
	Maximum Recommended Slope when Operating with:		
Configuration	**Front Uphill** 	**Rear Uphill** 	**Side Uphill** 
Traction unit without attachment	12°	20°	23°
Traction unit with an attachment rated with one of the following stability ratings for each slope position:*			
A	25°	25°	25°
B	22°	22°	22°
C	18°	16°	16°
D	10°	10°	10°
E	5°	5°	5°

Operation

Note: Determine the left and right sides of the machine from the normal operating position.

Important: Before operating, check the fuel and oil level, and remove debris from the traction unit. Also, ensure that the area is clear of people and debris. You should also know and have marked the locations of all utility lines.

Adding Fuel

Use unleaded gasoline (87 pump octane minimum). Leaded, regular gasoline may be used if unleaded is not available.



In certain conditions, gasoline is extremely flammable and highly explosive. A fire or explosion from gasoline can burn you and others and can damage property.

- **Fill the fuel tank outdoors, in an open area, when the engine is cold. Wipe up any gasoline that spills.**
- **Never fill the fuel tank inside an enclosed trailer.**
- **Do not fill the fuel tank completely full. Add gasoline to the fuel tank until the level is 1/4 to 1/2 inch (6 to 13 mm) below the bottom of the filler neck. This empty space in the tank allows gasoline to expand.**
- **Never smoke when handling gasoline, and stay away from an open flame or where gasoline fumes may be ignited by a spark.**
- **Store gasoline in an approved container and keep it out of the reach of children. Never buy more than a 30-day supply of gasoline.**
- **Do not operate without entire exhaust system in place and in proper working condition.**



In certain conditions during fueling, static electricity can be released causing a spark which can ignite the gasoline vapors. A fire or explosion from gasoline can burn you and others and can damage property.

- **Always place gasoline containers on the ground away from your vehicle before filling.**
- **Do not fill gasoline containers inside a vehicle or on a truck or trailer bed because interior carpets or plastic truck bed liners may insulate the container and slow the loss of any static charge.**
- **When practical, remove gas-powered equipment from the truck or trailer and refuel the equipment with its wheels on the ground.**
- **If this is not possible, then refuel such equipment on a truck or trailer from a portable container, rather than from a gasoline dispenser nozzle.**
- **If a gasoline dispenser nozzle must be used, keep the nozzle in contact with the rim of the fuel tank or container opening at all times until fueling is complete.**

Important: Do not use methanol, gasoline containing methanol, or gasohol containing more than 10% ethanol because the fuel system could be damaged. Do not mix oil with gasoline.

Using Stabilizer/Conditioner

Use a fuel stabilizer/conditioner in the traction unit to provide the following benefits:

- Keeps gasoline fresh during storage of 90 days or less. For longer storage it is recommended that the fuel tank be drained.
- Cleans the engine while it runs
- Eliminates gum-like varnish buildup in the fuel system, which causes hard starting

Important: Do not use fuel additives containing methanol or ethanol.

Add the correct amount of gas stabilizer/conditioner to the gas.

Note: A fuel stabilizer/conditioner is most effective when mixed with fresh gasoline. To minimize the

chance of varnish deposits in the fuel system, use fuel stabilizer at all times.

Filling the Fuel Tank

1. Park the traction unit on a level surface, lower the loader arms, and stop the engine.
2. Remove the key and allow the engine to cool.
3. Clean around the fuel tank cap and remove it.
4. Add unleaded gasoline to the fuel tank, until the level is just below the bottom of the filler neck.

   Important: This space in the tank allows gasoline to expand. Do not fill the fuel tank completely full.
5. Install the fuel tank cap securely.
6. Wipe up any gasoline that may have spilled.

Checking the Engine Oil Level

1. Park the traction unit on a level surface, lower the loader arms, and stop the engine.
2. Remove the key and allow the engine to cool.
3. Open the hood.
4. Clean around the oil dipstick (Figure 9).

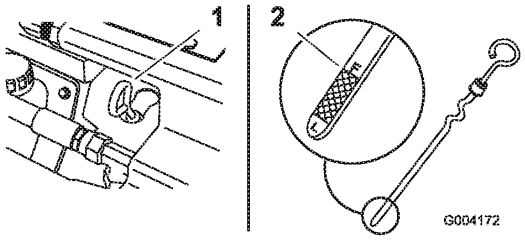


Figure 9

1. Oil dipstick
2. Metal end

5. Pull out the dipstick and wipe the metal end clean (Figure 9).
6. Slide the dipstick fully into the dipstick tube (Figure 9).
7. Pull the dipstick out and look at the metal end.
8. If the oil level is low, clean around the oil filler cap and remove the cap (Figure 10).

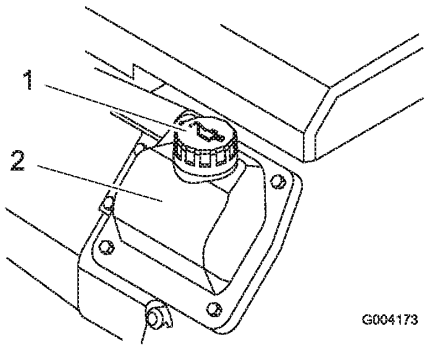


Figure 10

1. Filler cap
2. Valve cover

9. Slowly pour only enough oil into the valve cover to raise the level to the F (full) mark.

   Important: Do not overfill the crankcase with oil because the engine may be damaged.
10. Replace the filler cap and dipstick.
11. Close the hood.

Checking the Hydraulic Fluid Level

Check the hydraulic fluid level before the engine is first started and after every 25 operating hours.

Hydraulic Tank Capacity: 12 US gallons (45.4 l)

Use 10W-30 or 15W-40 detergent, diesel engine oil (API service CH-4 or higher).

1. Remove the attachment, if one is installed; refer to Removing an Attachment.
2. Park the traction unit on a level surface, lower the loader arms, and fully retract the tilt cylinder.
3. Stop the engine, remove the key, and allow the engine to cool.
4. Open the hood.
5. Clean the area around the filler neck of the hydraulic tank (Figure 11).
6. Remove the cap from the filler neck and check the fluid level on the dipstick (Figure 11).

   The fluid level should be between the marks on the dipstick.

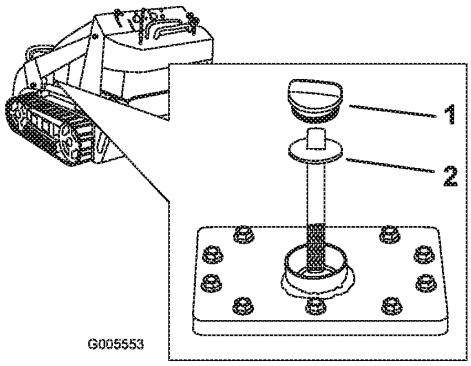


Figure 11

1. Filler neck cap
2. Dipstick

7. If the level is low, add enough fluid to raise it to the proper level.
8. Install the cap on the filler neck.
9. Close the hood.

Starting and Stopping the Engine

Starting the Engine

1. Ensure that the auxiliary hydraulics lever is in neutral.
2. Pull out the choke lever if you are starting a cold engine.
3. Move the throttle lever midway between slow (turtle) and fast (rabbit) positions.

   Note: A warm or hot engine may not require choking.
4. Turn the ignition key to the start position. When the engines starts, release the key.

   Important: Do not engage the starter for more than 10 seconds at a time. If the engine fails to start, allow a 30 second cool-down period between attempts. Failure to follow these instructions can burn out the starter motor.
5. After the engine starts, gradually push the choke down. If the engine stalls or hesitates, pull the choke out again until the engine warms up.
6. Move the throttle lever to desired setting.

   Important: If the engine is run at high speeds when the hydraulic system is cold (i.e., when the ambient air temperature is near freezing or lower), hydraulic system damage could occur. When starting the engine in cold conditions, allow the engine to run in the middle throttle position for 2 to 5 minutes before moving the throttle to fast (rabbit).

   Note: If outdoor temperature is below freezing, store the traction unit in a garage to keep it warmer and aid in starting.

Stopping the Engine

1. Move the throttle lever to the slow (turtle) position.
2. Lower the loader arms to the ground.
3. Turn the ignition key off.

   Note: If the engine has been working hard or is hot, let it idle for a minute before turning the ignition key off. This helps cool the engine before it is stopped. In an emergency, the engine may be stopped immediately.

Stopping the Traction Unit

To stop the traction unit, release the traction control, move the throttle lever to slow (turtle), lower loader arms to the ground, and stop the engine. Set the parking brake and remove the key.

A child or untrained bystander could attempt to operate the traction unit and be injured.

Remove the key from the switch when leaving the traction unit, even if just for a few seconds.

Moving a Non-functioning Traction Unit

Important: Do not tow or pull the traction unit without first opening the tow valves, or the hydraulic system will be damaged.

1. Stop the engine.
2. Open the rear access cover.
3. Using a wrench, turn the tow valves on the hydraulic pumps twice counter-clockwise (Figure 12).

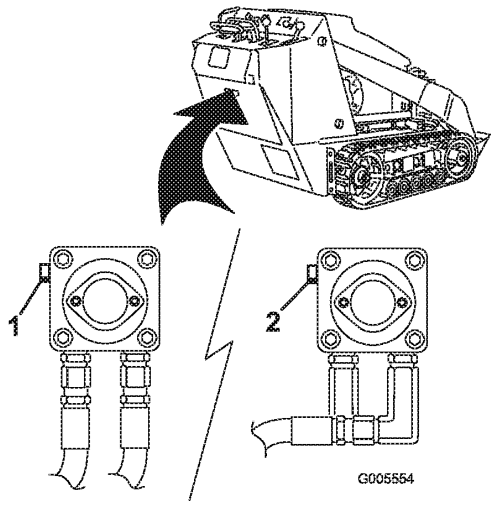


Figure 12

1. Left tow valve (right track)
2. Right tow valve (left track)

4. Tow the traction unit as required.
5. When the traction unit has been repaired, close the tow valves before operating it.

Using the Cylinder Lock

The loader arms may lower when in the raised position crushing anyone under them.

Install the cylinder lock before performing maintenance that requires raised loader arms.

Installing the Cylinder Lock

1. Remove the attachment.
2. Raise the loader arms to the fully raised position.
3. Stop the engine.
4. Remove the hairpin cotter and clevis pin securing the cylinder lock to the loader arm (Figure 13).

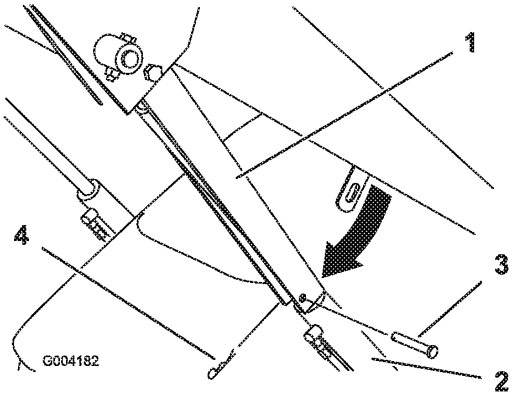


Figure 13

1. Cylinder lock
2. Lift cylinder
3. Clevis pin
4. Hairpin cotter

5. Lower the cylinder lock over the cylinder rod and secure it with the clevis pin and hairpin cotter (Figure 13).
6. **Slowly** lower the loader arms until cylinder lock contacts the cylinder body and rod end.

Removing/Storing the Cylinder Lock

Important: Ensure that the cylinder lock is removed from the rod and fully secured in the storage position before operating the traction unit.

1. Start the engine.
2. Raise the loader arms to the fully raised position.
3. Stop the engine.
4. Remove the clevis pin and cotter pin securing the cylinder lock.
5. Rotate the cylinder lock up to the loader arm and secure it with the clevis pin and hairpin cotter.
6. Lower the loader arms.

Using Attachments

Important: If you are using an attachment with a serial number of 200999999 or earlier, the manual for the attachment may contain information specific to the use of the attachment with other Dingo models, such as settings for the flow divider control and speed selector lever and the use of a counterweight on the traction unit. These systems are built into the Dingo TX, and you should ignore any references to them.

Installing an Attachment

Important: **Use only Toro-approved attachments. Attachments can change the stability and the operating characteristics of the traction unit. The warranty of the traction unit may be voided if used with unapproved attachments.**

Important: **Before installing the attachment, ensure that the mount plates are free of any dirt or debris and that the pins rotate freely. If the pins do not rotate freely, grease them.**

1. Position the attachment on a level surface with enough space behind it to accommodate the traction unit.
2. Start the engine.
3. Tilt the attachment mount plate forward.
4. Position mount plate into the upper lip of the attachment receiver plate (Figure 14).

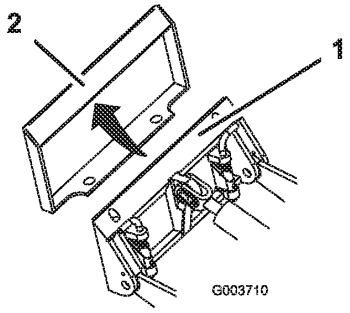


Figure 14

1. Mount plate
2. Receiver plate

5. Raise the loader arms while tilting back the mount plate at the same time.

   Important: **The attachment should be raised enough to clear the ground, and the mount plate should be tilted all the way back.**

6. Stop the engine.
7. Engage the quick attach pins, ensuring that they are fully seated in the mount plate (Figure 15).

   Important: **If the pins do not rotate to the engaged position, the mount plate is not fully aligned with the holes in the attachment receiver plate. Check the receiver plate and clean it if necessary.**

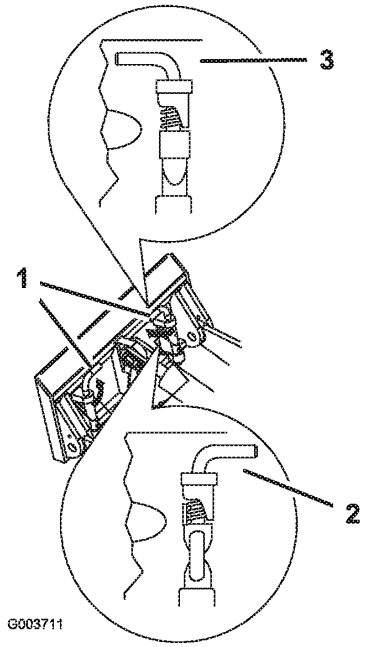


Figure 15

1. Quick attach pins (shown in engaged position)
2. Disengaged position
3. Engaged position

If you do not fully seat the quick attach pins through the attachment mount plate, the attachment could fall off of the traction unit, crushing you or bystanders.

Ensure that your quick attach pins are fully seated in the attachment mount plate.

Connecting the Hydraulic Hoses

If the attachment requires hydraulics for operation, connect the hydraulic hoses as follows:

1. Stop the engine.
2. Move the auxiliary hydraulics lever forward, backward, and back to neutral to relieve pressure at the hydraulic couplers.
3. Move the auxiliary hydraulics lever into the reverse position.
4. Remove the protective covers from the hydraulic couplers on the traction unit.
5. Ensure that all foreign matter is cleaned from the hydraulic connectors.

6. Push the attachment male connector into the female connector on the traction unit.

   Note: When you connect the attachment male connector first, you will relieve any pressure built up in the attachment.

Hydraulic fluid escaping under pressure can penetrate skin and cause injury. Fluid injected into the skin must be surgically removed within a few hours by a doctor familiar with this form of injury or gangrene may result.

- **Keep your body and hands away from pin hole leaks or nozzles that eject high pressure hydraulic fluid.**
- **Use cardboard or paper to find hydraulic leaks, never use your hands.**

Hydraulic couplers, hydraulic lines/valves, and hydraulic fluid may be hot. If you contact hot components you may be burned.

- **Wear gloves when operating the hydraulic couplers.**
- **Allow the traction unit to cool before touching hydraulic components.**
- **Do not touch hydraulic fluid spills.**

7. Push the attachment female connector into the male connector on the traction unit.
8. Confirm that the connection is secure by pulling on the hoses.
9. Move the auxiliary hydraulics lever to neutral.

Removing an Attachment

1. Lower the attachment to the ground.
2. Stop the engine.
3. Disengage the quick attach pins by turning them to the outside.
4. If the attachment uses hydraulics, move the auxiliary hydraulics lever forward, backward, and back to neutral to relieve pressure at the hydraulic couplers.
5. If the attachment uses hydraulics, slide the collar back on the hydraulic couplers and disconnect them.

   Important: Connect the attachment hoses together to prevent hydraulic system contamination during storage.
6. Install the protective covers onto the hydraulic couplers on the traction unit.
7. Start the engine, tilt the mount plate forward, and back the traction unit away from the attachment.

Securing the Traction Unit for Transport

When transporting the traction unit on a trailer, always use the following procedure:

Important: Do not operate or drive the traction unit on roadways.

1. Lower the loader arms.
2. Stop the engine.
3. Secure the traction unit to the trailer with chains or straps using the tie-down/lift loops (Figure 3) to secure the rear of the traction unit and the loader arms/mount plate to secure the front of the traction unit.

Lifting the Traction Unit

You can lift the traction unit using the tie-down/lift loops as lift points (Figure 3).

Maintenance

Note: Determine the left and right sides of the machine from the normal operating position.

Recommended Maintenance Schedule(s)

Maintenance Service Interval	Maintenance Procedure
After the first 8 hours	• Replace the hydraulic filter.
After the first 50 hours	• Change the engine oil and filter. • Check and adjust the track tension.
Before each use or daily	• Check the engine oil level. • Grease the traction unit. • Check the condition of and clean the tracks. • Remove debris from the traction unit. • Check for loose fasteners.
Every 25 hours	• Check the hydraulic fluid level. • Clean the foam air filter element and check the paper element for damage. • Inspect the drive belt for wear or damage.
Every 100 hours	• Replace the paper air filter element. • Change the engine oil (more frequently when operating conditions are extremely dusty or sandy). • Check the battery electrolyte level (replacement battery only). • Check the battery cable connections. • Check and adjust the track tension. • Check the hydraulic lines for leaks, loose fittings, kinked lines, loose mounting supports, wear, weather, and chemical deterioration. • Check for dirt build-up in the chassis.
Every 200 hours	• Change the oil filter. • Check the spark plugs. • Change the fuel filter. • Replace the drive belt. • Replace the hydraulic filter.
Every 250 hours	• Check and grease the road wheels.
Every 400 hours	• Change the hydraulic fluid.
Every 1,500 hours	• Replace all moving hydraulic hoses.
Yearly or before storage	• Check and adjust the track tension. • Touch up chipped paint

Important: Refer to your *Engine Operator's Manual* for additional maintenance procedures.

Note: After 50 hours and then every 100 hours thereafter (that is at 150, 250, 350, etc.) the hour meter displays CHG OIL to remind you to change the engine oil. After every 100 hours, the screen displays SVC to remind you to perform the other maintenance procedures based on a 100, 200, or 400 hour schedule. These reminders come on starting three hours prior to the service interval time and flash at regular intervals for six hours.

If you leave the key in the ignition switch, someone could accidently start the engine and seriously injure you or other bystanders.

Remove the key from the ignition and disconnect the wire from the spark plug before you do any maintenance. Set the wire aside so that it does not accidentally contact the spark plug.

Premaintenance Procedures

Before opening any of the covers, stop the engine and remove the key. Allow the engine to cool before opening any covers

Opening the Hood

1. Turn the hood latch clockwise (Figure 16).

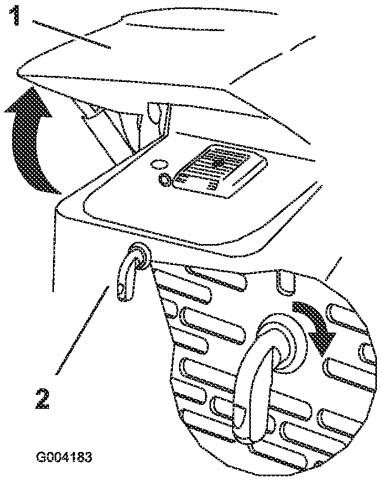


Figure 16

1. Hood
2. Hood latch

2. Swing the hood up (Figure 16).
3. Swing the prop rod up and secure it in the bracket on the hood (Figure 17).

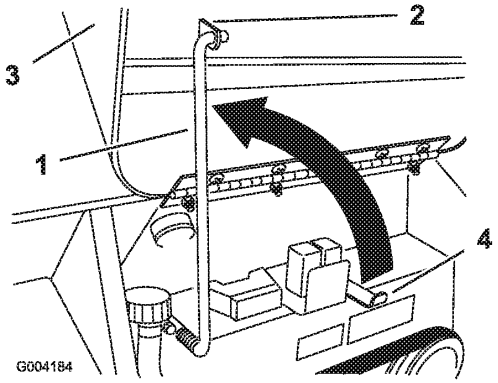


Figure 17

1. Prop rod
2. Bracket
3. Hood
4. Prop rod holder

Closing the Hood

1. Pull the prop rod out of the bracket on the hood and lower it into its holder.
2. Lower the hood and secure it by pushing down on the front of the hood until it locks in place.

Opening the Rear Access Cover

1. Unscrew the 2 hand knobs securing the rear access cover to the machine (Figure 18).

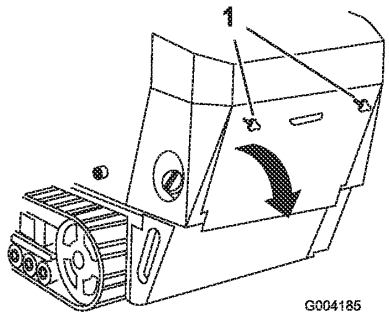


Figure 18

1. Hand knob

2. Tilt the rear access cover down and remove to access the internal components (Figure 18).

Closing the Rear Access Cover

1. Move the rear access cover in place over the back of the traction unit making sure the tabs line up in the slots.
2. Push the access cover forward, lining up the hand knob screws with the threaded holes in the machine.
3. Screw the hand knobs tight to secure the rear access cover in place.

Removing the Side Screens

1. Open the hood.
2. Slide the side screens (Figure 19) up and out of the slots in the front screen and frame.

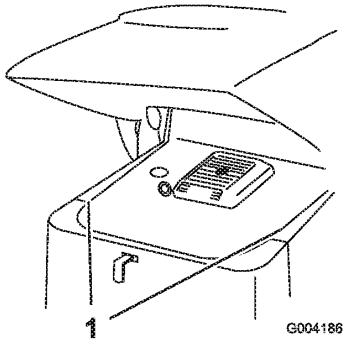


Figure 19

1. Side screen

Installing the Side Screens

Slide the side screens into place in the slots in the front screen and frame.

Removing the Front Screen

If the engine has been running the heat shield will be very hot and could burn you.

Allow the traction unit cool completely before touching the heat shield.

1. Open the hood and remove both side screens.
2. Loosen the bolts securing the front weight (Figure 20).

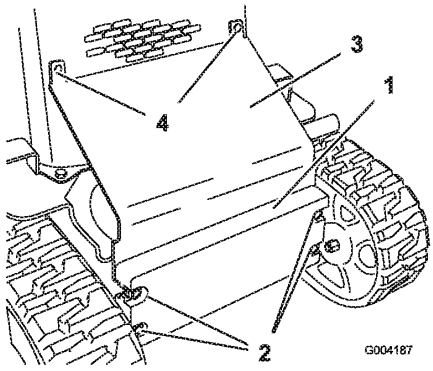


Figure 20

1. Front weight
2. Bolts
3. Heat shield
4. Carriage bolts

3. Remove the carriage bolts and nuts securing the heat shield (Figure 20).
4. Lift the heat shield up and off of the traction unit.
5. Remove the 4 bolts securing the front screen to the traction unit frame (Figure 21).

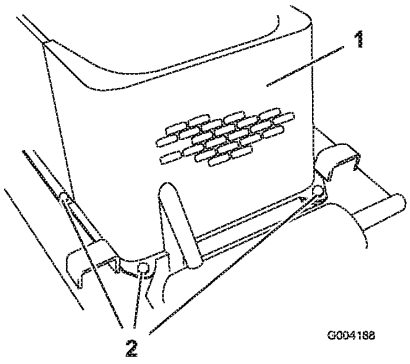


Figure 21

1. Front screen
2. Bolts (left side bolt not shown)

6. Remove the shoulder bolts and nuts securing the oil cooler to the top of the front screen (Figure 22).

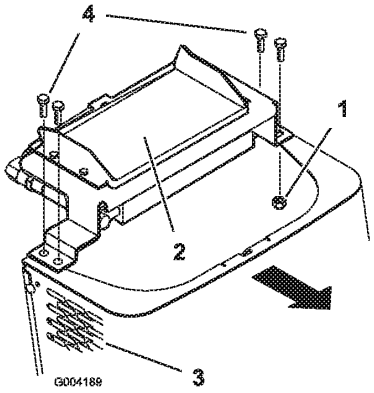


Figure 22

1. Nut
2. Oil cooler
3. Front screen
4. Shoulder bolts

7. Remove the front screen.
8. When finished, install the front screen with the 4 bolts removed previously.
9. Install the oil cooler to the front screen with the 4 shoulder bolts and nuts removed previously.
10. Slide the heat shield between the frame and the front weight and secure it to the front screen grill using the carriage bolts and nuts removed previously (Figure 20).
11. Tighten the bolts securing the front weight (Figure 20).
12. Install the side screens and close the hood.

Lubrication

Greasing the Traction Unit

Grease all pivot joints every 8 operating hours and immediately after every washing.

Grease Type: General-purpose grease.

1. Lower the loader arms and stop the engine. Remove the key.
2. Clean the grease fittings with a rag.
3. Connect a grease gun to each fitting (Figure 23 and Figure 24).

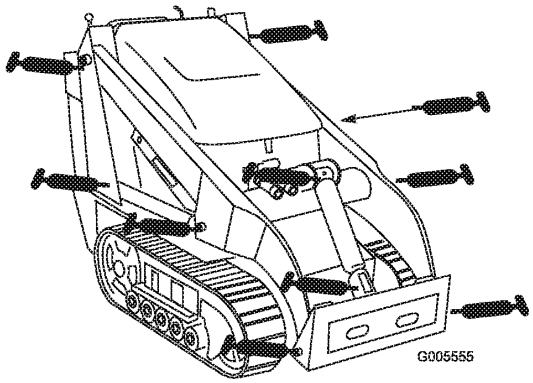


Figure 23

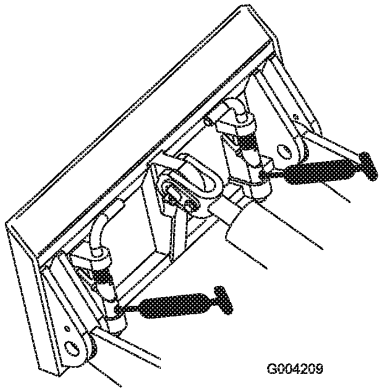


Figure 24

4. Pump grease into the fittings until grease begins to ooze out of the bearings (approximately 3 pumps).
5. Wipe up any excess grease.

Engine Maintenance

Servicing the Air Cleaner

Foam Pre-filter: Clean every 25 operating hours.

Paper Filter: Check for damage every 25 operating hours. Replace after every 100 operating hours.

Note: Service the air cleaner more frequently if operating conditions are extremely dusty or sandy.

Removing the Filters

1. Lower the loader arms, stop the engine, and remove the key.
2. Open the hood.
3. Clean around the air cleaner to prevent dirt from getting into the engine and causing damage.
4. Unscrew the knob and remove the air cleaner cover (Figure 25).

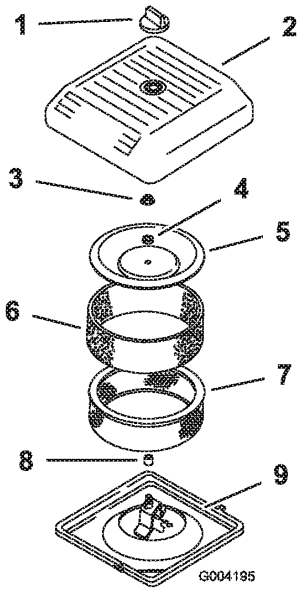


Figure 25

1. Knob
2. Air cleaner cover
3. Cover nut
4. Spacer
5. Cover
6. Foam pre-filter
7. Paper filter
8. Rubber seal
9. Air cleaner base

5. Carefully slide the foam pre-filter off of the paper element (Figure 25).
6. Unscrew the cover nut and remove the cover, spacer and paper filter (Figure 25).

Cleaning the Foam Pre-filter

Important: Replace the foam element if it is torn or worn.

1. Wash the foam pre-filter in liquid soap and warm water. When clean, rinse it thoroughly.
2. Dry the pre-filter by squeezing it in a clean cloth (do not wring).
3. Put one or two ounces of oil on the pre-filter (Figure 26).

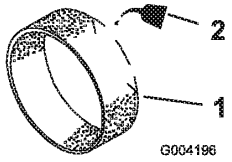


Figure 26

1. Foam element
2. Oil

4. Squeeze the pre-filter to distribute the oil.
5. Inspect the paper filter for tears, an oily film, and damage to the rubber seal (Figure 27).

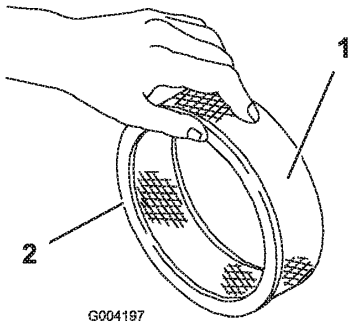


Figure 27

1. Paper element
2. Rubber seal

Important: Never clean the paper element. Replace the paper element if it is dirty or damaged (i.e., after approximately 100 operating hours).

Installing the Filters

Important: To prevent engine damage, always operate the engine with the complete foam and paper air cleaner assembly installed.

1. Carefully slide the foam pre-filter onto the paper filter (Figure 27).
2. Place the air cleaner assembly onto the air cleaner base (Figure 25).

3. Install the cover, spacer and secure it with the cover nut (Figure 25). Torque the nut to 95 inch-lb (11 N-m).
4. Install the air cleaner cover and secure with the knob (Figure 25).
5. Close the hood.

Servicing the Engine Oil

Change oil and filter after the first 50 operating hours and then change the oil every 100 operating hours thereafter.

Note: Change oil more frequently when operating conditions are extremely dusty or sandy.

Oil Type: Detergent oil (API service SG, SH, SJ, or higher)

Crankcase Capacity: w/filter, 2.1 qt. (2 l)

Viscosity: See table below

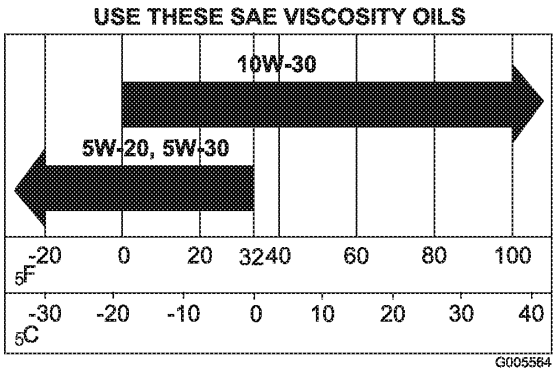


Figure 28

Changing the Oil

1. Start the engine and let it run for five minutes. This warms the oil so it drains better.
2. Park the traction unit so that the drain side is slightly lower than the opposite side to ensure that the oil drains completely.
3. Lower the loader arms, set the parking brake, stop the engine, and remove the key.

Components will be hot if the traction unit has been running. If you touch hot components you may be burned.

Allow the traction unit to cool before performing maintenance or touching components under the hood.

4. Remove the drain plug (Figure 29).

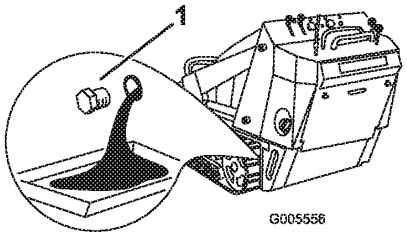


Figure 29

1. Oil drain valve

5. When the oil has drained completely, replace the plug.

   Note: Dispose of the used oil at a certified recycling center.
6. Remove the oil fill cap and slowly pour approximately 80% of the specified amount of oil in through the valve cover.
7. Check the oil level; refer to Checking the Engine Oil Level.
8. Slowly add additional oil to bring the level to the F (full) mark on the dipstick.
9. Replace the fill cap.

Changing the Oil Filter

Replace the oil filter every 200 hours or every other oil change.

Note: Change the oil filter more frequently when operating conditions are extremely hot, dusty, or sandy.

1. Drain the oil from the engine; refer to Changing the Oil.
2. Place a shallow pan or rag under the filter to catch oil.
3. Remove the old filter (Figure 30) and wipe the surface of the filter adapter gasket.

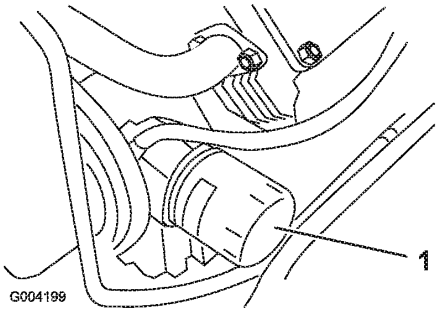


Figure 30

1. Oil filter

4. Pour new oil of the proper type through the center hole of the filter. Stop pouring when the oil reaches the bottom of the threads.
5. Allow a minute or two for the oil to be absorbed by filter material, then pour off the excess oil.
6. Apply a thin coat of new oil to the rubber gasket on the replacement filter.
7. Install the replacement oil filter to the filter adapter. Turn the oil filter clockwise until the rubber gasket contacts the filter adapter, then tighten the filter an additional 1/2 turn.
8. Fill the crankcase with the proper type of new oil; refer to Changing the Oil.

Servicing the Spark Plugs

Check the spark plugs after every 200 operating hours. Ensure that the air gap between the center and side electrodes is correct before installing each spark plug. Use a spark plug wrench for removing and installing the spark plugs and a gapping tool/feeler gauge to check and adjust the air gap. Install new spark plugs if necessary.

Type: Champion Platinum 3071, RC12YC, or equivalent.
Air Gap: 0.030 inch (0.76 mm)

Removing the Spark Plugs

1. Lower the loader arms, stop the engine, and remove the key.
2. Open the hood.
3. Pull the wires off of the spark plugs (Figure 31).

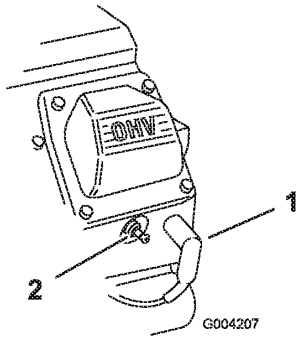


Figure 31

1. Spark plug wire 2. Spark plug

4. Clean around the spark plugs.
5. Remove both spark plugs and metal washers.

Checking the Spark Plugs

1. Look at the center of both spark plugs (Figure 32). If you see light brown or gray on the insulator, the engine is operating properly. A black coating on the insulator usually means the air cleaner is dirty.

Important: Never clean the spark plugs. Always replace the spark plugs when they have a black coating, worn electrodes, an oily film, or cracks.

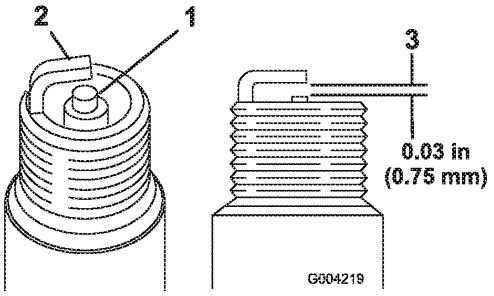


Figure 32

1. Center electrode insulator 3. Air gap (not to scale)
2. Side electrode

2. Check the gap between the center and side electrodes (Figure 32).
3. Bend the side electrode (Figure 32) if the gap is not correct.

Installing the Spark Plugs

1. Thread the spark plugs into the spark plug holes.
2. Tighten the spark plugs to 20 ft-lb (27 N-m).
3. Push the wires onto the spark plugs (Figure 31).
4. Close the hood.

Fuel System Maintenance

Changing the Fuel Filter

Change the fuel filter after every 200 operating hours or yearly, whichever occurs first.

1. Lower the loader arms, stop the engine, and remove the key.
2. Open the hood and remove the left side screen.
3. Loosen the tank cap to relieve pressure.
4. Clamp the fuel lines on both sides of the fuel filter (Figure 33).

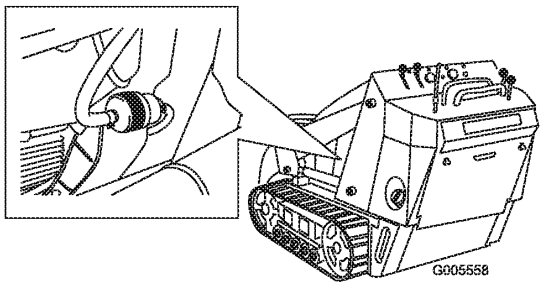


Figure 33

1. Filter
2. Hose clamp

5. Squeeze the ends of the hose clamps together and slide them away from the filter (Figure 33).
6. Place a drain pan under the fuel lines to catch any leaks, then remove the filter from the fuel lines.
7. Slide the fuel lines on the new fuel filter fittings, ensuring that the arrow on the filter points away from the fuel line coming from the fuel tank and toward the line going to the fuel pump.

   Important: Never install a dirty filter.

8. Move the hose clamps close to the filter.
9. Remove the clamp blocking fuel flow and open the fuel valves.
10. Secure the tank cap.
11. Replace the side screen and close the hood.

Draining the Fuel Tank

In certain conditions, gasoline is extremely flammable and highly explosive. A fire or explosion from gasoline can burn you and others and can damage property.

- **Drain gasoline from the fuel tank when the engine is cold. Do this outdoors in an open area. Wipe up any gasoline that spills.**
- **Never smoke when draining gasoline, and stay away from an open flame or where a spark may ignite the gasoline fumes.**

1. Lower the loader arms, stop the engine, and remove the key.
2. Syphon the gasoline from the tank using a pump type syphon.

Note: Now is the best time to install a new fuel filter because the fuel tank is empty.

Electrical System Maintenance

Servicing the Battery

Warning

CALIFORNIA
Proposition 65 Warning

Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. Wash hands after handling.

Important: The following procedures apply when servicing a (dry) battery that has replaced the original battery. The original (wet) battery does not require service.

Check the electrolyte level in the battery every 100 hours. Always keep the battery clean and fully charged. Use a paper towel to clean the battery case. If the battery terminals are corroded, clean them with a solution of four parts water and one part baking soda. Apply a light coating of grease to the battery terminals to reduce corrosion.

Voltage: 12 v, 450 Cold Cranking Amps

Checking the Electrolyte Level

1. Stop the engine and remove the key.
2. Remove the 4 bolts securing the battery cover and remove it from over the battery.
3. Look at the side of the battery. The electrolyte must be up to the Upper line (Figure 34). Do not allow the electrolyte to fall below the Lower line (Figure 34).

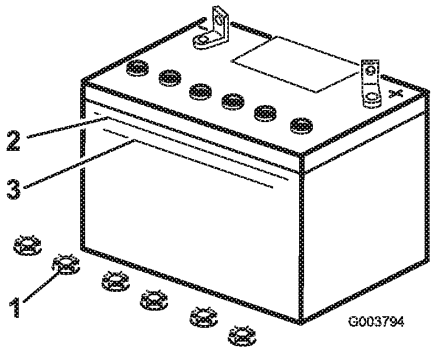


Figure 34

1. Filler caps
2. Upper line
3. Lower line

4. If the electrolyte is low, add the required amount of distilled water; refer to Adding Water to the Battery.

Adding Water to the Battery

The best time to add distilled water to the battery is just before you operate the traction unit. This lets the water mix thoroughly with the electrolyte solution.

Battery electrolyte contains sulfuric acid which is a deadly poison and causes severe burns.

- **Do not drink electrolyte and avoid contact with skin, eyes or clothing. Wear safety glasses to shield your eyes and rubber gloves to protect your hands.**
- **Fill the battery where clean water is always available for flushing the skin.**

1. Remove the battery from the traction unit.

   Important: Never fill the battery with distilled water while the battery is installed in the traction unit. Electrolyte could be spilled on other parts and cause corrosion.

2. Clean the top of the battery with a paper towel.
3. Remove the filler caps from the battery (Figure 34).
4. Slowly pour distilled water into each battery cell until the electrolyte level is up to the Upper line (Figure 34) on the battery case.

   Important: Do not overfill the battery because electrolyte (sulfuric acid) can cause severe corrosion and damage to the chassis.

5. Wait five to ten minutes after filling the battery cells. Add distilled water, if necessary, until the electrolyte

level is up to the Upper line (Figure 34) on the battery case.

6. Install the battery filler caps.

Charging the Battery

Charging the battery produces gasses that can explode.

Never smoke near the battery and keep sparks and flames away from battery.

Important: Always keep the battery fully charged (1.265 specific gravity). This is especially important to prevent battery damage when the temperature is below 32°F (0°C).

1. Check the electrolyte level; refer to Checking Electrolyte Level.
2. Make sure the filler caps are installed in the battery.
3. Charge the battery for 10 to 15 minutes at 25 to 30 amps or 30 minutes at 4 to 6 amps (Figure 35). Do not overcharge the battery.

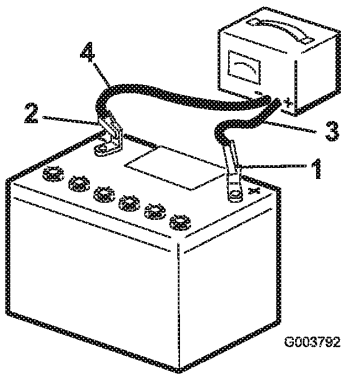


Figure 35

1. Positive battery post
2. Negative battery post
3. Red (+) charger lead
4. Black (-) charger lead

4. When the battery is fully charged, unplug the charger from the electrical outlet, then disconnect the charger leads from the battery posts (Figure 35).
5. Replace the battery cover.

Drive System Maintenance

Servicing the Tracks

Cleaning the Tracks

Check the tracks for excessive wear and clean them periodically. If the tracks are worn, replace them.

1. With a bucket on the loader arms, lower the bucket to the ground so that the front of the traction unit lifts off of the ground a few inches.
2. Stop the engine, and remove the key.
3. Using a water hose or pressure washer, remove dirt from each track system.

Important: Ensure that you use high-pressure water to wash only the track area. Do not use a high-pressure washer to clean the rest of the traction unit. High-pressure washing can damage the electrical system and hydraulic valves or deplete grease.

Important: Ensure that you fully clean the road wheels, the tension wheel, and the drive sprocket (Figure 36). The road wheels should rotate freely when clean.

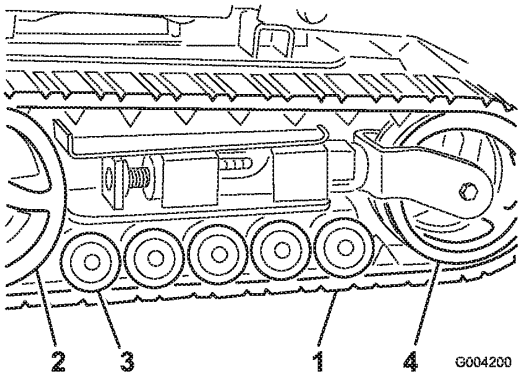


Figure 36

1. Track
2. Tension wheel
3. Road wheels
4. Drive sprocket

Adjusting the Track Tension

Check and adjust the track tension after the first 50 operating hours and every 100 operating hours thereafter. There should be 2-3/4 inches (7 cm) between the tension nut and the back of the tension tube (Figure 37). If not, adjust the track tension using the following procedure:

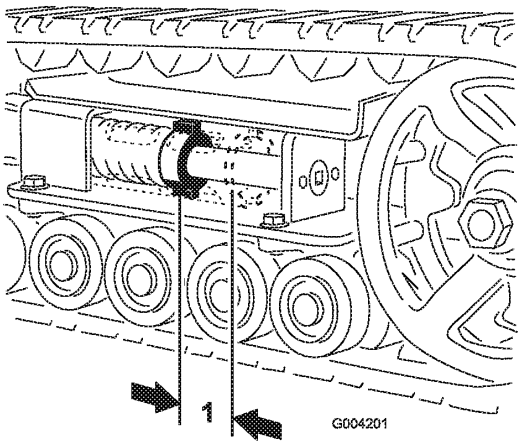


Figure 37

1. 2-3/4 inches (7 cm)

1. Lower the loader arms, stop the engine, and remove the key.
2. Lift/support the side of the unit to be worked on so that the track is off of the ground.
3. Remove the locking bolt and nut (Figure 38).

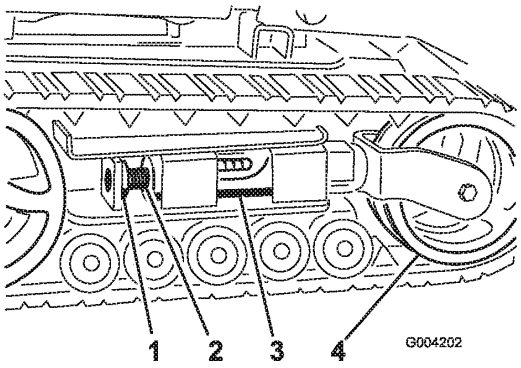


Figure 38

1. Locking bolt
2. Tensioning screw
3. Tension tube
4. Tension wheel

4. Using a 1/2 inch drive socket (Figure 39), turn the tensioning screw counter-clockwise until the distance between the tension nut and the back of the tension tube (Figure 37) is 2-3/4 inches (7 cm).
5. Align the closest notch in the tension screw to the locking bolt hole and secure the screw with the locking bolt and nut (Figure 38).
6. Lower the traction unit to the ground.

Replacing the Tracks (TX 420, Model 22306)

When the tracks are badly worn, replace them.

1. Lower the loader arms, stop the engine, and remove the key.
2. Lift/support the side of the unit to be worked on so that the track is 3 to 4 inches (7.6 to 10 cm) off of the ground.
3. Remove the locking bolt and nut (Figure 38).
4. Using a 1/2 inch drive socket, release the drive tension by turning the tensioning screw clockwise (Figure 38 and Figure 39).

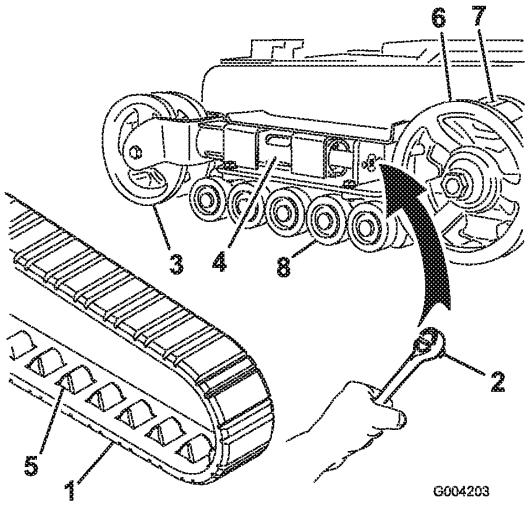


Figure 39

1. Track
2. 1/2 inch socket
3. Tension wheel
4. Fork tube
5. Track lug
6. Drive sprocket
7. Sprocket spacer
8. Road wheels

5. Push the tension wheel toward the rear of the unit to move the fork tube against the frame (Figure 39). (If it does not touch the frame, continue turning the tensioning screw until it does.)
6. Begin removing the track at the top of the tension wheel, peeling it off of the wheel while rotating the track forwards.
7. When the track is off of the tension wheel, remove it from the drive sprocket and road wheels (Figure 39).
8. Beginning at the drive sprocket, coil the new track around the sprocket, ensuring that the lugs on the track fit between the spacers on the sprocket (Figure 39).
9. Push the track under and between the road wheels (Figure 39).
10. Starting at the bottom of the tension wheel, install the track around the wheel by rotating the track rearward while pushing the lugs into the wheel.

11. Turn the tensioning screw counter-clockwise until the distance between the tension nut and the back of the fork tube (Figure 37) is 2-3/4 inches (7 cm).
12. Align the closest notch in the tension screw to the locking bolt hole and secure the screw with the locking bolt and nut.
13. Lower the traction unit to the ground.
14. Repeat steps 2 through 13 to replace the other track.

Replacing the Tracks (TX 425, Model 22307)

When the tracks are badly worn, replace them.

1. Lower the loader arms, stop the engine, and remove the key.
2. Lift/support the side of the unit to be worked on so that the track is 3 to 4 inches (7.6 to 10 cm) off of the ground.
3. Remove the locking bolt and nut (Figure 38).
4. Using a 1/2 inch drive socket, release the drive tension by turning the tensioning screw clockwise (Figure 38 and Figure 40).

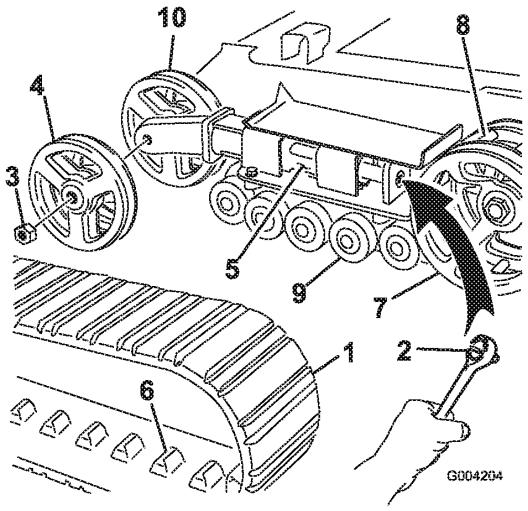


Figure 40

1. Track
2. 1/2 inch socket
3. Tension wheel nut
4. Outer tension wheel
5. Fork tube
6. Track lug
7. Drive sprocket
8. Sprocket spacer
9. Road wheels
10. Inner tension wheel

5. Push the tension wheel toward the rear of the unit to move the tension tube against the frame (Figure 40). (If it does not touch the frame, continue turning the tensioning screw until it does.)
6. Remove the nut securing the outer tension wheel and remove the wheel (Figure 40).
7. Remove the track (Figure 40).
8. Remove the nut securing the inner tension wheel and remove the wheel (Figure 40).
9. Pull the 4 large washers out of the 2 wheels, 1 on each side of each wheel.
10. Clean the old grease and dirt out of the area between where the washers were installed and the bearings inside the wheels, then fill this area on each side of each wheel with grease.
11. Install the large washers on the wheels over the grease.
12. Install the inner tension wheel and secure it with the nut removed previously (Figure 40).
13. Torque the nut to 300 ft-lb (407 N-m).
14. Install the new track, ensuring that the lugs in the track fit between the spacers in the middle of the drive sprocket (Figure 40).
15. Install the outer tension wheel and secure it with the nut removed previously (Figure 40).
16. Torque the nut to 300 ft-lb (407 N-m).
17. Turn the tensioning screw counter-clockwise until the distance between the tension nut and the back of the tension tube (Figure 37) is 2-3/4 inches (7 cm).
18. Align the closest notch in the tension screw to the locking bolt hole and secure the screw with the locking bolt and nut.
19. Repeat steps 2 through 18 to replace the other track.
20. Lower the traction unit to the ground.

Maintaining the Road Wheels

Check and grease the road wheels every 250 operating hours or yearly.

1. Remove the tracks; refer to Replacing the Tracks.
2. Remove the 4 bolts securing each lower track guide which contains the road wheels, and remove them (Figure 41).

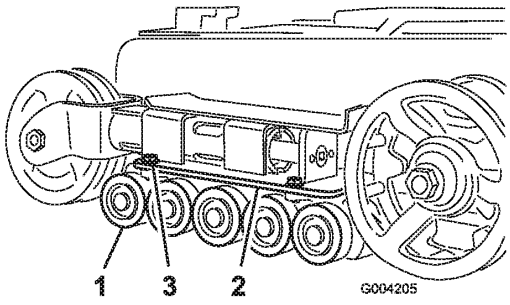


Figure 41

1. Road wheels
2. Lower track guide
3. Track guide bolts (only two shown)

3. Remove the snap ring and cap from a road wheel (Figure 42).

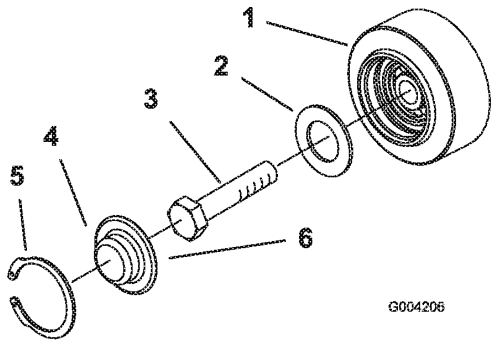


Figure 42

1. Road wheel
2. Gasket
3. Bolt
4. Road wheel cap
5. Snap ring
6. Add grease under the cap

4. Check the grease under the cap and around the gasket (Figure 42). If it is dirty, gritty, or depleted, clean out all of the grease, replace the gasket, and add new grease.
5. Ensure that the road wheel turns smoothly on the bearing. If it is frozen, replace the road wheel as described in the *Road Wheel Kit Installation Instructions* or contact your Authorized Service Dealer for repair.
6. Place the greased road wheel cap over the bolt head (Figure 42).
7. Secure the road wheel cap with the snap ring (Figure 42).
8. Repeat steps 3 through 7 for the other road wheels.
9. Install each track guide to the traction unit frame using the fasteners you removed previously. Torque the bolts to 67 to 83 ft-lb (91 to 112 N-m).
10. Install the tracks; refer to Replacing the Tracks.

Belt Maintenance

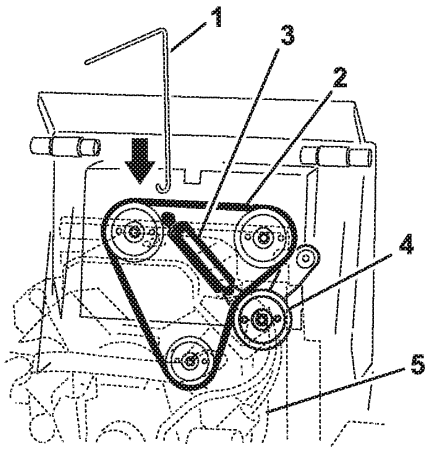
Inspecting/Replacing the Drive Belt

Inspect the drive belt, located behind the engine, every 25 operating hours. Replace the belt if you find any signs of wear, cracks, or damage or after 200 operating hours, whichever comes first.

To replace the drive belt, complete the following procedure:

Note: To complete this procedure, you will need a sturdy metal hook to disconnect the idler pulley spring, such as the Spring Removal Tool (Toro part number 92–5771) available for order from you Authorized Service Dealer.

1. Lower the loader arms, stop the engine, and remove the key.
2. Open the hood.
3. Connect the hook on the spring removal tool to the hook on the idler pulley spring, and disconnect the spring from the stud as illustrated in Figure 43.



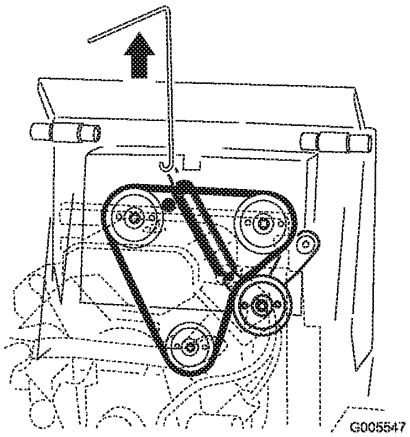


Figure 43

1. Spring removal tool
2. Drive belt
3. Idler pulley spring
4. Idler pulley
5. Engine (see-through for illustrative purposes)

4. Remove the idler pulley spring from the idler pulley assembly (Figure 44).

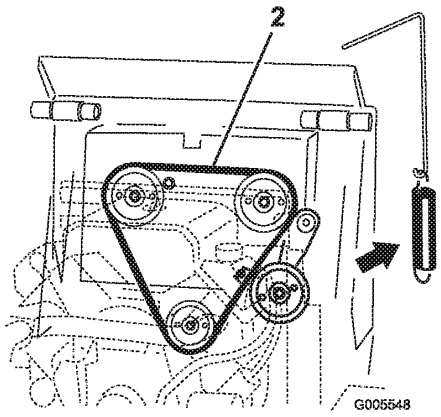


Figure 44

1. Idler pulley assembly
2. Drive belt routing

5. Remove the belt from the three pulleys (Figure 45).

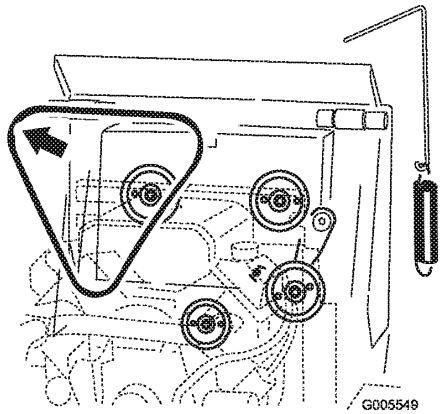


Figure 45

6. Install a new drive belt around the three pulleys (Figure 44).
7. Install the end of the idler pulley spring to the arm on the idler pulley assembly.
8. Using the spring removal tool, pull the idler spring hook up and around the stud on the traction unit, pulling the idler pulley tight.
9. Remove the spring removal tool from the spring and close the hood.

Controls System Maintenance

The factory adjusts the controls before shipping the traction unit. However, after many hours of use, you may need to adjust the traction control alignment, the neutral position of the traction control, and the tracking of the traction control in the full forward position.

Important: To adjust the controls properly, complete each procedure in the order listed.

Adjusting the Traction Control Alignment

If the traction control bar does not rest flush and square with the reference bar when in the full backward position, immediately complete the following procedure:

1. Park the traction unit on a flat surface and lower the loader arm.
2. Stop the engine and remove the key.
3. Pull straight back on the traction control so the front of the control contacts the reference bar (Figure 46).

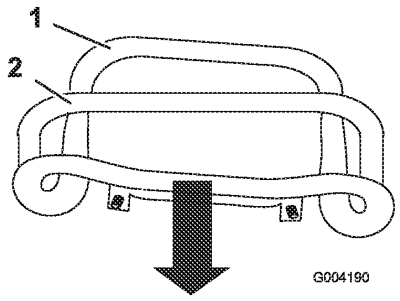


Figure 46

1. Front of the control, out of alignment
2. Reference bar

4. If the front of the traction control does not rest square and flush with the reference bar, loosen the flange nut and bolt in the stem of the traction control (Figure 47).

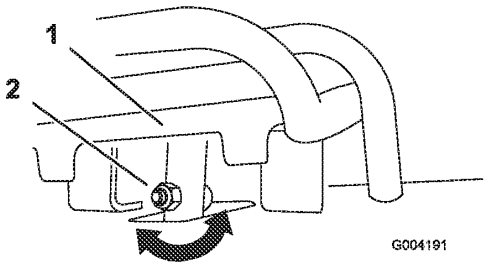


Figure 47

1. Traction control
2. Stem , bolt and nut

5. Adjust the traction control so that it rests flush against the reference bar when it is pulled straight back (Figure 47 and Figure 48).

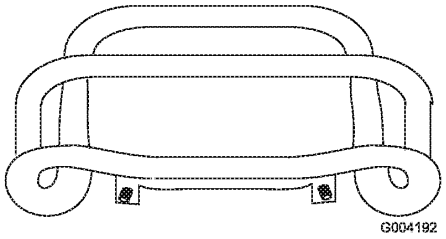


Figure 48

6. Tighten the flange nut and bolt in the traction control stem.

Adjusting the Traction Control Neutral Position

If the traction unit creeps forward or backward when the traction control is in neutral and the unit is warm, immediately complete the following procedure:

1. Lift/support the traction unit so that both tracks are off of the ground.
2. Open the rear access cover.
3. Loosen the jam nuts on the traction rods, under the control panel (Figure 49).

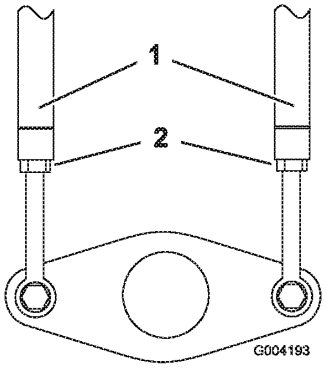


Figure 49

1. Traction rod
2. Jam nut

4. Start the traction unit and set the throttle to about 1/3 open position.

When the traction unit is running, you could be caught and injured in moving parts or burned on hot surfaces.

Stay away from pinch points, moving parts, and hot surfaces when adjusting the running traction unit.

5. If the **left** track moves, lengthen or shorten the **right** traction rod until the track stops moving.
6. If the **right** track moves, lengthen or shorten the **left** traction rod until the track stops moving.
7. Tighten the jam nuts.
8. Close the rear access cover.
9. Stop the engine and lower the traction unit to the ground.
10. Drive the traction unit in full reverse, checking to see if the unit tracks straight. If it does not, note the direction the traction unit veers. Repeat the adjustment previously described so that it tracks straight in reverse.

Adjusting the Tracking of the Traction Control, Full Forward Position

If the traction unit does not drive straight when you hold the traction control against the reference bar, complete the following procedure:

1. Drive the traction unit with the traction control against the reference bar, noting which direction the traction unit veers.
2. Release the traction control.
3. If the traction unit veers to the **left**, loosen the **right** jam nut and adjust the tracking set screw on the front of the traction control (Figure 50).
4. If the traction unit veers to the **right**, loosen the **left** jam nut and adjust the tracking set screw on the front of the traction control (Figure 50).

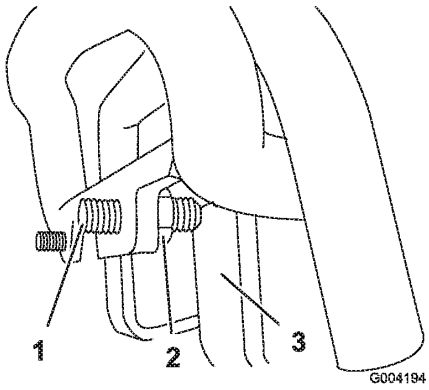


Figure 50

1. Set screw
2. Jam nut
3. Stop

5. Repeat steps 1 through 4 until the traction unit drives straight in the full forward position.

Important: Ensure the tracking set screws touch the stops in the full forward position to avoid over stroking the hydraulic pumps.

Hydraulic System Maintenance

Replacing the Hydraulic Filter

Important: Do not substitute an automotive oil filter or severe hydraulic system damage may result.

Change the hydraulic filter:

- After the first 8 operating hours
- After every 200 operating hours

1. Position traction unit on a level surface.
2. Lower the loader arms, stop the engine, and remove the key.
3. Open the rear access cover.
4. Place a drain pan under the filter (Figure 51).

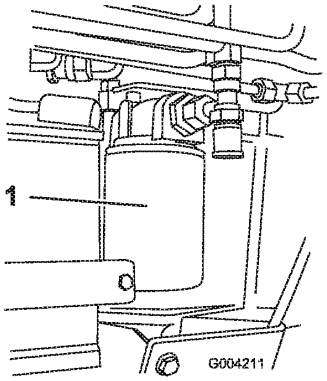


Figure 51

1. Hydraulic filter

5. Remove the old filter (Figure 51) and wipe the surface of the filter adapter gasket clean.
6. Apply a thin coat hydraulic fluid to the rubber gasket on the replacement filter.
7. Install the replacement hydraulic filter onto the filter adapter (Figure 51). Tighten it clockwise until the rubber gasket contacts the filter adapter, then tighten the filter an additional 3/4 turn.
8. Clean up any spilled fluid.
9. Start the engine and let it run for about two minutes to purge air from the system.
10. Stop the engine and check for leaks.

Hydraulic fluid escaping under pressure can penetrate skin and cause injury. Fluid injected into the skin must be surgically removed within a few hours by a doctor familiar with this form of injury or gangrene may result.

- **Keep your body and hands away from pin hole leaks or nozzles that eject high pressure hydraulic fluid.**
- **Use cardboard or paper to find hydraulic leaks, never use your hands.**

11. Check the fluid level in the hydraulic tank (refer to Checking the Hydraulic Fluid) and add fluid to raise the level to mark on dipstick. Do not over fill the tank.
12. Close the rear access cover.

Changing the Hydraulic Fluid

Change the hydraulic fluid after every 400 operating hours or yearly.

1. Position the traction unit on a level surface.
2. Open the hood.
3. Install the cylinder lock, stop the engine, and remove the key.
4. Allow the traction unit to cool completely.
5. Remove the hydraulic tank cap and dipstick (Figure 52).

Note: The filler cap is behind the front screen. If you want to improve your access to it, remove the screen.

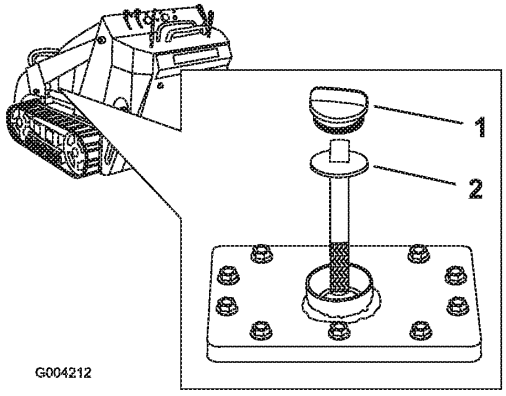


Figure 52

1. Filler neck cap
2. Dip stick

6. Place a large drain pain (capable of holding 15 US gallons) under the drain plug on the front of the traction unit (Figure 53).

   Note: The drain plug is located behind the front weight, under the muffler.

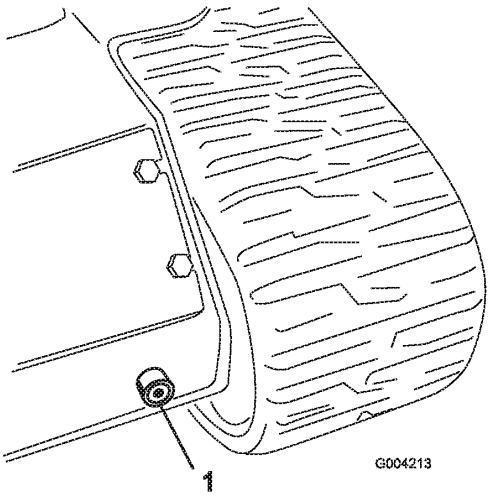


Figure 53

1. Drain plug

7. Remove the drain plug and allow the oil to drain into the pan (Figure 53).
8. When finished, install and tighten the drain plug.

   Note: Dispose of the used oil at a certified recycling center.

9. Fill the hydraulic tank with approximately 12 US gallons (45.4 l) of 10W-30 detergent, diesel engine oil (API service CH-4 or higher); refer to Checking Hydraulic Fluid.
10. Start the engine and let it run for a few minutes.
11. Stop the engine.
12. Check the hydraulic fluid level and top it off if necessary; refer to Checking Hydraulic Fluid.
13. Close the hood.

Hydraulic fluid escaping under pressure can penetrate skin and cause injury. Fluid injected into the skin must be surgically removed within a few hours by a doctor familiar with this form of injury or gangrene may result.

- **Keep your body and hands away from pin hole leaks or nozzles that eject high pressure hydraulic fluid.**
- **Use cardboard or paper to find hydraulic leaks, never use your hands.**

Checking the Hydraulic Lines

After every 100 operating hours, check the hydraulic lines and hoses for leaks, loose fittings, kinked lines, loose mounting supports, wear, weather, and chemical deterioration. Replace all moving hydraulic hoses every 1500 hours or 2 years, which ever comes first. Make necessary repairs before operating.

Cleaning

Removing Debris from the Traction Unit

Important: Operating the engine with blocked screens, dirty or plugged cooling fins, and/or cooling shrouds removed, will result in engine damage from overheating.

1. Park the traction unit on a level surface, lower the loader arms, and stop the engine.
2. Remove the key and allow the engine to cool.
3. Open the hood.
4. Clean any debris from the front and side screens.
5. Wipe away debris from the air cleaner.
6. Clean any debris build-up on the engine and in the oil cooler fins with a brush or blower.

   Important: It is preferable to blow dirt out, rather than washing it out. If water is used, keep it away from electrical items and hydraulic valves. Do not use a high-pressure washer. High-pressure washing can damage the electrical system and hydraulic valves or deplete grease.
7. Clean debris from the cooler fan grill on the hood.
8. Close the hood.

Cleaning the Chassis

Over time, the chassis under the engine collects dirt and debris that must be removed. Using a flashlight, open the hood and inspect the area under the engine on a regular basis. When the debris is 1 to 2 inches deep, complete the following procedure (refer to Figure 54 throughout this procedure):

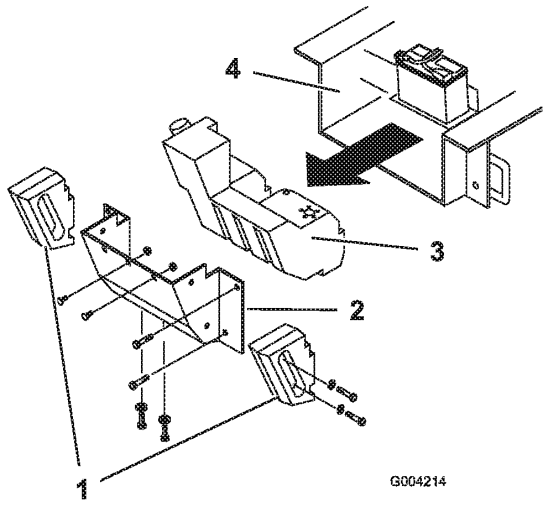


Figure 54

1. Side weights
2. Rear panel
3. Fuel tank
4. Chassis

1. Lift and support the front of the traction unit.
2. Stop the engine and remove the key.
3. Disconnect the negative battery cable.
4. Remove the bolts, washers, and lock washers securing the two side weights, removing the weights (Figure 54).
5. Open the rear access cover.
6. Remove the 2 carriage bolts and washers from the battery base.
7. Remove the six nuts and bolts securing the rear panel, removing the panel (Figure 54).
8. Loosen the tank cap to relieve pressure.
9. Place a clamp on the fuel line, 2 inches from where it comes out of the fuel tank.
10. Slide the fuel tank to the rear (Figure 54).
11. Disconnect the fuel line.
12. Disconnect the two wires leading to the right side of the tank (Figure 55).

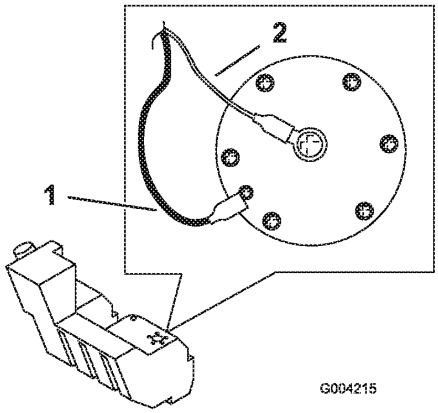


Figure 55

1. Black wire
2. Orange wire

13. Carefully remove the tank and set it upright to keep from spilling the gasoline.

In certain conditions, gasoline is extremely flammable and highly explosive. A fire or explosion from gasoline can burn you and others and can damage property.

- **Remove the fuel tank outdoors in an open area. Wipe up any gasoline that spills.**
- **Do not remove the fuel tank near an open flame or where gasoline fumes may be ignited by a spark.**
- **Do not smoke while handling the fuel tank.**

14. Remove any large deposits of debris.
15. Wash out the chassis with water until the water running out the back of the unit is clear.

    Important: Take care not to get water into the engine or electrical components.

16. Slide the fuel tank part way into the chassis (Figure 54).
17. Connect the fuel line and remove the clamp.
18. Secure the tank cap.
19. On the right side of the tank, connect the orange wire to the center post and the black wire to the outside post (Figure 55).
20. Slide the tank all the way into the traction unit.

    Important: The fuel line and wires must be away from the engine pulleys and the frame.

21. Replace the rear panel and secure it with the six bolts and nuts removed previously (Figure 54).
22. Secure the battery tray with the bolts and washers removed previously.
23. Install the side weights with the bolts, washers, and lock washers removed previously (Figure 54).
24. Close the rear access cover.
25. Lower the traction unit to the ground.

Storage

1. Lower the loader arms, stop the engine, and remove the key.
2. Remove dirt and grime from the external parts of the entire traction unit, especially the engine. Clean dirt and chaff from the outside of the engine cylinder head fins and blower housing.

   Important: You can wash the traction unit with mild detergent and water. Do not pressure wash the traction unit. Avoid excessive use of water, especially near the control panel, engine, hydraulic pumps, and motors.
3. Service the air cleaner; refer to Servicing the Air Cleaner.
4. Grease the traction unit; refer to Greasing the Traction Unit.
5. Change the crankcase oil; refer to Servicing the Engine Oil.
6. Change the crankcase oil; refer to Servicing the Engine Oil
7. Remove the spark plugs and check the condition of each; refer to Servicing the Spark Plugs.
8. With the spark plugs removed from the engine, pour two tablespoons of engine oil into each spark plug hole.
9. Place rags over the spark plug holes to catch any oil spray, then use the starter to crank the engine and distribute the oil inside the cylinder.
10. Install the spark plugs, but do not install the wires on the spark plugs.
11. Charge the battery; refer to Servicing the Battery.
12. For storage over 30 days, prepare the traction unit as follows:

    A. Add a petroleum based stabilizer/conditioner to fuel in the tank. Follow mixing instructions from stabilizer manufacturer. (1 oz. per US gallon). **Do not use an alcohol based stabilizer (ethanol or methanol).**

    Note: Fuel stabilizer/conditioner is most effective when mixed with fresh gasoline and used at all times.

    B. Run the engine to distribute conditioned fuel through the fuel system (5 minutes).

    C. Stop the engine, allow it to cool and drain the fuel tank using a pump type syphon.

    D. Restart the engine and run it until it stops.

    E. Choke the engine.

    F. Start and run the engine until it will not start again.

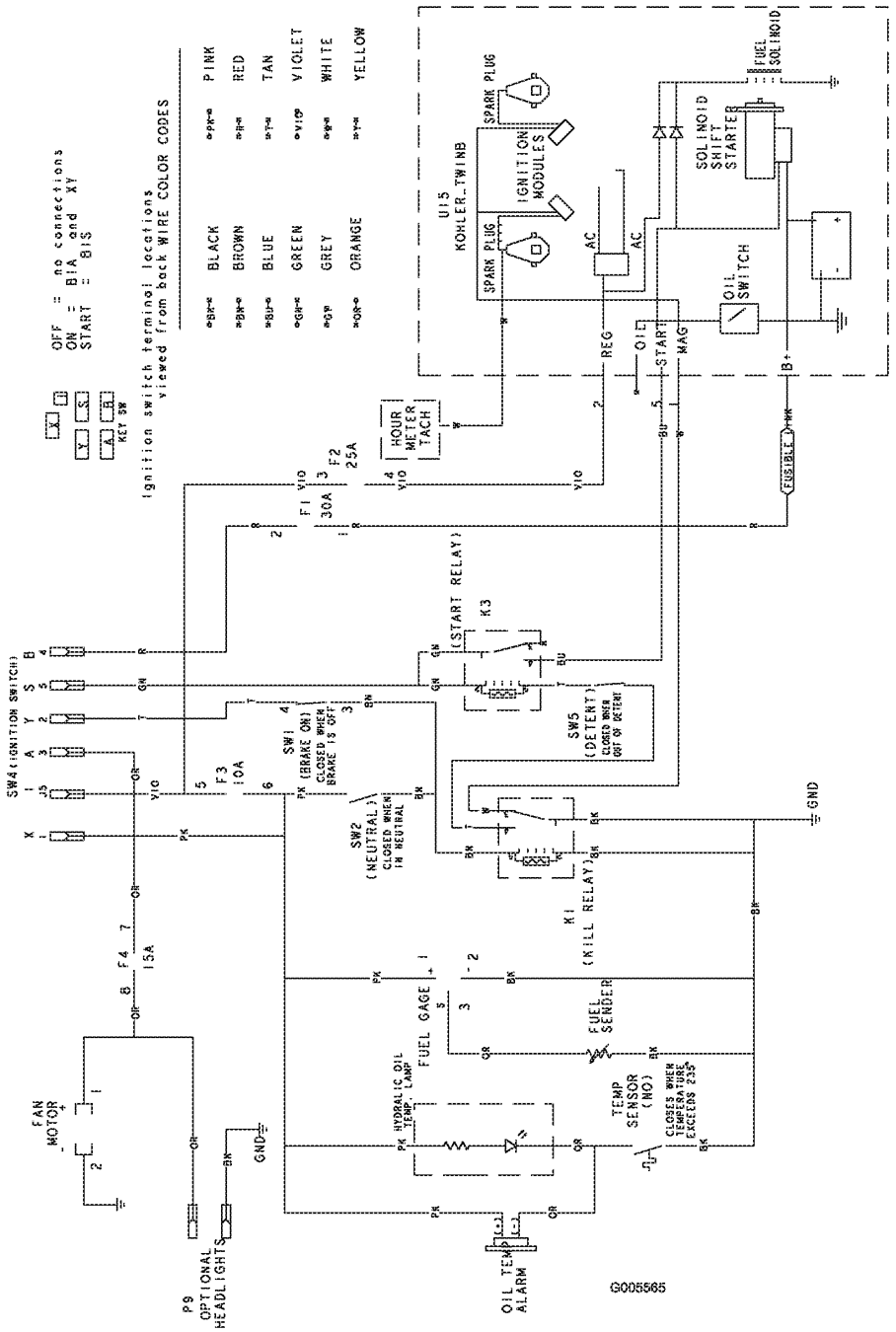
    G. Dispose of fuel properly. Recycle as per local codes.

    Important: Do not store stabilizer/conditioned gasoline over 90 days.
13. Check and adjust the track tension; refer to Adjusting the Track Tension.
14. Check and tighten all bolts, nuts, and screws. Repair or replace any part that is damaged.
15. Paint all scratched or bare metal surfaces. Paint is available from your Authorized Service Dealer.
16. Store the traction unit in a clean, dry garage or storage area. Remove the key from the ignition switch and keep it in a memorable place.
17. Cover the traction unit to protect it and keep it clean.

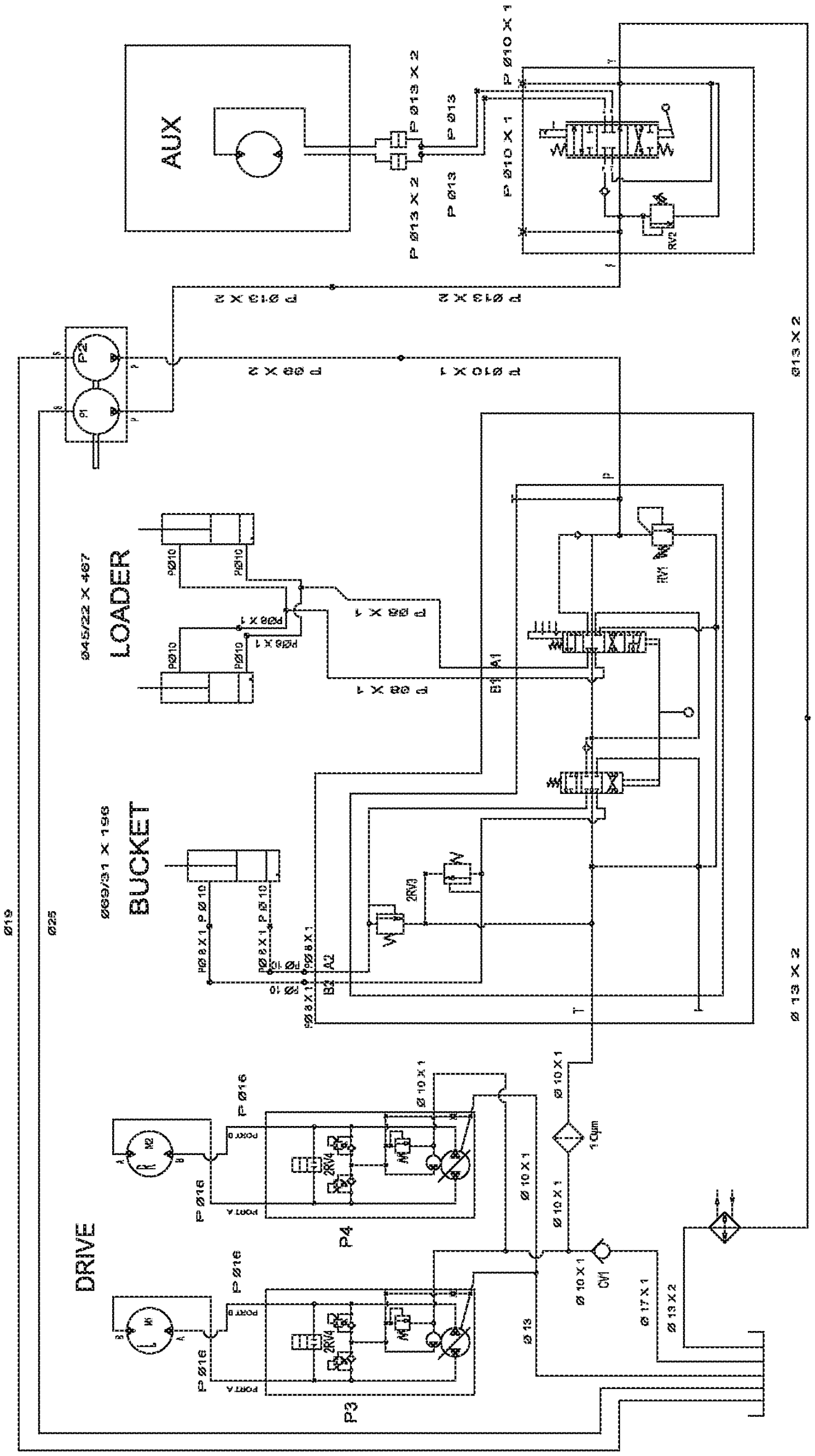
Troubleshooting

Problem	Possible Cause	Corrective Action
The starter does not crank	1. The battery is discharged. 2. The electrical connections are corroded or loose. 3. The relay or switch is damaged.	1. Charge the battery or replace it. 2. Check the electrical connections for good contact. 3. Contact your Authorized Service Dealer.
The engine will not start, starts hard, or fails to keep running.	1. The fuel tank is empty. 2. The choke is not on. 3. The air cleaner is dirty. 4. The spark plug wires are loose or disconnected. 5. The spark plugs are pitted, fouled, or the gap is incorrect. 6. There is dirt in the fuel filter. 7. Dirt, water, or stale fuel is in fuel system.	1. Fill the fuel tank with gasoline. 2. Move the choke lever fully forward. 3. Clean or replace the air cleaner elements. 4. Install the wires on the spark plugs. 5. Install new, correctly gapped spark plugs. 6. Replace the fuel filter. 7. Contact Authorized Service Dealer.
Engine loses power.	1. The engine load is excessive. 2. The air cleaner is dirty. 3. The oil level in crankcase is low. 4. The cooling fins and air passages under the engine blower housing are plugged. 5. The spark plugs are pitted, fouled, or the gap is incorrect. 6. There is dirt in the fuel filter. 7. Dirt, water, or stale fuel is in fuel system.	1. Reduce ground speed. 2. Clean or replace the air cleaner elements. 3. Check and add oil to the crankcase. 4. Remove any obstructions from the cooling fins and air passages. 5. Install new, correctly gapped spark plugs. 6. Replace the fuel filter. 7. Contact Authorized Service Dealer.
The engine overheats.	1. The engine load is excessive. 2. The oil level in crankcase is low. 3. The cooling fins and air passages under the engine blower housing are plugged.	1. Reduce ground speed. 2. Check and add oil to the crankcase. 3. Remove any obstructions from the cooling fins and air passages.
Abnormal vibration.	1. The engine mounting bolts are loose.	1. Tighten the engine mounting bolts.
The traction unit does not drive.	1. The parking brake is on. 2. The hydraulic fluid level low. 3. The tow valves are open. 4. The hydraulic system is damaged.	1. Release the parking brake. 2. Check and add hydraulic fluid. 3. Close the tow valves. 4. Contact Authorized Service Dealer.

Schematics



Electrical Schematic (Rev. A)



DISPLACEMENT AND PRESSURE CHART						
COMPONENT	DISPLACEMENT		PRESSURE		FLOWRATE*	
COMPONENT	CU IN/REV	CU CM/REV	PSI	BARS	GPM	LPM
* P1	0.73 CU IN	12 CC			11.2	42.4
* P2	0.36 CU IN	6 CC			5.5	21.0
M1,M2	32.3 CU IN	528 CC				
** P3,P4	0-1.28 CU IN	21 CC			17	64
RV1			2465 PSI	170 BARS		
RV2			3000 PSI	207 BARS		
2RV3			3050 PSI	210 BARS		
2RV4			2900 PSI	200 BARS		
CV1			5 PSI	.35 BARS		

* FLOWRATE CALCULATED AT 3600 RPM AND 98% EFFICIENCY.

** FLOWRATE CALCULATED AT 3100 RPM AND 98% EFFICIENCY.

Hydraulic Schematic (Rev. A)

Evaporative Emission Control Warranty Statement

California Evaporative Emission Control Warranty Statement
Your Warranty Rights and Obligations

Introduction

The California Air Resources Board and The Toro® Company are pleased to explain the evaporative emission control system's warranty on your 2007 model year equipment. In California, new equipment that use small off-road engines must be designed, built, and equipped to meet the State's stringent anti-smog standards. The Toro® Company must warrant the evaporative emission control system on your equipment for two years provided there has been no abuse, neglect or improper maintenance of your equipment.

Your evaporative emission control system may include parts such as: fuel lines, fuel line fittings, and clamps.

Manufacturer's Warranty Coverage:

This evaporative emission control system is warranted for two years. If any evaporative emission-related part on your equipment is defective, the part will be repaired or replaced by The Toro® Company.

Owner's Warranty Responsibilities:

- As the equipment owner, you are responsible for performance of the required maintenance listed in your Operator's Manual. The Toro® Company recommends that you retain all receipts covering maintenance on your equipment, but The Toro® Company cannot deny warranty solely for the lack of receipts.
- As the equipment owner, you should however be aware that The Toro® Company may deny you warranty coverage if your emission warranty parts have failed due to abuse, neglect, or improper maintenance or unapproved modifications.
- You are responsible for presenting your equipment to an Authorized Service Dealer as soon as the problem exists. The warranty repairs should be completed in a reasonable amount of time, not to exceed 30 days. If you have a question regarding your warranty coverage, you should contact The Toro® Company at 1-952--948--4027 or call us toll free at the number listed in your Toro Warranty statement.

Defects Warranty Requirements:

1. The warranty period begins on the date the engine or equipment is delivered to an ultimate purchaser.
2. General Evaporative Emissions Warranty Coverage. The emission warranty parts must be warranted to the ultimate purchaser and any subsequent owner that the evaporative emission control system when installed was:
   A. Designed, built, and equipped so as to conform with all applicable regulations; and
   B. Free from defects in materials and workmanship that causes the failure of a warranted part for a period of two years.
3. The warranty on evaporative emissions-related parts will be interpreted as follows:
   A. Any warranted part that is not scheduled for replacement as required maintenance in the written instructions must be warranted for the warranty period of two years. If any such part fails during the period of warranty coverage, it must be repaired or replaced by The Toro® Company. Any such part repaired or replaced under the warranty must be warranted for a time not less than the remaining warranty period.
   B. Any warranted part that is scheduled only for regular inspection in the written instructions must be warranted for the warranty period of two years. A statement in such written instructions to the effect of "repair or replace as necessary" will not reduce the period of warranty coverage. Any such part repaired or replaced under warranty must be warranted for a time not less than the remaining warranty period.
   C. Any warranted part that is scheduled for replacement as required maintenance in the written instructions must be warranted for the period of time prior to the first scheduled replacement point for that part. If the part fails prior to the first scheduled replacement, the part must be repaired or replaced by The Toro® Company. Any such part repaired or replaced under warranty must be warranted for a time not less than the remainder of the period prior to the first scheduled replacement point for the part.
   D. Repair or replacement of any warranted part under the warranty provisions of this article must be performed at no charge to the owner at an Authorized Service Dealer.
   E. Notwithstanding the provisions of subsection (D) above, warranty services or repairs must be provided at an Authorized Service Dealer.
   F. The owner must not be charged for diagnostic labor that leads to the determination that a warranted part is in fact defective, provided that such diagnostic work is performed at an Authorized Service Dealer.
   G. Throughout the evaporative emission control system's two year warranty period, The Toro® Company must maintain a supply of warranted parts sufficient to meet the expected demand for such parts.
   H. Manufacturer approved replacement parts must be used in the performance of any warranty maintenance or repairs and must be provided without charge to the owner. Such use will not reduce the warranty obligations of The Toro® Company.
   I. The use of any add-on or modified parts will be grounds for disallowing a warranty claim made in accordance with this article. The Toro® Company will not be liable under this Article to warrant failures of warranted parts caused by the use of an add-on or modified part.
   J. The Toro® Company shall provide any documents that describe the warranty procedures or policies within five working days of request by the Air Resources Board.

Emission Warranty Parts List:

The following lists includes the parts covered under this warranty:

- Fuel Lines
- Fuel Line Fittings
- Clamps

Dingo Products
- Kohler Powered

The Toro Dingo® Product Line Warranty

A One-Year Limited Warranty

Conditions and Products Covered

The Toro® Company and its affiliate, Toro Warranty Company, pursuant to an agreement between them, jointly warrant your Toro Dingo Product ("Product") to be free from defects in materials or workmanship. The following time periods apply from the date the Product is delivered to the original retail purchaser:

The following time periods apply from the date of purchase:

Products	Warranty Period
All traction units and attachments	1 year or 1000 operational hours, whichever occurs first
Kohler engines	3 years

Where a warrantable condition exists, we will repair the Product at no cost to you including diagnosis, labor, and parts.

Instructions for Obtaining Warranty Service

If you think that your Toro Product contains a defect in materials or workmanship, follow this procedure:

1. Contact any Authorized Dingo Service Dealer to arrange service at their dealership. To locate a dealer convenient to you, access our website at www.Toro.com. You may also call our Toro Customer Care Department toll free at 888-577-7466 (U.S. customers) or 877-484-9255 (Canadian customers).
2. Bring the product and your proof of purchase (sales receipt) to the Service Dealer.

If for any reason you are dissatisfied with the Service Dealer's analysis or with the assistance provided, contact us at:

LCB Customer Service Department
Toro Warranty Company
8111 Lyndale Avenue South
Bloomington, MN 55420-1196
Toll Free: 888-577-7466 (U.S. customers)
Toll Free: 877-484-9255 (Canada customers)

Owner Responsibilities

You must maintain your Toro Product by following the maintenance procedures described in the Operator's Manual. Such routine maintenance, whether performed by a dealer or by you, is at your expense. Parts scheduled for replacement as required maintenance ("Maintenance Parts"), are warranted for the period of time up to the scheduled replacement time for that part. Failure to perform required maintenance and adjustments can be grounds for disallowing a warranty claim.

Items and Conditions Not Covered

Not all product failures or malfunctions that occur during the warranty period are defects in materials or workmanship. This express warranty does not cover the following:

- Product failures which result from the use of non-Toro replacement parts, or from installation and use of add-on, modified, or unapproved accessories
- Product failures which result from failure to perform required maintenance and/or adjustments
- Product failures which result from operating the Product in an abusive, negligent or reckless manner
- Parts subject to consumption through use unless found to be defective. Examples of parts which are consumed, or used up, during normal Product operation include, but are not limited to, digging teeth, tines, spark plugs, tires, tracks, filters, chains, etc.
- Failures caused by outside influence. Items considered to be outside influence include, but are not limited to, weather, storage practices, contamination, use of unapproved coolants, lubricants, additives, or chemicals, etc.
- Normal "wear and tear" items. Normal "wear and tear" includes, but is not limited to, worn painted surfaces, scratched decals or windows, etc
- Any component covered by a separate manufacturer's warranty
- Pickup and delivery charges

General Conditions

Repair by an Authorized Toro Service Dealer is your sole remedy under this warranty. **Neither The Toro® Company nor Toro Warranty Company is liable for indirect, incidental or consequential damages in connection with the use of the Toro Products covered by this warranty, including any cost or expense of providing substitute equipment or service during reasonable periods of malfunction or non-use pending completion of repairs under this warranty. Some states do not allow exclusions of incidental or consequential damages, or limitations on how long an implied warranty lasts, so the above exclusions and limitations may not apply to you.** This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Except for the Emissions warranty referenced below, if applicable, there is no other express warranty. All implied warranties of merchantability and fitness for use are limited to the duration of this express warranty.

Note to California residents: The Emissions Control System on your Product may be covered by a separate warranty meeting requirements established by the U.S. Environmental Protection Agency (EPA) or the California Air Resources Board (CARB). The hour limitations set forth above do not apply to the Emissions Control System Warranty. Refer to the California Emission Control Warranty Statement printed in you operator's manual or contained in the engine manufacturer's documentation for details.

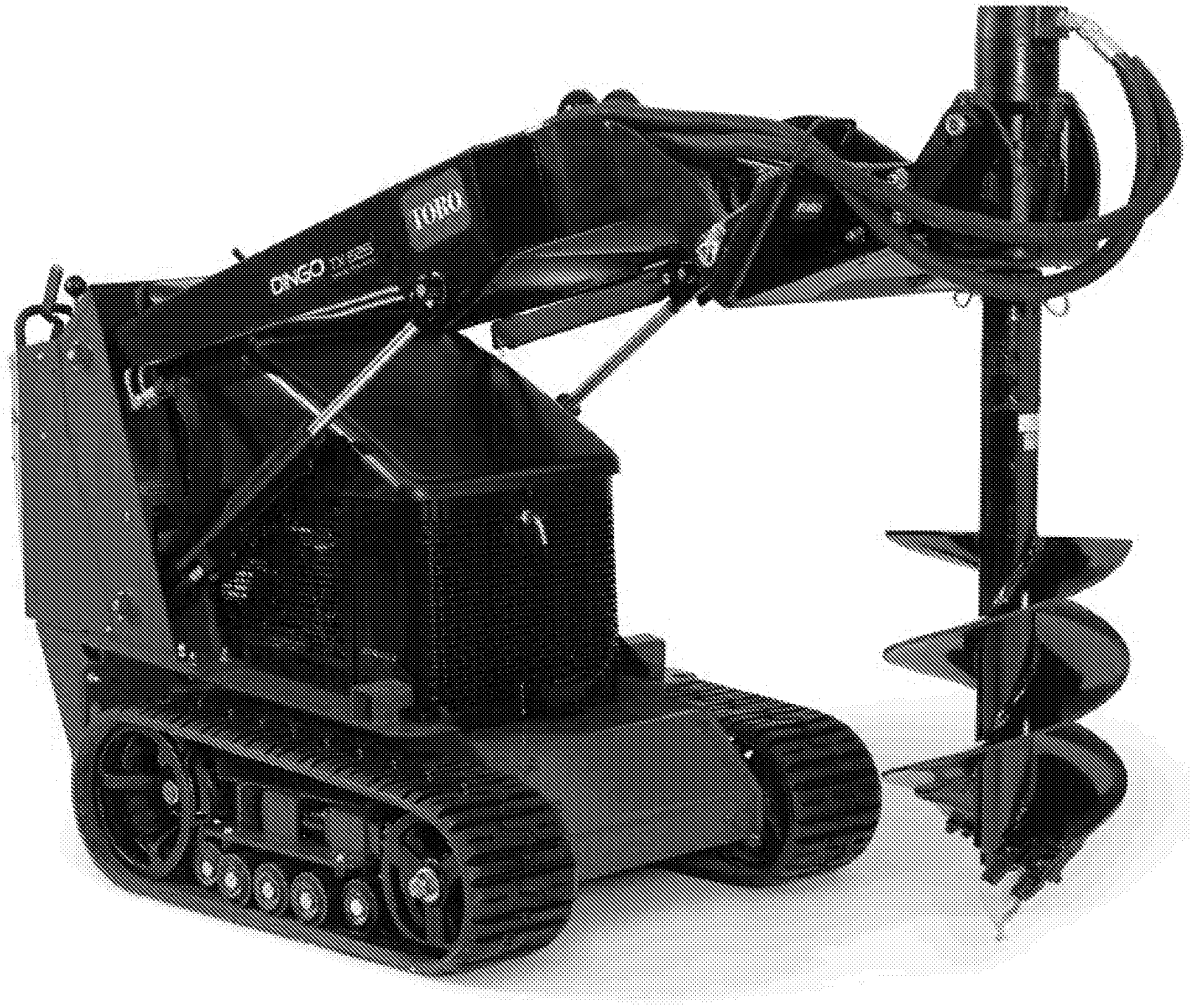
Countries Other than the United States or Canada

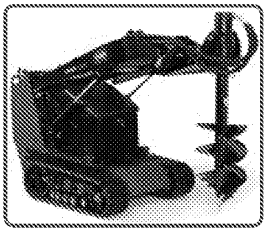
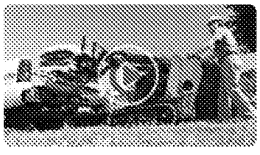
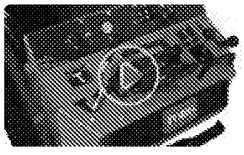
Customers who have purchased Toro products exported from the United States or Canada should contact their Toro Distributor (Dealer) to obtain guarantee policies for your country, province, or state. If for any reason you are dissatisfied with your Distributor's service or have difficulty obtaining guarantee information, contact the Toro importer. If all other remedies fail, you may contact us at Toro Warranty Company.

Part Number 374-0047 Rev. B

Exhibit 6

Dingo® TX 525 Wide Track



Dingo Brochure ()

Highlights

- 23.3 HP (17.3 kW) Kubota D902
- 42" width with bucket
- Turf friendly at only 2013 pounds
- Patented, easy-to-use traction control system

Overview

Features

Specifications

Cooling System
Liquid Cooled

Engine
23.3 HP (17.3 kW) Kubota D902

Flow
13.8 gpm (52 lpm)

Ground Clearance
4.6" (11.7 cm)

Ground Pressure
3.5 PSI

Ground Speed
0-4.5 mph (0-7.2 km/h) / 0-2.0 mph (0-3.2 km/h)

Height
46.1" (117.1 cm)

Hinge Pin Height
65.8" (167.1 cm)

Hydraulic System Pressure
3,000 PSI

Length
92" (233.7 cm) w/bucket; 70.7" (180 cm) w/o bucket

Loader Arm Flow
6 gpm (23 lpm)

Loader Hydraulic System
Joystick control for all funct

Operating Capacity
553 lbs. (251 kg)

Reservoir Capacity
10.5 gallons (40 liters)

Tip Capacity
1,580 lbs. (717 kg)

Track
96.6" x 9.5" (245 cm x 24 cm)

Traction Flow
16.9 gpm (64 lpm)

Warranty
Product - One Year* / Engine - Two Year*

Weight
2,013 lbs (907 kg)

Width
41" (104 cm)

Disclaimer
*See your local dealer for warranty details.

Accessories

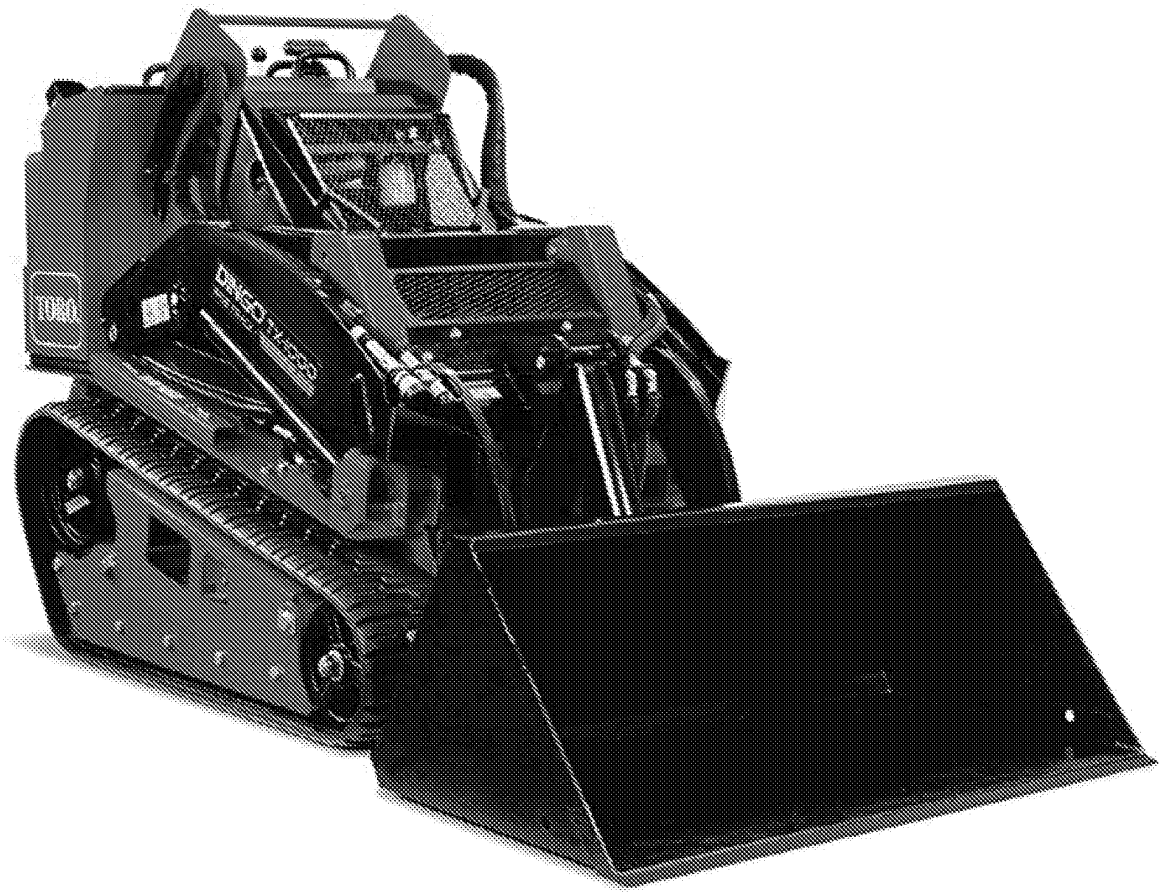
Documents

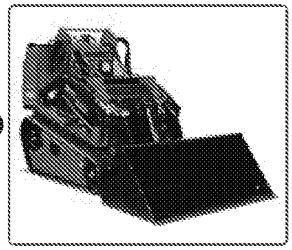
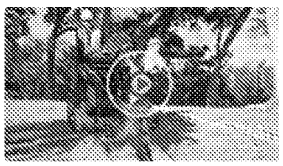
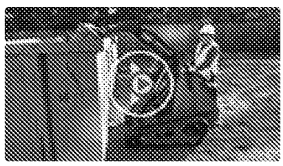
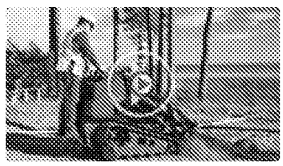
Parts & Manuals

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Exhibit 7

Dingo® TX 1000 Wide Track



Dingo Brochure (https://cdn2.toro.com/en/-/media/Images/Toro/sitework-systems/Professional-Contractor/Compa

Highlights

- Toro-exclusive vertical lift loader arm design increases load capacity and greater reach at full height
- Rated operating capacity over 1,000-lbs to lift more than any compact utility loader on the market
- 81" (206 cm) hinge pin height easily clears side of a 30-yard dumpster or one-ton truck for maximum jobsite productivity
- Exclusive traction control design is intuitive, easy to operate, and effortless

Overview

Specifications

Air Filter
Two-stage, heavy-duty, remote

Auxillary Flow
15.2 gpm

Controls
Patented traction control design

Cooling System
Liquid Cooled

Engine
24.9 HP (18.6 kW) Kubota® D1305 Diesel

Ground Clearance
6.0" (15 cm)

Ground Pressure
3.6 PSI

Ground Speed
4.7 mph (7.6 km/h)/ /4.7 mph (7.6 km/h)

Height
53.2" (135 cm)

Hinge Pin Height
81" (206 cm

Hydraulic System Pressure
3,000 PSI

Length
100.7" (256 cm) w/bucket; 81.7" (208 cm) w/o bucket

Operating Capacity
1,075 lbs (488 kg) (35% of Tip Capacity)

Reservoir Capacity
10 gallons (57.5 liters)

Steering Controls
Patented traction control design

Tip Capacity
3,071 lbs (1,393 kg)

Track
127.6" x 9.5" (324 cm x 24 cm)

Track Width
9.5" (24 cm)

Traction Flow
13.3 gpm (each pump)

Weight
2,860 lbs (1297 kg)

Width
41" (104 cm)

Accessories

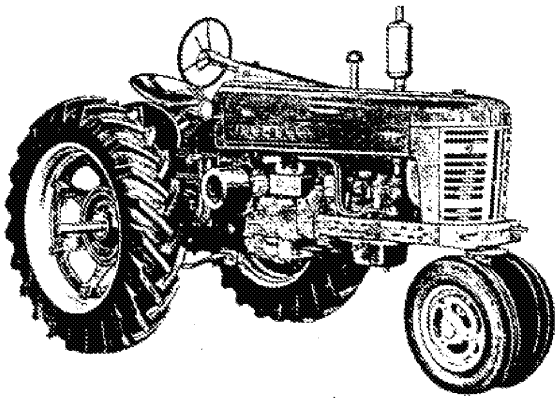
Documents

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Exhibit 8

Operator's Manual



Mc Cormick Deering International

FARMALL

300 AND 300 HI-CLEAR

TRACTOR

INTERNATIONAL HARVESTER COMPANY

180 North Michigan Avenue Chicago 1, Illinois, U.S.A.

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Jensales.com | 800.443.06

Driving the Tractor

Adjusting the Seat

The hydraulic seat gives the operator the maximum in driving comfort.

Before starting the tractor, adjust the seat to one of the five positions available to provide the most comfortable position for the operator.

The seat is quickly and easily adjusted by means of the seat position release lever (*Illust. 19*) located at the front of the seat suspension unit.

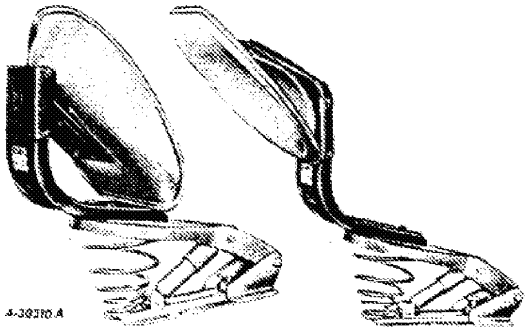
Press down on the lever and move the seat forward or backward to the most comfortable operating position.



Illust. 19

Adjusting the seat.

Tilt-Back Seat Bracket



Illust. 19A

Tilt-back seat bracket.

When equipped with the tilt-back seat bracket, the seat pan on the hydraulic seat support can be flipped up (left, *Illust. 19A*) to provide ample room for the operator to stand. The seat can be set in a semi-vertical position, giving the operator a support against which he can brace his legs while standing. Also, the seat can be tilted all the way back (right, *Illust. 19A*) to keep out rain and snow. When the seat is down, a latch keeps it from tilting if the operator grasps it while getting on or off the tractor.



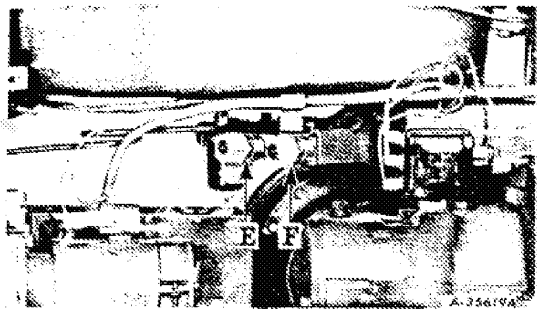
If the tractor will not move because the rear wheels have dug in or sunk deeply into the ground, don't fasten logs, posts, or anything to the rear wheels that will prevent them from rotating. This would be certain to tip the tractor over backward. Instead.....



.....dig out or jack up the rear wheels and fill in under them. Or, if another tractor is available, hitch it with a chain to the front end of the "stuck" tractor at the implement mounting bolt holes in the side channels or at the base of the upper bolster. Never hitch to the lower bolster. The power of both tractors should be used, and a heavy pull must be kept on the chain all the time.

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There are six junction ports (two on the rear, two on the right, and two, "E" (coded white) and "F" (coded black), on the left) on a tractor with a triple valve system for attaching hoses to rear tractor-mounted, trailing-type, and right and left front tractor-mounted implements. *See Illusts. 29A, 29B, and 30.*



Illust. 30

Left side of tractor showing junction ports.

An auxiliary junction block is available for tractors with either a double or triple valve system, which permits the operation of two cylinders with one valve.

These junction ports are self-sealing and close automatically when disconnecting the hoses. The self-sealing coupling can be connected and sealed by turning the nut by hand until tight. No wrenches are needed.

Rear Tractor-Mounted or Pull-Type Implements

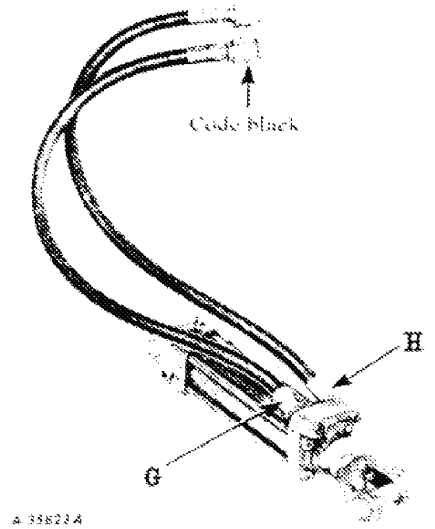
Connect one end of the hose with black coded couplings to junction port "A" (*Illust. 29A*) and connect the other end of the hose to cylinder port "G" (*Illust. 30A*). Connect the other hose with white coded couplings to junction port "B" (*Illust. 29A*) and cylinder port "H" (*Illust. 30A*).

Right Front Tractor-Mounted Implements

Connect one end of the hose with white coded couplings to junction port "C" (*Illust. 29B*) and the other end of the hose to cylinder port "H" (*Illust. 30A*). Connect the other hose with black coded couplings to junction port "D" (*Illust. 29B*) and cylinder port "G" (*Illust. 30A*).

Left Front Tractor-Mounted Implements

Connect one end of the hose with white coded couplings to junction port "E" (*Illust. 30*) and the other end of the hose to cylinder port "H" (*Illust. 30A*). Connect the other hose with black coded couplings to junction port "F" (*Illust. 30*) and cylinder port "G" (*Illust. 30A*).



Illust. 30A

Cylinder connections.

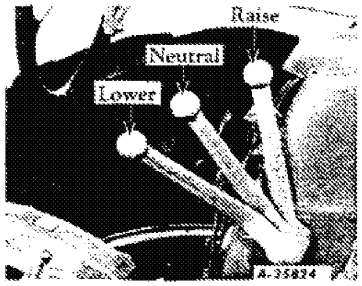
If you are using a cylinder which supplies only one-way (single) action, connect the single hose to junction port "F" (*Illust. 30*) on the left side or to junction port "D" (*Illust. 29B*) on the right side for front tractor-mounted implements. Connect the single hose to junction port "A" (*Illust. 29A*) for rear tractor-mounted implements.

Raising and Lowering the Implement

To raise front tractor-mounted implements all the way up (on double or triple valve systems), move the left or middle control handles all the way forward, separately or together, as desired by the operator. To raise rear tractor-mounted or trailing implements, move the right control handle all the way forward. *See Illust. 31.*

To partially raise the implement when it is desirable to ease the load, as when hitching implements or in cultivating through soft spots, move the control handle forward slowly just enough to secure the proper lift. To lower front tractor-mounted implements (on a double or triple valve system), move the left or middle control handle all the way back (*see Illust. 31*). To lower rear tractor-mounted or trailing implements, move the right control handle all the way back. The right control handle on a double or triple valve system or the handle on the single valve system will also operate trailing-type implements. Push forward to raise, pull backward to lower. *See Illust. 31.*

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Illust. 31

Operating the Hydra-Touch system.

Note: When the control valve is set for the cylinder to supply two-way (double) action, the control handles will automatically return to the neutral position when the implement has reached the proper working depth or lifting height.

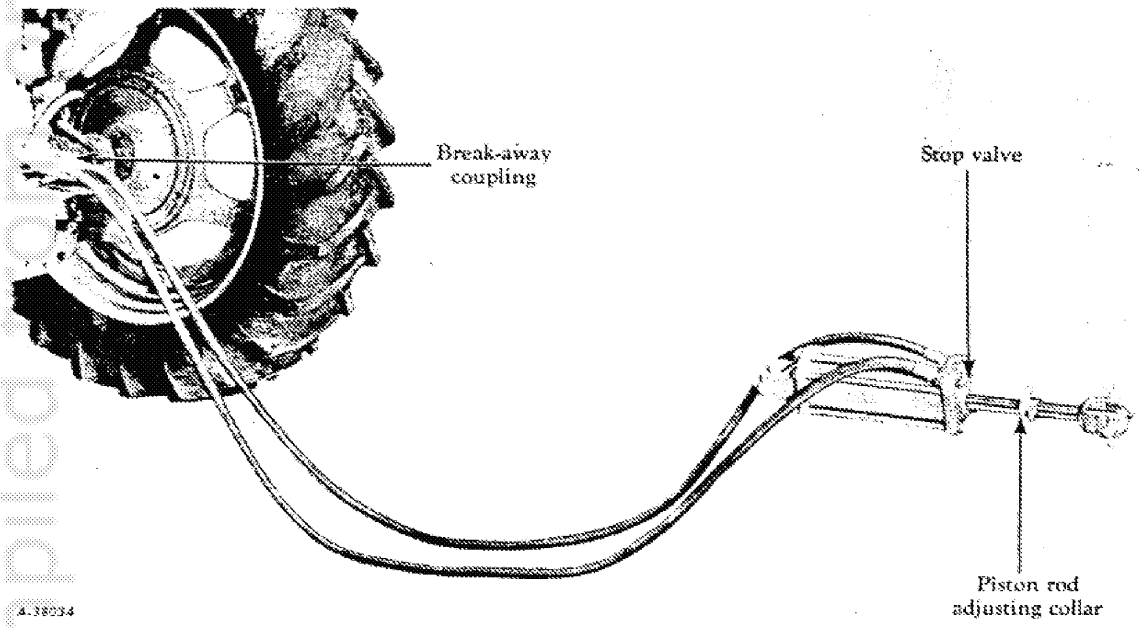
When the control valve is set for the cylinder to supply one-way (single) action and when any of the control handles are moved all the way back to provide the implement with float, the control handles will remain in the rearward position until manually returned to the neutral position.

Adjusting the Working Depth (Cylinders set for Double Action)

The length of the cylinder piston stroke gauges the working position of the implement. If you want to set the implement for a six-inch depth, loosen the thumb screw on the stroke limit collar and adjust the collar on the piston rod to give the length of stroke that will correspond to a six-inch working depth. Tighten the thumb screw. The implement will automatically stop at this depth when the collar comes against the limit stop valve. When the valve closes, fluid circulation to the cylinder is stopped, thus halting piston travel. This valve eliminates the need for heavy collars, yokes and other cumbersome mechanism used on some types of cylinders. No tools are needed to adjust the position of the collar.

To hold the implement in a raised position when the cylinder is removed, use the locking pin and quick-attachable cotter pin located on the cylinder support furnished with the implement.

To transport the implement, set the stroke limit collar against the valve in the end of the cylinder. This prevents circulation of fluid and thus locks the implement rigidly in position.



Illust. 31A

Cylinder and hoses.

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Minor Engine Service Operations

Cylinder Head Gasket

For most satisfactory results in tightening the cylinder head after installing the cylinder head gasket, tighten down all nuts fairly snug, starting with the row in the center, then going to the others. Retighten in the same order, giving each nut a fraction of a turn at a time. Continue this until all nuts are tight. Do not screw one nut down perfectly tight and then go to the next, as you will not obtain an even pressure on the gasket in this manner.

After replacing the cylinder head, it is necessary to insure against leaks by retightening the stud nuts after the engine has been operating and the water jacket has become thoroughly heated. To properly tighten the nuts the valve rocker shaft assembly must be raised.

Caution! Be sure to adjust the valve tappet clearance after the last tightening of the cylinder head stud nuts. See "Valve Clearance Adjustment."

Crankshaft Bearings, Pistons and Rings

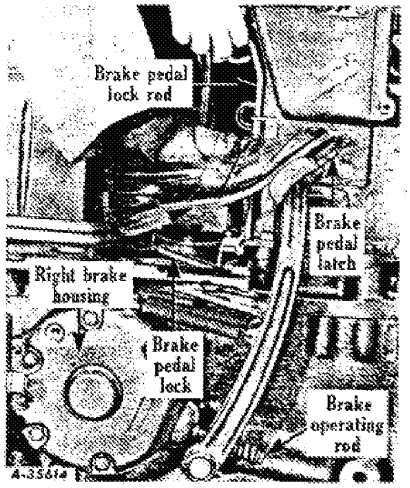
We cannot impress too strongly the necessity of having your International Harvester dealer do the work of replacing the connecting-rod bearings, crankshaft bearings, pistons and rings, and grinding the valves.

Brakes

The tractor is equipped with mechanical, disc-type brakes. The brakes are controlled by foot pedals which can be operated individually, or simultaneously when latched together.

Caution! Always latch the brake pedals together when traveling in high gear.

The brakes should not drag and should not have an excessive free movement of the pedals before they take hold. The pedals should have a free movement of 1⅛ to 1⅜ inches, the measurement to be taken between the points of contact of the brake pedals with the top of the rear frame cover, or just enough movement so that when a slight pressure is applied on the brake pedals, the brake lock can be dropped into the first notch in the rack on the left brake pedal.



Illust. 72
Brake pedals.

Ex. 2002
Page 912 of 915

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Exhibit 9

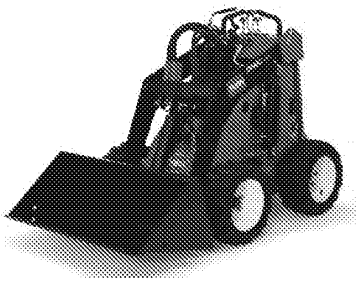
TORO®

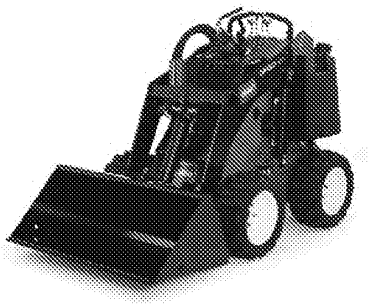
Sitework Systems

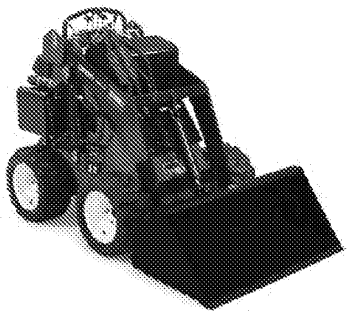
Wheeled Compact Utility Loader

Service Manual

Chain Drive / 4-Paw Gas / 4-Paw Diesel







Form No. 492-9216

SPECIFICATIONS

Dimensions

A. **Overall operating height, fully raised** / 91.2" (2317mm)
B. **Hinge pin height, fully raised** / 66.0" (1676mm)
C. **Overall height** / 48.7" (1237mm)
D. **Overall length** / 82.2" (2088mm)
E. **Dump angle** / 34°
F. **Dump height** / 47.0" (1194mm)
G. **Reach, fully raised** / 26.0" (660mm)
H. **Bucket rollback, ground position** / 19°
I. **Bucket rollback, fully raised** / 97°
J. **Wheelbase** / 28.0" (711mm)
K. **Overall width** / 40.5" (1029mm)
X. **Ground Clearance, front** / 5.8" (147mm)
X. **Ground Clearance, rear** / 5.8" (147mm)
X. **Reach, maximum** / 28.0" (711mm)
X. **Bucket rollback, carry position** / 20°

X. = Dimension not shown

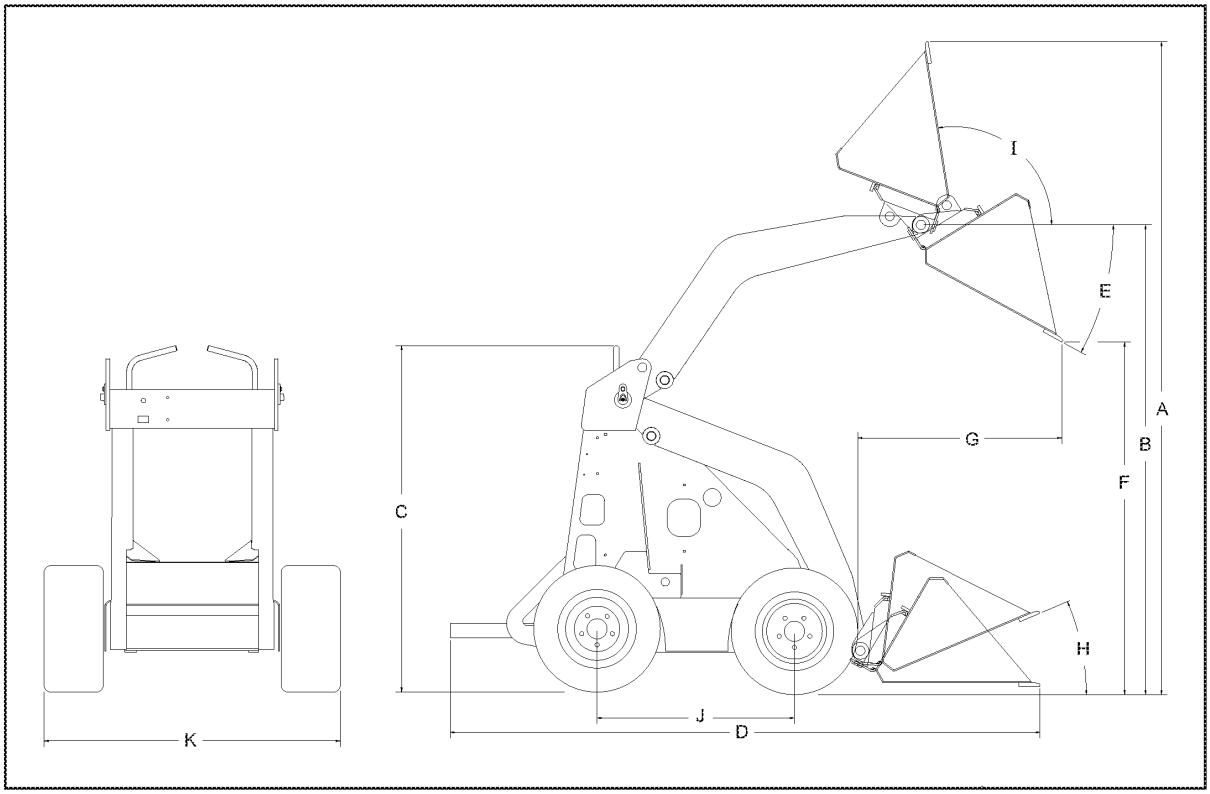


Fig A 99-8886