

SECTION 5 - BASIC HYDRAULICS INFORMATION & SCHEMATICS

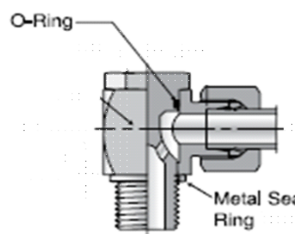
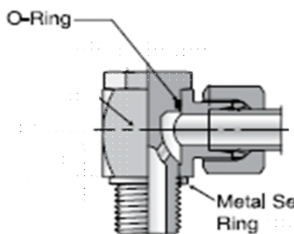
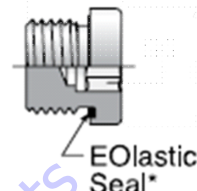
Table 5-26. British Standard Parallel Pipe Port (BSPP) - L Series - Table 2 of 3

TYPE/FITTING IDENTIFICATION			FORM E* (Elastomeric Sealing Ring) STUD ENDS with 37° (JIC) or L series DIN (MBTL) opposite end						FORM G/H*** (O-RING W/ RETAINING RING) STUD ENDS & ADJUSTABLE STUD ENDS with 37° (JIC) or L series DIN (MBTL) opposite end								
MATERIAL	BSPP Thread G Size	Connecting Tube O.D.	Torque									Torque					
			[Ft-Lb]			[N-m]			[Ft-Lb]			[N-m]					
	(metric)	(mm)	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max			
STEEL FITTINGS WITH STEEL MATING COMPONENTS; UN-LUBRICATED THREADS	G 1/8A	6	13	14	14	18	19	19	13	14	14	18	19	19			
	G 1/4A	8	26	28	29	35	38	39	26	28	29	35	38	39			
	G 1/4A	10	26	28	29	35	38	39	26	28	29	35	38	39			
	G 3/8A	12	52	55	57	70	75	77	52	55	57	70	75	77			
	G 1/2A	15	66	70	73	90	95	99	66	70	73	90	95	99			
	G 1/2A	18	66	70	73	90	95	99	66	70	73	90	95	99			
	G 3/4A	22	133	140	146	180	190	198	133	140	146	180	190	198			
	G 1A	28	229	241	252	310	327	342	229	241	252	310	327	342			
	G 1-1/4A	35	332	349	365	450	473	495	332	349	365	450	473	495			
	G 1-1/2A	42	398	418	438	540	567	594	398	418	438	540	567	594			
ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS; UN-LUBRICATED THREADS	G 1/8A	6	8	9	9	11	12	12	8	9	9	11	12	12			
	G 1/4A	8	17	18	19	23	24	26	17	18	19	23	24	26			
	G 1/4A	10	17	18	19	23	24	26	17	18	19	23	24	26			
	G 3/8A	12	34	36	37	46	49	50	34	36	37	46	49	50			
	G 1/2A	15	43	45	47	58	61	64	43	45	47	58	61	64			
	G 1/2A	18	43	45	47	58	61	64	43	45	47	58	61	64			
	G 3/4A	22	86	91	95	117	123	129	86	91	95	117	123	129			
	G 1A	28	149	157	164	202	213	222	149	157	164	202	213	222			
	G 1-1/4A	35	216	227	237	293	308	321	216	227	237	293	308	321			
	G 1-1/2A	42	259	272	285	351	369	386	259	272	285	351	369	386			

*Typical for JLG Straight Male Stud Fittings
 ** Non typical for JLG Straight Male Stud Fittings, reference only.
 ***Typical for JLG Adjustable Fittings

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Table 5-27. British Standard Parallel Pipe Port (BSP) - L Series - Table 3 of 3

																				
TYPE/FITTING IDENTIFICATION			BANJO FITTINGS with L series DIN (MBTL) opposite end						HIGH PRESSURE BANJO FITTINGS with L series DIN (MBTL) opposite end						FORM E (EOLASTIC SEALING RING) HOLLOW HEX PLUGS					
MATERIAL	BSP Thread G Size	Connecting Tube O.D.	Torque						Torque						Torque					
			[Ft-Lb]			[N-m]			[Ft-Lb]			[N-m]			[Ft-Lb]			[N-m]		
	(metric)	(mm)	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
STEEL FITTINGS WITH STEEL MATING COMPONENTS; UN-LUBRICATED THREADS	G 1/8A	6	13	14	14	18	19	19	13	14	14	18	19	19	10	11	11	13	15	15
	G 1/4A	8	30	32	33	40	43	45	33	35	36	45	47	49	22	23	24	30	31	33
	G 1/4A	10	30	32	33	40	43	45	33	35	36	45	47	49	22	23	24	30	31	33
	G 3/8A	12	48	51	53	65	69	72	52	55	57	70	75	77	44	46	48	60	62	65
	G 1/2A	15	66	70	73	90	95	99	89	94	98	120	127	133	59	62	65	80	84	88
	G 1/2A	18	66	70	73	90	95	99	89	94	98	120	127	133	59	62	65	80	84	88
	G 3/4A	22	92	97	101	125	132	137	170	179	187	230	243	254	103	108	113	140	146	153
	G 1A	28	--	--	--	--	--	--	236	248	260	320	336	353	148	156	163	200	212	221
	G 1-1/4A	35	--	--	--	--	--	--	398	418	438	540	567	594	295	313.5	332	400	425	450
	G 1-1/2A	42	--	--	--	--	--	--	516	542	568	700	735	770	332	349	365	450	473	495
ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS; UN-LUBRICATED THREADS	G 1/8A	6	8	9	9	11	12	12	8	9	9	11	12	12	6	7	7	8	9	9
	G 1/4A	8	20	21	21	27	28	28	21	22	23	28	30	31	14	15	16	19	20	22
	G 1/4A	10	20	21	21	27	28	28	21	22	23	28	30	31	14	15	16	19	20	22
	G 3/8A	12	31	33	34	42	45	46	34	36	37	46	49	50	29	30	31	39	41	42
	G 1/2A	15	43	45	47	58	61	64	58	61	64	79	83	87	38	40	42	52	54	57
	G 1/2A	18	43	45	47	58	61	64	58	61	64	79	83	87	38	40	42	52	54	57
	G 3/4A	22	60	63	66	81	85	89	111	117	122	150	159	165	67	70	73	91	95	99
	G 1A	28	--	--	--	--	--	--	153	161	169	207	218	229	96	101	106	130	137	144
	G 1-1/4A	35	--	--	--	--	--	--	259	272	285	351	369	386	216	227	237	293	308	321
	G 1-1/2A	42	--	--	--	--	--	--	335	352	369	454	477	500	216	227	237	293	308	321

* Typical for JLG Straight Male Stud Fittings

** Non typical for JLG Straight Male Stud Fittings, reference only.

*** Typical for JLG Adjustable Fittings

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Table 5-28. British Standard Parallel Pipe Port (BSPP) - S Series - Table 1 of 3

TYPE/FITTING IDENTIFICATION			FORM A** (SEALING WASHER) STUD ENDS with (ORFS) or S series DIN (MBTS) opposite end						FORM B** (CUTTING FACE) STUD ENDS with (ORFS) or S series DIN (MBTS) opposite end					
MATERIAL	BSPP Thread G Size	Connecting Tube O.D.	Torque						Torque					
			[Ft-Lb]			[N-m]			[Ft-Lb]			[N-m]		
	(metric)	(mm)	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
STEEL FITTINGS WITH STEEL MATING COMPONENTS; UN-LUBRICATED THREADS	G 1/4A	6	26	28	29	35	38	39	41	43	45	55	58	61
	G 1/4A	8	26	28	29	35	38	39	41	43	45	55	58	61
	G 3/8A	10	33	35	36	45	47	49	66	70	73	90	95	99
	G 3/8A	12	33	35	36	45	47	49	66	70	73	90	95	99
	G 1/2A	14	48	51	53	65	69	72	111	117	122	150	159	165
	G 1/2A	16	48	51	53	65	69	72	96	101	106	130	137	144
	G 3/4A	20	66	70	73	90	95	99	199	209	219	270	283	297
	G 1A	25	111	117	122	150	159	165	251	264	276	340	358	374
	G 1-1/4A	30	177	186	195	240	252	264	398	418	438	540	567	594
	G 1-1/2A	38	214	225	235	290	305	319	516	542	568	700	735	770
ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS; UN-LUBRICATED THREADS	G 1/4A	6	17	18	19	23	24	26	27	28	29	37	38	39
	G 1/4A	8	17	18	19	23	24	26	27	28	29	37	38	39
	G 3/8A	10	21	22	23	28	30	31	43	45	47	58	61	64
	G 3/8A	12	21	22	23	28	30	31	43	45	47	58	61	64
	G 1/2A	14	31	33	34	42	45	46	72	76	79	98	103	107
	G 1/2A	16	31	33	34	42	45	46	62	66	69	84	89	94
	G 3/4A	20	43	45	47	58	61	64	129	136	142	175	184	193
	G 1A	25	72	76	79	98	103	107	163	171	179	221	232	243
	G 1-1/4A	30	115	121	127	156	164	172	259	272	285	351	369	386
	G 1-1/2A	38	139	146	153	188	198	207	335	352	369	454	477	500

*Typical for JLG Straight Male Stud Fittings

** Non typical for JLG Straight Male Stud Fittings, reference only.

***Typical for JLG Adjustable Fittings

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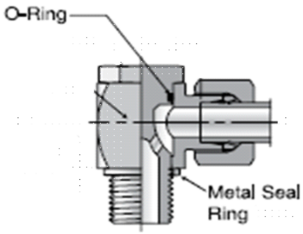
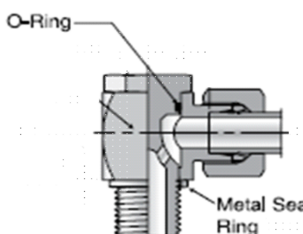
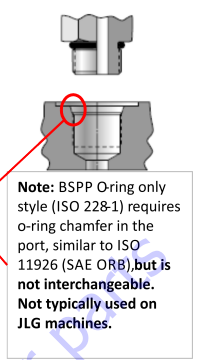
Table 5-29. British Standard Parallel Pipe Port (BSPP) - S Series - Table 2 of 3

TYPE/FITTING IDENTIFICATION			FORM E* (EOLASTIC SEALING RING) STUD ENDS AND HEX TYPE PLUGS with (ORFS) or S series DIN (MBTS) opposite end						FORM G/H*** (O-RING W/ RETAINING RING) STUD ENDS & ADJUSTABLE STUD ENDS with (ORFS) or S series DIN (MBTS) opposite end							
MATERIAL	BSPP Thread G Size	Connecting Tube O.D.	Torque									Torque				
			[Ft-Lb]			[N-m]			[Ft-Lb]			[N-m]				
	(metric)	(mm)	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max		
STEEL FITTINGS WITH STEEL MATING COMPONENTS; UN-LUBRICATED THREADS	G 1/4A	6	41	43	45	55	58	61	26	28	29	35	38	39		
	G 1/4A	8	41	43	45	55	58	61	26	28	29	35	38	39		
	G 3/8A	10	59	62	65	80	84	88	52	55	57	70	75	77		
	G 3/8A	12	59	62	65	80	84	88	52	55	57	70	75	77		
	G 1/2A	14	85	90	94	115	122	127	66	70	73	90	95	99		
	G 1/2A	16	85	90	94	115	122	127	66	70	73	90	95	99		
	G 3/4A	20	133	140	146	180	190	198	133	140	146	180	190	198		
	G 1A	25	229	241	252	310	327	342	229	241	252	310	327	342		
	G 1-1/4A	30	332	349	365	450	473	495	332	349	365	450	473	495		
	G 1-1/2A	38	398	418	438	540	567	594	398	418	438	540	567	594		
ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS; UN-LUBRICATED THREADS	G 1/4A	6	27	28	29	37	38	39	17	18	19	23	24	26		
	G 1/4A	8	27	28	29	37	38	39	17	18	19	23	24	26		
	G 3/8A	10	38	40	42	52	54	57	34	36	37	46	49	50		
	G 3/8A	12	38	40	42	52	54	57	34	36	37	46	49	50		
	G 1/2A	14	55	58	61	75	79	83	43	45	47	58	61	64		
	G 1/2A	16	55	58	61	75	79	83	43	45	47	58	61	64		
	G 3/4A	20	86	91	95	117	123	129	86	91	95	117	123	129		
	G 1A	25	149	157	164	202	213	222	149	157	164	202	213	222		
	G 1-1/4A	30	216	227	237	293	308	321	216	227	237	293	308	321		
	G 1-1/2A	38	259	272	285	351	369	386	259	272	285	351	369	386		

*Typical for JLG Straight Male Stud Fittings
 ** Non typical for JLG Straight Male Stud Fittings, reference only.
 ***Typical for JLG Adjustable Fittings

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Table 5-30. British Standard Parallel Pipe Port (BSPP) - S Series - Table 3 of 3

															 <p>Note: BSPP O-ring only style (ISO 228-1) requires o-ring chamfer in the port, similar to ISO 11926 (SAE ORB), but is not interchangeable. Not typically used on JLG machines.</p>					
TYPE/FITTING IDENTIFICATION			BANJO FITTINGS with S series DIN (MBTS) opposite end						HIGH PRESSURE BANJO FITTINGS with S series DIN (MBTS) opposite end						JIS/BSPP O-RING ONLY					
MATERIAL	BSPP Thread G Size	Connecting Tube O.D.	Torque						Torque						Torque					
			[Ft-Lb]			[N-m]			[Ft-Lb]			[N-m]			[Ft-Lb]			[N-m]		
			Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
	(metric)	(mm)																		
STEEL FITTINGS WITH STEEL MATING COMPONENTS, UN-LUBRICATED THREADS	G1/4A	6	30	32	33	40	43	45	33	35	36	45	47	49	Fitting type not typically specified on JLG applications. Refer to the specific procedure in this Service Manual.					
	G1/4A	8	30	32	33	40	43	45	33	35	36	45	47	49						
	G3/8A	10	48	51	53	65	69	72	52	55	57	70	75	77						
	G3/8A	12	48	51	53	65	69	72	52	55	57	70	75	77						
	G1/2A	14	66	70	73	90	95	99	89	94	98	120	127	133						
	G1/2A	16	66	70	73	90	95	99	89	94	98	120	127	133						
	G3/4A	20	92	97	101	125	132	137	170	179	187	230	243	254						
	G1A	25	--	--	--	--	--	--	236	248	260	320	336	353						
	G1-1/4A	30	--	--	--	--	--	--	398	418	438	540	567	594						
	G1-1/2A	38	--	--	--	--	--	--	516	542	568	700	735	770						
MATERIAL	BSPP Thread G Size	Connecting Tube O.D.	Torque						Torque						Torque					
			[Ft-Lb]			[N-m]			[Ft-Lb]			[N-m]			[Ft-Lb]			[N-m]		
			Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
	(metric)	(mm)																		
ALUMINUM/BRASS FITTINGS OR ALUMINUM/BRASS MATING COMPONENTS, UN-LUBRICATED THREADS	G1/4A	6	20	21	21	27	28	28	22	22	23	30	30	31	Fitting type not typically specified on JLG applications. Refer to the specific procedure in this Service Manual.					
	G1/4A	8	20	21	21	27	28	28	22	22	23	30	30	31						
	G3/8A	10	31	33	34	42	45	46	34	36	37	46	49	50						
	G3/8A	12	31	33	34	42	45	46	34	36	37	46	49	50						
	G1/2A	14	43	45	47	58	61	64	58	61	64	79	83	87						
	G1/2A	16	43	45	47	58	61	64	58	61	64	79	83	87						
	G3/4A	20	60	63	66	81	85	89	111	117	122	150	159	165						
	G1A	25	--	--	--	--	--	--	153	161	169	207	218	229						
	G1-1/4A	30	--	--	--	--	--	--	259	272	285	351	369	386						
	G1-1/2A	38	--	--	--	--	--	--	335	352	368	454	477	499						
* Typical for JLG Straight Male Stud Fittings																				
** Non typical for JLG Straight Male Stud Fittings, reference only.																				
*** Typical for JLG Adjustable Fittings																				

**Assembly Instructions for Flange Connections:
(FL61 and FL62)**

1. Make sure sealing surfaces are free of rust, splits, scratches, dirt, foreign matter or burrs.
2. Install O-ring as per "O-ring Installation (Replacement)".
3. Pre-lubricate the O-ring with Hydraulic Oil.
4. Position flange and clamp halves.
5. Place lock washers on bolt and bolt through clamp halves.
6. Tighten all bolts by hand.
7. Torque bolts in diagonal sequence in two or more increments to the torque listed on Table 5-31 and Table 5-32.

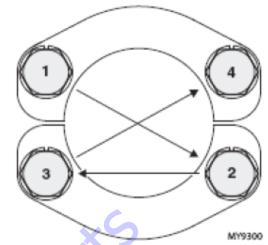
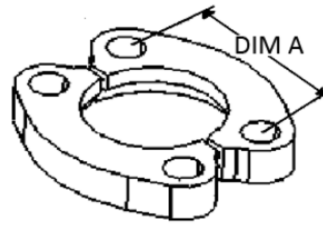
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Table 5-31. Flange Code (FL61 & FL62) -Inch Fasteners

TYPE/FITTING IDENTIFICATION						STEEL 4-BOLT FLANGE SAE J518 (INCH FASTENERS)												
TYPE	Inch Flange SAE Dash Size	Flange Size		A*		Bolt Thread Size	Fastener Torque for Flanges Equipped with GRADE 5 Screws						Fastener Torque for Flanges Equipped with GRADE 8 Screws					
		(in)	(mm)	(in)	(mm)		[Ft-Lb]			[N-m]			[Ft-Lb]			[N-m]		
						(UNF)	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
CODE 61 SPLIT FLANGE (FL61)	8	0.50	13	1.50	38.10	5/16-18	18	19	19	24	25	26	24	25	26	32	34	35
	12	0.75	19	1.88	47.75	3/8-16	32	33	35	43	45	47	44	46	49	60	63	66
	16	1.00	25	2.06	52.32	3/8-16	32	33	35	43	45	47	44	46	49	60	63	66
	20	1.25	32	2.31	58.67	7/16-14	52	54	57	70	74	77	68	71	75	92	97	101
	24	1.50	38	2.75	69.85	1/2-13	77	81	85	105	110	116	111	116	122	150	158	165
	32	2.00	51	3.06	77.72	1/2-13	77	81	85	105	110	116	111	116	122	150	158	165
	40	2.50	64	3.50	88.90	1/2-13	77	81	85	105	110	116	111	116	122	150	158	165
	48	3.00	76	4.19	106.43	5/8-11	155	163	170	210	221	231	218	228	239	295	310	325
	56	3.50	89	4.75	120.65	5/8-11	155	163	170	210	221	231	218	228	239	295	310	325
	64	4.00	102	5.13	130.30	5/8-11	155	163	170	210	221	231	218	228	239	295	310	325
	80	5.00	127	6.00	152.40	5/8-11	155	163	170	210	221	231	218	228	239	295	310	325
CODE 62 SPLIT FLANGE (FL62)	8	0.50	13	1.59	40.39	5/16-18	--	--	--	--	--	--	24	25	26	32	34	35
	12	0.75	19	2.00	50.80	3/8-16	--	--	--	--	--	--	44	46	49	60	63	66
	16	1.00	25	2.25	57.15	7/16-14	--	--	--	--	--	--	68	71	75	92	97	101
	20	1.25	32	2.62	66.55	1/2-13	--	--	--	--	--	--	111	116	122	150	158	165
	20	1.25	32	2.62	66.55	--	--	--	--	--	--	--	--	--	--	--	--	--
	24	1.50	38	3.12	79.25	5/8-11	--	--	--	--	--	--	218	228	239	295	310	325
	32	2.00	51	3.81	96.77	3/4-10	--	--	--	--	--	--	332	348	365	450	473	495

* A dimension for reference only.



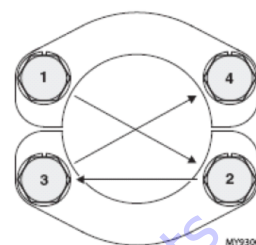
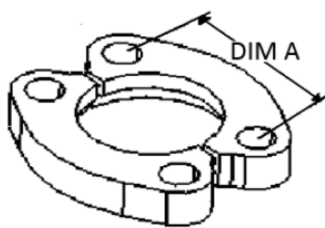
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Table 5-32. Flange Code (FL61 & FL62) - Metric Fasteners

TYPE/FITTING IDENTIFICATION						STEEL 4-BOLT FLANGE SAE J518 (INCH FASTENERS)												
TYPE	Inch Flange SAE Dash Size	Flange Size		A*		Bolt Thread Size (Metric)	Fastener Torque for Flanges Equipped with CLASS 8.8 Screws						Fastener Torque for Flanges Equipped with CLASS 10.9 Screws					
		(in)	(mm)	(in)	(mm)		[Ft-Lb]			[N-m]			[Ft-Lb]			[N-m]		
							Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
CODE 61 SPLIT FLANGE (FL61)	8	0.50	13	1.50	38.10	(Metric)	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
	12	0.75	19	1.88	47.75	M8x1.25	18	19	19	24	25	26	18	19	19	24	25	26
	16	1.00	25	2.06	52.32	M10x1.5	37	39	41	50	53	55	37	39	41	50	53	55
	20	1.25	32	2.31	58.67	M10x1.5	37	39	41	50	53	55	37	39	41	50	53	55
	24	1.50	38	2.75	69.85	M10x1.5	37	39	41	50	53	55	37	39	41	50	53	55
	32	2.00	51	3.06	77.72	M12x1.75	68	71	75	92	97	101	68	71	75	92	97	101
	40	2.50	64	3.50	88.90	M12x1.75	68	71	75	92	97	101	68	71	75	92	97	101
	48	3.00	76	4.19	106.43	M12x1.75	68	71	75	92	97	101	68	71	75	92	97	101
	56	3.50	89	4.75	120.65	M16x2	155	163	170	210	221	231	155	163	170	210	221	231
	64	4.00	102	5.13	130.30	M16x2	155	163	170	210	221	231	155	163	170	210	221	231
	80	5.00	127	6.00	152.40	M16x2	155	163	170	210	221	231	155	163	170	210	221	231
CODE 62 SPLIT FLANGE (FL62)	8	0.50	13	1.59	40.39	M8x1.25	--	--	--	--	--	--	24	25	26	32	34	35
	12	0.75	19	2.00	50.80	M10x1.5	--	--	--	--	--	--	52	54	57	70	74	77
	16	1.00	25	2.25	57.15	M12x1.75	--	--	--	--	--	--	96	101	105	130	137	143
	20	1.25	32	2.62	66.55	M12x1.75	--	--	--	--	--	--	96	101	105	130	137	143
	20	1.25	32	2.62	66.55	M14x2	--	--	--	--	--	--	133	139	146	180	189	198
	24	1.50	38	3.12	79.25	M16x2	--	--	--	--	--	--	218	228	239	295	310	325
	32	2.00	51	3.81	96.77	M20x2.5	--	--	--	--	--	--	406	426	446	550	578	605

* A dimension for reference only.



Double Wrench Method

To prevent undesired hose or connector rotation, two wrenches must be used; one torque wrench and one backup wrench. If two wrenches are not used, inadvertent component rotation may occur which absorbs torque and causes improper joint load and leads to leaks. For hose connections,

the 'layline' printed on the hose is a good indicator of proper hose installation. A twisted lay-line usually indicates the hose is twisted. See Figure 5-11. for double wrench method requirements.

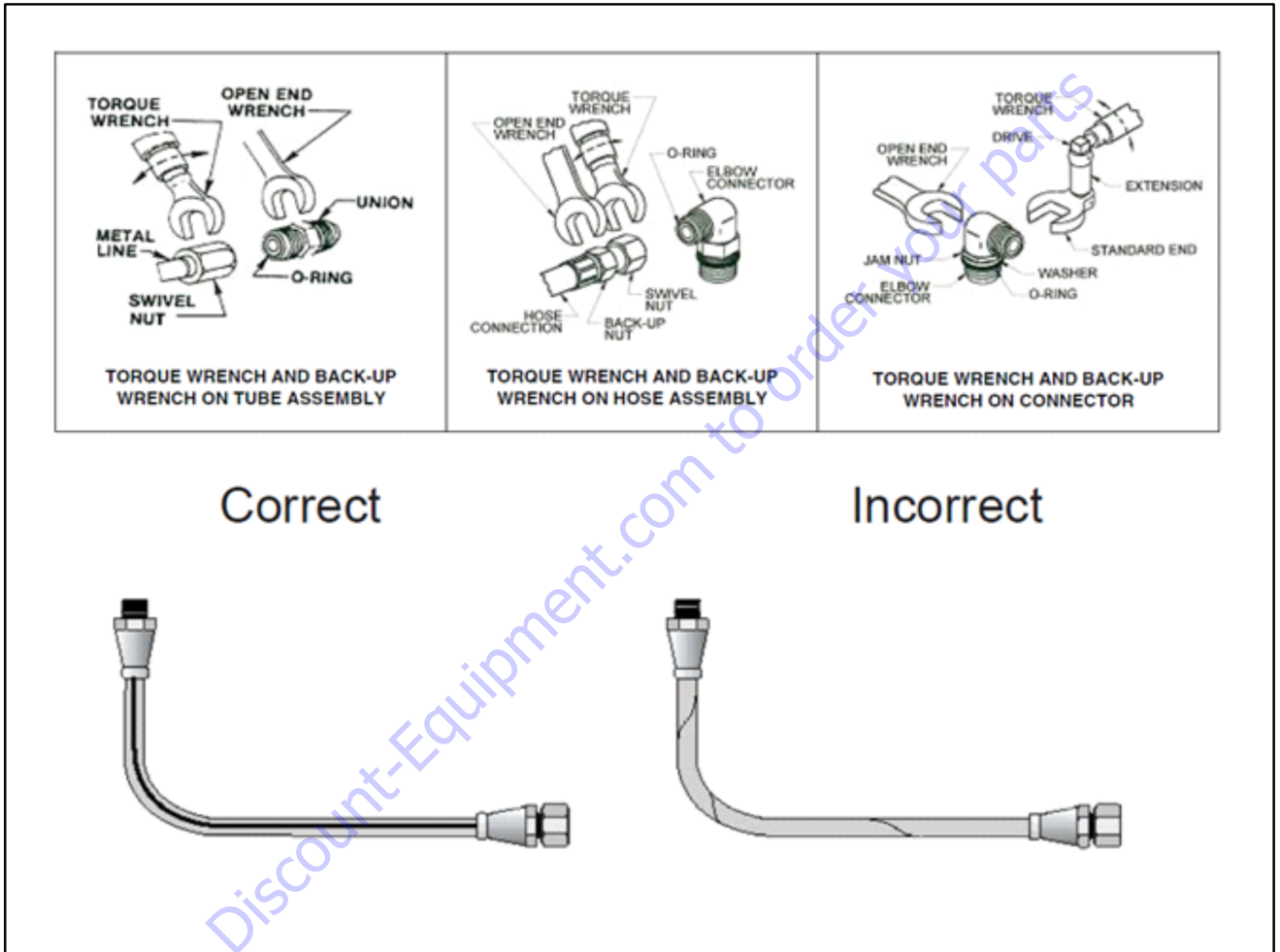


Figure 5-11. Double Wrench Method

FFWR and TFFT Methods

FFWR (FLATS FROM WRENCH RESISTANCE METHOD)

1. Tighten the swivel nut to the mating fitting until no lateral movement of the swivel nut can be detected; finger tight condition.
2. Mark a dot on one of the swivel hex nut flats and another dot in line on the connecting tube adapter. See Figure B.1.
3. Use the double wrench method per Appendix A, turn the swivel nut to tighten as shown in Figure 5-11. The nut is to be rotated clockwise the number of hex flats as defined by the applicable Table in Section 5.0.
4. After the connection has been properly tightened, mark a straight line across the connecting parts, not covering the dots, to indicate the connection has been properly tightened. See Figure 5-12.

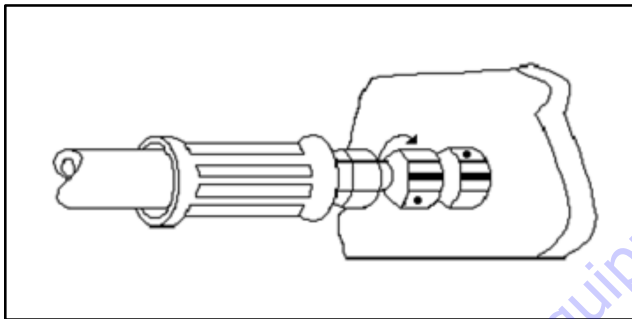


Figure 5-12. FFWR Method

TFFT (TURNS FROM FINGER TIGHT METHOD)

1. Tighten the swivel nut to the mating fitting until no lateral movement of the swivel nut can be detected; finger tight condition.
2. Mark a dot on one of the swivel hex nut flats and another dot in line on the connecting tube adapter.
3. Use the double wrench method per Appendix A, turn the swivel nut to tighten. The nut is to be rotated clockwise the number of turns as defined by the applicable Table in Section 5.0.
4. After the connection has been properly tightened, mark a straight line across the connecting parts, not covering the dots, to indicate the connection has been properly tightened.

Adjustable Stud End Assembly

For Adjustable Stud End Connections; the following assembly steps are to be performed:

1. Lubricate the o-ring with a light coat of hydraulic oil.
2. Position #1 – The o-ring should be located in the groove adjacent to the face of the backup washer. The washer and o-ring should be positioned at the extreme top end of the groove as shown.
3. Position #2 – Position the locknut to just touch the backup washer as shown. The locknut in this position will eliminate potential backup washer damage during the next step.
4. Position #3 – Install the connector into the straight thread box port until the metal backup washer contacts the face of the port as shown.
5. Position #4 – Adjust the connector to the proper position by turning out (counterclockwise) up to a maximum of one turn as shown to provide proper alignment with the mating connector, tube assembly, or hose assembly.
6. Position #5 – Using two wrenches, use the backup wrench to hold the connector in the desired position and then use the torque wrench to tighten the locknut to the appropriate torque.
7. Visually inspect, where possible, the joint to ensure the o-ring is not pinched or bulging out from under the washer and that the backup washer is properly seated flat against the face of the port.

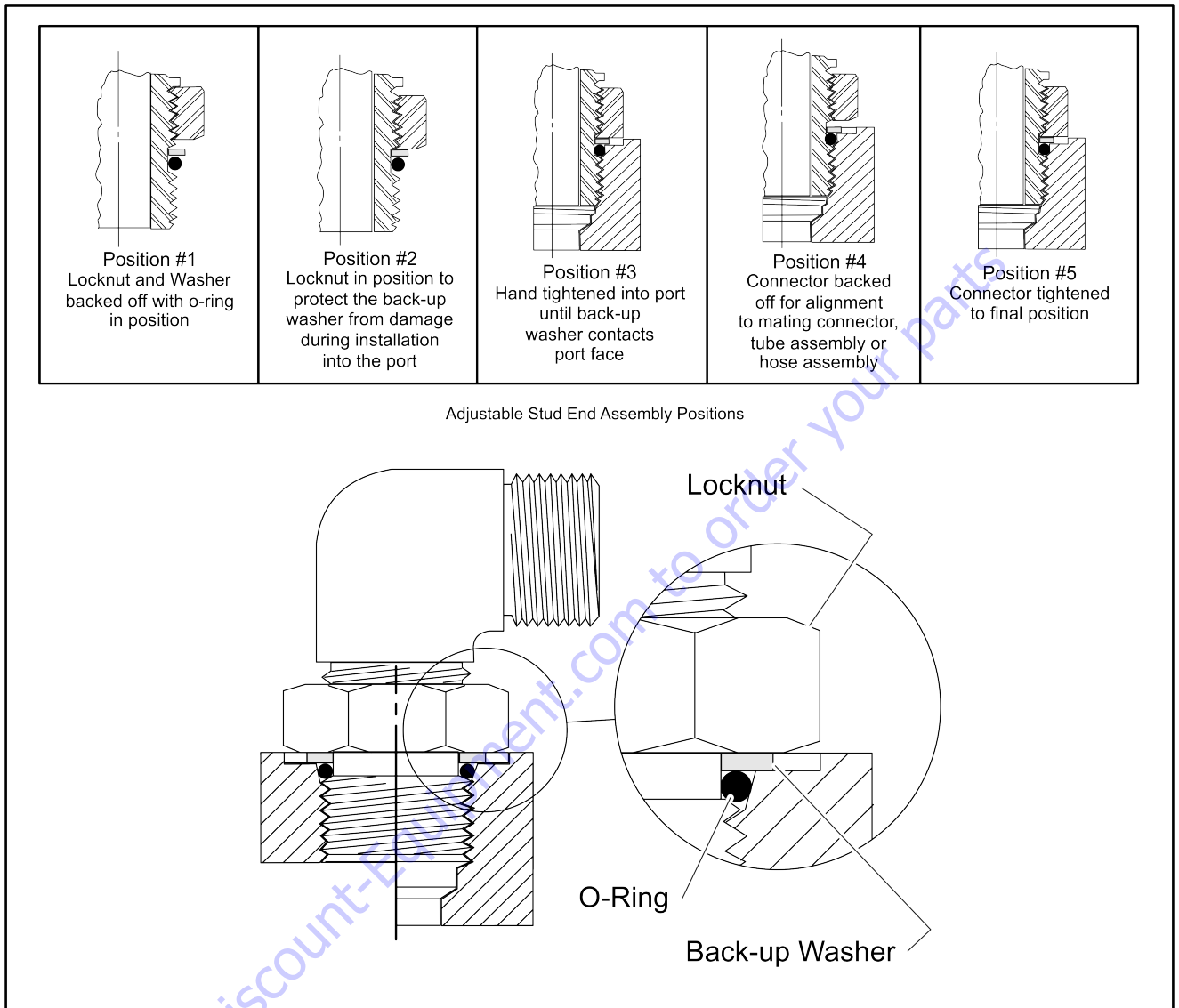


Figure 5-13. Adjustable Stud End Assembly

O-ring Installation (Replacement)

Care must be taken when installing O-rings over threads during replacement or installation. O-rings could become nicked or torn. A damaged O-ring could lead to leakage problems.

1. Inspect O-ring for tears or nicks. If any are found replace O-ring.
2. Ensure proper O-ring to be installed. Many O-rings look the same but are of different material, different hardness, or are slightly different diameters or widths.
3. Use a thread protector when replacing O-rings on fittings.
4. In ORB; ensure O-ring is properly seated in groove. On straight threads, ensure O-ring is seated all the way past the threads prior to installation.
5. Inspect O-ring for any visible nicks or tears. Replace if found.

5.3 HYDRAULIC CYLINDERS

Axle Lockout Cylinder

DISASSEMBLY

NOTICE

DISASSEMBLY OF THE CYLINDER SHOULD BE PERFORMED ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

⚠ WARNING

ROD CAN FALL OUT OF BARREL AND CAUSE INJURY OR DAMAGE TO THE EQUIPMENT. BE CAREFUL WHEN REMOVING AXLE CYLINDER. OPENING BLEED VALVE CAN CAUSE ROD TO FALL OUT OF BARREL.

1. Open bleeder valve. Rotate rod and remove from barrel.
2. Remove two wear rings, wiper seal and rod seal from grooves of barrel bore. Do not scratch barrel bore.
3. Remove counterbalance valve and plugs.

CLEANING AND INSPECTION

1. Inspect bore and rod for scoring, pitting, or excessive wear.
2. Remove minor surface blemishes with wet sandpaper.
3. Pitting requires replacement of barrel and rod.

ASSEMBLY

NOTE: Prior to cylinder assembly, ensure that the proper cylinder seal kit is used. See your JLG Parts Manual.

NOTE: Apply a light film of hydraulic oil to all components prior to assembly.

NOTICE

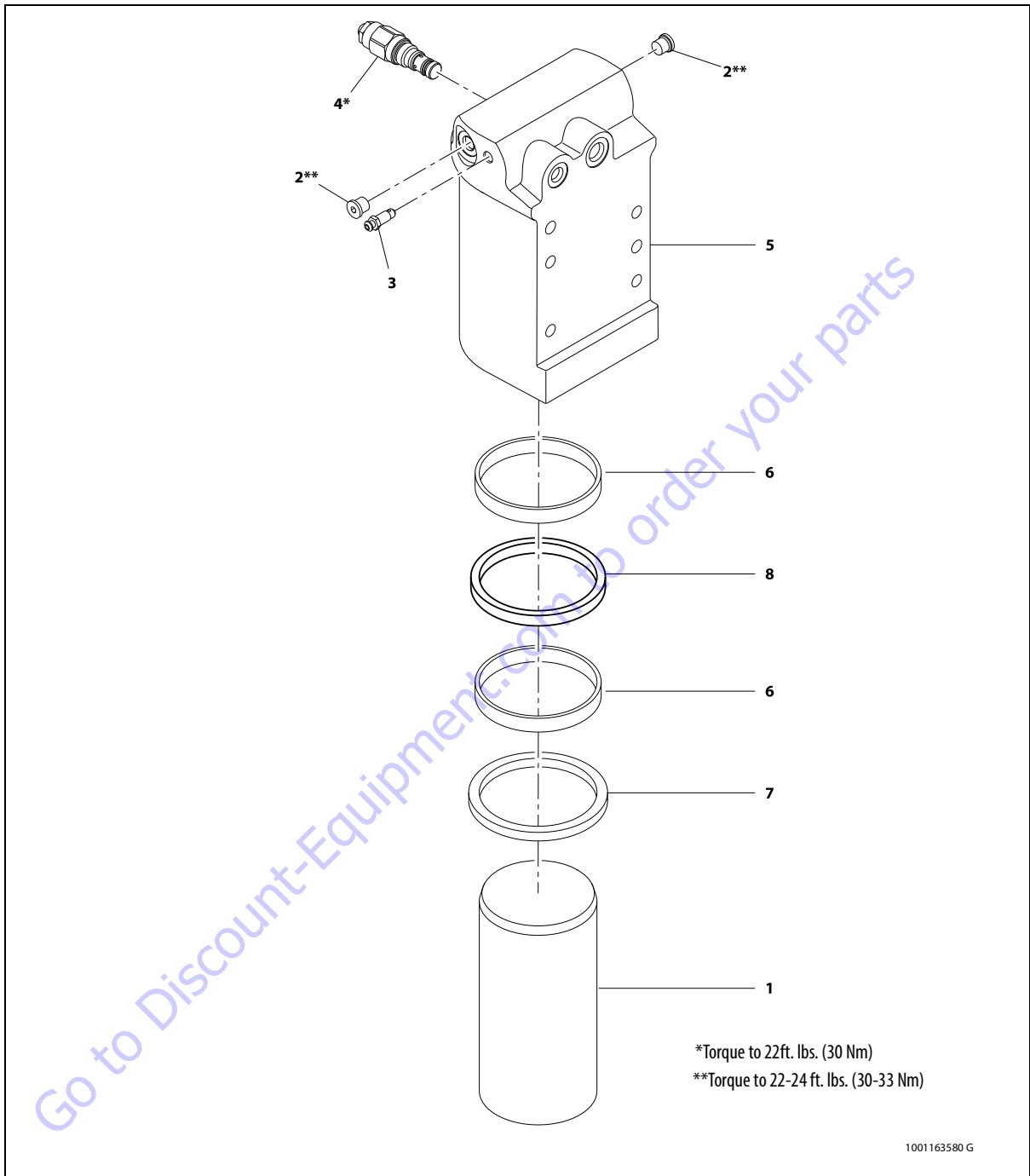
WHEN INSTALLING NEW SEALS, ENSURE SEALS ARE INSTALLED PROPERLY. IMPROPER SEAL INSTALLATION COULD RESULT IN CYLINDER LEAKAGE AND IMPROPER CYLINDER OPERATION.

1. Install two new wear rings, wiper seal and rod seal in barrel bore grooves. Make sure they are not twisted.
2. Lubricate rod bore with clean hydraulic fluid.

NOTICE

EXTREME CARE SHOULD BE TAKEN WHEN INSTALLING THE ROD. AVOID PULLING THE ROD OFF-CENTER, WHICH COULD CAUSE DAMAGE TO THE ROD AND CYLINDER BARREL SURFACES.

3. Insert and push the rod into top of barrel bore, rotate to install the rod into barrel bore.
4. Install plugs and counterbalance valve. Torque the plugs to 22-24 ft. lbs. (30-33 Nm) and counterbalance valve to 22 ft. lbs. (30 Nm).
5. Bleed system.



- | | |
|-------------------------|---------------|
| 1. Rod | 5. Barrel |
| 2. Plug | 6. Wear Ring |
| 3. Bleeder Valve | 7. Rod Seal |
| 4. Counterbalance valve | 8. Wiper seal |

Figure 5-14. Axle Lockout Cylinder

Platform Level Cylinder

DISASSEMBLY

NOTICE

DISASSEMBLY OF THE CYLINDER SHOULD BE PERFORMED ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

1. Connect a suitable auxiliary hydraulic power source to the cylinder port block fitting.

WARNING

DO NOT FULLY EXTEND CYLINDER TO THE END OF STROKE. RETRACT CYLINDER SLIGHTLY TO AVOID TRAPPING PRESSURE.

2. Operate the hydraulic power source and extend the cylinder. Shut down and disconnect the power source. Adequately support the cylinder rod, if applicable.
3. Remove the counterbalance valves and plugs from the cylinder port block. Discard o-rings.
4. Place the cylinder barrel into a suitable holding fixture.

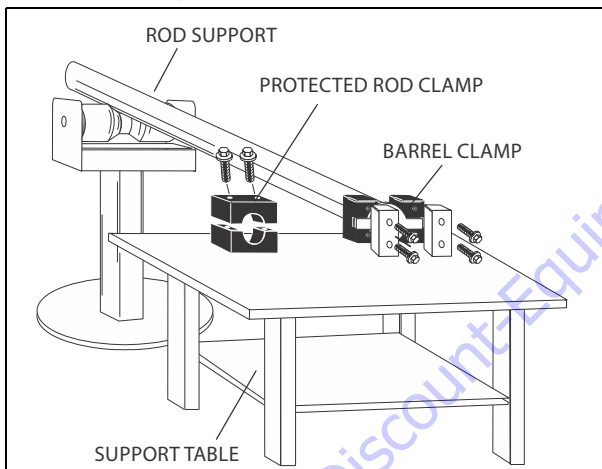


Figure 5-15. Cylinder Barrel Support

5. Mark cylinder head and barrel with a center punch for easy realignment. Using a pin-face spanner wrench, unscrew the cylinder head from the barrel.

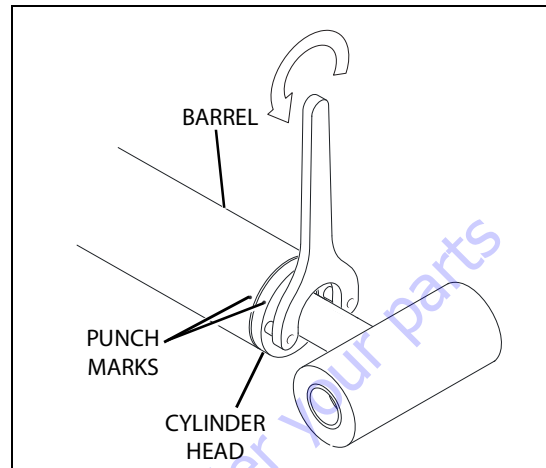


Figure 5-16. Cylinder Head Removal

6. Attach a suitable pulling device to the cylinder rod port block end or cylinder rod end, as applicable.

NOTICE

EXTREME CARE SHOULD BE TAKEN WHEN REMOVING THE CYLINDER ROD, HEAD AND PISTON. AVOID PULLING THE ROD OFF-CENTER, WHICH COULD CAUSE DAMAGE TO THE PISTON AND CYLINDER BARREL SURFACES.

7. With the barrel clamped securely, apply pressure to the rod pulling device and carefully withdraw the complete rod assembly from the cylinder barrel.

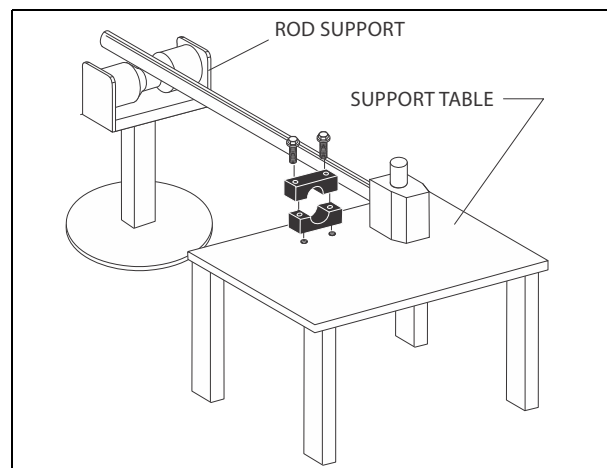
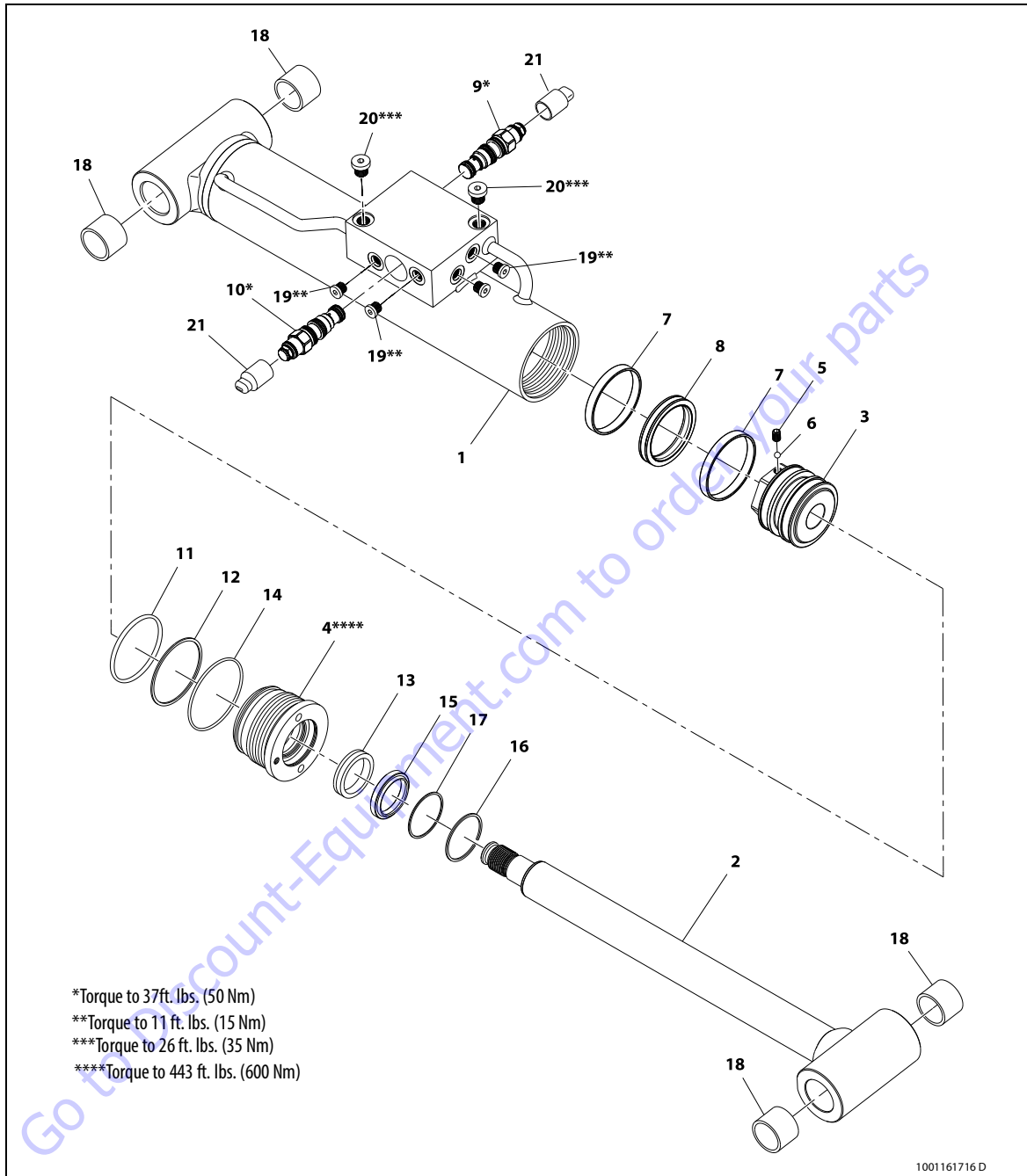


Figure 5-17. Cylinder Rod Support



- | | | | | |
|-------------|-------------------------|--------------------------|--------------------|-------------|
| 1. Barrel | 6. Ball | 10. Counterbalance Valve | 14. O-Ring | 18. Bushing |
| 2. Rod | 7. Wear Ring | 11. O-Ring | 15. Wiper Seal | 19. Plug |
| 3. Piston | 8. Seal | 12. Backup Ring | 16. O-Ring | 20. Plug |
| 4. Head | 9. Counterbalance Valve | 13. Rod Seal | 17. Retaining Ring | 21. Plug |
| 5. Setscrew | | | | |

Figure 5-18. Platform Level Cylinder

8. Using suitable protection, clamp the cylinder rod in a vise or similar holding fixture as close to the piston as possible.
9. Loosen and remove the setscrew and ball which attaches the piston to the rod.
10. Screw the piston counterclockwise by hand and remove the piston from cylinder rod.
11. Remove and discard the piston bearing rings and piston seal.
12. Remove the rod from the holding fixture. Remove the cylinder head. Discard the o-rings, seal, rod seal, retaining ring and wiper seal.

CLEANING AND INSPECTION

1. Clean all parts thoroughly in an approved cleaning solvent.
2. Inspect the cylinder rod for scoring, tapering, ovality, or other damage. If necessary, dress rod with Scotch Brite or equivalent. Replace rod if necessary.
3. Inspect threaded portion of rod for excessive damage. Dress threads as necessary.
4. Inspect inner surface of cylinder barrel tube for scoring or other damage. Check inside diameter for tapering or ovality. Replace if necessary.
5. Inspect threaded portion of barrel for damage. Dress threads as necessary.
6. Inspect piston surface for damage and scoring and for distortion. Dress piston surface or replace piston as necessary.
7. Inspect threaded portion of piston for damage. Dress threads as necessary.
8. Inspect seal and o-ring grooves in piston for burrs and sharp edges. Dress applicable surfaces as necessary.
9. Inspect cylinder head inside diameter for scoring, tapering, ovality or other damage. Replace if necessary.
10. Inspect threaded portion of head for damage. Dress threads as necessary.
11. Inspect seal and o-ring grooves in head for burrs and sharp edges. Dress applicable surfaces as necessary.
12. Inspect cylinder head outside diameter for scoring, tapering, ovality or other damage. Replace if necessary.
13. If applicable, inspect rod and barrel bearings for signs of correct excessive wear or damage. Replace as necessary.
 - a. Thoroughly clean hole (steel bushing) of burrs, dirt etc. to facilitate bearing installation.
 - b. Inspect steel bushing for wear or other damage. If steel bushing is worn or damaged, rod/barrel must be replaced.
 - c. Lubricate inner side of steel bushing prior to bearing installation.
 - d. Using an arbor of the correct size, carefully press the bearing into steel bushing.

NOTE: Install pin into the composite bearing dry. Lubrication is not required with nickel plated pins and bearings.

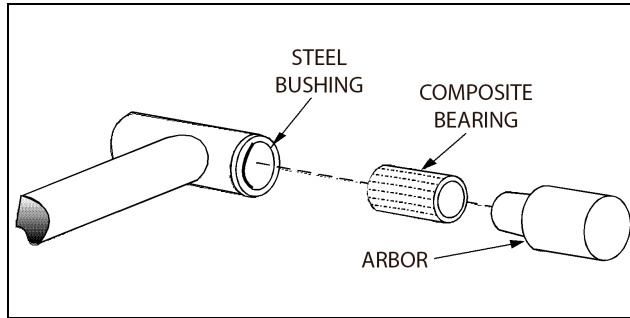


Figure 5-19. Composite Bearing Installation

- 14. Inspect port block fittings and holding valve. Replace if necessary.
- 15. Inspect the oil ports for blockage or the presence of dirt or other foreign material. Repair if necessary.
- 16. Inspect piston rings for cracks or other damage. Replace if necessary.

ASSEMBLY

NOTE: Prior to cylinder assembly, ensure that the proper cylinder seal kit is used. See your JLG Parts Manual.

NOTE: Apply a light film of hydraulic oil to all components prior to assembly.

- 1. A special tool is used to install a new rod seal into the applicable cylinder head groove.

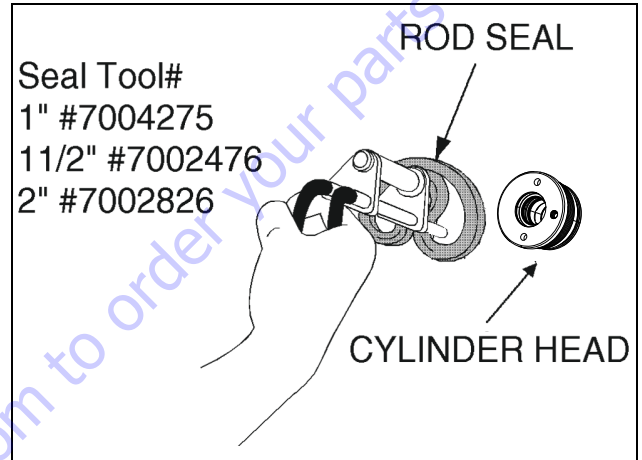


Figure 5-20. Rod Seal Installation

NOTICE

WHEN INSTALLING NEW SEALS, ENSURE SEALS ARE INSTALLED PROPERLY. IMPROPER SEAL INSTALLATION COULD RESULT IN CYLINDER LEAKAGE AND IMPROPER CYLINDER OPERATION.

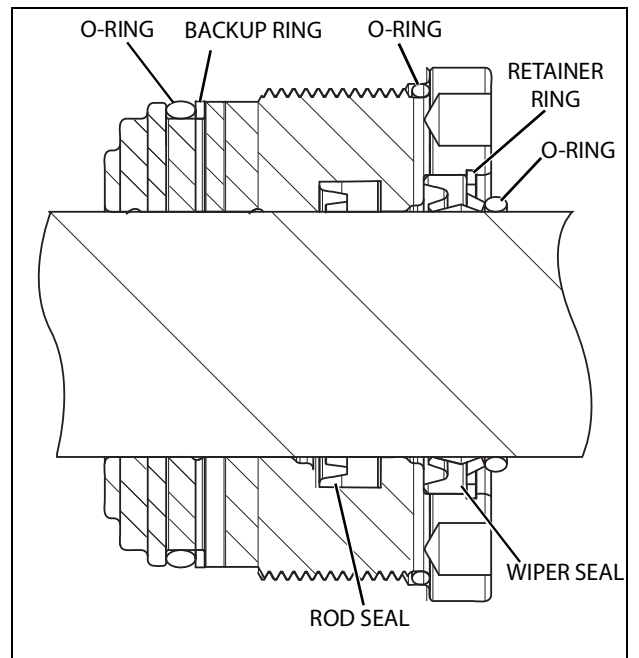


Figure 5-21. Cylinder Head Seal Installation

- Use a soft mallet to tap a new wiper seal into the applicable cylinder head groove. Install a new retaining ring and o-ring into the applicable inside diameter of the cylinder head groove.

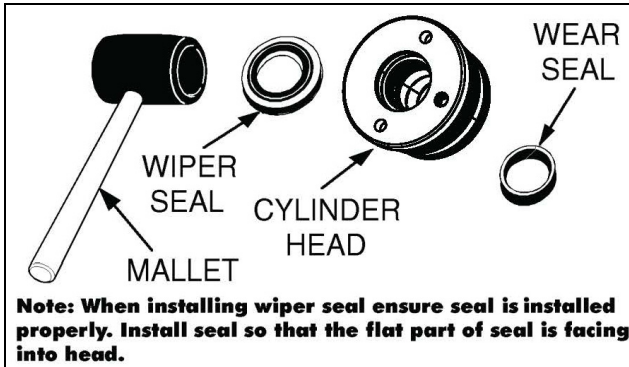


Figure 5-22. Wiper Seal Installation

- Place a new o-ring and seal in the applicable outside diameter groove of the cylinder head.

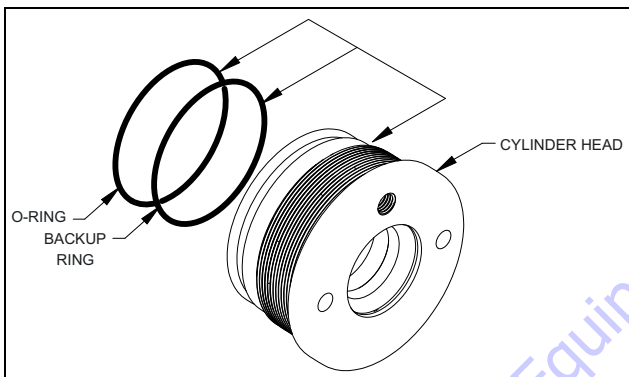


Figure 5-23. Installation of Head Seal Kit

- Carefully install the cylinder head on the rod, ensuring that the wiper seal, retaining ring and rod seals are not damaged or dislodged. Push the head along the rod to the rod end.
- Using suitable protection, clamp the cylinder rod in a vise or similar holding fixture as close to piston as possible.
- Carefully thread the piston on the cylinder rod hand tight. Secure using ball and setscrew.

- Remove the cylinder rod from the holding fixture. Place new seal and bearing rings in the outer piston diameter groove. (A tube, with I.D. slightly larger than the O.D. of the piston is recommended to install the solid seal).

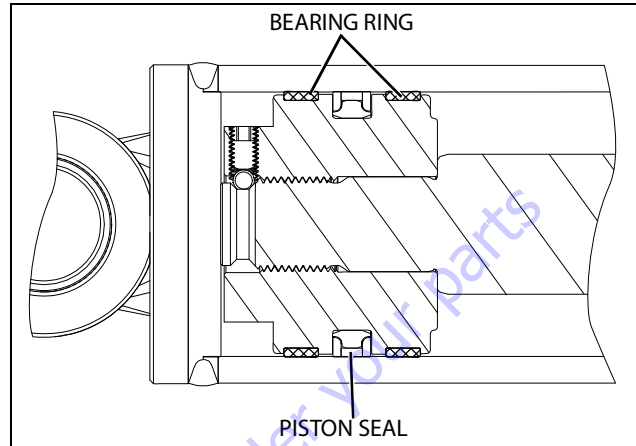


Figure 5-24. Piston Seal Kit Installation

- Position the cylinder barrel in a suitable holding fixture.

NOTICE

EXTREME CARE SHOULD BE TAKEN WHEN INSTALLING THE CYLINDER ROD, HEAD AND PISTON. AVOID PULLING THE ROD OFF-CENTER, WHICH COULD CAUSE DAMAGE TO THE PISTON AND CYLINDER BARREL SURFACES.

- With barrel clamped securely, and while adequately supporting the rod, insert the piston end into the barrel cylinder. Ensure that the piston loading bearing rings and seals are not damaged or dislodged.
- Continue pushing the rod into the barrel until the cylinder head can be inserted into the barrel cylinder.
- Screw the cylinder head into the barrel using a pin-face spanner wrench and torque cylinder head to 443 ft. lbs. (600 Nm).
- After the cylinder has been reassembled, the rod should be pushed all the way in (fully retracted) prior to the reinstallation of any holding valve or valves.
- Install the counterbalance valves in the rod port block. Torque to 37 ft. lbs. (50 Nm).
- Install the new o-rings and plugs into the cylinder port block and torque plugs as shown in Figure 5-18.

Jib Lift Cylinder

DISASSEMBLY

NOTICE

DISASSEMBLY OF THE CYLINDER SHOULD BE PERFORMED ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

1. Connect a suitable auxiliary hydraulic power source to the cylinder port block fitting.

WARNING

DO NOT FULLY EXTEND CYLINDER TO THE END OF STROKE. RETRACT CYLINDER SLIGHTLY TO AVOID TRAPPING PRESSURE.

2. Operate the hydraulic power source and extend the cylinder. Shut down and disconnect the power source. Adequately support the cylinder rod, if applicable.
3. Remove the counterbalance valves and plugs from the cylinder port block. Discard o-rings.
4. Place the cylinder barrel into a suitable holding fixture.

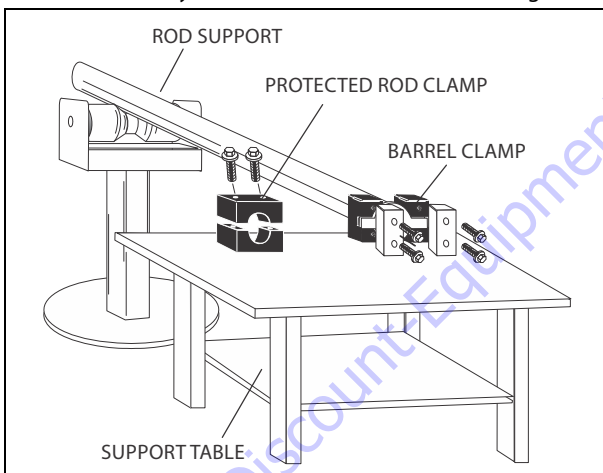


Figure 5-25. Cylinder Barrel Support

5. Mark cylinder head and barrel with a center punch for easy realignment. Using a spanner wrench, unscrew the cylinder head from the barrel. (It is easier to do this with rod pulled out 5cm from the cylinder head).

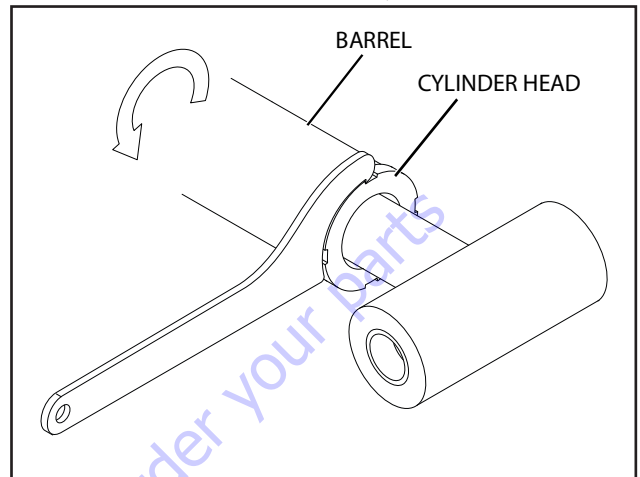


Figure 5-26. Cylinder Head Removal

6. Attach a suitable pulling device to the cylinder rod port block end or cylinder rod end, as applicable.

NOTICE

EXTREME CARE SHOULD BE TAKEN WHEN REMOVING THE CYLINDER ROD, HEAD AND PISTON. AVOID PULLING THE ROD OFF-CENTER, WHICH COULD CAUSE DAMAGE TO THE PISTON AND CYLINDER BARREL SURFACES.

7. With the barrel clamped securely, apply pressure to the rod pulling device and carefully withdraw the complete rod assembly from the cylinder barrel.

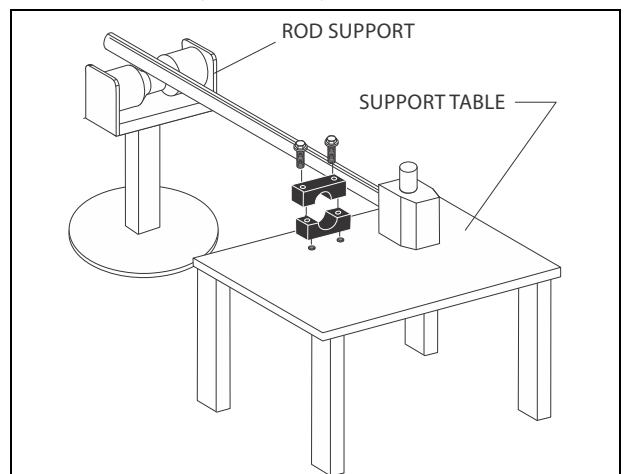
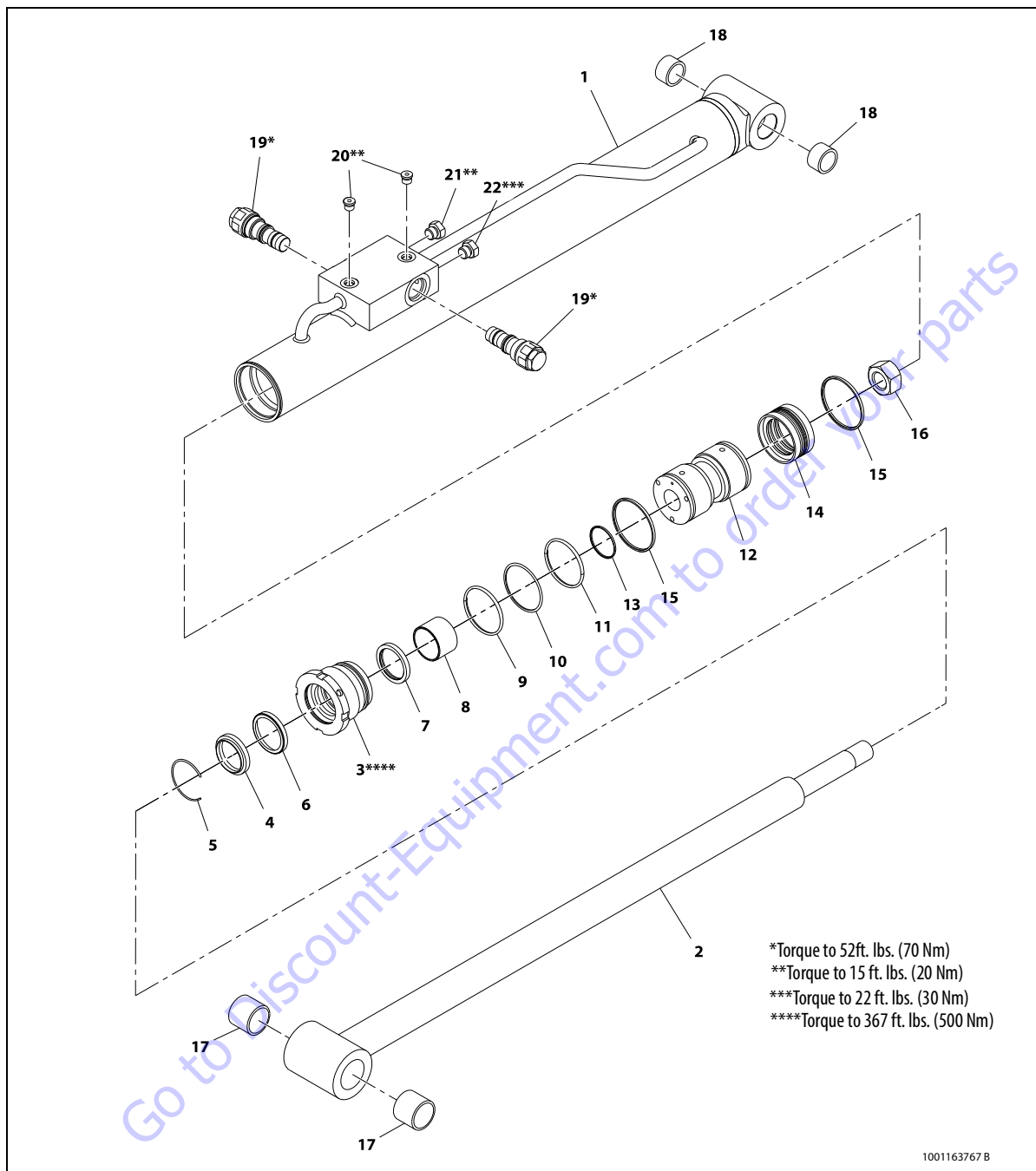


Figure 5-27. Cylinder Barrel Support



- | | | | | |
|-------------------|-----------------|-----------------|--------------------------|----------|
| 1. Barrel | 6. Rod Seal | 11. O-Ring | 16. Nut | 20. Plug |
| 2. Rod | 7. Backup Ring | 12. Piston | 17. Bushing | 21. Plug |
| 3. Head | 8. Bearing | 13. O-Ring | 18. Bushing | 22. Plug |
| 4. Wiper Seal | 9. O-Ring | 14. Piston Seal | 19. Counterbalance Valve | |
| 5. Retaining Ring | 10. Backup Ring | 15. Piston Ring | | |

Figure 5-28. Jib Lift Cylinder

8. Using suitable protection, clamp the cylinder rod in a vise or similar holding fixture as close to the piston as possible.
9. Remove locknut from the piston rod.
10. Screw the piston counterclockwise, by hand, and remove the piston from cylinder rod.
11. Remove and discard the piston ring and piston seals.
12. Remove the rod from the holding fixture. Remove the cylinder head. Discard the o-rings, backup rings, rod seal, retainer ring, bearing and wiper seal.

CLEANING AND INSPECTION

1. Clean all parts thoroughly in an approved cleaning solvent.
2. Inspect the cylinder rod for scoring, tapering, ovality or other damage. If necessary, dress rod with Scotch Brite or equivalent. Replace rod if necessary.
3. Inspect threaded portion of rod for excessive damage. Dress threads as necessary.
4. Inspect inner surface of cylinder barrel tube for scoring or other damage. Check inside diameter for tapering or ovality. Replace if necessary.
5. Inspect threaded portion of barrel for damage. Dress threads as necessary.
6. Inspect piston surface for damage and scoring and for distortion. Dress piston surface or replace piston as necessary.
7. Inspect seal and o-ring grooves in piston for burrs and sharp edges. Dress applicable surfaces as necessary.
8. Inspect cylinder head inside diameter for scoring, tapering, ovality or other damage. Replace if necessary.
9. Inspect threaded portion of head for damage. Dress threads as necessary.
10. Inspect seal and o-ring grooves in head for burrs and sharp edges. Dress applicable surfaces as necessary.
11. Inspect cylinder head outside diameter for scoring, tapering or ovality other damage. Replace if necessary.
12. If applicable, inspect rod and barrel bearings for signs of correct excessive wear or damage. Replace if necessary.
 - a. Thoroughly clean hole (steel bushing) of burrs, dirt etc. to facilitate bearing installation.
 - b. Inspect steel bushing for wear or other damage. If steel bushing is worn or damaged, rod/barrel must be replaced.
 - c. Lubricate inner side of steel bushing prior to bearing installation.
 - d. Using an arbor of the correct size, carefully press the bearing into steel bushing.

NOTE: Install pin into the composite bearing dry. Lubrication is not required with nickel plated pins and bearings.

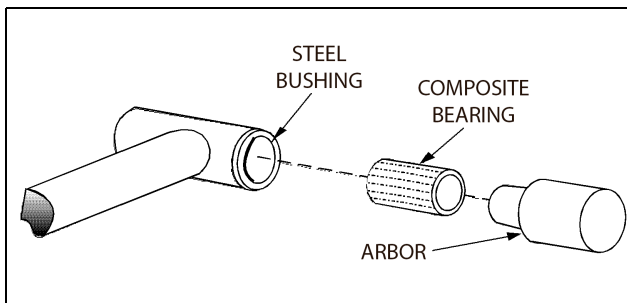


Figure 5-29. Composite Bearing Installation

- 13. Inspect the oil ports for blockage or the presence of dirt or other foreign material. Repair as necessary.
- 14. Inspect piston rings for cracks or other damage. Replace if necessary.

ASSEMBLY

NOTE: Prior to cylinder assembly, ensure that the proper cylinder seal kit is used. See the respective JLG Parts Manual.

NOTE: Apply a light film of hydraulic oil to all components prior to assembly.

- 1. A special tool is used to install a new rod seal into the applicable cylinder head groove.

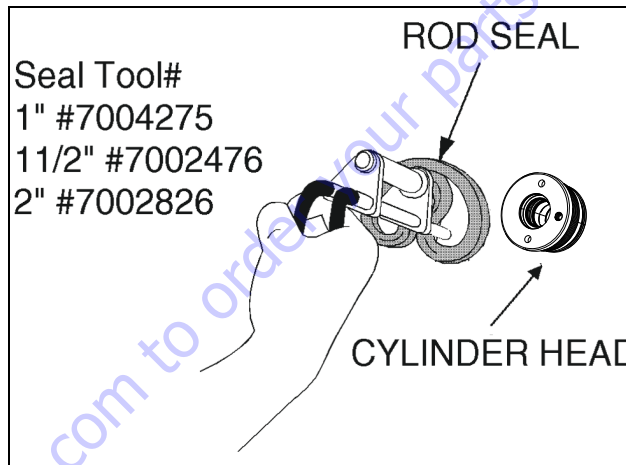


Figure 5-30. Rod Seal Installation

NOTICE

WHEN INSTALLING NEW SEALS, ENSURE SEALS ARE INSTALLED PROPERLY. IMPROPER SEAL INSTALLATION COULD RESULT IN CYLINDER LEAKAGE AND IMPROPER CYLINDER OPERATION.

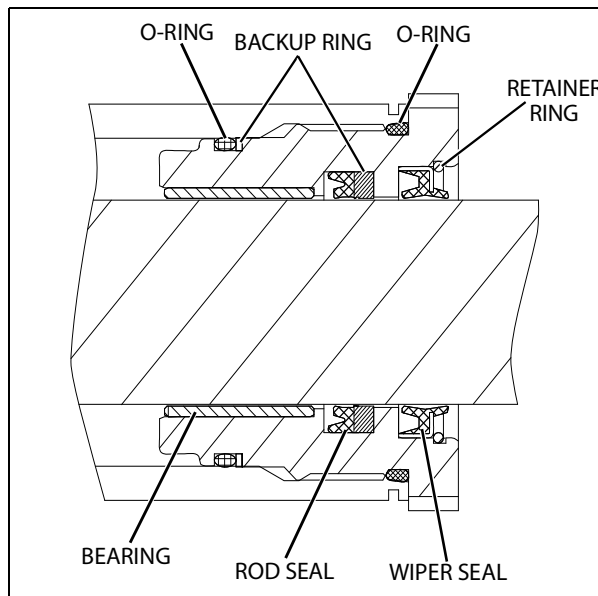


Figure 5-31. Cylinder Head Seal Installation

2. Use a soft mallet to tap a new wiper seal into the applicable cylinder head groove. Install a new retaining ring, backup ring and dry bearing into the applicable inside diameter of the cylinder head groove.

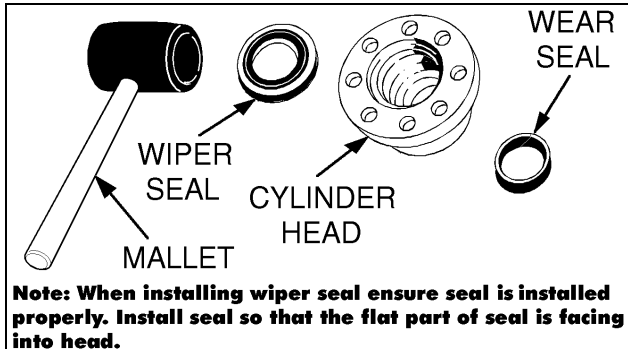


Figure 5-32. Wiper Seal Installation

3. Place new o-rings and backup ring in the applicable outside diameter groove of the cylinder head.

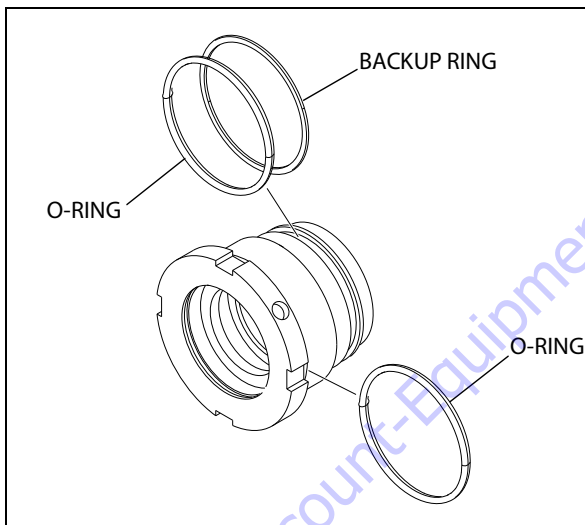


Figure 5-33. Installation of Head Seal Kit

4. Carefully install the cylinder head on the rod, ensuring that the wiper and rod seals are not damaged or dislodged. Push the head along the rod to the rod end, as applicable.
5. Using suitable protection, clamp the cylinder rod in a vise or similar holding fixture as close to piston as possible.
6. Place a new o-ring in the applicable inner piston diameter
7. Carefully thread the piston on the cylinder rod and hand tight.
8. Install locknut onto the piston rod.
9. Remove the cylinder rod from the holding fixture.

10. Place new piston rings and piston seal in the outer piston diameter grooves. (A tube, with I.D. slightly larger than the O.D. of the piston is recommended to install the solid seal).

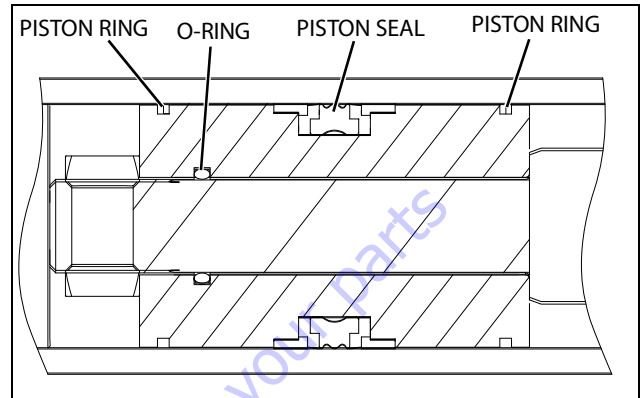


Figure 5-34. Installation of Piston Seal Kit

11. Position the cylinder barrel in a suitable holding fixture.

NOTICE

EXTREME CARE SHOULD BE TAKEN WHEN INSTALLING THE CYLINDER ROD, HEAD AND PISTON. AVOID PULLING THE ROD OFF-CENTER, WHICH COULD CAUSE DAMAGE TO THE PISTON AND CYLINDER BARREL SURFACES.

12. With barrel clamped secured and adequately supporting the rod, insert the piston end into the barrel cylinder. Ensure that the piston loading piston rings and piston seal are not damaged or dislodged.
13. Continue pushing the rod into the barrel until the cylinder head can be inserted into the barrel cylinder.
14. Screw the cylinder head into the barrel using a spanner wrench and torque cylinder head to 369 ft. lbs. (500 Nm).
15. After the cylinder has been reassembled, the rod should be pushed all the way in (fully retracted) prior to the reinstallation of any holding valve or valves.
16. Install the counterbalance valves in the rod port block. Torque to 52 ft. lbs. (70 Nm).
17. Install the new o-rings and plugs into the cylinder port block and torque plug as shown in Figure 5-28.

Main Lift Cylinder

DISASSEMBLY

NOTICE

DISASSEMBLY OF THE CYLINDER SHOULD BE PERFORMED ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

1. Connect a suitable auxiliary hydraulic power source to the cylinder port block fitting.

WARNING

DO NOT FULLY EXTEND CYLINDER TO THE END OF STROKE. RETRACT CYLINDER SLIGHTLY TO AVOID TRAPPING PRESSURE.

2. Operate the hydraulic power source and extend the cylinder. Shut down and disconnect the power source. Adequately support the cylinder rod, if applicable.
3. Remove the check valve, cartridge valves, pressure compensator valve, orifice plug and plugs from the cylinder port block. Discard o-rings.
4. Place the cylinder barrel into a suitable holding fixture.

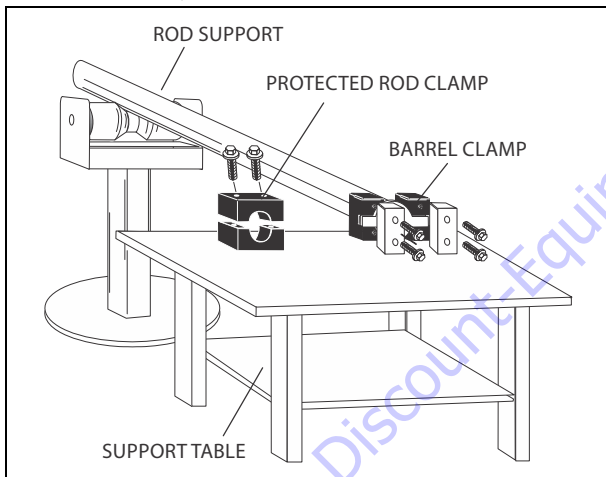


Figure 5-35. Cylinder Barrel Support

5. Mark cylinder head and barrel with a center punch for easy realignment. Using a hook wrench, unscrew the cylinder head from the barrel.

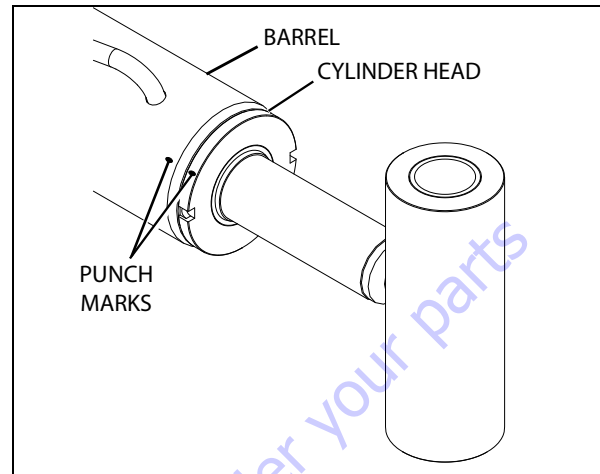


Figure 5-36. Cylinder Head Removal

6. Attach a suitable pulling device to the cylinder rod port block end or cylinder rod end, as applicable.

NOTICE

EXTREME CARE SHOULD BE TAKEN WHEN REMOVING THE CYLINDER ROD, HEAD AND PISTON. AVOID PULLING THE ROD OFF-CENTER, WHICH COULD CAUSE DAMAGE TO THE PISTON AND CYLINDER BARREL SURFACES.

7. With the barrel clamped securely, apply pressure to the rod pulling device and carefully withdraw the complete rod assembly from the cylinder barrel.

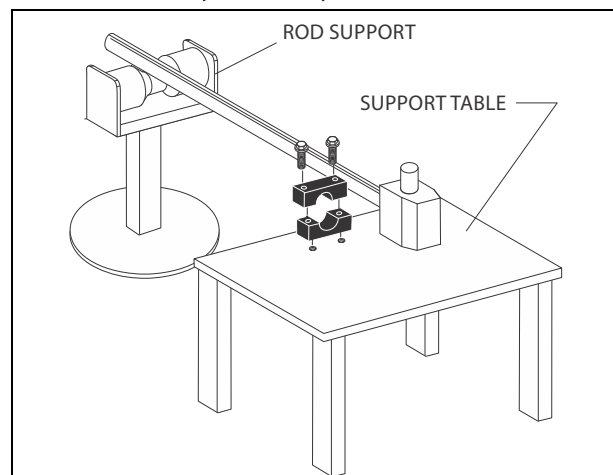
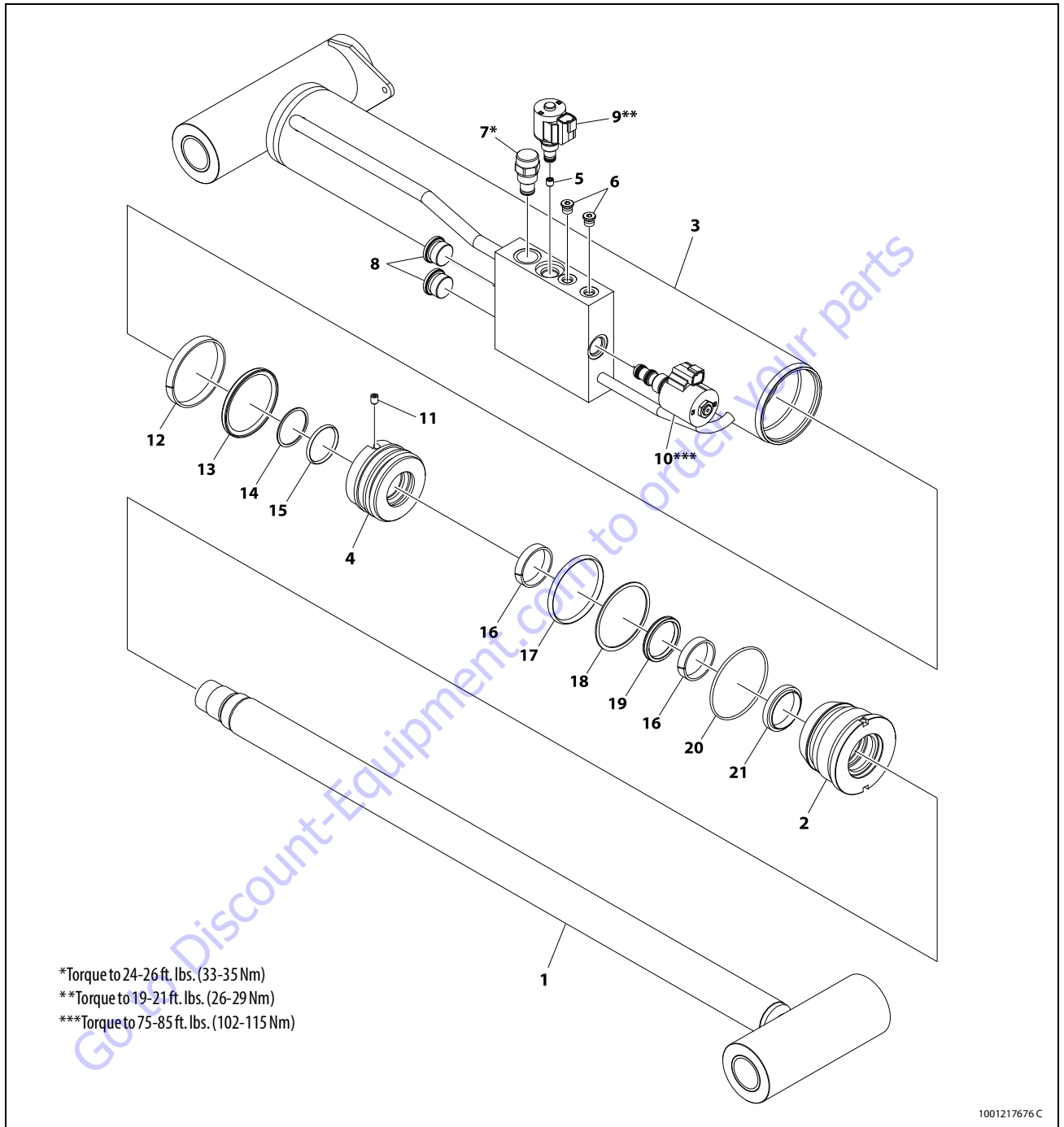


Figure 5-37. Cylinder Barrel Support



- | | | | | |
|-----------------|--------------------|---|-----------------|-----------------|
| 1. Rod | 6. Plug | 10. Pressure Compensated Flow Control Valve | 14. Backup Ring | 18. Backup Ring |
| 2. Head | 7. Check Valve | | 15. O-ring | 19. Rod Seal |
| 3. Barrel | 8. Plug | 11. Radial Screw | 16. Wear Ring | 20. O-ring |
| 4. Piston | 9. Cartridge Valve | 12. Wear Ring | 17. O-ring | 21. Wiper Seal |
| 5. Orifice Plug | | 13. Piston Seal | | |

Figure 5-38. Main Lift Cylinder

8. Using suitable protection, clamp the cylinder rod in a vise or similar holding fixture as close to the piston as possible.
9. Loosen and remove the radial screw which attaches the piston to the rod.
10. Screw the piston counterclockwise, by hand, and remove the piston from cylinder rod.
11. Remove and discard the piston o-ring, wear rings, backup rings and piston seal.
12. Remove the rod from the holding fixture. Remove the cylinder head. Discard the o-rings, backup rings, rod seal, wear ring, and wiper seal.

CLEANING AND INSPECTION

1. Clean all parts thoroughly in an approved cleaning solvent.
2. Inspect the cylinder rod for scoring, tapering, ovality or other damage. If necessary, dress rod with Scotch Brite or equivalent. Replace rod if necessary.
3. Inspect threaded portion of rod for excessive damage. Dress threads as necessary.
4. Inspect inner surface of cylinder barrel tube for scoring or other damage. Check inside diameter for tapering or ovality. Replace if necessary.
5. Inspect threaded portion of barrel for damage. Dress threads as necessary.
6. Inspect piston surface for damage and scoring and for distortion. Dress piston surface or replace piston as necessary.
7. Inspect threaded portion of piston for damage. Dress threads as necessary.
8. Inspect seal and o-ring grooves in piston for burrs and sharp edges. Dress applicable surfaces as necessary.
9. Inspect cylinder head inside diameter for scoring, tapering, ovality or other damage. Replace if necessary.
10. Inspect threaded portion of head for damage. Dress threads as necessary.
11. Inspect seal and o-ring grooves in head for burrs and sharp edges. Dress applicable surfaces as necessary.
12. Inspect cylinder head outside diameter for scoring, tapering or ovality other damage. Replace if necessary.
13. If applicable, inspect rod and barrel bearings for signs of correct excessive wear or damage. Replace if necessary.
 - a. Thoroughly clean hole (steel bushing) of burrs, dirt etc. to facilitate bearing installation.
 - b. Inspect steel bushing for wear or other damage. If steel bushing is worn or damaged, rod/barrel must be replaced.
 - c. Lubricate inner side of steel bushing prior to bearing installation.
 - d. Using an arbor of the correct size, carefully press the bearing into steel bushing.

NOTE: Install pin into the composite bearing dry. Lubrication is not required with nickel plated pins and bearings.

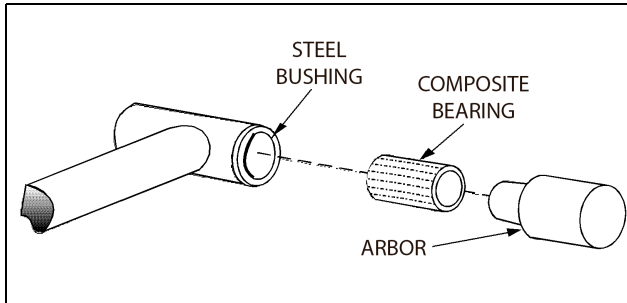


Figure 5-39. Composite Bearing Installation

14. Inspect port block fittings and valves. Replace if necessary.
15. Inspect the oil ports for blockage or the presence of dirt or other foreign material. Repair as necessary.
16. Inspect piston rings for cracks or other damage. Replace if necessary.

ASSEMBLY

NOTE: Prior to cylinder assembly, ensure that the proper cylinder seal kit is used. See the respective JLG Parts Manual.

NOTE: Apply a light film of hydraulic oil to all components prior to assembly.

1. A special tool is used to install a new rod seal into the applicable cylinder head groove.

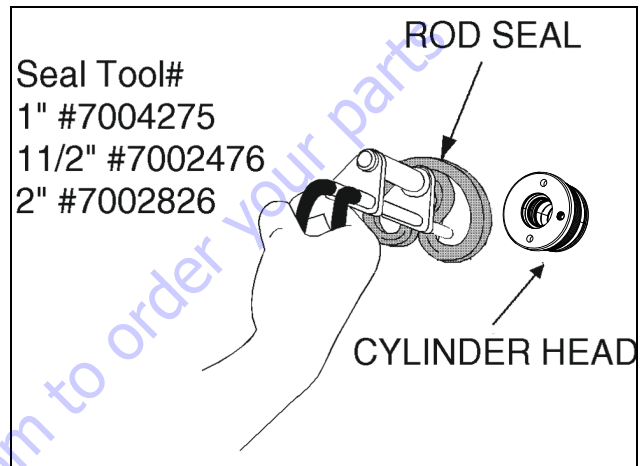


Figure 5-40. Rod Seal Installation

NOTICE

WHEN INSTALLING NEW SEALS, ENSURE SEALS ARE INSTALLED PROPERLY. IMPROPER SEAL INSTALLATION COULD RESULT IN CYLINDER LEAKAGE AND IMPROPER CYLINDER OPERATION.

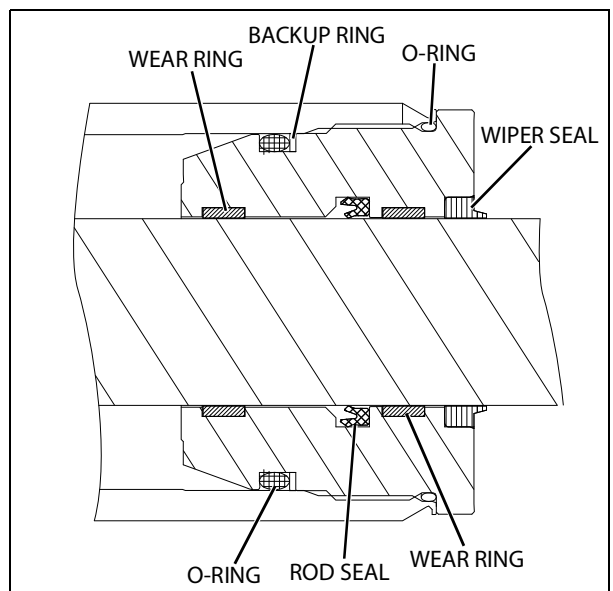


Figure 5-41. Cylinder Head Seal Installation

2. Use a soft mallet to tap a new wiper seal into the applicable cylinder head groove. Install a new wear rings into the applicable inside diameter of the cylinder head groove.

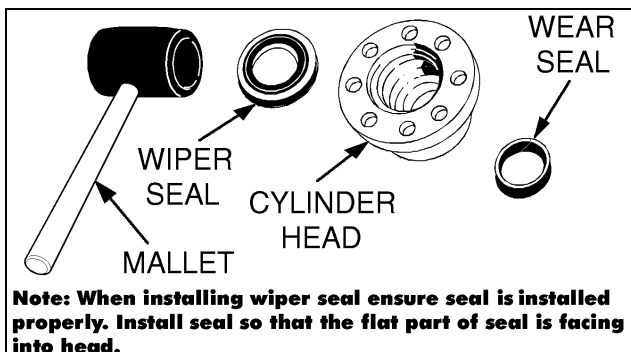


Figure 5-42. Wiper Seal Installation

3. Place new o-rings and backup ring in the applicable outside diameter groove of the cylinder head.

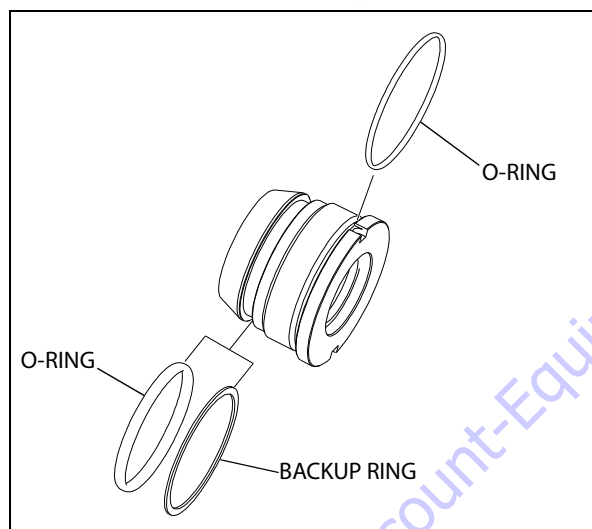


Figure 5-43. Installation of Head Seal Kit

4. Carefully install the cylinder head on the rod, ensuring that the wiper seal, wear rings and rod seals are not damaged or dislodged. Push the head along the rod to the rod end, as applicable.
5. Using suitable protection, clamp the cylinder rod in a vise or similar holding fixture as close to piston as possible.
6. Place a new o-ring and backup rings in the inner piston diameter groove.
7. Carefully thread the piston on the cylinder rod, hand tight, ensuring that the o-ring and backup rings are not damaged or dislodged.
8. Apply locking glue on the threads of radial screw and install on the piston.

9. Put needle shock on piston to prevent the radial screw from loosening.
10. Remove the cylinder rod from the holding fixture.
11. Place new wear rings and piston seal in the outer piston diameter grooves. (A tube, with I.D. slightly larger than the O.D. of the piston is recommended to install the solid seal).

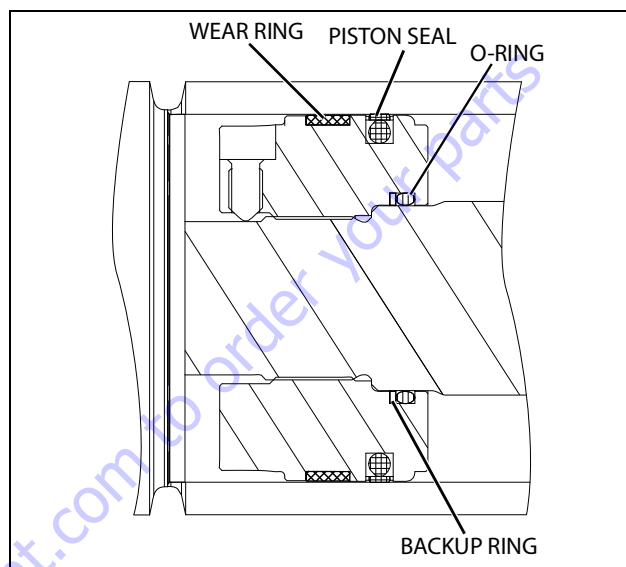


Figure 5-44. Installation of Piston Seal Kit

12. Position the cylinder barrel in a suitable holding fixture.

NOTICE

EXTREME CARE SHOULD BE TAKEN WHEN INSTALLING THE CYLINDER ROD, HEAD AND PISTON. AVOID PULLING THE ROD OFF-CENTER, WHICH COULD CAUSE DAMAGE TO THE PISTON AND CYLINDER BARREL SURFACES.

13. With barrel clamped secured and adequately supporting the rod, insert the piston end into the barrel cylinder. Ensure that the piston loading piston rings and piston seal are not damaged or dislodged.
14. Continue pushing the rod into the barrel until the cylinder head can be inserted into the barrel cylinder.
15. Screw the cylinder head into the barrel using a hook wrench and torque the cylinder head.
16. After the cylinder has been reassembled, the rod should be pushed all the way in (fully retracted) prior to the reinstallation of any holding valve or valves.
17. Install the new o-rings, plugs, check valve, cartridge valves, pressure compensator valve and orifice plug in the cylinder port block. Torque as shown Figure 5-64. and Figure 5-38. as per the applicable cylinder.

Tower Boom Lift Cylinder

DISASSEMBLY

NOTICE

DISASSEMBLY OF THE CYLINDER SHOULD BE PERFORMED ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

1. Connect a suitable auxiliary hydraulic power source to the cylinder port block fitting.

WARNING

DO NOT FULLY EXTEND CYLINDER TO THE END OF STROKE. RETRACT CYLINDER SLIGHTLY TO AVOID TRAPPING PRESSURE.

2. Operate the hydraulic power source and extend the cylinder. Shut down and disconnect the power source. Adequately support the cylinder rod, if applicable.
3. Remove the cartridge valves, orifice plugs check valve, and plugs from the cylinder port block. Discard o-rings.
4. Place the cylinder barrel into a suitable holding fixture.

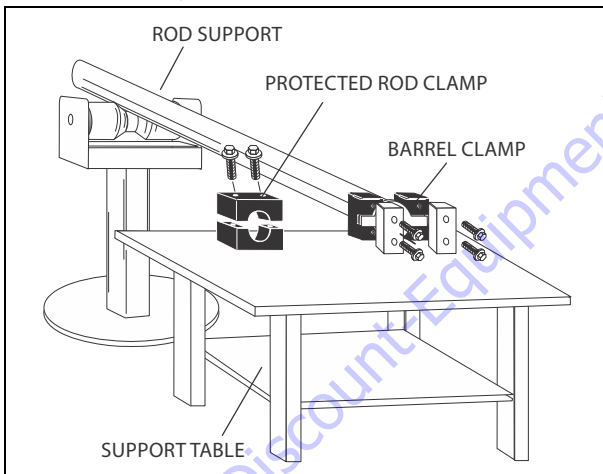


Figure 5-45. Cylinder Barrel Support

5. Mark cylinder head and barrel with a center punch for easy realignment. Using a hook wrench, unscrew the cylinder head from the barrel.

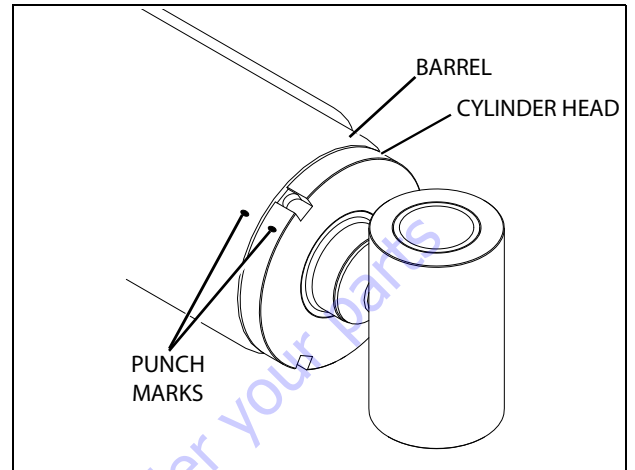


Figure 5-46. Cylinder Head Removal

6. Attach a suitable pulling device to the cylinder rod port block end or cylinder rod end, as applicable.

NOTICE

EXTREME CARE SHOULD BE TAKEN WHEN REMOVING THE CYLINDER ROD, HEAD AND PISTON. AVOID PULLING THE ROD OFF-CENTER, WHICH COULD CAUSE DAMAGE TO THE PISTON AND CYLINDER BARREL SURFACES.

7. With the barrel clamped securely, apply pressure to the rod pulling device and carefully withdraw the complete rod assembly from the cylinder barrel.

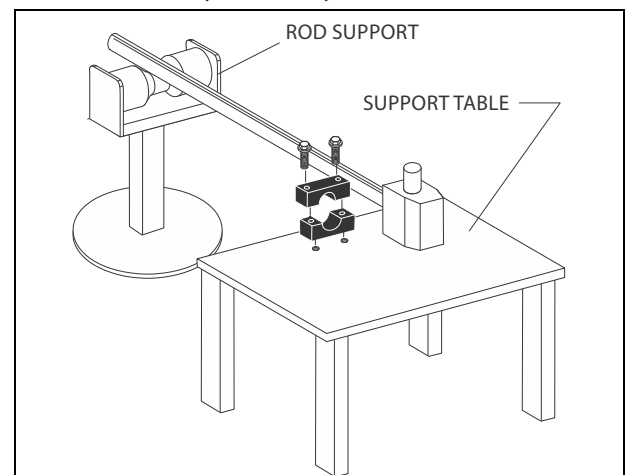
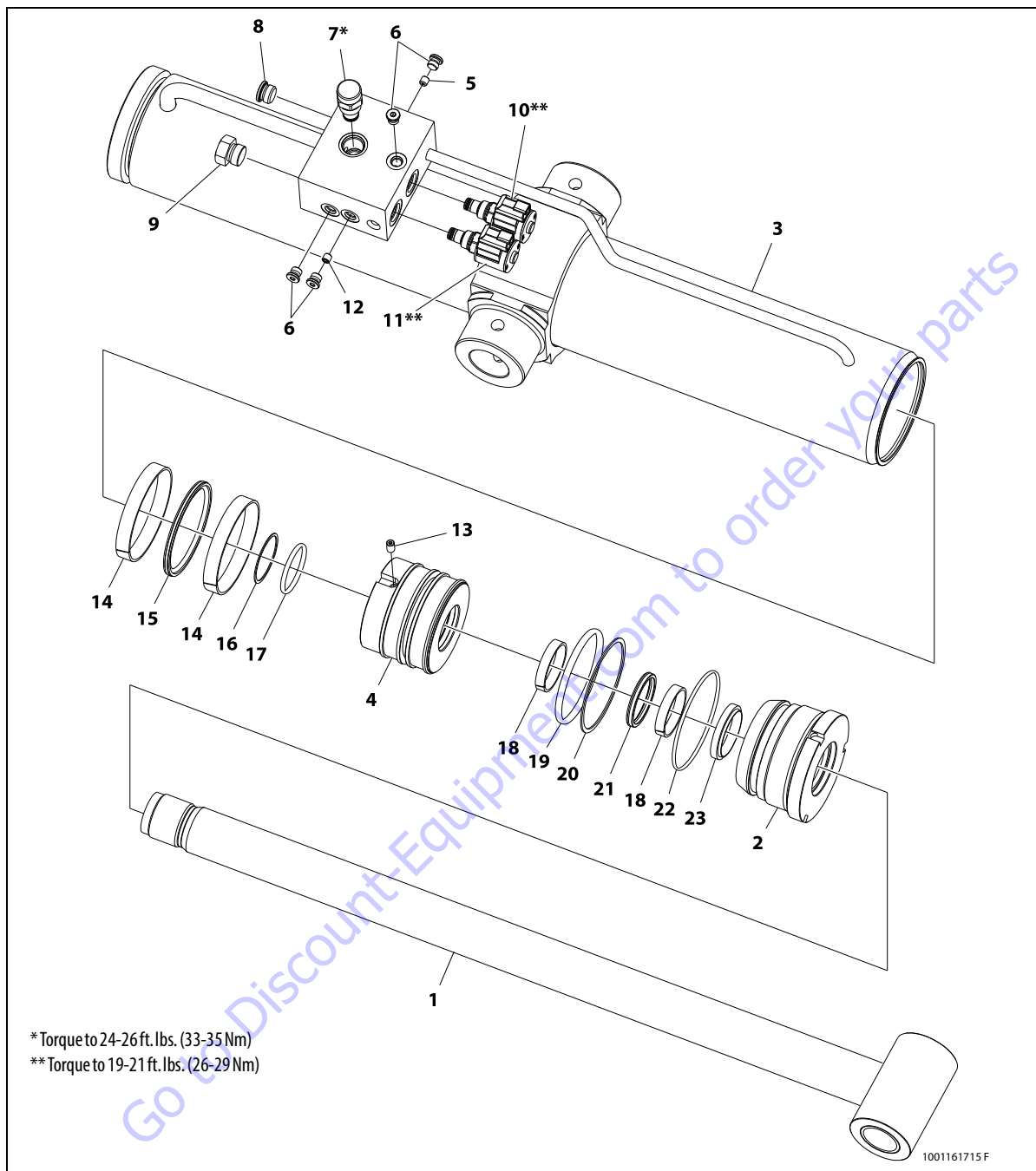


Figure 5-47. Cylinder Barrel Support



- | | | | | |
|-----------------|---------------------|---------------------|-----------------|-----------------|
| 1. Rod | 6. Plug | 11. Cartridge Valve | 16. Backup Ring | 20. Backup Ring |
| 2. Head | 7. Check Valve | 12. Orifice Plug | 17. O-ring | 21. Rod Seal |
| 3. Barrel | 8. Plug | 13. Radial Screw | 18. Wear Ring | 22. O-ring |
| 4. Piston | 9. Plug | 14. Wear Ring | 19. O-ring | 23. Wiper Seal |
| 5. Orifice Plug | 10. Cartridge Valve | 15. Piston Seal | | |

Figure 5-48. Tower Boom Lift Cylinder

8. Using suitable protection, clamp the cylinder rod in a vise or similar holding fixture as close to the piston as possible.
9. Loosen and remove the radial screw which attaches the piston to the rod.
10. Screw the piston counterclockwise, by hand, and remove the piston from cylinder rod.
11. Remove and discard the piston o-ring, wear rings, backup rings and piston seal.
12. Remove the rod from the holding fixture. Remove the cylinder head. Discard the o-rings, backup rings, rod seal, wear ring, and wiper seal.

CLEANING AND INSPECTION

1. Clean all parts thoroughly in an approved cleaning solvent.
2. Inspect the cylinder rod for scoring, tapering, ovality or other damage. If necessary, dress rod with Scotch Brite or equivalent. Replace rod if necessary.
3. Inspect threaded portion of rod for excessive damage. Dress threads as necessary.
4. Inspect inner surface of cylinder barrel tube for scoring or other damage. Check inside diameter for tapering or ovality. Replace if necessary.
5. Inspect threaded portion of barrel for damage. Dress threads as necessary.
6. Inspect piston surface for damage and scoring and for distortion. Dress piston surface or replace piston as necessary.
7. Inspect threaded portion of piston for damage. Dress threads as necessary.
8. Inspect seal and o-ring grooves in piston for burrs and sharp edges. Dress applicable surfaces as necessary.
9. Inspect cylinder head inside diameter for scoring, tapering, ovality or other damage. Replace if necessary.
10. Inspect threaded portion of head for damage. Dress threads as necessary.
11. Inspect seal and o-ring grooves in head for burrs and sharp edges. Dress applicable surfaces as necessary.
12. Inspect cylinder head outside diameter for scoring, tapering or ovality other damage. Replace if necessary.
13. If applicable, inspect rod and barrel bearings for signs of correct excessive wear or damage. Replace if necessary.
 - a. Thoroughly clean hole (steel bushing) of burrs, dirt etc. to facilitate bearing installation.
 - b. Inspect steel bushing for wear or other damage. If steel bushing is worn or damaged, rod/barrel must be replaced.
 - c. Lubricate inner side of steel bushing prior to bearing installation.
 - d. Using an arbor of the correct size, carefully press the bearing into steel bushing.

SECTION 5 - BASIC HYDRAULICS INFORMATION & SCHEMATICS

NOTE: Install pin into the composite bearing dry. Lubrication is not required with nickel plated pins and bearings.

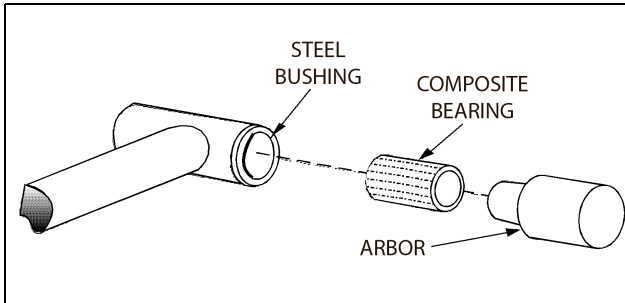


Figure 5-49. Composite Bearing Installation

14. Inspect port block fittings and valves. Replace if necessary.
15. Inspect the oil ports for blockage or the presence of dirt or other foreign material. Repair as necessary.
16. Inspect piston rings for cracks or other damage. Replace if necessary.

ASSEMBLY

NOTE: Prior to cylinder assembly, ensure that the proper cylinder seal kit is used. See the respective JLG Parts Manual.

NOTE: Apply a light film of hydraulic oil to all components prior to assembly.

1. A special tool is used to install a new rod seal into the applicable cylinder head groove.

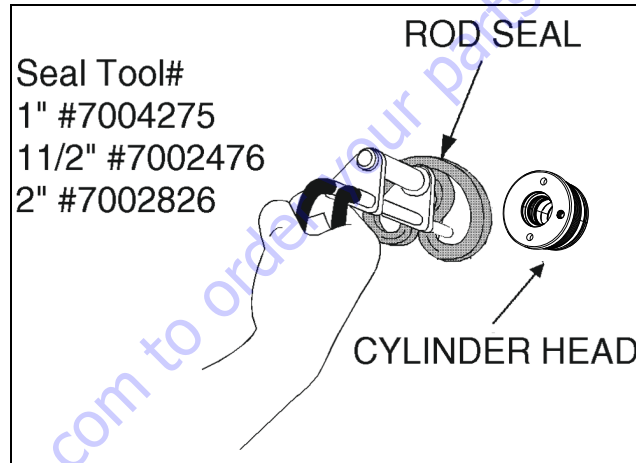


Figure 5-50. Rod Seal Installation

NOTICE

WHEN INSTALLING NEW SEALS, ENSURE SEALS ARE INSTALLED PROPERLY. IMPROPER SEAL INSTALLATION COULD RESULT IN CYLINDER LEAKAGE AND IMPROPER CYLINDER OPERATION.

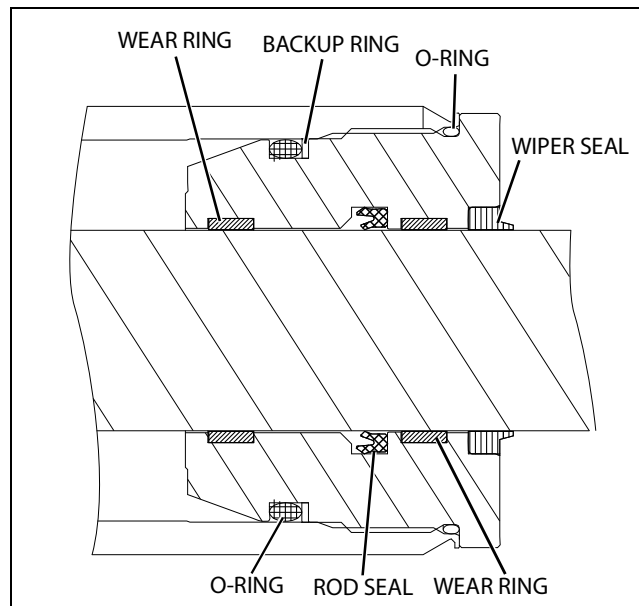


Figure 5-51. Cylinder Head Seal Installation

2. Use a soft mallet to tap a new wiper seal into the applicable cylinder head groove. Install new wear rings into the applicable inside diameter of the cylinder head groove.

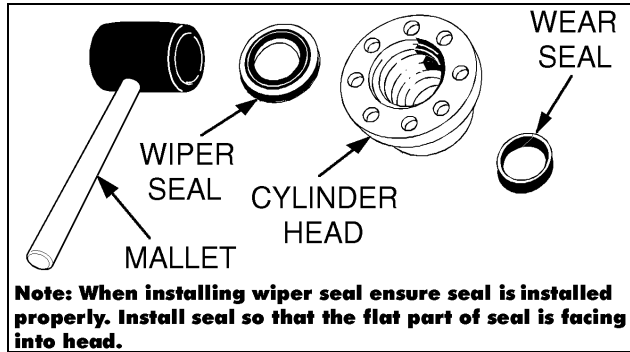


Figure 5-52. Wiper Seal Installation

3. Place new o-rings and backup ring in the applicable outside diameter groove of the cylinder head.

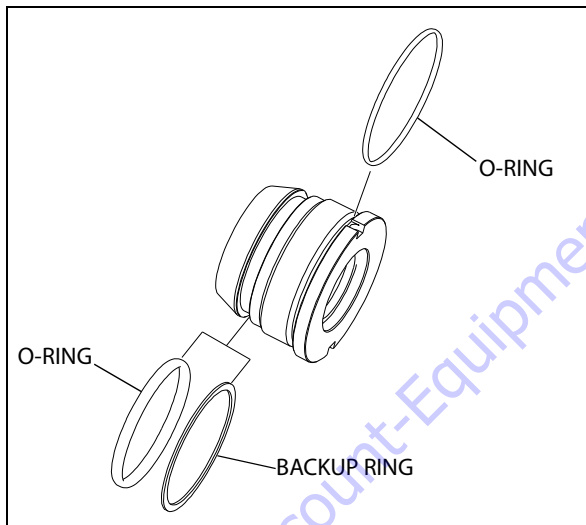


Figure 5-53. Installation of Head Seal Kit

4. Carefully install the cylinder head on the rod, ensuring that the wiper seal, wear rings and rod seals are not damaged or dislodged. Push the head along the rod to the rod end, as applicable.
5. Using suitable protection, clamp the cylinder rod in a vise or similar holding fixture as close to piston as possible.
6. Place a new o-ring and backup rings in the inner piston diameter groove.
7. Carefully thread the piston on the cylinder rod, hand tight, ensuring that the o-ring and backup rings are not damaged or dislodged.
8. Apply locking glue on the threads of radial screw and install on the piston.

9. Put needle shock on piston to prevent the radial screw from loosening.
10. Remove the cylinder rod from the holding fixture.
11. Place new wear rings and piston seal in the outer piston diameter grooves. (A tube, with I.D. slightly larger than the O.D. of the piston is recommended to install the solid seal).

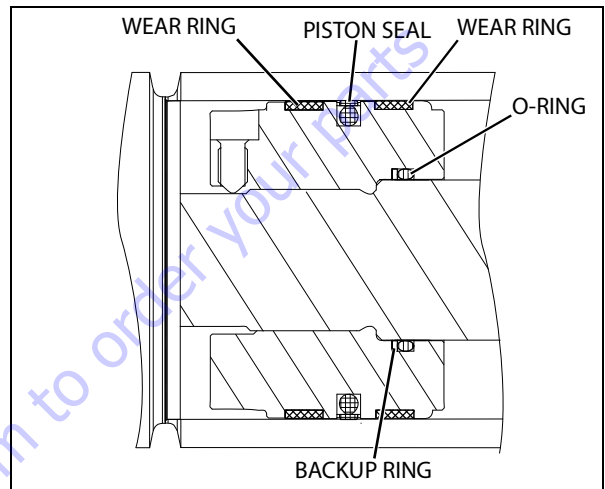


Figure 5-54. Installation of Piston Seal Kit

12. Position the cylinder barrel in a suitable holding fixture.

NOTICE

EXTREME CARE SHOULD BE TAKEN WHEN INSTALLING THE CYLINDER ROD, HEAD AND PISTON. AVOID PULLING THE ROD OFF-CENTER, WHICH COULD CAUSE DAMAGE TO THE PISTON AND CYLINDER BARREL SURFACES.

13. With barrel clamped secured and adequately supporting the rod, insert the piston end into the barrel cylinder. Ensure that the piston loading piston rings and piston seal are not damaged or dislodged.
14. Continue pushing the rod into the barrel until the cylinder head can be inserted into the barrel cylinder.
15. Screw the cylinder head into the barrel using a hook wrench and torque cylinder head.
16. After the cylinder has been reassembled, the rod should be pushed all the way in (fully retracted) prior to the reinstallation of any holding valve or valves.
17. Install the check valve, orifice plugs and cartridge valve. Torque as shown in Figure 5-48.
18. Install the new o-rings and plugs into the cylinder port block.

Master Cylinder

DISASSEMBLY

NOTICE

DISASSEMBLY OF THE CYLINDER SHOULD BE PERFORMED ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

1. Connect a suitable auxiliary hydraulic power source to the cylinder port block fitting.

WARNING

DO NOT FULLY EXTEND CYLINDER TO THE END OF STROKE. RETRACT CYLINDER SLIGHTLY TO AVOID TRAPPING PRESSURE.

2. Operate the hydraulic power source and extend the cylinder. Shut down and disconnect the power source. Adequately support the cylinder rod, if applicable.
3. Remove the plugs from the cylinder ports.
4. Place the cylinder barrel into a suitable holding fixture.

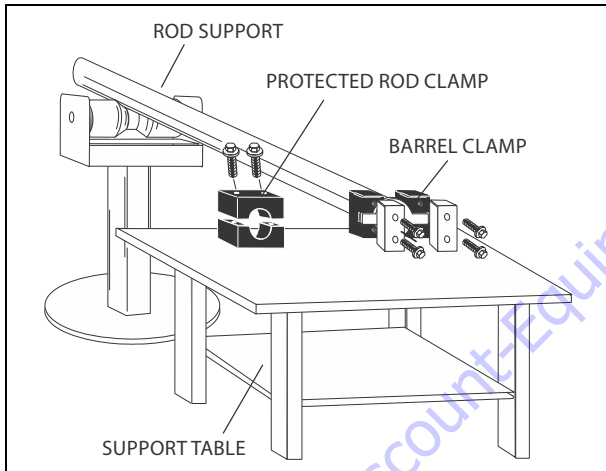


Figure 5-55. Cylinder Barrel Support

5. Mark cylinder head and barrel with a center punch for easy realignment. Using a pin-face spanner wrench, unscrew the cylinder head from the barrel.

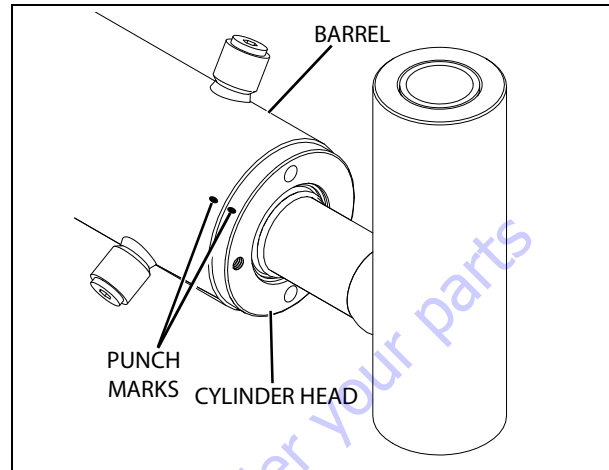


Figure 5-56. Cylinder Head Removal

6. Attach a suitable pulling device to the cylinder rod port block end or cylinder rod end, as applicable.

NOTICE

EXTREME CARE SHOULD BE TAKEN WHEN REMOVING THE CYLINDER ROD, HEAD AND PISTON. AVOID PULLING THE ROD OFF-CENTER, WHICH COULD CAUSE DAMAGE TO THE PISTON AND CYLINDER BARREL SURFACES.

7. With the barrel clamped securely, apply pressure to the rod pulling device and carefully withdraw the complete rod assembly from the cylinder barrel.

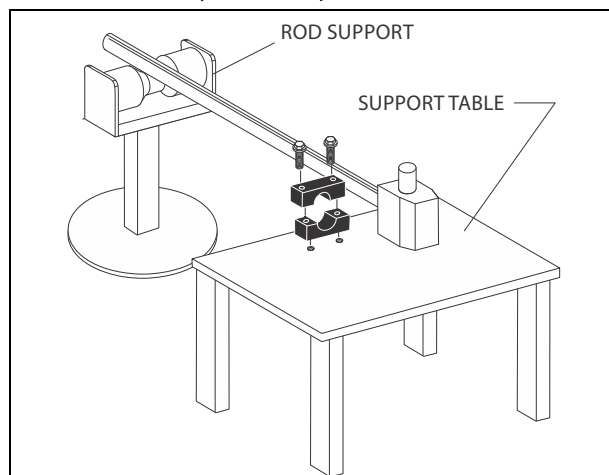
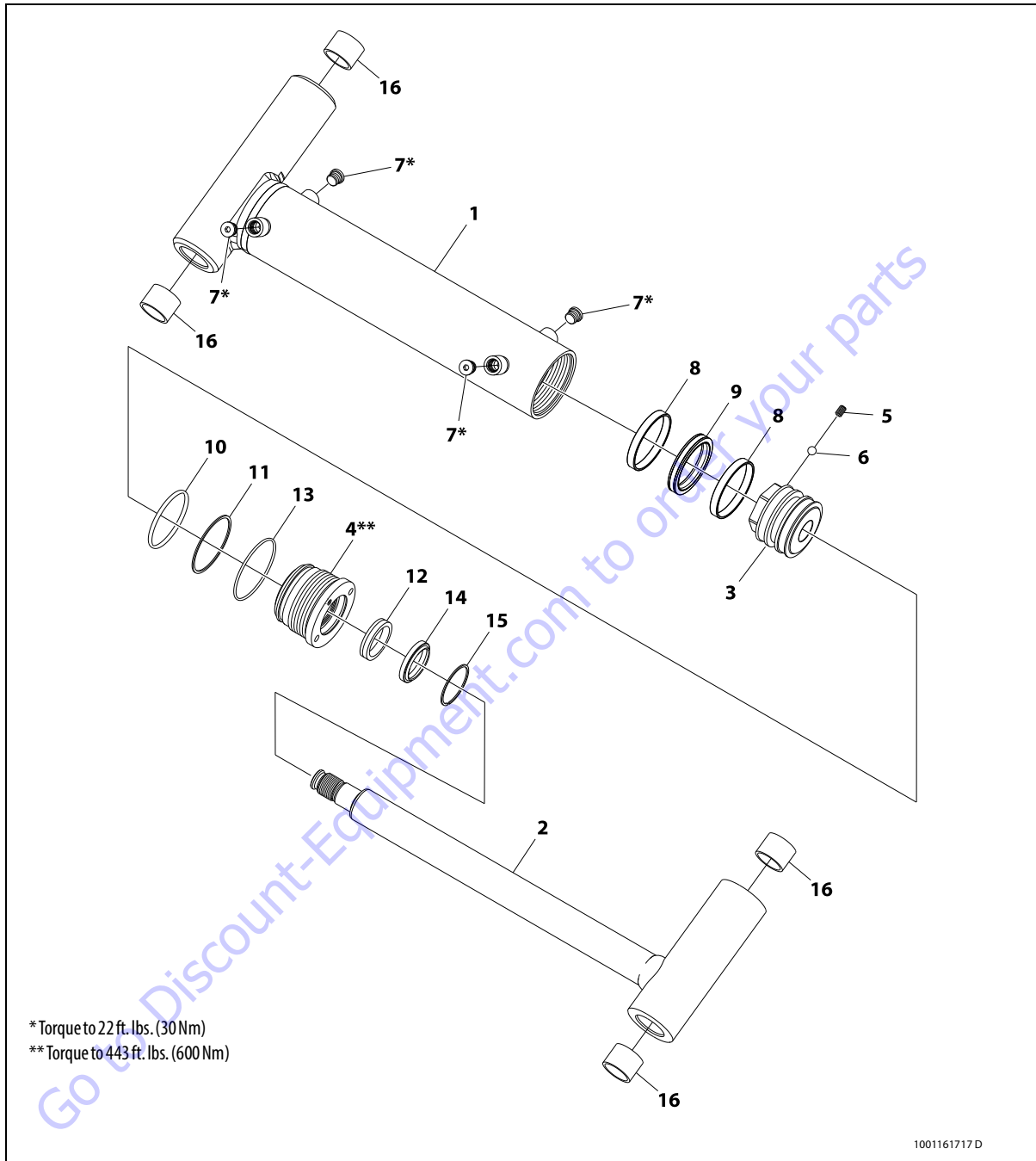


Figure 5-57. Cylinder Barrel Support



- | | | | |
|-----------|----------------|-----------------|-------------------|
| 1. Barrel | 5. Setscrew | 9. Seal | 13. O-ring |
| 2. Rod | 6. Ball | 10. O-ring | 14. Wiper Seal |
| 3. Piston | 7. Plug | 11. Backup Ring | 15. Retainer Ring |
| 4. Head | 8. Piston Ring | 12. Rod Seal | 16. Bushing |

Figure 5-58. Master Cylinder

8. Using suitable protection, clamp the cylinder rod in a vise or similar holding fixture as close to the piston as possible.
9. Loosen and remove the setscrew and which attaches the piston to the rod.
10. Screw the piston counterclockwise, by hand, and remove the piston from cylinder rod.
11. Remove and discard the piston rings and seal.
12. Remove the rod from the holding fixture. Remove the cylinder head. Discard the o-rings, backup rings, rod seal, retaining ring, and wiper seal.

CLEANING AND INSPECTION

1. Clean all parts thoroughly in an approved cleaning solvent.
2. Inspect the cylinder rod for scoring, tapering, ovality or other damage. If necessary, dress rod with Scotch Brite or equivalent. Replace rod if necessary.
3. Inspect threaded portion of rod for excessive damage. Dress threads as necessary.
4. Inspect inner surface of cylinder barrel tube for scoring or other damage. Check inside diameter for tapering or ovality. Replace if necessary.
5. Inspect threaded portion of barrel for damage. Dress threads as necessary.
6. Inspect piston surface for damage and scoring and for distortion. Dress piston surface or replace piston as necessary.
7. Inspect threaded portion of piston for damage. Dress threads as necessary.
8. Inspect seal and o-ring grooves in piston for burrs and sharp edges. Dress applicable surfaces as necessary.
9. Inspect cylinder head inside diameter for scoring, tapering, ovality or other damage. Replace if necessary.
10. Inspect threaded portion of head for damage. Dress threads as necessary.
11. Inspect seal and o-ring grooves in head for burrs and sharp edges. Dress applicable surfaces as necessary.
12. Inspect cylinder head outside diameter for scoring, tapering or ovality other damage. Replace if necessary.
13. If applicable, inspect rod and barrel bearings for signs of correct excessive wear or damage. Replace if necessary.
 - a. Thoroughly clean hole (steel bushing) of burrs, dirt etc. to facilitate bearing installation.
 - b. Inspect steel bushing for wear or other damage. If steel bushing is worn or damaged, rod/barrel must be replaced.
 - c. Lubricate inner side of steel bushing prior to bearing installation.
 - d. Using an arbor of the correct size, carefully press the bearing into steel bushing.

NOTE: Install pin into the composite bearing dry. Lubrication is not required with nickel plated pins and bearings.

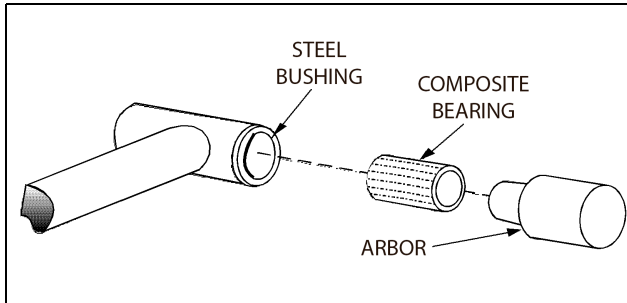


Figure 5-59. Composite Bearing Installation

14. Inspect port block fittings and valves. Replace if necessary.
15. Inspect the oil ports for blockage or the presence of dirt or other foreign material. Repair as necessary.
16. Inspect piston rings for cracks or other damage. Replace if necessary.

ASSEMBLY

NOTE: Prior to cylinder assembly, ensure that the proper cylinder seal kit is used. See the respective JLG Parts Manual.

NOTE: Apply a light film of hydraulic oil to all components prior to assembly.

1. A special tool is used to install a new rod seal into the applicable cylinder head groove.

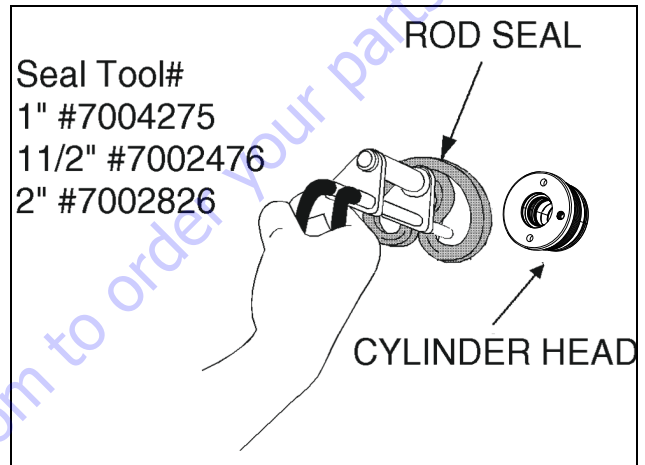


Figure 5-60. Rod Seal Installation

NOTICE

WHEN INSTALLING NEW SEALS, ENSURE SEALS ARE INSTALLED PROPERLY. IMPROPER SEAL INSTALLATION COULD RESULT IN CYLINDER LEAKAGE AND IMPROPER CYLINDER OPERATION.

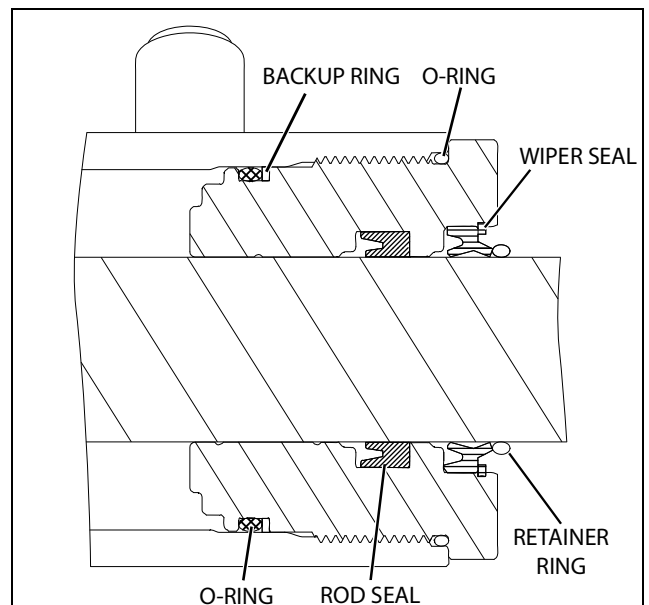


Figure 5-61. Cylinder Head Seal Installation

2. Use a soft mallet to tap a new wiper seal into the applicable cylinder head groove. Install a new retainer ring into the applicable inside diameter of the cylinder head groove.

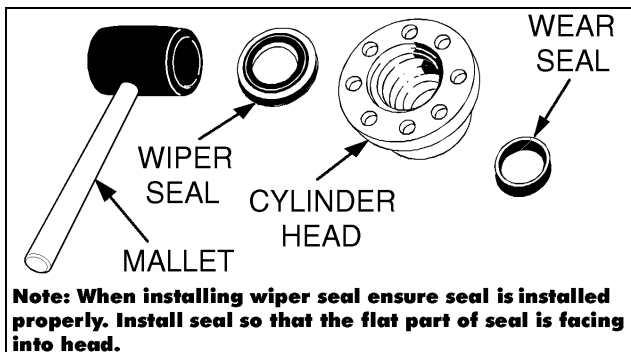


Figure 5-62. Wiper Seal Installation

3. Place new o-rings and backup ring in the applicable outside diameter groove of the cylinder head.

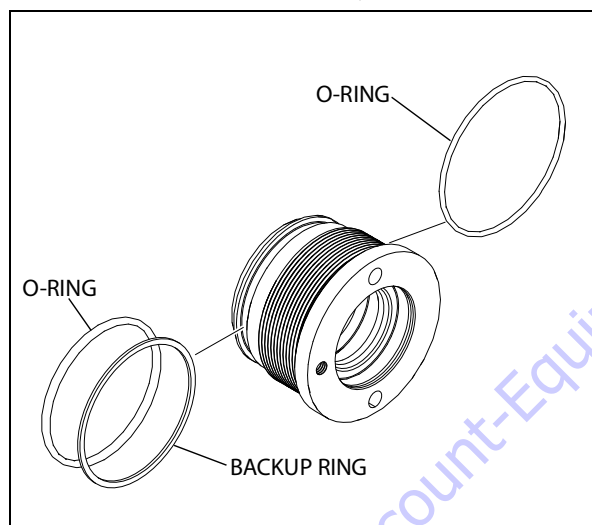


Figure 5-63. Installation of Head Seal Kit

4. Carefully install the cylinder head on the rod, ensuring that the wiper seal, retaining ring and rod seals are not damaged or dislodged. Push the head along the rod to the rod end, as applicable.
5. Using suitable protection, clamp the cylinder rod in a vise or similar holding fixture as close to piston as possible.
6. Carefully thread the piston on the cylinder rod, hand tight, ensuring that the o-ring and backup rings are not damaged or dislodged.
7. Install the setscrew and ball on the piston and attach the piston on the rod.
8. Remove the cylinder rod from the holding fixture.

9. Place new seal and piston ring in the outer piston diameter grooves. (A tube, with I.D. slightly larger than the O.D. of the piston is recommended to install the solid seal).

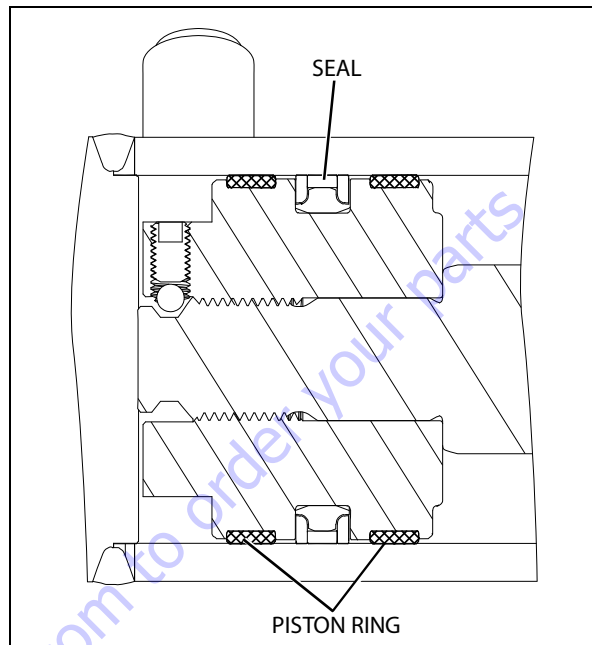


Figure 5-64. Installation of Piston Seal Kit

10. Position the cylinder barrel in a suitable holding fixture.

NOTICE

EXTREME CARE SHOULD BE TAKEN WHEN INSTALLING THE CYLINDER ROD, HEAD AND PISTON. AVOID PULLING THE ROD OFF-CENTER, WHICH COULD CAUSE DAMAGE TO THE PISTON AND CYLINDER BARREL SURFACES.

11. With barrel clamped secured and adequately supporting the rod, insert the piston end into the barrel cylinder. Ensure that the piston loading piston rings and piston seal are not damaged or dislodged.
12. Continue pushing the rod into the barrel until the cylinder head can be inserted into the barrel cylinder.
13. Screw the cylinder head into the barrel using a pin-face spanner wrench and torque cylinder head to 443 ft. lbs. (600 Nm).
14. After the cylinder has been reassembled, the rod should be pushed all the way in (fully retracted) prior to the reinstallation of any plugs.
15. Install the plugs in the cylinder ports and torque to 22 ft. lbs. (30 Nm).

Steer Cylinder

DISASSEMBLY

NOTICE

DISASSEMBLY OF THE CYLINDER SHOULD BE PERFORMED ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

1. Connect a suitable auxiliary hydraulic power source to the cylinder port block fitting.

WARNING

DO NOT FULLY EXTEND CYLINDER TO THE END OF STROKE. RETRACT CYLINDER SLIGHTLY TO AVOID TRAPPING PRESSURE.

2. Operate the hydraulic power source and extend the cylinder. Shut down and disconnect the power source. Adequately support the cylinder rod, if applicable.
3. Remove the plugs from the cylinder ports. Discard o-rings.
4. Place the cylinder barrel into a suitable holding fixture.

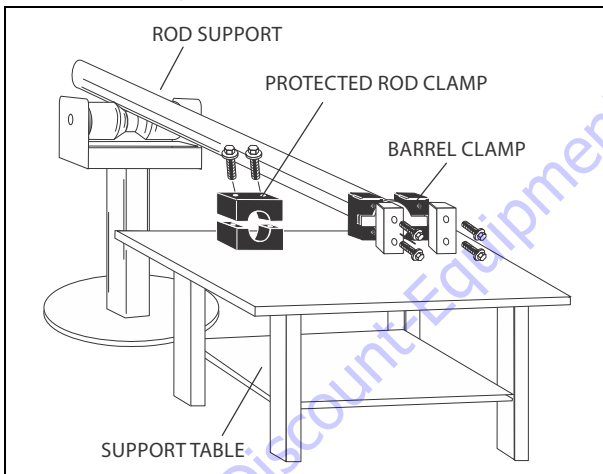


Figure 5-65. Cylinder Barrel Support

5. Using a hook spanner, loosen the cylinder head on both ends of the rod. Remove the cylinder head from the barrel and the rod.

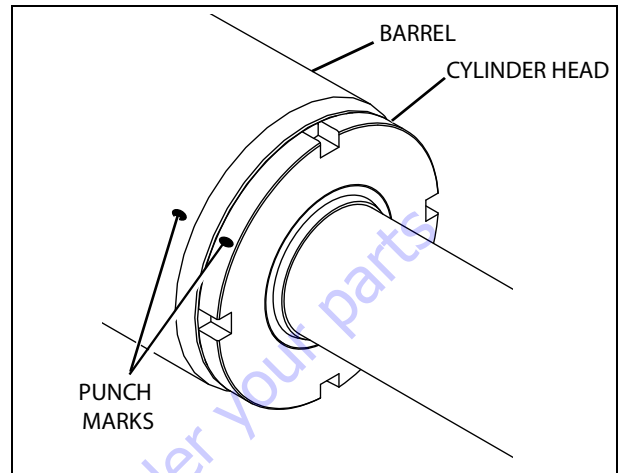


Figure 5-66. Cylinder Head Removal

6. Remove and discard the wiper seal, rod seal, backup ring, bearing, and o-ring from both the cylinder head.
7. Attach a suitable pulling device to the cylinder rod port block end or cylinder rod end, as applicable.

NOTICE

EXTREME CARE SHOULD BE TAKEN WHEN REMOVING THE CYLINDER ROD, HEAD AND PISTON. AVOID PULLING THE ROD OFF-CENTER, WHICH COULD CAUSE DAMAGE TO THE PISTON AND CYLINDER BARREL SURFACES.

8. With the barrel clamped securely, apply pressure to the rod pulling device and carefully withdraw the complete rod assembly from the cylinder barrel.

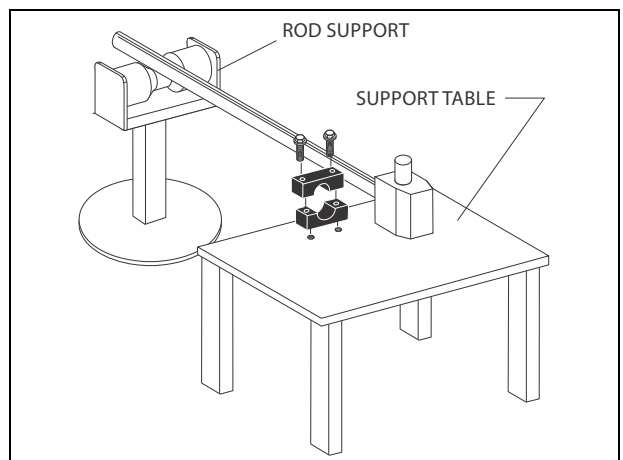
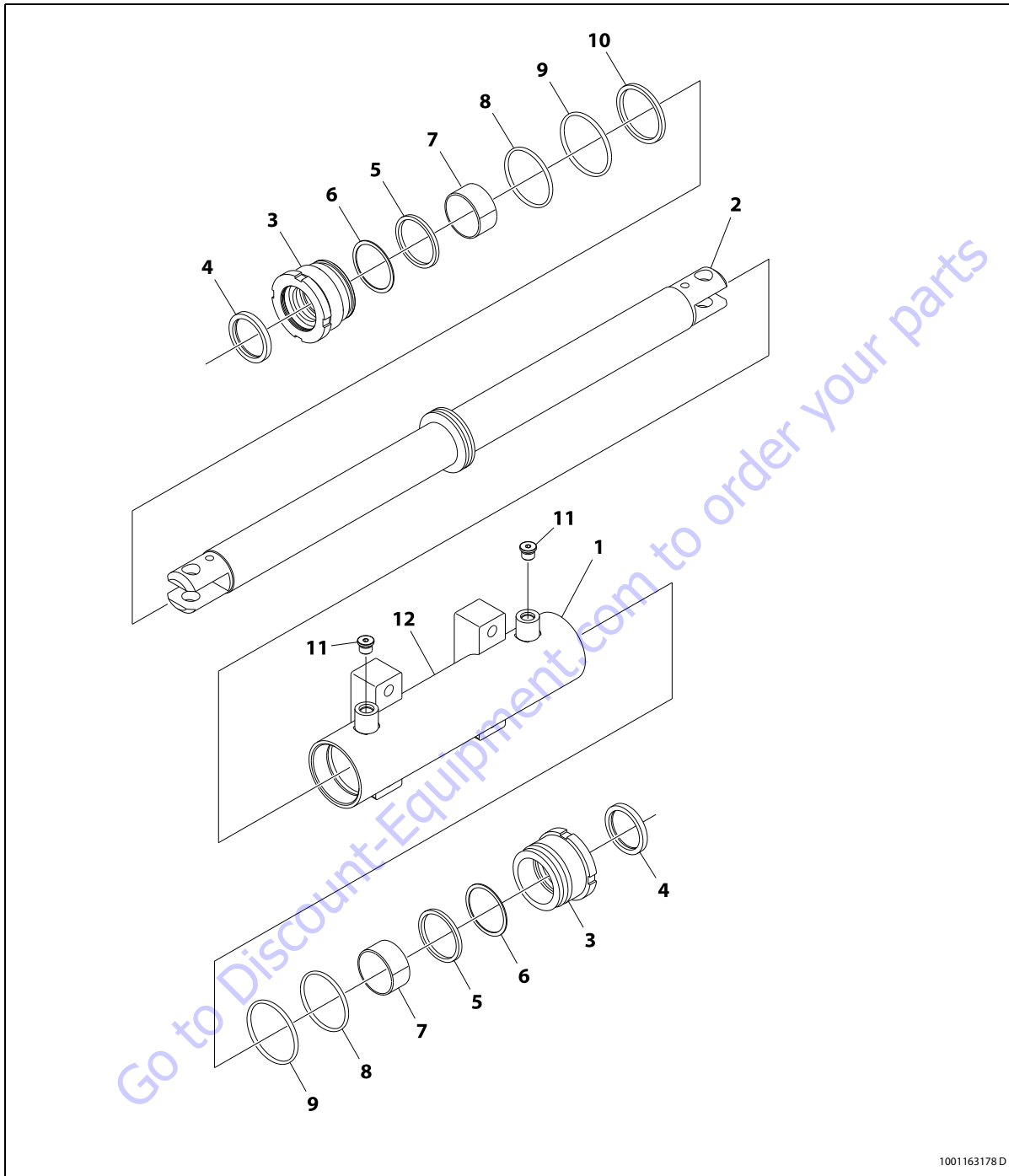


Figure 5-67. Cylinder Barrel Support

9. Remove and discard the piston seal from the rod.



- | | | |
|---------------|----------------|-----------------|
| 1. Barrel | 5. Rod Seal | 9. O-ring |
| 2. Rod | 6. Backup Ring | 10. Piston Seal |
| 3. Head | 7. Bearing | 11. Plug |
| 4. Wiper Seal | 8. O-ring | |

Figure 5-68. Steer Cylinder

CLEANING AND INSPECTION

1. Clean all parts thoroughly in an approved cleaning solvent.
2. Inspect the cylinder rod for scoring, tapering, ovality or other damage. If necessary, dress rod with Scotch Brite or equivalent. Replace rod if necessary.
3. Inspect inner surface of cylinder barrel tube for scoring or other damage. Check inside diameter for tapering or ovality. Replace if necessary.
4. Inspect threaded portion of barrel for damage. Dress threads as necessary.
5. Inspect cylinder head inside diameter for scoring, tapering, ovality or other damage. Replace if necessary.
6. Inspect threaded portion of head for damage. Dress threads as necessary.
7. Inspect seal and o-ring grooves in head for burrs and sharp edges. Dress applicable surfaces as necessary.
8. Inspect cylinder head outside diameter for scoring, tapering or ovality other damage. Replace if necessary.
9. Inspect port block fittings and valves. Replace if necessary.
10. Inspect the oil ports for blockage or the presence of dirt or other foreign material. Repair as necessary.

ASSEMBLY

NOTE: Prior to cylinder assembly, ensure that the proper cylinder seal kit is used. See the respective JLG Parts Manual.

NOTE: Apply a light film of hydraulic oil to all components prior to assembly.

1. A special tool is used to install a new rod seal into the applicable cylinder head groove.

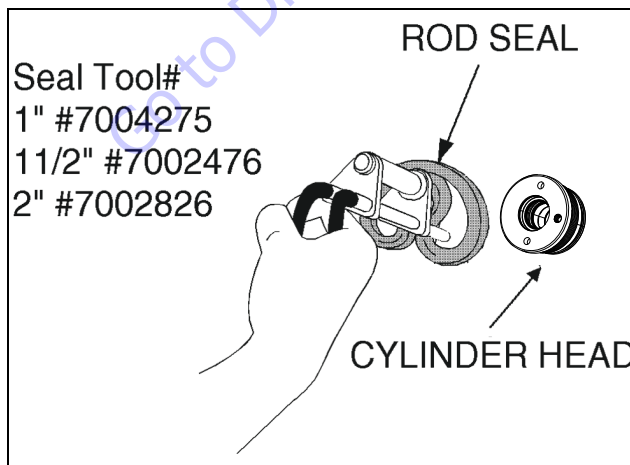


Figure 5-69. Rod Seal Installation

NOTICE

WHEN INSTALLING NEW SEALS, ENSURE SEALS ARE INSTALLED PROPERLY. IMPROPER SEAL INSTALLATION COULD RESULT IN CYLINDER LEAKAGE AND IMPROPER CYLINDER OPERATION.

2. Use a soft mallet to tap a new wiper seal into the applicable cylinder head groove. Install a new bearing and backup ring into the applicable inside diameter of the cylinder head groove.

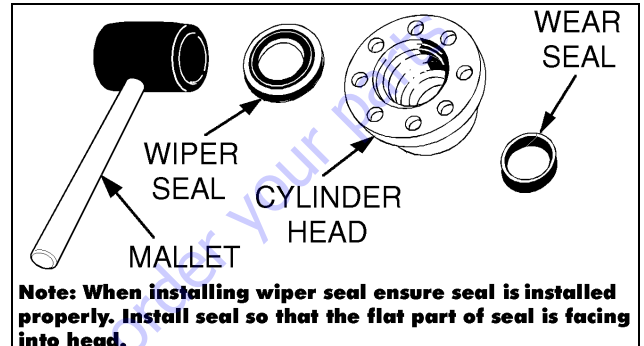


Figure 5-70. Wiper Seal Installation

3. Place new o-rings in the applicable outside diameter groove of the cylinder head.
4. Place new piston seal in the applicable groove of the rod.
5. With barrel clamped secured and adequately supporting the rod, insert the rod into the barrel cylinder.
6. Carefully install the cylinder head on the rod, ensuring that the wiper and rod seals are not damaged or dislodged. Push the head along the rod to the barrel, as applicable.
7. Install new plugs into the cylinder port block.

Telescope Cylinder

DISASSEMBLY

NOTICE

DISASSEMBLY OF THE CYLINDER SHOULD BE PERFORMED ON A CLEAN WORK SURFACE IN A DIRT FREE WORK AREA.

1. Connect a suitable auxiliary hydraulic power source to the cylinder port block fitting.

WARNING

DO NOT FULLY EXTEND CYLINDER TO THE END OF STROKE. RETRACT CYLINDER SLIGHTLY TO AVOID TRAPPING PRESSURE.

2. Operate the hydraulic power source and extend the cylinder. Shut down and disconnect the power source. Adequately support the cylinder rod, if applicable.
3. Remove the motor control valves and plugs from the cylinder port block. Discard o-rings.
4. Place the cylinder barrel into a suitable holding fixture.

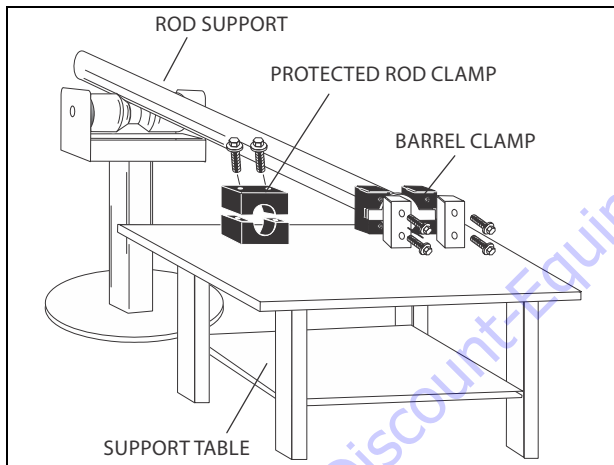


Figure 5-71. Cylinder Barrel Support

5. Mark cylinder head and barrel with a center punch for easy realignment. Using a hook spanner wrench, unscrew the cylinder head from the barrel.

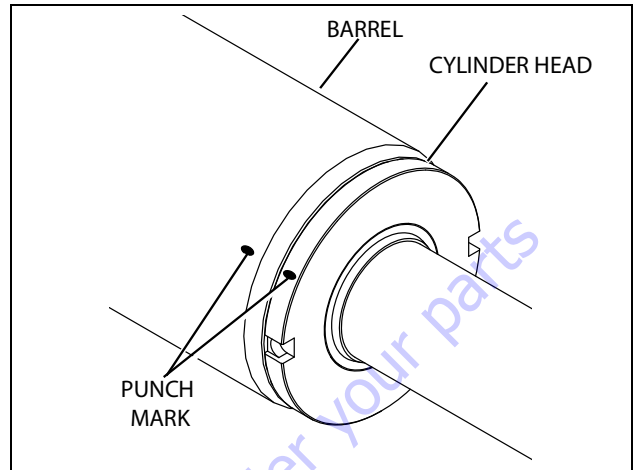


Figure 5-72. Cylinder Head Removal

6. Attach a suitable pulling device to the cylinder rod port block end or cylinder rod end, as applicable.

NOTICE

EXTREME CARE SHOULD BE TAKEN WHEN REMOVING THE CYLINDER ROD, HEAD AND PISTON. AVOID PULLING THE ROD OFF-CENTER, WHICH COULD CAUSE DAMAGE TO THE PISTON AND CYLINDER BARREL SURFACES.

7. With the barrel clamped securely, apply pressure to the rod pulling device and carefully withdraw the complete rod assembly from the cylinder barrel.

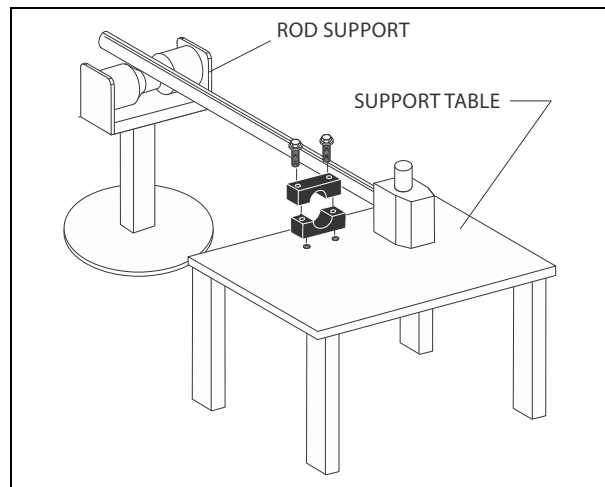
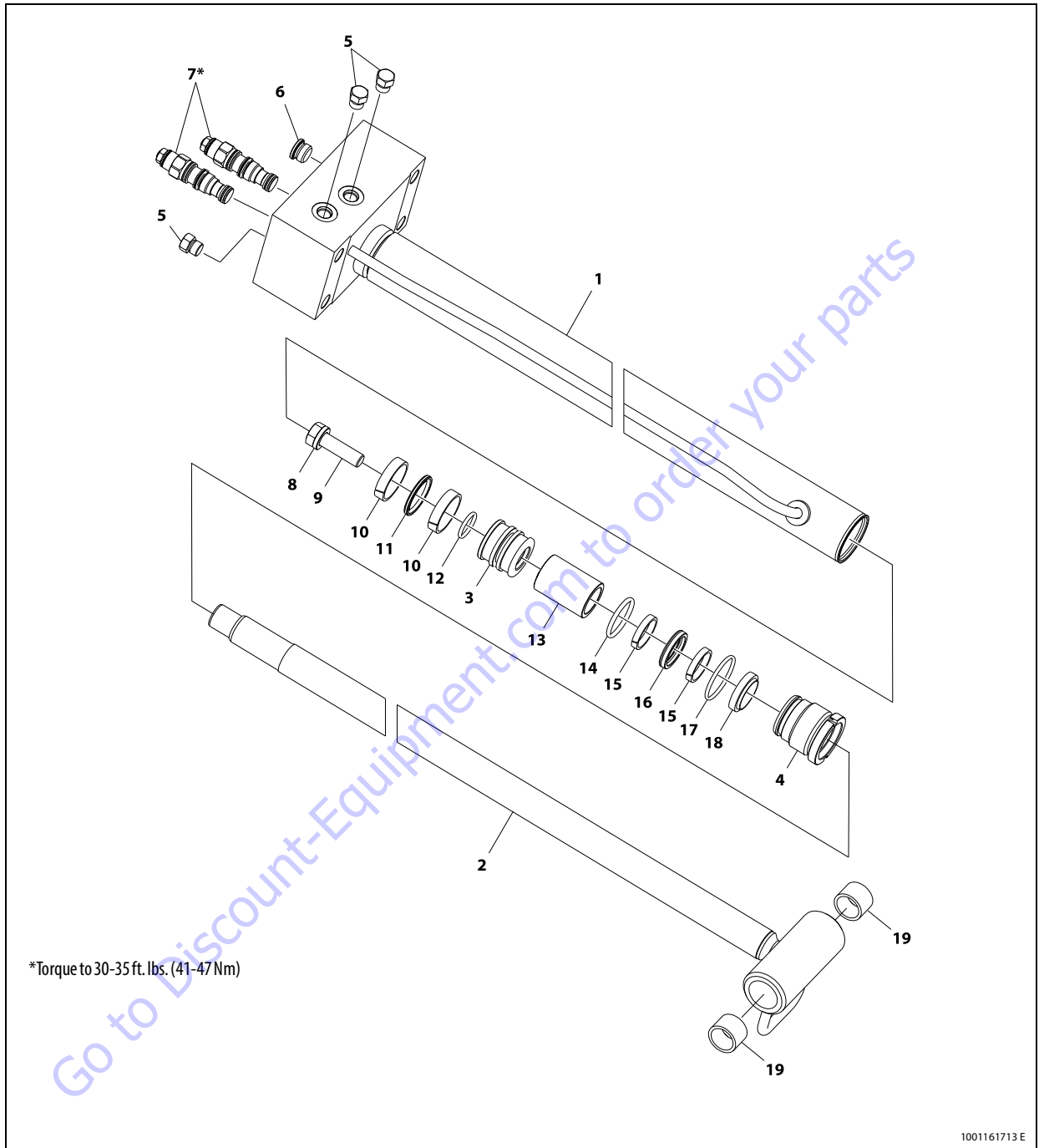


Figure 5-73. Cylinder Rod Support



*Torque to 30-35 ft. lbs. (41-47 Nm)

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- | | | | |
|-----------|-------------------------|-----------------|----------------|
| 1. Barrel | 6. Plug | 11. Piston Seal | 16. Rod Seal |
| 2. Rod | 7. Counterbalance Valve | 12. O-ring | 17. O-ring |
| 3. Piston | 8. Washer | 13. Spacer | 18. Wiper Seal |
| 4. Head | 9. Bolt | 14. O-ring | 19. Bushing |
| 5. Plug | 10. Wear Ring | 15. Wear Ring | |

Figure 5-74. Telescope Cylinder

8. Using suitable protection, clamp the cylinder rod in a vise or similar holding fixture as close to the piston as possible.
9. Remove bolt and washer attaching the piston to the rod
10. Screw the piston counterclockwise, by hand and remove the piston from cylinder rod.
11. Remove and discard the piston o-ring, piston seal and wear rings.
12. Remove piston spacer from the rod.
13. Remove the rod from the holding fixture. Remove the cap and the cylinder head. Discard the o-rings, wear rings, rod seal and wiper seal.

CLEANING AND INSPECTION

1. Clean all parts thoroughly in an approved cleaning solvent.
2. Inspect the cylinder rod for scoring, tapering, ovality, or other damage. If necessary, dress rod with Scotch Brite or equivalent. Replace rod if necessary.
3. Inspect threaded portion of rod for excessive damage. Dress threads as necessary.
4. Inspect inner surface of cylinder barrel tube for scoring or other damage. Check inside diameter for tapering or ovality. Replace if necessary.
5. Inspect threaded portion of barrel for damage. Dress threads as necessary.
6. Inspect piston surface for damage and scoring and for distortion. Dress piston surface or replace piston as necessary.
7. Inspect threaded portion of rod for damage. Dress threads as necessary.
8. Inspect seal and o-ring grooves in piston for burrs and sharp edges. Dress applicable surfaces as necessary.
9. Inspect cylinder head inside diameter for scoring, tapering, ovality or other damage. Replace if necessary.
10. Inspect threaded portion of head for damage. Dress threads as necessary.
11. Inspect seal and o-ring grooves in head for burrs and sharp edges. Dress applicable surfaces as necessary.
12. Inspect cylinder head outside diameter for scoring, tapering, ovality or other damage. Replace if necessary.
13. If applicable, inspect rod and barrel bearings for signs of correct excessive wear or damage. Replace if necessary.
 - a. Thoroughly clean hole (steel bushing) of burrs, dirt etc. to facilitate bearing installation.
 - b. Inspect steel bushing for wear or other damage. If steel bushing is worn or damaged, rod/barrel must be replaced.
 - c. Lubricate inner side of steel bushing prior to bearing installation.
 - d. Using an arbor of the correct size, carefully press the bearing into steel bushing.

NOTE: Install pin into the composite bearing dry. Lubrication is not required with nickel plated pins and bearings.

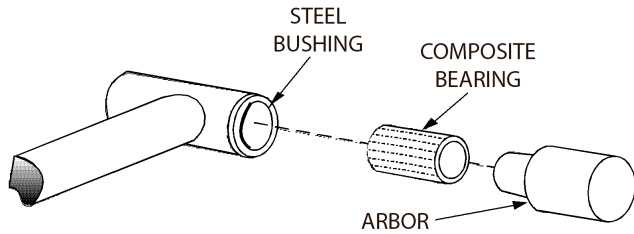


Figure 5-75. Composite Bearing Installation

14. Inspect spacer for burrs and sharp edges. If necessary, dress inside diameter surface with Scotch Brite or equivalent.
15. Inspect port block fittings and holding valve. Replace if necessary.
16. Inspect the oil ports for blockage or the presence of dirt or other foreign material. Repair if necessary.

ASSEMBLY

NOTE: Prior to cylinder assembly, ensure that the proper cylinder seal kit is used. See your JLG Parts Manual.

NOTE: Apply a light film of hydraulic oil to all components prior to assembly.

1. A special tool is used to install a new rod seal into the applicable cylinder head groove.

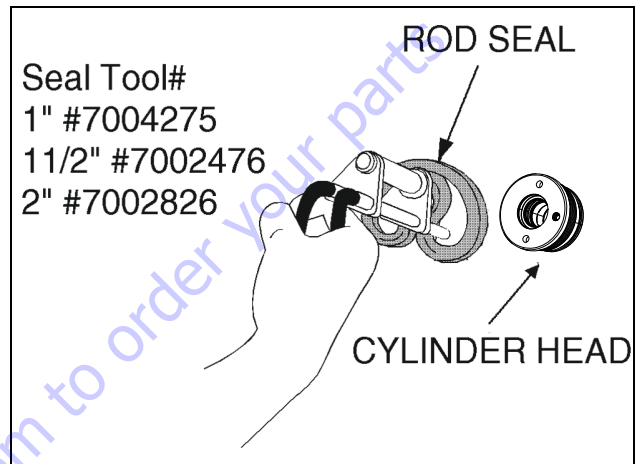


Figure 5-76. Rod Seal Installation

NOTICE

WHEN INSTALLING NEW SEALS, ENSURE SEALS ARE INSTALLED PROPERLY. IMPROPER SEAL INSTALLATION COULD RESULT IN CYLINDER LEAKAGE AND IMPROPER CYLINDER OPERATION.

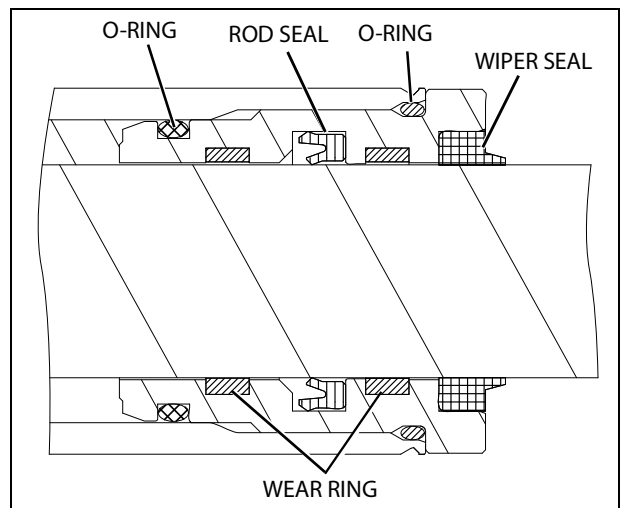


Figure 5-77. Cylinder Head Seal Installation

2. Use a soft mallet to tap a new wiper seal into the applicable cylinder head groove. Install a new wear ring into the applicable inside diameter of the cylinder head groove.

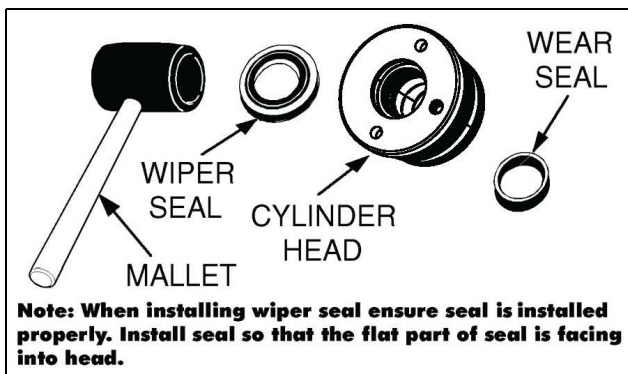


Figure 5-78. Wiper Seal Installation

3. Place a new o-rings in the applicable outside diameter groove of the cylinder head.

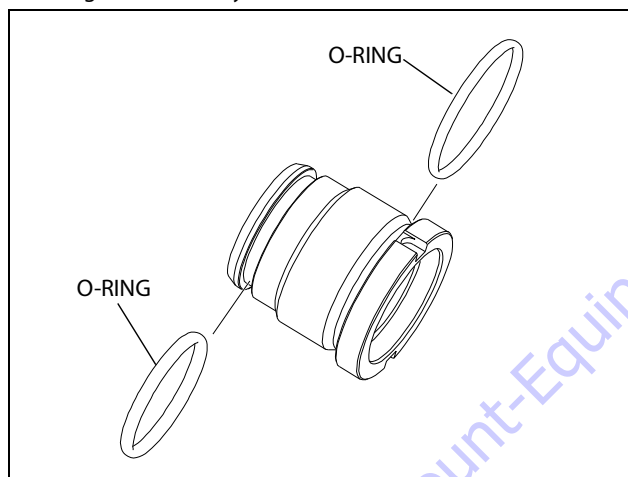


Figure 5-79. Installation of Head Seal Kit

4. Carefully install the cylinder head on the rod, ensuring that the wear ring, rod seal and wiper seal are not damaged or dislodged. Push the head along the rod to the rod end.
5. Install the spacer tube onto the cylinder rod.
6. Place a new o-ring in the inner piston diameter groove.
7. Using suitable protection, clamp the cylinder rod in a vise or similar holding fixture as close to piston as possible.
8. Carefully install the piston on the cylinder rod till it abuts the spacer, ensuring that the o-ring is not damaged or dislodged.
9. Secure the piston onto the rod using bolt and washer
10. Remove the cylinder rod from the holding fixture.

11. Position the cylinder barrel in a suitable holding fixture.
12. Place new piston seal and wear rings in the outer piston diameter groove. (A tube, with I.D. slightly larger than the O.D. of the piston is recommended to install the solid seal).

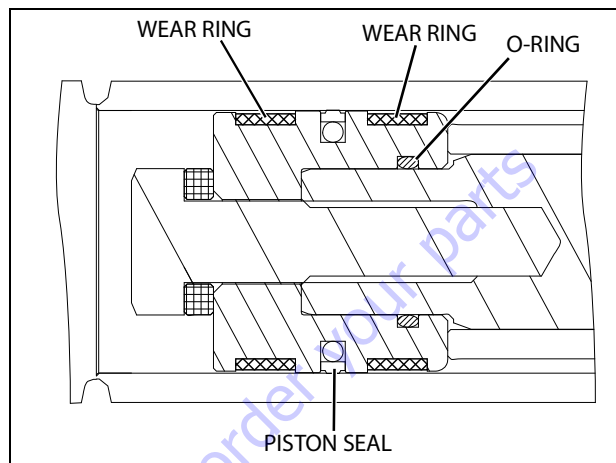


Figure 5-80. Piston Seal Kit Installation

NOTICE

EXTREME CARE SHOULD BE TAKEN WHEN INSTALLING THE CYLINDER ROD, HEAD AND PISTON. AVOID PULLING THE ROD OFF-CENTER, WHICH COULD CAUSE DAMAGE TO THE PISTON AND CYLINDER BARREL SURFACES.

13. With barrel clamped securely, and while adequately supporting the rod, insert the piston end into the barrel cylinder. Ensure that the piston loading o-ring and seal ring are not damaged or dislodged.
14. Continue pushing the rod into the barrel until the cylinder head can be inserted into the barrel cylinder.
15. Screw the cylinder head into the barrel using a hook wrench and torque the cylinder head.
16. After the cylinder has been reassembled, the rod should be pushed all the way in (fully retracted) prior to the reinstallation of any holding valve or valves.
17. Install the motor control valves in the rod port block. Torque to 30-35 ft. lbs. (41-47 Nm).
18. Install the new o-rings and plugs into the cylinder port block.

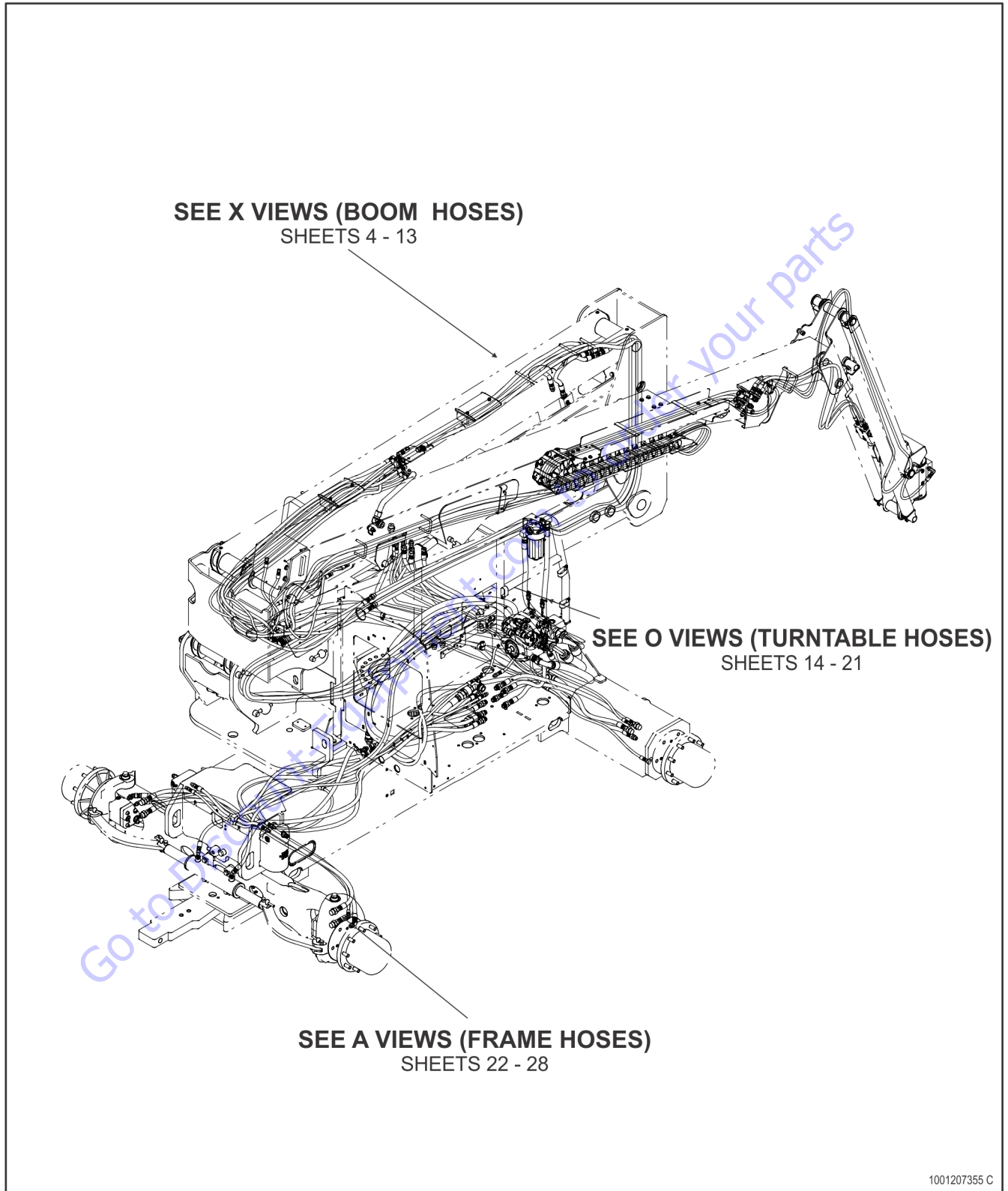
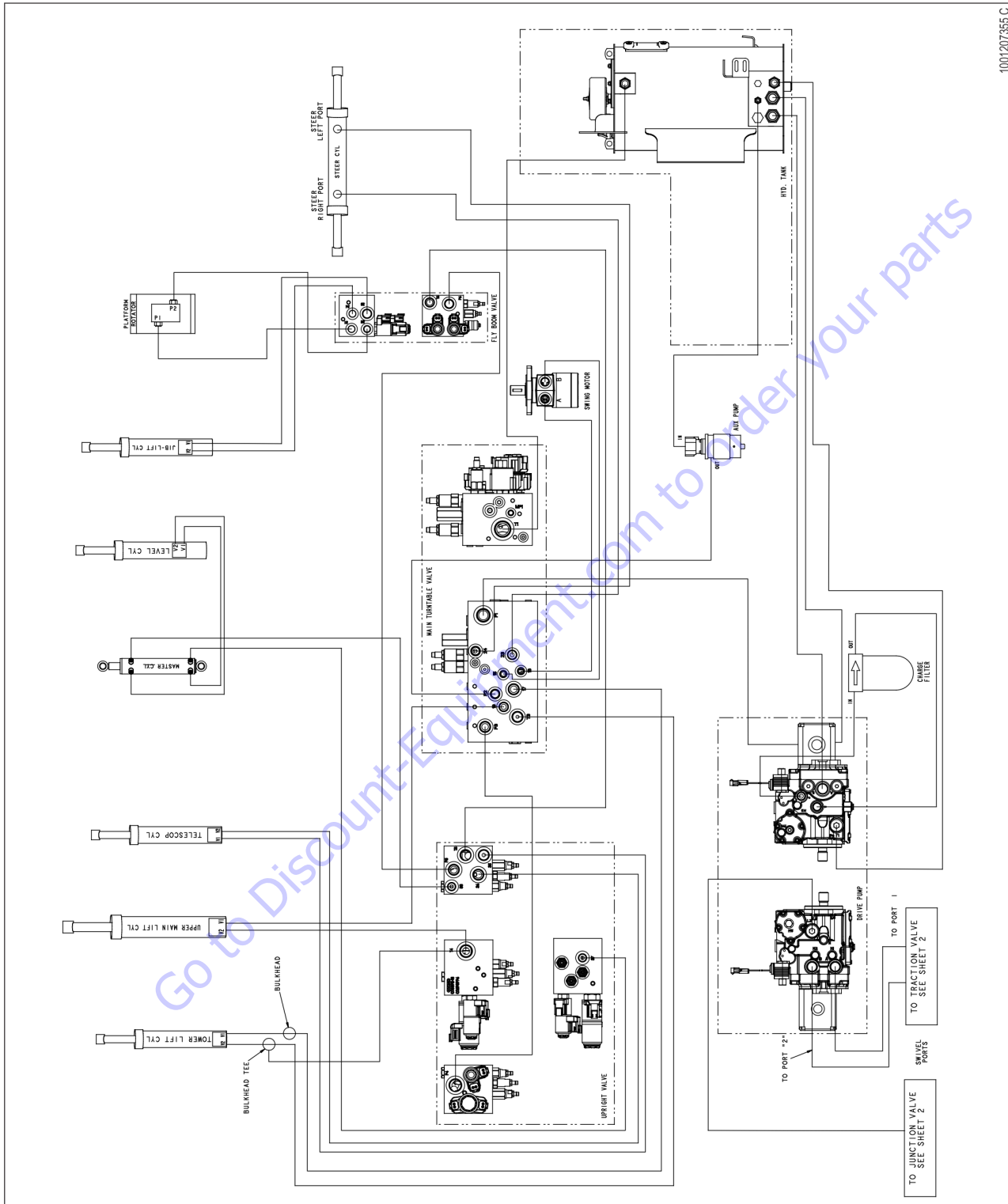


Figure 5-81. Hydraulics Installation - Sheet 1 of 28

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SECTION 5 - BASIC HYDRAULICS INFORMATION & SCHEMATICS



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Figure 5-82. Hydraulics Installation - Sheet 2 of 28

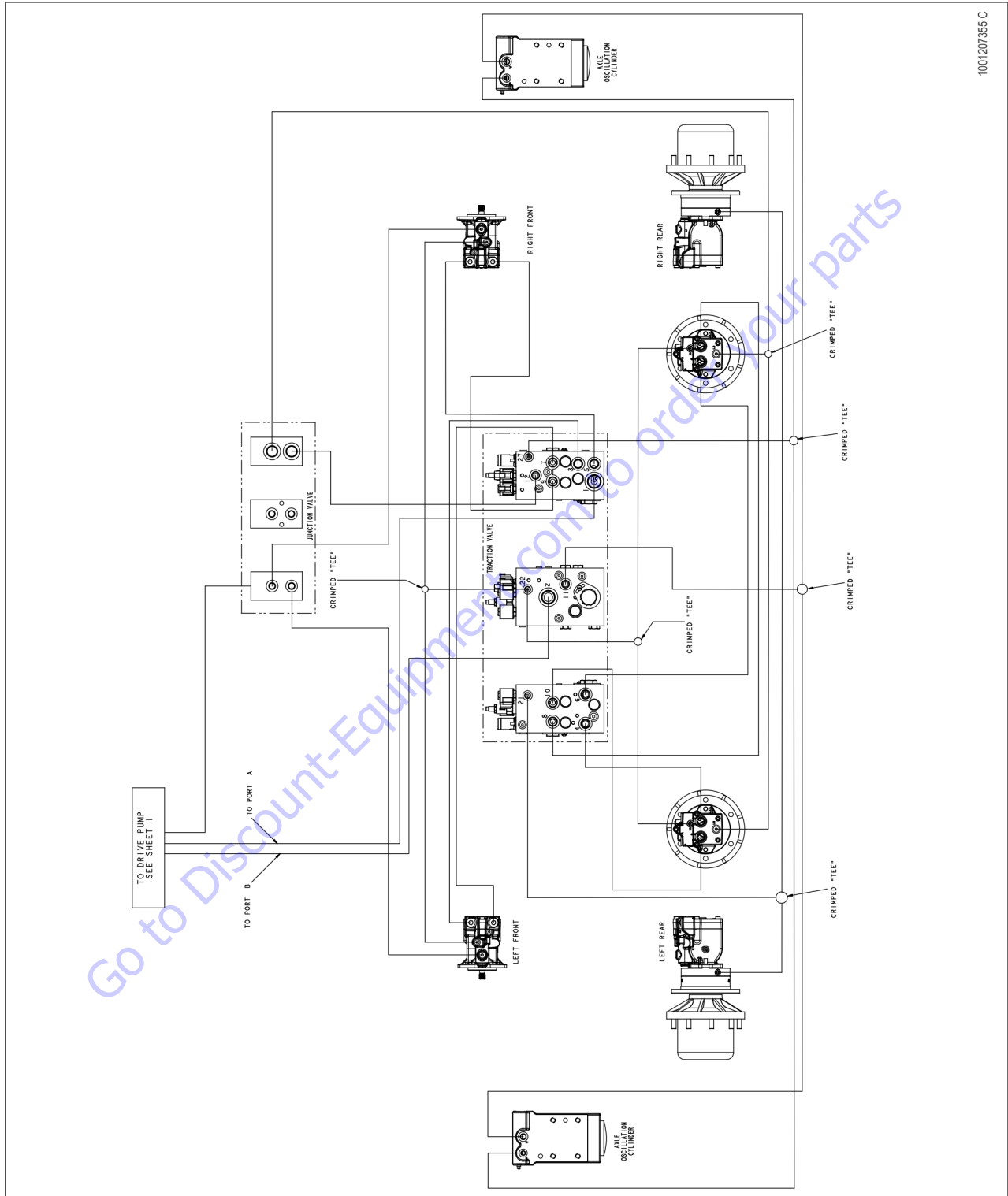


Figure 5-83. Hydraulics Installation - Sheet 3 of 28

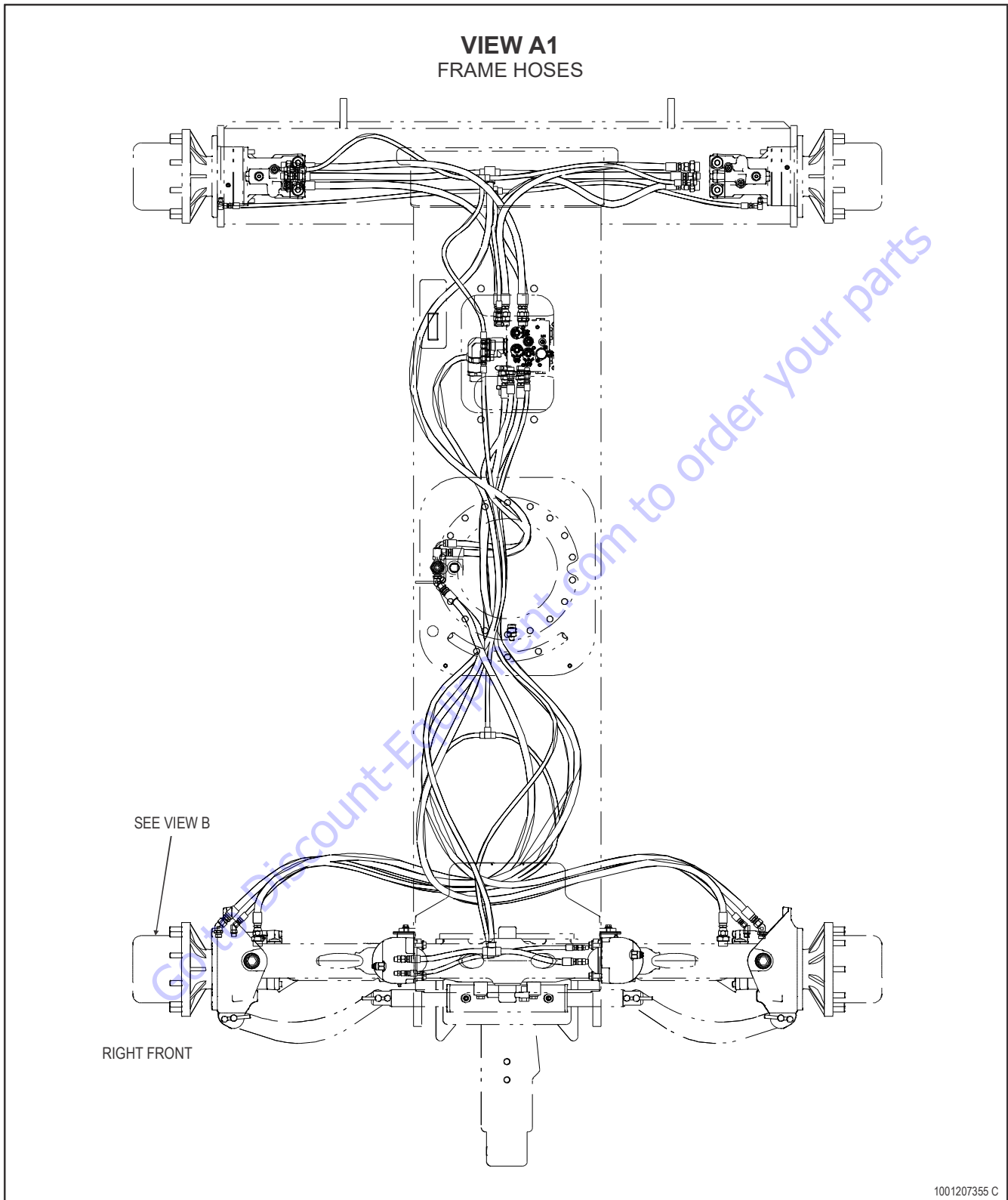
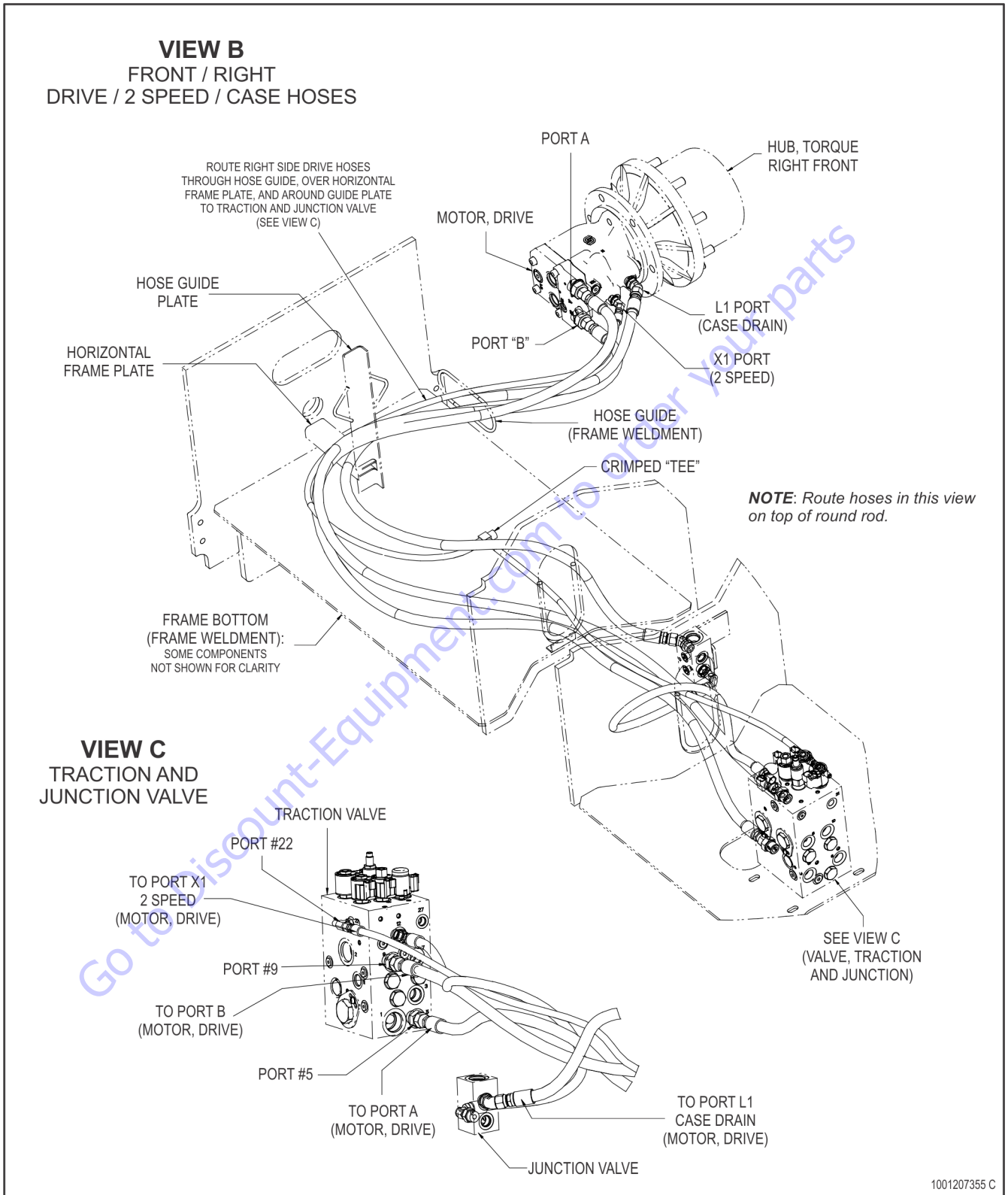


Figure 5-84. Hydraulics Installation - Sheet 4 of 28



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Figure 5-85. Hydraulics Installation - Sheet 5 of 28

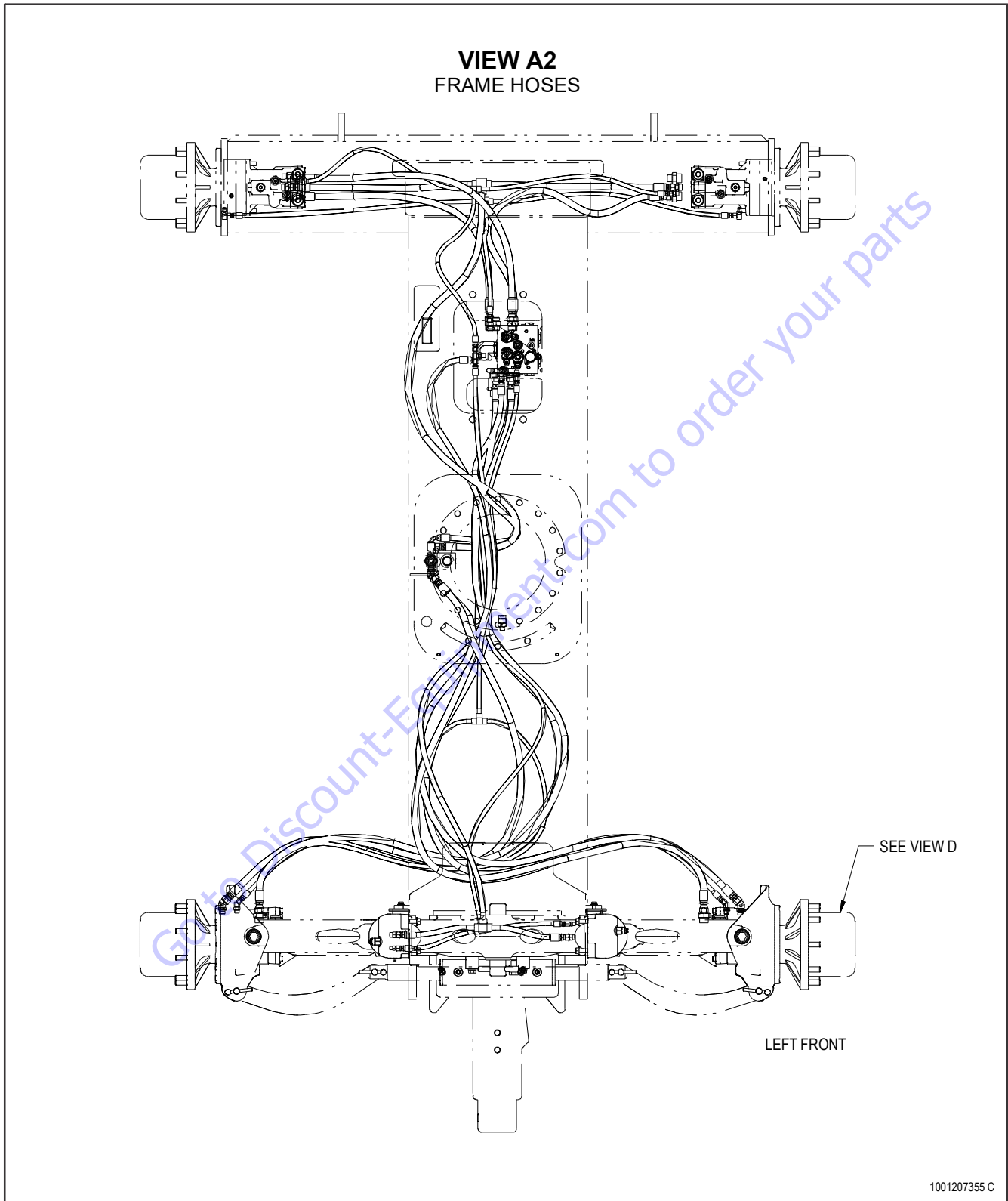


Figure 5-86. Hydraulics Installation - Sheet 6 of 28

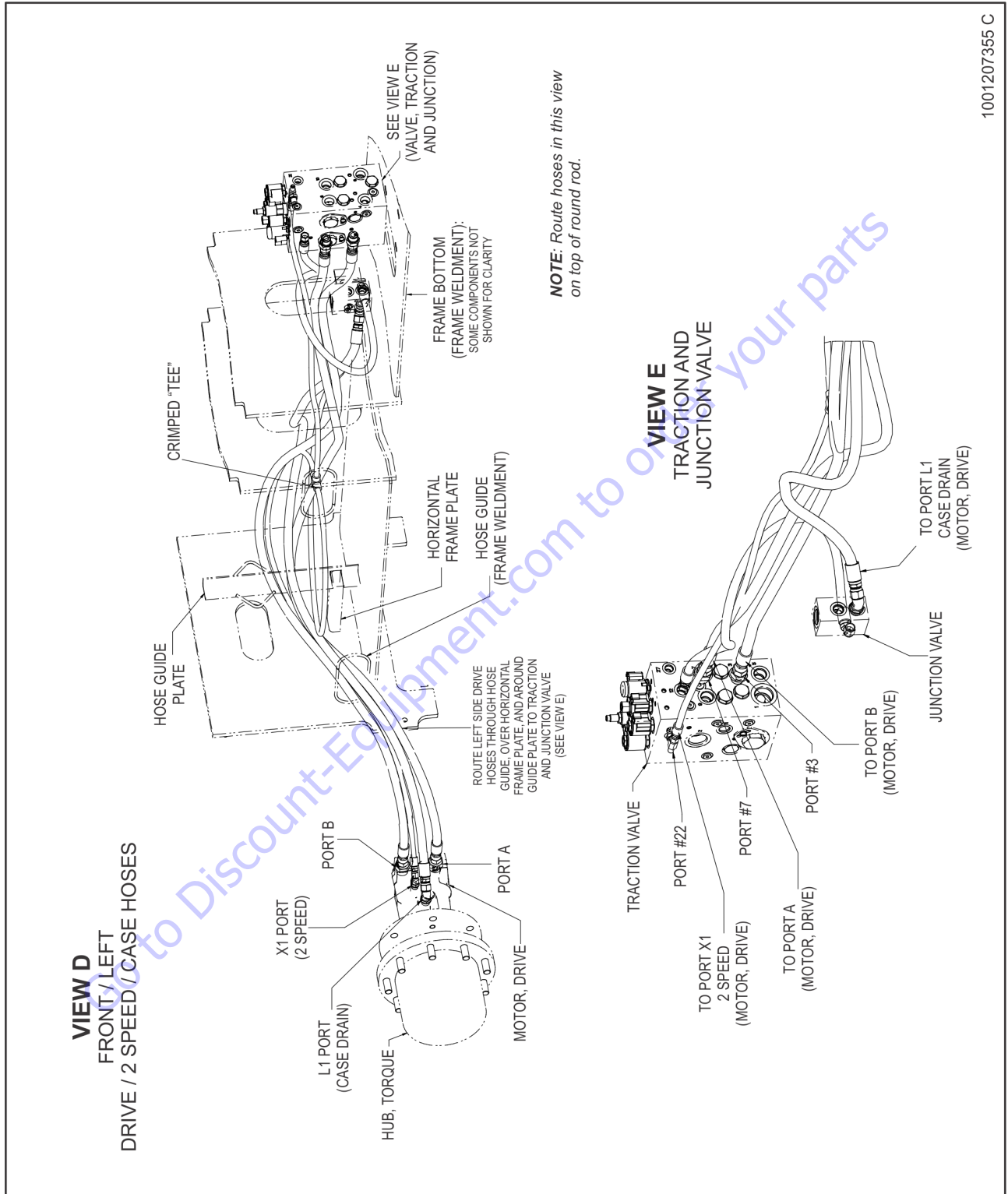


Figure 5-87. Hydraulics Installation - Sheet 7 of 28

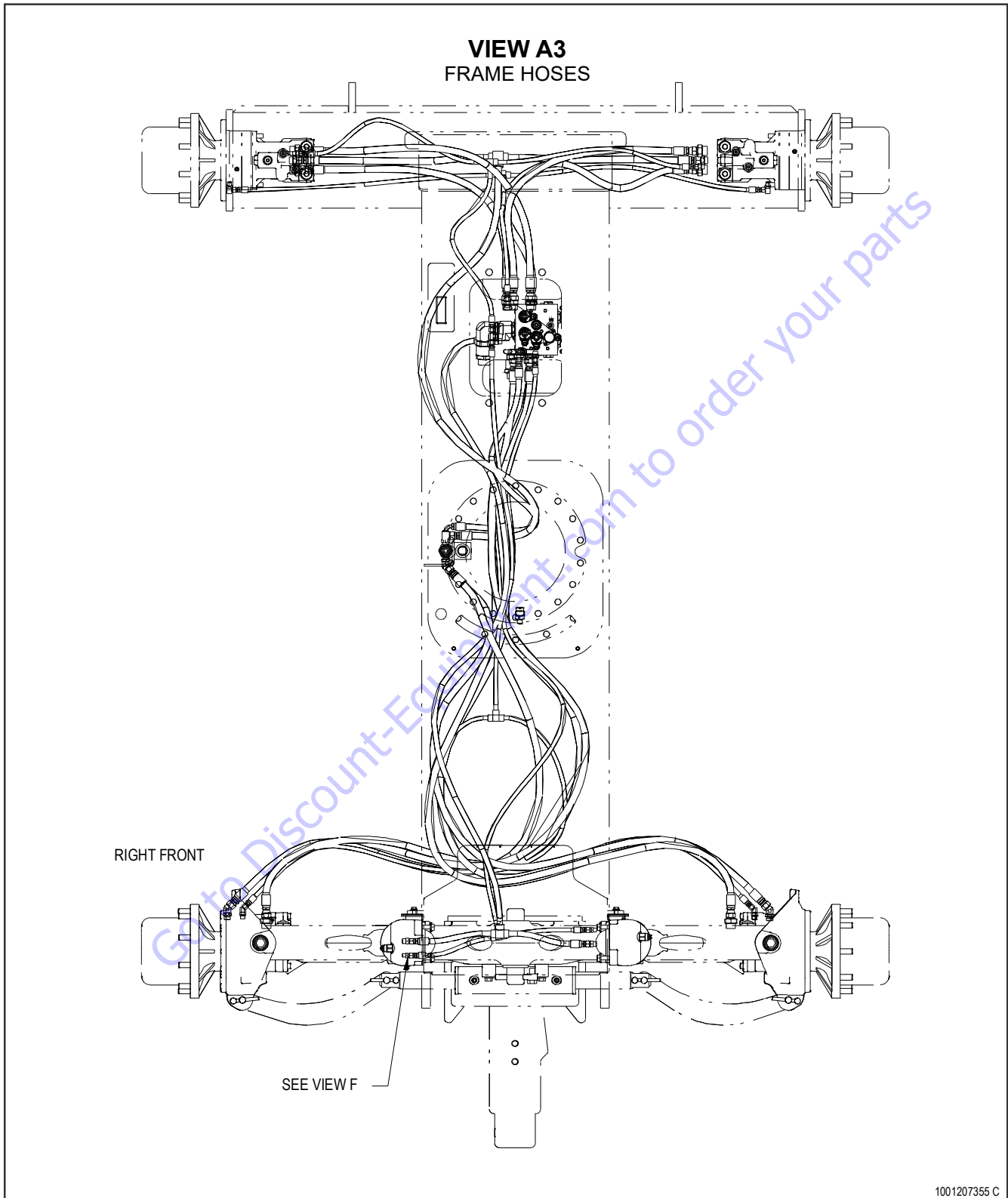


Figure 5-88. Hydraulics Installation - Sheet 8 of 28

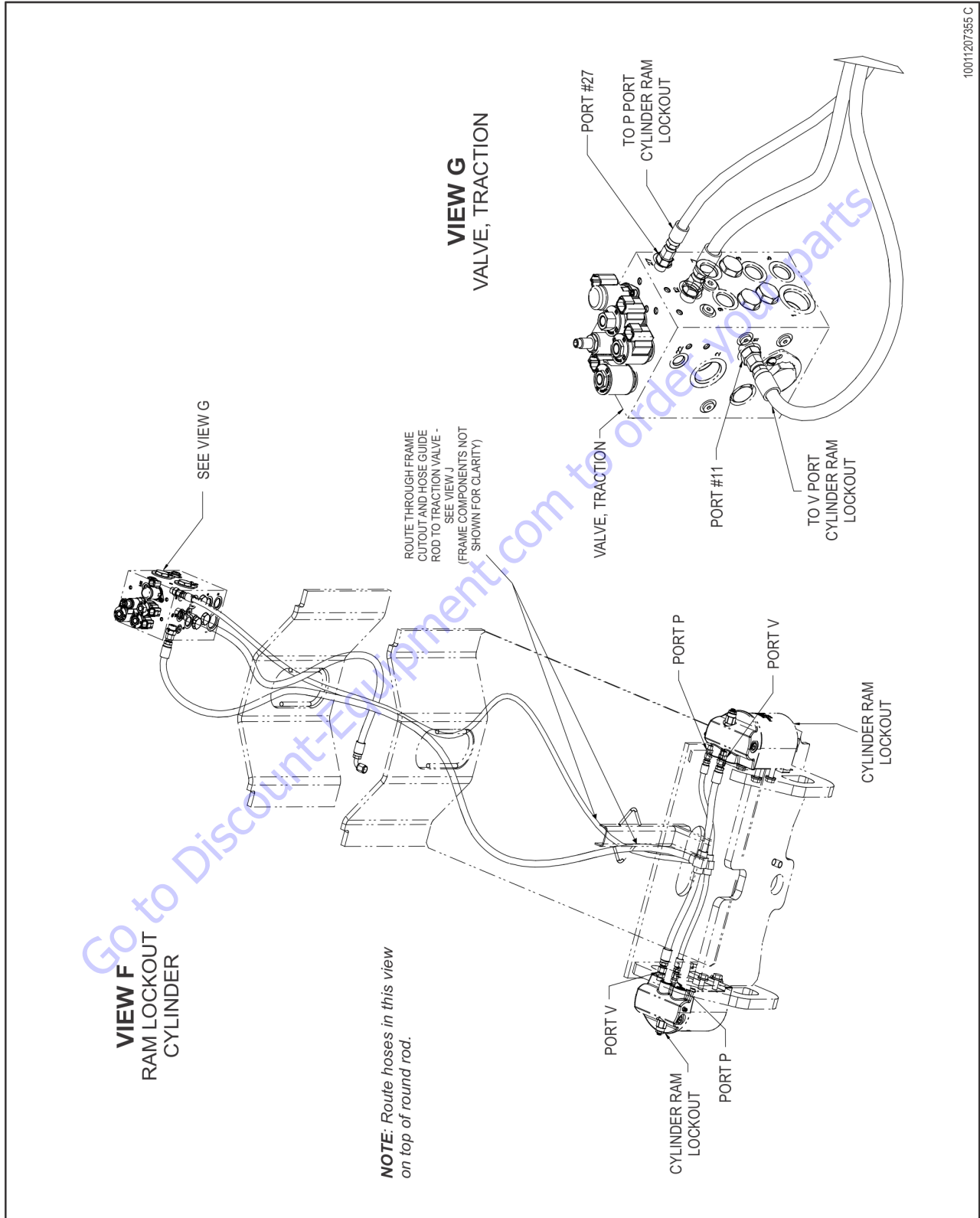


Figure 5-89. Hydraulics Installation - Sheet 9 of 28

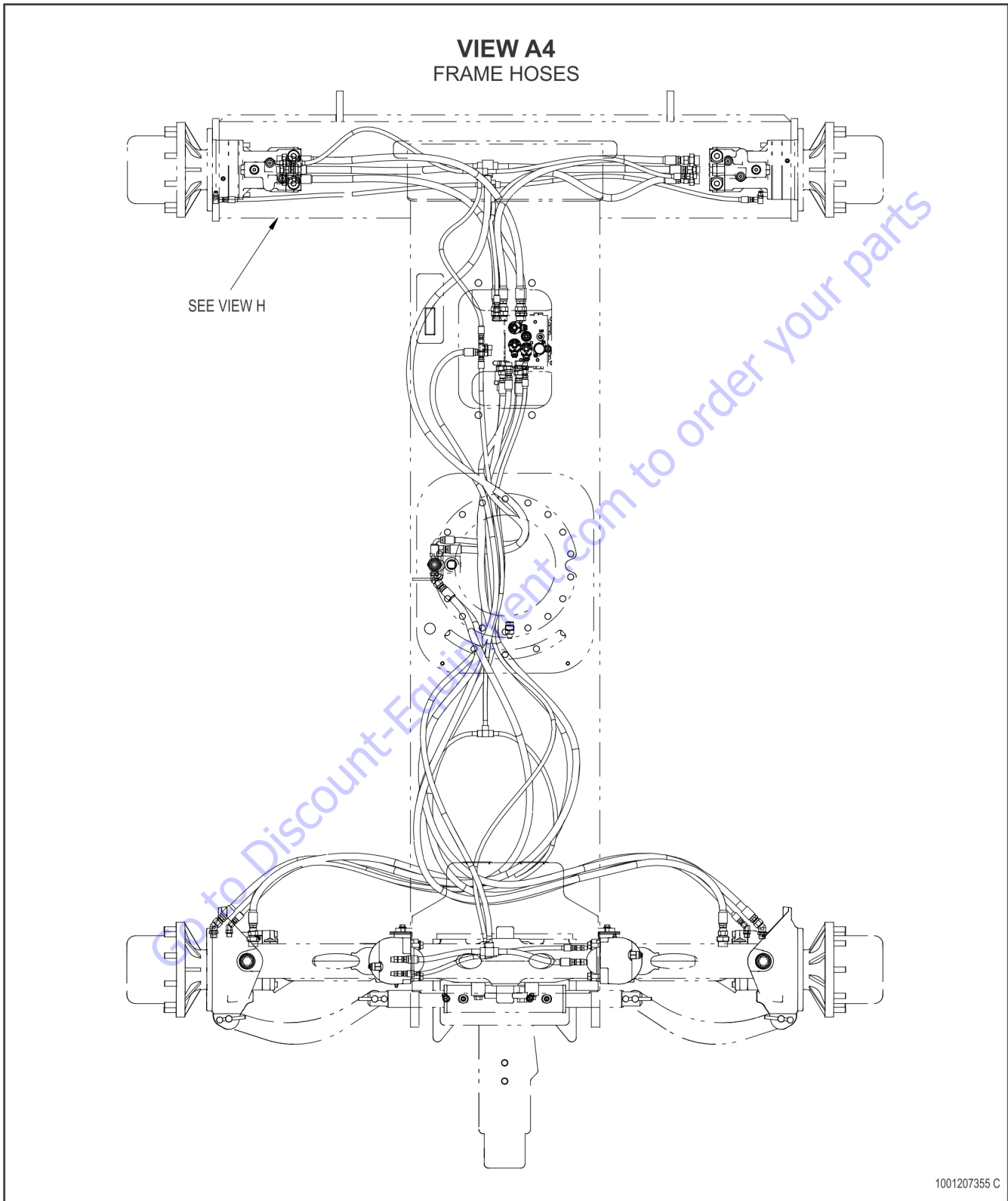


Figure 5-90. Hydraulics Installation - Sheet 10 of 28

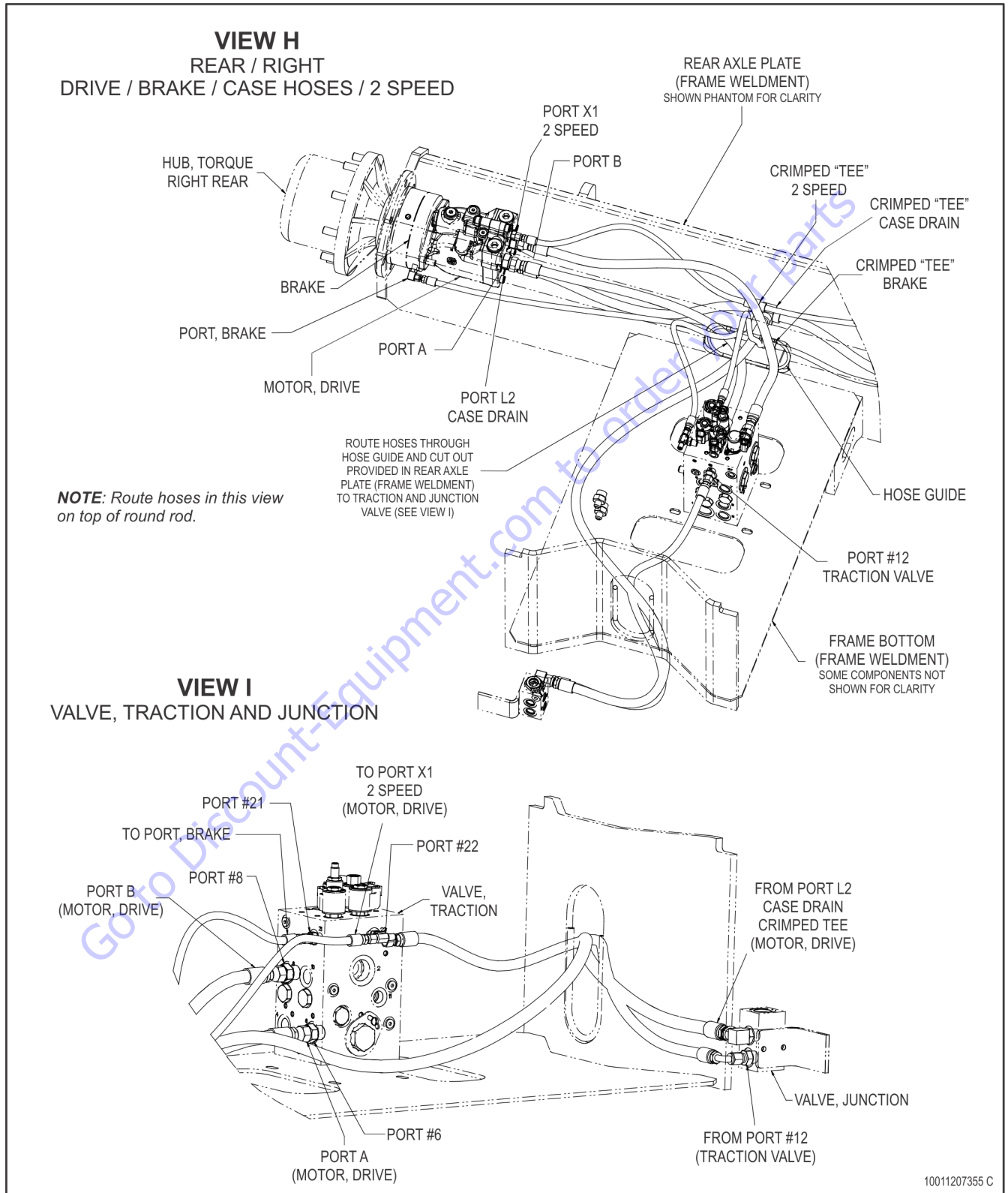


Figure 5-91. Hydraulics Installation - Sheet 11 of 28

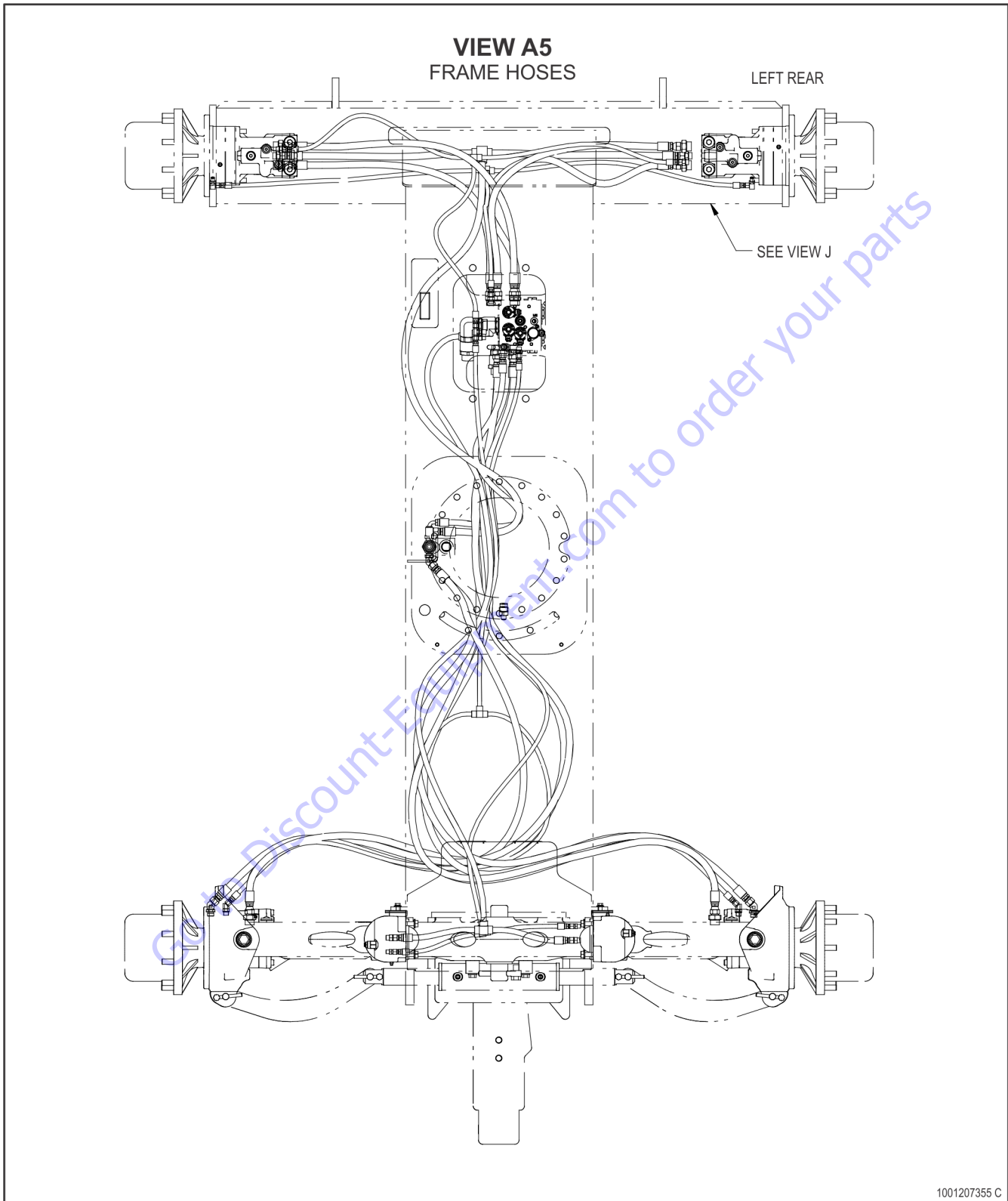


Figure 5-92. Hydraulics Installation - Sheet 12 of 28

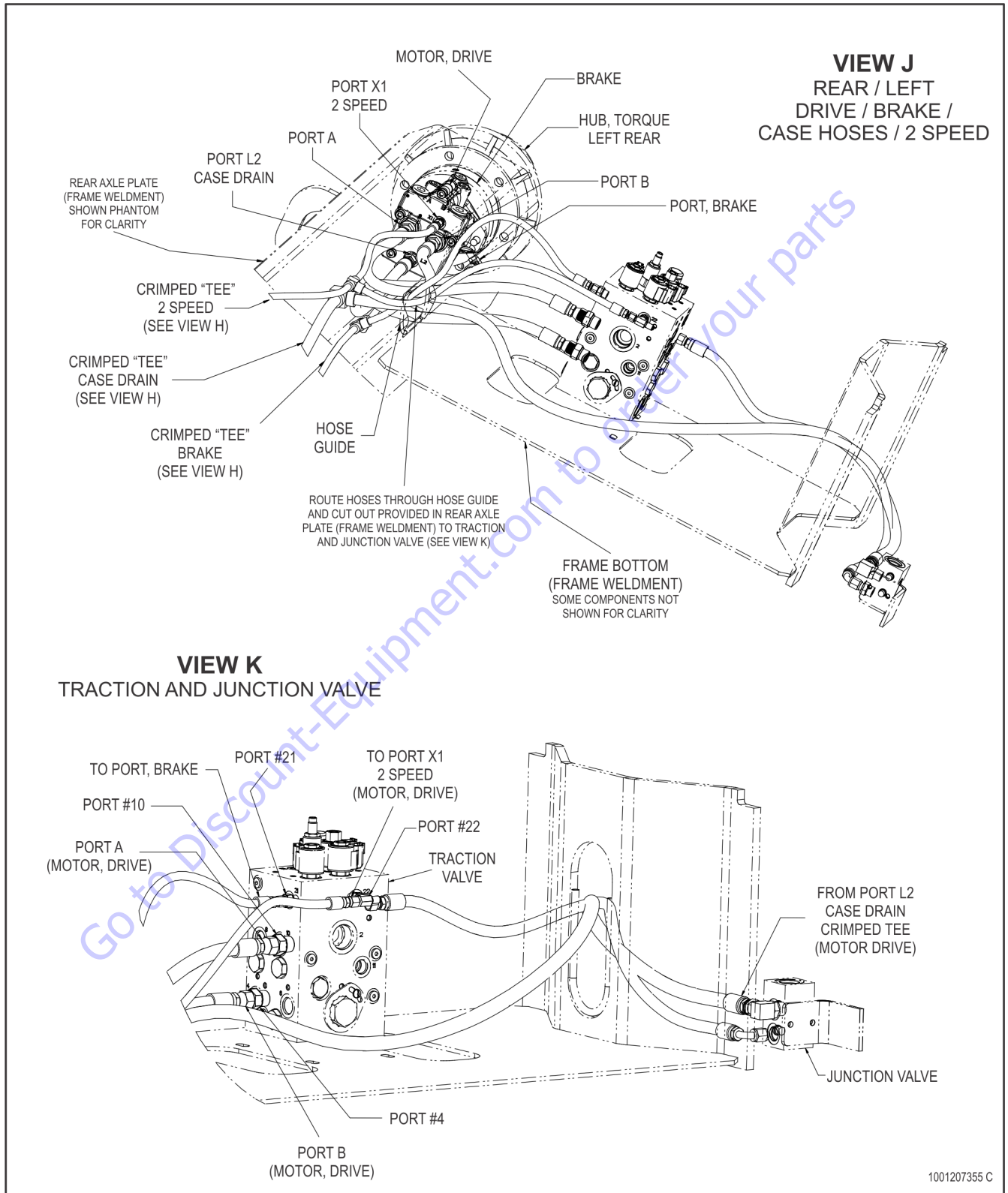


Figure 5-93. Hydraulics Installation - Sheet 13 of 28

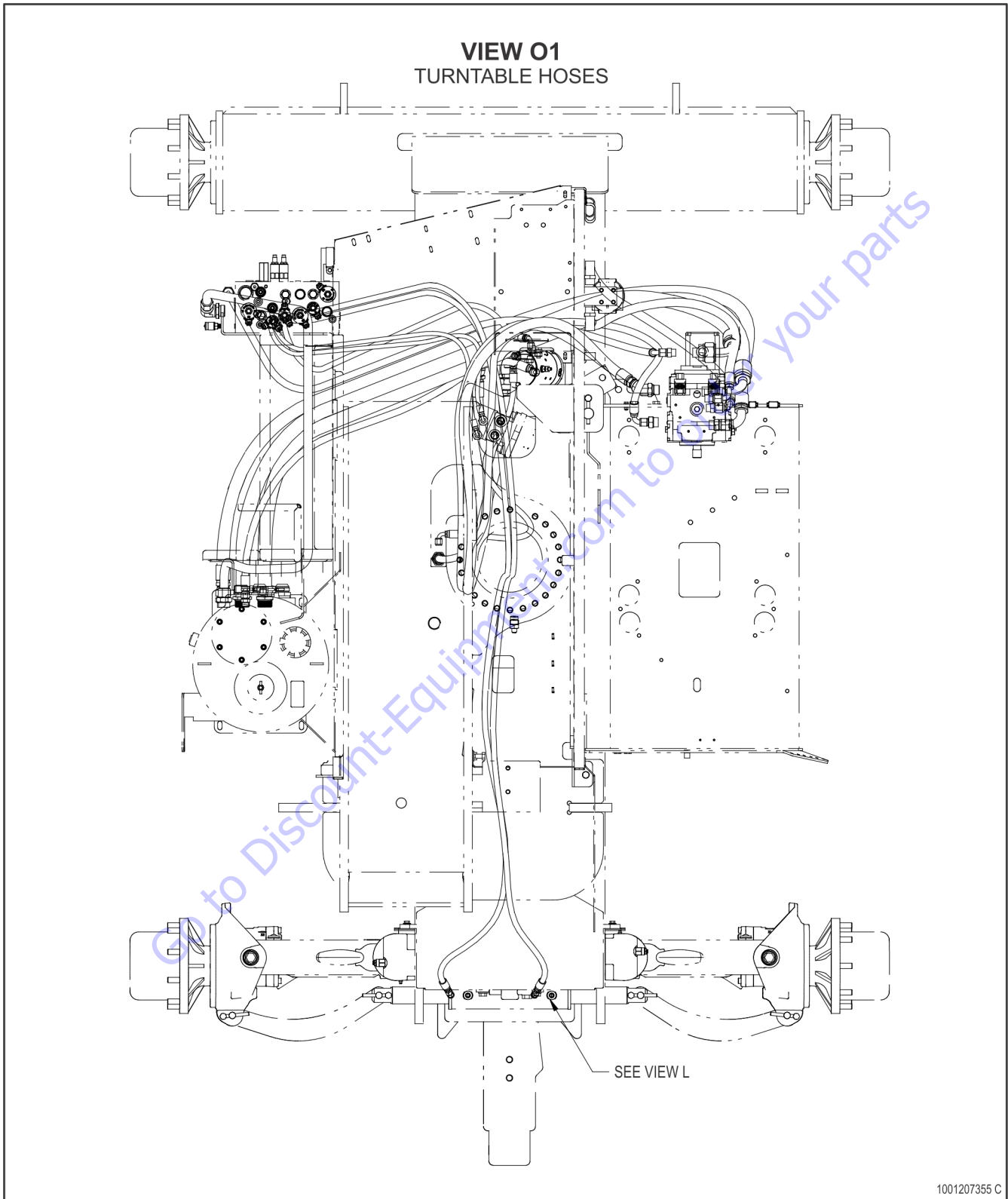


Figure 5-94. Hydraulics Installation - Sheet 14 of 28

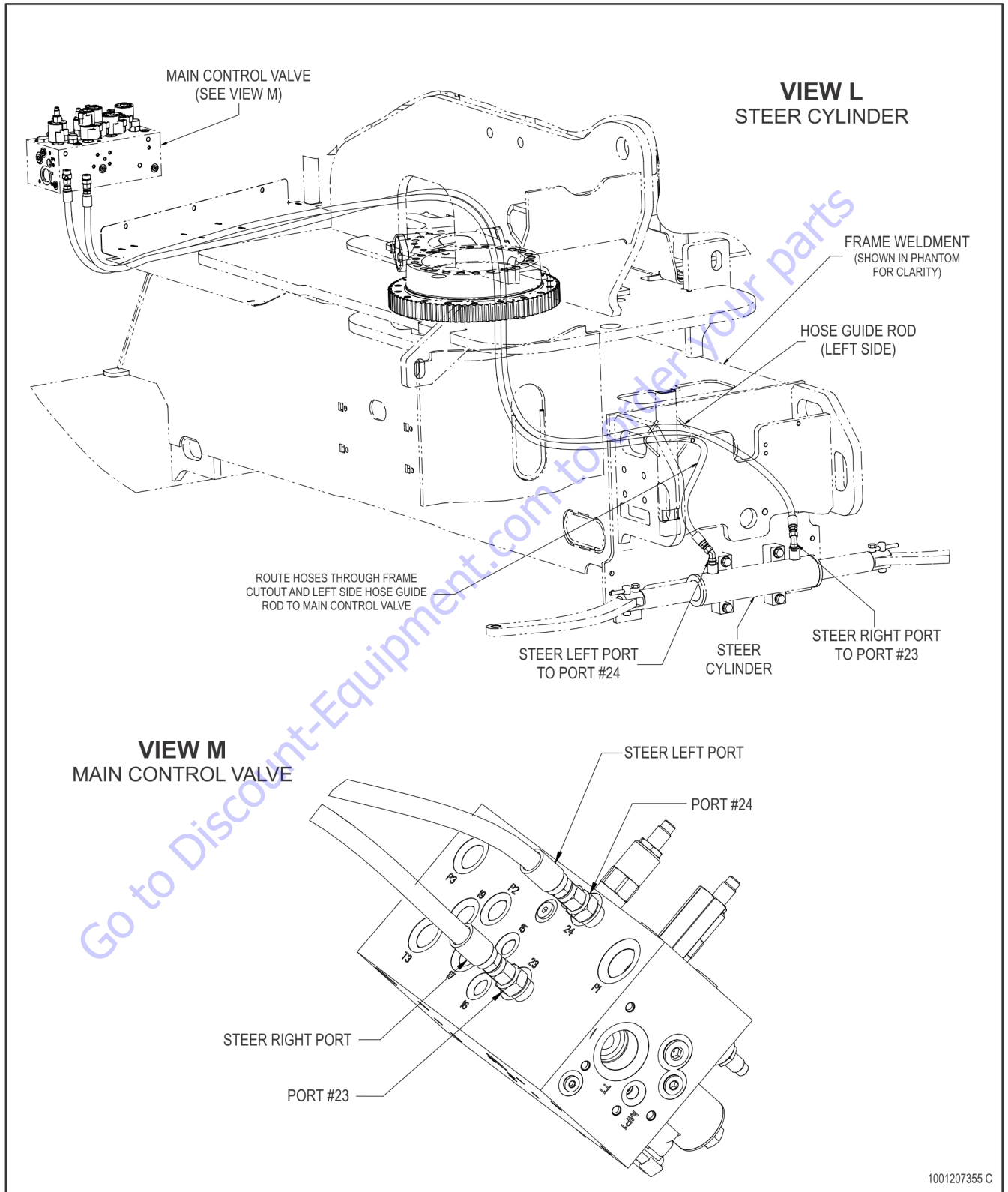


Figure 5-95. Hydraulics Installation - Sheet 15 of 28

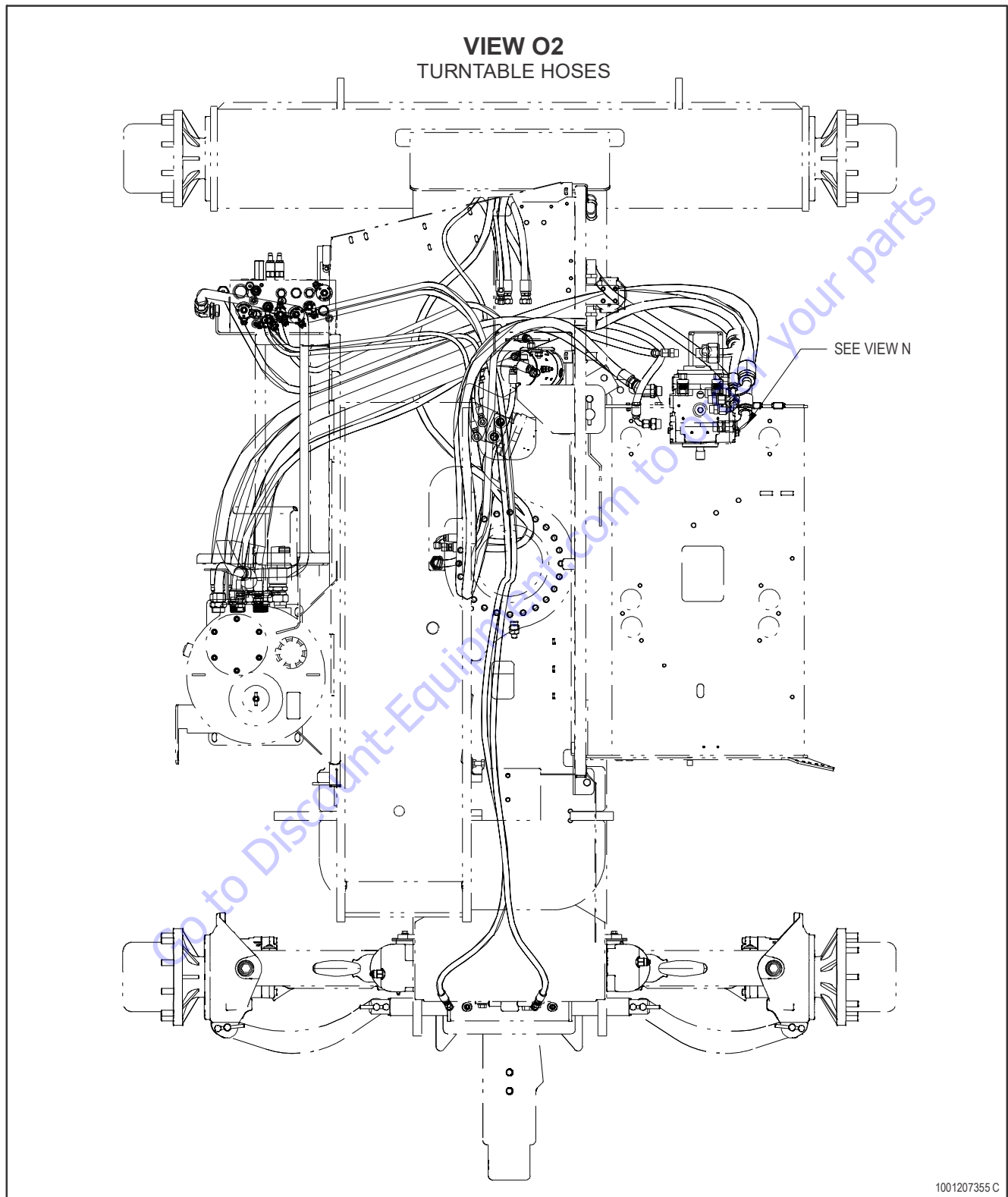


Figure 5-96. Hydraulics Installation - Sheet 16 of 28

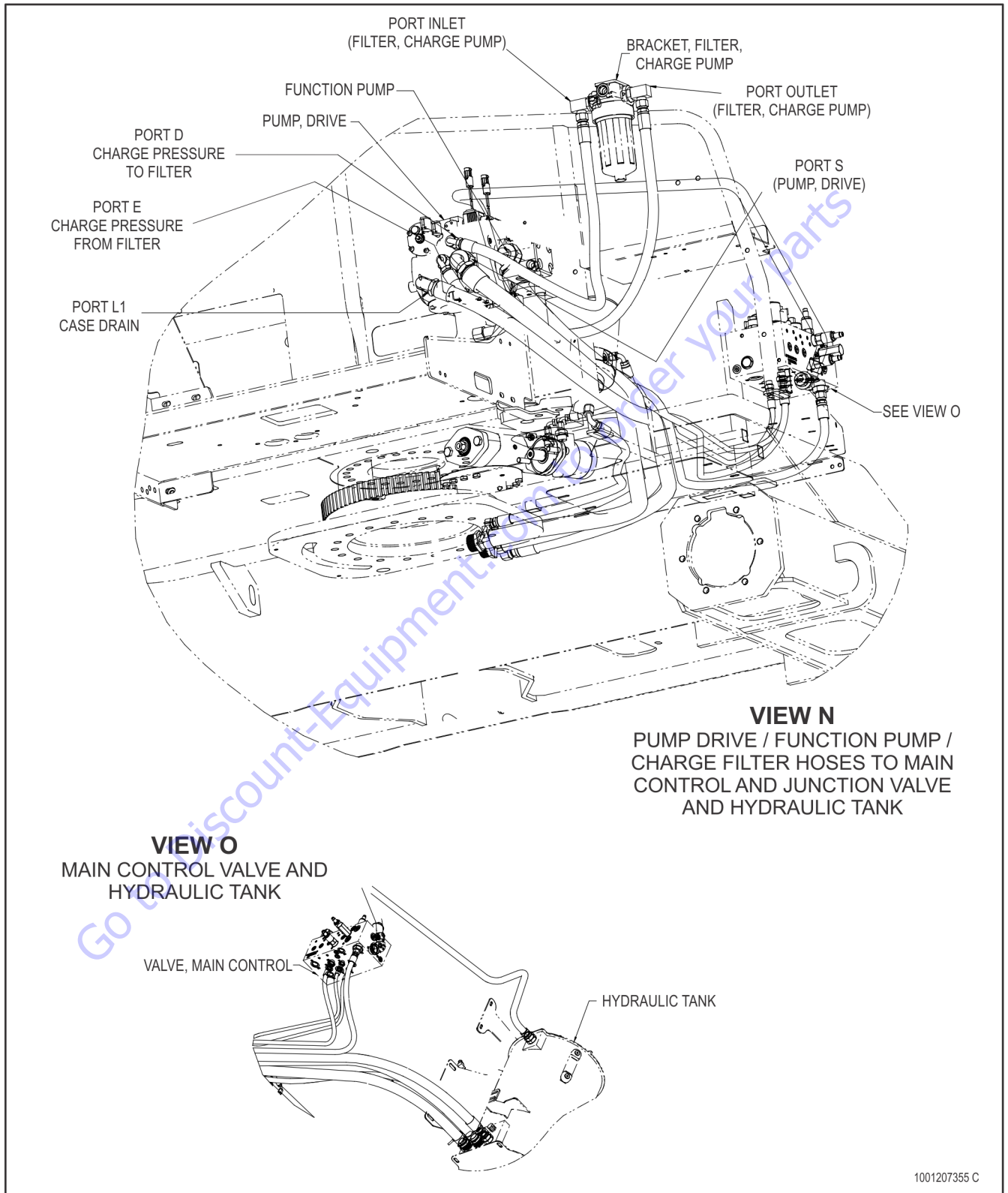


Figure 5-97. Hydraulics Installation - Sheet 17 of 28

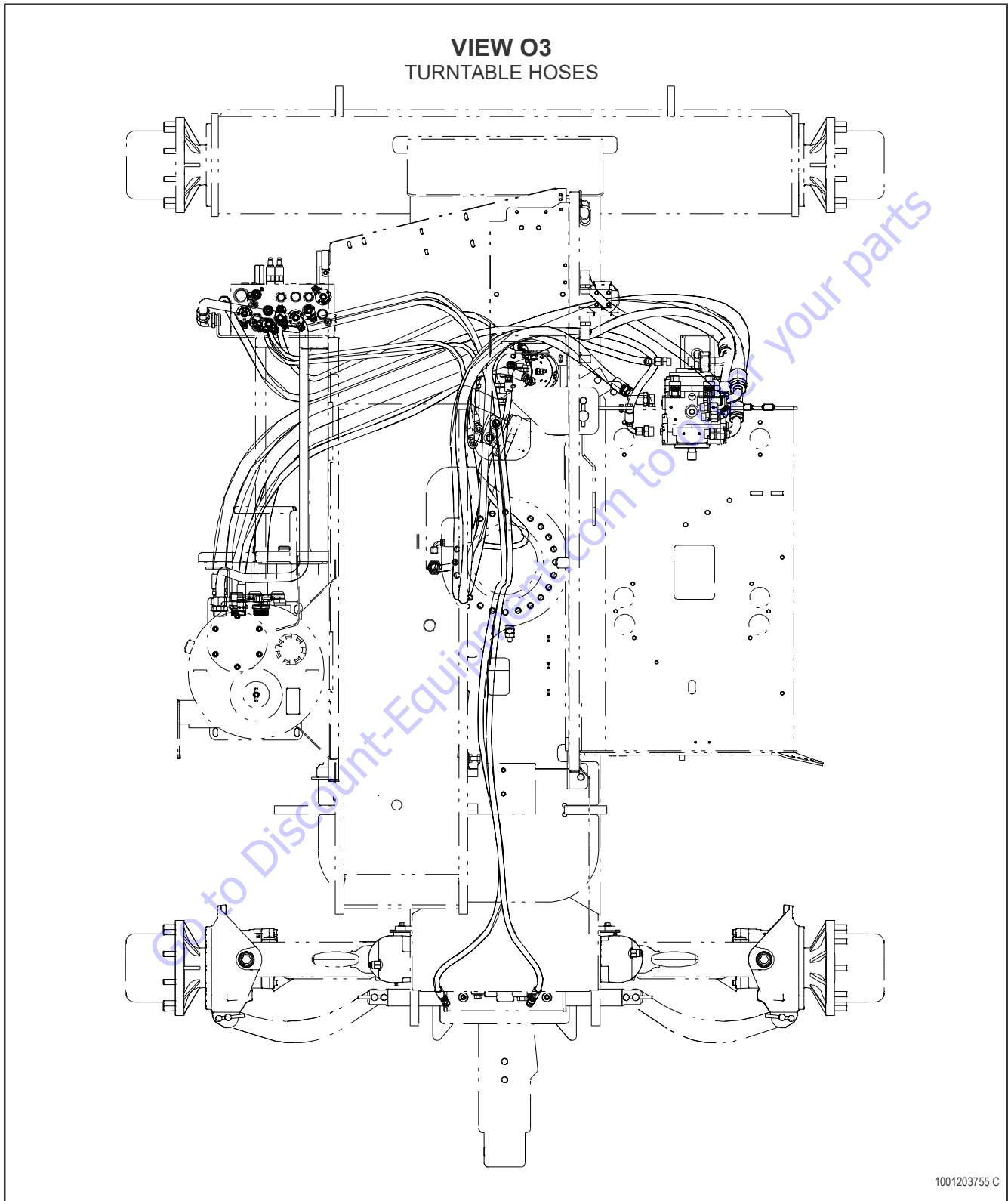


Figure 5-98. Hydraulics Installation - Sheet 18 of 28

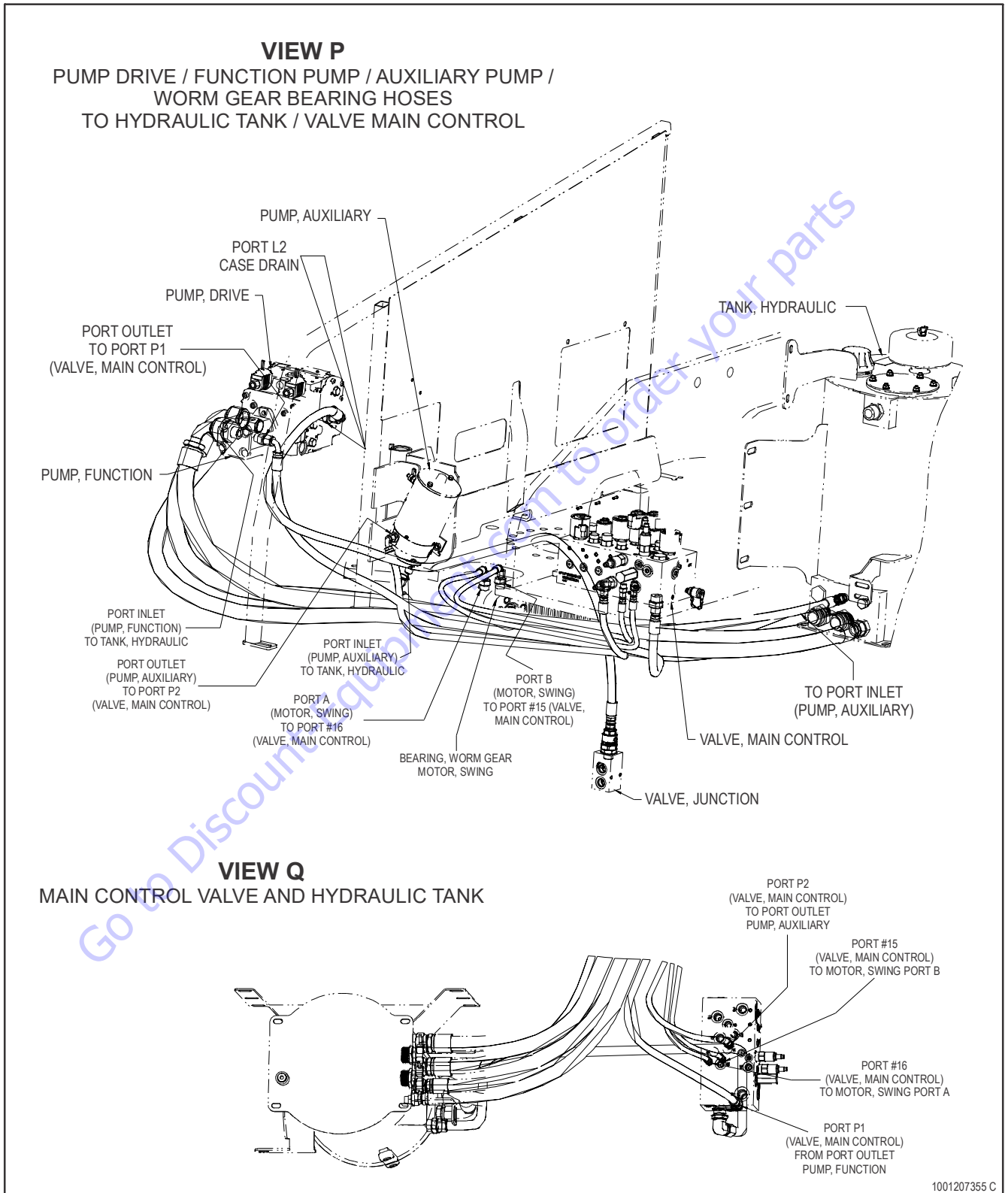
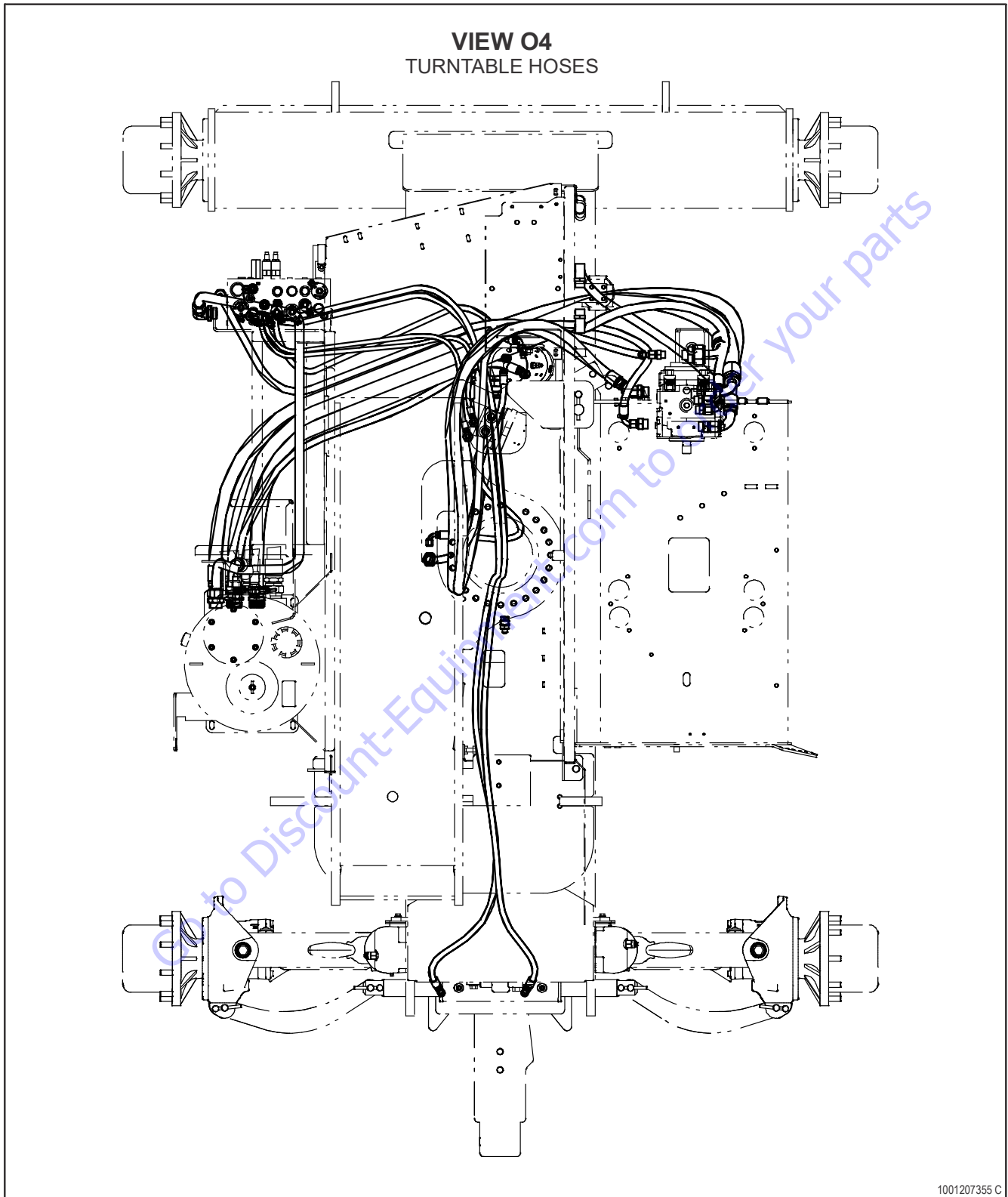


Figure 5-99. Hydraulics Installation - Sheet 19 of 28



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Figure 5-100. Hydraulics Installation - Sheet 20 of 28

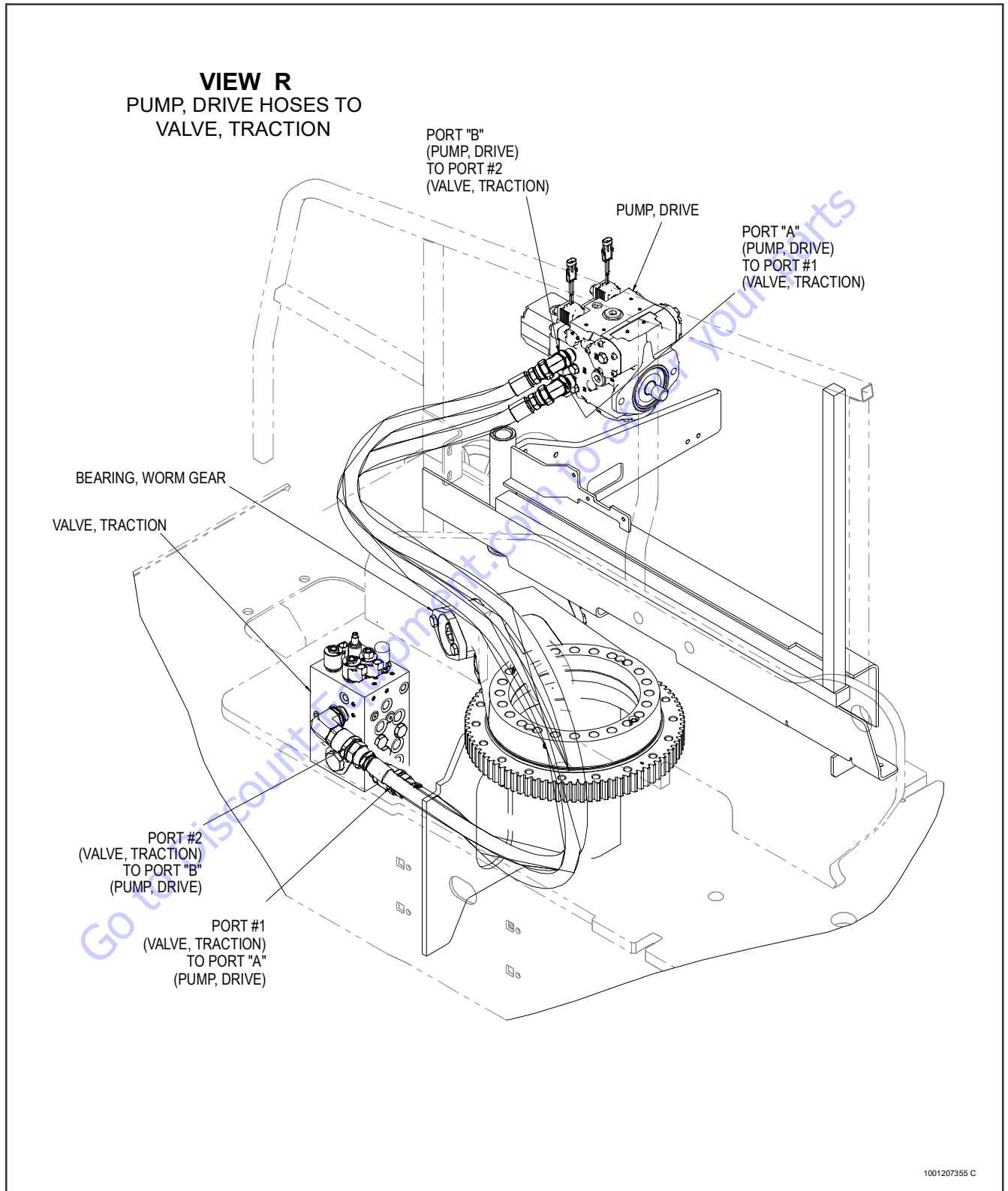


Figure 5-101. Hydraulics Installation - Sheet 21 of 28

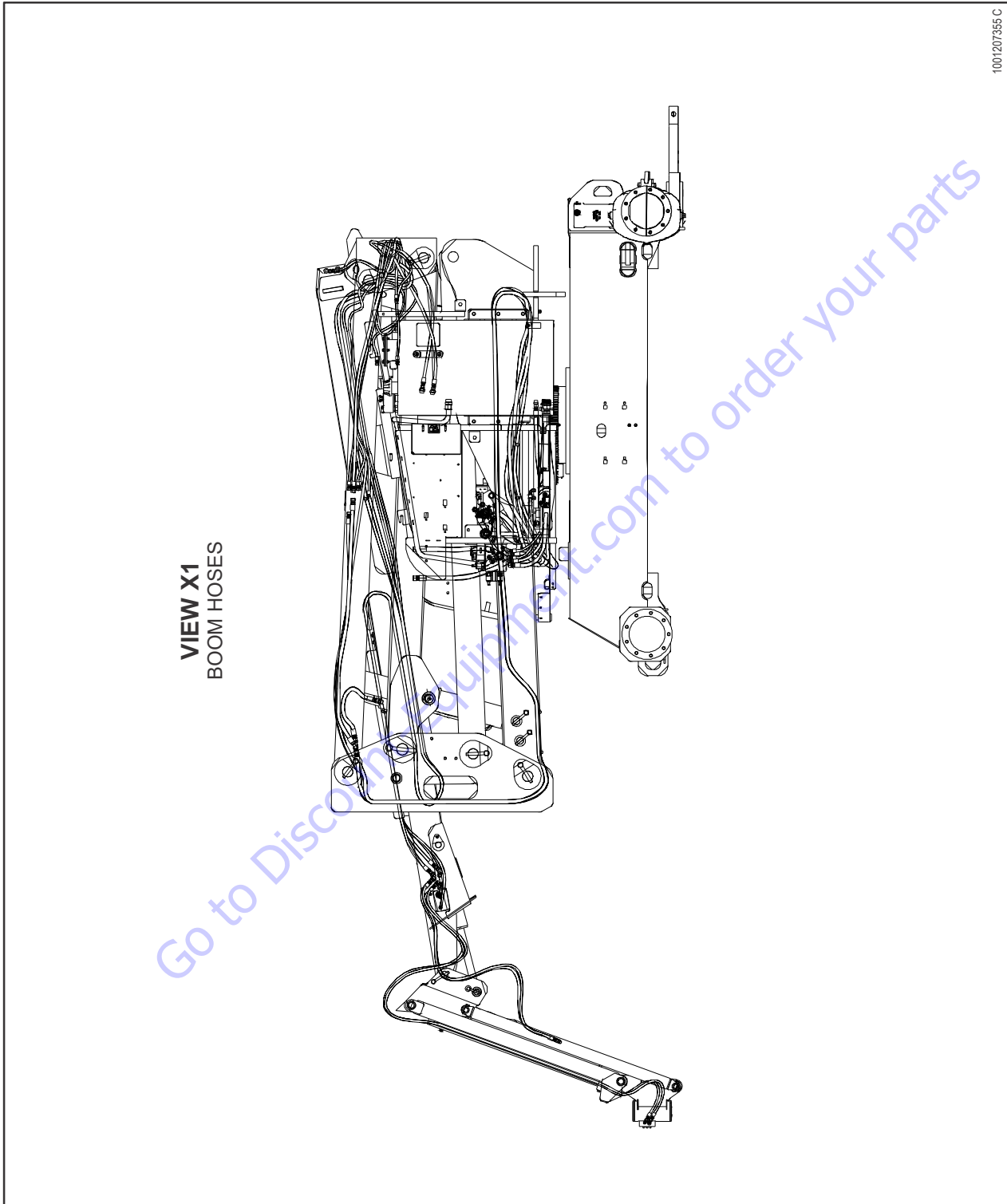


Figure 5-102. Hydraulics Installation - Sheet 22 of 28

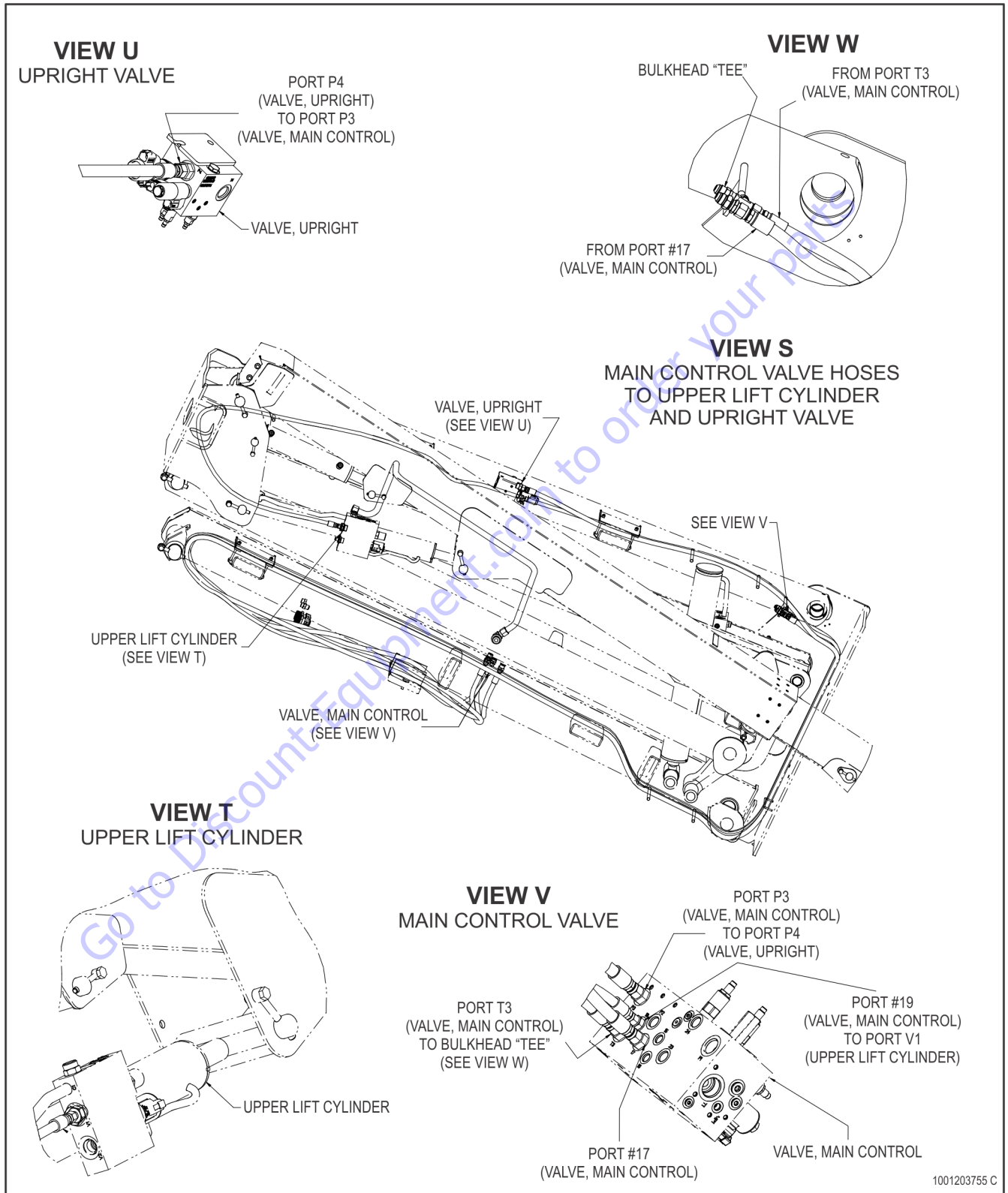


Figure 5-103. Hydraulics Installation - Sheet 23 of 28

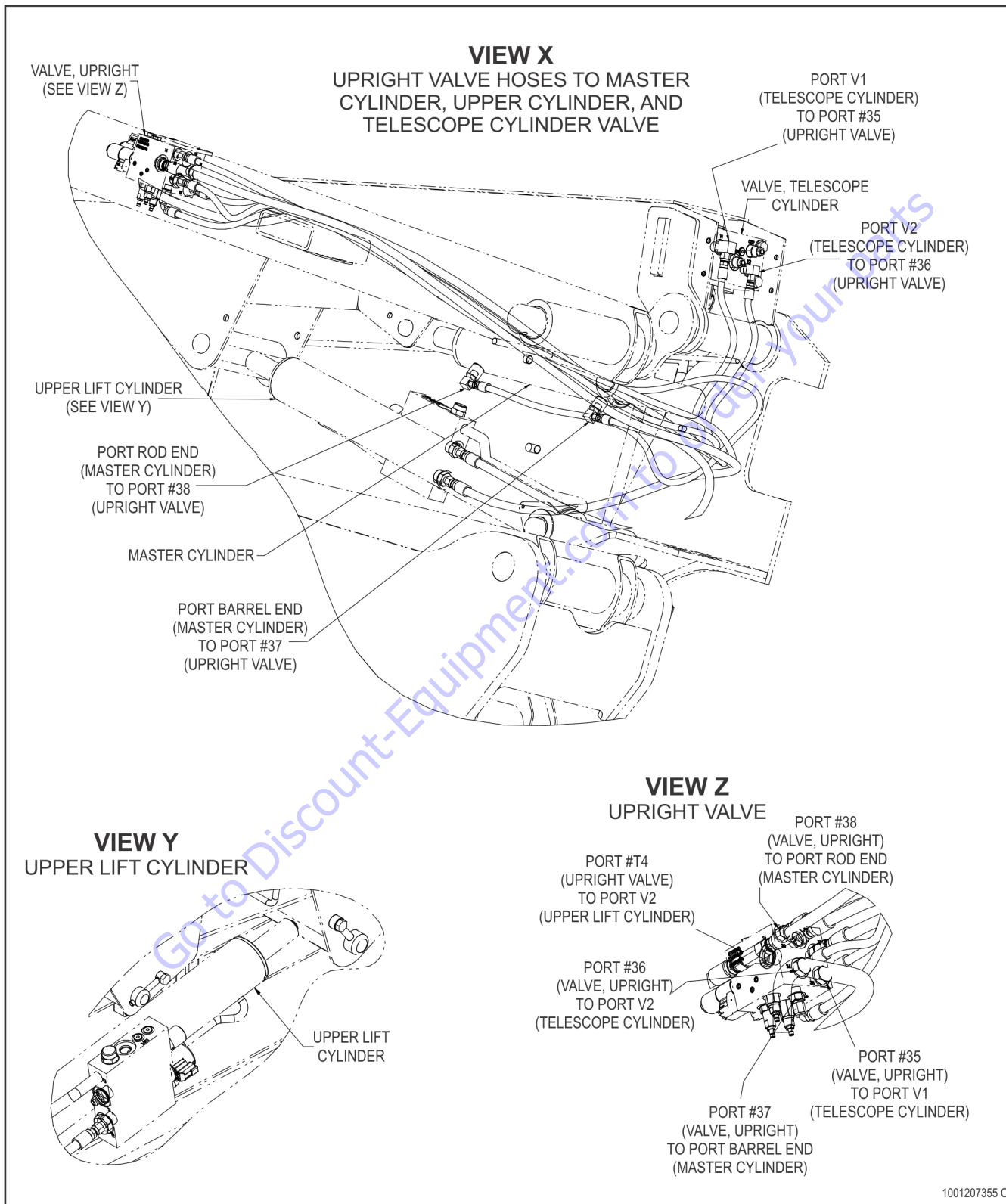


Figure 5-104. Hydraulics Installation - Sheet 24 of 28

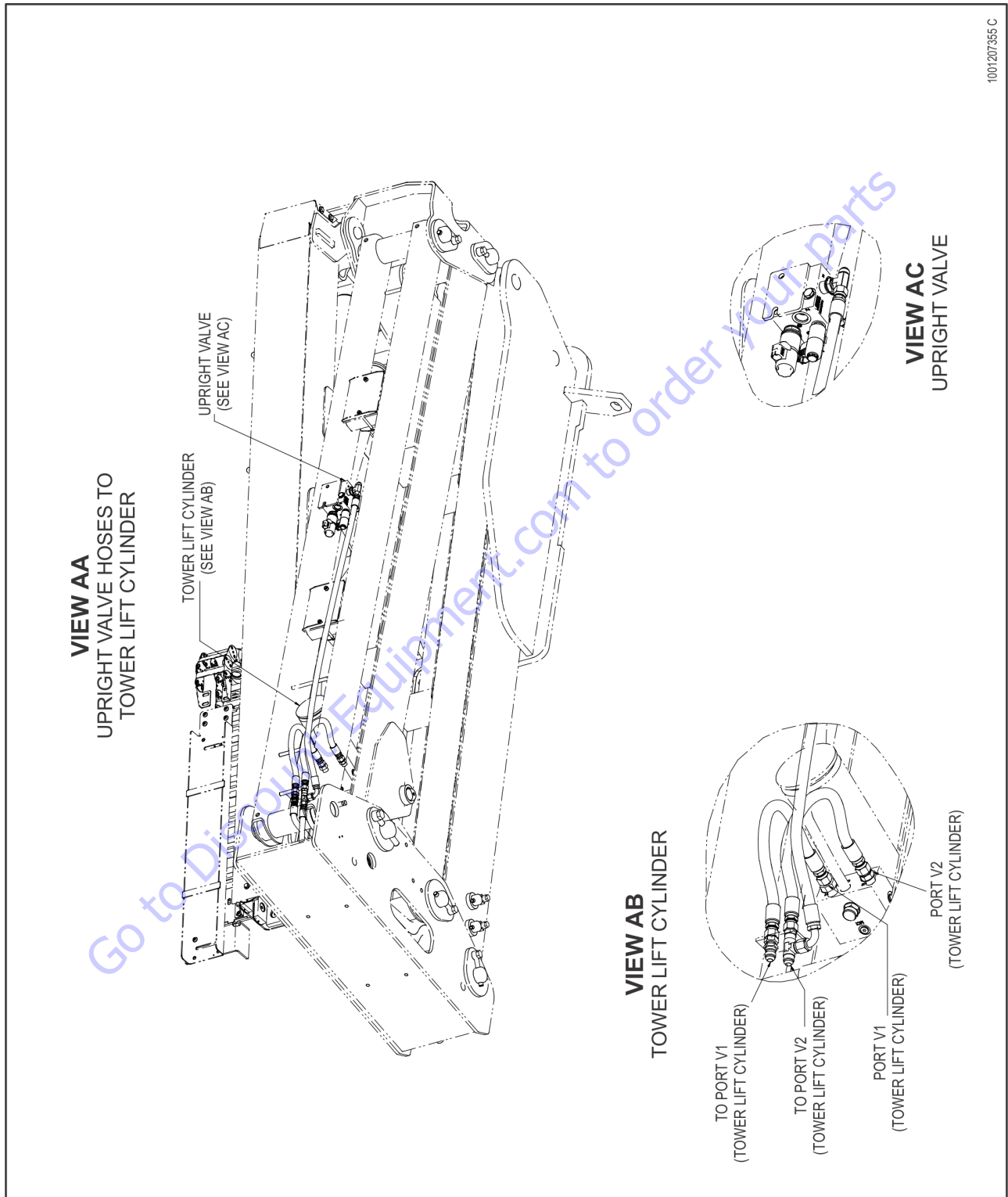


Figure 5-105. Hydraulics Installation - Sheet 25 of 28

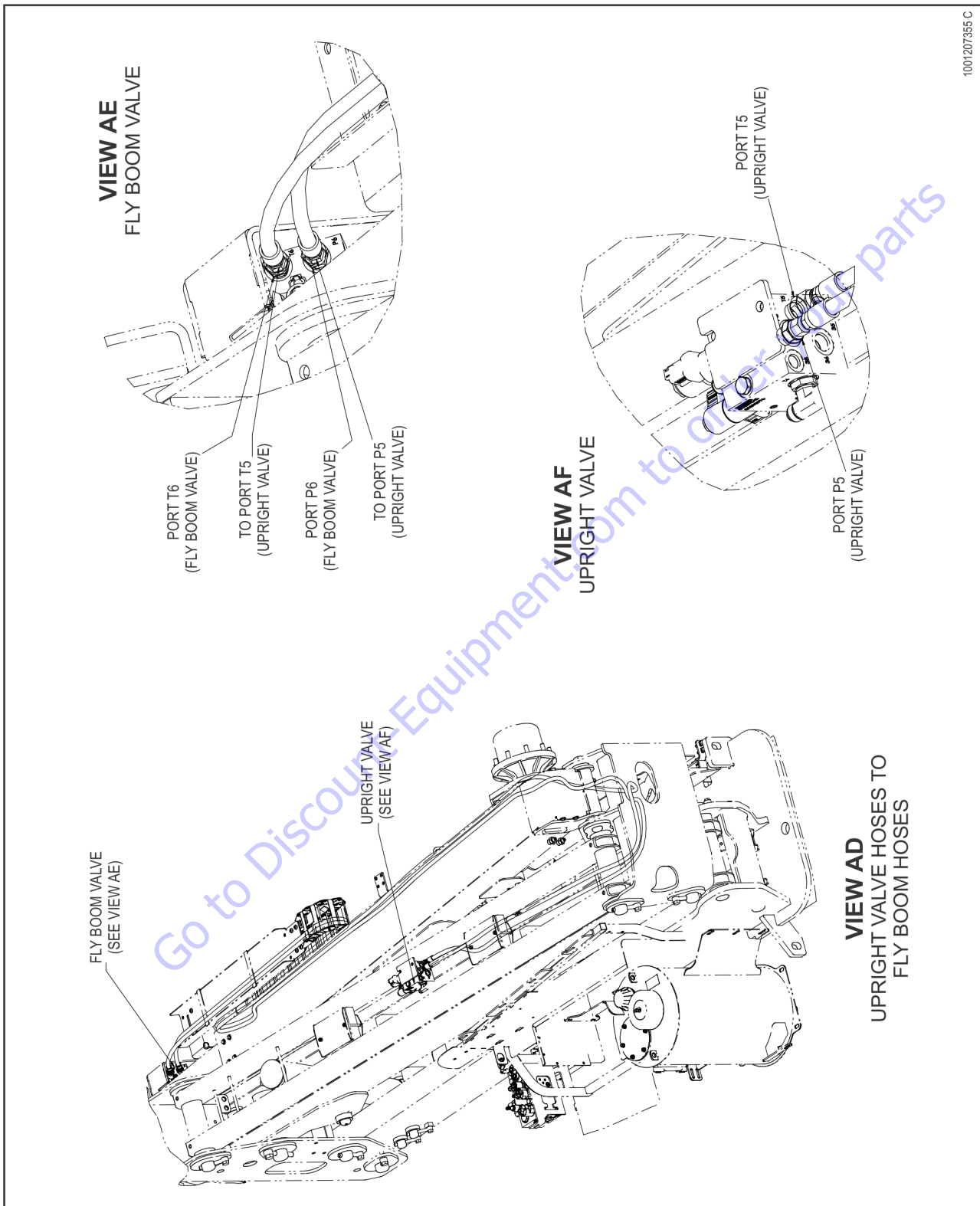


Figure 5-106. Hydraulics Installation - Sheet 26 of 28

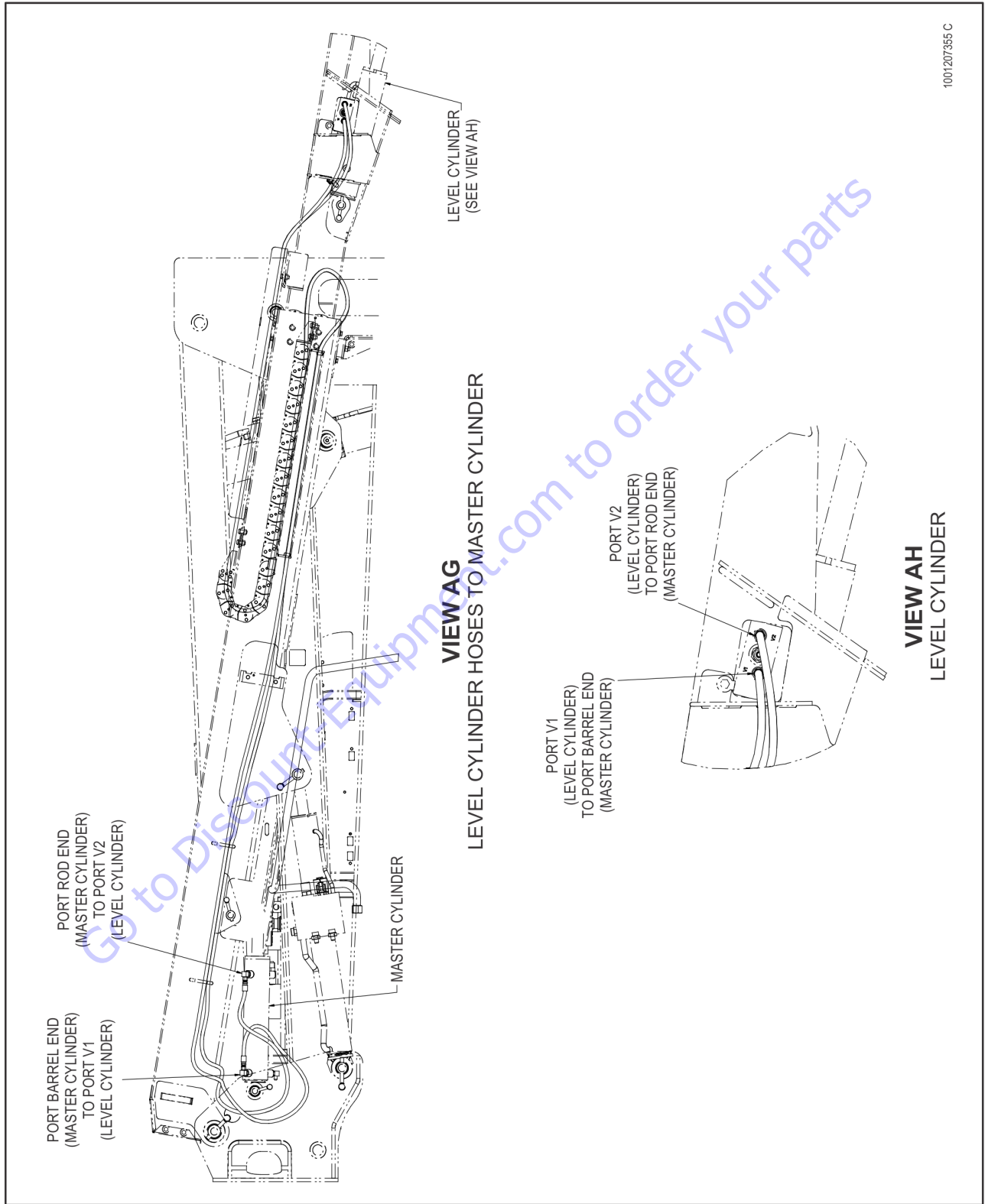


Figure 5-107. Hydraulics Installation - Sheet 27 of 28

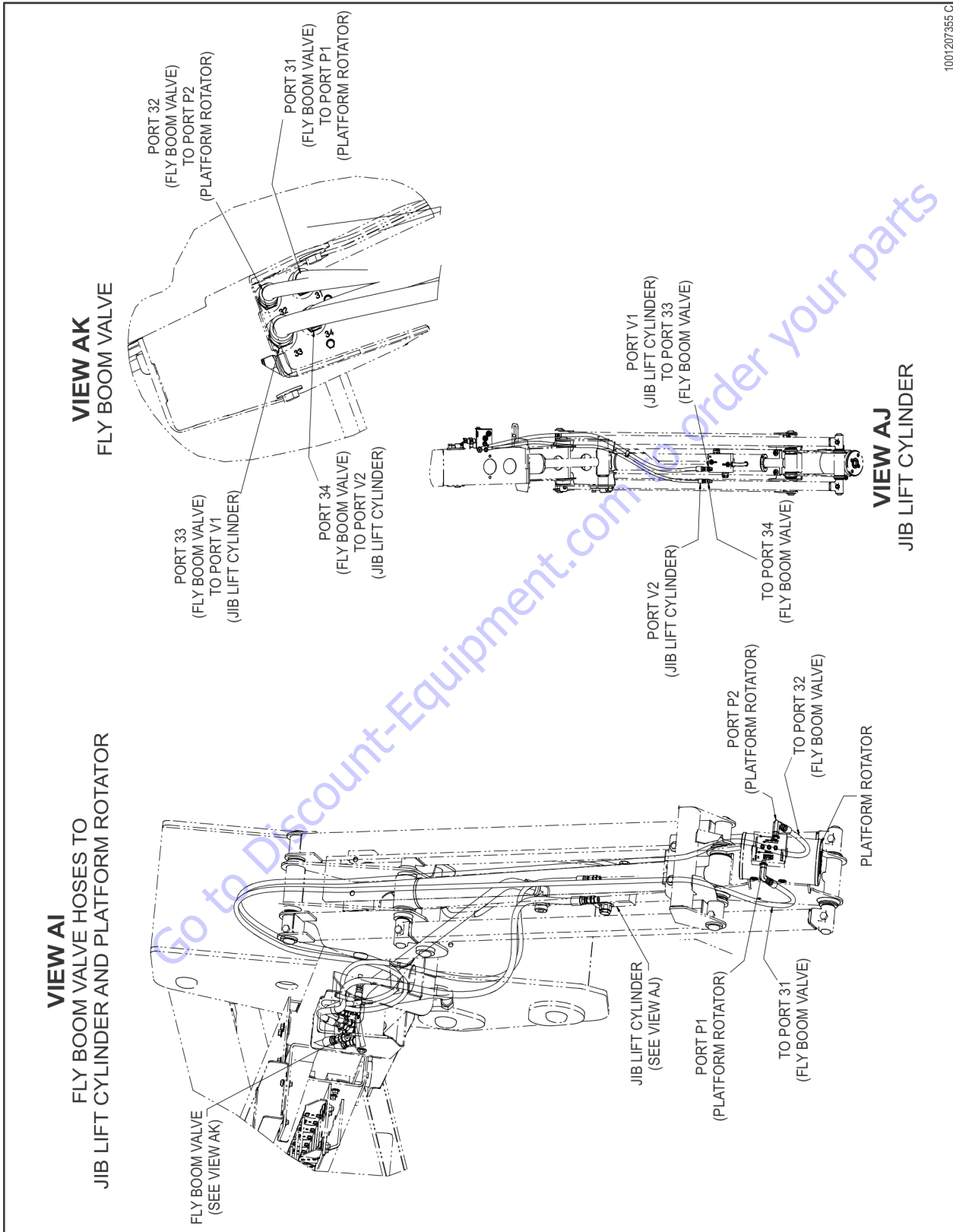


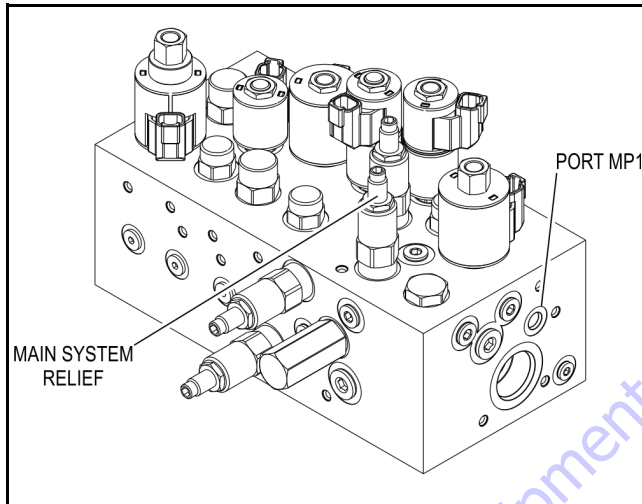
Figure 5-108. Hydraulics Installation - Sheet 28 of 28

5.4 PRESSURE SETTING PROCEDURE

Cold temperatures have a significant impact on pressure readings. JLG Industries Inc. recommends operating the machine until the hydraulic system has warmed to normal operating temperatures prior to checking pressures. JLG Industries Inc. also recommends the use of a calibrated gauge. Pressure readings are acceptable if they are within $\pm 5\%$ of specified pressures.

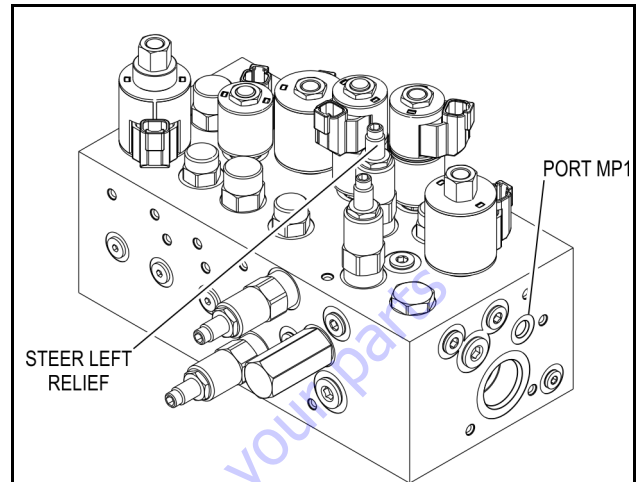
To ensure all pressures are set correctly, the following procedures must be followed.

Main System Relief



1. Install a pressure gauge at port MP1 of the Main Control Valve capable of reading pressures up to 4000 psi (275 Bar).
2. Activate telescope in function continuously at end of stroke. Pressure that is observed should be 3000 ± 75 psi (207 ± 6 Bar).
3. If necessary, loosen jam nut and adjust the Main System Relief valve clockwise to increase and counterclockwise to decrease.

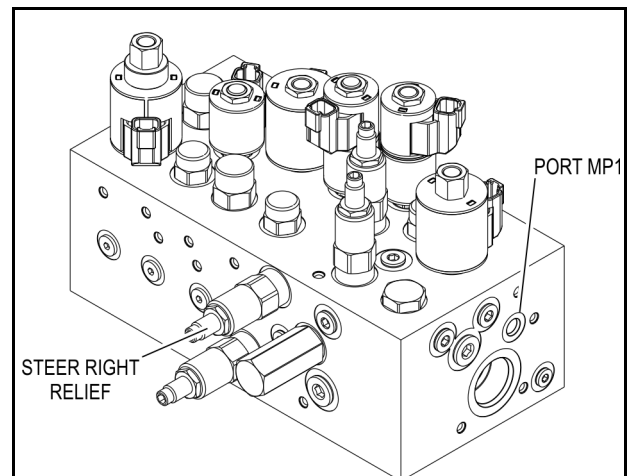
Steer Left Relief



1. Install a pressure gauge at port MP1 of the Main Control Valve capable of reading pressures up to 4000 psi (275 Bar).
2. Activate Steer Left function continuously at end of stroke. Pressure that is observed should be 2750 ± 75 psi (190 ± 6 Bar).
3. If necessary, loosen jam nut and adjust the Steer Left Relief valve clockwise to increase and counterclockwise to decrease.

NOTE: Steer left pressure at port 24 is 2500 psi (173 Bar); a gauge may be placed there for troubleshooting.

Steer Right Relief



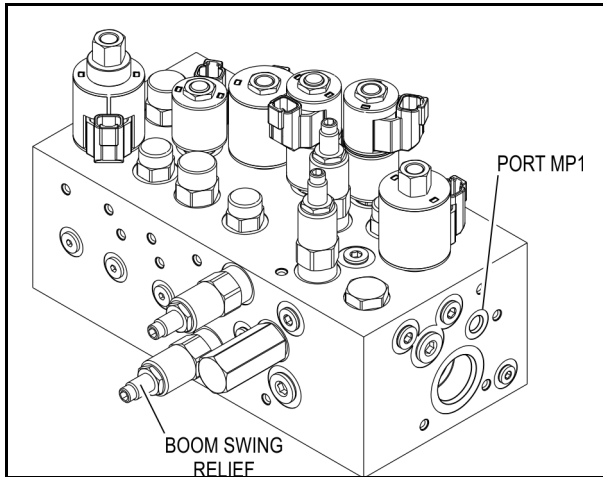
1. Install a pressure gauge at port MP1 of the Main Control Valve capable of reading pressures up to 4000 psi (275 Bar).
2. Activate Steer Right function continuously at end of stroke. Pressure that is observed should be 2750 ± 75 psi (190 ± 6 Bar).

SECTION 5 - BASIC HYDRAULICS INFORMATION & SCHEMATICS

3. If necessary, loosen jam nut and adjust the Steer Right Relief valve clockwise to increase and counterclockwise to decrease.

NOTE: Steer Right pressure at port 23 is 2500 psi (173 Bar); a gauge may be placed there for troubleshooting.

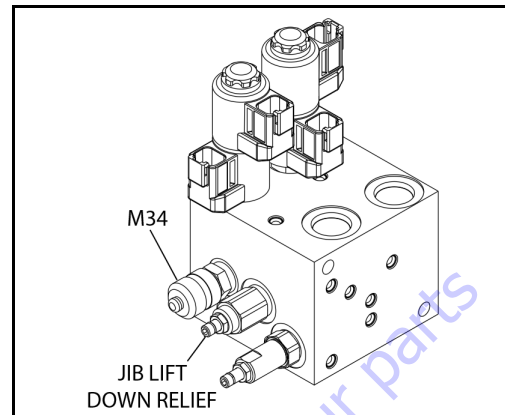
Swing Relief



1. Install a pressure gauge at port MP1 of the Main Control Valve capable of reading pressures up to 3000 psi (207 Bar).
2. Activate Boom Swing Right or Left function continuously against the stop or lock. Pressure that is observed should be 1800 ± 50 psi (125 ± 4 Bar).
3. If necessary, loosen jam nut and adjust the Boom Swing Relief valve clockwise to increase and counterclockwise to decrease.

NOTE: Boom Swing Right pressure at port 15 and Boom Swing Left pressure at port 16 is 1700 psi (117 Bar); a gauge may be placed there for troubleshooting.

Jib Lift Down Relief

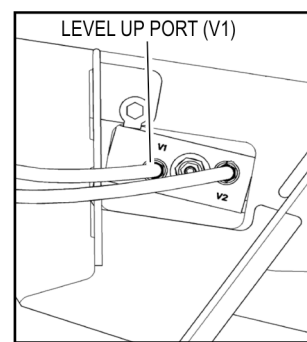


1. Install a pressure gauge at port M34 of the Jib Control Valve capable of reading pressures up to 3000 psi (207 Bar).
2. Activate Jib Lift Down function continuously at end of stroke.
3. Pressure that is observed should be 1500 ± 50 psi (104 ± 4 Bar).
4. If necessary, loosen jam nut and adjust the Jib Lift Down Relief valve clockwise to increase and counterclockwise to decrease.

Platform Level Up Relief

The Platform Level Up relief is preset and does not normally need checked or adjusted. If necessary, the following procedure may be utilized for troubleshooting purposes:

1. With the tower boom fully lowered, lift the main boom up several degrees from the fully lowered position. Ensure that there is still access to the level cylinder.
2. Remove the hose from the Level Up port of the Level Cylinder (V1 Port) - Install a pressure gauge capable of reading pressures up to 4000 psi (275 Bar) onto this hose and cap or plug the port in the Level Cylinder.



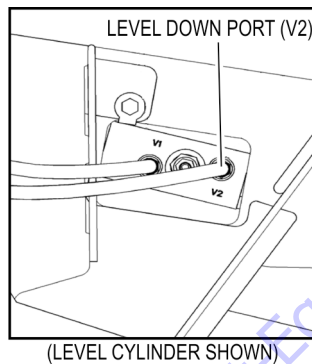
(LEVEL CYLINDER SHOWN)

3. Activate Main Boom Lift Down function using Axillary Mode continuously until fully lowered.
4. Pressure that is observed should be 3400 ± 85 psi (234 ± 6 Bar).
5. If necessary, loosen jam nut and adjust the Platform Level Up Relief valve clockwise to increase and counterclockwise to decrease.
6. Remove the gauge and reinstall the hose.

Platform Level Down Relief

The Platform Level Down relief is preset and does not normally need checked or adjusted. If necessary, the following procedure may be utilized for troubleshooting purposes:

1. With the tower boom fully lowered, lift the main boom down until fully lowered.
2. Remove the hose from the Level Down port of the Level Cylinder (V2 Port) - Install a pressure gauge capable of reading pressures up to 3000 psi (207 Bar) onto this hose and cap or plug the port in the Level Cylinder.

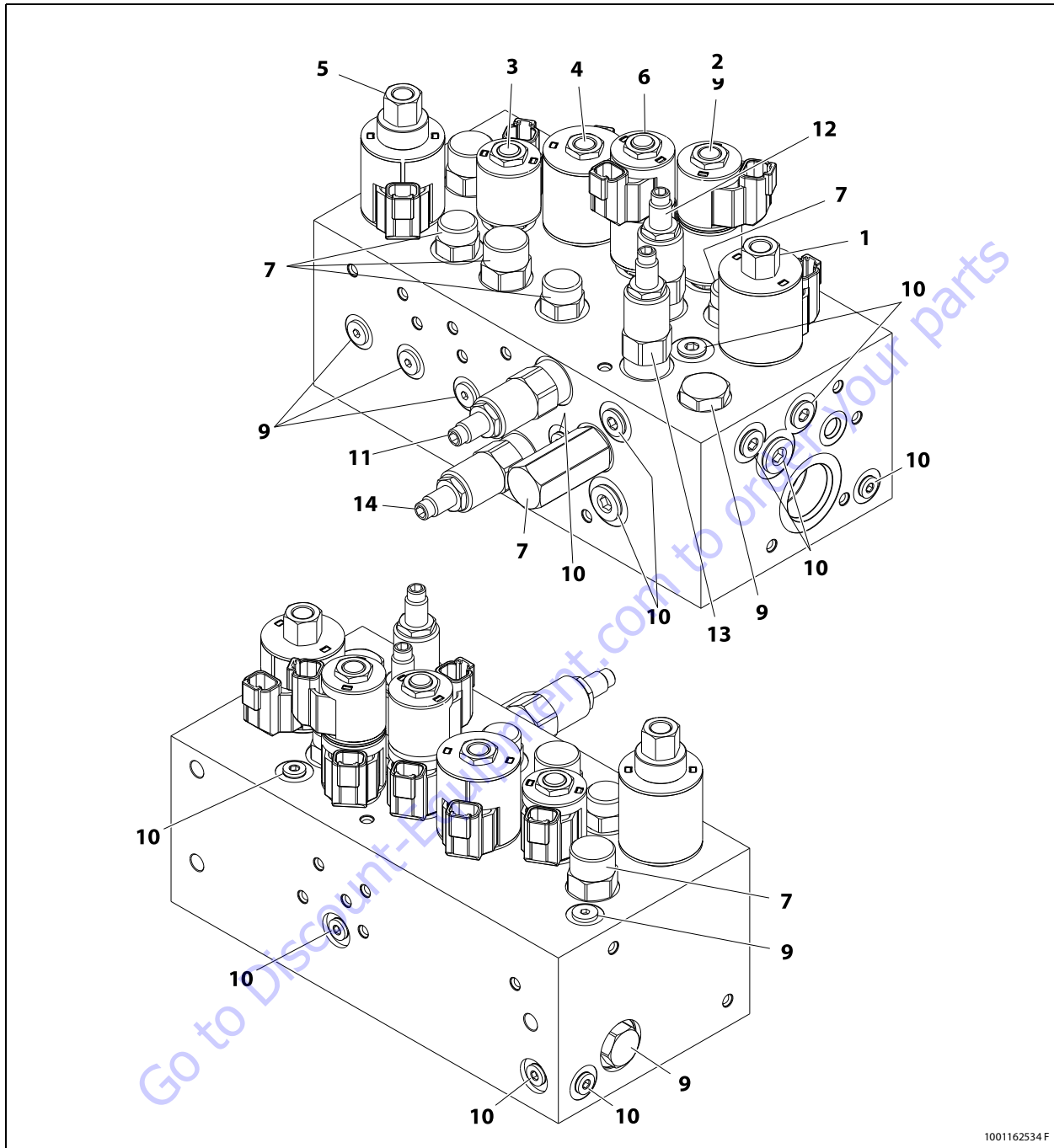


3. Activate Platform Level Down function continuously.
4. Pressure that is observed should be 2000 ± 50 psi (138 ± 4 Bar). If necessary, loosen jam nut and adjust the Platform Level Down Relief valve clockwise to increase and counterclockwise to decrease.
5. Remove the gauge and reinstall the hose.

5.5 DRIVE PUMP PRE-FILL PROCEDURE

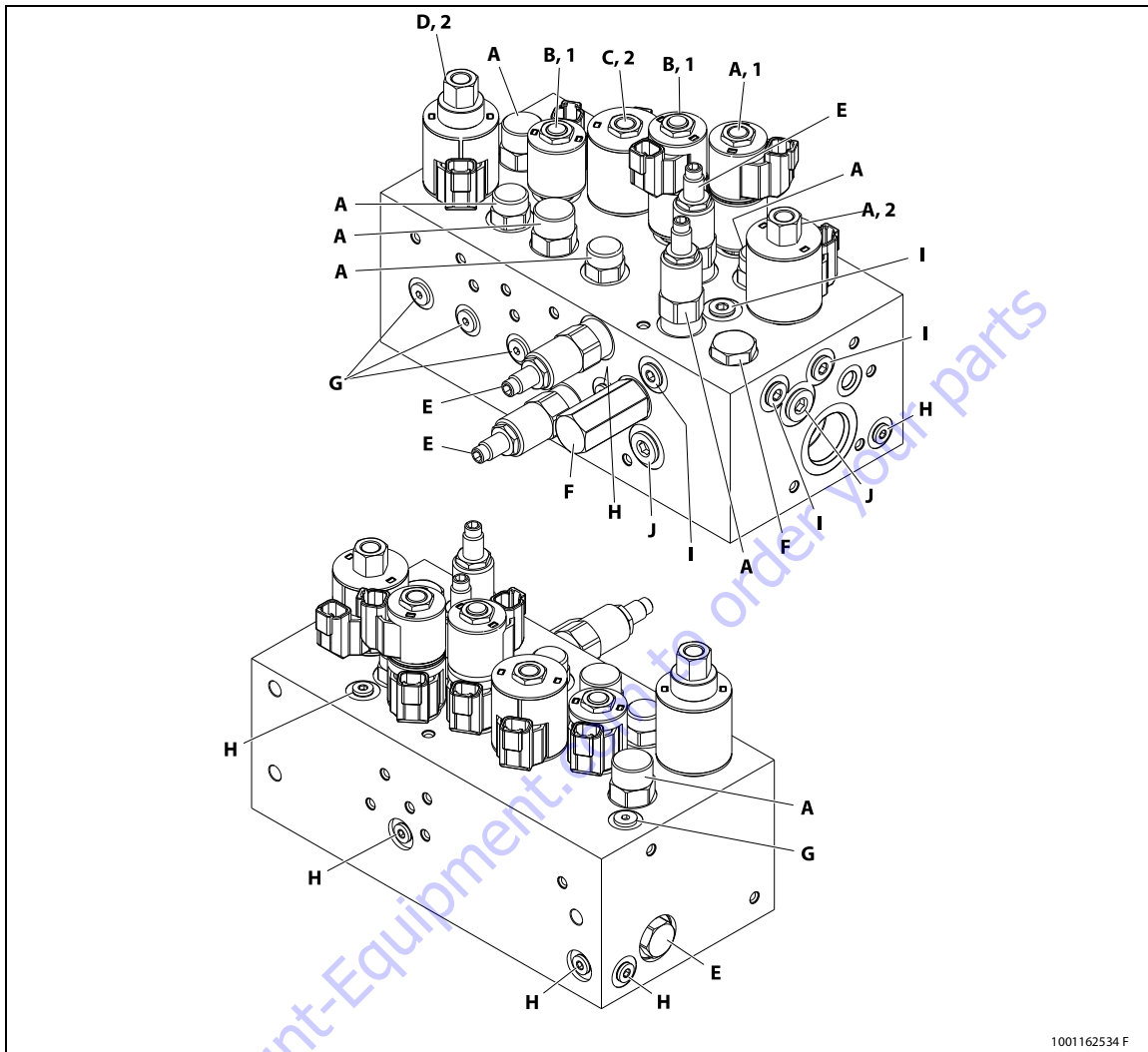
The case of the hydraulic drive pump, MUST be pre-filled before starting the engine. Failure to do so can cause premature failure of the pump.

1. Fill the hydraulic reservoir.
2. Determine if the hydraulic oil tank sight level gauge is higher than other hydraulic components.
 - a. Determine if the hydraulic oil tank sight level gauge is higher than the hydraulic drive pump assembly.
 - b. Determine if the hydraulic oil tank sight level gauge is higher than all hydraulic hose loops or routings between the hydraulic tank and the drive pump assembly.
 - c. If sight level gauge is the highest hydraulic oil level point, proceed to step 3.
 - d. If sight level gauge is NOT the highest hydraulic oil level point, low pressure air may need to be applied to the hydraulic oil tank (fill cap via air regulator) in conjunction with step 4 to get hydraulic oil to move over the air locks created by these high spots.
3. If the machine is be equipped with a hydraulic oil cooler option:
 - a. Determine if there is a hydraulic 'tee' fitting installed at the hydraulic drive pump that has a 'cap' fitting attached to it. (this will generally be at or near the top of the hydraulic drive pump body). This 'cap' fitting is to be used to manually fill the hydraulic drive pump case.
 - b. Remove 'cap' fitting.
 - c. Fill hydraulic drive pump case with hydraulic oil.
 - d. Reattach and torque 'cap' fitting.
 - e. Prefilling of the hydraulic drive pump w/oil cooler option is complete (Step #4 can be omitted at this point.)
4. If machine is NOT equipped with a hydraulic oil cooler option,
 - a. Locate a case access port on the hydraulic drive pump. Preferably one located at or near the top or upper sides of the pump.
 - b. Using the proper wrench, remove the O-ring plug to allow air to escape from the hydraulic drive pump case.
 - c. Hydraulic oil will flow by gravity from the hydraulic tank to the drive pump.
 - d. When hydraulic oil starts to flow out this port, the pump is full.
 - e. Re-install the O-ring plug and torque.
5. Pre-filling of the hydraulic drive pump is complete.



- | | | |
|------------------------|--------------------|------------------------|
| 1. Main Dump Valve | 6. Swing Valve | 11. Steer Right Relief |
| 2. Steer Valve | 7. Cartridge Valve | 12. Steer Left Relief |
| 3. Main Lift Up Valve | 8. Relief Valve | 13. Main System Relief |
| 4. Tower Lift Up Valve | 9. Check Valve | 14. Boom Swing Relief |
| 5. Flow Control Valve | 10. Plug | |

Figure 5-109. Main Control Valve Identification



1001162534 F

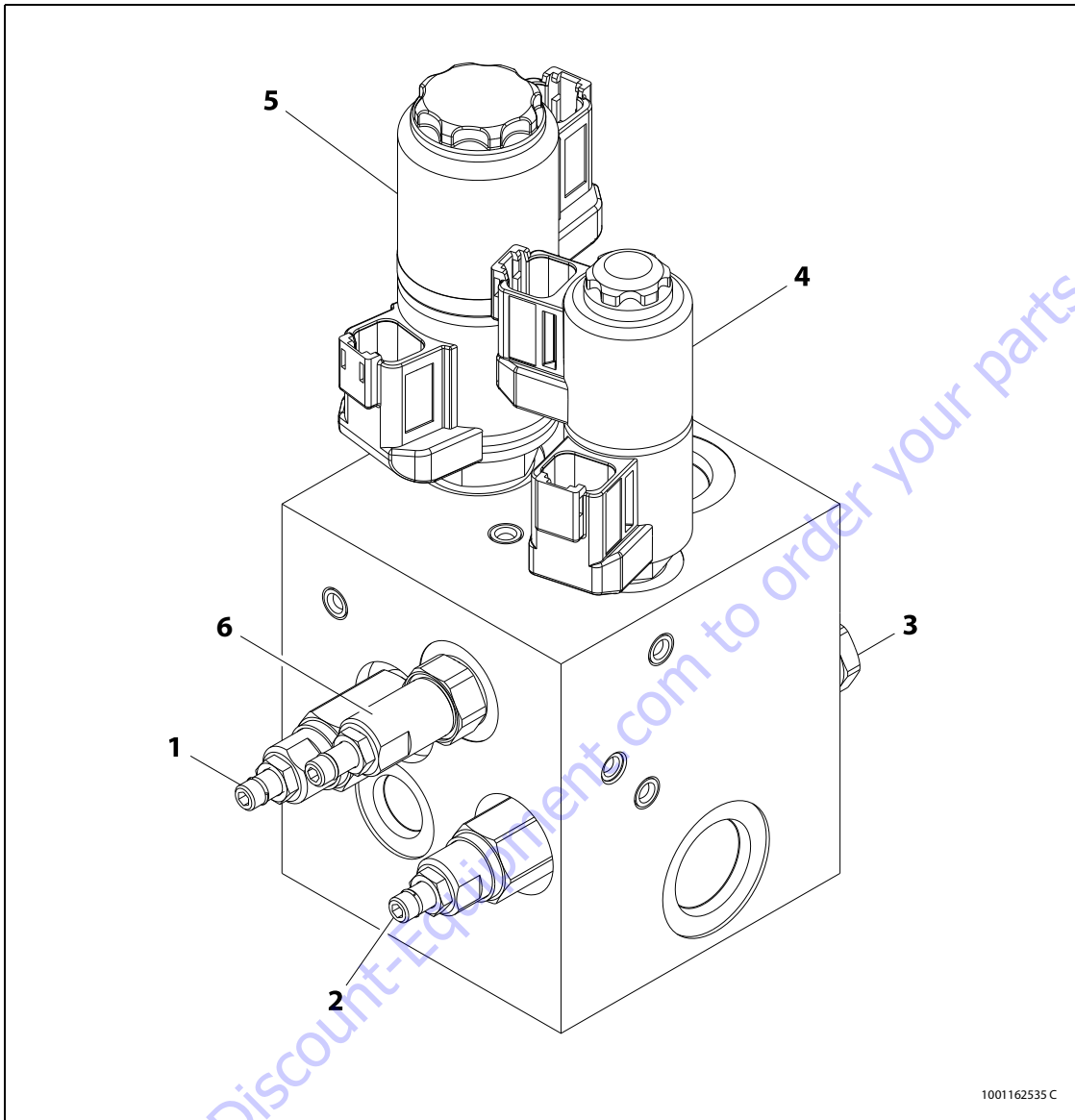
Table 5-33. Cartridge Torque Values

	Ft. lbs.	Nm
A	38	51
B	40	54
C	48	65
D	50	67
E	28	38
F	43	58
G	13	18
H	8	11
I	12	16
J	30	41

Table 5-34. Coil Torque Values

	Ft. lbs.	Nm
1	4.5	6
2	6	8

Figure 5-110. Main Control Valve Torque Values



1001162535 C

- | | |
|-------------------------------|---------------------------------|
| 1. Cartridge Valve | 4. Cartridge Valve Without Coil |
| 2. Platform Level Down Relief | 5. Cartridge Valve Without Coil |
| 3. Relief Valve | 6. Platform Level Down Relief |

Figure 5-111. Upright Valve Identification

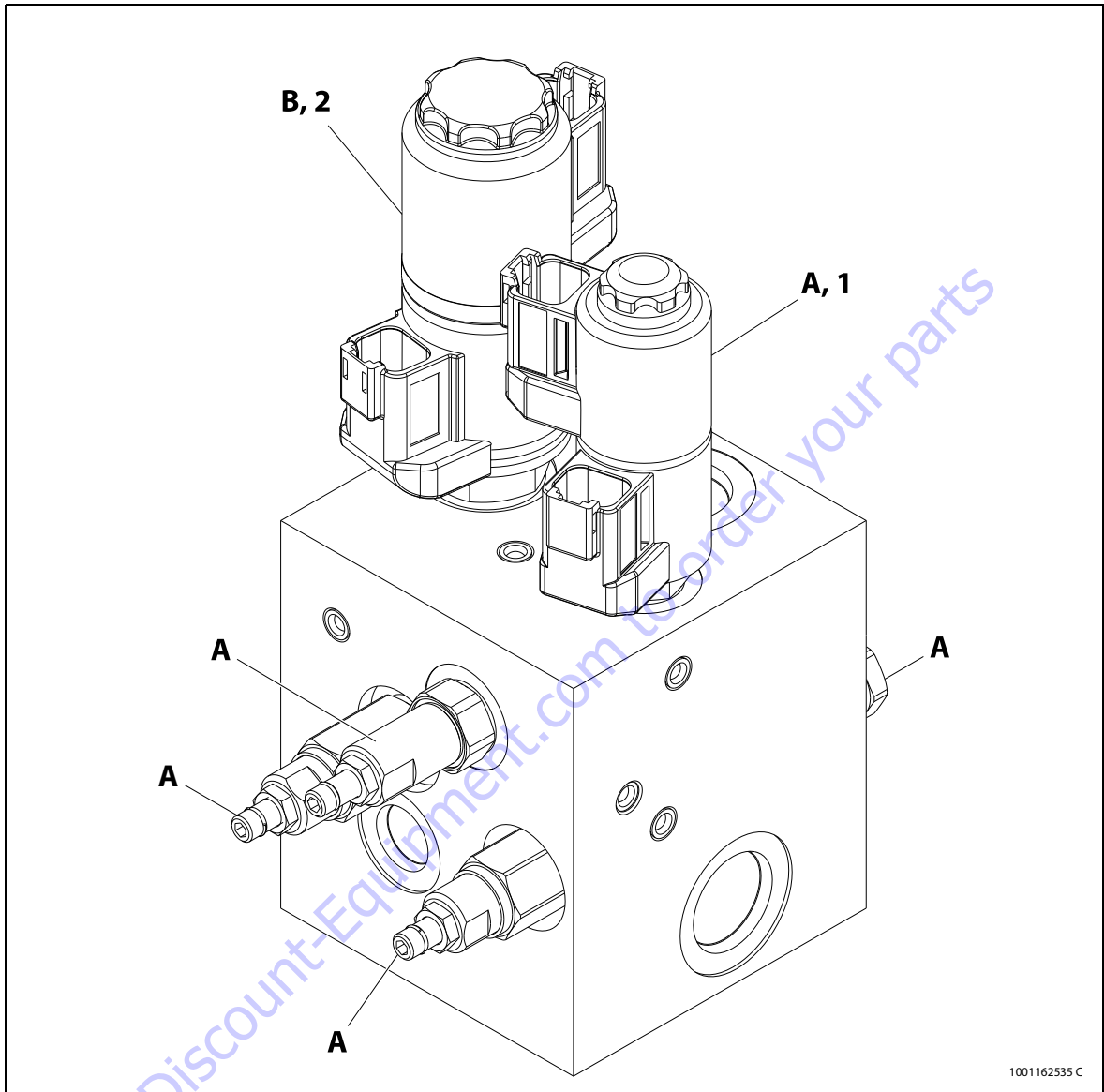


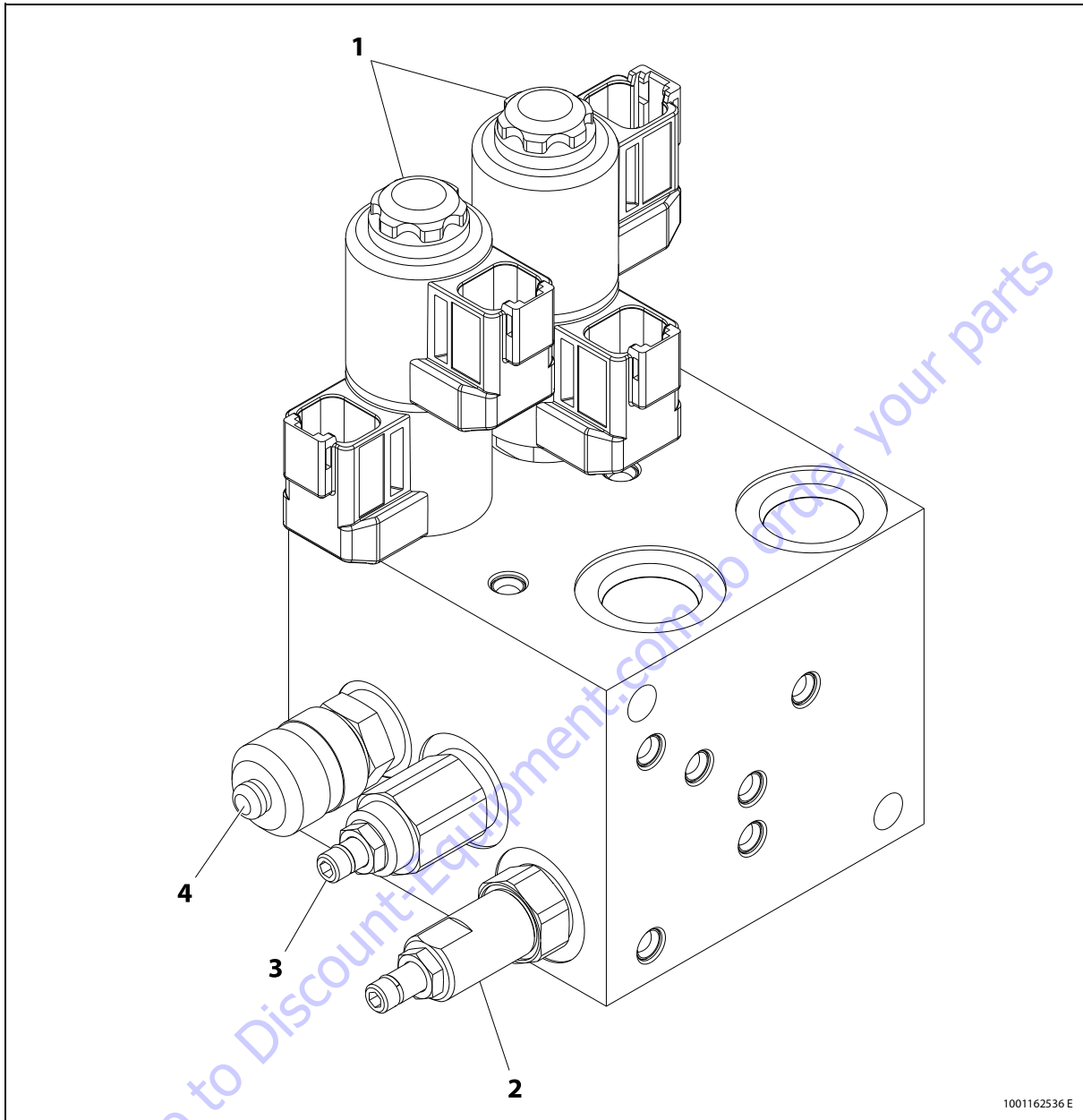
Table 5-35. Cartridge Torque Values

	Ft. lbs.	Nm
A	13.5	18
B	31	42

Table 5-36. Coil Torque Values

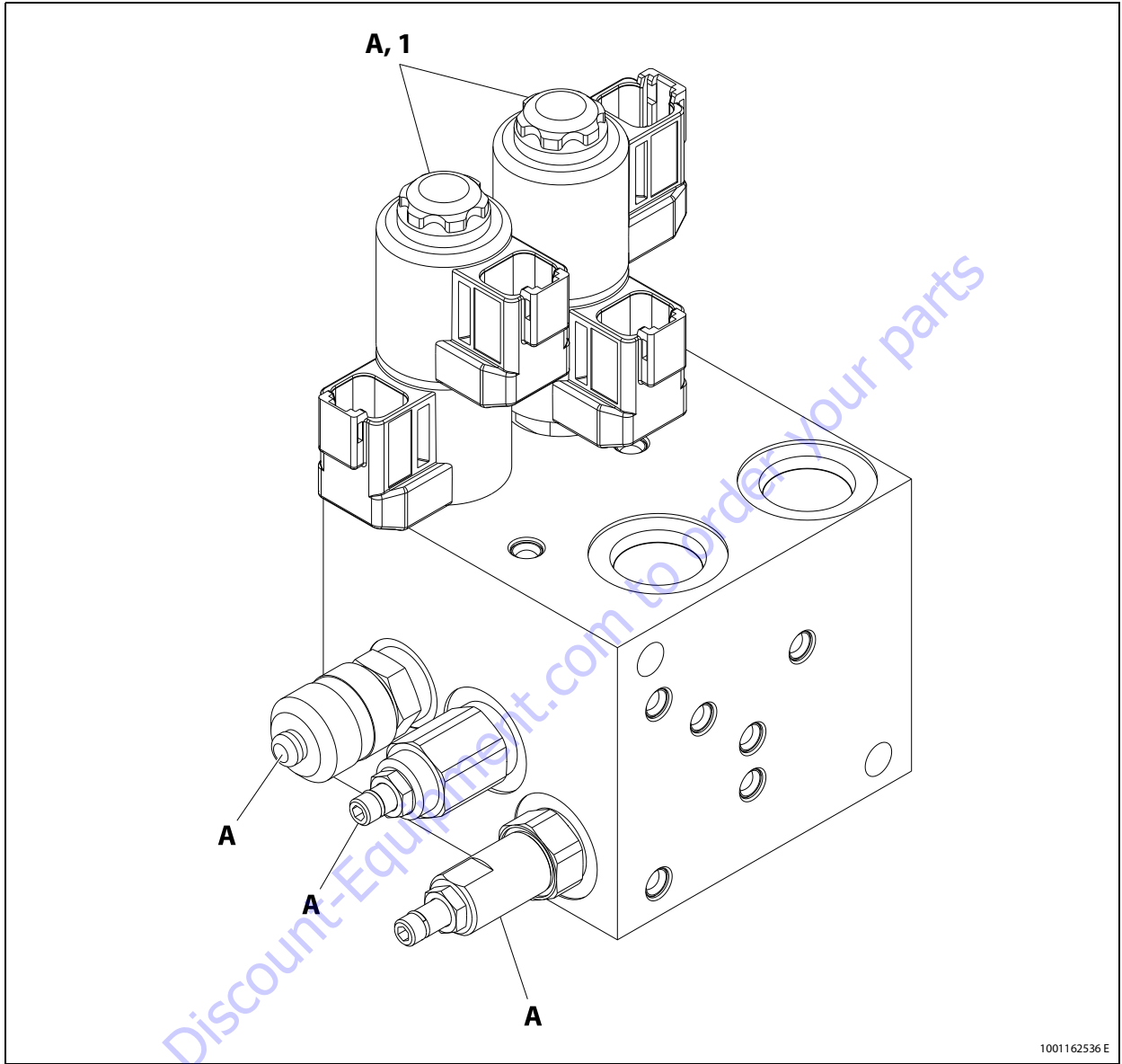
	Ft. lbs.	Nm
1	1.5	2
2	4	5

Figure 5-112. Upright Valve Torque Values



- 1. Cartridge Valve Without Coil
- 2. Cartridge Valve
- 3. Jib Down Relief Valve
- 4. Test Fitting

Figure 5-113. Fly Boom Valve Identification



1001162536 E

Table 5-37. Cartridge Torque Values

	Ft. lbs.	Nm
A	13.5	18

Table 5-38. Coil Torque Values

	Ft. lbs.	Nm
1	1.5	2

Figure 5-114. Fly Boom Valve Torque Values

5.6 HYDRAULIC SCHEMATICS

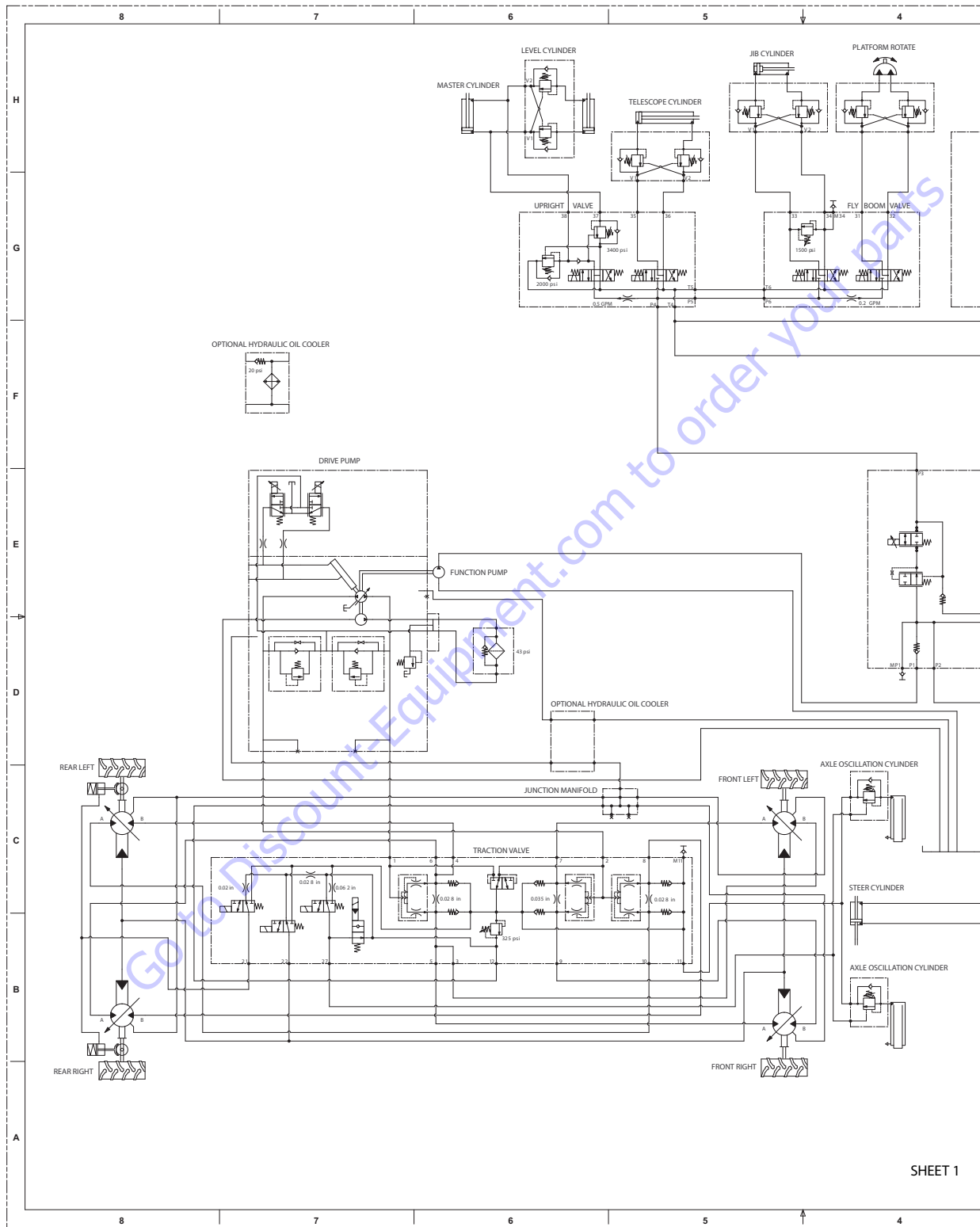
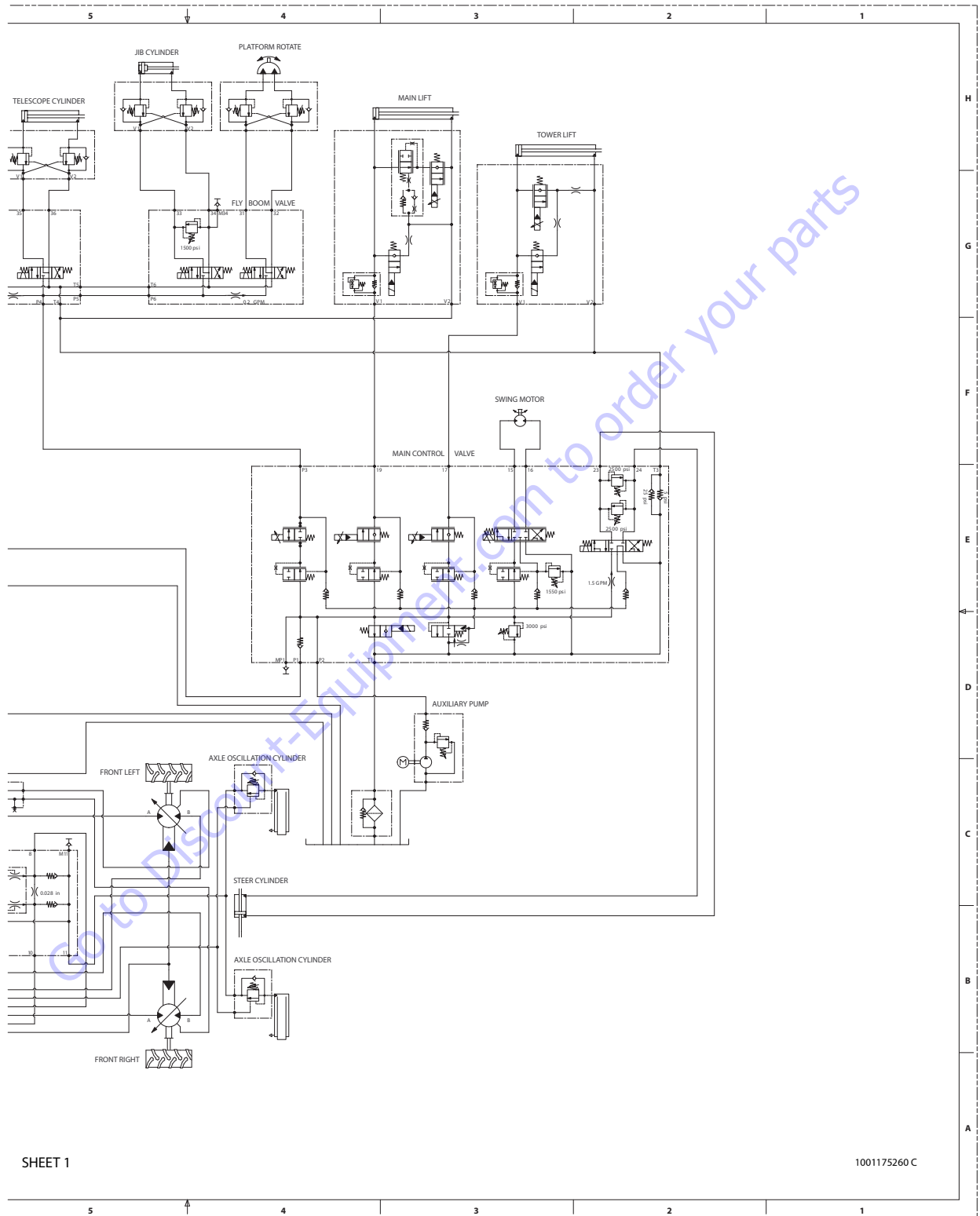


Figure 5-115. Hydraulic Schematics - Sheet 1 of 4



SHEET 1

1001175260 C

Figure 5-116. Hydraulic Schematics - Sheet 2 of 4

SECTION 5 - BASIC HYDRAULICS INFORMATION & SCHEMATICS

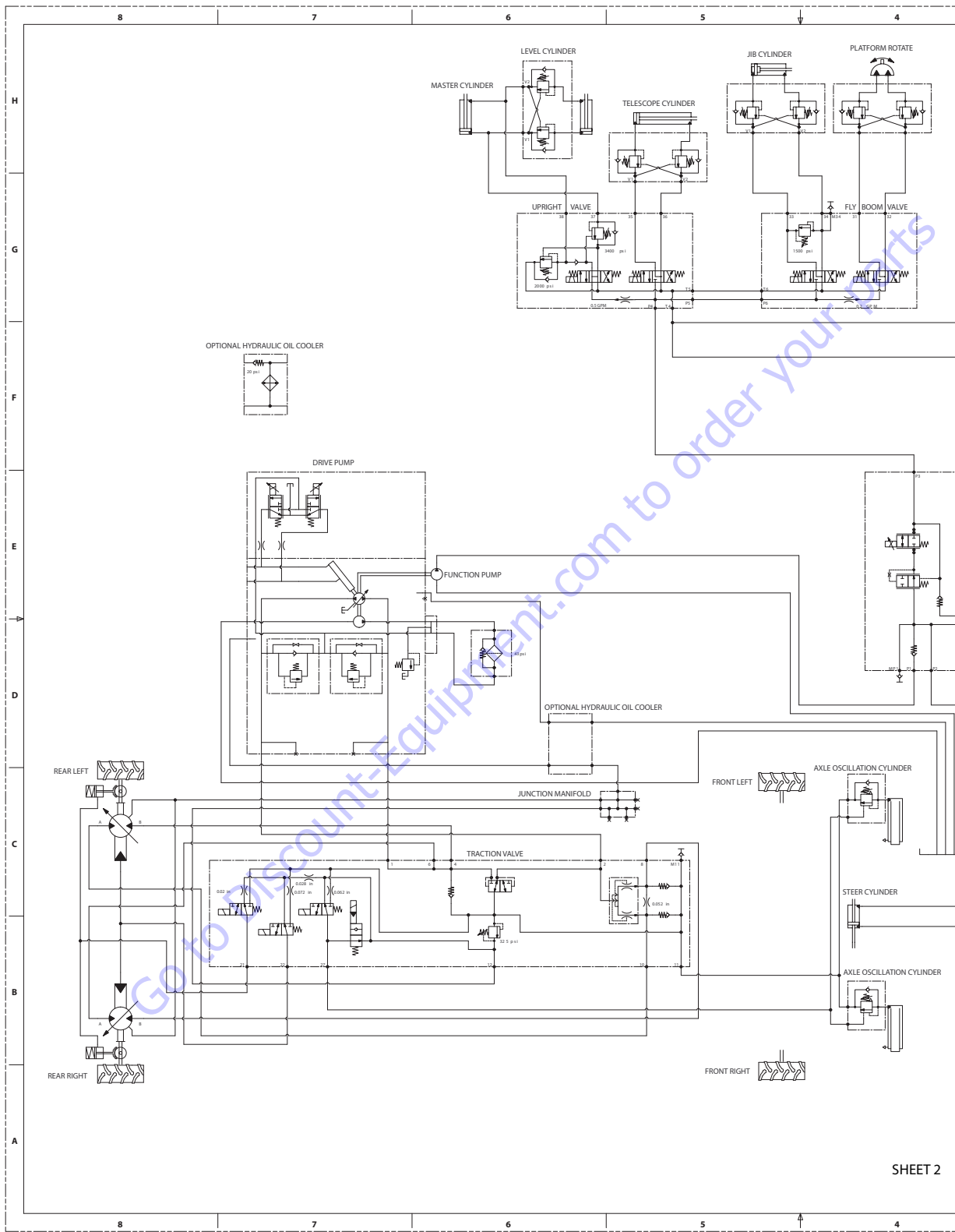


Figure 5-117. Hydraulic Schematics - Sheet 3 of 4

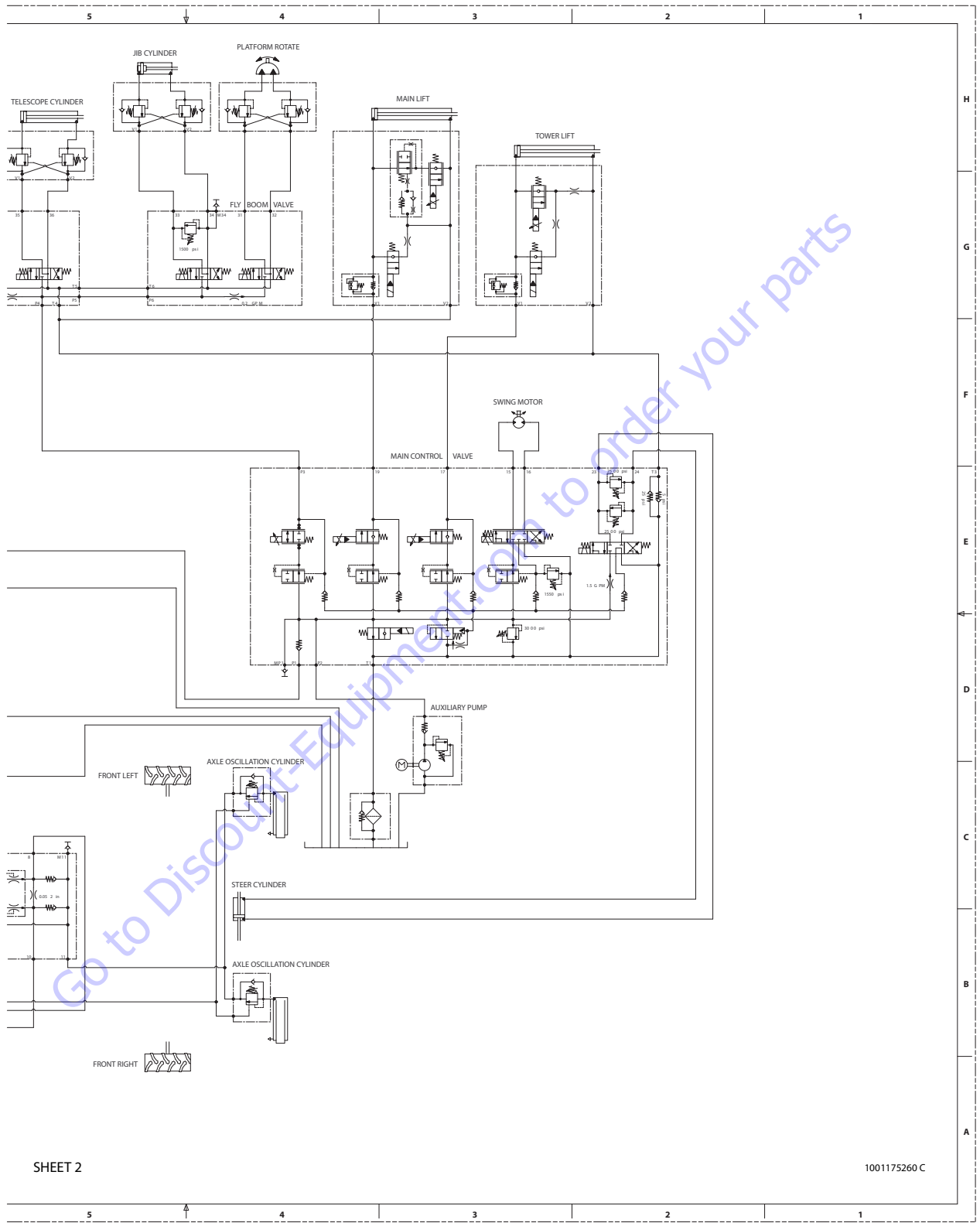


Figure 5-118. Hydraulic Schematics - Sheet 4 of 4

PARTS FINDER

**Search Website
by Part Number**



**Search Manual
Library For Parts
Manual & Lookup Part
Numbers – Purchase
or Request Quote**

Search Manuals

Enter the information below to search our manual library for parts.

* Brand:

* Model:

* Serial:

* Part Number:

SEARCH

**Can't Find Part or
Manual? Request Help
by Manufacturer,
Model & Description**

Parts Order Form

Please fill in the information below to request help finding a part.

MANUFACTURER:	<input type="text"/>
MODEL:	<input type="text"/>
DESCRIPTION:	<input type="text"/>
PART NUMBER:	<input type="text"/>
QUANTITY:	<input type="text"/>
DATE ORDERED:	<input type="text"/>
YOUR NAME:	<input type="text"/>
YOUR PHONE:	<input type="text"/>
YOUR FAX:	<input type="text"/>
YOUR E-MAIL:	<input type="text"/>
YOUR ADDRESS:	<input type="text"/>
CITY:	<input type="text"/>
STATE:	<input type="text"/>
ZIP:	<input type="text"/>
COUNTRY:	<input type="text"/>

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We sell worldwide for the brands: Genie, Terex, JLG, MultiQuip, Mikasa, Essick, Whiteman, Mayco, Toro Stone, Diamond Products, Generac Magnum, Airman, Haulotte, Barreto, Power Blanket, Nifty Lift, Atlas Copco, Chicago Pneumatic, Allmand, Miller Curber, Skyjack, Lull, Skytrak, Tsurumi, Husquvarna Target, , Stow, Wacker, Sakai, Mi-T- M, Sullair, Basic, Dynapac, MBW, Weber, Bartell, Bennar Newman, Haulotte, Ditch Runner, Menegotti, Morrison, Contec, Buddy, Crown, Edco, Wyco, Bomag, Laymor, Barreto, EZ Trench, Bil-Jax, F.S. Curtis, Gehl Pavers, Heli, Honda, ICS/PowerGrit, IHI, Partner, Imer, Clipper, MMD, Koshin, Rice, CH&E, General Equipment, ,AMida, Coleman, NAC, Gradall, Square Shooter, Kent, Stanley, Tamco, Toku, Hatz, Kohler, Robin, Wisconsin, Northrock, Oztec, Toker TK, Rol-Air, Small Line, Wanco, Yanmar

SECTION 6. JLG CONTROL SYSTEM

6.1 JLG CONTROL SYSTEM ANALYZER KIT INSTRUCTIONS

Introduction

NOTICE

WHEN INSTALLING A NEW POWER MODULE CONTROLLER ON THE MACHINE, IT WILL BE NECESSARY TO PROGRAM THE CONTROLLER FOR THE PROPER MACHINE CONFIGURATION, INCLUDING OPTIONS.

NOTICE

IT IS A GOOD PRACTICE TO AVOID PRESSURE-WASHING ELECTRICAL/ELECTRONIC COMPONENTS. SHOULD PRESSURE-WASHING BE UTILIZED TO WASH AREAS CONTAINING ELECTRICAL/ELECTRONIC COMPONENTS, JLG INDUSTRIES, INC. RECOMMENDS A MAXIMUM PRESSURE OF 750 PSI (52 BAR) AT A MINIMUM DISTANCE OF 12 INCHES (30.5 CM) AWAY FROM THESE COMPONENTS. IF ELECTRICAL/ELECTRONIC COMPONENTS ARE SPRAYED, SPRAYING MUST NOT BE DIRECT AND BE FOR BRIEF TIME PERIODS TO AVOID HEAVY SATURATION.

The JLG designed Control System is a 12 volt based control unit installed on the boom lift.

The JLG Control System has reduced the need for exposed terminal strips, diodes and trimpots and provides simplicity in

viewing and adjusting the various personality settings for smooth control of: acceleration, deceleration, creep, min speed, and max.-speed for all boom, drive, and steering functions.

The main lift, swing, and drive are controlled by individual joysticks, with steering being controlled by a rocker switch built into the top the drive joystick. To activate Drive, Lift, and Swing simply pull up on the slide lock location on the joystick and move the handle into the direction desired.

The control system will control the voltage output to the valves and pump, as programmed for smooth operation and maximum cycle time. Ground control speeds for all boom functions can also be programmed into the control system.

The JLG Control System controller has a built in LED to indicate any faults. The system stores recent faults which may be accessed for troubleshooting. Optional equipment includes a soft touch system, head and tail lights, and ground alarm. These options may be added later but must be programmed into the control system when installed.

The Control System may be accessed utilizing a custom designed, hand held analyzer (Analyzer Kit, JLG part no. 2901443) which will display two lines of information at a time, by scrolling through the program.

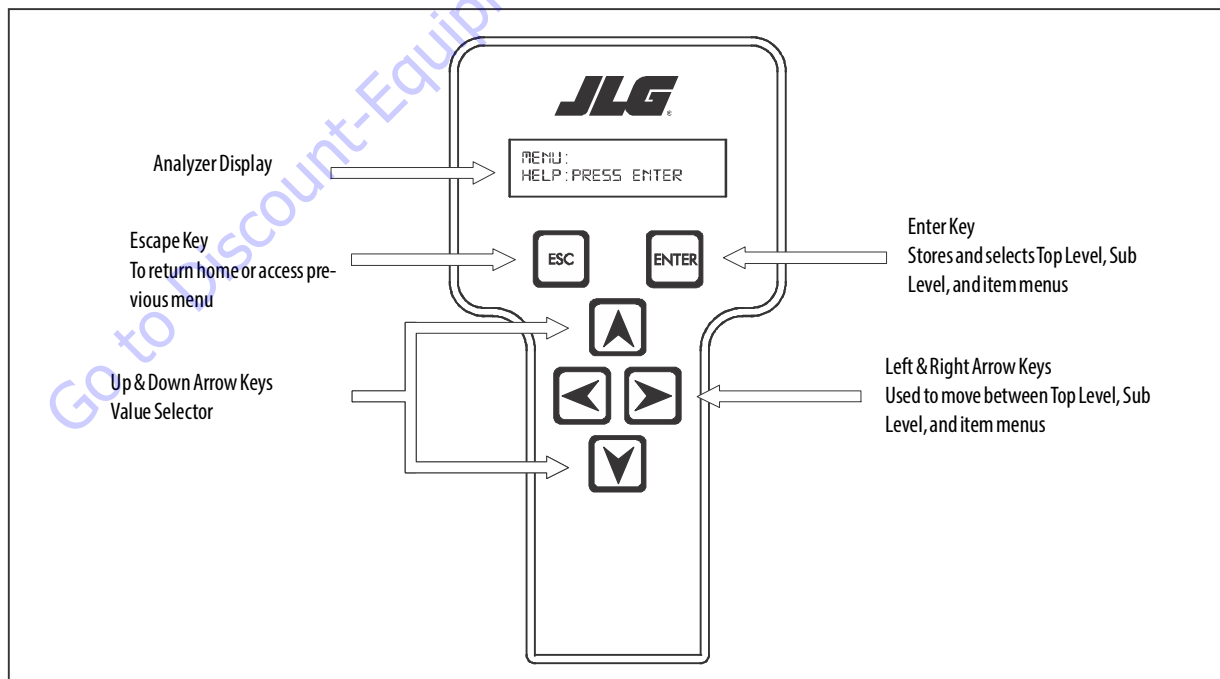


Figure 6-1. Hand Held Analyzer

To Connect the JLG Control System Analyzer

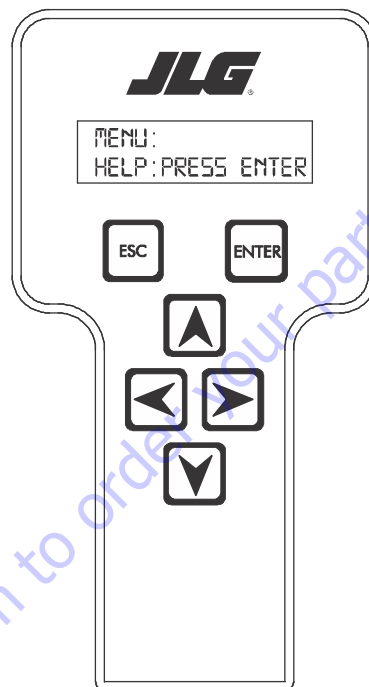
1. Connect the four pin end of the cable supplied with the analyzer, to the motor controller module located in the platform box or at the power module and connect the remaining end of the cable to the analyzer.

NOTE: The cable has a four pin connector at each end of the cable; the cable cannot be connected backwards.

2. Power up the Control System by turning the lower key to the platform or ground position and pulling both emergency stop buttons on.


Using the Analyzer

With the machine power on and the analyzer connected properly, the analyzer will display the following:



**HELP:
PRESS ENTER**


At this point, using the RIGHT  and LEFT  arrow keys, you can move between the top level menu items. To


select a displayed menu item, press ENTER . To cancel a

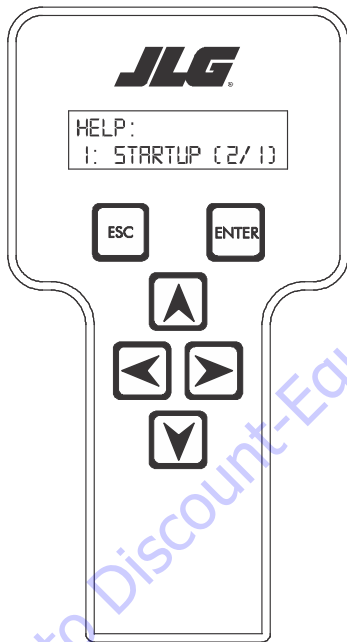
selected menu item, press Escape ; then you will be able to scroll using the right and left arrow keys to select a different menu item.

The top level menus are as follows:

- HELP
- DIAGNOSTICS
- ACTIVATE TEST
- ACCESS LEVEL
- PERSONALITIES
- MACHINE SETUP
- LEVEL VEHICLE (level 1 only)
- CALIBRATIONS (view only)

If you press **ENTER** , at the **HELP: PRESS ENTER** display, and a fault is present, the analyzer display will scroll the fault across the screen. If there was no fault detected, the display will read: **HELP: EVERYTHING OK**. If powered up at the ground station, the display will read: **GROUND OK**.

If **ENTER**  is pressed again, the display moves to the following display:




LOGGED HELP
1: STARTUP (2/1)

At this point, the analyzer will display the last fault the system has seen, if any are present. You may scroll through the fault logs to view what the last 25 faults were. Use the right and left arrow keys to scroll through the fault logs. To return to the

beginning, press **ESCAPE**  two times. **STARTUP (2/1)** indicates a power up.

When a top level menu is selected, a new set of menu items may be offered: for example:

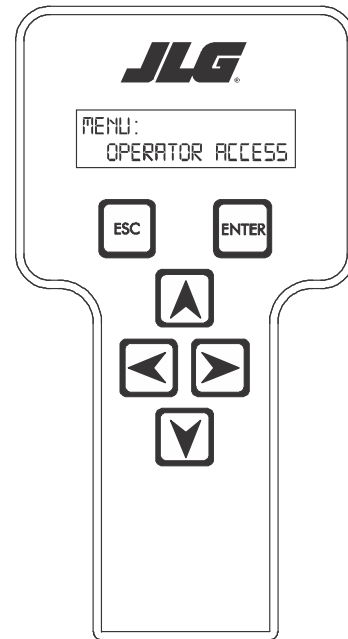
- DRIVE
- BOOM
- SYSTEM
- DATALOG
- VERSIONS

Pressing **ENTER** , with any of the above displayed menus, will display additional sub-menus within the selected menu. In some cases, such as **DRIVE**, the next level is the parameter or information to be changed. Refer to the flow chart for what menus are available within the top level menus. You may only view the personality settings for selected menus while in access level 2. Remember, you may always cancel a selected


menu item by pressing the **ESCAPE**  key.

Changing the Access Level of the Hand Held Analyzer

When the analyzer is first connected, you will be in Operator Access which enables you to only view most settings which cannot be changed until you enter a password to advance to a lower level. This ensures that a setting cannot be accidentally altered. To change the access level, the correct password must be entered. To enter the password, scroll to the **ACCESS LEVEL** menu. For example:






ACCESS LEVEL:
CODE 00000

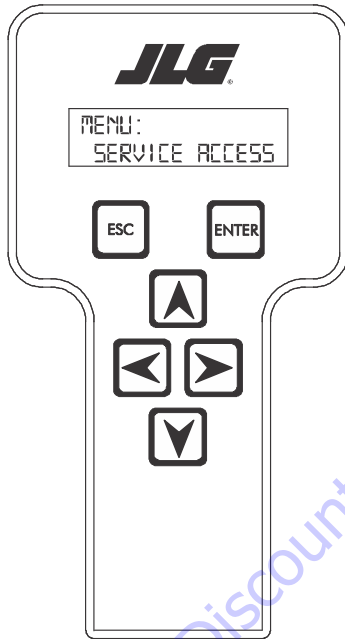
Press **ENTER**  to select the **ACCESS LEVEL** menu.

Using the **UP**  or **DOWN**  arrow keys, enter the first digit of the password, 3.

Then using the **RIGHT**  arrow key, position the cursor to the right one space to enter the second digit of the password.

Use the **UP**  or **DOWN**  arrow key to enter the second digit of the password which is 33271.

Once the correct password is displayed, press **ENTER** . The access level should display the following, if the password was entered correctly:



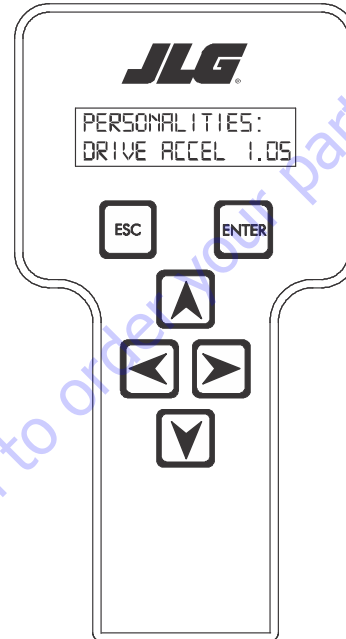
**MENU:
SERVICE ACCESS**

Repeat the above steps if the correct access level is not displayed or you can not adjust the personality settings.

Adjusting Parameters Using the Hand Held Analyzer


Once you have gained access to level 1, and a personality item


is selected, press the **UP**  or **DOWN**  arrow keys to adjust its value, for example:




**DRIVE:
ACCEL 1.5s**


There will be a minimum and maximum for the value to ensure efficient operation. The Value will not increase if the **UP**

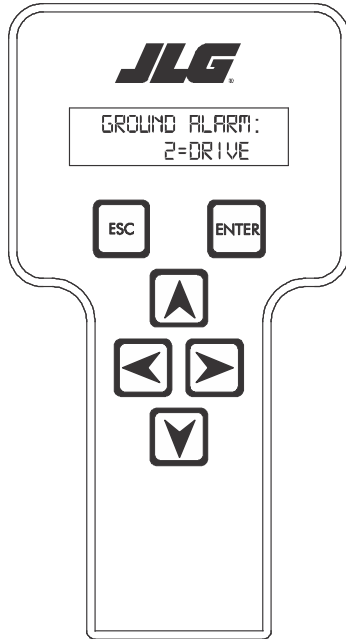
 arrow is pressed when at the maximum value nor will

the value decrease if the **DOWN**  arrow is pressed and the value is at the minimum value for any particular personality. If the value does not change when pressing the up and down arrows, check the access level to ensure you are at access level 1.

Machine Setup

When a machine digit item is selected, press the **UP**  or

DOWN  arrow keys to adjust its value, for example:



**GROUND ALARM:
2 = DRIVE**

The effect of the machine digit value is displayed along with its value. The above display would be selected if the machine was equipped with a ground alarm and you wanted it to sound when driving. There are certain settings allowed to install optional features or select the machine model.

When selection the machine model to match the size of the machine, the personality settings will all default to the factory recommended setting.

NOTE: Refer to *Personality Ranges/Defaults* for the recommended factory settings.

NOTE: Password 33271 will give you access to level 1, which will permit you to change all machine personality settings.

There is a setting that JLG strongly recommends that you do not change. This setting is so noted below:

ELEVATION CUTBACK

WARNING

CHANGING THIS SETTING MAY ADVERSELY AFFECT THE PERFORMANCE OF YOUR MACHINE.

NOTICE

IT IS A GOOD PRACTICE TO AVOID PRESSURE-WASHING ELECTRICAL/ELECTRONIC COMPONENTS. SHOULD PRESSURE-WASHING BE UTILIZED TO WASH AREAS CONTAINING ELECTRICAL/ELECTRONIC COMPONENTS, JLG INDUSTRIES INC. RECOMMENDS A MAXIMUM PRESSURE OF 750 PSI (52 BAR) AT A MINIMUM DISTANCE OF 12 INCHES (30.5CM) AWAY FROM THESE COMPONENTS. IF ELECTRICAL/ELECTRONIC COMPONENTS ARE SPRAYED, SPRAYING MUST NOT BE DIRECT AND BE FOR BRIEF TIME PERIODS TO AVOID HEAVY SATURATION.


Tilt Sensor Calibration

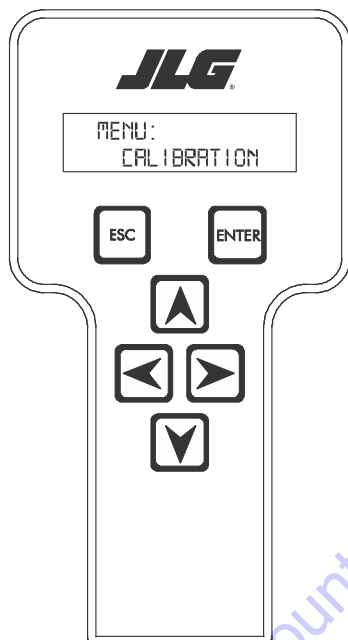
Refer to Figure 6-2, Tilt Sensor Location.


⚠ WARNING

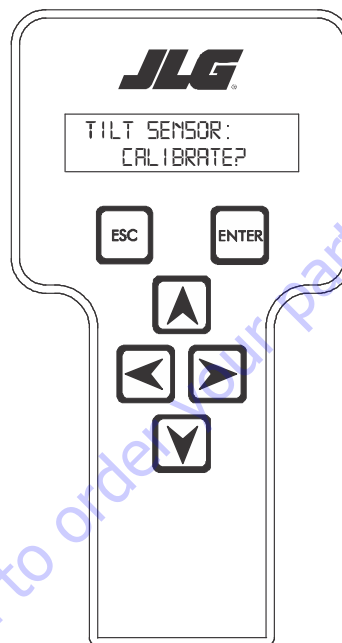
DO NOT CALIBRATE THE TILT SENSOR EXCEPT ON A LEVEL SURFACE.

1. Place the machine on a firm, level surface.
2. Using the analyzer, go to Service Access level. Refer to Changing the Access Level of the Hand Held Analyzer in this section.
3. Using the arrow keys, navigate to Calibrations Menu as

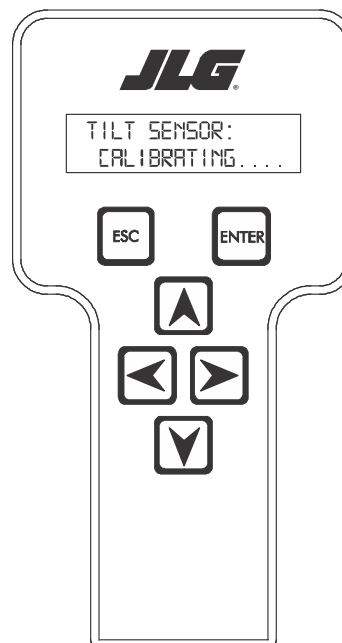
shown below and press **ENTER** .



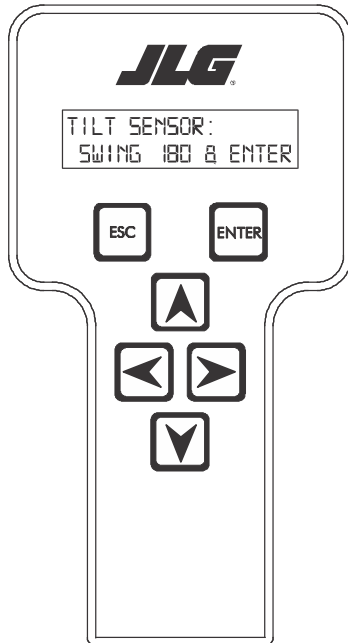
4. Using the arrow keys, navigate to the Tilt Sensor calibration as shown below and press **ENTER** .



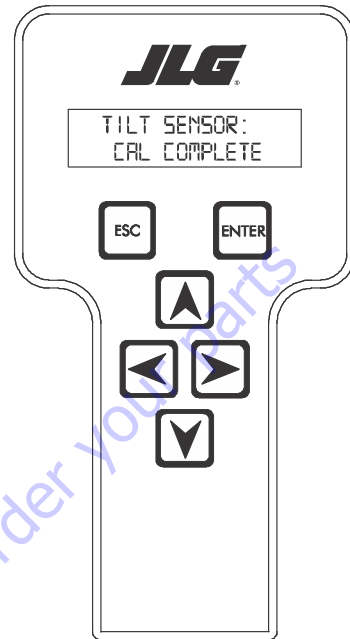
the screen will then read:



5. When the sensor is calibrated in that position, the screen will read:



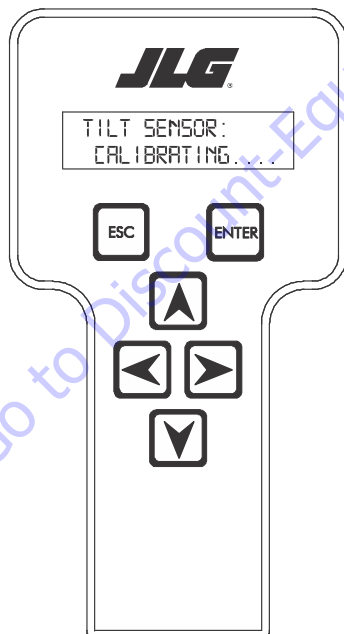
7. When the calibration is complete the screen will read as shown below. Return the machine to the travel position.

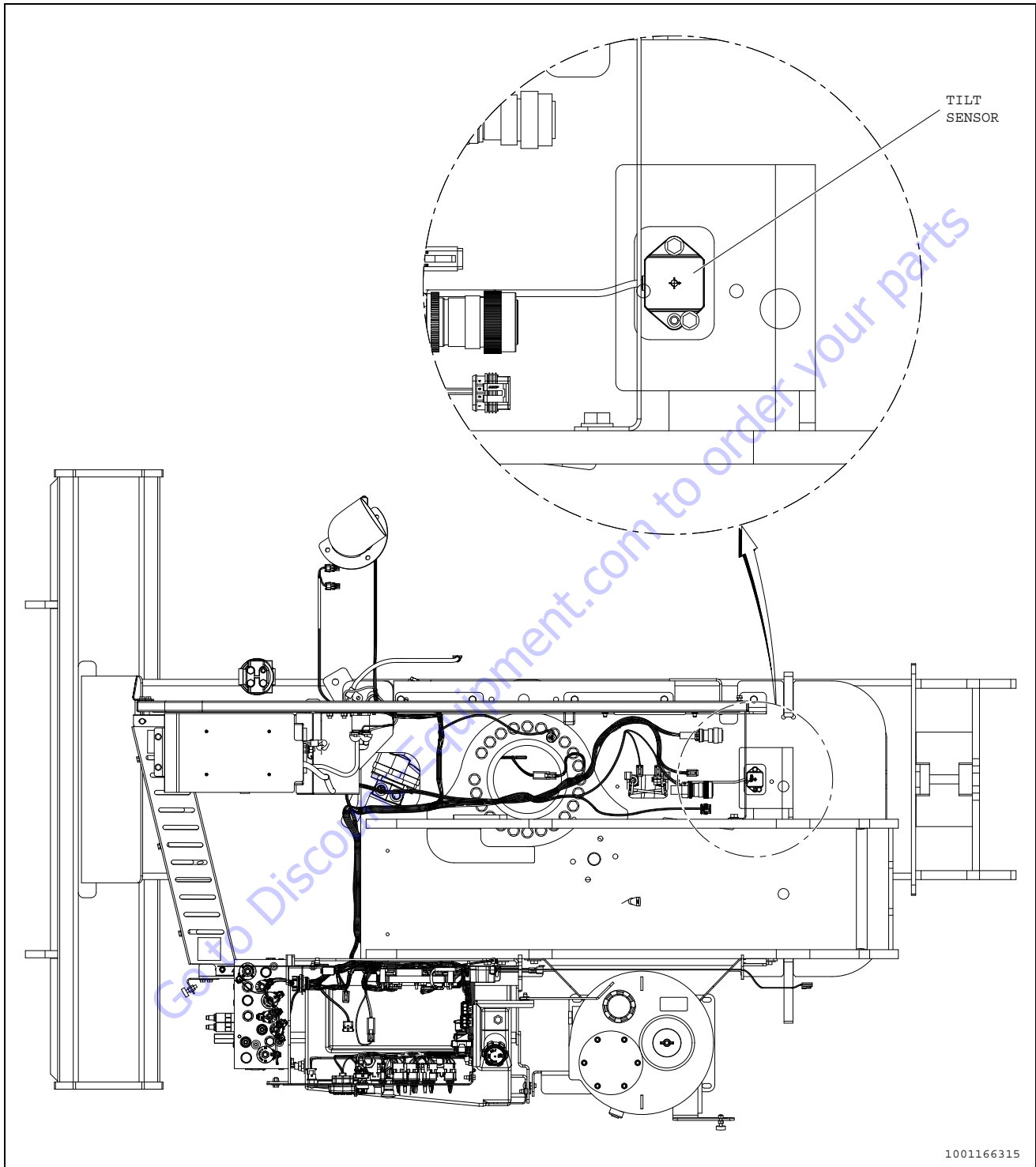


6. Swing the machine 180 degrees, making sure the boom is centered and in the transport position, and **ENTER**



. The screen will read:





1001166315

Figure 6-2. Tilt Sensor Location

Ground Control Console Display Gauge

(See Figure 6-6., Ground Control Console Display Gauge)

The Display Gauge shows engine hours, fuel level (if applicable), and Diagnostic Trouble Codes (DTCs) from both the JLG Control System and the engine control system. During machine start up, with no active DTCs in the control system, the splash screen will show for 3 seconds and then switch to main screen. If there is an active DTC while powering up the machine, the splash screen will show for 3 seconds, and then launch the Diagnostics Screen. The indicator lamp will light when there is an active DTC in the Fault Log.



Figure 6-3. Splash Screen

The Diagnostic Screen will show active and inactive faults from the JLG Control System on the screen. An asterisk (*) will be displayed to show active faults.

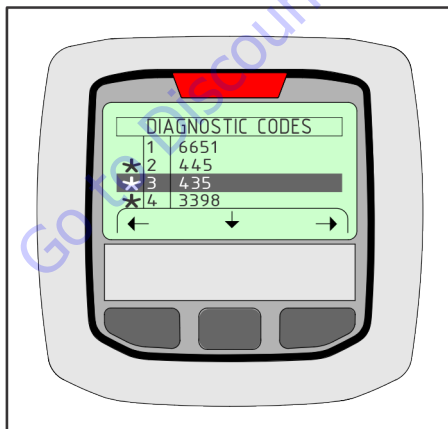


Figure 6-4. Diagnostic Screen

The Engine Diagnostics Screen will show SPN (Suspect Parameter Number), FMI (Failure Mode Identifier), and Occurrence count information. Engine SPN text is not scrollable. If there is more than one engine trouble code, the operator must exit from the Engine DTC Screen to see other SPN and FMI information.

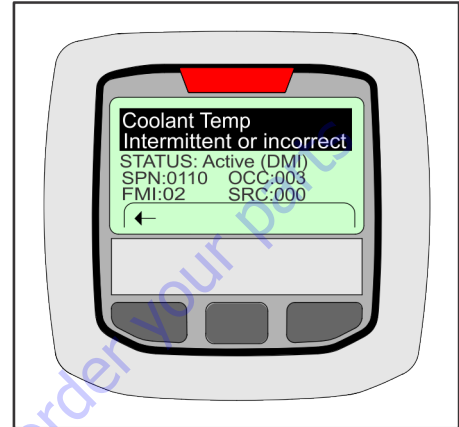


Figure 6-5. Engine Diagnostic Screen

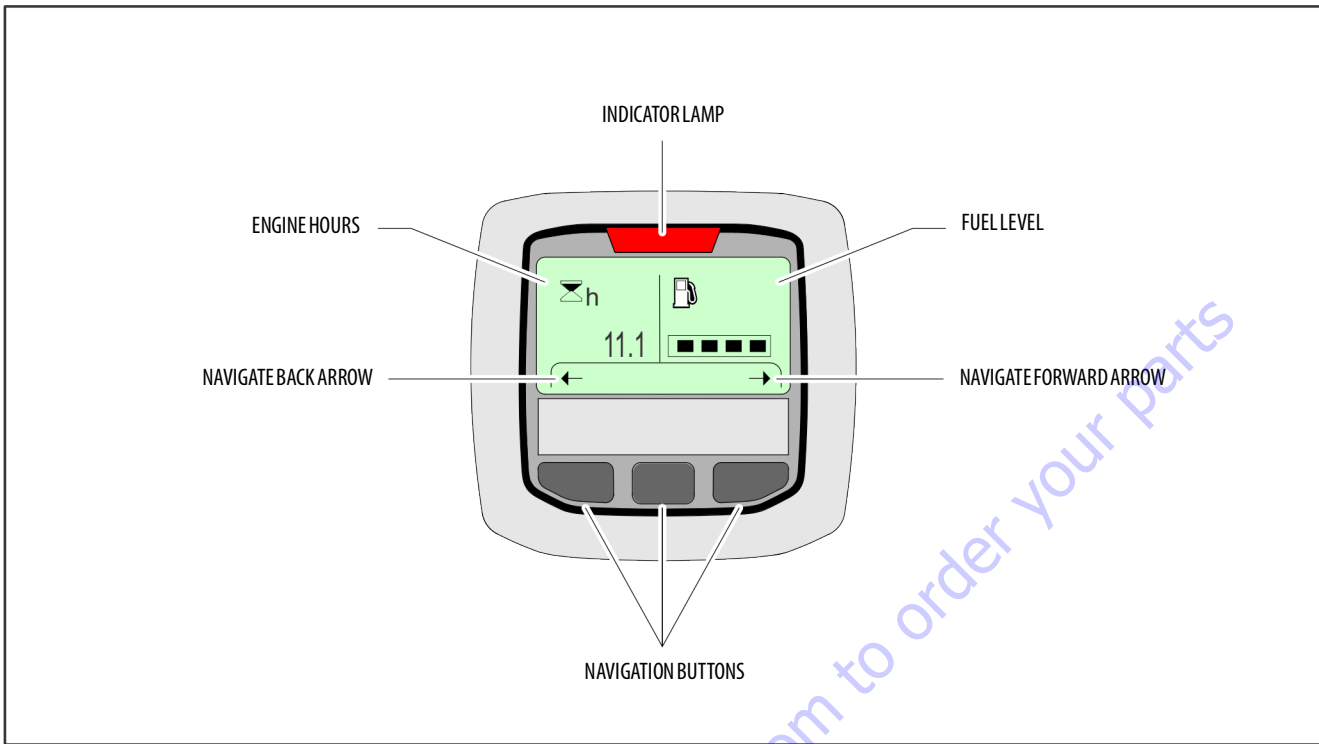


Figure 6-6. Ground Control Console Display Gauge

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Table 6-1. Analyzer Abbreviations

ABBREVIATION	MEANING
ACCEL	ACCELERATE
ACT	ACTIVE
A/D	ANALOG DIGITAL CONVERTER COUNT
AMB.	AMBIENT
ANG	ANGLE
AUX	AUXILIARY
BCS	BOOM CONTROL SYSTEM
BM	BOOM LENGTH ANGLE MODULE
BLAM	BOOM LENGTH ANGLE MODULE
BR	BROKEN
BSK	BASKET
CAL	CALIBRATION
CL	CLOSED
CM	CHASSIS MODULE
CNTL	CONTROL
CNTRL	CONTROL
C/O	CUTOUT
CONT(S)	CONTRACTOR(S)
COOR	COORDINATED
CRKPT	CRACK POINT
CRP	CREEP
CUT	CUTOUT
CYL	CYLINDER
DECEL	DECELERATE
D	DOWN
DN	DOWN
DWN	DOWN
DEG.	DEGREE
DOS	DRIVE ORIENTATION SYSTEM
DRV	DRIVE
E	ERROR
E&T	ELEVATED & TILTED
ELEV	ELEVATION
ENG	ENGINE
EXT	EXTEND
F	FRONT
FL	FLOW
FNT	FRONT
FOR	FORWARD
FWD	FORWARD
FSW	FOOT SWITCH
FUNC	FUNCTION
G	GROUND

Table 6-1. Analyzer Abbreviations

ABBREVIATION	MEANING
GND	GROUND
GRN	GREEN
GM	GROUND MODULE
H	HOURS
HW	HARDWARE
HWFS	HARDWARE FAILSAFE
I	IN or CURRENT
JOY	JOYSTICK
L	LEFT
LB	POUND
LEN	LENGTH
LIM	LIMIT
LT	LEFT
LVL	LEVEL
M	MINUTES
MIN	MINIMUM
MAX	MAXIMUM
M	MAIN
MN	MAIN
NO	NORMALLY OPEN or NO
NC	NORMALLY CLOSED
O	OUT
O/C	OPEN CIRCUIT
OP	OPEN
O/R	OVERRIDE or OUTRIGGER
O//R	OVERRIDE
OSC	OSCILLATING
OVRD	OVERRIDE
P	PLATFORM
P	PRESSURE
PCV	PROPORTIONAL CONTROL VALVE
PLAT	PLATFORM
PLT	PLATFORM
PM	PLATFORM MODULE
POT	POTENTIOMETER
PRES	PRESSURE
PRS	PRESSURE
PT	POINT
R	REAR or RIGHT
REV	REVERSE or REVISION
RET	RETRACT
ROT.	ROTATE
RT	RIGHT

SECTION 6 - JLG CONTROL SYSTEM

Table 6-1. Analyzer Abbreviations

ABBREVIATION	MEANING
S/C	SHORT CIRCUIT
SEL	SELECTOR
SN	SERIAL NUMBER
SPD	SPEED
STOW	STOWED
STOWD	STOWED
SW	SWITCH or SOFTWARE
TELE	TELESCOPE
TEMP	TEMPERATURE
TORQ.	TORQUE
TRN	TRANSPORT
T/T	TURNTABLE
T	TOWER
TURNTBL	TURNTABLE
TWR	TOWER
U	UPPER or UP
V	VOLT
VER	VERSION
VLV	VALVE
WIT	WITNESS
YEL	YELLOW

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Figure 6-7. Analyzer Connecting Points

SECTION 6 - JLG CONTROL SYSTEM

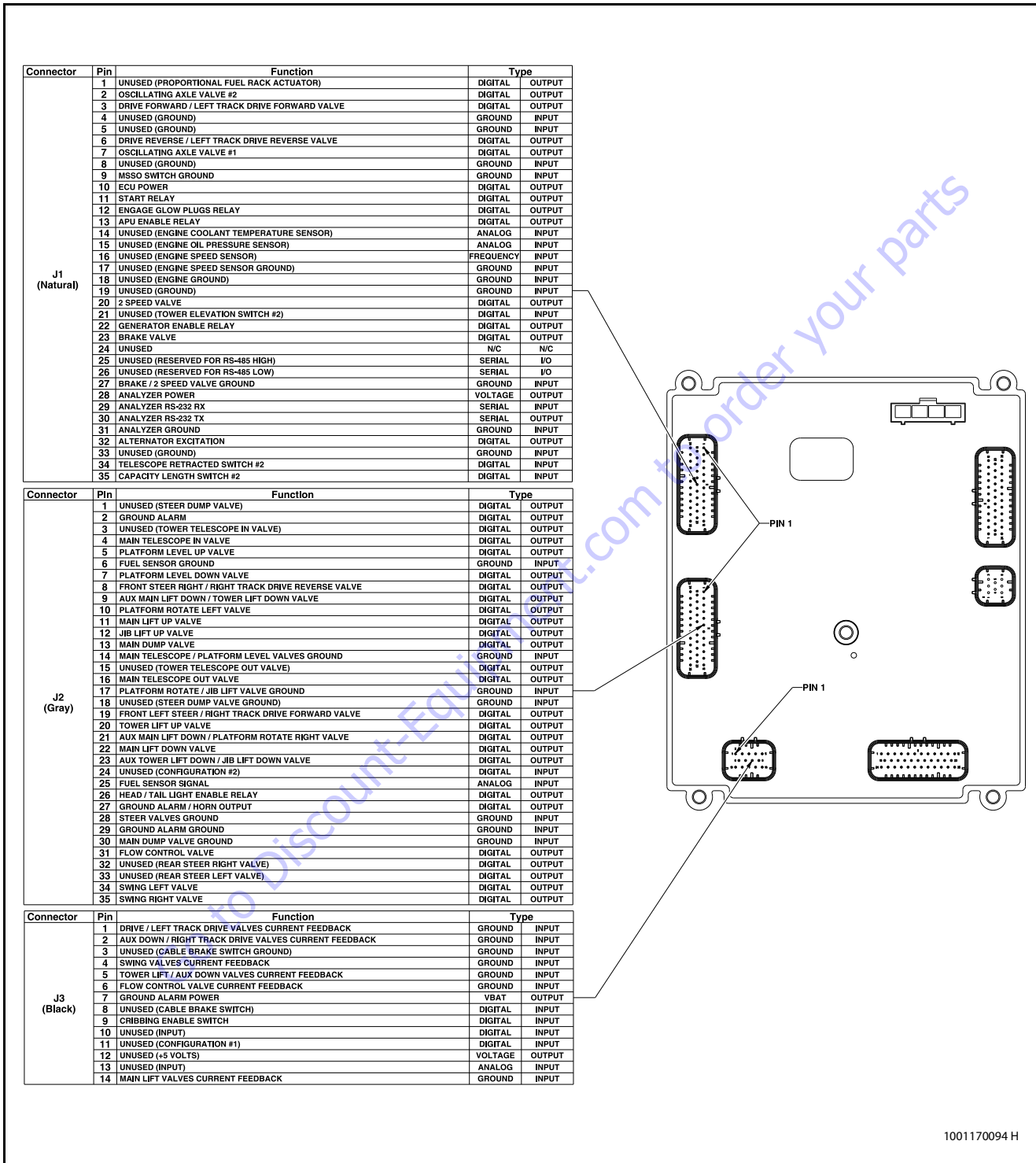
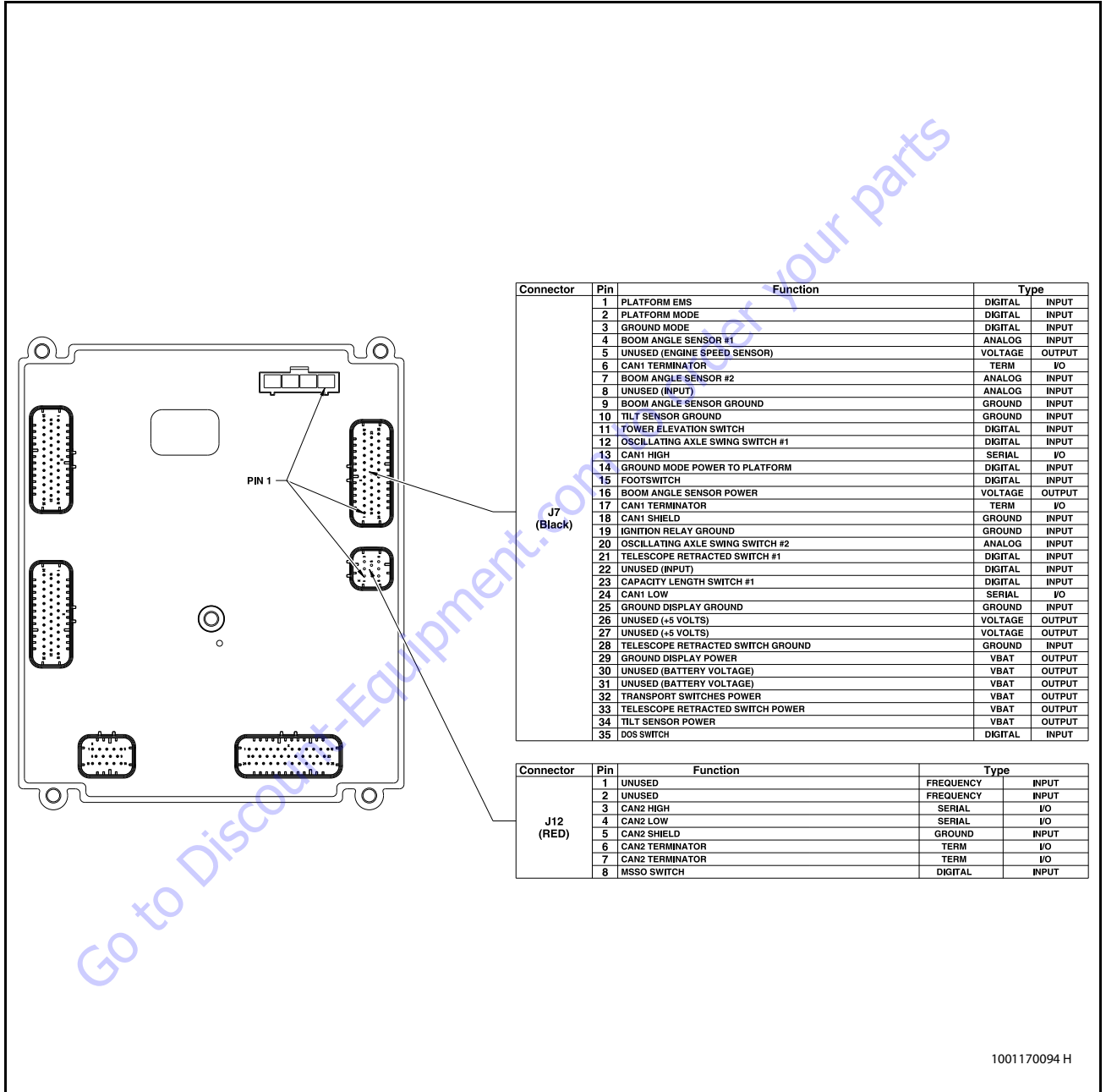


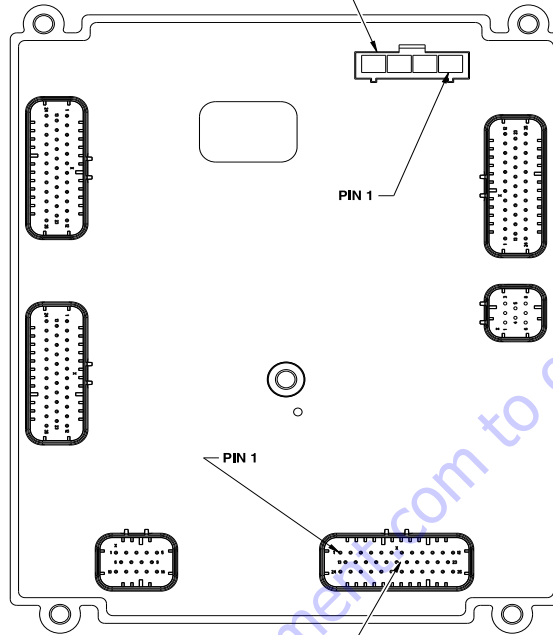
Figure 6-8. Ground Control Module - Sheet 1 of 3



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Figure 6-9. Ground Control Module - Sheet 2 of 3

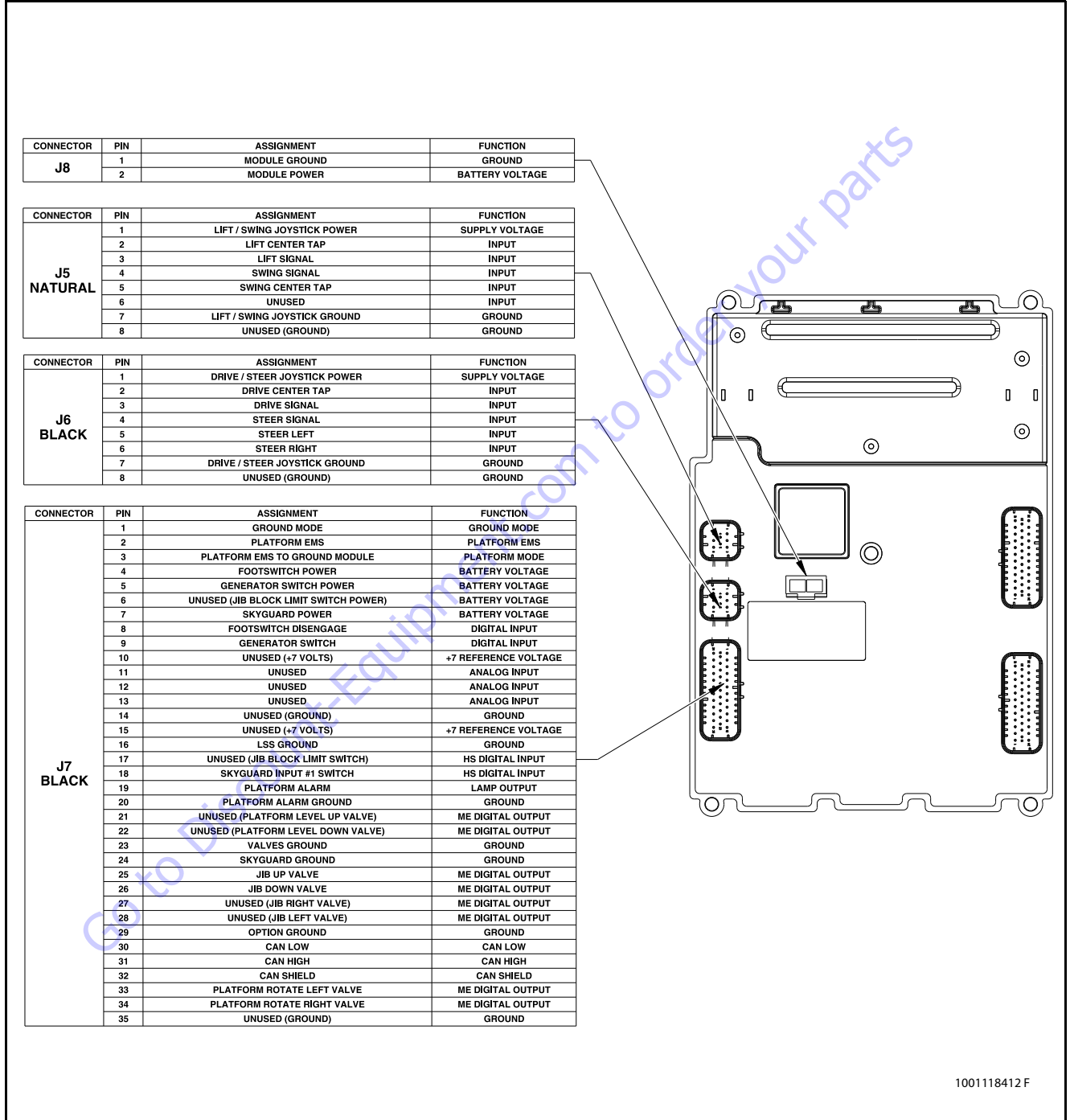
Connector	Pin	Function	Type
J8 (Black)	1	MODULE GROUND	GROUND OUTPUT
	2	MODULE POWER	VBAT INPUT
	3	GROUND TO PLATFORM MODULE	GROUND INPUT
	4	POWER TO PLATFORM MODULE	VBAT OUTPUT



Connector	Pin	Function	Type
J4 (Blue)	1	CRIBBING ENGAGED INDICATOR	DIGITAL OUTPUT
	2	SYSTEM DISTRESS INDICATOR	DIGITAL OUTPUT
	3	GLOWPLUG INDICATOR	DIGITAL OUTPUT
	4	ENGINE START SWITCH	DIGITAL INPUT
	5	PLATFORM LEVEL DOWN SWITCH	DIGITAL INPUT
	6	PLATFORM ROTATE LEFT SWITCH	DIGITAL INPUT
	7	MAIN TELESCOPE IN SWITCH	DIGITAL INPUT
	8	JIB LIFT DOWN SWITCH	DIGITAL INPUT
	9	UNUSED (JIB LEFT SWITCH)	DIGITAL INPUT
	10	TOWER LIFT UP SWITCH	DIGITAL INPUT
	11	UNUSED (TOWER TELESCOPE IN SWITCH)	DIGITAL INPUT
	12	UNUSED (OUTPUT)	DIGITAL OUTPUT
	13	LOW FUEL INDICATOR	DIGITAL OUTPUT
	14	PLATFORM OVERLOADED INDICATOR	DIGITAL OUTPUT
	15	UNUSED (BOOM MALFUNCTION INDICATOR)	DIGITAL OUTPUT
	16	AUXILIARY POWER / FUNCTION ENABLE SWITCH	DIGITAL INPUT
	17	PLATFORM LEVEL UP SWITCH	DIGITAL INPUT
	18	PLATFORM ROTATE RIGHT SWITCH	DIGITAL INPUT
	19	JIB LIFT UP SWITCH	DIGITAL INPUT
	20	UNUSED (JIB RIGHT SWITCH)	DIGITAL INPUT
	21	TOWER LIFT DOWN SWITCH	DIGITAL INPUT
	22	UNUSED (TOWER TELESCOPE OUT SWITCH)	DIGITAL INPUT
	23	MAIN LIFT UP SWITCH	DIGITAL INPUT
	24	UNUSED (BATTERY VOLTAGE)	VBAT OUTPUT
	25	SWITCHES POWER	VBAT OUTPUT
	26	BATTERY LOW / NOT CHARGING INDICATOR	DIGITAL OUTPUT
	27	UNUSED (OUTPUT)	DIGITAL OUTPUT
	28	ENGINE HIGH COOLANT TEMPERATURE INDICATOR	DIGITAL OUTPUT
	29	ENGINE LOW OIL PRESSURE INDICATOR	DIGITAL OUTPUT
	30	MAIN TELESCOPE OUT SWITCH	DIGITAL INPUT
	31	INDICATORS GROUND	GROUND INPUT
	32	INDICATORS GROUND	GROUND INPUT
	33	MAIN LIFT DOWN SWITCH	DIGITAL INPUT
	34	SWING LEFT SWITCH	DIGITAL INPUT
	35	SWING RIGHT SWITCH	DIGITAL INPUT

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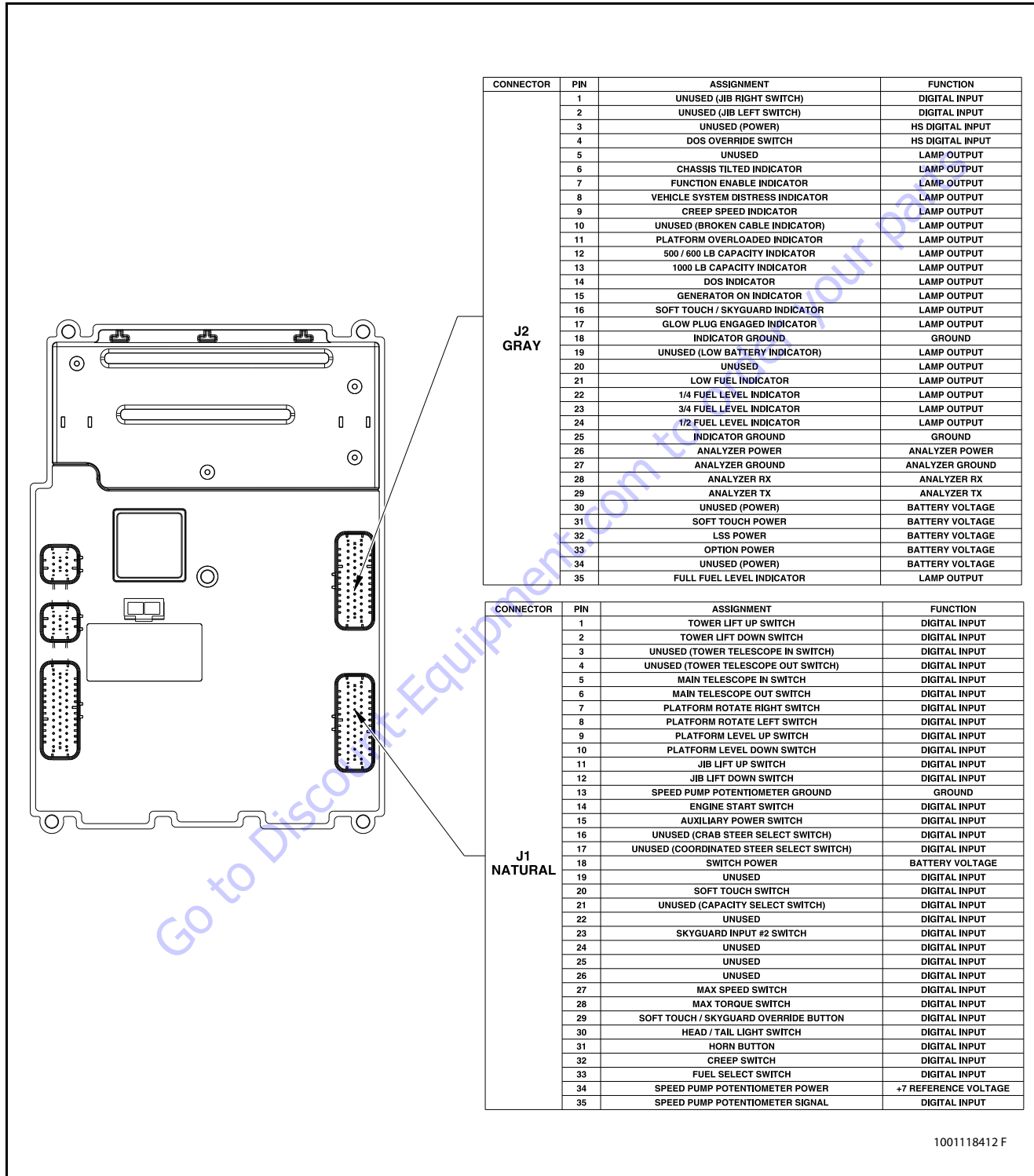
Figure 6-10. Ground Control Module - Sheet 3 of 3



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Figure 6-11. Platform Module - Sheet 1 of 2

SECTION 6 - JLG CONTROL SYSTEM



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Figure 6-12. Platform Module - Sheet 2 of 2

Table 6-2. Machine Configuration Programming Information (Software Version P2.7)

Configuration Label/Digit	Number	Description	Default Number
MODEL NUMBER: 1	0	????: Visible only on a Non-Configured UGM	1
	1	400S	
	2	400SC	
	3	450AJ	
MARKET: 2	1	ANSIUSA	1
	2	ANSI EXPORT	
	3	CSA	
	4	CE	
	5	AUSTRALIA	
	6	JAPAN	
	7	GB	
ENGINE: 3*	1	KUBOTA D1105	3
	2	KUBOTA DUAL FUEL	
	3	DEUTZ EMR2: (Tier 4i)	
	4	DEUTZ EMR4: (Tier 4f)	
<p>* Only visible under certain model selections. * Certain model selections will limit engine options. * Certain market selection will limit engine options.</p>			
FLYWHEEL TEETH: 4*	1	98 TEETH: 98 flywheel teeth.	1
	*This menu item is not visible.		
GLOW PLUG: 5*	1	NO GLOW PLUGS: No glow plugs installed.	2
	2	IN-CYLINDER: Glow plugs installed in each cylinder.	
*This menu item is not visible.			

SECTION 6 - JLG CONTROL SYSTEM

Table 6-2. Machine Configuration Programming Information (Software Version P2.7)

Configuration Label/Digit	Number	Description	Default Number
STARTER LOCKOUT: 6*	1	DISABLED: Automatic pre-glow time determined by ambient air temperature; engine start can be attempted at any time during pre-glow.	1
	2	ENABLED: Automatic pre-glow time determined by ambient air temperature; engine start is NOT permitted until pre-glow is finished.	
*Only visible for Engine Selection = Kubota D1105, Deutz EMR2 or Deutz EMR4.			
ENGINE SHUTDOWN: 7	1	DISABLED: No engine shutdown.	2
	2	ENABLED: Shutdown engine for high coolant temperature fault or low oil pressure fault	
FUEL CUTOUT: 8*	1	ONE RESTART: One restart with limited run time when near Empty.	4
	2	ENGINE STOP: No starting permitted when near Empty.	
	3	NONE	
	4	RESTART: Restarts allowed with limited run time when near Empty	
*Only visible for Engine Selection = Kubota D1105, Deutz EMR2 or Deutz EMR4. *Only visible if Fuel Level Menu selection is not NONE.			

Table 6-2. Machine Configuration Programming Information (Software Version P2.7)

Configuration Label/Digit	Number	Description	Default Number
TILT: 9*	1	5 DEGREES: Reduces the maximum speed of all boom functions to creep when tilted more than 5 degrees and above elevation; also reduces drive speed to creep.	9
	2	4.5 DEGREES: Reduces the maximum speed of all boom functions to creep when tilted more than 4.5 degrees and above elevation; also reduces drive speed to creep.	
	3	4 DEGREES: Reduces the maximum speed of all boom functions to creep when tilted more than 4 degrees and above elevation; also reduces drive speed to creep.	
	4	3 DEGREES: Reduces the maximum speed of all boom functions to creep when tilted more than 3 degrees and above elevation; also reduces drive speed to creep.	
	5	5 DEGREES + CUT: Reduces the maximum speed of all boom functions to creep when tilted more than 5 degrees and above elevation; also disallows tower lift up, drive, telescope out and lift up.	
	6	4.5 DEG + CUT: Reduces the maximum speed of all boom functions to creep when tilted more than 4.5 degrees and above elevation; also disallows tower lift up, drive, telescope out and lift up.	
	7	4 DEGREES + CUT: Reduces the maximum speed of all boom functions to creep when tilted more than 4 degrees and above elevation; also disallows tower lift up, drive, telescope out and lift up.	
	8	3 DEGREES + CUT: Reduces the maximum speed of all boom functions to creep when tilted more than 3 degrees and above elevation; also disallows tower lift up, drive, telescope out and lift up.	
	9	5 DEG + DRV CUT: Reduces the maximum speed of all boom functions to creep when tilted more than 5 degrees and above elevation; also reduces drive speed to creep when drive reversal is allowed, drive is disallowed otherwise.	
	10	4.5 DEG + DRV CT: Reduces the maximum speed of all boom functions to creep when tilted more than 4.5 degrees and above elevation; also reduces drive speed to creep when drive reversal is allowed, drive is disallowed otherwise.	
	11	4 DEG + DRV CUT: Reduces the maximum speed of all boom functions to creep when tilted more than 4 degrees and above elevation; also reduces drive speed to creep when drive reversal is allowed, drive is disallowed otherwise.	
	12	3 DEG + DRV CUT: Reduces the maximum speed of all boom functions to creep when tilted more than 3 degrees and above elevation; also reduces drive speed to creep when drive reversal is allowed, drive is disallowed otherwise.	
<p>*Certain market selections will limit tilt options and alter default setting. *Drive Reversal feature of X DEG + DRV CUT does not apply to crawlers. Note: Any of the selections above will light the tilt lamp when a tilted condition occurs and will sound the platform alarm when the machine is also above elevation.</p>			
JIB: 10*	1	NO: No jib installed.	2
	2	YES: Jib installed, which has up and down movements only.	
<p>*Certain model selections will limit visibility.</p>			
SOFT TOUCH: 11	1	NO: No Soft Touch system installed.	1
	2	YES: Soft Touch system installed.	

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Table 6-2. Machine Configuration Programming Information (Software Version P2.7)

Configuration Label/Digit	Number	Description	Default Number
SKYGUARD: 12	1	NO: No SkyGuard system installed.	2
	2	YES: SkyGuard system installed.	
GEN SET/WELDER: 13	1	NO: No generator installed.	1
	2	BELT DRIVE: Belt driven setup.	
GEN SET CUTOUT: 14*	1	MOTION ENABLED: Motion enabled when generator is ON.	1
	2	MOTION CUTOUT: Motion cutout in platform mode only.	
* Only visible if Gen Set / Welder Menu selection is not 1.			
H & T LIGHTS: 15*	1	NO: No head and tail lights installed.	1
	2	YES: Head and tail lights installed.	
* Only visible under certain model selection.			
LOAD SYSTEM: 16*	1	NO: No load sensor installed.	1
	2	WARN ONLY: Functions in creep, overload lamp lit, platform alarm beeps (5 sec ON, 2 sec OFF).	
	3	CUTOUT PLATFORM: All functions cutout, overload lamp lit, platform alarm beeps (5 sec ON, 2 sec OFF).	
	4	CUTOUT ALL: All functions cutout, flash overload light (500mS on, 500mS off), platform alarm beeps (5 sec ON, 2 sec OFF).	
	5	SPECIAL 1: Functions in creep, overload lamp lit, disables telescope out & lift up, platform alarm beeps (5 sec ON, 2 sec OFF).	
* Only visible under certain market selections. * Certain market selections will limit function cutout options or alter default setting.			
FUNCTION CUTOUT: 17*	1	NO: No drive cutout.	1
	2	BOOM CUTOUT: Boom function cutout while driving above elevation.	
	3	DRIVE CUTOUT: Drive & steer cutout above elevation.	
	4	DRIVE CUT E&T: Drive & steer cutout above elevation and tilted.	
* Only visible under certain market selections. * Certain market selections will limit function cutout options or alter default setting.			

Table 6-2. Machine Configuration Programming Information (Software Version P2.7)

Configuration Label/Digit	Number	Description	Default Number
GROUND ALARM: 18	1	NO: No ground alarm installed.	4
	2	DRIVE: Travel alarm sounds when the drive function is active.	
	3	DESCENT: Descent alarm sounds when lift down is active.	
	4	MOTION: Motion alarm sounds when any function is active.	
DRIVE TYPE: 19*	1	4WD: Four wheel drive.	1
	2	2WD: 2 wheel drive.	
* Only visible under certain model selection.			
DISPLAY UNITS: 20*	1	METRIC: Celsius, Kilograms, KiloPascal.	2
	2	IMPERIAL: Fahrenheit, Pounds, Pounds/in²	
* Certain market selections will alter default setting.			
CLEARSKY: 21*	1	NO: ClearSky (telematics) options is disabled.	1
	2	YES: ClearSky (telematics) option is enabled.	
* Only visible under certain model selection.			
CRIBBING OPTION: 22*	1	NO: Cribbing Option is disabled.	1
	2	YES: Cribbing Option is enabled.	
* Only visible under certain model selection. * Only visible under certain market selection.			
ALERT BEACON: 23	1	OFF FOR CREEP	1
	2	IN CREEP 20FPM	
TEMP CUTOUT: 24*	1	NO: No Low Temp Cutout system installed.	1
	2	YES: Low Temp Cutout system installed.	
* Only visible under certain market selection.			
PLAT LVL OVR CUT: 25	1	NO: Platform Level functions above elevation.	1
	2	YES: Platform Level does not function above elevation.	
ALARM / HORN: 26	1	SEPARATE: Ambient alarm installed.	2
	2	COMBINED: Single Horn / Alarm installed.	

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Table 6-2. Machine Configuration Programming Information (Software Version P2.7)

Configuration Label/Digit	Number	Description	Default Number
TELE CUTBACK: 27*	1	NO: Telescope Cutback Option is disable.	1
	2	YES: Telescope Cutback Option is enable.	
* Only visible under certain model selection.			
FUEL LEVEL: 28*	1	NONE: Fuel Level Switch / Sensor is not installed.	3
	2	SWITCH: Fuel Level Switch is installed.	
	3	SENSOR: Fuel Level Sensor is installed.	
* Only visible under certain model selection.			
WATER IN FUEL SENSOR: 29*	1	NO: Water in Fuel Sensor is not installed	1
	2	YES: Water in Fuel Sensor is installed	
* Only visible under certain market selection. * Only visible for Engine Selection = Deutz EMR4.			

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Table 6-3. Machine Configuration Programming Settings - 450A (Software Version P2.7)

450A	ANSI USA	ANSI Export	CSA	CE	Australia	Japan
Model Number	3	3	3	3	3	3
Market	1	2	3	4	5	6
Engine	X	X	X	X	X	X
	2	2	2	X	X	2
	3	3	3	X	X	3
	4	4	4	4	4	4
	5	5	5	5	5	5
Flywheel Teeth	X	X	X	X	X	X
Glow Plug	2	2	2	2	2	2
Starter Lockout	1	1	1	1	1	1
	2	2	2	2	2	2
Engine Shutdown	1	1	1	1	1	1
	2	2	2	2	2	2
Fuel Cutout	1	1	1	1	1	1
	2	2	2	2	2	2
	X	X	X	X	X	X
Tilt	4	4	4	4	4	4
	1	1	1	1	1	1
	X	X	X	X	X	X
	3	3	3	3	3	3
	4	4	4	4	4	4
	5	5	5	5	5	5
	X	X	X	X	X	X
	7	7	7	7	7	7
	8	8	8	8	8	8
	9	9	9	9	9	9
	X	X	X	X	X	X
	11	11	11	11	11	11
12	12	12	12	12	12	
Jib	1	1	1	1	1	1
	2	2	2	2	2	2
Soft Touch	1	1	1	1	1	1
	2	2	2	2	2	2
SkyGuard	1	1	1	1	1	1
	2	2	2	2	2	2
GenSet/Welder	1	1	1	1	1	1
	2	2	2	2	2	2
GenSet Cutout	1	1	1	1	1	1
	2	2	2	2	2	2

Table 6-3. Machine Configuration Programming Settings - 450A (Software Version P2.7)

450A	ANSI USA	ANSI Export	CSA	CE	Australia	Japan
Head & Taillights	1	1	1	1	1	1
	2	2	2	2	2	2
Load System	1	1	1	1	1	1
	X	2	X	X	X	2
	X	3	X	X	3	3
	X	4	X	4	X	4
	X	X	X	X	X	X
Function Cutout	1	1	1	X	1	1
	X	2	2	2	2	2
	3	3	3	X	3	3
Ground Alarm	1	1	1	1	1	1
	2	2	2	2	2	2
	3	3	3	3	3	3
	4	4	4	4	4	4
Drive Type	1	1	1	1	1	1
	2	2	2	2	2	2
Display Units	1	1	1	1	1	1
	2	2	2	2	2	2
Clearsky	1	1	1	1	1	1
	2	2	2	2	2	2
Cribbing Option	1	X	X	X	X	X
	2	X	X	X	X	X
Alert Beacon	1	1	1	1	1	1
	2	2	2	2	2	2
Temp Cutout	1	1	1	1	1	1
	X	2	X	2	X	X
Plat Lvl Ovr Cut	1	1	1	1	1	1
	2	2	2	2	2	2
Alarm/Horn	1	1	1	1	1	1
	2	2	2	2	2	2
Tele. Cutback	X	X	X	X	X	X
	X	X	X	X	X	X
Fuel Level	X	X	X	X	X	X
	2	2	2	2	2	2
	X	X	X	X	X	X
Water In Fuel Sensor	X	1	X	X	X	X
	X	2	X	X	X	X

BOLD TEXT indicates the default setting. Plain text indicates another available selection. **ITALIC TEXT** indicates the default when option is factory installed. SHADED CELLS indicate hidden menu or selection.

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Table 6-4. Machine Configuration Programming Settings - 450AJ (Software Version P2.7)

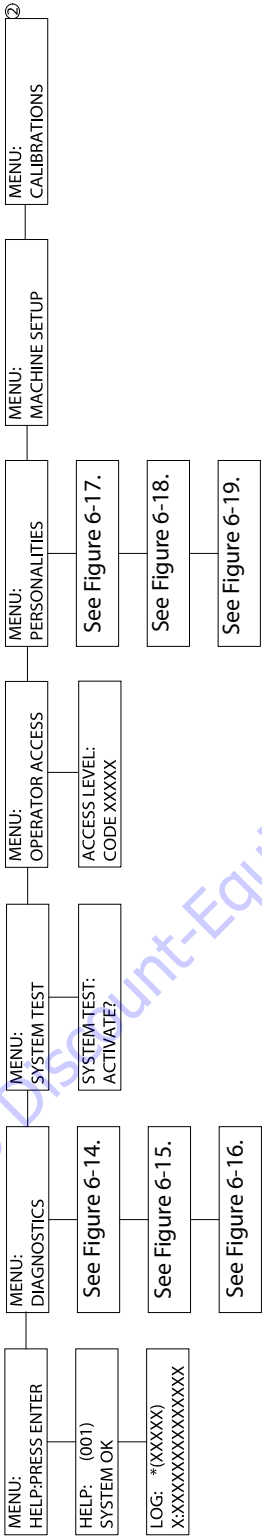
450AJ	ANSI USA	ANSI Export	CSA	CE	Australia	Japan
Model Number	3	3	3	3	3	3
Market	1	2	3	4	5	6
Engine	X	X	X	X	X	X
	2	2	2	X	X	2
	3	3	3	X	X	3
	4	4	4	4	4	4
	5	5	5	5	5	5
Flywheel Teeth	X	X	X	X	X	X
Glow Plug	2	2	2	2	2	2
Starter Lockout	1	1	1	1	1	1
	2	2	2	2	2	2
Engine Shutdown	1	1	1	1	1	1
	2	2	2	2	2	2
Fuel Cutout	1	1	1	1	1	1
	2	2	2	2	2	2
	X	X	X	X	X	X
	4	4	4	4	4	4
Tilt	1	1	1	1	1	1
	X	X	X	X	X	X
	3	3	3	3	3	3
	4	4	4	4	4	4
	5	5	5	5	5	5
	X	X	X	X	X	X
	7	7	7	7	7	7
	8	8	8	8	8	8
	9	9	9	9	9	9
	X	X	X	X	X	X
	11	11	11	11	11	11
	12	12	12	12	12	12
Jib	1	1	1	1	1	1
	2	2	2	2	2	2
Soft Touch	1	1	1	1	1	1
	2	2	2	2	2	2
SkyGuard	1	1	1	1	1	1
	2	2	2	2	2	2
GenSet/Welder	1	1	1	1	1	1
	2	2	2	2	2	2
GenSet Cutout	1	1	1	1	1	1
	2	2	2	2	2	2
Head & Taillights	1	1	1	1	1	1
	2	2	2	2	2	2

Table 6-4. Machine Configuration Programming Settings - 450AJ (Software Version P2.7)

450AJ	ANSI USA	ANSI Export	CSA	CE	Australia	Japan
Load System	1	1	1	1	1	1
	X	2	X	X	X	2
	X	3	X	X	3	3
	X	4	X	4	X	4
Function Cutout	1	1	1	X	1	1
	X	2	2	2	2	2
	3	3	3	X	3	3
	X	X	X	X	X	X
Ground Alarm	1	1	1	1	1	1
	2	2	2	2	2	2
	3	3	3	3	3	3
	4	4	4	4	4	4
Drive Type	1	1	1	1	1	1
	2	2	2	2	2	2
Display Units	1	1	1	1	1	1
	2	2	2	2	2	2
Clearsky	1	1	1	1	1	1
	2	2	2	2	2	2
Cribbing Option	1	X	X	X	X	X
	2	X	X	X	X	X
Alert Beacon	1	1	1	1	1	1
	2	2	2	2	2	2
Temp Cutout	1	1	1	1	1	1
	X	2	X	2	X	X
Plat Lvl Ovr Cut	1	1	1	1	1	1
	2	2	2	2	2	2
Alarm/Horn	1	1	1	1	1	1
	2	2	2	2	2	2
Tele Cutback	X	X	X	X	X	X
	X	X	X	X	X	X
Fuel Level	X	X	X	X	X	X
	2	2	2	2	2	2
	X	X	X	X	X	X
Water In Fuel Sensor	X	1	X	X	X	X
	X	2	X	X	X	X

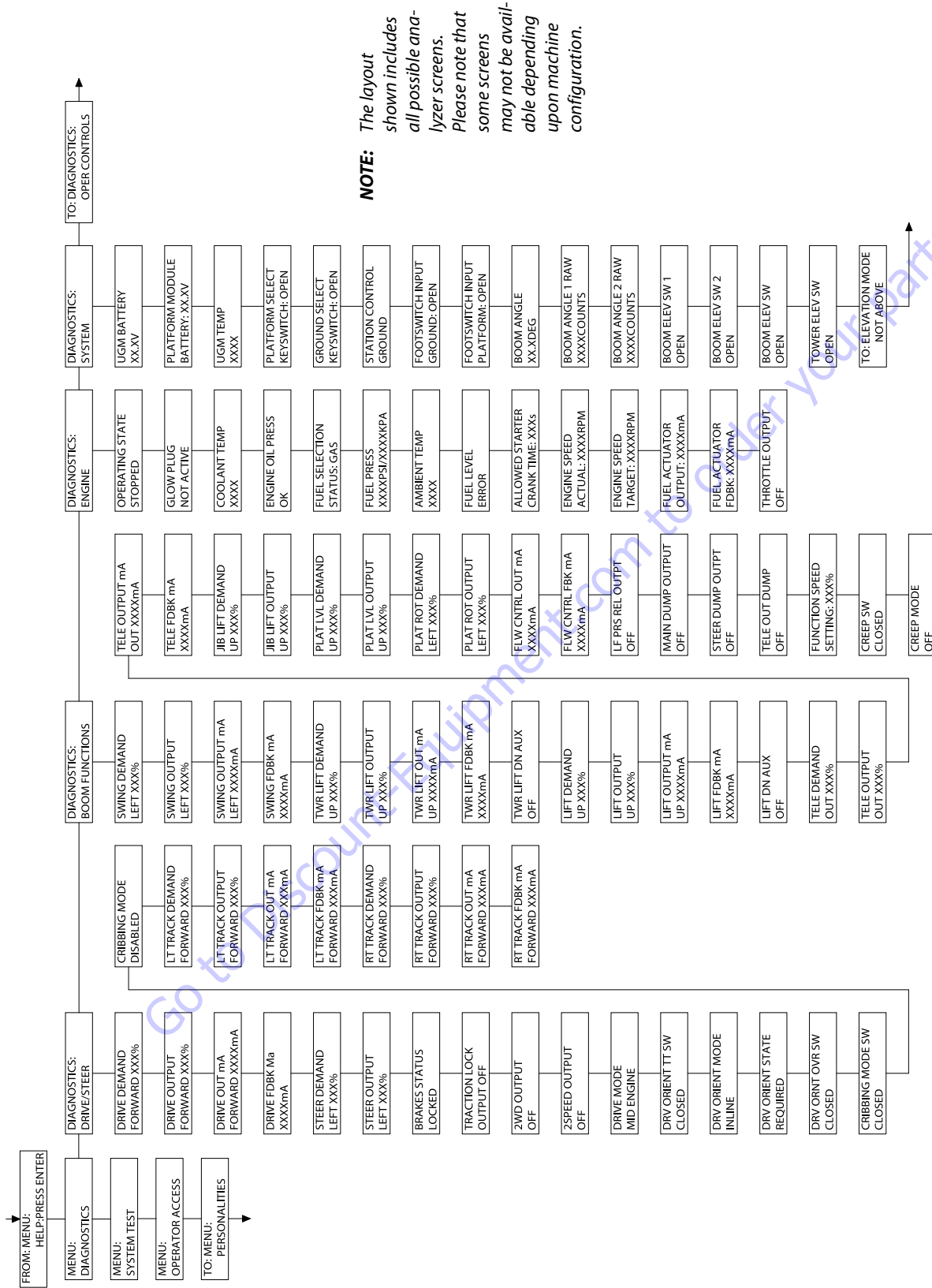
BOLD TEXT indicates the default setting. Plain text indicates another available selection. **ITALIC TEXT** indicates the default when option is factory installed. SHADED CELLS indicate hidden menu or selection.

1001193425-F



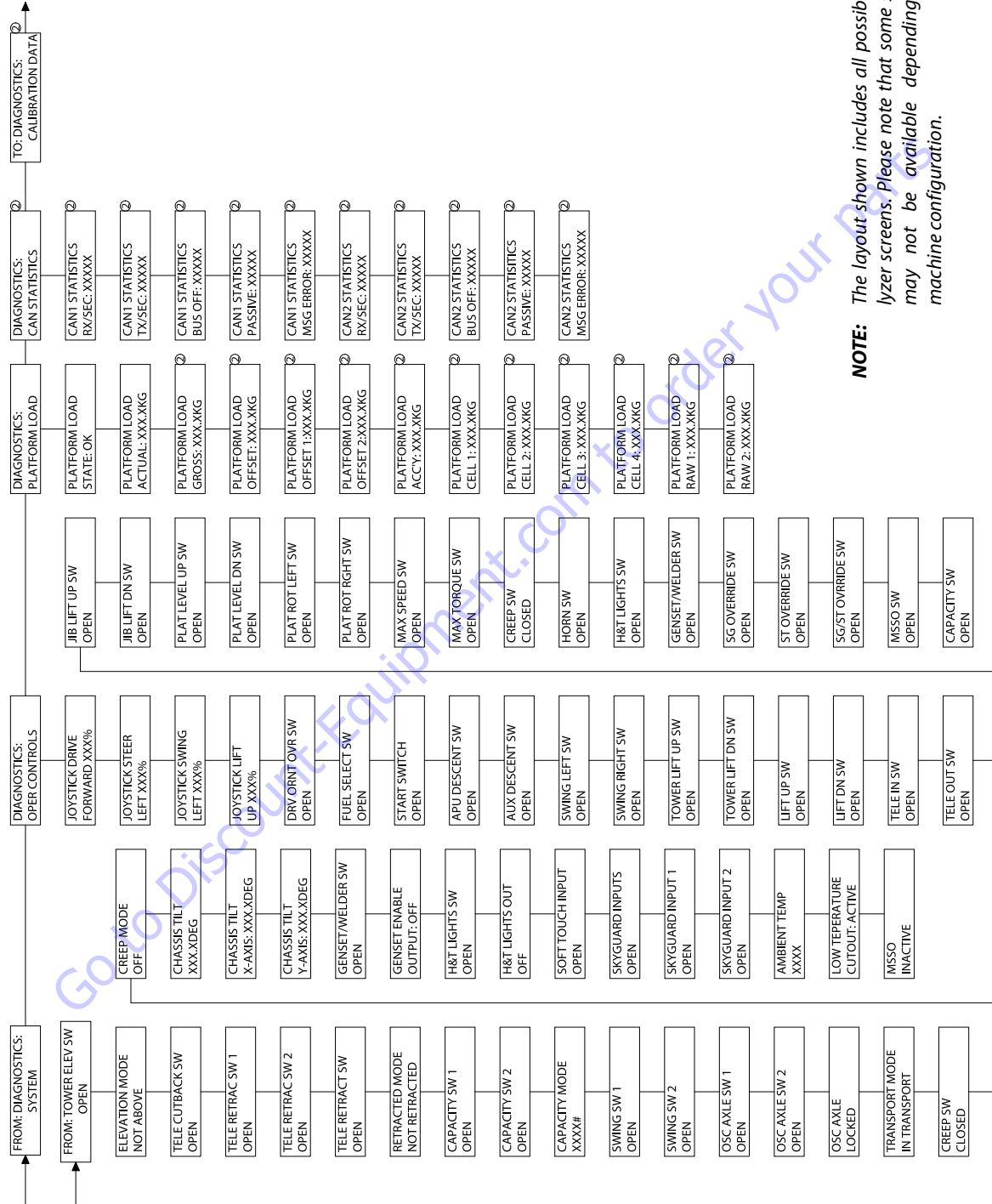
NOTE: The layout shown includes all possible analyzer screens. Please note that some screens may not be available depending upon machine configuration.

Figure 6-13. Analyzer Flow Chart



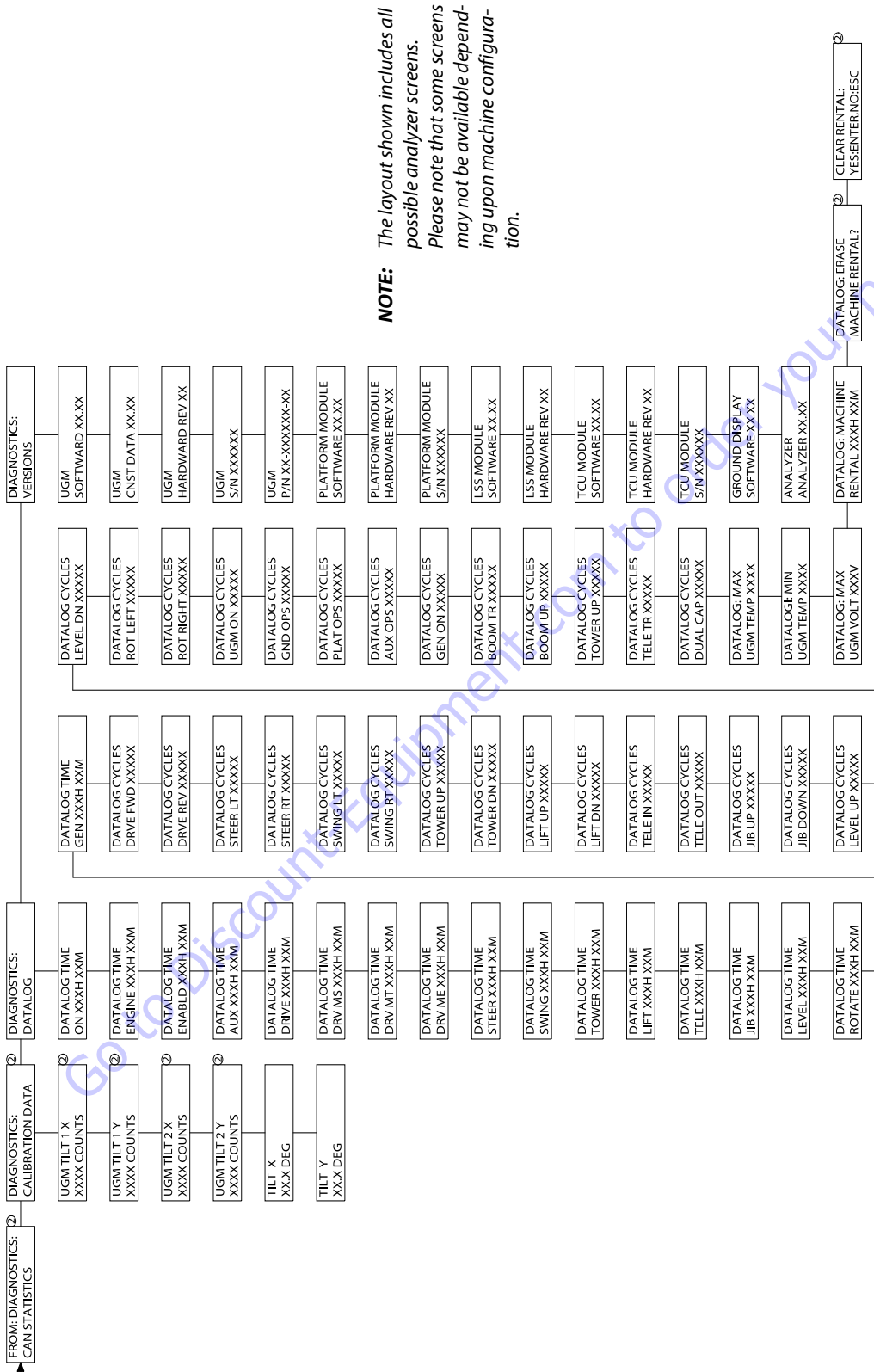
NOTE: The layout shown includes all possible analyzer screens. Please note that some screens may not be available depending upon machine configuration.

Figure 6-14. Analyzer Flow Chart - Diagnostics (Software Version 2.7) - Sheet 1 of 3



NOTE: The layout shown includes all possible analyzer screens. Please note that some screens may not be available depending upon machine configuration.

Figure 6-15. Analyzer Flow Chart - Diagnostics (Software Version 2.7) - Sheet 2 of 3



NOTE: The layout shown includes all possible analyzer screens. Please note that some screens may not be available depending upon machine configuration.

Figure 6-16. Analyzer Flow Chart - Diagnostics (Software Version 2.7) - Sheet 3 of 3



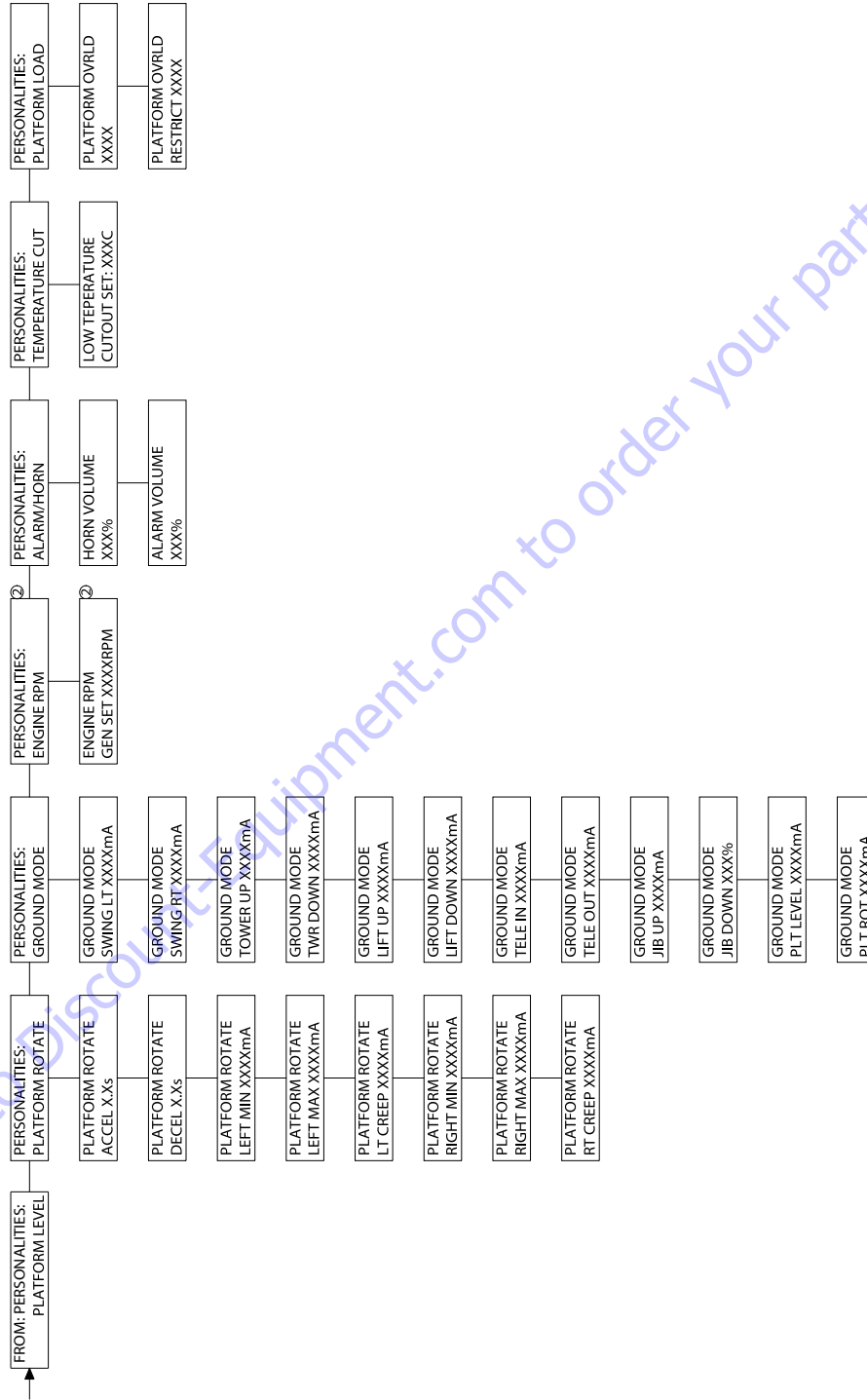
NOTE: The layout shown includes all possible analyzer screens. Please note that some screens may not be available depending upon machine configuration.

Figure 6-17. Analyzer Flow Chart - Personalities (Software Version 2.7) - Sheet 1 of 3



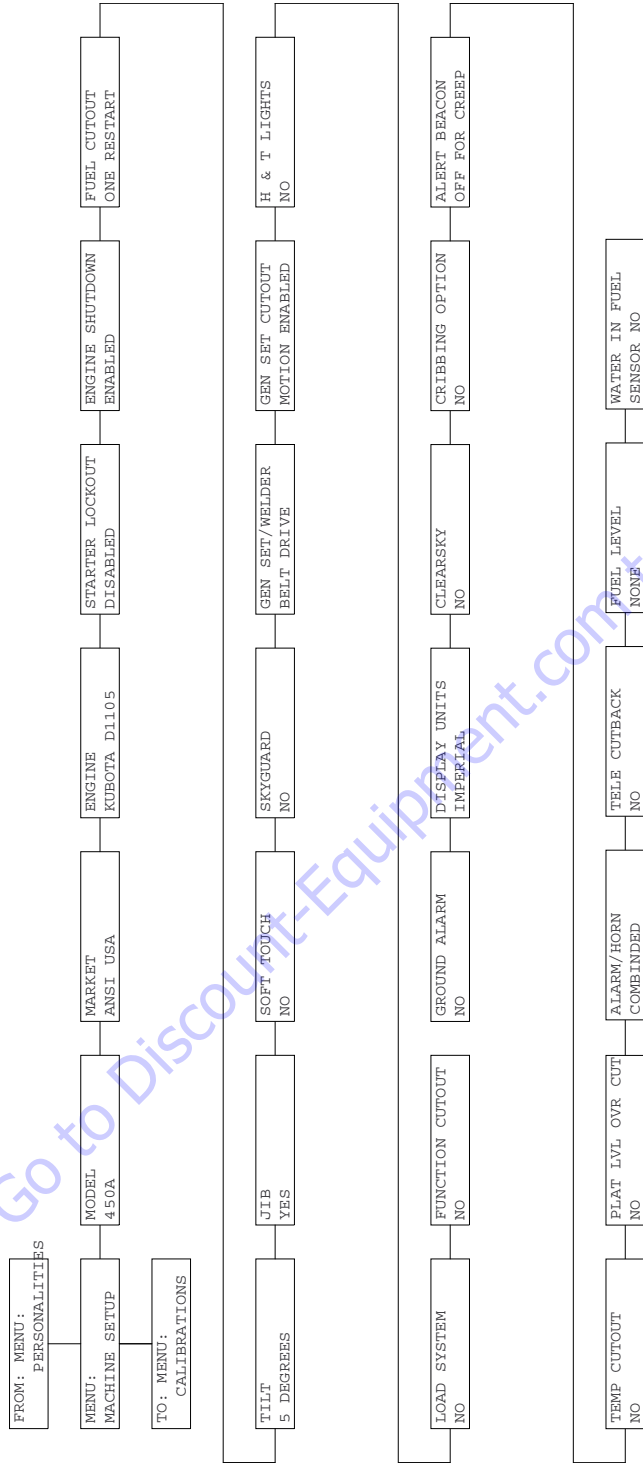
NOTE: The layout shown includes all possible analyzer screens. Please note that some screens may not be available depending upon machine configuration.

Figure 6-18. Analyzer Flow Chart - Personalities (Software Version 2.7) - Sheet 2 of 3



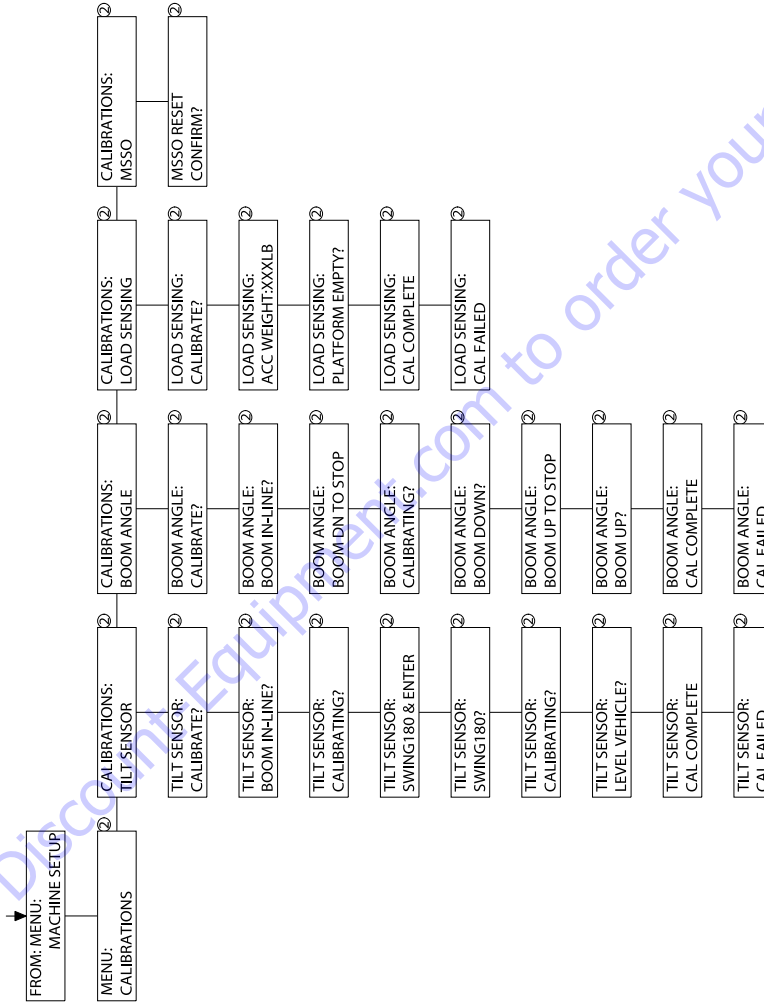
NOTE: The layout shown includes all possible analyzer screens. Please note that some screens may not be available depending upon machine configuration.

Figure 6-19. Analyzer Flow Chart - Personalities (Software Version 2.7) - Sheet 3 of 3



NOTE: The layout shown includes all possible analyzer screens. Please note that some screens may not be available depending upon machine configuration.

Figure 6-20. Analyzer Flow Chart - Machine Setup (Software Version 2.7)




NOTE: The layout shown includes all possible analyzer screens. Please note that some screens may not be available depending upon machine configuration.

Figure 6-21. Analyzer Flow Chart - Calibrations (Software Version 2.7)

6.2 LSS SYSTEM

The JLG-designed Load Sensing System (LSS) measures platform load via a sensor mounted in the platform support structure. If the actual platform load exceeds the selected Rated Load, the following will occur:

1. The Overload Visual Warning Indicator will flash at the selected control position (platform or ground). 
2. The Platform and Ground Alarms will sound 5 seconds On, and 2 seconds Off.
3. All normal movement will be prevented from the platform control position (optional - ground control functions may be prevented).
4. Further movement is permitted by:
 - a. Removing the excess platform load until actual platform load is less than Rated Load.
 - b. Operation of the overriding emergency system (Auxiliary Power Unit).
 - c. By an authorized person at the ground control position (optional - ground control functions may be prevented).

NOTICE

THE LOAD SENSING SYSTEM MUST BE CALIBRATED WHEN ONE OR MORE OF THE FOLLOWING CONDITIONS OCCUR:

- a. LSS Sensor removal or replacement
- b. Addition or removal of certain platform mounted accessories. (Refer to Calibration)
- c. Platform is removed, replaced, repaired or shows evidence of impact.




NOTICE

THE LOAD SENSING SYSTEM REQUIRES PERIODIC FUNCTION VERIFICATION NOT TO EXCEED 6 MONTHS FROM PREVIOUS VERIFICATION. REFER TO TESTING & EVALUATION.

All calibration procedures are menu driven through the use of a JLG Analyzer.

Diagnostic Menu

The Diagnostic Menu is another troubleshooting tool for the Load Sensing System. Sensor and status information is presented in real-time for the technician. Several sub-menus exist to organize the data.

To access the Diagnostic Menu, use the LEFT  and RIGHT  Arrow keys to select DIAGNOSTICS from the Top Level Menu. Press the ENTER key  to view the menu.

Press the LEFT and RIGHT Arrow keys to view the displays and select the various sub-menus. To access a sub-menu, press the ENTER key. Once in a sub-menu, press the LEFT and RIGHT Arrow keys to view the various displays (just like a Top Level


menu). To exit a sub-menu, press the ESC key .

Table 6-5, Diagnostic Menu Descriptions details the structure of the Diagnostic Menu, and describes the meaning of each piece of information presented.

Table 6-5. Diagnostic Menu Descriptions

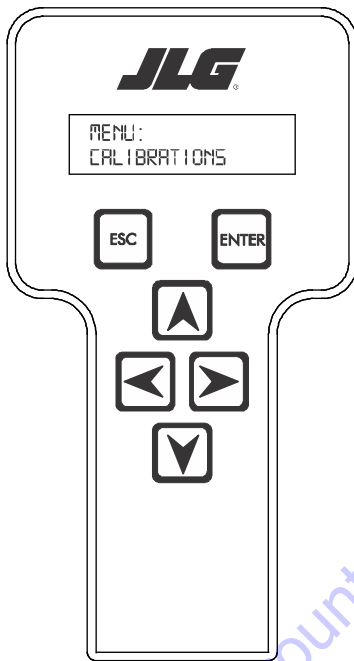
Diagnosics Menu (Displayed on Analyzer 1 st Line)	Parameter (Displayed on Analyzer 2 nd Line)	Parameter Value (Displayed on Analyzer 2 nd Line)	Description
PLATFORM LOAD	STATE:	OK / OVERLOAD	LSS Status.
PLATFORM LOAD	ACTUAL:	XXX.X KG	Calibrated weight of the platform. ??? if Platform Load is Unhealthy**.
PLATFORM LOAD (service*)	GROSS:	XXX.X KG	Gross weight of the platform. ??? if both Cells are Unhealthy**.
PLATFORM LOAD (service*)	OFFSET 1:	XXX.X KG	Stored offset weight of Cell 1. ??? if LSS is not calibrated.
PLATFORM LOAD (service*)	OFFSET 2:	XXX.X KG	Stored offset weight of Cell 1. ??? if LSS is not calibrated.
PLATFORM LOAD (service*)	ACCESSORY	XXX.X KG	Stored accessory weight. ??? if LSS is not calibrated.
PLATFORM LOAD (service*)	UNRESTRICT	XXX.X KG	UGM will set Unrestricted Rated Load as defined by Machine Configuration.
PLATFORM LOAD (service*)	RESTRICT	XXX.X KG	UGM will set Restricted Rated Load as defined by Machine Configuration.
PLATFORM LOAD (service*)	RAW 1:	XXX.X KG	Gross value from Cell 1. ??? if Unhealthy**.
PLATFORM LOAD (service*)	RAW 2:	XXX.X KG	Gross value from Cell 2. ??? if Unhealthy**.

* Indicates only visible in service view mode


** Typically indicates a DTC is active

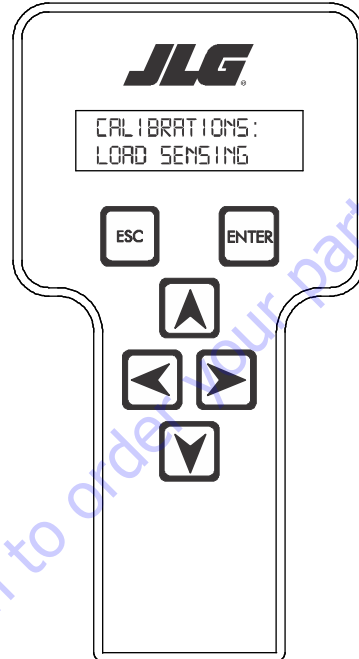
Calibration Procedure

1. Remove everything from the platform, except permanently fixed JLG Accessories, to allow the Load Sensing System to record its' weight during calibration. This includes all tools, debris, and customer-installed devices.
2. Plug the JLG Analyzer into the Machine at the Ground Station and enter Service Access Password 33271.
3. The platform should be approximately level for calibration. Level the platform from ground control (if necessary) to within +/- 5°.
4. To access the Calibration Menu, use the LEFT and RIGHT Arrow keys to select CALIBRATION from the Top Level Menu. The screen will read:

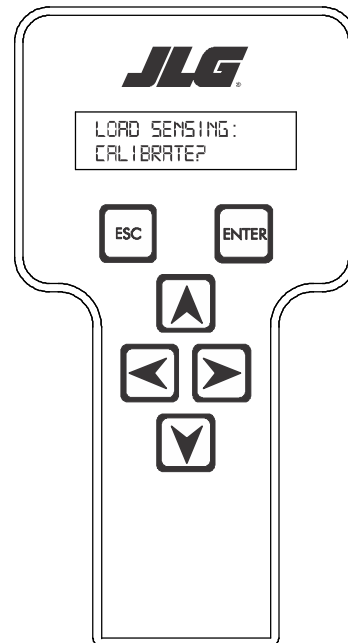


NOTE: The Calibration Menu is not available in OPERATOR ACCESS.


5. Press the ENTER key  to view the menu. Upon entry to the Calibration Menu, the JLG Control System will link to the Analyzer and the screen will read:



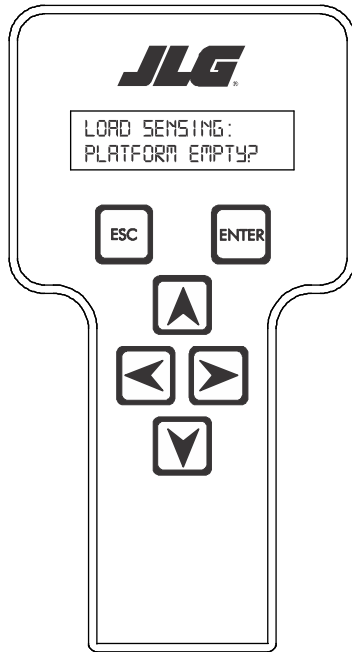
6. Press Enter . The Screen will read:




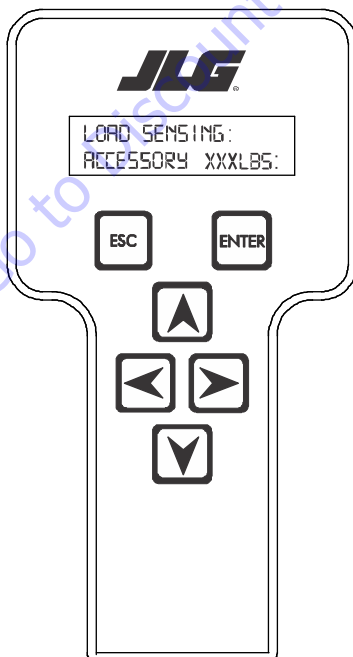
NOTE: Calibration will auto fail if LSS DTC's are active (443, 444, 4479, 4480, 663, 821, 822, 823, 824, 8218, 8222 -> 8238, 991, 992, 993, 994 or 99285).

Pressing the ESC key  after starting calibration and before calibration is complete will display the CAL FAILED message. This will not disturb the prior calibration information.

7. Press ENTER . The analyzer screen will read:




8. If the platform is empty, press ENTER . The screen will read:



NOTE: Accessory weight will reset to 0 lb each time the machine is re-calibrated and will need to be re-entered.

NOTE: The Accessory weight will be temporarily stored in the Control System until calibration has been completed successfully.

Refer to Table 6-6, Accessory Weights. Use the up and down analyzer keys to enter the accessory weight(s) (in lb). When all the accessory weights are entered, press

ENTER . The screen will read:

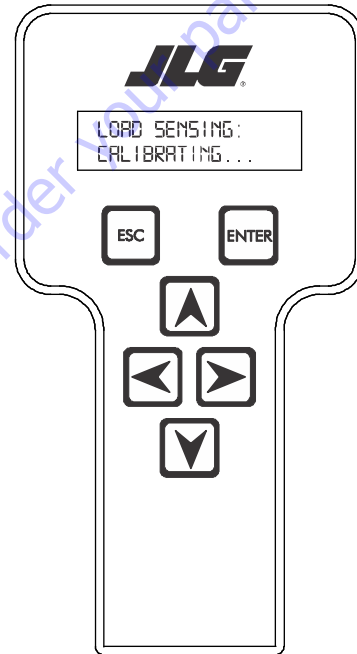


Table 6-6. Accessory Weights

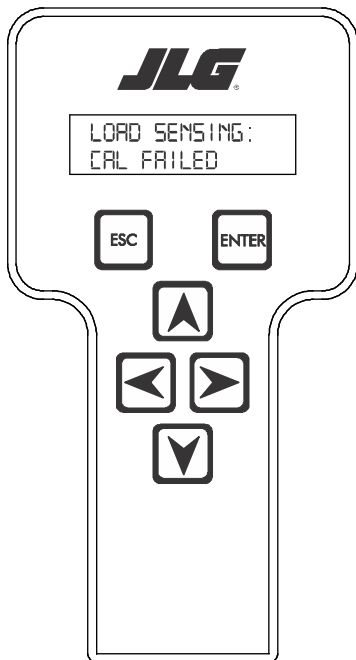
Accessory	Weight
SkyWelder (stick welder)	70 lb (32 kg)
SkyWelder Prep	Prep only = 15 lb (7 kg) Full install = 70 lb (32 kg)
SkyCutter (plasma cutter)	70 lb (32 kg)
SkCutter / SkyWelder Combo	140 lb (64 kg)
Fire Extinguisher	45 lb (20 kg)
Overhead SoftTouch	80 lb (36 kg)
WorkSurface	20 lb (9 kg)

NOTE: Not all Accessories are available on every JLG model. Some Accessory combinations are prohibited due to excessive weight and/or load restriction. If any installed JLG Accessories are labeled with weight decals but are not listed in the table above, include their weight when entering the ACC WEIGHT value.


SECTION 6 - JLG CONTROL SYSTEM

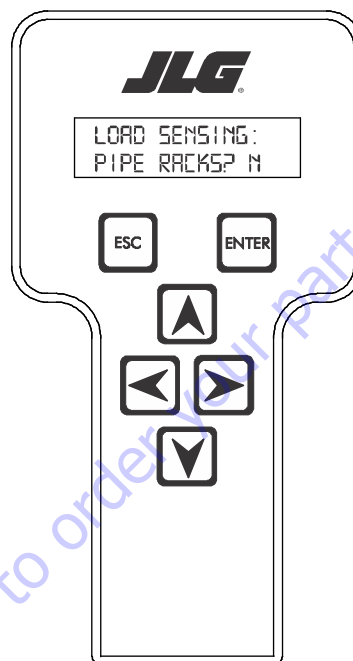
9. The control system will calculate the load cell readings and ensure it is greater than 130 lb (59 kg), but less than 575 lb (261 kg).


If the platform weight is not within the allowed range, the calibration attempt will be unsuccessful and the Analyzer will show the following:

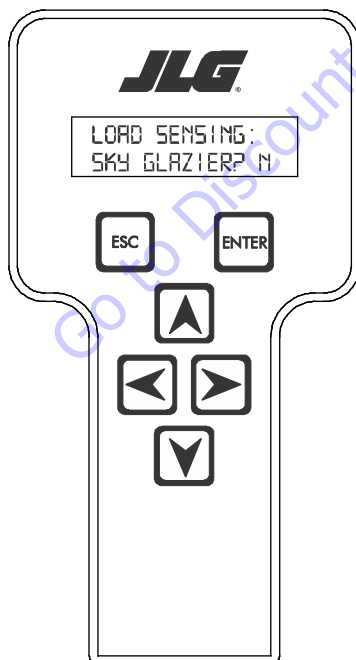


11. Use the analyzer keys to select N for no or Y for yes. Press


ENTER . The screen will read:



10. Press ENTER . The control system will ask for installed accessories. The screen will show the following:



12. Use the analyzer keys to select N for no or Y for yes. Press

ENTER . The control system will default to an estimate of unrestricted capacity, which can be adjusted if necessary. Refer to Table 6-7, SkyGlazier Capacity Reductions and Table 6-8, Pipe Rack Capacity Reductions.

The screen will read:

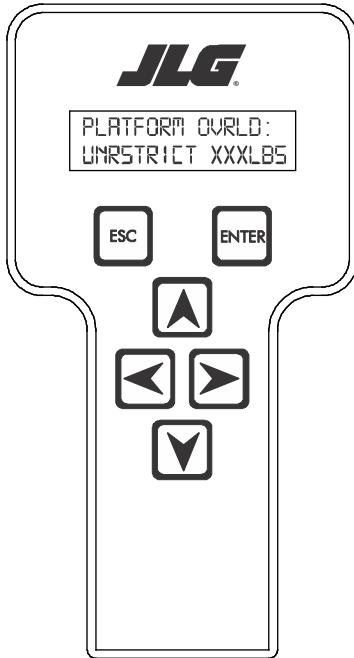


Table 6-7. SkyGlazier Capacity Reductions


Capacity	PLATFORM OVRLD	PLATFORM OVRLD RESTRICT
500 lb (227 kg)	400 lb (181 kg)	n/a
550 lb (250 kg)	400 lb (181 kg)	n/a
600 lb (272 kg)	400 lb (181 kg)	n/a
750 lb (340 kg)	n/a	590 lb (268 kg)
1000 lb (454 kg)	n/a	750 lb (340 kg)

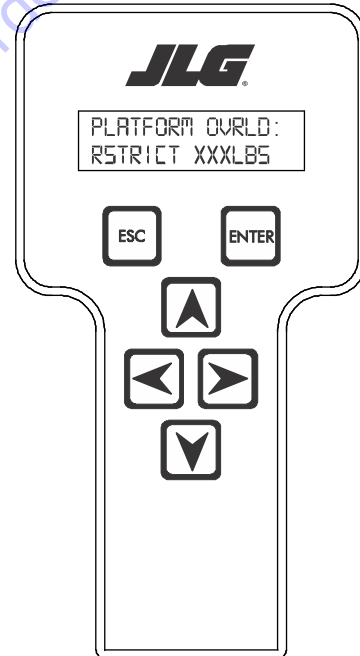
NOTE: If both SkyGlazier and Pipe Racks are configured, capacity will be the lower of the two values.


Table 6-8. Pipe Rack Capacity Reductions

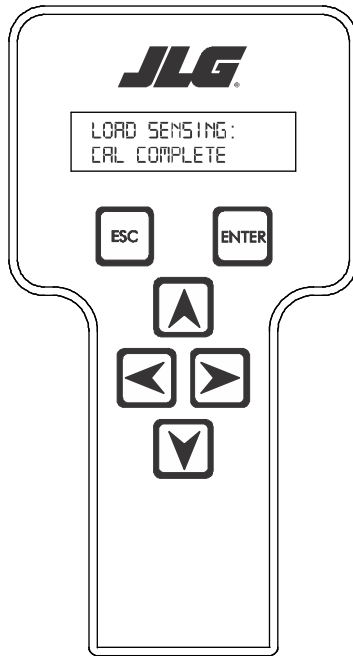
Capacity	PLATFORM OVRLD	PLATFORM OVRLD RESTRICT
500 lb (227 kg)	400 lb (181 kg)	n/a
550 lb (250 kg)	450 lb (204 kg)	n/a
600 lb (272 kg)	500 lb (227 kg)	n/a
750 lb (340 kg)	n/a	650 lb (295 kg)
1000 lb (454 kg)	n/a	900 lb (408 kg)

NOTE: If both SkyGlazier and Pipe Racks are configured, capacity will be the lower of the two values.

13. Press ENTER . The following screen will be displayed for restricted capacity, which can be adjusted if necessary. Refer to Table 6-7, SkyGlazier Capacity Reductions and Table 6-8, Pipe Rack Capacity Reductions.



14. Press ENTER . If calibration is successful, the screen will read:



Testing & Evaluation

Refer to Troubleshooting if the Load Sensing System fails to meet these guidelines.

1. Connect the JLG Analyzer.
2. Level the Platform. The platform should be approximately level for analysis, or the guidelines below will not be applicable. Level the platform from Ground Control (if necessary) to within ± 5 degrees.
3. Observe the Empty Platform Weight. Proceed to the DIAGNOSTICS, PLTLOAD sub-menu and observe the measured platform load. All tools, debris, and customer-installed devices shall be removed during evaluation. Ideally, the PLTLOAD should be zero but can vary ± 15 lb (± 7 kg). Further, the reading should be stable and should not vary by more than ± 2 lb (± 1 kg) (unless there is heavy influence from wind or vibration).
4. Use the Technician's Weight to Evaluate. The technician should enter the platform and record the PLTLOAD reading while standing in the center of the platform.
5. Confirm Control System Warnings and Interlocks. Using the keyswitch, select Platform Mode and power-up. Start the vehicle's engine and ensure that all controls are functional and the Load Sensing System's Overload Visual and Audible Warnings are not active. Simulate an Overload by unplugging the Shear Beam Load Cell. The Overload Visual Warning should flash, and the Audible Warning (at Platform and Ground) should sound for 5

seconds On, and 2 seconds Off. With the engine running, all control should be prevented. Cycle the Platform EMS to stop the engine and then power-up again. The Overload Visual and Audible Warning should continue. Confirm that controls are responsive when using the Auxiliary Power Unit for emergency movement. Reconnect the Load Cell. The Overload Visual and Audible Warnings should cease and normal control function should return. Switch the vehicle's keyswitch to Ground Mode and repeat the above procedure. The Overload Visual Warning at the Ground Controls should flash, and the Audible Warning (at Platform and Ground) should sound for 5 seconds On, 2 seconds Off. However, the controls should remain functional when using the engine and the Auxiliary Power Unit (if the Control System's MACHINE SETUP, LOAD is set to "2=CUTOUT PLT". If set to "3=CUTOUT ALL", then Ground Controls will be prevented when using the engine as in the platform).

6. Confirm Control System Capacity Indication (optional for vehicles with Dual Capacity Ratings). For vehicles equipped with a Capacity Select switch on the Platform Console Box, it is necessary to examine an additional interface between the Load Sensing System and the Control System. Using the keyswitch, select Platform Mode and power-up. If necessary, put the boom in the transport position (completely stowed) and center the Jib Plus (if equipped). Place the Capacity Select switch in the unrestricted position and ensure that the proper indicator illuminates on the Platform Console Box. Plug the JLG Analyzer into the Analyzer connection and proceed to the DIAGNOSTICS, SYSTEM submenu. Ensure that the CAPACITY displays indicate OFF. Place the Capacity Select switch in the unrestricted position (if so equipped) and ensure that the proper indicator illuminates on the Platform Console Box (but does not flash). For vehicles with unrestricted capacity, ensure that the unrestricted CAPACITY display indicates ON but the restricted CAPACITY indicates OFF. For vehicles with restricted capacity, ensure that the unrestricted CAPACITY display indicates OFF but the restricted CAPACITY indicates ON.
7. Confirm Load Sensing System Performance with Calibrated Weights. Operate the vehicle from Ground Control and place the boom in the transport position (fully stowed) for safety. Plug the JLG Analyzer into the control system connection and proceed to the DIAGNOSTICS, PLTLOAD display. Place 500lb (230kg) in the platform and ensure that PLTLOAD is with $\pm 5\%$ of the actual weight. For Dual Capacity vehicles, do the same for the alternate capacity (unrestricted or restricted).

Troubleshooting

The following tables are furnished to provide possible resolutions for common difficulties. Difficulties are classified as General, Calibration, Measurement Performance, and Host System Functionality.

Table 6-9. LSS Troubleshooting Chart

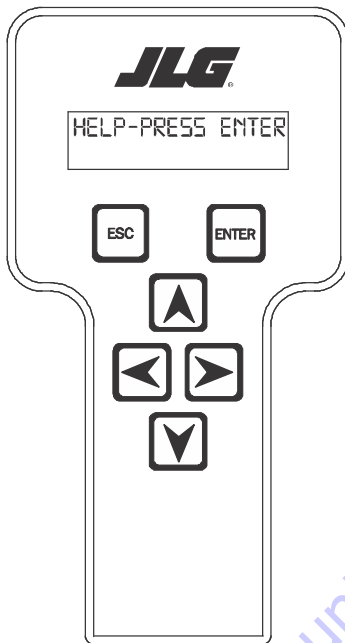
Difficulty	Possible Resolution
<p>Empty Platform Weight (DIAGNOSTICS, PLAT-FORM LOAD) is not within $\pm 15\text{lb}$ ($\pm 7\text{kg}$) of zero.</p> <p>or</p> <p>Platform Load readings (DIAGNOSTICS, PLTLOAD) are unstable by more than $\pm 2\text{lb}$ ($\pm 1\text{kg}$) (without the influence of vibration or wind).</p> <p>or</p> <p>There are large variations in Platform Load (DIAGNOSTICS, PLTLOAD) based on the location of the load. Tolerance to variations is 20lb for an evaluation using the technician's weight, and $\pm 5\%$ of Rated Load when using calibrated weights.</p>	<p>The LSS System is unable to properly measure the platform weight.</p> <ol style="list-style-type: none"> 1. The Load Cell is not properly plugged into the LSS Harness. It is possible poor electrical contact is made. 2. Wiring leading to the Load Cell is damaged. Carefully inspect sensor wiring where it passes through cable clamps for signs of damage. Inspect wiring where damage to the channel is apparent. 3. The Load Cell was not assembled properly during installation. Examine the sensor's reading using the JLG Analyzer. Proceed to the DIAGNOSTICS, CELL, LOAD displays and determine if the readings are reasonable. It is often helpful to apply slight downward pressure above the sensor and observe that its output increases (increasing force measurement; decreasing means the sensor is mounted upside-down). 4. The Load Cell is contaminated by debris or moisture. Examine the sensor's reading using the JLG Analyzer. Proceed to the DIAGNOSTICS, CELL, LOAD displays and determine if the readings are reasonable and stable (not changing by more than $\pm 2\text{lb}$ ($\pm 1\text{kg}$) (without the influence of vibration or wind). Lack of measurement stability is a key indication of contamination. Unplug the connector and inspect for dirt or moisture. Look carefully into the female connector on the sensor's cordset for evidence of contamination. Debris should be brushed away with a soft bristle brush (do not introduce any cleaners as they will leave conductive residue). Moisture should be allowed to evaporate or accelerated with a heat-gun (use low heat and be carefully to not melt connector materials). Moisture intrusion into the molded portion of the connector (capillary action into the wire bundle) or the Shear Beam Load Cell itself will require replacement of the sensor. 5. The Load Cell has been mechanically damaged. If the Load Cell is physically deformed or has damage to the cover it should be replaced immediately. It is also possible to have invisible mechanical damage resulting from an extreme overload ($> 6000\text{lb}$ [$> 2722\text{kg}$]).
<p>The Visual and Audible Overload Warnings fail to sound when platform is loaded beyond Rated Load, or when simulated by unplugging the Load Cell. Controls remain functional at Platform and Ground Control positions.</p>	<p>The Control System is failing to regard the overload signal from the LSS System, or the signal is shorted.</p> <ol style="list-style-type: none"> 1. The Load Sensing System must be enabled within the Control System. Plug the JLG Analyzer into the Control System, enter the Access Level 1 password (33271), and examine the MACHINE SETUP, LOAD sub-menu. The selection "2=CUTOUT PLT" should be displayed (platform controls prevented during overload, ground controls remain operational). In country- or customer-specific circumstance, the selection "3=CUTOUT ALL" is used (platform and ground controls prevented during overload).
<p>The Ground Audible Warning fails to sound, but the Platform Audible Warning sounds properly.</p>	<p>The Ground Alarm is missing or improperly installed. Verify that the device is mounted. Verify wiring from the Main Terminal Box and Ground Module.</p>
<p>Controls remain functional at the Ground Control position during an overload, or when simulated by unplugging the Load Cell. The Controls at the Platform Control position are prevented when using the engine, but not when using the Auxiliary Power Unit.</p>	<p>The JLG Control System is configured to prevent platform controls only in the event of overload. Alternately, the Host Control System can be configured to prevent ground and platform controls for country- or customer-specific circumstances.</p> <p>Using the JLG Analyzer, enter the Access Level 1 password (33271). Proceed to the MACHINE SETUP, LOAD sub-menu. Set this parameter to "2=CUTOUT PLT" to prevent platform controls in the event of overload. Set this parameter to "3=CUTOUT ALL" to prevent platform and ground controls in the event of overload.</p>



6.3 RESETTING THE MSSO SYSTEM

1. Use the following procedure to reset the MSSO system.
2. Position the Platform/Ground select switch to the desired position.
3. Plug the analyzer into the connector coming from the ground control module or from the platform console.

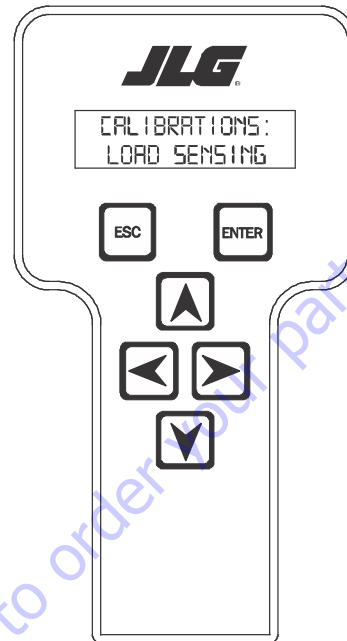
NOTE: If performing the procedure from the platform console, the Emergency Stop switch on the ground console must also be pulled out.



4. Pull out the Emergency Stop switch.
5. The analyzer screen should read:



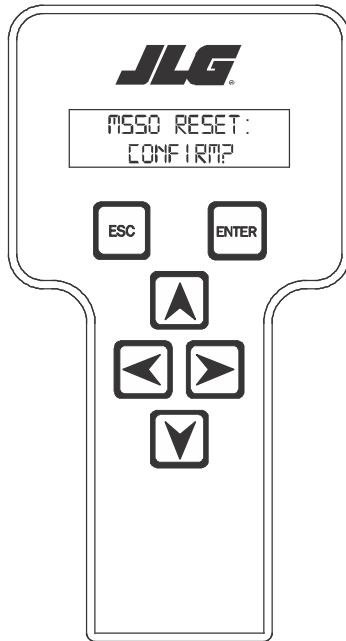
6. Use the arrow button to reach OPERATOR ACCESS. Press  Enter.
7. Enter the Access Code, 33271.
8. Use the right Arrow key to reach MENU: CALIBRATIONS. Press Enter .



9. Use the arrow keys to reach the LOAD SENSING menu. The screen should read:



10. Press ENTER .
11. Use the Down  arrow to reach MSSO RESET.



12. Press Enter . The screen will read:



13. Press Enter . The JLG Control System will reset an active 873 DTC and the MSSO System will be reset. Press Escape  to return to the CALIBRATIONS menu.


6.4 MACHINE MODEL ADJUSTMENT

Adjustment Notes

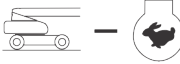



1. Personality settings can be adjusted anywhere within the adjustment range in order to achieve optimum machine performance.
2. Stop watch should be started with the function movement, not with actuation of the joystick or switch.
3. Drive speeds should be set to the values below regardless of the tire size.
4. All speed tests are run from the platform, these speeds do not reflect the ground control operation.
5. The Function Speed Control knob must be at full speed (turned clockwise completely) unless noted. 
6. Some flow control functions may not work with the Function Speed Control knob clicked into the creep position. 
7. Functional speeds may vary due to cold thick hydraulic oil. Test should be run with the oil temperature above 38° C (100° F)

Machine Orientation When Performing Test

DRIVE (BELOW ELEVATION)

1. Test should be done on a smooth, level surface. The Drive Select Switch should be in the "Max Speed" position. 
2. Start approximately 7.6 m (25 ft) from starting point so the unit is at a maximum speed when starting the test.
3. Results should be recorded for a 61 m (200 ft) course.
4. Drive forward, "High Speed", record time
5. Drive Reverse, "High Speed", record time

DRIVE (ABOVE ELEVATION)

1. Test should be done on a smooth, level surface. The Drive Select Switch should be in the "Max Speed" position. 
2. The boom should be > 10° above horizontal to ensure the drive is operating in Max Torque mode.
3. Results should be recorded for a 15.2 m (50 ft) course.
4. Drive forward, record time
5. Drive Reverse, record time
6. Turn Platform Speed Control Knob fully counterclockwise to enter Creep mode. 
7. Creep light on Panel must be energized. 
8. Verify that machine will Drive Forward and Reverse.
9. Return Knob to fully clockwise. 

SWING

1. Boom at full elevation, Telescope retracted. Swing Right until over rear axle or end stop (if equipped).
2. Swing Left 360° or end stop (if equipped), record time.
3. Swing Right 360° or end stop (if equipped), record time.
4. Turn Platform Speed Control Knob fully counterclockwise to enter Creep mode.



5. Creep light on Panel must be energized.



6. Verify that machine will swing left and right.
7. Return Function Speed Knob to fully clockwise.



TOWER LIFT

1. Tower Lift in stowed position, Telescope Retracted.
2. Tower Lift Up, record time.
3. Tower Lift Down, record time.
4. Turn Platform Speed Control Knob fully counterclockwise to enter Creep mode.



5. Creep light on Panel must be energized.

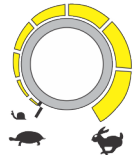


6. Verify that machine will Tower Up and Down. Return Knob to fully clockwise.



MAIN LIFT

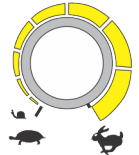
1. Main Lift in stowed position, Telescope Retracted.
2. Main Lift Up, record time.
3. Main Lift Down, record time.
4. Turn Platform Speed Control Knob fully counterclockwise to enter Creep mode.



5. Creep light on Panel must be energized.

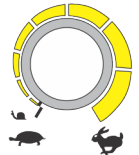


6. Verify that machine will Lift Up and Down.
7. Return Knob to fully clockwise.



TELESCOPE

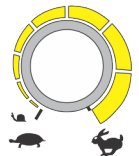
1. Main Lift at full elevation, Telescope Retracted.
2. Telescope Out, record time.
3. Telescope In, record time.
4. Turn Platform Speed Control Knob fully counterclockwise to enter Creep mode.



5. Creep light on Panel must be energized.



6. Verify that machine will Telescope In and Out.
7. Return Knob to fully clockwise.



JIB LIFT

1. Platform level and centered with the boom. Jib Lift Down until stop.
2. Jib Lift Up, record time.
3. Jib Lift Down, record time.
4. Turn Platform Speed Control Knob fully counterclockwise to enter Creep mode.



5. Creep light on Panel must be energized.



6. Verify that machine will Jib Lift Up and Down.
7. Return Knob to fully clockwise.



PLATFORM ROTATE

1. Platform level, Rotate Platform Right until stop
2. Platform Left, record time.
3. Platform Right, record time.
4. Turn Platform Speed Control Knob fully counterclockwise to enter Creep mode.



5. Creep light on Panel must be energized.



6. Verify that machine will Platform Rotate Left and Right.
7. Return Knob to fully clockwise.



NOTE: When the platform speed control knob is turned fully counterclockwise. The platform rotate may not work, this is acceptable.

Table 6-10. Machine Model Adjustment Speeds

FUNCTION		ADJUSTMENT RANGES	450AJ MODEL DEFAULTS		MODEL TIME RANGES (IN SECONDS)
					450AJ
DRIVE			4WD	2WD	
	Accel	25–2000mA/s	300 mA/s		
	Decel	25–2000mA/s	800 mA/s		
	Min	250–1000mA	725mA	725 mA	
	Max	250–1400mA	1175mA	1175 mA	30–34
Drive to Stop	Decel	25–2000mA/s	400 mA/s		
MT: Elevated	Max	250–1200mA	890 mA	795 mA	68–85
ME: Elevated	Max	250–1200mA	990 mA	835 mA	68–85
Max Torque	Creep	250–1200mA	890 mA	795mA	
Mid Engine	Creep	250–1200mA	990 mA	835 mA	
ME = Max Engine, MT = Max Torque					
SWING					
	Accel	0–5s	2.2 s		
	Decel	0–5s	1.2 s		
LEFT	Min	250–1400mA	570 mA		
	Max	250–1400mA	1000 mA		70–90
	Creep	250–1400mA	650 mA		
RIGHT	Min	250–1400mA	570 mA		
	Max	250–1400mA	1000 mA		70–90
	Creep	250–1400mA	650 mA		
TOWER LIFT					
	Accel	0–5s	1.5 s		
	Decel	0–5s	0.6 s		
UP	Min	250–1400mA	400 mA		
	Max	250–1400mA	1000 mA		15–18
	Creep	250–1400mA	600 mA		
DOWN	Min	250–1400mA	400 mA		
	Max	250–1400mA	950 mA		15–18
	Creep	250–1400mA	500 mA		
	Soft Down	250–1400mA	450 mA		
LIFT					
	Accel	0–5s	1.5 s		
	Decel	0–5s	0.8 s		
UP	Min	250–1400mA	420 mA		
	Max	250–1400mA	900 mA		16–20
	Creep	250–1400mA	650 mA		

Table 6-10. Machine Model Adjustment Speeds

FUNCTION		ADJUSTMENT RANGES	450AJ MODEL DEFAULTS	MODEL TIME RANGES (IN SECONDS)
				450AJ
DOWN	Min	250 – 1400mA	380 mA	
	Max	250 – 1400mA	690 mA	16 – 20
	Creep	250 – 1400mA	500 mA	
	Soft Down	250 – 1400mA	450 mA	
TELESCOPE				
	Accel	0 – 5s	1 s	
	Decel	0 – 5s	0.8 s	
IN	Min	250 – 1400mA	350 mA	
	Max	250 – 1400mA	775 mA	12 – 15
	Creep	250 – 1400mA	550 mA	
OUT	Min	250 – 1400mA	360 mA	
	Max	250 – 1400mA	1100 mA	12 – 15
	Creep	250 – 1400mA	625 mA	
JIB LIFT				
	Accel	0 – 5s	1.2 s	
	Decel	0 – 5s	0.5 s	
UP	Min	250 – 1400mA	350 mA	
	Max	250 – 1400mA	690 mA	18 – 22
	Creep	250 – 1400mA	500 mA	
DOWN	Min	250 – 1400mA	350 mA	
	Max	250 – 1400mA	600 mA	18 – 22
	Creep	250 – 1400mA	450 mA	
PLATFORM LEVEL				
	Accel	0 – 5s	0 s	
	Decel	0 – 5s	0 s	
UP	Min	250 – 1400mA	400 mA	
	Max	250 – 1400mA	600 mA	
	Creep	250 – 1400mA	600 mA	
DOWN	Min	250 – 1400mA	400 mA	
	Max	250 – 1400mA	600 mA	
	Creep	250 – 1400mA	600 mA	
PLATFORM ROTATE				
	Accel	0 – 5s	0 s	
	Decel	0 – 5s	0 s	
LEFT	Min	250 – 1400mA	400 mA	
	Max	250 – 1400mA	600 mA	20 – 32
	Creep	250 – 1400mA	600 mA	

Table 6-10. Machine Model Adjustment Speeds

FUNCTION		ADJUSTMENT RANGES	450AJ MODEL DEFAULTS	MODEL TIME RANGES (IN SECONDS)
				450AJ
RIGHT	Min	250 – 1400mA	400 mA	
	Max	250 – 1400mA	600 mA	20–32
	Creep	250 – 1400mA	600 mA	
GROUND MODE				
SWING	Left	250 – 1400mA	995 mA	
	Right	250 – 1400mA	995 mA	
TOWERLIFT	Up	250 – 1400mA	995 mA	
	Down	250 – 1400mA	945 mA	
LIFT	Up	250 – 1400mA	895 mA	
	Down	250 – 1400mA	685 mA	
TELESCOPE	In	250 – 1400mA	770 mA	
	Out	250 – 1400mA	1095 mA	
JIB	Up	250 – 1400mA	685 mA	
	Down	250 – 1400mA	595 mA	
PLATFORM	Up / Down	250 – 1400mA	595 mA	
PLATFORM	Left / Right	250 – 1400mA	595 mA	

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Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault
Note: "Controls Initialized" means all controls have been released / returned to neutral, and the machine enable (footswitch) has been released.				
EVERYTHING OK	001 ¹	Machine is in Platform Mode; The UGM determines no problems exist	No response required for this DTC	
GROUND MODE OK	002 ¹	Machine is in Ground Mode; The UGM determines no problems exist	No response required for this DTC	
RUNNING AT CUTBACK – OUT OF TRANSPORT POSITION	0010 ¹	Machine is in the Out of Transport position	Response described in Drive Modes section	Machine is not in the Out of Transport position
FSW OPEN	0011 ¹	Machine is in Platform Mode; Any of the following Platform inputs become active after power up, but before Machine Enabled: Drive joystick is not in the neutral position Steer; Lift and/or Swing joystick is not in the neutral position; Tower Lift (340AJ, 450AJ); Telescope; Platform Level; Platform Rotate; Jib Lift (if MACHINE SETUP > JIB = YES)	The UGM shall not Enable the Machine	Controls initialized
RUNNING AT CREEP - CREEP SWITCH OPEN	0012 ¹	Machine is in Platform Mode; Platform Creep switch input = HIGH; DTC 0013 is not active	The UGM shall limit the machine to Creep speed	Platform Creep switch input = Low
RUNNING AT CREEP - TILTED AND ABOVE ELEVATION	0013 ¹	Machine is in Platform Mode; The Boom is Above Elevation; Machine chassis is considered Tilted	The UGM shall limit the machine to Creep speed; If MACHINE SETUP > TILT = (angle) + CUT, response described in Tilted Output Cutouts section	Not all of the trigger conditions are met
FUEL LEVEL LOW – ENGINE SHUTDOWN	0031	Engine Shutdown has occurred due to Fuel Level = EMPTY condition.	Response described in Fuel Shutdown section	Power Cycled
APU ACTIVE	0035	Auxiliary Power/Emergency Descent Mode is active	Response described in Auxiliary Power/Emergency Descent Mode section	Auxiliary Power/Emergency Descent Mode is not active
FUNCTION PREVENTED - FUNCTION SELECTED BEFORE GROUND ENABLE	0036	Machine is in Ground Mode; Any of the following Ground inputs become active after power up, but before Machine Enabled: Lift; Swing; Tower Lift (340AJ, 450AJ); Telescope; Platform Level; Platform Rotate; Jib Lift (if MACHINE SETUP > JIB = YES)	The UGM shall not Enable the Machine	Controls initialized
SKYGUARD ACTIVE – FUNCTIONS CUTOUT	0039	MACHINE SETUP > SKYGUARD = YES; Machine is in Platform Mode; SkyGuard Enabled	Response described in Sky-Guard section	Not all of the trigger conditions are met
Power Cycle	211			

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault
KEYSWITCH FAULTY	212	UGM Ground Mode input J7-3 input = High; UGM Platform Mode input J7-2 input = High	The UGM shall assume a station selection of Ground	(J7-3 input = LOW) or (J7-2 input = LOW)
FSW FAULTY	213	The ground footswitch input and platform footswitch input have been both HIGH or both LOW for greater than or equal to 1 second	The UGM shall not Enable the Machine	Power Cycled
FUNCTION PROBLEM - HORN PERMANENTLY SELECTED	221	Machine is in Platform Mode; The Horn switch input = High at Startup	The UGM shall prohibit Horn; Ground and Platform Alarm are still permitted	The Horn switch input = Low
FUNCTION PROBLEM - STEER LEFT PERMANENTLY SELECTED	224	Machine is in Platform Mode; The Steer Left switch input = High at Startup	The UGM shall prohibit Steer Left and Right; The UGM shall limit Drive to Creep	The Steer Left switch input = Low; Steer Left and Right and full Drive speed permitted after controls are initialized
FUNCTION PROBLEM - STEER RIGHT PERMANENTLY SELECTED	225	Machine is in Platform Mode; The Steer Right switch input = High at Startup	The UGM shall prohibit Steer Left and Right; The UGM shall limit Drive to Creep	The Steer Right switch input = Low; Steer Left and Right and full Drive speed permitted after controls are initialized
STEER SWITCHES FAULTY	227	The Steer Left switch input = High; The Steer Right switch input = High; (detectable in Platform or Ground mode)	The UGM shall prohibit Steer; The UGM shall limit Drive to Creep	The Steer Left switch input = Low; The Steer Right switch input = Low; Steer and full Drive speed permitted after controls are initialized
FSW INTERLOCK TRIPPED	2211	Machine is in Platform Mode; The Footswitch is active for more than seven seconds with no Drive, Steer, or Boom commands	The UGM shall disable Machine Enable	The footswitch is released
DRIVE LOCKED - JOYSTICK MOVED BEFORE FOOTSWITCH	2212	Machine is in Platform Mode; The UGM detects one of the following conditions: Drive joystick is not in the neutral position at Startup; Drive joystick is not in the neutral position when Footswitch becomes active or while DTC 2213, 2221 or 2223 is active	If triggered by the Drive joystick not being in the neutral position at Startup, the UGM shall prohibit Drive and Steer. If triggered by the Drive joystick not being in the neutral position when Footswitch becomes active or while DTC 2213, 2221 or 2223 is active, the UGM shall not Enable the Machine	If triggered by the Drive joystick not being in the neutral position at Startup, then (Drive joystick is returned to its neutral position) and (Drive and Steer permitted after controls initialized) If triggered by the Drive joystick not being in the neutral position when Footswitch becomes active or while DTC 2213, 2221 or 2223, then controls initialized
STEER LOCKED - SELECTED BEFORE FOOTSWITCH	2213	Machine is in Platform Mode; A Steer input is active when Footswitch becomes active or while DTC 2212, 2221 or 2223 is active	The UGM shall not Enable the Machine	Controls initialized
D/S JOY. OUT OF RANGE HIGH	2216	The PM detects that the Drive or Steer joystick signal voltage > 8.1V and reports the fault to the UGM.	The UGM shall prohibit Drive; Brake release and Steer still permitted	The PM no longer reports the fault
D/S JOY. CENTER TAP BAD	2217	The PM detects that the Drive or Steer center tap voltage is not between 3.31 volts and 3.75 volts and reports the fault to the UGM	The UGM shall prohibit Drive; Brake release and Steer still permitted	The PM detects that the drive/steer center tap voltage is between 3.31 and 3.75 volts and no longer reports the fault to the UGM
L/S JOY. OUT OF RANGE HIGH	2219	The PM detects that the Lift or Swing joystick signal voltage > 8.1V and reports the fault to the UGM.	If the Machine is in Platform Mode, the UGM shall prohibit Lift and Swing	The PM detects that the Lift and Swing joystick signal voltage is < 8.1V and no longer reports the fault to the UGM

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault
L/S JOY. CENTER TAP BAD	2220	The PM detects that the Lift or Swing center tap voltage is not between 3.31 volts and 3.75 volts and reports the fault to the UGM	If the Machine is in Platform Mode, the UGM shall prohibit Lift and Swing	The PM detects that the lift/swing center tap voltage is between 3.31 and 3.75 volts and no longer reports the fault to the UGM
LIFT/SWING LOCKED - JOY-STICK MOVED BEFORE FOOTSWITCH	2221	Machine is in Platform Mode; The UGM detects one of the following conditions: Lift and/or Swing joystick is not in the neutral position at Startup; Lift and/or Swing joystick is not in the neutral position when Footswitch becomes active or while DTC 2212, 2213 or 2223 is active	If triggered by the Lift and/or Swing joystick not being in the neutral position at Startup, the UGM shall prohibit Lift and Swing. If triggered by Lift and/or Swing joystick is not in the neutral position when Footswitch becomes active or while DTC 2212, 2213 or 2223 is active, the UGM shall not Enable the Machine	If triggered by the Lift and/or Swing joystick not being in the neutral position at Startup, then (Lift and/or Swing joystick is returned to its neutral position) and (Lift and Swing permitted after controls initialized) If triggered by the Lift and/or Swing joystick is not in the neutral position when Footswitch becomes active or while DTC 2212, 2213 or 2223 is active, then controls initialized
WAITING FOR FSW TO BE OPEN	2222	Machine is in Platform Mode; Footswitch is active at Start Up	The UGM shall not Enable the Machine	Controls initialized
FUNCTION SWITCHES LOCKED - SELECTED BEFORE ENABLE	2223	Machine is in Platform Mode; Any of the following Platform inputs are active when Footswitch becomes active or while DTC 2212, 2213 or 2221 is active: Tower Lift; Telescope; Platform Level; Platform Rotate; Jib Lift (if MACHINE SETUP > JIB = YES)	The UGM shall not Enable the Machine	Controls initialized
FOOTSWITCH SELECTED BEFORE START	2224	Machine is in Platform Mode; The engine is stopped; Startup time has expired; The Footswitch is active before the Platform Engine Start switch input = High	The UGM shall prohibit Engine Start	The Platform Engine Start switch input = Low;
FUNCTION PROBLEM - PLATFORM ROTATE LEFT PERMANENTLY SELECTED	2247	Machine is in Platform Mode; The Platform Rotate Left switch input = High at Startup	The UGM shall prohibit Platform Rotate Left and Right	The Platform Rotate Left switch input = Low; Platform Rotate Left and Right permitted after controls are initialized
FUNCTION PROBLEM - PLATFORM ROTATE RIGHT PERMANENTLY SELECTED	2248	Machine is in Platform Mode; The Platform Rotate Right switch input = High at Startup	The UGM shall prohibit Platform Rotate Left and Right	The Platform Rotate Right switch input = Low; Platform Rotate Left and Right permitted after controls are initialized
FUNCTION PROBLEM - JIB LIFT UP PERMANENTLY SELECTED	2249	Machine is in Platform Mode; MACHINE SETUP > JIB = YES; The Jib Lift Up switch input = High at Startup	The UGM shall prohibit Jib Lift Up and Down	The Jib Lift Up switch input = Low; Jib Lift Up and Down permitted after controls are initialized
FUNCTION PROBLEM - JIB LIFT DOWN PERMANENTLY SELECTED	2250	Machine is in Platform Mode; MACHINE SETUP > JIB = YES; The Jib Lift Down switch input = High at Startup	The UGM shall prohibit Jib Lift Up and Down	The Jib Lift Down switch input = Low; Jib Lift Up and Down permitted after controls are initialized
FUNCTION PROBLEM - TELESCOPE IN PERMANENTLY SELECTED	2251	Machine is in Platform Mode; The Telescope In switch input = High at Startup	The UGM shall prohibit Telescope In and Out	The Telescope In switch input = Low; Telescope permitted after controls are initialized

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault
FUNCTION PROBLEM - TELESCOPE OUT PERMANENTLY SELECTED	2252	Machine is in Platform Mode; The Telescope Out switch input = High at Startup	The UGM shall prohibit Telescope In and Out	The Telescope Out switch input = Low; Telescope permitted after controls are initialized
FUNCTION PROBLEM - TOWER LIFT UP PERMANENTLY SELECTED	2257	Machine is in Platform Mode; The Tower Lift Up switch input = High at Startup	The UGM shall prohibit Tower Lift Up and Down	The Tower Lift In switch input = Low; Tower Lift Up and Down permitted after controls are initialized
FUNCTION PROBLEM - TOWER LIFT DOWN PERMANENTLY SELECTED	2258	Machine is in Platform Mode; The Tower Lift Down switch input = High at Startup	The UGM shall prohibit Tower Lift Up and Down	The Tower Lift Down switch input = Low; Tower Lift Up and Down permitted after controls are initialized
FUNCTION PROBLEM - PLATFORM LEVEL UP PERMANENTLY SELECTED	2262	Machine is in Platform Mode; The Platform Level Up switch input = High at Startup	The UGM shall prohibit Platform Level Up and Down	The Platform Level Up switch input = Low; Platform Level Up and Down permitted after controls are initialized
FUNCTION PROBLEM - PLATFORM LEVEL DOWN PERMANENTLY SELECTED	2263	Machine is in Platform Mode; The Platform Level Down switch input = High at Startup	The UGM shall prohibit Platform Level Up and Down	The Platform Level Down switch input = Low; Platform Level Up and Down permitted after controls are initialized
FUNCTION PROBLEM - DOS OVERRIDE PERMANENTLY SELECTED	2264	Machine is in Platform Mode; The DOS Override switch input = High at Startup	No response required for this DTC	The DOS Override switch input = Low
FUNCTION PROBLEM - SOFT TOUCH / SKYGUARD OVERRIDE PERMANENTLY SELECTED	2286	[(MACHINE SETUP > SKYGUARD = YES) or (MACHINE SETUP > SOFT TOUCH = YES)]; Machine is in Platform Mode; The Soft Touch / SkyGuard Override switch input = High at Startup	No response required for this DTC	The Soft Touch / SkyGuard Override switch input = Low
FUNCTION SWITCHES FAULTY - CHECK DIAGNOSTICS/BOOM	234	The UGM detects one of the following conditions (continuous monitoring): The machine is in Ground Mode and both direction inputs of the following boom controls are engaged at the same time: Engine Start/Aux, Telescope, Platform Level, Platform Rotate, Jib Lift, Tower Lift, Lift, or Swing. The machine is in Platform Mode and both direction inputs of the following boom controls are engaged at the same time: Engine Start/Aux, Telescope, Platform Level, Platform Rotate, Jib Lift (MACHINE SETUP > JIB = YES), Tower Lift (340AJ, 450AJ); or for Drive Mode – Max Speed/Max Torque	Disable whichever boom functions whose boom control inputs are triggering the fault. If Engine Start/Aux at fault, disable Engine Start but permit Auxiliary Power/ Emergency Descent.	None of the boom controls that trigger this fault have both of their direction inputs engaged at the same time
FUNCTION SWITCHES LOCKED - SELECTED BEFORE AUX POWER	235	The UGM detects one of the following conditions: The machine is in Ground Mode and the engine is stopped and the ground APU/Function Enable switch becomes engaged while a Ground control input is already engaged. The machine is in Platform Mode and the engine is stopped and the platform APU/Auxiliary Descent switch becomes engaged while a Platform control input is already engaged.	The UGM not enable Auxiliary Power/ Emergency Descent mode	The applicable APU/Auxiliary Descent switch is disengaged or all applicable control inputs become disengaged or the engine state becomes ENGINE RUNNING

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault
FUNCTION SWITCHES LOCKED - SELECTED BEFORE START SWITCH	236	The UGM detects one of the following conditions: The machine is in Ground Mode and the engine is stopped and any configured boom control is already engaged and the ground start switch changes from not engaged to engaged The machine is in Platform Mode and the engine is stopped and any drive/steer or configured boom control is already engaged and the footswitch is not engaged and the platform start switch changes from not engaged to engaged	The UGM shall prohibit Engine Start	The selected station's start switch is no longer engaged
START SWITCH LOCKED - SELECTED BEFORE KEYSWITCH	237	The start switch for the selected station is engaged during the UGM startup sequence	The UGM shall prohibit Engine Start	The selected station's start switch is no longer engaged
FUNCTION PROBLEM - GROUND ENABLE PERMANENTLY SELECTED	2310	Machine is in Ground Mode; The Ground Enable switch input = High at Startup	The UGM shall prohibit Engine Start; The UGM shall not Enable the Machine	Controls initialized
BOOM ANGLE SENSOR - NOT CALIBRATED	2343	The Boom Angle Sensor has not been calibrated	The UGM shall assume the Boom is Above Elevation; The UGM shall report a faulted boom angle of 90 degrees	Boom angle sensor calibrated
BOOM ANGLE SENSOR - OUT OF RANGE HIGH	2344	The UGM detects that Boom Angle Sensor #1 or Boom Angle Sensor #2 signal voltage > 4.5V.	The UGM shall assume the Boom is Above Elevation; The UGM shall report a faulted boom angle of 90 degrees	Power Cycled
BOOM ANGLE SENSOR - OUT OF RANGE LOW	2345	The UGM detects that Boom Angle Sensor #1 or Boom Angle Sensor #2 signal voltage < 0.5V.	The UGM shall assume the Boom is Above Elevation; The UGM shall report a faulted boom angle of 90 degrees	Power Cycled
BOOM ANGLE SENSOR - NOT RESPONDING	2346	The UGM detects the following conditions: The UGM detects < 1 deg change of Boom Angle Main Lift Up or Main Lift Down output value ≥ Creep output value Main Lift Up or Main Lift Down has been active longer than 5 seconds.	The UGM shall assume the Boom is Above Elevation; The UGM shall report a faulted boom angle of 90 degrees	Power Cycled
FUNCTION PROBLEM - JIB LIFT UP PERMANENTLY SELECTED	2370	Machine is in Ground Mode; MACHINE SETUP > JIB = YES; The Jib Lift Up switch input = High at Startup	The UGM shall prohibit Jib Lift Up and Down	The Jib Lift Up switch input = Low; Jib Lift Up and Down permitted after controls are initialized
FUNCTION PROBLEM - JIB LIFT DOWN PERMANENTLY SELECTED	2371	Machine is in Ground Mode; MACHINE SETUP > JIB = YES; The Jib Lift Down switch input = High at Startup	The UGM shall prohibit Jib Lift Up and Down	The Jib Lift Down switch input = Low; Jib Lift Up and Down permitted after controls are initialized
FUNCTION PROBLEM - SWING LEFT PERMANENTLY SELECTED	2372	Machine is in Ground Mode; The Swing Left switch input = High at Startup	The UGM shall prohibit Swing Left and Right	The Swing Left switch input = Low; Swing Left and Right permitted after controls are initialized
FUNCTION PROBLEM - SWING RIGHT PERMANENTLY SELECTED	2373	Machine is in Ground Mode; The Swing Right switch input = High at Startup	The UGM shall prohibit Swing Left and Right	The Swing Left switch input = Low; Swing Left and Right permitted after controls are initialized

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault
BOOM ANGLE SENSOR DIS-AGREEMENT	2396	The UGM detects that Boom Angle Sensor #1 and Boom Angle Sensor #2 readings disagree ≥ 2.5 deg for longer than 5 seconds; Do not report if DTC2343 is active	The UGM shall assume the Boom is Above Elevation and will report a faulted boom angle of 90 degrees	Power Cycled
FUNCTION PROBLEM – TOWER LIFT UP PERMANENTLY SELECTED	23105	Machine is in Ground Mode; The Tower Lift Up switch input = High at Startup	The UGM shall prohibit Tower Lift Up and Down	The Tower Lift Up switch input = Low; Tower Lift Up and Down permitted after controls are initialized
FUNCTION PROBLEM – TOWER LIFT DOWN PERMANENTLY SELECTED	23106	Machine is in Ground Mode; The Tower Lift Down switch input = High at Startup	The UGM shall prohibit Tower Lift Up and Down	The Tower Lift Down switch input = Low; Tower Lift Up and Down permitted after controls are initialized
FUNCTION PROBLEM - LIFT UP PERMANENTLY SELECTED	23107	Machine is in Ground Mode; The Lift Up switch input = High at Startup	The UGM shall prohibit Lift Up and Down	The Lift Up switch input = Low; Lift Up and Down permitted after controls are initialized
FUNCTION PROBLEM - LIFT DOWN PERMANENTLY SELECTED	23108	Machine is in Ground Mode; The Lift Down switch input = High at Startup	The UGM shall prohibit Lift Up and Down	The Lift Down switch input = Low; Lift Up and Down permitted after controls are initialized
FUNCTION PROBLEM - TELESCOPE IN PERMANENTLY SELECTED	23109	Machine is in Ground Mode; The Telescope In switch input = High at Startup	The UGM shall prohibit Telescope In and Out	The Telescope In switch input = Low; Telescope In and Out permitted after controls are initialized
FUNCTION PROBLEM - TELESCOPE OUT PERMANENTLY SELECTED	23110	Machine is in Ground Mode; The Telescope Out switch input = High at Startup	The UGM shall prohibit Telescope In and Out	The Telescope Out switch input = Low; Telescope In and Out permitted after controls are initialized
FUNCTION PROBLEM - PLATFORM LEVEL UP PERMANENTLY SELECTED	23111	Machine is in Ground Mode; The Platform Level Up switch input = High at Startup	The UGM shall prohibit Platform Level Up and Down	The Platform Level Up switch input = Low; Platform Level Up and Down permitted after controls are initialized
FUNCTION PROBLEM - PLATFORM LEVEL DOWN PERMANENTLY SELECTED	23112	Machine is in Ground Mode; The Platform Level Down switch input = High at Startup	The UGM shall prohibit Platform Level Up and Down	The Platform Level Down switch input = Low; Platform Level Up and Down permitted after controls are initialized
FUNCTION PROBLEM - PLATFORM ROTATE LEFT PERMANENTLY SELECTED	23113	Machine is in Ground Mode; The Platform Rotate Left switch input = High at Startup	The UGM shall prohibit Platform Rotate Left and Right	The Platform Rotate Left switch input = Low; Platform Rotate Left and Right permitted after controls are initialized
FUNCTION PROBLEM - PLATFORM ROTATE RIGHT PERMANENTLY SELECTED	23114	Machine is in Ground Mode; The Platform Rotate Right switch input = High at Startup	The UGM shall prohibit Platform Rotate Left and Right	The Platform Rotate Right switch input = Low; Platform Rotate Left and Right permitted after controls are initialized
TELESCOPE RETRACT SWITCHES - DISAGREEMENT	23154	The UGM detects the following conditions: Telescope Retracted Switch #1 and Telescope Retracted Switch #2 readings disagree for longer than 5 seconds; Telescope In or Telescope Out output value \geq Creep output value	The UGM shall assume the Boom is Not Retracted	Power Cycled
SWING SWITCHES - DISAGREEMENT	23155	The UGM detects the following conditions: Swing Switch #1 and Swing Switch #2 readings disagree for longer than 5 seconds; Swing Left or Swing Right value \geq Creep output value	The UGM shall assume the Boom is Swung	Power Cycled
FUNCTION PROBLEM – MSSO PERMANENTLY SELECTED	23163	The MSSO switch input = Low at Startup	No response required for this DTC	Power Cycled

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault
BOOM ANGLE SENSOR - SINGLE POINT CALIBRATION PERFORMED	23170	Single point Boom Angle calibration is successfully completed	No response required for this DTC	Fault shall be retentive through Power Cycled; Can be reset if CALIBRATIONS > BOOM ANGLE is successfully completed
AMBIENT TEMPERATURE SENSOR - OUT OF RANGE LOW	241	MACHINE SETUP > TEMP CUTOUT = YES; Ambient Temperature sensor reading \leq -50C	The UGM shall set Low Temperature Cutout state = Faulty If the Machine is in Platform Mode and if the Boom is Above Elevation; The UGM shall suspend motion; The UGM shall limit the machine to Creep speed after controls initialized If the Machine is in Platform Mode and if the Boom is not Above Elevation; The UGM shall limit Swing, Tower Lift (340AJ, 450AJ), Tele, Lift, Platform Rotate, Platform Level, and Jib Lift (if MACHINE SETUP > JIB = YES) to Creep speed If the Machine is in Ground Mode; No response required for this DTC	Ambient Temperature sensor reading > -50C; Full Speed permitted after controls are initialized

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault
AMBIENT TEMPERATURE SENSOR – OUT OF RANGE HIGH	242	MACHINE SETUP > TEMP CUTOUT = YES; Ambient Temperature sensor reading $\geq 85^{\circ}\text{C}$	The UGM shall set Low Temperature Cutout state = Faulty If the Machine is in Platform Mode and if the Boom is Above Elevation; The UGM shall suspend motion; The UGM shall limit the machine to Creep speed after controls initialized If the Machine is in Platform Mode and if the Boom is not Above Elevation; The UGM shall limit Swing, Tower Lift (340AJ, 450AJ), Tele, Lift, Platform Rotate, Platform Level, and Jib Lift (if MACHINE SETUP > JIB = YES) to Creep speed If the Machine is in Ground Mode; No response required for this DTC	Ambient Temperature sensor reading $< 85^{\circ}\text{C}$; Full Speed permitted after controls are initialized
DRIVE & LIFT PREVENTED - BRAKES ELECTRICALLY RELEASED FOR TOWING	258			
MODEL CHANGED – HYDRAULICS SUSPENDED – CYCLE EMS	259	The MACHINE SETUP > MODEL NUMBER is changed using the analyzer	Disable all machine and engine functions (i.e., command engine shutdown and do not permit start)	Power Cycled
GENERATOR MOTION CUTOUT ACTIVE	2513	MACHINE SETUP > GEN SET = BELT DRIVE; MACHINE SETUP > GEN SET CUTOUT = MOTION CUTOUT; The platform Generator Switch is engaged Footswitch State = Depressed The machine is in Platform mode	The UGM shall not Enable the Machine	Not all of the trigger conditions are met
BOOM PREVENTED – DRIVE SELECTED	2514	MACHINE SETUP > FUNCTION CUTOUT = BOOM CUTOUT; Drive or Steer is already engaged; The boom is Above Elevation The operator is attempting to activate one of the boom functions DTC 2514 supercedes DTC 2518 if drive/steer and boom functions are both active when machine transitions from Below Elevation to Above Elevation.	The UGM shall prohibit all boom functions	Not all of the trigger conditions are met
DRIVE PREVENTED – ABOVE ELEVATION	2516	MACHINE SETUP > FUNCTION CUTOUT = DRIVE CUTOUT The boom is Above Elevation The operator is attempting to activate Drive or Steer	The UGM shall prohibit Drive and Steer	Not all of the trigger conditions are met

Table 6-11. Diagnostic Trouble Code Chart

Help Message	DTC	Fault Condition/Trigger (For configurable items, fault applies only if configured. All listed conditions to be met unless stated otherwise)	Required Control Response or State Assignment	Conditions Required for Movement and/or to Clear Fault
DRIVE PREVENTED – TILTED & ABOVE ELEVATION	2517	MACHINE SETUP > FUNCTION CUTOUT = DRIVE CUT E&T The boom is Above Elevation The chassis is considered Tilted The operator is attempting to activate Drive or Steer	The UGM shall prohibit Drive and Steer	Not all of the trigger conditions are met
DRIVE PREVENTED – BOOM SELECTED	2518	MACHINE SETUP > FUNCTION CUTOUT = BOOM CUTOUT The boom is Above Elevation Any boom function is already active The operator attempts to activate Drive or Steer	The UGM shall prohibit Drive and Steer	Not all of the trigger conditions are met
SYSTEM TEST MODE ACTIVE	2548			
DRIVE & BOOM PREVENTED - SOFT TOUCH ACTIVE	2549	MACHINE SETUP > SOFT TOUCH = YES; Machine is in Platform Mode; Soft Touch State = Enabled	Response detailed in Soft Touch section	Not all of the trigger conditions are met
SKYGUARD SWITCH – DIS-AGREEMENT	2563	MACHINE SETUP > SKYGUARD = YES; Machine is in Platform Mode; [(SkyGuard input #1 Platform Module J7-18) ≠ (SkyGuard input #2 Platform Module J1-23)] > 160ms	Response detailed in Sky-Guard section	[(SkyGuard inputs (Platform Module J7-18 = High) and (Platform Module J1-23 = High)) and (Footswitch State = Not Depressed)]
DRIVE PREVENTED - LEFT BRAKE NOT RELEASING	2564			
PLATFORM LEVEL PREVENTED – ABOVE ELEVATION	2576	Platform Level Override Cutout = Enabled; The Platform Level Up or Down switch input = High; Footswitch is active	The UGM shall suspend Platform Level Up and Down commands; The UGM shall prohibit Platform Level Up and Down	Controls initialized
BRAKE – SHORT TO BATTERY	331	The UGM detects a short to battery at this output	The UGM shall prohibit Drive and Brake outputs.	Power Cycled
BRAKE – OPEN CIRCUIT	332	The UGM detects an open circuit at this output	No response required for this DTC	Power Cycled
LIFT UP VALVE – OPEN CIRCUIT	334	The UGM detects an open circuit at this output	The UGM shall suspend Lift Up and Down command and revert to Open Loop Current control for Lift; The UGM shall limit Lift Up and Down to Creep speed after controls initialized	The UGM no longer detects open circuit; Full speed Lift Up and Down permitted after controls are initialized
LIFT DOWN VALVE – OPEN CIRCUIT	336	The UGM detects an open circuit at this output	The UGM shall suspend Lift Up and Down command and revert to Open Loop Current control for Lift; The UGM shall prohibit Lift Up; The UGM shall limit Lift Down to Creep speed after controls initialized	The UGM no longer detects open circuit; Full speed Lift Up and Lift Down permitted after controls are initialized
GROUND ALARM – SHORT TO BATTERY	3311	The UGM detects a short to battery at this output	No response required for this DTC	Power Cycled
MAIN DUMP VALVE – SHORT TO GROUND	3358	The UGM detects a short to ground at this output	The UGM shall prohibit Main Dump	Power Cycled