

FS Series Heads

Swing to Tree Disc Saw Heads

S/N WCFS20X003001 –

S/N WCFS22X002001 –

S/N WCFS24X004001 –

TECHNICAL MANUAL FS Series Disc Saw Heads TMF382053 (JULY01)

**CALIFORNIA
Proposition 65 Warning**

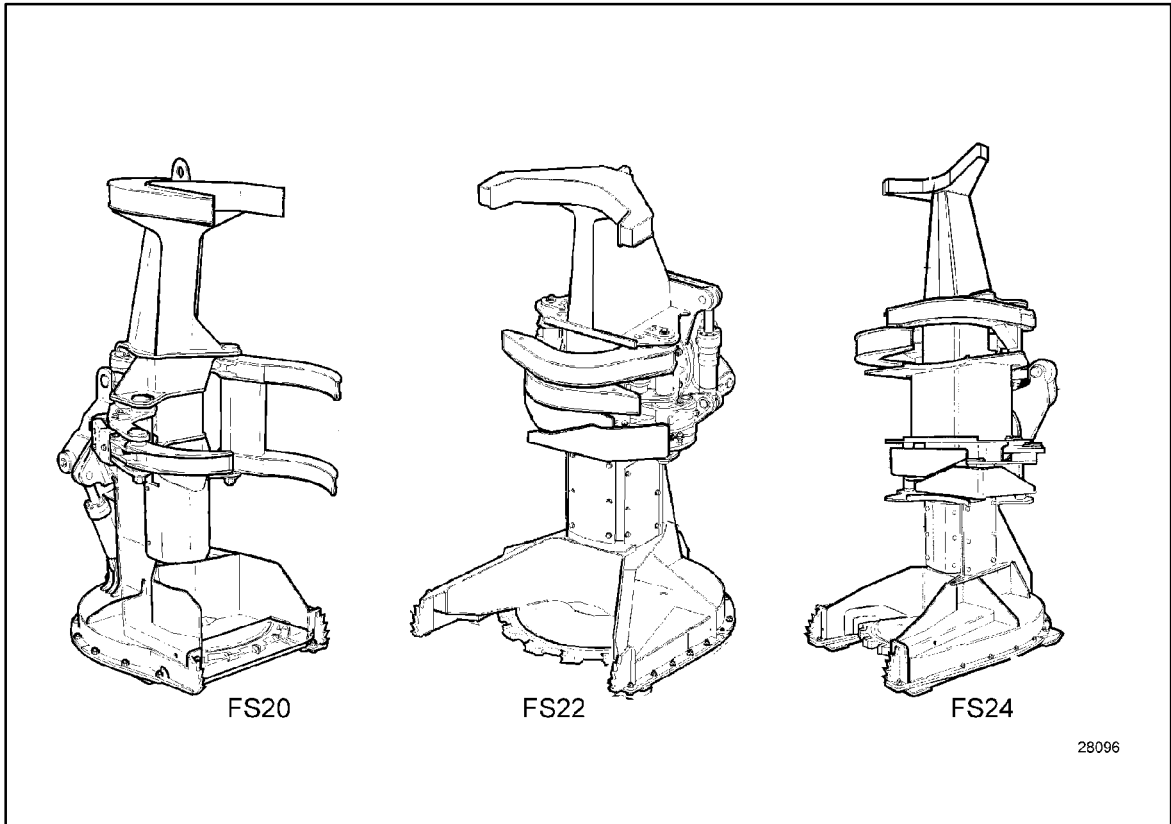
Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects and other reproductive harm.



WARNING

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

Workshop Manual



Swing to Tree Disc Saw Felling Heads

Timberjack Inc.
P.O. Box 160
925 Devonshire Avenue
Woodstock, Ontario, Canada
N4S 7X1

Telephone:

(519) 537-6271

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1.1 Introduction

1.1.1 General

The Workshop Manual is intended to provide technical information, component specifications, troubleshooting and removal, disassembly and reassembly procedures for most of the major components of the felling head. Use this manual in conjunction with the applicable Operator/Maintenance Manual and the applicable Carrier Workshop Manuals.

When practical, the Workshop Manual lists likely causes of malfunctions, offers test procedures to verify causes and then illustrates the steps for the adjustment or repair procedure(s).

Troubleshooting must always be a multi-step process. Use the following steps:

1. Know the operation of all machine systems.
2. Ask the operator about symptoms and when they occur.
3. Operate the machine yourself if practical.
4. List all possible causes.
5. Inspect for obvious causes.
6. Eliminate the simple ones by checking oil, changing filters, etc.
7. Carry out diagnostic procedures like pressure and leakage testing to pinpoint the cause.

Component specifications provide performance and mode of operation information that can be very useful in troubleshooting.

Disassembly and reassembly procedures are given for many major components. When possible, clearance and torques are given. If a manufacturer's workshop manual is available, it should be given priority.

Reference to special equipment for testing and repair is limited, as most repair shops or local machine shops are well equipped to fabricate on an as-needed basis to reduce downtime.

1.1.2 Models Covered By This Manual

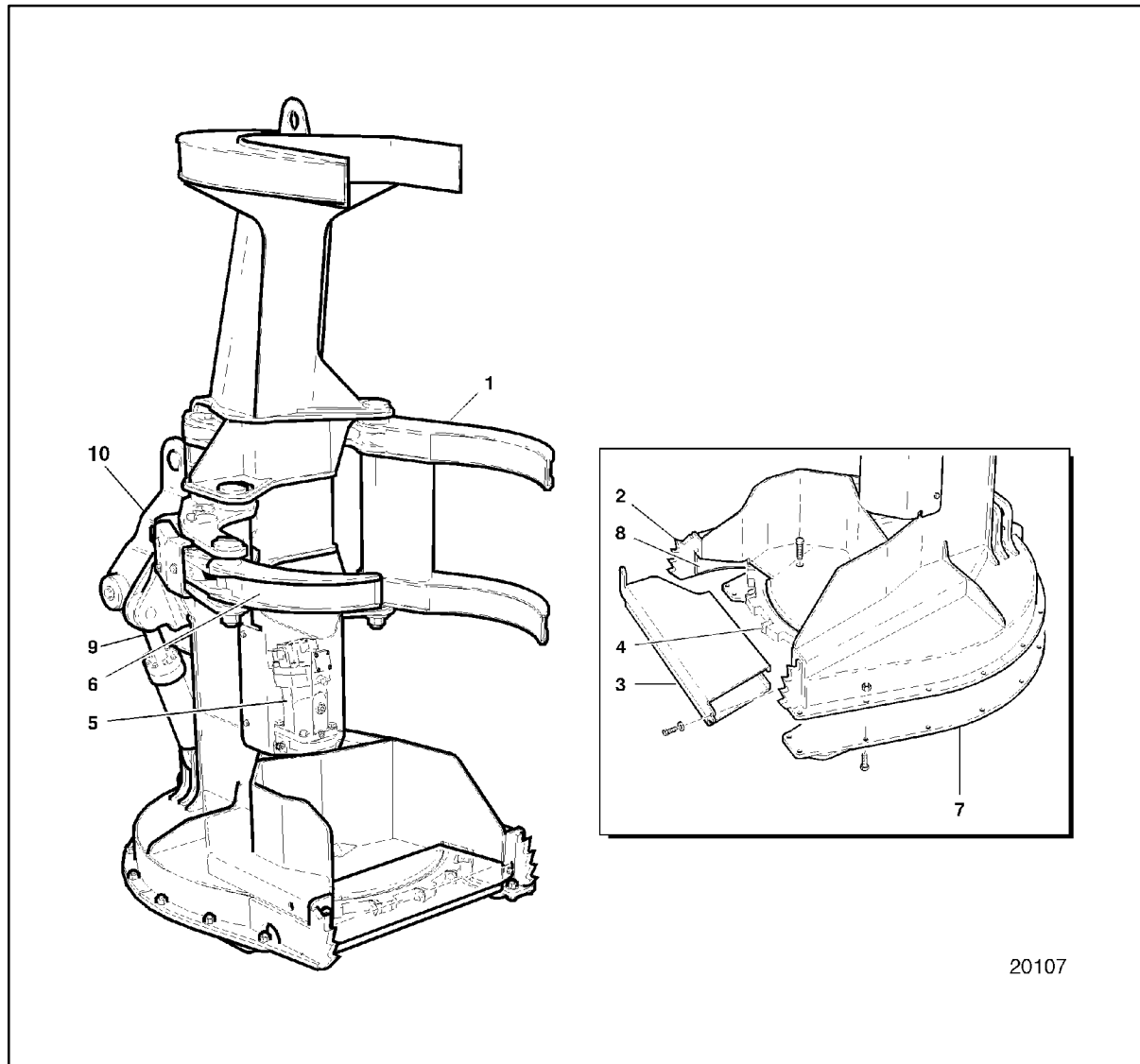
Technical information, component specifications, troubleshooting, removal, disassembly and reassembly procedures for the following model felling heads are covered in this manual:

1. FS20 (Swing to Tree)
2. FS22 (Swing to Tree)
3. FS24 (Swing to Tree)

1.2 FS20 (Swing to Tree)

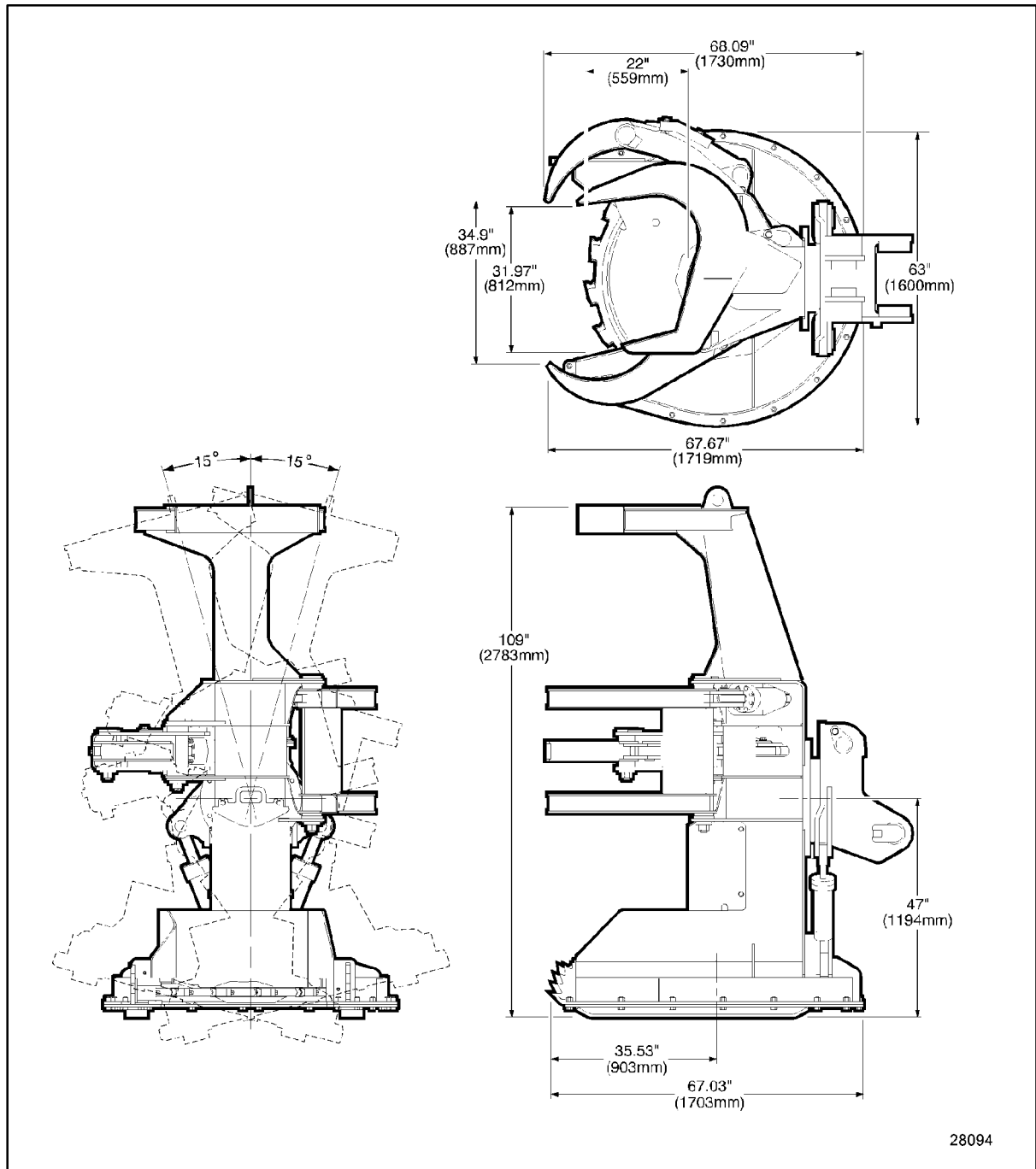
1.2.1 Component Description

1. L.H. (Harvesting) Clamp Arms - 7412
2. Log Rollers - 7411
3. Saw Blade Guard - 7411
4. Disc Saw Blade - 7430
5. Saw Drive Hydraulic Motor - 7440
6. R.H. (Accumulating) Clamp Arm - 7412
7. Lower Guards/Skis - 7411
8. Chip Deflector - 7411
9. Wrist Cylinder - 7440
10. Wrist - 7420



1.2 FS20 (Swing to Tree)

1.2.2 General Dimensions



1.2 FS20 (Swing to Tree)

1.2.3 General Specifications

Bolt Torques (lb ft/lubricated)

Disc Saw Blade Lower Flange Plate	280-320 lb. ft. (380-434 Nm) (3/4"-16 UNF)
Lower Guard Plate	165 lb. ft. (224 Nm) (locknut end) (3/4"-10 UNC)
Saw Tooth	85 lb. ft. (115 Nm) (1/2"-20 UNF)
	160 lb. ft (216 Nm) (5/8"-18 UNF)
Saw Drive Motor	200-220 lb. ft. (271-298 Nm) (3/4"-10 UNC)
Clamp Arm Pin Retainer Nuts	300-350 lb. ft. (407-475 Nm) (1.38"-12 UNC)
Clamp Arm Pin Retainer Bolts	200-220 lb. ft. (271-298 Nm) (3/4"-10 UNC)
Wrist Attachment Pin Retainers	200-220 lb. ft. (271-298 Nm) (3/4"-10 UNC)
	475-525 lb. ft. (644-712 Nm) (7/8"-9 UNC)
Wrist Bearing Retainer	450-500 lb. ft. (610-678 Nm) (7/8"-9 UNC)
Wrist Attachment to Bearing	780-800 lb. ft. (1058-1084 Nm) (1"-14 UNC)

Clamp/Wrist Cylinders

No. Cylinders	2 Clamp - 2 Wrist
Bore Diameter	4.0 in. (101.6 mm)
Rod Diameter	2.0 in. (50.8 mm)
Stroke	8.5 in. (215.9 mm)
Operating Pressure	3000 psi (207 bar)

Hydraulic Requirements

Disc Saw Motor	30 gpm @ 3500 psi (114 L/m @ 241 bar)
	25 gpm @ 4000 psi (95 L/m @ 276 bar)
Clamp Cylinders	25 gpm @ 3000 psi (114 L/m @ 207 bar)
Optional Wrist Group	10 gpm @ 3000 psi (38 L/m @ 207 bar)

Miscellaneous

Cutting Capacity	22" (559 mm) diameter
Weight	4850 lb. (2200 kg)
	5350 lb. (2427 kg) (w/optional wrist group)

Disc Saw Blade

Series	4000B (NK - Narrow Kerf or WK - Wide Kerf)
No. Teeth	18 rotatable
Type	Curved Carbide/Hardened
Saw Speed	1175 +/- 25 rpm
Maximum Allowable Saw Disc Runout	0.100" (2.5 mm)
Diameter	56.0" (1422 mm)
Weight	735 lb. (334 kg)

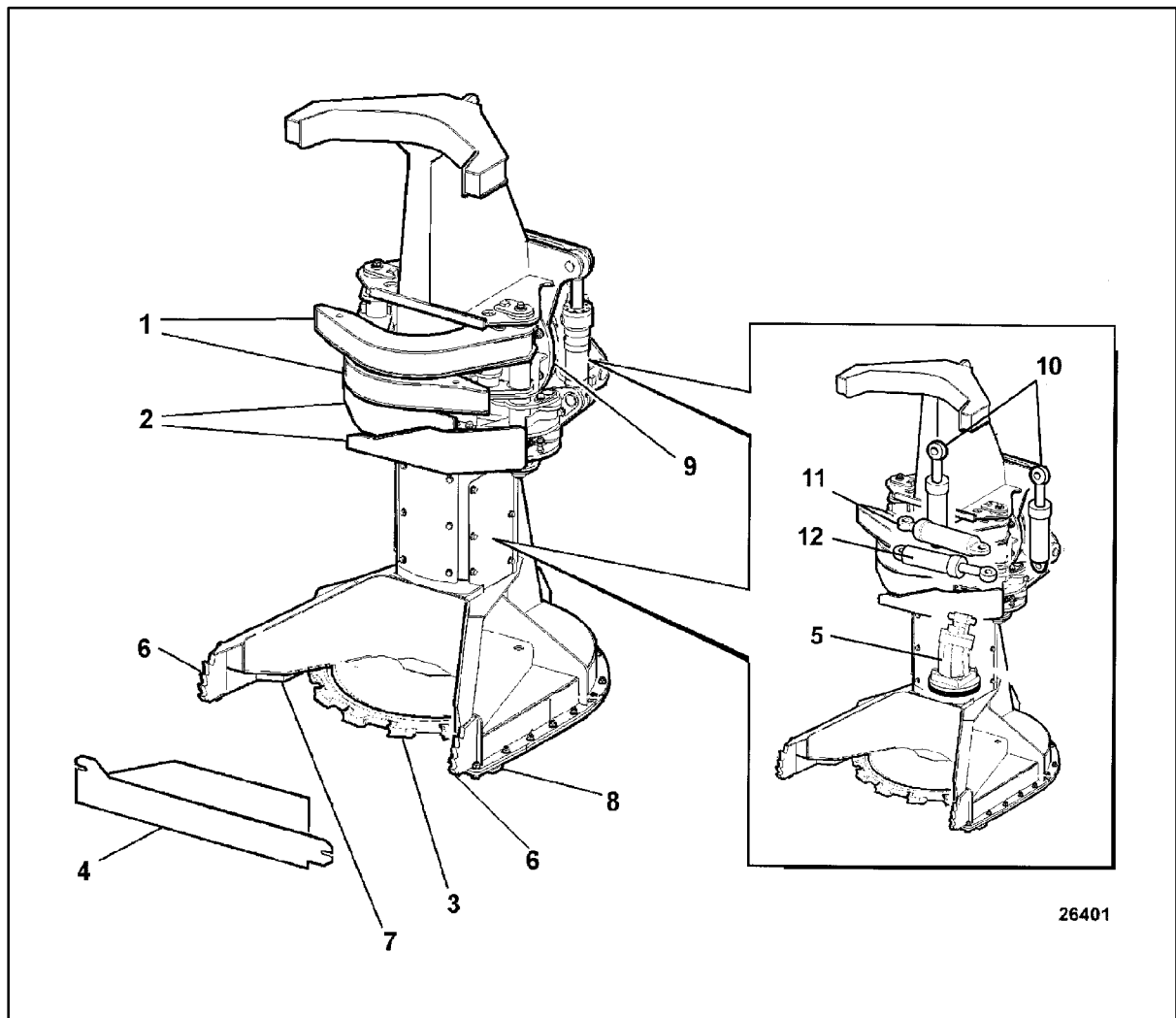
Note!

Refer to OEM carrier workshop manual for applicable Service Specifications by Model.

1.3 FS22 (Swing to Tree)

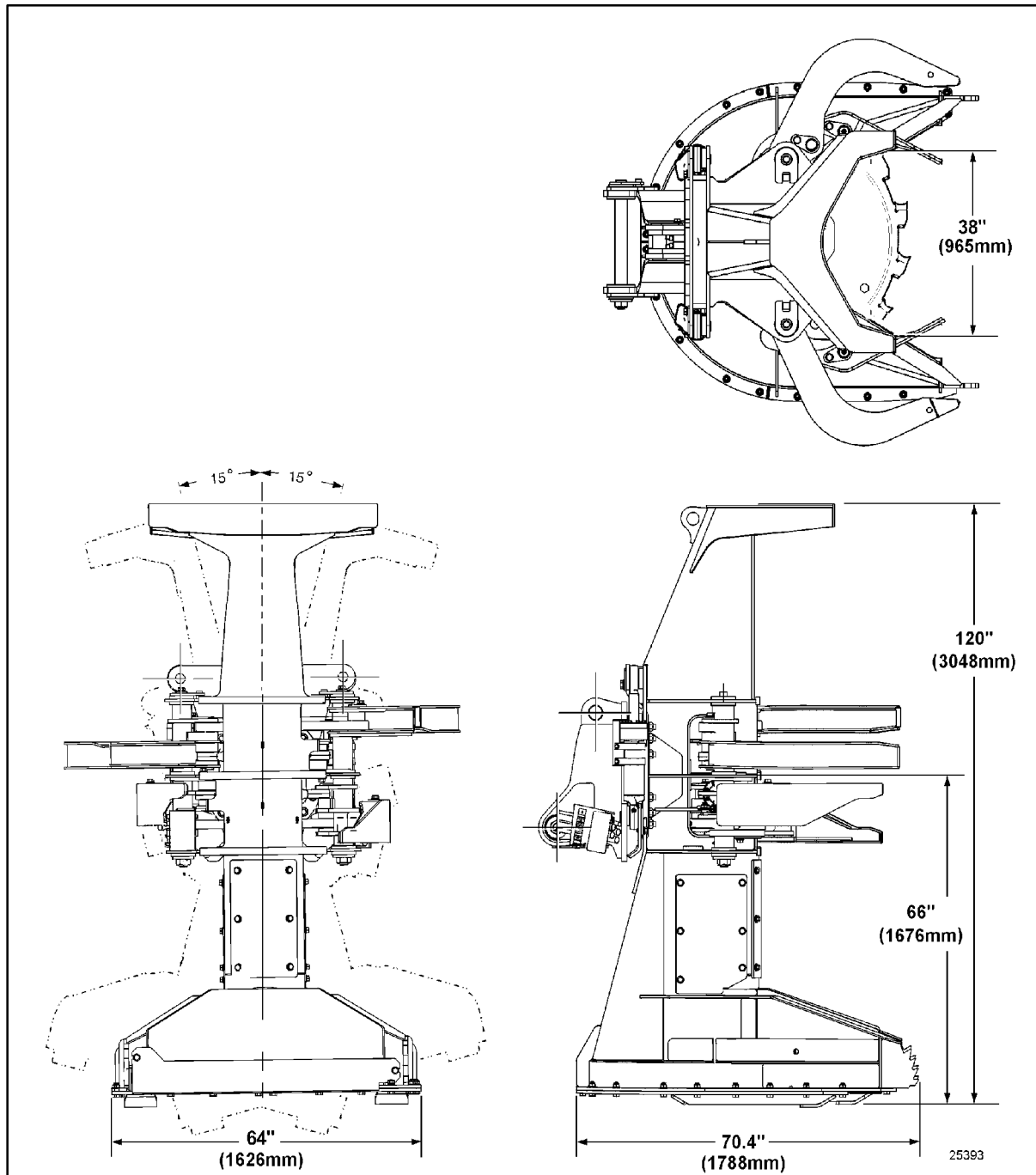
1.3.1 Component Description

- | | |
|-------------------------------------|---|
| 1. Harvesting Clamp Arms - 7412 | 7. Chip Deflector - 7411 |
| 2. Accumulating Clamp Arms - 7412 | 8. Lower Guards/Skis - 7411 |
| 3. Disk Saw Blade - 7430 | 9. Wrist - 7420 |
| 4. Saw Blade Guard - 7411 | 10. Wrist Cylinder - 7440 |
| 5. Saw Drive Hydraulic Motor - 7440 | 11. Harvesting Clamp Arms Cylinder - 7440 |
| 6. Nose Extensions | 12. Accumulating Clamp Arms Cylinder - 7440 |



1.3 FS22 (Swing to Tree)

1.3.2 General Dimensions



1.3 FS22 (Swing to Tree)

1.3.3 General Specifications

Bolt Torques (lb ft/lubricated)

Disc Saw Blade Lower Flange Plate	280-320 lb. ft. (380-434 Nm) (3/4"-16 UNF)
Lower Guard Plate	260-295 lb. ft. (353-400 Nm)
.....	(locknut end) (M20 x 2.5)
Saw Tooth	85 lb. ft. (115 Nm) (1/2"-20 UNF) - 4000NK
.....	160 lb. ft (217 Nm) (5/8"-18 UNF) - 4000WK
Saw Drive Motor Mounting	260-295 lb. ft. (353-400 Nm) (M20 x 2.5)
Clamp Arm Pin Retainers.....	1000 - 1300 lb. ft. (1356 - 1763 Nm)
.....	(M42 x 4.5)

Clamp/Wrist Cylinders

No. Cylinders	2 Clamp, 2 Wrist
Bore Diameter	3.5 in. (88.9 mm)/or 4in. (101.6 mm)
Rod Diameter	2.0 in. (50.8 mm)
Stroke	8.5 in. (215.9 mm)
Operating Pressure	3625 psi (250 bar) (3.5in)
.....	2500 psi (172 bar) (4in)

Hydraulic Requirements

Disc Saw Motor	30 gpm @ 3500 psi (114 L/m @ 241 bar)
.....	25 gpm @ 4000 psi (95 L/m @ 276 bar)
Clamp and Wrist Cylinders	3.5 in. - 26.4 gpm @3625 psi (100 L/m @ 250 bar)
.....	4.0 in. - 34.6 gpm @ 2960 psi (131 L/m @ 204 bar)

Miscellaneous

Cutting Capacity	22" (559 mm) diameter
Weight (Fix Boom Adapter and Wide Kerf Blade) ...	6440 lb. (2917 kg)

Disc Saw Blade

Series	4000B (NK - Narrow Kerf or WK - Wide Kerf)
No. Teeth	18 rotatable
Type	Curved Carbide/Hardened
Saw Speed	1175 +/- 25 rpm
Maximum Allowable Saw Disc Runout	0.100" (2.5 mm)
Diameter	56.0" (1422 mm)
Weight	735 Lbs (334 kg)

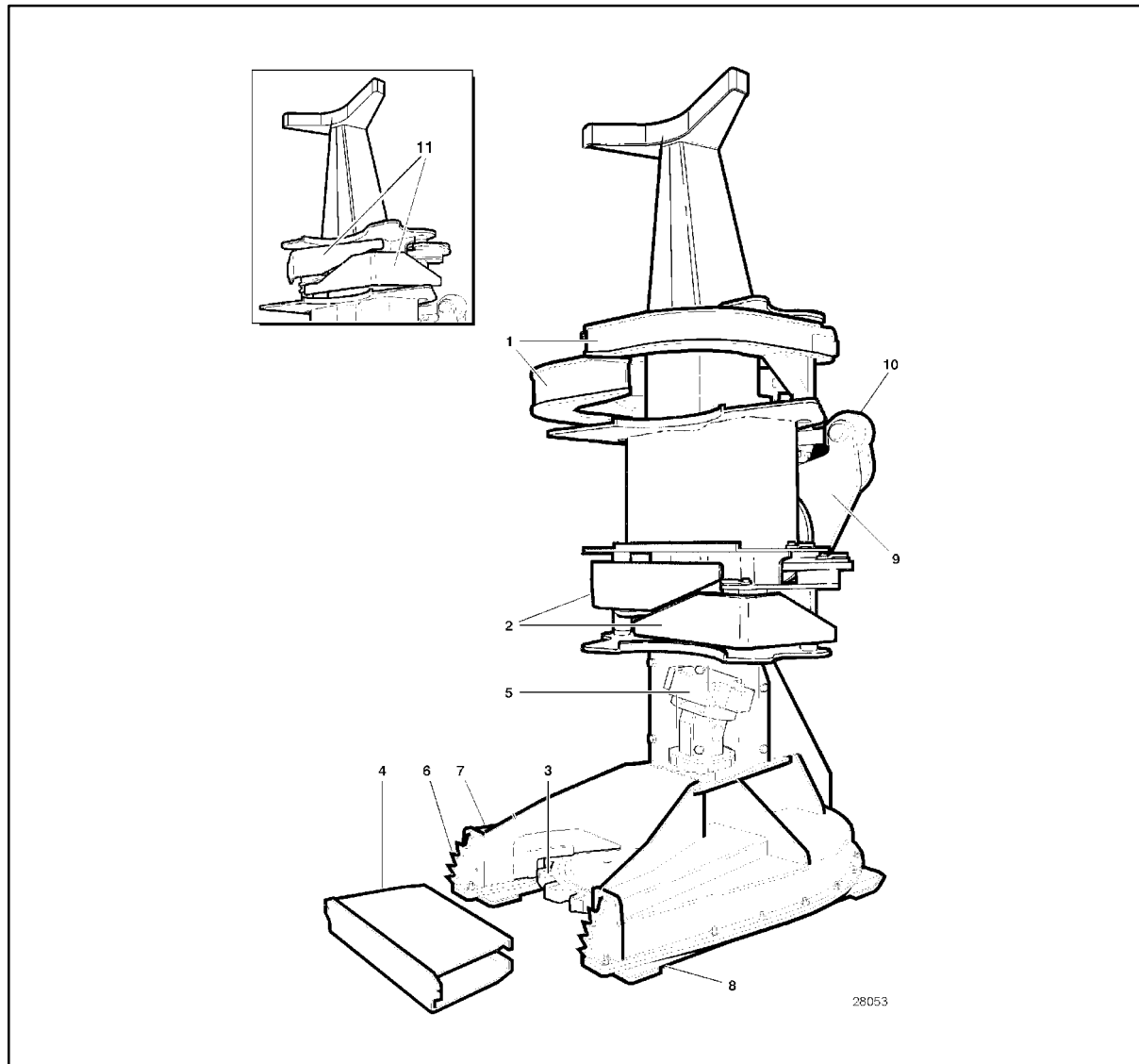
Note!

Refer to OEM carrier workshop manual for applicable Service Specifications by Model.

1.4 FS24 (Swing to Tree)

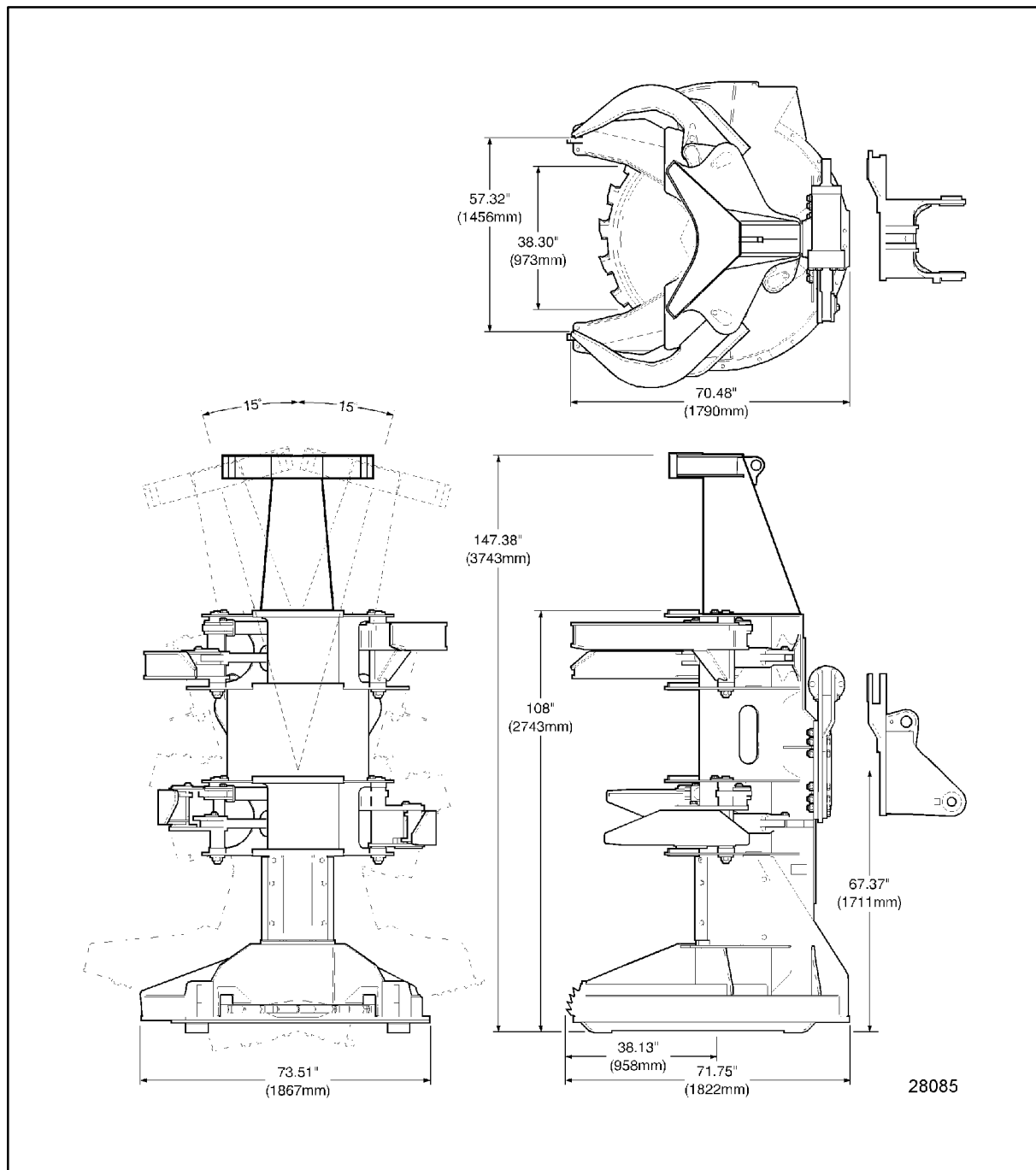
1.4.1 Component Description

- | | |
|---|--|
| 1. Upper (Harvesting) Clamp Arms - 7412 | 7. Chip Deflector - 7411 |
| 2. Lower (Accumulating) Clamp Arms - 7412 | 8. Lower Guards/Skis - 7411 |
| 3. Disc Saw Blade - 7430 | 9. Wrist - 7420 |
| 4. Saw Blade Guard - 7411 | 10. Wrist Cylinder - 7440 |
| 5. Saw Drive Hydraulic Motor - 7440 | 11. Optional Upper Accumulating Clamp Arms |
| 6. Nose Extensions | |



1.4 FS24 (Swing to Tree)

1.4.2 General Dimensions



1.4 FS24 (Swing to Tree)

1.4.3 General Specifications

Bolt Torques (lb ft/lubricated)

Disc Saw Blade Lower Flange Plate	280-320 lb. ft. (380-434 Nm) (3/4"-16 UNF)
Lower Guard Plate	165 lb. ft. (224 Nm) (locknut end) (3/4"-10 UNC)
Saw Tooth	85 lb. ft. (115 Nm) (1/2"-20 UNF)
	160 lb. ft (216 Nm) (5/8"-18 UNF)
Saw Drive Motor	200-220 lb. ft. (271-298 Nm) (3/4"-10 UNC)
Clamp Arm Pin Retainers	150-180 lb. ft. (203-244 Nm) (3/4"-10 UNC)

Clamp Cylinders

No. Cylinders	2
Bore Diameter	3.5 in. (88.9 mm)
Rod Diameter	2.0 in. (50.8 mm)
Stroke	12.38 in. (314.5 mm)
Operating Pressure	3000 psi (207 bar)

Wrist Cylinder

No. Cylinders	1
Bore Diameter	6.0 in. (150 mm)
Rod Diameter	3.0 in. (76.2 mm)
Stroke	11.2 in. (284 mm)
Operating Pressure	3000 psi (207 bar)

Hydraulic Requirements

Disc Saw Blade Moror	30 gpm @ 3500 psi (114 L/m @ 241 bar)
	25 gpm @ 4000 psi (95 L/m @ 276 bar)
Clamp Cylinders	30 gpm @ 3000 psi (114 L/m @ 204 bar)
Wrist Cylinder	10 gpm @ 3000 psi (371 L/m @ 204 bar)

Miscellaneous

Cutting Capacity	24" (610 mm) diameter
Weight	7900 lb. (3582 kg)

Disc Saw Blade

Series	4000B (WK - Wide Kerf only)
No. Teeth	20 rotatable
Type	Hardened
Saw Speed	1100 +/- 25 rpm
Maximum Allowable Saw Disc Runout	0.100" (2.5 mm)
Diameter	60.5" (1537 mm)
Weight	809 lb. (367 kg)

Note!

Refer to OEM carrier workshop manual for applicable Service Specifications by Model.

1.5 Torque Values

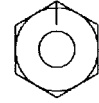
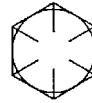
The following torque values are for use in general applications and where torque values are not otherwise specified.

1.5.1 Steel Fasteners

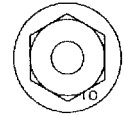
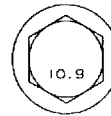
This Standard applies to steel cap screws engaged with steel female thread and is applicable for all thread pitches. Torque values for other materials are to be specified on the drawings where needed.

Fastener Markings

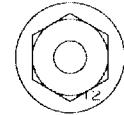
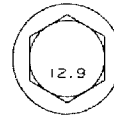
Grade 8 - Imperial



Class 10.9 - Metric



Class 12.9 - Metric



1.5 Torque Values

1.5.1 Steel Fasteners

Imperial Hex Head

Nominal Thread Diameter		Tightening Torque Values for Grade 8			
		Nm		lb.ft.	
		Min	Max	Min	Max
1/4	0.2500	12	14	9	10
5/16	0.3125	24	27	18	20
3/8	0.3750	50	55	34	40
7/16	0.4375	80	90	60	65
1/2	0.5000	125	135	90	100
9/16	0.5625	170	190	125	140
5/8	0.6250	240	255	175	190
3/4	0.7500	405	455	300	330
7/8	0.8750	645	710	475	525
1	1.000	985	1085	725	800
1-1/8	1.125	1425	1595	1050	1175
1-1/4	1.250	2000	2205	1475	1625
1-3/8	1.375	2710	2980	2000	2200
1-1/2	1.500	3525	3865	2600	2850
1-5/8	1.625	4680	5150	3450	3800
1-3/4	1.750	5850	6510	4300	4800
1-7/8	1.875	8270	7460	5500	6100
2	2.000	8810	9760	6500	7200

1.5 Torque Values

1.5.1 Steel Fasteners

Metric Hex Head

Nominal Thread Diameter	Tightening Torque Values							
	Class 10.9				Class 12.9			
	Nm		lb.ft.		Nm		lb.ft.	
	Min	Max	Min	Max	Min	Max	Min	Max
M5	7	8	5	6	8	9	6	7
M6	12	14	9	10	14	16	10	12
M8	30	35	22	24	35	40	25	28
M10	55	65	42	48	65	75	50	56
M12	100	115	75	85	120	135	85	100
M14	165	185	120	135	190	210	140	155
M16	250	285	185	210	290	330	215	245
M20	490	550	360	405	570	645	420	475
M22	665	745	490	550	775	875	570	645
M24	840	950	620	700	1000	1125	725	820
M30	1700	1900	1250	1400	1950	2200	1450	1625
M36	2900	3300	2150	2450	3425	3850	2525	2850
M42	4675	5250	3450	3900	5500	6150	4050	4550
M48	7050	7900	5200	5800	8200	9200	6050	6800

1.5 Torque Values

1.5.1 Steel Fasteners

Metric Flanged Hex Head

Nominal Thread Diameter	Tightening Torque Values for Class 10.9			
	Nm		lb.ft.	
	Min	Max	Min	Max
M5	7	8	5	6
M6	12	15	9	11
M8	32	38	23	26
M10	60	70	45	50
M12	110	125	80	90
M14	170	190	125	140
M16	265	300	195	220
M20	515	575	380	425
M22	665	745	490	550
M24	840	950	620	700

Notes:

1. Torque values shown are based on Zinc Phosphate or oil coating.
2. The torque values listed develop clamping forces that are based on material proof loads for the different class fasteners. The clamping forces developed are $85 \pm 5\%$ of proof loads.
3. All the torque values in Nm or lb.ft. are rounded to the nearest multiple of 5, or in some cases, to the nearest whole number to be in line with graduations on torque wrenches and dials.



CAUTION

Use only metric tools on metric hardware and imperial tools on imperial hardware to assure correct torque readings, and to prevent damage to tools and hardware as well as possible injury.

1.5 Torque Values

1.5.2 Hydraulic Fittings

This standard establishes torques for various types of hydraulic fittings.

O-Ring Fittings

All O-Rings must have a light coat of system fluid before tightening to the torque in the following chart.

O-Ring Face Seal End			Nominal SAE Dash No.	O-Ring Boss End		
Thread Size	Swivel Nut Torque			Thread Size	Straight Fitting or Locknut Torque	
	Nm	lb.ft			Nm	lb.ft.
9/16-18	14-16	10-12		-4	7/16-20	20-22
11/16-16	24-27	18-20	-6	9/16-18	33-35	24-26
13/16-16	43-47	32-35	-8	3/4-16	68-78	50-60
1-14	60-68	46-50	-10	7/8-14	98-110	72-80
1-3/16-12	90-95	65-70	-12	1-1/16-12	170-183	125-135
1-3/16-12	90-95	65-70	-14	1-3/16-12	215-245	160-180
1-7/16-12	125-135	92-100	-16	1-5/16-12	270-300	200-220
1-11/16-12	170-190	125-140	-20	1-5/8-12	285-380	210-280
2-12	200-225	150-165	-24	1-7/8-12	370-490	270-360

Ref: SAE J1453 June '94

1.5 Torque Values

1.5.2 Hydraulic Fittings

SAE Code 61 and 62 Flanges

For both one piece and split flanges turn the bolts until mating parts are in full contact. Tighten one bolt, then the opposite, followed by the remaining two before applying torque.

Flange Size	Flange Dash No.	Code 61 - Standard Pressure Series			Code 62 - High Pressure Series		
		Torque lb.ft.	Nm	Bolt Thread	Torque lb.ft.	Nm	Bolt Thread
1/2	-08	15-19	20-25	5/16-18	15-19	20-25	5/16-18
3/4	-12	21-30	28-40	3/8-16	25-34	34-45	3/8-16
1	-16	27-36	37-48	3/8-16	42-50	56-68	7/16-14
1-1/4	-20	35-46	48-62	7/16-14	63-75	85-102	1/2-13
1-1/2	-24	46-59	62-79	1/2-13	117-134	158-181	5/8-11
2	-32	54-67	73-90	1/2-13	271-294	200-217	3/4-10
2-1/2	-40	79-92	107-124	1/2-13			
3	-48	138-150	186-203	5/8-11			

Ref: SAE J518 June '93

1.5 Torque Values

1.5.2 Hydraulic Fittings

Tapered Pipe Threads (NPTF & NPT)

Pipe Thread Size	Dash No.	Threads with sealant (Loctite)		Pipe Thread Size	Dash No.	Threads with sealant (Loctite)	
		lb.ft.	Nm			lb.ft.	Nm
1/8-27	-02	15	20	1-11-1/2	-16	55	75
1/4-18	-04	18	25	1-1/4-11-1/2	-20	70	95
3/8-18	-06	26	35	1-1/2-11-1/2	-24	81	110
1/2-14	-08	33	45	2-11-1/2	-32	96	130
3/4-14	-10	44	60				

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1.5 Torque Values

1.5.2 Hydraulic Fittings

Flare Fittings

1. Check flare and seat for defects that might cause leakage and lubricate the connection with system fluid.
2. Install hoses without twist.
3. When a torque wrench cannot be used, tighten until seats bottom. Using two wrenches to prevent twisting, rotate the nut the number of hex flats or equivalent shown below.

Torque and Turn Flats for Tightening Flare Fittings

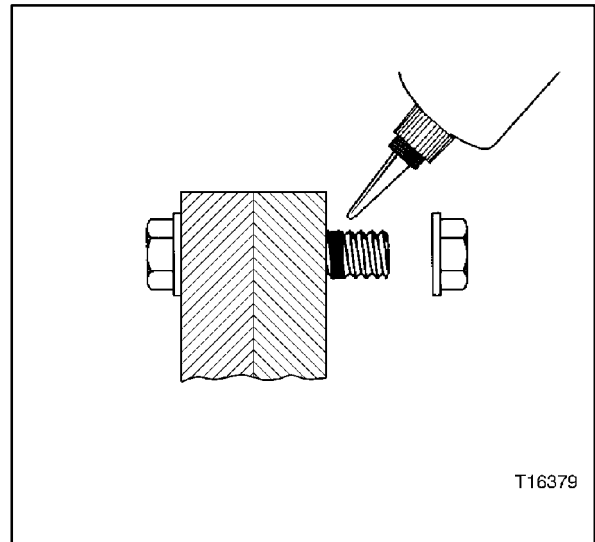
Tube O.D. (Inches)	Tube Dash No.	Thread Size	37° Flare		Number of Flats	
			lb.ft.	Nm	New	Re-assy
3/16	-03	3/8-24	4-5	5-7	2-1/2	1
1/4	-04	7/16-20	9-10	12-14	2-1/2	1
5/16	-05	1/2-12	15-17	20-23	2-1/2	1
3/8	-06	9/16-18	20-22	27-30	2	1
1/2	-08	3/4-16	30-33	41-45	2	1
5/8	-10	7/8-14	40-44	54-60	1-1/2-2	1
3/4	-12	1-1/16-12	70-77	95-104	1	3/4
7/8	-14	1-3/16-12	82-90	111-122	1	3/4
1	-16	1-5/16-12	90-99	122-134	3/4	3/4
1-1/4	-20	1-5/8-12	120-132	163-179	3/4	3/4
1-1/2	-24	1-7/8-12	131-144	178-195	1/2	1/2
2	-32	2-1/2-12	300-330	407-447	1/2	1/2

1.6 Application of Adhesives

To ensure repairs are performed correctly, adhesive application techniques are presented here, along with recommended adhesive types for each scenario.

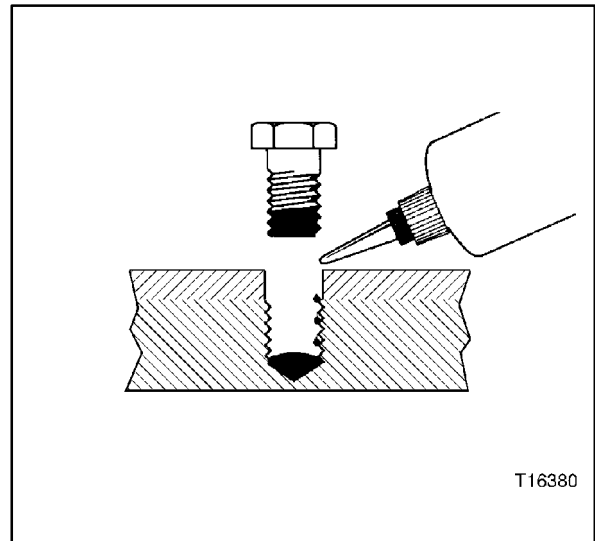
1.6.1 Through Hole (Bolts and Nuts)

1. Clean all threads (bolt and nut) with cleaning solvent.
2. Spray all threads with primer such as Loctite™ 7649 (Primer N). Allow 30 seconds to dry.
3. Insert bolt into through-hole assembly.
4. Apply several drops of Loctite™ 242 or equivalent threadlocker at proposed tightened nut engagement area.
5. Assemble and tighten nut to specifications.



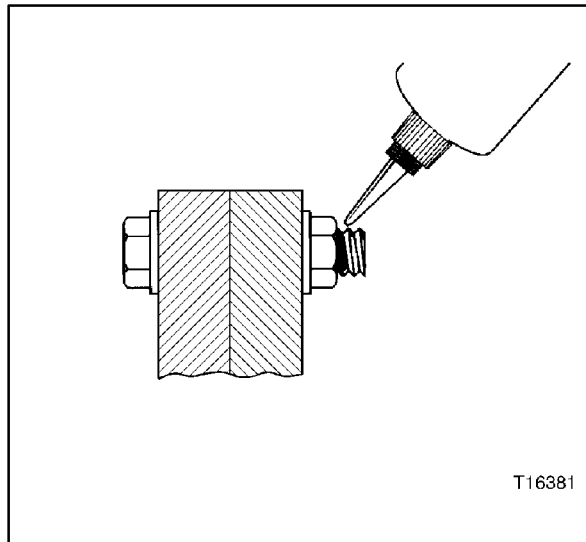
1.6.2 Blind Holes (Cap Screws, etc.)

1. Clean all threads (bolt and hole) with cleaning solvent.
2. Spray all threads with primer such as Loctite™ 7649 (Primer N). Allow 30 seconds to dry.
3. Squirt several drops of Loctite™ 277 or equivalent threadlocker down female threads into bottom of hole.
4. Apply several drops to bolt.
5. Tighten as usual.



1.6 Application of Adhesives

1.6.3 Pre-Assembled Fasteners



1. Clean bolts and nuts with cleaning solvent.
2. Assemble components.
3. Tighten nuts.
4. Apply drops of Loctite™ 290 or equivalent threadlocker at the bolt/nut juncture.

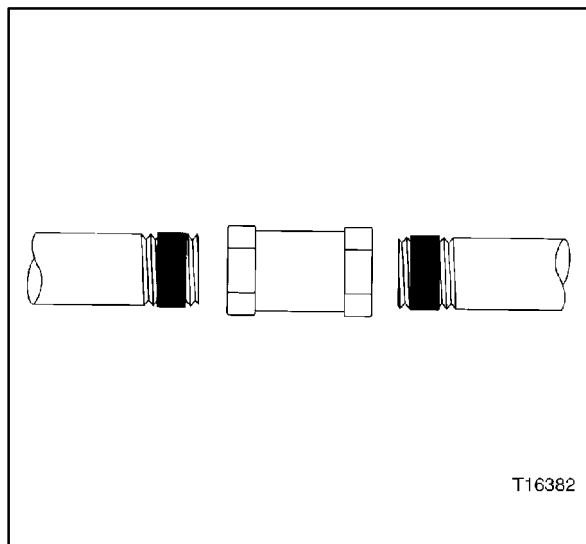
Important!

Avoid touching bottle tip to metal.

Note!

For preventive maintenance on existing equipment, retighten nuts and apply Loctite™ 290 or equivalent at the bolt/nut juncture.

1.6.4 Hydraulic Fittings



1. Clean all threads with solvent.
2. Spray all threads (male and female) with primer, such as Loctite™ 7649 (Primer N). Allow 30 seconds to dry.

Note!

Primer is not required for brass parts.

3. Apply Loctite™ Pneumatic/Hydraulic Seal 545 or equivalent threadsealer to male threads, starting one or two threads from end of the pipe.
4. Assemble parts snugly. Do not overtighten.
5. If initial pressure exceeds 1000 psi. (6.9 MPa), wait 30 minutes before pressurizing.