850 / 950 FELLER BUNCHER

S/N 10BA1235 – 10BA1235

S/N 10BA1272 – WC0850X008018

TECHNICAL MANUAL
850 / 950 FELLER BUNCHER
TMF435673

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.

Worldwide Construction and Forestry Division

English

Table of Contents

1. Introduction and Specifications

1.1 Introduction

The Service Manual is intended to provide technical information, component specifications, troubleshooting and removal, disassembly and reassembly procedures for most of the major components of the machine.

Certain components such as the engine, felling head, and fire suppression system are covered in individual manuals provided by the respective manufacturers. For specifications, parts listings and servicing procedures these manuals should be obtained to supplement the Service Manual.

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

Since it is never possible to anticipate all of the possible failure or malfunction scenarios, a concerted effort has been made to explain the function of, or method of operation, of many complex components. This information can be used to predict other causes of machine malfunction.

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 the machine for obvious causes.
6. Eliminate the simple ones by checking oil, changing filters, etc.
7. Carry out diagnostic procedures like pressure, leakage and slippage testing to pinpoint the cause.

1.1 Introduction

When troubleshooting there is no substitute for knowledge of the machine systems. This Service Manual contains both hydraulic and electrical system schematics. They should be used to gain a working knowledge of flow paths.

Both sets of schematics are supported by component location charts or illustrations to assist in locating electrical and hydraulic components on the machine.

Specifications (Section 1.2), 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, stacking order, clearance and torques are given. If a manufacturers' service 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.

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.
Battery terminals and posts contain lead or lead compounds, which are known to the State of California to cause cancer and birth defects. Wash hands after handling batteries.

1.2 Foreword

This manual is written for an experienced technician. Essential tools required in performing certain service work are identified in this manual and are recommended for use.

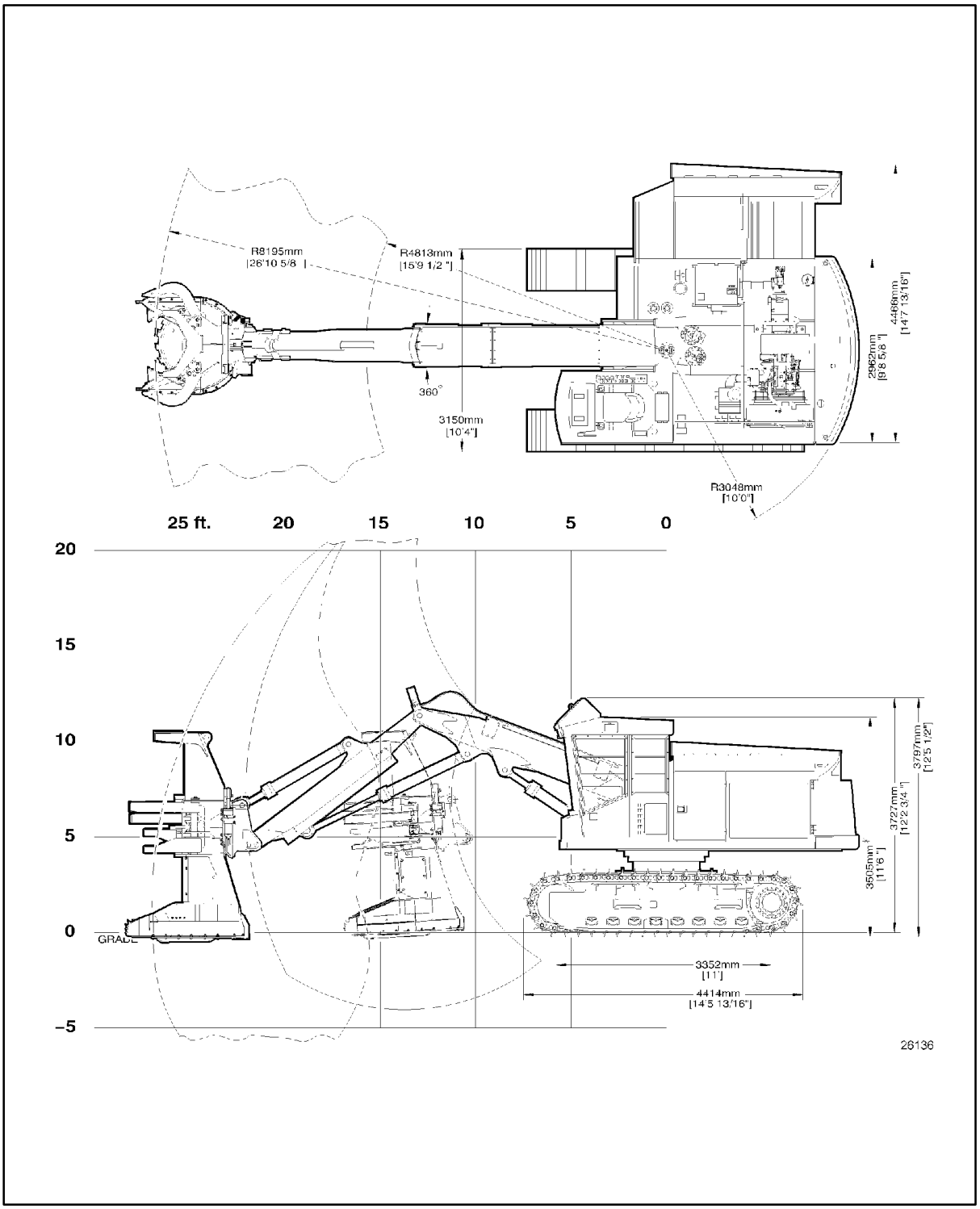
Live with safety: Read the safety messages in Section 2 of this manual and the cautions presented throughout the text of the manual.

This is the safety-alert symbol. When you see this symbol on the machine or in this manual, be alert to the potential for personal injury.

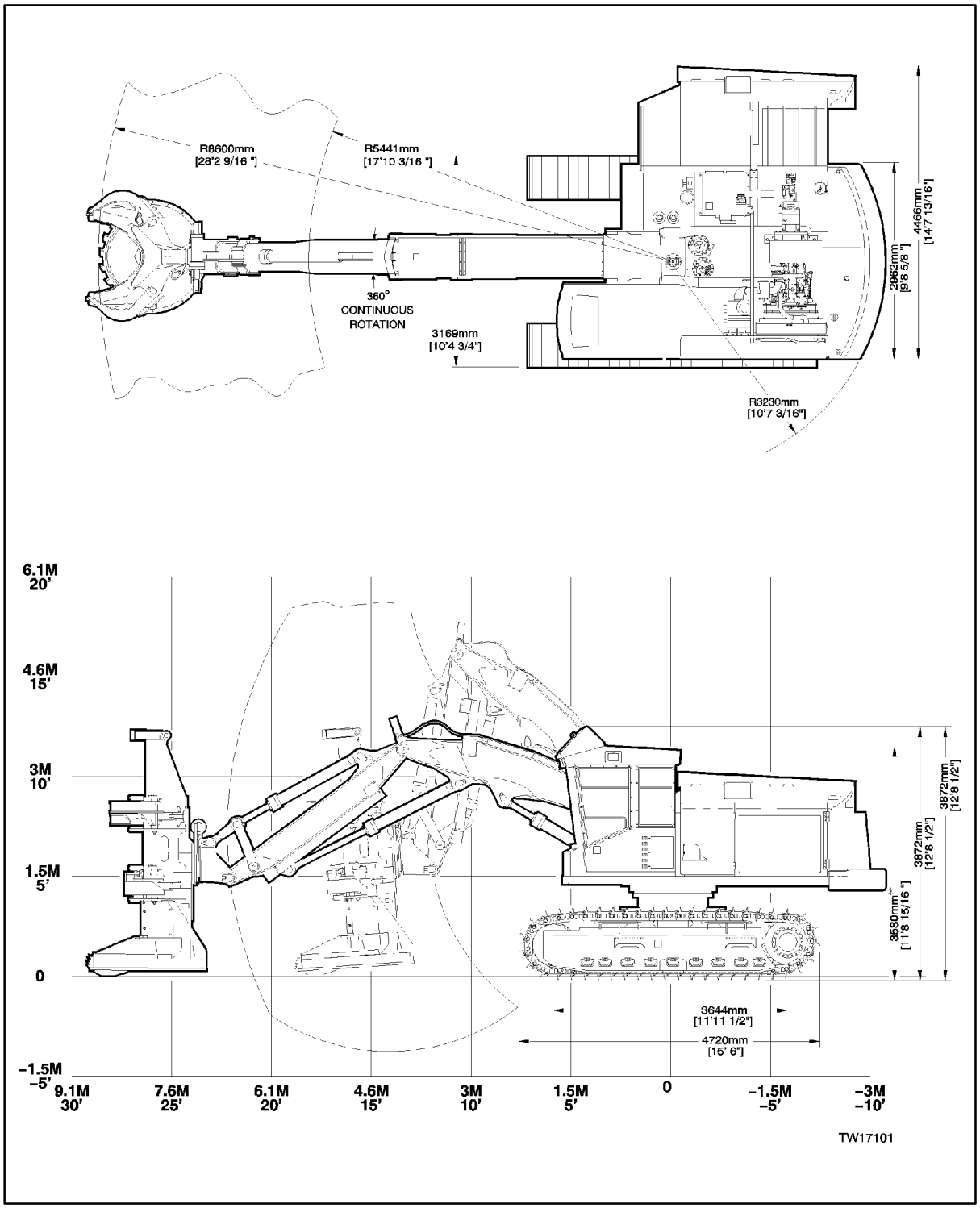
Technical Manuals are concise guides for specific machines. They are on-the-job guides containing only the vital information needed for diagnosis, analysis, testing, and repair.

Fundamental service information is available from other sources covering basic theory of operation, fundamentals of troubleshooting, general maintenance, and basic type of failures and their causes.

1.3 Machine Dimensions



1.3 Machine Dimensions



1.4 Specifications

ENGINE: 850/950

Model	Cummins 6CTA8.3
No. of cylinders	6
Displacement	504 cu. in. (8.3 litres)
Bore/Stroke	4.49 x 5.32 in. (114 x 135 mm)
Rated Power	230 hp (174 kW) 2000 rpm
Rated Maximum Torque	720 lb ft (976 Nm) 1500 rpm
High Idle	2275 +/- 45 rpm
Low Idle	950 +/- 45 rpm

SWING DRIVE GEARBOX (2): 850

Type	Double Reduction Planetary
Pinion	12 Tooth
Brake	Integral with swing gear
Brake Type	Wet - Spring Applied Hydraulic Released (SAHR)
Brake Release Pressure	507 - 550 psi (3.5 - 3.8 MPa)

SWING DRIVE GEARBOX (2): 950

Type	Triple Reduction Planetary
Pinion	12 Tooth
Brake	Integral with swing gear
Brake Type	Wet - Spring Applied Hydraulic Released (SAHR)
Brake Release Pressure	507 - 550 psi (3.5 - 3.8 MPa)

FLEXIBLE COUPLING:

Type	Flex Drive
	(Must not put end thrust on engine crankshaft)

1.4 Specifications

AIR CLEANER:

Type	Dry, Two Stage Aspirated
Inlet	6 in. (153 mm)
Outlet	5 in. (127 mm)
Size	13 in. O.D. (355 mm)
Pre-cleaner	Aspirated

ENGINE OIL FILTER:

Type	Spin - on cartridge

RADIATOR:

Core Type	7.0 fins/in. (0.28 fins/mm) 6 Rows - copper fins with steel insert
System Pressure	15 psi (103 kPa)

SURGE TANK:

Capacity Rating	15 psi (103 KPa)
System Capacity	2.25 U.S. gal (8.5 litres)

FAN:

Type	6 blade (suction)
Diameter	30 in. (762 mm)
Projected Width	2.83 in.(72 mm)
Drive Ratio	1.00:1 - Direct drive off engine crankshaft

HYDRAULIC OIL COOLER:

Type	6.5 fins/in. (0.24 fins/mm) - 4 rows
Location	In front of engine radiator
Thermal Bypass	Begins @ 120ºF (49°C)
Full Oil Flow	@ 140 ºF (60 ºC)
Pressure Bypass	50 psi (350 kPa)

1.4 Specifications

BRAKES:

Type	Multi disc, wet
Activated	(Integral) Spring Applied Hydraulic Release (SAHR)

EXHAUST:

Type	Silencer (with spark arrestor)
Inlet Diameter	4 in. (102 mm)

FUEL TANK:

Capacity	295 U.S. gal (1117 litres)
Fill Opening	3.5 in. (89mm) ..... Strainer in opening
Level Sender	Variable Resistor
	(Full - 30 ohms/Empty - 240 ohms)

FUEL/WATER SEPARATOR:

Type	Replaceable Element - at fuel tank

FUEL FILTERS:

Type	Spin - on cartridge

HYDRAULIC FILL PUMP:

Type	Hand Operated Piston

1.4 Specifications

MAIN HYDRAULIC PUMP:

Type	Variable Displacement Axial Piston
Displacement	15.86 cu in/rev (260 cc/rev)
Rotation	cw (looking at shaft)
Nominal Flow	126 U.S. gal (475 litres) @ 2000 rpm

SAW PUMP:

Type	Variable Displacement Axial Piston
Displacement	2.44 cu.in./rev (40 cc/rev)
Operating Press	4420 psi (30.5 MPa)
Rotation	cw (looking at shaft)
Nominal Flow	20.1 U.S. gal (76 litres) @ 2000 rpm

CLAMP/WRIST PUMP:

Type	Variable Displacement Axial Piston
Displacement	3.66 cu.in./rev (60 cc/rev)
Operating Press	3625 psi (25 MPa)
Rotation	cw (looking at shaft)
Standby Pressure	435 psi (3.0 MPa)
Nominal Flow	31.7 U.S. gal (120 litres) @ 2000 rpm

SWING DRIVE MOTORS (2):

Type	Fixed Displacement Axial Piston
Displacement	2.75 cu in/rev (45 cc/rev)
Rotation	Bi-directional
Control	Main Valve Spool

1.4 Specifications

TRACK DRIVE MOTORS (2):

Type	Variable Displacement Axial Piston
Displacement: (850)	4.88 cu in/rev (80.0 cc/rev)
(950)	6.52 cu in/rev (107.0 cc/rev)
Rotation	Bi-directional
Control	Main Valve Spools - Using pilot pressure
Begin Of Regulation	3175 psi (21.9 MPa) (Measured @ L.S. test port)
Cross Line Relief	5220 psi (36.0 MPa) (Measured @ L.S. test port)
Brake Release Pressure	304 - 363 psi (2.1 - 2.5 MPa)

SAW VALVE:

Location	Engine compartment near fuel tank
Type	Pilot operated
Relief valves	5076 psi (35.0 MPa)

PILOT HYDRAULIC VALVE:

Location	Top of hydraulic tank
Type	Electric over hydraulic, four functions
System Operating Pressure	525 psi (3.6 MPa)

JOYSTICK & FOOT PEDAL VALVES:

Quantity	2 each
Operating voltage	24 volts

SWING CROSSLINE RELIEF VALVE:

Quantity	2
Relief Settings: (850)	3000 psi (20.7 MPa) (Measured @ L.S. test port)
(950)	2857 psi (19.7 MPa) (Measured @ L.S. test port)

1.4 Specifications

MAIN HYDRAULIC VALVE:

Quantity	1
Type	Load sense, pressure/anti-saturation compensated
Pilot Relief Setting	525 psi (3.6 MPa)
LS Main Relief	4700 psi (32.4 +/- 0.2 MPa) (Measured @ L.S. test port)
Swing Feed Reducer: (850)	2700 psi (18.7 +/- 0.2 MPa) (Measured @ L.S. test port)
(950)	2567 psi (17.7 +/- 0.2 MPa) (Measured @ L.S. test port)
Boom Feed Reducer: (850)	3480 psi (24.0 +/- 0.2 MPa) (Measured @ L.S. test port)
(950)	4205 psi (29.0 +/- 0.2 MPa) (Measured @ L.S. test port)
Unloader Relief Setting	4641 psi (32.0 MPa)
Clamp and Wrist Port Reliefs	4061 psi (28.0 MPa) (Preset)
Check Valve Setting	73 psi (0.5 MPa) and 131 psi (0.9 MPa)
Spool Limit Screws	Individually adjustable
Pilot Orifices	1.0 mm for swing; 0.6 mm for tracks and head functions

HYDRAULIC RETURN FILTER:

Quantity	2 (5/10 micron Beta 2/20)
Location	Inside hydraulic tank
Bypass valve	22 psi (0.0152 MPa)
	Warning light at 18 psi (0.0124 MPa)

SUCTION STRAINER:

Quantity	1 (100 mesh)
Location	Inside hydraulic tank
Capacity	250 U.S. gpm (946 l/min)
Pressure at pump	2.5 - 3.0 psi (0.0172 - 0.0207 MPa)
	Warning light at 2 psi (13.8 kPa)

HYDRAULIC TANK:

Maximum Capacity	60 U.S. gal (227 litre)
Minimum Capacity	55 U.S. gal (207 litre)
Relief Pressure	15 psi (0.103 MPa)
Charge Pressure	10 psi (0.069 MPa)

1.4 Specifications

HOIST & STICK CYLINDERS:

Quantity	2 (hoist), 1 (stick)
Bore	5.0 in. (127 mm)
Stroke	44.5 in. (1130 mm)
Rod diameter	3.5 in. (88.9 mm)
Collapsed length	67.3 in. (1709 mm)
Pin diameter	3.0 in. (76.2 mm)
Cushioned	Both ends

TILT CYLINDER:

Quantity	1
Bore	5.0 in. (127 mm)
Stroke	44.5 in. (1130 mm)
Rod diameter	3.0 in. (76.2 mm)
Collapsed length	67.3 in. (1709 mm)
Pin diameter	3.0 in. (76.2 mm)
Cushioned	Both ends

ENCLOSURE TILT CYLINDER:

Quantity	1
Bore	3.5 in. (90 mm)
Stroke	15.6 in. (397 mm)
Rod diameter	1.8 in. (45 mm)
Collapsed length	30.9 in. (786 mm)
Pin diameter	1.77 in. (45 mm)
Cushion	None

1.4 Specifications

CLAMP CYLINDER :

Clamp Cylinders (3.5“)

No. Cylinders	2
Retracted Length	23 in. (584 mm)
Extended Length	31.5 in. (800 mm)
Bore Diameter	3.5 in. (88.9 mm)
Rod Diameter	2.0 in. (50.8 mm)
Stroke	8.5 in. (216 mm)
Operating Pressure	3625 psi (250 bar)
Cushioning	Base End

Clamp Cylinders (4.0”)

No. Cylinders	2
Retracted Length	23 in. (584 mm)
Extended Length	31.5 in. (800 mm)
Bore Diameter	4.0 in. (101.6 mm)
Rod Diameter	2.0 in. (50.8 mm)
Stroke	8.5 in. (216 mm)
Operating Pressure	3000 psi (207 bar)
Cushioning	Base End

WRIST CYLINDER:

Wrist (3.5”)

No. Cylinders	2
Retracted	23 in (584 mm)
Extended	31.5 in. (31.5 mm)
Bore Diameter	3.5 in. (88.9 mm)
Rod Diameter	2.0 in. (50.8 mm)
Stroke	8.5 in. (216 mm)
Wrist Movement	+/- 15º
Wrist Speed	1.6 rpm

1.4 Specifications

ALTERNATOR:

Amperage	70 amp
Voltage	24 volt (charges @ 26 - 28 volts)
Ground	Negative

STARTER:

Model	42MT
Voltage	24 volt
Ground	Negative

BATTERY:

Quantity	2
Model	4D - 1000
Capacity rating	1000 CCA @0 ºF (-18 ºC)
Reserve	300 minute
System voltage	24 volts
Battery voltage	12 volts, two connected in series

LIGHTS:

Voltage	24 volt
Front Cab (3)	140 watt
Side Cab	140 watt
Enclosure(2)	140 watt
Service (2)	70 watt
Dome	29 watt

1.4 Specifications

24v/12v CONVERTER:

Battery/Converter Equalizer	24 - 12 VDC Equalizer
Output Current	10 amp continuous @ 12 volts
Maximum Current	20 amp intermittent @ 12 volts

AUTO-LUBRICATION SYSTEM (OPTIONAL):

Type	Piston (electrically powered)
Capacity	1 U.S.gal (4 L) (low level activates warning)
Timing	Adjustable (continuous power for memory)
Maximum pressure	3000 psi (20.7 MPa) (activates warning) Indicates problem location (See System Manual)

SWING BEARING:

Ring Gear (Internal)	104 Teeth

TRACK:

Shoe sizes	24, 30 or 36 inch (610, 762 or 914 mm)
Shoe types	Single, double or triple grouser
Track chain pitch: (850)	8.0 in. (203 mm)
(950)	8.5 in. (216 mm)
Track shoe bolt: (850)	3/4 - 16
(950)	7/8 - 14
Tightening Torque: (850)	220 +/- 40 lb ft (298 +/- 54 Nm) + 1/3 turn
(950)	250 +/- 50 lb ft (339 +/- 68 Nm) + 1/3 turn
Inspection Torque: (850)	420 lb ft (569 Nm)
(950)	650 lb ft (881 Nm)
Track Roller Bolt	430 - 450 lb ft (590 - 610 Nm)

1.4 Specifications

TRACK DRIVE GEARBOX (2):

Type	Triple Reduction Planetary
Brake	Integral with gearbox
Brake Type	Wet - Spring Applied Hydraulic Released (SAHR)
Brake Release Pressure	304 - 363 psi (2.1 - 2.5 MPa)

ENGINE OIL PRESSURE:

Gauge	0 - 100 psi (0 - 0.69 MPa)
Sender	0 psi (0 MPa) - 240 ohm
	25 psi (0.172 MPa) - 153 ohm
	100 psi (0.69 MPa) - 33.5 ohm
Engine Anti-rotation	N.O., closes at 4 psi (0.0275 MPa)
Low Pressure Warning	N.O., closes at 15 psi (0.103 MPa)

HYDRAULIC OIL PRESSURE:

Pump Inlet Switch	N.O., closes at 2 psi (0.0138 MPa)
Oil Level Sender	N.O., closes for low level
Filter Bypass Switch	N.O., closes @ 18 psi (0.124 MPa)

ENGINE COOLANT TEMPERATURE:

Gauge	100 - 280 ºF (38 - 138 ºC)
Sender	195 ºF (90.3 ºC) - 123.8 ohm
	280 ºF (138 ºC) - 35.6 ohm
Switch	N.C., Opens at 210 ºF (99 ºC)

HYDRAULIC OIL TEMPERATURE:

Gauge	100 - 280 ºF (38 - 138 ºC)
Sender	195 ºF (90.3 ºC) - 123.8 ohm
	280 ºF (138 ºC) - 35.6 ohm
Switch	N.C., Opens at 210 ºF (99 ºC) - sounds alarm

1.4 Specifications

VOLTMETER:

Range . . . . . 20 - 32 Volts

HOURMETER:

Digital display . . . . . Activated when engine is running.

LOW COOLANT WARNING:

Coolant probe . . . . . Provides current path to ground when covered with coolant
Coolant Module . . . . . Amplifies signal to activate warning light

MACHINE WEIGHTS:

Total Weight: (850) . . . . . 65 000 lb (29 480 Kg)

Weight includes 24” Double Grouser, FS22 Felling Head, and 1/2 tank of fuel.

Total Weight: (950) . . . . . 77,200 lb (35,020 Kg)

Weight includes 24” Double Grouser, FS24 Felling Head, and 1/2 tank of fuel.

ATTACHMENTS:

850 - FS22 Felling Head
950 - FS24 Felling Head Std (FS22 Felling Head Optional)

1.5 Function Speeds

Hydraulic Speeds (@2000 Engine rpm)

(850 and 950 Full Stroke)

Cylinder	Extend	Retract
Tilt	4.13 Seconds	3.93 Seconds
Stick	4.25 Seconds	4.25 Seconds
Hoist	3.35 Seconds	3.35 Seconds
Clamp	0.87 Seconds	0.65 Seconds
Wrist	2.92 Seconds	2.91 Seconds

Turntable Swing Speed

850: 6.9 rpm

950: 5.3 rpm

1.6 Travel Speeds

(@2000 Engine rpm)

850:

High Range: 2.5 mph (4.0 km/hr)

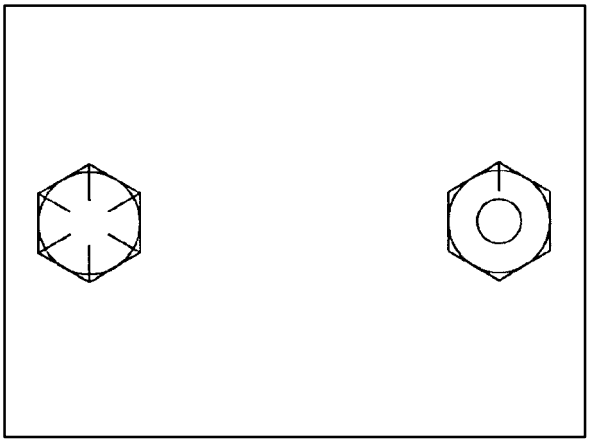
Low Range: 1.3 mph (2.1 km/hr)

950:

High Range: 3.0 mph (4.8 km/hr)

Low Range: 1.3 mph (2.1 km/hr)

1.7 Torque Values

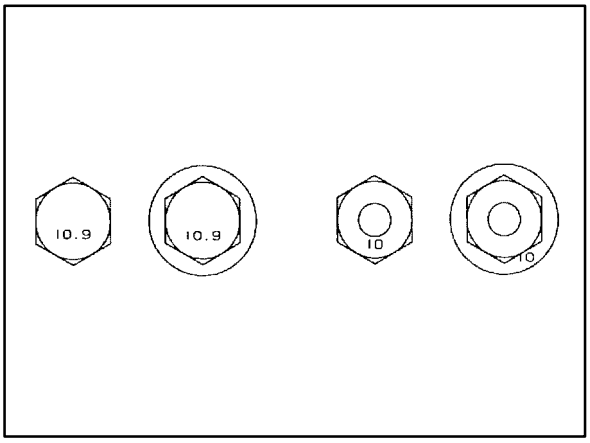


The following torque values are for use in general applications and where torque values are not otherwise specified.

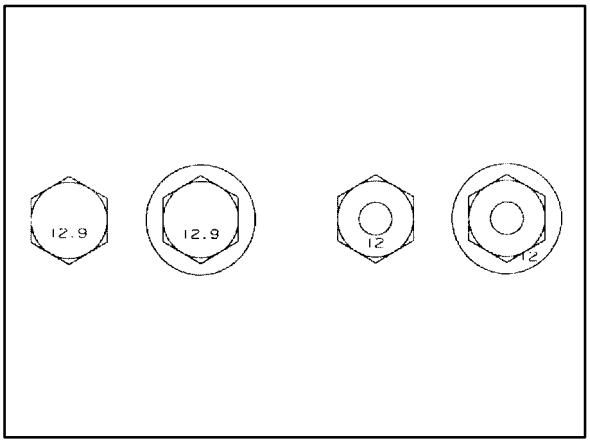
1.7.1 Steel Fasteners

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

1.7 Torque Values

1.7.1 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
3/80	.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

1.7 Torque Values

1.7.1 Steel Fasteners

Metric Hex Head

Nominal Thread Diameter	Tightening Torques 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

1.7 Torque Values

1.7.1 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 +/- 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.

1.7 Torque Values

1.7.2 Hydraulic Fittings

This standard establishes torques for tightening of hydraulic fittings of various types in use on forestry machines.

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	14 - 16
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 Jun 94

1.7 Torque Values

1.7.2 Hydraulic Fittings

SAE Code 61 and Code 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 other 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	5/1 6 -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 Jun 93

Tapered Pipe Threads (NPTF & NPT)

Pipe Thread Size	Dash No.	Threads with sealant (Loctite) lb ft	Nm	Pipe Thread Size	Dash No.	Threads with Sealant (Loctite) lb ft	Mn
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				

1.7 Torque Values

1.7.2 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/	21
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

1.8 Hydraulic Fluids

1.8.1 Recommended Hydraulic System Fluids

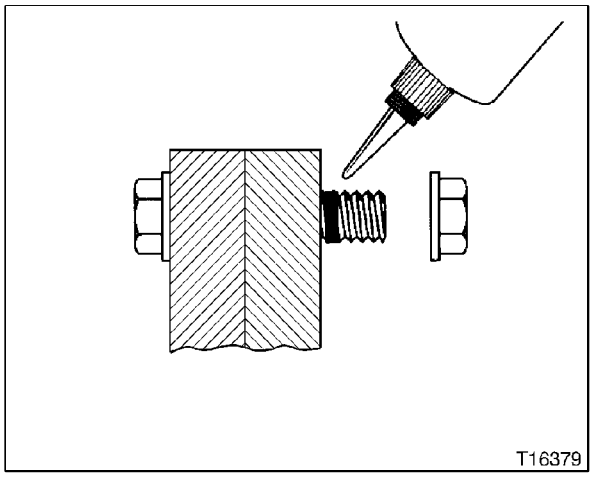
Oil Name Grade	Pour Point		Min. Continuous Operating		Max. Continuous Operating		Pump Start-Up Temperature	
SUMMER OIL	°F	°C	°F	°C	°F	°C	°F	°C
Chevron 68	-29	-34	126	52	167	75	23	-5
*Esso Univis N68	-22	-30	129	54	169	76	36	2
Irving LP58	-45	-43	129	54	181	83	10	-12
Petro Canada Harmony AW68	27	-33	127	53	169	76	30	-1
Shell Tellus 68	-17	-27	127	53	171	77	26	-2
WINTER OIL								
Chevron 32	-33	-36	97	36	135	57	7	-14
*Esso Univis N32	-44	-42	99	37	142	61	0	-18
Irving LP22	-51	-46	77	25	122	50	-17	-27
Petro Canada Harmony HVI-22	-65	-54	81	27	126	52	-17	-27
Petro Canada Harmony HVI-36	-38	-39	106	41	153	67	3	-16
Shell Tellus T22	-71	-57	77	25	118	48	-18	-28
Shell Tellus T32	-60	-51	99	37	142	61	0	-18

If hydraulic oil operating temperatures exceed temperatures listed above, consult your Dealer.
Other oils may be suitable; consult your Dealer.

*Factory fill-depending on date and machine location.

DO NOT MIX FLUID BRANDS AND TYPES.

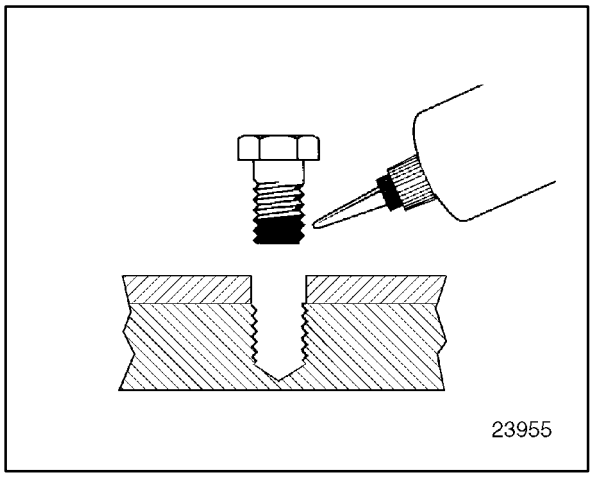
1.9 Application of Adhesives



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

1.9.1 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 specification.



1.9.2 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 on the bolt threads.
4. Tighten as usual.

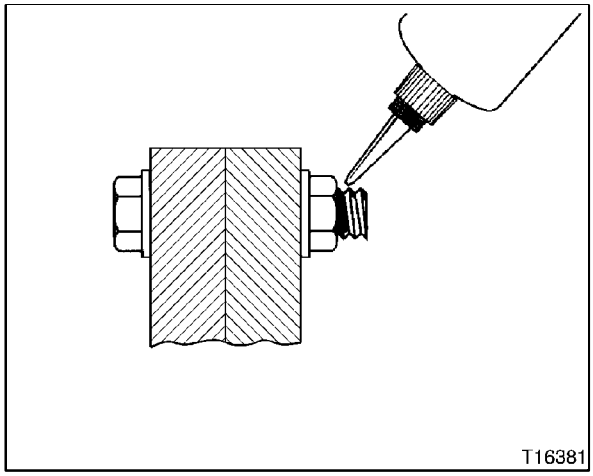
1.9 Application of Adhesives

1.9.3 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.

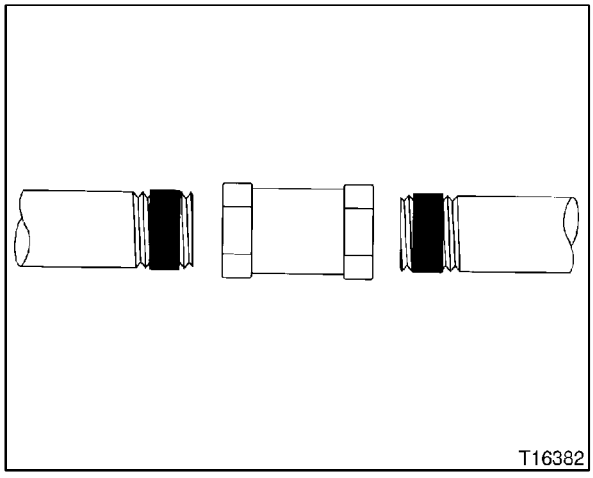


1.9.4 Hydraulic Fittings

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 the end of the pipe.
4. Assemble parts snugly. Do not overtighten.
5. If initial pressure exceeds 1000 psi, wait 30 minutes before pressurizing.



1.10 Tool List

The following list of tools is provided as a guideline for a typical dealer. It should be used as a guideline and may not be 100% complete. Refer frequently to Service Bulletins, which from time to time may contain information about new service or test methods, and additional tools required to implement them.

1.10.1 Service Shop

1. 3/4” torque wrench - 0 - 600 lb ft
2. 1/2” torque wrench - 0 - 150 lb ft
3. Torque multiplier 3/4” to 1” - 4:1 ratio
4. Dial Indicator with magnetic base
5. Hand held tachometer
6. 0 - 10000 psi pressure gauge
7. 0 - 1000 psi pressure gauge (qty 2)
8. 0 - 10000 psi Delta P gauge
9. Set of metric combination open and box end wrenches 6 mm to 32 mm
10. Set of SAE combination open and box end wrenches 1/4” to 1 3/4”
11. Set of allen wrenches 2.5 mm to 12 mm
12. Flow meter with 150 U.S. gpm capacity
13. Relief valve with a capacity to hold 45 psi (3 bar) for pump test
14. 1/4” drive metric socket set 8 mm to 14 mm
15. 1/4” drive SAE socket set 1/4” to 9/16”
16. 3/8” drive metric socket set 9 mm to 19 mm
17. 3/8” drive SAE socket set 3/8” to 7/8”
18. 1/2” drive metric socket set 13 mm to 32 mm
19. 1/2” drive SAE socket set 1/2” to 1 1/4”
20. 3/4” drive metric socket set 19 mm to 50 mm
21. 3/4” drive SAE socket set 3/4” to 2 1/2”
22. Magnetic pencil (Snap On)
23. Compensator removal tool available from Parker
24. Feed reducer seat removal tool available from Parker
25. Air compressor (150 psi)
26. 1/2” impact wrench
27. 3/4” impact wrench
28. Multi meter
29. Crimping tool
30. Pin extractor tool
31. Pin extractor tool
32. Chain Hoist
33. Lifting straps (3 ft long)
34. 20 litre pails (qty 4)
35. T-bar puller to remove brake disc
36. Various sizes of snap ring pliers
37. Metric vernier for measuring x dimensions
38. 3/4 drive 4” torque adapter
39. Master track pin press
40. Analog multimeter

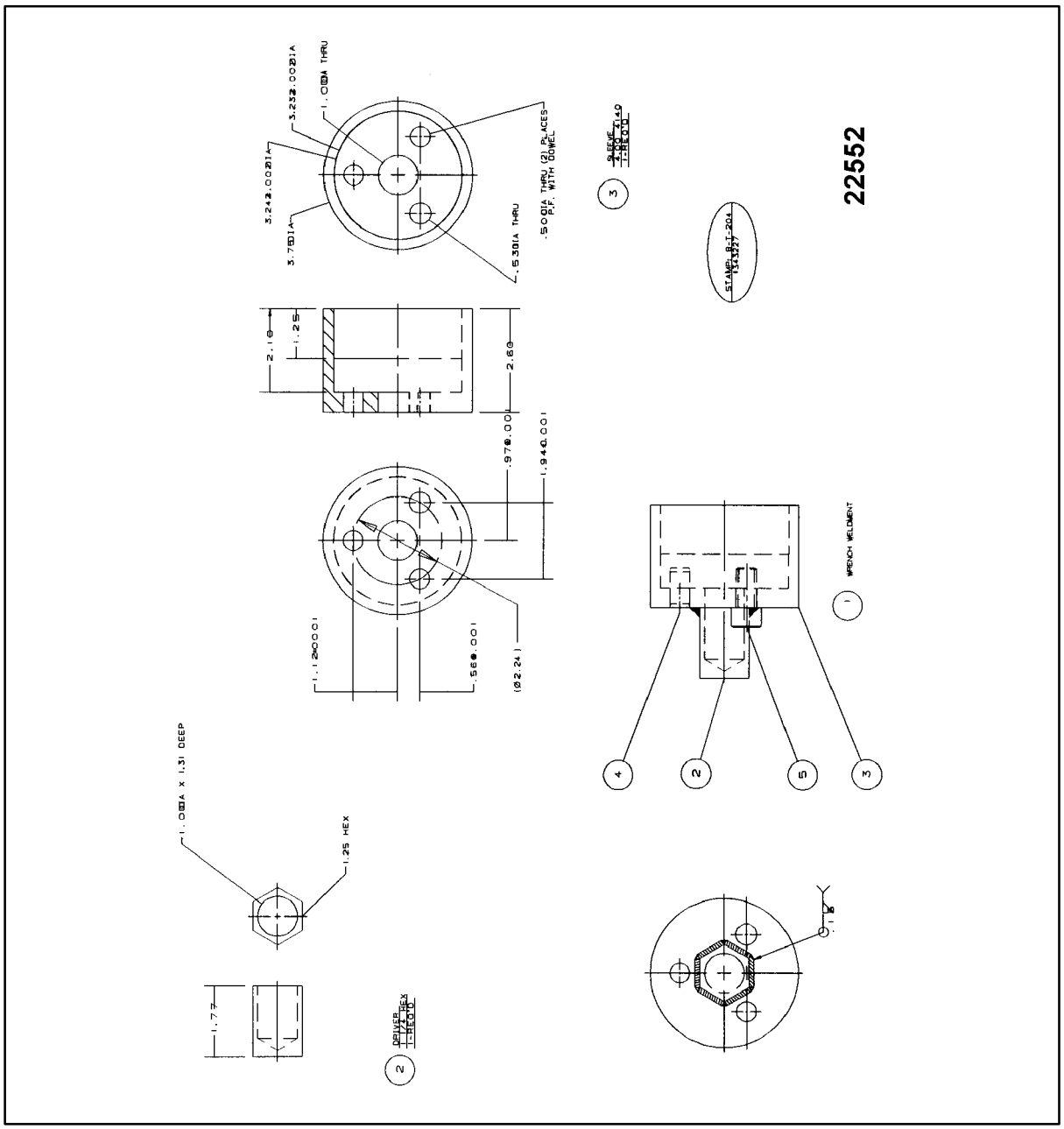
1.10 Tool List

1.10.2 Service Truck

1. Magnetic base dial indicator
2. Large caliper for measuring track rollers
3. Feeler gauges
4. Gauges
   0 - 100 psi
   0 - 600 psi
   0 - 1000 psi
   0 - 4000 psi
   0 - 6000 psi.
5. Flow meter with 150 gpm capacity
6. Digital Multimeter
7. Analog Multimeter
8. Electrical terminal kit
9. Air compressor (150 psi)
10. Arc welding machine (optional)
11. Oxygen/Acetylene welding/cutting torch
12. Lifting boom, slings and chains
13. Chain hoist
14. Torque multiplier 3/4” to 1” - 4:1 ratio
15. 3/4” torque wrench - 0 - 600 lb ft
16. 1/2” torque wrench - 0 - 150 lb ft
17. 1/2” and 3/4” impact wrenches
18. Set of metric combination open and box end wrenches 6 mm to 32 mm
19. Set of SAE combination open and box end wrenches 1/4” to 1 3/4”
20. Set of allen wrenches - 2.5 mm to 12 mm
21. 1/4” drive metric socket set - 8 mm to 14 mm
22. 1/4” drive SAE socket set 1/4” to 9/16”
23. 3/8” drive metric socket set 9 mm to 19 mm
24. 3/8” drive SAE socket set 3/8” to 7/8”
25. 1/2” drive metric socket set 13 mm to 32 mm
26. 1/2” drive SAE socket set 1/2” to 1 1/4”
27. 3/4” drive metric socket set 19 mm to 50 mm
28. 3/4” drive SAE socket set 3/4” to 2 1/2”
29. Magnetic pencil (Snap On)
30. Crimping tool
31. Pin extractor tool
32. Pin extractor tool
33. Kit of assorted snap ring pliers
34. Assorted pullers
35. Vacuum pump
36. Soldering kit
37. Portable track pin press
38. Flow meter
39. Photo tachometer
40. Non contact thermometer (hand held)
41. Heat shrinkable tubing
42. 20 litre pails (qty 4)
43. Test Fittings
    Coupler, Male - Hyd. Test Port - 1/4 NPTF
    Adapter - Male Metric - JIC - M10X1
    Adapter - Male Metric - JIC - M12X1.5
    Male Stauff to #4 SAE o-ring boss
    Male Stauff to #4 JIC female swivel
44. Test Hoses
    400 mm long
    500 mm long
    4000 mm long
45. T-bar puller set
46. Cylinder Piston Tools
    see page 1-32
    see page 1-31
47. Support stand for raising track off ground

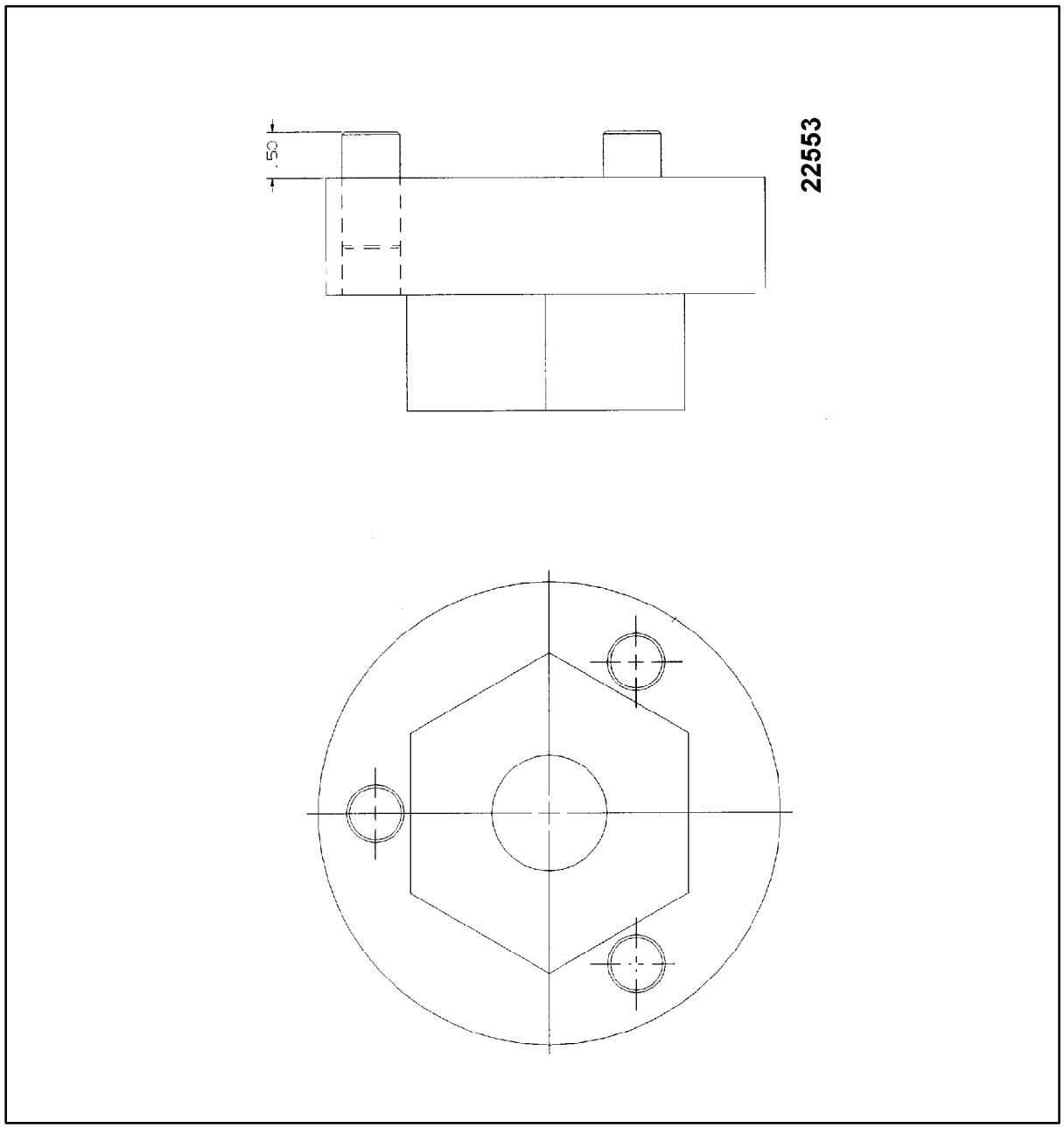
1.10 Tool List

Piston Spanner



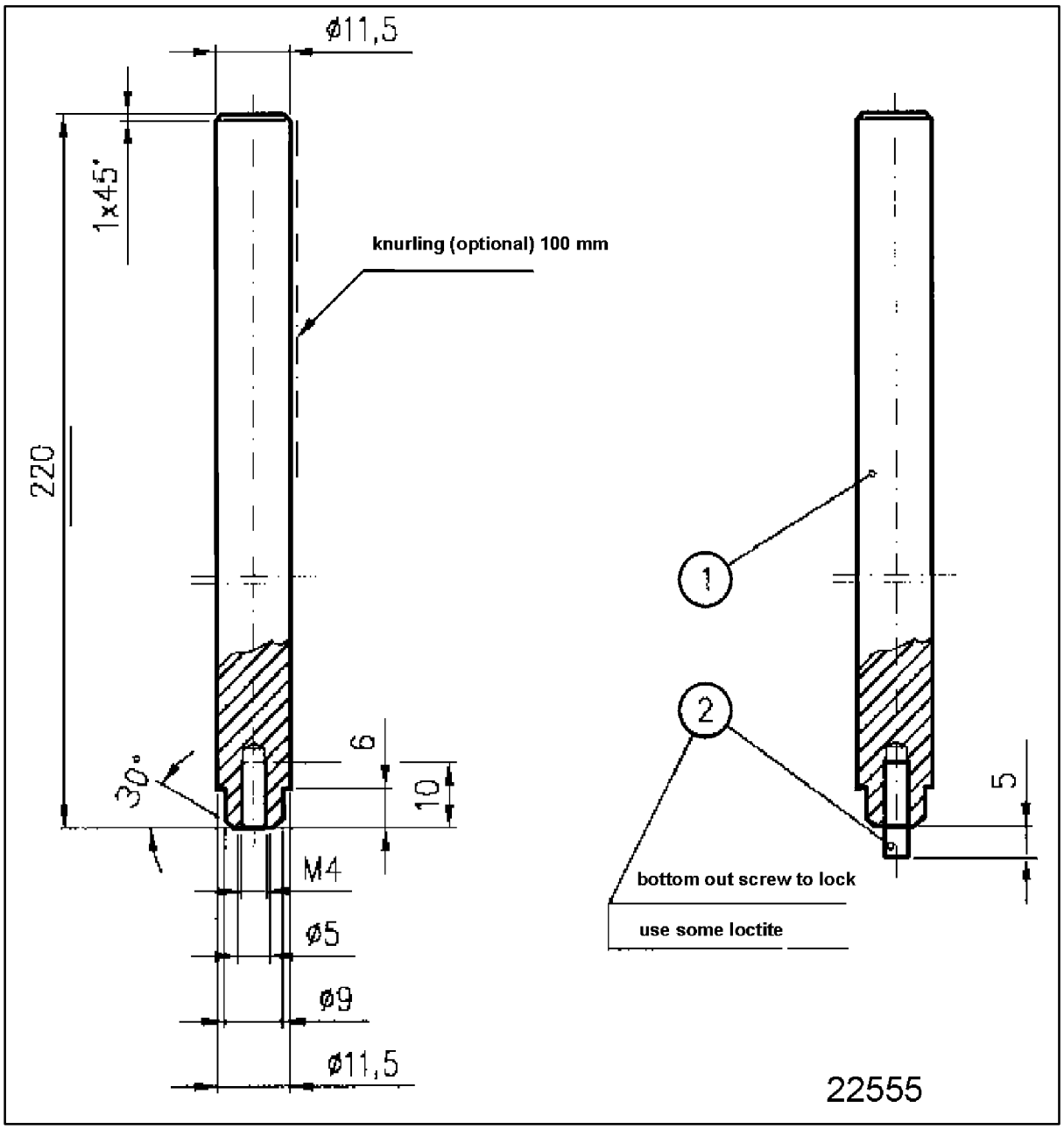
1.10 Tool List

Nut Driver



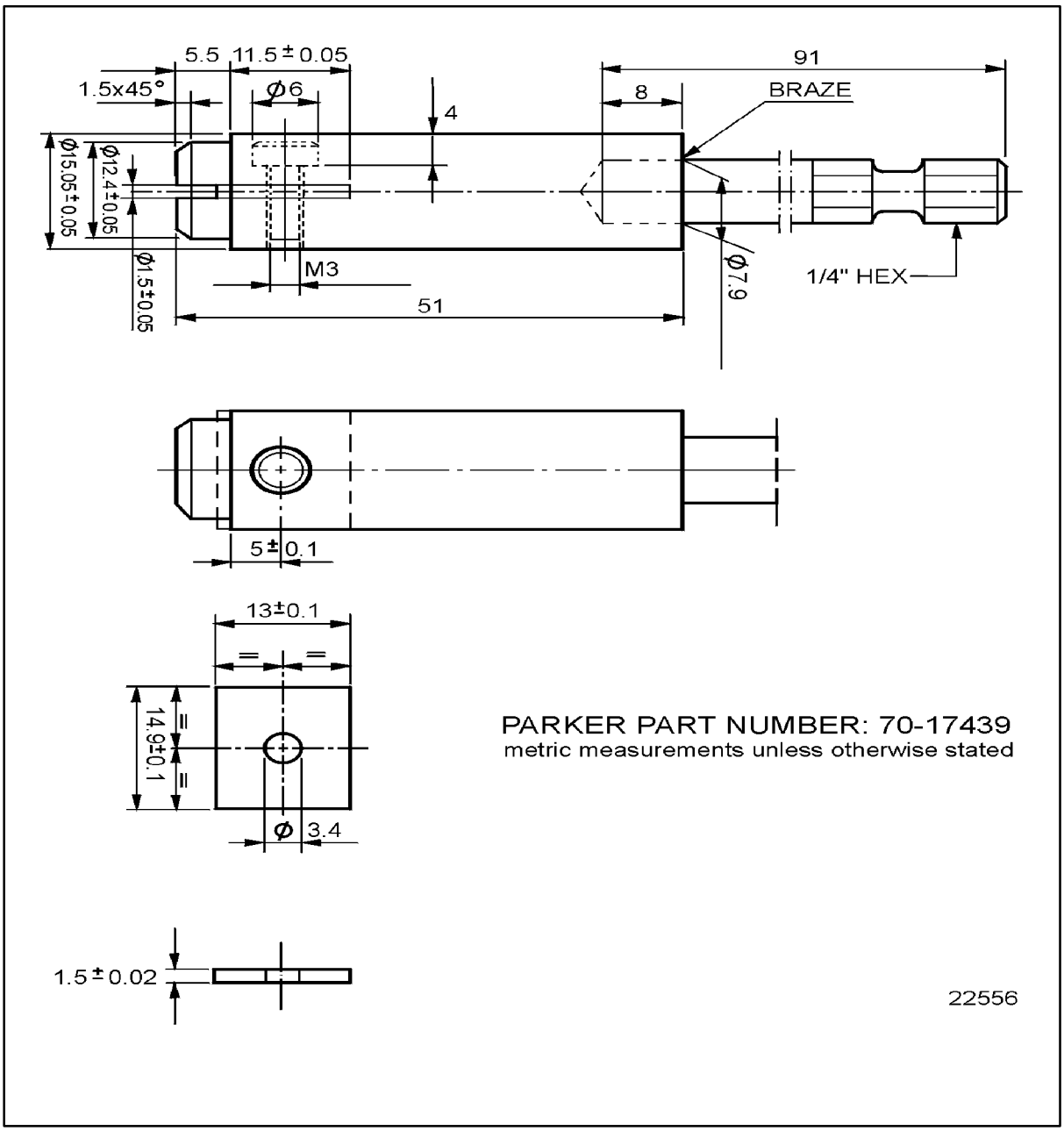
1.10 Tool List

Threaded Rod



1.10 Tool List

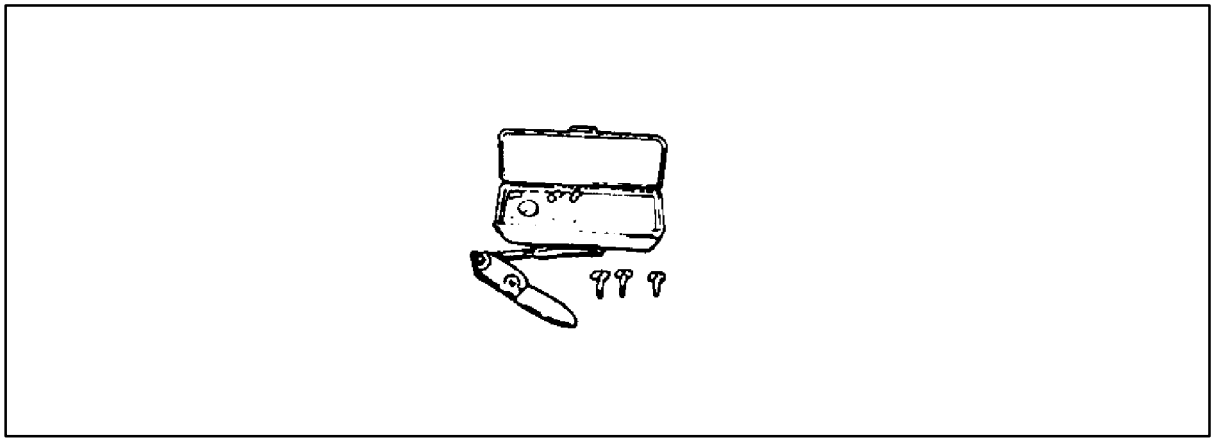
Seat Removal Tool



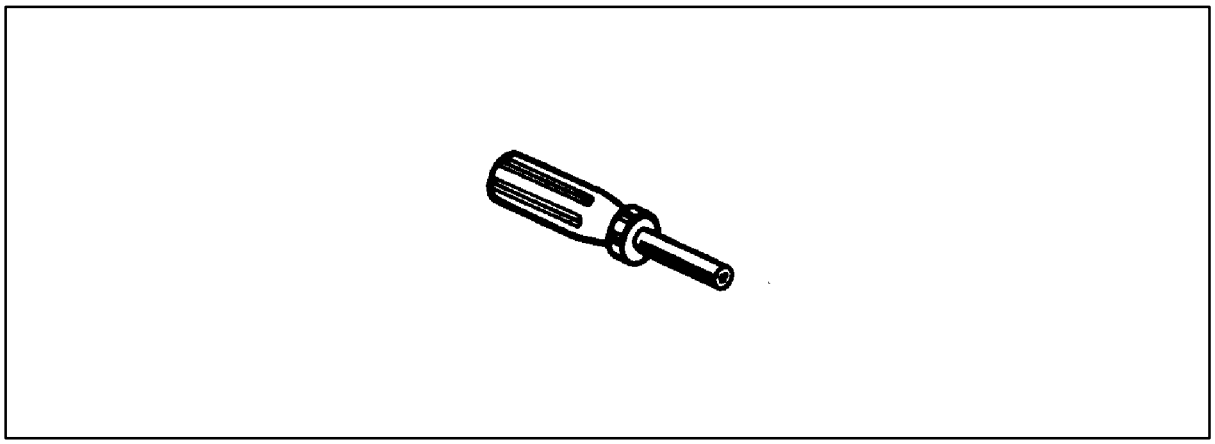
1.10 Tool List

Deutsch™ Electrical Repair Tool Kit JDG359

Includes:
Crimper JDG360
12-14 Gauge Extractor (Set of two) JDG361
16-18 Gauge Extractor (Set of two) JDG362
20-24 Gauge Extractor (Set of Two) JDG363

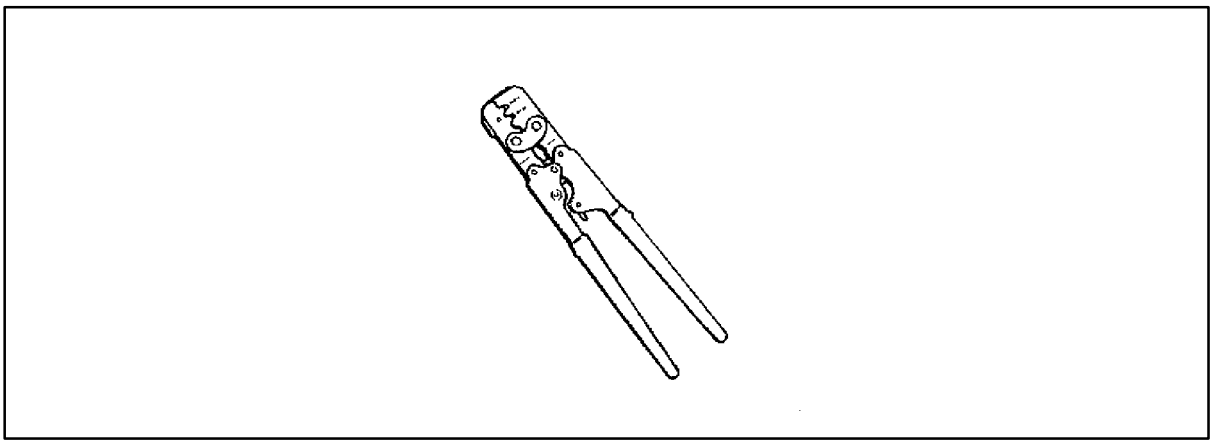


WEATHER PACK™ Extraction Tool JDG364

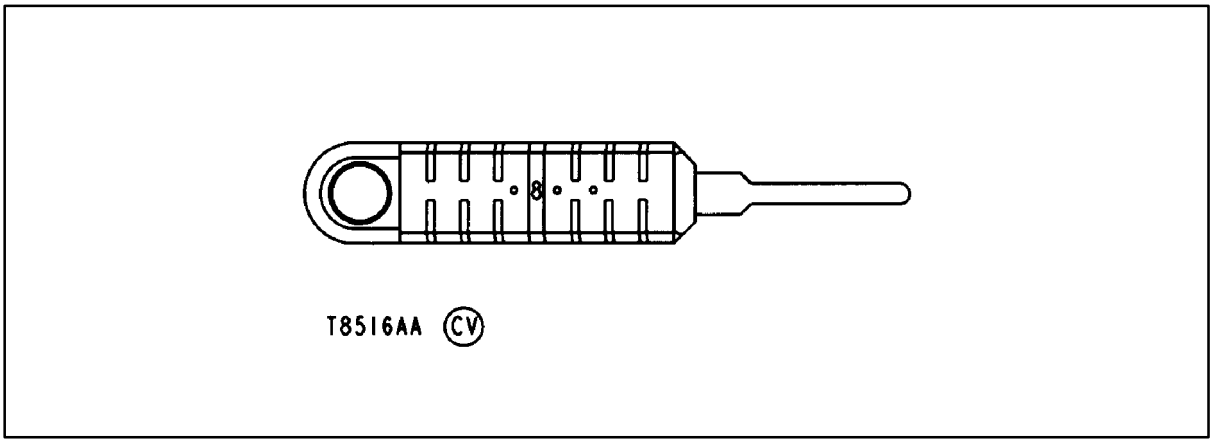


1.10 Tool List

WEATHER PACK™ Crimping Tool JDG783



Metri-Pack Extractor Tool JDG939



1.11 Modifications or Repairs to Roll-over Protective Structures (ROPS)

Maintain ROPS Integrity (Certification)

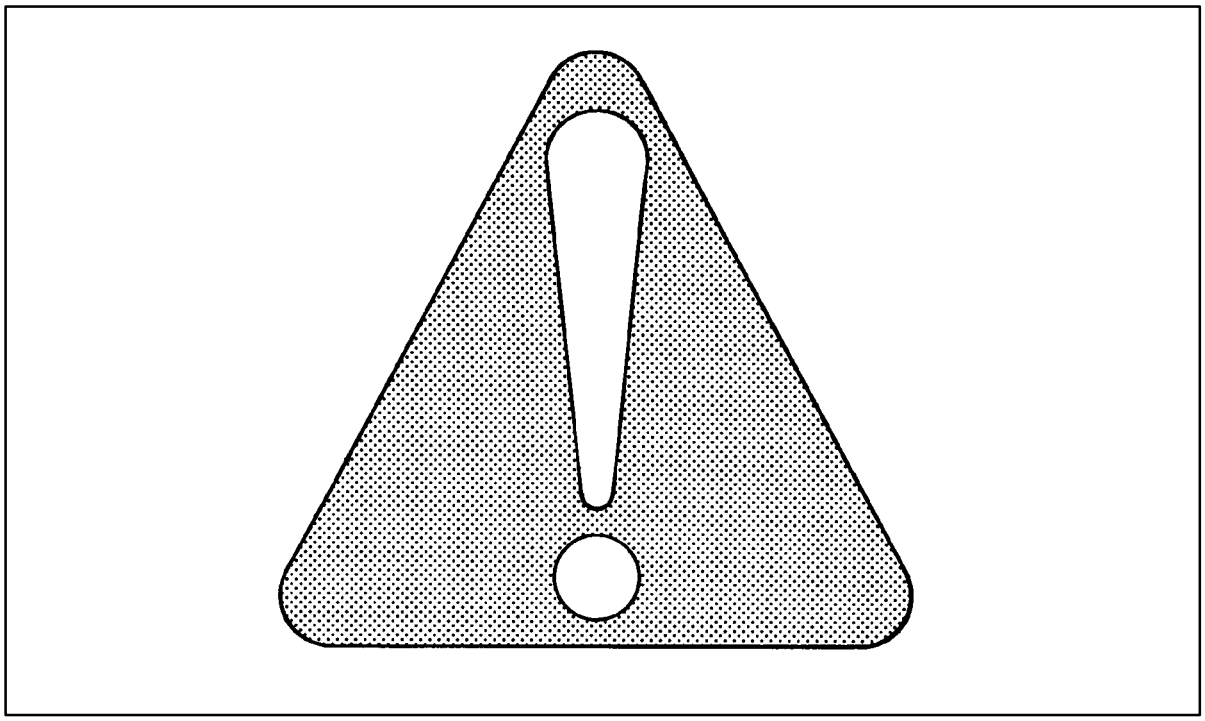
Damage or modification of any kind to the ROPS structure or its mountings may reduce its ability to protect the operator.

The integrity of the ROPS will be affected if it is involved in an overturn incident, is subjected to structural damage, or is altered by welding, bending, drilling or cutting.

A damaged or altered ROPS should be replaced - not reused

Modification, alteration or damage to the ROPS will automatically void the Certification explained on the label affixed to this structure, except where such modification has been specifically approved by the manufacturer by bulletin or other recognized manner.

2. Safety Rules



2.1 General

Should there be any information or instructions in this manual that are not in compliance with local laws and regulations in force in the country or region where this equipment is operated, the local laws and regulations must take precedence.

This equipment should not be operated or maintained by personnel other than those who have been thoroughly trained on this or similar type of equipment.

As the owner/maintainer, ensure that you become familiar with all occupational safety regulations pertaining to forest machinery as well as all safety instructions pertaining to this equipment. Observe the instructions provided in this manual and on all hazard and information decals on the equipment.

2.2 Safety Symbol

This safety alert symbol is used throughout the manual to call your attention to areas in which carelessness or failure to follow specific procedures may result in personal injury and/or component damage or malfunction.

2.3 Understanding Signal Words

 **DANGER**

 **WARNING**

 **CAUTION**

A signal word - DANGER, WARNING, or CAUTION- is used with the safety-alert symbol. DANGER identifies the most serious hazards.

DANGER or WARNING safety signs are located near specific hazards. General precautions are listed on CAUTION safety signs. CAUTION also calls attention to safety messages in this manual.

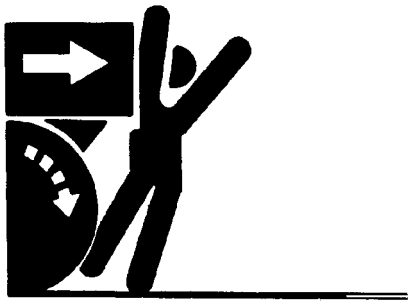
2.4 General Safety Precautions

Avoid Injury From Backover Accidents.

Before Moving Machine, Be Sure All Persons Are Clear of Area.

Always Be Alert for Bystanders Moving into the Work Area. Use Horn or Other Signal to Warn Bystanders Before Moving Machine.

When Using a Signal Person, Keep Person in View at All Times. Be Sure Signal Person Is Clear Before Backing Up.



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To avoid backover accidents:

Always look around before you back up. Be sure that everyone is in the clear.

Keep bystanders away from pivot area of an articulated machine.

Keep reverse warning alarm in working condition, if equipped.

Use a signal person when backing up if view is obstructed. Always keep signal person in view.

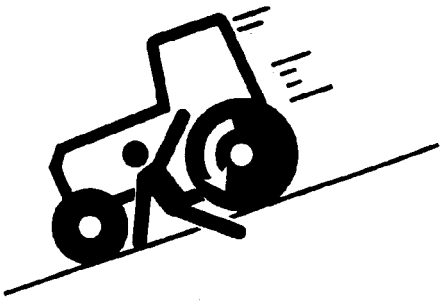
Learn the meaning of all flags, signs, and markings used on the job, and who has the responsibility for signaling.

Keep windows, mirrors, and lights clean and in good condition.

Dust, heavy rain, fog, etc., can reduce visibility. As visibility decreases, reduce speed and use proper lighting.

Read and understand the operating instructions in this operator's manual.

2.4 General Safety Precautions



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Avoid Injury From Rollaway Accidents

To Prevent Rollaway, Always Make Sure Machine Is Properly Secured Before Leaving Operator's Seat.

Death or Serious Injury May Result If You Attempt to Mount or Stop a Moving Machine.

To avoid rollaways:

Select level ground when possible to park machine.

Engage park brake.

Lower all equipment to ground.

Stop the engine.

Block all tracks if you must park on a grade. Position machine to prevent rolling.

Park a reasonable distance from other machines.

Read and understand the operating instructions in this operator's manual.

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Inspect Machine

Inspect your machine carefully each day by walking around it before you start it. (Perform Maintenance - 8 hour interval).