

SECTION 00 - GENERAL INFORMATION

BOOK 1 - 86705316

CONTENTS

Section	Description	Page
00 000	Precautionary Statements	3
	Safety Precautions	3
	General Considerations	5
	Tractor Identification	12
	Engine Identification	15
	Service Techniques	17
	Minimum Hardware Tightening Torques	18
	Standard Torque Data	20
	Recommended Lubricants and Coolants	22
	Recommended Sealants	24

SECTION 10 - ENGINE

BOOK 1 - 86705316

Chapter 1 - Engine Systems

CONTENTS

Section	Description	Page
	AIR INDUCTION SYSTEM	
	Specifications	3
	Bolt Torque Specifications	4
	Special Tools	6
	Air Induction System - Description and Operation	6
	Introduction	6
	Component Operation	8
	Troubleshooting	10
	Turbocharger Boost Testing	11
	Air Induction System - Removal and Repair of Components	13
	Turbocharger Intake Tube	13
	Turbocharger Outlet Tube	14
	Air Filter Housing, Precleaner, and Air Induction Scoop	15
	Turbocharger	20
	Repair Time Schedule	25
	EXHAUST SYSTEM	
	Specifications	26
	Bolt Torque Specifications	27
	Exhaust System - Description of Operation	27
	Exhaust System Component Removal and Repair	28
	Exhaust Muffler and Stack	28
	Repair Time Schedule	32
	ENGINE	
	Engine Specifications	33
	Torque Values	40
	Special Tools	42
	Description and Operation	44
	Introduction	44
	Cylinder Head Assembly	44
	Camshaft Assembly	46
	Connecting Rods	47
	Pistons	48
	Manifolds	48
	Cylinder Block Assembly	48
	Timing Gears	49

SECTION 10 - ENGINE (CONTINUED)

BOOK 1 - 86705316

Chapter 1 - Engine Systems

Section	Description	Page
	Lubrication System	50
	Troubleshooting	51
	Dynamometer Engine Testing	55
	Dynamometer Engine Break In	59
	Compression Test	60
	Engine Overhaul	62
	Introduction	62
	Engine Removal	62
	Engine Disassembly	76
	Engine Component Disassembly, Inspection, and Assembly	88
	Front Timing Gears, Oil Pan, Camshaft, and Valve Tappets (Lifters)	97
	Pistons and Connecting Rods	99
	Crankshaft and Main Bearings	103
	Oil Pump and Sump Tube	109
	Oil Cooler/Filter Support Assembly	111
	Flywheel	112
	Engine Assembly	113
	Engine Installation	132
	Repair Time Schedule – Engine Overhaul	143
	COOLING SYSTEM	
	Bolt Torque Specifications	154
	Special Tools	150
	Cooling System Description and Operation	151
	Introduction	151
	Individual Component Operation	152
	Cooling System Troubleshooting	157
	Cooling System Testing	158
	Cooling System Tests	158
	Cooling System - Removal and Repair of Components	163
	Radiator	163
	Thermostat	168
	Cooling Fan (North American Models)	171
	Cooling Fan and Viscous Clutch (International Models)	172
	Fan Belt Tensioner	173
	Water Pump	175
	Repair Time Schedule - Cooling System	186

SECTION 10 - ENGINE

BOOK 1 - 86705316

Chapter 2 - Fuel System

CONTENTS

Section	Description	Page
	FUEL SYSTEM	
	Specifications	2
	TV140 Fuel Injection Pump Test Plan	3
	Special Tools	4
	Fuel System – Description and Operation	5
	Introduction	5
	Fuel Injection Pump	12
	Engine Shutoff	18
	Troubleshooting	19
	Injector Nozzle Testing	20
	Fuel System Service	24
	Bleeding The Fuel Injection System	24
	Fuel Injectors	25
	Bosch VE Fuel Injection Pump	30
	Electric Lift Pump	39
	Fuel Sedimenter	40
	Fuel Filter	43
	Fuel Tanks	46
	Crossover Tube	53
	Cold Start System – North American Models	54
	Cold Start System – International Models	58
	Throttle Cable	59
	Repair Time Schedule - Fuel System	65

SECTION 21 - TRANSMISSIONS

BOOK 2 - 86705317

Chapter 1 - Splitter Box, Hydrostatic Drive, and Drivelines

CONTENTS

Section	Description	Page
	Introduction	2
	Orientation	2
	Splitter Box	2
	Hydrostatic Drive Description	2
	Specifications	3
	Torque Specifications	5
	Special Tools	7
	Safety	10
	Power Flow	12
	Description of Operation	13
	Splitter Box Description	13
	Splitter Box Gear Sets	14
	Hydrostatic and Hydraulic System Components	16
	Hydrostatic Drive Description	18
	Moving a Disabled Tractor	31
	Troubleshooting and Testing	37
	Pressure Testing	44
	Range Select Control Switch and Valve	51
	Overhaul	62
	Removal and Installation	62
	Introduction	62
	Splitter Box	62
	Auxiliary Pump	62
	Disassembly, Inspection, and Repair	65
	Auxiliary Drive Housing	69
	Auxiliary 3/4" Couplers	79
	Articulation Joint Drive Shafts	86
	Upper Drive Shaft	86
	Engine Power Input Shaft	91
	Lower Drive Shaft	94
	Splitter Box Power Input (Top) Shaft	98
	Splitter Box Power Output (Bottom) Shaft	101
	Engine-end Axle Drive Shaft	103
	Splitter Box	107
	Tapered Bearing End Play Check and Adjustment	116
	Hydrostatic Motor	125
	Hydrostatic Pump	133
	FNR Lever Cables	139
	Repair Time Schedule	151

SECTION 25 - ENGINE-END AXLE

BOOK 2 - 86705317

Chapter 1 - Engine-End Axle

CONTENTS

Section	Description	Page
	Specification	3
	Axle Shaft Preload	3
	Axle Shaft Spacer Selection Table	3
	Differential Bearing Preload	3
	Differential Bearing Shim Table	3
	Drive Pinion Preload	4
	Drive Pinion Spacer Table	4
	Tightening Torques	5
	Special Tools	6
	Introduction	7
	Drive Path	8
	Drive Pinion	9
	Differential	11
	Planetary Assembly	12
	Axle Shaft and Trumpet Housing	13
	Differential Lock	14
	Troubleshooting	22
	Disassembly and Repair	27
	Trumpet/Axle Disassembly	28
	Planetary Disassembly	31
	Planetary Inspection	32
	Planetary Reassembly	32
	Planetary Ring Gear Removal	33
	Planetary Ring Gear Installation	34
	Trumpet/Axle Inspection	34
	Trumpet/Axle Reassembly	36
	Pinion Gear Removal	42
	Pinion Gear Disassembly	44
	Pinion Gear Inspection	46
	Center Housing Inspection	46
	Pinion Gear Reassembly	47
	Pinion Bearing Preload	48
	Drive Pinion Spacer Table	49
	Pinion Gear Installation	50
	Differential Disassembly	51

SECTION 25 - ENGINE-END AXLE (CONTINUED)

BOOK 2 - 86705317

Chapter 1 - Engine-End Axle

Section	Description	Page
	Differential Inspection	54
	Differential Reassembly	55
	Differential Bearing Preload	59
	Differential Bearing Shim Table	60
	Differential Lock Internal Operating Components Overhaul	61
	Differential Lock Valve and Tube Removal	62
	Differential Lock Valve and Tube Inspection	62
	Differential Lock Valve and Tube Installation	63
	Oscillating Components	63
	Rear Trunnion Inspection	66
	Rear Trunnion Installation	67
	Front Trunnion Removal	69
	Front Trunnion Inspection	71
	Front Trunnion Installation	72
	Diff Lock Switch Removal	74
	Diff Lock Switch Inspection	75
	Diff Lock Switch Installation	76
	Apply Solenoid and Valve Removal	76
	Apply Solenoid and Valve Inspection	76
	Apply Solenoid and Valve Installation	76
	Breather Removal	77
	Breather Inspection	77
	Breather Installation	77
	Repair Time Schedule	78

SECTION 27 - CAB-END AXLE

BOOK 2 - 86705317

Chapter 1 - Cab-End Axle

CONTENTS

Section	Description	Page
27 000	Specifications	2
	Torque Specifications	2
	Special Tools	4
	Introduction	5
	Overview	5
	Description of Operation	6
	Troubleshooting	19
	Overhaul	24
	Repair Time Schedule	105

SECTION 31 - POWER TAKE-OFF

BOOK 3 - 86705318

Chapter 1 - Cab-End PTO

CONTENTS

Section	Description	Page
	Specifications	2
	Special Tools	3
	Description of Operation	4
	Cab-End PTO Clutch Control Valve Operation	5
	Cab-End Output Drive	8
	Electrical Operation	10
	Cab-End PTO Electrical Circuit	10
	Troubleshooting	14
	Disassembly and Repair	16
	Preliminary Procedures	16
	Cab-End PTO Clutch	17
	Cab-End PTO Shafts and Gears	35
	PTO Switch	51
	Repair Time Schedule	53

SECTION 31 - POWER TAKE-OFF

BOOK 3 - 86705318

Chapter 2 - Engine-End PTO

CONTENTS

Section	Description	Page
	Specifications	2
	Special Tools	2
	Description of Operation	3
	Electrical Operation	4
	Engine-End PTO Electrical Circuit	4
	Engine-End Output Drive	8
	Clutch and Brake Pressure Apply	10
	Lubrication Flow	13
	Breather Lines	15
	Troubleshooting	17
	Testing PTO Gearbox Drain Pump Flow	19
	Disassembly and Repair	22
	Preliminary Procedures	22
	Engine-End PTO Gearbox Overhaul	22
	PTO Transfer Shaft and Coupler	76
	Clutch Pressure Apply Hose	82
	Lube Motor	86
	Lube Circuit Hose	89
	Breather and Hose	99
	Apply Solenoid and Valve	107
	Brake	111
	PTO Switch	115
	Repair Time Schedule	117

SECTION 33 - BRAKES

BOOK 3 - 86705318

Chapter 1 - Brakes

CONTENTS

Section	Description	Page
	Specifications	2
	Special Tools	3
	Introduction	4
	Overview	4
	Description of Operation	5
	Troubleshooting and Testing	15
	Adjustments	19
	Removal and Installation of Components	25
	Brake Disc Components	25
	Foot Pedal Linkage	37
	Master Cylinder	42
	Reservoir	50
	Hose - Reservoir To Master Cylinder	52
	Tubes - Pressure Supply	54
	Park Brake Lever	56
	Park Brake Cables and Links	59
	Brake Pedal Switch	65
	Park Brake Switch	66
	Repair Time Schedule	68

SECTION 35 - HYDRAULIC SYSTEMS

BOOK 4 - 86705319

Chapter 1 - Hydraulics and Steering

CONTENTS

Section	Description	Page
	Specifications	2
	Special Tools	8
	Description and Operation	10
	Auxiliary Hydraulics	10
	Component Identification	11
	Hydraulic Circuits	15
	Description of Operation	36
	Steering Control Valve	65
	Troubleshooting and Testing	83
	Disassembly and Repair	129
	Implement Pump	130
	Implement Valve	146
	Priority (Inlet) Valve Section	150
	Tan (Float) Valve Section	152
	Blue (Detent) Valve Section	162
	Green (Standard) Valve Section	172
	Implement Valve	177
	1/2" Couplers	180
	Implement Valve Control Linkage	185
	Control Lever Cable	186
	Control Pedal Assembly	195
	Control Pedal Cable	196
	Steering Control Valve	201
	In Cab Flow Control Cables	230
	Hydraulic System Hoses	233
	3/4" Couplers	299
	Hydraulic Oil Heater	306
	Engine End Remote Valves	309
	Hydraulic Oil Cooler	322
	Hydraulic Oil Cooler By-pass	327
	Repair Time Schedule	336

SECTION 35- HYDRAULIC SYSTEMS

BOOK 5 - 86705320

Chapter 2 - Cab-End Hitch

CONTENTS

Section	Description	Page
	Specifications	2
	Special Tools	3
	Description of Operation	4
	Three-Point Hitch Electrical Control Components	7
	Three-Point Hitch Electrical Control System	10
	Neutral – Manual Mode	14
	Raise – Manual Mode	17
	Lower – Manual Mode	20
	Raise – Manual Mode – Fender Switches	23
	Lower – Manual Mode – Fender Switches	26
	Neutral – Automatic Mode	29
	Raise – Automatic Mode	32
	Lower – Automatic Mode	35
	Raise – Automatic Mode – Fender Switches	38
	Lower – Automatic Mode – Fender Switches	39
	Float – Automatic Mode	40
	Float Position Control – Automatic Mode	43
	Hydraulic Lift Assembly Control Valve	46
	Troubleshooting	50
	Three-Point Hitch Controller Fault Codes	51
	Electrical	52
	Hydraulics	75
	Adjustments	79
	Calibration Mode	79
	Upper Limit Operating Set Point Adjustment	83
	Removal and Repair of Components	86
	Raise/Lower Switches	86
	Automatic/Manual Switch	88
	Status Light	90
	Depth Control Potentiometer	92
	Lowering Rate Potentiometer	94
	External Three-Point Hitch Controls	96
	Feedback Potentiometer	98
	Hydraulic Lift Cover	99
	Lift Cylinder	112
	Cross Shaft	118
	Control Valve	122
	Upper Lift Link	128
	Lower Lift Link Stabilizer Assembly	131
	Lower Lift Link	134
	Lift Assist Ram	137
	Flexible Link Ends	142
	Link Assembly	143
	Repair Time Schedule	148

SECTION 35 - HYDRAULIC SYSTEMS

BOOK 5 - 86705320

Chapter 3 - Engine-End Hitch

CONTENTS

Section	Description	Page
	Description of Operation	2
	Three-Point Hitch Electrical Control Components	5
	Three-Point Hitch Electrical Control System	8
	Manual Mode	11
	Automatic Mode	20
	Hydraulic Lift Assembly Control Valve	35
	Special Tools	39
	Specifications	40
	Troubleshooting	41
	Electrical	43
	Hydraulics	66
	Adjustments	70
	Calibration Mode	70
	Upper Limit Operating Set Point Adjustment	74
	Removal and Repair of Components	77
	Status Light	81
	Depth Control Potentiometer	83
	Lowering Rate Potentiometer	85
	Feedback Potentiometer	87
	Cross Shaft	91
	Control Valve	99
	Center Lift Link	109
	Stabilizer Assembly	111
	Lower Lift Link	114
	Hydraulic Cylinders	115
	Flexible Link Ends	121
	Lift Link Assembly	122
	Repair Time Schedule	125

SECTION 37 - WHEELS, TIRES, AND BALLASTING

BOOK 6 - 86705321

Chapter 1 - Wheels and Tires

CONTENTS

Section	Description	Page
	Introduction	2
	Proper Jacking	3
	Tire Inflation	4
	Tire and Wheel Options	5

SECTION 37 - WHEELS, TIRES, AND BALLASTING

BOOK 6 - 86705321

Chapter 2 - Ballasting

CONTENTS

Section	Description	Page
	Ballasting and Tires	2
	Wheel Slippage	3
	Ballast Limitations	3
	Ballasting Recommendations	3
	Cast Iron Weights	4
	Liquid Ballast Calculations	5

SECTION 39 - FRAMES

BOOK 6 - 86705321

Chapter 1 - Frames

CONTENTS

Section	Description	Page
	Specifications	2
	Torques	3
	Special Tools	5
	Description of Operation	5
	Introduction	5
	Troubleshooting	6
	Overhaul	7
	Engine Hood	7
	Hood Support Assembly	10
	Side Panels, Right-hand and Left-hand	14
	Front Grille	16
	Cab-end Fenders	18
	Left-hand and Right-hand	18
	Engine-end Fenders	18
	Left-hand and Right-hand	18
	Heatshield	22
	Engine End Drawbar	28
	Cab End Drawbar	33
	Front Axle Support	34
	Frame Side Rails	38
	Steering Pins	42
	Pivot Pins	43
	Front Frame	51
	Rear Frame	60
	Repair Time Schedule	62

SECTION 50 - CLIMATE CONTROL

BOOK 6 - 86705321

Chapter 1 - Climate Control

CONTENTS

Section	Description	Page
	Specifications	2
	Special Tools	2
	Description and Operation	3
	R134a Refrigerant Information	3
	The Basics of Refrigeration	6
	Individual Component Operation	9
	Compressor and Clutch	9
	Condenser	13
	Receiver-drier	15
	Thermal Expansion Valve	18
	Evaporator/Heater Assembly	22
	Blower Motor Assembly	23
	Thermostatic Switch	25
	High and Low Pressure Switches	28
	Heater Control Valve	29
	Switched Power: Fuses and HVAC Relay	31
	Air Filtration	32
	Troubleshooting and Testing	33
	General Safety and Service Precautions	33
	Recovering R134a Refrigerant With OEM1598	36
	System Evacuation and Recharging With OEM1598	40
	Oil Level Check Or Adjustment	45
	Leak Detection	49
	Performance Testing	58
	Pressure/Temperature Relationship Chart	58
	Conditions For Performance Testing	58
	Gauge Readings and Interpretations	59
	Performance Test and Diagnosis Summary	71
	General Troubleshooting Summary	74
	Heating System	74
	Air Conditioning System	74
	Air-conditioning Component Removal and Installation	83
	Thermal Expansion Valve	91
	Evaporator/Heater Assembly	93
	Condenser	97
	High and Low Pressure Switches	99
	Compressor	100
	Compressor Clutch	102
	Receiver-drier	109
	Air Conditioning Hoses	110
	Heater Control Valve	116
	Recirculation Door Control	120
	Blower Speed Control	123
	Heater Hoses	124
	Repair Time Schedule	128

SECTION 55 - ELECTRICAL SYSTEM

BOOK 7 - 86705322

Chapter 1 - Electrical System

CONTENT

Section	Description	Page
	Specifications	2
	Fuse and Relay Panel	6
	Torque Specifications	12
	Special Tools	12
	Introduction	13
	Electrical System	14
	Using Schematics	36
	Circuit Troubleshooting	40
	Temporary Wiring Harness Repair	43
	Description of Operation	46
	Batteries	46
	Starting and Charging Systems	47
	Starter	253
	Batteries Troubleshooting	254
	Starter Troubleshooting	279
	EICS Error Codes	286
	EICS Connector Chart	292
	Alarms	303
	Three-Point Hitch Controller	316

SECTION 55 - ELECTRICAL SYSTEM

BOOK 8 - 86705323

Chapter 2 - Electrical Wiring Diagrams

CONTENT

Section	Description	Page
	Electrical Wiring Diagrams	3
	Schematic Index	5
	Disassembly and Repair	134
	Alternator	134
	Fan Belt Tensioner	136
	Starter	137
	Electronic Instrument Control System (EICS)	144
	Connectors	145
	Repairing Connectors	164
	Lamp Replacement	195
	Harness Removal and Installation	201
	Italian Brake Harness	276
	Repair Time Schedule	278

SECTION 88 - ACCESSORIES

BOOK 9 - 86705324

Chapter 1 - Accessories

CONTENTS

Section	Description	Page
	Introduction	2
	Electrical Kits and Accessories	3
	Frame and Platform	5
	Hydraulic and PTO Kits	9
	Loader Kits and Accessories	12

SECTION 90 - CAB

BOOK 9 - 86705324

Chapter 1 - Cab

CONTENTS

Section	Description	Page
90 000	Specifications	2
	Torque Specifications	2
	Special Tools	5
	Description of Operation	6
	Troubleshooting	14
	Removal and Installation	16
	Cab Mounts	50
	Cab	51
	Cab Roof	53
	Taillight Panel	55
	Cab Fenders	58
	Wiper Motor Cover	58
	Windshield Wipers	60
	Doors	68
	Cab Door Lock and Latch	69
	Lock Cylinder	73
	Window Latch	75
	Door Glass	77
	Side Windows	78
	Floor Mats	88
	Seat Console	92
	Fender Well Covers	103
	Seat	108
	Console Assembly	133
	Steering Logic Valve Trip Linkage	162
	Rotating Grommet Assembly	165
	Headliner	167
	Louvers	169
	Radio and Speakers	169
	Calibration (Adjustments)	170
	Repair Time Schedule	174

SECTION 00 - GENERAL INFORMATION

CONTENTS

Section	Description	Page
00 000	Precautionary Statements	3
	Safety Precautions	3
	General Considerations	5
	Tractor Identification	12
	Engine Identification	15
	Service Techniques	17
	Minimum Hardware Tightening Torques	18
	Standard Torque Data	20
	Recommended Lubricants and Coolants	22
	Recommended Sealants	24

FOREWORD

Appropriate service methods and correct repair procedures are essential for the safe, reliable operation of all equipment, as well as the personal safety of the individual performing the repair.

This Repair Manual provides troubleshooting, overhaul, and pressure-testing instructions using recommended procedures and equipment. Following these instructions will ensure the safe, efficient, and timely completion of the service or repair.

There are numerous variations in procedures, techniques, tools, and parts for servicing machines, as well as in the skill of the individual doing the work. This manual cannot possibly anticipate all such variations and provide advice or cautions as to each. Accordingly, anyone who departs from the instructions provided in this manual must first establish that their personal safety, the safety of others, and the integrity of the machine will not be compromised by the choice of methods, tools or parts.

The manual is divided into sections which are subdivided into chapters: Each chapter contains information on general operating principles, detailed inspection, overhaul and, where applicable, specific troubleshooting, special tools, and specifications.

Any reference in this manual to right, left, rear, front, top, or bottom is as viewed from the operator's seat, looking toward the engine.

All data and illustrations in this manual are subject to variations in build specification. This information was correct at the time of issue, but New Holland policy is one of continuous improvement, and, the right to change specifications, equipment, or design at any time, without notice, is reserved.

ABOUT IMPROVEMENTS

New Holland is continually striving to improve its products. We must, therefore, reserve the right to make improvements or changes when it becomes practical and possible to do so, without incurring any obligation to make changes or additions to the equipment sold previously.

ALL SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

PART AND ACCESSORIES

Genuine NEW HOLLAND parts and accessories have been specifically designed for NEW HOLLAND MACHINES.

We would like to point out that "NON GENUINE parts and accessories have not been examined and released by NEW HOLLAND. The installation and or use of such products could have a negative effect upon the design characteristics of your machine and thereby affect its safety. NEW HOLLAND is not liable for any damage caused by the use of "NON GENUINE" NEW HOLLAND parts and accessories.

PRECAUTIONARY STATEMENTS

PERSONAL SAFETY

Throughout this manual and on machine decals, you will find precautionary statements (“DANGER”, “WARNING”, and “CAUTION”) followed by specific instructions. These precautions are intended for the personal safety of you and those working with you. Please take the time to read them.

 **DANGER** 

This word “DANGER” indicates an immediate hazardous situation that, if not avoided, will result in death or serious injury. The color associated with Danger is RED.

 **WARNING** 

This word “WARNING” indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury. The color associated with Warning is ORANGE.

 **CAUTION** 

This word “CAUTION” indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices. The color associated with Caution is YELLOW.

FAILURE TO FOLLOW THE “DANGER”, “WARNING”, AND “CAUTION” INSTRUCTIONS MAY RESULT IN SERIOUS BODILY INJURY OR DEATH.

MACHINE SAFETY

The additional precautionary statement (“IMPORTANT”) is followed by specific instructions. This statement is intended for machine safety.

IMPORTANT: *The word “IMPORTANT” is used to inform the reader of something he needs to know to prevent minor machine damage if a certain procedure is not followed.*

INFORMATION

NOTE: *Instructions used to identify and present supplementary information.*

SAFETY PRECAUTIONS

Practically all service work involves the need to drive the tractor. The operator’s manual, supplied with each tractor, contains detailed safety precautions relating to driving, operating, and servicing that tractor. These precautions are as applicable to the service technician as they are to the operator and should be read, understood and practiced by all personnel.

Prior to undertaking any maintenance, repair, overhaul, dismantling or reassembly operations, whether within a workshop facility or in the field, consideration should be given to factors that may have an effect upon safety, not only upon the mechanic carrying out the work, but also upon bystanders.

PERSONAL CONSIDERATIONS

The wrong clothes or carelessness in dress can cause accidents. Check to see that you are suitable clothed.

Some jobs require special protective equipment.

Skin Protection

Used motor oil may cause skin cancer. Follow work practices that minimize the amount of skin exposed and length of time used oil stays on your skin.

Eye Protection

The smallest eye injury may cause loss of vision. Injury can be avoided by wearing eye protection when engaged in chiselling, grinding, discing, welding, and painting.

Breathing Protection

Fumes, dust, and paint spray are unpleasant and harmful. These can be avoided by wearing respiratory protection.

Hearing Protection

Loud noise may damage your hearing, and the greater the exposure the worse the damage. If the noise is excessive, wear ear protection.

Lifting Protection

Avoid injury by correctly handling components. Make sure you are capable of lifting the object. If in doubt get help.

Hand Protection

It is advisable to use a protective cream before work to prevent irritation and skin contamination. After work clean your hands with soap and water. Solvents such as mineral spirit and kerosene may harm the skin.

Foot Protection

Substantial or protective foot wear with reinforced toe caps will protect your feet from falling objects. Additionally, oil-resistant soles will help to avoid slipping.

Special Clothing

For certain work it may be necessary to wear flame or acid-resistant clothing.

EQUIPMENT CONSIDERATIONS

Machine Guards

Before using any machine, check to ensure that the machine guards are in position and serviceable. These guards not only prevent parts of the body or clothing coming in contact with the moving parts of the machine, but also ward off objects that might fly off the machine and cause injury.

Lifting Devices

Always ensure that lifting equipment, such as chains, slings, lifting brackets, hooks and eyes, are thoroughly checked before use. If in doubt, select stronger equipment than is necessary.

Never stand under a suspended load or raised implement.

Compressed Air

The pressure from a compressed-air line often exceeds 100 PSI (690 kPa). It is perfectly safe if used correctly. Any misuse may cause injury.

Never use compressed air to blow dust, filing, and dirt away from your work area unless the correct type of nozzle is fitted.

Compressed air is not a cleaning agent; it will only move dust from one place to another. Look around before using an air hose as bystanders may get grit into their eyes, ears, or skin.

Hand Tools

Many cuts, abrasions and injuries are caused by defective tools. Never use the wrong tool for the job, as this generally leads either to some injury or to a poor job.

When removing or replacing hardened pins, use a copper or brass drift rather than a hammer.

For dismantling, overhaul, and assembly of major and sub-components, always use the Special Service Tools recommended. These will reduce the work effort, labor time, and the repair cost.

Electricity

Electricity has become so familiar in day to day usage, that its potentially dangerous properties are often overlooked. Misuse of electrical equipment can endanger life.

Before using any electrical equipment particularly portable appliances - make a visual check to make sure that the wiring is not worn or frayed and that the plugs and sockets are intact. Make sure you know where the nearest isolating switch for your equipment is located.

GENERAL CONSIDERATIONS

Solvents

Use cleaning fluids and solvents that are known to be safe. Certain types of fluids can cause damage to components, such as seals, and can cause skin irritation. Solvents should be checked that they are suitable not only for the cleaning of components and individual parts, but also that they do not affect the personal safety of the user.

Housekeeping

Many injuries result from tripping over or slipping on objects or material left lying around by a careless worker. Prevent these accidents from occurring. If you notice a hazard, don't ignore it remove it.

A clean, hazard-free place of work improves the surroundings and daily environment for everybody.

Fire

Fire has no respect for persons or property. The destruction that a fire can cause is not always fully realized. Everyone must be constantly on guard.

Extinguish matches, cigars, and cigarettes before throwing them away.

Work cleanly, disposing of waste material into proper containers.

Locate the fire extinguishers and find out how to operate them.

Do not panic - warn those near and raise the alarm.

Do not allow or use an open flame near the tractor fuel tank, battery, or component parts.

First Aid

In the type of work that mechanics are engaged in, dirt, grease, and fine dusts settle upon the skin and clothing. If a cut, abrasion or burn is disregarded it may become infected within a short time. Seek medical aid immediately.

Cleanliness

Cleanliness of the tractor hydraulic system is essential for optimum performance. When carrying out service and repairs, plug all hose ends and component connections to prevent dirt entry.

Clean the exterior of all components before carrying out any form of repair. Dirt and abrasive dust can reduce the efficiency and working life of a component and lead to costly replacement. Use of a high-pressure washer or steam cleaner is recommended.

OPERATIONAL CONSIDERATIONS

Stop the engine, if at all possible, before performing any service.

Place a warning sign on tractors which, due to service or overhaul, would be dangerous to start. Disconnect the battery leads if leaving such a unit unattended.

Do not attempt to start the engine while standing beside the tractor or attempt to bypass the safety start switch.

Avoid prolonged running of the engine in a closed building or in an area with inadequate ventilation as exhaust fumes are highly toxic.

Always turn the radiator cap to the first stop to allow pressure in the system to dissipate when the coolant is hot.

Never work beneath a tractor which is on soft ground. Always take the unit to an area which has a hard working surface, preferably concrete.

If it is found necessary to raise the tractor for ease of servicing or repair, make sure that safe and stable supports are installed beneath axle housings, casings, etc., before starting work.

Certain repair or overhaul procedures may necessitate separating the tractor, either at the engine/transmission or transmission/rear axle location. These operations are simplified by the use of the Tractor Splitting Stands. Should this equipment not be available, every consideration must be given to stability, balance and weight of the components, especially if a cab is installed.

Use footsteps or working platforms when servicing those areas of a tractor that are not within easy reach.

Before loosening any hoses or tubes connecting implements to remote control valves, etc., switch off the engine, remove all pressure in the lines by operating levers several times. This will remove the danger of personal injury by oil pressure.

Prior to pressure testing, make sure all hoses and connectors of the tractor and the test equipment are in good condition and tightly sealed. Pressure readings must be taken with the gauges specified. The correct procedure should be rigidly observed to prevent damage to the system or the equipment, and to eliminate the possibility of personal injury.



WARNING



Escaping hydraulic/diesel fluid under pressure can penetrate the skin causing serious injury.



Do not use your hand to check for leaks. Use a piece of cardboard or paper to search for leaks. Stop the engine and relieve pressure before connecting or disconnecting lines.

Tighten all connections before starting the engine or pressurizing lines.

If any fluid is injected into the skin, obtain medical attention immediately or gangrene may result.

Use “position control” when equipment or implements are required to be attached to the hydraulic linkage either for testing purposes or for transportation.

Always lower equipment to the ground when leaving the tractor.

If high lift attachments are installed on a tractor, beware of overhead power, electric or telephone cables when travelling. Drop the attachment near to ground level to increase stability and minimize risks.

Do not park or attempt to service a tractor on an incline. If unavoidable, take extra care and block all wheels.

Observe recommended precautions as indicated in this Service Manual when dismantling the air conditioning system as escaping refrigerant can cause frostbite.

Prior to removing wheels and tires from a tractor, check to determine whether additional ballast (liquid or weights) has been added. Seek assistance and use suitable equipment to support the weight of the wheel assembly.

When inflating tires, beware of over inflation - constantly check the pressure. Over inflation can cause tires to burst and result in personal injury.

SERVICING A TRACTOR WITH A LOADER INSTALLED

If the tractor is equipped with a loader, lower the loader and rest the bucket on the ground.

If servicing the tractor and the loader must be raised, empty the bucket and curl the bucket to fully retract the bucket cylinders. Raise the loader and install the loader supports over the cylinder rods and lower the loader on the supports.

HEALTH AND SAFETY PRECAUTIONS

Many of the procedures associated with vehicle maintenance and repair involve physical hazards or other risks to health. This section lists, alphabetically, some of these hazardous operations, materials and equipment associated with them. The precautions necessary to avoid these hazards are identified.

The list is not inclusive; all operations, procedures, and handling of materials should be carried out with health and safety in mind.

ACIDS AND ALKALIS (SEE BATTERY ACIDS, I.E., CAUSTIC SODA, SULPHURIC ACID)

Used in batteries and cleaning materials.

Irritating and corrosive to the skin, eyes, nose and throat. Causes burns.

Avoid splashes to the skin, eyes, and clothing. Wear suitable protective gloves and goggles. Can destroy ordinary protective clothing. Do not breathe mists.

Ensure access to water and soap is readily available for splashing accidents.

ADHESIVES AND SEALERS (SEE FIRE)



Highly flammable, combustible.

Generally should be stored in “NO SMOKING” areas; cleanliness and tidiness while in use should be observed, i. e., from applications where possible, disposable paper should be dispensed to cover benches. Containers, including secondary containers, should be labelled.

Solvent-Based Adhesives/Sealers (See Solvents)

Follow manufacturer’s Instructions

Water-Based Adhesives/Sealers

Those based on polymer emulsions and rubber lattices may contain small amounts of volatile toxic and harmful chemicals.

Skin and eye contact should be avoided, and adequate ventilation provided during use.

Follow manufacturer’s Instructions

Resin-Based Adhesive/Sealers (i.e., Epoxide and Formaldehyde Resin Based)

Mixing should only be carried out in well-ventilated areas as harmful or toxic volatile chemicals may be released.

Skin contact with uncured resins and hardeners can result in irritation, dermatitis, and absorption of toxic, or harmful chemicals through the skin. Splashes can damage the eyes.

Provide adequate ventilation; avoid skin and eye contact. Follow manufacturer’s instructions.

Anaerobic Cyanoacrylate and other Acrylic Adhesives

Many are irritating, sensitizing, or harmful to the skin. Some are eye irritants.

Skin and eye contact should be avoided and the manufacturer's instructions followed.

Cyanoacrylate adhesives (super-glues) must not contact the skin or eyes. If skin or eye tissue is bonded, cover with a clean moist pad and get medical attention. Do not attempt to pull tissue apart. Use in well-ventilated areas as vapours can cause irritation of the nose and eyes.

For two-part systems: See Resin-Based Adhesive/ Sealers

Isocyanate (Polyurethane) Adhesive/Sealers (See Resin-Based Adhesives)

Individuals suffering from asthma or respiratory allergies should not work with, or near, these materials as sensitivity reactions can occur.

Any spraying should preferably be carried out in exhaust ventilated booths removing vapours and spray droplets from the breathing zone. Individuals working with spray applications should wear supplied air respirators.

ANTIFREEZE (SEE FIRE, SOLVENTS, I.E., ISOPROPNOL, ETHYLENE GLYCOL, METHANOL)

—————  **CAUTION**  —————

Highly flammable, combustible.

Used in vehicle coolant systems, brake air pressure systems, and windshield washing solutions.

Vapours given off from coolant antifreeze (Glycol) arise only when heated.

Antifreeze may be absorbed through the skin in toxic or harmful quantities. Swallowed antifreeze is fatal if not treated; medical attention must be sought immediately.

BATTERY ACIDS (SEE ACIDS AND ALKALIS)

Gases released during charging are explosive. Never use an open flame or allow sparks near charging or recently charged batteries.

(North America Only)

CALIFORNIA
Proposition 65 Warning
Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.
Wash hands after handling.

BRAKE AND CLUTCH LININGS AND PADS (SEE LEGAL ASPECTS)

These items may contain asbestos which, if inhaled, may cause lung damage and, in some cases, cancer.

The normal handling and fitting of these items should not cause any hazard, but any drilling, grinding, or filling of friction materials may produce asbestos dust and should only be carried out under strictly controlled conditions.

The dust in brake drums, etc., contains very little asbestos, but care should be taken to avoid inhalation of this dust during servicing of brakes and clutches. The use of drum cleaning units, vacuum cleaning, or damp wiping is preferred to the use of air jets for "blowing-out."

The dust should be collected in a sealed plastic bag and disposed appropriately, according to local laws and regulations.

BRAZING (SEE WELDING)

CHEMICAL MATERIALS - GENERAL (SEE LEGAL ASPECTS)

Chemical materials such as solvents, sealers, adhesives, paints, resin foams, battery acids, antifreeze, oils, and grease should always be used with caution, stored and handled with care. They may be toxic, harmful, corrosive, irritating, or highly flammable, causing hazardous fumes and dusts.

The effects of excessive exposure to chemicals may be immediate or delayed, briefly experienced or permanent, cumulative, superficial, life threatening, or may reduce life expectancy.

CLUTCH LININGS AND PADS (SEE BRAKE AND CLUTCH LININGS AND PADS)

CORROSION PROTECTION MATERIALS (SEE SOLVENTS, FIRE)

—————  **CAUTION**  —————
Highly flammable, combustible.

These materials are varied; the manufacturer's instructions should be followed. They may contain solvents, resins, and petroleum products. Skin and eye contact should be avoided. They should only be sprayed in conditions of adequate ventilation, and not in confined spaces.

CUTTING (SEE WELDING)

DEWAXING (SEE SOLVENTS AND FUELS - KEROSENE)

DO'S

Do remove chemical materials from the skin and clothing as soon as practicable. Change heavily soiled clothing and have it cleaned.

Do carefully read and observe hazard and precaution warnings given on material containers (labels) and in any accompanying leaflets, poster or other instructions. Material health and safety data sheets can be obtained from manufacturers.

Do organize work practices by wearing protective clothing and safety devices to avoid contact with chemical materials; breathing vapours, aerosols, dusts, and fumes; inadequate container labelling; or fire and explosion hazards.

Do wash before job breaks, before eating, smoking, drinking, or using toilet facilities when handling chemical materials.

Do keep work areas clean, uncluttered, and free of spills.

Do store according to national and local regulations.

Do keep chemical materials out of reach of children.

DON'TS

Do not mix chemical materials except under the manufacturer's instructions; some chemicals can form other toxic or harmful chemicals, releasing toxic or harmful fumes, or be explosive when mixed together.

Do not spray chemical materials, particularly those based on solvents, in confined spaces, i.e., when people are inside a vehicle.

Do not apply heat or flame to chemical materials, except under the manufacturer's instructions. Some are highly flammable, and some may release toxic or harmful fumes.

Do not leave containers open. Escaping fumes can build up to toxic, harmful, or explosive concentrations. Some fumes are heavier than air and will accumulate in confined areas, pits, etc.

Do not transfer chemical materials to unlabeled containers.

Do not clean hands or clothing with chemical materials. Chemicals, particularly solvents and fuels, will dry the skin, and may cause irritation with dermatitis. Some can be absorbed through the skin in toxic or harmful quantities.

Do not use emptied containers for other materials, except when they have been cleaned under supervised conditions.

Do not sniff or smell chemical materials. Brief exposure to high concentrations of fumes can be harmful or toxic.

DUSTS

Powder or dusts may be an irritant, harmful or toxic. Avoid breathing dusts from powdery chemical materials, or those arising from dry abrasion operations. Wear respiratory protection if ventilation is inadequate.

ELECTRIC SHOCK

Electric shocks can result from the use of faulty electrical equipment or from the misuse of equipment even in good condition.

Ensure electrical equipment is maintained in good condition and frequently tested.

Ensure flexes, cables, plugs and sockets are not frayed, kinked, cut, cracked, or otherwise damaged.

Ensure electric equipment is protected by the correct rated fuse.

Never use electrical equipment or any other equipment which is in any way faulty. The results could be fatal.

Use reduced voltage equipment for inspection and working lights, where possible.

Ensure the cables of mobile electrical equipment cannot get trapped and damaged, such as in a vehicle hoist.

In Cases of Electrocutation:

- Switch off electricity before approaching victim.
- If this is not possible, push or drag the victim from the source of electricity using dry non-conductive material.
- Commence resuscitation if trained to do so.
- **SUMMON MEDICAL ASSISTANCE IMMEDIATELY.**

EXHAUST FUMES

These contain asphyxiating, harmful and toxic chemicals, and particles such as carbon oxides, nitrogen oxides, aldehydes, lead, and aromatic hydrocarbons. Engines should only run under conditions of adequate extraction, or general ventilation, not in confined spaces.

(North America Only)

<p style="text-align: center;">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.</p>

Diesel Engine

Soot, discomfort, and irritation usually give adequate warning signs of hazardous fume concentration.

FIBRE INSULATION (SEE DUSTS)

Used in noise and sound insulation.

The fibrous nature of surfaces and cut edge can cause skin irritation. This is usually a physical, not a chemical effect.

Precautions should be taken to avoid excessive skin contact through careful organization of work practices and the use of gloves.

FIRE (SEE WELDING, FOAMS, LEGAL ASPECTS)

Many of the materials found on, or associated with, the repair of vehicles are highly flammable. Some release toxic or harmful fumes if burned.

Observe strict fire safety when storing and handling flammable materials or solvents, particularly near electrical equipment or welding processes.

Before using electrical or welding equipment, be sure there is no fire hazard present.

Have a suitable fire extinguisher available when using welding or heating equipment.

FIRST AID

Apart from meeting any legal requirements, it is desirable for someone in the workshop to be trained in first aid procedures.

Splashes in the eye should be flushed with clean water for at least ten minutes.

Soiled skin should be washed with soap and water.

Inhalation affected individuals should be removed to fresh air immediately.

If chemicals are swallowed, consult a doctor immediately with (label) information on material used.

Do not induce vomiting, unless indicated by manufacturer.

FOAMS- POLYURETHANE (SEE FIRE)

Used in sound and noise insulation. Cured foams are used in seat and trim cushioning.

Follow manufacturer's instructions.

Unreacted components are irritating and may be harmful to the skin and eyes. Wear gloves and goggles.

Individuals with chronic respiratory diseases, asthma, bronchial medical problems, or histories of allergic diseases should not work with or near uncured materials.

The component's vapours and spray mists can cause direct irritation and/or sensitivity reactions and may be toxic or harmful.

Vapours and spray mists must not be breathed. These materials must be applied with adequate ventilation and respiratory protection. Do not remove respirator immediately after spraying, wait until vapour/mists have cleared.

Burning of the uncured components and the cured foams can generate toxic and harmful fumes.

Smoking, open flames, or the use of electrical equipment should not be allowed during foaming operations until vapours/mists have completely cleared. Any heat cutting of cured foams or partially cured foams should be conducted with extraction ventilation (see Legal Aspects).

SECTION 00 - GENERAL INFORMATION

FUELS (SEE FIRE, LEGAL ASPECTS, CHEMICALS - GENERAL, SOLVENTS)

Used as fuels and cleaning agents.

Gasoline (Petrol)

—————  **CAUTION**  —————

Highly flammable, combustible.

Swallowing can result in mouth and throat irritation; absorption from the stomach can result in drowsiness and unconsciousness. Small amounts can be fatal to children. Aspiration of liquid into the lungs, i.e., through vomiting, is a very serious hazard.

Prolonged or repeated contact with gasoline dries the skin and causes irritation and/or dermatitis. Liquid in the eye causes severe pain.

Motor gasoline may contain high quantities of benzene which is toxic upon inhalation; the concentrations of gasoline vapours must be kept very low. High concentrations will cause eye, nose and throat irritation, nausea, headache, depression and symptoms of drunkenness. Very high concentrations will result in rapid loss of consciousness.

Ensure there is adequate ventilation when handling and using gasoline. Great care must be taken to avoid the serious consequences of inhalation in the event of vapour build-up arising from spillages in confined spaces.

Special precautions apply to cleaning and maintenance operations on gasoline storage tanks.

Gasoline should not be used as a cleaning agent. It must not be siphoned by mouth.

Kerosene (Paraffin)

Used also as heating fuel, solvent, and cleaning agent.

—————  **CAUTION**  —————

Flammable.

Irritation of the mouth and throat may result from swallowing. The main hazard from swallowing arises if liquid aspiration into the lungs occurs. Liquid contact dries the skin and can cause irritation and/or dermatitis. Splashes in the eye may be slightly irritating.

In normal circumstances, the low volatility does not give rise to harmful vapours. Exposure to mists and vapours from kerosene at elevated temperatures should be avoided (mists may arise in dewaxing). Avoid skin and eye contact; be sure there is adequate

Diesel Fuel (Gas-Oil) (See Fuels-Kerosene)

—————  **CAUTION**  —————

Combustible.

Gross or prolonged skin contact with high boiling gas oils may cause serious skin disorders, including skin cancer.

GAS CYLINDERS (SEE FIRE)

Gases such as oxygen, acetylene, carbon dioxide, argon, and propane are normally stored in cylinders at pressures of up to 2000 PSI (137.8 bar). Great care should be taken in handling these cylinders to avoid mechanical damage to them or the valve gear attached. The contents of each cylinder should be clearly identified by appropriate markings.

Cylinders should be stored in well-ventilated enclosures and protected from ice, snow, or direct sunlight. Fuel gases, i.e., acetylene and propane, should not be stored in close proximity to oxygen cylinders.

Care should be exercised to prevent leaks from gas cylinders and lines and to avoid sources of ignition.

Only trained personnel should undertake work involving gas cylinders.

GASES (SEE GAS CYLINDER)

GAS SHIELDING WELDING (SEE WELDING)

GAS WELDING (SEE WELDING)

GENERAL WORKSHOP TOOLS AND EQUIPMENT

It is essential that all tools and equipment are maintained in good condition and the correct safety equipment used where required.

Never use tools or equipment for any purpose other than for which they were designed.

Never overload equipment such as hoists, jacks, axle and chassis Stands, or lifting slings. Damage caused by overloading is not always immediately apparent and may result in a fatal failure the next time the equipment is used.

Do not use damaged, defective tools or equipment, particularly high-speed equipment such as grinding wheels. A damaged grinding wheel can disintegrate without warning causing serious injury.

Wear suitable eye protection when using grinding, chiselling, or sandblasting equipment.

Wear a suitable breathing mask when using sandblasting equipment, working with asbestos based materials, or using spraying equipment.