HTC- 8670/8675 Series - Master Keysheet
(F2 Prefix On Crane Serial Number)

AREA 00 GENERAL INFORMATION

SM00- 000- 000.00 How To Use This Manual, General Service Instructions And Safety Procedures

AREA 01 RUBBER TIRE LOWER

SM01- 001- 005.00 Boom Rest, R & I
SM01- 001- 007.00 Boom Rest Extension, R & I (Generation 1)
SM01- 001- 008.00 Boom Rest Extension, R & I (Generation 2)
SM01- 002- 012.00 Front Axle, Recondition (Eaton EFA Series)
SM01- 002- 015.00 Front Wheel & Brake Drum, R & I
SM01- 003- 010.00 Brakes, Recondition (Eaton EB & ES Type)
SM01- 003- 014.00 Adjusting The Brakes (Eaton EB,ES & Rockwell/Meritor “P,Q,T” Series)
SM01- 003- 019.00 Automatic Slack Adjusters (Eaton)
SM01- 004- 004.00 Front Axle & Suspension, R & I (Generation 1)
SM01- 004- 009.00 Front Axle & Suspension, R & I (Generation 2)
SM01- 005- 003.00 Steering Gear, Recondition (Master)
SM01- 005- 004.00 Steering Gear, Recondition (Slave)
SM01- 005- 005.00 Miter Box, R & I
SM01- 005- 010.00 Steering Drive Shafts, Recondition
SM01- 005- 013.00 Steering Column, R & I
SM01- 005- 015.00 Steering Column, Recondition
SM01- 006- 015.00 Steering Gears, R & I (Generation 1)
SM01- 006- 017.00 Front Wheel Alignment & Steering Linkage Adjustment (Generation 1)
Relief Plunger Adjustment
Axle Stop Adjustment
SM01- 006- 022.00 Steering Gears, R & I (Generation 2)
SM01- 006- 023.00 Front Wheel Alignment & Steering Linkage Adjustment (Generation 2)
Relief Plunger Adjustment
Axle Stop Adjustment
SM01- 010- 018.00 Power Steering Pump, R & I (Generation 1)
SM01- 010- 019.00 Power Steering Pump, Recondition (Generation 1)
SM01- 010- 028.00 Power Steering Pump, Recondition (Generation 2 - w/Hydraulic Radiator Fan)
SM01- 010- 029.00 Power Steering Pump Priority Valve, Recondition (Gen 2 - w/Hyd Radiator Fan)
SM01- 010- 034.00 Power Steering Pump, R & I (Generation 2 - w/Hydraulic Radiator Fan)
SM01- 016- 001.00 Heater Core, R & I
SM01- 016- 002.00 Heater Core & A/C Coil, R & I
SM01- 017- 008.00 Clutch, R & I And Recondition
SM01- 018- 041.00 Transmission, Recondition (Eaton)
SM01- 018- 042.00 Transmission, R & I
SM01- 019- 011.00 Transmission Slave Control, R & I
SM01- 019- 014.00 Transmission Air Shift Control, Recondition
SM01- 019- 020.00 Transmission Shift Cable Adjustment
SM01- 019- 024.00 Transmission Master Control, R & I
SM01- 020- 002.00 Suspended Brake Pedal, Recondition
SM01- 020- 005.00 Suspended Brake Pedal, R & I (Generation 1)
SM01- 020- 008.00 Suspended Brake Pedal, R & I (Generation 2)
SM01- 022- 005.00 U- Joint Installation - Full Round Yokes
SM01- 024- 005.00 Rear- Rear Axle, Recondition (Rockwell/Meritor)
SM01- 024- 009.00 Front- Rear Axle, Recondition (Rockwell/Meritor)
SM01- 024- 010.00 Rear Axles, Recondition (Eaton RS520/DS520 Model Series)
SM01- 024- 015.00 Rear Axles, Recondition (Dana R52/D52- 190 Model Series)
SM01- 025- 008.00 Brakes, Recondition (Rockwell/Meritor “P,Q & T” Series)
SM01- 025- 009.00 Automatic Slack Adjusters, Recondition (Rockwell/Meritor Rear Brakes)

SM01- 025- 016.00 Antilock Brake System (ABS EC- 60), Troubleshooting
SM01- 027- 000.00 Pneumatic System Air Line Identification Code
SM01- 027- 026.00 Caging Dual Air Brake Chambers
SM01- 027- 027.00 Air Brake Chamber, R & I (w/o Auto Slack Adjusters)
SM01- 027- 028.00 Front Air Brake Chamber, Recondition (Cam Type Brakes)
SM01- 027- 029.00 Rear Dual Air Brake Chamber, Recondition
SM01- 027- 056.00 Air Dryer, R & I (Horton)
SM01- 027- 057.00 Air Dryer, Recondition (Horton)
SM01- 027- 060.00 Air System Schematic Diagram (Generation 1)
SM01- 027- 061.00 Spring Brake Valve, Recondition
SM01- 027- 062.00 Air Dryer, R & I (Bendix)
SM01- 027- 063.00 Air Dryer, Recondition (Bendix)
SM01- 027- 064.00 Air System Components, R & I (Generation 1)
SM01- 027- 085.00 Air System Schematic Diagram (Generation 2)
SM01- 027- 086.00 Air System Schematic Diagram (Generation 3)
SM01- 027- 091.00 Front Air Brake Chamber, R & I
SM01- 027- 092.00 Rear Dual Air Brake Chamber, R & I
SM01- 027- 093.00 Air System Components, R & I (Generation 2 - w/Rear Air Suspension)
SM01- 027- 094.00 Air System Schematic Diagram (Generation 4 - w/Rear Air Suspension)
SM01- 027- 123.00 Air System Components, R & I (Generation 3 - w/Rear Air Suspension)
SM01- 027- 137.00 Air System Components, R & I (Generation 5 - w/ABS)
SM01- 028- 002.00 Rear Wheel Hub & Brake Drum, R & I
SM01- 029- 012.00 Rear Axles & Suspension, R & I (Rockwell/Meritor Axles)
SM01- 029- 016.00 Rear Axles & Suspension, R & I (Eaton/Dana Axles - Generation 1)
SM01- 029- 019.00 Rear Axles & Air Suspension, R & I (Eaton/Dana Axles - Generation 2)
SM01- 029- 021.00 Suspension Lift Cylinder, Recondition (Generation 1 - Hydraulic Technologies)
SM01- 029- 022.00 Suspension Lift Cylinder, R & I
SM01- 029- 028.00 Suspension Lift Cylinder, Recondition (Generation 2 - Texas Hydraulics)
SM01- 029- 034.00 Rear Axles & Air Suspension, R & I (Eaton/Dana Axles - Generation 3)
SM01- 039- 002.00 Vacuum Pressure Relief Valve, Recondition
SM01- 039- 003.00 Hydraulic System Cleaning Procedure
SM01- 039- 004.00 Hydraulic Reservoir Filter Assembly, R & I
SM01- 039- 005.00 Hydraulic Reservoir Filter Assembly, Recondition
SM01- 043- 001.00 Solenoid Valves, General Recondition
SM01- 043- 003.00 Outrigger Solenoid Valve Stack, Recondition (Function)
SM01- 043- 004.00 Four Way Solenoid Valve, Recondition (Outrigger Directional)
SM01- 043- 010.00 Outrigger Function Valve Stack, R & I
SM01- 043- 018.00 Outrigger Directional Valve, R & I
SM01- 043- 035.00 Four Way Directional Solenoid Valve, Recondition (Fifth Outrigger)
SM01- 044- 007.00 Lock Valve, Recondition (Main Outriggers)
SM01- 044- 008.00 Jack Cylinder Lock Valve, R & I (Main Outrigger)
SM01- 044- 009.00 Jack Cylinder Lock Valve, Recondition (Fifth Outrigger)
SM01- 044- 017.00 Fifth Outrigger Lock Valve, R & I
SM01- 044- 023.00 Outrigger Lock Valve Cartridge, R & I (Jack Cylinder w/Integral Lock Valve)
SM01- 045- 014.00 Outrigger Beam Cylinders, Recondition (Generation 1)
SM01- 045- 025.00 Single Stage Outrigger Beam Cylinder, R & I
SM01- 045- 029.00 Outrigger Beam, Jack & Beam Cylinder, R & I
SM01- 045- 048.00 Bottom Outrigger Beam Cylinder, Recondition (Generation 2)
SM01- 045- 049.00 Top Outrigger Beam Cylinder, Recondition (Generation 2)
SM01- 046- 016.00 Jack Cylinder, Recondition
SM01- 046- 024.00 Fifth Outrigger Jack Cylinder, R & I (Generation 1)
SM01- 046- 025.00 Fifth Outrigger Jack Cylinder, Recondition (Generation 1)
SM01- 046- 028.00 Jack Cylinder, R & I
SM01- 046- 034.00 Jack Cylinder, Recondition (Generation 2 - Fifth Outrigger)
SM01- 046- 041.00 Fifth Outrigger Jack Cylinder, R & I (Generation 2)
SM01- 047- 011.00 Relief Valve, Recondition (Outriggers - Generation 1)
SM01- 047- 034.00 Relief Valve, Recondition (Outriggers - Generation 2)

SM01- 048- 015.00 Rotating Joint, R & I (Generation 1)
SM01- 048- 017.00 10- Way Rotating Joint, Recondition (Generation 1)
SM01- 048- 039.00 Rotating Joint, R & I (Generation 2)
SM01- 048- 040.00 8- Way Rotating Joint, Recondition (Generation 2)
SM01- 048- 045.00 Rotating Joint, R & I (Generation 3 - w/Water Swivel))
SM01- 048- 046.00 Rotating Joint, Recondition (Generation 3 - w/Water Swivel)
SM01- 063- 086.00 Starter, R & I (50 & 60 Series Engines)
SM01- 063- 087.00 Alternator, R & I (Generation 1 - 50 & 60 Series Engines)
SM01- 063- 088.00 Radiator, R & I (Generation 1 - w/Engine Driven Fan)
SM01- 063- 091.00 Radiator Fan Clutch, R & I
SM01- 063- 092.00 Radiator Fan Clutch, Recondition
SM01- 063- 093.00 Torque Limit Switch Check, Adjustment, & Troubleshooting (Generation 1)
SM01- 063- 105.00 Radiator, R & I (Generation 2 - w/Hydraulic Radiator Fan Motor)
SM01- 063- 106.00 Alternator, R & I (Generation 2 - w/o Air Conditioning)
SM01- 063- 107.00 Alternator, R & I (Generation 2 - w/Air Conditioning)
SM01- 063- 108.00 Torque Limit Switch Check, Adjustment, & Troubleshooting (Generation 2)
SM01- 066- 026.00 Battery, R & I
SM01- 069- 009.00 Tires & Rims, R & I
SM01- 071- 003.00 Engine Housing, R & I (Generation 1)
SM01- 071- 004.00 Repair Of Components Made Of Fibrous Composite Materials
SM01- 071- 008.00 Engine Housing, R & I (Generation 2 - w/Hydraulic Radiator Fan Motor)
SM01- 073- 001.00 Electronic Gauge, Troubleshooting (Generation 1 - AMETEK/Dixson)
SM01- 073- 002.00 Electronic Gauge, Troubleshooting (Generation 2 - AMETEK/Dixson)
SM01- 076- 020.00 Collector Ring, R & I (Generation 1)
SM01- 076- 021.00 Collector Ring, Recondition (Generation 1)
SM01- 076- 024.00 Collector Ring, Recondition (Generation 2)
SM01- 076- 029.00 Collector Ring, Recondition (Generation 3)
SM01- 076- 038.00 Collector Ring, Recondition (Generation 4)
SM01- 076- 045.00 Collector Ring, R & I (Generation 2)
SM01- 076- 046.00 Collector Ring, Recondition (Generation 5)
SM01- 079- 003.00 Lower Hydraulic Components, R & I (Generation 1 - w/o Rear Air Suspension)
SM01- 079- 015.00 Lower Hydraulic Components, R & I (Generation 2)
SM01- 079- 020.00 Lower Hydraulic Components, R & I (Generation 3)
SM01- 079- 024.00 Lower Hydraulic Components, R & I (Generation 4)
SM01- 079- 026.00 Lower Hydraulic Components, R & I (Generation 5 - w/Hydraulic Radiator Fan)
SM01- 080- 019.00 Pump Drive, Recondition (Generation 1 - Funk Mfg)
SM01- 080- 023.00 Pilot Control & Boom Hoist Pumps, R & I
SM01- 080- 029.00 Four Section Pump, R & I - (Generation 1 - Main Hydraulic w/Funk Pump Drive)
SM01- 080- 030.00 Pump Drive, R & I (Generation 1 - w/Funk Mfg Pump Drive)
SM01- 080- 031.00 Pump Drive Shaft Assembly, R & I
SM01- 080- 032.00 Pump Drive Shaft Assembly, Recondition
SM01- 080- 045.00 Pump Drive, R & I (Generation 2 - w/Durst Pump Drive)
SM01- 080- 046.00 Pump Drive, Recondition (Generation 2 - Durst)
SM01- 081- 013.00 Pressure Compensating Pump, Recon. (Gen 1- Pilot Control & Ctwt Removal)
SM01- 081- 014.00 Hydraulic Pump, Recondition (Multi Section Commercial- Intertech)
SM01- 081- 026.00 Hydraulic Pump, Recondition (One Section, Boom Hoist)
SM01- 081- 027.00 Main Hydraulic Pump, R & I (Generation 2 - w/Durst Pump Drive)
SM01- 081- 028.00 Tandem Hydraulic Pump, Recondition
SM01- 081- 029.00 Radiator Fan Pump, R & I
SM01- 081- 036.00 Radiator Fan Motor, Recondition
SM01- 081- 045.00 Radiator Fan Motor, R & I
SM01- 083- 009.00 Pressure Compensating Pump, Recon. (Gen 2- Pilot Control & Ctwt Removal)
SM01- 083- 010.00 Pressure Compensating Pump, R & I (Gen 2 - Pilot Control & Ctwt Removal)
SM01- 085- 002.00 Engine Preheater, R & I
SM01- 085- 004.00 Engine Preheater, Recondition

AREA 03 UPPER REVOLVING FRAME

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SM03- 001- 056.00 Upper Revolving Frame & Turntable Bearing, R & I
SM03- 010- 024.00 Counterweight Removal Cylinder, R & I
SM03- 010- 025.00 Counterweight Removal Cylinder, Recondition

AREA 04 VERTICAL SHAFTS

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SM04- 005- 017.00 Brake Caliper, Recondition (Mechanical Application)
SM04- 005- 022.00 Swing Brake Assembly, Recondition (Internal Multi Disc Type)
SM04- 005- 023.00 Swing Brake Caliper, Recondition (Hydraulic Application)
SM04- 005- 024.00 Swing Brake, R & I (Caliper Type)

SM04- 005- 025.00 Swing Brake, R & I (Internal Multi Disc Type Brake)
Swing Brake Bleeding Procedure
SM04- 010- 010.00 Swing Speed Reducer, Recondition (w/Caliper Type Swing Brake)
SM04- 010- 023.00 Swing Reduction Unit, R & I
SM04- 010- 024.00 Swing Speed Reducer, Recondition (w/Internal Multi Disc Type Swing Brake)

AREA 05 HORIZONTAL SHAFTS

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SM05- 006- 013.00 Winch Assembly, R & I (Generation 1 - w/Braden CH150A, 175A, 185A, CH230)
SM05- 006- 014.00 Winch, Recondition (Generation 1 - w/Braden CH150A, 175A, 185A, CH230)
SM05- 006- 021.00 Winch, Troubleshooting (Generation 1 - w/Braden CH150A, 175A, 185A, CH230)
SM05- 006- 026.00 Winch, Troubleshooting (Generation 2 - w/Braden CH210)
SM05- 006- 027.00 Winch, R & I (Generation 2 - w/Braden CH210 & Rexroth Motor)
SM05- 006- 028.00 Winch, Recondition (Generation 2 - w/Braden CH210)
SM05- 006- 034.00 Winch, R & I (Generation 3 - w/Braden CH210 & Linde Motor)
SM05- 010- 006.00 Drum Rotation Indicator, R & I And Troubleshooting
SM05- 018- 005.00 Winch Roller, Recondition (Steel Roller)
SM05- 018- 006.00 Winch Roller, R & I And Recondition (Nylon Roller)

AREA 06 UPPER ENGINE

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SM06- 008- 009.00 Throttle Treadle Assembly, R & I (Electronic)
SM06- 008- 010.00 Throttle Treadle Assembly, Recondition (Electronic)
SM06- 025- 004.00 Diesel Cab Heater, R & I (Generation 1)
SM06- 025- 005.00 Diesel Cab Heater, Recondition & Troubleshooting (Generation 2)
SM06- 025- 006.00 11,000 B.T.U. Diesel Cab Heater, Recondition
SM06- 025- 007.00 Hydraulic Cab Heater, R & I (Floor Mount)
SM06- 025- 008.00 Hydraulic Cab Heater, Recondition (Floor Mount)
SM06- 025- 009.00 Hydraulic Heater - Troubleshooting
SM06- 025- 010.00 Diesel Cab Heater, Recondition & Troubleshooting (Generation 1)
SM06- 025- 012.00 Hydraulic Cab Heater, R & I (Elevated Mount)
SM06- 025- 014.00 Hydraulic Cab Heater, Recondition (Elevated Mount)
SM06- 025- 017.00 Diesel Cab Heater, R & I (Generation 2)
SM06- 025- 018.00 Diesel Cab Heater, Recondition & Troubleshooting (Generation 3)
SM06- 025- 019.00 Operator's Cab Water Heater, R & I
SM06- 025- 022.00 A/C Coil & Heater Core, Illustrated
SM06- 025- 023.00 Upper Cab Water Heater & A/C Evaporator Coil, R & I
SM06- 025- 024.00 Upper Cab Heater Water Swivel, R & I And Recondition (Rotating Joint)
SM06- 047- 000.00 Electrical System Wire Identification Code
SM06- 047- 056.00 Electrical System Schematic Diagram (Generation 1)
SM06- 047- 090.00 Electrical System Schematic Diagram (Generation 2)
SM06- 047- 091.00 Electrical System Schematic Diagram (Generation 3)
SM06- 047- 092.00 Electrical System Schematic Diagram (Generation 4)
SM06- 047- 093.00 Electrical System Schematic Diagram (Generation 5)
SM06- 047- 094.00 Electrical System Schematic Diagram (Generation 6)

SM06- 047- 095.00 Electrical System Schematic Diagram (Generation 7)
SM06- 047- 103.00 Electrical System Schematic Diagram (Generation 8)
SM06- 047- 104.00 Electrical System Schematic Diagram (Generation 9)
SM06- 047- 111.00 Electrical System Schematic Diagram (Generation 10)
SM06- 047- 120.00 Electrical System Schematic Diagram (Generation 11)
SM06- 047- 126.00 Electrical System Schematic Diagram (Generation 12)
SM06- 047- 127.00 Electrical System Schematic Diagram (Generation 13)

AREA 07 HYDRAULIC POWER SUPPLY

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SM07- 000- 098.00 Hydraulic System Schematic Diagram (Generation 1)
SM07- 000- 120.00 Hydraulic System Schematic Diagram (Generation 2)
SM07- 000- 121.00 Hydraulic System Schematic Diagram (Generation 3)
SM07- 000- 140.00 Hydraulic System Schematic Diagram (Generation 4)
SM07- 000- 142.00 Hydraulic System Schematic Diagram (Generation 5 - w/Hydraulic Radiator Fan)
SM07- 001- 025.00 Pilot Control Accumulator, R & I
SM07- 003- 006.00 Solenoid Valves, General Recondition
SM07- 004- 005.00 Upper Hydraulic Components, R & I (Generation 2)
SM07- 004- 008.00 Upper Hydraulic Components, R & I (Generation 3)
SM07- 004- 020.00 Upper Hydraulic Components, R & I (Generation 4)
SM07- 005- 051.00 Hydraulic Heater Gear Pump, R & I
SM07- 005- 052.00 Hydraulic Gear Pump Assembly, Recondition (Hydraulic Heater)
SM07- 005- 064.00 Hydraulic Heater Gear Pump, R & I (Upper w/Air Conditioning)
SM07- 006- 034.00 Swing Motor, Recondition
SM07- 006- 047.00 Two Speed Hydraulic Motor, Recondition - Winch (Rexroth 60 Series)
SM07- 006- 052.00 Winch Motor, R & I (Generation 1 - w/Rexroth Motor)
SM07- 006- 055.00 Two Speed Hydraulic Motor, Recondition - Winch (VOAC)
SM07- 006- 056.00 Hydraulic Motor, Recondition - Winch (Rexroth 63 Series)
SM07- 006- 057.00 Swing Motor, R & I (W/Caliper Type Swing Brake)
SM07- 006- 058.00 Hydraulic Heater Motor, Recondition
SM07- 006- 059.00 Hydraulic Motor, Recondition (Oil Cooler)
SM07- 006- 062.00 Swing Motor, R & I (w/Internal Multi Disc Type Swing Brake)
SM07- 006- 063.00 Hydraulic Oil Cooler Motor, R & I
SM07- 006- 064.00 Hydraulic Heater Motor, R & I
SM07- 006- 085.00 Hydraulic Heater Motor, R & I (Upper w/Air Conditioning)
SM07- 006- 095.00 Hydraulic Motor, Recondition - Winch (Linde)
SM07- 006- 101.00 Winch Motor, R & I (Generation 2 - w/Linde Motor)
SM07- 008- 014.00 Winch Counterbalance Valve, Recondition (Generation 1)
SM07- 008- 037.00 Pressure Reducing Valve, Recondition
SM07- 008- 048.00 Foot Control Valve, R & I (Generation 1 - Boom Telescope)
SM07- 008- 049.00 Winch Counterbalance Valve, R & I (Generation 1)
SM07- 008- 051.00 Boom Hoist Control Valve, Recondition
SM07- 008- 055.00 Controller Valve Assembly, R & I (Dual Axis - Generation 1)
SM07- 008- 056.00 Controller Valve Assembly, Recondition (Comm- Intertech Dual Axis)
SM07- 008- 058.00 Winch Control Valve, Recondition
SM07- 008- 060.00 Counterweight Removal Cylinder Control Valve, Recondition
SM07- 008- 065.00 Pressure Reducing Valve, Recondition (Generation 1)
SM07- 008- 066.00 Control Valve, Recondition (Gresen V40)
SM07- 008- 067.00 Foot Control Valve, Recondition (Generation 1 - Boom Telescope)
SM07- 008- 068.00 Upper Hydraulic Components, R & I (Generation 1)
SM07- 008- 076.00 Single Axis Control Valves, R & I (Generation 1)
SM07- 008- 077.00 Single Axis Control Valves, Recondition (Generation 1 - Comm- Intertech)
SM07- 008- 107.00 Controller Valve, Recondition (Monson Dual Axis)
SM07- 008- 108.00 Single Axis Controller Valve, Recondition (Monson)
SM07- 008- 112.00 Pressure Reducing Valve, Recondition (Generation 2)
SM07- 008- 114.00 Boom Telescope Foot Control Valve, Recondition (Generation 2)
SM07- 008- 116.00 Dual Axis Controller Valve, R & I (Generation 2)

How To Use This Manual, General Service Instructions, And Safety Procedures

The following information is provided to help guide the user of this manual. An explanation of how this manual is organized, as well as general information and safety considerations which should be understood when performing any service or maintenance procedure, is given. This information is general in nature and should supplement any of the specific procedures in this manual along with a constant awareness of safety and common sense.

How To Use This Manual

This Service Manual is a collection of written procedures which are used to service and maintain a specific crane model. The index, which is called a "Keysheet", is used to organize the procedures within this manual and serve as a Table Of Contents as well. Each procedure, in this manual, is written so that it can stand alone and typically covers only one procedure. Procedures are given a numerical designation, or "SM Code" Number, (Example: SM01—005—034.00) which is unique to that procedure and that procedure only. The following is a listing of the general area definitions which are designated by the first digits in the SM Code Number sequence:

General Area Descriptions

SM01 — Rubber Tire Lower
SM02 — Crawler Lower
SM03 — Upper Revolving Frame & Machinery
SM04 — Vertical Shafts
SM05 — Horizontal Shafts
SM06 — Upper Engine
SM07 — Hydraulic Power Supply
SM08 — Angle Boom
SM09 — Tubular Boom
SM10 — Tagline Winder
SM11 — Fairleader
SM12 — Shovel Attachment
SM13 — Trench Hoe, Logger & Scrapper Attachment & Prop Handler
SM14 — Cab & House Assembly
SM15 — Rotascope Attachment (Discontinued)
SM16 — Wire Rope Requirements
SM17 — Hydraulic Boom And Attachments
SM18 — Special Attachments
SM19 — Diesel Pile Hammer (Discontinued)
SM20 — Tower, Climbing Assembly, Traveling Base & Gantry (Discontinued)
SM21 — Log Skidder (Discontinued)
SM22 — Hydraulic Hammer (Discontinued)

The procedures in this manual are collated by SM Code Number sequence. Use the Keysheet in the front of this manual, the general area descriptions shown previously, and the SM Code title shown on the Keysheet to find the specific procedure required to service the crane.

Throughout this manual, reference is made to the left, right, front, and rear, pertaining to directions and locations. These reference directions are relative to the operator, sitting in the operator's seat, with the upper directly over the front of the carrier, unless otherwise stated. (Crawler mounted cranes: upper over the front of the crane with travel motors to the rear.)

Danger, warning, and caution captions as well as special notes are used throughout this manual and on the crane to emphasize important and critical instructions. **If any instruction, caution, warning, or danger labels, decals, or plates become lost, damaged, or unreadable, they must be replaced.** Information contained on such labels, decals, and plates is important and failure to follow the information they contain could result in an accident. Replacement labels, decals, and plates can be ordered through a Link-Belt Distributor. For the purpose of this manual, danger, warning, and caution captions and notes are defined as follows:

DANGER

An operating procedure, practice, etc. which, if not correctly followed, may result in severe personal injury, dismemberment, or loss of life.

WARNING

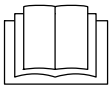
An operating procedure, practice, etc. which, if not correctly followed, may result in personal injury.

CAUTION

An operating procedure, practice, etc. which, if not correctly followed, may result in damage to, or destruction of, equipment or property.

NOTES

Note: An operating procedure step, condition, etc. which is essential in order for the process to be completed properly.



This symbol may appear in manuals or on a label on the crane to alert personnel that additional instructions are included in the crane Operator's Manual.

Figure 1
Keep hands and tools clear of moving parts.

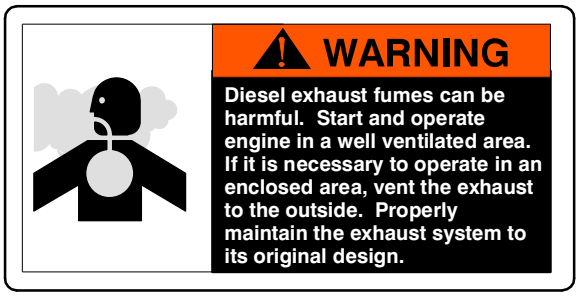


Figure 2
Diesel Exhaust Fumes.

Service Safety And Set Up Guidelines

The following is a list of safety and set up considerations which may apply to any service or maintenance procedure. Review the entire list and understand the type of things you must consider to perform a safe service procedure and then apply these guidelines to each specific service or maintenance procedure.

DANGER

Do not operate the crane unless you are qualified. Unauthorized operation by untrained personnel could result in an accident. Crane operation is to be performed by a certified operator only.

Service Safety

1. Read and understand the service or maintenance procedure to be performed before beginning work. By reading the procedure ahead of time, you can be sure to have the replacement parts and tools on hand that are required to complete the job.
2. Wear protective gear to prevent injury; hard hat, safety glasses, gloves, steel toed shoes, etc.

Figure 3
Pinch Point Label

3. First aid supplies and a fire extinguisher should be on the job site to assist in an unexpected situation. The location of these items should be known to all as well as access to a telephone for emergencies.
4. Work in a clean, dry, firm, level area whenever possible. Choosing the correct work site can make a big difference on how well the job goes.
5. Use caution around flammable materials. Be aware of all the materials in the work area which are a threat. Also make others aware of volatile materials; post signs if necessary.
6. Release all trapped pressure in air and hydraulic circuits before disconnecting any line or component. Shutdown the crane, exhaust all pressure from the crane's air reservoir(s) and work the hydraulic control levers back and forth before servicing the crane.
7. Do not disconnect any hydraulic line from a crane which has its attachment in the air. Trapped pressure may be all that is suspending it. Disconnecting a line could release the trapped pressure, causing the attachment to fall. Lower the attachment to the ground or on to its rest before servicing the crane.
8. Do not work on a crane which is in motion. Fans, belts, gear trains, etc. can catch an unexpecting person and quickly dismember them.
9. Do not climb on the attachment or other hard to reach areas. If the steps and/or ladders which are installed on the crane do not provide adequate access to the area of the crane which needs servicing, use a step ladder or other approved device.
10. Pinch points exists between the upper and lower frames. Death or dismemberment may result from personnel caught in these points. Learn where these pinch points are and stay clear of the rotating upper frame.

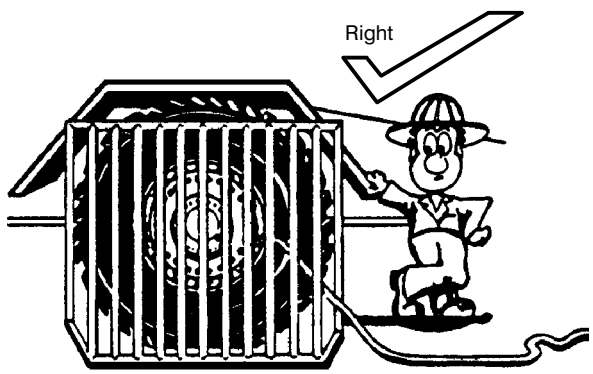


Figure 4
Use a guard when inflating tires.

11. If working in a confined area, be sure to provide adequate ventilation when running the engine(s), using toxic solvents, welding, or any other operation which contaminates the fresh air supply.
12. Post a sign in the operator's cab to alert others that the crane is under service. Starting the crane while it is being serviced could severely injure someone. Crane damage could also occur if systems are operated prematurely. Imagine starting the engine(s) before the oil is replaced.
13. Secure access panels, doors, and machinery hoods when in the open position to ensure they do not fall or slam shut due to wind or accidental disruption.
14. Crane parts may be heavy. Always use an appropriate lifting device to support work. Do not attempt to lift an object without knowing its weight. Get help if necessary.
15. Always use a safety rim cage when inflating or deflating tires. Worn or misassembled parts can "explode" from the assembly causing serious injury. Use a safety rim cage, clip on air chuck, and stand aside when inflating or deflating tires.

Crane Set Up And Disassembly

1. Properly park the crane as described in the Operator's Manual. Park the crane in an area which provides the most comfortable working conditions. However, do not park the crane where it will be an obstruction or an intrusion to traffic, coworkers, or to the public. Keep in mind that a major service procedure, or a repair part which requires a long lead time, could have the crane disabled for an extended period of time.
2. Keep in mind the mess which is sometimes caused by a crane under repair. Oil or other fluid leaks should be contained or prevented. Consider your responsibility of maintaining a safe clean work area and a healthy environment for all.

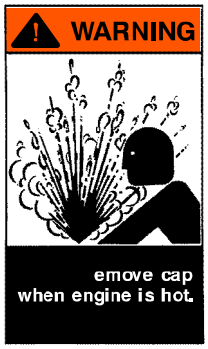


Figure 5
Allow engine to cool before removing the radiator cap.

3. If the crane is equipped with outriggers, it may be safer as well as an advantage to raise and level the crane on outriggers to provide easier access to areas underneath. Do not work under a crane that is improperly supported.
4. Shutdown the engine(s) per the instructions given in the Operator's Manual.
5. Post a sign in the operator's cab to alert others that the crane is being serviced.
6. Engines, transmissions, hydraulic systems, etc. generate extreme heat during operation. Temperatures can reach levels which may cause serious burns. Allow the crane to cool before attempting to service it.

WARNING

Engine coolant is hot. Failure to allow engine(s) to sufficiently cool before draining coolant could result in severe burns or other personal injury. Allow the engine(s) and radiator(s) to cool before draining coolant from the radiator(s).

7. Pressure is generated inside the engine's cooling system due to the heat transfer process from the engine(s) to the radiator(s). Do not attempt to open or drain the radiator(s) until it/they has/have had sufficient time to cool. Disconnecting hoses before the engine(s) and radiator(s) has/have cooled is even more dangerous. Wait until the engine(s) and radiator(s) have cooled and then drain the radiator(s) before disconnecting any hoses. Properly store or dispose of used coolant.

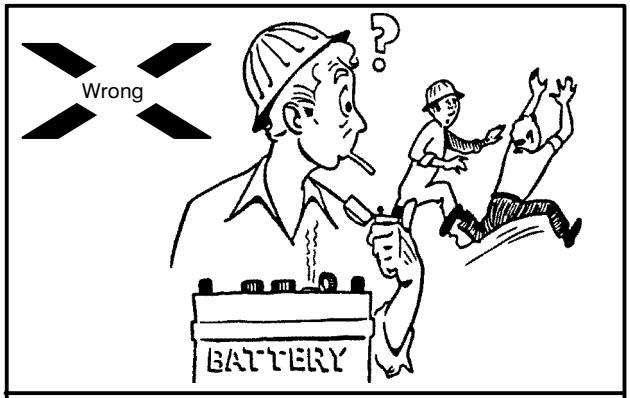


Figure 6
Do not use an open flame near the battery.

WARNING

Solvents and cleaning solutions can be hazardous. Serious personal injury may result from misuse of these products. Read and follow all the manufacturer's recommendations concerning solvents and cleaning solutions.

8. Thoroughly clean the area of the crane which is to be serviced. Dirt or other contamination could enter the hydraulic, air, lubricating system, etc. and cause immediate and/or long term problems. Cleaning the service area not only prevents contamination problems but it also makes working on the crane easier and sometimes problems are more recognizable.
9. Before beginning any removal or disassembly procedure, take a moment to observe critical features of the assembly which may greatly simplify the installation or assembly process. Label electrical, hydraulic, air, or other connections. Index mark pump, motor, and valve sections. Lightly spray paint or count the threads of adjustment screws. Simple steps such as these can minimize the effort needed to put the crane back in service.

WARNING

Hydraulic oil is under pressure and may be hot. A sudden release of hot oil could cause severe burns and/or other serious injury. Shutdown the engine(s) and exhaust all trapped hydraulic pressure from the system before removing any line or component.

10. Hydraulic systems, while operating, are under high pressure. Even after the crane is shutdown these pressures can remain trapped in the hydraulic lines and system components. Some hydraulic systems utilize an air pressurized reservoir which maintains pressure on the system after the crane is shutdown. It is critical that all residual pressure, which is trapped in the system, be neutralized before disconnecting any line or hydraulic component. Use the following techniques to exhaust trapped hydraulic pressure from the system:
    a. Lower the attachment to the boom rest, onto blocking, or onto the ground and shutdown the engine(s).
    b. Open the drain valves on the air system reservoir(s), if equipped, to bleed the air system pressure.
    c. Relieve any residual or precharge pressure by pushing the button on the pressure relief valve, on the hydraulic reservoir, if equipped. Otherwise, loosen the filler cap 1/4 turn.
    d. Turn the ignition switch to the **ON POSITION**, but **DO NOT START THE ENGINE.**
    e. Operate the steering control(s) back and forth repeatedly until steering becomes hard. (On cranes equipped with emergency steering system, it will take several rotations of steering wheel before steering becomes hard.)
    f. Work the crane control levers and outrigger switches, if equipped, back and forth several times.
    g. Turn ignition switch to the **OFF POSITION.**
    h. When pressure is fully relieved, close the drain valves on the air system reservoir(s), if equipped.

WARNING

Air lines may contain high pressure. Opening lines and fittings before relieving air pressure may result in serious injury. Shutdown the engine(s) and drain the air system reservoir(s) before opening any line or fitting.

11. Air system circuits, like hydraulic circuits, contain high pressures also. Although the threat of a hot working fluid does not exist, highly pressurized lines and components can possibly "fly off" if lines are disconnected before the system pressure is relieved. Open the drain valve on the air system reservoir(s) to exhaust system pressure before working on the crane.

WARNING

Use care not to cause sparks at the battery terminals while disconnecting or connecting the battery. Battery gasses are volatile and could be ignited by a spark or flame causing the battery to explode. Keep the area around the battery well ventilated and disconnect the negative side of the battery first, with the ignition switch "OFF", to minimize hazard.

Battery posts, terminals, and related accessories contain lead and lead compounds. Eating or smoking with lead residue on hands may cause lead poisoning. Wash hands after handling lead products.

12. When working on electrical circuits, disconnect the battery to minimize shock, burn, spark, or other hazard. When disconnecting the battery, confirm that the ignition switch is in the "OFF" position. Disconnect the negative side of the battery first to minimize the potential for sparks at the battery. Battery gases which are exposed to such sparks, could cause an explosion. Likewise when connecting the battery, confirm that the ignition switch is in the "OFF" position and install the positive cable(s), first and the negative connection(s) last.
13. It is a good practice when disassembling hydraulic components to lay the parts out in the order that they were disassembled. Keeping the parts in this order during disassembly, cleaning, and inspection will aid in the assembly process.

Welding

1. When making repairs which require welding, disconnect any electronic equipment (such as rated capacity limiters and engine computers) to prevent damage to them. Use the battery disconnect switch(es), if equipped.
2. Be aware of systems adjacent to areas being welded. Residual heat from the welding process could cause damage to other components. Heat may also vaporize materials which may become toxic or volatile.
3. Remove paint from areas to be welded to prevent toxic fumes.
4. The grounding connection should be within 3 feet (*1 m*) of the welded parts.
5. Connect the ground to the lower, if welding on the lower, or to the upper if welding on the upper. Electrical current through the turntable bearing could cause an arc which could damage it.
6. Do not position the ground connection where seals or bearing, as in transmissions or valves, will be between it and the welded parts.
7. Remove any flammable materials from the area.
8. Use the appropriate setting on the welder for the size of the welding operation. Do not use more than 200 Volts continuously.

Cleaning And Inspection

WARNING

Solvents and cleaning solutions can be hazardous. Serious personal injury may result from misuse of these products. Read and follow all the manufacturer's recommendations concerning solvents and cleaning solutions.

1. All components should be thoroughly cleaned with an approved cleaning solvent, air dried and carefully inspected for damage, wear and corrosion.
2. All Loctite® or other sealant residue should be removed from threads of hardware and parts that are going to be reused.
3. All "soft parts", such as seals, gaskets, back up rings, and o-rings, should be replaced.
4. Replacement of bearings and bushings is generally a good preventive maintenance measure. Even though a bearing or bushing seems to be intact and is functioning properly, its life span is limited. Replacing a simple bearing or bushing while the opportunity is at hand could save a complete component failure later.
5. In the event of severe defects, contact factory personnel for directions whether to repair or replace any major component.

Crane Assembly

1. Loosely assemble parts to ensure all parts are in place and fasteners started before beginning torquing procedure. Always use a cross torquing sequence to ensure even and uniform installation.

WARNING

Lubricants, sealants, joint and thread locking compounds, etc. can be hazardous. Serious personal injury may result from misuse of these products. Read and follow all manufacturer's recommendations concerning these products.

Figure 7
Proper disposal is important.

2. Unless otherwise stated, torque all fasteners per the instructions given in SM Code Area 18—000.
3. When installing hydraulic hoses, lines, and fittings, use two wrenches to ensure the hoses and lines are not twisted. One wrench must be on the male fitting, the other wrench on the female fitting.
4. Unless otherwise stated, torque all hydraulic fittings per the instructions given in SM Code Area 07—018.
5. Check all fluid levels before returning the crane to service; hydraulic reservoir oil level, transmission fluid level, engine(s) oil level, etc. Add oil as required. See Operator's Manual and/or engine(s) manufacturer's manual(s) for correct type of fluids and procedures.
6. Always replace guards, grilles, and other types of protective shields. Also, be sure that any systems which were disconnected such as load indicating systems, anti-two block devices, control cables, etc. are functioning properly before returning the crane to service.
7. Start the appropriate engine and let it idle for five minutes. Inspect the connections on the hydraulic, air, transmission, etc. lines for leaks. Repair if needed.
8. Check that all hydraulic, air, and electrical functions are operating normally before returning the crane to service.
9. After crane is assembled, refer to the Operator's Manual for any periodic type of adjustments which may have been affected by the service procedure.
10. Properly dispose of any used oils, solvents, cleaners, etc.

Boom Rest, R & I

This procedure covers the removal and installation of the boom rest. If boom rest extensions are used, see SM Keysheet 01–001 for additional information.

Removal

1. Lower, detach, and secure load, as required.
2. Stabilize the crane for service as follows:
   a. Park the crane out of the way on a firm and level surface.
   b. Engage the park brake and/or properly block the tires.
   c. Engage the swing park brake or travel swing lock, as required.
   d. Level the crane on fully extended outriggers.
   e. Fully retract and lower the boom over the rear of the carrier.
3. Shutdown the engine and disengage the main hydraulic pump.

⚠ WARNING

Solvents and cleaning solutions can be hazardous. Serious personal injury may result from misuse of these products. Read and follow all the manufacturer's recommendations concerning solvents and cleaning solutions.

4. Thoroughly clean area to be disassembled with an approved cleaning solvent. Allow the area to air dry.

Refer to Figure 1.

5. Remove the engine housing (1). See SM Keysheet Area 01–071 for the correct procedure.
6. Support the boom rest assembly with an auxiliary lifting device.

   Note: The boom rest assembly weighs approximately 340 lb (*154kg*).

7. Remove the cotter pins (10) and pins (9) which secure the cross tube assembly (8) to the carrier frame (7).
8. Remove the boom rest assembly from the crane.
9. If further disassembly of the boom rest is required, proceed with Steps a thru c as needed.
   a. Remove the nylon pads (3) from the locator caps (2) by removing the screws (4).
   b. Remove the locator caps (2) by removing the capscrews, washers, and locknuts (5).

      Note: To ensure proper installation, note which holes in the pivot assembly the capscrews are installed through.

   c. Using an auxiliary lifting device, separate the pivot assembly (6) and cross tube assembly (8) by removing the cotter pins (11) and pin (12).

      Note: The pivot assembly weighs approximately 180 lb (*82kg*) and the cross tube assembly weighs approximately 75 lb (*34kg*).

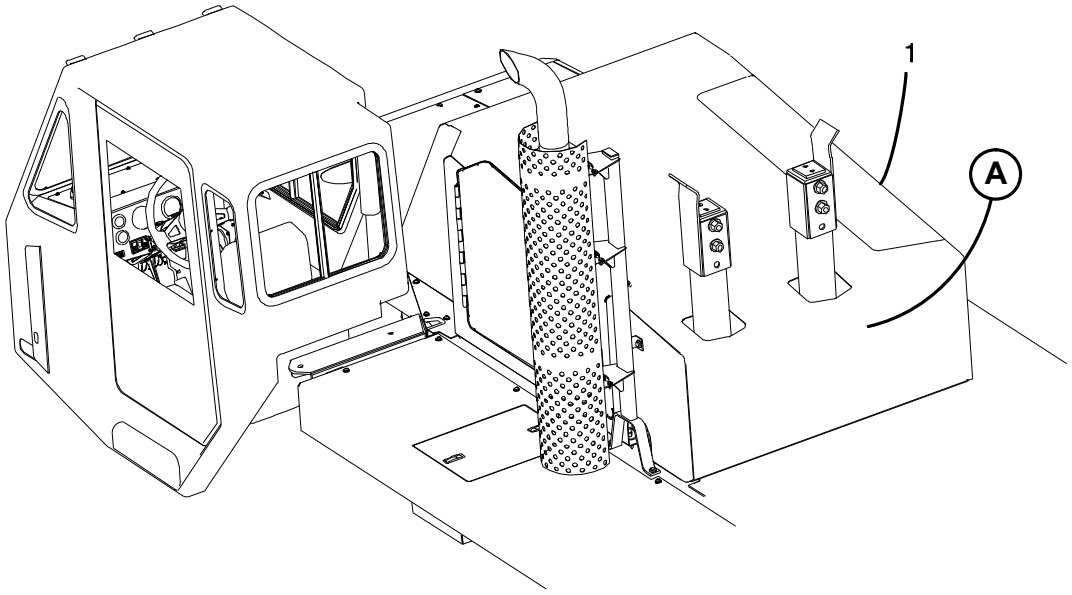
10. If boom rest is to removed for an extended period of time, adequately support the boom.

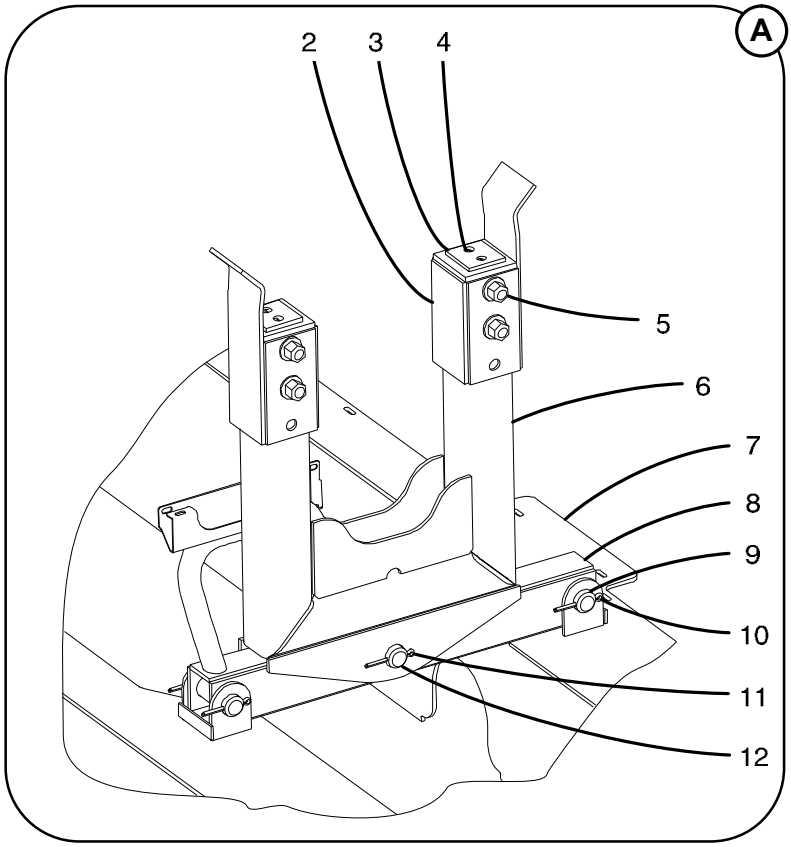
Cleaning And Inspection

⚠ WARNING

Solvents and cleaning solutions can be hazardous. Serious personal injury may result from misuse of these products. Read and follow all the manufacturer's recommendations concerning solvents and cleaning solutions.

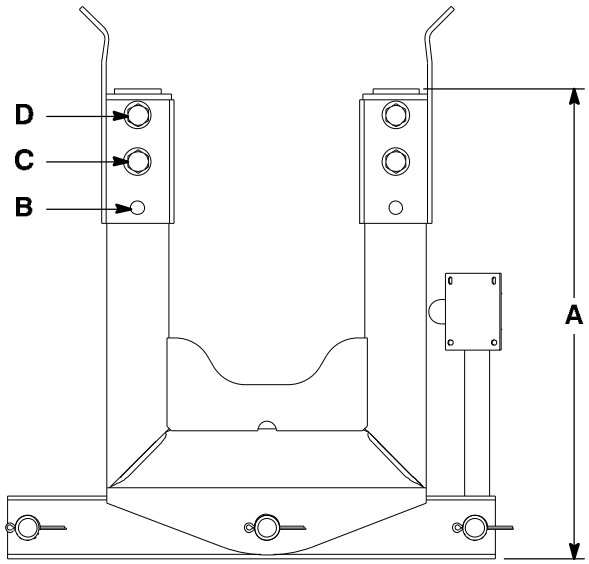
1. All components should be thoroughly cleaned with an approved cleaning solvent, air dried, and carefully inspected.
2. All Loctite®, Permatex®, or other sealant residue should be removed from threads of hardware and the mounting surfaces of parts that are going to be reused. Prior to applying new thread locking compounds or sealants, clean threads and surfaces with Loctite® 7070 Cleaner to ensure best performance of products.
3. Thoroughly inspect all related parts for damage, wear, fatigue or stress fractures, and corrosion. Repair or replace as required.
4. In the event of severe defects, contact factory personnel for directions whether to repair or replace any major component.





1. Engine Housing
2. Locator Caps
3. Nylon Pads
4. Screws
5. Capscrews, Washers, & Locknuts
6. Pivot Assembly
7. Carrier Frame
8. Cross Tube Assembly
9. Pins
10. Cotter Pins
11. Cotter Pins
12. Pin

Figure 1
Boom Rest



Serial Number Model Prefix	Assembly Height (Dimension A)		Mounting Hole Locations
	in	*cm*	
E9	38.50	*97.79*	C & D
F2	42.25	*107.32*	B & C

Table 1
Installation Specifications

Installation

WARNING

Lubricants, sealants, joint and thread locking compounds, etc. can be hazardous. Serious personal injury may result from misuse of these products. Read and follow all manufacturer's recommendations concerning these products.

Refer to Figure 1.

1. If assembly of the boom rest is required, proceed with Steps a thru d as needed.
   a. Using an auxiliary lifting device, position the pivot assembly (6) to the cross tube assembly (8) and install the pin (12) and cotter pins (11). Bend cotter pins (11) only slightly.

      Note: The pivot assembly weighs approximately 180 lb (*82kg*) and the cross tube assembly weighs approximately 75 lb (*34kg*).

   b. Install the locator caps (2) on the pivot assembly (6) and secure with the capscrews, washers, and locknuts (5). Refer to Table 1 for correct mounting hole locations.
   c. Position the nylon pads (3) on the locator caps (2) and install the screws (4).
   d. Verify correct assembly height with dimensions given in Table 1. Adjust as required.
2. Using an auxiliary lifting device, align boom rest assembly to the carrier frame (7).

   Note: The boom rest assembly weighs approximately 340 lb (*154kg*).

3. Install the pins (9) and cotter pins (10) which secure the cross tube assembly (8) to the carrier frame (7). Bend cotter pins (10) only slightly.
4. Install the engine housing (1). See SM Keysheet Area 01–071 for the correct procedure.
5. Complete the installation by testing the boom rest for proper alignment. The boom should rest evenly on the pads. Adjust as required.