

# SCHEMATIC FEATURES AND TIPS

Make sure your Adobe Acrobat Reader is up to date in order to access the latest features of this schematic.

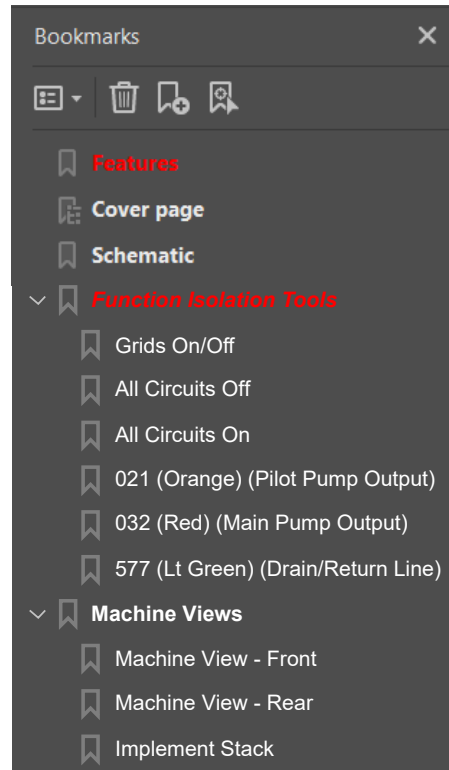
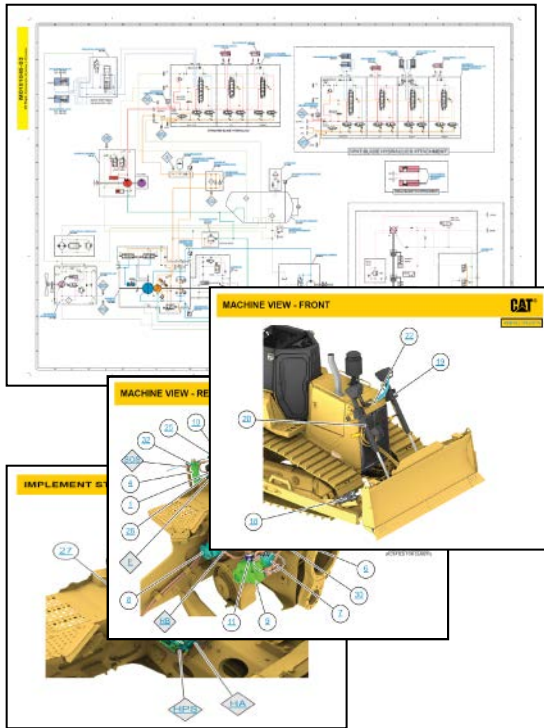


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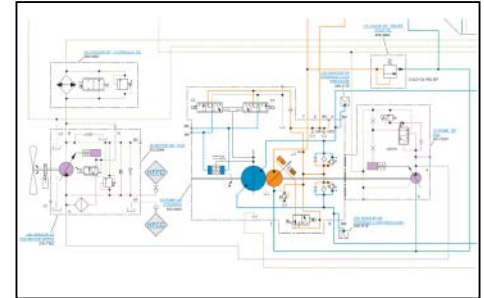


SAVE  
a copy of this schematic

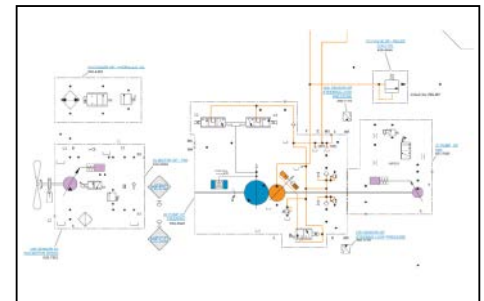
THE BOOKMARKS PANEL WILL ALLOW YOU TO QUICKLY NAVIGATE TO POINTS OF INTEREST.



THE FUNCTION ISOLATION TOOLS ISOLATE CIRCUITS FOR TRACING HYDRAULIC LINES

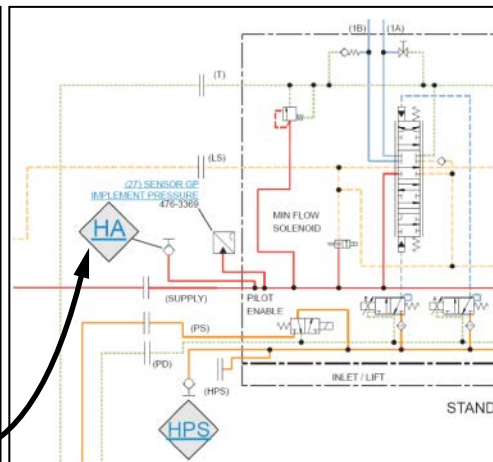
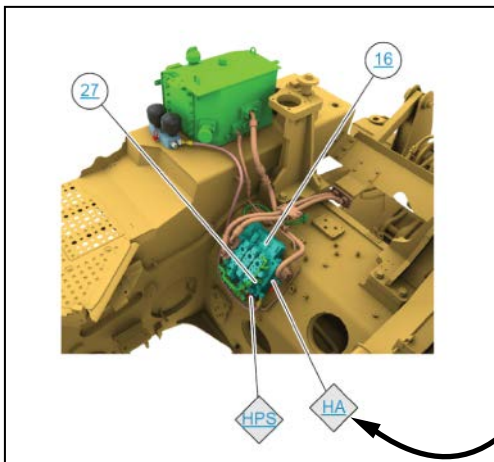


STANDARD VIEW



021 (Orange) (Pilot Output)  
CIRCUIT ISOLATED

UTILIZE HYPERTEXT TO NAVIGATE TO COMPONENTS AND THEIR MACHINE LOCATION QUICKLY. HYPERTEXT IS INDICATED BY TEXT THAT IS [BLUE AND UNDERLINED](#).



[VIEW ALL CALLOUTS](#)

WHEN ONLY ONE CALLOUT IS SHOWING ON A MACHINE VIEW, CLICKING ON THIS BUTTON WILL MAKE ALL OF THE CALLOUTS VISIBLE. THIS BUTTON IS TYPICALLY LOCATED IN THE TOP RIGHT CORNER OF EVERY MACHINE VIEW PAGE.

[CLICK HERE TO VIEW THE SCHEMATIC SYMBOLS AND DEFINITIONS PAGE](#)







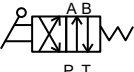
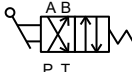
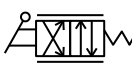




ELECTRICAL SYMBOLS			
Pressure Switch	Temperature Switch	Level Switch	Circuit Breaker
BASIC HYDRAULIC SYMBOLS			
Fluid Conditioner	Pump or Motor	Spring (Adjustable)	Variability





HOTKEYS (Keyboard Shortcuts)		
	FUNCTION	KEYS
	Zoom In	"CTRL" / "+"
	Zoom Out	"CTRL" / "-", "0"
	Fit to Page	"CTRL" / "0" (zero)
	Hand Tool	"SPACEBAR" (hold down)
	Find	"CTRL" / "F"
	Search	"CTRL" / "SHIFT" / "F"

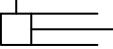
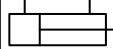
Due to different monitor sizes and PDF reader preferences there may be some variance in linked schematic locations. This document is best viewed at a screen resolution of 1024 X 768.









# SCHEMATIC SYMBOLS AND DEFINITIONS





VALVES			
ENVELOPES			
			
One Position	Two Position	Three Position	
PORTS			
			
Two-way	Three-Way	Four-Way	
CONTROL			
			
Normal Position	Shifted Position	Infinite Position	
CHECK			
			
Basic Symbol	Spring Loaded	Shuttle	Pilot Controlled



INTERNAL PASSAGEWAYS			
 Infinite Positioning	 Two Position	 Three Position	 Cross Flow

















CYLINDERS	
 Single Acting	 Double Acting

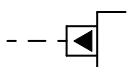




ACCUMULATORS	
 Spring Loaded	 Gas Charged








PUMPS	
FIXED DISPLACEMENT	
 Unidirectional	 Bidirectional
VARIABLE DISPLACEMENT NON- COMPENSATED	
 Unidirectional	 Bidirectional



MOTORS	
FIXED DISPLACEMENT	
 Unidirectional	 Bidirectional
VARIABLE DISPLACEMENT NON- COMPENSATED	
 Unidirectional	 Bidirectional




ROTATING SHAFTS	
 Unidirectional	 Bidirectional


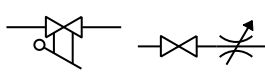




BASIC HYDRAULIC COMPONENT SYMBOLS	
 Pump or Motor	 Variability
 Fluid Conditioner	 Spring (Adjustable)
 Spring	 Pressure Compensation
 Control Valves	 Line Restriction (Variable)
 Restriction	 Line Restriction (Fixed)
 Line Restriction Variable and Pressure Compensated	 2-Section Pump
 Attachment	 Pump: Variable and Pressure Compensated
 Hydraulic Energy Triangles	
 Pneumatic Energy Triangles	





PILOT CONTROL		
RELEASED PRESSURE		
		
External Return	Internal Return	
REMOTE SUPPLY PRESSURE		
		
Simplified	Complete	Internal Supply Pressure









COMBINATION CONTROLS						
 Solenoid	 Solenoid or Manual	 Solenoid and Pilot	 Solenoid and Pilot or Manual	 Servo	 Thermal	 Detent






LINES	
 Crossing	 Joining


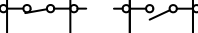
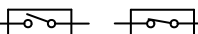
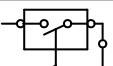
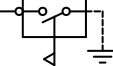

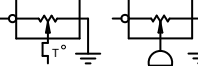
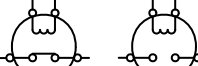
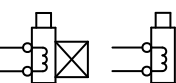
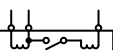
MEASUREMENT		
 Pressure	 Temperature	 Flow

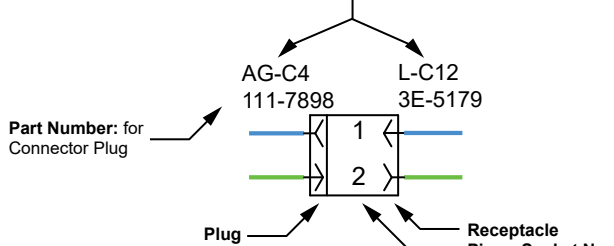
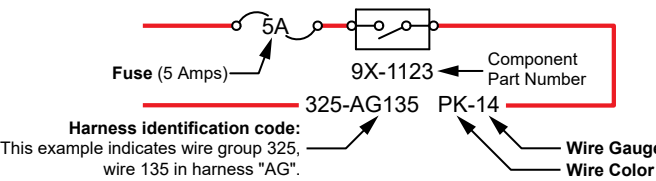
MANUAL CONTROL					
 Push-pull Lever	 Manual Shutoff	 General Manual	 Push Button	 Pedal	 Spring

FLUID STORAGE RESERVOIRS			
 Vented	 Pressurized	 Return Above Fluid Level	 Return Below Fluid Level

HYDRAULIC SYMBOLS - ELECTRICAL							
 Transducer (Fluid)	 Transducer (Gas / Air)	 Generator	 Electric Motor	 Pressure Switch	 Pressure Switch (Adjustable)	 Temperature Switch	 Electrical Wire

ELECTRICAL SYMBOLS				
 Pressure Switch	 Temperature Switch	 Level Switch	 Flow Switch	 Circuit Breaker

BASIC ELECTRICAL COMPONENT SYMBOLS	
	<b>Fuse:</b> A component in an electrical circuit that will open the circuit if too much current flows through it.
	<b>Switch (Normally Open):</b> A switch that will close at a specified point (temp, press, etc.). The circle indicates that the component has screw terminals and a wire can be disconnected from it.
	<b>Switch (Normally Closed):</b> A switch that will open at a specified point (temp, press, etc.). No circle indicates that the wire cannot be disconnected from the component.
	<b>Ground (Wired):</b> This indicates that the component is connected to a grounded wire. The grounded wire is fastened to the machine.
	<b>Ground (Case):</b> This indicates that the component does not have a wire connected to ground. It is grounded by being fastened to the machine.
	<b>Reed Switch:</b> A switch whose contacts are controlled by a magnet. A magnet closes the contacts of a normally open reed switch; it opens the contacts of a normally closed reed switch.
	<b>Sender:</b> A component that is used with a temperature or pressure gauge. The sender measures the temperature or pressure. Its resistance changes to give an indication to the gauge of the temperature or pressure.
	<b>Relay (Magnetic Switch):</b> A relay is an electrical component that is activated by electricity. It has a coil that makes an electromagnet when current flows through it. The electromagnet can open or close the switch part of the relay.
	<b>Solenoid:</b> A solenoid is an electrical component that is activated by electricity. It has a coil that makes an electromagnet when current flows through it. The electromagnet can open or close a valve or move a piece of metal that can do work.
	<b>Magnetic Latch Solenoid:</b> An electrical component that is activated by electricity and held latched by a permanent magnet. It has two coils (latch and unlatch) that make electromagnet when current flows through them. It also has an internal switch that places the latch coil circuit open at the time the coil latches.

HARNESS AND WIRE SYMBOLS	
<b>Wire, Cable, or Harness Assembly Identification:</b> Includes Harness Identification Letters and Harness Connector Serialization Codes (see sample).	
	
<b>Harness Identification Letter(s):</b> (A, B, C, AA, AB, AC, ...) <b>Harness Connector Serialization Code:</b> The "C" stands for "Connector" and the number indicates which connector in the harness (C1, C2, C3, ...)	
	
<b>Deutsch connector:</b> Typical representation of a Deutsch connector. The plug contains all sockets and the receptacle contains all pins. <b>Sure-Seal connector:</b> Typical representation of a Sure-Seal connector. The plug and receptacle contain both pins and sockets.	



# Schematic

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## **12M, 140, 150, 160, 140M, and 160M Motor Grader Hydraulic System**

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B92369-UP  
B9D4763-UP  
B9E1144-UP  
D9G1586-UP  
D9T1439-UP  
B541-UP  
B551-UP  
B561-UP  
B571-UP  
B591-UP

# COMPONENT LOCATION

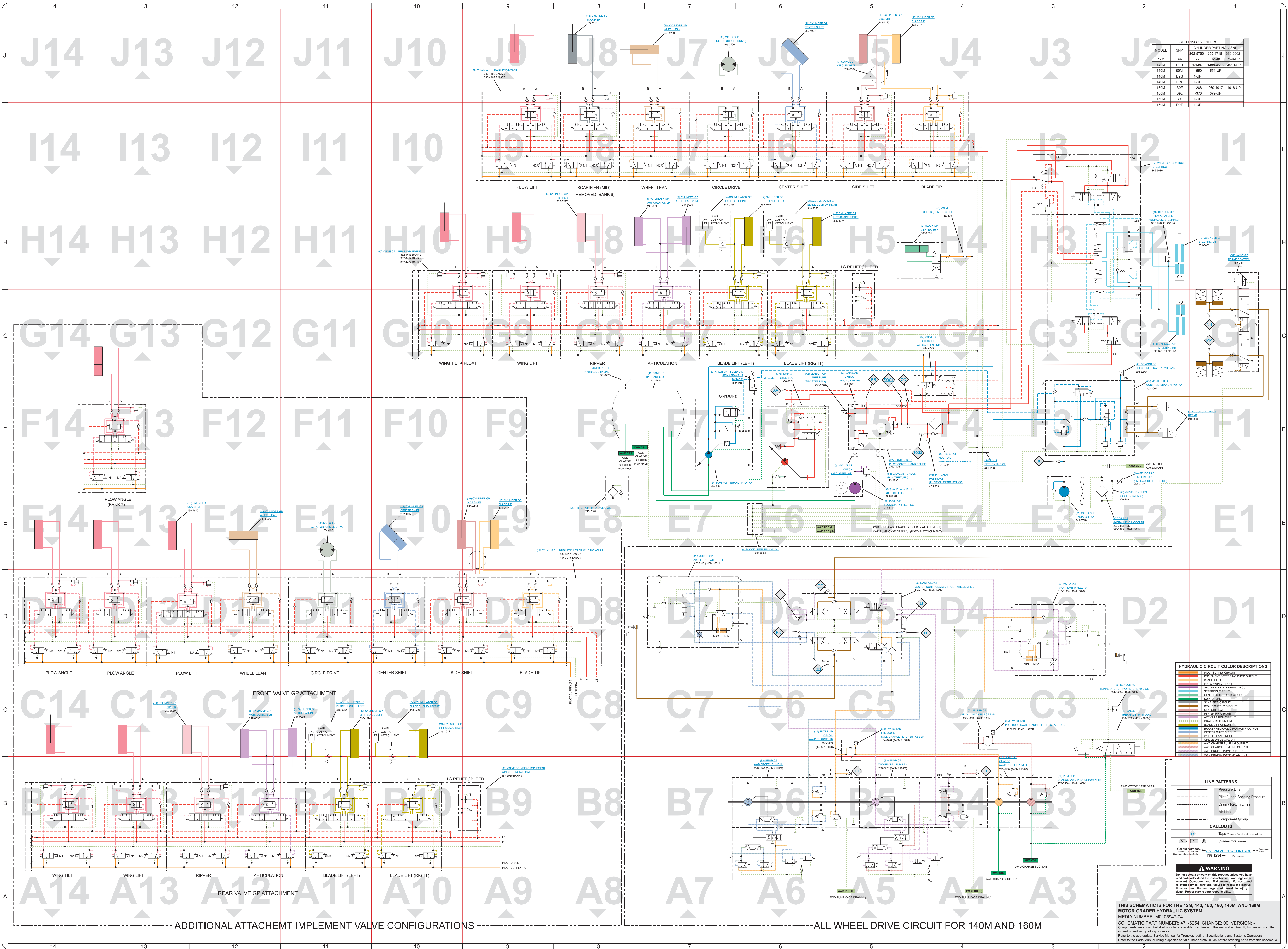


Description	Schematic Location	Machine Location
Accumulator Gp - Blade Cushion Left	<a href="#">H-7, C-11</a>	<a href="#">1</a>
Accumulator Gp - Blade Cushion Right	<a href="#">H-6, C-10</a>	<a href="#">2</a>
Accumulator Gp - Brake	<a href="#">F-2</a>	<a href="#">3</a>
Block - Return Hydraulic Oil	<a href="#">E-6</a>	<a href="#">4</a>
Block - Return Hydraulic Oil	<a href="#">F-4</a>	<a href="#">5</a>
Breather - Hydraulic (Inline)	<a href="#">G-8</a>	<a href="#">6</a>
Core As - Hydraulic Oil Cooler	<a href="#">E-2</a>	<a href="#">7</a>
Cylinder Gp - Articulation LH	<a href="#">H-7, C-12</a>	<a href="#">8</a>
Cylinder Gp - Articulation RH	<a href="#">H-7, C-11</a>	<a href="#">9</a>
Cylinder Gp - Blade Tip	<a href="#">J-5, E-9</a>	<a href="#">10</a>
Cylinder Gp - Center Shift	<a href="#">J-6, E-10</a>	<a href="#">11</a>
Cylinder Gp - Lift (Blade Left)	<a href="#">H-5, C-11</a>	<a href="#">12</a>
Cylinder Gp - Lift (Blade Right)	<a href="#">H-6, C-10</a>	<a href="#">13</a>
Cylinder Gp - Ripper	<a href="#">H-8, C-13</a>	<a href="#">14</a>
Cylinder Gp - Scarifier	<a href="#">J-8, E-13</a>	<a href="#">15</a>
Cylinder Gp - Side Shift	<a href="#">J-5, E-9</a>	<a href="#">16</a>
Cylinder Gp - Steering LH	<a href="#">H-1</a>	<a href="#">17</a>
Cylinder Gp - Steering RH	<a href="#">G-2</a>	<a href="#">18</a>
Cylinder Gp - Wheel Lean	<a href="#">J-7, E-12</a>	<a href="#">19</a>
Filter Gp - Hydraulic Oil	<a href="#">E-8</a>	<a href="#">20</a>
Filter Gp - Hydraulic Oil (AWD Charge LH)	<a href="#">C-5</a>	<a href="#">21</a>
Filter Gp - Hydraulic Oil (AWD Charge RH)	<a href="#">C-4</a>	<a href="#">22</a>
Filter Gp - Pilot Oil (Implement / Steering)	<a href="#">F-4</a>	<a href="#">23</a>
Lock Gp - Centershift	<a href="#">H-4</a>	<a href="#">24</a>
Manifold Gp - Control (Brake / Hydraulic Fan)	<a href="#">F-2</a>	<a href="#">25</a>
Manifold Gp - Clutch Control (AWD Front Wheel Drive)	<a href="#">D-5</a>	<a href="#">26</a>
Manifold Gp - Pilot Control and Relief	<a href="#">F-5</a>	<a href="#">27</a>
Motor Gp - AWD Front Wheel LH	<a href="#">E-7</a>	<a href="#">28</a>
Motor Gp - AWD Front Wheel RH	<a href="#">D-3</a>	<a href="#">29</a>
Motor Gp - Gerotor (Circle Drive)	<a href="#">J-7, E-11</a>	<a href="#">30</a>
Motor Gp - Radiator Fan	<a href="#">E-3</a>	<a href="#">31</a>
Pump Gp - AWD Propel LH	<a href="#">B-6</a>	<a href="#">32</a>
Pump Gp - AWD Propel RH	<a href="#">B-5</a>	<a href="#">33</a>
Pump Gp - Brake / Hydraulic Fan	<a href="#">E-7</a>	<a href="#">34</a>
Pump Gp - Charge (AWD Propel Pump LH)	<a href="#">B-4</a>	<a href="#">35</a>
Pump Gp - Charge (AWD Propel Pump RH)	<a href="#">B-3</a>	<a href="#">36</a>
Pump Gp - Implement / Steering	<a href="#">F-6</a>	<a href="#">37</a>
Pump Gp - Secondary Steering	<a href="#">E-5</a>	<a href="#">38</a>
Sensor As - Temperature (AWD Return Hydraulic Oil)	<a href="#">C-2</a>	<a href="#">39</a>
Sensor As - Temperature (Hydraulic Return Oil)	<a href="#">E-2</a>	<a href="#">40</a>
Sensor Gp - Pressure (Brake / Hydraulic Fan)	<a href="#">G-2</a>	<a href="#">41</a>
Sensor Gp - Pressure (Secondary Steering)	<a href="#">F-5</a>	<a href="#">42</a>
Sensor Gp - Temperature (Hydraulic Steering)	<a href="#">H-2</a>	<a href="#">43</a>
Switch As - Pressure (AWD Charge Filter Bypass LH)	<a href="#">C-4</a>	<a href="#">44</a>
Switch As - Pressure (AWD Charge Filter Bypass RH)	<a href="#">C-5</a>	<a href="#">45</a>
Switch As - Pressure (Pilot Oil Filter Bypass)	<a href="#">F-4</a>	<a href="#">46</a>
Swivel Gp - Circle Drive	<a href="#">J-5</a>	<a href="#">47</a>
Tank Gp - Hydraulic Oil	<a href="#">G-7</a>	<a href="#">48</a>
Valve - Thermal Bypass AWD	<a href="#">C-2</a>	<a href="#">49</a>
Valve As - Check (Pilot Charge)	<a href="#">F-5</a>	<a href="#">50</a>
Valve As - Check (Pilot Return)	<a href="#">F-5</a>	<a href="#">51</a>
Valve As - Check (Secondary Steering)	<a href="#">F-5</a>	<a href="#">52</a>
Valve As - Relief (Secondary Steering)	<a href="#">E-5</a>	<a href="#">53</a>
Valve Gp - Brake Control	<a href="#">H-1</a>	<a href="#">54</a>
Valve Gp - Check (Center Shift)	<a href="#">H-4</a>	<a href="#">55</a>
Valve Gp - Check (Cooler Bypass)	<a href="#">E-2</a>	<a href="#">56</a>
Valve Gp - Control (Steering)	<a href="#">I-2</a>	<a href="#">57</a>
Valve Gp - Front Implement	<a href="#">J-9</a>	<a href="#">58</a>
Valve Gp - Front Implement w/ Plow Agle	<a href="#">E-8</a>	<a href="#">59</a>
Valve Gp - Rear Implement	<a href="#">H-10</a>	<a href="#">60</a>
Valve Gp - Rear Implement w/ Wing Lift Non-Float	<a href="#">B-9</a>	<a href="#">61</a>
Valve Gp - Shutoff w/ Load Sensing	<a href="#">G-4</a>	<a href="#">62</a>
Valve Gp - Solenoid (Fan / Brake LS Bypass)	<a href="#">G-6</a>	<a href="#">63</a>

# TAP LOCATION

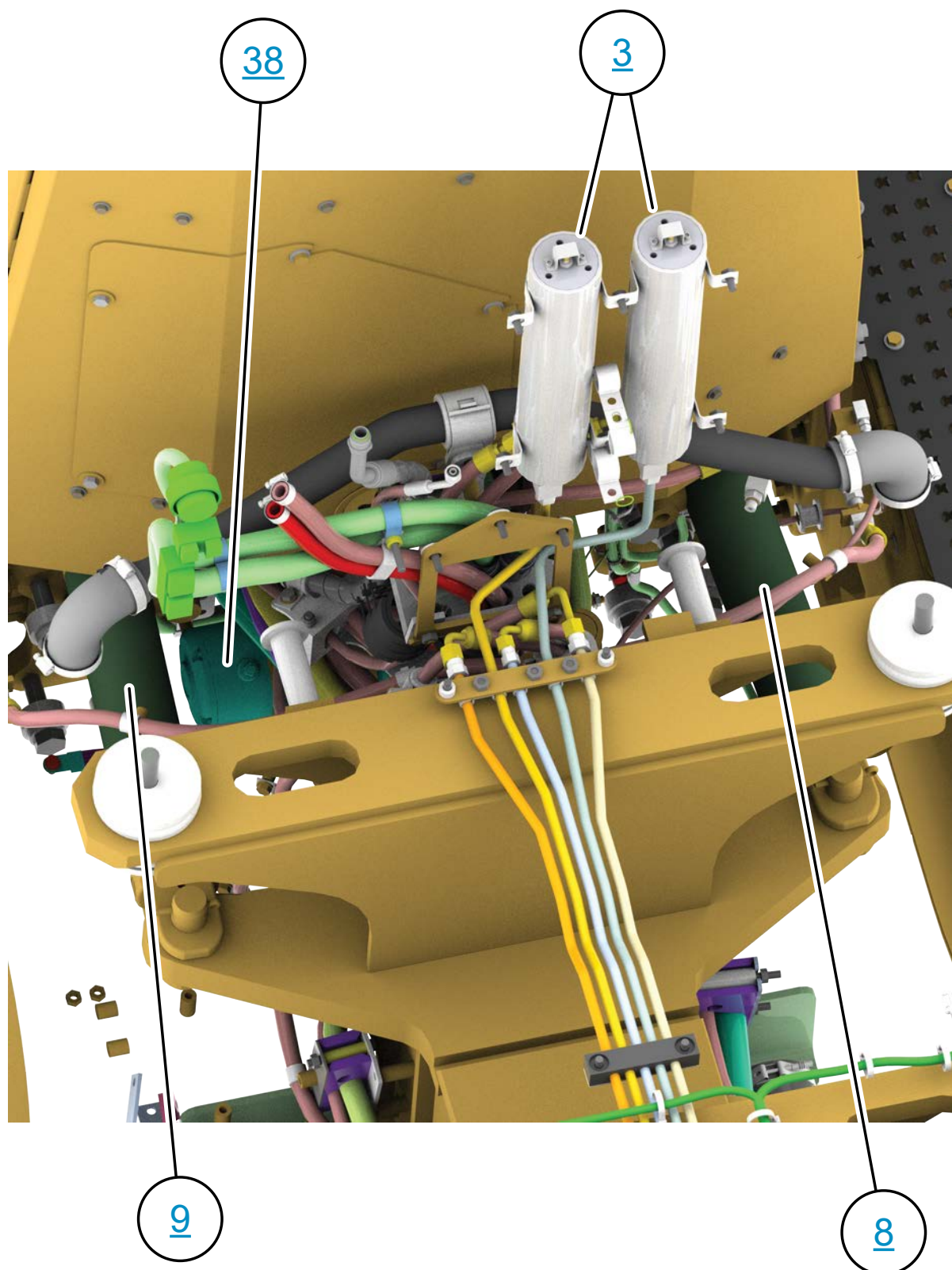


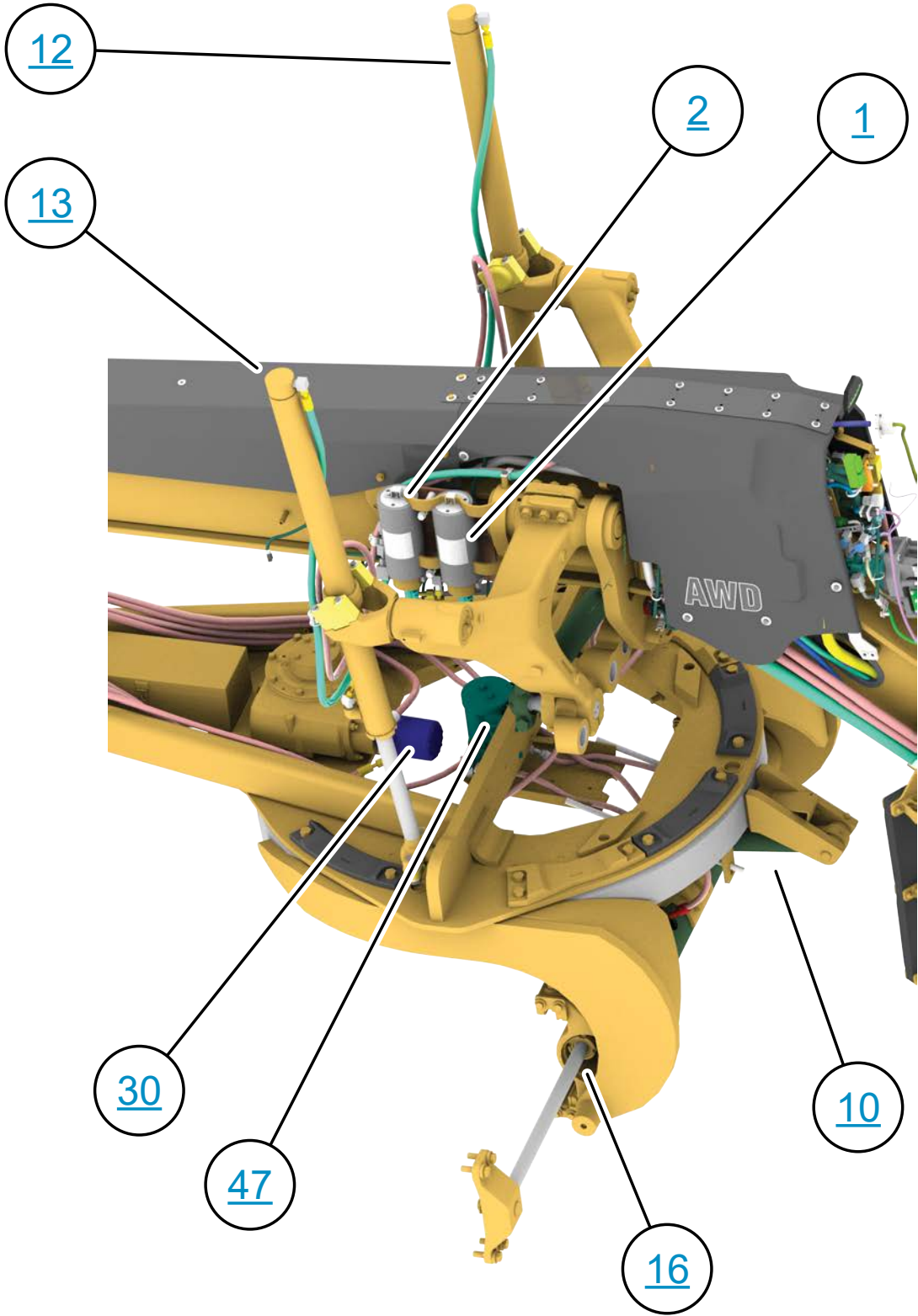
Tap Number	Description	Schematic Location
<a href="#">AA</a>	Implement / Steering Pump Load Sense	<a href="#">F-6</a>
<a href="#">BB</a>	Implement / Steering Pump Pressure	<a href="#">F-5</a>
<a href="#">CC</a>	Pilot Relief Pressure	<a href="#">F-5</a>
<a href="#">DD</a>	Fan Motor Supply Pressure	<a href="#">F-3</a>
<a href="#">EE</a>	AWD LH Charge Pump Pressure	<a href="#">B-5</a>
<a href="#">FF</a>	AWD RH Charge Pump Pressure	<a href="#">B-4</a>
<a href="#">GG</a>	AWD Front Wheel RH Brake Pressure	<a href="#">D-5</a>
<a href="#">HH</a>	AWD Front Wheel LH Brake Pressure	<a href="#">D-5</a>
<a href="#">II</a>	AWD RH Motor FWD Supply Pressure	<a href="#">D-6</a>
<a href="#">JJ</a>	AWD RH Motor REV Supply Pressure	<a href="#">D-5</a>
<a href="#">KK</a>	AWD LH Motor REV Supply Pressure	<a href="#">D-6</a>
<a href="#">LL</a>	AWD LH Motor FWD Supply Pressure	<a href="#">D-5</a>
<a href="#">MM</a>	RH Service Brake Pressure	<a href="#">G-1</a>
<a href="#">NN</a>	LH Service Brake Pressure	<a href="#">G-1</a>
<a href="#">SOS1</a>	Hydraulic Oil Sampling	<a href="#">F-5</a>
<a href="#">SOS2</a>	Hydraulic Oil Sampling	<a href="#">F-4</a>



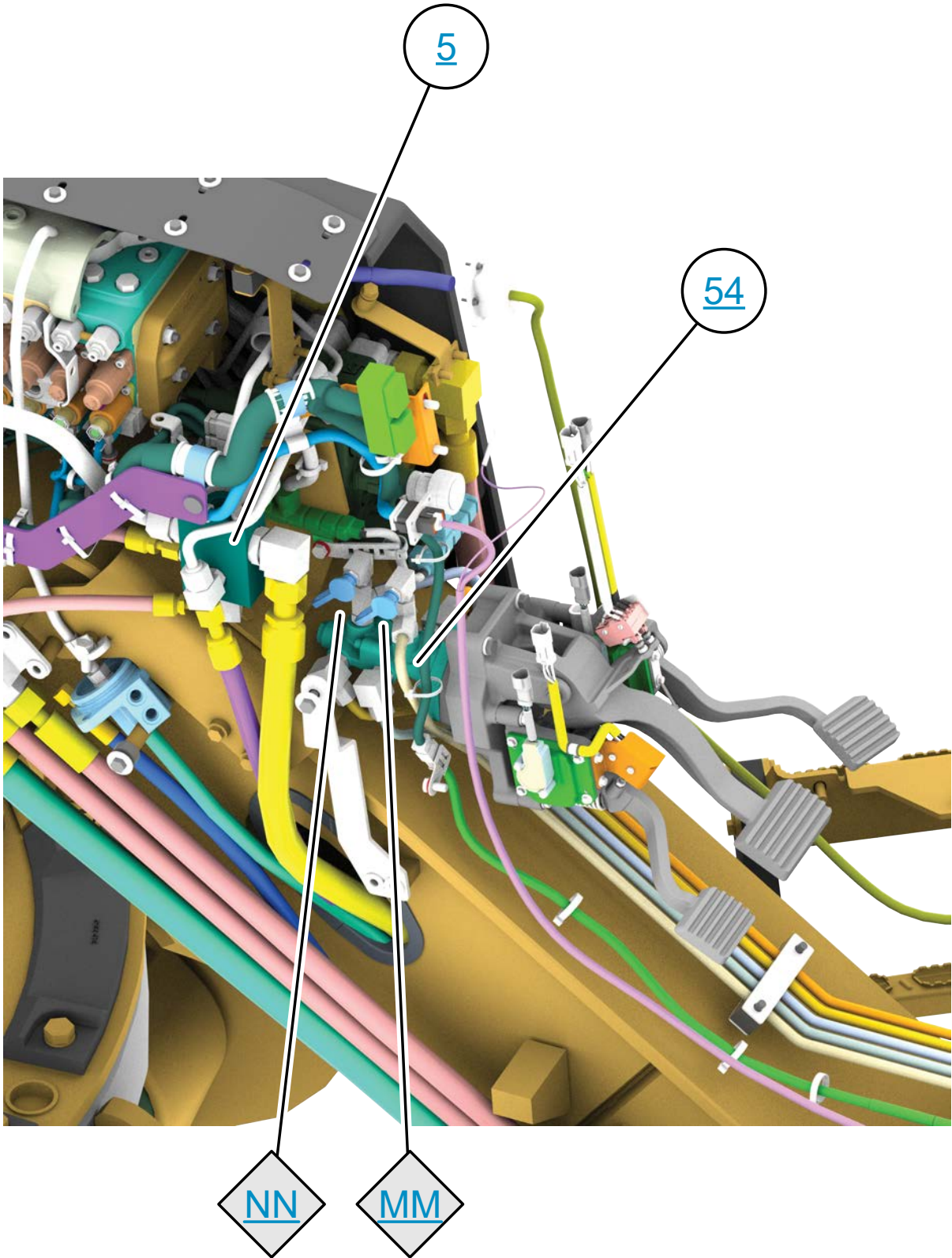
ADDITIONAL ATTACHEMNT IMPLEMENT VALVE CONFIGURATIONS

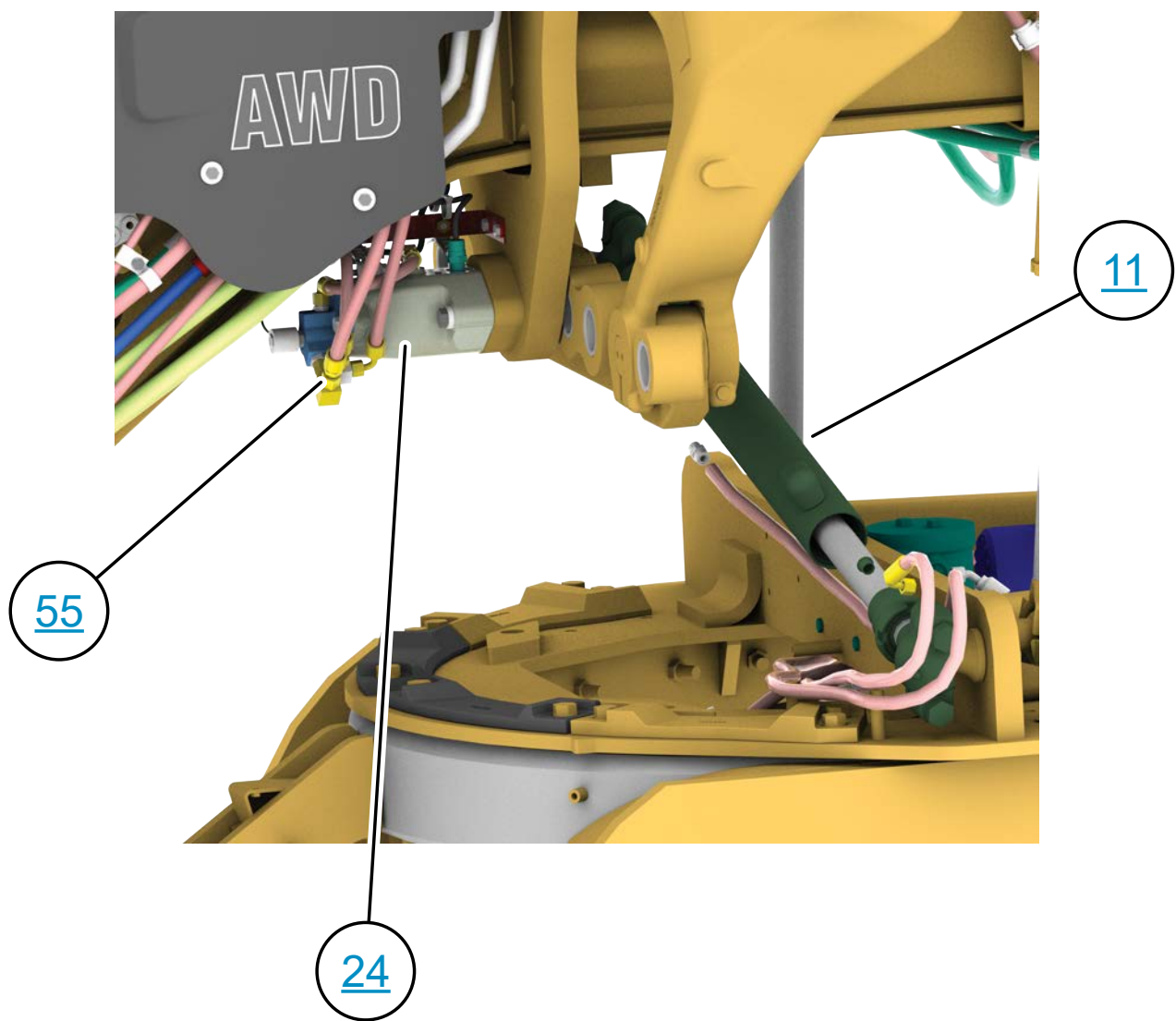
ALL WHEEL DRIVE CIRCUIT FOR 140M AND 160M



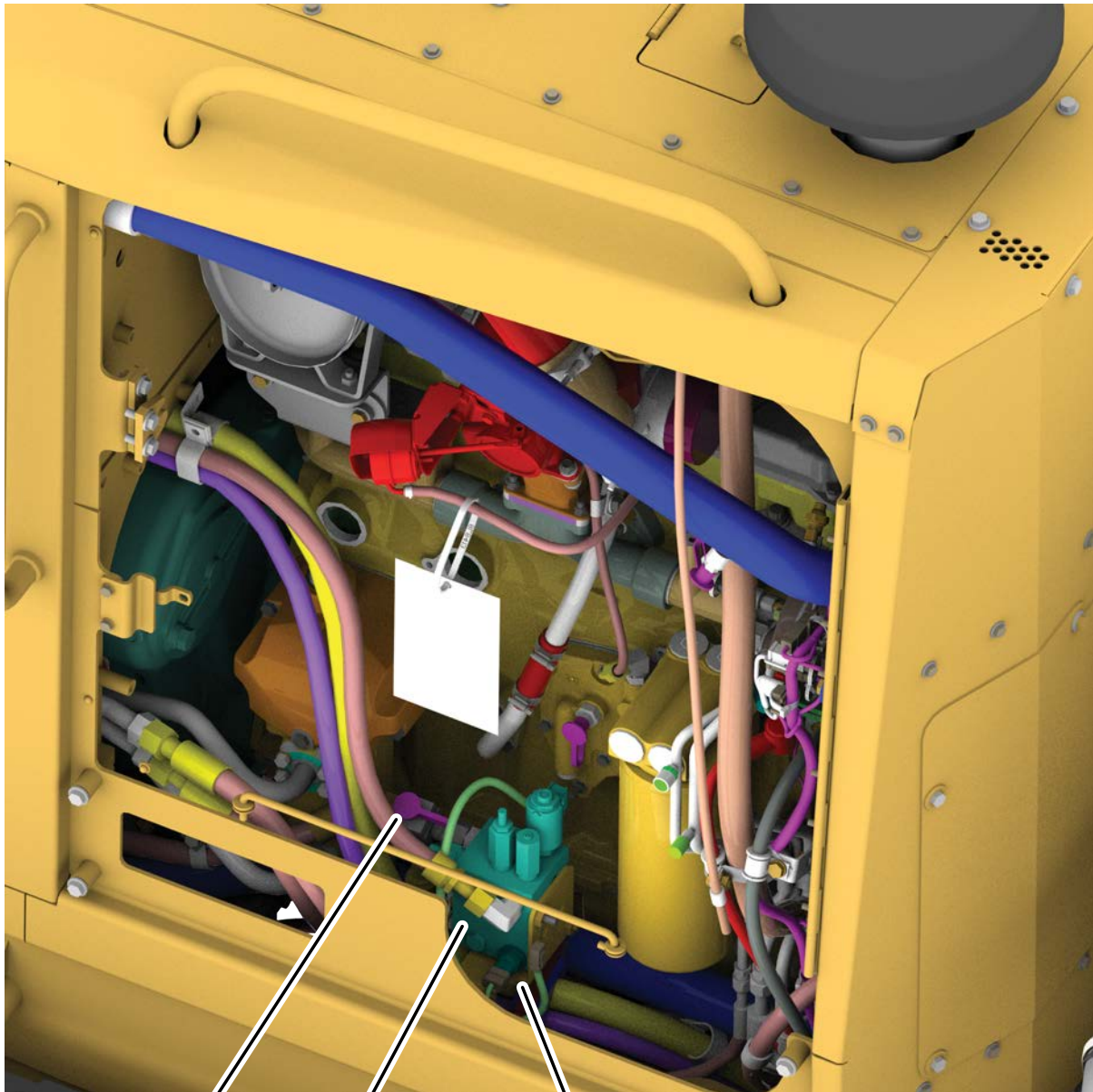


# BRAKE CONTROL VALVE LH VIEW





## LH ENGINE COMPARTMENT

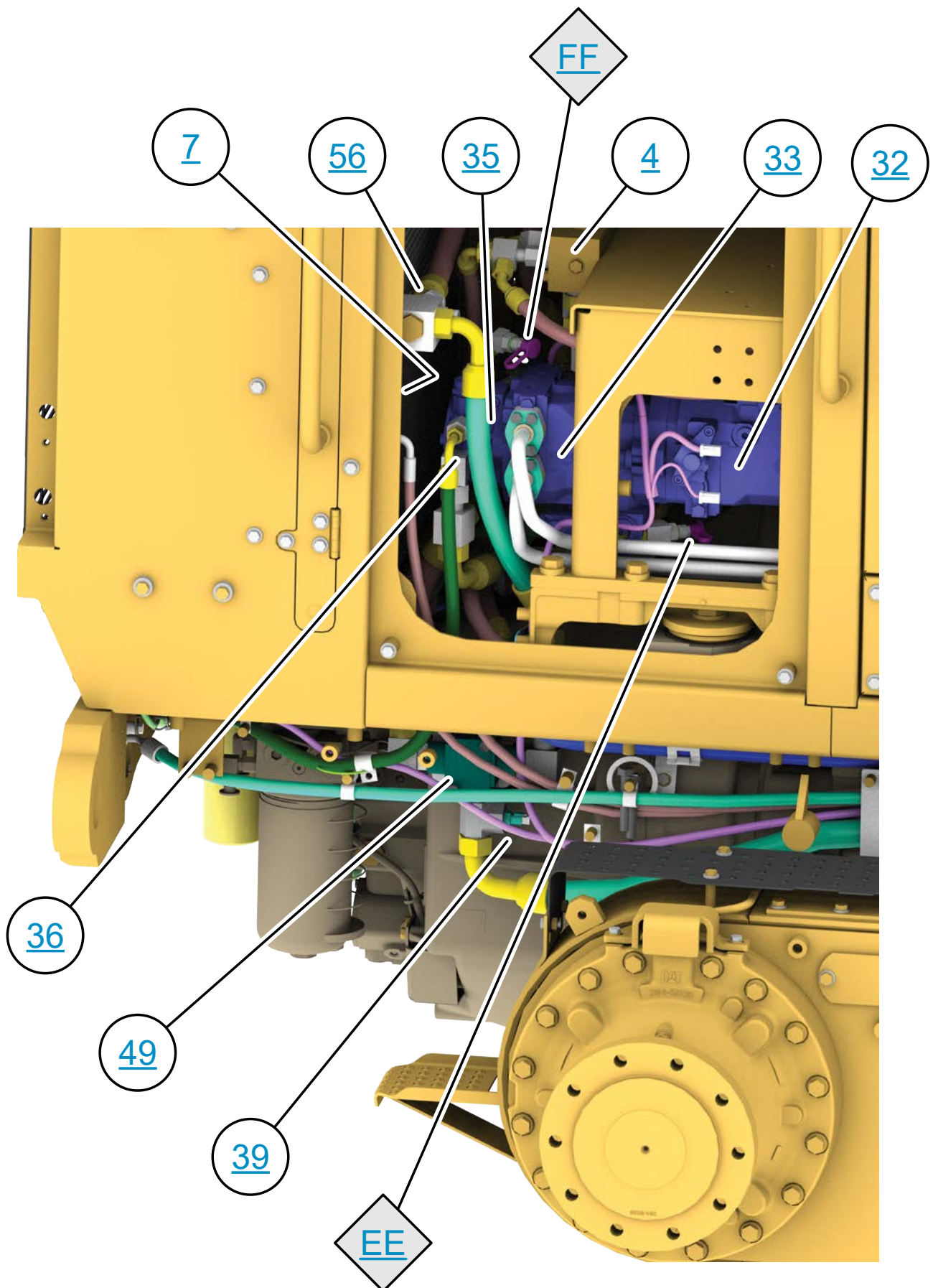


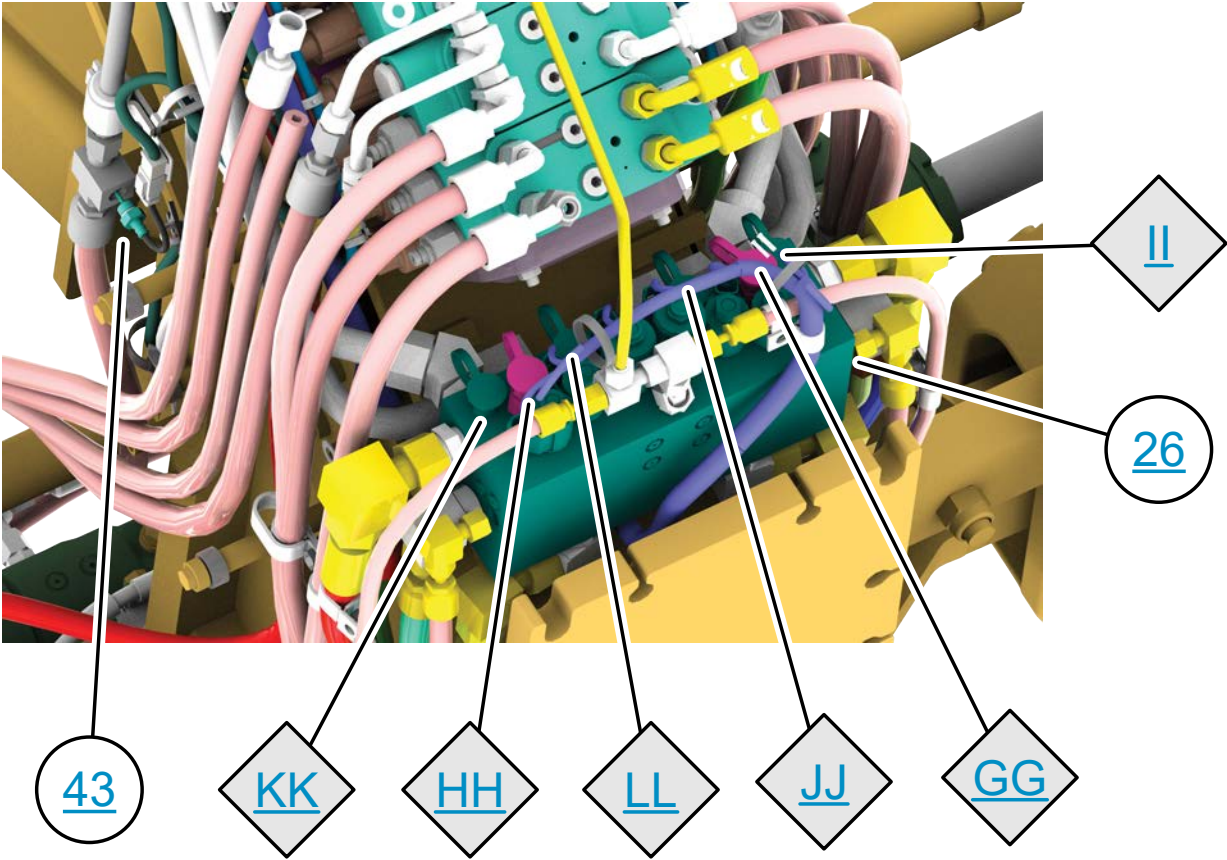
DD

25

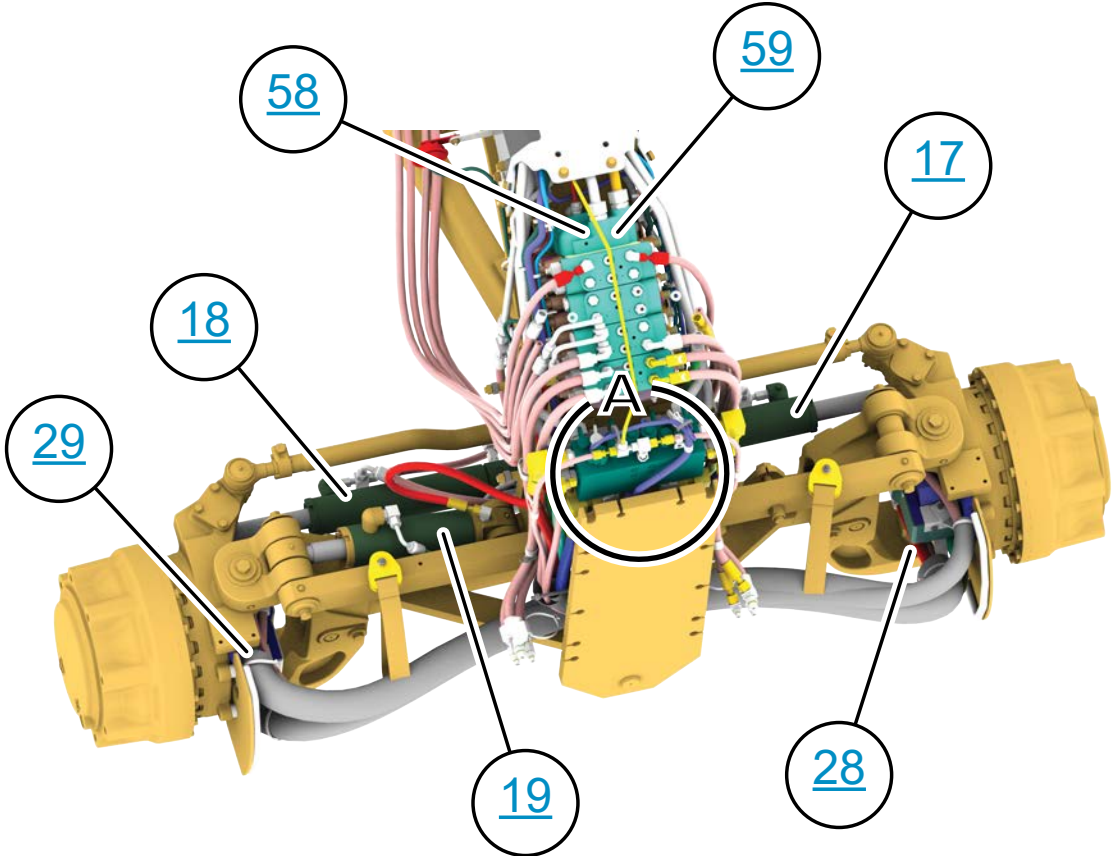
41

# LH REAR HYDRAULIC COMPARTMENT

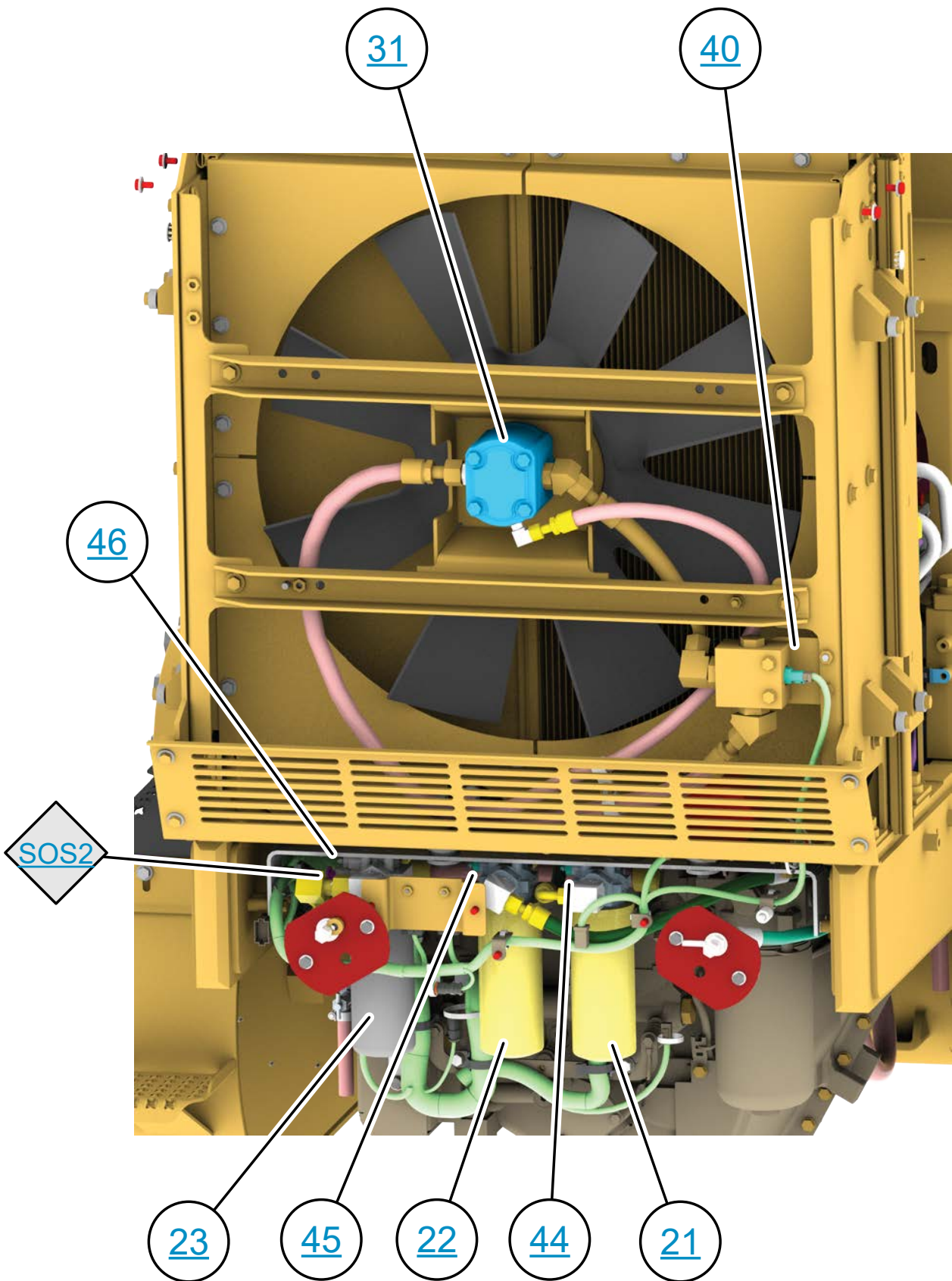




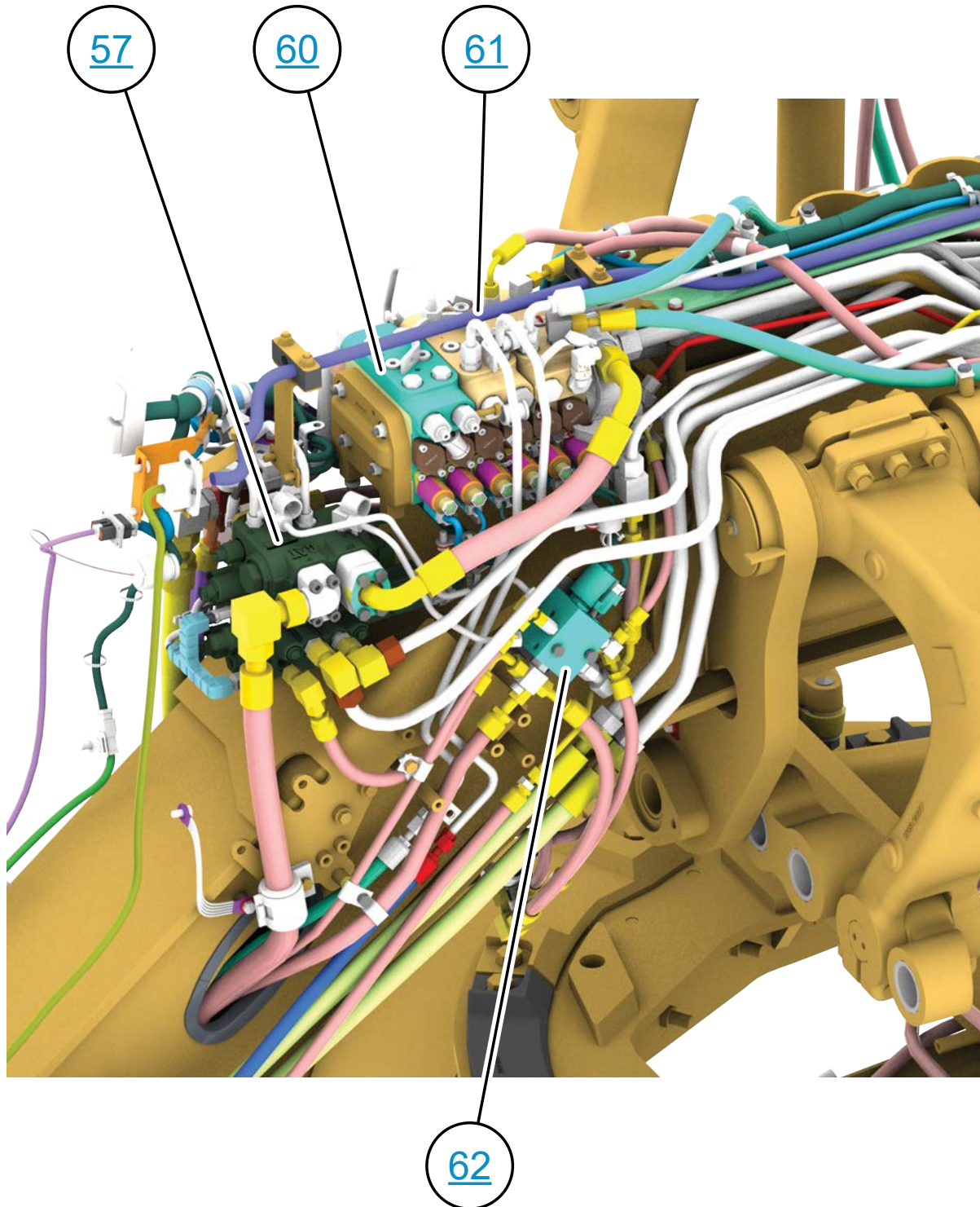
VIEW OF AREA "A"



MACHINE REAR VIEW



# REAR IMPLEMENT VALVE RH VIEW



# RH REAR HYDRAULIC COMPARTMENT



VIEW OF AREA "B"  
(ROTATED FOR CLARITY)

