

# APPLICATION ILLUSTRATIONS

HYDRAULIC AND ELECTROHYDRAULIC BRAKING SYSTEMS  
BRAKES, BRAKE ACTUATION, VALVES, CONTROLS



The intended purpose of this catalog is to provide an understanding of how ZF components can be used in hydraulic and electrohydraulic brake systems. The systems and components shown in the illustrations and schematics may not be exact representations of actual machines.

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### Edition 1

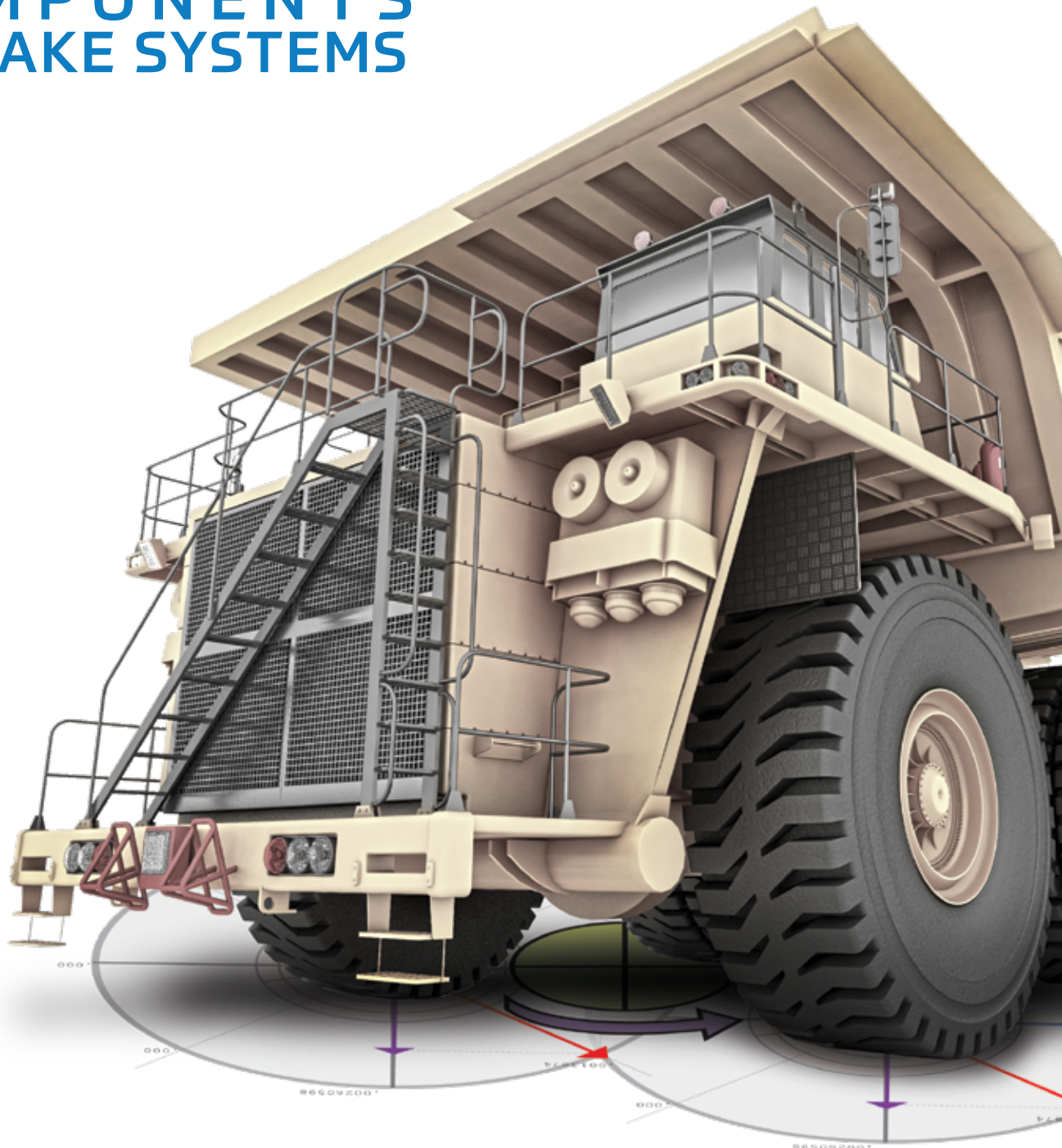
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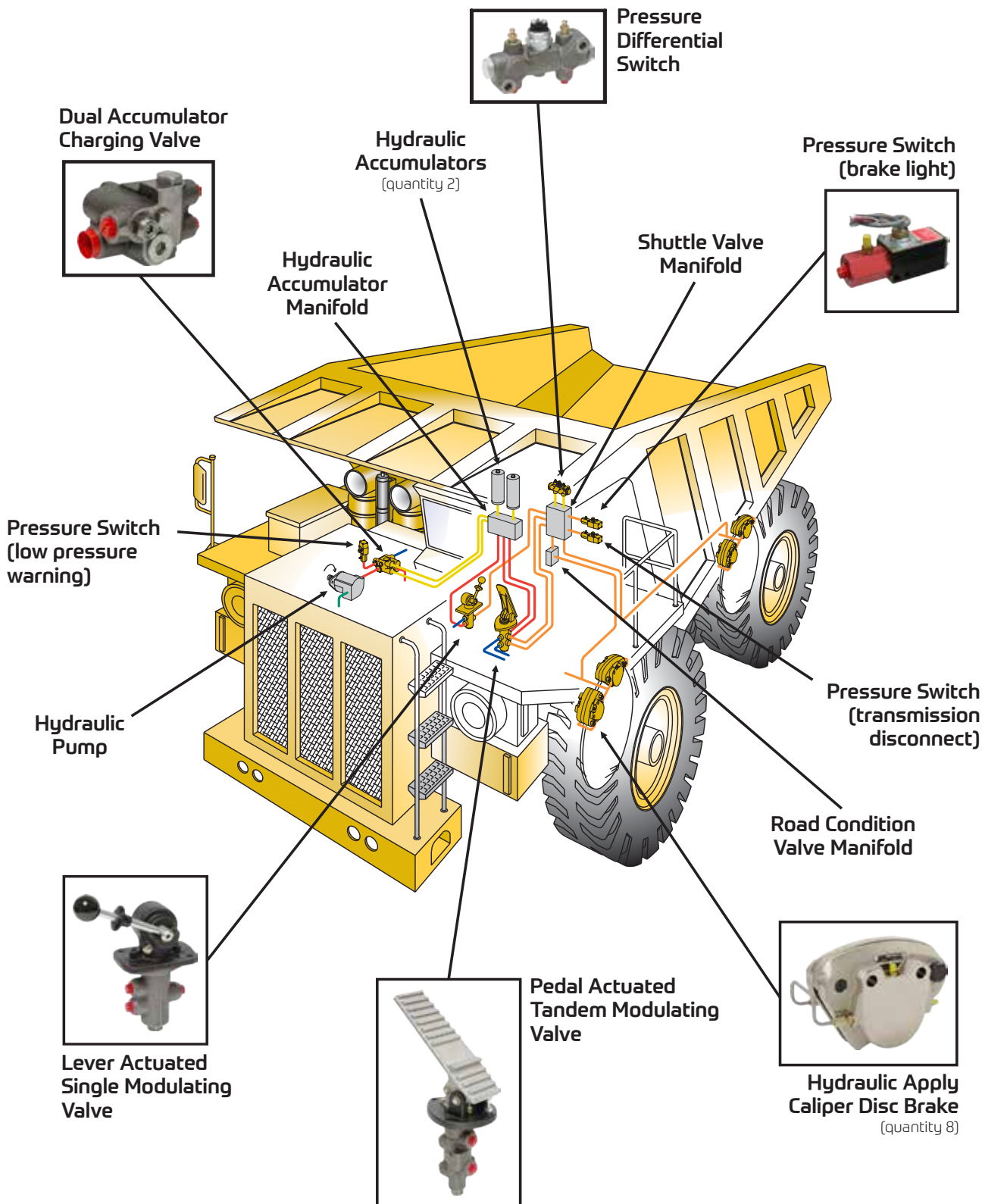
You will find the current edition at [www.mico.com](http://www.mico.com)

# HYDRAULIC COMPONENTS & BRAKE SYSTEMS

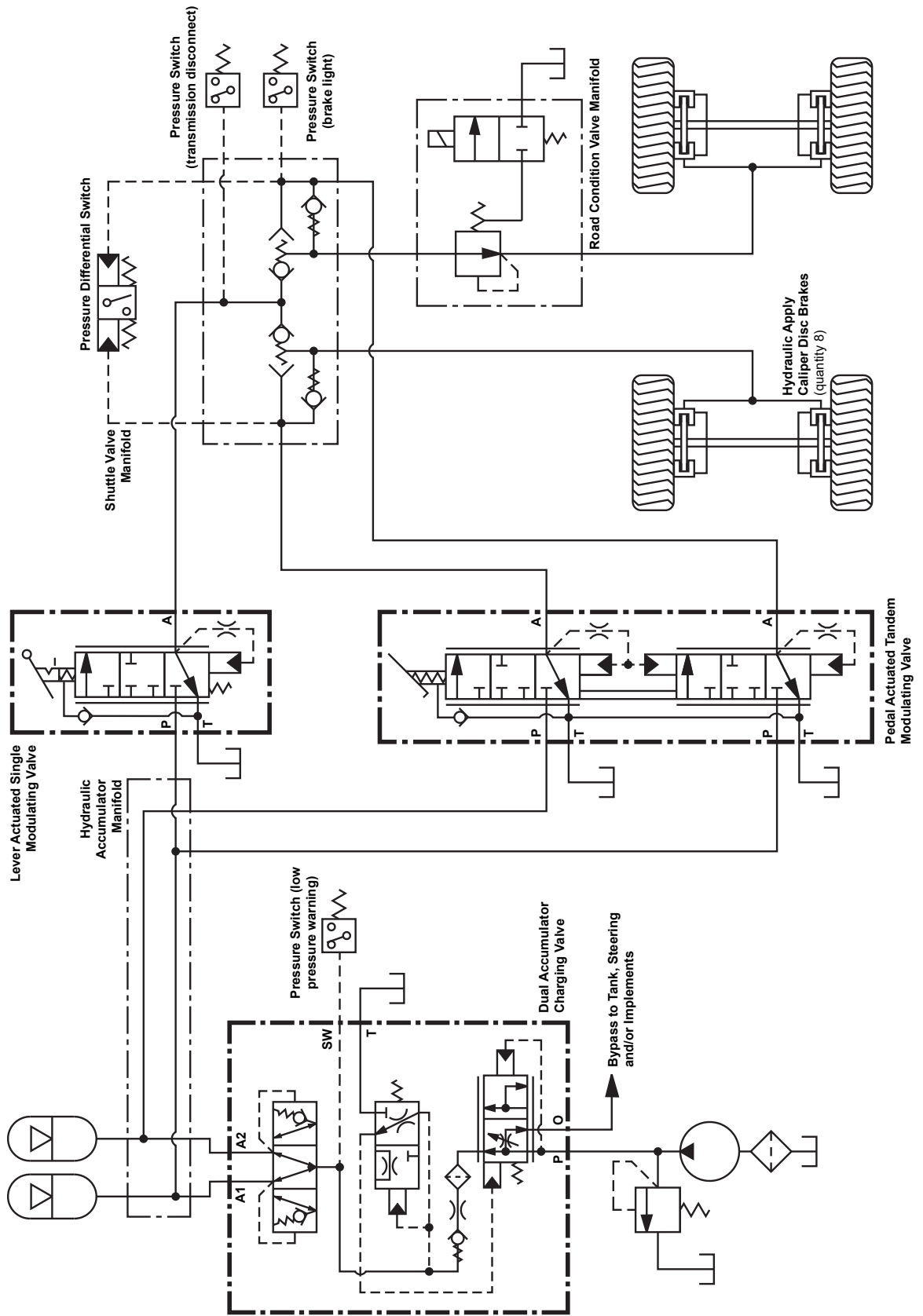


# Hydraulic Components and Brake Systems

## Haul Truck example

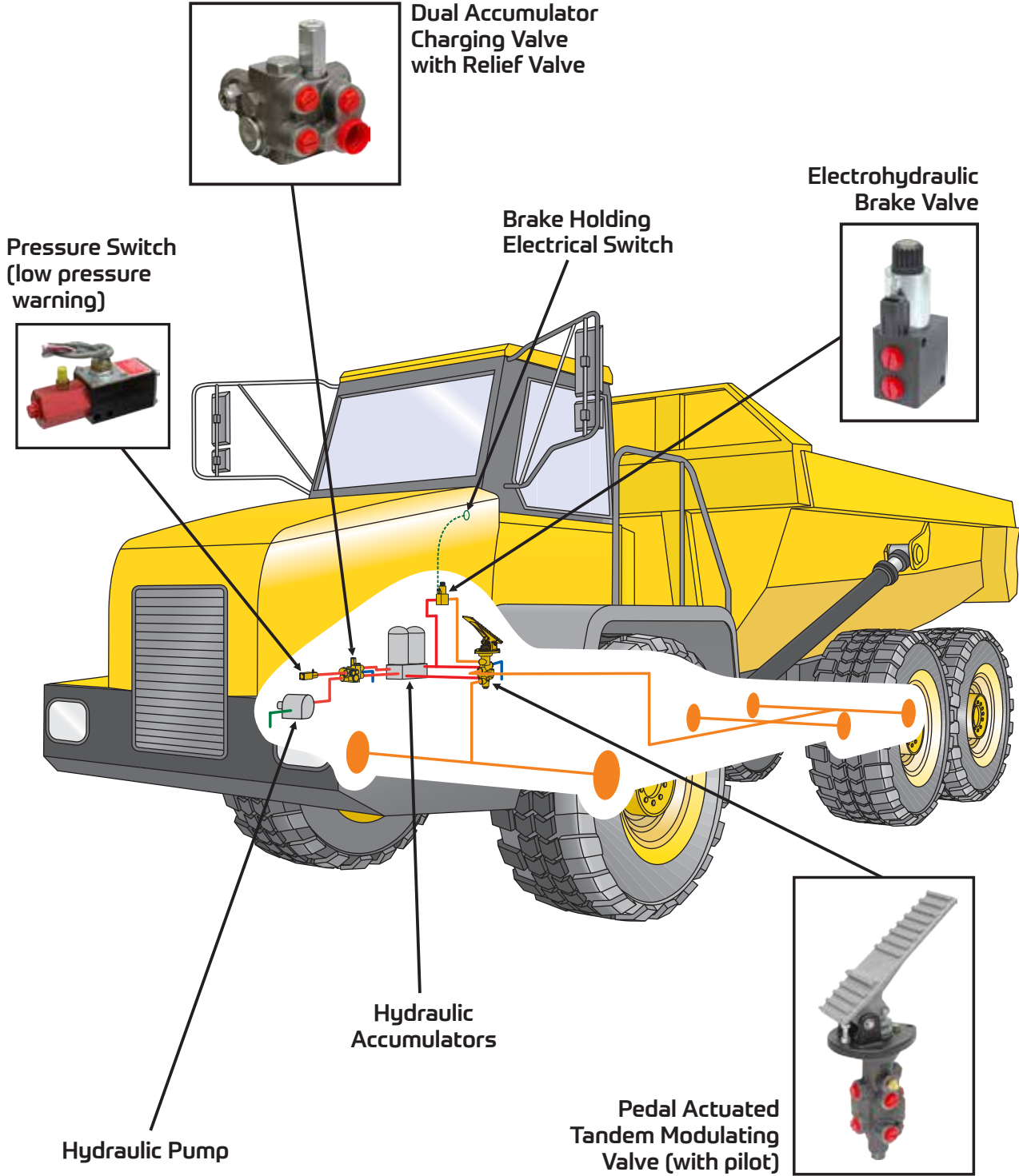


# Haul Truck System Schematic

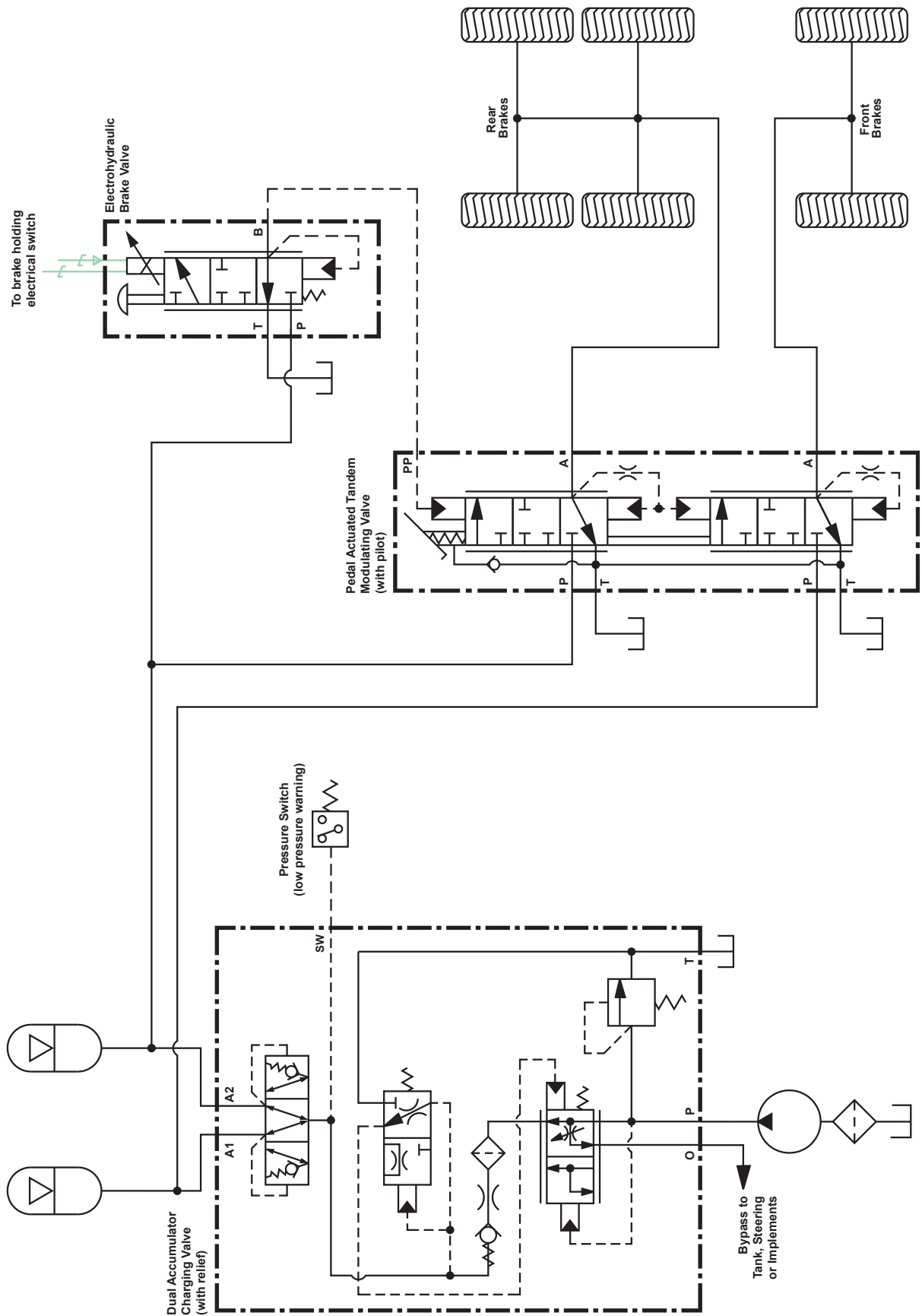


# Hydraulic Components and Brake Systems

## Articulated Dump Truck example

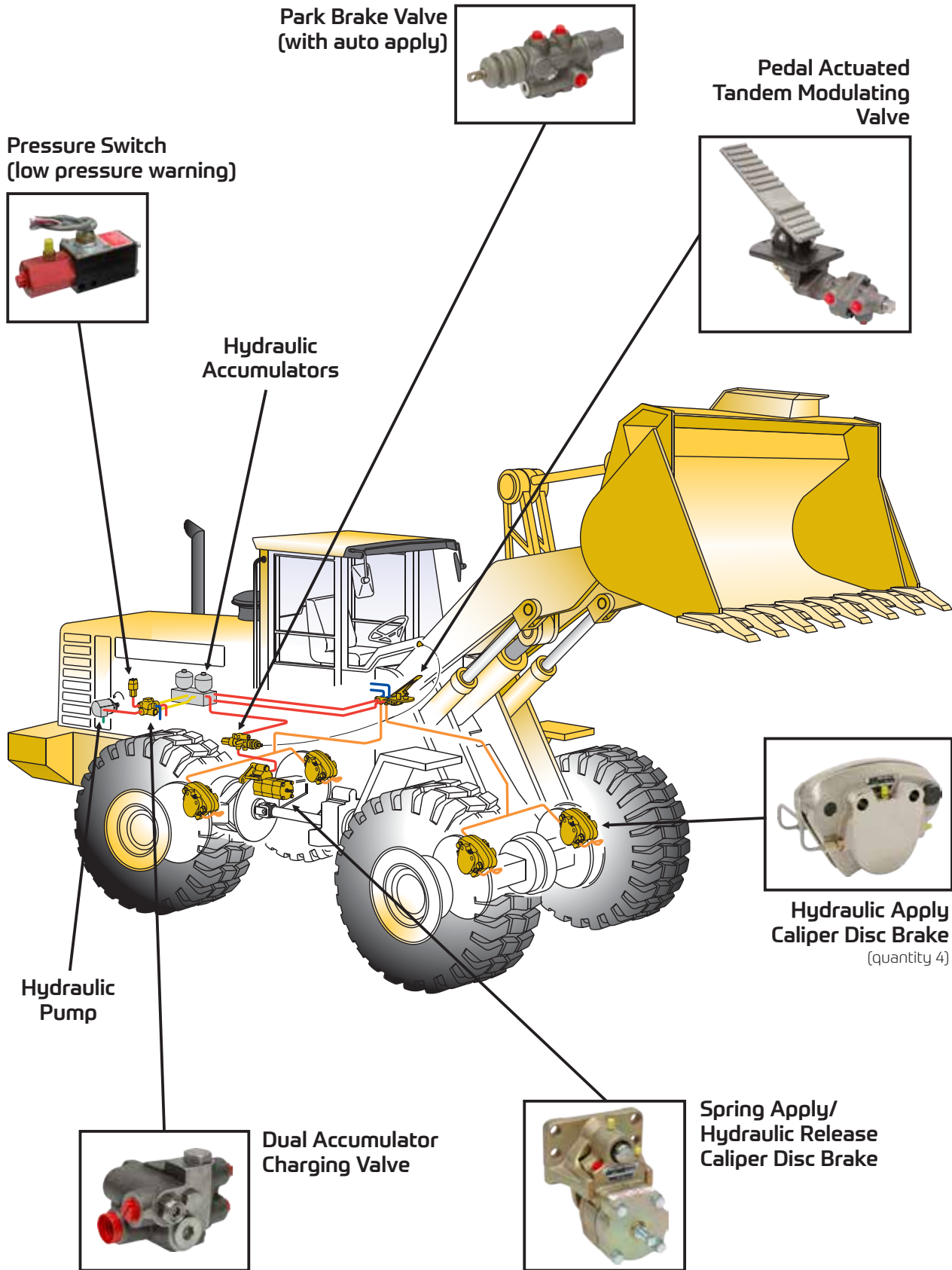


# Articulated Dump Truck System Schematic



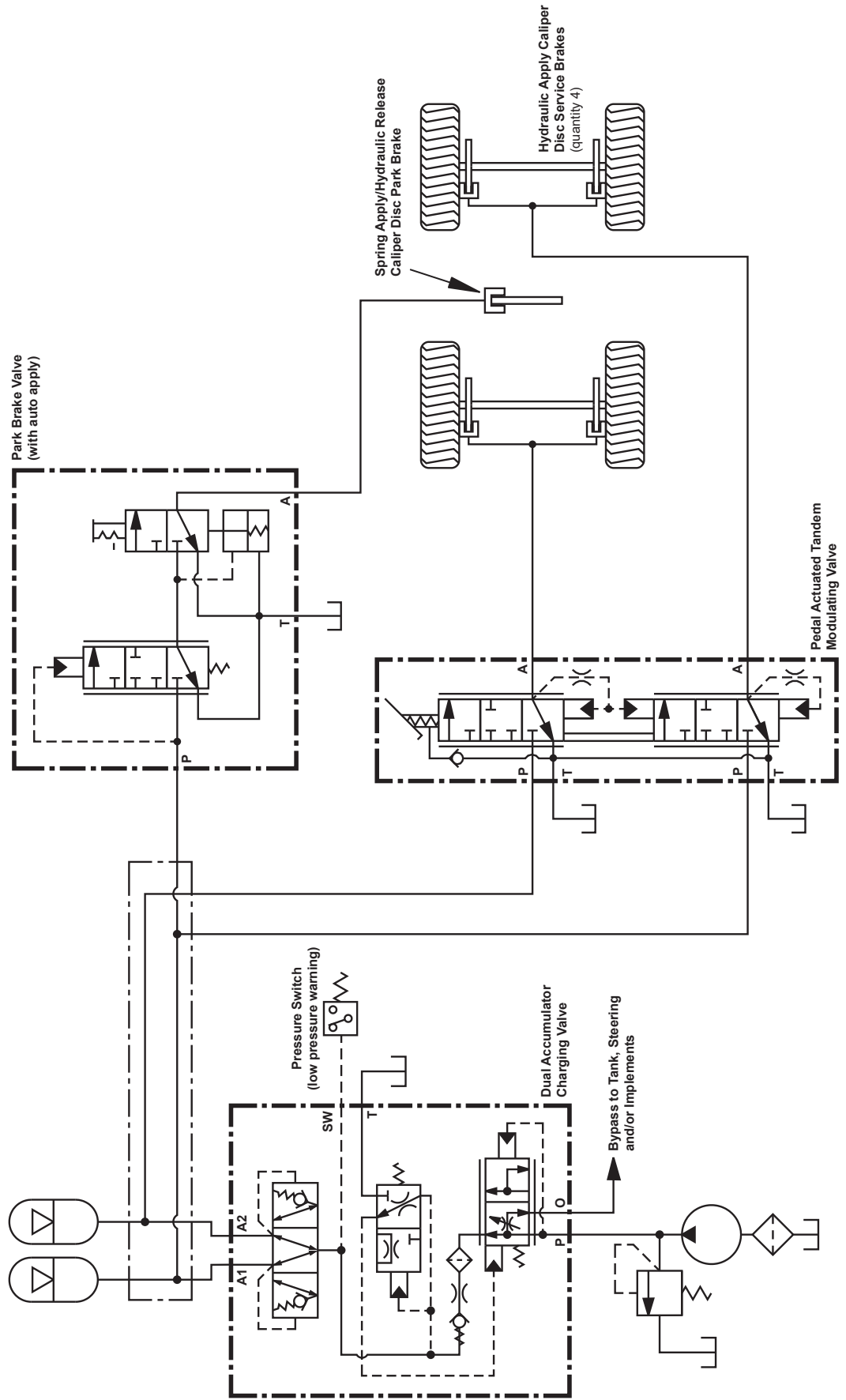
# Hydraulic Components and Brake Systems

## Wheel Loader example



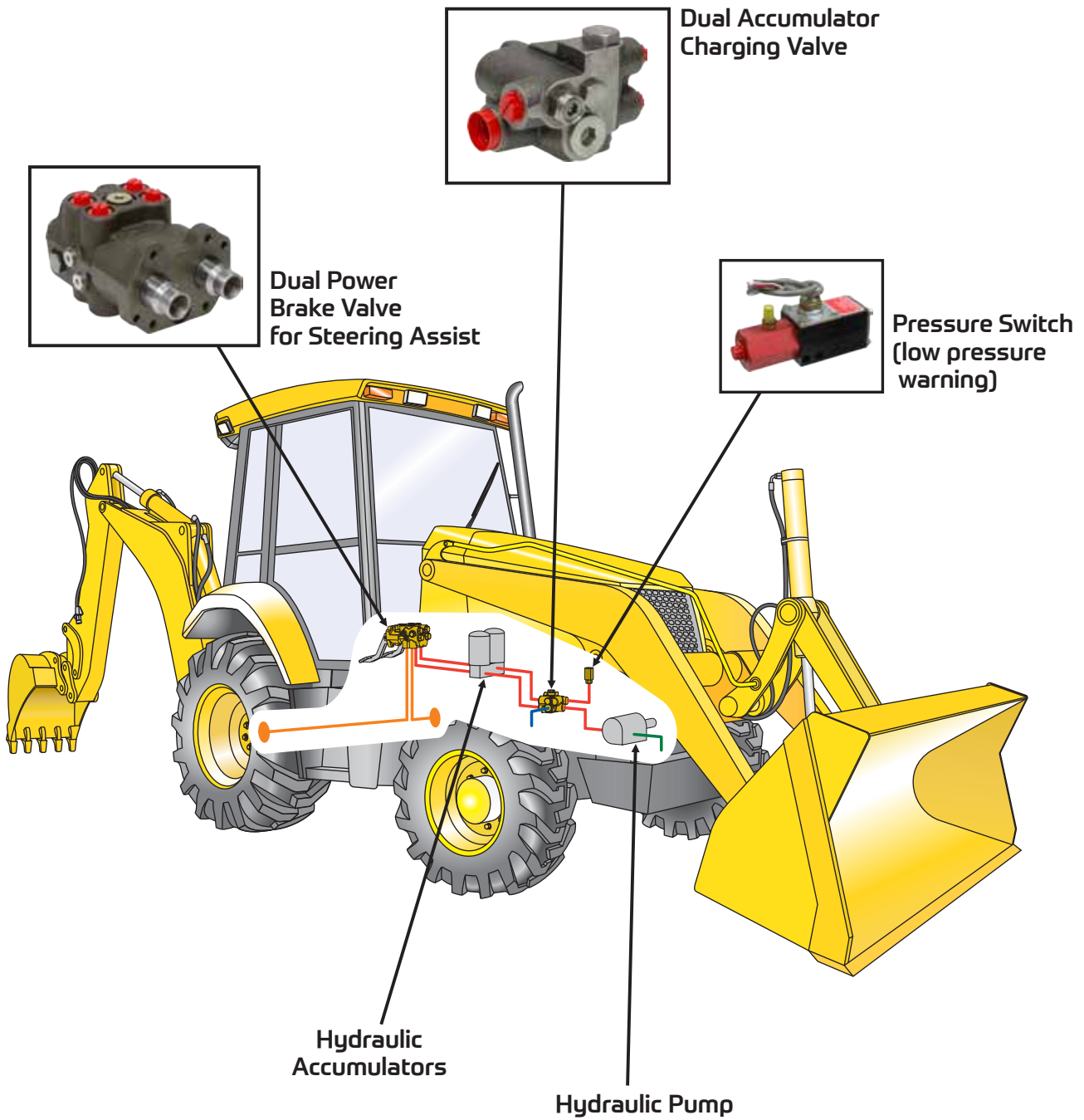


# Wheel Loader System Schematic

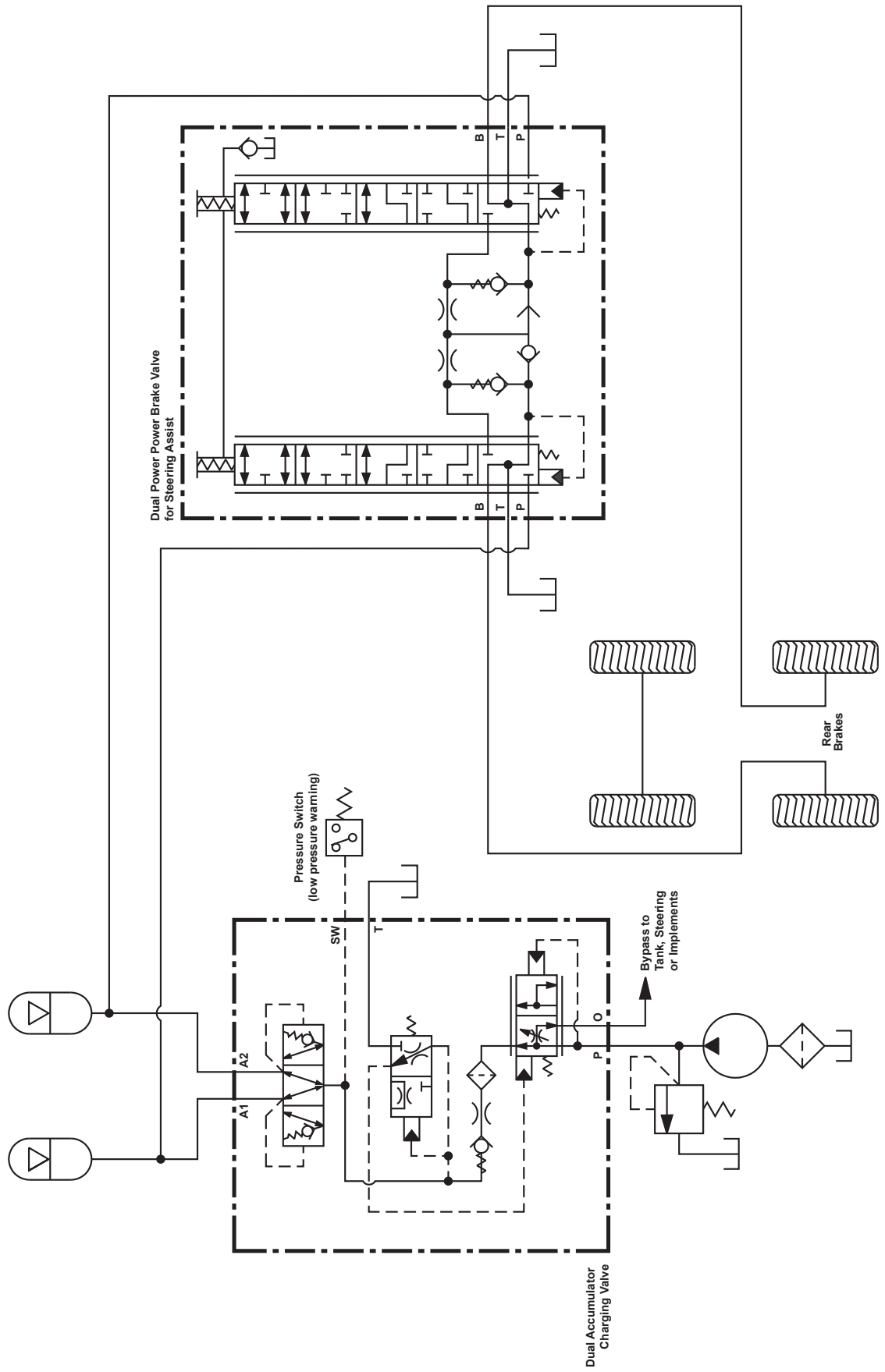


# Hydraulic Components and Brake Systems

## Backhoe Loader example

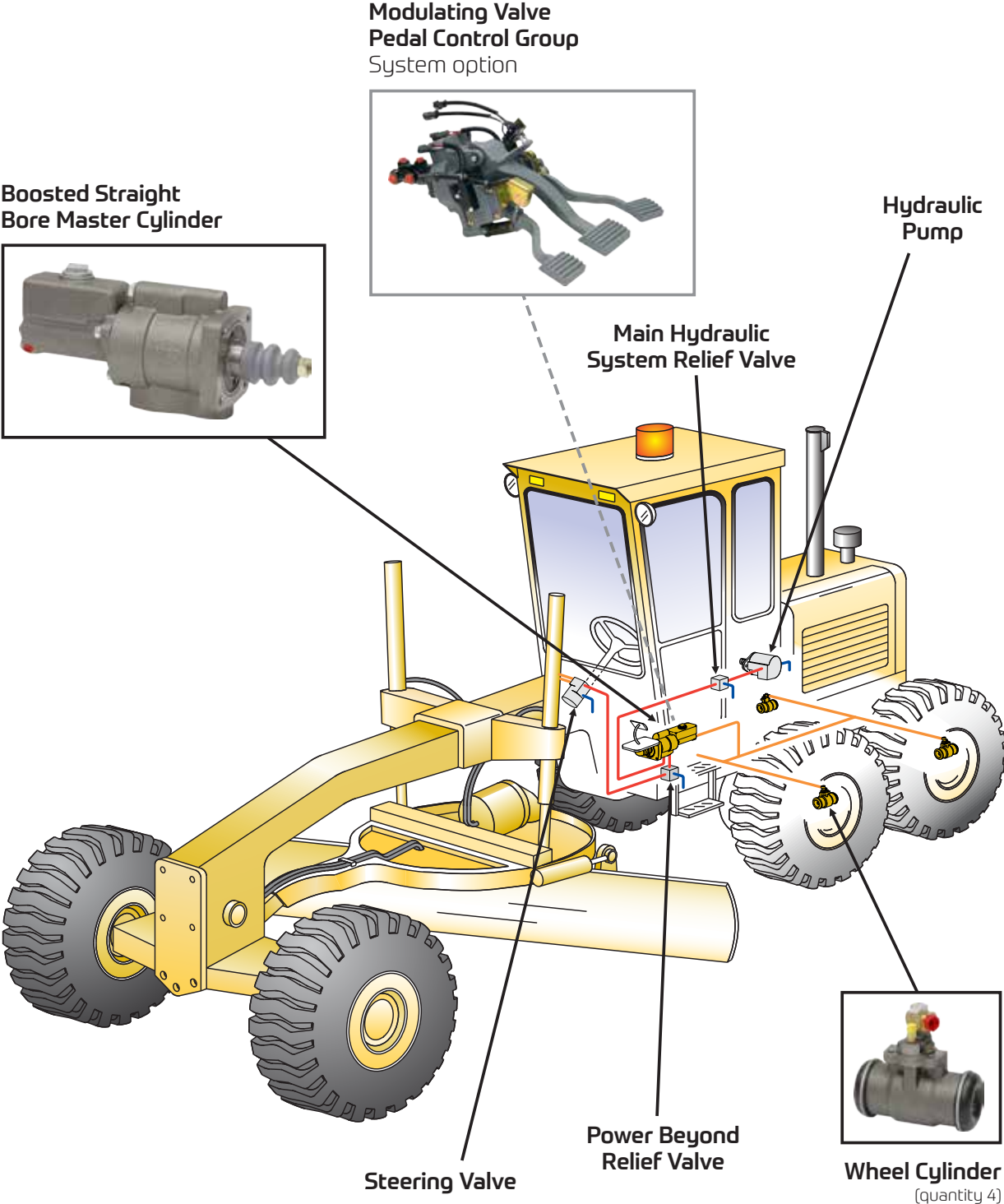


# Backhoe Loader System Schematic

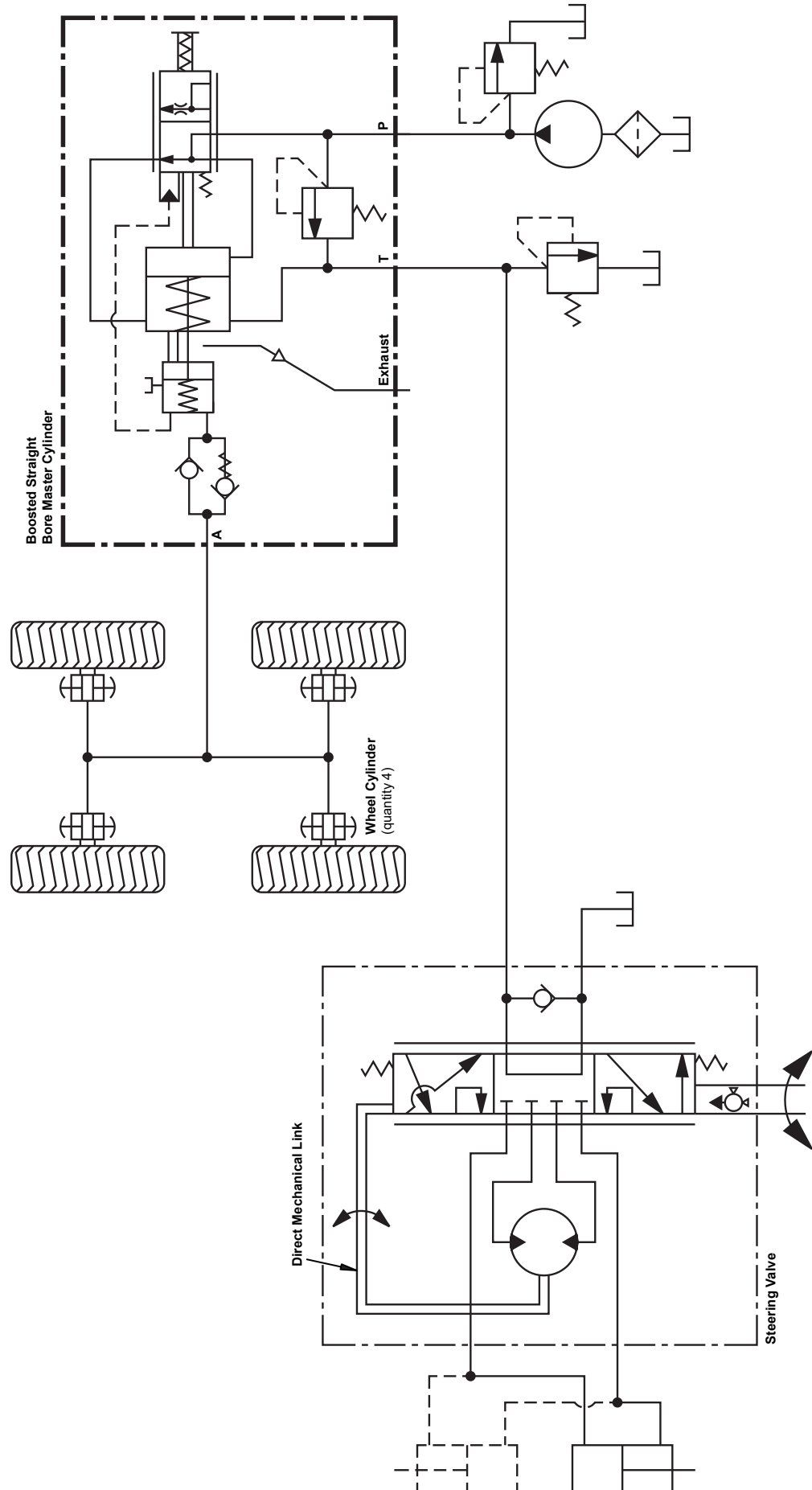


# Hydraulic Components and Brake Systems

## Motor Grader example

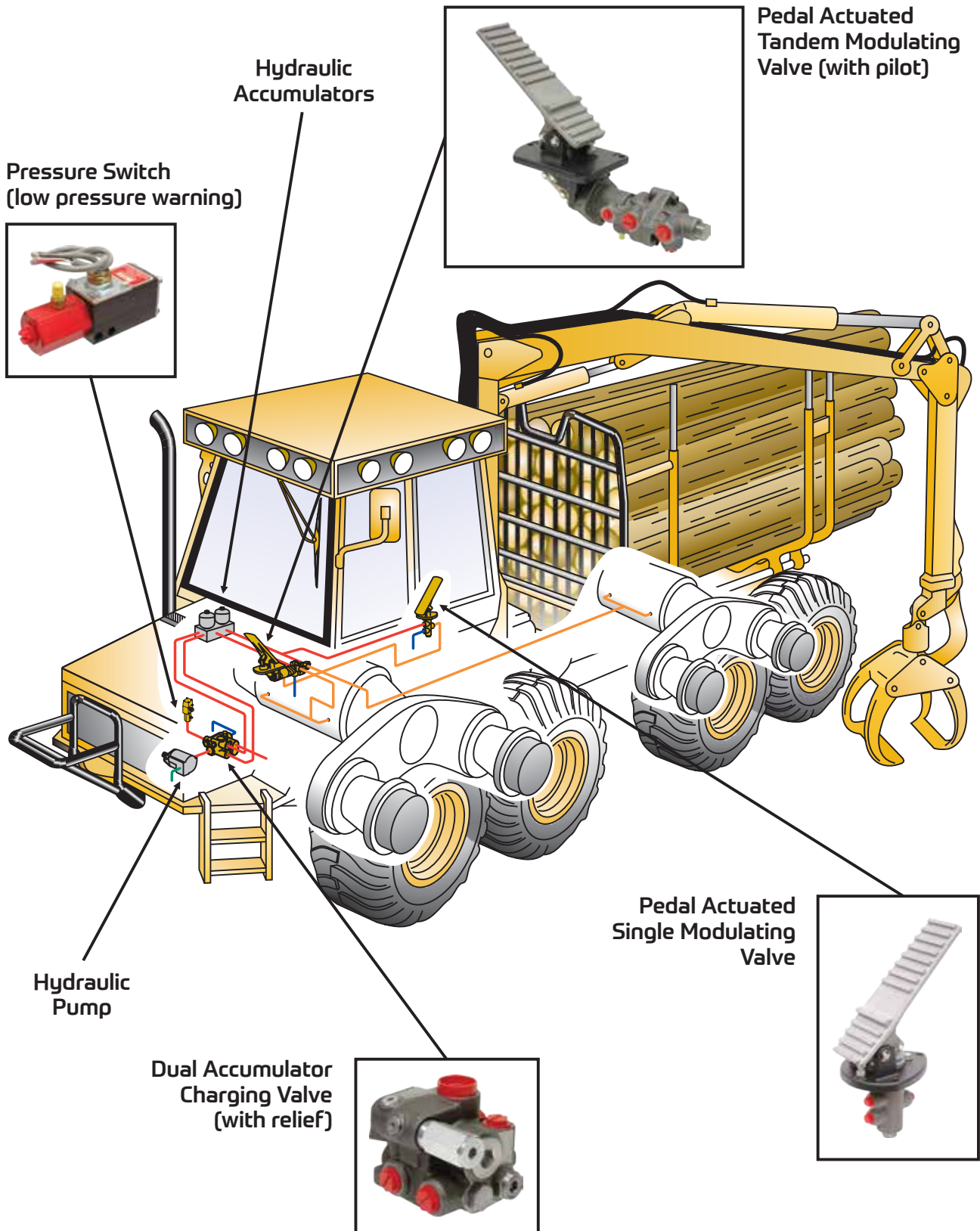


# Motor Grader System Schematic

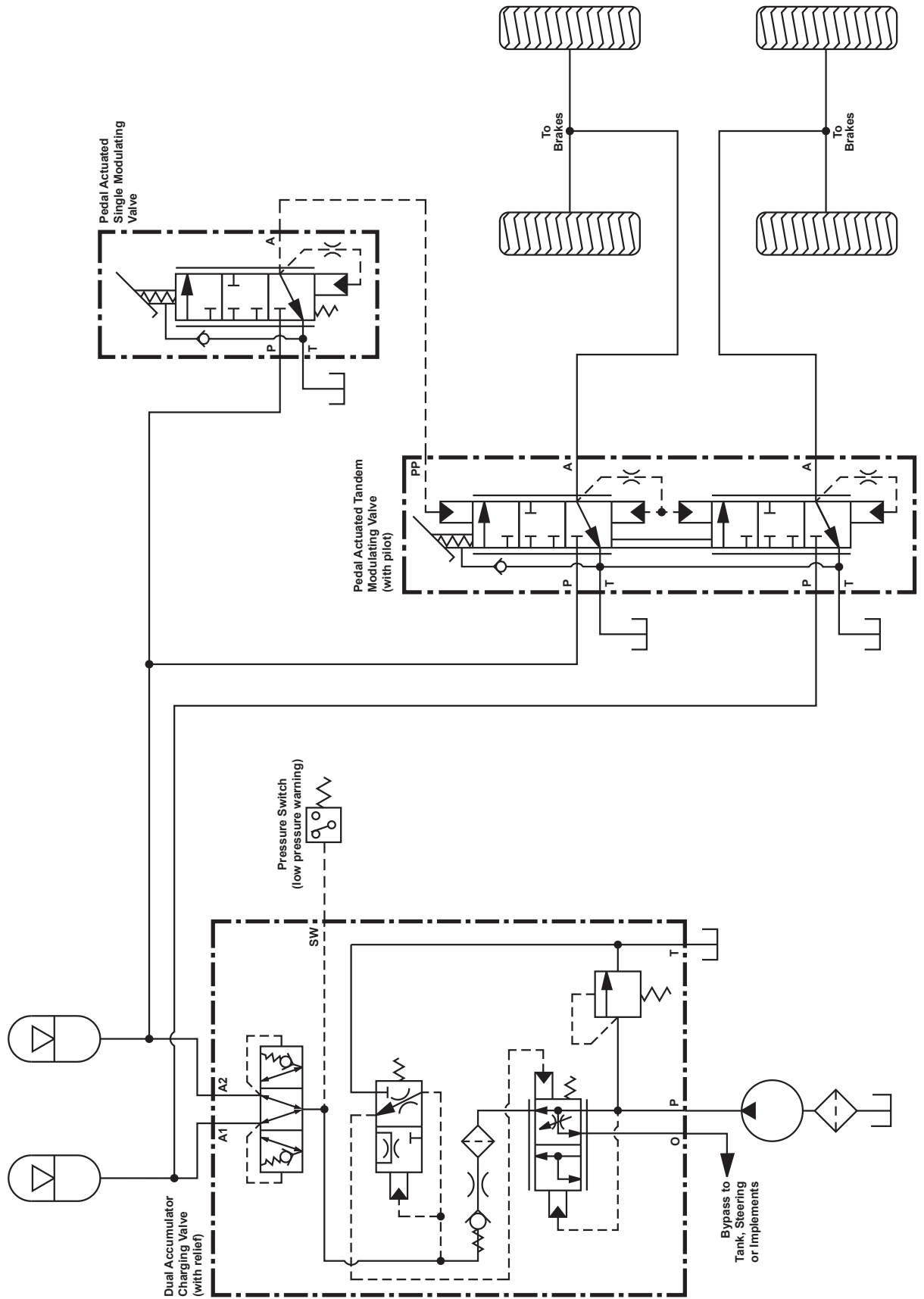


# Hydraulic Components and Brake Systems

## Logging Forwarder example

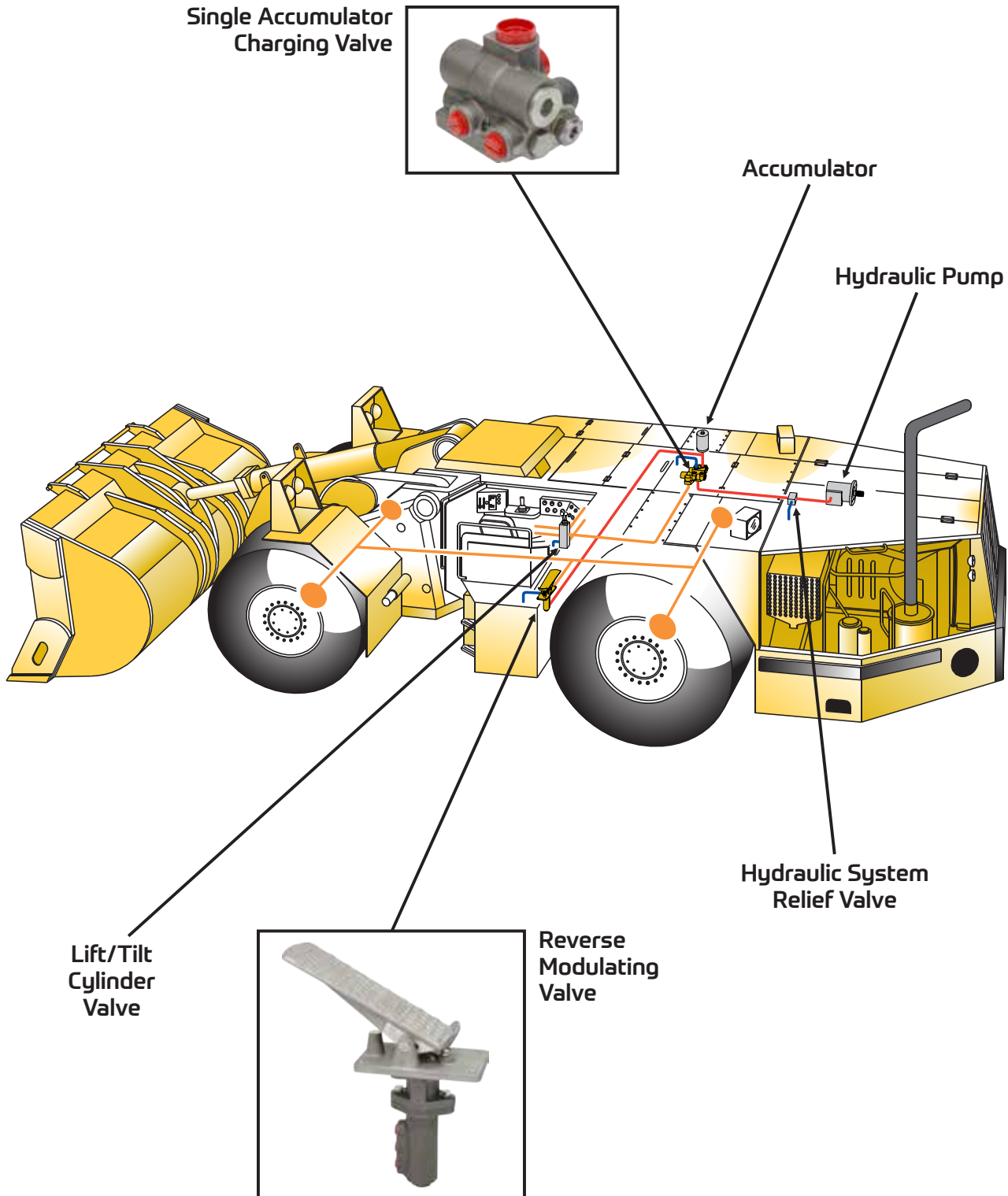


# Logging Forwarder System Schematic



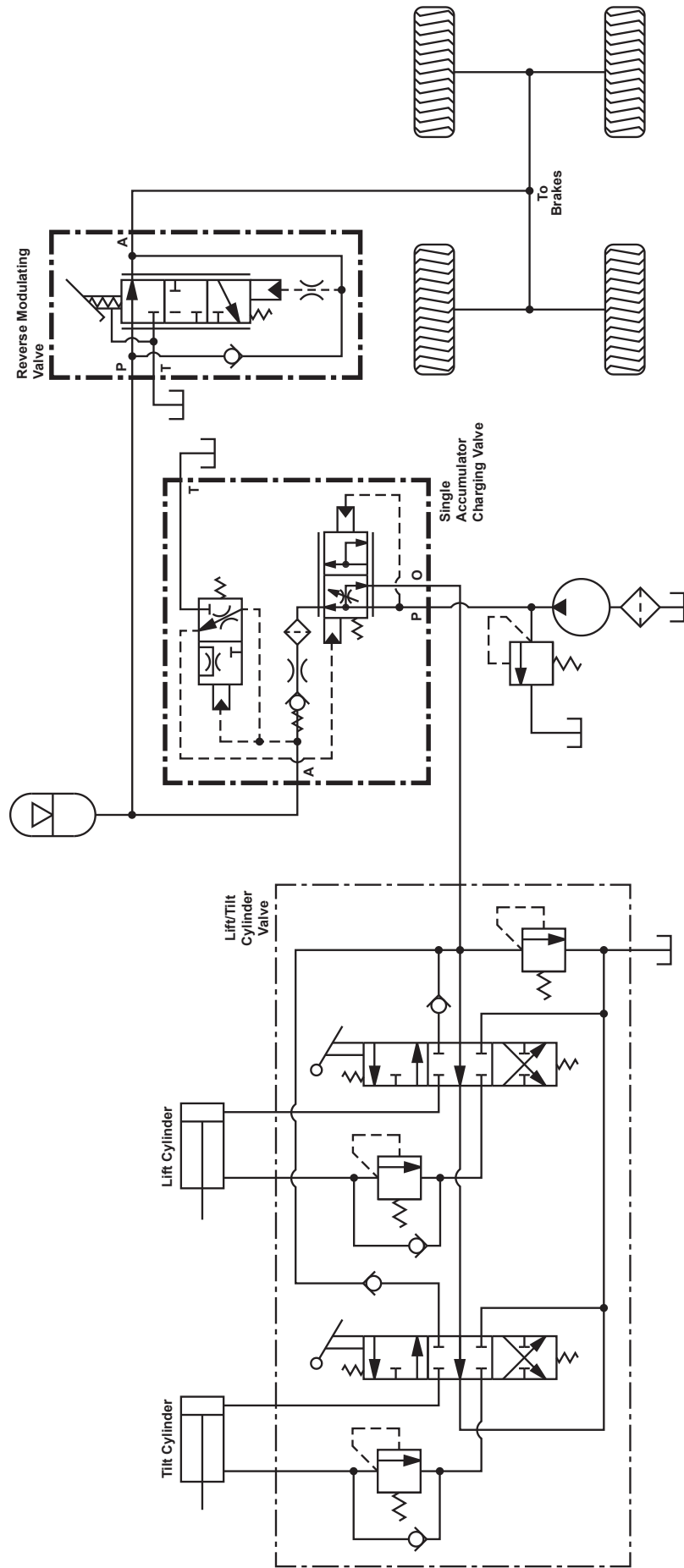
# Hydraulic Components and Brake Systems

## Underground Loader example



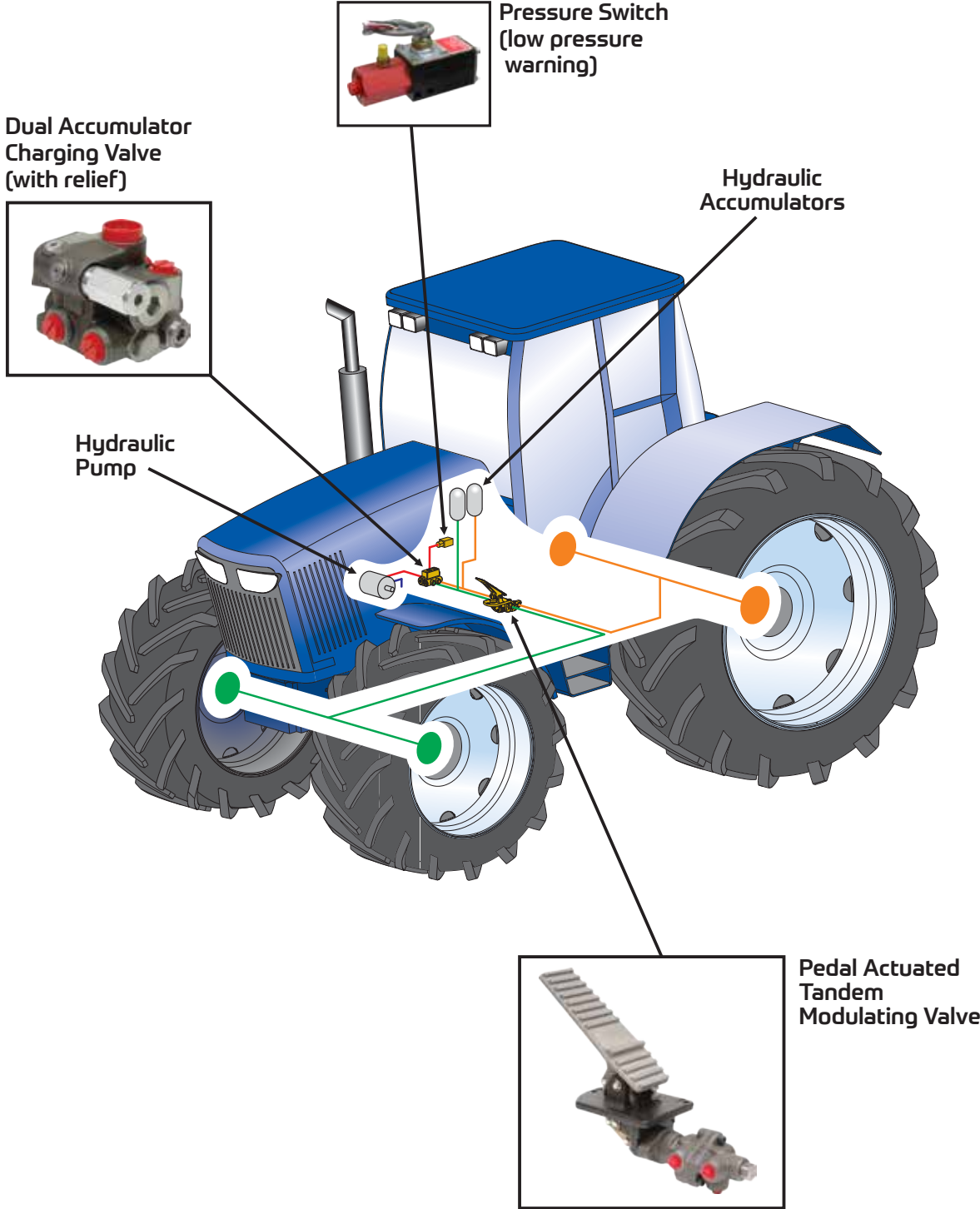


# Underground Loader System Schematic

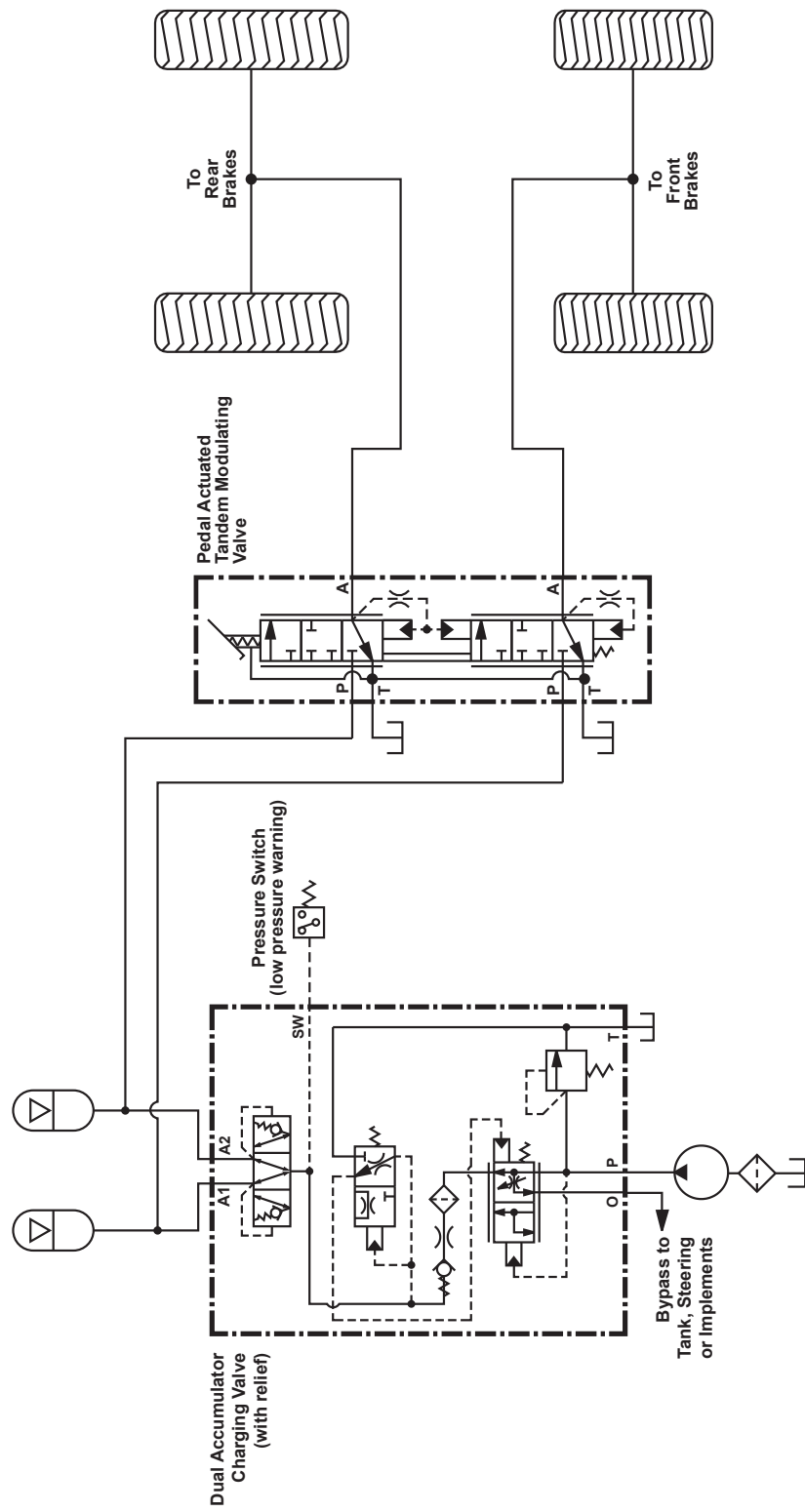


# Hydraulic Components and Brake Systems

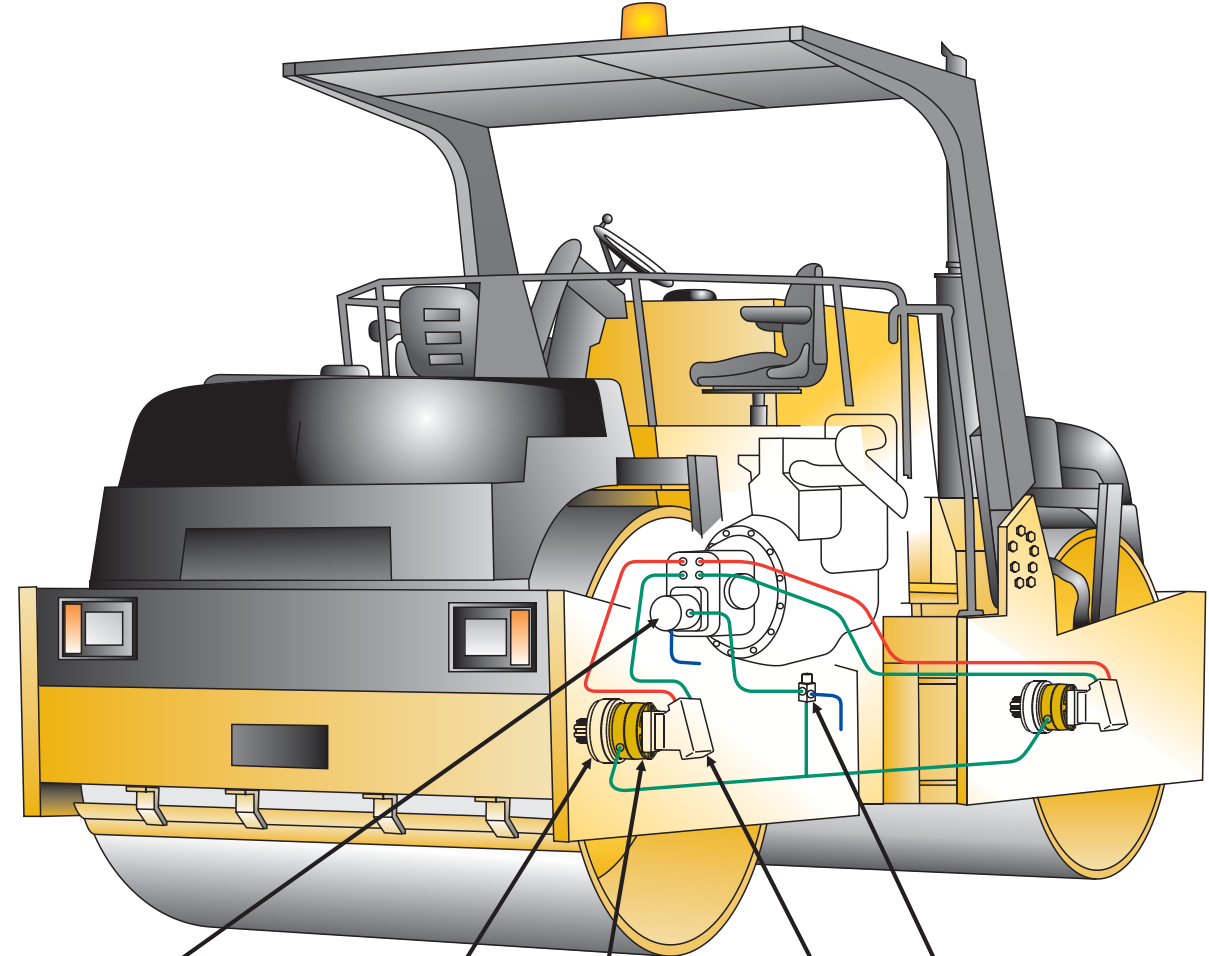
## Agricultural Tractor example



# Agricultural Tractor System Schematic



# Road Roller example



Engine Driven Pump

Park Brake Valve

Gear Box  
(quantity 2)

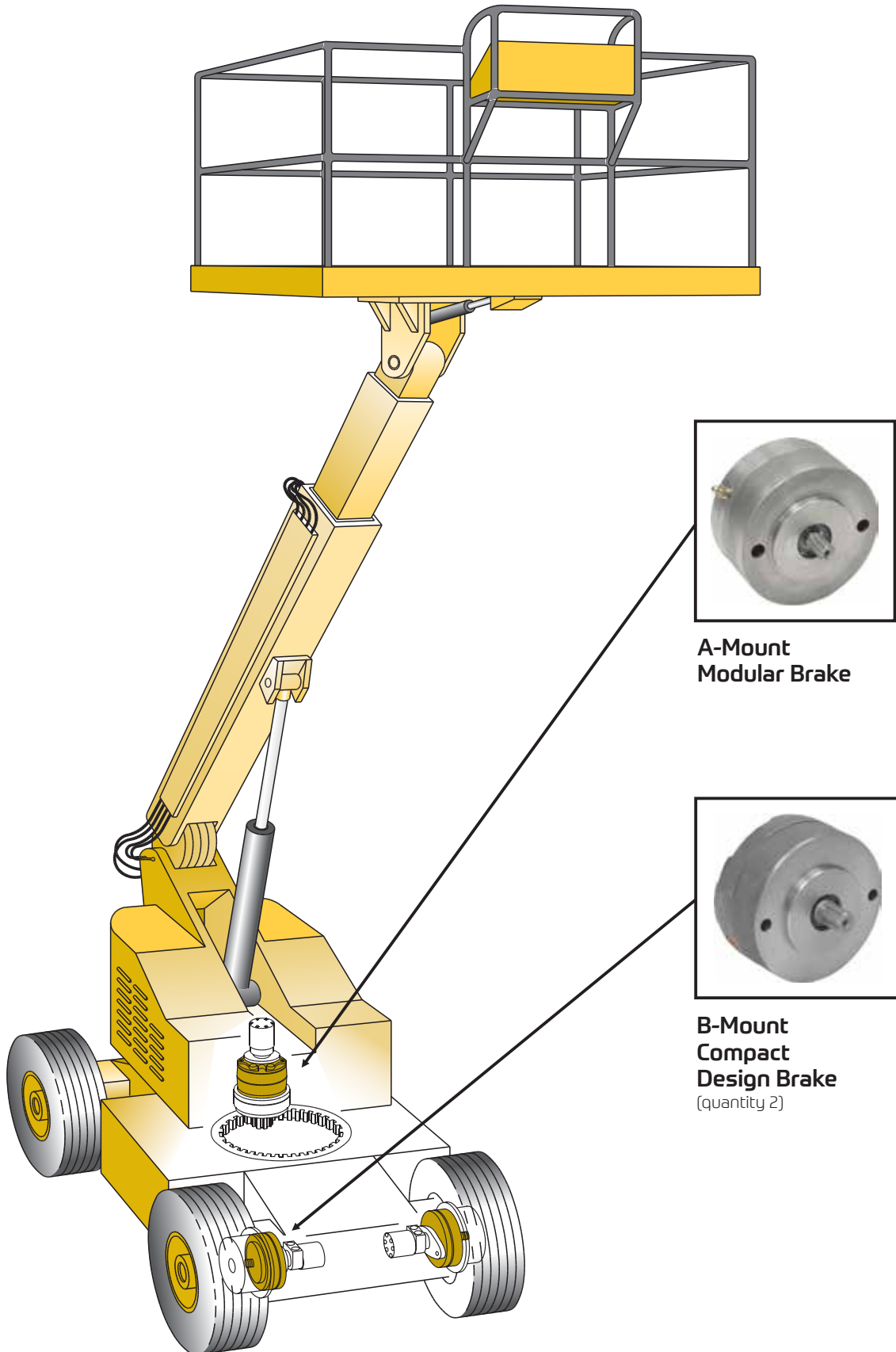
Hydraulic Motor  
(quantity 2)



C-Mount Multiple Disc Brake  
(modular design)  
(quantity 2)

# Hydraulic Components and Brake Systems

## Manlift example



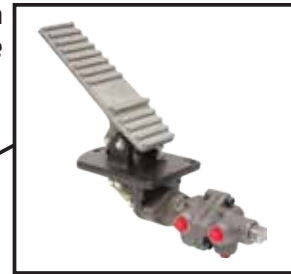
# Hydraulic Components and Brake Systems

## Straddle Carrier example

**Relay Valve**  
(quantity 4)



**Pedal Actuated Tandem Modulating Valve**



**Accumulator**  
(quantity 2)

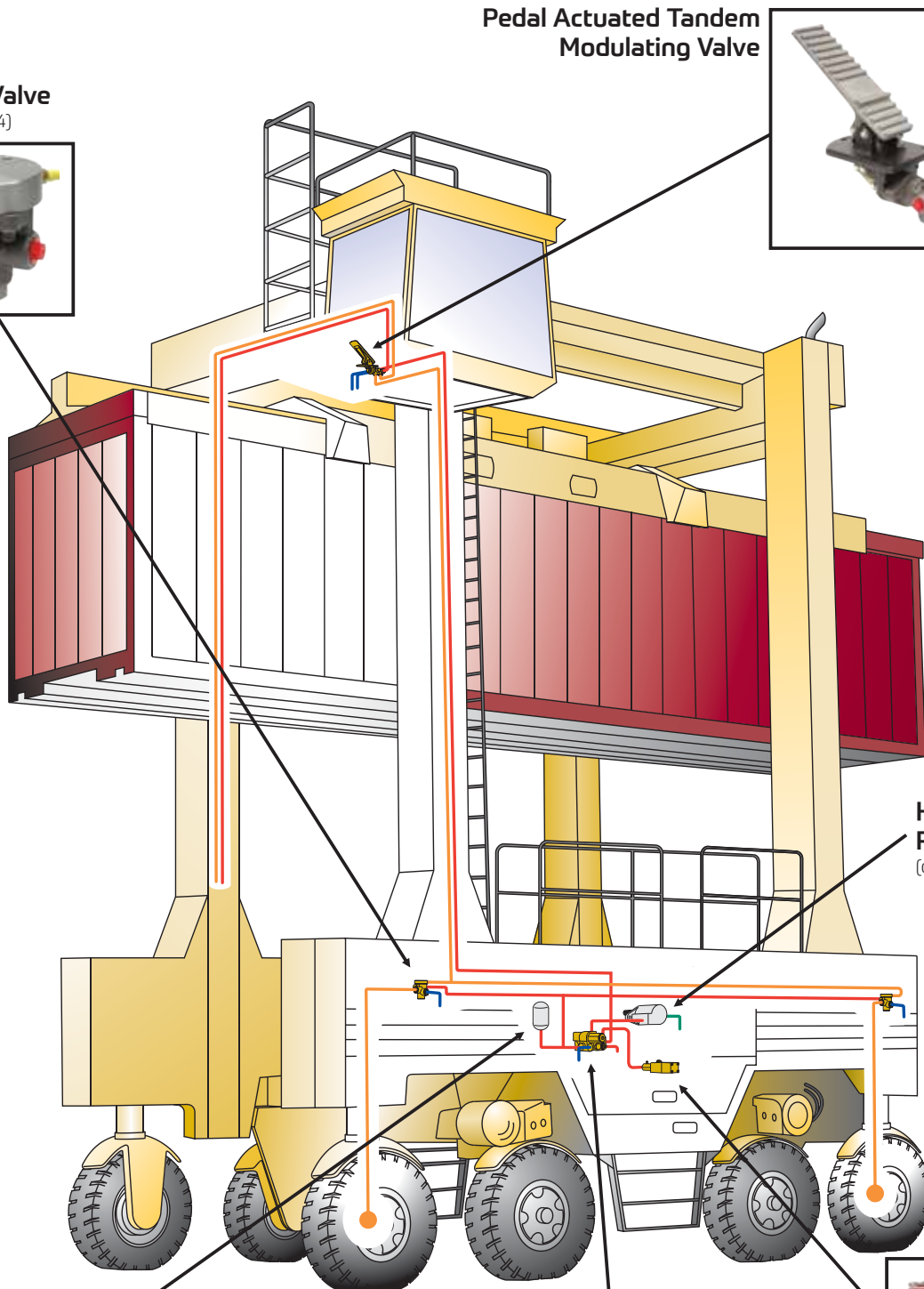
**Single Accumulator Charging Valve (with relief)**  
(quantity 2)



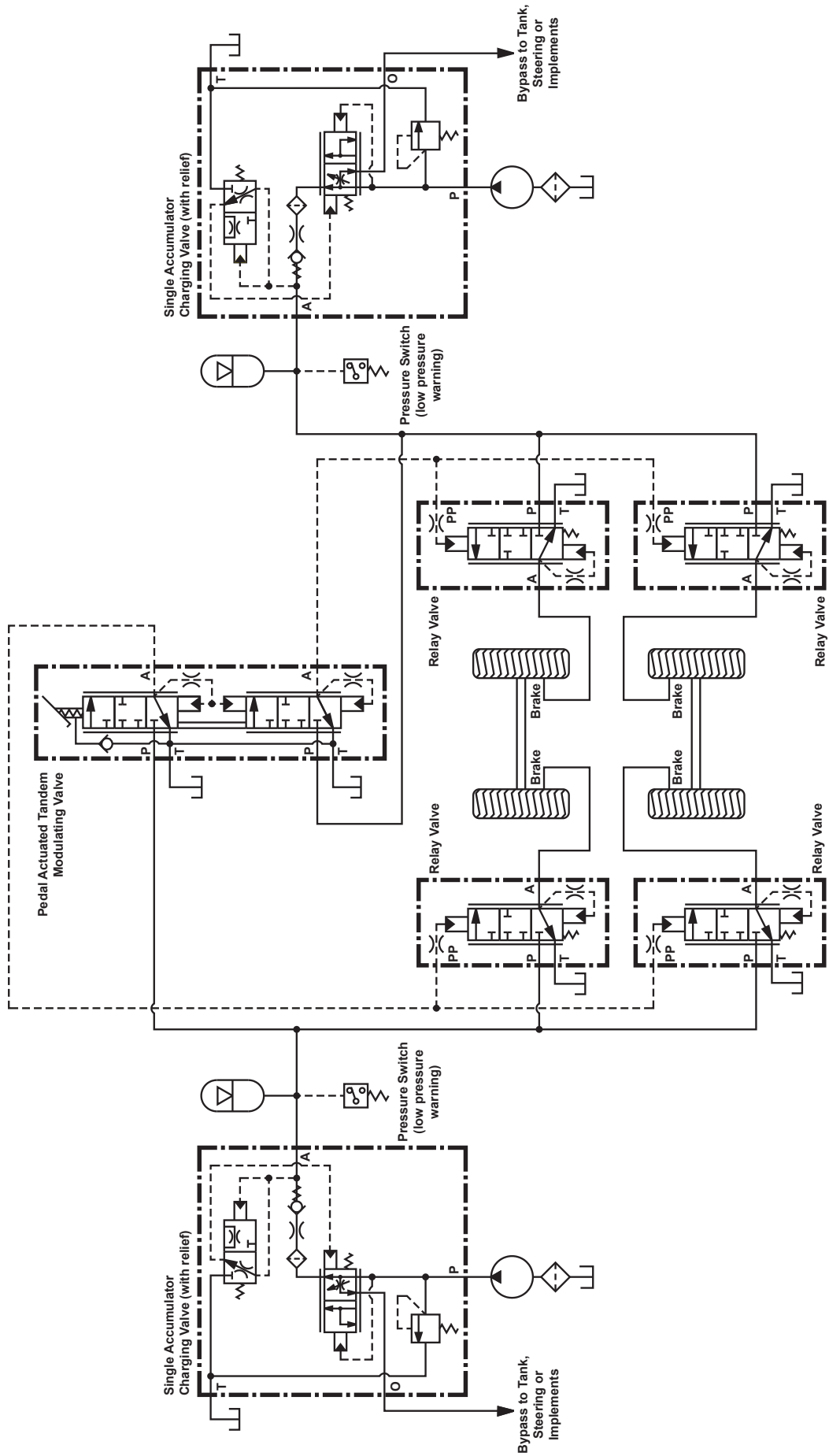
**Pressure Switch (low pressure warning)**  
(quantity 2)



**Hydraulic Pump**  
(quantity 2)

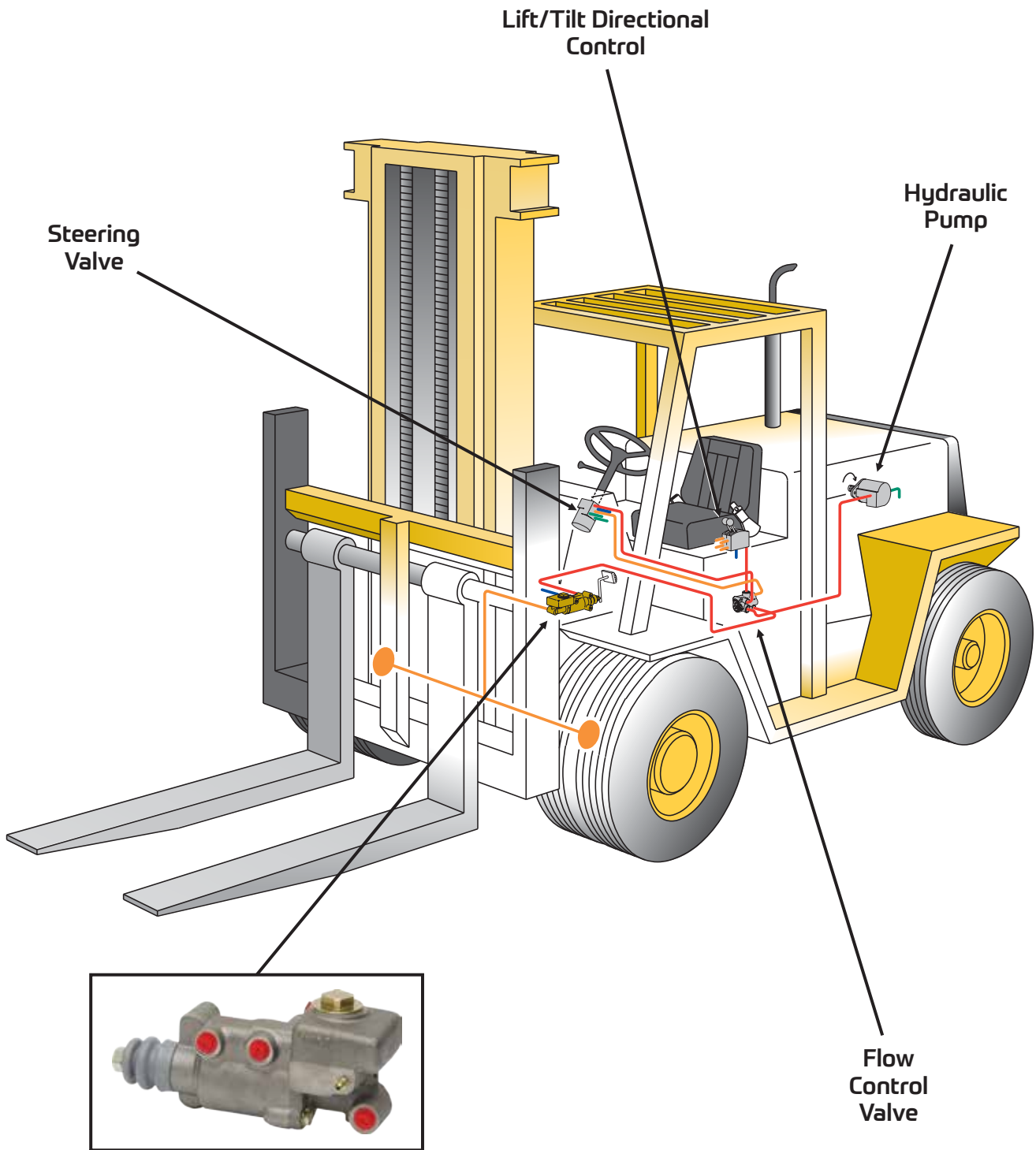


# Straddle Carrier System Schematic



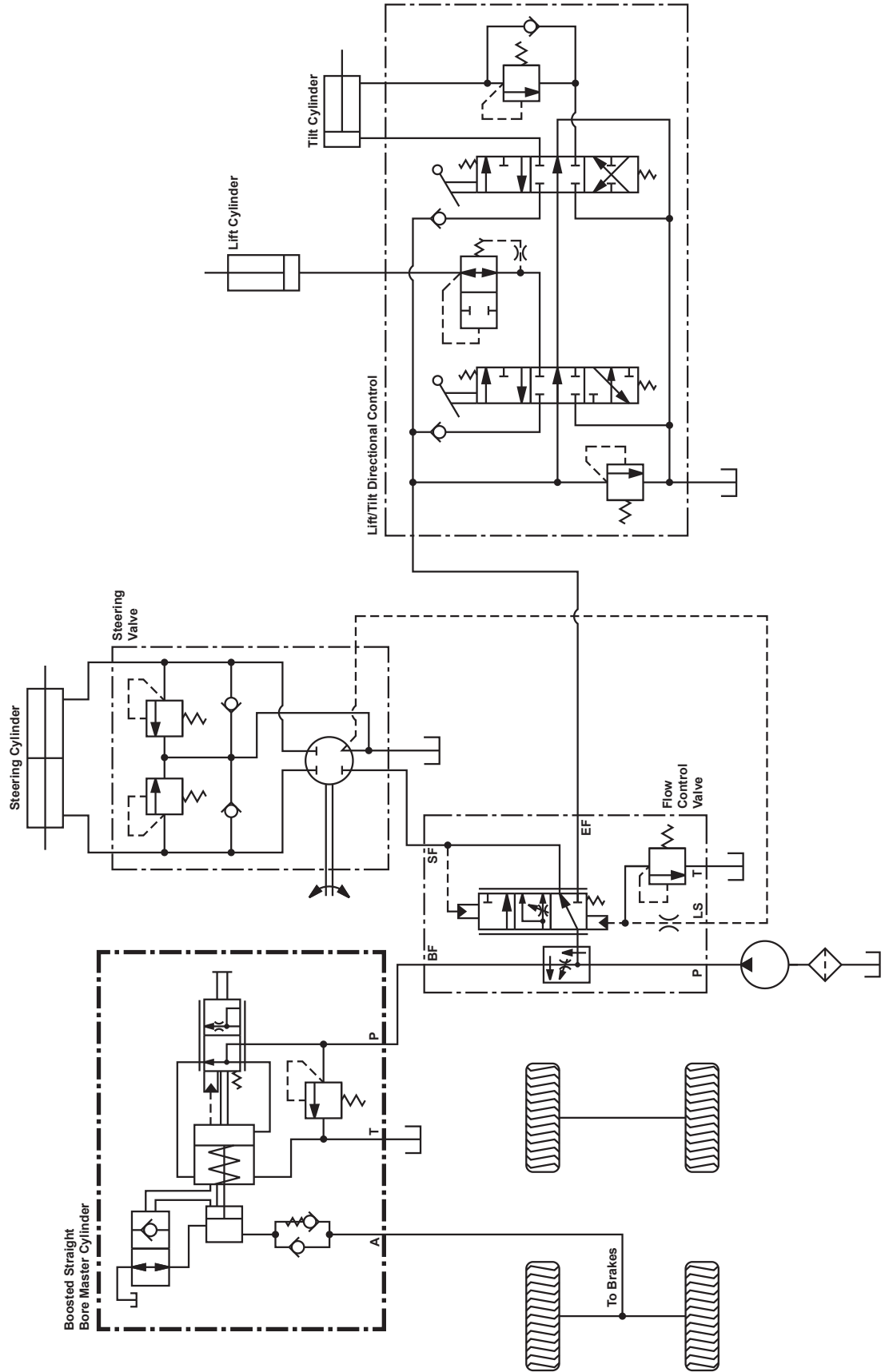
# Hydraulic Components and Brake Systems

## Forklift example

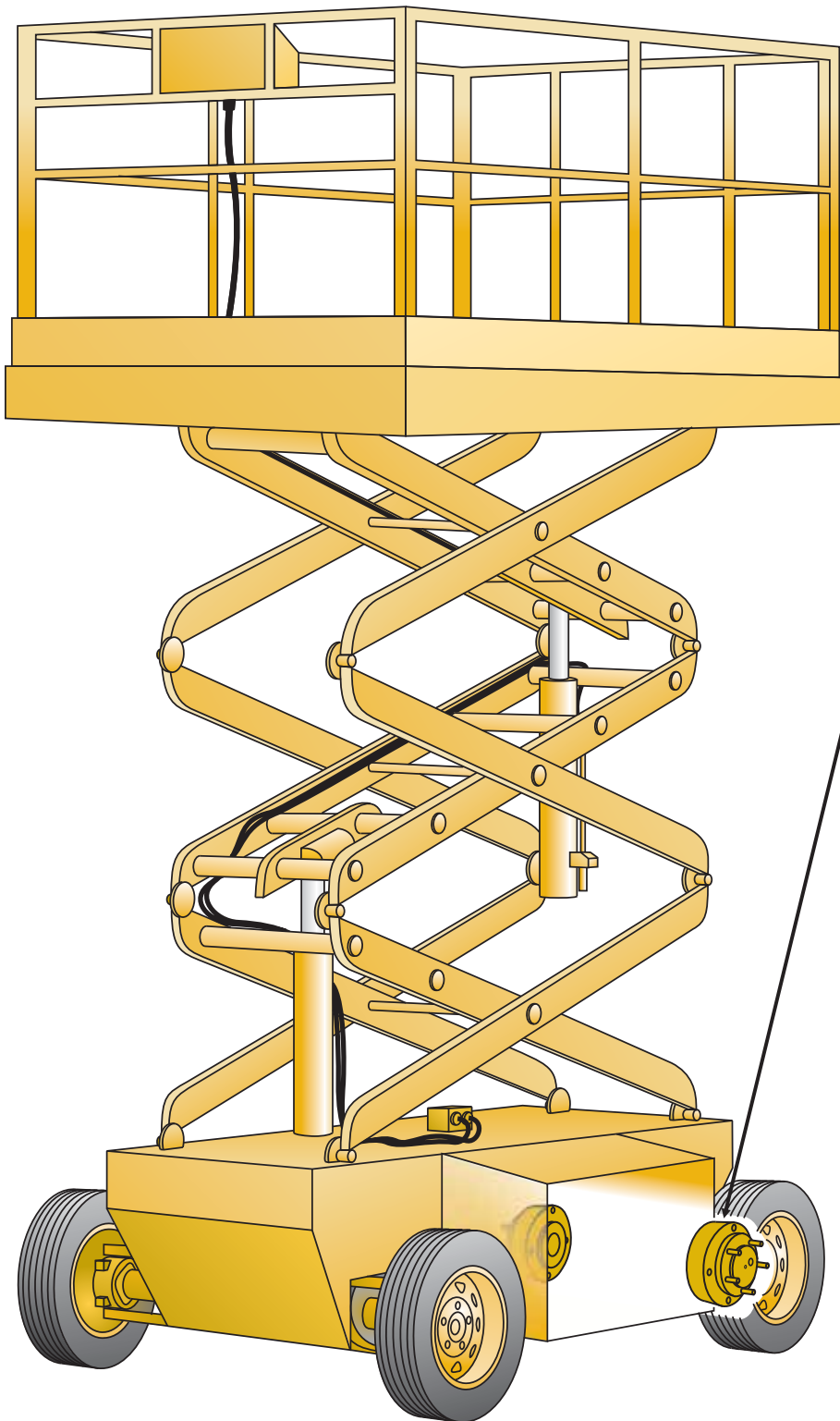




# Forklift System Schematic



## Scissors Lift example



**Compact Wheel Mount Multiple Disc Brake**  
(quantity 2)



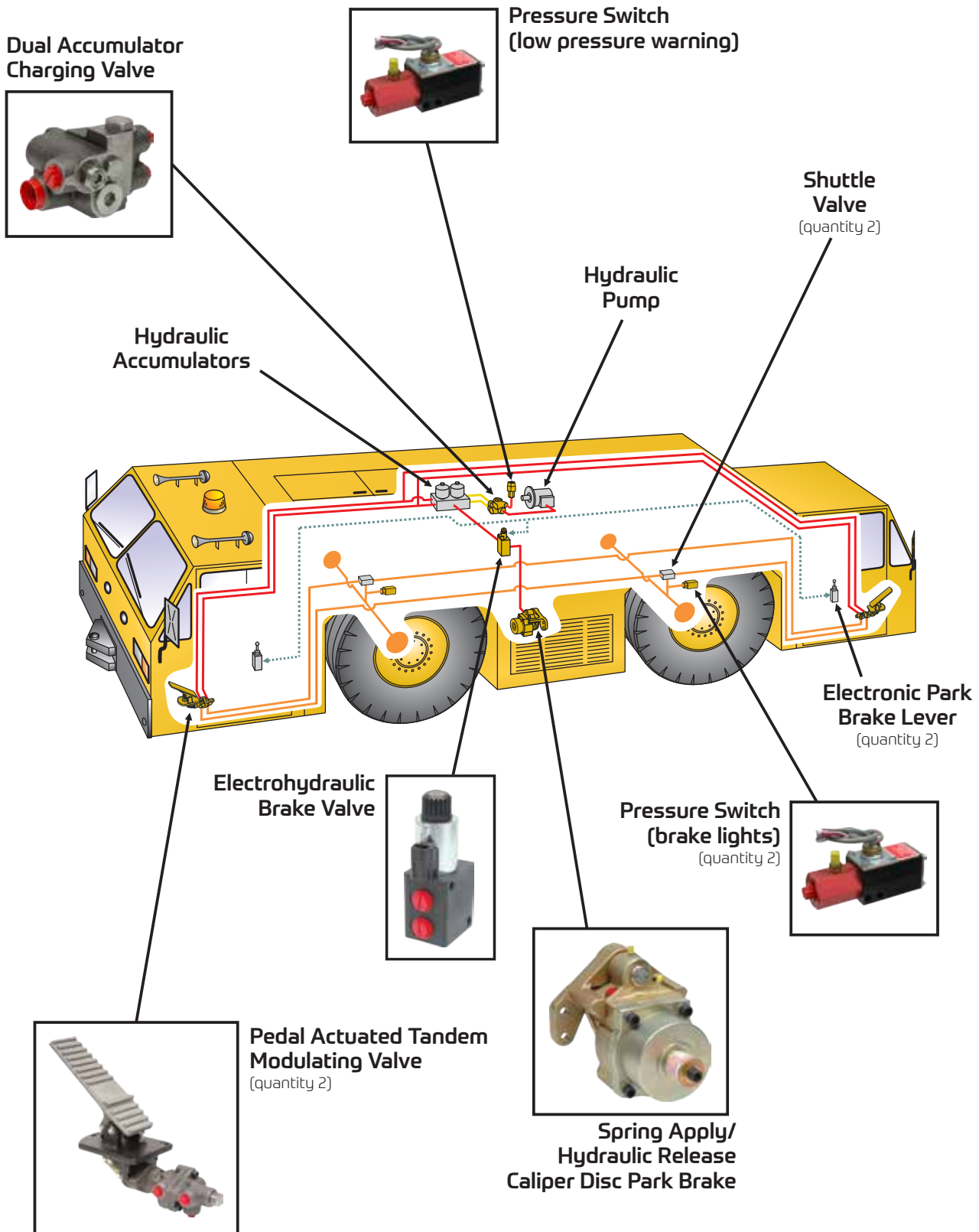
**Large Wheel Mount Multiple Disc Brake (motor input)**  
For heavier load applications

# ELECTROHYDRAULIC COMPONENTS & BRAKE SYSTEMS

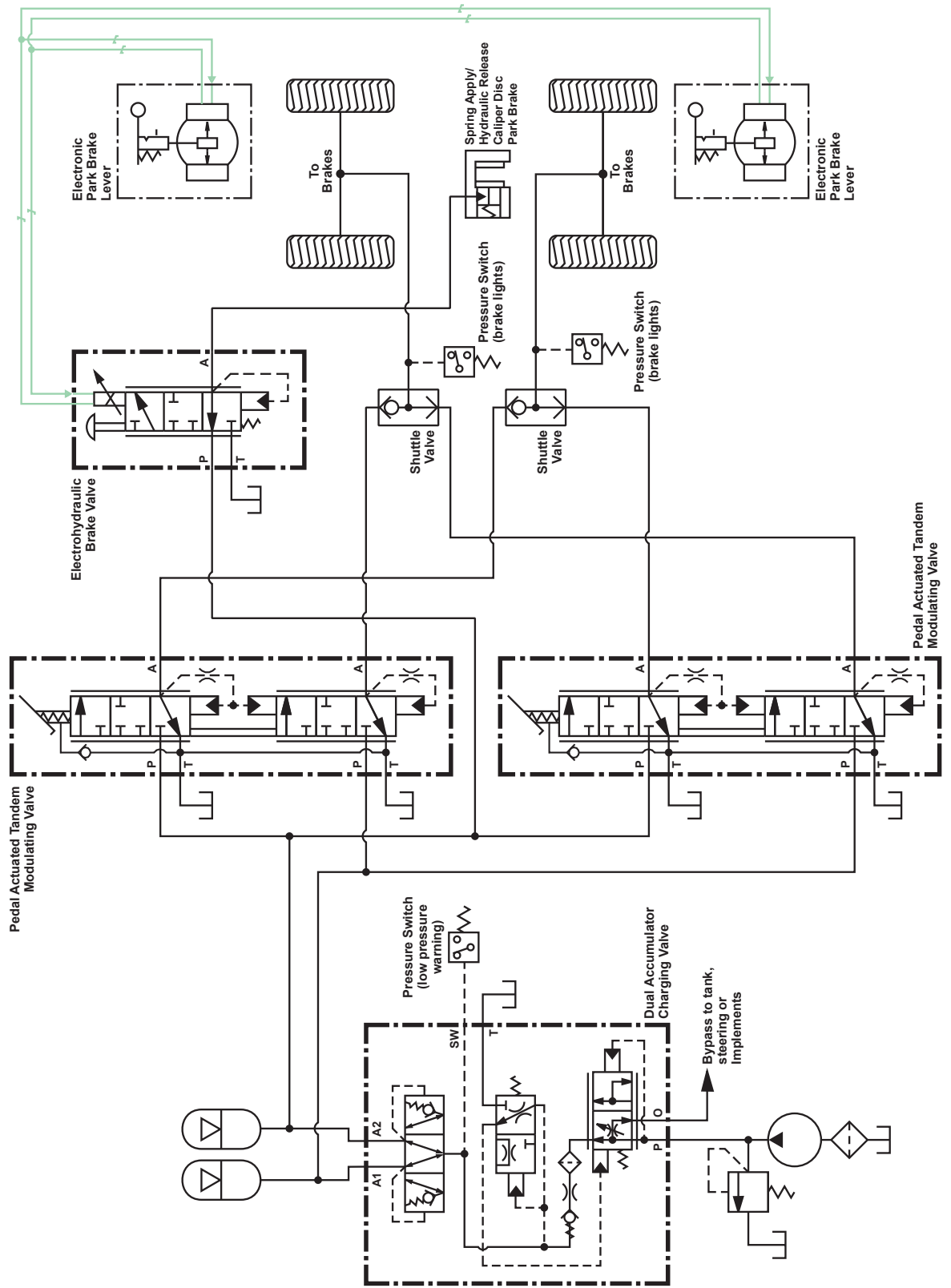


# Electrohydraulic Components and Brake Systems

## Aircraft Tow Tractor example

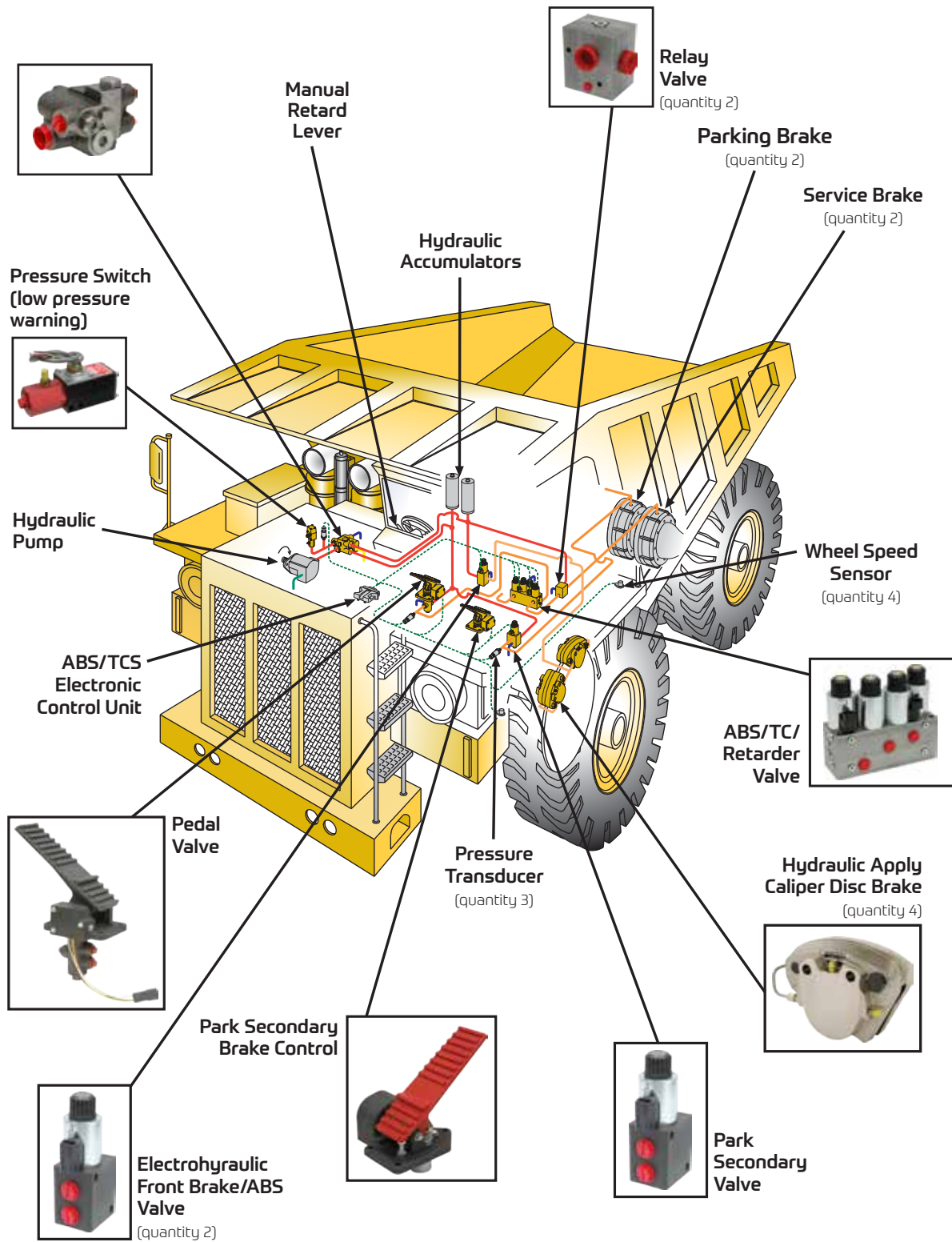


# Aircraft Tow Tractor System Schematic

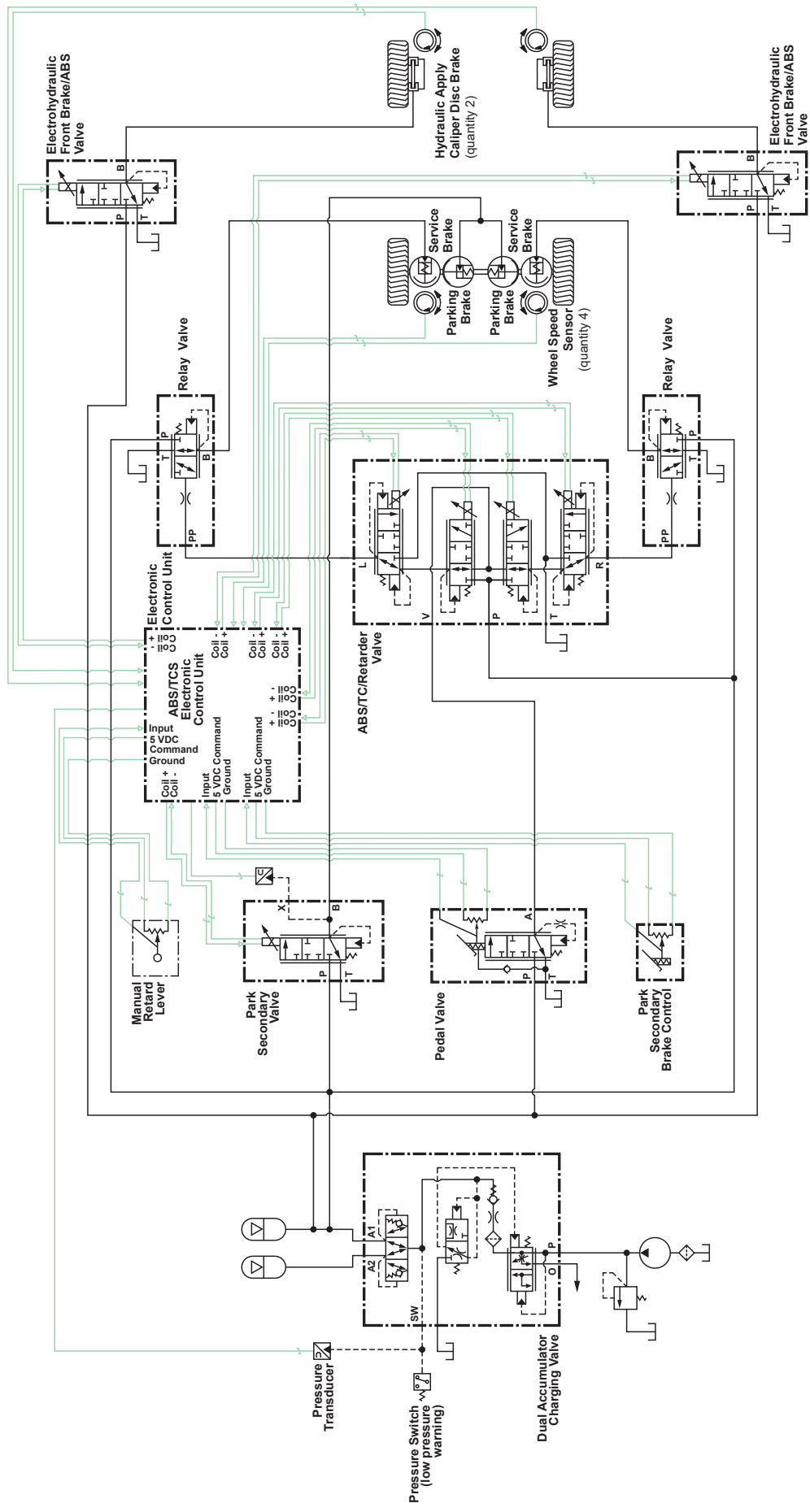


# Electrohydraulic Components and Brake Systems

## Haul Truck example



# Haul Truck System Schematic



# Electrohydraulic Components and Brake Systems

## Wheel Loader example



Electronic Pedal

CAN Valve Driver  
(quantity 2)

Pressure Switch  
(low pressure warning)



Hydraulic Accumulators

Hydraulic Pump

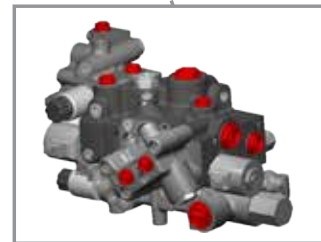


Electrohydraulic Brake Valve  
(quantity 2)

Hydraulic Apply Caliper Disc Service Brake  
(quantity 4)



Dual Accumulator Charging Valve

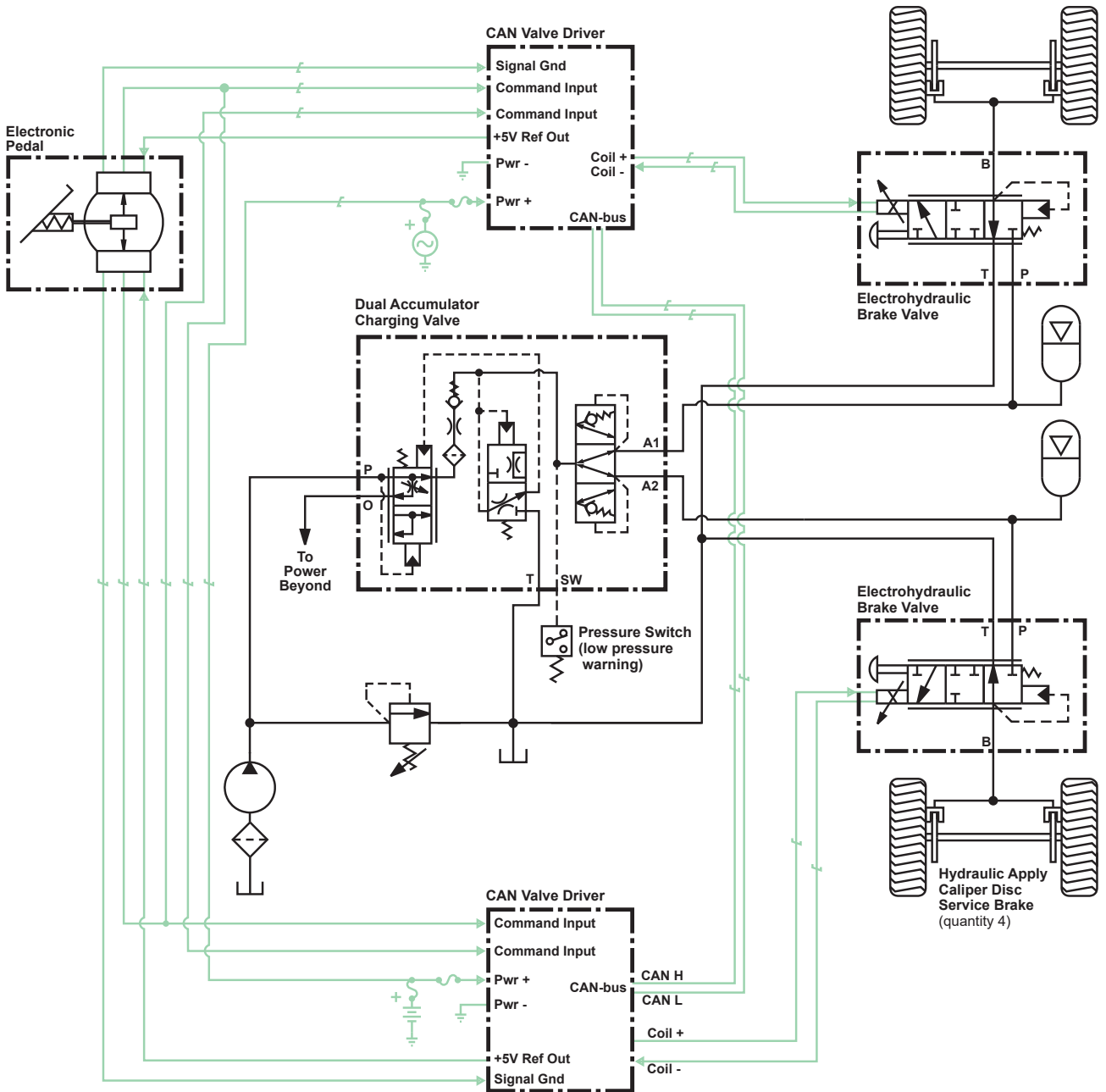


Universal Charging Valve  
System option

**NOTE: A redundant method of powering the system is required. It is the machine manufacturers responsibility to insure that a single point power failure does not result in non-functional brakes.**



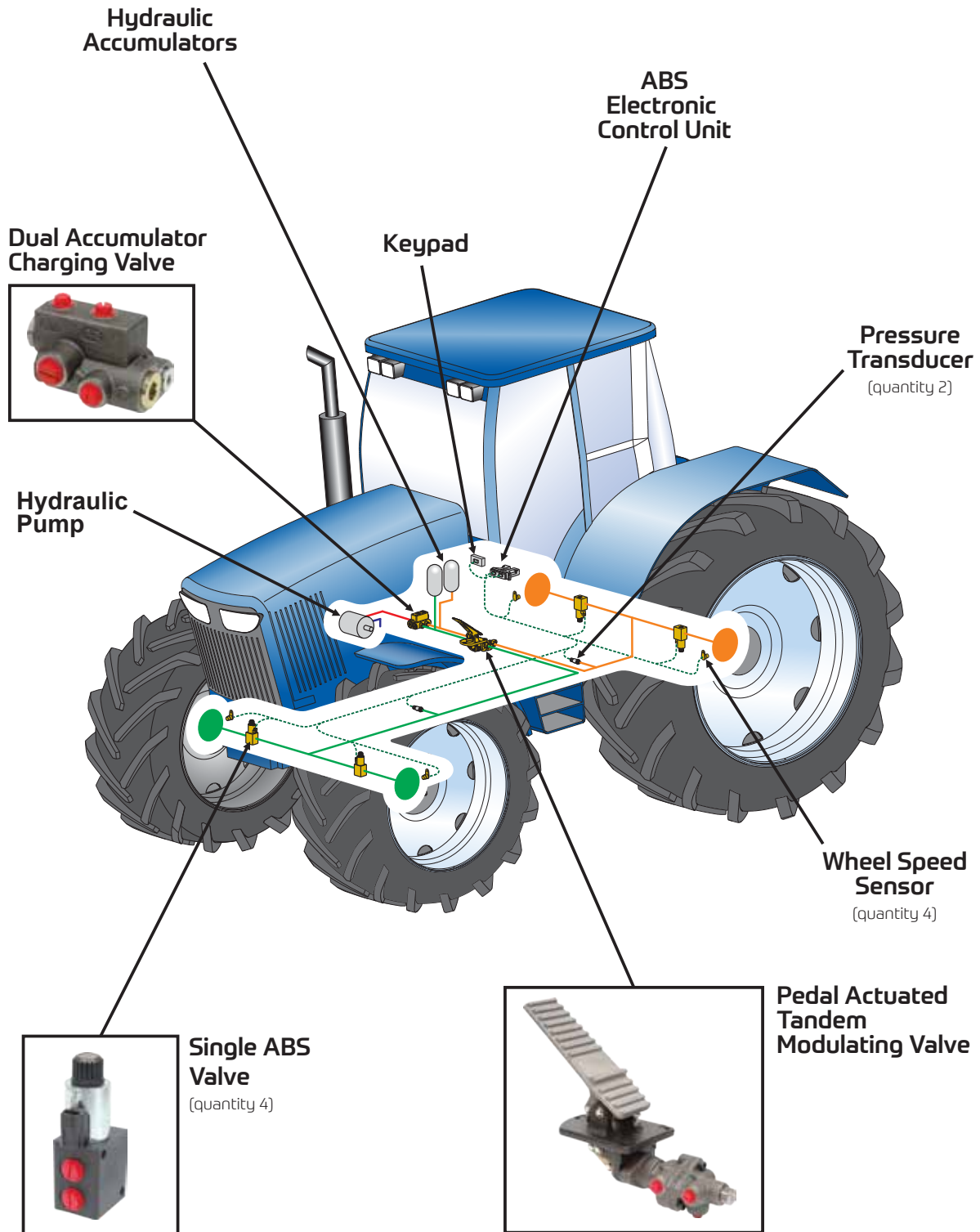
# Wheel Loader System Schematic



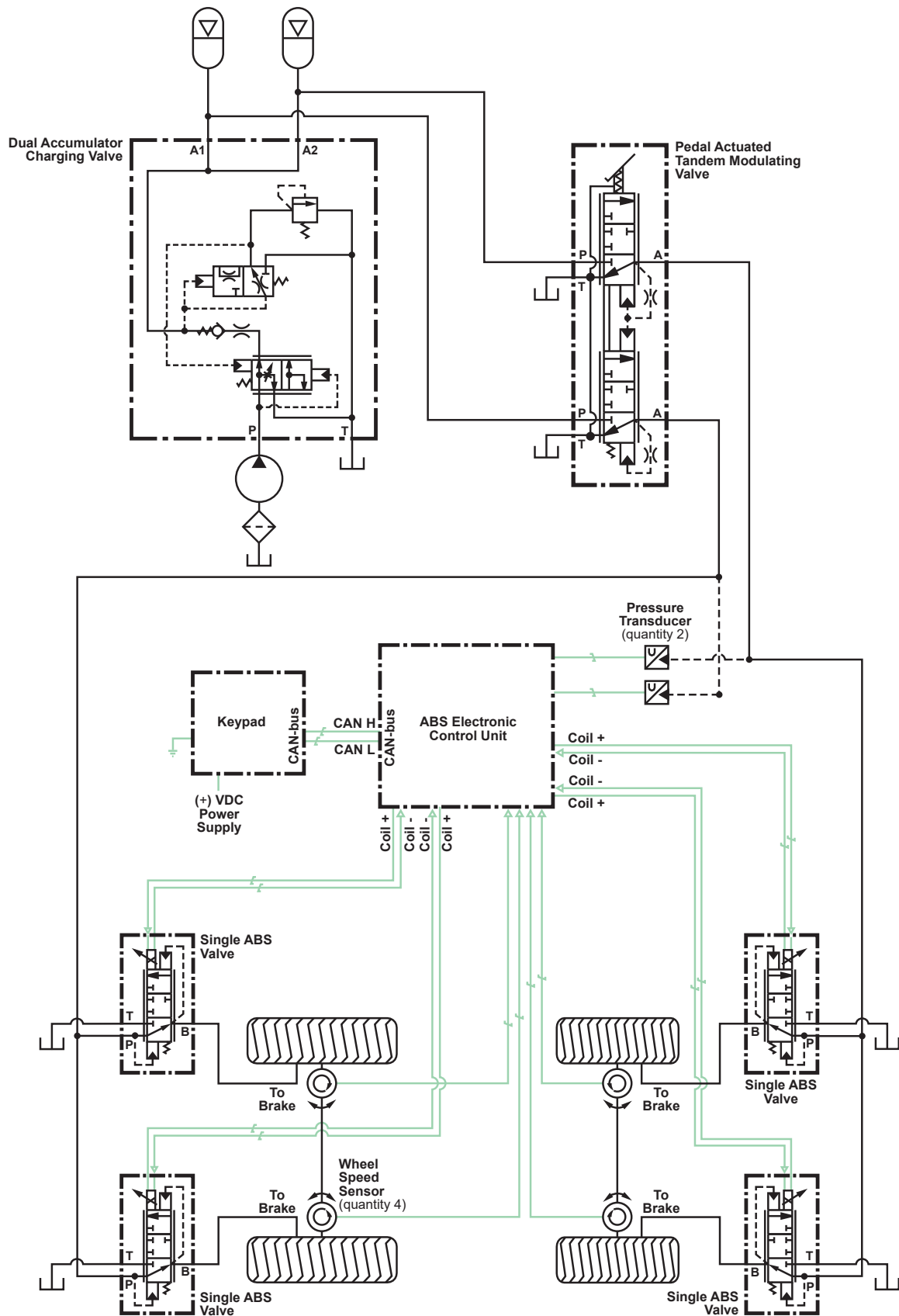
**NOTE:** A redundant method of powering the system is required. It is the machine manufacturers responsibility to insure that a single point power failure does not result in non-functional brakes.

# Electrohydraulic Components and Brake Systems

## Agricultural Tractor example

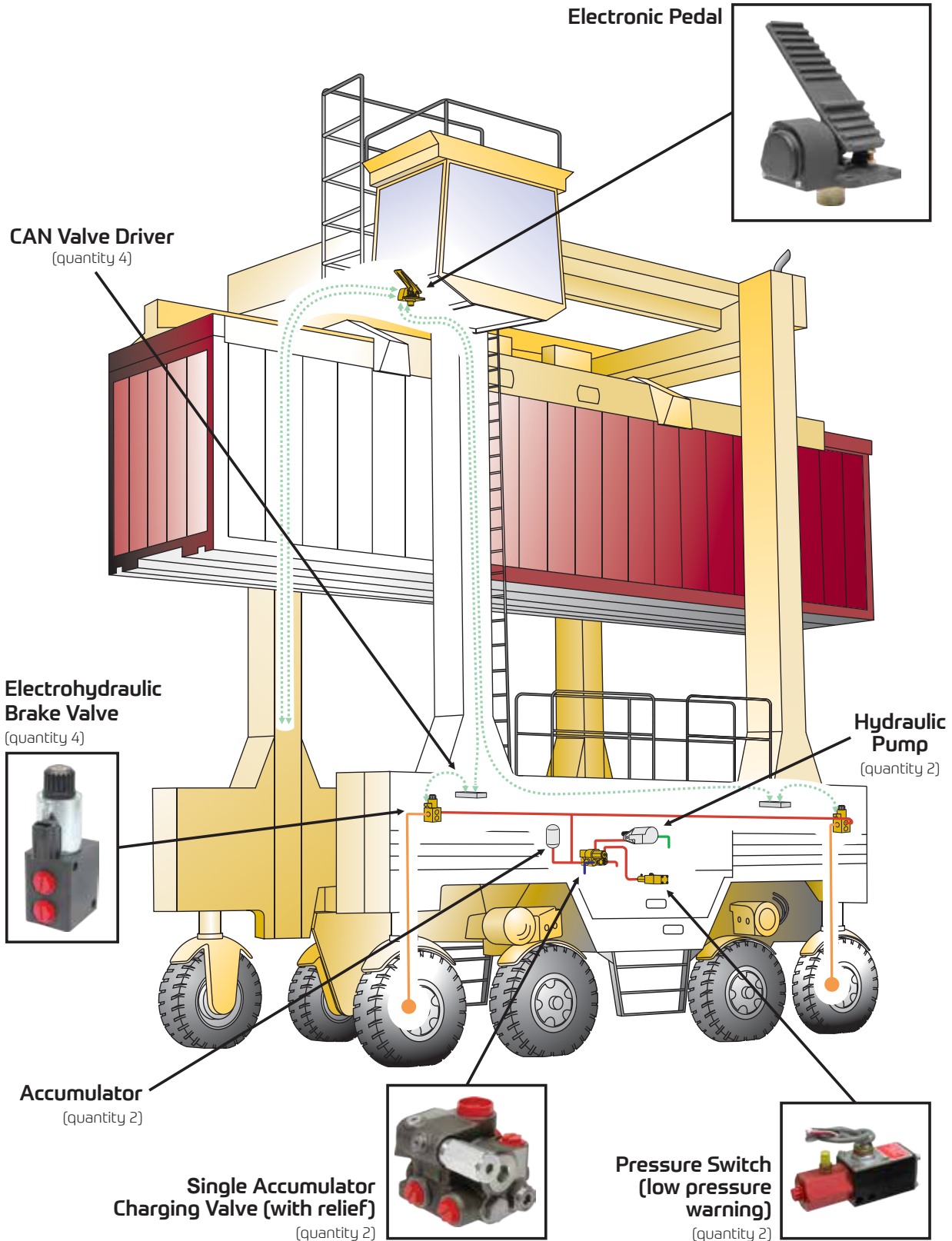


# Agricultural Tractor System Schematic



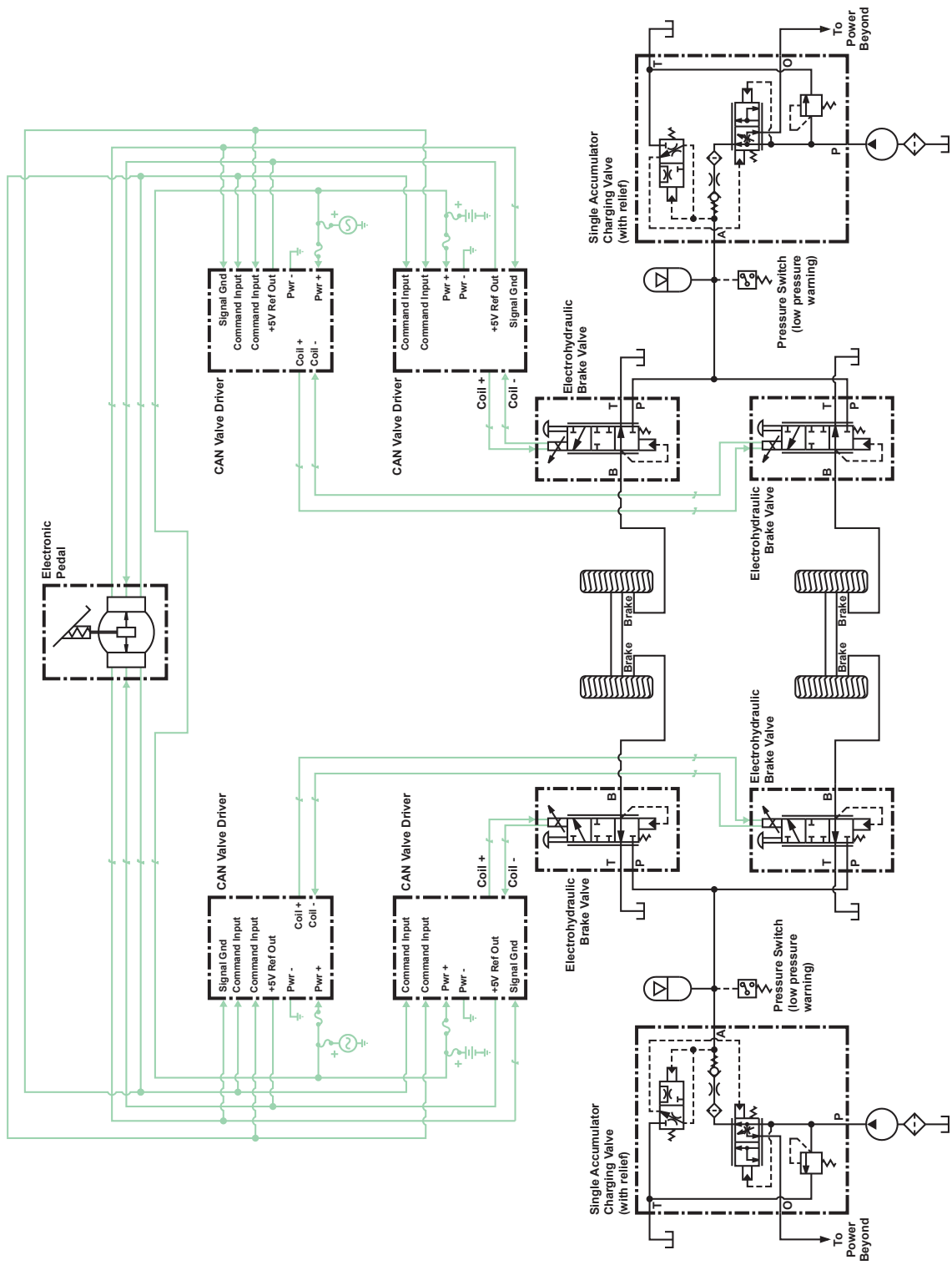
# Electrohydraulic Components and Brake Systems

## Straddle Carrier example



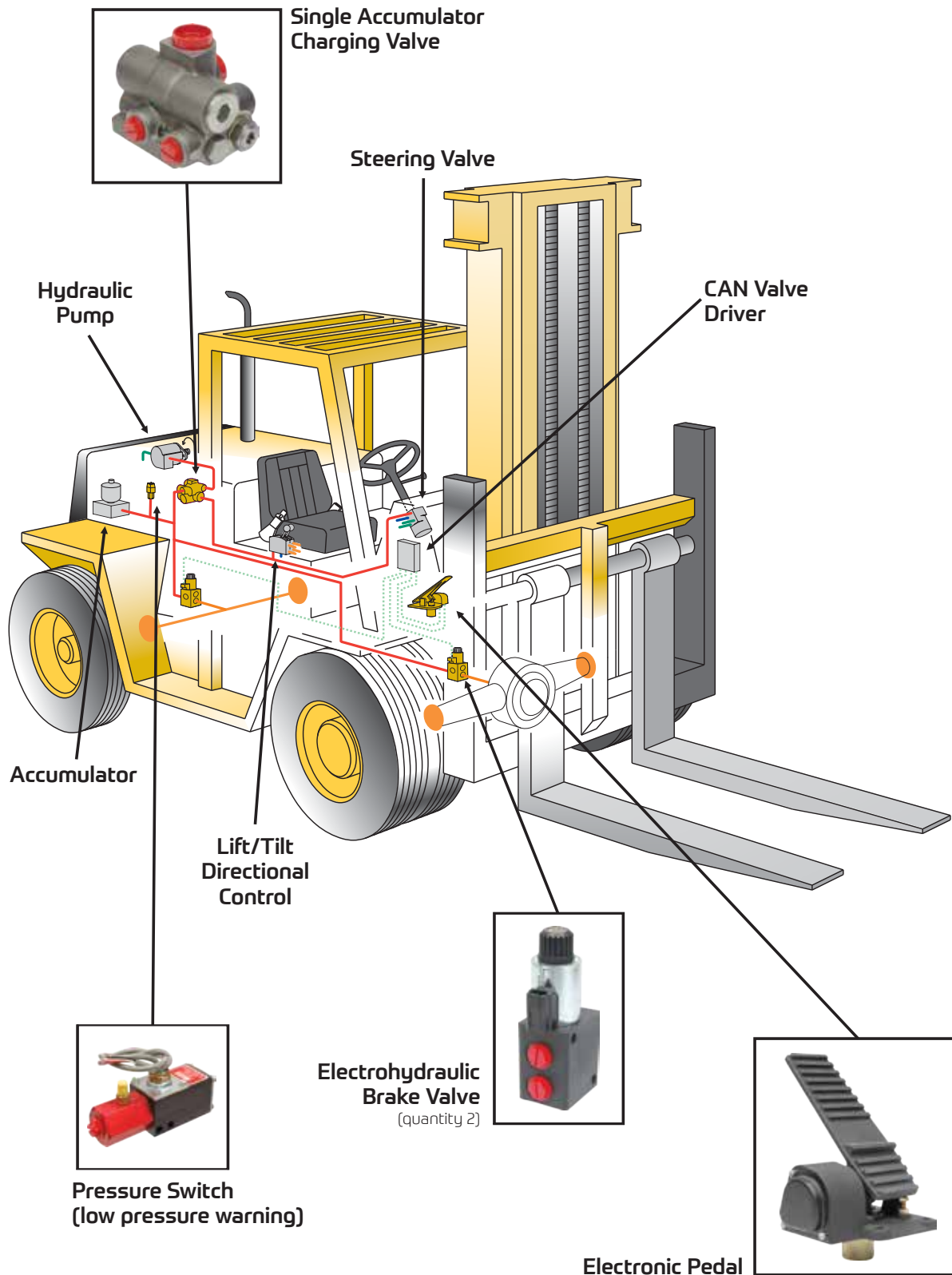
**NOTE: A redundant method of powering the system is required. It is the machine manufacturer's responsibility to insure that a single point power failure does not result in non-functional brakes.**

# Straddle Carrier System Schematic



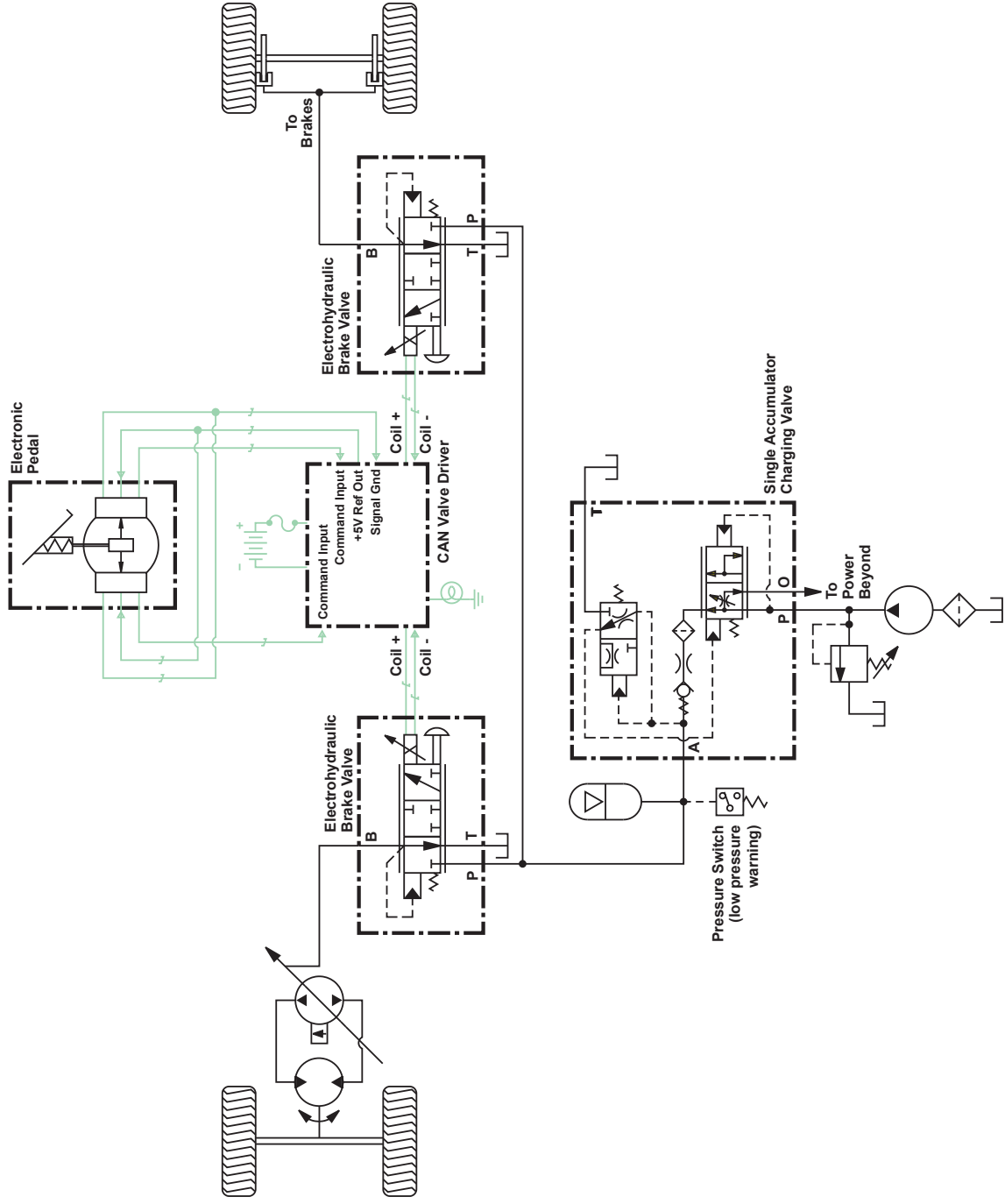
**NOTE:** A redundant method of powering the system is required. It is the machine manufacturers responsibility to insure that a single point power failure does not result in non-functional brakes.

# Electrohydraulic Components and Brake Systems Forklift (with inching control) example



**NOTE:** A redundant method of powering the system is required. It is the machine manufacturers responsibility to insure that a single point power failure does not result in non-functional brakes.

# Forklift (with inching control) System Schematic



**NOTE:** A redundant method of powering the system is required. It is the machine manufacturers responsibility to insure that a single point power failure does not result in non-functional brakes.

# Electrohydraulic Components and Brake Systems

## Aircraft Tow Tractor example

Dual Accumulator Charging Valve



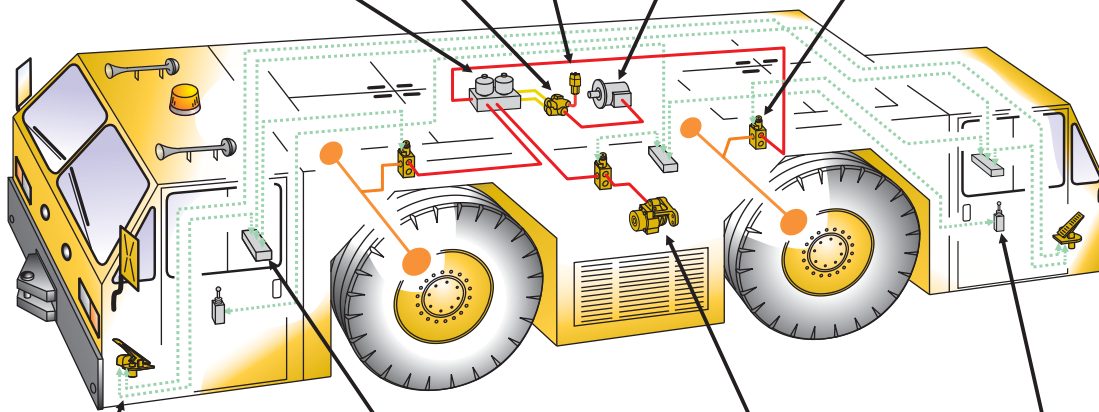
Pressure Switch  
(low pressure warning)

Electrohydraulic Brake Valve  
(quantity 3)



Hydraulic Accumulators

Hydraulic Pump

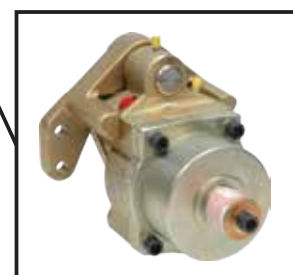


Electronic Park Brake Lever  
(quantity 2)



Electronic Pedal  
(quantity 2)

CAN Valve Driver  
(quantity 3)

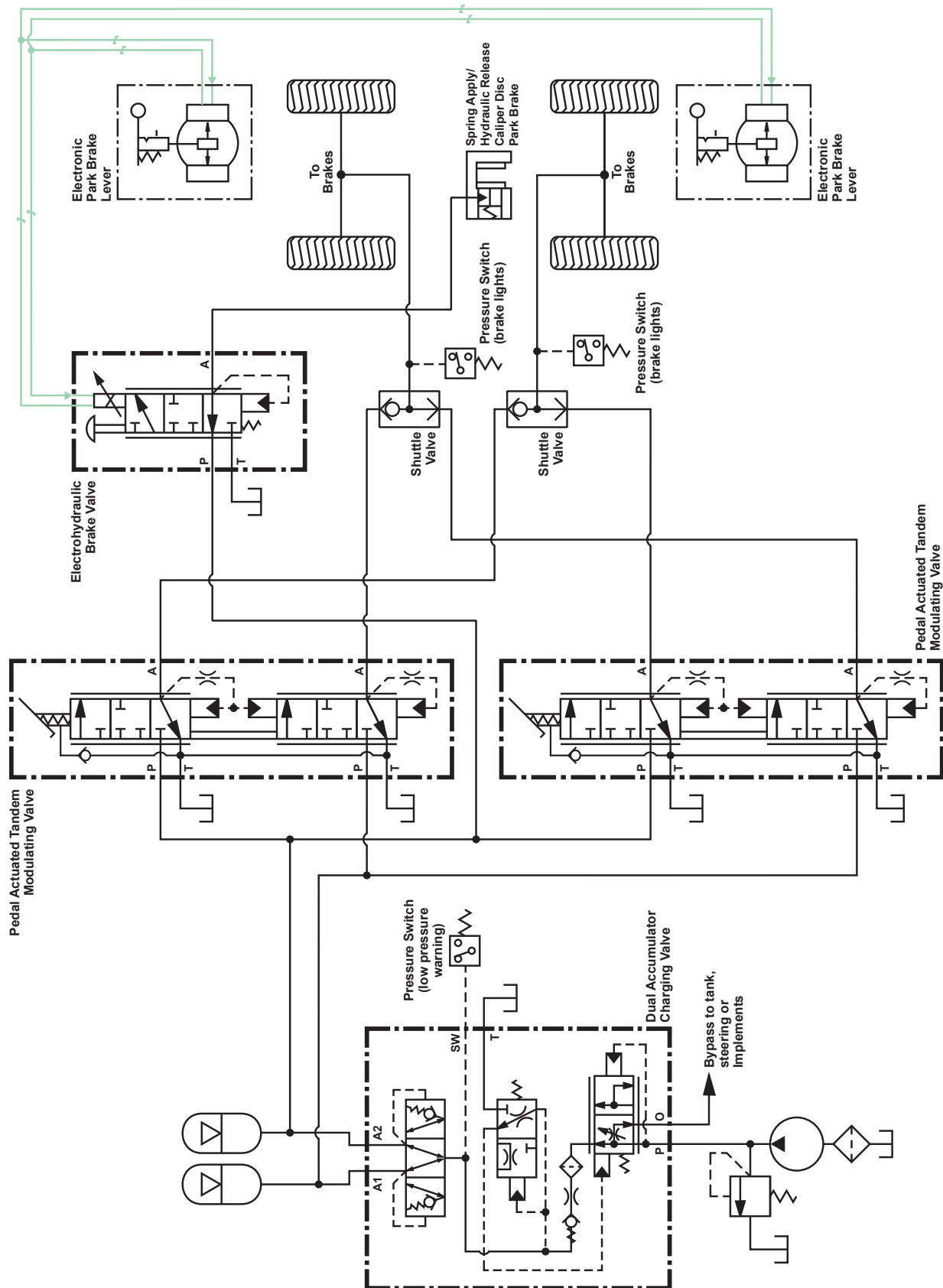


Spring Apply/  
Hydraulic Release  
Caliper Disc Park Brake

**NOTE: A redundant method of powering the system is required. It is the machine manufacturer's responsibility to insure that a single point power failure does not result in non-functional brakes.**



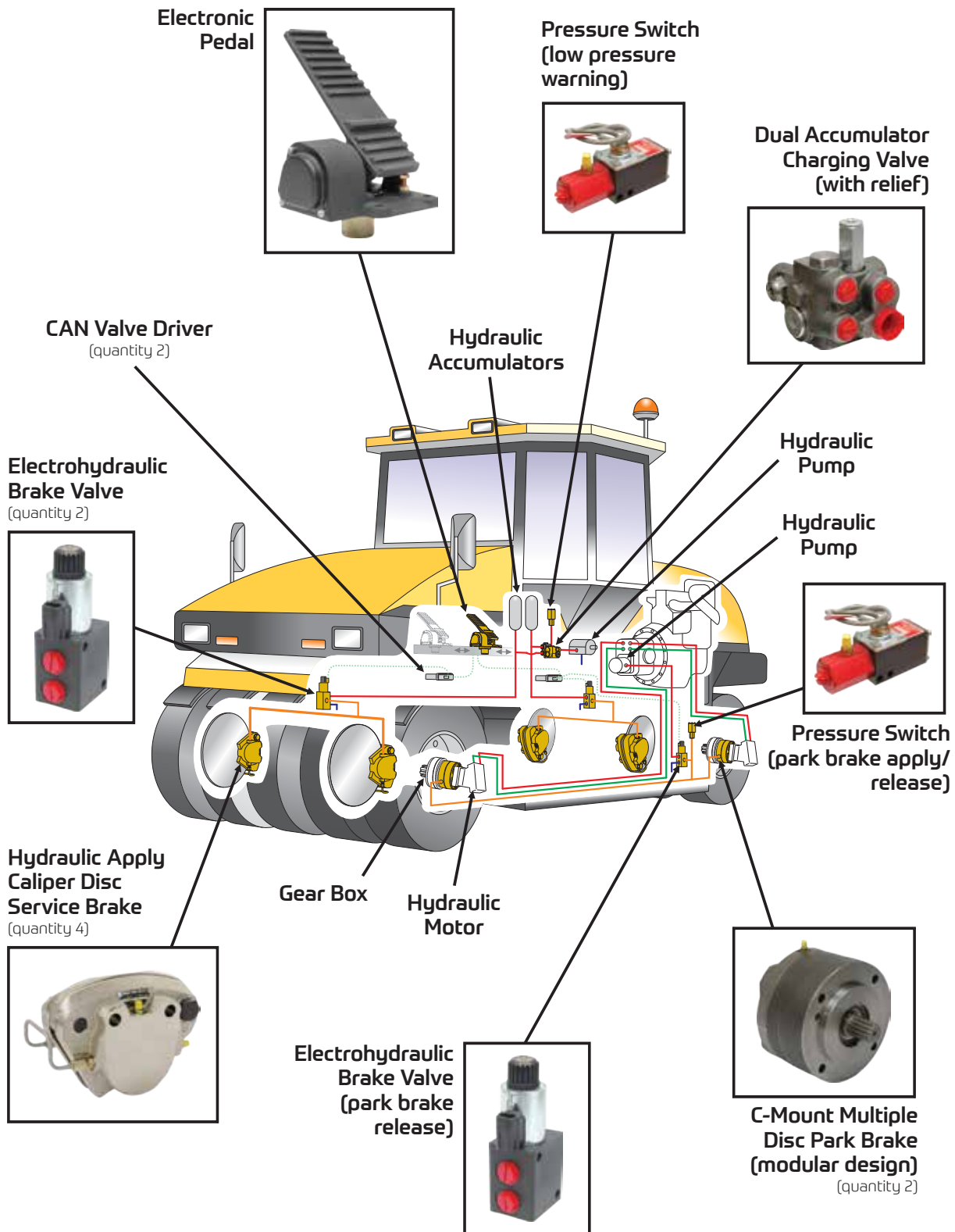
# Aircraft Tow Tractor System Schematic



**NOTE:** A redundant method of powering the system is required. It is the machine manufacturers responsibility to insure that a single point power failure does not result in non-functional brakes.

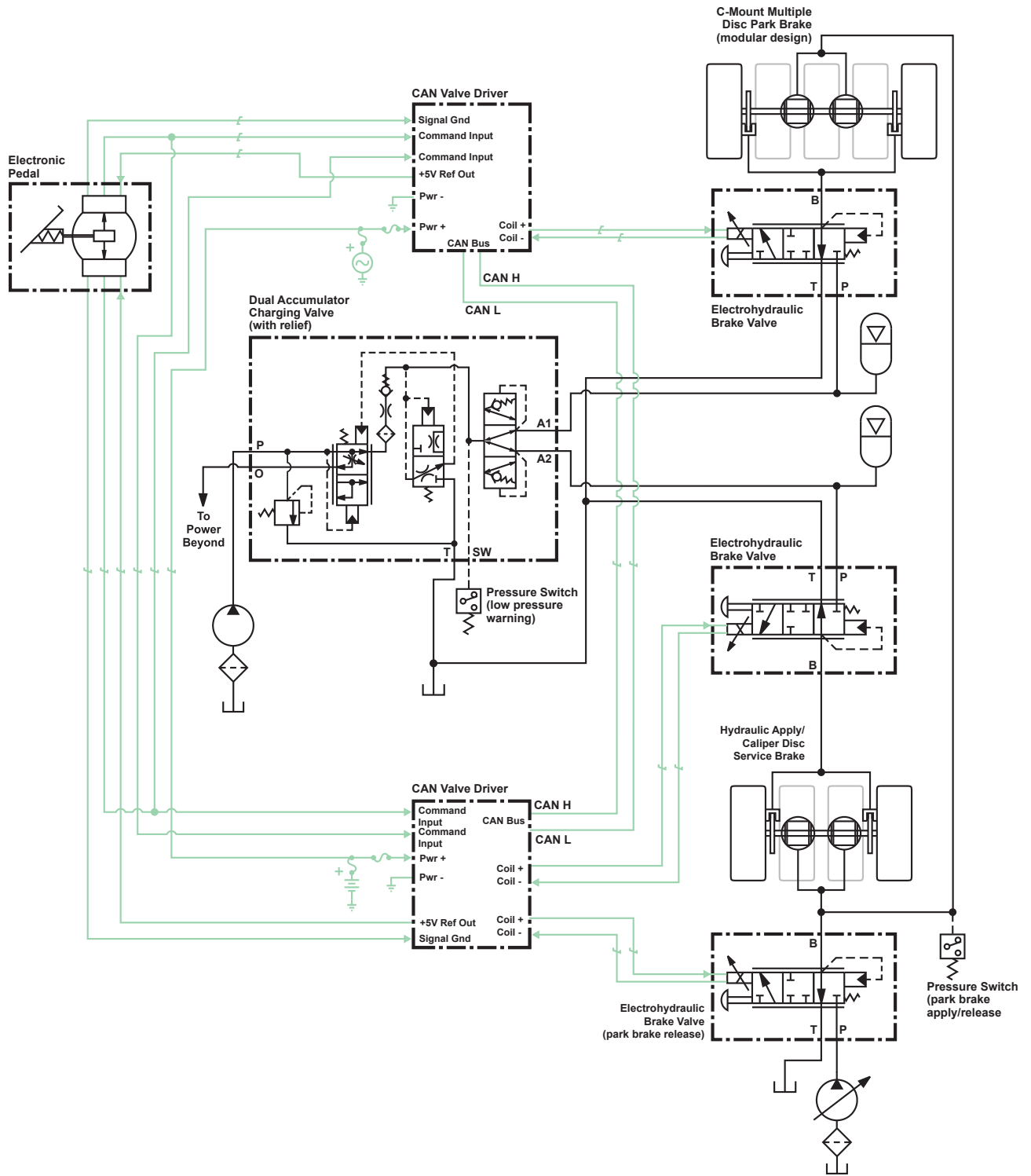
# Electrohydraulic Components and Brake Systems

## Rubber Tire Road Roller example



**NOTE: A redundant method of powering the system is required. It is the machine manufacturer's responsibility to insure that a single point power failure does not result in non-functional brakes.**

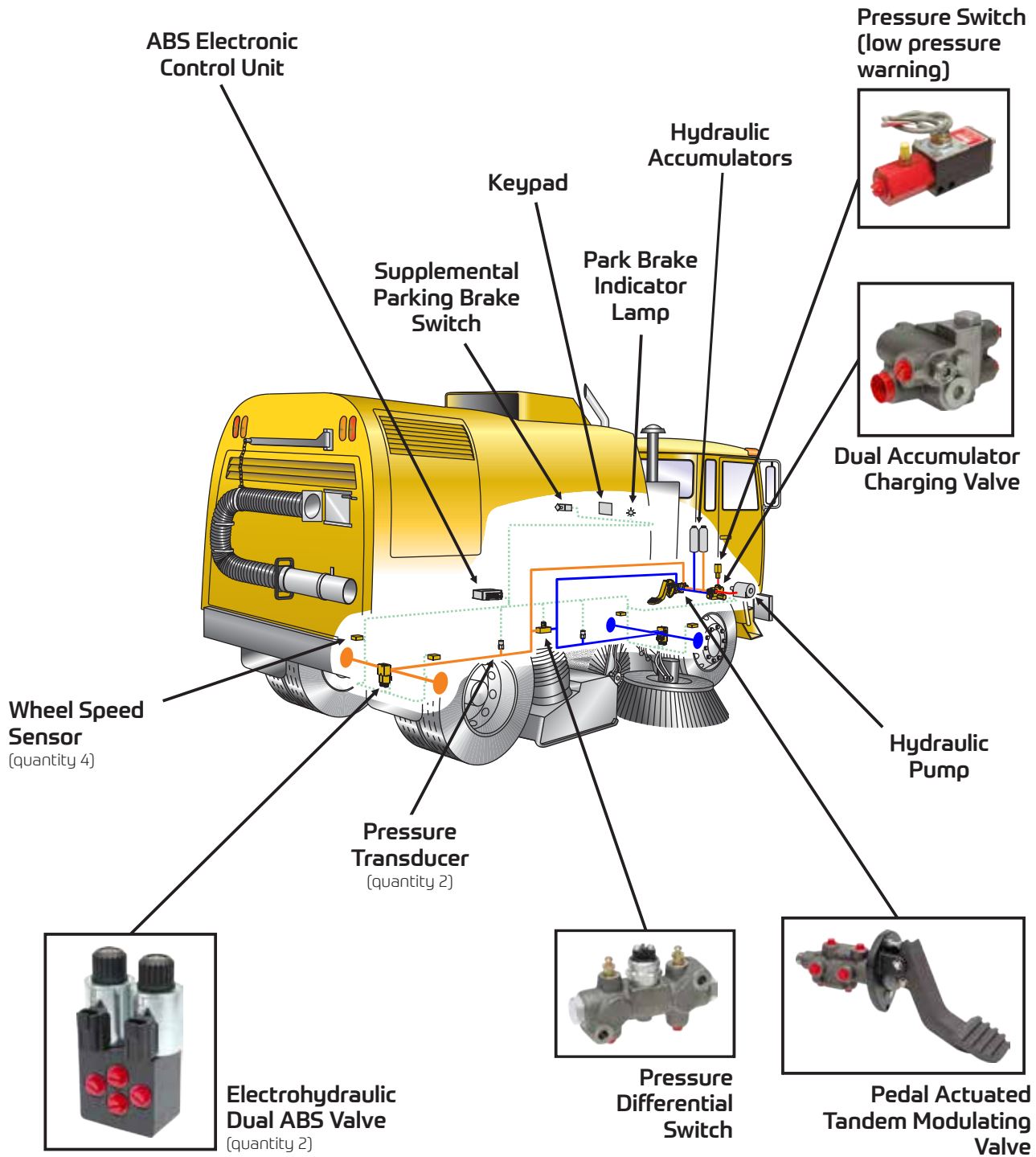
# Rubber Tire Road Roller System Schematic



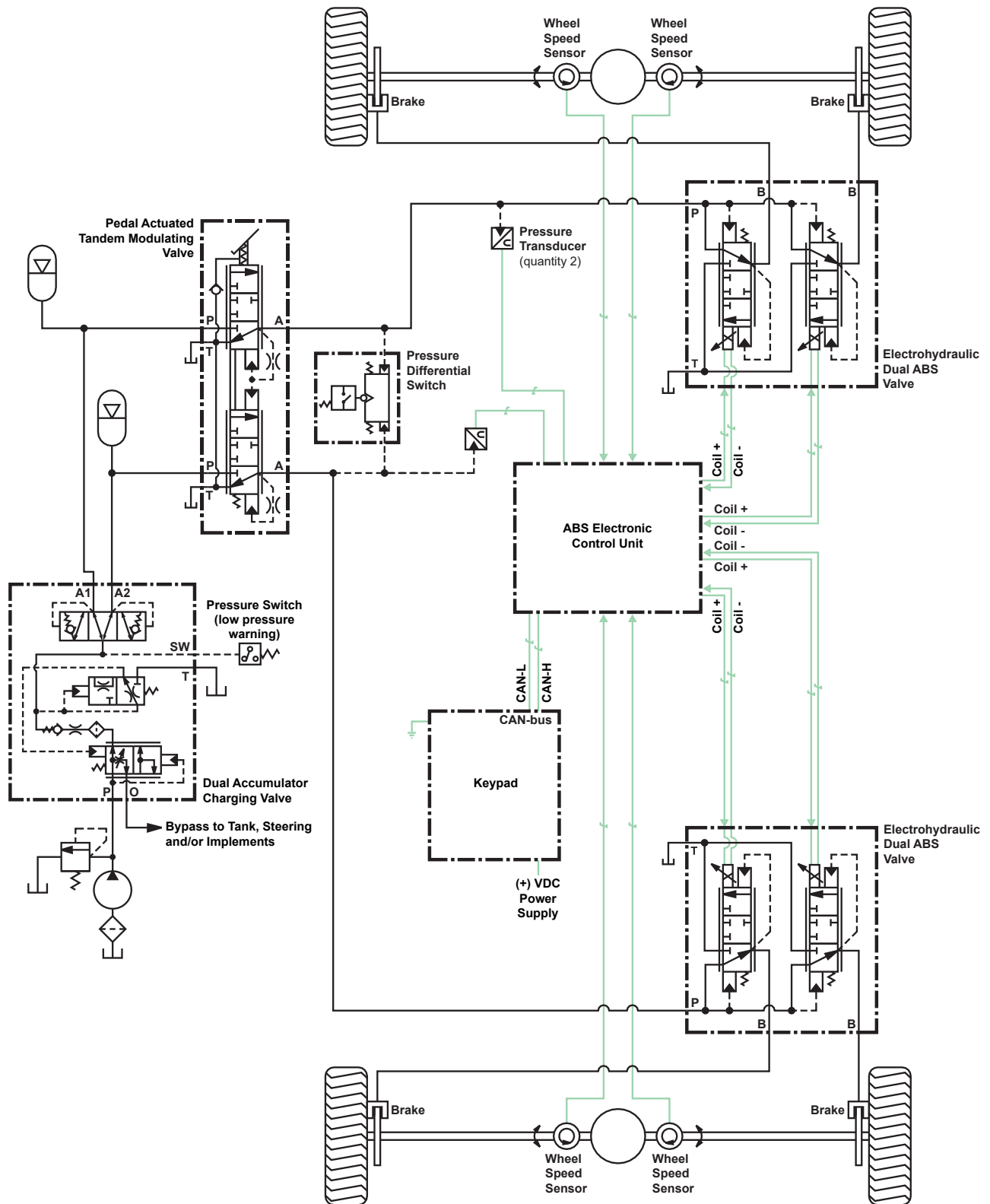
**NOTE:** A redundant method of powering the system is required. It is the machine manufacturer's responsibility to insure that a single point power failure does not result in non-functional brakes.

# Electrohydraulic Components and Brake Systems

## Street Sweeper example

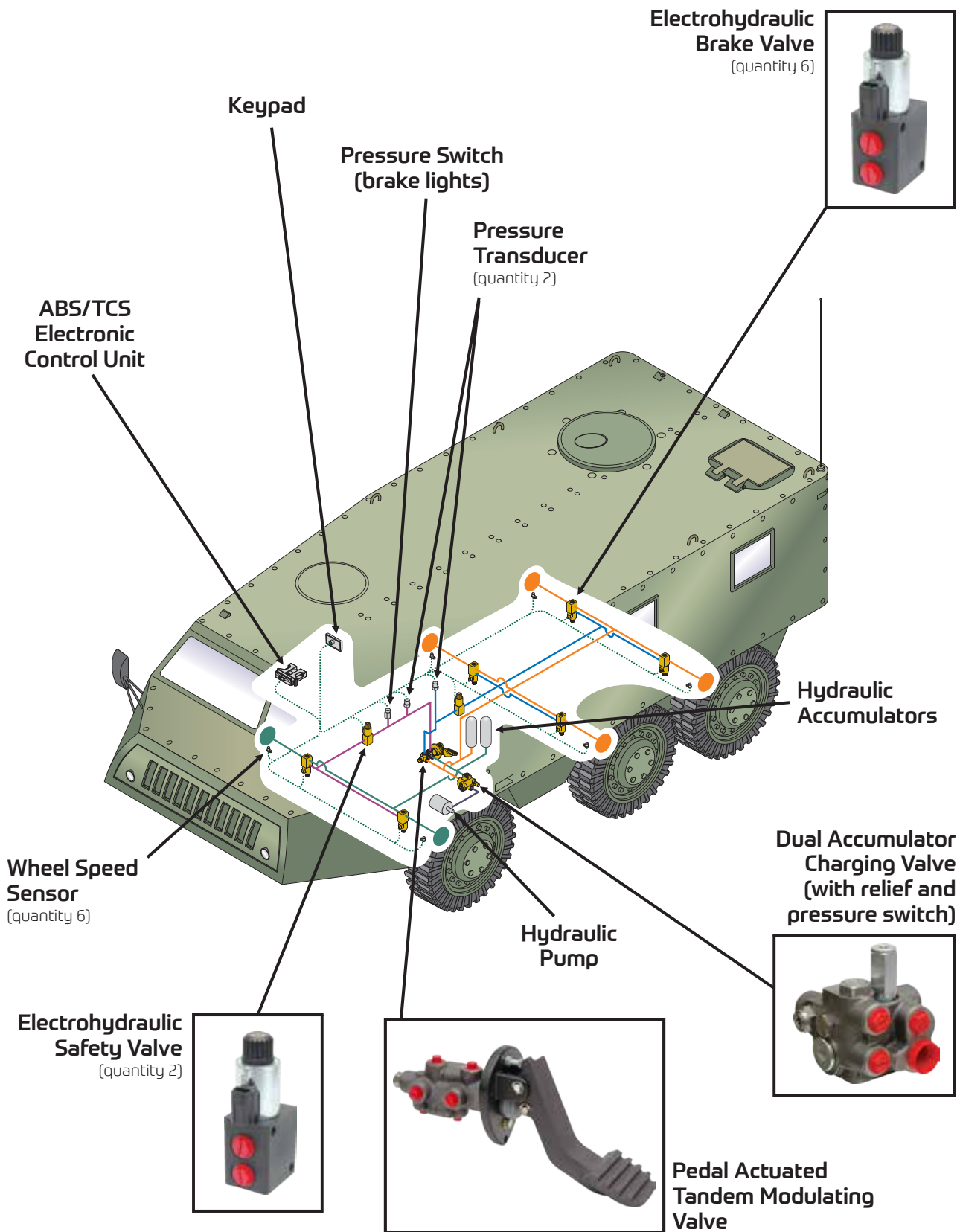


# Street Sweeper System Schematic

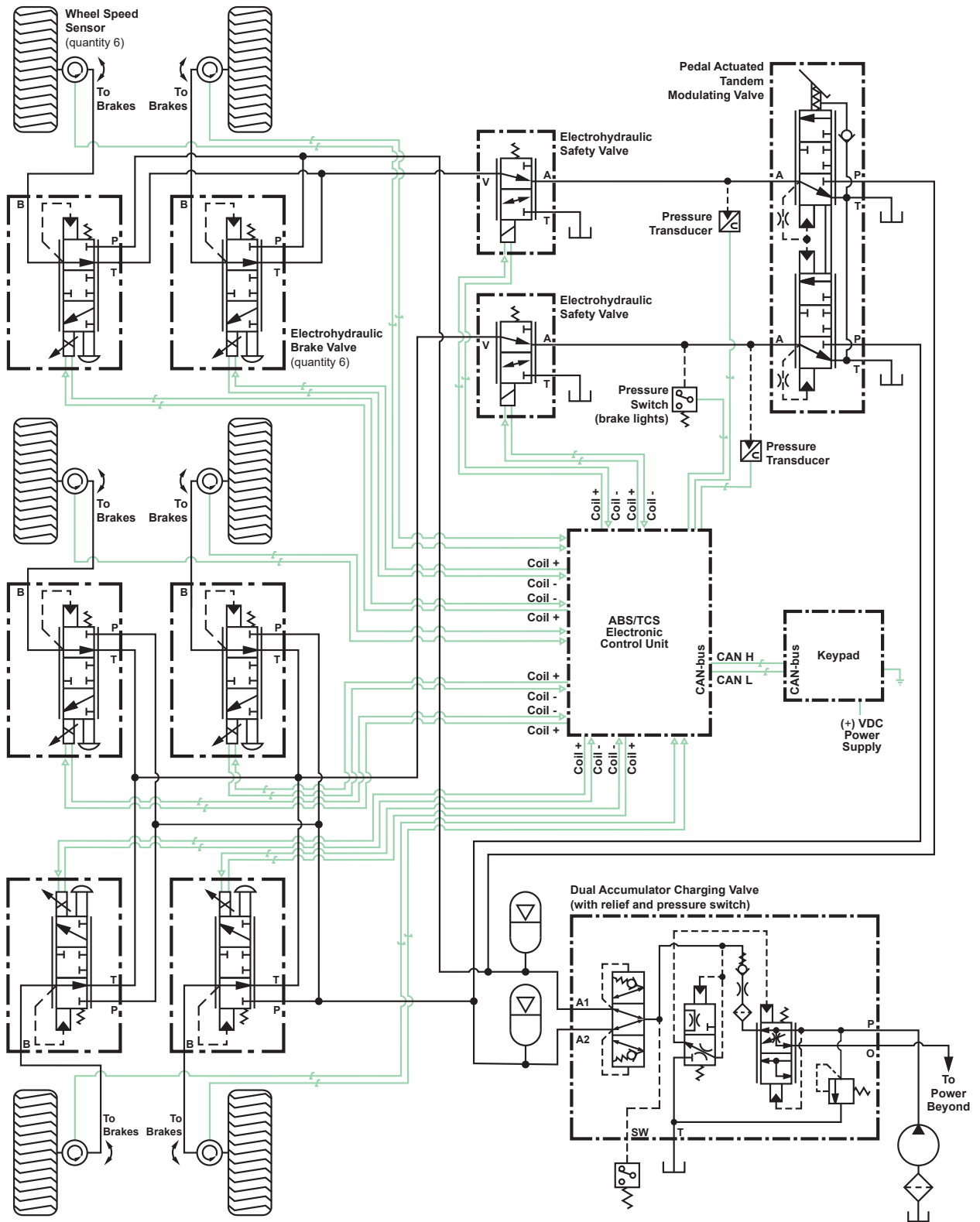


# Electrohydraulic Components and Brake Systems

## Armoured Personnel Carrier example



# Armoured Personnel Carrier System Schematic



## About ZF Friedrichshafen AG

ZF is a global technology company and supplies systems for passenger cars, commercial vehicles and industrial technology, enabling the next generation of mobility. ZF allows vehicles to see, think and act. In the four technology domains Vehicle Motion Control, Integrated Safety, Automated Driving, and Electric Mobility, ZF offers comprehensive solutions for established vehicle manufacturers and newly emerging transport and mobility service providers. ZF electrifies different kinds of vehicles. With its products, the company contributes to reducing emissions and protecting the climate.

ZF, which acquired WABCO Holdings Inc. on May 29, 2020, now has 162,000 employees worldwide with approximately 260 locations in 41 countries. In 2019, the two then-independent companies achieved sales of €36.5 billion (ZF) and \$3.4 billion (WABCO).

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