Maintenance Section

ES351

Mechanical Road Sweeper

Part No 02636-1

Revision Level A

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CHAPTER 1

Scheduled Maintenance

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Safety Notice

- **Ensure the machine is standing on firm, level ground and that there are no obstructions above before raising the hopper.**
- **Ensure the safety props are used at all times when working under the hopper.**
- **Ensure operators are fully conversant with the controls and operation.**
- **Isolate the air in the systems locker before working on any pneumatically operated or controlled equipment.**
- **Disconnect vehicle battery when working on the electrical system.**
- **Ensure the engine is switched off once the pickup broom has been lowered for adjustment.**
- **Keep hands, loose clothing, hair, etc., well clear of moving parts.**
- **Do not grasp any part of the engine or exhaust system without first making sure that it has cooled sufficiently to avoid scalding.**
- **Do not use ill-fitting tools such as spanners that may slip and cause injury.**
- **Always get a second person to check periodically that all is well when only one person is working on the machine or under the hopper.**

INTRODUCTION

Regular Maintenance

It is impossible to over-emphasize the importance of regular maintenance and inspection to maintain efficiency and obtain trouble-free service from the machine.

The maintenance schedule specified is for average operating conditions. Under particularly dry and dusty conditions, it is essential that more frequent attention is given to:

1. Air cleaner servicing
2. Fluid oil changes
3. Hydraulic oil changes

Bolt Torque
Security of Equipment

The tables below give correct torque values for various bolts and capscrews. Tighten all bolts to the torques specified in the appropriate table unless otherwise noted. Check tightness of bolts periodically, using the appropriate bolt torque table as a guide. Replace hardware with the same strength bolt.

FA-0051 Tightening Torque

Zinc Plated or Dacromet Bolts/setscrews & Nuts (Friction coefficient 0.12 assembled dry) or
Stainless Steel (Friction coefficient 0.1 assembled lubricated with Molycote grease)
Generally bolts and nuts of the same grade material are used together.

Bolts with metric coarse thread

Thread	Property Class			
	4.8/5.6 Steel	8.8 Steel	10.9 Steel	12.9 Steel
	-	A1- 50 S/S	A2-70 S/S	A4- 80 S/S
M 2	0.13 Nm	0.35 Nm	0.5 Nm	0.6 Nm
	-	0.1 Nm	0.23 Nm	0.3 Nm
M 3	0.60 Nm	1.3 Nm	1.8 Nm	2.1 Nm
	-	0.4 Nm	0.8 Nm	1.1 Nm
M 4	1.4 Nm	3.0 Nm	4.5 Nm	5.0 Nm
	-	0.86 Nm	1.85 Nm	4.0 Nm
M 5	2.8 Nm	6 Nm	8.5 Nm	10 Nm
	-	1.6 Nm	3.6 Nm	4.8 Nm
M 6	4.3 Nm	10 Nm	16 Nm	20 Nm
	-	2.9 Nm	6.3 Nm	8.5 Nm
M 8	11.5 Nm	25 Nm	35 Nm	40 Nm
	-	7.1 Nm	15 Nm	20 Nm
M 10	23 Nm	48 Nm	70 Nm	80 Nm
	-	14 Nm	30 Nm	40 Nm
M 12	40 Nm	84 Nm	120 Nm	140 Nm
	-	24 Nm	50 Nm	70 Nm
M 14	60 Nm	135 Nm	195 Nm	230 Nm
	-	38 Nm	82 Nm	110 Nm
M 16	95 Nm	205 Nm	300 Nm	355 Nm
	-	58 Nm	125 Nm	165 Nm
M 18	130 Nm	290 Nm	420 Nm	485 Nm
	-	82 Nm	175 Nm	235 Nm
M 20	185 Nm	410 Nm	580 Nm	680 Nm
	-	115 Nm	245 Nm	375 Nm
M 22	250 Nm	560 Nm	800 Nm	940 Nm
	-	157 Nm	337 Nm	450 Nm
M 24	320 Nm	710 Nm	1000 Nm	1180 Nm
	-	-	-	-
M 27		1050 Nm	1480 Nm	1750 Nm
	-	-	-	-
M 30		1420 Nm	2030 Nm	2380 Nm
	-	-	-	-

Bolts with metric fine thread

Thread	Property Class		
	8.8 Steel	10.9 Steel	12.9 Steel
M 8 x 1	25 Nm	35 Nm	45 Nm
M 10 x 1,25	50 Nm	75 Nm	85 Nm
M 12 x 1,25	90 Nm	135 Nm	155 Nm
M 12 x 1,5	90 Nm	125 Nm	150 Nm
M 14 x 1,5	140 Nm	205 Nm	245 Nm
M 16 x 1,5	215 Nm	320 Nm	370 Nm
M 18 x 1,5	325 Nm	460 Nm	545 Nm
M 20 x 1,5	450 Nm	645 Nm	755 Nm
M 22 x 1,5	610 Nm	870 Nm	1020 Nm
M 24 x 2	765 Nm	1095 Nm	1280 Nm
M 27 x 2	1150 Nm	1600 Nm	1950 Nm
M 30 x 2	1600 Nm	2250 Nm	2700 Nm

These torques apply unless specified on the drawing.

For steel bolts used in conjunction with aluminium parts the follwing rule applies:

Use the next lower value from the column for property class 10.9.

This directive is valid for all thread diameters and grades.

(e.g. M10 grade 10.9 bolt clamping aluninium parts should be torque to 35 Nm not 70 Nm)

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Used oils and filters should be disposed of in accordance with the local waste disposal regulations.

These procedures should be carried out by qualified service personnel.

STANDARD REPAIR TIMES (SRT)

This Guide Detail the time taken to remove, refit and validate the item listed. Where the task is listed as 2 person the total time taken is shown in the table however certain aspects of the tasks may require 2 persons for the safe completion of the task.

ES351 Standard Repair Times (SRT)

Area	Remove/Refit	Time Taken (Mins)	Special tools	1 or 2 persons
Elevator	Elevator chains (both)	240		1
Elevator	Elevator flights (each)	15		1
Elevator	Elavator flight rubbers (each)	15		1
Elevator	Position cylinders (each)	30	Puller	1
Elevator	Chain tensioners (each)	20		2
Elevator	Elevator floor plates (all)	480		1
Elevator	Position switches (each)	10		1
Sweep gear	Rear broom	20		1
Sweep gear	Gutter broom brushes (each)	20		1
Sweep gear	Gutter broom cylinders	30		1
Sweep gear	Drag shoes (each)	15		1
Sweep gear	Rear broom arms (each)	60		1
Sweep gear	Rear broom dampers (each)	10		1
Sweep gear	Overcenter lift assembly (each side)	30		1
Sweep gear	Rear broom cover	10		1
Sweep gear	Rear broom swivel bearing	20		1
Sweep gear	Rear broom spherical bearing	120		1
Systems Locker	Rear broom and elevator manifold	90		1
Systems Locker	Hopper manifold	90		1
Systems Locker	Gutter broom manifold	90		1
Systems Locker	Pneumatic valve manifold	30		1
Systems Locker	Water manifold	30		1
Systems Locker	Oil cooler	30		1
Hopper	Hopper	480		2
Hopper	Hopper tip cylinder (each)	120		2
Hopper	Hopper pressure control manifold	60		1
Hopper	Hopper door cylinder	30		1
Hopper	Position switch	10		1
Hopper	Hopper lift cyinders (each)	120		2
Water System	Water tank	240		1
Water System	Water filter assembly	30		1
Water System	Water pump	30		1
Subframe	PTO pump	180		2
Subframe	Scissor lift	960		2
Cab	Control panel	30		1
Cab	Relay box	30		1
Maintenance	50Hr Service	90	None	1
Maintenance	"A" Service	120	None	1
Maintenance	"B" Service	240	None	1
Maintenance	"C" Service	480	None	1

MAINTENANCE SCHEDULE

Please refer to chapter 4 in the Operator's Guide for the daily and weekly routine maintenance that can be executed by the operator.

The following items are not covered in the Operator's Guide. Qualified personnel is required for the following tasks.

Chassis Maintenance

The chassis should be maintained in accordance with the recommendations specified in the chassis manufacturer's manual.

Service A - Every 500 Hours

1. Check the elevator flights for adjustment and wear - adjust or replace as required.
2. Check both elevator drive chain and flight chains for correct adjustment.

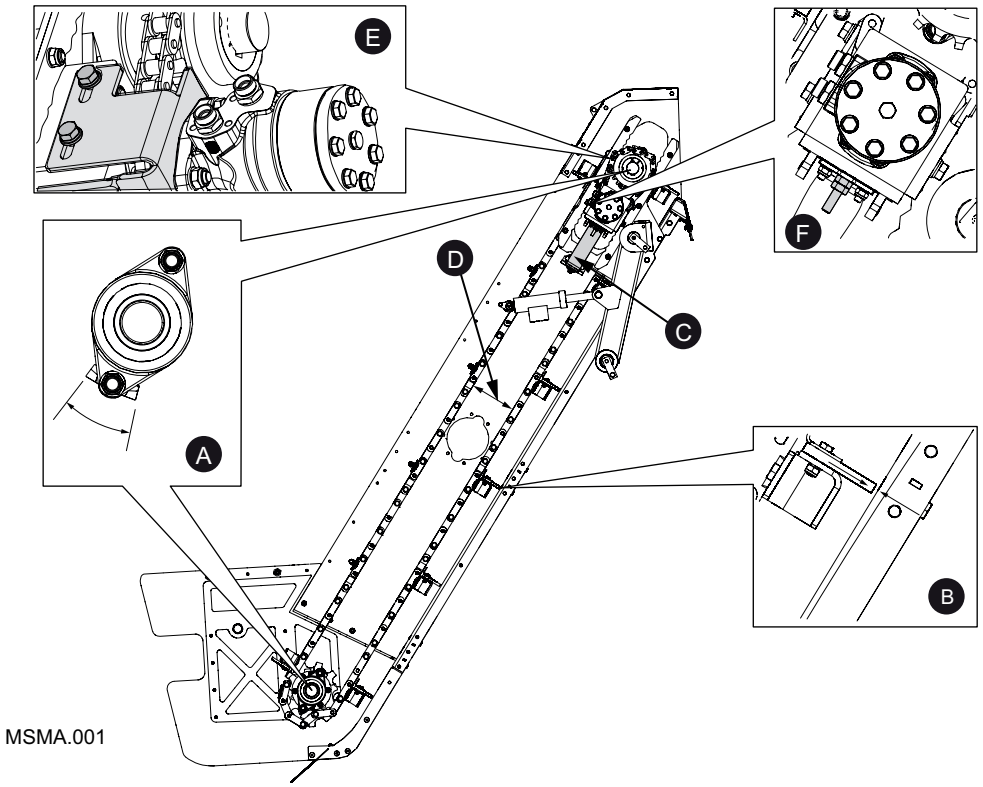
Service B - Every 1000 Hours

1. **Carry out 500 hour service;**
2. Carry out a visual inspection for the security of body mounts, pivot pins and equipment.

Service C - Every 2000 Hours

1. **Carry out 1000 hour service;**
2. Drain hydraulic reservoir.
3. Replace suction and return filters.
4. Refill hydraulic reservoir.

Used oils and filters should be disposed of in accordance with local waste disposal regulations.



Service A – Every 500 hours

1. Check the Elevator Flights for adjustment and wear – adjust or replace as required

Adjust the bearings on each side of the elevator shafts using the elongated holes **(A)** to bring the flight rubber **(B)** into contact with the elevator floor. Then back off to provide a nominal working clearance.

Note: The rubbers need replacement, when no further adjustment is possible.

The elevator flight rubbers are changed by removing the clamp strip and then replacing the elevator flight rubber.

Note: Both shafts will need to be repositioned to the rear to allow the new rubbers to be fitted. It is recommended to replace all the rubbers at the same time.

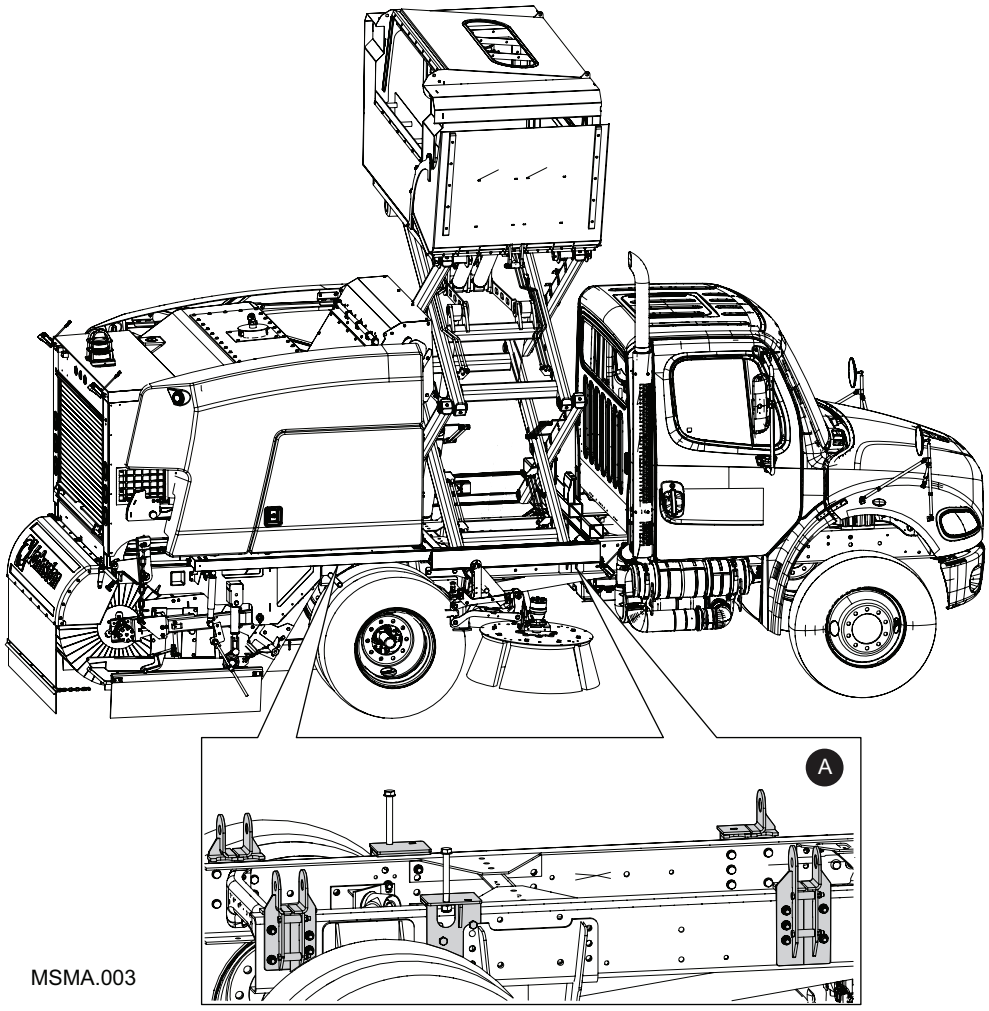
2. Check both Elevator drive chain and Flight chains for correct adjustment

A) Elevator Flight Chains:

Increasing the chain tension:
Greasing the elevator tension cylinders **(C)** will tighten the drive chain. Ensure to alternate from left to right in order to equalize the tension.

Reducing the chain tension:
Pressing the centre of the grease point will release the grease from the cylinder and reduce the tension.
The correct spread of the chain is **3 inches (7.5 cm)**, and should be measured at the mid-point between each shaft **(D)**.

B) Elevator Drive Chain:
To tension the elevator drive chain, loosen the 4 screws of the motor mount **(E)** and use screw **(F)** to adjust the tension.
The correct adjustment is achieved when the chain does not touch the frame.



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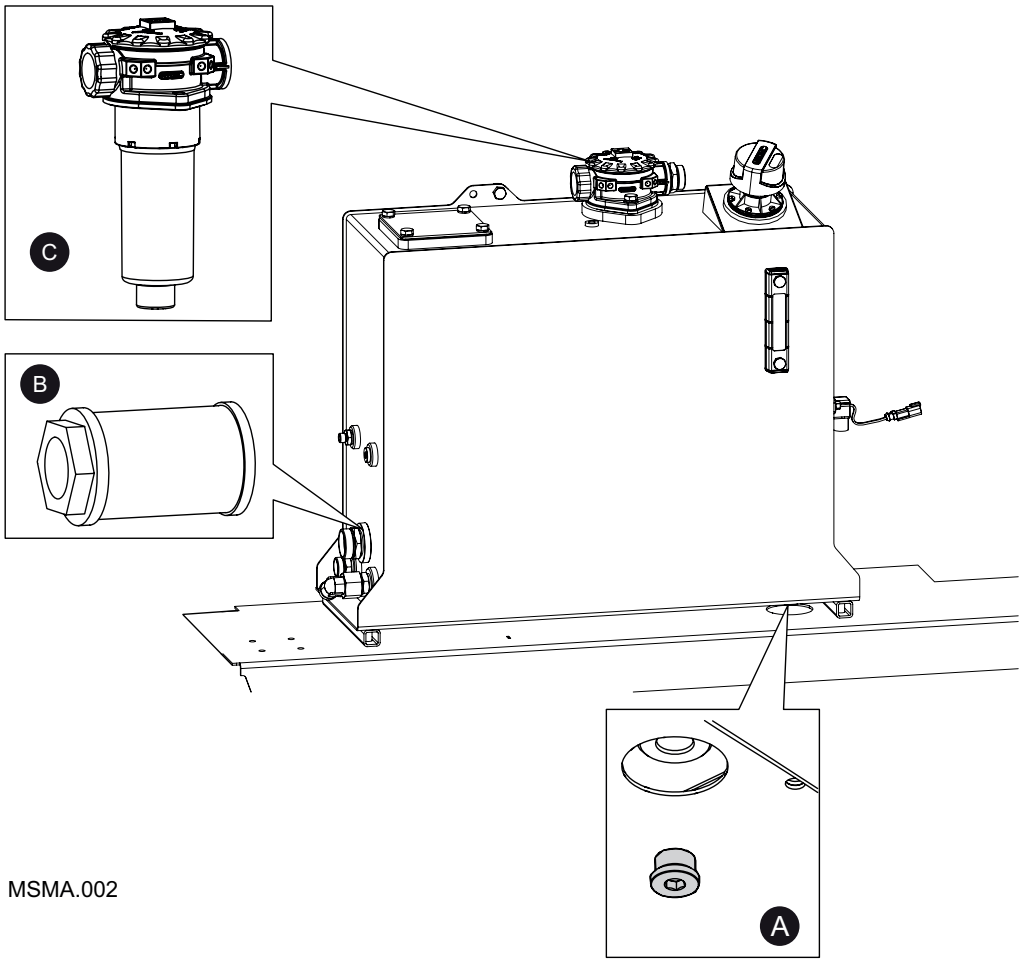
Service B – Every 1000 hours

1. Carry out 500 hours service plus the following;

2. Carry out a visual inspection for the security of body mounts, pivot pins and equipment.

Security of Body Mounts:
Check the body mounts are secure **(A)**. Ensure the torque identification marks are aligned and re-torque as required (See torque chart in chapter 1).

Pivot Pins and Equipment:
Check the security of all pivot pins ensuring that the retaining method used is present and secure.
Check for excessive wear around the pin diameter and replace as required.



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Service C – Every 2000 hours

Carry out 1000 hours service plus the following:

Drain hydraulic reservoir and change filters:
Before draining the hydraulic reservoir, make sure the hopper and frame are in the lowered position.
Place a suitable container underneath the drain port and remove the plug **(A)** to drain the hydraulic reservoir. Once the hydraulic reservoir is drained, replace the suction filter cartridge **(B)** and the return filter **(C)**. Re-fill the reservoir through the return filter **(D)**, this will ensure the new oil is filtered.

Note: Refer to label for the correct level.

Used oils and filters should be disposed of in accordance with local waste disposal regulations.

CHAPTER 2

Hydraulic System

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GENERAL DESCRIPTION

The hydraulic system is divided into two circuits fed from a common hydraulic reservoir.

1. Gutter Brooms
2. Rear pickup broom, elevator and hopper

Hydraulic filtration is provided by suction filters within the hydraulic tank, together with a replaceable type 'in line' filter mounted externally on the upper face of the hydraulic tank.

Hydraulic System Inital Operation

When the hydraulic system is first put into service, or after changing a hydraulic hose, it is necessary to purge any air from the system by repeatedly performing the hopper discharge procedure and operating the gutter brooms, pickup broom and elevator while the vehicle is stationary.

CAUTION: Failure to purge the hydraulic system may cause the system to operate poorly

CIRCUIT PRESSURES

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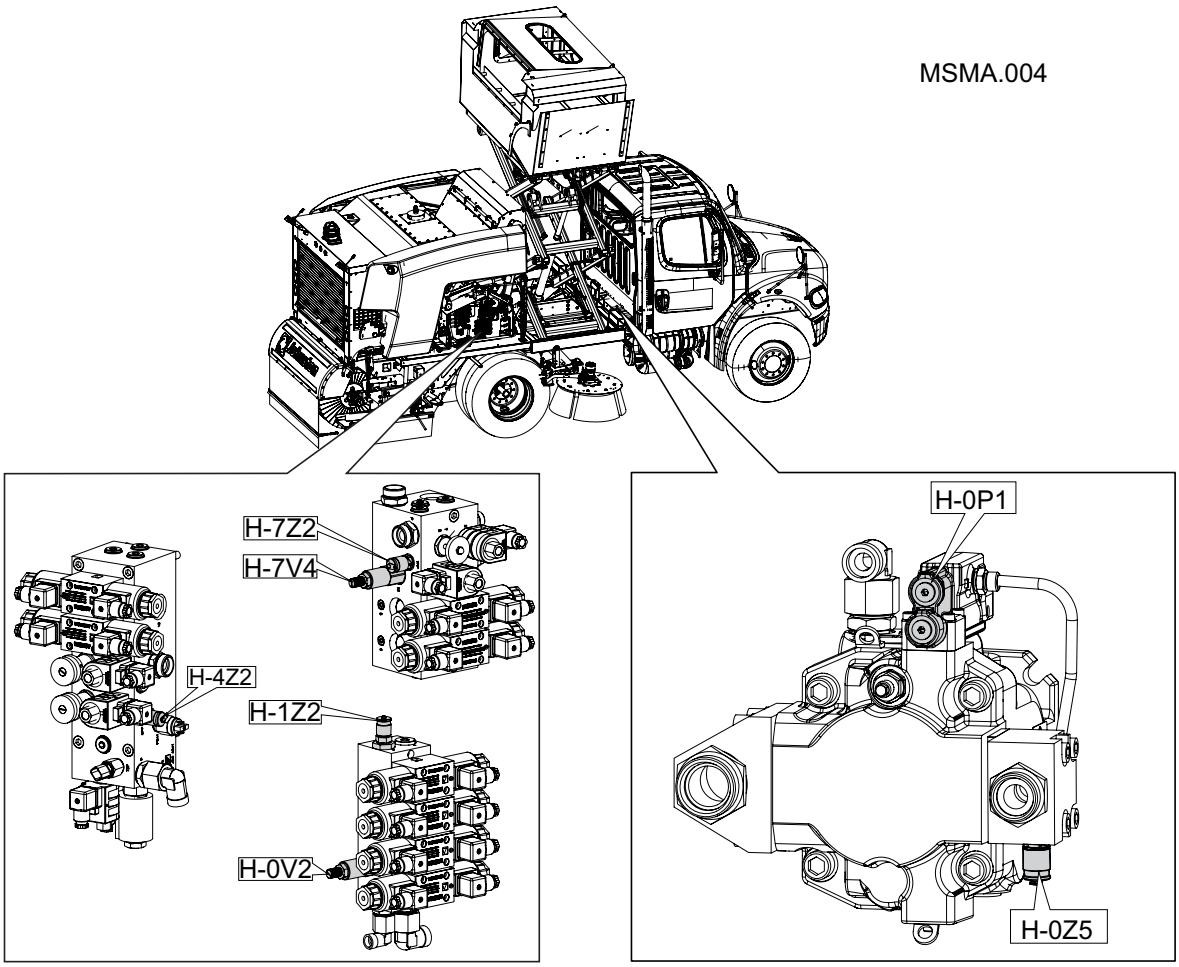


Test points are provided on the hydraulic system to carry out pressure checks.

Point No.	Pressure	Function	Relief Valve
H-7Z2	3120 PSI / 215 Bar	Gutter brooms manifold	H-7V4
H-1Z2	3120 PSI / 215 Bar	Hopper discharge manifold	H-0V2
H-4Z2	3120 PSI / 215 Bar	Pickup broom, elevator manifold	H-0V2
H-0Z5	2830 PSI / 195 Bar	System pressure	H-0P1

Sweeping System

Connect suitable 5000 PSI / 345 Bar gauges to Test Points **H-7Z2, H-4Z2** and **H-1Z2**

To check or set Relief Valves **H-0V2** and **H-7V4**, first fully increase Main Pump Relief Valve **H-0P1**.

Connect gauge to test point **H-1Z2**, operate Hopper Lower Switch when hopper is fully lowered adjust and set relief valve to 215 Bar.

Connect gauge to test point **H-7Z2**, lock up LH Gutter Broom so the motor doesn't turn, operate LH Gutter Broom Switch adjust and set relief valve to 215 Bar

Finally re-set Main Pump Relief **H-0P1**, Connect gauge to test point **H-1Z2**, operate Hopper Lower Switch when hopper is fully lowered adjust and set the pump relief valve to 195 Bar.

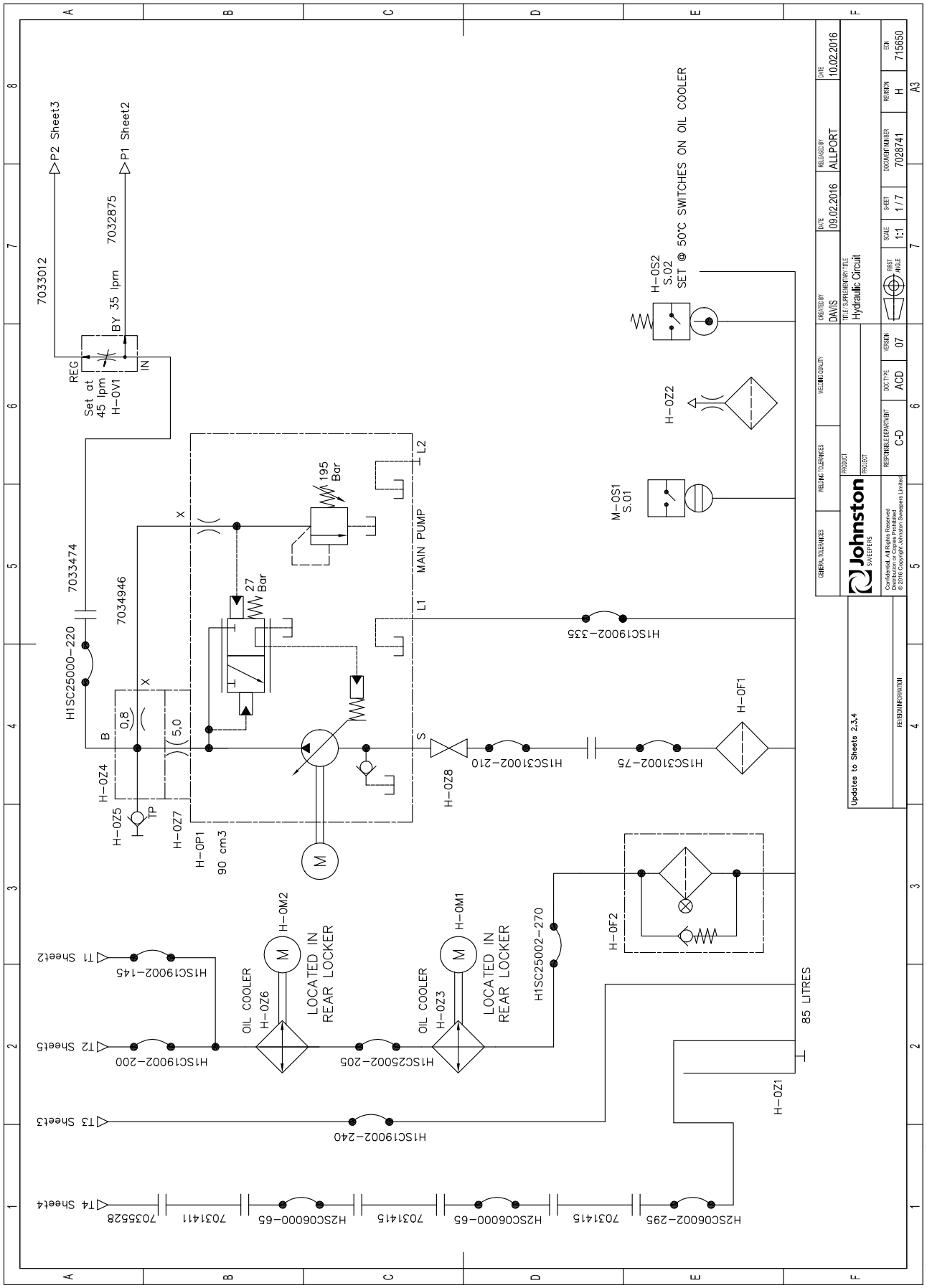
KEY: ✓ = solenoid energized
RHGB = Right Hand Gutter Broom
LHGB = Left Hand Gutter Broom
PUB/Elev = Pickup Broom / Elevator
AF = Automatic Function (function fulfilled without pressing any additional switches)

Electrical Control - Fluid Power Systems- Modus Operandi

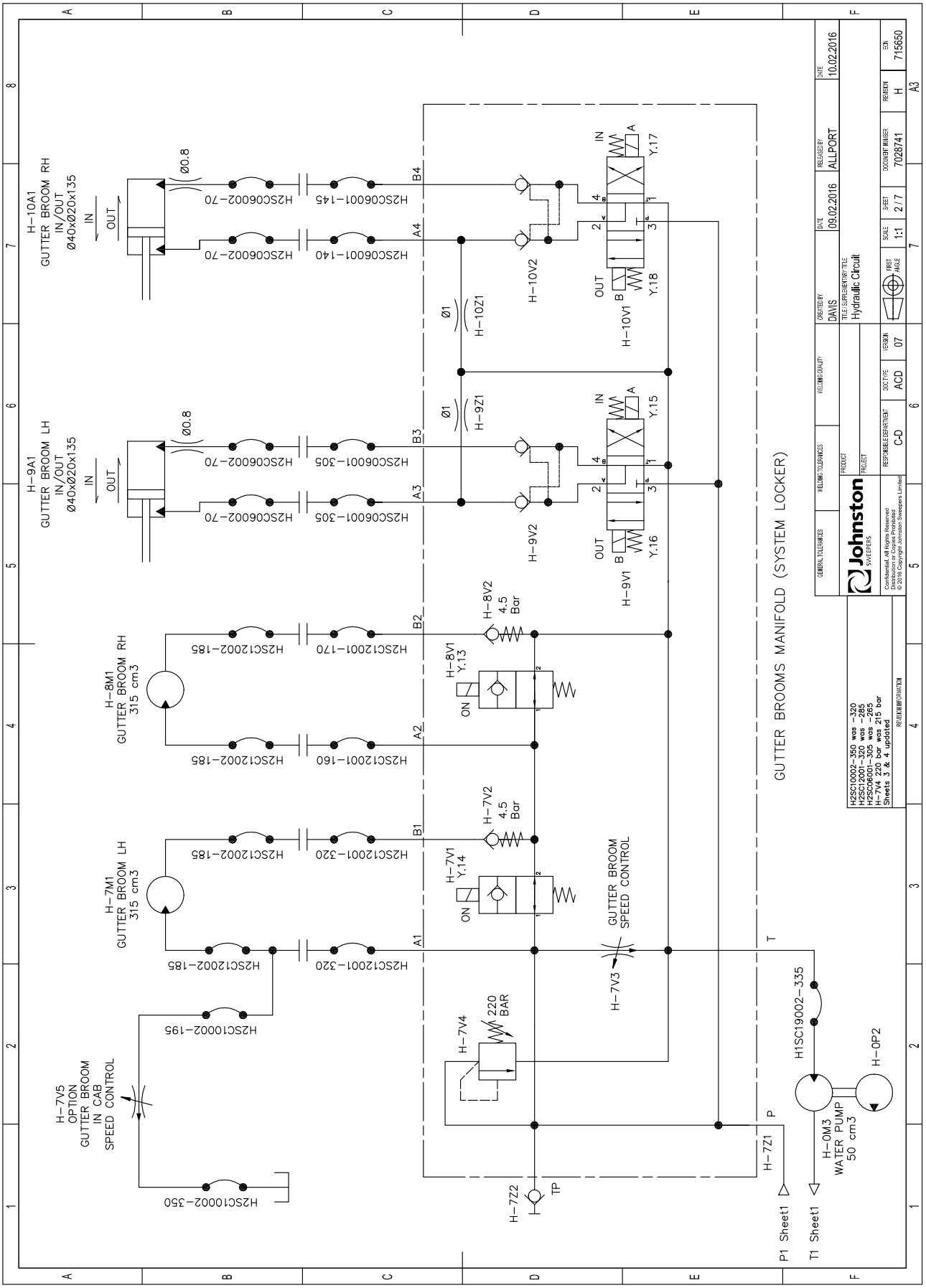
OPERATION	SOLENOIDS ENERGIZED									
	H1V1 B	H1V1 A	H2V1 B	H2V1 A	H3V1 B	H3V1 A	H4V1	H5V1	H5V4	H6V1
Left Hand Gutter Broom (LHGB)										
LHGB - ON - normal sweep										
LHGB - ON - normal sweep + water										
LHGB - STOW (for 5 sec after turning from ON to OFF										
LHGB - ON - varabrush in (option)										
LHGB - ON - varabrush out (option)										
Right Hand Gutter Broom (RHGB)										
RHGB - ON - normal sweep										
RHGB - ON - normal sweep + water										
RHGB - STOW (for 5 sec after turning from ON to OFF										
RHGB - ON - varabrush in (option)										
RHGB - ON - varabrush out (option)										
Rear Broom / Elevator (RB/Elev)										
RB/Elev - ON - normal sweep								✓		✓
RB/Elev - ON - normal sweep + water								✓		✓
RB/Elev - ON - normal sweep - ELEV REVERSE (momentary) (RB halts)								✓	✓	
RB/Elev - Off										
RB/Elev - OFF - ELEV REVERSE (continuous until cancelled)								✓	✓	
RB/Elev - ON - normal sweep + additional water								✓		✓
Elev - LIFT - RB/Elev still working								✓		✓
Lift and Dump Functions										
Elev Tip Pos - (prior to hopper raise or dump)							✓			
Frame Raise - (only possible once Elev tip pos satisfied)	✓						✓			
Frame Lower - (only possible once Elev tip pos satisfied)		✓		✓			✓			
Hopper Tip Gate Open - (only possible once Elev tip pos satisfied)			✓		✓		✓			
Hopper Return Gate Closed - (only possible once Elev tip pos satisfied)				✓		✓	✓			
Elev Work Pos - after Hopper fully lowered Gate closed 5 sec							✓			

OPERATION	H7V1	H8V1	H9V1 B	H9V1 A	H10V1 B	H10V1 A	H11V1 B	H11V1 A	H12V1 B	H12V1 A	H13V1 B	H13V1 A
Left Hand Gutter Broom (LHGB)												
LHGB - ON - normal sweep	✓		✓									
LHGB - ON - normal sweep + water	✓		✓									
LHGB - STOW (for 5 sec after turning from ON to OFF				✓								
LHGB - ON - varabrush in (option)	✓			✓								
LHGB - ON - varabrush out (option)	✓		✓									
Right Hand Gutter Broom (RHGB)												
RHGB - ON - normal sweep		✓			✓							
RHGB - ON - normal sweep + water		✓			✓							
RHGB - STOW (for 5 sec after turning from ON to OFF						✓						
RHGB - ON - varabrush in (option)		✓				✓						
RHGB - ON - varabrush out (option)		✓			✓							
Rear Broom / Elevator (RB/Elev)												
RB/Elev - ON - normal sweep							✓				✓	
RB/Elev - ON - normal sweep + water							✓				✓	
RB/Elev - ON - normal sweep - ELEV REVERSE (momentary) (RB halts)							✓				✓	
RB/Elev - Off								✓				✓
RB/Elev - OFF - ELEV REVERSE (continuous until cancelled)												
RB/Elev - ON - normal sweep + additional water							✓				✓	
Elev - LIFT - RB/Elev still working								✓			✓	
Lift and Dump Functions												
Elev Tip Pos - (prior to hopper raise or dump)									✓			
Frame Raise - (only possible once Elev tip pos satisfied)									✓			
Frame Lower - (only possible once Elev tip pos satisfied)									✓			
Hopper Tip Gate Open - (only possible once Elev tip pos satisfied)									✓			
Hopper Return Gate Closed - (only possible once Elev tip pos satisfied)									✓			
Elev Work Pos - after Hopper fully lowered Gate closed 5 sec										✓		

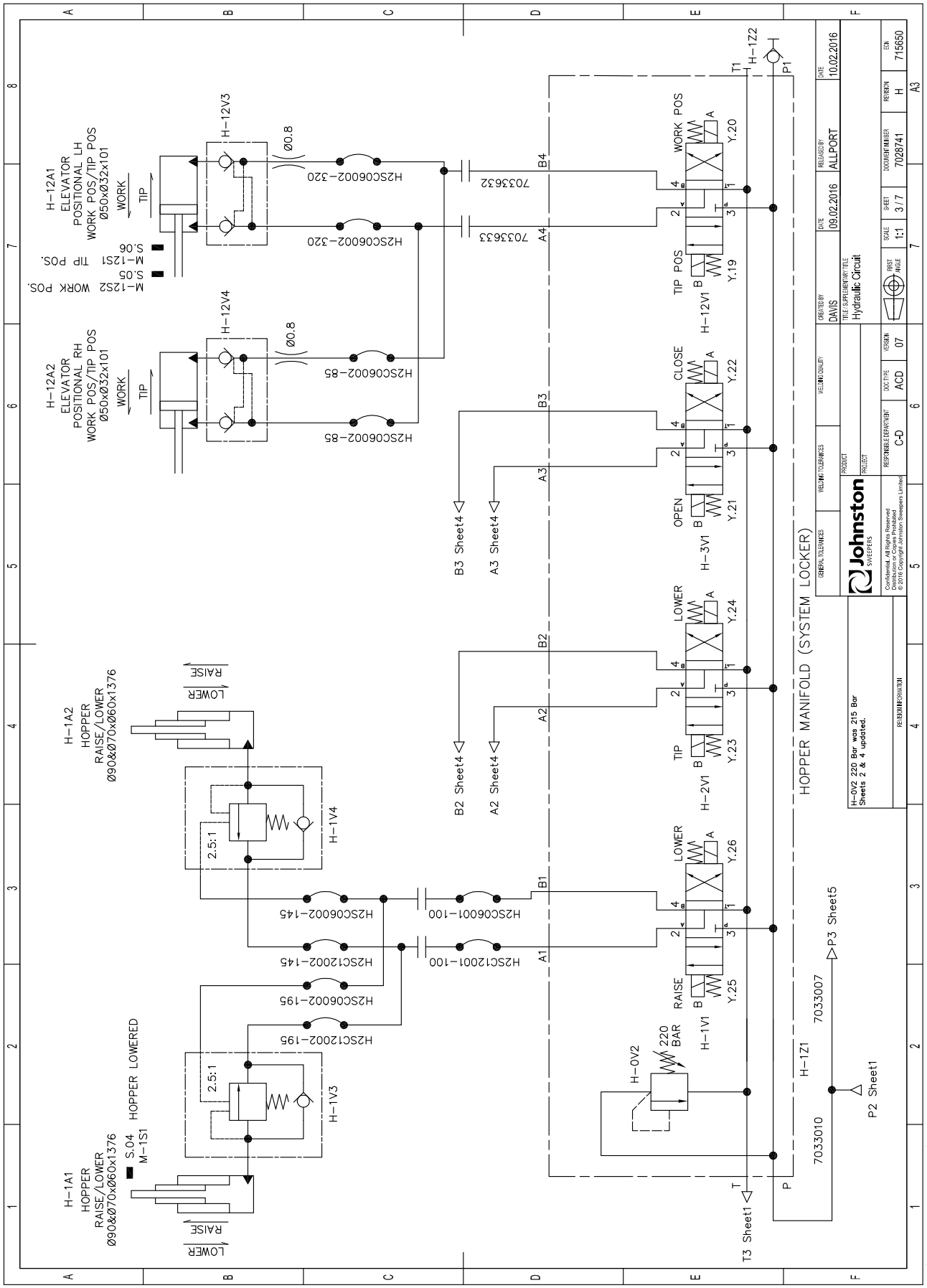
Hydraulic / Pneumatic Circuit - Sheet 1/7 Rev H



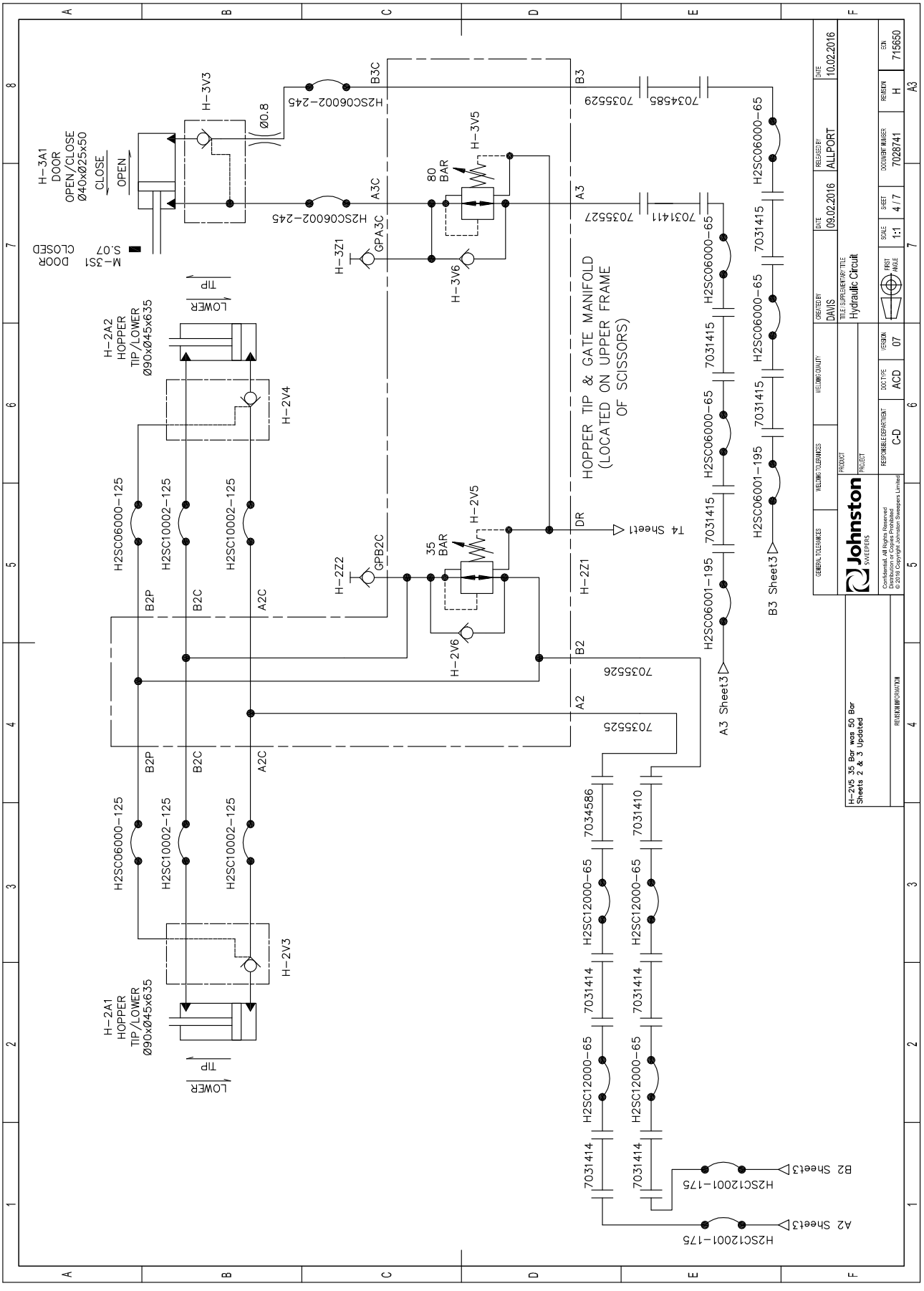
Hydraulic / Pneumatic Circuit - Sheet 2/7 Rev H



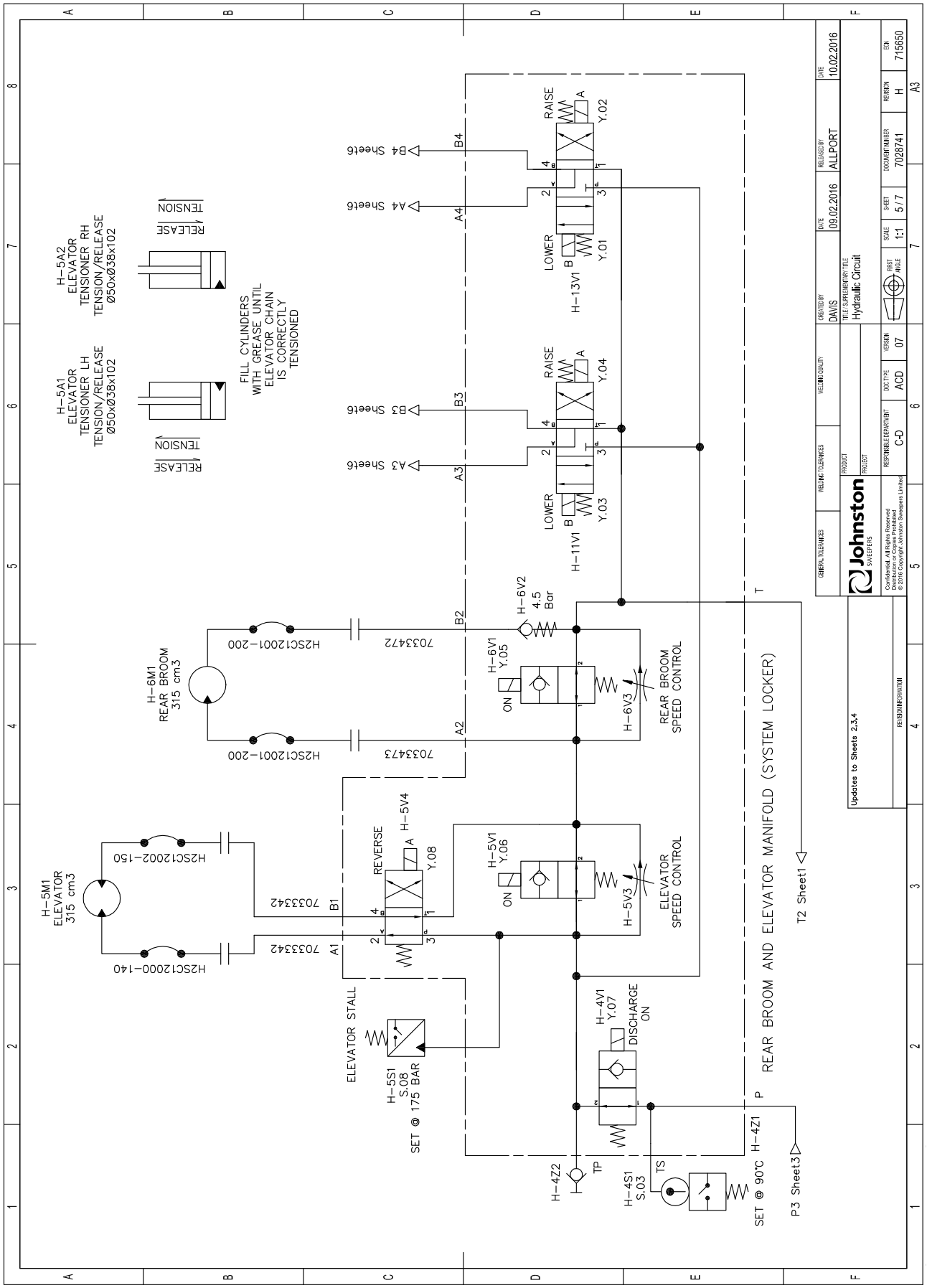
Hydraulic / Pneumatic Circuit - Sheet 3/7 Rev H



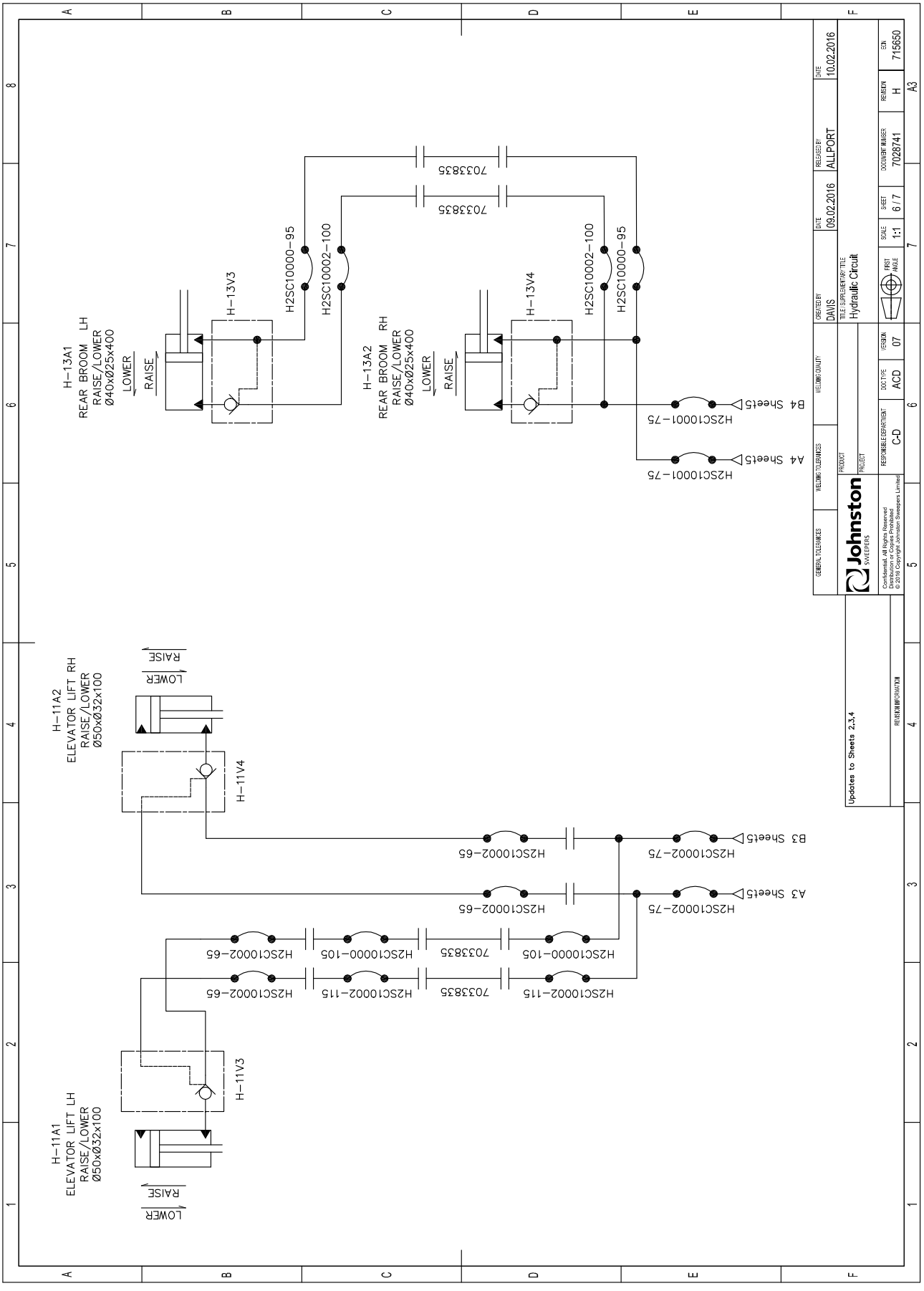
Hydraulic / Pneumatic Circuit - Sheet 4/7 Rev H



Hydraulic / Pneumatic Circuit - Sheet 5/7 Rev H



Hydraulic / Pneumatic Circuit - Sheet 6/7 Rev H



CHAPTER 3

Electrical System

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INTRODUCTION

General Description

The electrical system is integrated with that of the chassis ; it shares its battery and power source. The electrical system of the chassis activates all operational functions of the sweeper.

CIRCUIT DIAGRAMS

Please refer to the CD for the circuit diagrams.

COMPONENT IDENTIFICATION

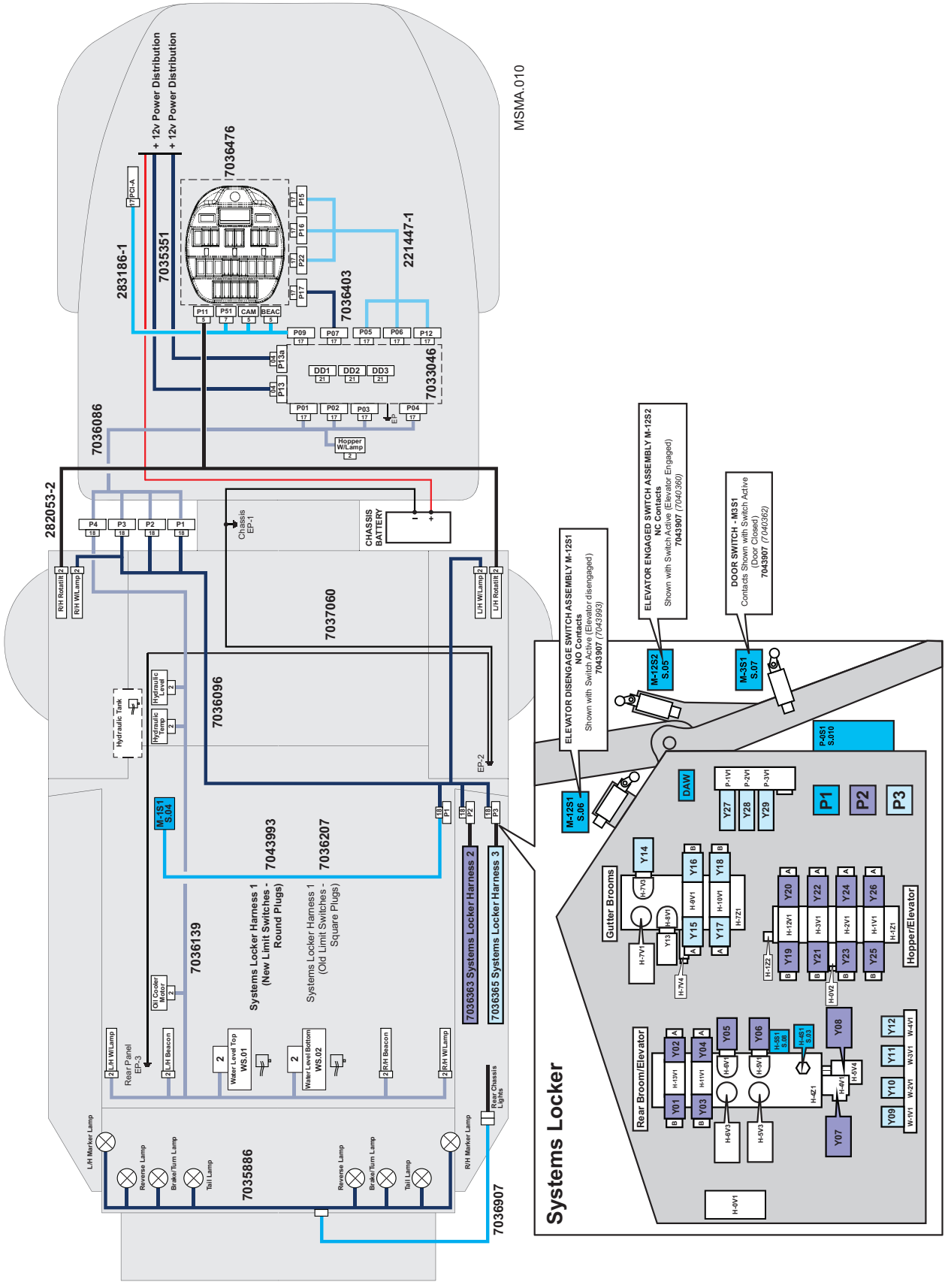
Relays

Ident.	Description / Function	Circuit(s) Ref.	Notes
AW	Audible warning		
PR2	Power supply equipment ignition controlled		
PR3	Pragramms relay		
R1	Low air pressure		
R2	Rear Broom		
R3	Elevator reverse		
R4	Elevator		
R5	Negative signal control		
R6	Discharge select		
R7	Front beacon		
R8	Discharge select		
R9	Hydraulic oil level		
R10	Low level water		
R11	Vacant		
R12	Elevator isolate		
R13	Neutral		
R14	Hnadbrake		
R15	L/H oil cooler		
R16	R/H oil cooler		

Time Relays

Ident.	Description / Function	Circuit(s) Ref.	Notes
T1	Rear broom / elevator lift		
T2	Left hand gutter broom out		
T3	Left hand gutter broom in		
T4	Right hand gutter broom out		
T5	Right hand gutter broom in		

Electrical Looms



CHAPTER 4

Water System

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INTRODUCTION

General Description

Pressure for the water supply is provided by a twin diaphragm hydraulic pump. Pressure regulation is by a relief valve situated on the water pump. Filtration is by in-line filter type located at the rear locker. An isolator valve is built into the in-line filter for ease of element servicing. All sweeping spray jets are controlled by simple solenoid valves, manifold mounted within the systems locker.

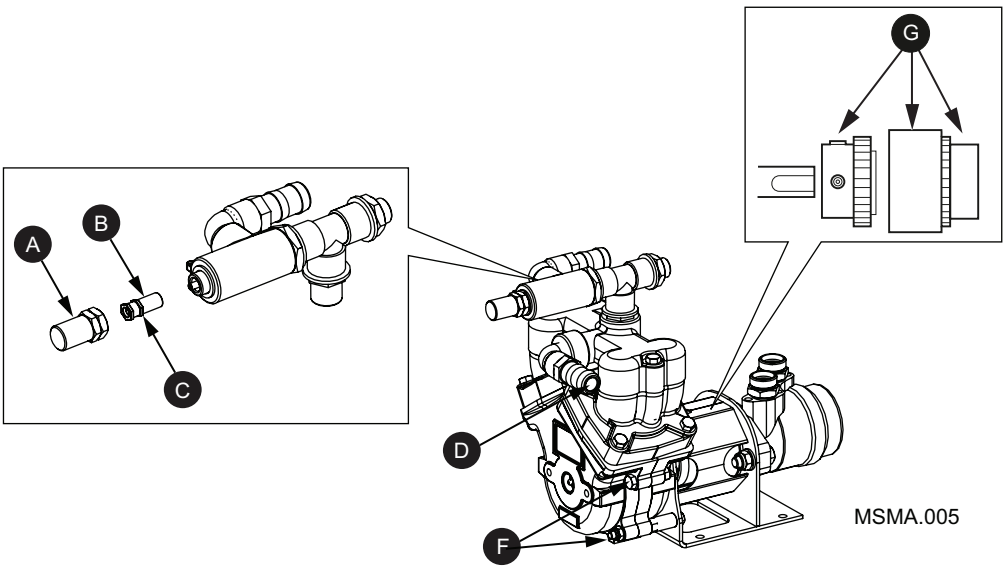
COMPONENT MAINTENANCE AND SETTINGS

Relief Valve

This valve is factory set and should not normally be touched, but should it be necessary to make adjustments, the pressure is set as follows.

Pressure Setting

Remove the cover (**A**) and loosen adjuster locknut (**B**). Connect a pressure gauge to the test point located in the systems locker. With chassis engine running and PTO engaged ensure all water sprays are switched off, turn adjuster screw (**C**) until gauge reads 3.5 bar (50 psi). Tighten the locknut and replace cover.



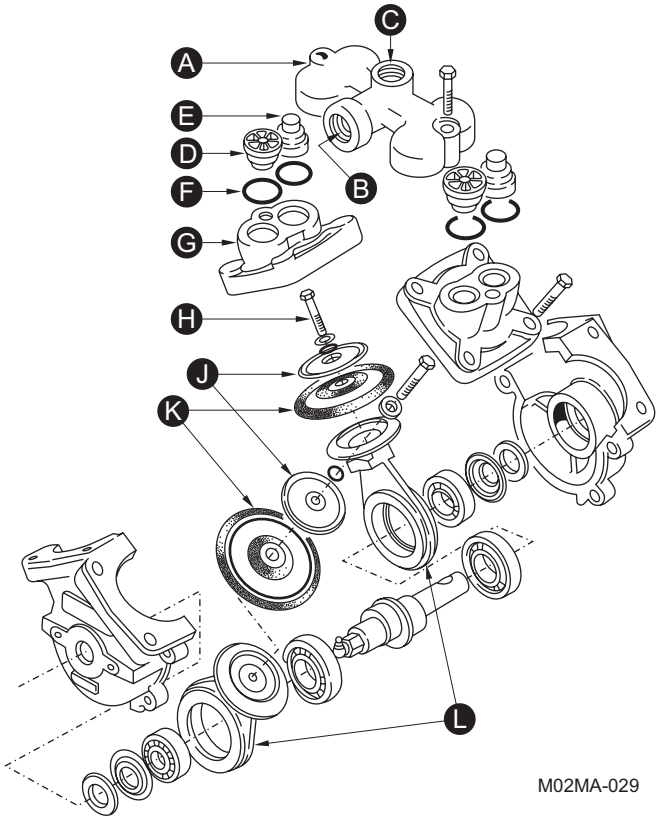
Water Pump - Dust Suppression

Removal and Refitting:

1. Isolate the water supply at the filter unit.
2. Disconnect the feed and pressure water pipes **(D)** to the pump.
3. Remove the 4 bolts **(E)** holding the water pump to the drive motor.
4. Withdraw the pump assembly from the drive coupling **(F)**.
5. Refitting is the reverse procedure, ensure that the pump drive gear does not bottom in the drive coupling.

Note: It is possible to replace the pump diaphragms and valves with the pump in situ.

Water Pump



KEY

A) Manifold
B) Suction Port
C) Delivery Port
D) Suction Valve
E) Delivery Valve
F) Valve Sealing Rings
G) Pump Chamber
H) Tension Pad Bolts
J) Tension Pads
K) Diaphragms
L) Connecting Rods

Diaphragms
When replacing a diaphragm, turn the crankshaft until the relative connecting rod is at TDC so that when securing the diaphragm and the tension pad by means of the tension pad bolt, the periphery of the diaphragm is free of the crank case.
Ensure that the tension pad is pulled down onto the connecting rod.

Pump Chambers
Before fitting a pump chamber, turn the crankshaft until the relative diaphragm is at the centre of its stroke, i.e. so that the periphery of the diaphragm is just resting on the face of the crankcase. Place the pump chamber in position, place the bolts and nuts in position and tighten ‘finger tight’. Tighten down, but make sure that the pump chamber is pulled down square so that the lower face of the chamber is correctly located against the crankcase.

Manifolds and Valves
Fit the valve sealing rings onto the valve seat. Place the delivery valve (stem upwards) over the delivery orifice of the pump chamber and push the sealing ring down so that it is flush with the pump chamber. Fit the suction valves in a similar manner, but with stem downwards. Place the manifold over the valves and see that it sits square. If the manifold does not sit square, then either the valves or the sealing rings are not correctly located. Place the securing bolts in position and pull down squarely.

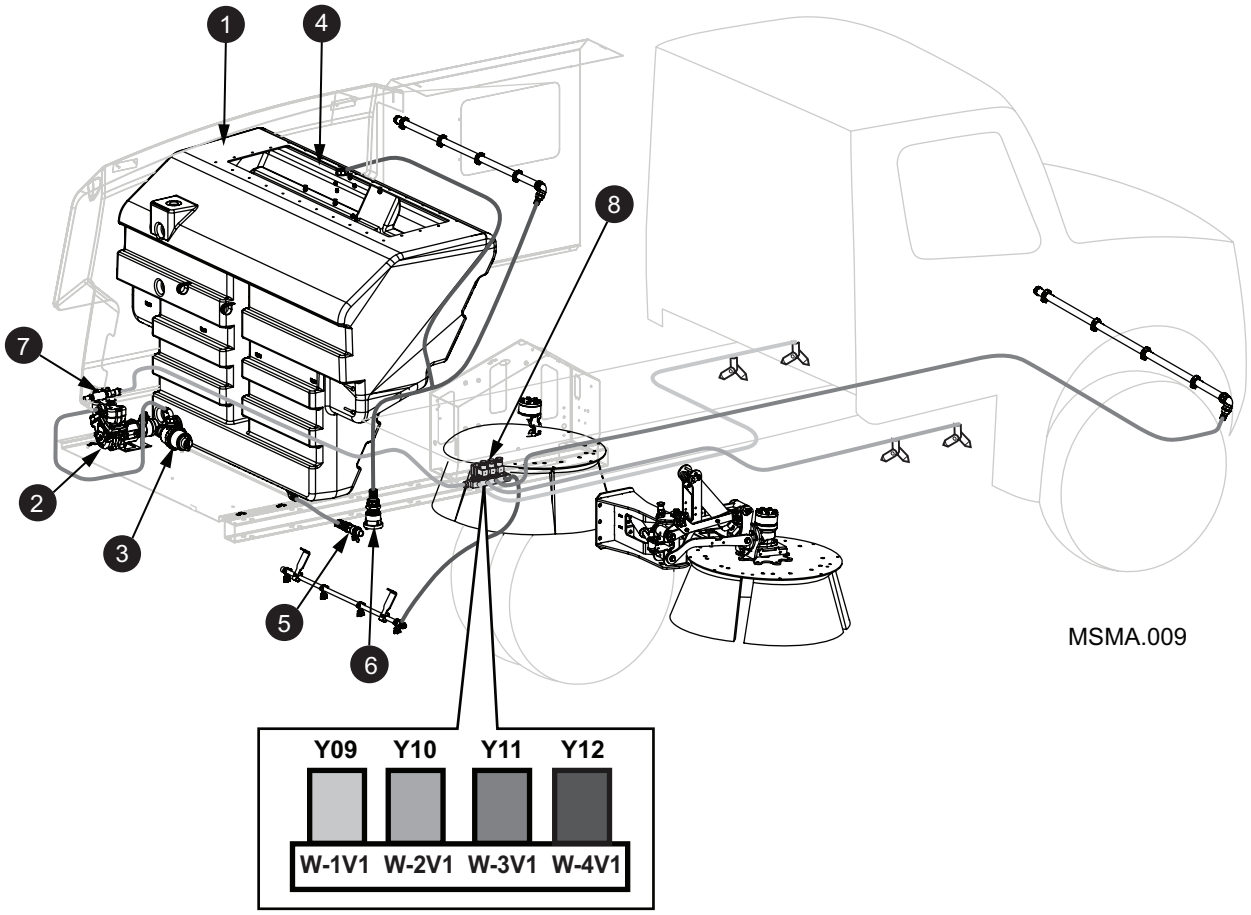
Solenoid Valves

Solenoid valves control the water spray jets and are located in the systems locker (see Modus Operandi below).

Electrical Control - Water System- Modus Operandi

	SOLENOIDS ENEGIZED			
OPERATION	W-1V1	W-2V1	W-3V1	W-4V1
Right Hand Gutter Broom water		✓		
Left Hand Gutter Broom water	✓			
Pickup Broom/Elevator water			✓	
Additional Spraybar				✓

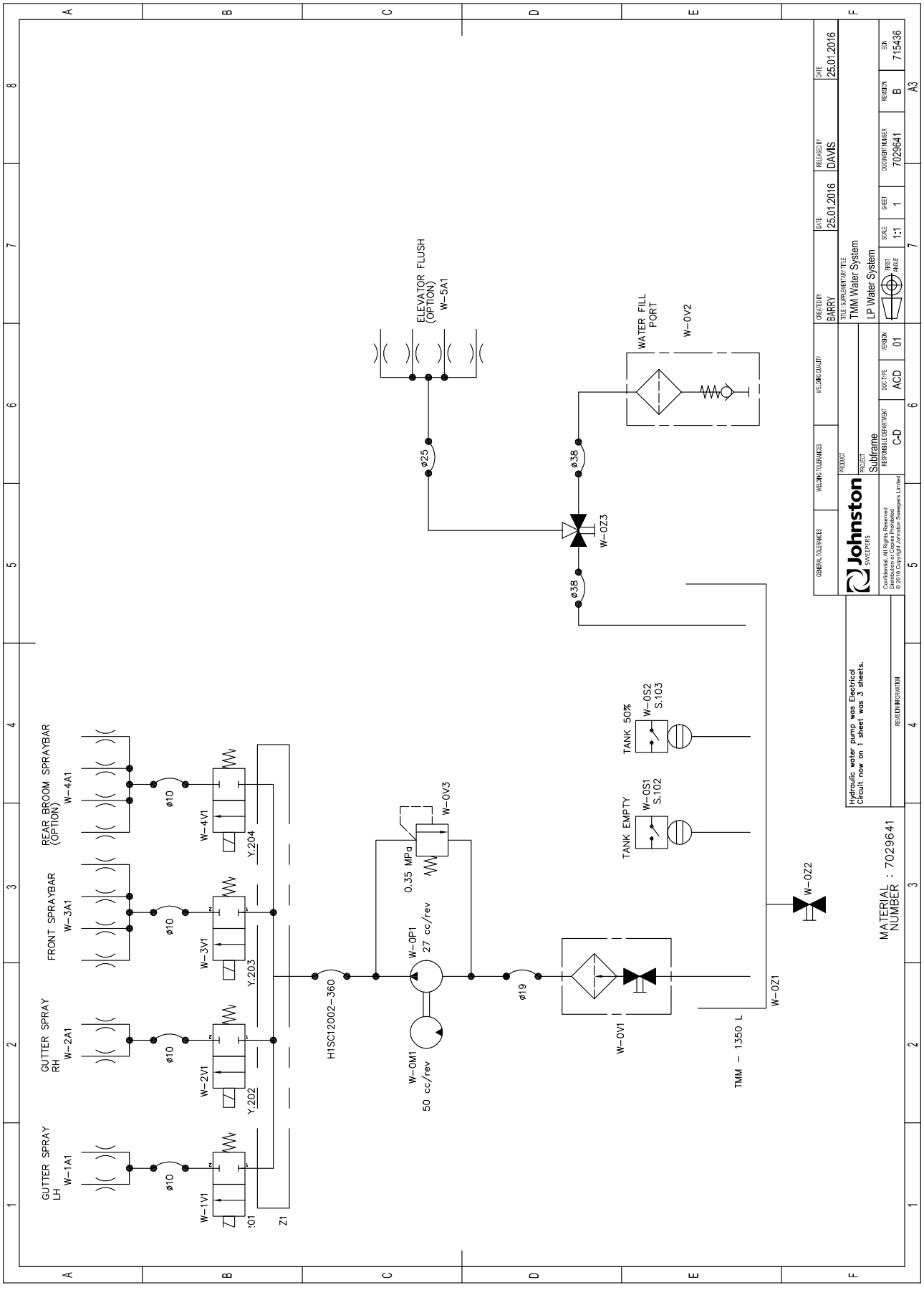
PIPING DIAGRAM / COMPONENT LOCATION



Component Key

1	Water tank
2	Water pump
3	Suction filter
4	Tank filler port
5	Tank drain / flushing valve
6	Hydrant filler port for water tank
7	Relief valve
8	Water valve manifold

Water System - Sheet 1/1 Rev B



CHAPTER 5

Pneumatic System

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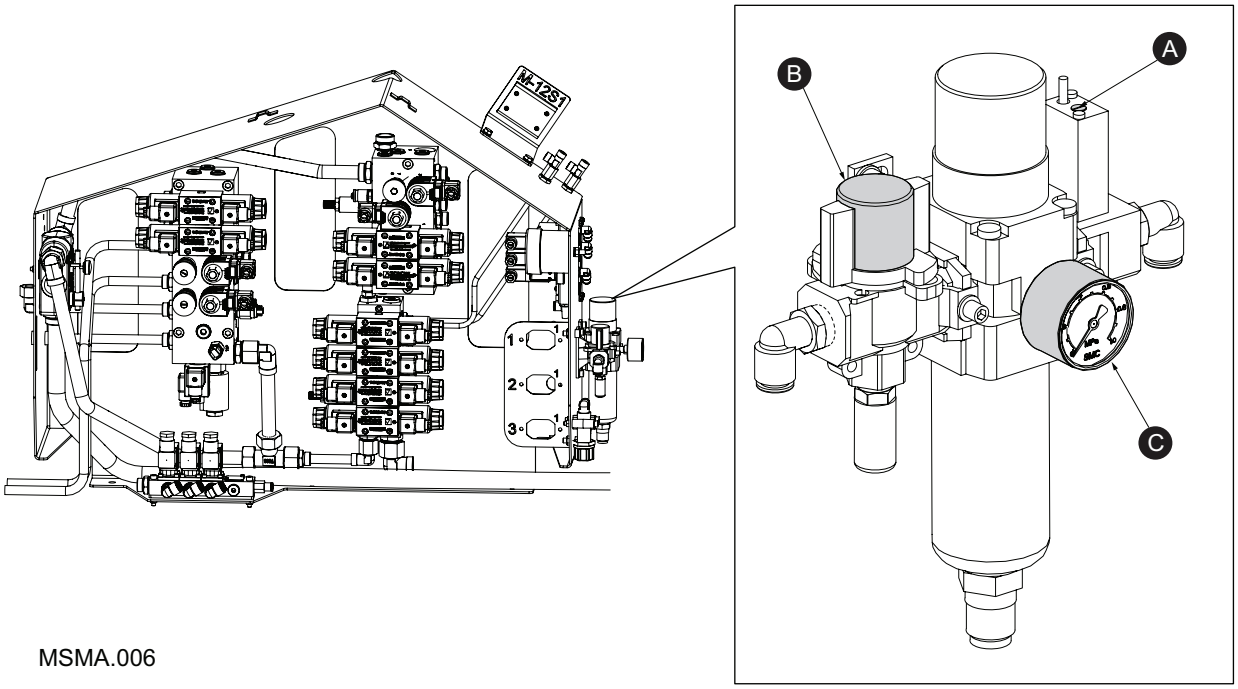
INTRODUCTION

General Description

The air supply for the pneumatic system is taken from the vehicle braking system via a safety regulating valve that ensures the braking system receives priority in the event of a failure to the sweeper air system. The sweeper's pneumatic system runs at 3.5bar, ehich can be adjusted by the screw **(A)**Low air pressure warning buzzers are located within the relay box.

Safety Notice

Before servicing any components on this system, the air supply has to be shut off by means of the shut off valve (B) mounted on top of the filter regulator unit which is located on the systems locker. Before carrying out any work ensure the system is fully depressurised (C). The shut off valve does not drain air from the vehicle braking system.



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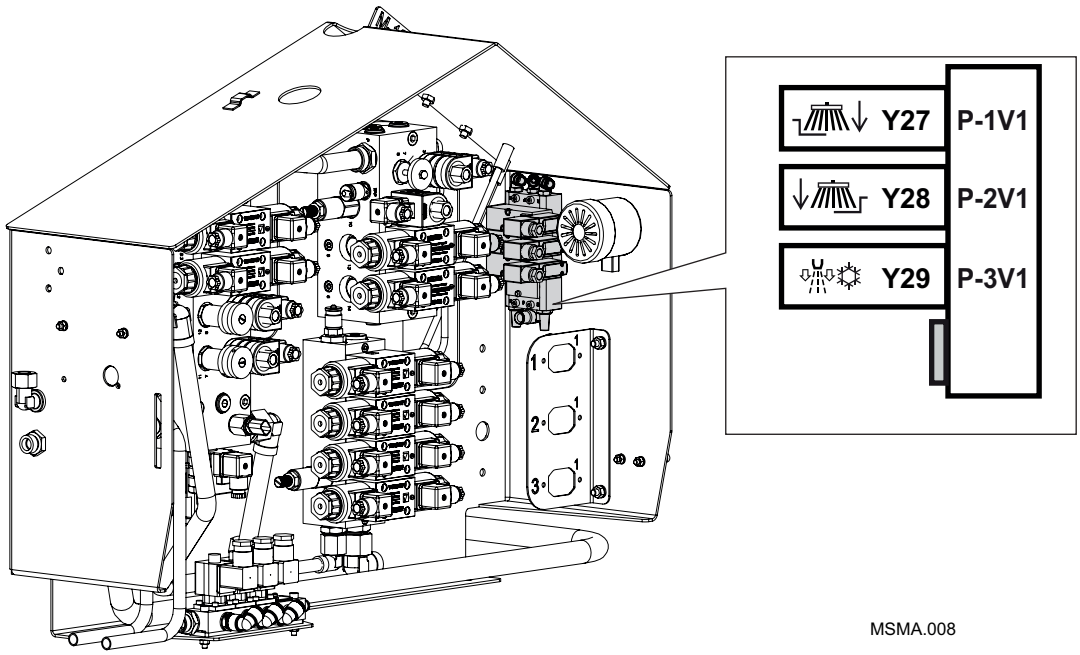
Pneumatic Pipe Colours

A system of colour coding has been introduced to assist pipe identification and fault finding. The following colours have been adopted.

R = Red - used for live feed/supply
U = Blue - used for switch supply via valve or tap
B = Black - used for permanent vent/exhaust line

Valve Identification / Location

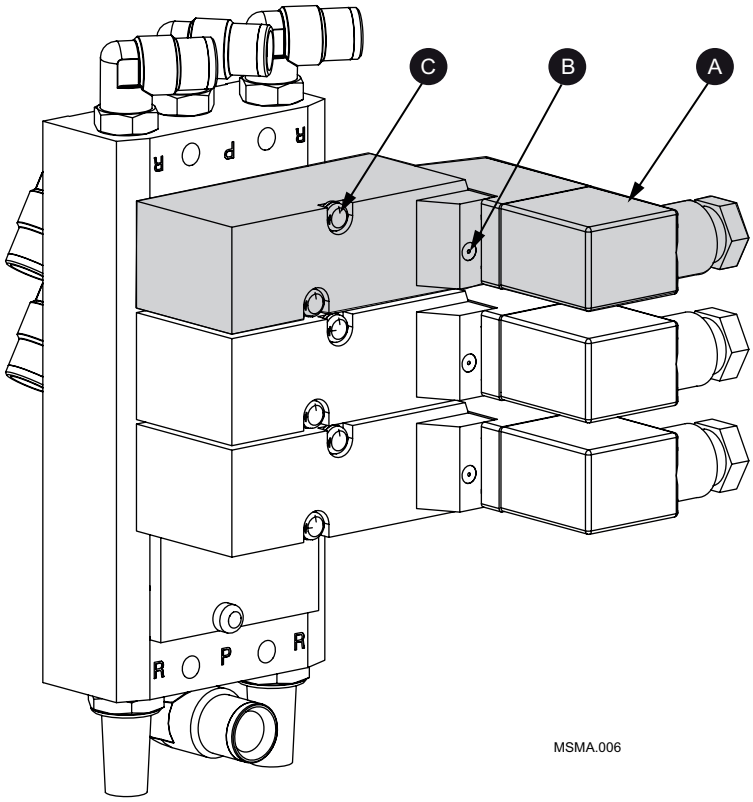
The pneumatic valve manifold **(A)** is located in the systems locker.



COMPONENT REMOVAL

Pneumatic Valve Replacement

Unplug the plug **(A)** by losening the screw **(B)**. The pneumatic valve can be replaced by unscrewing the 2 screws **(C)**.

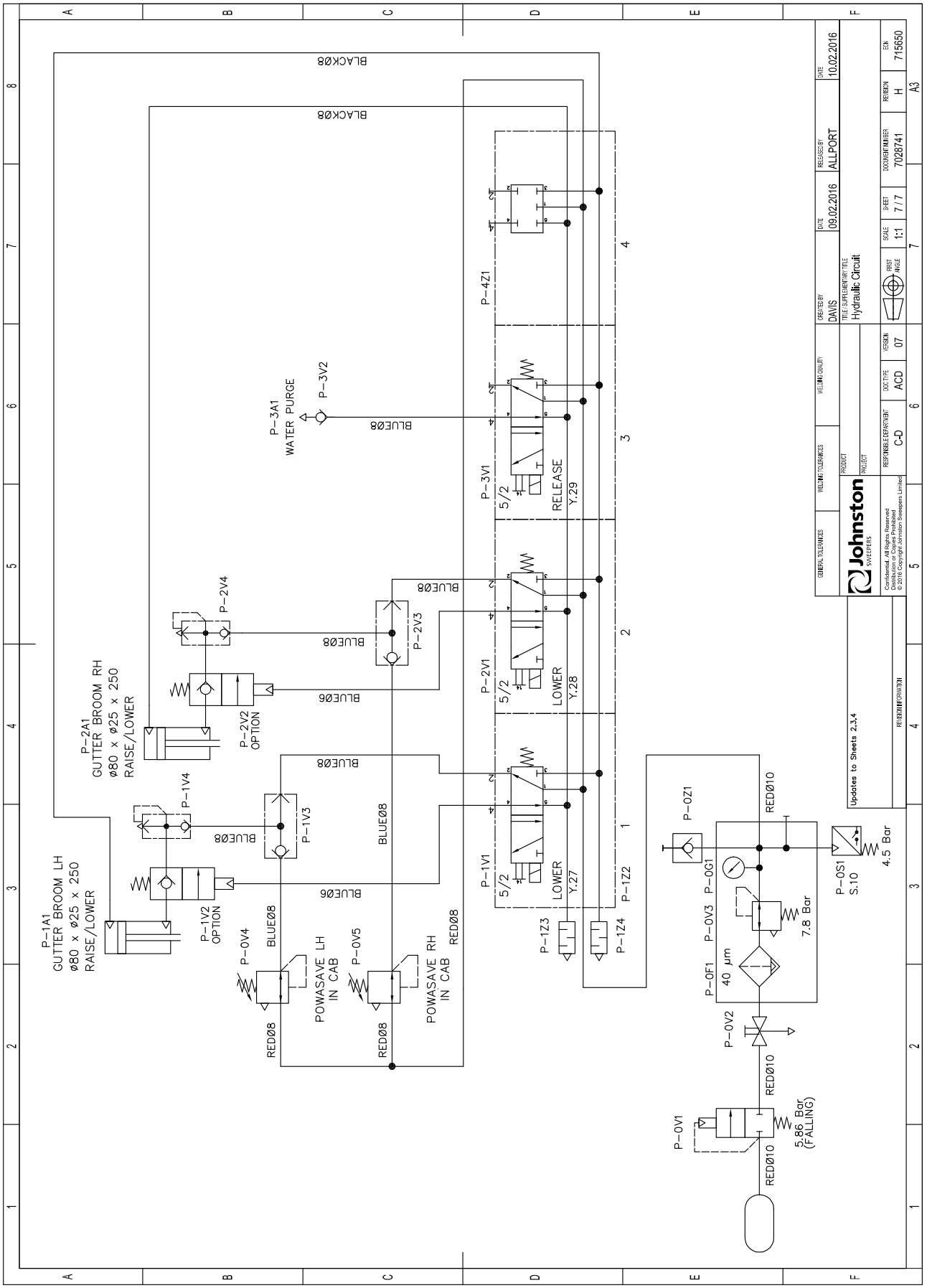


Electrical Control - Pneumatic System - Modus Operandi

	SOLENOIDS ENERGIZED		
OPERATION	P1V1	P2V1	P3V1
Water System Purge ON			✓
LHGB - ON - normal sweep	✓		
RHGB - ON - normal sweep		✓	

KEY: ✓ = solenoid energized
RHGB = Right Hand Gutter Broom
LHGB = Left Hand Gutter Broom

Pneumatic Circuit - Sheet 7/7 Rev H



CHAPTER 6

Service Tools

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The following tools are available through our Spares Network

TOOL NO	ITEM	FUNCTION
437-3	Pressure Gauge Set	Measures hydraulic, pneumatic and water pressures
437-7	0 - 55 Litres/Min Flow Gauge	Hydraulics flows
437-311	Nylon Tube Cutter	Ø4 - Ø16mm

CHAPTER 7

Health and Safety

Introduction

The information presented in this chapter does not infer that there are hazards associated with the Johnston sweepers. It is given as a guide to general precautions that should be exercised in the course of their maintenance work.

Whilst every effort has been made to ensure completeness of this document, owners and operators of Johnston sweepers are reminded of their responsibilities to comply with all relevant legislation including Risk/COSHH Assessments and Approved Codes of Practice.

HEALTH AND SAFETY PRECAUTIONS

The information presented in this section does not infer there are any particular hazards associated with these machines. It is given as a guide to the general precautions that should be taken in any workshop environment when working on machines of this nature in the course of their maintenance.

Safety symbol:
The universal symbol is used throughout this manual to indicate information which is essential for health and safety of all operating personnel.

Refer to all state, district/company, or council Health and Safety Regulations and follow the procedures laid down.

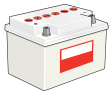
The repair and maintenance of machinery such as this can involve physical hazards or other risks to health. This section lists some of these hazards and the precautions necessary to avoid them.

The list is only general but all other operations, procedures and the handling of materials should be carried out in accordance with the requirement of health and safety laws, which is the responsibility of the Owner/Operator/Maintainer.

Sharp objects warning:
There can be a risk of injury from sharp objects such as discarded hypodermic needles becoming lodged in the sweeping system. The use of 'needle stick gloves' is recommended when changing brushes, using the wanderhose/Littasnatch and when cleaning out the machine.

Anti Freeze:
Anti-freeze may be absorbed though the skin in toxic or harmful quantities.
If swallowed, seek medical attention immediately.
Some types, i.e., isopropanol, ethylene glycol and methanol are flammable.

Batteries:
Gases released during charging are explosive. Never use naked flames or allow sparks near charging or recently charged batteries.



Disconnection:
Disconnect the negative battery lead from battery first. The positive cable must always be disconnected last.

Reconnection:
Always reconnect the positive battery cable first.

Jump-starting and use of auxiliary (booster) batteries:
Do not jump-start maintenance free batteries if in a deeply discharged state as internal short circuits may occur.

If a maintenance free battery is found to be in a deeply discharged state, it is essential to remove the battery and recharge off the vehicle. Jump-starting will not enable the vehicles own charging system to initiate the charging process.

Jump starting procedure:
Always follow this procedure when connecting a booster battery.

Take care not to cause sparking which could ignite hydrogen gas being given off by the batteries.

1. Apply the park brake, turn off ignition, lights and other electrical loads.
2. If the slave battery is mounted on another vehicle, ensure that the vehicles are not touching.
3. Ensure that the donor battery voltage is compatible with the vehicle battery.
4. Ensure that adequate ventilation is available to the vehicle and slave batteries.
5. Connect positive terminal of the donor battery group to positive terminal of the discharged battery group.
6. Connect negative terminal or slave battery group to chassis earth of the discharged battery group.
7. Attempt to start the casualty vehicle.
8. Once the vehicle has started, remove the negative lead from the chassis and then the slave battery.
9. Remove positive lead from discharged chassis and then the donor chassis.

If the vehicle will not start with a booster battery, contact your local Johnston Service Network.

Chemical materials:
Chemical materials such as solvents, sealers, adhesive, paints, resin foams, battery acids, anti-freezes, brake fluids, oils and grease should always be used with caution and stored and handled with care.

Chemical materials may be toxic, harmful, corrosive, irritant or highly flammable and give rise to hazardous fumes and dust.

Always consult the appropriate safety standards for handling such materials.

Typical biohazard symbol

Typical radioactive material symbol

Typical poison symbol

Always use appropriate protective clothing

REMINDERS
Chemical materials

DO remove chemical materials from the skin and clothing as soon as practical after soiling. Change heavily soiled clothing and have it cleaned.

DO carefully read and observe hazard and precaution warnings given on hazardous material containers and in any accompanying leaflets, posters or other instructions. Hazardous material health and safety data can be obtained from manufacturers.

DO organise work practices and use protective clothing to avoid soiling of the skin and eyes; breathing vapours, aerosols, dust, and fumes; inadequate container labelling; fire and explosive 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 NOT mix chemical materials except in accordance with the manufacturer's instructions. Some chemicals can form other toxic or harmful substances; give off toxic or harmful fumes; be explosive when mixed together.

DO NOT spray chemical materials, particularly those based on solvents, in confined spaces; for example, 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. Fumes given off 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 unlabelled 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.

Dusts:
Powder, dusts or clouds may be irritant, harmful or toxic. Avoid breathing dusts from powdery chemical materials or those arising from dry abrasion operations.
Wear respiratory protection in accordance with the requirement of the Health and Safety Acts.

Electric shocks:
When working on electrical systems, remove watches, bracelets and rings as these can conduct electricity and cause shorts and/or burns.

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

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

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

Ensure that electrical equipment is protected by the correct rated fuse and if used outside an earth-leakage circuit breaker is used.

Never misuse electrical equipment and never use equipment that is in any way faulty. The results could be fatal.

Use reduced voltage equipment (110 or 24 volt) for inspection and working lights where possible.

Ensure that the cables of mobile electrical equipment cannot be trapped and damaged such as in a vehicle hoist, trolley jacks, etc.

Use air operated mobile equipment where possible in preference to electrical equipment.

Exhaust fumes:
These contain asphyxiating, harmful and toxic chemicals and particles such as carbon oxides, nitrogen oxides, aldehydes, leads and aromatic hydrocarbons.
Engines should only be run under conditions of adequate extraction or general ventilation and not in confined spaces.
NB : Catalyst exhausts/silencers can run at extremely high temperatures.

Fire and welding:
Observe strict fire safety when storing and handling flammable materials or solvents, particularly near electrical equipment or welding processes.
Disconnect battery, microprocessors, etc. before commencing welding. Failure to observe this could cause failure of components.
Ensure before using electrical or welding equipment that there is no fire hazard present.
Have a suitable fire extinguisher available when using welding or heating equipment.
Special precautions must be taken before any welding or cutting takes place on vessels which have contained combustible materials, e.g. fuel tanks.
The sound insulation foam used on the equipment must be removed if any welding is to be carried out in that area of the machine.

First aid:
It is desirable for someone in the workshop to be trained in the first aid procedures.
Splashes or particles in the eye should be flushed with clean water for at least ten minutes and medical attention sought.
Soiled skin should be washed with soap and water.
Inhalation affected individuals should be removed to fresh air immediately.
If hazardous material has been swallowed or if the effects of exposure to hazardous materials persist, consult a doctor with information (label) on material used.
Do not induce vomiting (unless indicated by the manufacturer).

High-pressure air and lubrication equipment:
Always keep high-pressure equipment in good condition and regularly maintained, particularly at joints and unions.

Never direct a high (or low) pressure nozzle at the skin as the fluid may penetrate to the underlying tissue, etc, and cause serious and potentially fatal injury.

Oils and greases:
Prolonged and repeated contact with mineral oil may result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis.
Gross and prolonged contact, especially with used engine oil, which contains potentially harmful contaminants, may cause skin cancer.

Where there is a risk of eye contact, e.g., by splashing, eye protection should be worn, for example, chemical goggles or face shields; in addition, an eyewash facility should be provided.

Adequate means of skin protection and washing facilities should be provided.

Repeated or prolonged skin contact should be avoided by wearing protective clothing, including impervious gloves where practical. Particular care should be taken with used oils and greases containing lead.

First Aid treatment should be obtained immediately for open cuts and wounds.

Apply barrier cream before each work period to help when removing oil from the skin.

Use proprietary hand cleaners only if they can be removed from the skin using water.

Overalls must be cleaned regularly. Discard clothing that cannot be cleaned and footwear that has become impregnated.

In the event of a skin condition occurring consult a doctor and tell him/her that your work involves using oil.

Solvents:
Solvents such as acetone, white spirit, toluene, xylene and trichloroethane are flammable.

Avoid splashes to the skin, eyes and clothing. Wear protective gloves, goggles and clothing.

When using solvents ensure good ventilation; avoid breathing fumes, vapours, spray-mists and keep containers tightly sealed. Do not use in confined spaces. When spraying materials containing solvents, for example paints, adhesives or coatings, use extraction ventilation or personal respiratory protection in the absence of adequate general ventilation.

Do not apply heat or flame except under specific and detailed manufacturer's instructions.

Suspended loads:
Never work under an unsupported, suspended or raised load. For example, jacked up vehicle, raised tipper body, suspended engine, etc.

Always ensure that lifting equipment e.g., jacks, hoists, axle stands, slings, etc are adequate and suitable for the job, in good condition and regularly maintained.

NEVER improvise lifting tackle. **ALWAYS** ensure body props and/or axle stands are used when working under bodies or chassis.

Workshop tools and equipment:
Only use tools and equipment for their intended purposes.

Never overload equipment such as hoists, jacks, axles 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.

Never use damaged or defective tools or equipment.

Always wear suitable eye protection when using grinding, chiselling or air guns.

Always wear a suitable breathing mask when using sand blasting equipment, working with asbestos based materials (such as brake linings) or using spraying equipment.

ALWAYS use approved safety platforms/gantries when working above ground level.