

# Maintenance Manual



## RT655 Mk III Regenerative Air Twin Engine Sweeper

Part No 7045553

Revision Level B

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**P Chapter - Page Issue Levels**

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**10 Chapter - Health and Safety**

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**CHAPTER****1**

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**Scheduled Maintenance****Table of Contents**

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## INTRODUCTION

### REGULAR MAINTENANCE

It is impossible to over emphasise the importance of regular maintenance, inspection and running adjustments to maintain efficiency and obtain trouble free service from the machine.

Attention is drawn to the recommendation in the Auxiliary Engine Handbook relating to the post delivery check over.

The maintenance schedule specified are 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 Engine oil changes.
- 3 Fluid oil changes.
- 4 Hydraulic oil changes.

Attention to the servicing of air cleaners fitted to both auxiliary and vehicle engines is of vital importance as clean air is essential for the proper functioning and ultimate life of an engine. Badly serviced air cleaners can allow dust particles to be directly induced into the internal working surfaces with a resulting rapid increase in engine wear and eventually complete failure. This also applies to any air leaks occurring between the air cleaner and the engine inlet manifold. See separate instructions for Air Cleaner Servicing.

It is important that the following Safety Precautions are observed when working on the machine.



## Safety Precautions



- Ensure the machine is standing on firm, level ground and there are no obstructions above or to the rear before raising the body.
- Ensure the safety prop is used at all times when working under the body.
- Ensure operators are fully conversant with the controls and operation.
- Isolate the air before working on any pneumatically operated or controlled equipment.
- Disconnect or isolate the vehicle battery when working on the electrical system.
- Ensure the auxiliary engine is switched off once the channel brush has been lowered for adjustment.
- Be aware of the safety instructions relative to the suction fan given in the equipment maintenance notes.
- Keep hands, loose clothing, hair etc. well clear of moving parts.
- Do not climb on the engine walkways unnecessarily or approach the fan inlet whilst the engine is running.
- Do not grasp any part of the engine or exhaust system without first ascertaining whether it has cooled sufficiently to avoid scalding.
- Do not use ill-fitting tools such as spanners that may slip and cause injury.
- Use approved safety platforms/gantries when working above ground level. Get a second person to check periodically when only one person is working on access equipment or inside the body.
- The use of 'needle stick gloves' is recommended when changing brushes, using the wanderhose/ Littasnatch and when cleaning out the machine.

**SECURITY OF SWEEPING EQUIPMENT**

It is necessary to check every six months the security of various components as part of the maintenance programme, the bolts that secure the sweeper subframe to the chassis.

**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 following rule applies:

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

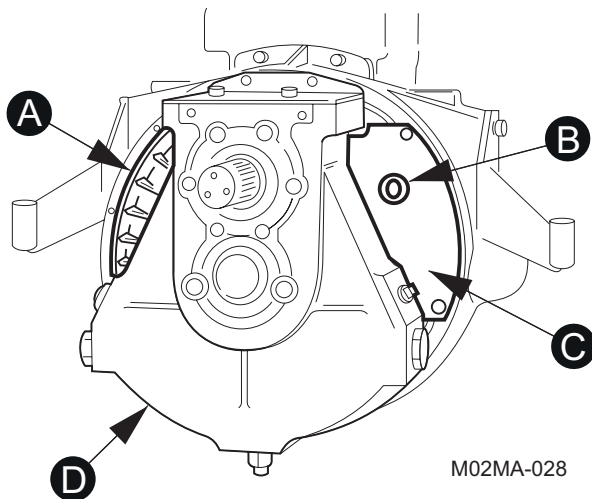
This directive is valid for all thread diameters and grades.

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

## AUXILIARY ENGINE - FLUID FLYWHEEL

The fluid flywheel transmits power from the engine to the gearbox. Its design allows for the minimum of maintenance, minimal mechanical wear and superior longevity to the remainder of the transmission system. With the correct attention it should last the life of the sweeper.

### FLUID FLYWHEEL FILLING PORTS (Viewed with fan case and fan not shown for clarity)



- (A) Flywheel with side cover (C) removed.
- (B) Flywheel filler/inspection port visible through side cover sight hole.
- (C) Flywheel side cover.
- (D) Step-up gearbox.

## Maintenance

After the first 50 hours operation check the fluid level; this operation must be carried out with the unit cold. Repeat this check every 500 hours. The fluid flywheel is fitted with a fusible plug which melts at 198°C (recognised by four equi-spaced indentations round the hexagonal socket). Oil should be replaced after 4,000 hours operation.

## Draining Instructions

- Ensure the flywheel is cool before removing the level filler plug
- Using a propriety vacuum pump or oil extractor/syringe, drain the oil from the flywheel.

## Filling Instructions

Ensure the flywheel's filler port aligns with sight hole (B) in either of the two flywheel side covers (C), approximately 2 o'clock and 10 o'clock.

Remove the side cover and spacers. Remove filler plug using a 5/16 AF allen key and fill with the correct oil until it reaches the level of the port. (See Operators Guide page OG6:17 for oil specification)

During filling, carefully rock the flywheel to ensure that no air pockets form below the oil level.

**DO NOT OVERFILL AS THIS WILL CAUSE THE UNIT TO OVERHEAT AND RAPID SEAL DETERIORATION WILL OCCUR**

Replace the filler plug using thread sealant to ensure a good seal. Visually check for oil leaks and replace the flywheel cover.

**THROTTLE SETTINGS**

The engine has its own ECU and the speeds are preset and can only be checked.

- 1 Raise the body.
- 2 With the fan safety flap closed and a plate (suitably secured with clamps) completely blanking the fan inlet.
- 3 Start the engine and allow to warm up.
- 4 Check the tickover speed and the maximum flight speeds. If these are incorrect, they must be reset by an authorised distributor.
- 5 **NOTE** : Stop the engine before removing the fan inlet blanking plate and lowering the body.

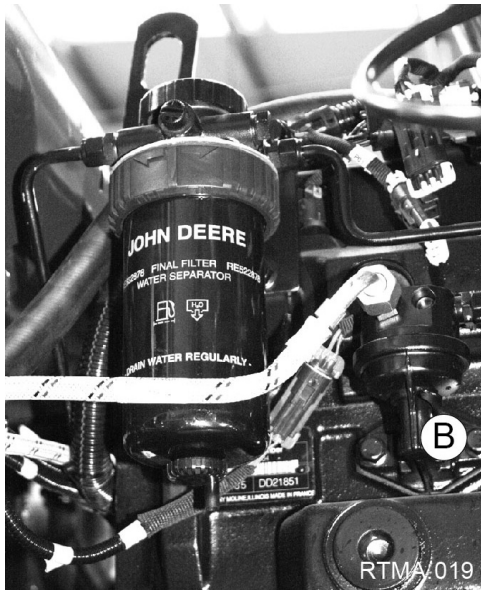
<b>ENGINE TYPE</b>	<b>JOHNSTON PART NO.</b>	<b>IDLE SPEED Rev/Min</b>	<b>MAXIMUM FLIGHT SPEED (Off Load) Rev/min</b>
John Deere Turbocharged Electronic - Tier 3 (86kW) -24V	283791-12 7008984	750 750	2000 2000

## AUXILIARY ENGINE - FUEL SYSTEM

John Deere Stage 3A 86kW Turbocharged.

Under no circumstances should injector pipes be loosened and the engine cranked. These engines use very high injection pressures and will cause injury. The system is self-priming by using the manual plunger on the top of the fuel filter.

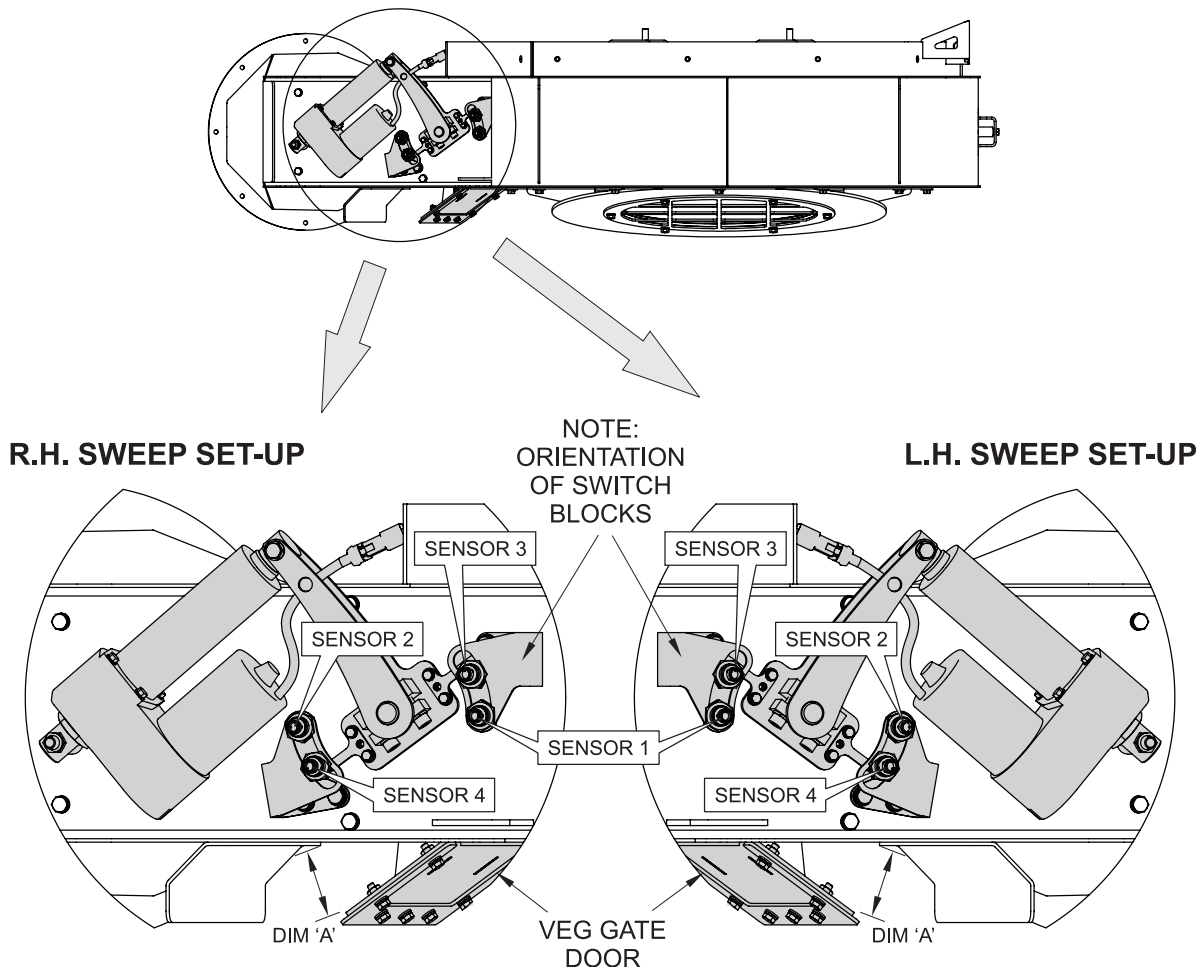
When starting the engine for the first time after bleeding the fuel system, or if the engine has run out of fuel, air pockets in the fuel system may prevent the engine from starting correctly. The procedure for priming the fuel system and removing the air pockets is as follows.



1. Locate the fuel priming pump (B) located on the engine, as shown.
2. Pump the lever on the side of the pump as indicated, until it becomes difficult/stiff to operate (this may take several minutes).
3. Crank the engine until the engine fires. The maximum cranking time should not exceed 15 seconds or damage to the fuel pump may occur. It may be necessary to repeat step two. Wait at least a minute for the battery to recover before re-cranking the engine.

**FAN CASE / VEG GATE SET UP**

If the VEG gate actuator / fan case or VEG gate door are replaced, it is essential to ensure that they are set up correctly to give the correct machine performance. The actuator is positioned on top of the fan case.



LED ILLUMINATED	SENSOR POSITION	DIMENSION 'A' LIGHT ON	DIMENSION 'A' LIGHT OFF	FUNCTION 'A'
RED	1	CLOSED 0mm	26mm	FULL REGEN
YELLOW	2	25mm	61mm	60% REGEN
BLUE	3	60mm	97mm	30% REGEN
GREEN	4	FULLY OPEN 96mm		VACUUM

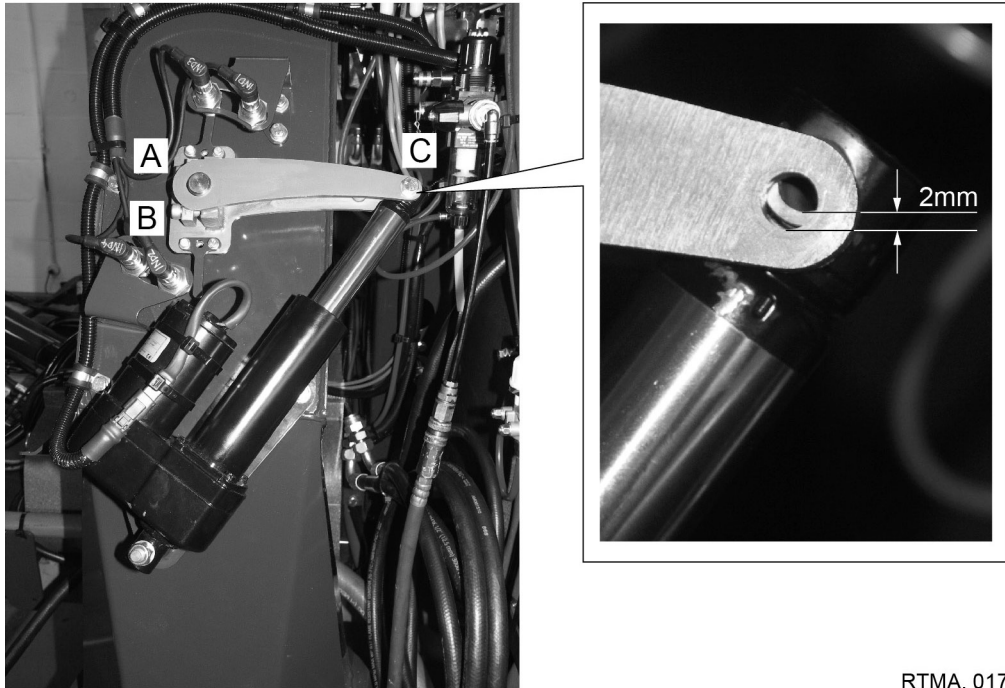
RTMA. 015-3

There are 4 operating positions of the VEG gate door.

Loosening the appropriate sensor and slide in the slot will effect the position of dimension 'A' when the light on the switch panel will illuminate and go out.



## MECHANICAL ADJUSTMENT FOR VEG GATE ACTUATOR



RTMA. 017

- Disconnect and remove bolt C.
- Hold the actuator spindle and activate the actuator to its maximum stroke.
- Adjust bolts A and B to give a parallel gap between the clamping blocks of the lever arm and secure to the pivot shaft.
- Hold the lever arm in its raised position ensuring the flap is fully closed.
- Align the hole in the lever arm together with the hole in the spindle of the actuator.
- Adjust the bolts A and B so that the hole in the lever arm is lower than the hole in the spindle of the actuator by approx 2mm. This will ensure the flap is secure in it's closed position.
- Loosen A and tighten B the lever arm will lower.  
Loosen B and tighten A the lever arm will raise.



### Safety Notice



Before changing the filter ensure the oil is cold.  
 Before removing the return filter. Ensure no pressure is present by allowing the system to rest for a short time after turning off the equipment.

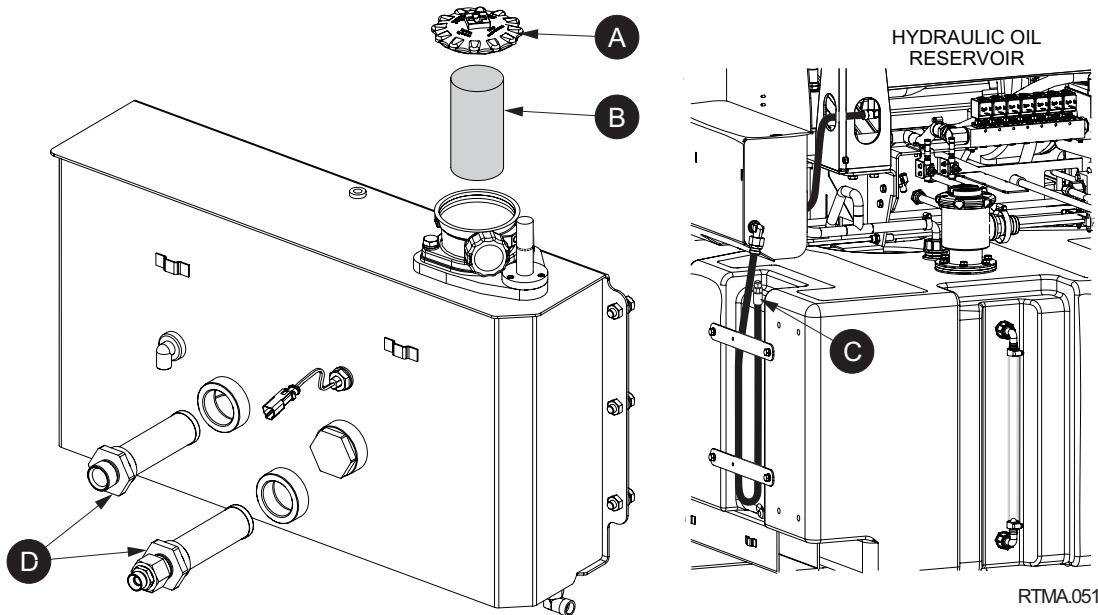
## HYDRAULIC OIL RESERVOIR

### Return Filter

The filter should be changed every 1000 hours, however there is an integral filter indicator on the side of the filter head and, should this indicate red whilst the suction fan is operating, i.e. body raised, then the filter is contaminated and requires changing at an earlier interval.

### Renewing the Return Filter

Unscrew cover (A) and lift out the cartridge element (B). Fit new cartridge and screw on the cover



### Renewing the Suction Filters

#### Note:-

**Drain Oil Before Removing Suction Filters.**

The oil can be drained by removing the drain plug (C) located under the systems locker or by using a propriety vacuum pump or oil extractor/syringe.

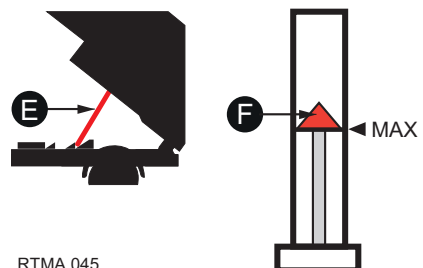
The filters (D) should be changed whilst the system is empty.

### System Refilling

The system capacity dry is 75 litres.

Raise the body and engage the body prop (E) in its highest position. The bottom of the level indicator (F) should not be higher than the Maximum line as shown on the gauge.

It is important that the correct level is maintained as under filling can adversely affect the heat dissipation rate of the oil, whilst over filling can cause oil to overflow when the body is lowered. The recommended oil is shown in the lubrication chart at the end of this chapter.



**FILTER REGULATOR UNIT**

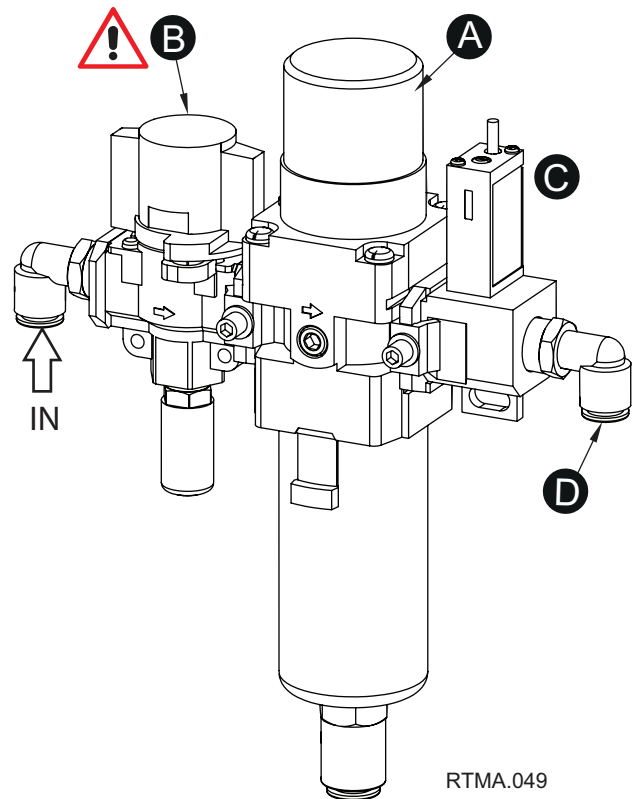
Comprises of a combined air filter/pressure regulator (A) and a lubrication unit (B). It is mounted in the engine Powapak on the right hand side of the machine.

**Safety Precautions**

The shut off valve must be used when servicing any item on the air system

The Air Filter Regulator Unit incorporates the following features:-

- (A) Pressure regulator ensures the equipment is not over pressurised. It is factory set and sealed at 7.5 bar (108 psi).
- (B) Isolation/drain valve, automatically dumps accumulated water when the machine is shut down or when the air supply is isolated by the shut off valve
- (C) Pressure switch is fitted to illuminate the low air pressure warning lamp on the control panel.
- (D) Service connection enabling the system to be charged using a workshop air supply.



RTMA.049

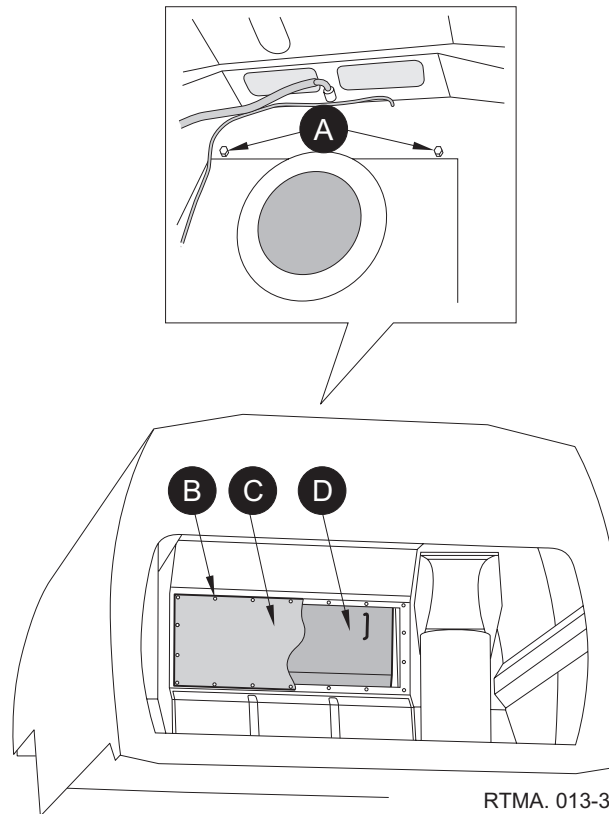
### SEPAVAC

Raise the body and remove the 2 bolts (A) in the body front. Remove the screws (B) retaining the cover (C) over the SepaVac.

With the panel removed the SepaVac door (D) can be lifted out for inspection, providing bolts (A) have been removed.

Check that all parts are in good repair and replace if worn, and that the chamber is clean of debris.

Refit procedure is the reverse of the above.  
Apply sealant to the cover (C) when refitting.



### PNEUMATIC CYLINDER MAINTENANCE

Periodically inspect the cylinder rods for damage, blemishes or build up of material such as tar, cement, paint etc. The rods can be cleaned with fine wire wool and/or spirit and should be kept clean to ensure long seal life.

### HYDRAULIC CYLINDER MAINTENANCE

Observe the notes on damage etc. described under pneumatic cylinders, especially with regard to the channel brush slewing cylinder on dual sweep machines and hood lift cylinders.

Avoid spraying the water washdown hose over the body tip cylinder when in the fully raised condition.

### CLEANING THE VEHICLE

With the advent of high pressure steam and washdown equipment, damage can be caused by playing this equipment onto the electrical control system, paintwork etc. and great care should be exercised when it is carried out.

**Low pressure should always be used near electrical equipment.**

## CHAPTER

## 2

**Hydraulic System****Table of Contents**

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**HYDRAULIC GENERAL DESCRIPTION**

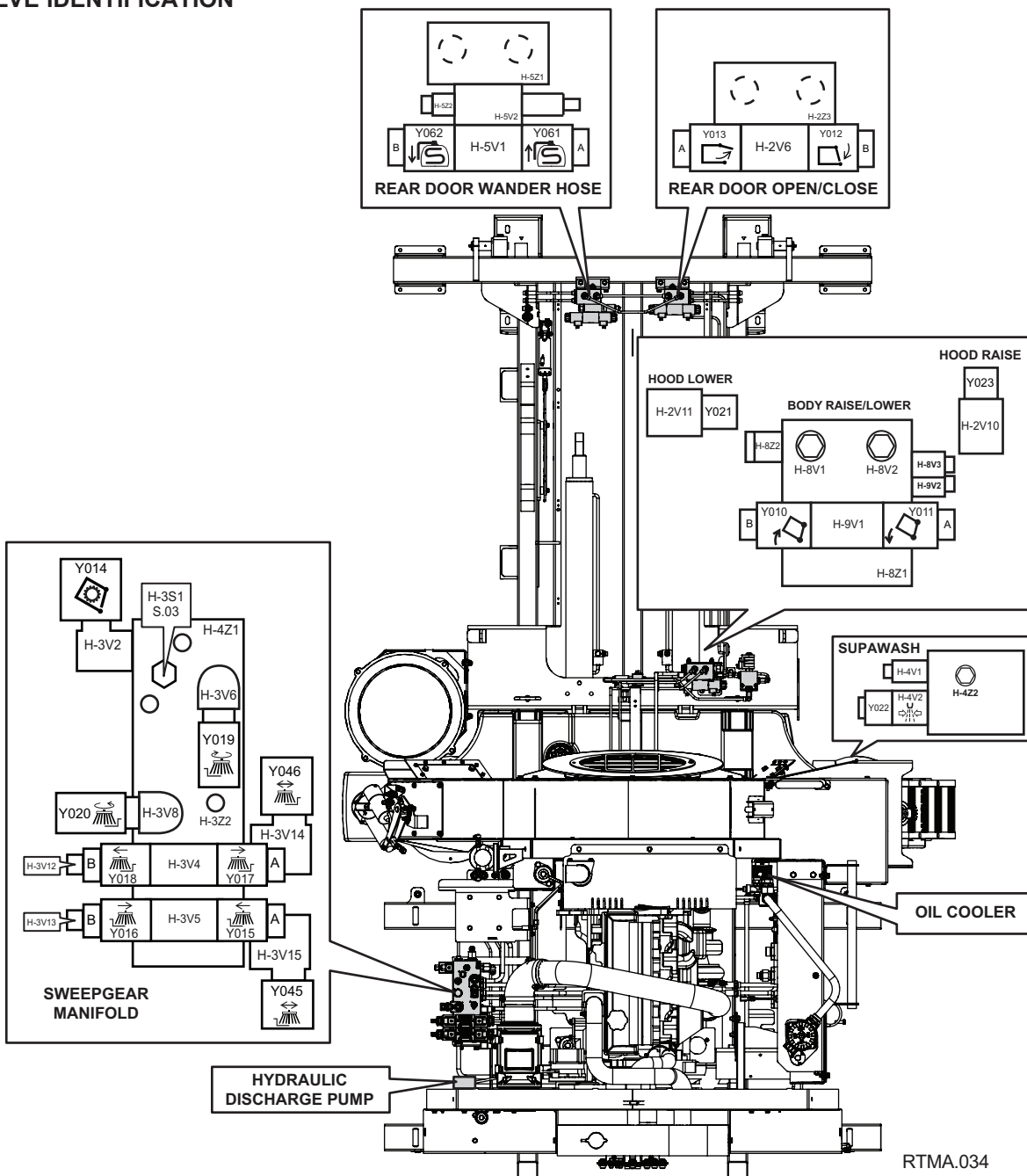
The hydraulic system can be divided into two circuits, for use with or without the auxiliary engine. The system that uses the engine is used for sweeping; the system for use without the engine is used for discharging the load, or lifting the body in case of auxiliary engine failure.

Options are available which easily integrate into the hydraulic system, such as Supawash, and Rear Mounted Hydraulic Wanderhose.

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

**Test point identification Function Machine Type**

H-8Z2 – Main system relief – 200 Bar	H-3Z2 – Sweep manifold Test Point
H-3Z3 – Gutterbroom pressure reducing valve 30 bar	H-4Z2 – Supawash Pump – 220 Bar
H-3Z4 – Gutterbroom pressure reducing valve 30 bar	H-5Z2 – Rear Wanderhose/Powaboom – 50 Bar

**VALVE IDENTIFICATION**


RTMA.034

**HYDRAULIC SYSTEM**

NOTE: Do not run the pressure test for more than 20 seconds

**Body Discharge system:**

Connect a suitable 250 bar gauge to test point H-8Z2 on the body raise/ lower block on the LH side of the machine.

Lift the body and engage body prop on the first subframe position

Start the engine and run at low idle

Using the control pendant open the rear door, then close the rear door.

Check the pressure when locking, and adjust relief valve H-8V3 on the discharge block to 200bar.

**System Pressure:**

Connect a suitable 250 bar gauge to test point H-8Z2 on the body raise/ lower block on the LH side of the machine.

Lift the body and engage body prop on the first subframe position

Start the engine and run at low idle

Using the control pendant, power the body down against body prop

Check the pressure and adjust relief valve H-9V2 on the discharge block to 80bar.

Do not run the pressure test for more than 20 seconds

**Gutterbroom:**

NOTE: If Gutterbroom Extension Override (GEO) is not fitted, manual override of hydraulic valve H-3V4 B (Y-018) (RH) and H-3V5 B (Y-016) (LH) is necessary.

Each Gutterbroom has a pressure reducing valve on the annulus side of the cylinder.

Connect a suitable 50 bar gauge to test point H-3Z3 and then H-3Z4

Start the engine and run at low idle

Switch on the RH Gutterbroom. Then extend out the RH Gutterbroom to maximum. Continue to power it out.

Check the pressure and adjust relief valve H-3V12 (RH) to 30 bar.

To check LH Gutterbroom, stow RH, remove test point, place it on LH side (H-3Z4) and repeat test.

**HYDRAULIC VALVE SWEEPGEAR BLOCK**

VALVE	ID	FUNCTION
H-3V2	Y014	LOAD DISCHARGE ACTIVE
H-3V6	Y019	L/H GUTTER BROOM MOTOR
H-3V5-A	Y015	L/H GUTTER BROOM OUT
H-3V5-B	Y016	L/H GUTTER BROOM IN
H-3V15	Y045	L/H GUTTER BROOM LOCK
H-3V8	Y020	R/H GUTTER BROOM MOTOR
H-3V4-A	Y017	R/H GUTTER BROOM OUT
H-3V4-B	Y018	R/H GUTTER BROOM IN
H-3V14	Y046	R/H GUTTER BROOM LOCK

**Modus Operandi**

LH GUTTERBROOM					
Function	Lower	Extend/Retract	Motor	Unlock Hydraulics	Water
LH GB Activate	Y040	"Y015 (4 seconds)"	Y019	"Y045 (4 seconds)"	
LH GB Out		Y015		Y045	
LH GB In		Y016		Y045	
LH GB Water					Y026
LH Gutterspray					Y025
LH GB Stow		"Y016 (5.5 seconds)"	"Y019 (1 second)"	"Y045 (5.5 seconds)"	
RH GUTTERBROOM					
Function	Lower	Extend/Retract	Motor	Unlock Hydraulics	Water
RH GB Activate	Y041	"Y017 (4 seconds)"	Y020	"Y046 (4 seconds)"	
RH GB Out		"Y017 (4 seconds)"		"Y046 (4 seconds)"	
RH GB In		Y018		Y046	
RH GB Water					Y030
RH Gutterspray					Y029
RH GB Stow		"Y018 (5.5 seconds)"	"Y020 (1 second)"	"Y046 (5.5 seconds)"	
POWATHRUST					
Function	Powathrust				
Powathrust Activate	Y044				
HOOD					
Function	Lower	Raise	Discharge Select	Water	Discharge Pump
Hood Lower	Y021				
Hood Raise on GB Motors		Y023			
Hood Raise on Discharge Select		Y023	Y014		
Hood Hop on GB Motors		Y023			
Hood Hop on Discharge Select		Y023	Y014		
Emergency Hood Lift		Y023			K16
Hood Water				Y027	
Front Spraybar				Y031	



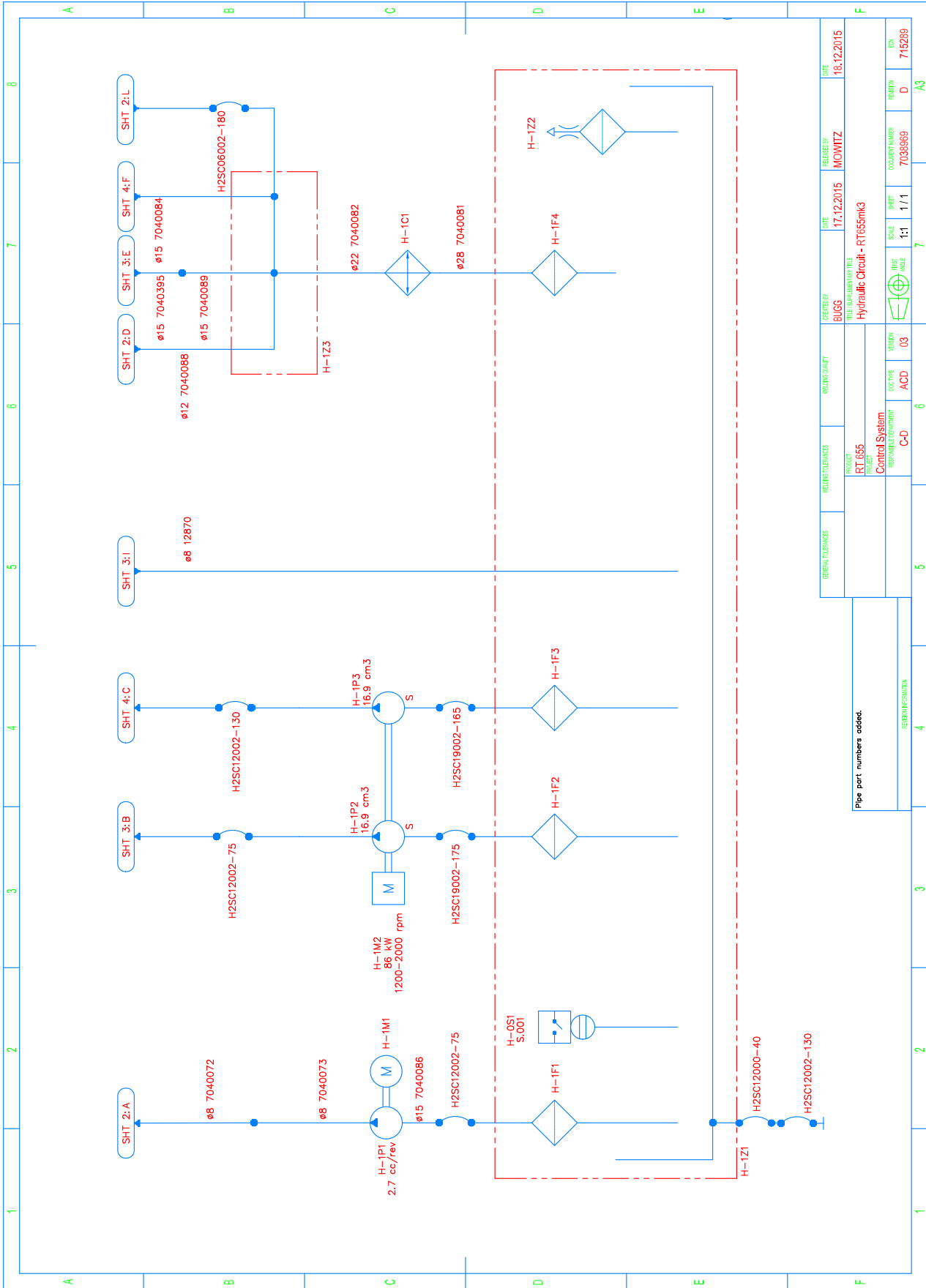
**Modus Operandi**

DISCHARGE							
Function	Hopper Raise	Hopper Lower	Door Open	Door Close	Discharge Select	Discharge Pump	Prop Release
Hopper Raise on Engine	Y010				Y014		
Hopper Raise on Discharge Pump	Y010					K16	
Hopper Lower on Engine		Y011			Y014		
Hopper Lower on Discharge Pump		Y011				K16	
Door Open on Engine			Y013		Y014		
Door Open on Discharge Pump			Y013			K16	
Door Close on Engine				Y012	Y014		
Door Close on Discharge pump				Y012		K16	
Body Prop Release							Y042

ADDITIONALS						
Function	Water	Supawash	Discharge Select	Powaboom Raise	Powaboom Lower	
Hopper Water	Y028					
Supawash		Y022				
Powaboom Raise			Y014	Y060		
Powaboom Lower			Y014		Y061	

PAUSE/REVERSE						
Function	LH GB	RH GB	Hood			
Pause	LH GB Stows	RH GB Stows	Hood Raises			
Reverse	LH GB Stows	RH GB Stows	Hood Raises			
Reverse with Reverse Override	LH GB Stows	RH GB Stows				

Hydraulic System - Sheet 01/05 Rev D



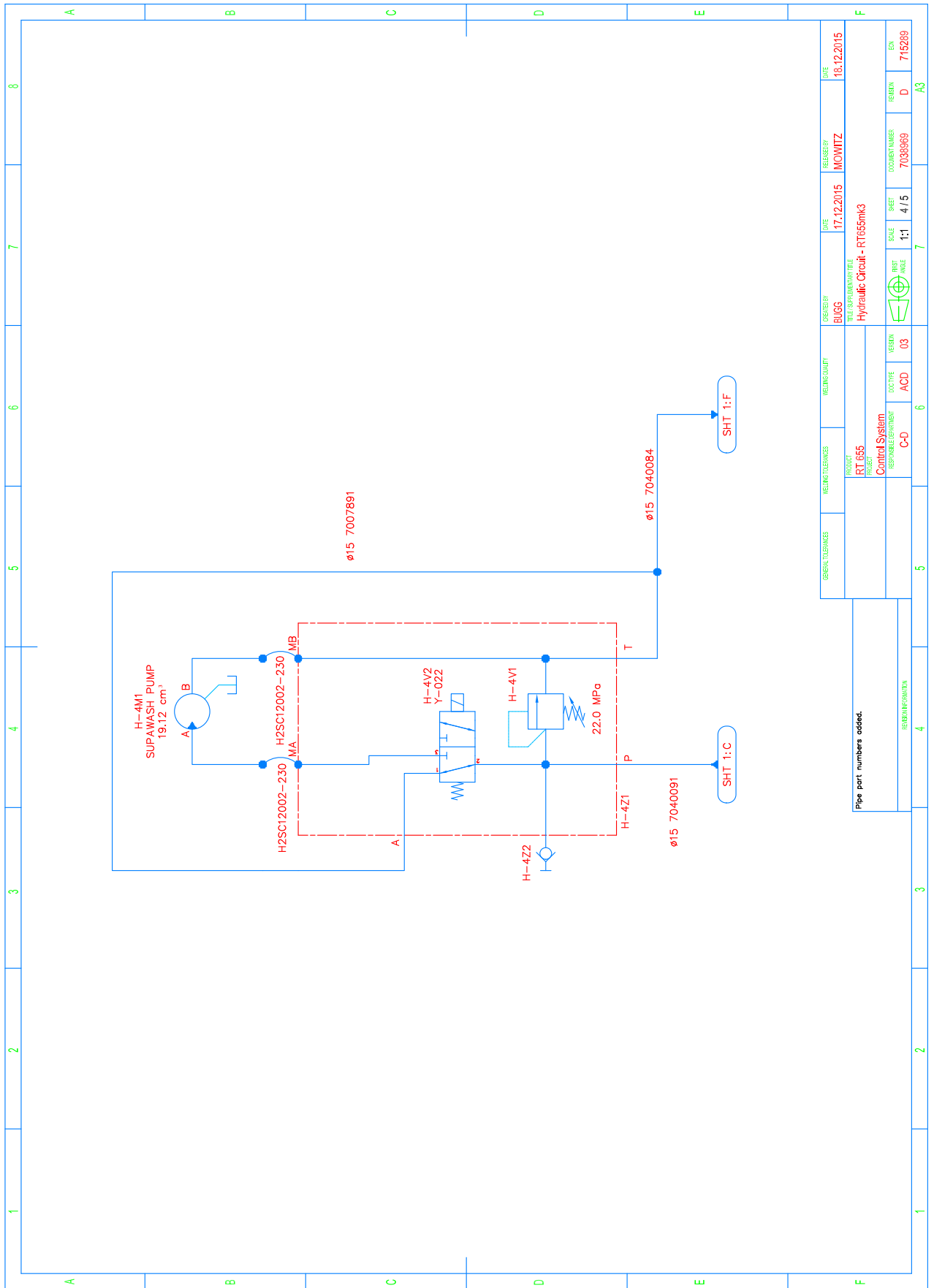
GENERAL TOLERANCES	WELDING TOLERANCES	WELDING QUALITY	CREATED BY	DATE	RELEASED BY	DATE
			BUGG	17.12.2015	IMOMITZ	16.12.2015
TITLE: SUPPLEMENTARY FILE						
PRODUCT: RT 655						
PROJECT: Control System						
DESIGN APPROVAL	DESIGN	DATE	SCALE	SHEET	CHECKED	DATE
C-D	C-D	03	1:1	1/1	7038969	16.12.2015
REVISION NUMBER	REVISION	DATE	BY	APP. NO.	DATE	BY

Pipe part numbers added.





Hydraulic System - Sheet 04/05 Rev D

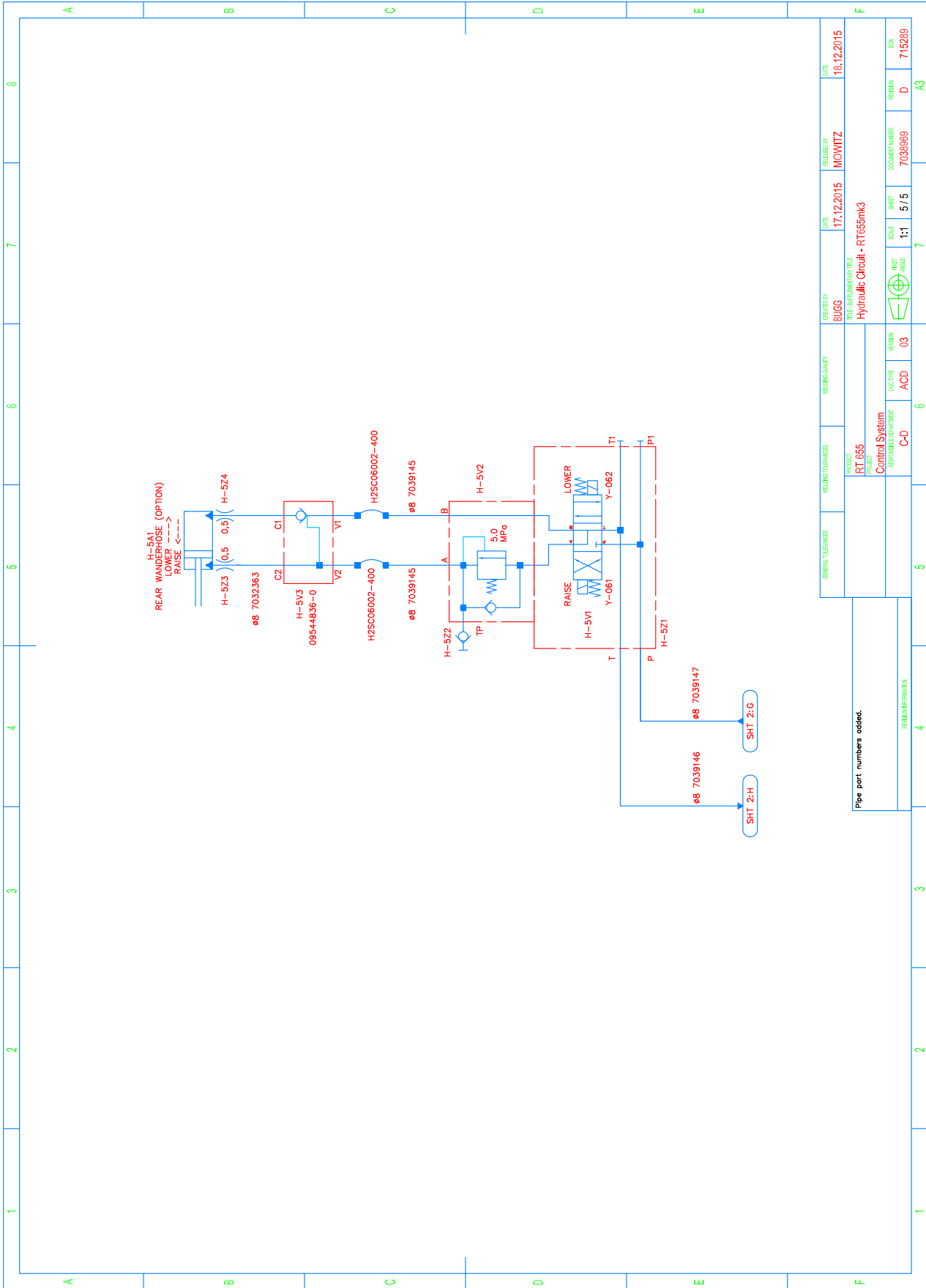


DATE	18.12.2015
REVISION	D
REVISION	715289
REVISION	D
REVISION	7038969
REVISION	4/5
REVISION	1:1
REVISION	7
REVISION	6
REVISION	3
REVISION	03
REVISION	ACD
REVISION	C-D
REVISION	Control System
REVISION	RT 655
REVISION	RT 655
REVISION	BUGG
REVISION	17.12.2015
REVISION	MOWITZ
REVISION	18.12.2015

GENERAL TOLERANCES	REQUIREMENTS	VEINSUMMARY
REVISION INFORMATION	REVISION INFORMATION	REVISION INFORMATION

GENERAL TOLERANCES	REQUIREMENTS	VEINSUMMARY
REVISION INFORMATION	REVISION INFORMATION	REVISION INFORMATION

Hydraulic System - Sheet 05/05 Rev D



GENERAL TOLERANCES	MELTING TOLERANCES	WELDING QUALITY	CREATED BY	DATE	RELEASED BY	DATE
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TITLE: SUPPLEMENTARY FILE						
PRODUCT: RT 655						
PROJECT: Control System						
DESIGN APPROVAL	DESIGN	DATE	SCALE	SHEET	CHECK NUMBER	REV. NO.
C-D	ACC	03	1:1	5/5	7038969	D
REVISION INFORMATION						A3

Pipe part numbers added.

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**CHAPTER****3****Electrical System****Table of Contents**

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System Description	3 : 2
<b>Component Identification</b>	
Relay Box	3 : 3
<b>Circuit Diagrams</b>	
Circuit Diagrams	3 : 4

## GENERAL DESCRIPTION

The electrical system circuit diagrams are sub divided into modularised sub circuits all of which use the same identification number ending with a revision alpha code, i.e. A, B, C etc. All circuit diagrams are up-issued simultaneously irrespective to change, so they will all display the identical alpha code.

## SYSTEM DESCRIPTION

The system comprises of part CAN controlled and part electrically controlled functions. The CAN control system comprises a keypad node, with rocker switch inputs for sweeping control, a discharge pendant, with push buttons for body discharge, and an I/O node with an integrated controller running the Johnston RT655 Control application program.

The controller provides CAN controlled hydraulics and pneumatics for the sweepgear and discharge functions, as well as providing auxiliary engine control and speed regulation.

There is a John Deere Engine ECU, which maintains the auxiliary engine, and the engine information gauge (Murphy Gauge) displays engine data for operator use.

Beacons, work lights, water valves and optional hydraulic valves are controlled by a hard wired system, supplied by the Power Supply Board with integrated relays mounted in the cab.

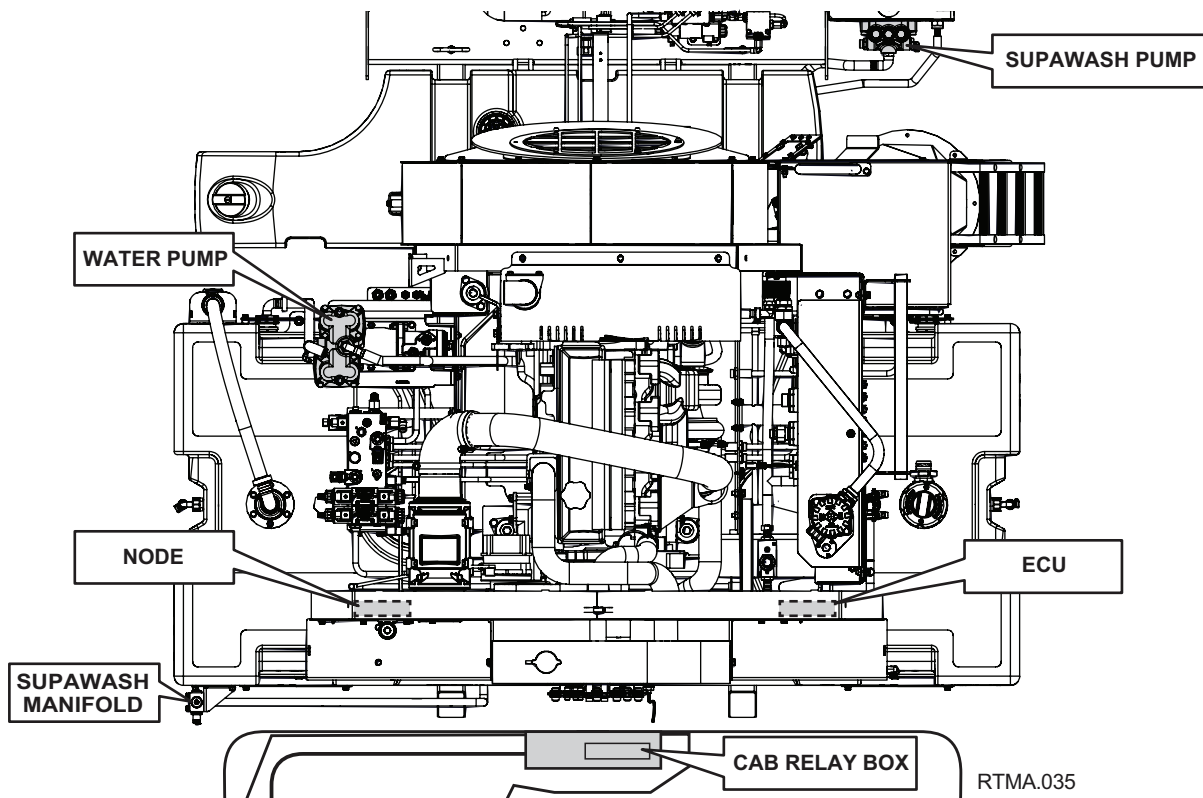
All solenoid valve connectors are by purpose weatherproof connections incorporating status tell-tales and electrical shock suppression. The wiring is fully protected within conduits against mechanical and environmental hazards. The wiring is colour coded and fuse protected.

To assist fault finding and troubleshooting, the solenoids have an LED in the electrical connection plug which illuminate when power is achieved.

The main feed from the battery to the electrical system is protected by a maxi power fuse 60 amp mounted to the battery terminal.

**NOTE: A wiring schematic pdf, with hyper-links to aid fault finding, is included on the Technical Manual CD supplied with this machine.**

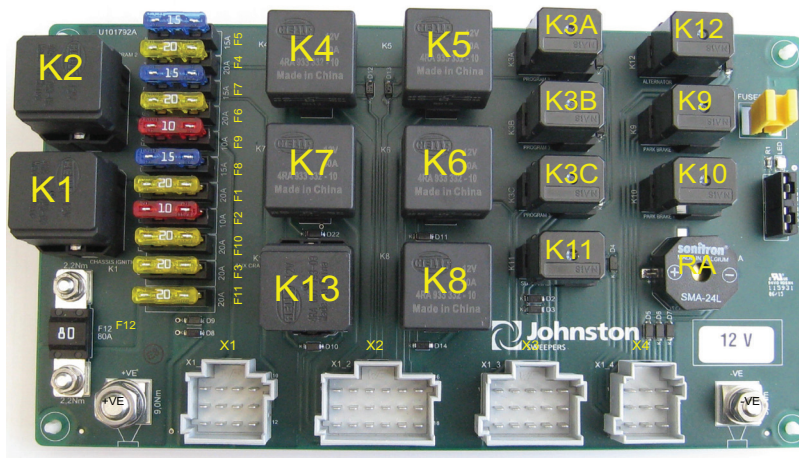
## COMPONENT IDENTIFICATION





**RELAY BOX**

Dual sweep box shown



- Relay K1 70 Amp Chassis Ignition
- Relay K2 70 Amp Program 2
- Relay K3A 15 Amp Program 3
- Relay K3B 15 Amp Program 3
- Relay K3C 15 Amp Program 3
- Relay K4 40 Amp LH Work Light
- Relay K5 40 Amp RH Work Light
- Relay K6 40 Amp Rear Beacons
- Relay K7 40 Amp Front Beacons
- Relay K8 40 Amp Marker Lights
- Relay K9 15 Amp Park Brake -
- Relay K10 15 Amp Park Brake +
- Relay K11 15 Amp Supa Wash

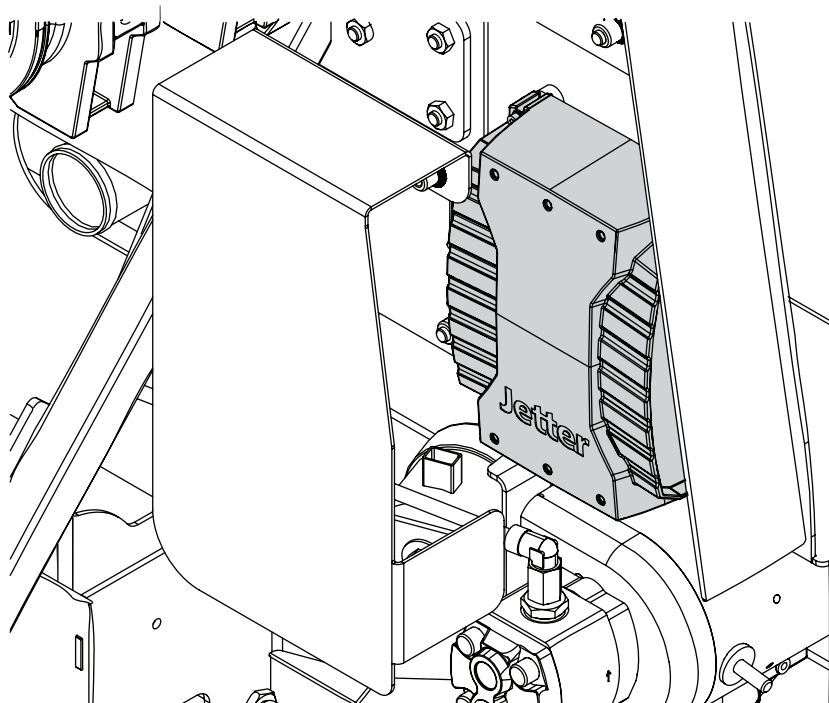
**PSB1**

PSB1 12 Volt 7042905

PSB1 24 Volt 7042909

RTMA.032

**Powapack Management Node/Controller  
John Deere 'HP' Tier 3**



RTMA.038

**Locations - Diagram 7045822 Sht 200/9 Rev C**

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A	F
1	10
2	9
3	8
4	7
5	6
6	5
7	4
8	3
9	2
10	1
11	0
12	9
13	8
14	7
15	6
16	5
17	4
18	3
19	2
20	1
21	0
22	9



Johnston Sweepers Limited  
RT 655  
Road-Sweeper  
Product: RT 655 Project Control System

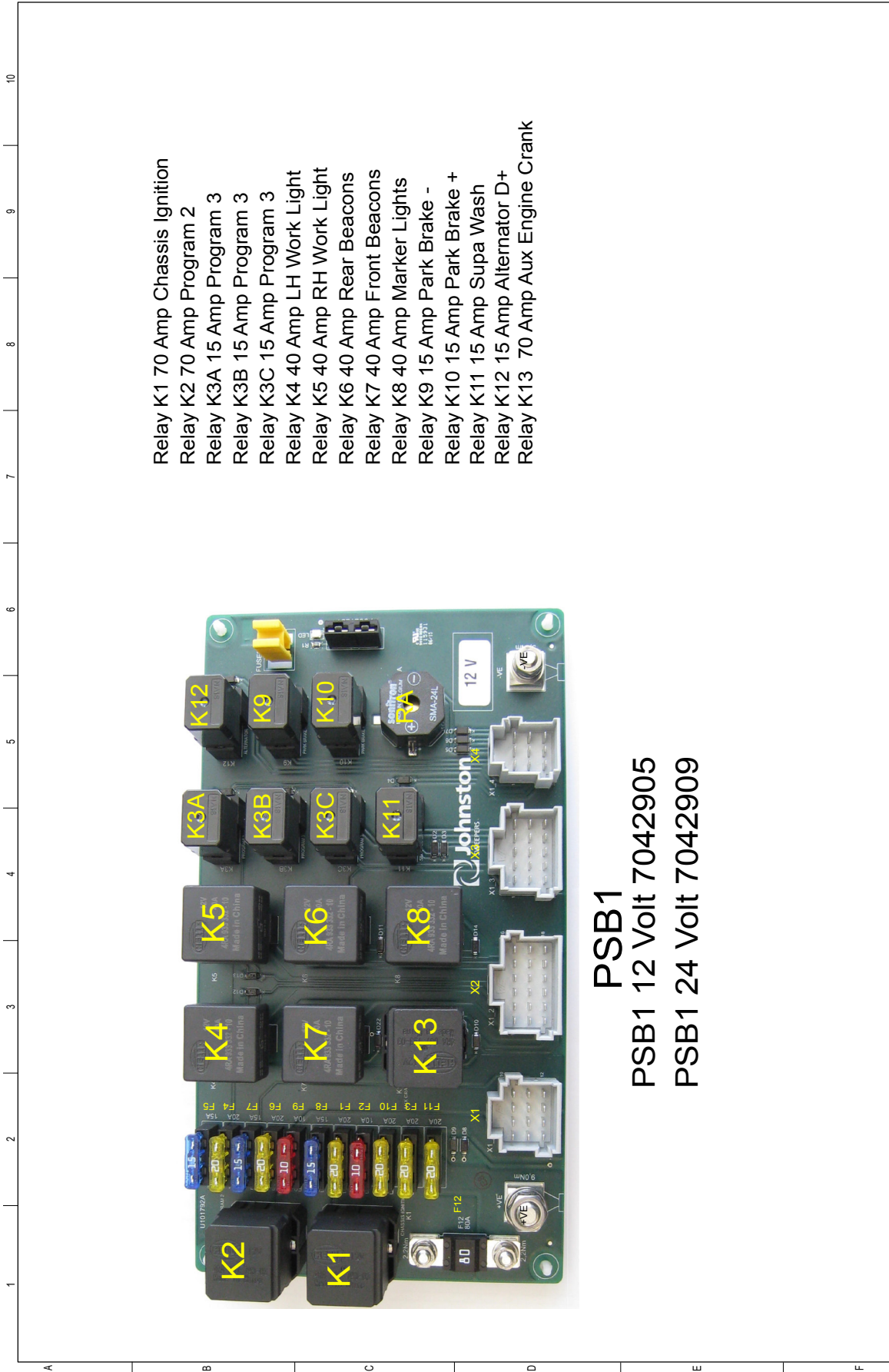
RT 655  
Locations

Released by: **7045822**  
Drawn Date: 2007/9  
Released Date: ECN 715289  
Version: 00  
Sheet: 200/9

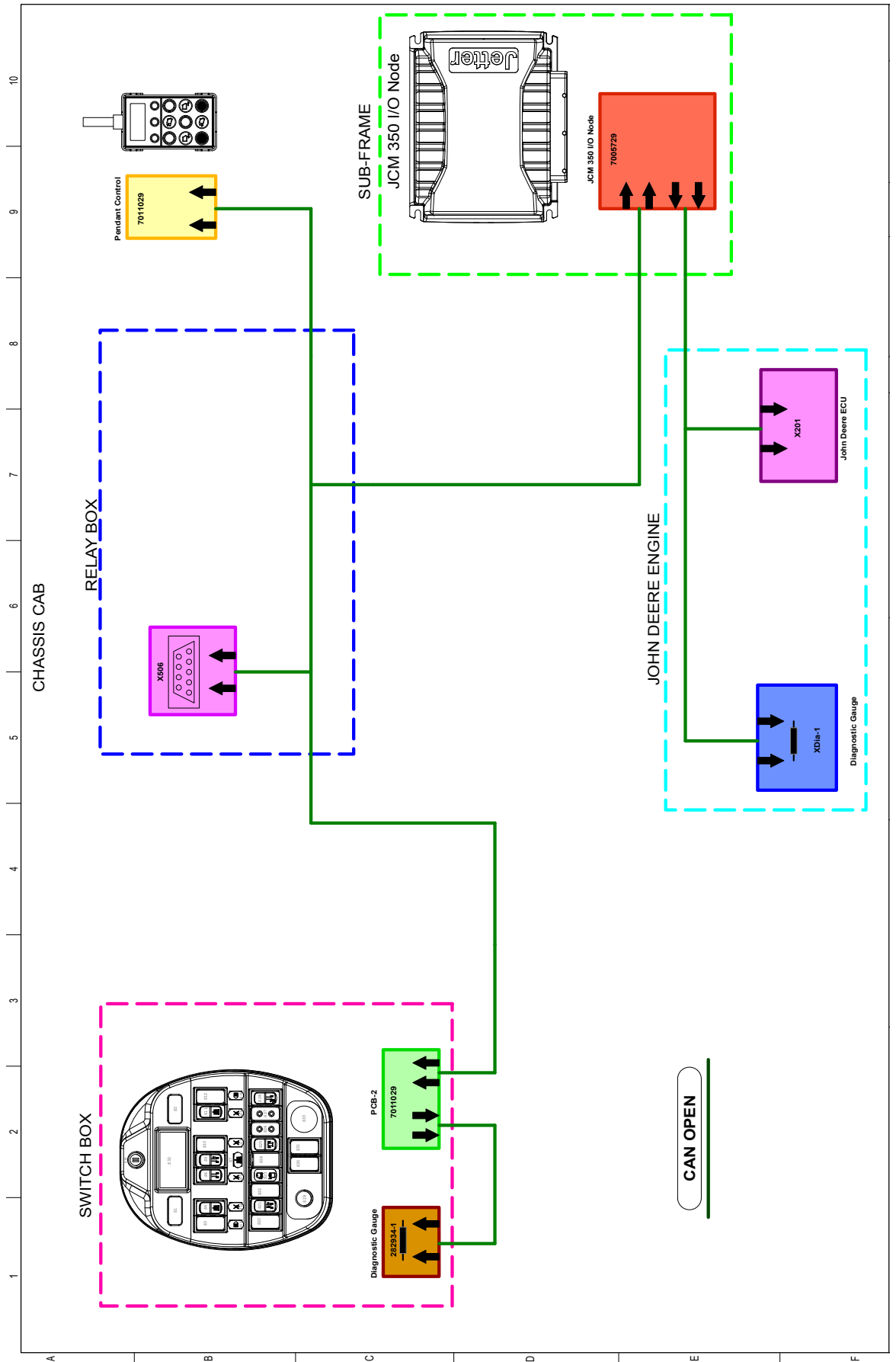
Fuse Rating - Diagram 7045822 Sht 201/9 Rev C

<p>03/2015                  Confidential. All Rights Reserved. Distribution or                  Copies prohibited. Copyright © Johnston Sweepers Ltd.                  Für dieses Dokument behalten wir uns alle Rechte vor.                  Unerlaubte Vervielfältigung wird verfolgt. © Johnston Sweepers Ltd.</p>		<p>10</p>	
<p>1</p>		<p>9</p>	
<p>2</p>		<p>8</p>	
<p>3</p>		<p>7</p>	
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<p>A</p>		<p>F</p>	
<p>B</p>		<p>C</p>	
<p>C</p>		<p>D</p>	
<p>D</p>		<p>E</p>	
<p>E</p>		<p>F</p>	
<p>F</p>		<p>Hydraulic Valves Numbers Reconfigured</p>	
<p>-F1 Beacons</p>		<p>20A /2.F2 +PSB1</p>	
<p>-F2 Marker Lights</p>		<p>10A /2.F2 +PSB1</p>	
<p>-F3 Power I/O Node</p>		<p>20A /2.E2 +PSB1</p>	
<p>-F4 Water/Supawash/rotatilt</p>		<p>20A /2.D7 +PSB1</p>	
<p>-F5 Work Lights/Water Switches</p>		<p>15A /2.D7 +PSB1</p>	
<p>-F6 Power VEG Gate</p>		<p>20A /2.D7 +PSB1</p>	
<p>-F7 Aux Engine Ignition</p>		<p>15A /2.C7 +PSB1</p>	
<p>-F8 Chassis Ignition</p>		<p>15A /2.E4 +PSB1</p>	
<p>-F9 Chassis Ignition/Supawash Controls/VEG Sensors</p>		<p>10A /2.E4 +PSB1</p>	
<p>-F10 Aux Engine ECU Power</p>		<p>20A /2.C2 +PSB1</p>	
<p>-F11 Aux Engine Crank</p>		<p>20A /2.C2 +PSB1</p>	
<p>-F12 Main Power Fuse</p>		<p>80A /2.C1 +PSB1</p>	
<p>-F13 Cab Permanent +VE</p>		<p>200mA /31.C4 +12 Volt Chassis Cab</p>	
<p>Johnston Sweepers                  RT655                  Road-Sweeper                  Product RT 655 Project Control System</p>		<p>Johnston                  SWEEPERS</p>	
<p>RT 655                  Fuse Rating</p>		<p>Released by                  Moore                  Drawn Date                  2017/9                  Sheet                  00                  Version                  7045822</p>	
<p>Released Date                  ECN                  715289</p>		<p>Released Date                  ECN                  715289</p>	

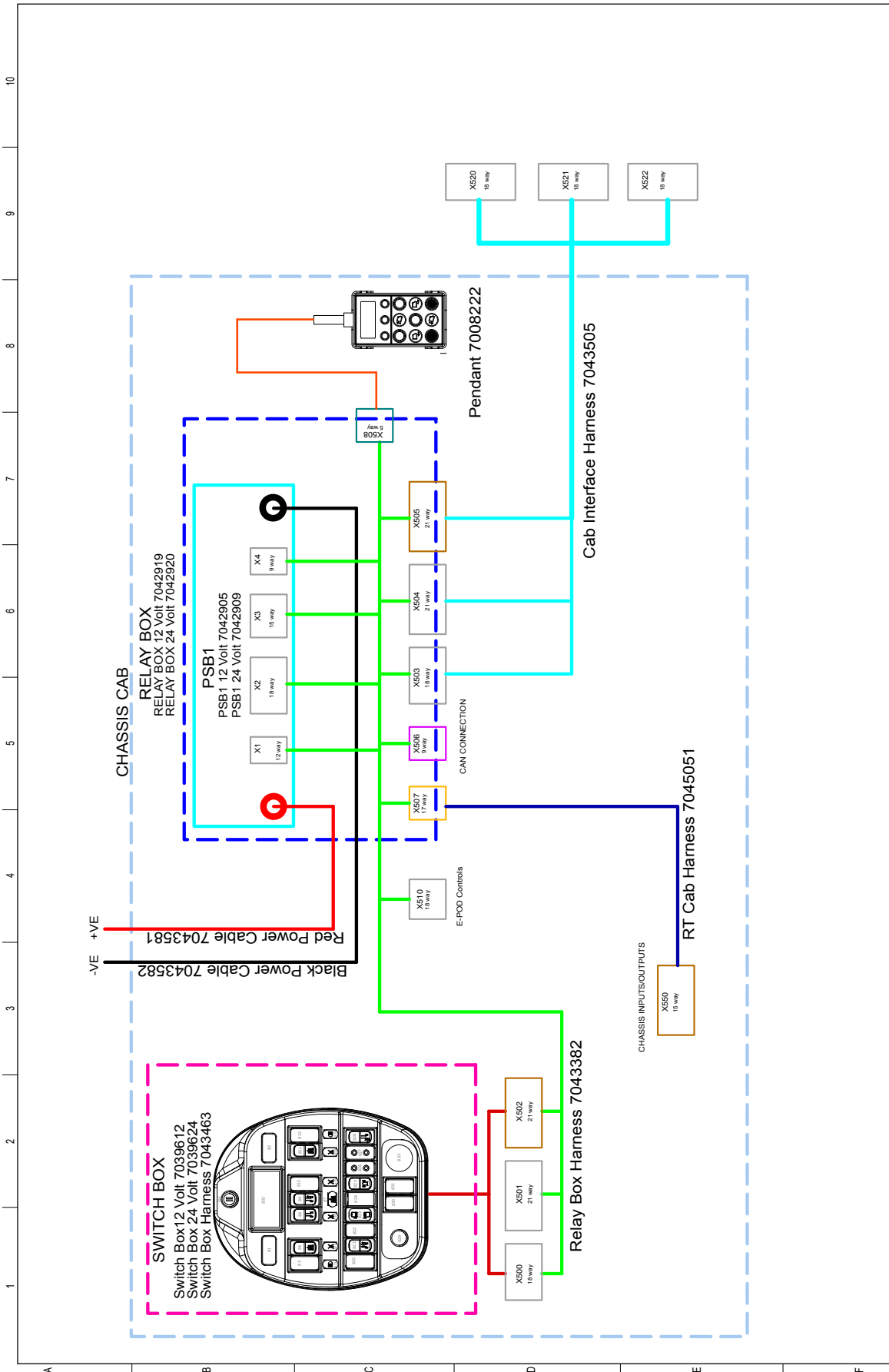
**PSB1/Relay Numbers - Sheet 202/9 Rev C**



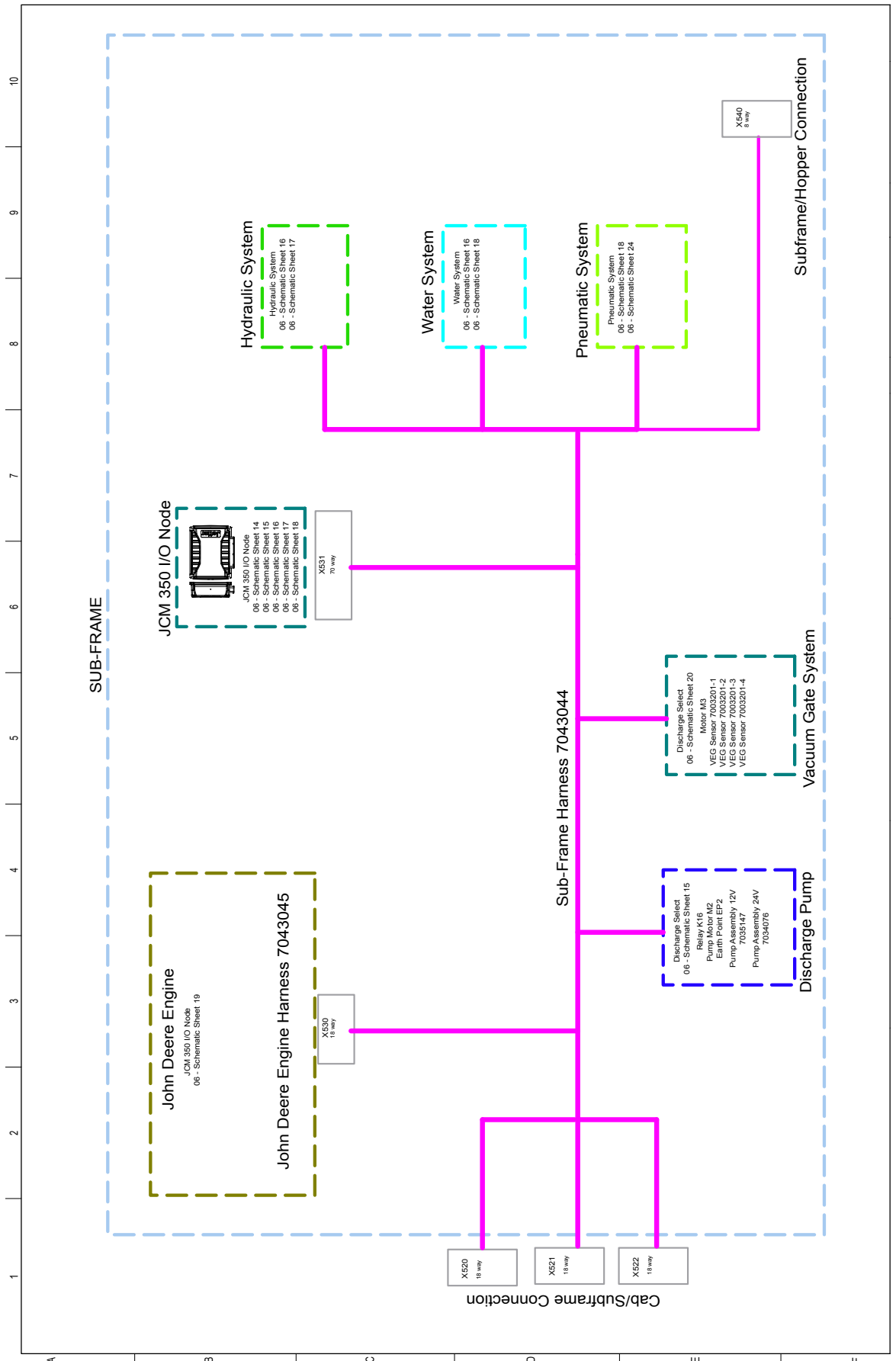
CAN Topology - Sheet 203/9 Rev C



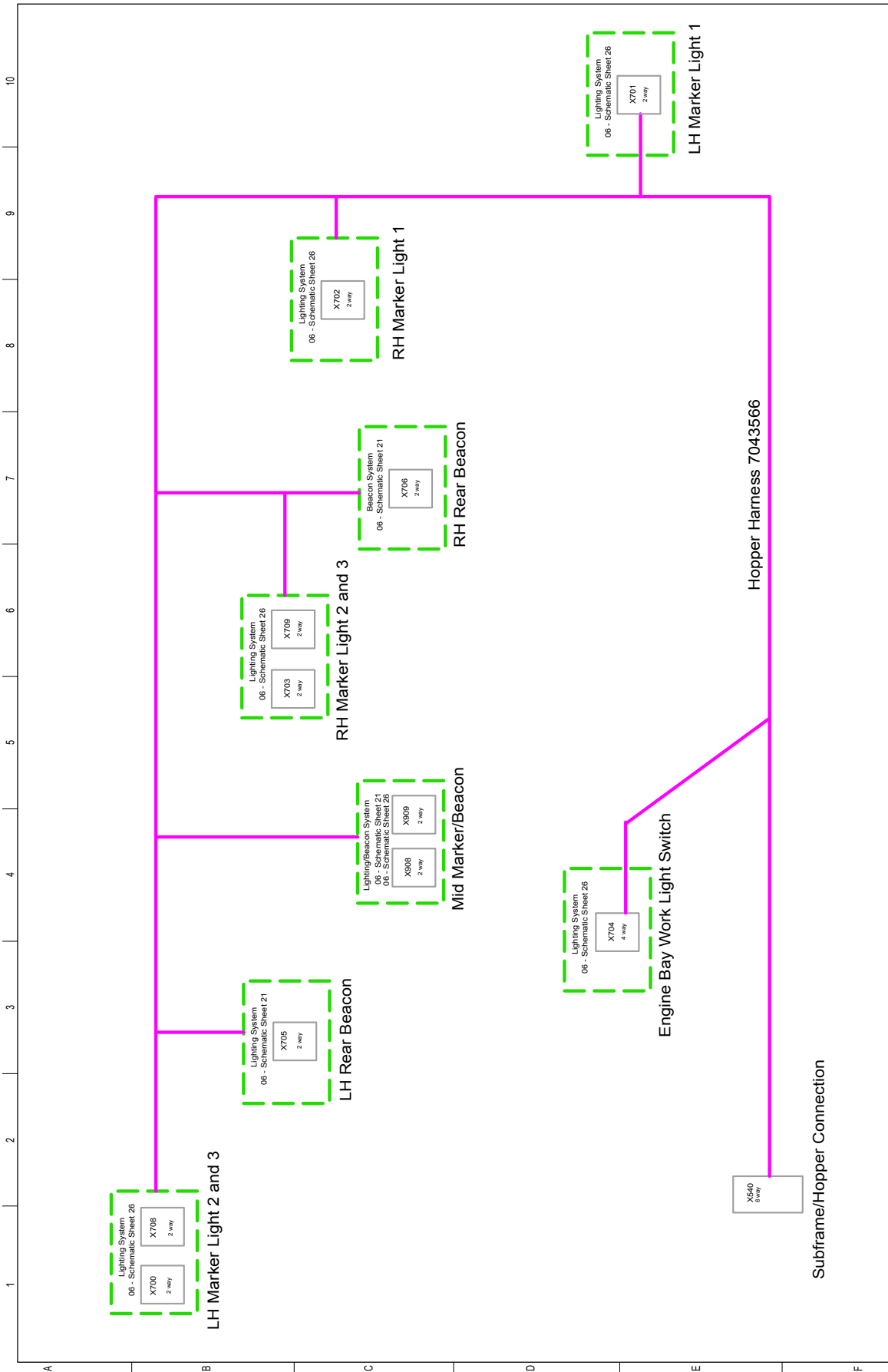
**Cab Main Connections - Sheet 204/9 Rev C**



Sub Frame Connections - Diagram Sheet 205/9 Rev C

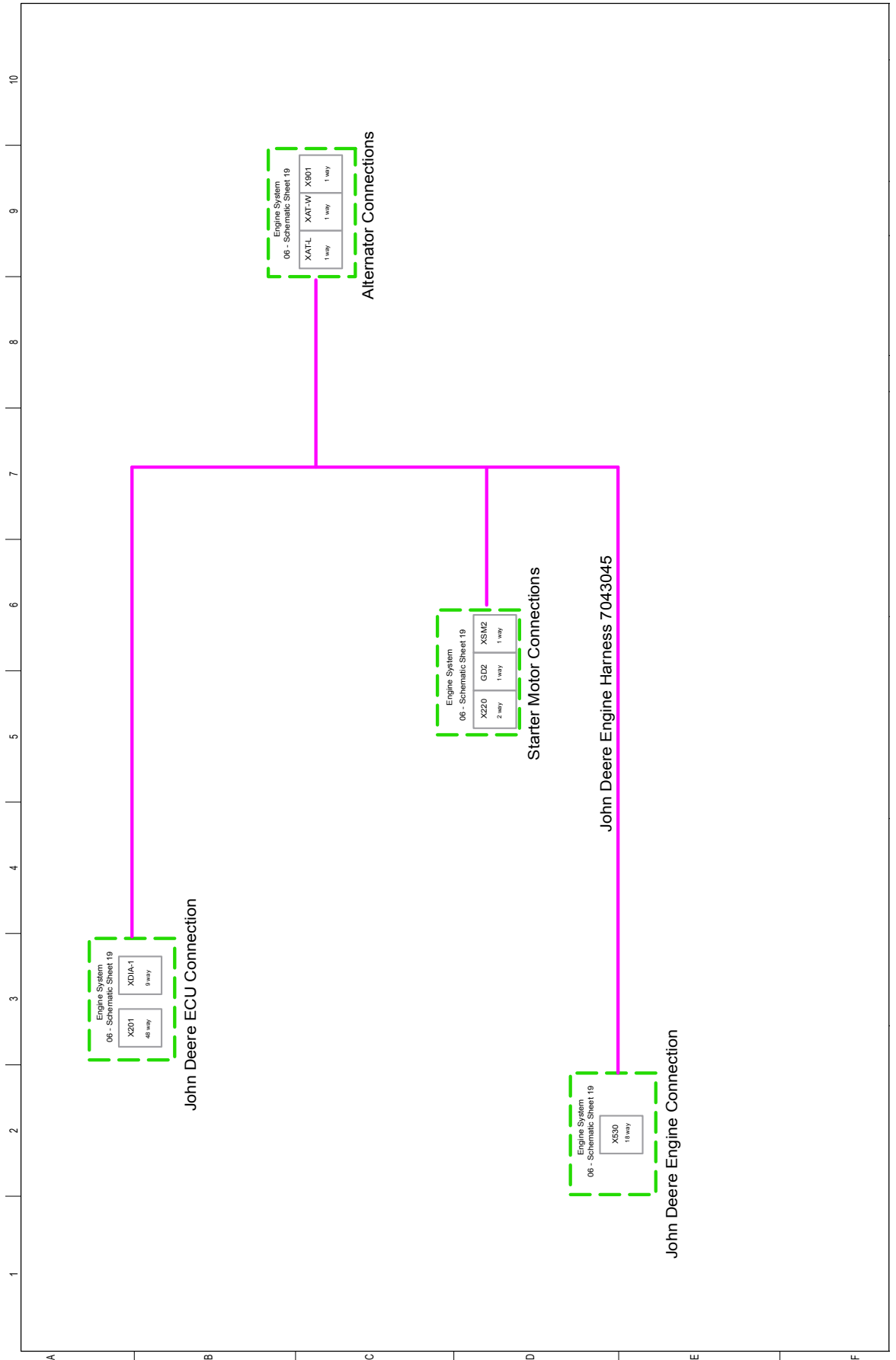


**Hooper Connections - Sheet 206/9 Rev C**

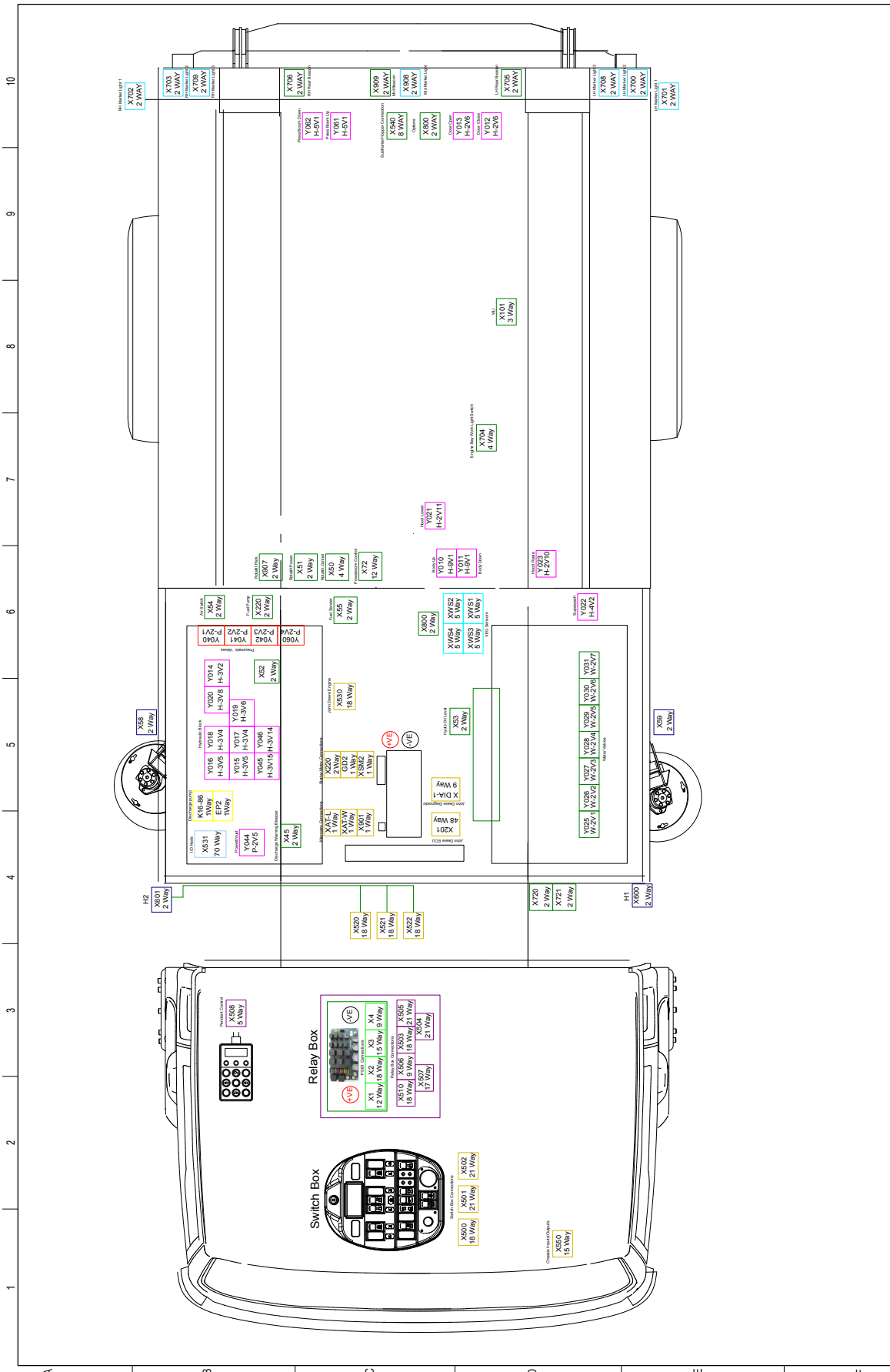




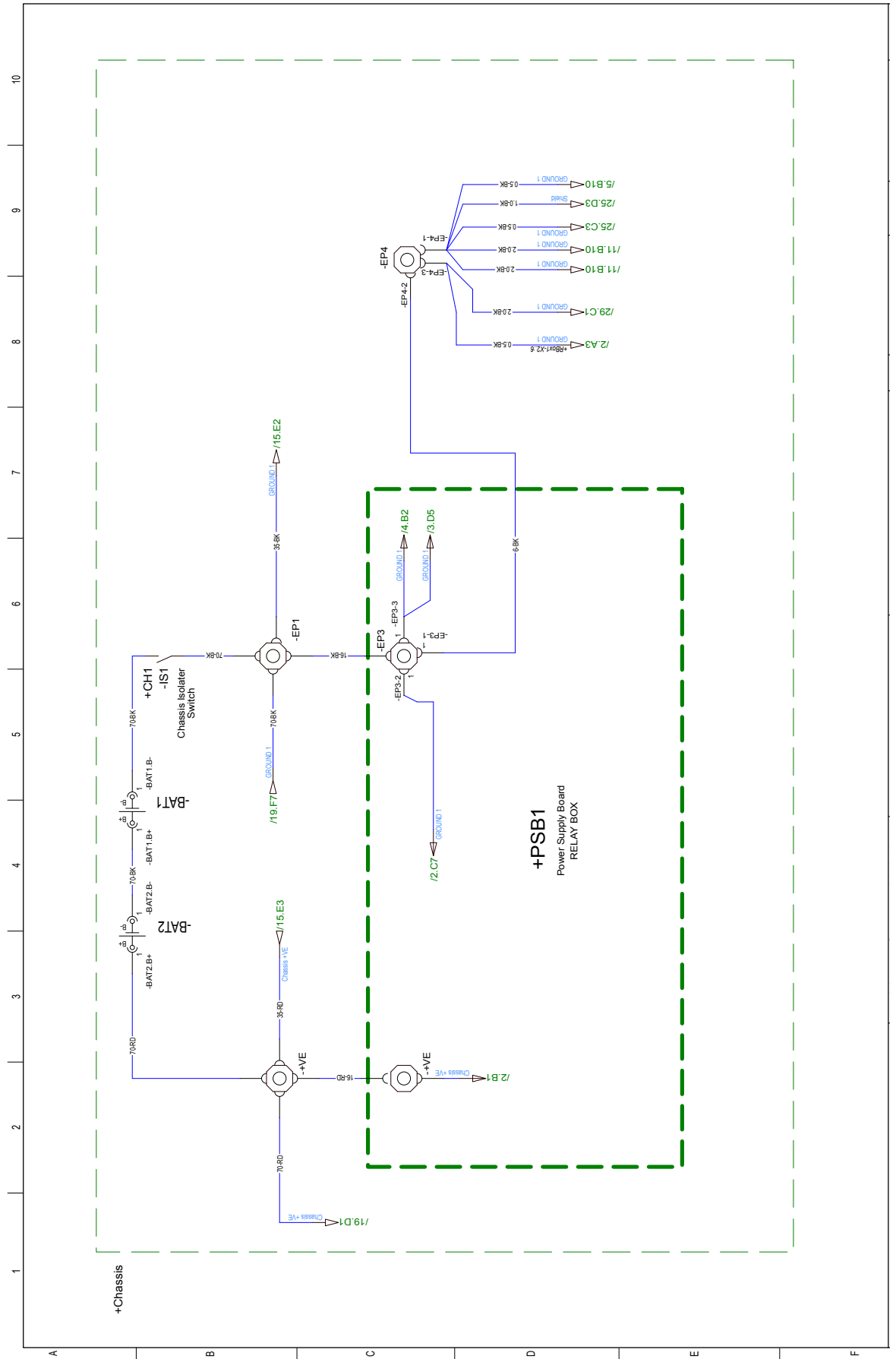
Engine Connections - Sheet 207/9 Rev C



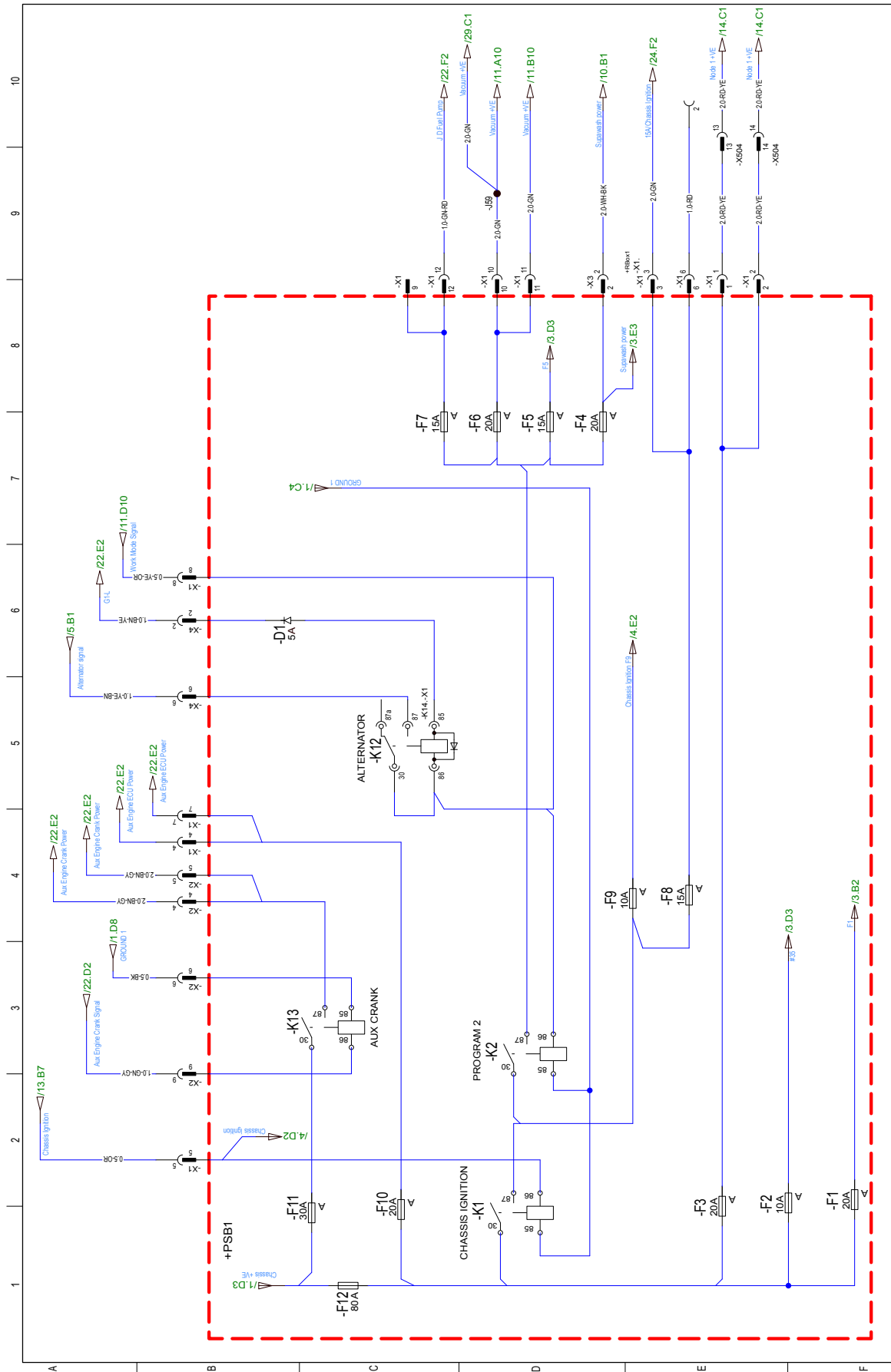
**Location of Connectors - Sheet 208/9 Rev C**



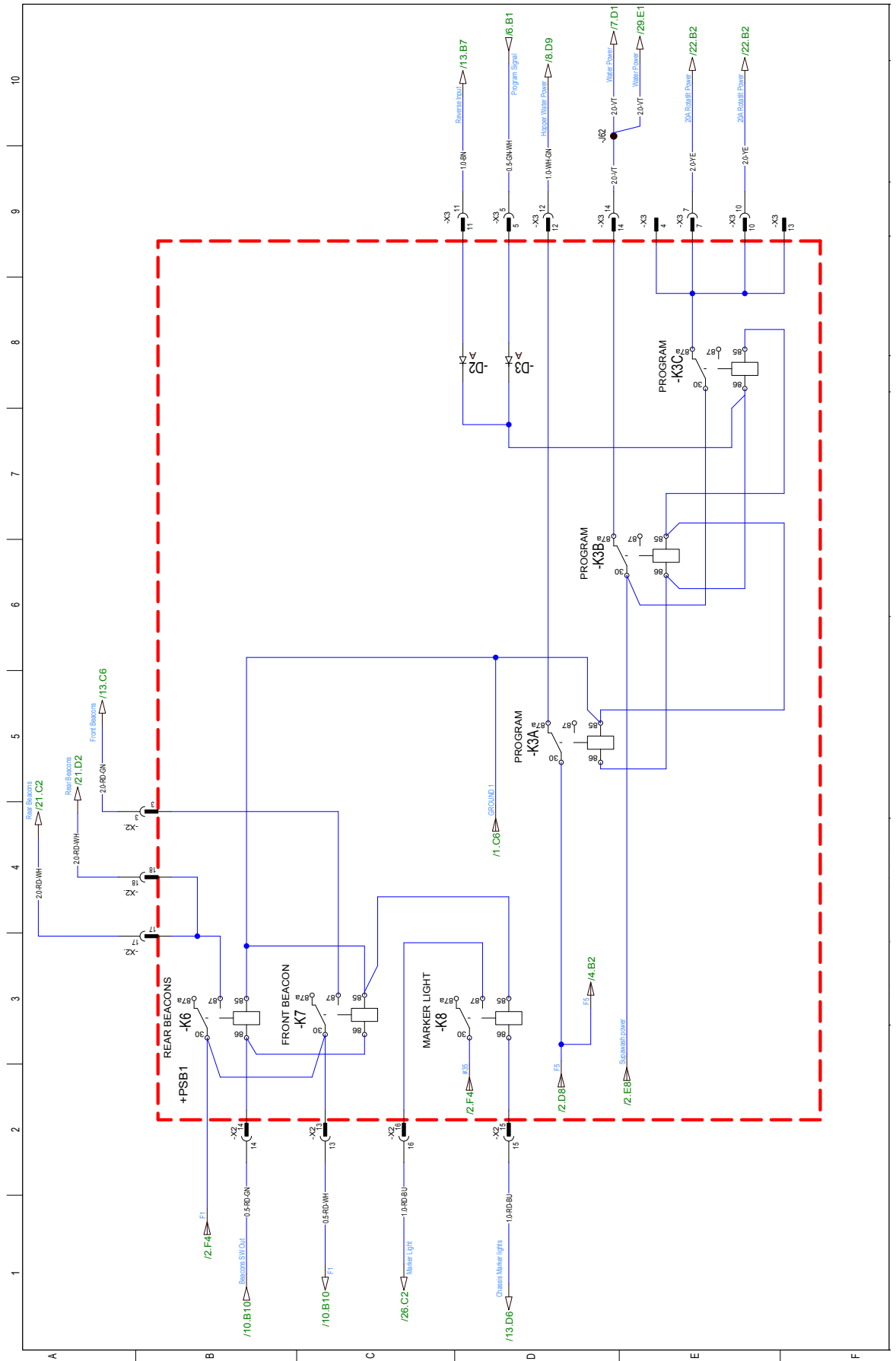
Main Power - Batterys/PSB1 - Sheet 01/35 Rev C



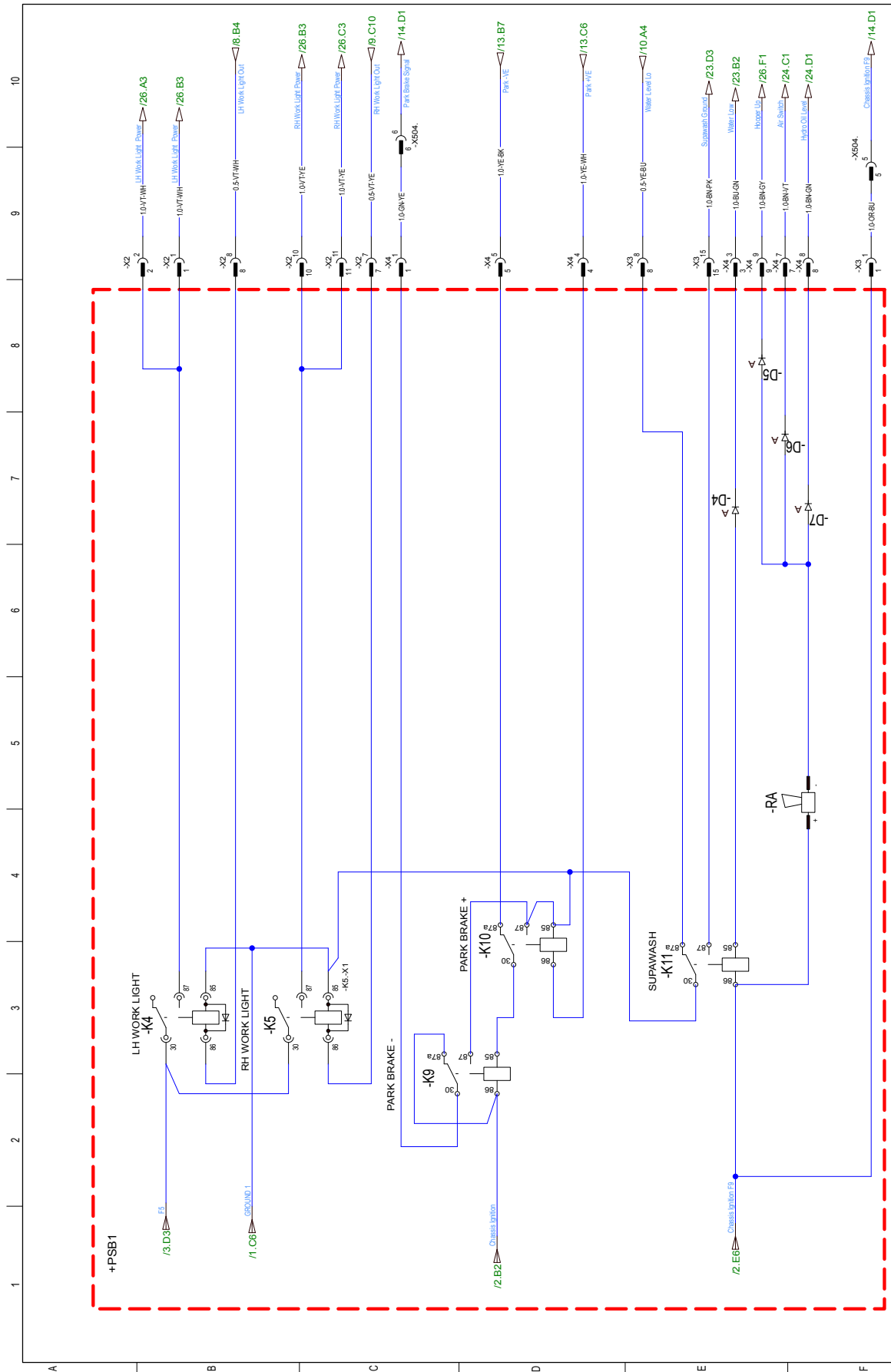
**Main Power - PSB1-1 - Sheet 02/35 Rev C**



Main Power - PSB1-2 - Sheet 03/35 Rev C



**Main Power - PSB1-3 - Sheet 04/35 Rev C**





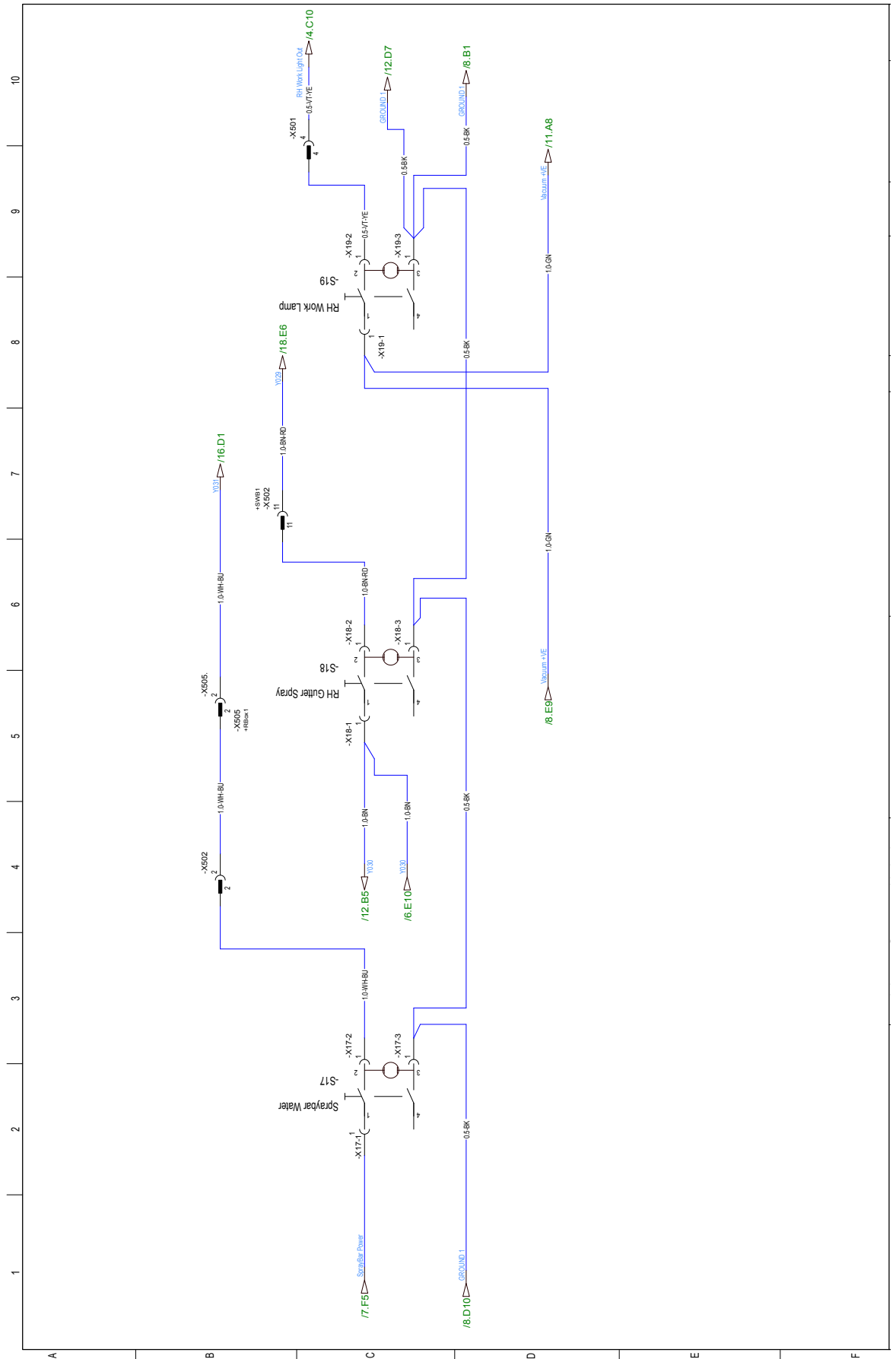






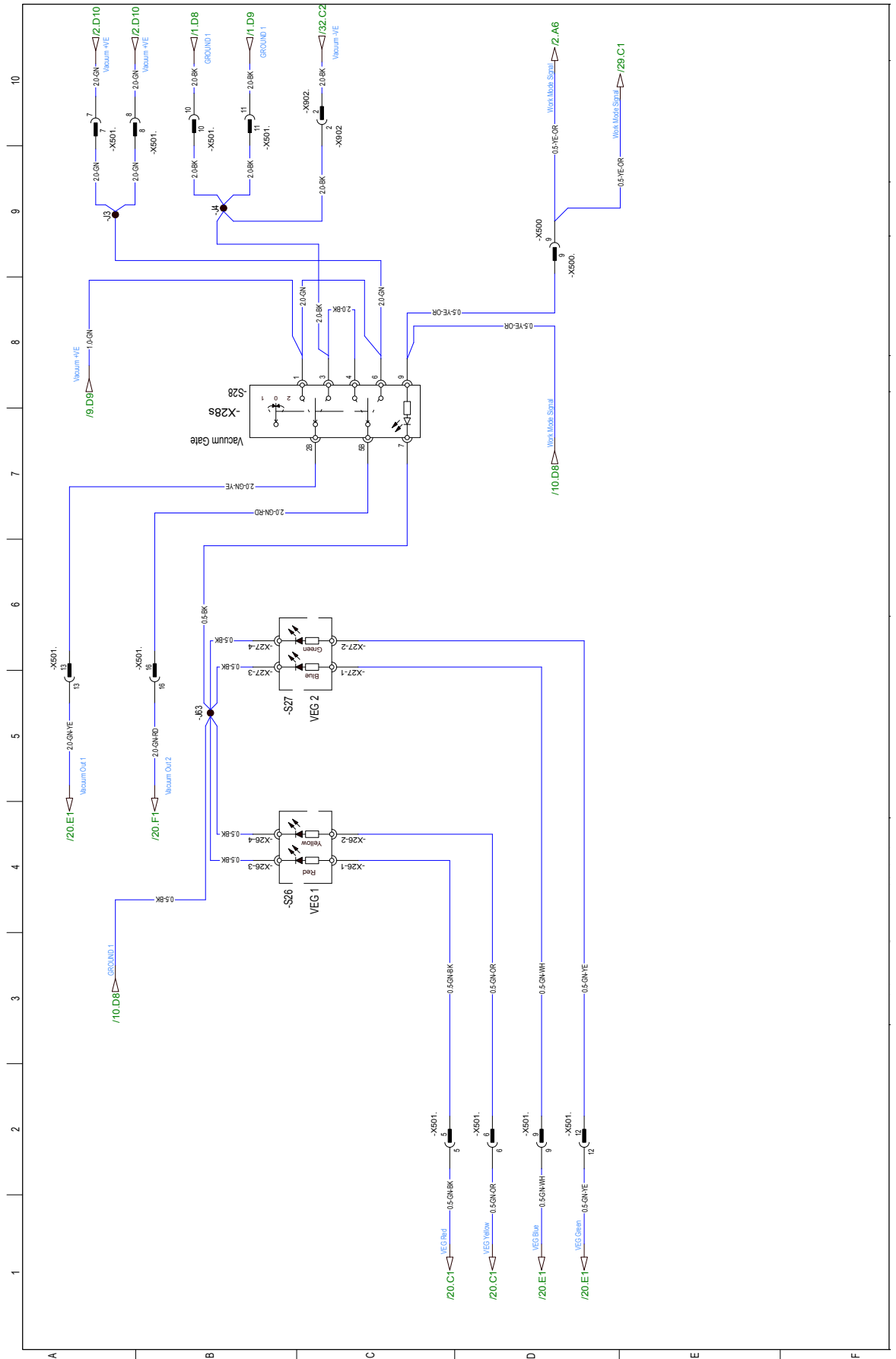


Switch Box - Lamps/Water Co - Sheet 09/35 Rev C



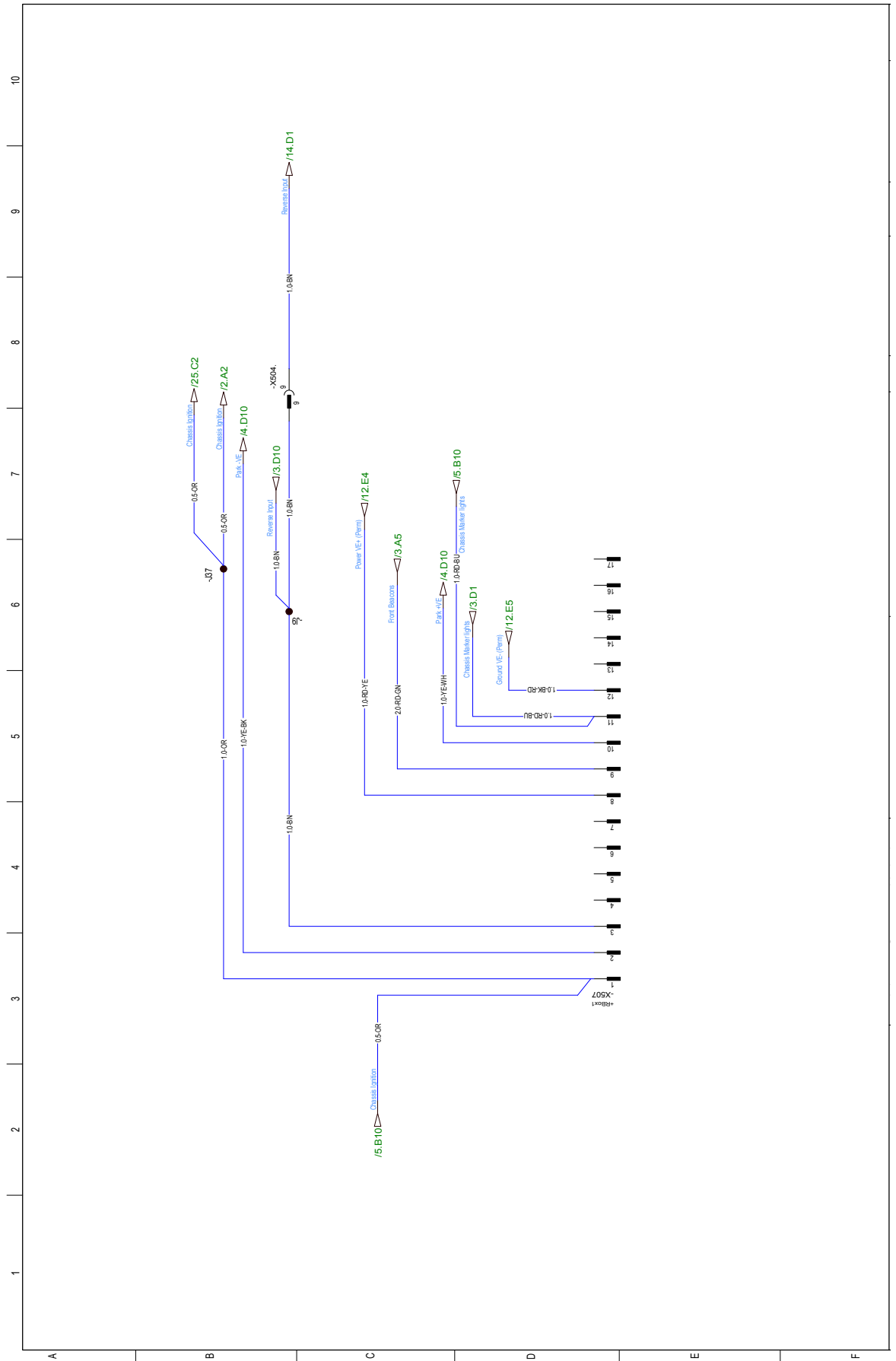


Switch Box - VEG Controls - Sheet 11/35 Rev C

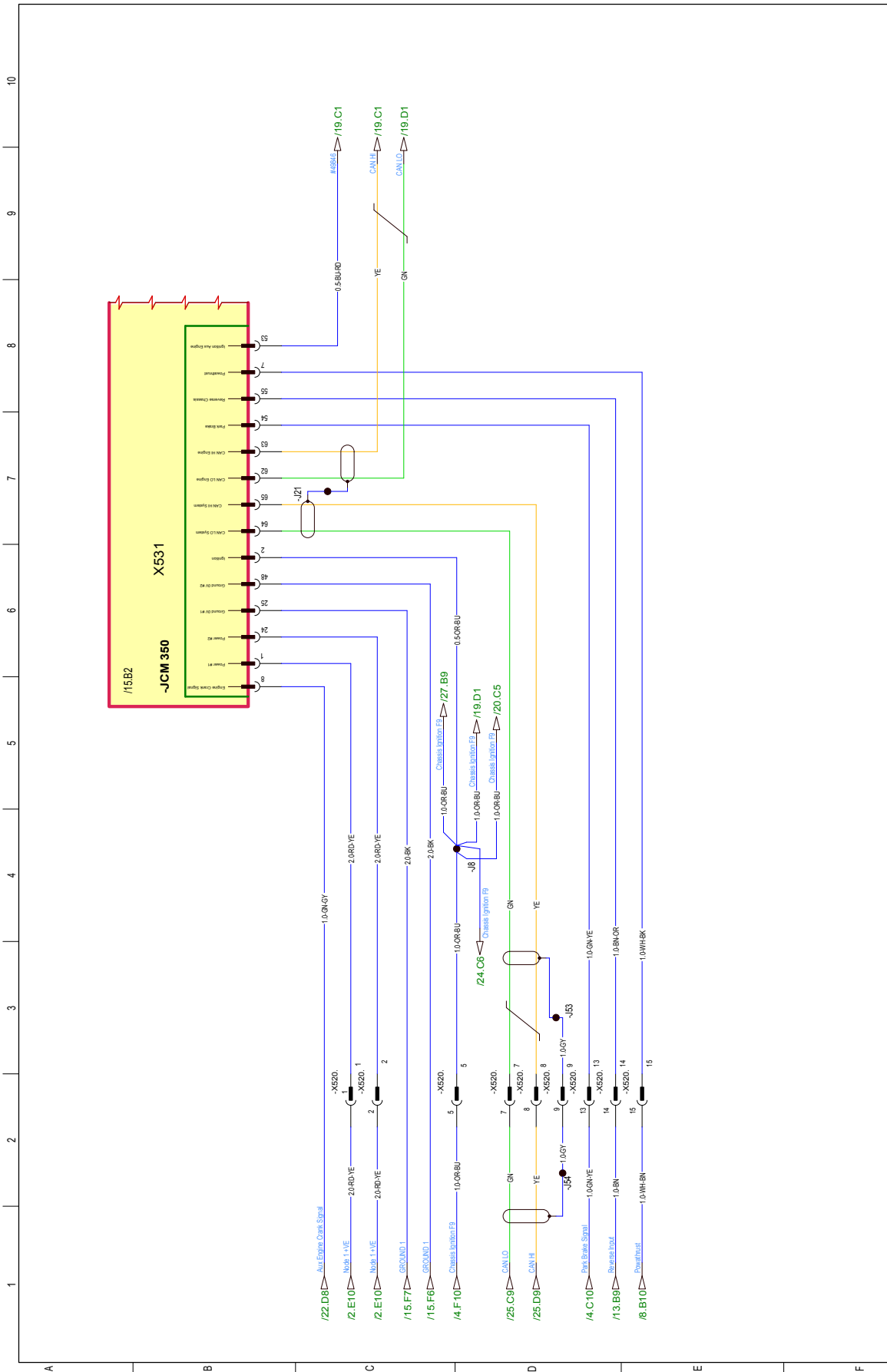




Relay Box - Chassis Inputs/Outputs - Sheet 13/35 Rev C



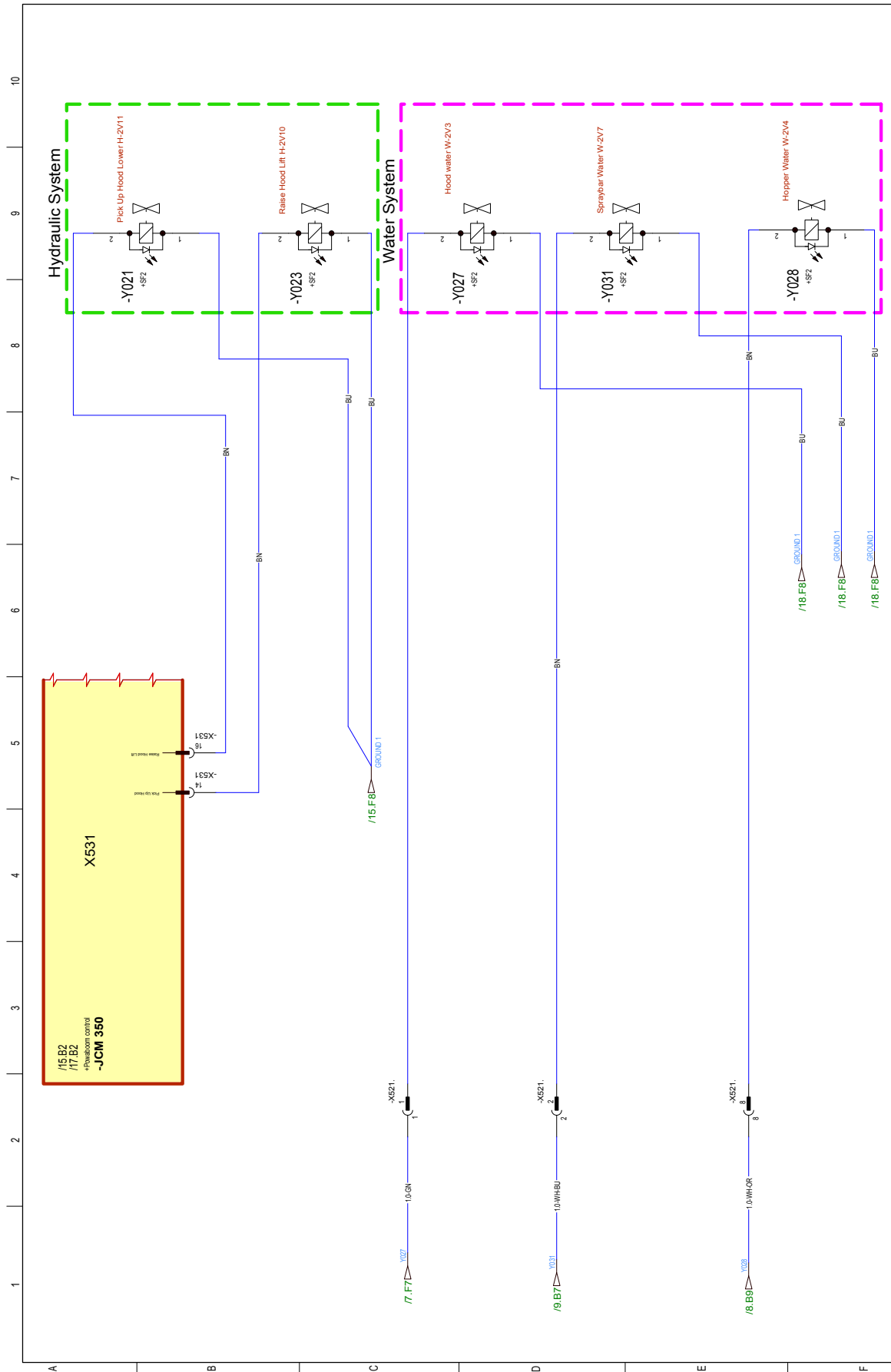
**Sub-Frame - Node JCM Signals/Power - Sheet 14/35 Rev C**



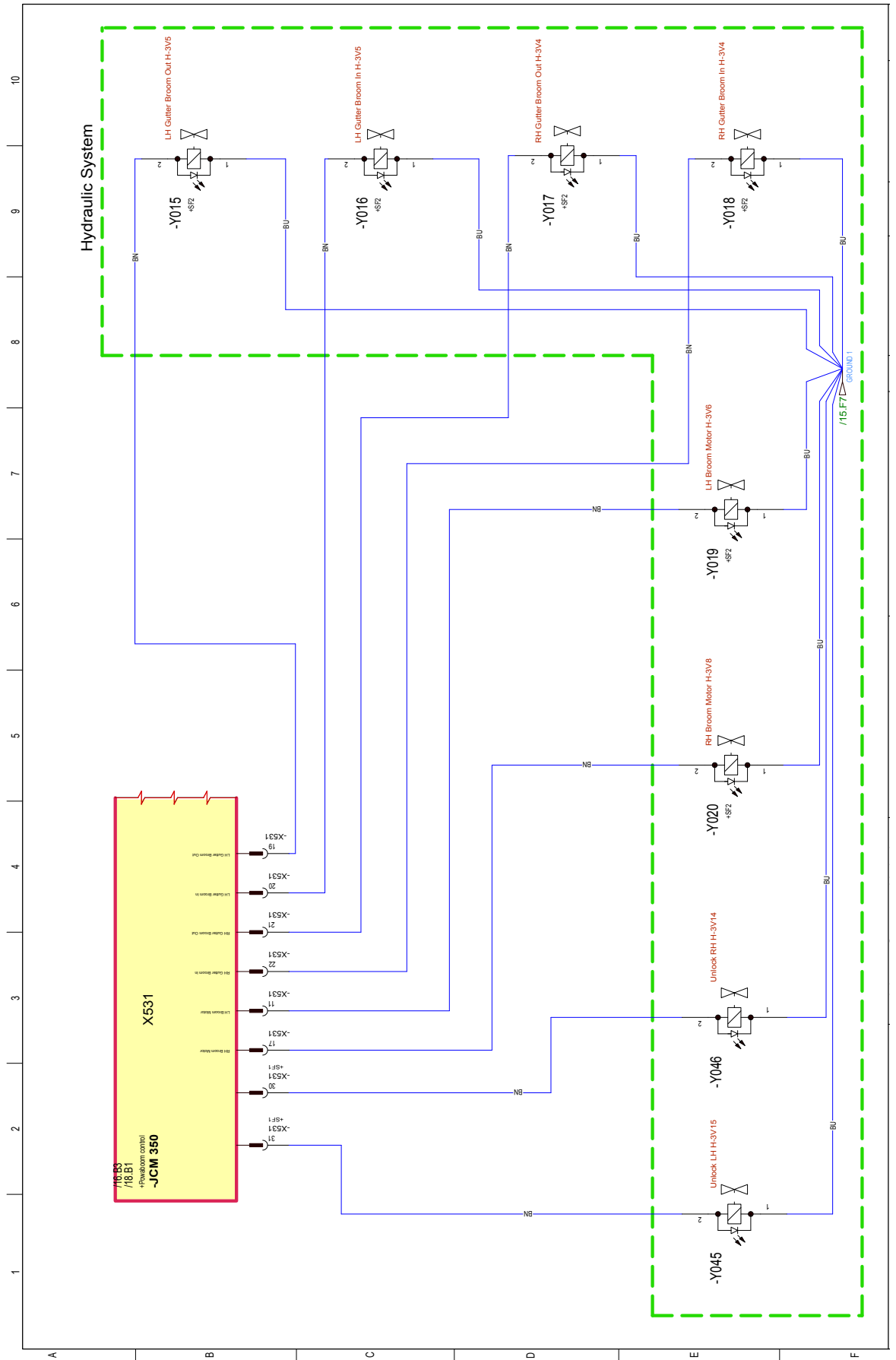




**Sub-Frame - Pick Up Hood - Sheet 16/35 Rev C**

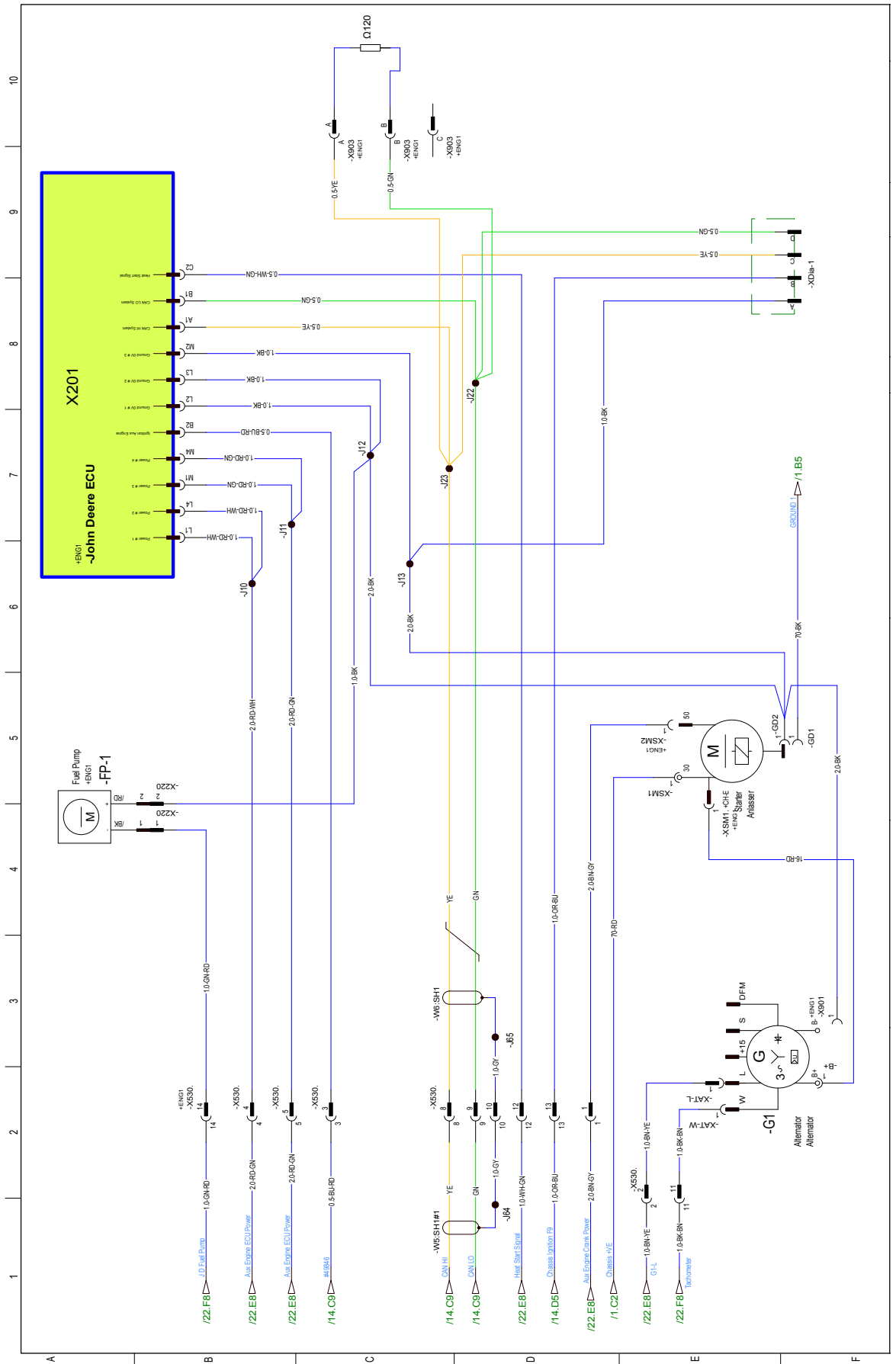


Sub-Frame - Sweep Gear Hydraulic - Sheet 17/35 Rev C



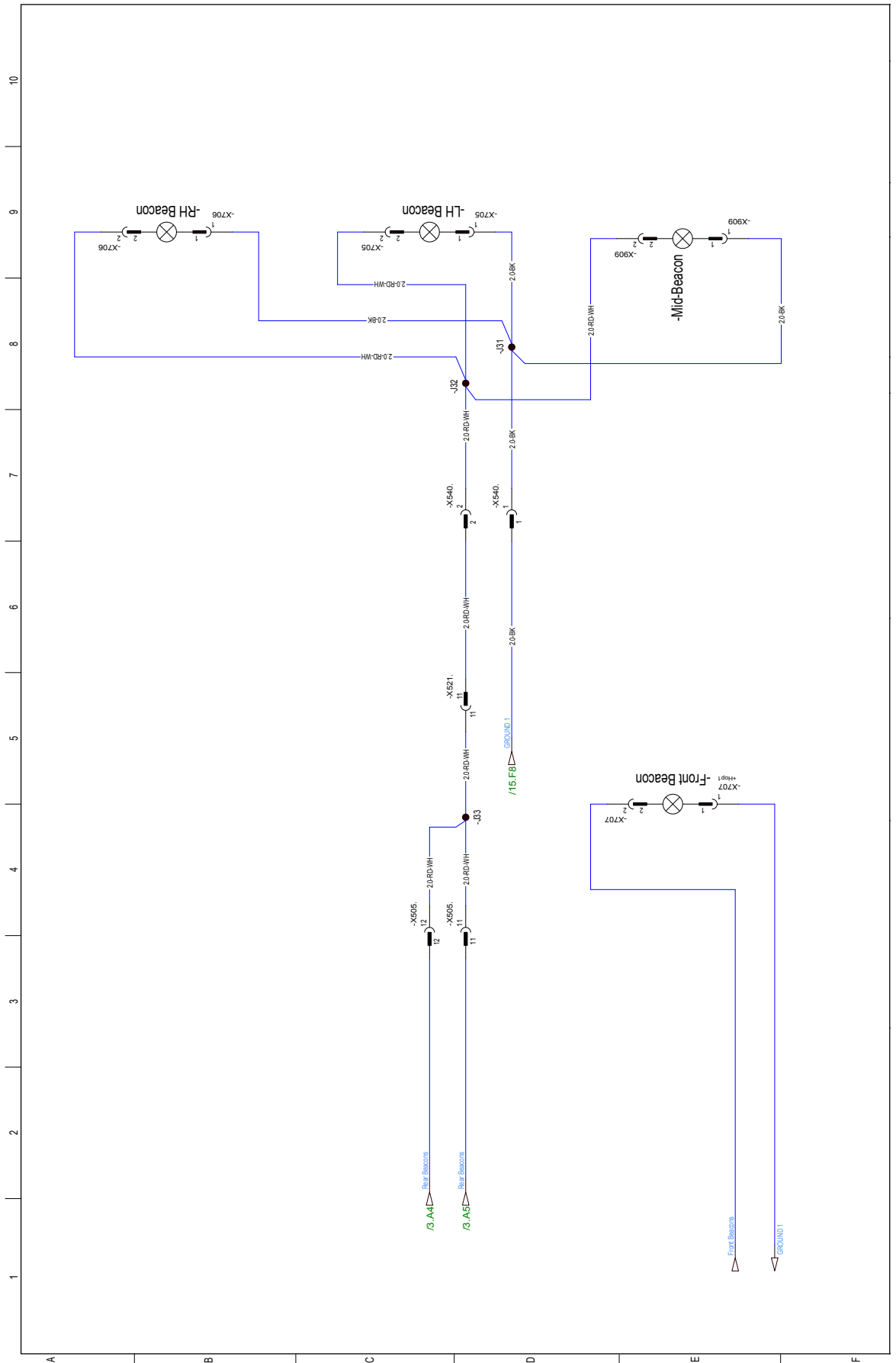


Power Pack - John Deere 86kw - Sheet 19/35 Rev C

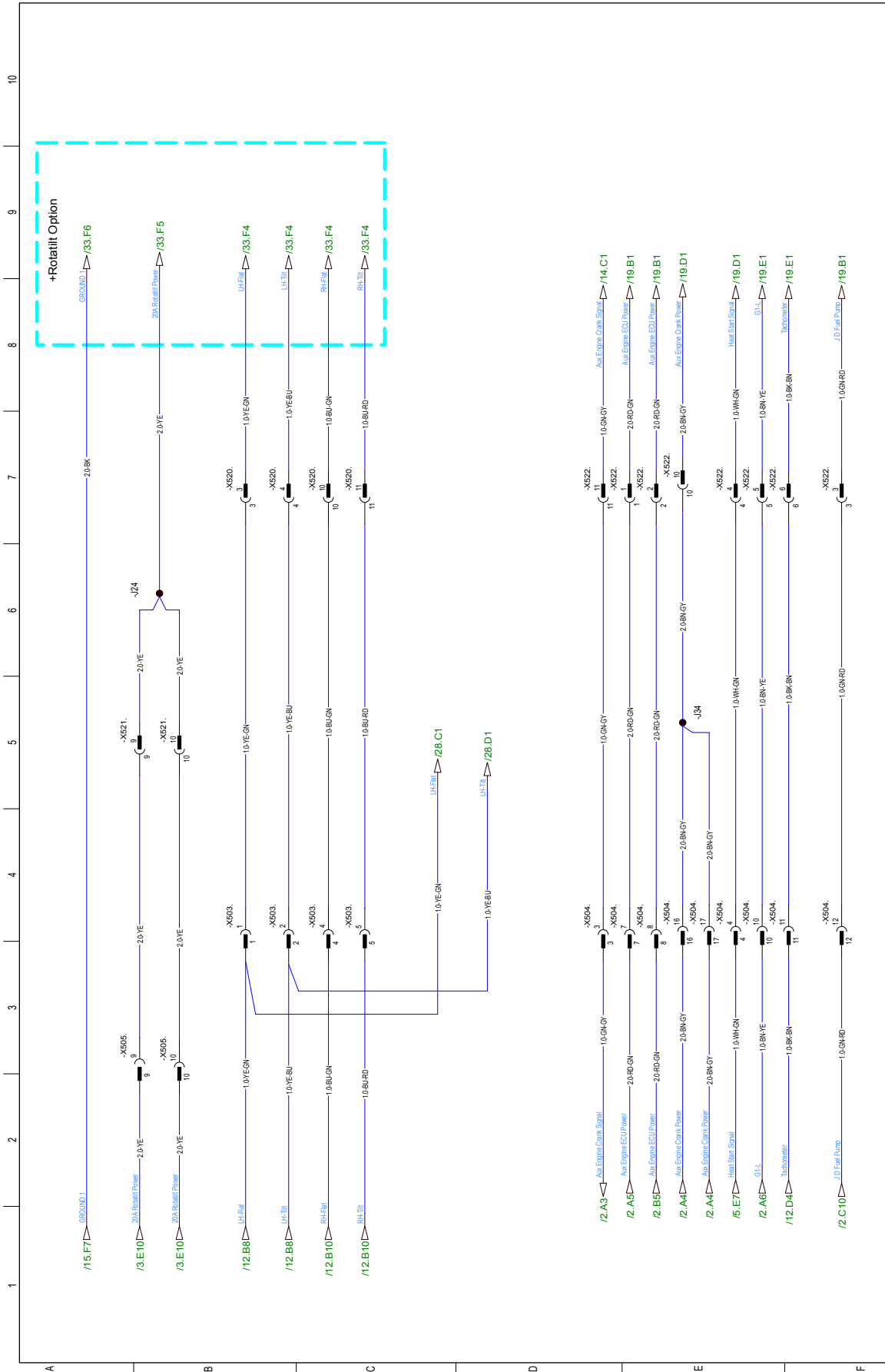




Hopper Electric - Beacons/Lights - Sheet 21/35 Rev C

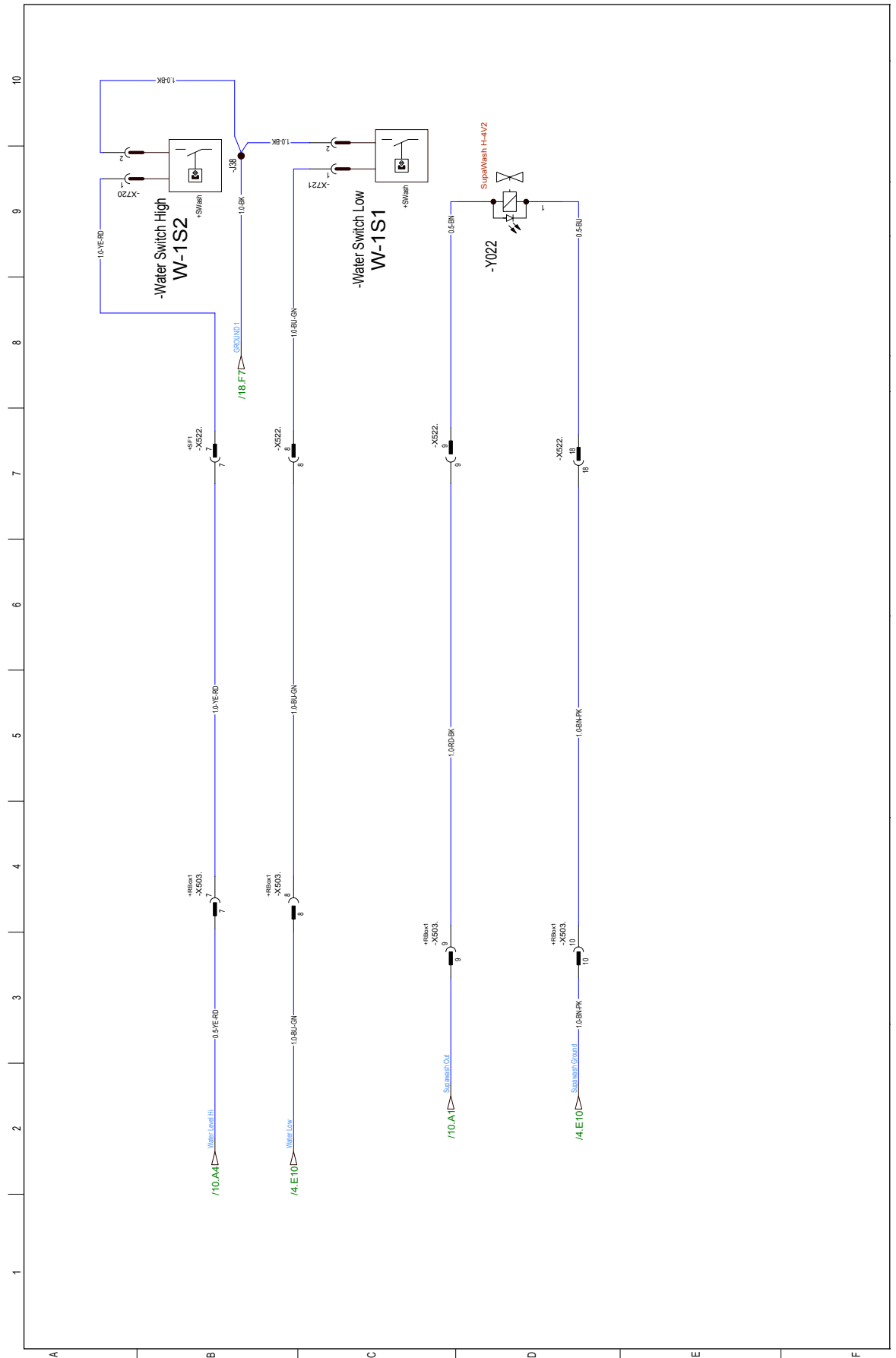


**Sub-Frame - Auxiliaries 1 - Sheet 22/35 Rev C**

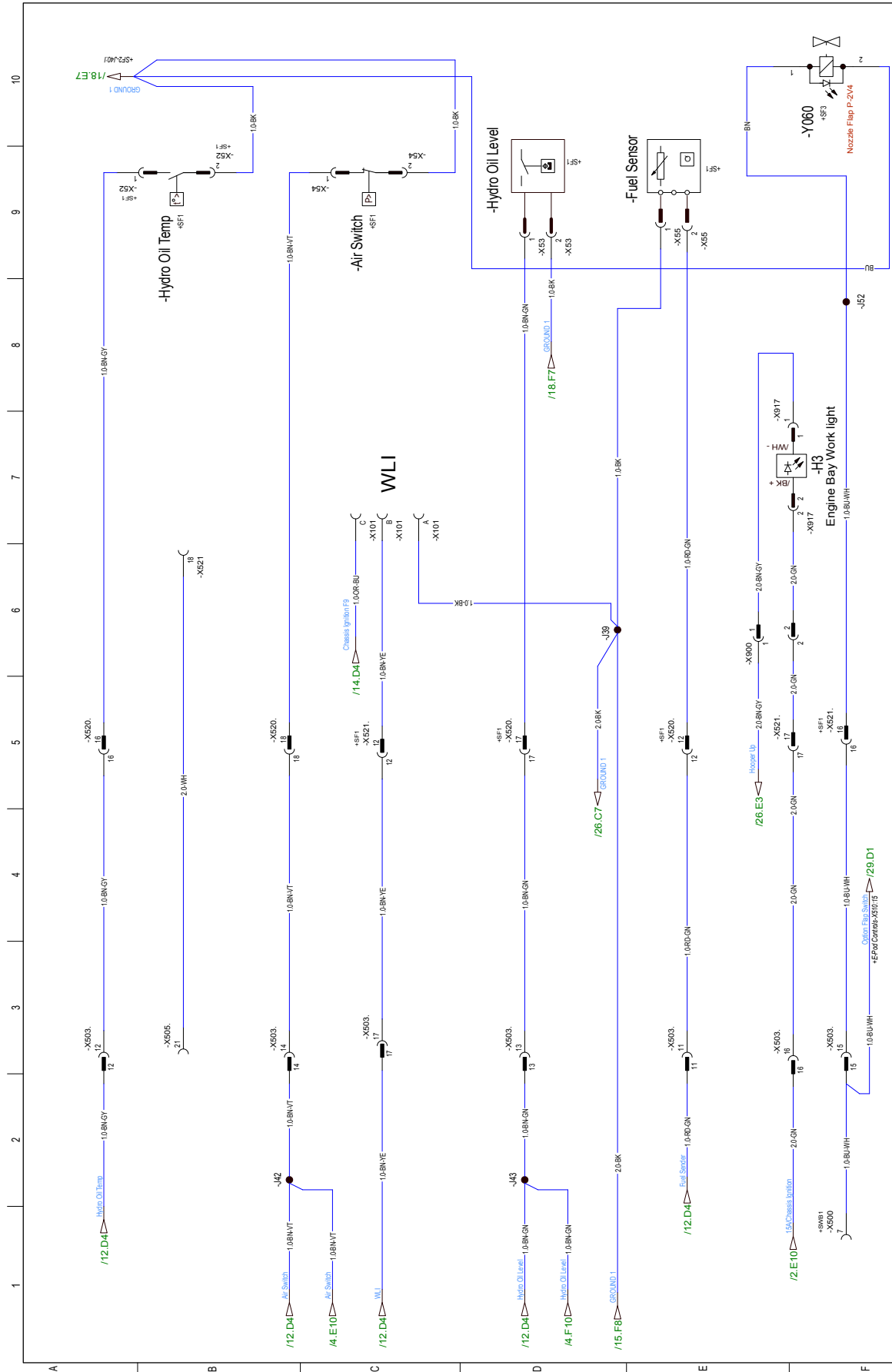




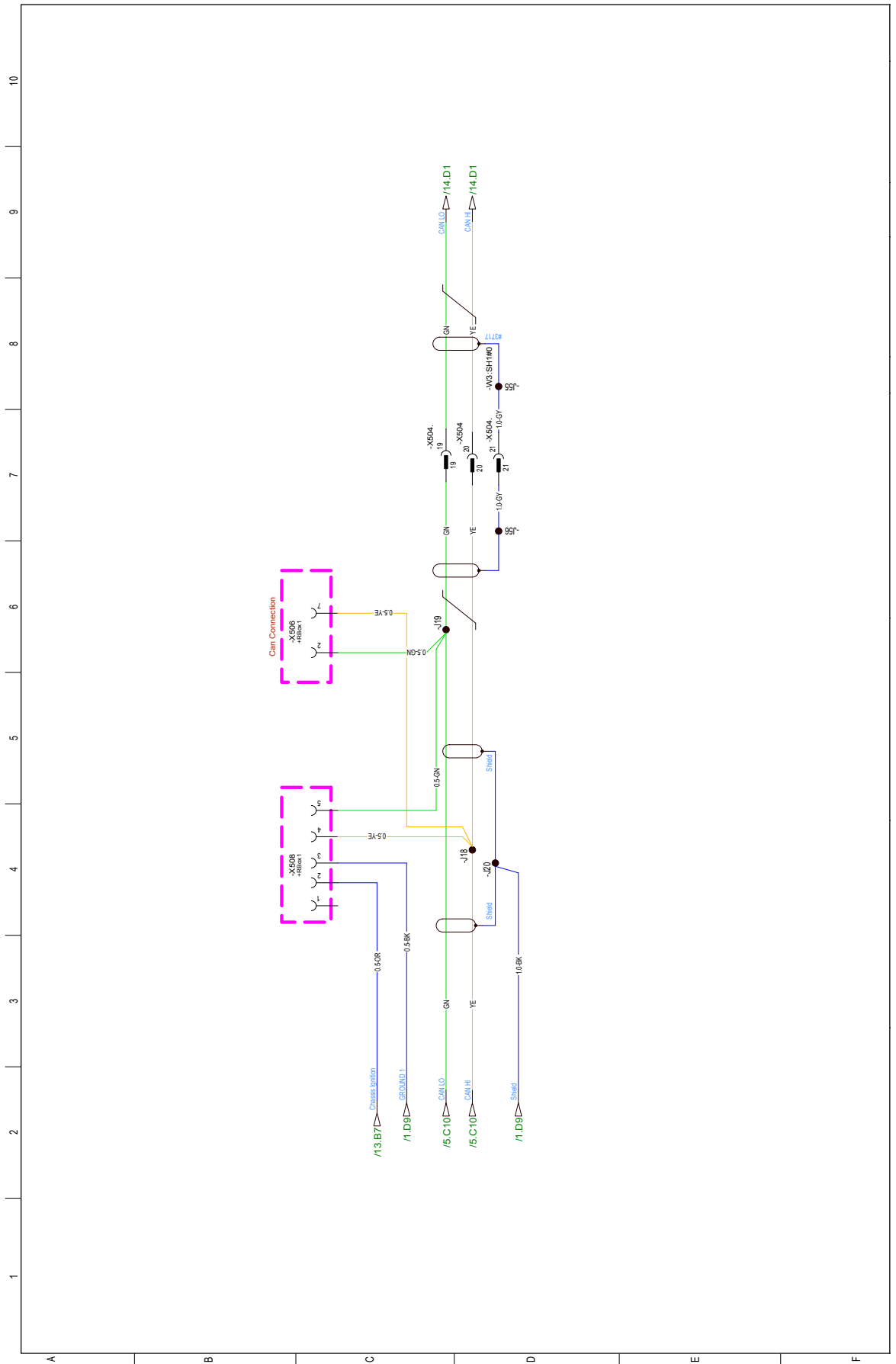
Sub-Frame - Auxiliaries 2 Fuse Rating - Beacons/Lights - Sheet 23/35 Rev C



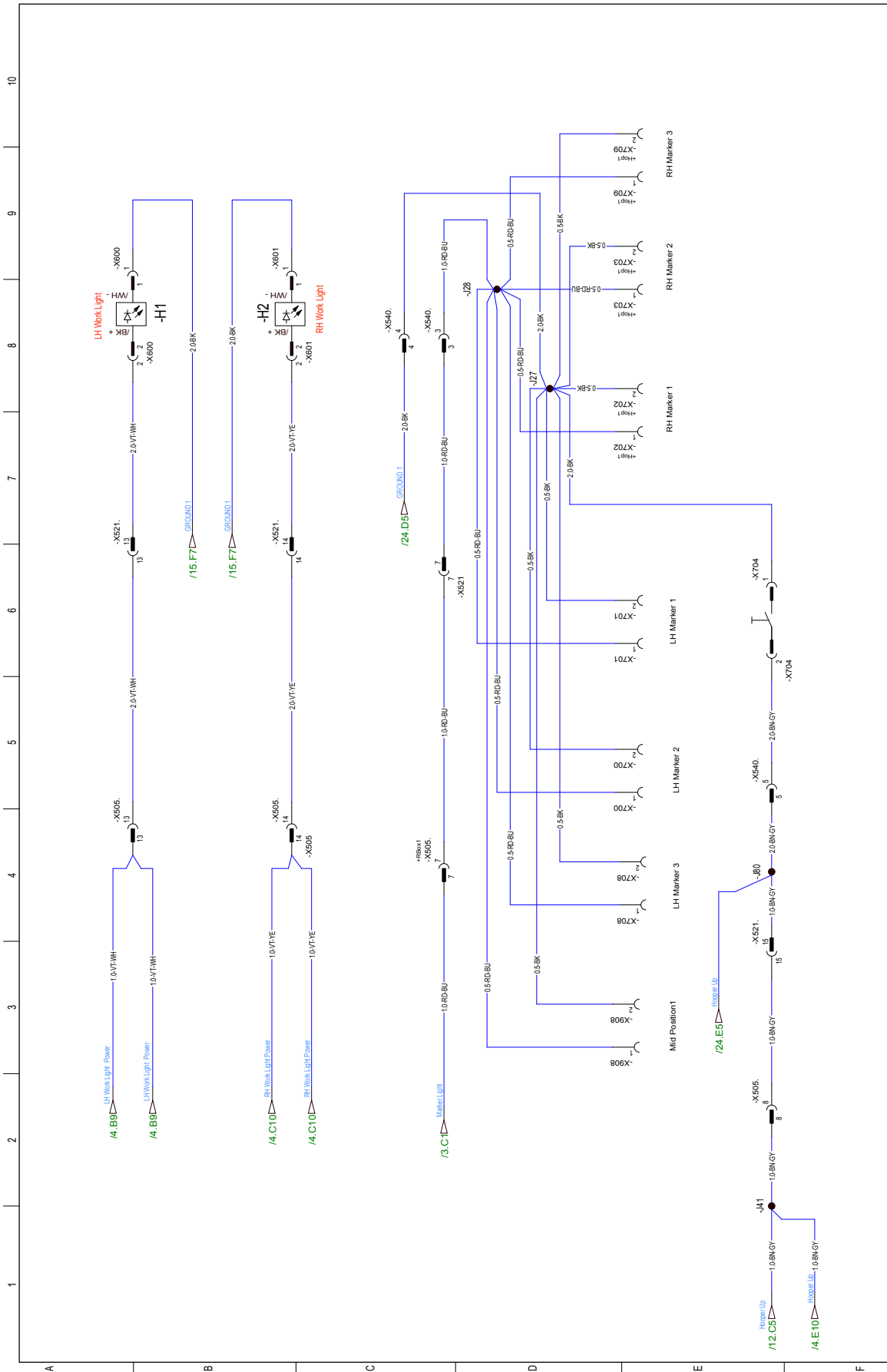
Sub-Frame - Auxiliaries 3 - Sheet 24/35 Rev C



Cab Connections - Relay Box - Sheet 25/35 Rev C

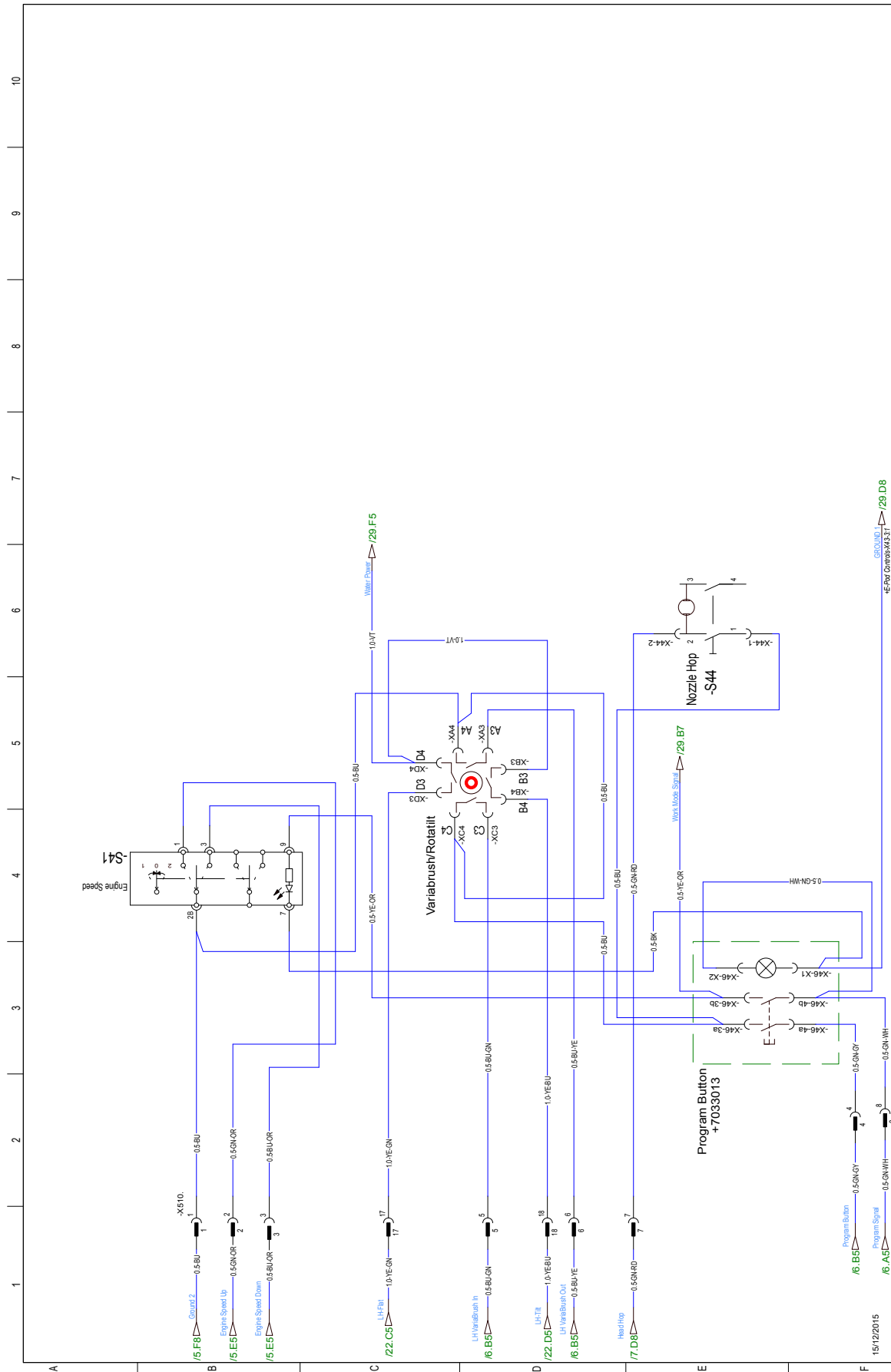


**Sub-Frame - Work lights - Sheet 26/35 Rev C**

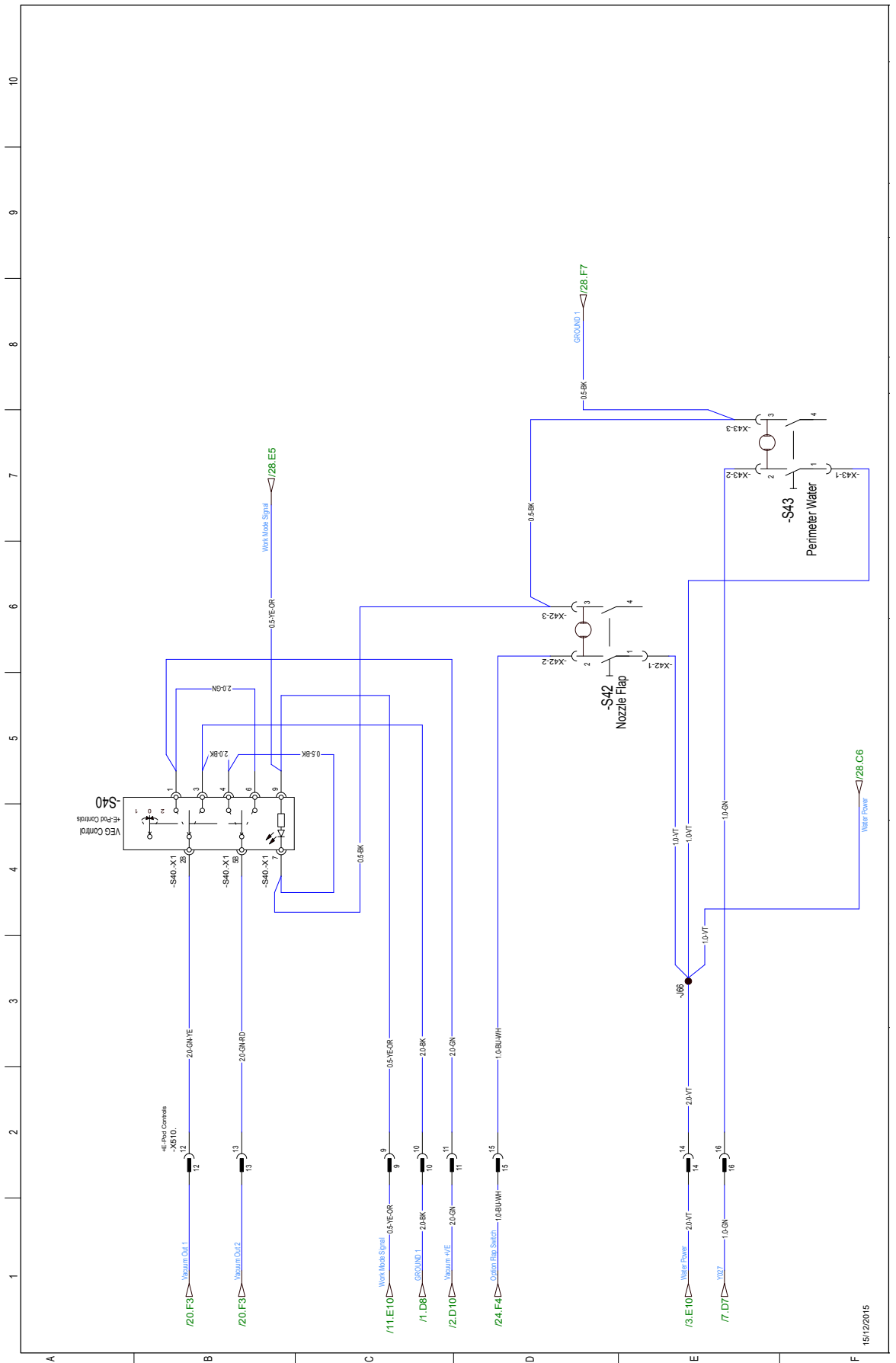




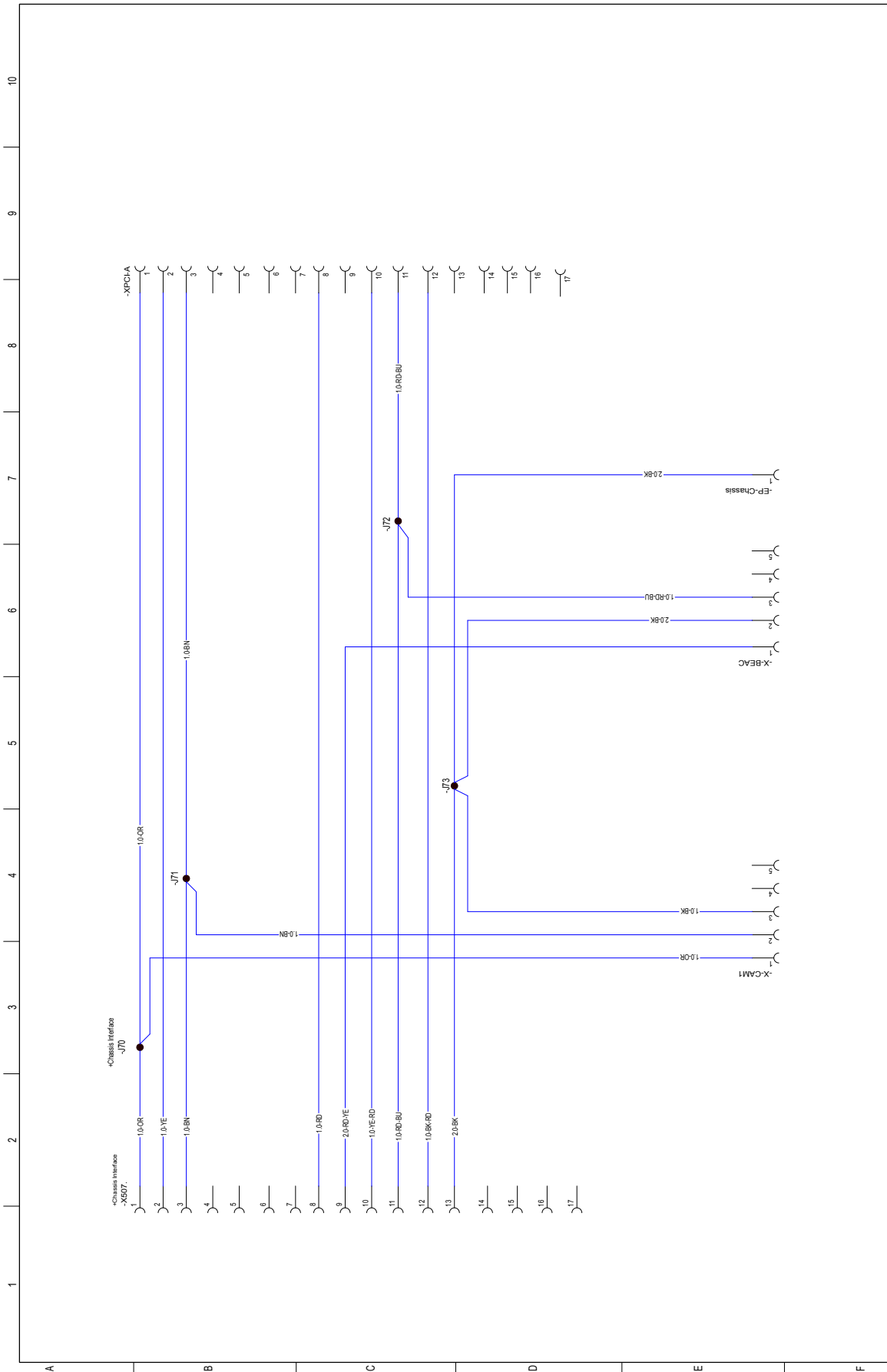
**Cab - E-POD Controls 1 - Sheet 28/35 Rev C**



Cab - E-POD Controls 2 - Beacons/Lights - Sheet 29/35 Rev C

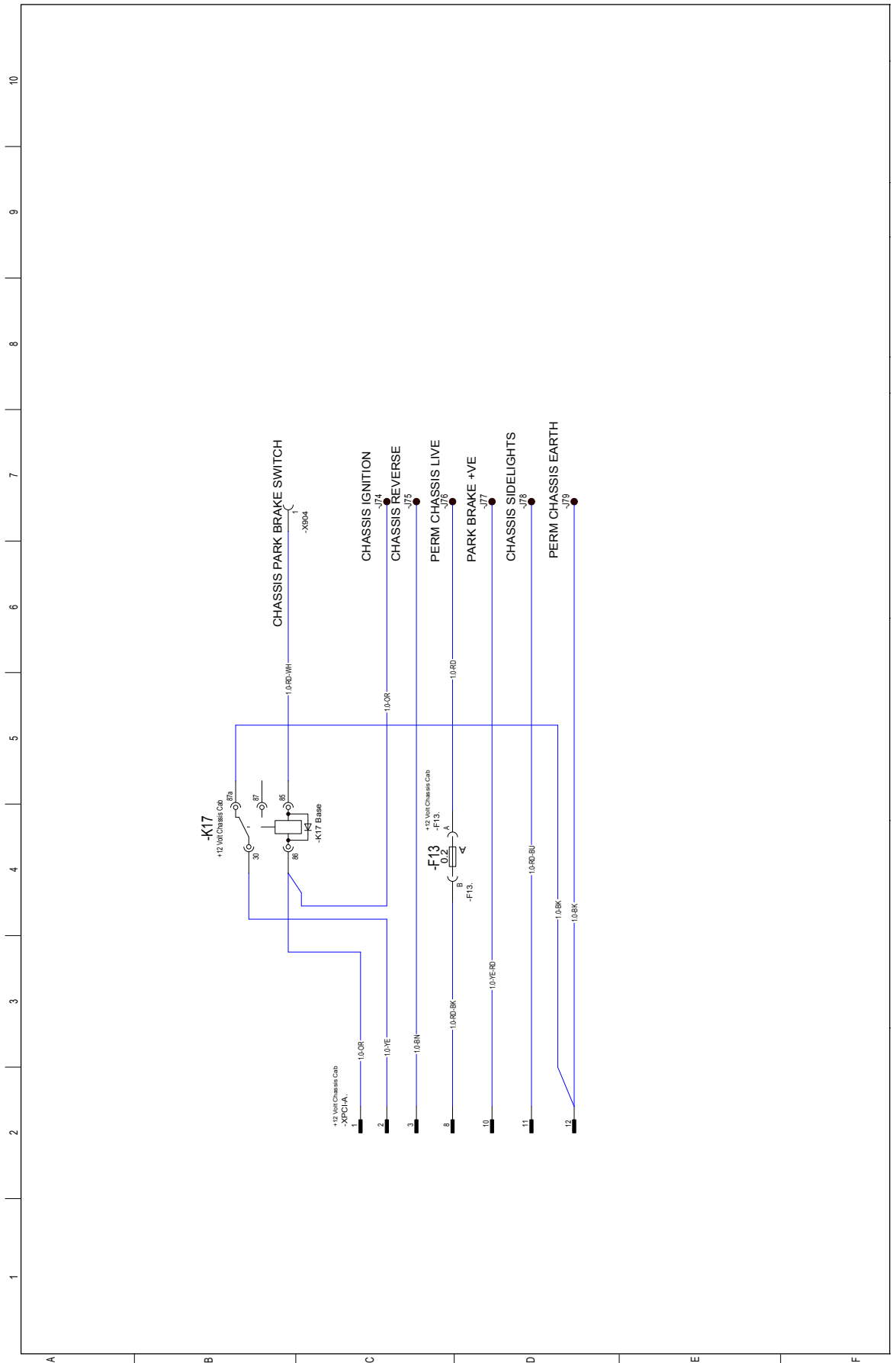


**Cab Interface - Sheet 30/35 Rev C**

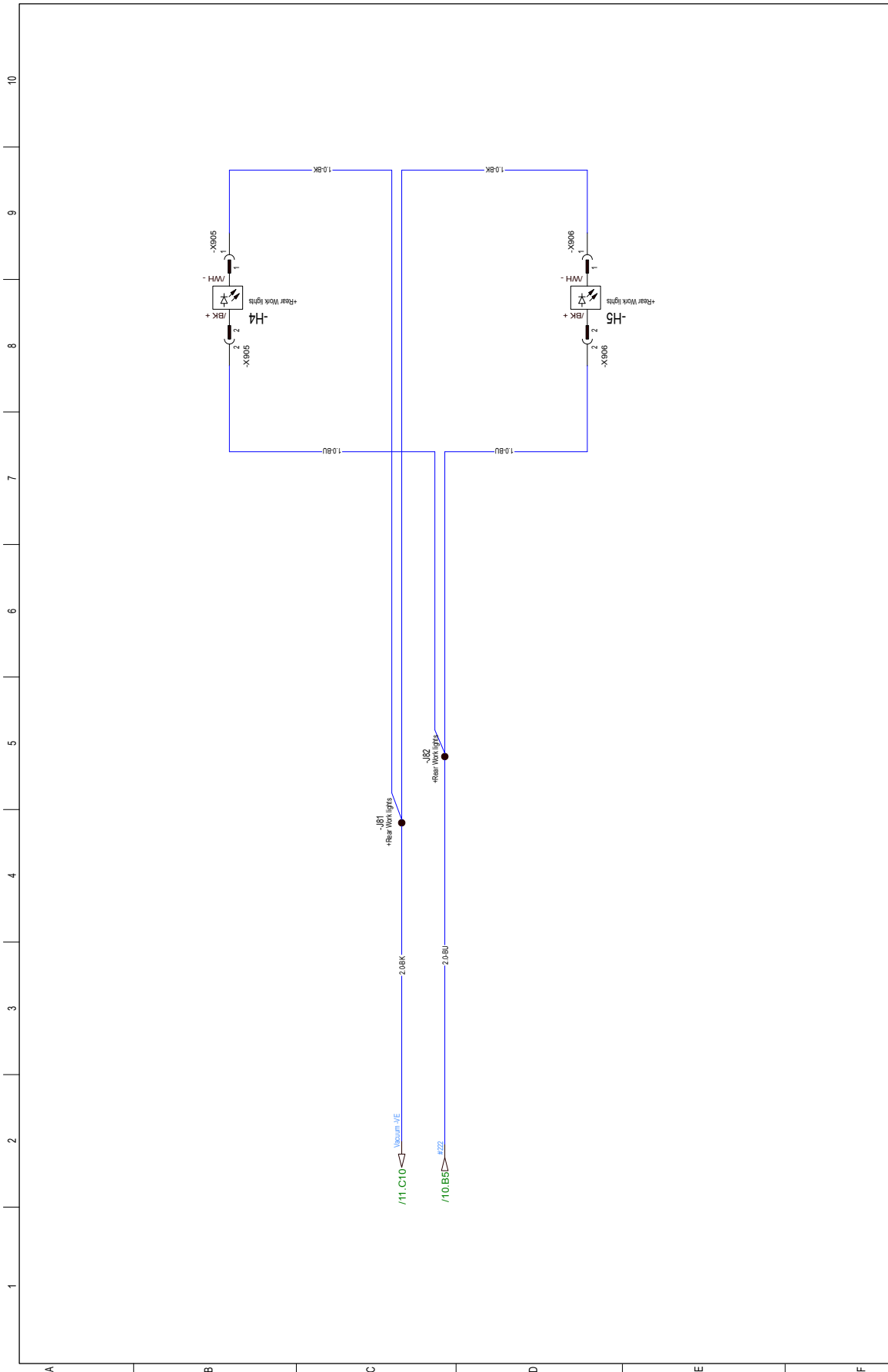




Cab Interface - Sheet 31/35 Rev C



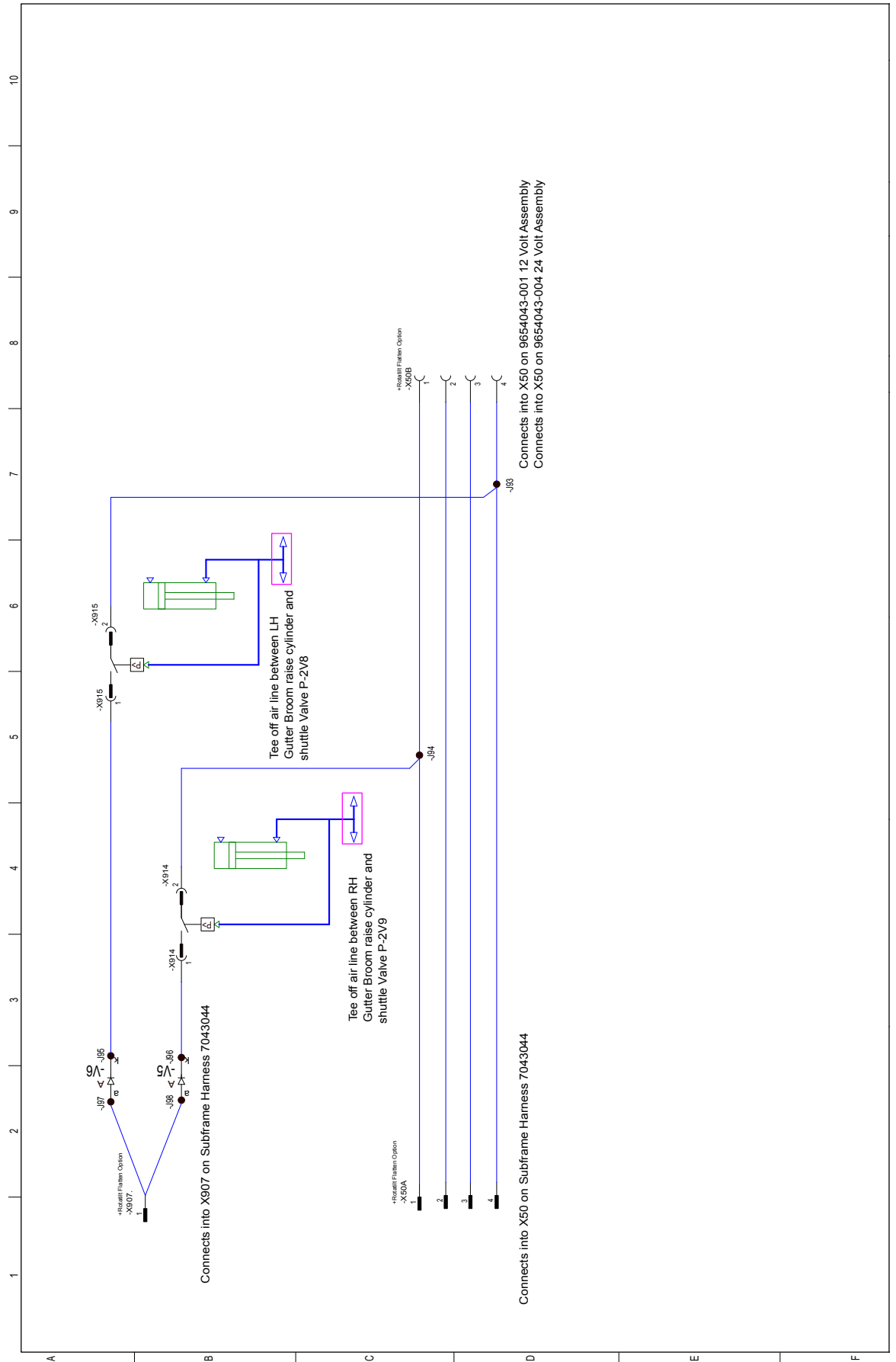
**Rear work Lights - Sheet 32/35 Rev C**







Rotatilt Flatten Option - Sheet 35/35 Rev C





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**CHAPTER****4**

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**Water System****Table of Contents**

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Circuit Pressures	4 : 2
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Piping Diagram	4 : 3
Component Location	4 : 3
Water Pump	4 : 4
Water Valve Station Utilisation	4 : 5
Relief Valve	4 : 5
Hydrant Filler	4 : 5
<b>Circuit Diagrams</b>	
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Low Pressure - Dual Sweep	4 : 7
High Pressure	4 : 8

## GENERAL DESCRIPTION

Pressure for the water supply is provided by a twin diaphragm pump hydraulically driven from the auxiliary engine. Pressure regulation is by a regulator situated in the Powapak. Filtration is by one in-line type located on the kerb side between the water and fuel tank. 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 on the left hand side of the Powapak.

Control of the washdown hose is by manual valves at the rear of the machine subframe.

## SUPAWASH

This optional equipment comprises a hydraulically driven high pressure water pump, and a hand lance mounted on the chassis of the machine with a 15 metre hose wound onto a recoiling reel.

Front spraybar is optional equipment.

## SUPAWASH UNLOADER VALVE

1. Ensure that the hydraulic relief valve has been set as outlined in section 2.
2. Fit a hydraulic test gauge to the Supawash manifold (T13).
3. Disconnect the 3/8" bypass pipe at the unloader valve and plug the hose end.
4. Turn on the front spraybar tap.
5. Activate the Supawash and increase the engine speed to 2000 rpm. Check to see if any water is leaking from the bypass port on the unloader, if not loosen the retaining nut on the top of the unloader and unscrew anticlockwise until water dribbles from the bypass port. Gently turn the adjuster clockwise until water stops dribbling, then turn the adjuster ½ turn clockwise and lock off the retaining nut. The operational pressure at the manifold should be 100 bar nominal. If the pressure is higher check again for blocked jets. If the pump operates at a pressure in excess of 100 bar there is a problem that will effect the life of the pump and invalidate any warranty.

**NB:** Do not turn off the front Supawash spraybar or water will be ejected from the bypass valve where the hose has been removed.

6. Stop the engine and reconnect the bypass hose.

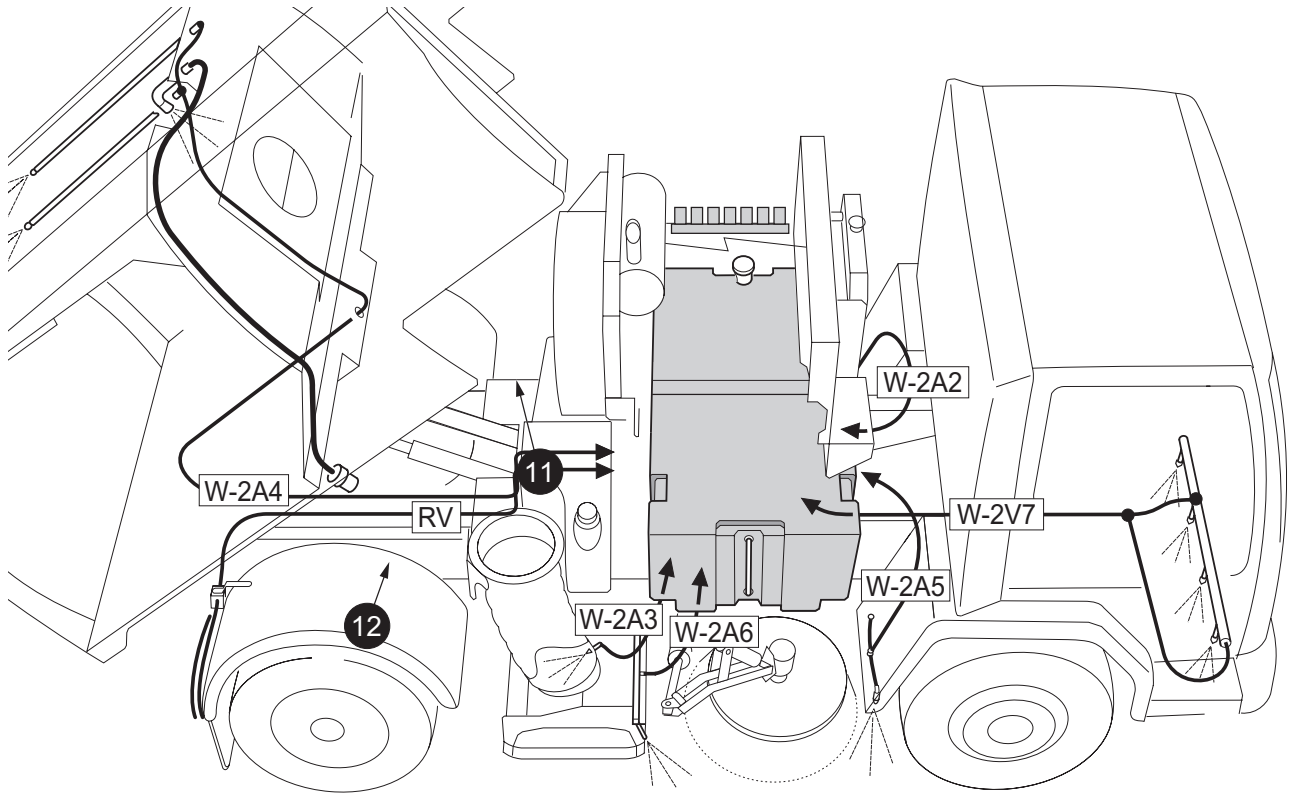
## CIRCUIT PRESSURES

Two test points are provided for checking the water pressures.

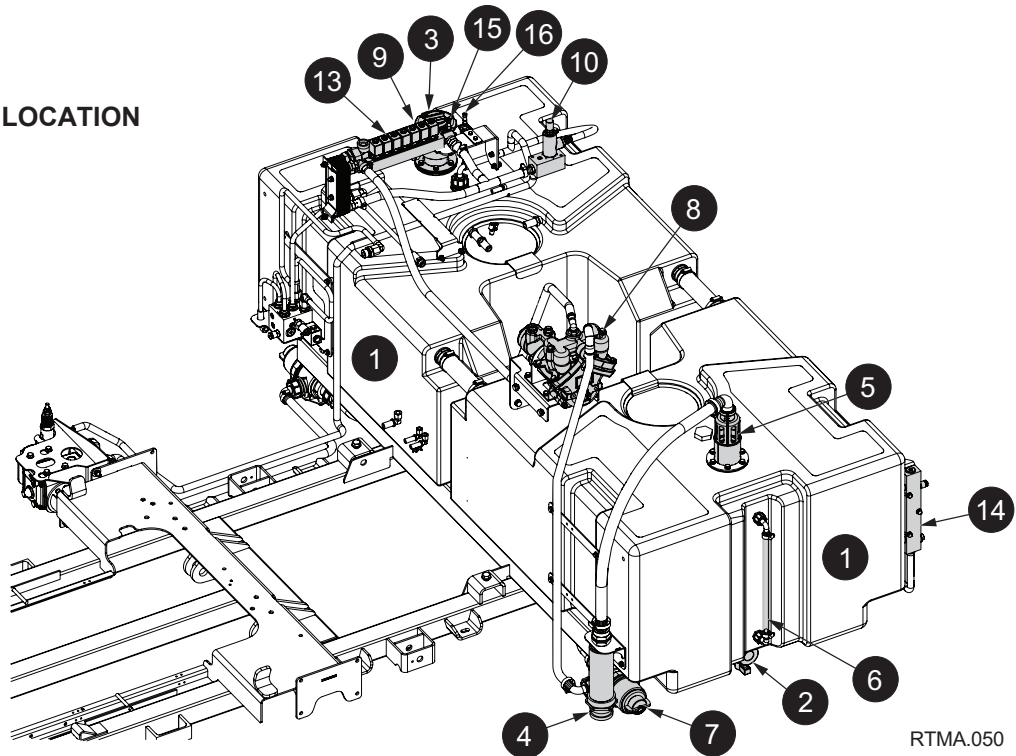
Test Point No.	Function
W-2Z3	Dust Suppression Sweep System
W-3Z2	Supawash System



PIPING DIAGRAM



COMPONENT LOCATION

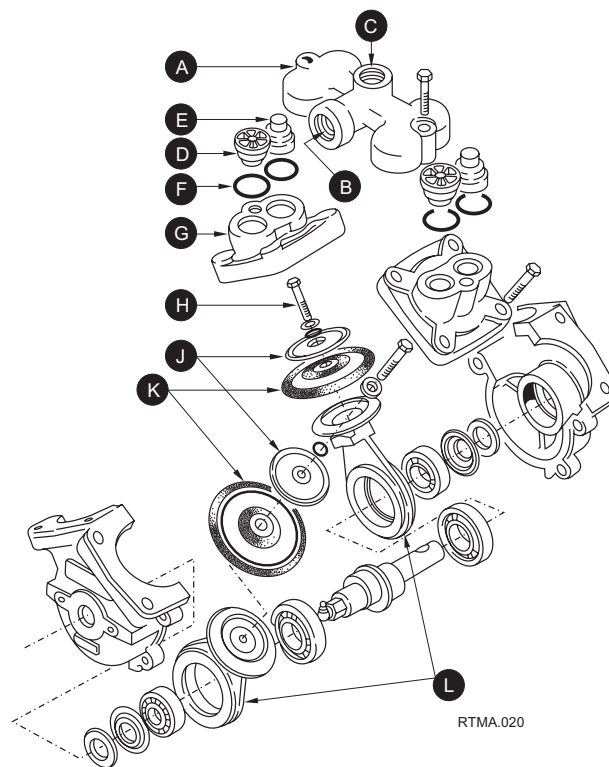


RTMA.050

- |   |                                      |    |   |
|---|--------------------------------------|----|---|
| 1 | Water tanks                          | 10 | Relief valve (RV)                           |
| 2 | Drain plugs                          | 11 | 'Sepavac' water flush hydrant connection    |
| 3 | Tank filler port - hosepipe          | 12 | Washdown hose - shown this side for clarity |
| 4 | Tank filler port - hydrant           | 13 | Water valve manifold                        |
| 5 | 'Type A' anti syphon water break     |    | (see table on page OG4:7)                   |
| 6 | Water level sight glass - both tanks | 14 | Supawash Manifold                           |
| 7 | Suction filter                       | 15 | Pressadrain                                 |
| 8 | Water pump - output 35 l/m           | 16 | Supawash Pressadrain                        |
| 9 | Tank overflow hose                   |    |   |

**WATER PUMP**

- 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



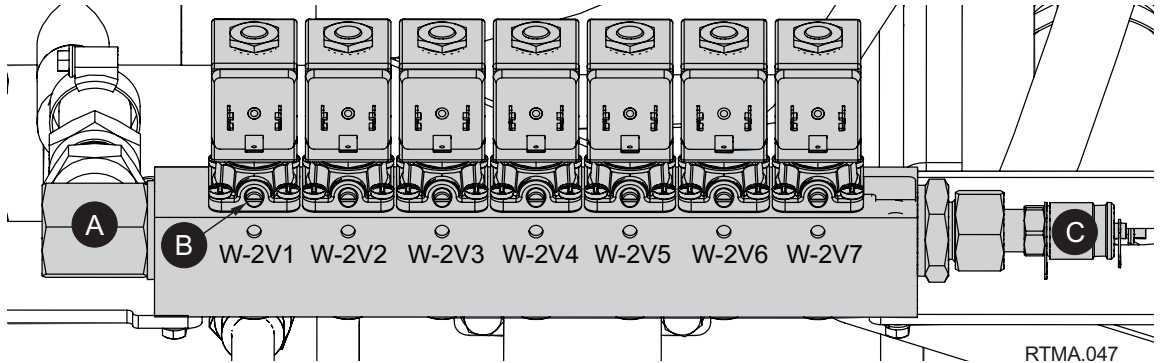
The assembly of the twin diaphragm pump is quite simple and straightforward, but attention to the under mentioned points will afford economy by prolonging the life of the pump and, more especially, the expendable components.

- 1 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.
- 2 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.
- 3 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.

It is important that these instructions are carried out, especially with regard to the fitting of the manifolds, to ensure a satisfactory seal at the valve sealing rings. Unless these instructions are followed, leakage will be experienced at the joint between the manifold and the pump chambers. On dismantling a pump for examination, if the valve sealing rings have taken on a permanent set to their location (roughly triangular in cross section), they should be replaced.

**WATER SYSTEM - WATER VALVE STATION UTILISATION**

VALVE	ELECTRICAL ID	FUNCTION
W-2V1	Y025	LH Gutter spray
W-2V2	Y026	LH Gutter broom
W-2V3	Y027	Suction duct
W-2V4	Y028	Sepavac/hopper
W-2V5	Y029	RH Gutter spray
W-2V6	Y030	RH Gutter broom
W-2V7	Y031	Spray bar



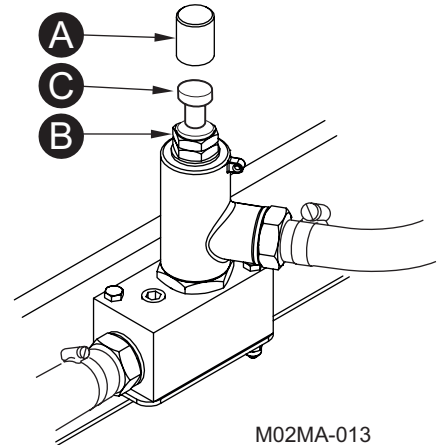
- A Water supply
- B Manual override levers
- C Water test point

**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.

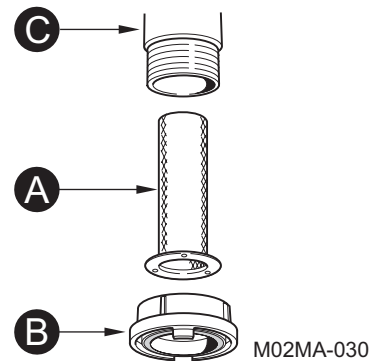
**Pressure Setting**

Remove the cover (A) and loosen adjuster locknut (B). Connect a pressure gauge to the test point located in the systems locker. With the auxiliary engine running at low idle speed (750/800), and all water sprays switched off, turn adjuster screw (C) until gauge reads 3.5 bar (50 psi). Tighten locknut and replace cover.

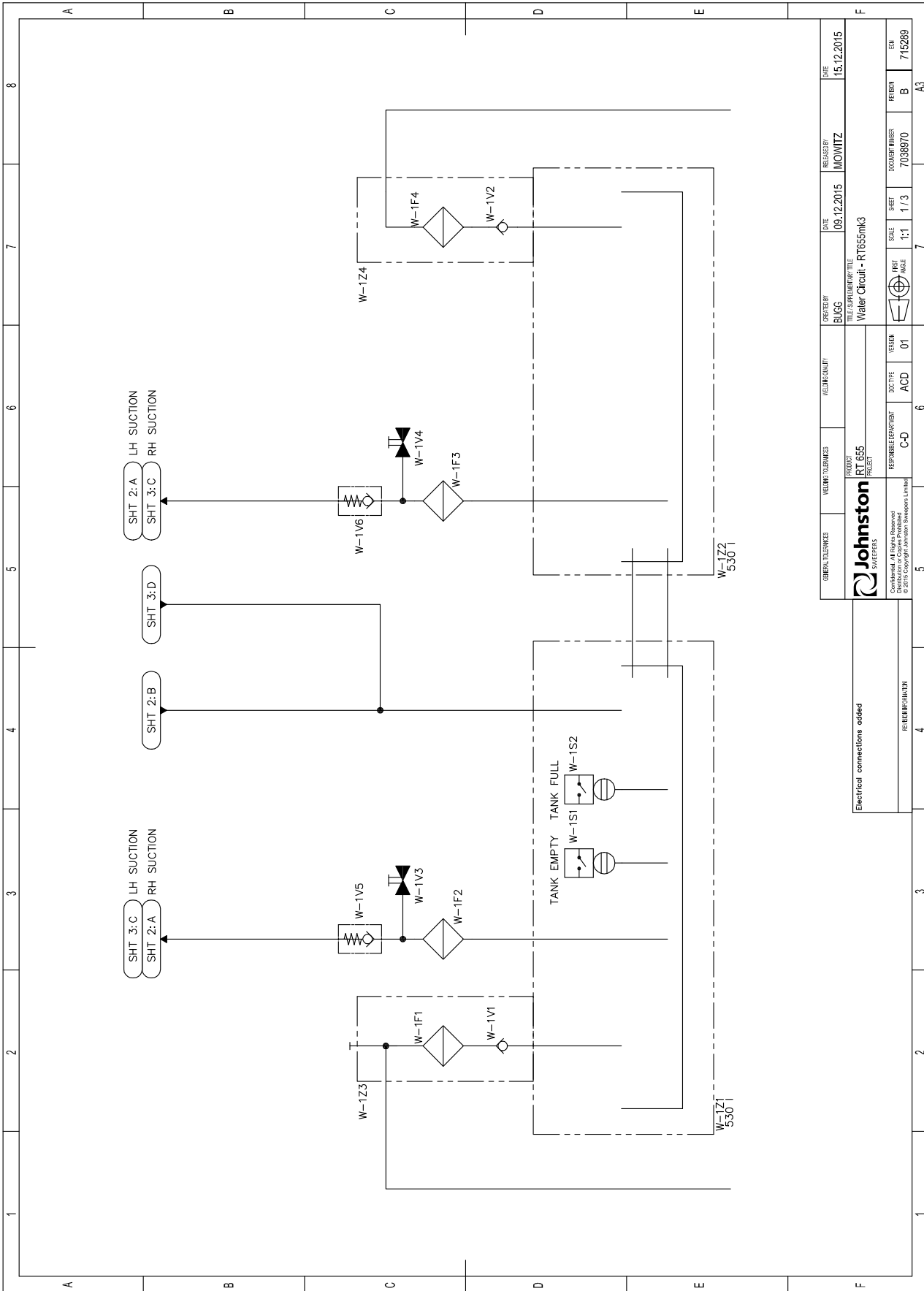


**HYDRANT FILTER**

Periodically the hydrant filter (A) should be cleaned, or replaced if damaged. To gain access to the filter, unscrew the hydrant coupling (B) and withdraw the filter from its housing (C).



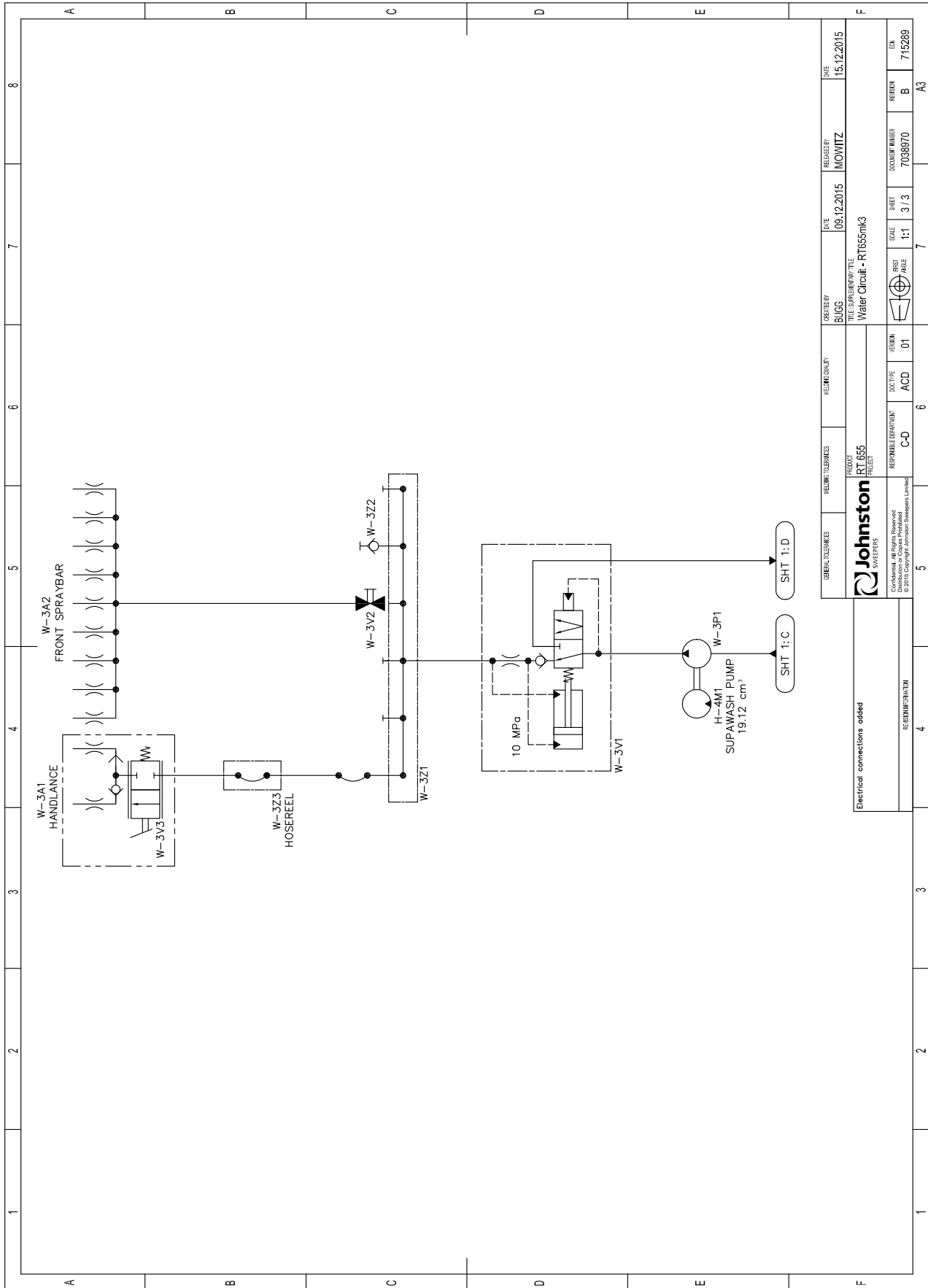
Water System - Sheet 01/03 Rev B



GENERAL TOLERANCES	WELDING TOLERANCES	WELDING QUALITY	ORIGINATOR	DATE	RELEASED BY	DATE
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			PRODUCT	TITLE (APPARENT) / TITLE		
Confidential. All Rights Reserved. © 2015 Copyright Johnston Swepens Limited.			RT 655 PROJECT	Water Circuit - RT655mk3		
Electrical connections added			RESPONSIBLE PERSON	DOCTYPE	REVISION	SCALE
			C-D	ACD 01	01	1:1
			REVISION NUMBER	SHEET	DATE	ENR
			7038970	1/3	7	715289
			REVISION	SCALE	DATE	ENR
			B	1:1	7	715289



Water System - Sheet 03/03 Rev B



GENERAL TOLERANCES	REVISIONS	REVISION	DATE	RELEASED BY	DATE
			09.12.2015	MOWITZ	15.12.2015
ORDERED BY	PROJECT	SCALE	DRW	SCALE	DRW
BLJGG	Water Circuit - RT655mk3	1:1	3 / 3	7098970	B
		DOUGH NUMBER	RESIN	EM	
PRODUCT RT 655 PROJECT		DOUGH NUMBER	RESIN	EM	
RESPONSIBLE EQUIPMENT C-D		DOUGH NUMBER	RESIN	EM	
RESPONSIBLE EQUIPMENT ACD 01		DOUGH NUMBER	RESIN	EM	
RESPONSIBLE EQUIPMENT SHT 1:C		DOUGH NUMBER	RESIN	EM	
RESPONSIBLE EQUIPMENT SHT 1:D		DOUGH NUMBER	RESIN	EM	
Electrical connections added		DOUGH NUMBER	RESIN	EM	
RESPONSIBLE EQUIPMENT A3		DOUGH NUMBER	RESIN	EM	

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**CHAPTER****5**

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**Pneumatic System****Table of Contents**

<b>Section</b>	<b>Page</b>
<b>Introduction</b>	
General Description	5 : 2
Circuit Pressures	5 : 2
Safety Precautions	5 : 2
Pneumatic Pipe Colours	5 : 2
Valve Identification/Location	5 : 2
<b>Component Removal</b>	
Air Filtration and Regulator (FR)	5 : 3
Pneumatic Valve Island	5 : 3
<b>Circuit Diagrams</b>	5 : 4

## 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. A filter regulator unit with integral shut off/drain facility and low air pressure warning buzzers are located within the engine bay, as are the electrical solenoid control valves for operation of channel brush/body prop retract.



### Safety Precautions



**Before servicing any components on this system, the air supply should be shut off by means of the shut off valve mounted on top of the filter regulator unit. This not only severs the pneumatic supply, it also exhausts the air from the system causing the nozzle and wide sweep brush to lower. Wait approximately 15 seconds to allow air to completely exhaust before carrying out any work. The shut off valve does not drain air from the vehicle braking system.**

## CIRCUIT PRESSURES

A test point (on piping diagram) is provided in the engine bay to carry out pressure checks, i.e. 8.0 bar (115 PSI).

- 1 First ensure truck air system is up to pressure and sweepgear is lifted.
- 2 Fit a 25 bar minimum pressure gauge to test point PTP.

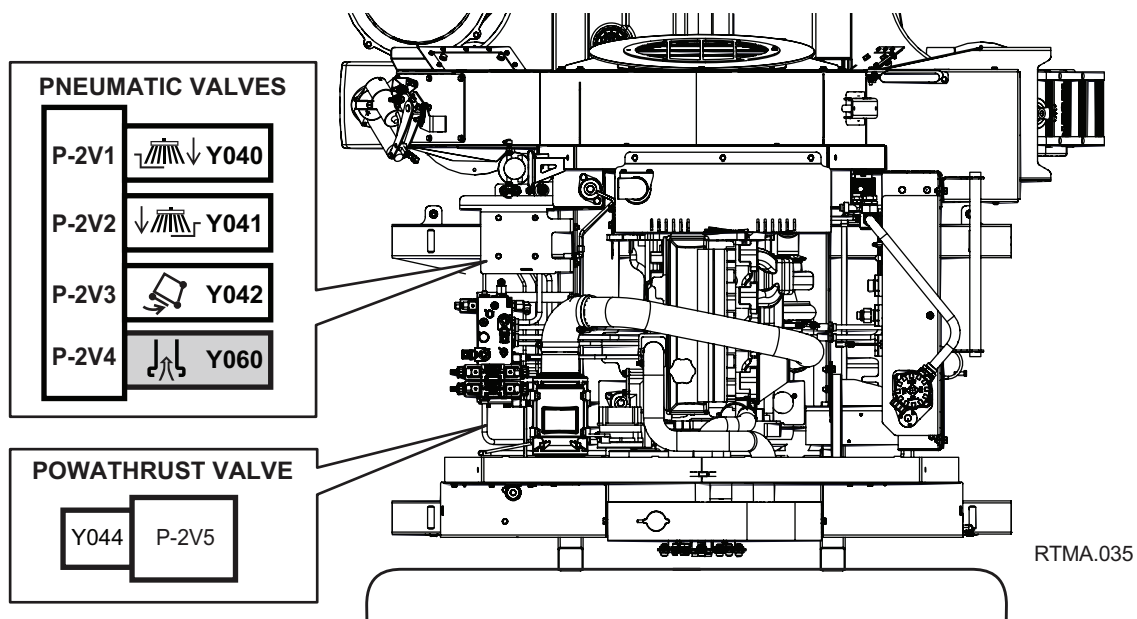
If pressure is incorrect, adjustment is carried out by turning the regulator control on the filter regulator unit.

## 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 switched supply via valve or tap
- B** = Black - used for permanent vent/exhaust line

## VALVE IDENTIFICATION/LOCATION





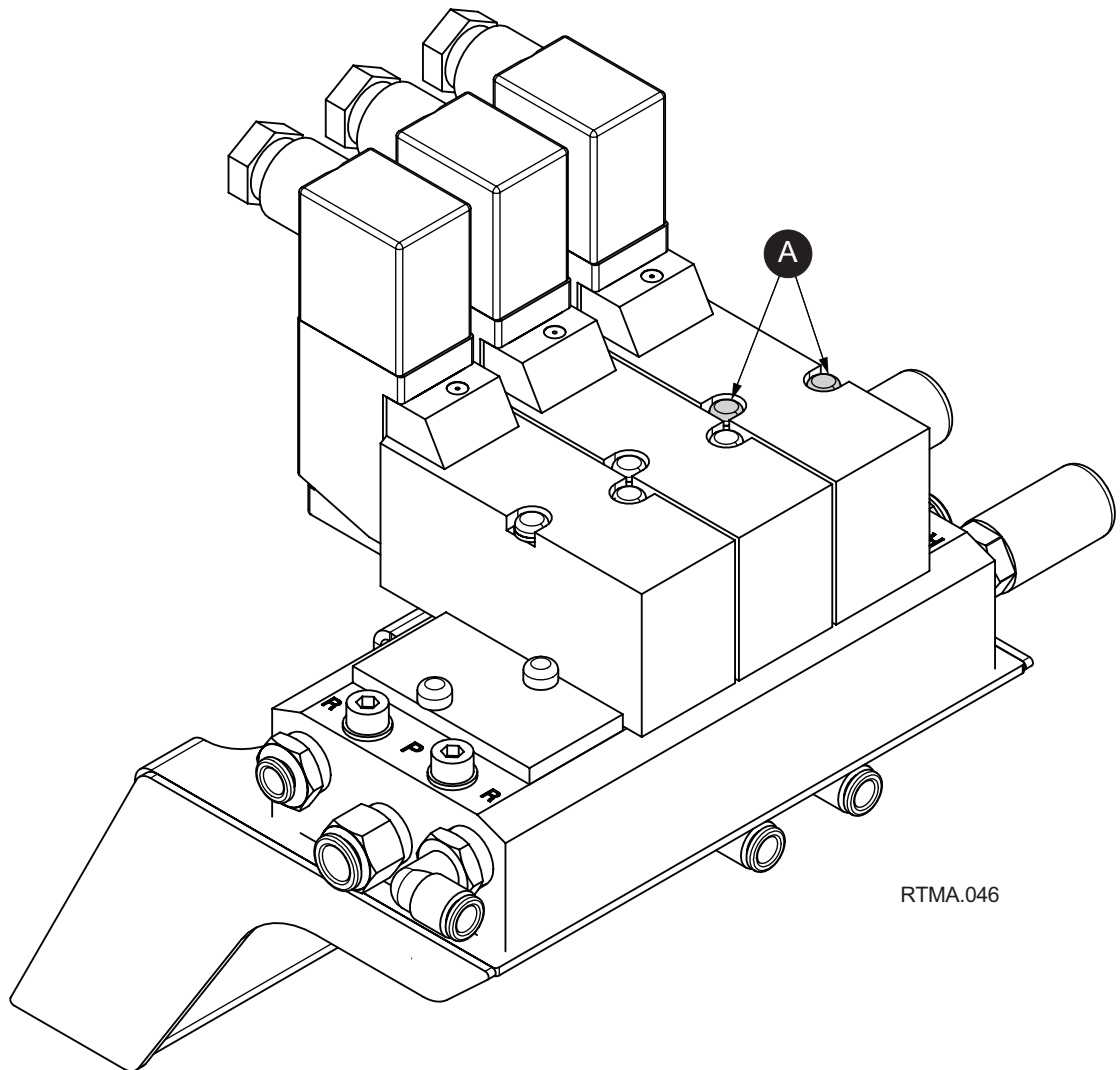
### AIR FILTRATION AND REGULATOR (FR)

A filter regulator unit, located on the right hand side of the body, filters the air for the sweeper section of the pneumatic system to prolong the life of the components served by it.

Before carrying out any major work on the unit, other than that described in the Routine Maintenance Section of the Operator's Guide, it will be necessary to drain the vehicle air system, then disconnecting the supply pipes and releasing the fixing bolts.

### PNEUMATIC VALVE ISLAND

The pneumatic valve island is a modular unit comprising either 3 or 4 (12V or 24V) valves. Each valve has an indicator light that illuminates when energised.

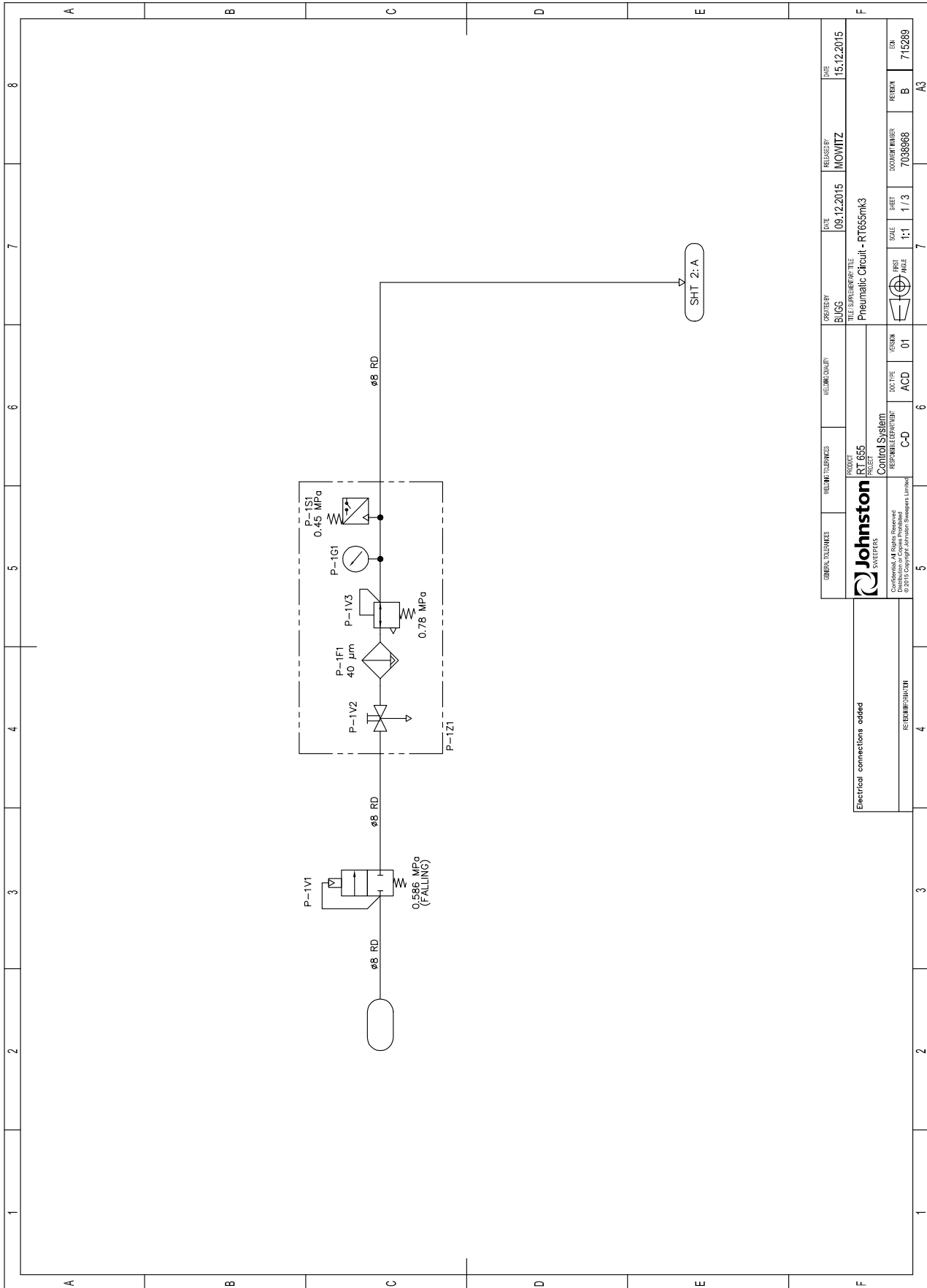


RTMA.046

The valves are identified by a code.

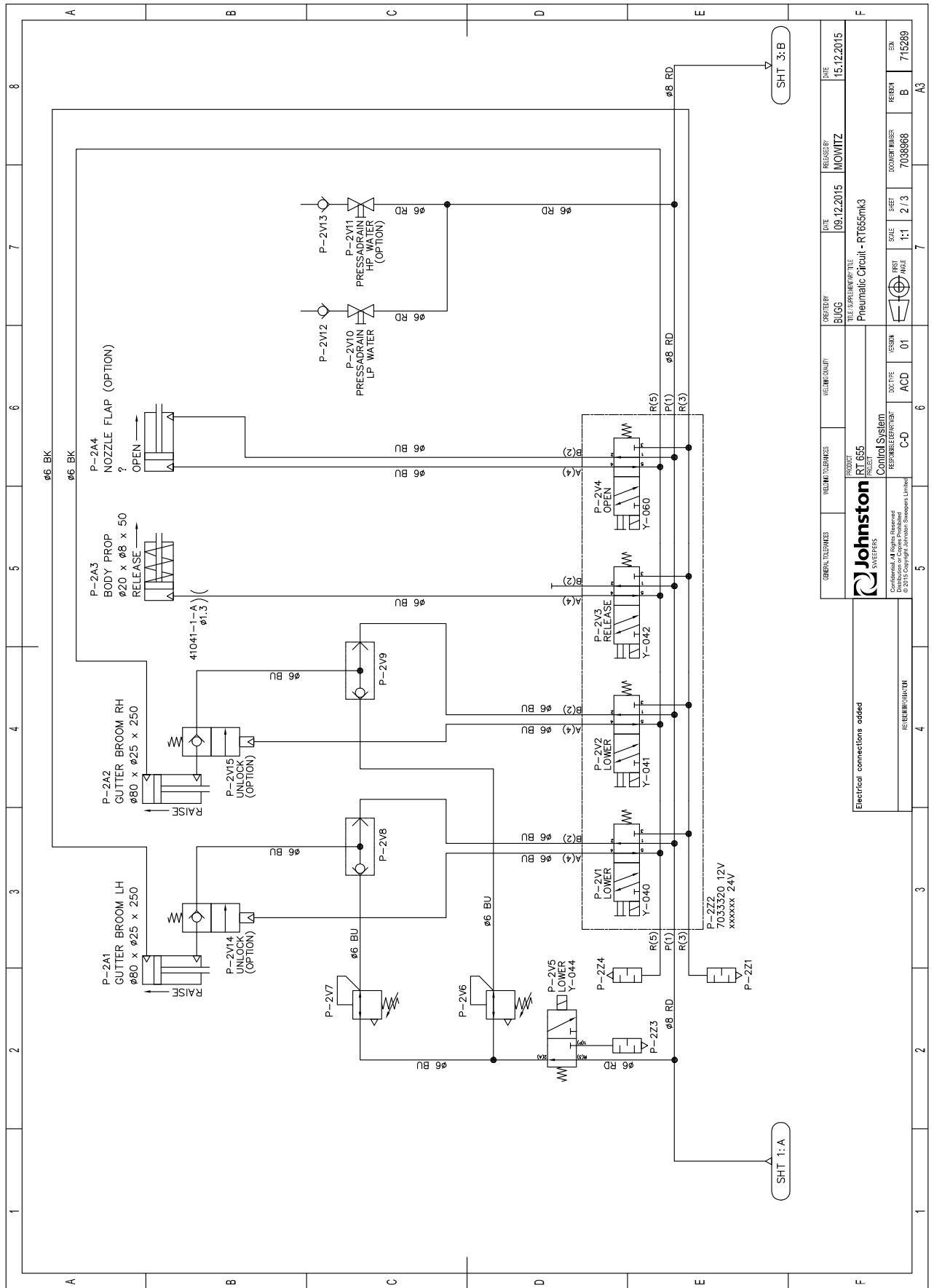
To replace a valve -

1. Remove solenoid and 2 screws (A) from problem valve
2. Fit new valve, ensuring any gaskets are in position
3. Connect solenoid
4. Test system electronically before a thorough test

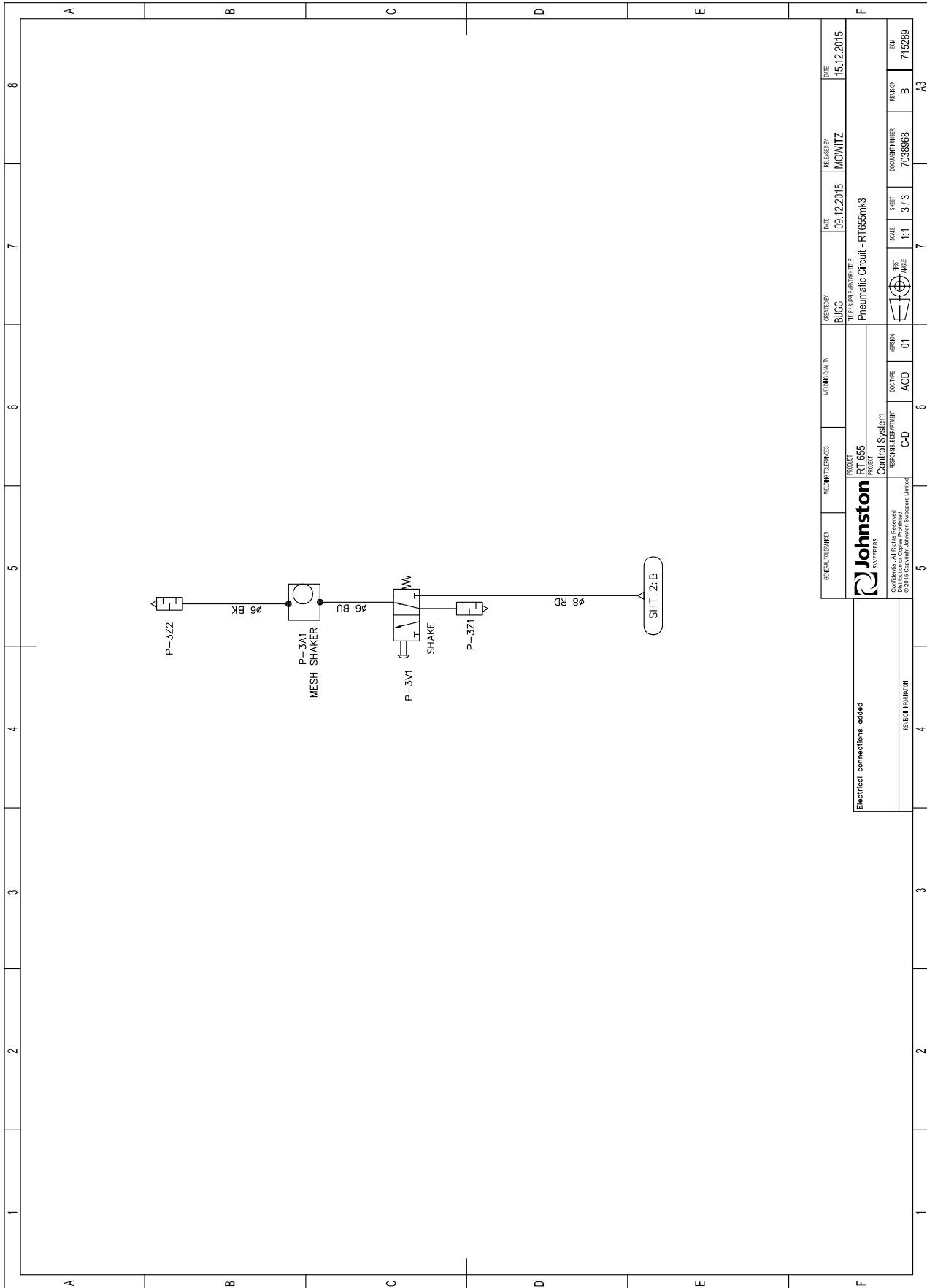
**Pneumatic System - Sheet 01/03 Rev B**




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<b>Johnston</b> SYSTEMS <small>Confidential. All Rights Reserved          © 2015 Copyright Johnston Swagelok Limited</small>			TITLE SUPPLEMENTARY TITLE Pneumatic Circuit - RT655mk3			
Electrical connections added REVISION/DESCRIPTION			PRODUCT RT 655 PROJECT Control System		SHEET 1 / 3	
REVISION/DESCRIPTION			DOC TYPE ACD 01		SCALE 1:1	
REVISION/DESCRIPTION			RESPONSIBLE DEPARTMENT C-D		DRAWING NUMBER 7038988	
REVISION/DESCRIPTION			RESON 01		REVISION B	
REVISION/DESCRIPTION			RESON 01		EDN 715289	

Pneumatic System - Sheet 02/03 Rev B



GENERAL TOLERANCES	VEHICLE TOLERANCES	VEHICLE QUANTITY	DATE	REVISION	DATE
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			10.12.2015	2	
			11.12.2015	3	
			12.12.2015	4	
			13.12.2015	5	
			14.12.2015	6	
			15.12.2015	7	
			16.12.2015	8	
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			17.03.2016	100	

**Pneumatic System - Sheet 03/03 Rev B**


GENERAL TOLERANCES		WELDING TOLERANCES		PRECISION QUALITY	OPERATED BY	DATE	RELEASED BY	DATE
					BUGG	09.12.2015	MOVITZ	15.12.2015
 Confidential. All Rights Reserved. © 2015 Copyright Johnston Sweepers Limited.		PRODUCT <b>RT 655</b>		TITLE SUPPLEMENTARY TITLE Pneumatic Circuit - RT655mk3				
Electrical connections added		RESPONSIBLE DEPARTMENT C-D		DOC TYPE ACD	REVISION 01	SCALE 1:1		SHEET 3 / 3
REVISIONS/NOTES				FIRST 		DOCKER NUMBER 7038988		REVISION B
								EDN 715289
								A3

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Intake Duct Flap	6 : 3
Wear Plate	6 : 4
Intake Duct	6 : 4
Flexible Intake and Blaster Trunkings	6 : 5
Intake Seat	6 : 5

**WEARING PARTS REPLACEMENT INSTRUCTIONS**

It is important that the following safety precautions are observed when working on the machines.

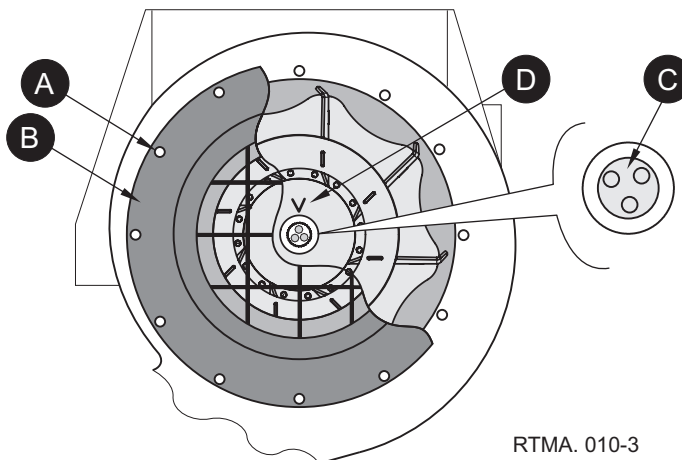
**Safety Precautions**

- Ensure the machine is standing on firm, level ground and there are no obstructions above or to the rear before raising the body.
- Ensure the safety prop is engaged at all times when working under the body.
- 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 or isolate the vehicle battery when working on the electrical system.
- Do not approach the fan inlet while the fan is running.
- Do not grasp any part of the engine or exhaust system without first ascertaining whether it has cooled sufficiently to avoid scalding.
- Be aware of the safety instructions relative to the suction fan given in the equipment maintenance notes.
- Keep hands, loose clothing, hair etc. well clear of moving parts.
- Do not climb on the engine walkways unnecessarily or approach the fan inlet whilst the engine is running.
- 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 inside the body.

**\* THE FANS FITTED TO OUR SWEEPERS ARE DYNAMIC COMPONENTS, WITH CONSIDERABLE INERTIA. THEY ARE ARGUABLY THE GREATEST SAFETY HAZARD ON THE SWEEPER, THEREFORE THEY SHOULD BE TREATED WITH RESPECT AT ALL STAGES OF HANDLING AND USE.**

**FAN IMPELLER \***

INSPECTION - This should be on a regular basis as outlined in the routine maintenance. The impeller should be replaced as soon as the blade thickness is less than 2mm or the blades have visible signs of wear/damage.



## REMOVAL

Raise the body and ensure the body prop is engaged in the rack.

Remove the fancase.

Before removing the fan impeller check for any lateral movement in a similar fashion to checking a wheel bearing. An excess of 2mm play would indicate wear in the gearbox bearing and would require overhaul/replacement.

Remove the 3 bolts under the securing tab washer in the centre of the fan on the VT, or one M12 setscrew/capscrew on the VS, The fan should slide off the spline - a bearing puller can be used if required.

## REFITTING

Refitting is the reverse procedure to removal.

Lightly grease the fan drive spline, using Kluer paste (JSL part number 94-24), before refitting the impeller using a new Tuflok Cap screws. Torque the 3 screws to 80 Nm (59 lbf. ft.).

All impellers have a "V" mark (D) at Top Dead Centre (TDC) applied when they are manufactured. When fitting a replacement impeller it should be rotated so this mark is at the 12 o'clock (TDC) position before the retaining bolts are tightened to the prescribed torque.

## IMPORTANT

- When replacing a fan impeller, always fit new securing screws. Never re-use existing hardware.
- Never use a second-hand or a non-Johnston fan.
- The fan impeller is supplied complete with the hub.  
Do not remove the hub or replace it, as the balancing will be adversely affected.
- Strictly adhere to the regular checking routines as outlined in the Johnston Operator's Guide.

Refit fan case inlet duct using sealant (part number 94-1), to the mating face, having first removed the old sealant.

## Refitting

Replacement is reverse procedure, taking note of the following.

Lightly grease the fan drive spline, using Kluber paste before refitting the impeller.

If setscrews are fitted replace with Tuflock Capscrews and torque up the three impeller securing bolts to 80 Nm.

**WEAR PLATE**

The wear plate is subject to aggressive abrasion and should be replaced when erosion makes it inappropriate to the task of protecting the body.

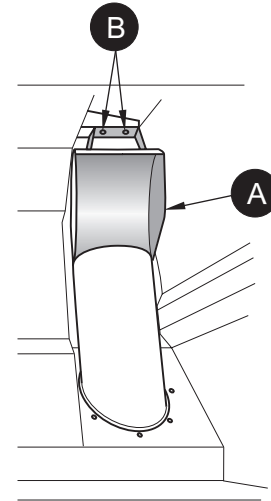
**REMOVAL**

Enter the body lowered and the rear door opened, enter the body. The wear plate is secured to the body by 2 screws. It is advisable to provide a suitable support or prop the wear plate before removing these screws to avoid the heavy wear plate dropping. Remove the wear plate.

**REFITTING**

Refitting is the reverse procedure to removal.

**Note:** Provision is made to allow positioning the wear plate to give optimum material loading. This is achieved by rotating the wear plate on the securing screw slots; a slight bias to the centre of the hopper is advised.



RTMA.009-2

**INTAKE DUCT**

The intake duct (A) is subject to aggressive abrasion. Inspect on a regular basis and replace when worn, before the duct is perforated.

**REMOVAL**

With the body lowered and the rear door opened, enter the body. Release the 3 screws (B) around the base of the intake duct.

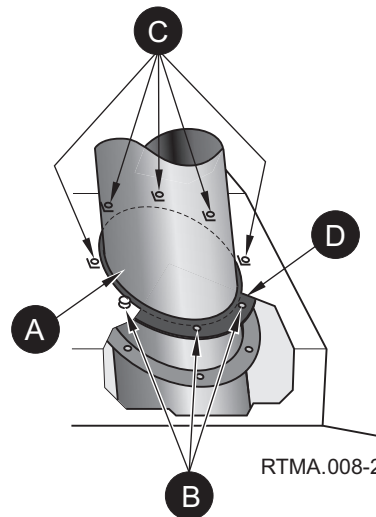
**Note:** A further 5 screws cannot be accessed from within the body, and the intake duct will still be secured with 3 screws removed.

Exit the body. Raise the body and ensure the prop is engaged.

Access and remove the 5 remaining screws (C) from the underside of the body and remove the intake duct.

**REFITTING**

Refitting is the reverse procedure to removal. Ensure seal (D) is in good condition, replace if necessary.



RTMA.008-2



## FLEXIBLE INTAKE AND BLASTER TRUNKINGS

The flexible trunkings are subject to erosion and should be regularly inspected for wear, damage and perforation.

### REMOVAL

Lower the pick-up hood.

**Intake trunking** - Release worm drive clip at top and quick release band at the bottom and remove the trunking.

**Blaster trunking** - Release the worm drive clips top and bottom and remove the trunking.

### REFITTING

Refitting the trunkings is the reverse procedure to removal. Ensure the trunkings are not twisted or rucked and do not foul on adjacent components when the pick-up hood is raised.

## INTAKE SEAT

### REMOVAL

Raise the body and ensure the prop is engaged.

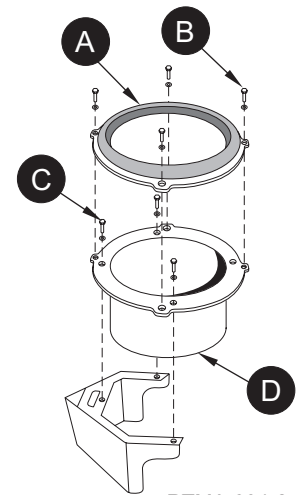
Release the trunking from the intake seat as described above.

Remove the intake seal and retainer (A) by unfastening the 4 screws (B) securing the retainer to the intake seat.

Remove the 3 countersunk screws (C) securing the intake seat to the support bracket and remove the intake seat (D).

### REFITTING

Refitting is the reverse procedure to removal.





## CHAPTER

## 7

## Remove and Refit Procedures

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Section	Pages
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Body Lift Cylinder	7 : 7

This section describes the removal and refitting of some of the major components on the machine. These are not routine jobs and should normally only need to be undertaken when overhauling or exchanging these units.



### Safety Precautions



The hinged prop stowed beneath the body **SHOULD BE USED AT ALL TIMES** to prop the body when carrying out any inspection, servicing or maintenance work beneath the body.

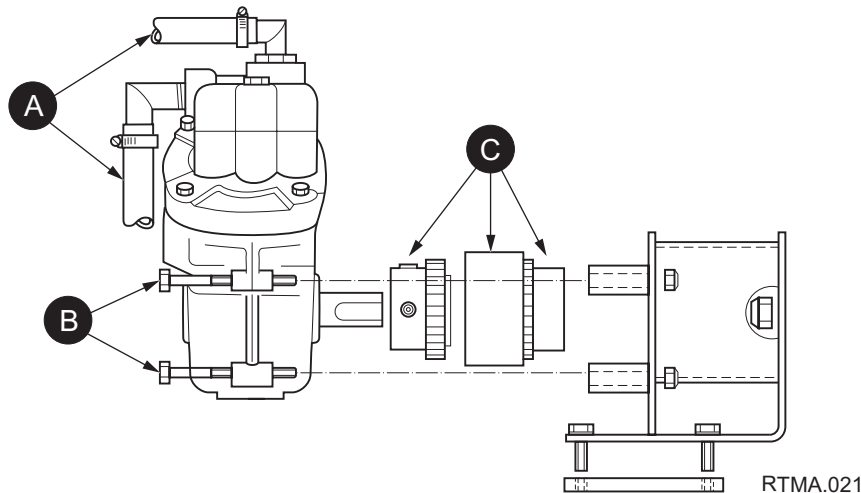
Disconnect the battery negative lead before undertaking any of the following operations on the auxiliary pack.

Isolate the air system at the filter regulator unit when working on the pneumatic system.

#### 1. WATER PUMP - DUST SUPPRESSION - Removal and Refitting

- 1 Isolate the water supply at the filter unit.
- 2 Disconnect the feed and pressure water pipes (A) to the pump.
- 3 Remove the 4 bolts (B) holding the water pump to the drive motor.
- 4 Withdraw the pump assembly from the drive coupling (C).
- 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.



RTMA.021



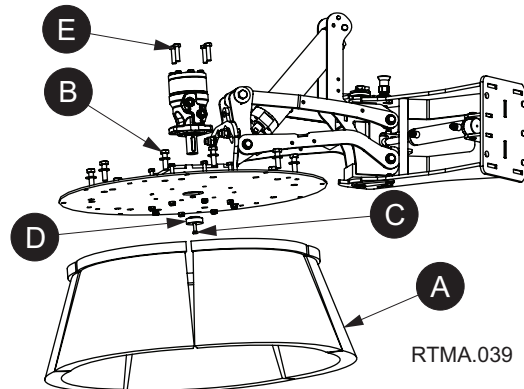
### Safety Notice



- The use of Needle stick gloves is recommended when working with this equipment

#### 2. GUTTER BROOM MOTOR - Removal and Refitting

- 1 Remove the brush segments (A).
- 2 Remove brush mounting plate 8 x M10 bolts (B).
- 3 Undo the centre retaining nut on motor shaft (C).
- 4 Pull off the drive plate (D).
- 5 Disconnect the motor hoses.
- 6 Remove 4 x M10 bolts and remove motor (E).
- 7 Refit procedure is the reverse of the above.

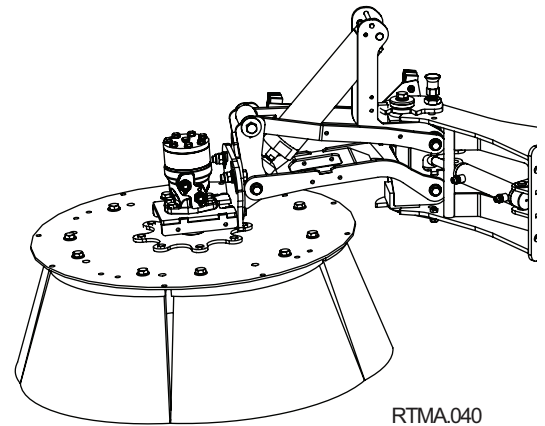


RTMA.039

**GUTTER BROOM - Upper and Lower Arms**

Removal

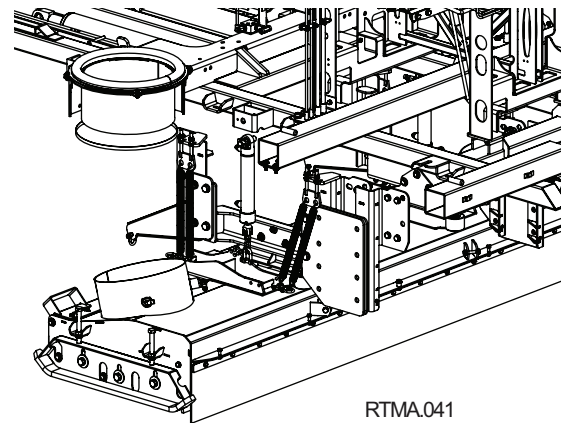
- 1 Release the pivot bolts on the arms at the brush motor head and pivot brackets. Note the position/location of the bearings and spacers.
- 2 The arm pivot bracket can be removed by unscrewing the top and bottom lug bolt and carefully drifting the pin out.



**3. PICK-UP HOOD - Removal and Refitting**

Removal

- 1 Remove front and rear safety chains from hooks.
- 2 Undo clips from nozzle trunkings.
- 3 Remove water pipes from pick-up hood.
- 4 Lower hood.
- 5 Remove nozzle trunkings.
- 6 Insert a pribar under the skid to raise hood so lift ram shackle can be removed - repeat on the other side.
- 7 Slide the hood out from underneath the machine - Note hood weighs 280 kg. (620 lbs).
- 8 Turn hood over with suitable lifting equipment to gain access to the rubber curtains.

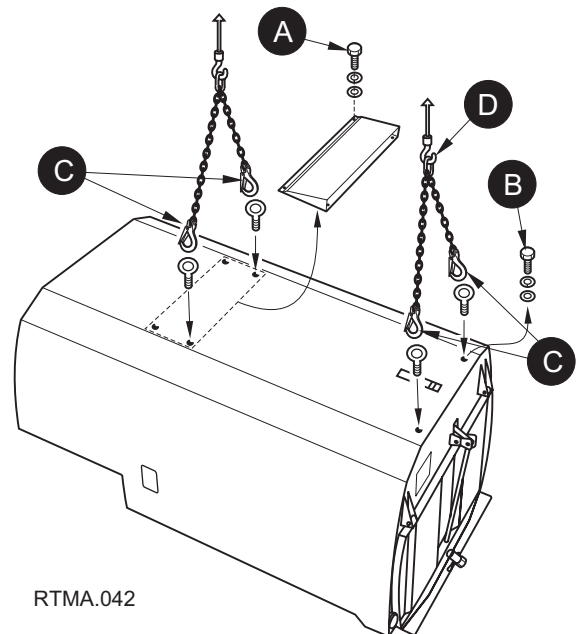


Refitting is a verse of the above procedure.

**4. LIFTING OR REMOVAL OF THE BODY**

If it is necessary to raise/remove the body four holes are provided, two at the front and two at the rear.

- 1 It is necessary to remove the retaining bolts (A) and remove the fan out cover.
- 2 Remove the two blanking bolts (B) at the body rear.
- 3 Insert the eye bolt item (C) part no. 422-1 into the M16 socket.
- 4 The body can be raised by the using the 4 eye bolts with suitable chains or web lifting straps (D).



**NB. The lifting eyes are not designed for lifting the skid unit, If this is required the appropriate discard beams should be used.**

**5. RADIATOR - Removal and Refitting**

- 1 Remove lower hose from water pump and direct flow of coolant into a suitable container.
- 2 Remove top hose from radiator.
- 3 Unscrew the four mounting screws and withdraw radiator from shroud.
- 4 Refitting is reverse of removal.

**6. HYDRAULIC PUMP - Removal and Refitting**

- 1 Remove both low and high pressure pipes from pump.
- 2 Remove the setscrews from the pump flange to timing case and remove pump.
- 3 Refitting is the reverse of removal. Apply a little grease, not sealant, to mating surfaces and fit a new gasket. Torque gear securing nut to 27 lb/ft.

**7. FAN IMPELLER - Removal**

Raise the body and ensure the prop is engaged.  
Remove the fan case inlet duct (12 screws).

**Note:** Before removing the impeller, check for any axial movement in a similar manner to checking an automotive wheel bearing. An excess of 2 mm play would indicate wear in the gearbox bearing and would require overhaul or replacement.

Remove the 3 bolts securing the fan impeller hub to the gearbox shaft in the centre of the fan. The fan should then slide off the splined shaft. A bearing puller (part number 437-2) can be used if required.

**8. FAN CASE - Removal**

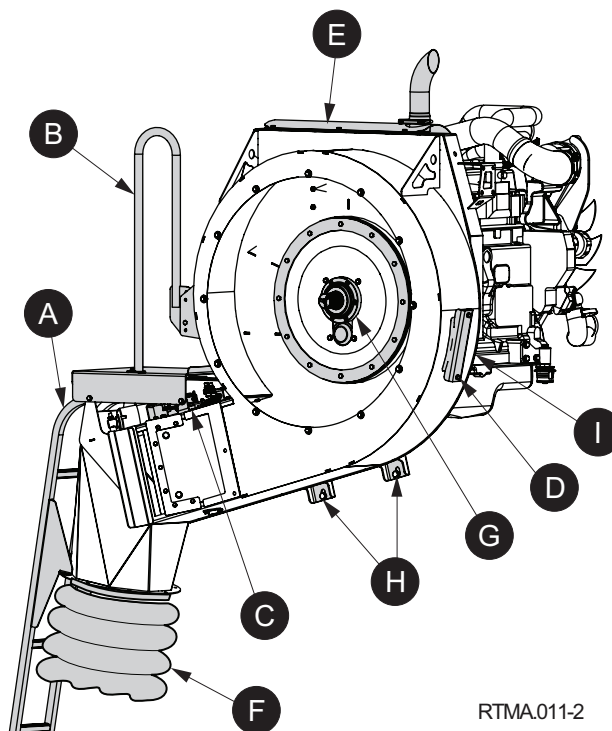
Carry out procedure for fan impeller removal.  
Remove the access ladder (A), walkway and grab handle (B).  
Disconnect electrical connections to VEG actuator and switches (C).  
Remove the screws securing the fuel bowl for the auxiliary engine from the right hand side of the fan case (D).

Disconnect the silencer assembly (E).

Disconnect the blaster trunking (F).

Remove the screws (G) holding the mask plate onto the gearbox.

Remove the 2 lower fan case mounting screws (H) - adjacent to the fuel tank and the 2 upper mounting screws (I) on the engine side of the fan case. Remove the fan case, an in-built lifting eye is provided.



RTMA011-2

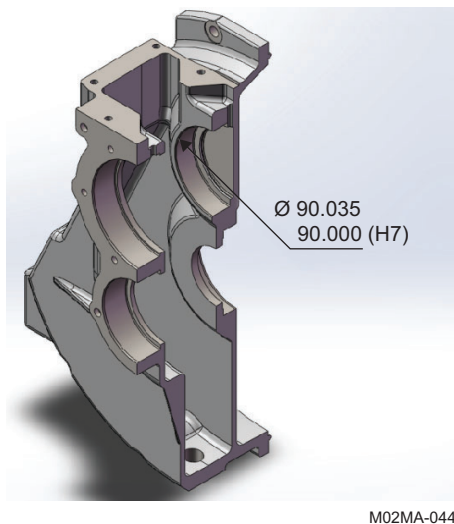
9 GEARBOX - Removal

Removal

1. Carry out procedures 7 and 8.
2. Drain fluid drive coupling as described in Chapter 6.
3. Remove the six setscrews securing the gearbox to the bell housing and the four bolts holding the two cover plates to the flywheel housing.
4. Withdraw the gearbox, supporting its weight so as not to damage the input shaft fluid drive coupling.

Repair / Overhaul

If it is proposed to carry out a repair or overhaul of the gearbox then it is important to check the following dimensions in respect to the bore supporting the output shaft.



In all cases maintenance of this gearbox should only be carried out by experienced and qualified personnel.

The integrity of the gearbox is reliant on the condition of the upper rear bearing housing. This bore needs to be checked and confirmed to be within the specified tolerances.

Note:

If the bore falls outside the tolerance of  $\text{Ø}90.000 - 90.035\text{mm}$  we recommend that the Gearbox is replaced.

10. FLUID DRIVE COUPLING - Removal

- 1 Carry out procedures 7, 8 and 9.
- 2 Remove the 20 socket head screws securing the coupling to the flywheel.
- 3 Insert M8 setscrews in the two blind extractor holes and tighten each half a turn at a time to ease the coupling from the flywheel.

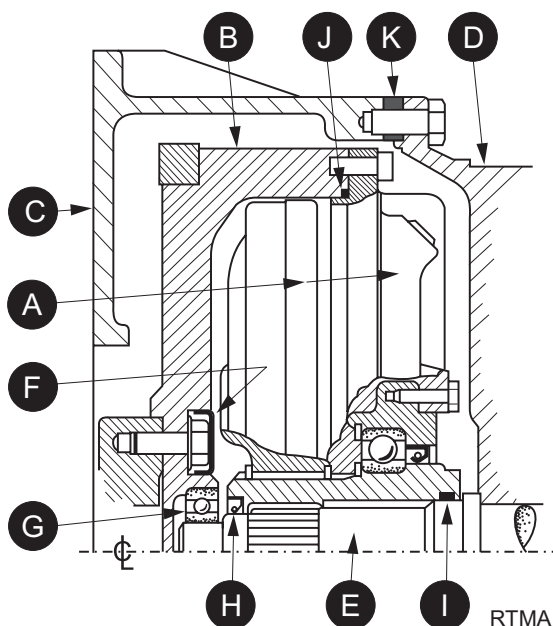


FIGURE 2 - FLUID DRIVE COUPLING AND FLYWHEEL (Procedures 6 to 9)

- A Fluid coupling.
- B Flywheel.
- C Bell housing.
- D Gearbox.
- E Gearbox input shaft.
- F Rubber cover if fitted. Part No. 221-3.
- G Gearbox support bearing.
- H Oil seal, Part No. 77-39.
- I 'O' ring, Part No. 656-2.
- J 'O' ring, Part No. 656-1.
- K Adaptor ring.

RTMA. 028

**11. FLYWHEEL - Removal**

- 1 Carry out procedures 7, 8, 9 and 10.
  - 2 Remove setscrews and withdraw the flywheel.
- 

**12. FLYWHEEL - Refitting**

- 1 Apply Loctite 510 between the crankshaft palm and the flywheel around the mounting holes. Also apply Loctite 275 onto the fixing bolts.
  - 2 Refit flywheel and torque retaining setscrews to 138 Nm.
  - 3 Replace the support bearing in the centre of the flywheel.
- 

**13. FLUID DRIVE COUPLING - Refitting**

- 1 Before fitting coupling, renew oil seal and 'O' rings (Items 8, 9 and 10, Figure 2).
- 2 Generously grease both 'O' rings and internal splines with Kluber Paste 46MR401, JSL Part No. 94-24.
- 3 Offer fluid drive to the flywheel ensuring bolt holes are in line. Push assembly together by hand, making sure not to trap and damage the large 'O' ring.
- 4 Refit the ring of M8 cap screws and tighten to a torque of 26 Nm (19 lbf.ft) on Perkins and Iveco engines.

**Note** - On the John Deere engines the capscrews are M6 and torqued up to 19 Nm.

---

**14. GEARBOX - Refitting**

- 1 Lightly grease splines on the input shaft with Kluber Paste, JSL Part No. 94-24.
  - 2 Some engine installations have an adaptor ring between the flywheel housing and the gearbox. (See Fig. 2, Item 11)
  - 3 Ease the gearbox onto the engine bell housing whilst rotating the output shaft. Use the securing setscrews to finally pull the gearbox up to the housing.
  - 4 Ensure the output shaft rotates freely after assembly.
  - 5 Refit the two side cover plates.
  - 6 At this point it is advisable to refill the fluid coupling and gearbox (if it has been drained) as described in Chapter 7 of this manual.
- 

**15. FAN CASE - Refitting**

Refitting is the reverse of removal described in Chapter 12, but when refitting the mask to the gearbox, ensure it abuts or is very close to the rubber diaphragm attached to the fan case. Apply stud lock to the mask retaining screws (G) before fitting.

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**16. FAN IMPELLER - Refitting**

See Chapter 6.

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**17. FAN CASE COVER - Refitting**

See Chapter 6. Apply flexible sealant on the mating surface to the fan case

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**18. EXHAUST SILENCER**

When refitting ensure the silencer is positioned so that the flexible joint on the inlet pipe is aligned in a straight line.

---

**19. FUEL TANK - Removal and Refitting**

## Removal

- 1 The RH intake seat and bracket need to be removed.
- 2 Drain the fuel tank and cap off the pipes and disconnect the sender plug.
- 3 Ensure all hydraulic hoses and electrical looms are clear of the tank.
- 4 Loosen the webbing clamps and remove the tank.

## Refitting

The reverse of the above procedure.

- NB:**
- a) Ensure the foam strip that the tank sits on is in good condition.
  - b) Refit webbing clamps loosely. Push tank up to the rear of the engine pack and tighten webbing adjuster so tank is held securely.

## Removal

- 1 Drain the water out of the tank.
- 2 Loosen and remove the various water pipe connections to the tank to be removed.
- 3 Disconnect the float switch loom connectors if fitted.
- 4 Remove the upper and lower connectors/hoses between the two tanks at the front of the machine.
- 5 Remove the work lamps (if fitted).
- 6a To remove LH tank undo the mounting plate with the valve block and oil cooler if Supawash is fitted.
- 6b To remove RH tank disconnect the output hose from the water filter. Unbolt the safety protection valve and the water manifold from the rear of the tank.
- 7 Undo the centre clamping bolt on the tank to be removed and lift the outer edge of the tank to clear the mounting frame.

## Refitting

Refitting is the reverse of the above procedure.

- NB:** Ensure the foam strip on the mounting frame is in good condition and carefully tighten the centre retaining bolt so the tank is held securely without deforming the plastic tank.
- 

**21. BODY LIFT CYLINDER - Removal and Refitting**

## Removal

- 1 Raise the body onto the first notch on the body prop.
- 2 Isolate the truck ignition.
- 3 Remove the 3 hydraulic hoses from the cylinder to be removed.
- 4 Support the cylinder and remove the end pins.
- 5 Lower the cylinder down from the chassis.

## Refitting

The refit procedure is the reverse of the above.

- NB:** Lubricate the cylinder mounting pins with grease when refitting.
-



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**CHAPTER****8**

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**Fault Diagnosis****Table of Contents**

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**HYDRAULIC SYSTEMS**

<b>FAULT SYMPTOM</b>	<b>POSSIBLE CAUSE</b>
Hydraulic oil frothing	<ol style="list-style-type: none"><li>1. Air getting into system. Check LP pipe to pump.</li><li>2. Defective pump shaft seal.</li><li>3. Hood lift/channel brush cylinder seals defective.</li><li>4. Return pipe separated from underside of return filter inside hydraulic tank.</li></ol>
Sluggish hydraulics	<ol style="list-style-type: none"><li>1. Cartridge valve not travelling full extent - measure oil flow.</li><li>2. Blocked filters.</li><li>3. Air in oil.</li></ol>

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**PNEUMATIC SYSTEMS**

<b>FAULT SYMPTOM</b>	<b>POSSIBLE CAUSE</b>
Low pressure warning buzzer on continuously	<ol style="list-style-type: none"><li>1. Air pressure switch faulty.</li><li>2. Insufficient pressure in Johnston system.</li></ol>
Constant air leak from solenoid block	<ol style="list-style-type: none"><li>1. Cylinder seals leaking internally.</li><li>2. Air solenoid faulty.</li></ol>

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**WATER SYSTEMS**

<b>FAULT SYMPTOM</b>	<b>POSSIBLE CAUSE</b>
Jet continuously leaking	<ol style="list-style-type: none"><li>1. Grit under armature seating.</li><li>2. Armature stuck open.</li><li>3. Manual override on.</li></ol>
No water to wash down hose or jets	<ol style="list-style-type: none"><li>1. Water pump filter blocked.</li><li>2. Water tank filter blocked.</li><li>3. Check hydraulic motor is turning.</li><li>4. Drain tap on filter open.</li><li>5. Filter isolation valve closed.</li><li>6. Filter assembled incorrectly</li><li>7. Pump valves fitted incorrectly after overhaul.</li></ol>
Lack of pressure	<ol style="list-style-type: none"><li>1. Grit under relief valve seating.</li><li>2. Relief valve spring broken.</li><li>3. Relief valve stuck open.</li><li>4. Relief valve worn.</li></ol>

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**ELECTRICAL SYSTEM**

<b>FAULT SYMPTOM</b>	<b>POSSIBLE CAUSE</b>
Beacon not working	<ol style="list-style-type: none"> <li>1. Check vehicle ignition is on.</li> <li>2. Check beacon bulb/motor.</li> <li>3. Check feed to beacon.</li> <li>4. Check earth wire.</li> <li>5. Check fuse No. 1 for front. Fuse 2 for rear.</li> <li>6. Check switches.</li> </ol>
Work lights not working	<ol style="list-style-type: none"> <li>1. Check vehicle ignition is on, ignition switch V is on.</li> <li>2. Check bulb.</li> <li>3. Check feed to light.</li> <li>4. Check earth wire.</li> <li>5. Check fuse No. 3.</li> <li>6. Check switch H1 or H2 illuminated.</li> </ol>
Pick-up hood fails to lower	<ol style="list-style-type: none"> <li>1. Check feed to solenoid/Plug LED NL.</li> <li>2. Check solenoid.</li> <li>3. Check earth wires.</li> <li>4. Check fuse No. 4.</li> <li>5. Check switch.</li> </ol>
Channel brush fails to lower	<ol style="list-style-type: none"> <li>1. Check feed to solenoid/Plug LED V1 or V2 &amp; V3 or V4.</li> <li>2. Check solenoid.</li> <li>3. Check earth wires.</li> <li>4. Check fuse No. 4.</li> <li>5. Check switch.</li> </ol>
Channel brush fails to rotate	<ol style="list-style-type: none"> <li>1. Check feed to solenoids/Plug LED (see Modus Operandi).</li> <li>2. Check solenoid.</li> <li>3. Check earth wire.</li> <li>4. Check fuse No. 4.</li> <li>5. Check switch.</li> </ol>
Channel brush water fails to operate	<ol style="list-style-type: none"> <li>1. Check feed to solenoid/Plug LED's W03/W08.</li> <li>2. Check solenoid for operation/obstruction.</li> <li>3. Check earth wire.</li> <li>4. Check fuse No. 4.</li> <li>5. Check wide sweep brush hydraulics.</li> </ol>
Pick-up hood water solenoid fails to operate	<ol style="list-style-type: none"> <li>1. Check feed to solenoid/Plug LED W04.</li> <li>2. Check solenoid for operation/obstruction.</li> <li>3. Check earth wire.</li> <li>4. Check fuse No. 4.</li> <li>5. Check switch.</li> </ol>

**SUCTION SYSTEM****FAULT SYMPTOM****POSSIBLE CAUSE**

No pick-up performance

1. Hopper full, causing airflow to be throttled - discharge load.
2. Pick-up hood trunking blocked or restricted by debris.
3. Check the pick-up hood water jets are not blocked, are working correctly and lubricating the intake duct.

Poor pick-up performance

1. Pick-up hood trunking partially restricted by debris. Check nozzle water jets are working correctly and so lubricating the duct.
2. Channel brush incorrectly set, not directing debris in line with nozzle.
3. Rear body meshes or SepaVac blocked or restricted.
4. VEG gate incorrectly set.
5. Low oil level in fluid flywheel.
6. Engine is not running at correct operational speeds. Check fuel filter or air filter blocked causing a restriction.

**AUXILIARY ENGINE**

<b>FAULT SYMPTOM</b>	<b>POSSIBLE CAUSE</b>
Auxiliary engine fails to turn over	<ol style="list-style-type: none"> <li>1. Check truck ignition is on.</li> <li>2. Check battery and connections.</li> <li>3. Check ignition switch.</li> <li>4. Check starter motor.</li> </ol>
Auxiliary engine starts but will not accelerate	<ol style="list-style-type: none"> <li>1. Check throttle cable is not broken/jammed.</li> <li>2. Check feed to actuator.</li> <li>3. Check fuse No. 8.</li> <li>4. Check switch.</li> </ol>
Auxiliary engine turns over but will not start	<ol style="list-style-type: none"> <li>1. Check fuel tank.</li> <li>2. Check electric feed to engine injector shut off fuse 8.</li> <li>3. Check injector shut off valve.</li> <li>4. Check fuel lines for loose connections.</li> <li>5. Check oil pressure sender and connections.</li> <li>6. Check water temperature sender.</li> <li>7. Bleed fuel system.</li> </ol>
Auxiliary engine runs but stops after 8 seconds	<ol style="list-style-type: none"> <li>1. Check engine oil pressure is above 0.5 bar.</li> <li>2. Oil pressure switch faulty.</li> </ol>

**AUXILIARY ENGINE ELECTRICS AND SHUT DOWN SYSTEM**

<b>FAULT SYMPTOMS</b>	<b>POSSIBLE CAUSE</b>
Oil pressure warning light not illuminated when ignition on engine stopped	<ol style="list-style-type: none"> <li>1. Check fuse No. 7.</li> <li>2. Check feed to oil pressure switch.</li> <li>3. Check earth wire.</li> <li>4. Check bulb.</li> </ol>
Water temperature	<ol style="list-style-type: none"> <li>1. Unit overheated.</li> <li>3. Blocked radiator.</li> <li>4. Check temperature sender if engine fails to shut down.</li> </ol>
ESOS electric failure	<ol style="list-style-type: none"> <li>1. Check fuse No. 8.</li> <li>2. Check oil pressure switch.</li> <li>3. Check water temperature switch.</li> <li>4. Check feeds to ESOS.</li> <li>5. Check ESOS valve.</li> </ol>

**PICK-UP HOOD**

<b>FAULT SYMPTOM</b>	<b>POSSIBLE CAUSE</b>
Bouncing	<ol style="list-style-type: none"><li>1. Spring regulation adjustment incorrect.</li><li>2. Brush stock bent.</li><li>3. Linkage pins/brackets worn/damaged.</li><li>4. Air damping system not working.</li></ol>
Not dropping	<ol style="list-style-type: none"><li>1. Check feed to solenoid/Plug LED V1 or V2.</li><li>2. Switch on control box faulty.</li></ol>
Lifts intermittently	<ol style="list-style-type: none"><li>1. Faulty or loose electrical connections while in working mode.</li></ol>

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**CHANNEL BRUSH / GUTTER BROOM**

<b>FAULT SYMPTOM</b>	<b>POSSIBLE CAUSE</b>
Brush slows down after	<ol style="list-style-type: none"><li>1. Hydraulic pump worn.</li><li>2. Channel brush worn.</li><li>3. Check hydraulic pressure for fault diagnosis.</li></ol>
Works intermittently	<ol style="list-style-type: none"><li>1. Check switch in control panel and looms for loose connections.</li></ol>
Brush fails to lift	<ol style="list-style-type: none"><li>1. Check for electrical power at solenoid/Plug LED V1 or V2.</li><li>2. Check pneumatic solenoid for correct operation.</li><li>3. Seals in cylinder leaking.</li></ol>



**BODY TIP****FAULT SYMPTOM****POSSIBLE CAUSE**

Rear door will not open

1. Check handbrake is on.
2. Check ignition switch V is illuminated.
3. Check green safety run button is pressed on pendant unit.
4. Check pendant unit has not become unplugged.

Body will not tip

1. Ensure handbrake is on.
2. Ensure master switch V is on (illuminated).
3. Check feed to solenoids/Plug LED.
4. Check green safety run button is pressed on pendant unit.
5. Check pendant unit has not become unplugged.



CHAPTER

9

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**Service Tools**

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The following tools are available through our Spares Network

<b>TOOL NO</b>	<b>ITEM</b>	<b>FUNCTION</b>
437-2	Bearing Puller	Removal of fan impeller bearings etc
437-3	Pressure Gauge Set	Measure hydraulic, pneumatic and water pressures
437-4	Optical Tachometer	Measure fan rpm
437-7	0-55 Litres/Min Flow Gauge	Hydraulic flows
437-8	Impulse Adaptor	Connects to 437-4 to measure engine speeds from fuel injection pipes
437-9	D-TEC Programme (PPU)	For calibration on D-TEC Units
437-11	Check valve insertion tool	To fit check valve 421-278
437-311	Nylon Tube Cutter	Ø4 - Ø16mm
422-1	Body Eye Bolt	Raising/lifting of body
7028665	ESU Unpacking Control Unit 12v (501, 651 & 801)	Rear door control enables ESU's to be unpacked
7021548	ESU Unpacking Control Unit 24v (501, 651 & 801)	Rear door control enables ESU's to be unpacked
7030357	ESU Unpacking Control Unit 12v (501, 651 & 801)	Rear door and body control enables ESU's to be unpacked

# CHAPTER 10

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## 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:**

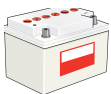
Anti-freeze may be absorbed through the skin in toxic or harmful quantities.

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.

